Large scale energy storage

CryoHub

Developing Cryogenic Energy Storage at Refrigerated Warehouses as an Interactive Hub to Integrate Renewable Energy in Industrial Food Refrigeration and to Enhance Power Grid Sustainability

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691761.

Deliverable D8.2
Energy Profile Report for EU Member States

Deliverable Information
Dissemination : Public
Nature : Report
Contractual Delivery Date : 31/03/2018
Actual Delivery Date : 24/09/2018

Scientific coordinator : Prof. J.Evans
London South Bank University, UK
e-mail : j.a.evans@lsbu.ac.uk

Document Information

Project	: CryoHub
Document	: D8.2
Filename	: D08.02 Report on Energy Profiles S1.docx
Last saved on	: 24/09/2018 20:37 by Jacques BERTRAND

Authorship and Review

	Name (Organisation)	Approval Date
Written by	Carole Bond (CDR) Paola Mazzuccelli (EUREC)	
For review by	Judith Evans (LSBU)	24/09/2018

Release Details

Release	Date	Comments
Release 01	13/08/2018	First release for approval by Coordinator
Submitted	24/09/2018	Submitted to the Commission

Distribution List

- On the project Portal
- On the CryoHub Intranet (http://cryohub.psutec.com/)

Table of Contents

1. Executive summary

The purpose of this report was to provide an analysis of EU member states' energy supply profiles and carbon footprints, installed RE supply & capacity and renewable energy economic, regulatory and policy drivers.

Production and consumption profiles were prepared for all the EU28 Member State countries. More in-depth energy profiles were assembled and analysed for a sub-group of 15 member state focus countries, selected on the basis of work carried out in work packages 2 and 3, which established countries where analysis for the potential introduction of CryoHub technology could be most usefully focused. These more comprehensive profiles additionally considered progress against renewable energy targets and policy barriers, enablers and recommendations.

Broader trends with the potential to impact CryoHub were also examined including global agreements, forthcoming EU legislation, EU renewable energy generation trends and developments in energy storage.

An analysis of barriers to the development of renewable energy sources (RES) revealed key themes and sub-themes, which were experienced by a number of the focus countries. These included:

- Lack of coherence, unity and certainty in national RES policy-making
- Unstable and unpredictable political/legislative climate
- Poor access to finance and investment
- Uncertainty, instability and retroactive adjustment of support schemes
- Support schemes unbalanced
- Lengthy, complex and costly grid connection processes and uncertain contracts
- Insufficient grid capacity and grid infrastructure investment
- Lack of certainty or compensation for curtailment conditions
- Lack of coordination between national and legal planning and permitting authorities
- Complex and costly planning and authorisation procedures
- Competing public interests in spatial planning especially military and civil aviation radar and radio infrastructure installations
- Lack of clarity regarding the future design of the electricity market
- Negative public perception of RES and political demonisation of producers
- Increasing local opposition and appeals against permits

The analysis also highlighted examples of good practice amongst the focus countries that could be usefully shared.

It was noted in the conclusions that there were a number of EU energy drivers that had implications for the developmental success of CryoHub technology. These included

- The drive for energy security and independence from energy imports boosting domestic development of renewable energy schemes
- The EU wide clean energy package - focussing on delivering the stable legislative framework needed to facilitate the clean energy transition and on achieving the Paris Agreement commitments
- Existing, legally binding member state targets for RES (20% by 2020) and GHG emission reduction working in concert, and the potential of future 'stretch' targets for RES of 32% by 2030
- Renewable energy trends anticipating ongoing growth in variable RES

- Planned investment in energy infrastructure to allow for integration of more RES into the power system
- The development and integration of energy storage as a key element of both the recast Renewable Energy Directive (REDII) and the Market Design Initiative (MDI)

Whilst it became clear that opportunities for the potential development of CryoHub technologies are apparent in a number of the focus countries, this was tempered by the understanding that that not only do attitudes to variable RES vary, both politically and socially from country to country, but in many cases RES support mechanisms, markets and infrastructure are also undergoing transition making development pathways, in the short term at least, less certain. This has implications for the ongoing development of market strategies, policies and business models.

2. Context

2.1. CryoHub overview

The CryoHub innovation project will investigate and extend the potential of large-scale Cryogenic Energy Storage (CES) and will apply the stored energy for both cooling and energy generation. By employing Renewable Energy Sources (RES) to liquefy and store cryogens, CryoHub will balance the power grid, while meeting the cooling demand of a refrigerated food warehouse and recovering the waste heat from its equipment and components.
The variable supply is a major obstacle to the RES power market. In reality, RES are fickle forces, prone to over-producing when demand is low and failing to meet requirements when demand peaks. Europe is about to generate 20% of its required energy from RES by 2020, so that the proper RES integration poses continent-wide challenges.
The CES, and particularly the Liquid Air Energy Storage (LAES), is a promising technology enabling on-site storage of RES energy during periods of high generation and its use at peak grid demand. Thus, CES acts as Grid Energy Storage (GES), where cryogen is boiled to drive a turbine and to restore electricity to the grid. To date, CES applications have been rather limited by the poor round trip efficiency (ratio between energies spent for and retrieved from energy storage) due to unrecovered energy losses.
The CryoHub project is therefore designed to maximise the CES efficiency by recovering energy from cooling and heating in a perfect RES-driven cycle of cryogen liquefaction, storage, distribution and efficient use. Refrigerated warehouses for chilled and frozen food commodities are large electricity consumers, possess powerful installed capacities for cooling and heating and waste substantial amounts of heat. Such facilities provide the ideal industrial environment to advance and demonstrate the LAES benefits.
CryoHub will thus resolve most of the above-mentioned problems at one go, thereby paving the way for broader market prospects for CES-based technologies across Europe.

2.2. Overview of Work Package 8 – Market barriers and strategies

Contextual factors form the basis of the regimes in which we operate and which we seek to change. These fundamentally non-technical aspects need to be recognised and attended to in order to develop and realise the potential of any technological change. Contextual activities

typically take place in the individual, interpersonal, social, cultural, organisational, commercial, financial, economic, policy and regulatory spheres.
Previous work with the cold storage industry has demonstrated the important influence that contextual issues such as individual and organisational attitudes and behaviours, as well as cultural and market conditions, can have on the adoption of low carbon technologies and energy efficient practices. Non-technical barriers and enablers to technological change have been identified, which have then informed the development of strategies designed both to remove or overcome the blockages and encourage and diffuse any helpful practices.

Building on this knowledge, this work package has two key objectives:

- to investigate and identify the non-technical, contextual barriers and enablers to the refrigerated warehouse and food processing sector in realising the low carbon potential of CryoHubs (defined here as cold energy storage systems that integrate renewable energy sources with liquid air energy storage).
- to examine the role that alternative business strategies and models have to play in delivering transformative CryoHub technology and in increasing its market uptake.

2.2.1. Purpose of deliverable

The purpose of this deliverable (8.2) is to provide an analysis of EU member states' energy supply profiles and carbon footprints, installed RE supply & capacity and renewable energy economic, regulatory and policy drivers.

3. Member State energy profiles

3.1. Scope & methodology

3.1.1. Country focus

Production and consumption energy profiles have been prepared for all EU28 Member State countries for this report. However the profiles of the key countries identified in the WP2 reports as having the most potential for adopting CryoHub technology ie where there is a concentration of warehouses of appropriate size and where there are concentrations of renewable energy sources, have been prepared in more detail and analysed in more depth. The rationale for this selection of these key focus countries is as follows:

- The D2.1 Report on refrigerated facility mapping survey outlined that the highest concentration of refrigerated food warehouses with estimated power consumption exceeding 500kW exists in Benelux, southern England, northern France and northern Germany.

- The D2.2 Report on mapping of renewable energy sources stated that clear concentrations of interesting renewable sites (both wind and PV) in EU28 exist in Germany and Benelux, in the Northern block (Ireland and UK), as well as in the Mediterranean area with a focus on Spain.
  In particular, solar PV installations are spread all over Europe, but with an important

presence in Spain, Germany, South of France, Italy, Bulgaria, Greece, and the UK. Whilst wind installations are more geographically concentrated in Germany, Benelux, Spain, Portugal, UK, Ireland, France, and Sweden.
The report recommended that those countries with an important share (> 50%) of variable renewable energies ie Belgium, Denmark, Germany, Greece, Ireland, Spain and the UK would be a good focus for further analysis regarding the potential introduction of the CryoHub technology along with Estonia, Lithuania, The Netherlands who are almost achieving 50%.

- The D2.3 Report on potential opportunities for CryoHub in Europe – commented further that the potential for the use of CryoHub at those facilities of both appropriate size and proximity to RE sources depended on a number of other factors including the overall technology level and economic development in a country or region, rather than just on the demand for food storage. Additionally factors, such as population growth, migration and urbanisation processes, dietary habits (e.g. increase use of ready-to-eat and chilled foods), also have a major influence.

For the purposes of this analysis therefore, the focus has been on the following countries' profiles and these have accordingly been prepared, analysed and compared in more detail.

Focus countries		
Belgium	Germany	Netherlands
Bulgaria	Greece	Portugal
Denmark	Ireland	Spain
Estonia	Italy	Sweden
France	Lithuania	UK

3.1.2. Profile structure

Each energy profile is made up of up to four sections. The contents that can be found in each section are outlined below along with the information sources used to compile them. Energy profiles of the focus countries have been complied using all four sections and these can be found in Appendix I. Production and consumption (section 1 only) profiles of the remaining member state countries have also been prepared and can be found in Appendix II.

Section 1
Production and consumption statistics are included, where available, for the years 1990, 2000, 2010, 2013, 2014, 2015, 2016.

Production statistics
Energy production total (Mtoe)
% Energy dependence all products
Primary production of renewable energy by type
Primary production of RE – wind
Primary production of RE – solar PV
Sources: EU Energy Statistical Pocketbook 2016/Eurostat/European Environment Agency

Consumption statistics
Final energy consumption (Mtoe)

Energy per capita (kgoe/cap)
Share of RE in gross final energy consumption combined (%)
Share of RE in gross final energy consumption electricity (%)
Greenhouse gas emissions (CO_2 equivalent)
Sources: EU Energy Statistical Pocketbook 2016/Eurostat/European Environment Agency

Section 2
National Renewable Energy Progress 2013-14
% contribution from RE sources from all sources
% contribution from RE sources from electricity
Gross final consumption of electricity from RES (Ktoe)
Gross total energy from RE consumption (Ktoe)

Contribution towards electricity from installed capacity & gross generation from RES (MW):
Solar PV
Wind onshore
Total wind (inc offshore)
Sub-total variable sources
Total all sources (inc hydro, tide/wave/ocean, waste & biomass)

Overview of relevant policies and measures including:
Financial support regimes
Other funding & grants to encourage deployment and innovation
Planning related measures
Unblocking barriers
Source: individual country deployment progress reports

Section 3
Analysis of deviations and barriers in NREAP reports including:
Political & economic framework
Employment
Market structure
Grid related issues
Administrative processes
Source: EU Keep on Track Deviations and Barriers Analysis 2015

Section 4
Policy recommendations
Overall
Electricity sector
Source: EU Keep on Track Policy Recommendations Report 2015

4. Analysis of key CryoHub statistics and drivers from energy profiles

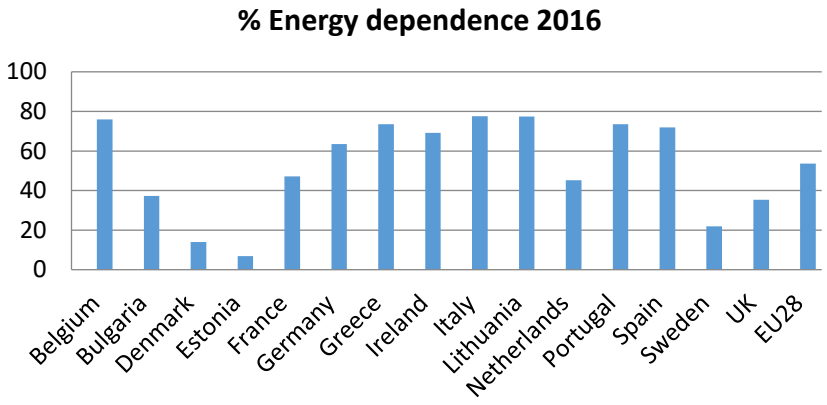
This section analyses the key statistics relevant to CryoHub from the energy profiles and considers the drivers for CryoHub technology. It looks at where these drivers are currently present or where their absence may hinder the deployment of CryoHub technology or be an active barrier to it. The section draws from the information contained in the member state

profiles in this report, and also linked CryoHub reports from WP 2, 3 and 8, to illustrate the wide range of drivers that have an influence on the potential uptake of CryoHub technology.

4.1. Statistical analysis

4.1.1. Energy dependence

Energy dependency shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. The relative energy dependence in 2016 of each of the focus countries is shown in the graph below along with the average across the EU.



Source: Eurostat (last updated) 14.02.2018

The dependency of the EU on energy imports, particularly oil and gas, forms the backdrop for policy concerns relating to the security of energy supplies. As a result of the shortfall between production and consumption, the EU is increasingly dependent on energy imports from non-member countries. In fact more than half (53.6 %) of the EU-28's gross inland energy consumption in 2016 came from imported sources.

Primary energy production in the EU28 in 2016 was spread across a range of different energy sources, the most important in terms of contribution size being nuclear energy (28.7 % of the total). The significance of nuclear energy was particularly high in France, Belgium and Slovakia, although elsewhere it was less than half of the total, and made no contribution at all in half of the EU Member States. Germany has announced plans to close all nuclear reactors by 2022.

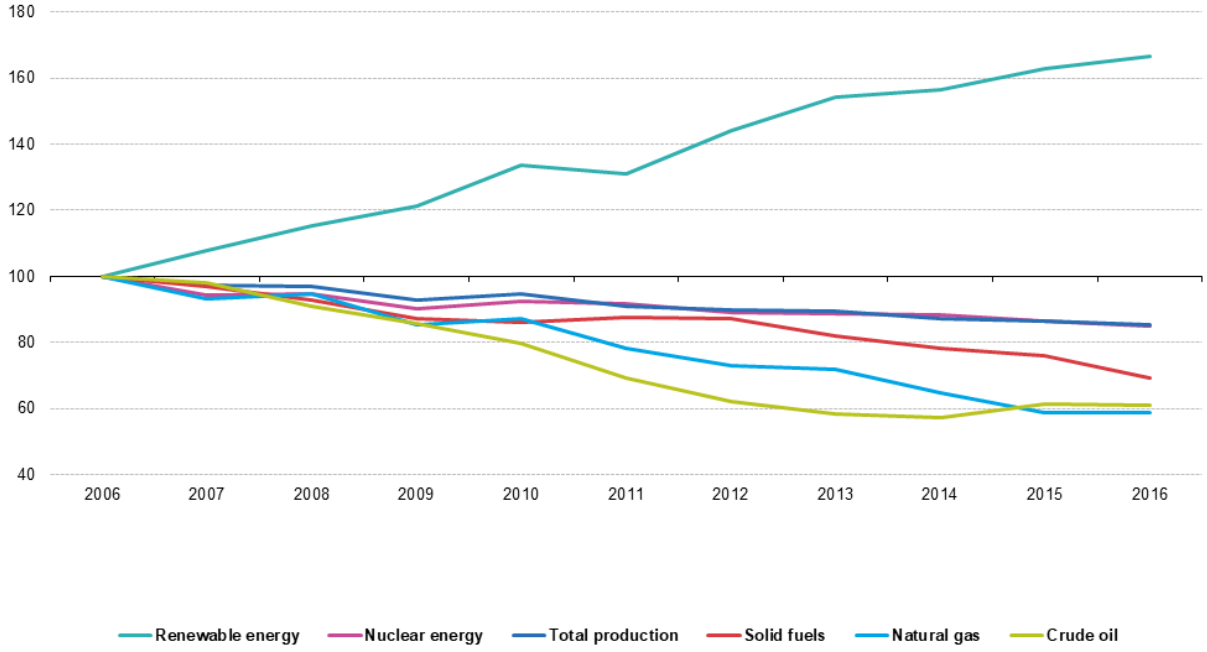
In the same year, more than one quarter (27.9 %) of the EU-28's total production of primary energy was accounted for by renewable energy, while the share for solid fuels (17.5 %,) was just below one fifth and for natural gas was (14.2 %) and crude oil (9.8 %).

As illustrated in the following graph, the growth of EU-28 primary production from renewable energy sources exceeded that of all the other energy types; this growth was relatively uniform during the period covering 2006-2016. Over this 11-year period the production from renewables increased by 66.5 %, replacing, to some degree, the production of other sources of energy.

By contrast, the production levels for the other sources fell, the largest reductions being recorded for natural gas (-41.2 %), crude oil (-39.0 %) and solid fuels (-30.8 %), with a more modest fall of 15.2 % for nuclear energy

Development of the production of primary energy (by fuel type)

EU-28, 2006-2016 (2006 = 100, based on tonnes of oil equivalent)

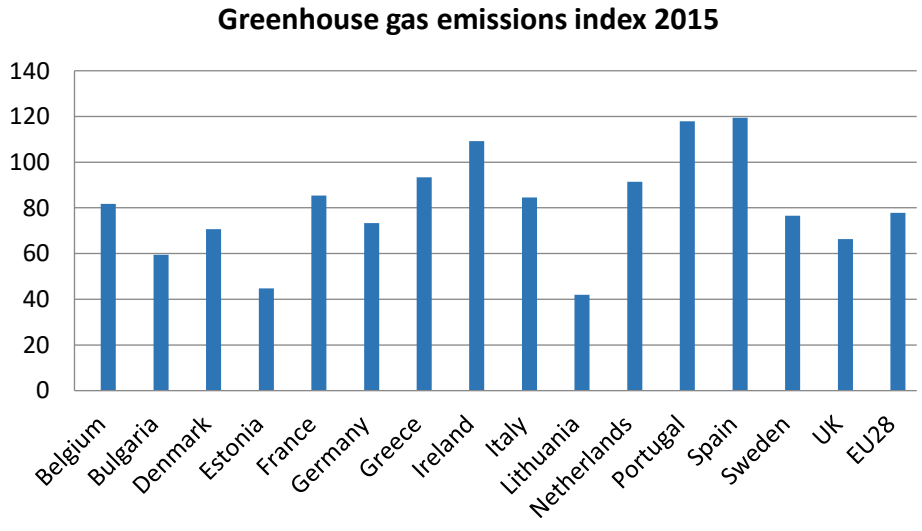


Source: Eurostat

4.1.2. Greenhouse gas emissions

The following graph shows the 2015 greenhouse gas emission index figure for each focus country indicating how they are currently performing against the overall EU target of at least 40% greenhouse gas emissions compared to 1990 levels by the year 2030.

The index performance figures speak to each country's energy efficiency achievements. A number of the focus countries' index figures are well above the EU28 average, notably Ireland, Portugal and Spain.



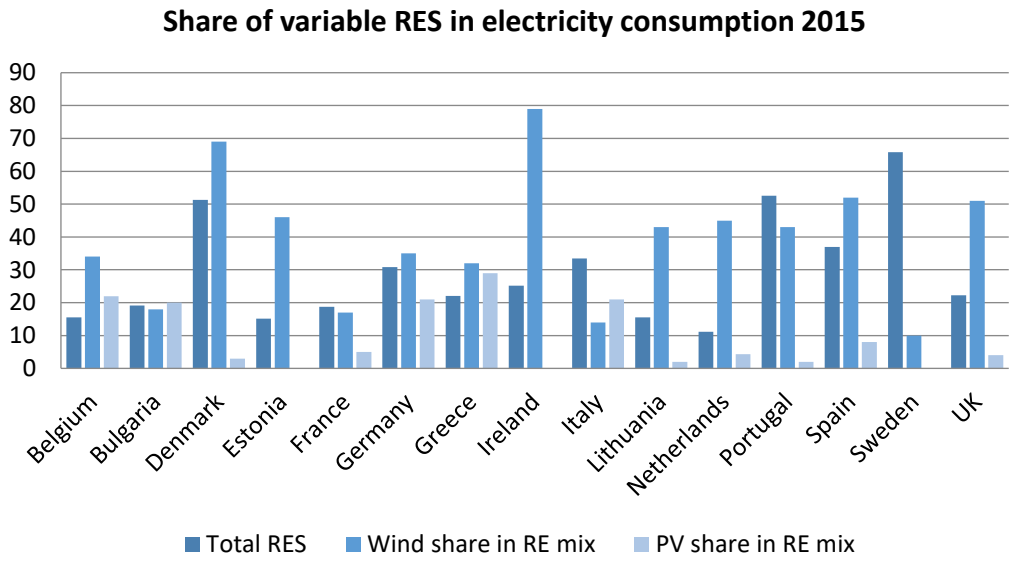
Source: Eurostat 2015

4.1.3. Contributions from variable renewable energy sources to electricity consumption

Overall the deployment of wind power more than quadrupled between 2004-2015 and it currently accounts for around one third of renewable electricity in the EU-28. The largest contributions come from Germany and Spain.

In 2015 Solar PV accounted for 12% of all EU renewable electricity. Between them, Germany, Italy and Spain accounted for 38%.

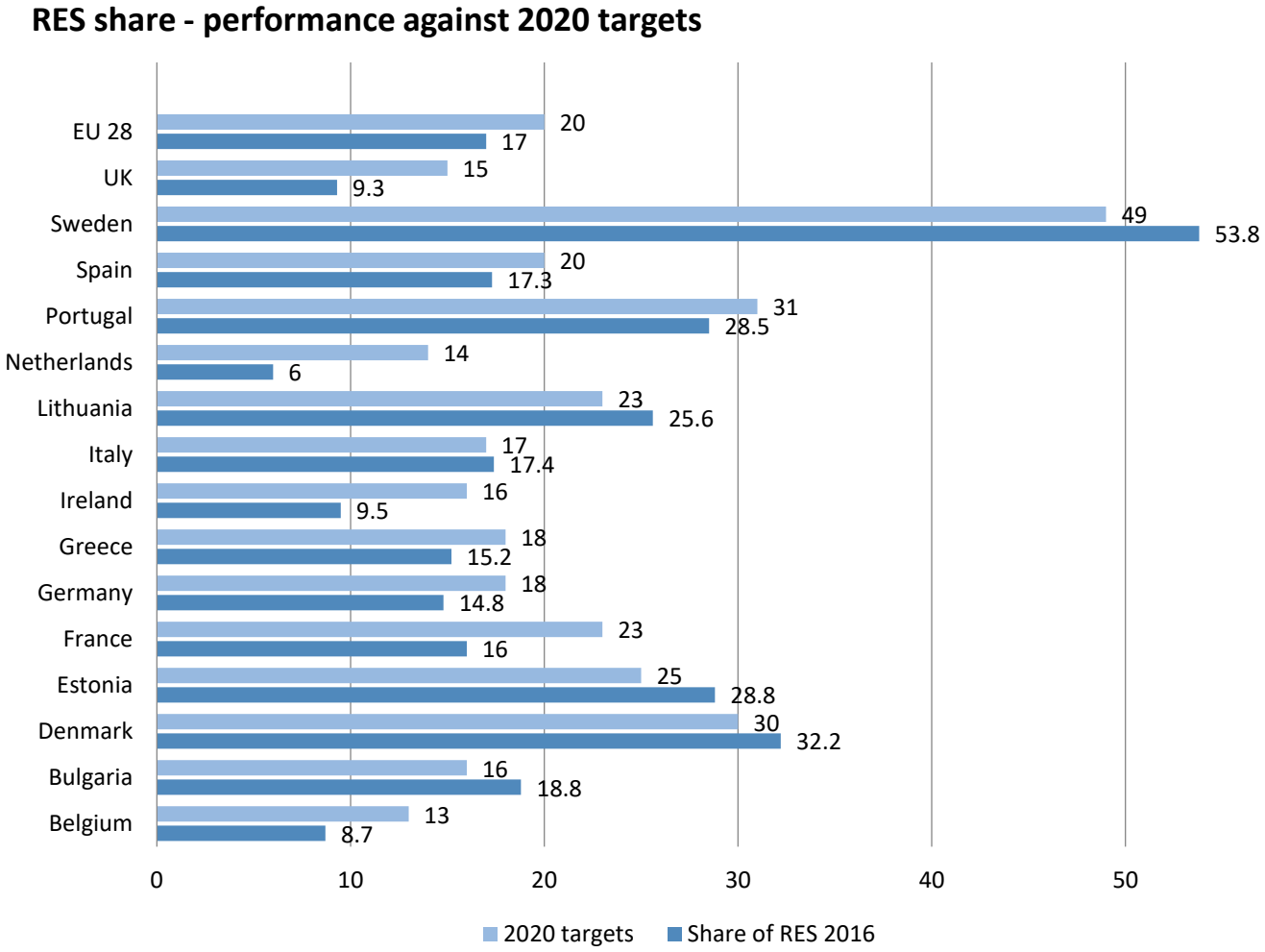
The following graph shows the percentage contribution from renewable energy sources to electricity consumption for each focus country, and indicates the relative contributions made by wind and PV. This data feeds into the monitoring of progress towards the RE targets of the Europe 2020 Strategy.



Source: Eurostat 2015

4.1.4. Performance against EU targets

The performance of the focus countries against their EU 2020 targets is captured in the following graph. 2016 figures for **% share RE in gross final energy consumption overall (ie combined**) are compared to the 2020 target for each country. As can be noted Sweden, Lithuania, Italy, Estonia, Denmark and Bulgaria have already exceeded their 2020 targets. Whereas France, Ireland, The Netherlands and the UK all still have some way to go.



Sources: EUROSTAT & EC Renewable Energy Progress Report 2017

4.2. Analysis of RES barriers, enablers and policy recommendations

4.2.1. Barriers

A thematic analysis of the key barriers to achieving RES targets arising in the focus group countries has been synthesised from the *EU Keep on Track Deviations and Barriers Analysis 2015*. The detailed analysis table, which can be found in Appendix 3, highlights in blue the key barrier themes and sub-themes that occur with most frequency and in each case indicates which focus group countries are affected by those particular barriers. A summary of the most frequently highlighted themes and sub-themes is shown below:

Summary of most common barriers to achieving RES targets

Political and economic framework

- ***Lack of coherence, unity and certainty in national RES policy-making*** (affects half of focus group countries):

  - Lack of political unity regarding energy policy
  - Lack of long-term vision for RES
  - Lack of political will to finalise energy strategy
  - Lack of coherent RES-E strategy
  - Uncertainty surrounding details of future policies
  - Decreasing political continuity of climate and RES policy targets
  - Uncertainty caused by continually changing policies
  - No Political plan for solar power
- **Unstable and unpredictable political/legislative climate** (affects a third of focus group countries):
  - Instability of legal framework for wind energy - frequency of successive reforms
  - Government instability impacting policy development
  - Lack of transparency in political decision-making process
  - Unstable political situation
  - Lack of transparency in the judicial system
- **Poor access to finance and investment** (affects a third of focus group countries):
  - Very poor access to local finance because of unpredictable investment climate
  - Banks cautious about lending because of uncertainty of support scheme
  - Private equity scheme model limiting solar development opportunities
  - Decrease in capital available to RES projects due to economic and financial crises
- **Uncertainty, instability and retroactive adjustment of support schemes** (affects more than two-thirds of focus group countries):
  - Uncertainty of RE support mechanism - reduction in financial support
  - Quarterly digressive revision of financial support based on numbers of new installations
  - Unknown modifications and amendments expected
  - Reduction or modification of incentives discouraging large PV installations
  - Withdrawal of support scheme compromising both existing installations and development of emerging technologies
  - Uncertainty of RE support mechanism -uncertainty about fairness of new support scheme and ability of grid to cope
  - Uncertainty of RE support mechanism - retroactive measures undermine the confidence of investors and developers
- **Support schemes unbalanced** (affects a third of focus group countries):
  - Favouring some technologies more than others
  - Not supporting some technologies
  - RES-E strategy biased towards some technologies over others

Grid regulation and infrastructure

- **Lengthy, complex and costly grid connection processes and uncertain contracts** (affects almost two-thirds of focus group countries):
  - Long timeframe for grid access and connection
  - Lengthy application delays
  - Grid connection permit process extremely complex
  - High & uncertain costs and unclear timeframes in grid connection for some technologies
  - Lack of transparency from DSOs regarding costs and duration of connection proposals
  - Uncertain connection contracts

- **Insufficient grid capacity and grid infrastructure investment** (affects a third of focus group countries):
  - Insufficient grid connection capacity
  - Lack of coherence in grid development
  - Lack of transparent and foreseeable grid development
  - Insufficient investment or financial incentives
  - Risks of installing additional capacity in existing wind farms without increasing the grid connection power
- **Lack of certainty or compensation for curtailment conditions** (affects a half of focus group countries):
  - Curtailment conditions (actual or potential) on connections without compensation
  - Priority curtailment of renewables
  - Lack of prior information from grid operators on curtailment
  - Curtailment due to overcapacity caused by neighbouring nation states dumping excessive energy onto domestic grid or domestic grid having no access to European transmission grid to share excess production

Administrative procedures

- **Lack of coordination between national and legal planning and permitting authorities** (affects a third of focus group countries):
  - Lack of co-ordination between decision making levels
  - Lack of co-ordination between the competent authorities involved in planning and permitting procedures
  - Lack of connection between national RE targets and local planning policies
  - Authorisation procedures differ in each region adding complexity to cross-regional applications
  - Multi-layered legislation and permits
  - Unclear rules leading to unpredictable decision making processes
- **Complex and costly planning and authorisation procedures** (affects more than half of focus group countries):
  - Planning/authorisation procedures time consuming, costly and complex
  - Delays in grid connection and expiration of planning permission
  - Absence of a one-stop shop
  - Lack of readily available information to support planning of new RE installations
  - Lack of information exchange between relevant stakeholders in wind developments
- **Competing public interests in spatial planning especially military and civil aviation radar and radio infrastructure installations** (affects more than a third of focus group countries):
  - Lack of clarity regarding installation conditions near military radars greatly impedes onshore wind development
  - Powerful restrictions arising from the military regarding aviation, radar and radio infrastructure installations
  - Competing public interests eg aviation (air traffic control), weather services and wind power

Market structure

- **Lack of clarity regarding the future design of the electricity market** (affects a third of focus group countries):
  - Absence of liberated, working energy market that would encourage small -scale RE projects

- Fair and independent regulation of the RES-E sector within a reforming electricity market
- Uncertainty regarding future of RES-E support with design of 'single electricity market' (SEM will hinder development of wind)
- Complex market mechanisms create barrier to entry for small/independent generators

Public acceptance/social awareness

- **Negative public perception of RES and political demonisation of producers** (affects more than a third of focus group countries):
  - Lack of support/political will for RE from wind from decision makers
  - Political doubts cast on solar energy support policy
  - Demonisation of RE producers by administrations, making them responsible for rising electricity prices
  - Public criticism of renewables as expensive by politicians
  - Public and political debate on fair apportionment of costs for RES-E support system
  - Negative media coverage of certain RES technologies
  - Bad/negative public perception of RES
  - Public debates hamper development of solar energy
  - Public acceptance varies across different technologies
  - Lighting provisions regarding wind farms impair their social acceptance
- **Increasing local opposition and appeals against permits** (affects almost two-thirds of focus group countries):
  - Increasing local opposition to wind energy
  - Public opposition impacts designation of land for wind farms
  - Local opposition to wind parks opposed on nature conservation grounds
  - Local opposition to plant construction
  - Anti-RES groups stimulating NIMBY-ism and appeals against permits for projects
  - Regulation allows even small groups of local objectors to stop or delay wind power plant development

4.2.2. Enablers

The table below outlines examples of enabling good and best practice criteria under each theme, which have been gleaned from the focus countries profiles.

Theme	Good practice examples
Political and economic framework	Denmark – Energy Agreement is very stable framework for development of RES
	France – abolishment of rule of minimum of 5 masts per wind farm fostered more wind energy development
	Germany – tendering procedure expected to improve conditions for large-scale PV projects as these are likely to be favoured in tendering process over small ones.
	Italy – virtual saturation and speculation had created bottlenecks in the authorisation and connection procedure. This has been overcome by introduction of 'Deliberation' to eliminate purely speculative projects from the queue of connection requests and 'incentives reduction' to reduce connection requests overall.
	Lithuania – introduction of net-metering is expected to accelerate

	the use of small-scale solar power.
Finance and investment	Netherlands – Green deal between Dutch Government and several commercial (green) banks aims at increasing the finance-ability of sustainable energy projects that have been difficult to finance
Grid regulation and infrastructure	Belgium - Walloon authority study panel on sustainable and intelligent electricity networks introduced the principle of 'grid connection with flexible access' as an alternative to curtailment conditions on connection without compensation.
	Belgium – new electricity tariffs which calculate operating costs based on the amount of kWh withdrawn from the grid aim to encourage self-consumption of electricity to save distribution grid costs.
Administrative procedures	Belgium – Flanders - simplification of permits – environment and construction permits bundled into one single permit
	Belgium – Wallonia – one stop shop system implemented to simplify the permitting system.
	Belgium – Wallonia – to overcome the issue of environment constraints around wind, the Wallonia Government initiated negotiations between the stakeholders of the wind energy sector and the administration in order to define a compromised protocol.
Integration of RES-E in spatial and environmental planning	Belgium – MOD released some training zones from military constraints as a result of the RE lobby and established new zones in areas where the Government assessed lower wind energy potential
	Belgium – MOD has validated for a single project new software developed by a Belgian Company in order to mitigate the wind energy signal on radars. (first step)
	Estonia – Air force accesses whether wind parks could disturb military radar communications systems – what was a barrier has become much easier with the cooperative role of the Estonian defence ministry
Market structure	Germany – green paper on electricity market for Germany's energy transition – helps to overcome uncertainty surrounding the future existence of functioning markets for RES-E – contains measures on making generation more secure, expanding the grid and further developing balancing markets and potentially introducing capacity market as second market.
Public acceptance/social awareness	Belgium – RES Sector commissioned opinion poll on attitudes to RES development – 95% French speaking Belgian people in favour and >80% living in rural zones in favour of wind. Communication campaign launched on the back of these results in order to counter the negative messages communicated by the limited but well organised opponents.
	Denmark – 20% share ownership offered to local citizens who live near wind farms. This sharing in the revenue stream supports the acceptance by local populations of wind farms.
	Germany – getting local citizens involved in the early stages of a project and giving them the possibility to take a financial share in the project.
	Netherlands – as a way to overcome NIMBY objections, it is

	proposed to focus on repowering existing onshore wind turbines, as bulk of installed Dutch turbines are of relatively small size
	Lithuania – to refute false statements and inform the public, the Lithuanian Power Association regularly publishes articles and gives lectures on topics like the balancing of renewable energy, prices or electricity generated from renewable sources and from fossil fuels, the economic, environmental and social benefits of renewable technologies and good practice examples from abroad.

4.2.3. Policy recommendations

An analysis of the policy recommendations made for each of the focus countries from the profiles in Appendix 1, (source: *Keep on Track! 2015 Policy Recommendations Report*) echoes the key barrier themes and sub-themes highlighted in section 4.2.1 very closely. The themes and sub-themes are shown in the table below along with the number of focus countries for whom each policy recommendation has been made.

Theme	Sub-themes	Number of policy recommendations
Political & economic procedures	Coherent national strategy/ political will	12
	Stability, transparency	2
	Finance & investment	5
	Support mechanisms	8
	Retroactive measures	4
	Support for different RES technologies	2
Grid regulation and infrastructure	Grid access – timing and complexity	2
	Grid access – costs and contracts	3
	Grid capacity and development	2
	Curtailment	2
Administrative procedures	Co-ordination between levels	3
	Long, costly, complex procedures	3
	Spatial planning	4
Market structure	Clarity on future market design	3
Public perception/social awareness	Negative public perception/increasing opposition and legal challenges	5

5. Key energy trends for CryoHub

5.1. Global agreements

At the Paris Climate Agreement in December 2015 nearly 200 countries, including EU member states, achieved consensus on the need to cut greenhouse gas emissions.
Key elements of the Paris Agreement were:

- To keep global temperatures "well below" 2.0C (3.6F) above pre-industrial times and 'endeavour to limit' them even more, to 1.5C
- To limit the amount of greenhouse gases emitted by human activity to the same levels that trees, soil and oceans can absorb naturally, beginning at some point between 2050 and 2100
- To review each country's contribution to cutting emissions every five years so they scale up to the challenge
- For rich countries to help poorer nations by providing 'climate finance' to adapt to climate change and switch to renewable energy.

However only elements of the Paris pact are legally binding and national pledges by countries to cut emissions are voluntary. A key issue at the progress assessment in Bonn in May 2018 was whether there should be two sets of guidance for developed and developing nations, or universal rules with allowances for differentiation. The EU is among those arguing for single guidance applying to all parties and for Nationally Determined Contributions (NDCs) to be quantifiable.

The EU's submission at the progress assessment talks outlined, amongst other things where it was and where it wanted to go and how it would get there:
Where we are

- With the existing policies under the EU 2020 climate and energy package, the EU and its Member states are set to (over)achieve the goal of a 20% GHG reduction domestically by 2020 (from 1990 levels). Current emission levels equate to a 23% domestic reduction and are projected to reach 26% by 2020
- By 2030 the EU 2030 Climate and Energy Framework is set to drive the EU to at least 40% domestic reduction in GHG emissions (compared to 1990 levels);
- This reduction target has been translated into a detailed and coherent legislative framework that will ensure delivery of objectives.

Where we want to go

- The common reference points for where we collectively want to go are the long-term goals of the Paris Agreement, in particular the long-term temperature goal of 1.5degC and the long-term mitigation goal.
- The EU NDC, and its domestic mitigation targets, is consistent with the objective to reduce GHG emissions by 80 to 95% by 2050 compared to 1990 levels, in the context of necessary reductions according to the IPCC by developed countries as a group.

How we will get there

- The EU and its Member States remain committed to the Paris Agreement goals
- All Parties are invited to communicate their mid-term low greenhouse gas emission reductions development strategies by 2020
- Building on what has already been achieved, the EU is working on an appropriate strategy to meet the Paris goals, and the European Commission will present by the first quarter of

2019 a proposal for a Strategy for long-term greenhouse gas emission reduction in accordance with the Paris Agreement, taking onto account the national plans. Furthermore, all Member States are to develop national low-carbon mid-century strategies (long-term low-emission strategies or national energy and climate plans as they are referred to under the EU Energy Union).

5.2. EU legislation

5.2.1. Clean Energy Package

Aimed at enabling the EU to deliver on its Paris Agreement commitments, the European Commission presented the 'Clean Energy for All Europeans' package of measures in November 2016, with the goal of providing the stable legislative framework needed to facilitate the clean energy transition and move towards the creation of the Energy Union.

The package has three main goals:

- Putting energy efficiency first
- Achieving global leadership in renewable energies
- Providing a fair deal for consumers

The aim is to foster cross-border cooperation and mobilise public and private investment in the clean energy sector boosting the economy and the environment.

The package includes 8 different legislative proposals (each with a linked impact assessment) covering:

- Energy Performance in Buildings
- Renewable Energy (recast Renewable Energy Directive)
- Energy Efficiency
- Governance
- Electricity Market Design (the Electricity Regulation, Electricity Directive, and Risk-Preparedness Regulation) also known as the ‘Market Design Initiative’
- Rules for the regulator ACER

Both the renewable energy and market design initiative elements of the Clean Energy Package have implications for energy storage (and this is explored more in both the following section and section 5.4)

5.2.2. Renewable energy directives

The current **Directive 2009/28/EC on the promotion of the use of energy from renewable sources** embodies the existing framework for 2020, which sets an EU 20% target for renewable energy consumption that relies on legally binding national targets.

National Renewable Energy Action Plans and the biennial monitoring provided for by the directive have been effective in promoting transparency and supported the increase in the share of renewables from 10.4% in 2007 to 17% in 2015.

The current revised proposal for a recast of the directive on promotion of use of energy from renewable sources (REDII), which is part of the EU's Clean Energy Package, is expected to be voted on by the European Parliament in the Autumn of 2018 before going back to the Council for final adoption.

The agreement sets a headline target of 32% energy from renewable sources in final energy consumption at EU level for 2030 although there is a clause to review this target in the event of changes in demand of energy consumption and to take account of the EU's international obligations. Significantly there are no new binding targets at national level, rather the target is binding at EU level and will be fulfilled through individual Member States' contributions guided by the need to deliver collectively for the EU. However, the binding national targets in the existing RES Directive would remain in the revised directive as baseline levels below which Member States are not allowed to go, ensuring that Member States do not weaken their commitment to promoting RES after 2020 due to the lack of new binding targets.

The recast RES directive sets out guiding principles concerning renewable energy self-consumption, renewable energy communities, and district heating and cooling systems and significantly financial support schemes for RES-generated electricity and RES permit- granting procedures:

Financial support schemes

- EU Member States may apply support schemes so long as these avoid unnecessary distortions of electricity markets, take into account balancing and grid constraints, and respond to market signals through competitive tendering;
- retroactive changes to RES support schemes are forbidden;
- each year the EU Member States must open a minimum share of new support schemes to RES generated electricity from other EU Member States (10 % of new capacity 2021-2025, 15 % of new capacity 2026-2030);
- the energy produced under these support schemes counts towards the Member States funding the installation;
- long-term schedules on expected financial support schemes must be published; they must cover at least the next three years and include the indicative timing, capacity sought and available budget.

RES permit-granting procedure

- Maximum time for the processing of permits;
  - three years for new capacity
  - one year for requests related to repowering of existing renewable energy plants
  - six months if such requests have no significant negative environmental and social impacts
- a simple notification procedure for all new RES projects and installations with a capacity of under 50 kW seeking connection to the grid;
- 'one stop shops' must be set up to coordinate the permit-granting process for new RES generation, transmission and distribution capacity.

The recast directive also enhances mechanisms for cross-border cooperation, simplifies administrative processes and outlines measures to mainstream the use of RES in the transport sector. Moreover the revised directive foresees some structural changes to the EU energy market legislation and so moves some provisions to other legislation in the Clean Energy package ie:

- all monitoring and reporting obligations are transferred to the proposed regulation on energy union governance, and
- provisions relating to grid access are transferred to the regulation on electricity markets.

The recast directive would enter into force on 1 January 2021, when the existing RES Directive would be repealed. The proposed transposition date for Member States would then be 30 June 2021.

5.3. EU Renewable energy generation trend analysis

The European Commission's EU reference scenario 2016 – Energy, Transport and GHG Emissions – Trends to 2050 sets out figures for renewable energy generation up to 2050 and gives an analysis of the main factors and policies, which can influence the different shares of renewable energies.

5.3.1. Electricity generation

The report states that in the short term, the set of EU and national specific policies that promote RES (notably implementation of supportive financial instruments such as feed-in-tariffs) drive a significant penetration of RES in power generation. By 2020, RES in power generation are projected to increase to 35.5% (RES-E indicator) or 37.2% of net electricity generation, of which 52% are projected to be variable RES (wind and solar).

Beyond 2020 support schemes are phased out and further investments in RES are driven by market forces, the ETS and the improvement in the techno-economic characteristics of the technologies**.** While RES provide growing shares in electricity generation (up to 56% in 2050 of net power generation in overall EU28), the contribution of variable RES (predominantly solar & wind) remains significantly lower. **These variable RES reach 19% of total generation in 2020 (from 6% in 2010), 25% in 2030 and 36% in 2050**, which is thought unlikely to pose any major issues to the grid stability. The development of solar PV and wind onshore post-2020 are based solely on market forces as support schemes are phased out.

Wind

Wind provides the largest contribution from RES supplying 14.4% of total net electricity generation in 2020, rising to 18% in 2030 and 25% by 2050. A share of 24% of total wind generation is produced from wind offshore capacities in 2020 (33GW installed capacity), but the share of offshore wind declines thereafter, as the high costs of wind-offshore limit its market penetration. At the end of the time period some substitution of existing offshore capacity takes place.

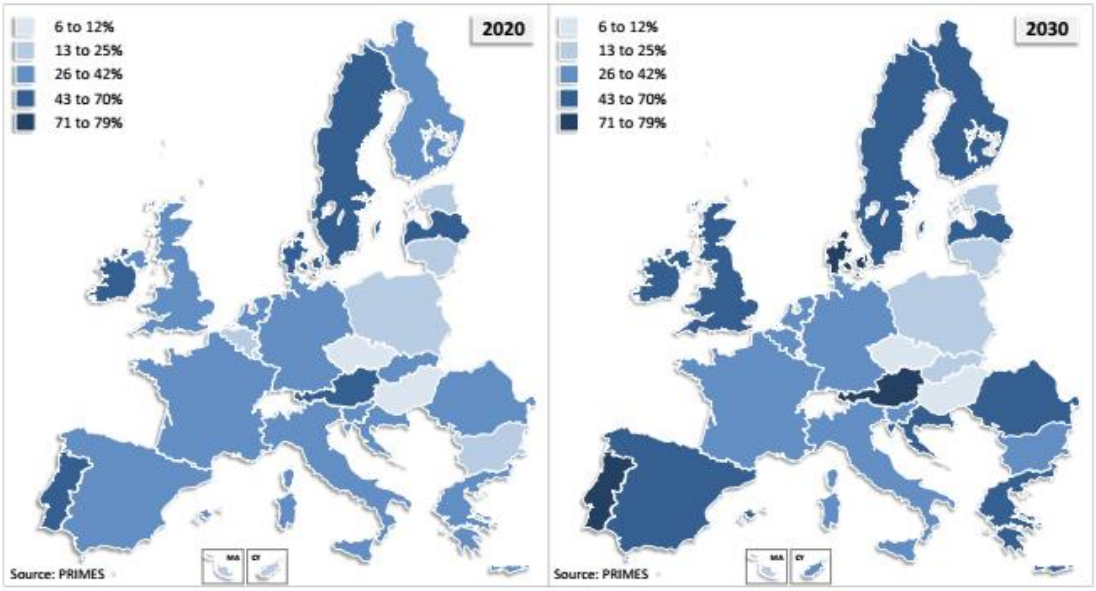
Total wind capacities increase to 207GW in 2020, 255GW in 2030 and 367GW in 2050, up from 86GW in 2010. Wind onshore capacity and generation increase because of exploitation of new sites but also because of the progressive replacement of wind turbines with newer taller ones which are assumed to have higher installed capacity and higher load hours.

Solar

Generation from PV contributes 4.8% in net generation by 2020. Beyond 2020, PV generation continues to increase up to 7% in 2030 and 11% in 2050. PV capacity is projected to reach 137.5GW in 2020, up from 30 GW in 2010. Investment is mostly driven by support schemes in the short term and the decreasing costs of solar panels and increasing competitiveness in the

long term, in particular where the potential is highest, i.e. Southern Europe. As a result, installed capacity reaches 183 GW in 2030 and 299 GW in 2050.

RES-E shares in EU Member States in 2020 and 2030



Source: *EU reference scenario 2016 energy, transport and GHG emissions trends to 2050*

5.3.1. Policy & indicator analysis

The Reference Scenario analysis highlights the following policy drivers and indicators that have impacts, which are pertinent to CryoHub:

- The agreed policies at EU and Member State levels, including the legally binding RES and GHG targets for 2020, as well as policies aimed at improving energy efficiency (e.g. the Energy Efficiency Directive, Ecodesign) are expected to lead to considerable changes in the energy system both independently and interactively (for example the increase in RES and improvements in energy efficiency also lead to the reduction of GHG emissions).
- Competitive energy provision for businesses and affordability of energy use are key aspects for economic and social development.
- An increase in renewable energy shares to 2050 at first driven by dedicated RES policies and later by the long-lasting effect of current policies, technological progress and better market functioning.
- A continued decoupling of GDP growth and energy demand growth: while the economy grows by 75% between 2010 and 2050, total energy consumption reduces by 15% in the same time period.

Short to medium term outlook

The projections anticipate substantial changes in the energy system between 2010 and 2020 driven, most notably, by the legally binding targets of the 2020 Energy and Climate package, the CO_2 standards for cars and vans, and the Energy Efficiency Directive.

These combined measures are expected to deliver an EU 2020 RES share of 21.0%, 18.4% energy efficiency gains, and GHG emission reductions of 25.7%.

Medium to long-term outlook
Looking further ahead, the RES share reaches 24.3% in 2030 driven significantly by the ETS, which delivers continued reductions of allowances over the projection period and increasing carbon prices.

GHG emission reductions are projected to reach 35.2% in 2030 and 47.7% in 2050 and although substantial, the decrease is less than the target agreed for 2030 and the objective for 2050. The influence of energy efficiency policies, the CO_2 standards for cars and vans, etc. continues beyond the 2020 horizon, with energy savings of 23.9% projected for 2030.

In the transitional period until 2030 investment costs in the transmission and distribution systems (driven largely by the development of The European Network for Transmission System Operators- Electricity (ENTSO-E) Ten Year Development Plan until 2030) have an upward effect on electricity prices, and on energy system costs. Beyond 2030 electricity prices stabilize and even decrease. Generally total energy system costs become more capital intensive over time. After the structural adjustments in order to cope with the 2020 targets and policies, the effects of which continue in the longer term, total energy system costs grow slower than GDP. This leads to a decreasing ratio of energy system costs to GDP in the period 2030-50.

5.4. Energy storage

According to a 2016 EU Working paper, energy storage is now being recognised as an increasingly important element in the European Union's electricity and energy system because of its ability to modulate demand and act as flexible generation when needed as well as being able to contribute to optimal use of generation and grid assets, and support emissions reductions in several economic sectors.

Storage is set to become a more prominent determinant of the characteristics of the new energy system, balancing centralised and distributed power generation. It can also strengthen energy security in emergency cases. Storage will contribute through various levels of the energy system and complement other flexible elements and grid development. Storage solutions are becoming an important cornerstone in an energy system with an increasing share of variable renewable power and the EU supports storage related R&D with several initiatives.

A Roundtable on Energy Storage organised by DG ENER in 2015 recognised that energy storage could enable the integration of higher shares of variable power into the energy system and could provide an option to supply power when needed without necessarily reverting to fossil energy sources. It also concluded that the market and legislative framework was lagging behind technological progress and needs and it identified a number of barriers to energy storage such as:

- access to networks;
- double/excessive grid fees;
- inability to combine value streams from interaction with other sectors (industry, agriculture etc).

The wide range of identified issues indicated that further development of the storage related regulatory framework and market mechanisms was required to enable full contribution of storage to a cost-efficient energy system.

Energy storage considerations are included in the framework of the Clean Energy for all Europeans Package. The proposed recast Renewable Energy Directive supports energy storage as a way of integrating renewables, in relation to the right of consumers to produce and self-consume electricity. Moreover the proposed Market Design Initiative (MDI) provides a framework for a level playing field for all flexibility solutions in the electricity grid. It introduces a number of elements into electricity markets which can potentially facilitate investments in energy storage:

- Investments should be based on market revenue rather than subsidies and should allow storage facilities to build on the various value streams that they provide (e.g. ancillary, including balancing services to the grid, avoidance of curtailed variable electricity, and decarbonisation of other sectors).
- Storage, together with other resources like demand response, should be considered in grid planning, both at transmission and distribution level.
- The access to grid connection should be ensured in the same way as for other flexibility solutions by the grid operator.
- Market, regulatory and administrative barriers to installation and operation of storage facilities should be removed. In the context of participation in the energy markets, a level playing field for storage should be established among storage operations across EU.
- Storage operators should be allowed to provide multiple services to electricity system operators and also simultaneously participate in other commercial activities with other economic actors (eg chemical industry). Some specific services provided by storage facilities to the grid operators can be seen as alternatives to grid extension, and this should be reflected in the investment analysis.
- Storage services should be traded in competitive markets, where new flexibility products would provide a market value reflecting the system benefits of storage.
- Owners of storage facilities should be independent from the grid operators, apart from clearly defined exceptions.
- To allow energy storage to play an effective role in relation to other economic sectors, an integrated approach would be needed. Various mechanisms can support markets for the integrated solutions, such as power to gas or liquids, power-to-heat, or integration of variable renewable electricity in mobility or as feedstock in industry (e.g. refining, fertilisers, mobility). Such solutions will support both decarbonisation in various economic sectors and provide additional economic opportunities for energy storage.

6. Conclusions

The purpose of this report was to provide an analysis of EU member states' energy supply profiles and carbon footprints, installed RE supply & capacity and renewable energy economic, regulatory and policy drivers.

Production and consumption profiles were prepared for all the EU28 Member State countries. More in-depth energy profiles were assembled and analysed for a sub-group of 15 member state focus countries, selected on the basis of work carried out in work packages 2 and 3 that established those countries where analysis for the potential introduction of CryoHub technology could be most usefully focused. These more comprehensive profiles additionally considered progress against renewable energy targets and policy barriers, enablers and recommendations.

Broader trends with the potential to impact CryoHub were also examined including global agreements, forthcoming EU legislation, EU renewable energy generation trends and developments in energy storage.

6.1. Energy drivers with implications for CryoHub

Energy dependence – energy security is a key driver for renewable energy in order to increase the amount of domestically produced energy and reduce reliance on imports from outside the union.
The current dependency of the EU on energy imports, particularly oil and gas, forms the backdrop for policy concerns relating to the security of energy supplies; more than half (53.6 %) of the EU-28's gross inland energy consumption in 2016 came from imported sources
However over the 11 year period 2006-2016, the growth of EU-28 primary production from renewable energy sources increased by 66.5%, exceeding that of all the other energy types and replacing, to some degree, the production of other sources of energy. As this trend continues it will offer increased opportunities for the integration of storage with variable RES.

The EU's Clean Energy Package has been designed to enable the EU to deliver its Paris Agreement commitments. It has the goal of providing the stable legislative framework needed to facilitate the clean energy transition and move towards the creation of the Energy Union, the 5 themes of which are energy security, energy efficiency, decarbonisation of the economy, innovation and a fully integrated energy market. The key aim is to foster cross-border cooperation and mobilise public and private investment in the clean energy sector boosting both the economy and the environment.

The package incorporates 8 different legislative proposals, which will work in concert and include the recast Renewable Energy Directive (REDII), Energy Efficiency measures and the Market Design Initiative (including the Electricity Regulation, Electricity Directive, and Risk-Preparedness Regulation). The market design initiative is a crucial first step in re-designing the existing energy system as a decentralised system capable of integrating a growing share of renewable energy sources including those from new and smaller players at the lowest possible cost. The integration of variable RE and flexible storage solutions is part of the MDI.

The agreed policies at EU and Member State levels, including the legally binding RES and GHG targets for 2020, as well as policies aimed at improving energy efficiency (e.g. the Energy Efficiency Directive, Ecodesign) are expected to lead to considerable changes in the energy system both independently and interactively (for example the increase in RES and improvements in energy efficiency also lead to the reduction of GHG emissions). Conversely the stimulation of the development of RES will contribute to reductions in GHG emissions.

The EU's trends analysis to 2050 anticipates growth in variable RES from 19% of total RES in 2020 (solar 5%, wind 14%) to 25% in 2030 (solar 7%, wind 18%) and 36% in 2050 (solar 11%, wind 25%).

The trends analysis also foresees significant investment in the transmission and distribution system in the transitional period 2020-2030. The investment costs will be driven largely by the development of The European Network for Transmission System Operators-Electricity (ENTSO-E) Ten Year Development Plan until 2030, the main objectives of which centre on the integration of renewable energy sources (RES) such as wind and solar power into the power system, and the completion of the internal energy market.

Energy storage is part of both REDII & the MDI, which suggests a raft of measures to support investment in energy storage which will make variable renewables a much more flexible and therefore attractive investment. These include:

- Ensured grid connection
- Freedom to build revenues based on various value streams including grid balancing services, avoidance of curtailment of variable electricity, decarbonisation of other sectors
- Inclusion in grid planning at transmission and distribution level
- Removal of market, regulatory and administrative barriers
- Freedom to provide multiple grid services to electricity system operators at the same time as participating in other commercial activities with other actors
- Opportunity for storage systems to be traded reflecting the market value of the system benefits of storage
- Mechanisms to support promotion of storage in integrated solutions with other economic sectors

Member state targets for RE - the existing EU Member State targets of 20% share of RE in the energy mix by 2020 look set to stretch to targets of 32% by 2030 if the recast REDII is agreed, increasing the potential for deployment of variable renewable technologies and the opportunities for cryogenic storage solutions, both as a means for storing RE on site and for increasing the flexibility of use of variable RE for the market.

Significantly the 2030 targets are not binding targets at national level, in the recast REDII, rather the target is binding at EU level and will be fulfilled through individual Member States' contributions guided by the need to deliver collectively for the EU. However, the binding national targets in the existing RES Directive would remain in the revised directive as baseline levels below which Member States are not allowed to go, ensuring that Member States do not weaken their commitment to promoting RES after 2020 due to the lack of new binding targets.

6.2. Focus country opportunities and challenges

The majority of focus countries are on track for achieving their 2020 targets but some are exhibiting less support for renewables than others. The following table reviews some of the opportunities and challenges in the context of the individual focus countries. Countries highlighted in bold have already met their 2020 RES targets.

It is clear that opportunities exist for the potential development of CryoHub in a number of the focus group countries. However attitudes to variable RES vary, both politically and socially and support mechanisms, markets and infrastructure will be in transition. It remains to be seen whether the ‘downgrading’ of individual member state binding targets in the recast REDII to an EU wide binding target contributed to by the member state countries becomes more problematic in countries that lack deep commitment to develop RE and has a further detrimental effect on the ongoing development of both variable RES and energy storage.

As renewable energy development in the EU enters the next phase, a rethinking of market strategies, policies and business models will be needed to enable the benefits of CryoHub technology to be fully realised. This work will continue to be developed in work packages 8 and 10.

Table: Focus country opportunities and challenges

	% combined RES		% variable RES in electricity consumption in 2015		
Focus group country	**2020 Target**	**2016 Achieved**	**Wind**	**PV**	**Commitment to variable RES**
Belgium	13	8.7	34	22	Policy makers at all levels need to cooperate and develop a common Belgian energy strategy in order to ensure energy security after the nuclear phase-out planned by 2025.
Bulgaria	16	18.8	18	20	Bulgaria's 2020 RES target has already been achieved. However Bulgaria needs to improve the country's energy regulatory framework and its implementation and provide coherent stable RES support mechanisms in order to restore investor confidence.
Denmark	30	32.2	69	3	2020 RES target already achieved. In 2014 wind energy produced 42.7 percent of Denmark's net electricity generation, the largest share from any source and larger than non-renewable generated electricity. Key system challenge as and when fluctuating wind power reaches more than50% of Danish electricity consumption.
Estonia	25	28.8	46	0	Estonia has already achieved its 2020 RES target share. The main potential for electricity from variable renewable energy sources is from wind.
France	23	16	17	5	Currently hydropower largest single RES. Plans for significant increase in PV capacity and to double wind capacity from 2015 levels of both by 2023[1].
Germany	18	14.8	35	21	Germany's renewable energy target for electricity in consumption is more than 50% by 2030. According to a 2017 national survey conducted for the German Renewable Energies Agency, 95% supported further expanding renewable energy. The amendments of the Renewable Energy Sources Act are significant and will have a negative impact on the future development of the RES sector.
Greece	18	15.2	32	29	The provisions of the "New Deal" resulted

	% combined RES		% variable RES in electricity consumption in 2015		
Focus group country	**2020 Target**	**2016 Achieved**	**Wind**	**PV**	**Commitment to variable RES**
					in a significant reduction of the short /medium term revenues of all operating RES projects threatening their viability and this has been exacerbated by serious liquidity problems of the national operator.
Ireland	16	9.5	79	0	Ireland's RES strategy focuses on wind but developers suffer from long delays and investors face insecurity around grid access and tariffs.
Italy	17	17.4	14	21	In 2016 Italy exceeded its 2020 target. Some of Italy's largest hydroelectric plants operate pumped storage providing the country with a means of balancing and storing the variable output from the countries growing solar and wind power facilities. Due to the abolition of support schemes for new PV installations and other RES plants, the incentive to invest in RES has decreased significantly. The government has indicated that it intends to focus funding incentives more on other sources of renewable energy in the future.
Lithuania	23	25.6	43	2	Strong focus on wind. Capacity caps are expected to be hit long before 2020, but are currently under revision.
Netherlands	14	6	45	4.3	The Dutch NREAP focuses on solid biomass, biogas and onshore wind as the most prominent technologies. Developers of RES projects often face significant public opposition; this is especially the case for wind farms.
Portugal	31	28.5	43	2	In 2014, Portugal reached a share of renewable energy in electricity generation of 51.7%, still far from the 2020 target of 60%. So, it will be necessary define new approaches to promote private investment into large-scale projects. Speeding up implementation of the National Hydroelectric Power Plant Plan will double the current hydro pumping/storage capacity, creating more

	% combined RES		% variable RES in electricity consumption in 2015		
Focus group country	**2020 Target**	**2016 Achieved**	**Wind**	**PV**	**Commitment to variable RES**
					competitive conditions to meet demand using variable renewable sources like wind and solar.
Spain	20	17.3	52	8	The economic crisis in Spain hugely impacted the RES sector. The electricity reform package (retroactive establishment of a new economic regime) radically changed the support system for RES, decreasing its stability. A clear and stable political framework promoting RES, with no retroactive changes has been called for.
Sweden	49	53.8	10	0	2020 RES target already achieved. Currently more than 50% RES from hydro. Cross-party political deal to planning to be 100% renewable by 2040. Increasing focus on wind power moving forward
UK	15	9.3	51	4	Policy risk and uncertainty in the market remain the key barriers affecting all renewable technologies across all sectors and directly or indirectly impact all project development steps. This stems from continually changing policies and financial support schemes.

1https://www.ecologique-solidaire.gouv.fr/programmations-pluriannuelles-lenergie-ppe

7. References

Carbon Trust, 2016. **Can Storage help reduce the cost of a future UK electricity system?** https://www.carbontrust.com/media/672486/energy-storage-report.pdf

CryoHub D2.2 2017 **Report on Renewable Energy Source Mapping.** https://cryohub.eu/en-gb/downloads

CryoHub D2.3 2017 **Report on Potential Opportunities for CryoHub in Europe**. https://cryohub.eu/en-gb/downloads

CryoHub D3.1 2017 **Report on Current and Future Benefits of CryoHub**. https://cryohub.eu/en-gb/downloads

EU 2016 **Energy Statistical Pocketbook** https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf

Eufores, Eclareon, Fraunhofer, Technische Universitat Wien, Keep on Track! 2015 **Policy Recommendations Report** http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Eur'Observ'ER 2016 **The State of Renewable Energies in Europe in 2016.** https://www.eurobserv-er.org/category/all-annual-overview-barometers/

European Commission, 2017, **Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the promotion of the use of energy from renewable sources** (recast): http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0767R%2801%29

European Commission 2017 **Renewable Energy Progress Report** https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports

European Commission Directorate-General for Energy, Directorate-General for Climate Action and Directorate-General for Mobility and Transport 2016 **EU Reference Scenario 2016 Energy, Transport and GHG Emissions Trends to 2050** https://ec.europa.eu/energy/sites/ener/files/documents/ref2016_report_final-web.pdf

European Commission Staff Working Document, 2017, **Energy Storage – the role of electricity** https://ec.europa.eu/energy/sites/ener/files/documents/swd2017_61_document_travail_service_part1_v6.pdf

European Commission Staff Working Document, 2016, **REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council** https://ec.europa.eu/energy/sites/ener/files/documents/2_en_autre_document_travail_service_part1_v2_416.pdf

European Commission Working Paper, 2016. **Energy Storage – proposed policy principles and definition** https://ec.europa.eu/energy/sites/ener/files/documents/Proposed%20definition%20and%20principles%20for%20energy%20storage.pdf

EUROSTAT database reports http://ec.europa.eu/eurostat/data/database

EUROSTAT Energy Production and Imports
https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_production_and_imports

Jan-Benjamin Spitzley, Jörn Banasiak, Filip Jirous, Céline Najdawi (eclareon), Simone Steinhilber (Fraunhofer), 2015, **Keep on Track! Project, Analysis of Deviations and Barriers 2014/2015**
http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Member States 2015**. Progress Reports on the Promotion and Use of Energy from Renewable Sources Article 22 of the Renewable Energy Directive 2009/28/EC** (reference year 2013-2014) https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports

Submission by Bulgaria and the European Commission on behalf of the European Union and its Member States. 2018 **Views on the Preparatory Phase of the Talanoa Dialogue**
http://www4.unfccc.int/sites/SubmissionPortal/Documents/201801301604---BG-30-01-2018%20-%20RSO%20EU%20submission%20for%20RD10%20at%20SB48%20.pdf

8. Appendix 1 Focus Country Energy profiles

ENERGY PROFILE: BELGIUM

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		13610	16150	15540	13210		
2	**% Energy dependence -** all products	75.1	78.1	78.2	77.4	80	84.3	76
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			2267.5	2966.4	2945.2	2989.6	3065.6
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			111.1	315.1	396.8	479.3	467.4
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			48.2	227.3	247.9	262.5	265.4
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		37.5	37.6	36.4	34.2	35.9	36.3
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		5794.6	5642.9	5063.9	4763.2		
8	**Share of RE in gross final energy consumption** (%) combined			5.7	7.5	8.0	7.9	8.7
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			7.1	12.5	13.4	15.5	15.8
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	103.63	91.83	82.85	79.41	81.75	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	12.42	13.36
Overall share of energy from renewable sources (including transport)	%	7.35	7.93
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	949.11	990.86
Gross total energy from RE consumption (including transport)	Ktoe	2776.70	2752.37
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	2992	3024
Wind onshore	MW	1084	1222
Total wind (inc offshore)	MW	1792	1930
Sub-total (variable sources)	**MW**	**5868**	**6176**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**6872**	**7046**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

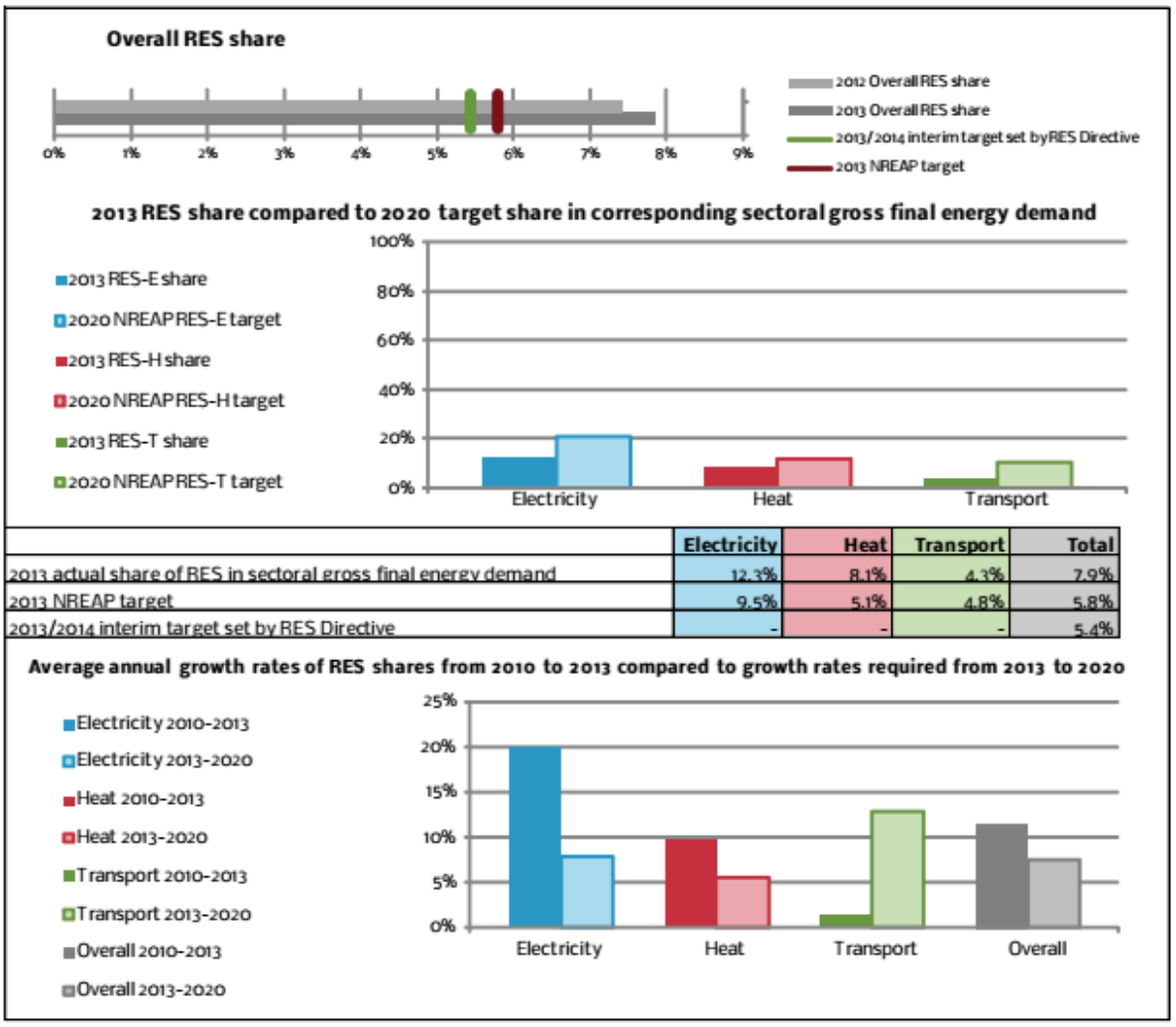
[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Flemish region					
Short term action energy landscapes	Regulatory	Installed capacity (MW)	Various	Existing	2012 -
Environmental innovation programme	Financial	Knowledge	Various	Existing	2012 -
Strategic ecology support	Financial	Energy generated or consumed (KTOE)	Investors	Existing	2013 -
Website & publications	Non-binding measures	Behavioural change	Various	Existing	2002 -
Inventory renewable energy in Flanders	Non-binding measure	Behaviour change	Various	Existing	2012 -
Walloon region					
Setting of post 2012 quotas (2012-2016)	Financial/regulatory	Installed capacity (MW)	Investors	Existing	2012>
New system, or system of green energy envelopes with reservation	Financial/regulatory	Installed capacity (MW)	Investors	Existing	July 2014
Wind: 2020 production target	Non-binding measure	Installed capacity (MW)	Investors	Existing	2012>
Wind: map of potential	Regulatory	Installed capacity (MW)	Public administration/investors	Planned	In progress
PV up to 10kW: Qualiwatt	Financial/regulatory	Energy generated or consumed (KTOE)	Investors	Existing	2014>
Brussels/Capital region					
Preparation of an integrated plan	Policy	Installed capacity (MW)	Public administration/investors	Planned	2015
Evaluation of green energy legislation	Regulatory	Installed capacity (MW)	Investors	Planned	In progress
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Belgium NREAP 2014/15

- Belgium has achieved both its 2013 NREAP target and the interim target 2013/14.
- Growth rates in the shares of RES-E and RES-H&C were high enough to ensure the achievement of the 2020 target if maintained. The RES-T growth rate has to be further increased in order to achieve the 2020 target.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	12.3%	8.1%	4.3%	7.9%
2013 NREAP target	9.5%	5.1%	4.8%	5.8%
2013/2014 interim target set by RES Directive	-	-	-	5.4%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Theme	Barrier
Political and economic framework	• In Belgium, the majority of barriers reported within the category of political and economic framework relates to the existing **RES-E strategy and support scheme** and underlines the lack of political willingness to finalize a real energy strategy. In 2014, Belgium has experienced federal and regional elections which resulted into a majority change, thus inducing a revision of the energy policy vision. The lack of political unity regarding energy policy has significant consequences not only on the development of renewable energies, but also on gas-fired power plants,which were disconnected due to their low profitability (their annual loading rate was deemed too low). In addition, Belgian nuclear power plants are close to their end of life of 40 years and the country has not yet implemented a concerted master plan to meet their scheduled phase-out between 2015 and 2025. As a result, Belgium is faced with the inability to fully meet its domestic electricity consumption and finds itself obliged to import energy • At the federal level, the nuclear phase-out law of 2003 originally planned the shutdown of nuclear power production at the latest by 2025. However, the federal government agreement of 10 October 2014 casts doubt on the willingness of the Belgian government to meet this commitment. In fact, the document underlines that the government shall "ensure the phase out of the current generation of nuclear reactors by 2025". • In Wallonia, the appointment of the new government in July 2014 has led to a confusion regarding the regional framework and objectives supporting the development of renewable energies. In fact, the achievements of the previous government are being called into question by the current government. Consequently, the regulatory framework for renewable energies established by the previous government is expected to be modified in the near future by the current government. For example, the roadmap submitted in July 2013 by the previous Minister of Energy Jean-Marc Nollet, defining renewable electricity generation targets for different RES technologies will probably be revised. In fact, the roadmap was based on the renewable energy targets as defined by the former government, namely 20% renewable energy in final energy consumption by 2020. However, this ambition will probably be lowered by the new Walloon government in order to meet the 13% share of renewable energy in final energy consumption imposed by the European Directive 2009/28/EC for Belgium (Mertens, Climact, 2014b). • As already reported in the two previous reports, the country still faces difficulties with regards to the uncertainty of the support mechanism. Due to green certificate overstock, the green certificate price has collapsed during the last years to reach its guaranteed price in Wallonia. Photovoltaic installations in Wallonia have been declared as partly responsible for this overstock and the financial support was consequently drastically decreased in 2013 with retroactive effect. In August 2014, the Walloon regulatory authority CWaPE adopted the transitional methodology for the calculation of the Qualiwatt-premium for photovoltaic installations with a capacity less or equal 10 kWp. According to this methodology, the amount of the premium is calculated so that the installation can benefit from guaranteed internal rates of return. Moreover, the amount of the support

partly depends on the evolution of the electricity price. However, the calculation methodology is only applicable until the end of 2016. It is therefore currently nearly impossible to define a business plan on the long term, as the calculation parameters after 2016 are still unknown (Al Bitar, Edora). This lack of visibility contributes to decrease the confidence of investors and to erode the image of renewable energies (Al Bitar, Edora). In the previous report, it was reported that the Walloon government had not found any agreement on the number of green certificates delivered per technology. This issue was partly resolved through the publication of a decree of the Walloon government17 in May 2014, which determines among others the amount of green certificates per technology for the period 2014-2016. However, it remains uncertain whether the provisions of the decree will be maintained, since the number of certificates was calculated on the basis of the renewable energy objectives of the previous government.

- The Walloon region also faces issues linked to a certain **revenue risk under the given support scheme.** In fact from 1 July 2014, renewable energy installations (except PV installations with a capacity under 10 kWp) are submitted to the obligation of reserving the number of green certificates corresponding to their electricity production prior to the installation of the renewable energy plant. Before 1 July 2014, the green certificates were automatically assigned once the administrative procedures performed. This new requirement enables a better planning of the number of green certificates needed, in order to avoid a surplus of green certificates on the market. However, this obligation results not only in increased competition from producers to obtain green certificates, but also in delays for some renewable energy installations (Mertens, Climact, 2014b).
- In Flanders, the green certificate mechanism has been reformed since January 2013 with different banding factors specified for each technology and for power categories within the different technologies. The support is based on a guaranteed IRR per technology and the banding factor is calculated on the basis of a complete cost analysis which determines the amount of green certificates needed. However, the banding factor is recalculated every year,thus leading to investment uncertainty (Al Bitar, Edora). Moreover, the green certificate system for photovoltaic installations under 10 kVA was completely abolished in January 2014, thereby affecting the confidence of stakeholders in the stability of the support scheme. The uncertainty of the support scheme was worsened in Flanders by the introduction of a grid injection fee from January 2013 for a period of 3 years, applying to new and existing PV systems up to 10 kWp that are benefiting from the net-metering scheme. Depending on the grid operator, a fixed fee amounting to 66 €/kW AC on average per year will apply to all PV systems. A smart meter, paid by the PV system owner, will measure the electricity injected in and withdrawn from the grid in order to establish the injection fee. This fee, officially implemented to compensate for the loss in distribution fee caused by these small PV systems, has resulted in an important reduction of the support level in Flanders. Following a complaint from the Flemish PV Association PV Vlaanderen, the Brussels Court of Appeal ruled in November 2013 that this grid fee was discriminating and that there was no legally-approved calculation methodology behind it (re-frame.eu Database). In 2014, the Flemish

	regulator has approved a new tariff methodology (now under regional competence) which included a new prosumer tariff for small PV system (< 10kWp). The DSO will define a new grid fee. There will therefore be a new system starting from July 2015, but it will remain based on a retroactive aspect (Al Bitar, Edora). Last but not least, the new Flemish government published a note on energy policy, including a proposal to reform the support mechanism, on the grounds that more emphasis should be given to the cost effectiveness of renewable energy policies. This position of the Flemish government leads to increased uncertainty among the renewable energy sector (Al Bitar, Edora). • The development of renewable energies in Belgium is not only hindered through the uncertainty of the support scheme, but also through the existence of shortcomings in the current legislative framework.. New sectorial conditions have been adopted by the Walloon government regarding onshore wind turbines. The aim of this new piece of legislation is to bring more clarity regarding the noise limits of wind turbines for people living in their vicinity. These new noise rules were essential because the noise from wind turbines has some specifics that do not allow to simply follow the general conditions for any industrial installation. • Furthermore, the **remuneration level for RES-E** does not take enough into account the positive externalities of renewable energies. It is very difficult to quantify the economic benefits of RES technologies (e.g. effect of climate changes or prevention of health problem) and the true cost of some traditional technologies (e.g. cost impact of a major nuclear incident). Consequently, RES technologies suffer from a lack of objective and quantitative comparison possibilities with other traditional technologies (re-frame.eu Database). Moreover, external elements such as the too cheap fossil and CO2 prices or even electricity prices also significantly impact the RES development. Consequently, RES plants have to compete with depreciated fossil or nuclear plants. This barrier was already reported last year and does not seem to have been addressed since then.
Grid regulation & infrastructure	• The barriers indicated throughout the previous reports in 2012 and 2013 have largely remained the same. In some regions, projects connecting to the medium voltage grid have to wait for a long time before being connected -lead times of at least half a year to two years are experienced (re-frame.eu Database). Moreover, the development of the RES decentralised production plants has led to insufficient **grid connection** capacity and a strong need for grid reinforcement. Although the renewable directive encourages a priority access to the grid for RES technologies, numerous projects cannot be connected at acceptable cost due to overcapacity at some connection points. In addition, the modalities of the connection contracts are sometimes vague and uncertain (re-frame.eu Database). As far as wind energy is concerned, new and small developers report that the best future development locations are already booked (contracts signed with land owners) and that important connection capacities are already booked at the TSO level, leading to scarce possibilities for new connection demands (Al Bitar, Edora). A further barrier deals with curtailment conditions, as DSOs often condition the connection to curtailment periods, without any compensation. Since these conditions are set at the end of the permit delivering process, the developer has no choice and must accept the conditions at the expense of the entire project.

	This barrier affects all renewable energy installations and more specifically wind farms (Al Bitar, Edora). In this regard, a study panel on “sustainable and intelligent electricity networks”, set up by the Walloon regulatory authority CWaPE upon request of the Walloon energy ministry, introduced the principle of “grid connection with flexible grid access”. Three cases are foreseen under this grid connection scheme: ○ Connection capacity is available: In this case, the grid operator does not have to reinforce the grid and the RES-installation can be connected without delay. If electricity is curtailed by the grid operator, the producer is entitled to financial compensation from the first day of connection. ○ The connection capacity is not available: In this case, an initial period is provided for the grid operator to perform the reinforcement works needed in order to receive all the electricity produced by the installation concerned. The producer can feed its electricity as far as possible, but he cannot receive financial compensation in case of curtailment. The grid operator has a maximum period of 5 years to undertake the necessary grid reinforcement, beyond which it is obliged to financially compensate the producer. ○ Grid connection location is considered "unreasonable": In this case, the producer is not entitled to financial compensation at all (Ghigny, CWaPE). • The support through net-metering leads to increasing rates of electricity distribution in Wallonia, due to the fact that distribution network costs are covered by a reduced number of net kWh consumed. This situation is deemed discriminating for electricity consumers not owning any renewable energy systems. This issue was however acknowledged by the Walloon government. As a result, new electricity tariffs came into force from 1 January 2015, which calculate the operating costs based on the amount of kWh withdrawn from the grid. Moreover, this new calculation method of tariffs aims at encouraging self-consumption of electricity to save the distribution grid costs (Ghigny, CWaPE).
Administrative processes	• The majority of barriers falling under the category of administrative processes relate to the **complexity of administrative procedure**. In Flanders, the situation has evolved since last year’s report. The permit procedure was simplified; the environment and the construction permits are now bundled into a single permit. This is a good development in Flanders, since the complicated permit system considerably impaired the RES development speed and the RES sector was claiming for a one stop shop system. In Wallonia, a one stop shop system is implemented and makes the process simpler. Last year, discussions on a fundamental review of the wind energy strategy (new regulation, new permit delivering method, new criteria, new spatial planning) have impaired the investment climate and jeopardised the wind energy projects currently in the pipeline. The new Walloon government has now abandoned this review of the permit delivering procedure. The investment climate is however even worse than last year due to a systematic challenge of the delivered permits by the wind energy opponents at the Council of State level. The new Government is currently reluctant to adopt the relevant measures in order to tackle this juridical uncertainty and even challenge any future new wind

farm plant which would not be in the vicinity of a motorway. Nearly 90% of the wind turbine projects in the pipeline are currently not in the vicinity of such motorways (Al Bitar, Edora).

- In this regard, some stakeholders report a wide-ranging **lack of coordination between decision-making levels,**thereby possibly leading to conflicting decisions impairing the good development of certain RES technologies (e.g. deletion of fiscal federal tax deduction without compensation on regional level for PV). Municipality vision may also differ from the regional one, especially regarding the impact of renewable energies. This particularly applies to onshore wind energy supported at regional level and opposed at local level due to the visual impact for citizens. In addition, rules in force for wind development are not clear and objective enough and lead several advisory administrations to decide on their own rules, making the decision process unpredictable and on a case by case basis for developers (e.g. for environment criteria). For example, municipalities have competence to deliver road permits (so called “permis de voirie”), in case the road has to be temporarily modified in order to enable the transport installation material. The further development of the project may thus depend on the granting of such road permits. Municipalities can also decide to impose a RES-production taxes that would compromise the profitability of the project (re-frame.eu Database). The complexity of administrative procedures also affects the **environment constraints** imposed for wind energy, biomass or hydro projects. In fact, these are deemed unclear, excessive, based on the worst case scenario, and open to interpretation. The environment constraints reduce investment security, as it is difficult to anticipate the environment measures to implement on the basis of the Environmental Impact Assessment (EIA). In addition, there is a lack of coherence between the different administrations for environment measures requirements. Some mitigation measures could be imposed – without scientific evidences - late in the permit process and could considerably reduce the productivity and profitability of the project. In some cases, the financial viability of the project is endangered. Mitigation measures are increasingly required, due to the systematic application of the precautionary principle (re-frame.eu Database). The issue of environment constraints has been partly acknowledged and addressed regarding wind energy in Wallonia. In 2013, the government has initiated a negotiation round between the stakeholders of the wind energy sector and the competent administration in order to define a compromised protocol (Al Bitar, Edora). However, the previous government did not succeed in enforcing the agreement. Moreover in February 2013, the Council of State suspended for the first time a wind permit for non-compliance with the Walloon noise standards. Following the suspension, an order of the Walloon government was published in March 2014 defining the applicable noise norms for wind farms having a total output up to 0.5 MW (Mertens, Climact, 2014b). This new piece of legislation allows higher noise limits than for other industrial installations, regarding the variable production of wind turbine. The noise limits also depend on meteorological conditions, in order to take into account the fact that during warmer periods, the opening of windows is more frequent (Al Bitar, Edora).
- Administrative permit procedures are sometimes also complicated by juridical uncertainty. This especially affects the development of wind energy. In fact, permits delivered for wind energy projects in Wallonia are

	nearly systematically challenged at the Council of State, which leads to the abortion of numerous projects. The situation has rather worsened in the past months, since a legal challenge was won in 2013 at the Council of State, thereby imposing on wind energy plants the same noise limit requirements as for any industrial installation in Wallonia.As wind energy noise is directly linked to the wind speed, meeting these requirements leads to considerable speed limitation of the turbine during nights and to significant production loss. This affects the profitability and the further development of numerous wind energy projects (re-frame.eu Database) • Further barriers belonging to the category of administrative processes relate to the **integration of RES-E in spatial and environmental planning**, namely aeronautical constraints for wind energy installations. In fact, a significant proportion of appropriate wind development sites are under military restrictions due to training area, radar vicinity or airport zones. Most of these restrictions are exclusion zones although others limit the height of the turbine and could affect the profitability of the project. As far as installations situated near military radars are concerned, the Defense Ministry does not apply the Eurocontrol guidelines. No clear decision process has been established in order to perform a detailed assessment study (re-frame.eu Database). In 2013, a little step forward was accomplished, as the Ministry of Defense released some training zones from military constraints as a consequence of the renewable energy sector lobby. However, new training exclusion zones were established, in areas where the government assessed lower wind energy potential (Al Bitar, Edora). In addition, the Air Traffic Control (ATC) has developed other exclusion zones in the vicinity of civil radars and civil airports. Although applying the Eurocontrol guidelines, the Belgian ATC seems more stringent than the other European guidelines (re-frame.eu Database). As a consequence, the installation of wind turbines is totally excluded in the region of Brussels-capital. Moreover in 2013, new aeronautic constraints have been identified, mainly related to wind turbines in the vicinity of meteorological radars and astronomical observation sites with excessive and subjective criteria (Al Bitar, Edora). Considering the density of population and the existence of many others installation constraints for wind energy, the aeronautical constraints for wind energy dramatically impact the development of Belgian onshore wind (re-frame.eu Database). Moreover, the renewable energy sector regularly complaints about the lacking clarity regarding the installation conditions near military radars. Since this year, the Ministry of Defence has validated for a single project new software developed by a Belgian company in order to mitigate the wind energy signal on radars. Even though this is positive for the future, the Ministry of Defense still needs to propose an objective evaluation protocol of the wind energy impact on their radars in order to be able to use this new software on several wind energy projects (Al Bitar, Edora). In 2014, there were some positive evolutions regarding the wind turbine impact assessment on radars. Thanks to the newly validated mitigation software, the Ministry of Defence has delivered positive advises regarding the incidence of some wind turbines on radars. A clear objectivation protocol is however still lacking. Despite this little step forward, the military and aeronautical constraints are still very negatively impacting the wind turbine development and remain one of the most damageable installation constraints (Al Bitar, Edora).

Other	• An important barrier to the deployment of renewable energies in Belgium is the **lack of support from decision makers.** Numerous policy-makers see renewable energies as cost-inducing technologies instead of environmental friendly technologies generating a significant socio-economic impact. The various positive externalities of renewable energy production remain insufficiently acknowledged. Some policy makers even take over the “Not In My Backyard” (NIMBY) messages from local anti-RES groups in order to justify their position (re-frame.eu Database). In addition, several political parties were in pre-election period (May 2014) and even asked for a moratorium in some sub-sectors, such as for PV and wind energy (Al Bitar, Edora). The negative communication of some policy makers on RES, combined to the negative image of certain RES technologies frequently relayed in the media has contributed to erode the image of the whole sector, leading to a **bad public perception of RES** (reframe.eu Database). • **Social acceptance** can also represent a significant obstacle for the development of renewable energies. Anti-RES (especially anti-wind energy) groups are becoming more and more vocal and organised, thereby disseminating misleading information and stimulating a NIMBY attitude. These organisations work with juridical experts and succeed in systematically sending delivered permit to appeals procedures. As described above, the lack of juridical certainty in the current regulations allows the appeal procedures to block or even abort numerous projects. Environment NGOs focused on local repercussions (bats, fishes etc.) also contribute to erode the RES image. Moreover, social acceptance is undermined by the conviction that renewable energy projects are very lucrative due to very attractive support schemes paid by final consumers (re-frame.eu Database). Still, various opinion polls show that RES projects remain massively supported by local communities. In 2013, the Belgian RES sector commissioned the market research company IPSOS in order to assess the general opinion of people regarding RES. The opinion poll shows that 95% of the French speaking Belgian people is in favour of RES development and more than 80% of people living in rural zones are in favour of wind energy development. The RES sector has therefore launched a communication campaign in order to counter the negative messages communicated by limited but well organised opponents (Al Bitar, Edora).)
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Belgium

Although Belgium has been confronted with the closure of some nuclear reactors due to security problems, which gave rise to some energy security concerns, RES still have the negative image of cost-inducing technologies for some policy-makers. In 2014, several regions challenged the RES target commitments adopted by previous governments and are currently reviewing RES scenarios inducing major investment uncertainty for the renewable sector. In addition, there is a dramatic lack of coordination between the federal government, which is responsible for energy security and the preparation of the nuclear phase-out to be achieved by 2025, and the regional governments, which are in charge of most of the renewable development but only interested in reducing the cost for consumers.

In Belgium, the RES-E support system has been amended at the different political levels and is now linked to the electricity price. The number of green certificates in Wallonia and Flanders is a function of a pre-determined IRR and the electricity price. In Wallonia, the precise relationship with the electricity price is not clearly defined, which leads to major investment uncertainty.

Electricity Sector

- Coherent Belgian renewable strategy: The federal government and the regional governments must rapidly cooperate and develop a common Belgian energy strategy in order to ensure energy security after the nuclear phase-out planned by 2025. Therefore, an alternative scenario must be collectively agreed in order to ensure sufficient energy capacity in 2025 based on a balanced energy mix. This scenario must integrate an increasing renewable energy share consisting of a mix of variable and dispatchable renewable energy sources and include a clear strategy on demand management and storage. Regional governments must base their renewable strategy on the challenges of energy security and climate change instead of adopting a traditional short-term cost reduction vision.
- In line with the defined targets, a clear framework must be implemented for each RES technology. Such a framework must be based on scientific criteria and must be protected at the statutory level through relevant legislative initiatives in order to prevent any legal action over the granted permits.
- Provide more transparency in the support system: When adapting the support system, the precise relationship between the support level and the electricity price must be clarified in order to provide higher transparency for renewable investments.
- Make sure grid reinforcements are in line with the RES spatial planning schedule based on a previously defined medium-term energy strategy. The integration of a large amount of offshore and, in Eastern Belgium, onshore wind power in Eastern Belgium remains a major challenge. Curtailment must be reduced to the lowest possible level and be accompanied by systematic financial compensation.
- Implement a one-stop shop for every permit-granting procedure and improve the coordination and coherence between decision-making bodies.
- Remove some installation constraints, taking into account mitigation and technical solutions (e.g. in order to instal lwind turbines in forest zones, in the vicinity of airports, radars…). This will allow to install plants in new places as far as possible away from residential areas.
- Launch public promotion campaigns for RES

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		9870	10530	10590	11320		
2	**% Energy dependence -** all products	62.8	46	39.6	37.7	34.5	35.4	37.2
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			1503.7	1825.5	1842.3	2032.6	1921.2
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			58.6	118.1	114.4	124.8	122.5
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			1.3	117	107.7	118.9	119.2
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		9.1	8.8	8.8	9	9.5	9.7
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		2261.4	2394.8	2300.2	2447.3		
8	**Share of RE in gross final energy consumption** (%) combined			14.1	19	18	18.2	18.8
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			12.7	18.9	18.9	19.1	19.2
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	57.11	58.26	53.47	55.59	59.42	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	18.9	18.9
Overall share of energy from renewable sources (including transport)	%	19.0	18.0
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	594	602
Gross total energy from RE consumption (including transport)	Ktoe	1846	1806
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	1020	1026
Wind onshore	MW		
Total wind (inc offshore)	MW	683	700
Sub-total (variable sources)	**MW**	**1703**	**1726**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**4940**	**4985**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Existing measures under Article 5 of the National Renewable Energy Action Plan (NPDEVI)					
Feed-in tariffs for electricity produced from renewable sources (FiT)	Financial	Energy generated (ktoe)	Investors	Existing	The measure is effective but changes were implemented during the reporting period. As of 27 July 2015 its application was limited to: - small energy sites, set out in items 1 and 3 of Article 24 of the ZEVI.
Measures planned under Table 5 (Annex 1) of the NPDEVI					
Establishment of an Agency for Sustainable Energy Development	Administrative	Installed capacity, generated and used energy from RS, behavioural change	Investors, energy undertakings, end consumers, planning authorities, associations and sectoral chambers, installation structures	Implemented	The Agency was set up in 2011 under the ZEVI as a successor to the Energy Efficiency Agency.
Elaboration of a geographical information system for Bulgaria	Soft	Installed capacity, energy generation	Investors, public administration, end consumers	Planned	Establishment of an Information Platform for Interoperability of Spatial Data and Services for use by the Public Administration and Citizens in relation to RES Energy under Operational Programme. Administrative Capacity, priority axis III 'Quality Administrative Service Delivery and Egovernance Development', Sub-priority 3.2. 'Standard Information and Communication Environment and Interoperability'. The project was completed in July 2014.

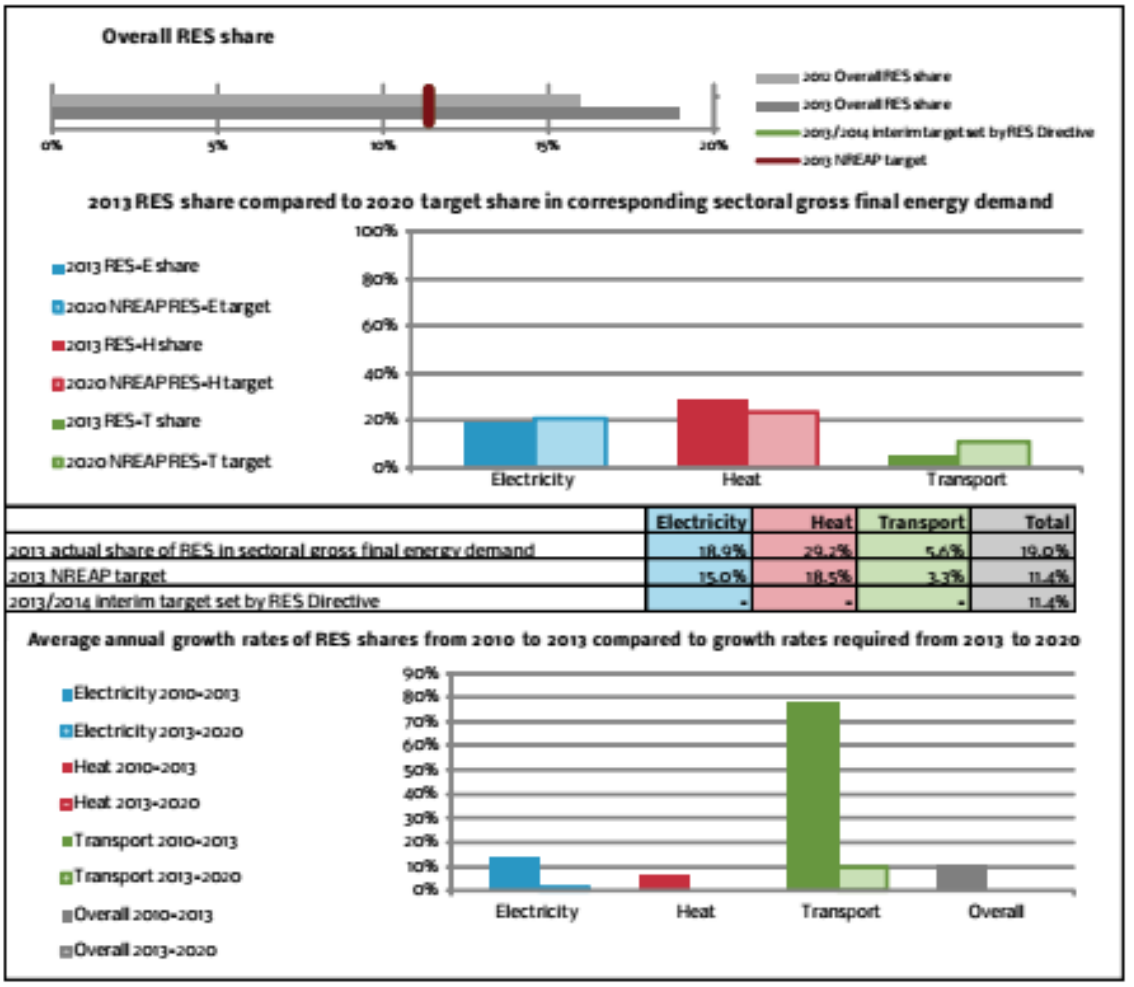
Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
One-stop shops	Administrative	New installed capacity (MW/year)	Investors/end consumers		A web-based system introduced by the AUER for on-line submission, registration and handling of applications and information regarding generation of energy from RS, guarantees of origin, transmission and distribution of electricity, production and use of biofuels. Started in July 2014.
Enhancing the administrative competence and capacity of officials responsible for authorisation and licensing	Administrative	Behavioural change	Authorities, authorisation bodies (all levels)	Implemented	Ongoing implementation; no deadline for Project 'Enhancing the institutional capacity of the AUER with a view to increasing the number and quality of services in the field of energy efficiency'. Programme BG04 'Energy Efficiency and Renewable Energy' under the Financial Mechanism of the European Economic Area 2009–2014 (FM of EEA) provides funds for strengthening the administrative capacity of experts of state institutions and municipalities with respect to measures for energy efficiency and renewable energy. Duration of the programme: until 30 April 2017.
Financing of projects for the production of energy from RS and energy efficiency	Financial	Installed capacity, energy generated and consumed, emissions savings	Investors, end consumers	Implemented	Ongoing implementation; no deadline for application.
Support for construction new transmission and distribution infrastructure, in relation to the connection of new producers from RS: status of a national	Administrative and regulatory	New installed capacity (MW/year)	Investors, end consumers	Implemented	Started in 2010 – permanent. No deadline

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
infrastructure site					
Competition between RS for energy generation	Regulatory	Installed capacity, energy generation	Electricity companies, investors	Planned	A Bulgarian Independent Energy Exchange was set up with a view to the full liberalisation of the electricity market. It signed a cooperation agreement with the exchange operator Nord Pool Spot for the selection of a platform. Since 24 July 2015 all new producers of electricity should sell their electricity on the electricity market. The only exceptions are energy sites under items 1 and 3 of Article 24 of the ZEVI.
Use of options for managing consumption and load reaction	Regulatory	Installed capacity (more efficient integration)	Research community, industry	Existing	Regulations for Management of the Grid (SG No 6 of 21 January 2014). Regulations for Trade in Electricity (SG No 66 of 26 July 2013, effective from 26 July 2013, amended and supplements No 39 of 9 May 2014, No 90 of 20 November 2015, effective from 20 November 2015)
List of qualified installers	Regulatory	Behavioural change, energy generated	Installer organisations, end consumers, investors, authorisation bodies, financial organisations	Implemented	The institutions licensed to provide vocational education and training under the ZPOO shall be obliged to submit a list of persons qualified to carry out the activities annually to the AUER
Application or use of cost/benefit analysis	Indefinite, financial, regulatory	Improving the business environment	Investors, end consumers, planning authorities	Implemented	Permanent. No deadline for application.

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Public awareness campaign, promoting RS	Indeterminate	Behavioural change	Installer organisations, end consumers, investors, authorising, bodies, financial organisations	Existing	2012-permanent. No deadline.
Measures implemented in the reporting period in addition to those given in the NPDEVI					
National Trust EcoFund (NDEF)	Financial	Reducing greenhouse gas emissions	Generating heat from waste and electricity from wind energy	Existing	Funds are extended within this measure to finance activities for energy efficiency and renewable energy sources. Ongoing implementation; no deadline for application.
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Bulgaria NREAP 2014/15

- Bulgaria has achieved its 2013 NREAP target, which is equivalent to its interim target 2013/2014.
- Growth in RES-E and RES-T is more than enough to achieve the 2020 targets. The 2020 target for RES-H&C has already been exceeded.



2013 RES share compared to 2020 target share in corresponding sectoral gross final energy demand

	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	18.9%	29.2%	5.6%	19.0%
2013 NREAP target	15.0%	18.5%	3.3%	11.4%
2013/2014 interim target set by RES Directive	-	-	-	11.4%

Average annual growth rates of RES shares from 2010 to 2013 compared to growth rates required from 2013 to 2020

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Theme	Barrier
Political & economic framework	• Most barriers which were reported under this category are connected with the **existence and reliability of the general RES-E strategy** as well as the **revenue risk under the given support scheme**. • As was identified in the first two years of the Keep-on-Track! Project, the **unstable and unpredictable legislative climate** constitutes one of the most severe barriers to the development of the renewable energy industry in Bulgaria. • Changes and amendments of legislation happen as often as each 6 months. Laws, ordinances and other tertiary legislation are being created, changed and amended with no assessment of the impact this might have on the interested parties, with no long term planning or even coordination between the responsible authorities. As a consequence the newly adopted laws contradict with the old ones and investors that have received financing from 111 institutions might lose it or declare bankruptcy as this state of affairs have not been envisaged (Kiriakov, APEE Bulgaria). Therefore, frequent amendments to the support system and abrupt regulatory changes have to be considered as threatening to the future of the entire industry. • On 14 September 2012, a retroactive grid usage fee was introduced for all RES-E plants connected to the grid since 2010, which had to be paid by RES-E plant operators to the grid operator in charge. For some technologies, this grid usage fee amounted to almost 40 % of the respective feed-in tariff (RES LEGAL Europe database). This decision brought many investors on the brink of bankruptcy. Particularly because of its retroactive nature, this measure subsequently led to a massive loss of trust in Bulgaria's governing and investment climate, as the European Commission began examining the legality of the grid usage fee in order to identify potential breaches of EU law. • However, on 18 June 2013, the Supreme Administrative Court of Bulgaria overruled this grid usage fee, after almost 1,000 companies filed official complaints (PV Magazine 2013). The court concluded that the fee was introduced in violation of the Energy Act, which stipulates that prices must be non-discriminatory, based on objective criteria and determined in a transparent manner. Subsequently, on 12 December 2013, the State Commission for Energy and Water Regulation (SEWRC) announced that renewable energy companies will receive a refund of the sums they paid to the three power distributors (ČEZ, EVN and Energo Pro) and the Electricity System Operator (ESO) in form of the grid usage fee (Petkov, Long Man Holding AD). According to SEWRC, the total sum of grid access fees amounted to over BGN 400 million (approx. € 200 million). Unfortunately, one of the power distributors, Energo Pro, is refusing to refund the sums and now there are lawsuits against them. • On 5 December 2013, the Bulgarian Parliament approved a proposal to

	introduce a **new 20% fee on the revenues of photovoltaic plants and wind farms** by amending the Renewable Energy Sources Act, which came into effect from 1 January 2014. The proposal was initially presented as a tax, but was subsequently revised to "fee" (Petrova, Moiry Consult Ltd.). Thus, starting from January 2014, all PV and wind power plant operators were obliged to disburse 20% of their income generated under the feed-in tariff system. • Moreover, after the first attempt to introduce a “temporary” grid access fee was rejected in 2013 by the Constitutional Court, the state regulatory authority SEWRC declared to raise a **new grid access fee for PV and wind power producers** on 18 February 2014. This fee now amounts to BGN 2.45 (approx. € 1.25) per MW for the access of wind and solar power plants to the transmission grid, which shall be paid to the transmission grid operator ESO. SEWRC decided to backdate the new fee to the date when the previous fee came into force, thus retroactively applying the fee to all renewable energy plants which have been connected to the grid since that date. This measure shall enable the highly indebted company ESO to subtract the fee out of its financial liabilities. The new grid access fee was harshly criticised by both renewable energy associations and distribution grid operators. This grid access fee in combination with the renewable energy tax amounted to approx. 40% of the revenues from the feed-in tariff scheme. This led to the situation that payback periods were longer than the 112 duration of the guaranteed tariffs and investors were not able to pay back their loans (Petrova, Moiry Consult Ltd.). • Despite the recommendation from the European Commission to avoid **abrupt and retroactive measures**, sudden steps are still being enforced. This includes but is not limited to the above described measures. What is more, even permits, issued officially by ministries (e.g. Ministry of Environment and Waters) are being declared null and void for investors/energy producers who have already commissioned their power plant. These measures brought many investors on the brink of bankruptcy (RE-frame database). • Another example for the **unpredictability of the investment climate** is the way how the 20% tax on the income of photovoltaic and wind power plant operators was introduced (Petkov, Long Man Holding AD). After the grid usage fee had been ruled unconstitutional by the Supreme Administrative Court, the Bulgarian Government tried to find another way to raise a retroactive burden on renewable energy producers and introduced a 20% fee on the revenues of photovoltaic plants and wind farms with effect from 1 January 2014. This drastic change to the support scheme came very suddenly, as there was no public debate prior to the proposal (Petrova, Moiry Consult Ltd.). • In essence, the tax is contrary to the principles of the Bulgarian Constitution and violates the regulations of the European legislation (Petkov, Long Man Holding AD). Representatives of the Bulgarian Photovoltaic Association (BPVA) condemned this measure as populist and unconstitutional and declared that the tax would “effectively kill off any

	investor interest in renewable energy" in Bulgaria (Solarnovus, 2013). As a result, Bulgarian President Rosen Plevneliev decided to notify the Constitutional Court about the renewable energy fee stating that it had been adopted "amid a lack of transparency" and that it would have a "dramatic impact on the business climate in Bulgaria" (Novinite 2013c). However, Prime Minister Plamen Oresharski said that if the Constitutional Court rejected the tax, the government would find a new way to tax the renewable energy producers. Eventually, on 31 July 2014 the Bulgarian Constitutional Court declared the 20% fee unconstitutional, leading to a suspension of this fee from the beginning of August 2014. However, PV and wind power plant operators have so far not been able to recover the amounts they have paid in the period from January to July 2014 (Petrova, Moiry Consult Ltd.). • Generally, there is a **serious lack of transparency** in the political decision-making process. Even in cases when a public discussion is held, in general statements, opinions, notes of suggestions are not taken into account. This situation can partly be explained by the fact that conventional energy producers play a dominant role in the political process. This "conventional lobby" aims at building large, centralised energy projects, which are characterised by a lack of transparency and are suspected of corruption (Petkov, Long Man Holding AD). • A similar state of unpredictability and intransparency can be observed in the Bulgarian judicial system. In general, law suits against the state regulator or the TSO are very lengthy and are mostly unsuccessful. According to stakeholders, courts are biased and decide often in favour of the state regulator (Pavlov, wpd Bulgaria). 113 For instance, in the beginning of September 2012 the National Energy Company NEK and the three distribution system operators Energo-Pro, ČEZ Bulgaria and EVN Bulgaria turned to the State Energy and Water Regulatory Commission (SEWRC) with a demand for imposing of provisional grid access fees for the renewable energy producers. Quite peculiarly that happened behind closed doors, with no public discussion with the interested parties. Two days after submitting the request-letters, SEWRC voted the new fees in a rather unlawful manner (not following the existing legislation and procedures of decision taking; not giving proper motives for the distinction between technologies) (RE-frame database). • In a similar fashion, the distribution system operators EnergoPro and EVN filed a request to the regulatory commission in 2013 to introduce the new grid access fee for renewable energy producers. In reaction to this proposal, the energy regulator SEWRC proposed a permanent fee in the amount of BGN 2.45 (approx. € 1.25) for the access of wind and solar power plants to the transmission grid, which shall be paid to the transmission grid operator ESO. Moreover, as the grid access fee only considers access fees for the transmission grid, the three distributors also demanded to raise fees for the access to their distribution grids. • Furthermore, **access to finance** is also a serious issue for the Bulgarian renewable energy industry. Due to the uncertain investment climate, the local banks deny financing of renewable energy projects. With regard to

	the high political and legal risk, there are virtually no more foreign companies investing in renewable energy in Bulgaria. In the past 2-3 years, no large PV or wind power project has been implemented. There are only few smaller projects mostly developed by Bulgarian investors. However, these Bulgarian developers only receive bank loans due to the fact that they have a "main business" (such as construction companies, hotels, etc.). Currently, there are no investors which would focus only on renewable energy (Tsachev, Renergy Bulgaria).
Market structure	• The barriers within this category are mostly related to the fair and independent regulation of the RES-E sector. • According to stakeholders, one of the biggest problems in Bulgaria is the fact that the unbundling of the transmission system operator provided by the Third European Energy Package has not been transposed into national law so far. Despite the clear requirements for unbundling, the National Electric Company (NEK) and the Electricity System Operator (ESO19) are still closely linked (RE-frame database). These requirements foresee that ESO is supposed to be entirely separated from NEK, so that ESO becomes owner of the grid and is solely responsible for its maintenance and investment, while NEK would be in charge of the production and commercial activity. • However, after the European Commission launched an official investigation against Bulgaria in December 2012 to inspect potential abuse of dominant position on the wholesale electricity market, the Bulgarian authorities were forced to act. Due to the fact that Bulgaria has so far failed to implement the Third Energy Package, the country could be penalised by the European Court of Justice with daily fines in the amount of € 8,448. At the beginning of October 2013, the Bulgarian Ministry of Economy and Energy presented its plans to transfer the Bulgarian transmission grid, which is currently operated by the country's largest utility NEK, to the Electricity System Operator (ESO). While ESO is currently still a subsidiary of NEK, the Bulgarian government envisages transferring the company to the Bulgarian Energy Holding (BEH), which in turn owns NEK. Whereas some of NEK's creditors disapprove of this plan and criticise the lack of an acceptable financial model, the Ministry countered these claims and pointed out that the new model had been consulted with the creditors of NEK (Novinite, 2013a). On 4 February 2014, BEH issued an official statement declaring that the separation of grid ownership of NEK and ESO had reached its final stage ensuring compliance with the Third Energy Package (BEH, 2014). • Effectively, there is still no liberated and working energy market in Bulgaria. Even though the Government adopted new Electricity Trading Rules in May 2014 which aimed at liberalising the Bulgarian energy sector, this intended market liberalisation is not working well. If the energy market had been actually liberalised, RES plant operators could officially register as energy traders and there would be some potential for new small-scale renewable energy projects (Petrova, Moiry Consult Ltd.). However, the current legal framework did not introduce new rights for RES plant

operators, but only new obligations. For example, as the balancing market was launched on 1 June 2014, PV and wind power operators are now obliged to provide regular forecasts for the electricity generated by these plants and fed into the grid. Yet, the Electricity Trading Rules fail to take account of the specifics of the RES generation which cannot achieve the desired forecasting accuracy in the "day-ahead" time framework set by the Energy Regulator. Furthermore, NEK is able to correct the forecasts of the RES producers and thus is able to increase the amount of their imbalances. For wind power producers, the balancing costs for the month of June ranged from 10% up to approximately 30% of the purchase price of the electricity produced (REframe database).

- Moreover, as curtailment still occurs on a regular basis in Bulgaria, it is almost impossible for the affected plant operators to fulfil their electricity generation forecasts. On order of the Transmission System Operator (TSO), the three electricity distribution companies (ČEZ, EVN and Energo-Pro) are frequently limiting the maximum power generation of all PV and wind power plants. The TSO argues that this step was necessary due to an imbalance between the production and consumption of electricity. This leads to the absurd situation that RES plant operators are being curtailed by the DSOs and then even have to pay higher balancing costs for not meeting their forecasts (Pavlov, wpd Bulgaria).

- The Electricity System Operator is using the revenue from these higher balancing costs to refinance the stateowned utility NEK which is technically bankrupt. As of October 2014, the company has run up a total debt of BGN 3 billion (approx. € 1.5 billion). One reason for NEK's financial situation is the fact that due to political reasons, the Bulgarian Government is keeping household prices for electricity artificially low. Currently, these prices are far below market prices. According to stakeholders, the entire energy market is therefore manipulated and the industry and especially RES plant operators have to pay different fees in order to save the state-owned company from bankruptcy (Pavlov, wpd Bulgaria).

- Household electricity prices are a sensitive topic in Bulgaria since they make up a large portion of monthly household expenses. While the country has the lowest electricity prices in the European Union, it also has the lowest average wages. All political parties are therefore trying to avoid social unrest at any cost. Prime Minister Boyko Borisov resigned following nationwide protests against high energy prices and low living standards in February 2013. Therefore, the next Bulgarian government led by the Socialist party even ordered three price decreases for households. Yet, after the resignation of Prime Minister Oresharski, the caretaker Minister of Economy and Energy, Vasil Shtonov, finally decided to raise electricity prices by 10% in order to stabilise NEK. Subsequently, the State Energy and Water Regulatory Commission approved on 1 October electricity price increases of an average of 9.79% with immediate effect. According to Shtonov, the price increase will refinance NEK by more than BGN 200 million (approx. € 100 million) (Sofia Globe, 2014).

- But not only the National Energy Company is in dire straits. According to the Parliamentary Committee for Energy, all three electricity distributors

	operating in Bulgaria are facing bankruptcy. This situation was supposedly caused by falling electricity prices, as well as the new rules for the purchase of electricity from renewable sources, which came into effect in March 2013. Since then, the reimbursement of expenses by SEWRC has been limited. The committee unveiled that EVN has recorded losses of almost BGN 300 million and ČEZ nearly BGN 200 million. According to Energo-Pro, the company expects to run up losses totalling BGN 143 million by the end of 2013. According to the new methodology which was introduced through an amendment of the Renewable Energy Act, NEK reimburses the power distributors on the basis of forecasts. Therefore, the risk of connecting excessive renewable capacity to the grid has been transferred to the distribution system operators (Novinite, 2013b) • Before the amendment of the reimbursement system, end suppliers bought renewable energy, sent invoices to the public provider NEK and were reimbursed for their expenses. However, due to the fact that the renewable energy output was much higher than expected, NEK amassed debts of nearly BGN 2 billion. Along with these liabilities, NEK is also facing bankruptcy due to excessive expenses for the Belene nuclear power plant as well as the Tsankov Kamak Hydro Power Plant which in total amount to more than BGN 2 billion (Petkov, Long Man Holding AD).
Grid regulation and infrastructure	• The barriers which were identified within this category, are mostly connected with the **predictability and transparency of the connection procedure** as well as the **treatment of RES-E dispatch (curtailment)**. Since June 2012, the State Energy and Water Regulatory Commission introduced a moratorium on all kinds of new large-scale RES-E installations. The moratorium is valid up to 2016 and it is not relevant only for wind and PV installations up to 30 kW mounted on rooftops and biomass and hydro power plants up to 1.5 MW. Even already constructed RES power plants were denied a grid connection permit (Tsachev, Renergy Bulgaria). Thus, since 2012 there has been no development in the Bulgarian renewable energy sector. • The main argument of the transmission and distribution companies is the lack of infrastructure to accommodate the RES energy and the fact that not much can be done if there were no allocated budgets for reconstruction and development, which, on the other hand is in the purview of State Energy and Water Regulatory Commission. All in all, there are no officially published 10-years grid development plans for the distribution grid and we are in the middle of a vicious cycle – no plans – no funds that lead to non-meeting of the deadlines for grid connection by the transmission and distribution companies, and results in delayed commissioning of renewable energy power plants, together with priority curtailing of renewables (on the ground that they are more easily managed than the conventional thermal power plants). Even though existing regulations read that renewable energy curtailments should be compensated, this is fact only for a small number of companies (RE-frame database).
	• The barriers within this category are mostly related to the integration of RES-E in spatial and environmental planning. • The real issue is not that there are ecological restraints, not that almost a

	third of the Bulgarian territory is within the borders of Natura 2000, it is the ungrounded bans for certain territories. According to some organisations the spread of the ban should be throughout Bulgaria, allowing no more than 20% of the land to be used for renewable energy installations. This kind of ecological fundamentalism has been denied on number of occasions by most respectful and trustworthy international organisations with vast experience and expertise in environmental protection and nature conservation, yet to no success with our Bulgarian authorities. In the same manner, there is an official ban for small wind energy installations in urban territories and for ground installation of photovoltaics, despite the new technologies that allow this kind of equipment to be safely used in populated places (RE-frame database). • When discussing the preliminary stages of an investment project, we should mention that although there are relief/lay, topographic, rough potential wind and solar, etc. maps which are publicly accessible, the finding of the documents is rather a lengthy and difficult process related with personal connections, trial-and-fail attempts at communication, pulling strings, etc. Despite the requirements of a EC directive, still there are no publicly available cadastral maps. Under these circumstances and as one might expect, there is no coordination between the stakeholders as to where one could install RES power plants while following the requirements and restrictions of all the authorities (RE-frame database).
Other	• The barriers within this category are connected with the **public perception of RES**. • According to the prevailing opinion of the administrative bodies in Bulgaria, renewable energy producers are the main cause for all serious problems in the Bulgarian energy sector, as well as for the increasing energy bills for private households, which is definitely not true (Petkov, Long Man Holding AD). • The renewable energy sources have been declared costly, inefficient, and even dangerous for the very climate. For the past couple of years the government used the mainstream media to create and nurture a negative image of the renewable energy sources. RES were branded as the perpetrator for every increase of electricity prices with constant reminders that we have expensive energy because of the mischievous investors in RES. Overall, the lack of political will for development of RES and unwillingness for diversification of the energy sources were masked as a movement to save the general public from the unjustified prices of green energy production (RE-frame database).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Bulgaria

According to the government progress report, Bulgaria's share of renewable energy in final energy consumption reached 16.4% in 2013. The target for 2020 is 16%, so Bulgaria is well above the target specified by Directive 2009/28/EC.

Currently, Bulgaria has 690 MW of installed wind capacity and 1020 MW of PV capacity, while hydro-power plants (large and small) account to approximately 3800 MW. As the total installed capacity of the Bulgarian electricity system is approximately 14 000 MW, variable RES power plants account for approximately 13% thereof.

Despite the negligible installed RES capacity, the renewable energy installations were declared to be cost-inducing technologies and were further blamed by the last two Bulgarian governments to be the reason for increasing electricity bills.

In May 2014, the Electricity Trading Rules entered into force, and the balancing energy market was launched in June 2014. The Electricity Trading Rules do not take account of the characteristics of different types of technologies and do not provide a level playing field for all market participants. Under the existing provisions of the Electricity Trading Rules, the imbalance costs for wind power producers have reached up to 37% of their income.

In March 2015, the Bulgarian government revoked the feed-in tariffs for newly installed RES power plants because Bulgaria met its target of a 16% share of renewable energy in its gross final energy consumption.

Although over the last few years legal actions against the retroactive measures have been successful, renewable energy operators will not receive any compensation. Firstly, the Supreme Administrative Court revoked the provisional grid access fee of September 18th 2012. Then, in August 2014, the Constitutional Court revoked the 20% tax on the income of wind and solar energy producers, but its decisions have no retroactive force, and the collected sums will not be compensated for.

Electricity Sector

- Improve the regulatory framework and its implementation:
  - Fully transpose the Third Package Directives
  - Fully transpose the Energy and Environmental State Aid Guidelines
  - Develop transparent and fair balancing and curtailment rules in line with EU legislation
  - Ensure that the network and balancing charges for renewables are fair and non-discriminatory
- Set up day-ahead, intraday and balancing markets.
- Review the renewable support scheme by shifting to a feed-in premium in line with the Energy and Environmental State Aid Guidelines.
- Ensure that renewables are gradually integrated into the market.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		28770	22920	16480	15810		
2	**% Energy dependence -** all products	45.8	-35	-15.7	12.3	12.4	13.4	13.9
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			3113.1	3069.2	3199.5	3559	3492.3
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			671.5	956.4	1124.6	1215.2	1099.1
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0.5	44.5	51.2	52	64
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		14.7	15.5	14.1	13.6	14	14.4
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3702.8	3621.5	3251.3	3004.1		
8	**Share of RE in gross final energy consumption** (%) combined			22.1	27.4	29.6	31	32.2
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			32.7	43.1	48.5	51.3	53.7
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	101.41	91.04	79.73	74.21	70.71	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	43.12	48.48
Overall share of energy from renewable sources (including transport)	%	26.68	28.45
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	1329	1460
Gross total energy from RE consumption (including transport)	Ktoe	4145	4246
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	571	607
Wind onshore	MW	3395	3583
Total wind (inc offshore)	MW	4492	4854
Sub-total (variable sources)	**MW**	**5063**	**5461**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**6418**	**6882**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

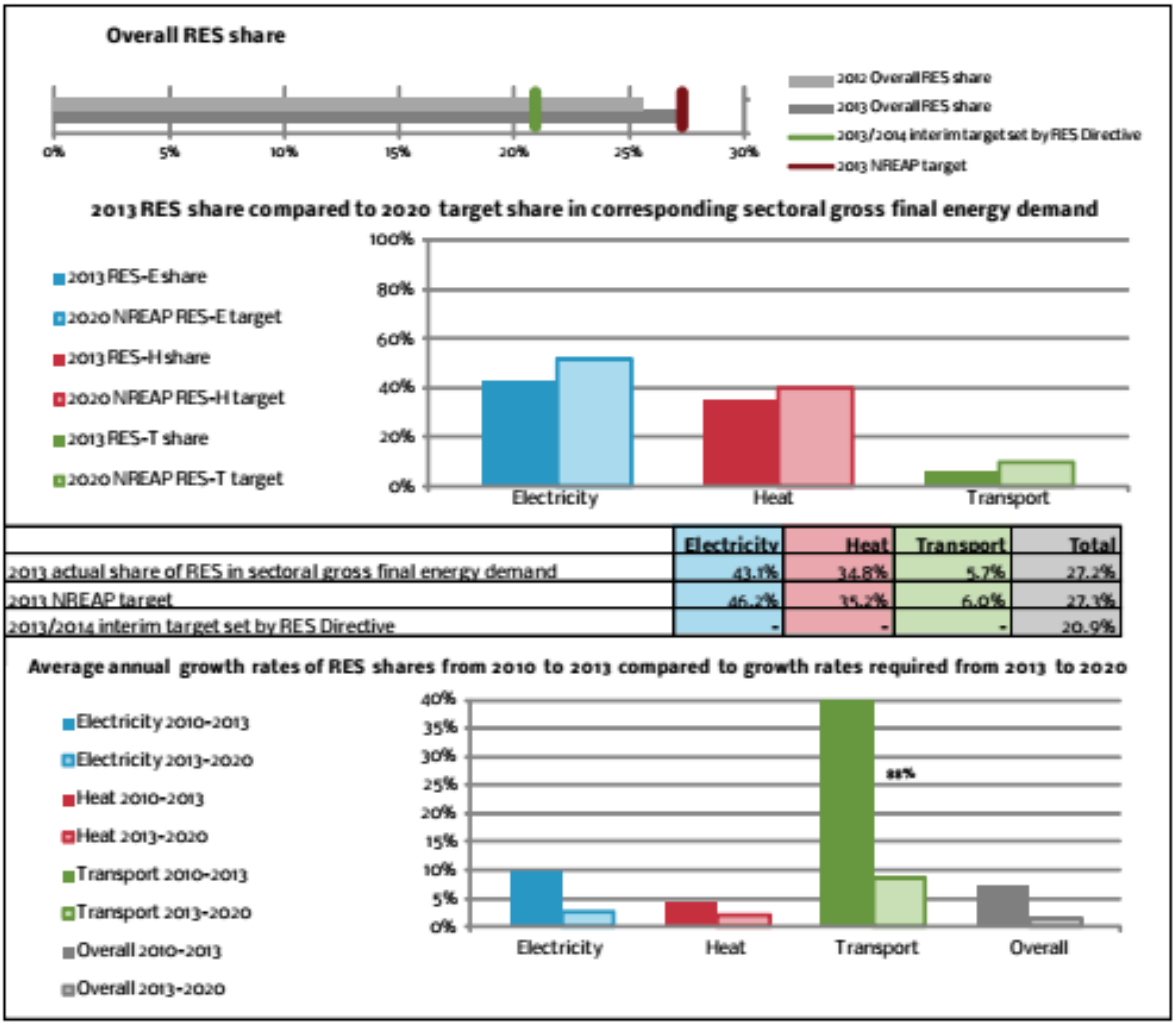
[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Adjustment of premium for wind turbines (RE Act	Economic	Erection of more efficient types of wind turbine.	Investors, RE electricity generation	Existing	Entered into force 1 January 2014
Increase in premium for domestic wind turbine	Economic	Large expansion of small domestic wind turbines	Autoproducers, investors, RE electricity generation	Existing	Decided January 2013. Entered into force February 2015
Funding pool for strategic energy planning in the municipalities	Economic	Promoting strategic energy planning between municipalities, undertakings and energy companies	Municipal authorities, undertakings and energy companies, as well as the Government & regional authorities	Existing	2012-2015
Funding pool for RE for processing	Economic	Promoting the energy-efficient use of renewable energy	Undertakings	Existing	2013-2020
Supervision of regulation of the Danish electricity supply sector	Regulation, analyses	Providing incentives for green conversion, cost-effectiveness, competition and consumer protection	The Government, electricity sector and others	Existing/ planned	2012-2014
Reorganisation of support for solar, wave power and hydro etc. after abolition of annual net settlement	Economic	Controlled expansion of solar photovoltaic etc.	Autoproducers, investors, RE electricity generation	Existing	Applies to plants erected since November 2012
Tendering of solar photovoltaic	Economic	Establishment of 20 MW of solar photovoltaic	RE electricity generation, investors	Planned	Contracts expected to be entered into in 2016
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Denmark NREAP 2014/15

- Denmark has very narrowly missed its 2013 NREAP target, but managed to achieve the less ambitious interim target 2013/2014.
- Growth rates in all of the three sectors' shares are enough to achieve the 2020 target, if maintained.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	43.1%	34.8%	5.7%	27.2%
2013 NREAP target	46.2%	35.2%	6.0%	27.1%
2013/2014 interim target set by RES Directive	-	-	-	20.9%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

The development of renewable energy sources, especially wind energy, is very successful in Denmark. In December 2013 wind power production accounted for what corresponds to more than half of the Danish electricity consumption during the month. On an annual basis, the share of wind power of the national electricity consumption reached 39.1% in 2014. (Holbech, Vindmølleindustrien) Further development of this energy source is to be expected. However, there are still some barriers, which may hinder or slow down the deployment of RES in Denmark.

Support scheme

In Denmark, electricity from renewable sources (RES-E) is promoted mainly through a premium tariff. The premium tariff system is based on bonus payments. The operators of renewable energy plants usually receive a variable bonus, which is paid on top of the market price. The sum of the market price and the bonus shall not exceed a statutory maximum per kWh, which depends on the source of energy used and the date of connection of a given plant. New onshore wind power plants receive a fixed premium of DKK 0.25 (approx. €ct 3) but the maximum subsidy (bonus plus market price) may not be higher than DKK 0.58 (approx. €ct 8) per kWh, for 6,600 full load hours and for electricity generation of 5.6 MWh per m2 rotor area, which corresponds to a duration of 6-8 years depending on the site (RES LEGAL Europe Database). This model is set to incentivize larger rotors (Holbech, Vindmølleindustrien). The support for off-shore wind energy is based on tenders. The winner of a tender is the one with the lowest bid for a premium tariff for 50,000 full load hours per MW installed capacity. Electricity producers using all or part of the electricity produced for their own needs are totally or partly exempt from paying a so-called Public Service Obligation (PSO) on this electricity. The PSO is a surcharge paid by every consumer on electricity consumption. The surcharge for the support of renewable energy is part of the PSO tariff. The surcharges are determined by Energinet.dk four times a year (RES LEGAL Europe Database)

The development of renewable energy sources, especially wind energy, is very successful in Denmark. In December 2013 wind power production accounted for what corresponds to more than half of the Danish electricity consumption during the month. On an annual basis, the share of wind power of the national electricity consumption reached 39.1% in 2014. (Holbech, Vindmølleindustrien) Further development of this energy source is to be expected. However, there are still some barriers, which may hinder or slow down the deployment of RES in Denmark.

Theme	Barrier
Political and economic framework	• Political issues constituting barriers for further development of RES can be divided into the policies on the European level and these on the national level. • European policy hindering RES is the EU 2030 framework for climate and energy policies from October 2014. The framework sets the European target for renewable energy sources of at least 27%, however, it sets no binding targets for RES for Member States (MS). This sends a message that the EU incentive for RES is not as strong as before (Holbech, Vindmølleindustrien). • Another issue related to the European policy is the EU Emissions Trading System (ETS). There is an oversupply of allowances in the system, which

	causes a very low price of carbon credits on the European market. Since the lack of binding RES targets for MS, ETS became even more important policy measure to encourage the countries to invest in low-carbon technologies. However, without an appropriate reform, ETS is failing to be the driver for a green transition in the EU. These two barriers combined jeopardise the development of renewable energy sources in the European Union. Thus since it is to expect that some MS will not be so ambitious in their RES development, it might also affect Danish RES industry. Especially the Denmark's companies producing wind energy technologies might face a decline in export opportunities for wind technology (Holbech, Vindmølleindustrien). • Also the European guidelines on environmental and energy State Aid for 2014-2020 in the EU (SAG) cause insecurity among wind energy developers regarding the way the support for wind energy in Denmark will be continued. The support design will have to change to be in accordance with the SAG. This design is apart from that also endangered through an ongoing case between the European Commission and Denmark on the Public Service Obligation tariff used for RES support. According to the European Commission it is incoherent with the Lisbon Treaty regulations on non-discrimination. It is still not clear how this case will be decided on, but it is possible that the support design will also have to be adjusted in order to be non-discriminatory towards electricity producers in other MS (Holbech, Vindmølleindustrien). • As highlighted in the previous report concerning barriers on the national level, there is a conflict between the energy and climate policy on one side and the tax policy on the other side. In Denmark there are a lot of socalled "green taxes", which are levied on electricity, heating and transport from fossil fuels. The conflict is caused by the politicians' expectation on high revenues from these taxes and the environmental targets they want to follow. The more renewable energy sources are used in energy generation and the more effective the energy efficiency measures are, the lower the tax revenues are (Ahm, PA Energy). • As a part of the Energy Agreement an analysis on current support scheme and its financing design (Public Service Obligation – PSO) is conducted. The analysis is planned to be finished by spring 2015. As a result of it, it is expected that the financing scheme will be put under pressure (Holbech, Vindmølleindustrien). • Also the support behind the Energy Agreement has become unsure. The Agreement constitutes a very stable framework for development of RES in Denmark, but political support to its measures and level of financing is not intact, and adjustments are frequent. The latest change was announced in the form of a Growth Package in 2014 from June 2014. The aim of the Growth Package is to boost the economy in Denmark. In the Package document it is stated, that the costs of the support for RES are higher than expected, mainly as a result of lower electricity prices and greater power generation from wind turbines. As a result some savings in the wind investments are planned, among others: a cut of DKK 100 million of support to onshore wind, reduction of 100 MW in the planned near-shore

	wind parks, and prolongation of the installation period for Kriegers Flak offshore park by 2 years. (Holbech, Vindmølleindustrien).
Market structure	• An issue, which is not yet so visible, but from around 2018-2020 and onwards will have a great impact on electricity system in Denmark is the amount of fluctuating wind power reaching more than 50% of Danish electricity consumption. A very important challenge will be to establish an adequate technical and regulatory framework for integration of wind power in the energy and transport systems. One of the solutions is to use wind electricity in the district heating sector through introduction of big heat pumps, development of interconnectors to neighbouring countries and electrification of the transport sector (see also RES-H&C sector) (Holbech, Vindmølleindustrien)
Other	• There is increasing local opposition towards wind energy. In December 2013, the Danish Ministry of the Environment, the Danish Ministry of Climate, Energy and Building and the Ministry of Health started a shared financed study of the relationship between noise from wind turbines and its effects on health. Since the results of the survey are still unknown, the municipalities are more cautious with permissions on installing turbines on their land (Holbech, Vindmølleindustrien). • In Denmark, next to already known on-shore and off-shore wind energy, there are also so-called near-shore wind energy installations, which are erected in a distance of at least 4 km from the coastline. This technology is still in the starting point and no tender on installing such turbines have been conducted yet. However, since on some planned locations the wind parks will be visible from the coast line, there is some insecurity among investors of near-shore wind energy on how the agreement between the wind park operator and people living on coastline will work. Neighbours of such turbines are, just like these of the on-shore turbines, entitled to receive compensation from the investor and to a local ownership scheme. This scheme means that at least 20% ownership shares are to be offered for sale to local citizens. Local citizens can thereby have a share in the revenue created by the wind farms. This has not been a problem regarding on-shore wind. On the contrary, it supported the acceptance of local populations towards wind energy. However, there is some insecurity concerning the possible impact this will have on the risk premium for the near shore tenders (Holbech, Vindmølleindustrien).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Denmark

Denmark is often mentioned as a best-practice example for RES support. The country has the long-term goal of building a carbon-free society. In March 2012, the Danish parliament adopted an ambitious Energy Agreement. However, adjustments have been made, the latest one in the form of a Growth Package in 2014, which aimed to reduce RES support costs, for instance by postponing the construction or reducing the tendered capacities of planned offshore and near-shore wind parks.

RES-E technologies are mainly supported via a feed-in premium scheme. Net metering, loan guarantees, and investment subsidies for small installations are also available. Wind energy (onshore and offshore) as well as solid biomass feature prominently in the Danish NREAP. The feed-in premium levels depend on the technology employed and are mostly set by an administrative process. The one exception is offshore wind power, for which support levels are determined in a tendering procedure. Premiums for onshore wind power are now designed to incentivize larger rotors. The Danish support system has proven to be very effective in the past and can provide policy guidance to other Member States. The experiences Denmark has been gathering in tendered auctions since 2004 show, for instance, that the devil is in the details when designing tender mechanisms. Penalties were applied in the Danish tenders for delayed or non-implementation of power plants. This constitutes best practice, as it ensures that bidders calculate the project realistically and are actually able to implement it in case they succeed in the tender. However, the Anholt tendering procedure has shown that penalties and time schedules, although necessary, should not be overly strict. Overly harsh penalties can deter potential bidders from applying, which leads to lower participation and competition in the tender procedure .

Electricity Sector

- Provide continuity based on the existing framework. The ambitious goals and measures specified in the 2012 Energy Agreement should be implemented.
- Public budgets: “Green taxes”, for instance on fossil fuels, generate revenue for the state. This revenue bound to decrease as renewables, exempt from such taxes, replace conventional fuels. Plans for future public budgets need to take this effect into account in order to reduce investor insecurity regarding possible future taxes on renewable fuels.
- Establish an adequate technical and regulatory framework for the integration of wind power into the energy system. One of the proposed solutions is to increase the use wind electricity in the district heating sector by establishing large heat pumps.
- Maintain and improve the public’s acceptance for RES plants: Finish and publish the study on the relationship between noise from wind turbines and its effects on health. Clarify compensation and local ownership schemes for citizens living in the vicinity of near-shore wind farms.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

ENERGY PROFILE: ESTONIA

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		3550	5600	6370	6630		
2	**% Energy dependence -** all products	45.1	32.2	13.6	11.9	9.2	7.3	6.8
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			987.5	1122.2	1186	1286.3	1460.6
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			23.8	45.5	51.9	61.5	51.1
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0	0	0	0	0
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		2.4	2.9	2.9	2.8	2.8	2.8
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3549.0	4612.6	5077.4	5111.6		
8	**Share of RE in gross final energy consumption** (%) combined			24.6	25.6	26.3	28.6	28.8
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			10.4	13	14.1	15.1	15.5
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	42.9	52.47	54.17	52.34	44.72	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	13.03	14.6
Overall share of energy from renewable sources (including transport)	%	25.62	26.47
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	107	121
Gross total energy from RE consumption (including transport)	Ktoe	818	830
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	0	0
Wind onshore	MW	248	341
Total wind (inc offshore)	MW	248	341
Sub-total (variable sources)	**MW**	**248**	**241**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**418**	**519**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

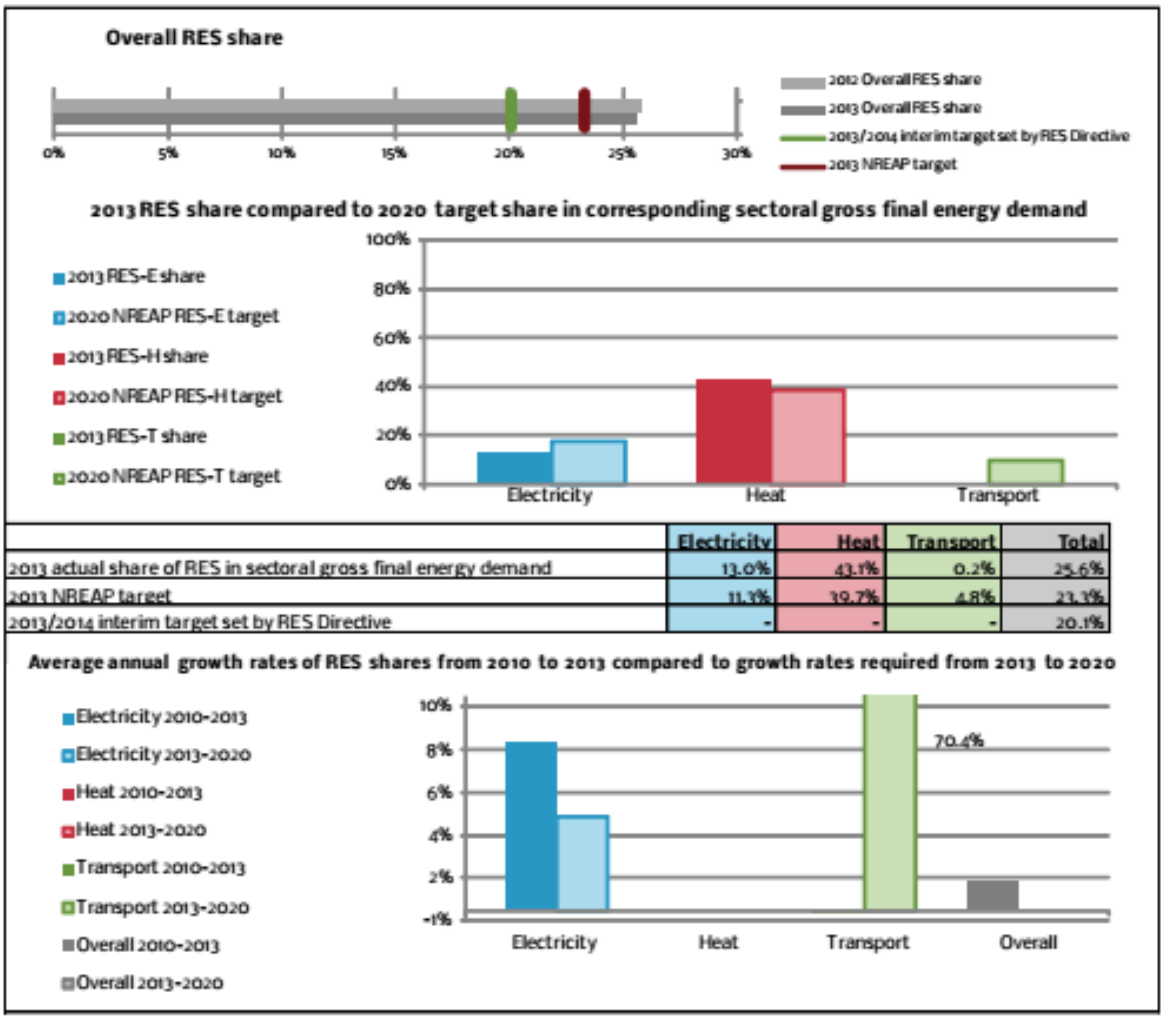
[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Financial/regulatory					
Patterns of production of renewable electricity for statistical trading	Financial/ regulatory	Energy production to guarantee the quantities specified in contracts for statistical transfers	Energy producers	Planned	Date of implementation 2016
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Estonia NREAP 2014/15

- Estonia has achieved both its 2013 NREAP target and the interim target 2013/14.
- The growth rate in the RES-E share is more than enough to achieve the 2020 target, if maintained. For RES-H&C, the 2020 target share has already been surpassed. However, the RES-H&C share has again slightly decreased from last year. This should be observed carefully.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	13.0%	43.1%	0.2%	25.6%
2013 NREAP target	11.3%	39.7%	4.8%	23.3%
2013/2014 interim target set by RES Directive	-	-	-	20.1%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Estonia's renewable energy growth has been extremely quick over the past years. In October 2014 Estonia's renewable electricity production amounted to 128 GWh. Half of this energy was generated from biomass, 49% from wind energy and 1% from hydro energy. Estonia has already met its renewable energy 2020 targets. In fact according to Eurostat the country's renewable energy production amounted to 25% of final energy consumption in 2011. In 2012 the share of renewable energy in final energy consumption increased to 25.2% (Äripäev, 2014). During last few years there has been a significant increase in renewable electricity production. The main potential for electricity from renewable energy sources (RES-E) lies in biomass, wind energy, biogas and small-scale hydroelectricity production (Elering, 2014).

Support scheme

Estonia's current premium priced feed-in tariff policy for renewable energies came into force in 2007 and is based on the Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. Since 2010, the premium amounts to €0.0537 per KWh payed on top of the income from the sale of the electricity. Since 2012, the Government of Estonia has made efforts in order to change the premium feed-in tariff in place. However on 27 February 2013 after a second reading, the draft legislation containing amendments to the current feed-in tariff scheme came to a halt, as amendments and their compliance with EU state aid rules must be consulted and approved by the EU Commission. In October 2014 Estonia received a confirmation from the EU Commission that the planned amendments to the feed-in tariff scheme comply with the EU state aid rules. The new scheme that shall be put into place will create a price ceiling for renewable energy producers. The amount of the premium will be calculated with the following formula: € xxx minus the last months weighted average spot price. The premium-priced feed-in tariff will be valid for a certain producer for 12 years (Maaleht, 2014). According to the Minister of the Economy and Communication Mrs. Urve Palo, these amendments will make renewable energy support schemes more flexible and eliminate the possibility of overcompensation as Estonia has already met its 2020 renewable energy targets. The new scheme foresees to pay out premiums only if there is a lack of renewable electricity from the yearly renewable electricity target. Amounts of renewable electricity that are missing from the yearly target shall be filled by least bidding tenders. This will ensure the least possible cost on consumers. Therefore, the support scheme will go through substantial amendments over the next years (MKM, 2015).

Theme	Barrier
Political and economic framework	• Compared to the previous year, one of the main barriers for the RES-E sector is the lack of reliable RES-E support scheme. The process of amending the support scheme has taken around three years already and currently it is not clear when the new scheme will be put in place. Also there is a strong possibility that the new scheme will not be put in place just as it was proposed in 2012, but some amendments will be made. Also there is no concrete information about the least-bidding tender scheme and the size of the yearly limit of supported renewable energy production. The discussion about the modification of support has been going on for several years and has thus discouraged investors and reduced the investment security in Estonia (Estonian Renewable Energy Association). In the renewable energy production sector only older projects have been completed and the new ones are waiting for the support scheme to be put

	in place. • The support scheme is currently being amended and the discussed conditions foresee that the new system will also apply to existing renewable energy projects. This would seriously endanger the business plans for existing power plants and it would reduce the trust of investors in future projects (Estonian Renewable Energy Association). • The Ministry of Economy and Communication has prepared a draft of amendments to the Electricity Market Act in June 2014 that would make small-scale electricity production up to 100 kW compete for support with larger renewable energy projects through a least-bidding system. This makes producing electricity for self-consumption non-attractive. In 2013 the number of households producing electricity for self-consumption corresponded to 152. In 2014 there were already over 300 micro-producers, which shows that people are interested in small-scale electricity production. If amendments are enforced, they will hinder the production of electricity for self-consumption. As a consequence, several companies offering renewable energy solutions would be forced to exit the Estonian market and local producers of PV panels would experience production difficulties (Estonian Renewable Energy Association, 2014). Amendments are expected to enter into force during 2015
Grid regulation and infrastructure	• Problems with the predictability of the connection procedure still exist. The preparatory work to obtain a grid connection permit and to be eligible for the support scheme is extremely complex. The process foresees several tests that are unique and not required in any other EU member state. Also, the transmission system operator has to conduct a grid study that should foresee the impact of the wind power system on the overall grid. For this calculation, the TSO requires information from wind turbine manufacturers which are considered business secrets. As a consequence, the authorisation process for project developers is very risky, lengthy and burdensome (Estonian Wind Power Association). One solution to overcome this barrier is to reduce the level of detail that the grid operator can ask from wind power developers and to standardise the tests to the level of detail in other countries (Estonian Wind Power Association).
Administrative processes	• Overall, the administrative procedures have improved but the administrative process is still very challenging when it comes to the integration of RES-E spatial and environmental planning. Estonia still lacks a spatial planning of the maritime area. Spatial planning of maritime area has been started, however its estimated completion date is unknown. For some project developers the length of the spatial and environmental planning process is unbearably long and causes severe financial distress. The process is lead by the environmental authority which practically has a veto power for wind power projects. Discussion and negotiations are not foreseen which prevents many projects to be completed succesfully (Estonian Renewable Energy Association). • The complexity of the administrative procedure is an issue. The Estonian air forces assess whether wind parks could disturb military radar communication systems. If this is their assessment then they will withhold

	their approval which is necessary to conclude the permission process. While this process was a serious barrier in the past it has become much easier also due to the cooperative role of the Estonian defense ministry. In some cases, however, it is still a reason why wind power plants cannot be realised (Estonian Wind Power Association).
Other	• As regards operational issues, there is a lack of technical experts. As a consequence foreign developers have to import their own staff (Estonian Renewable Energy Association).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Estonia

Estonia has already achieved its 2020 RES target share. The previous support scheme for RES-E consisted of a technology-neutral feed-in premium, resulting in a focus on low-cost technologies such as onshore wind and solid biomass. This is in accordance with the Estonian NREAP. A support scheme revision has been under discussion for years. Recently planned amendments in the support scheme include features to make it coherent with the requirements of the new European state aid regulation. A tendering procedure is now foreseen to ensure that production each year is sufficient to achieve the annually targeted RES-E production. Details on the tendering mechanism are still unclear, but the amendments will possibly also apply to existing power plants as well as to small plants <100kW.

Electricity Sector

- Provide long-term security for investors: Ensure an appropriate transition period after the final decision on support scheme amendments. It is definitely not advisable to apply the new tendering mechanism to existing power plants, as is currently being suggested. Such retrospective changes damage investor confidence and raise support costs in the long run. Consider an exemption from the tender procedure for small-scale installations, for which administratively set support levels may be more appropriate.

- Simplify grid connection procedures: Especially for wind farms, procedures are lengthy and complicated. Consider reducing the amount and level of details that the grid operator can ask from wind power developers and to standardise the required tests to a less detailed level similar to other Member States.

- As some offshore wind deployment is planned starting in the future, maritime spatial planning and permitting procedures need to be adapted to this.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		130140	134900	135320	136930		
2	**% Energy dependence -** all products	52.4	51.5	48.9	47.9	45.9	45.7	47.1
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			21070.2	23196.6	21453.3	21950.6	23895.7
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			855.1	1378.6	1483.1	1827.1	1840.1
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			53.3	407.1	508.5	624.4	701.6
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: FRANCE

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		155.3	154.4	151.8	141.3	145.3	147.2
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		4253.7	4130.7	3947.4	3771.5		
8	**Share of RE in gross final energy consumption** (%) combined			12.7	14.1	14.7	15.1	16
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			14.8	16.8	18.3	18.7	19.2
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	101.91	94.95	89.6	84.57	85.4	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	16.9	18.4
Overall share of energy from renewable sources (including transport)	%	14	14.3
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	7649	7873
Gross total energy from RE consumption (including transport)	Ktoe	22445	21568
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	5227	6320
Wind onshore	MW	8247	9110
Total wind (inc offshore)	MW	8247	9110
Sub-total (variable sources)	**MW**	**13474**	**15430**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**38535**	**40625**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

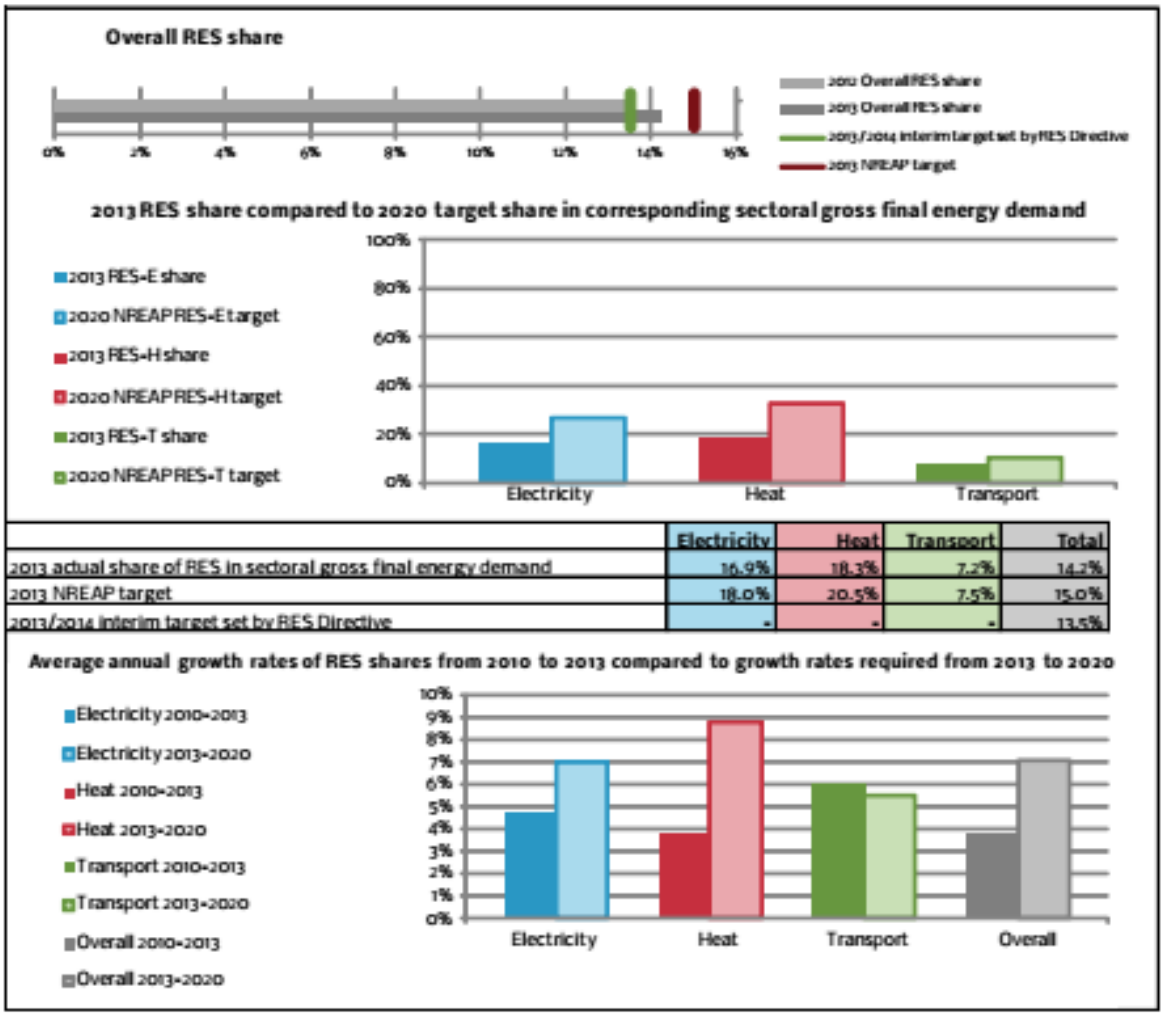
Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Regulatory measures					
Revision of administrative procedures	Regulatory	Simplification for small renewable electricity or heating projects; better account to be taken of the environment in large projects (photovoltaic, wind, biomass	Individuals, investors	Existing	2001 -
Single authorisation for the onshore wind and biogas sectors (installations classified for environmental protection purposes) and for offshore renewable energy and hydropower (installations, structures, works and activities)	Regulatory	Simplification of administrative procedures	Investors	Existing	2014 -
Guarantees of origin	Regulatory	Promotion of the renewable nature of the energy produced	Investors	Existing	2011 -
Planning related measures					
Regional Climate/Energy/Air plans	Planning	Success in identifying and capitalising on renewable energy potential	Local authorities	Existing	2010-2013
Financial measures					
Purchase prices for electricity produced from renewable energy sources	Financial	Increase in the number of renewable electricity production projects	Individuals, investors	Existing	2000 -
Calls for tender for renewable energy production	Financial	Increase in installed capacity for renewable energy production (wind, offshore wind, biomass, photovoltaic)	Investors	Existing for biomass and Photovoltaic	2005 - 2023

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
				Existing for offshore wind Existing for onshore wind in Corsica and overseas	
ADEME demonstration funds, extended by Future Investments sub-programmes	Grants	Stimulation of R&D	Investors/ researchers	Existing	2009 - 2013
Future investments	Grants	Stimulation of R&D	Investors/ researchers	Existing	2010 -
ANR (National Research Agency)	Grants	Stimulation of R&D	Researchers	Existing	2009 -
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in France NREAP 2014/15

- France has not achieved its 2013 NREAP target, but managed to meet the less ambitious interim target 2013/2014.
- Growth in RES-E and RES-H shares needs to accelerate in order to achieve the 2020 targets. The RES-T share's growth rate is enough to achieve the 2020 target, if maintained.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	16.9%	18.3%	7.2%	14.2%
2013 NREAP target	18.0%	20.5%	7.5%	15.0%
2013/2014 interim target set by RES Directive	-	-	-	13.5%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Theme	Barrier
Political and economic barriers	• The majority of barriers reported under the category "political and economic framework" relates to the existence and reliability of a renewable energy strategy and support scheme. In the previous report finalised in February 2014, one of the major barriers was **the lack of stable and durable support for renewable energies**, particularly affecting onshore wind energy and solar energy. Whereas the situation for solar energy has not significantly evolved, some important changes were observed in the wind energy sector. In fact, after three years of continuously decreasing yearly installed capacity since 2011, the wind energy sector finally witnessed an upward trend, with almost 1000 MW of installed capacity in 2014 (Cassin, Lebrun, CGR Légal). This growth is the result of several measures implemented in the last months. On the one hand, the publication in April 2013 of the so-called "Brottes" law64, which abolished the rule of minimum five masts per wind farm and removed the development areas for wind energy, fostered the development of wind energy. On the other hand, the publication of a new tariff order also contributed to restore confidence among the stakeholders of the wind energy sector. As a matter of fact, the wind energy sector in France long suffered from the uncertainty regarding the future of the feed-in tariff. Following the preliminary question raised by the State Council on 15 May 2012, the Court of Justice of the European Union concluded on 19 December 2013 that the French mechanism of purchase obligation of electricity from wind energy, financed through state resources, was a competitive advantage for electricity producers. Therefore, the purchase obligation was considered as state aid and should have been notified as such to the European Commission. This negligence from the French State led to legal uncertainty contrary to the interests of the industrial sector and undermining investors' confidence. After the cancellation of the FiT for wind energy by the State Council in May 2014, the Minister of Energy Ségolène Royal managed to notify rapidly a new tariff order to the Commission, which was published on 1 July 2014 with the same conditions as the previous one. The government thus avoided the wind energy sector to experience a legal vacuum which would have had devastating effects on wind energy development. Nevertheless, the judicial serial is not over yet, since the order was subject to an action for annulment, brought on 2 September 2014 by the Association Vent de colère, together with two other associations, and whose outcome is still unknown (Cassin, Lebrun, CGR Légal). • As far as solar energy is concerned, the photovoltaic sector was subject in the past years to **retroactive measures undermining the confidence of investors and developers**. On 7 January 2013, a decree was adopted introducing a reduction by 20% of the FiT for PV installations with an installed capacity between 100 kWp and 12 MWp for all projects which had asked grid connection after 1 October 2012 (re-frame.eu Database). The year 2014 further shattered the confidence of stakeholders through the entry into force of two measures, namely the removal of PV installations' eligibility to the tax credit from 1 January 2014 and the suppression of the bonus of up to 10% on top of the FiT for PV equipment produced in the EU

	from 9 May 201465 (Roland, Enerplan). • Besides, the degressive revision of the FiT every 3 months for photovoltaic installations is perceived as an **additional factor of instability**, since it allows very little visibility regarding the amount to be granted. In fact, the development of a project can be easily delayed due to lengthy administrative procedures (see below), which results into the allocation of a lower FiT for the project (Bescond, FNSEA). Moreover, in practice, it appears that the decrease of the FiT does not correlate with the actual number of projects connected to the grid. According to the legislation, the reduction of the FiT is calculated based on the number of connection requests submitted during the previous quarter. However, according to statistics provided by the distribution system operator ERDF, only 40% to 50% of the projects that submitted an application for connection are actually commissioned. Therefore, the FiT decreases more rapidly than it should (Roland, Enerplan). • The report of the Court of Auditors on renewable energy policies in France also casts doubt on the support to solar energy, which is deemed too expensive and inefficient. These conclusions gave rise to public debates on whether or not to focus on the promotion of more cost effective technologies such as wind energy, to the detriment of more expensive technologies such as photovoltaic energy. This debate hampers the development of solar energy and misrepresents the photovoltaic technology. In fact, there are some areas in France where the use of photovoltaic systems makes more sense than other technologies (Bescond, FNSEA). • A further barrier refers to the **shortcomings of the current support scheme** for renewable energies. Stakeholders namely warn against the negative effects of the allocation of production capacity by tendering processes. The tender procedure does not guarantee the sufficient development of installed capacity, since some tenders do not reach their targets in terms of installed capacity. For example, the call for tenders published in 2004 aiming at installing 500 MW of onshore wind energy only led to the construction of 278 MW in total, thus reaching only 56% of the initial objective defined by the tender (re-frame.eu Database). Altogether, the total installed capacity of offshore wind parks allocated so far through the two national calls for tenders amounts to 3,000 MW, whereas the decree on multiannual planning of capital expenditure of 200966 foresees a total installed capacity of 6,000 MW for offshore wind energy. This results into a lack of visibility of project developers, also creating a lack of project developments during 3-5 years (Cassin, CGR Légal). • Aside from not reaching its targets, the tendering system is also a **source of uncertainty** for project developers on the long term, since they cannot anticipate when the next call for tender will be published by the government. So far, tenders for PV installations over 250 kWp were published in September 2011, March 2013 and November 2014, for a total capacity of 1,200 MW. Not only is there no pattern for the publication of tenders, but also the specifications and evaluation criteria are modified for each new tender. As far as PV installations between 100 kWp and 250 kWp are concerned, the tendering specifications remained almost identical, yet only two tenders were published so far, namely in August 2011 and in March 2013 (Roland Enerplan).

	• Moreover, stakeholders point out the **instability of the legal framework for wind energy**. In fact, the frequency of successive reforms slows down the development of the sector. Yet industry players and investors need a reliable legal stability to commit to expensive and long-term wind energy projects. In this regard, the government has shown its willingness to simplify administrative procedures by introducing a new authorisation scheme in order to replace the currently complex legal framework. On 5 May 2014, a decree on the experimentation of a single environmental permit entered into force, which first only applies to certain regions of France67. This single permit is based on the ICPE authorisation68 (operating permit for installations classified for environmental protection) and stands as authorisation for other permits. As of January 2015, the little feedback from administrations and project developers made it difficult to confirm whether the single permit actually simplified the legal and administrative framework for wind energy installations. For now, project developers rather report that the procedural change leads to additional administrative burdens, since they had to review the content of application files which were already ready for submission (Cassin, Lebrun, CGR Légal). Despite the lack of feedback confirming the effectiveness of the single permit, the government intends to extend the experimentation to all regions. This change of regime could increase the fears of investors facing a new and unproven regulatory framework (Cassin, Lebrun, CGR Légal). • Other measures taken during the year 2014 even have a negative impact on the development of wind energy in the country. Such is the case of the decree of 14 May 2014 regarding foreign investments subject to prior authorisation.69 According to stakeholders of the wind energy sector, the provisions of this decree resulted into **complicated procedures** for the sale of wind farms to foreign investors (Cassin, Lebrun, CGR Légal). • Last but not least, industry stakeholders express their concerns about the **guidelines of the European Commission** of 9 April 2014 on State aid for environmental protection and energy for the period 2014-2020, which came into force on 1 July 2014.70 These guidelines foresee among others that from 1 January 2016 “aid is granted as a premium in addition to the market price (premium) whereby the generators sell its electricity directly in the market”. As a result, the guidelines foresee the removal of the mechanism of purchase obligation of electricity from renewable energies and the limitation of the duration of support to 10 years. The proposed reform will necessarily give rise to numerous barriers to the development of renewable energies by imposing a new and unproven support mechanism (Cassin, Lebrun, CGR Légal).
Grid regulation and infrastructure	• Barriers reported under this category mostly deal with the cost and duration of grid access. Since April 2012, grid reinforcement plans were introduced for the enhanced connection of renewable energy installations to the grid.71 However, the implementation of these plans is sometimes problematic. They namely foresee for each renewable energy plant the allocation of a defined connection point. Yet some assigned connection points can be located very far from the renewable energy installation. Therefore, this solution is **not deemed as cost effective**, all the more considering that project developers have to bear the costs of the electricity

transmission infrastructure from the installation to the grid connection point. Moreover, the decree establishing the grid reinforcement plans foresees shared grid connection costs between producers and grid operators during ten years. However, in the 10 plans developed until now, 82% of the grid reinforcement costs are only borne by the producers. This current **unfair distribution of costs for grid reinforcement** leads to an average 22% increase in the grid connection costs of wind energy developers and thus jeopardises the economic feasibility of their projects (Cassin, CGR Légal). During the year 2014, no measures were taken to balance the connection costs between producers and grid operators. It even seems that no solution will be found in this regard on the short term. In fact, in a deliberation of 20 January 2014, the regulatory authority CRE has stated that "provisions, such as those regulating the scope of the regional plans [for the connection of renewable energy installations to the grid], which define the boundary between the costs borne by producers and those borne by grid operators, have not resulted in a consensus".

- Another measure regarding the cost of grid access is problematic for large RES installations. According to the regional plans for the connection of renewable energy installations to the grid, RES installations over 100 kW are subject since late 2013 to the payment of a financial contribution to support grid reinforcement. This contribution corresponds to a defined share, proportional to the installed PV capacity, whose amount is specific to each administrative region. The share is determined for each region based on the amount of work needed on the electricity grid in order to ensure the achievement of the RES targets set by the regions for 2020. The amount of the share varies by region and can reach up to € 70 per kW of installed capacity. The share thus represents an additional financial burden for project developers on top of the grid connection cost (Roland, Enerplan).

- As far as the duration of grid access is concerned, the procurement of grid connection permits is often slowed down due to **long waiting periods** between the file request, the sending of the technical and financial grid connection proposition73 and the grid connection and commissioning contract.74 This waiting time may be explained by several reasons, including missing application documents or a work overload of the distribution system operator regarding contract processing (re-frame.eu Database). In addition, the grid connection procedure is often hindered by **technical constraints due to lacking grid capacity** in some areas. For example, if the installation is too far from the grid, or if the grid is overloaded, the distribution system operator (DSO) has to undertake specific works before being able to connect the installation to the grid. This procedure can be time consuming and have serious financial consequences (Cassin, CGR Légal).

- Finally, stakeholders report a **lack of transparency from DSOs** regarding costs and duration of connection proposals. Costs and time-lag for connection are also non-negotiable. This issue is all the more important in view of the fact that most of the renewable energy projects are connected to the French distribution system operator. In this regard, it is to be underlined that the distribution system operator, contrary to the transport

	system operator, is not regulated by the French energy regulatory authority (re-frame.eu Database).
Administrative processes	• The main barrier belonging to the category of administrative processes results from **multi-layered legislation and permits**, which are dissuasive for project developers, especially in the wind energy sector. Formerly, the wind energy sector was mainly subject to a planning permission and to a building permit, whose lengthy procedure already affected the development of the sector. In fact, between 6 and 8 years were often necessary to develop wind parks in France. Despite these existing administrative procedures, a further legislative layer was added for wind turbines in 2011, with the operating permit for installations classified for environmental protection.75 This permit implies a heavy administrative procedure normally restricted to the most polluting facilities, such as petrol stations or chemical factories. Thus, it is considered that wind turbines are likely to impair environmental protection and should therefore be authorised by prefectural order after being subject to a detailed environmental study. Apart from being discriminatory, this new requirement further hinders the deployment of wind energy (reframe.eu Database). Moreover, there is a **lack of coordination between the competent authorities involved in planning and permitting procedures**, since both permitting procedures require different time schedules and are delivered by different authorities.76 Whereas the building permit can be refused after one year of time, the acquisition of the ICPE authorisation can take more than 18 months (re-frame.eu Database). As a results of such administrative hurdles, the development of wind energy experienced a sharp slowdown between 2011 and 2013 with only 753 MW installed in 2012 against 1,100 MW in 2010 (re-frame.eu Database). • Furthermore, the **multiplicity of appeal proceedings** represents an additional administrative barrier and a source of insecurity. In this regards, stakeholders particularly reported this issue for the wind energy industry. In fact for wind energy installations, between 3 and 6 legal permits are delivered by the prefect, each of them being potentially subject to lawsuits (planning permit, operating permit for installations classified for environmental protection, electric authorisation, derogation regarding protected species etc.). In 2011, 31% of the building permits granted for wind turbines were challenged on appeal, 78% of which were confirmed. These figures highlight the intensive use of such legal processes on the part of wind energy opponents. As an example, building and operations permits for wind turbines are often attacked by opponents on the grounds that the simultaneous visibility of a historic monument and of a wind farm is considered as inacceptable. The resulting court proceedings can last several years and the interpretation of the competent administration in order to protect heritage is deemed excessive. On 19 August 2013, an order came in force limiting legal recourses against planning permits. This measure has been welcomed by the wind energy industry. However, the multiplicity of permits currently needed for wind energy installations in France still offers numerous opportunities for wind energy opponents to challenge the legality of wind energy installations and delay or even block their commissioning (reframe.eu Database)

Other	• One of the most important barriers under this category refers to the taxing regime applying to renewable energies. Wind and solar energy installations with an installed capacity over 100 kW are subject to a **flat-rate tax on grid businesses** called IFER77, which currently amounts to € 7,210 per MW. The amount of the tax is adjusted every year. The IFER tax was introduced in 2010 to level out the amount of a previously existing local business tax.78 Initially the amount of the tax to was set for all energy sources at € 2,900 per MW. In 2011 it was increased exclusively for solar and onshore wind installations to € 7,210 per MW. Therefore, the tax load is unduly high on wind and solar power compared to conventional power (re-frame.eu Database). • A further barrier lies in the **lack of information exchange between the relevant stakeholders**. While developing wind projects, developers namely face many difficulties due to the lack of communication between grid operators, regional and departmental directorates, landowners etc. Developers have to coordinate all stakeholders during the development phase of the project, which can easily discourage them from continuing their efforts. Several developers thus sold their projects in France, such as Iberdrola, EON or Vattenfall (Cassin, CGR Légal). • Last but not least, **public perception of renewable energies** is negatively affected by lighting provisions for wind turbines. While an IPSOS poll published in December 2012 showed that 68 % of respondents are willing to accept wind turbines in their town, the installation of wind farms remains problematic in France. In particular, lighting provisions regarding wind farms impair their social acceptance. Unlike other European and international legislation, the French legislation requires specific output values for flashing lights for each and every wind turbine (2000 cd red at night and 20,000 cd white during the day). The lighting must be visible within a radius of 360° and have autonomy of at least 12 hours in case of network failure. However, those requirements disturb numerous residents who frequently lodge complaints about abnormal troubles of the neighbourhood. In addition, most Regional Climate, Air quality and Energy plans79 as well as numerous individual permits are sued. The wind energy industry is thus very concerned by these too systematic complaints, which often result into legal proceedings in court (re-frame.eu Database).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for France

The main instrument to promote RES-E in France is a technology-specific feed-in tariff. Onshore and offshore wind, PV, geothermal, biogas, hydro, tidal and wave, and solid biomass are eligible for support. An automatic degression formula is in place. In the case of PV, the amount of electricity to be remunerated for every power plant is capped at 1500 full load hours annually. Any electricity production above this limit will be remunerated at a reduced tariff. In addition, tenders are held at irregular intervals, awarding promotional tariffs to wind, PV, geothermal, hydro, biogas and solid biomass installations. France already produces significant amounts of hydro power and according to its NREAP is planning to focus its further RES-E growth on onshore and offshore wind, as well as solid biomass.

Electricity Sector

- Avoid exposing RES producers to legal and regulatory uncertainty caused by frequent reforms in the legal framework, for instance as has recently been the case for environmental permits and even more prominently by the past failure of the French government to notify the feed-in tariff scheme as state aid to the European Commission. The predictability of tender calls would improve if they were held at regular intervals.

- Avoid changes in the taxing regime which retrospectively affect RES projects, such as the significant increase of the IFER tax especially for solar and onshore wind installations.

- Improve planning and permitting procedures: Ensure better coordination between involved authorities and their respective time schedules. The ideal solution would be a onestop-shop which can be approached by developers to handle all procedures and decreases waiting times. Speed up court procedures regarding complaints against planned wind farms. Simplify the adaptation of land use plans for large PV installations.

- Grid connection and access: Provide reliable long-term RES policies so grid operators are able to anticipate RES deployment in their area and can plan accordingly.
  Consider simplifying grid connection procedures and reducing the proportion of connection costs borne by RES producers.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		135600	133030	125320	124910		
2	**% Energy dependence -** all products	46.5	59.4	60.3	62.7	61.8	61.9	63.5
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			27712	33679.5	36017.9	38886.1	39481.4
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			3249.6	4446.1	4931.8	6810.5	6758.2
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			1008.5	2666.3	3100.3	3329.9	3275.8
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: GERMANY

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		220	219.7	217.7	208.9	212.1	216.4
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		4166.5	4070.4	3956.2	3874.9		
8	**Share of RE in gross final energy consumption** (%) combined			10.5	12.4	13.8	14.6	14.8
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			18.2	25.3	28.1	30.8	32.2
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	84.11	76.48	76.86	73.54	73.36	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	25.3	28.2
Overall share of energy from renewable sources (including transport)	%	12.4	13.8
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	12879	14041
Gross total energy from RE consumption (including transport)	Ktoe	27769	29734
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	36335	38234
Wind onshore	MW	33757	38156
Total wind (inc offshore)	MW	34660	39193
Sub-total (variable sources)	**MW**	**70997**	**77429**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**88668**	**95656**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

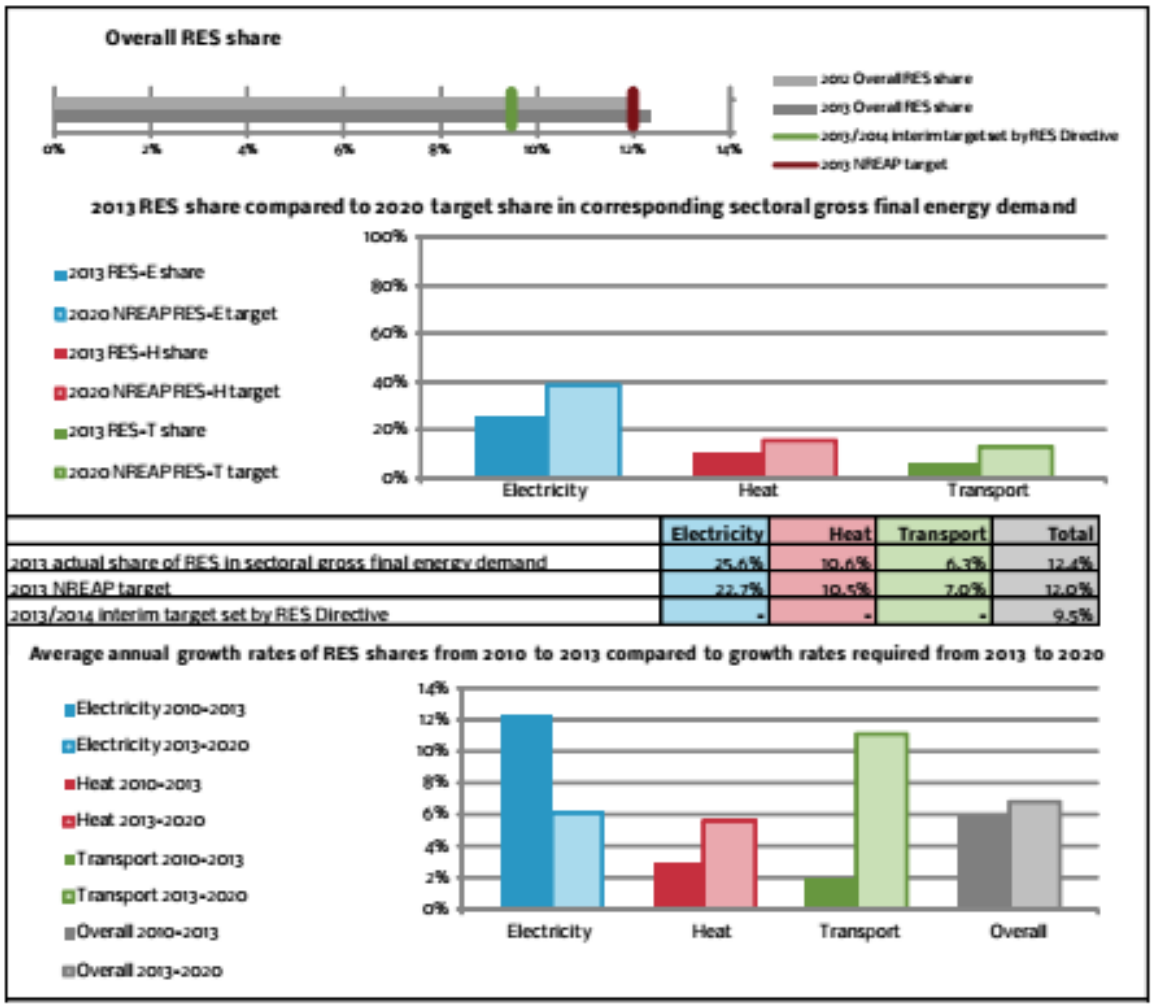
Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
		Regulatory			
Renewable Energies Act Changes through the Renewable Energies European Law Adaptation Act: Introduction of electronic register for guarantees of origin Timetable for connection to the grid etc. Amendments of 2012/2014: Market premium model with mandatory direct marketing and remote control for all new plants (to provide an incentive to feed in renewable energy at fairer prices) Flexibility surcharge to provide an incentive to feed in renewable energy at fairer prices Focus on cheaper technologies through adjustments to payment levels, reducing excessive subsidisation, cancellation of bonuses and ambitious degression Concrete expansion strategies for wind power, photovoltaic power (PV) and bioenergy Pilot tender procedures for ground mounted PV installations, incl. possibility of opening up the pilot across borders for renewable electricity from other EU Member States From 2017: funding levels for PV (above 1 MW) and onshore wind power (above 50 kW) in particular determined via calls for tenders	Regulatory	Increased share of renewable energy in electricity generation	Investors, private households	Exists	Start: April 2000 (as a successor to the Act on the Sale of Electricity to the Grid which has been in place since 1991); amendments in 2004, 2009, 2012 and 1 August 2014; the Act has no end-date
Grid Expansion Acceleration Act Introduction of a Federal Requirement Plan for extra high voltage lines crossing federal state or national borders, in which there is an overriding public interest, and new provisions for a planning approval procedure for such	Regulatory	To speed up the approval process for grid expansion (electricity)	Transmission system operator	Exists	In force since 5.8.2011, amended 20.12.2012 27.7.2013 Entry into force of the Regulation on the Allocation of

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
lines Transfer of responsibility for planning approval of NAPED lines to a federal authority (BNetzA					Planning Approval
Regulation on Land Use - Simplification of the granting of approvals under planning law for subsidiary ancillary plants to use solar radiation energy in and on roofs and outside walls of buildings or cogeneration plants inside buildings in urban areas even if all or most of the energy produced is fed into the public grid (commercial use)	Regulatory	Improvement of the granting of approvals for photovoltaic and solar thermal installations and cogeneration plants in urban areas	Particularly municipalities responsible for overall planning approval	Exists	Act to strengthen internal development in towns and municipalities and to enhance town planning law of 11 June 2013 (entered into force on 20 September 2013).
System Stability Regulation - Provisions on the upgrading of renewable energy and cogeneration plants so that these plants no longer instantly disconnect from the network in the event of under-frequency of 49.5 Hz or overfrequency of 50.2 Hz.	Regulatory	Solution to the '50.2 Hz and 49.5 Hz problem' (simultaneous disconnection of RE installations)	Distribution network operators	Exists	Regulation amending the System Stability Regulation of 9.3.2015 Entered into force on 14.3.2015
Financial measures					
'Energy storage' funding initiative - Newly established funding initiative under the 6th Energy Research Programme for electrical and thermal storage and general issues	Financial	Increased storage capacity for electricity and heat	Research, industrial partnerships	Exists	In force since 17.5.2011
'Sustainable grids' funding initiative	Financial	Development of sustainable grid technologies, improvement of environmental compatibility, effectiveness and efficiency of the electricity	Research, industrial partnerships	Exists	In force since 11.1.2013

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
		grids and security of the electricity supply			
Act to establish a special 'Energy and Climate Fund'	Financial	Measures in the following areas: energy efficiency, renewable energy, energy storage and grid technologies to support an environmentally sound, reliable and affordable energy supply and climate protection	Programme owners and those eligible to apply.	Exists	Entered into force on 1.1.2011 Amendment entered into force on 29.7.2011 Last amended by Article 1 of the Act of 22.12.2014
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Germany NREAP 2014/15

- Germany has achieved both its 2013 NREAP target and the interim target 2013/14.
- Growth in the RES-E share is enough to achieve the 2020 target, if it can be maintained. However, growth rates in the RES-H&C and RES-T shares need to be increased significantly.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	25.6%	10.6%	6.3%	12.4%
2013 NREAP target	22.7%	10.5%	7.0%	12.0%
2013/2014 interim target set by RES Directive	-	-	-	9.5%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Theme	Barrier
Political and economic framework	• As already highlighted in the previous report, the amendments of the EEG 2014 question the **existence of a general RES-E strategy and the reliability of the support scheme**. Even though the reform of the EEG and the introduction of the market premium went smoothly, the planned introduction of a tendering procedure starting 2017 still causes a lot of uncertainty in the market (Fischer, DKB; National profile of Germany, re-frame.eu). It is unclear how a pilot process for only one technology is expected to suffice for successfully transferring the experience gathered to other RES technologies. Some in the RES-E sector believe that if tendering is to be used, the Ministry for Economic Affairs and Energy (BMWi) should consider starting pilot tendering processes for all RES-E technologies, not only large-scale ground-mounted PV systems, for gathering more information. In addition, the ministry's time schedule for shifting to tendering is unrealistic, being too short (BMWi 2014a). It is impossible to learn from the first pilot auctions and to integrate this knowledge into the regulations for a tendering process for all technologies on the basis of the presented time schedule (Fischer, DKB; Hölder, CLENS). However, the ministry emphasised that it expects to gain mainly administrative experience with the pilot auctions (Hölder, CLENS). • In addition, a political strategy for bioliquids has been missing since the technology was excluded from the support scheme in 2009. Ever since, there has been no development in this sector at all (National profile of Germany, re-frame.eu). • There is also no clarity regarding the future design of the electricity market. Even though it is widely held that the electricity market design will have to change, the outcomes of the strategy process remain unknown (Fischer, DKB; Hölder, CLENS). • In general, there are many examples speaking to the decreasing political continuity and reliability of the German climate and RES policy targets. The on-going debate on how to achieve the climate target of 40% less greenhouse gas (GHG) emissions by 2020 and the massive political slowdown of the biomethane and biomass sector are only some of these examples. Most strikingly, however, the debate about the adequacy of Germany's CO2 targets is not limited to the political sphere anymore, but has spread to the experts (Hölder, CLENS). The president of the Federal Network Agency (BNetzA) recently stated that the adequacy of Germany's CO2 target is at least debatable and questioned whether it would be "dramatic" to postpone the 40% reduction target to 2025 (FR 2014). • The introduction of a tendering procedure does not only question the reliability of the support scheme, but also entails a number of **revenue risks under the given support scheme**. Its design is still unclear and it is expected that the first auctions will be subject to various difficulties, such as very low realisation rates among the winning projects and increasing costs for realising RES-E projects. Financial institutions predict that at least one of these two problems will occur with a two-thirds probability (Fischer, DKB).

	• Besides planned changes, already implemented measures also influence the stream of revenue. Current revenue risks refer to the conditions for receiving the market premium. Power plants already installed when the EEG 2014 entered into force will have to comply with the technical requirements for the remote control of RES plants by 1 April 2015. Otherwise, plant operators cannot receive the market premium. This translates into a transition period of less than a year, which is quite short for equipping all existing systems. To avoid losing financial support, plant operators of power plants below 500 kW can switch to the feed-in tariff (Hölder, CLENS). • Nevertheless, and contrary to fears expressed at the beginning of 2014, the introduction of the market premium model went very smoothly. Due to the very high competition among direct marketers, charges for direct marketing are very low. Especially for wind power, charges for direct marketing are subject to significant market pressure, also from plant operators. Consequently, plant operators retain a high share of the market premium granted under the EEG 2014. A negative effect, however, is that direct marketers are increasingly working at the edge of profitability and this could lead to a market concentration in the years to come (Hölder, CLENS). • Under the amended EEG 2014, **remuneration levels for RES-E** are unsuitable for some technologies. According to the DKB, especially for large-scale ground-mounted PV systems, support is almost missing and no new projects are being planned or realised. The sector expects better conditions from the tendering pilot process starting 2015 (Fischer, DKB). The development of the PV sector has already suffered because of the sharp decrease of the remuneration level in 2013. In 2013, the newly installed capacity had decreased by 50% as compared to 2012. In 147 2014, newly installed capacity remained lower than before and is expected to reach a total volume of approx. 2500 MW. • A change that might further slow down the development of the PV market is levying the EEG surcharge on solar on-site consumption. This negatively alters revenue and payback calculations for PV systems (National profile of Germany, re-frame.eu). • Because of the planned introduction of a tendering procedure by 2017, difficult **access to finance** for RES-E projects remains a relevant barrier. In order to finance RES-E plants, banks need to take into account the financial framework conditions for these technologies over a period of at least ten years. From an investor's point of view, the calculations for a new RES-E project under a tendering procedure are subject to a lot of uncertainties and to high financial risk. Consequently, the realisation of a high number of RES-E projects has been sped up, with investors trying to finish as many projects as possible within the next two years, before the introduction of tenders. Projects that cannot be finished by 2017 are being considerably postponed (by approximately four years), in order to bypass the tendering starting time. As a result, a significant gap of newly installed systems can be expected in the first years of the tendering process (Fischer, DKB). • The tendering procedure is expected to improve the framework

	conditions only for large-scale PV projects. In general, tendering is likely to favour large-scale RES-E projects rather than small-scale ones (Fischer, DKB)
Market structure	• By publishing its Green Paper "An Electricity Market for Germany's Energy Transition" (Ein Strommarkt für die Energiewende), the Ministry for Economic Affairs and Energy made an important step towards overcoming the uncertainty surrounding the future **existence of functioning markets for RES-E.** The paper contains important measures needed to make the electricity generation more secure and efficient: improving balancing group management, expanding the grid, and further developing the balancing energy markets. The Green Paper points out that a fundamental decision will have to be taken on whether to introduce a capacity market as a second market. Either way, additional reserve capacities should be introduced to give markets more certainty. In May 2015, the ministry intends to publish a White Paper that will be open for consultation until September 2015 (BMWi 2014b). The Green Paper is most welcome, as in the course of 2014 the process of reforming the balancing energy markets and enabling the participation of renewable energy power plants in these markets has been slowed down, mainly by the transmission system operators (TSOs) (Hölder, CLENS).
Grid regulation and infrastructure	• An important source of barriers within this category is the lack of **transparent and foreseeable grid development.** Even though there has been some positive development in the course of 2014, e.g. updated grid development plans, the overall situation remains almost unchanged. As already outlined in last years' reports, the current policy framework does not sufficiently stimulate grid reinforcement (Fischer, DKB). When considering that the amortisation of grid reinforcement investments takes approximately 40 years, the current policy framework does not provide adequate financial incentives to grid operators. To date, TSOs are facing too high interest rates and have to account for risk liabilities, which lead to negative investment decisions. • The financial incentives for swift grid reinforcement are different for different grid operators. On one hand, there are two privately-owned TSOs that have vast financial resources at their disposal. On the other hand, there are partly state-owned TSOs that do not have these resources and cannot reinforce the grid accordingly (National profile of Germany, re-frame.eu). The same holds true for distribution grid operators (DSOs). Due to the vast number of DSOs, designing regulation to stimulate the financing of grid reinforcement is particularly difficult. Furthermore, the business model of DSOs – based on collecting concession fees for the energy they transfer – is in danger, partly due to the increase in own consumption. Seeing that many grids belong to municipalities, investing into grid reinforcement might be difficult due to lacking financial reserves and other, more pressing investment priorities in the municipality (National profile of Germany, re-frame.eu). • Furthermore, there is a lack of political agreement regarding grid development between the Federal Government and the German states (Fischer, DKB). With regard to grid access of offshore wind, for

	example, grid development is often too slow, so that access to the grid has to be postponed (National profile of Germany, re-frame.eu). • As regards the **costs of RES-E grid access**, newly installed RES-E plants are obliged to have the necessary technical equipment to enable remote control and a certification of compliance with these technical requirements. As a consequence, grid access becomes more costly and more complex (National profile of Germany, re-frame.eu). • Another barrier, especially relevant in the northern part of the country, where wind energy is well developed, is the treatment of RES-E dispatch and curtailment of wind power plants. This negatively impacts the financing of projects. Under existing legislation, wind power plants can be curtailed by the grid operator in case of grid bottlenecks. It is at the grid operator's discretion to compensate plant operators or not. Both options are regulated by law30, though the decisions made by single grid operators are most often non-transparent and difficult to follow (National profile of Germany, re-frame.eu). However, the problem is not so much curtailment as such, but the lack of prior information from grid operators to direct marketers one or two hours before RES-E plants are curtailed. Instead of being able to make trade-based corrections to avoid unbalanced balancing groups, balancing capacities are used for feed-in management of the grid. This results in additional costs for direct marketers. Due to the missing transparency and standardisation of information about the curtailed power plants, passing these costs on to plant operators requires a lot of research and administrative work to identify the respective power plants. One solution for easing the situation would be to oblige grid operators to procure the necessary balancing capacity. Especially DSOs will then have to increasingly act as managers of the grid (Hölder, CLENS). • Another aspect regarding the dispatch of RES-E will become relevant as of 2016. Paragraph 24 of the EEG 2014 foresees the curtailment of new plants in case market prices for electricity are continuously negative for more than six hours. This might have a very negative impact on RES-E. However, it very much depends on the future development of the electricity market and the regulatory design, which might or might not favour the occurrence of negative prices (Fischer, DKB; National profile of Germany, re-frame.eu).
Administrative processes	• Just as in previous years, the majority of barriers reported within this category refer to the **integration of RES-E into spatial and environmental planning**. Spatial planning in Germany differs from one federal state to another, for example as regards height and distance restrictions for erecting wind power plants. Spatial planning can even differ within one state, as some municipalities have planning authority on these issues and can decide for example to include a height limitation in their land-use plan (a common limitation is around 100 m overall height). Furthermore, municipalities can designate specific areas for wind power projects. However, many municipalities designated few wind areas or chose areas with little wind power potential. These restrictions may hamper repowering of older wind power plants on one hand, and developing new wind projects on the other hand. Thus, in many German regions, it is not

	possible to use all available wind energy potential (National profile of Germany, re-frame.eu). • While land-use planning has improved in this regard, for example in Schleswig-Holstein, where areas designated to wind doubled (National profile of Germany, re-frame.eu), states like Saxony and Bavaria intend to make use of the so-called “Länderöffnungsklausel”31. As of 1 August 2014, paragraph 249 of the Construction Law (BauGB) has been amended, granting German states regulatory freedom to determine minimum distances between wind power plants and residential areas. On 12 November 2014, the Bavarian Parliament passed a law defining minimum distances for wind power plants, which must be at least ten times the hub height – even contrary to recommendations by a large majority of experts. Since modern wind power plants may reach a height of 200 m, prescribed distances will amount to two km (IWR, 2014; National profile of Germany, re-frame.eu). As a consequence, nearly all potential areas for wind power development will cease to be available (Fischer, DKB). It is clear that this tendency in spatial planning has the potential to completely stop the development of wind power at state level. • Further issues regard the proximity of wind power plants to radar areas. This applies to military radar areas as well as civil ones, for example, of meteorological services or civil aviation (National profile of Germany, re-frame.eu). In the course of 2014, the realisation of several hundreds of wind projects with an overall installed capacity of four GW was blocked due to disputes with operators of radars (SZ, 2014). A dialogue with the military has been initiated on this matter and progress has been made. However, cooperation with the German air traffic control and the German Weather Service proves to be more difficult, constituting a more serious barrier (National profile of Germany, re-frame.eu). According to an expert opinion by the Technical University Berlin (TU Berlin), the conflicts between radar stations and wind power plants can be solved (BWE, 2014). • Identifying suitable areas for ground-mounted PV systems has become difficult as well. It is a time-consuming process for project developers. In general, the approval of the respective municipality is necessary and implementation of the projects requires negotiations with landowners and the municipality (National profile of Germany, re-frame.eu). Other barriers are related to the **duration and complexity of the administrative procedure.** As outlined in the previous report, authorisation processes for grid reinforcement are lengthy at every level, and there is public resistance followed by delays by grid operators. Regional policy makers may even intensify opposition to grid extension, as in Bavaria regarding the construction of the SuedLink electricity line32 (National profile of Germany, re-frame.eu). • As regards complexity of the administrative procedure, for ground-mounted PV systems with an installed capacity above one MW, the complexity of the grid connection procedure is increased by the necessity to draft and amend land and urban development plans (National profile of Germany, re-frame.eu).
Other	• In order to assess the **public perception of RES-E** in Germany, one

	needs to differentiate between public endorsement of the support mechanism at an overarching level and the opposition from local communities to the construction of RES-E plants. Regarding the overall public support, the debate still focuses on the cost aspect and the distribution mechanism of the support system for RES-E – the EEG Apportionment Scheme (EEG-Umlage)33. The mechanism used allows utility companies to pass the costs of the scheme on to consumers in form of a surcharge on electricity prices. However, equal burden sharing is undermined by existing exemptions for energy intensive industries on grounds of competition. It has been pointed out that the political debate focuses disproportionately on these cost aspects, neglecting the generally high level of support required for such a fundamental energy transition. No relevant evolution regarding these barriers has been observed over the last year. • As regards the acceptance of constructing RES-E plants in local communities, it has improved over the last two years, mainly due to public participation. Getting local citizens involved in the early stages of a project and giving them the possibility to take a financial share in the project is key to maintaining public support for the energy transition (Fischer, DKB). • However, public acceptance varies across different technologies.
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Germany

The development of the renewable energy sector in Germany continued to be characterised by high levels of uncertainty in 2014. The Renewable Energy Sources Act underwent a fundamental change, with the support system shifting from a feed-in tariff to direct marketing and the inclusion of provisions introducing competitive bidding. The European Commission also played an important role, due to their investigation into the German support scheme and the special compensation scheme. Further, the Commission, in its guidelines on state aid for environmental protection and energy 2014-2020, forcefully introduced competitive bidding as the only way support schemes will not be regarded as contrary to European law. The political and energetic crisis in Ukraine also played a significant role.

The amendments of the Renewable Energy Sources Act are significant and will have a negative impact on the future development of the RES sector. The expansion goal of 100 MW and the low tariffs for bioenergy, the changes regarding solar self-consumption, the inclusion of competitive bidding starting 2017 and the provision regarding negative market prices and RES may lead to market distortion and a lot of uncertainty among investors.

Electricity Sector

- Forego the introduction of competitive bidding : Competitive bidding increases the support costs and threatens to exclude a large number of small and medium stakeholders from participating in the Energiewende. It increases investment uncertainty and negatively impacts public acceptance.

- Further develop the electricity markets: The new challenges of the Energiewende and the growing share of RES at the centre of the energy system require increasing the degree of flexibility of both generation and demand. Exploring these new options and introducing a strategic reserve also guarantee the security of supply.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics

		1990	2000	2010	2013	2014	2015	2016
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		10010	9460	9330	8850		
2	**% Energy dependence -** all products	62	69.5	69.1	62.2	66.2	71.7	73.6
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			1974.4	2486.8	2329.3	2640.8	2501.5
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			233.4	355.9	317.2	397.3	442.5
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			13.6	313.7	326	335.3	337.9
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		18.7	19	15.3	15.5	16.5	16.7
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		2625.5	2593.5	2208.4	2235.8		
8	**Share of RE in gross final energy consumption** (%) combined			9.8	15	15.3	15.4	15.2 (e)
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			12.3	21.2	21.9	22.1	23.8 (e)
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	122.07	114.53	99.38	96.81	93.4	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes	
6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	21.2	21.9
Overall share of energy from renewable sources (including transport)	%	14.9	15.3
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	1073	1108
Gross total energy from RE consumption (including transport)	Ktoe	2412	2501
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	2579	2596
Wind onshore	MW		
Total wind (inc offshore)	MW	1809	1978
Sub-total (variable sources)	**MW**	**4388**	**4574**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**7672**	**8010**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

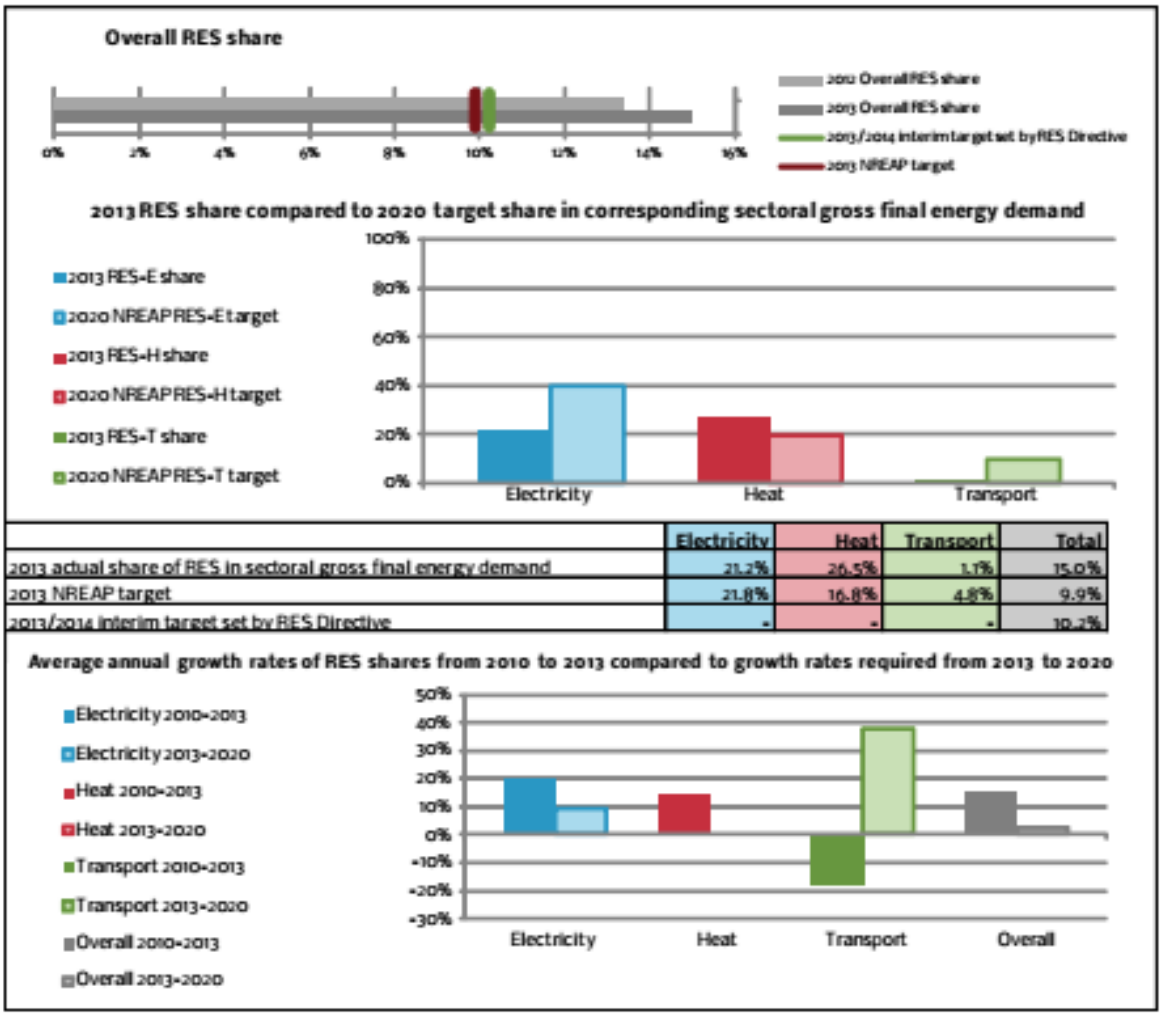
Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Regulatory					
Type and content of the electricity sales contract from solar thermal plants (with energy storage) on non-interconnected power grid,	Regulatory		Energy administrative authorities, solar thermal plants	Complementary to NREAP	2015
Law 4342/2015, Part C, production licenses and connection security payments	Regulatory		Energy companies/ investors, public administration, energy administrative authorities	Complementary to NREAP	2015
RES Net Metering installations' framework	Regulatory		PV and small wind plant investors, PV plant owners, end users	Complementary to NREAP	2014
Law 4315/2014, Art. 54 concerning reviving of installation licences subjecting to judicial judgement	Regulatory		Energy companies/ investors, public administration	Complementary to NREAP	2014-2015
Law 4203/2013 "Arrangement of topics on Renewable Energy Sources and other provisions"	Regulatory		Investors, end users, public administration	Complementary to NREAP	2013-2020
Law 4123/2013, Art. 24 concerning PV connection contracts, guarantees and farmer PV plants	Regulatory		Investors, public administration	Complementary to NREAP	2013-2015
Suspension of the licensing procedure and the issuance of grid connection offers for photovoltaic plants due to having met the targets set by the MD A.Y./F1/oik.19598	Regulatory		Investors, public administration	Complementary to NREAP	2012-2020
Procedure for granting grid access to groups of small-scaled RES producers in cases where there is no sufficient local medium or low-voltage grid capacity	Regulatory		Investors, public administration	Complementary to NREAP	2012-2020
Modification on the MD 9154/28.02.2011 regarding the special terms for the deployment of photovoltaics and solar systems on fields and buildings	Regulatory		Investors, public administration	Complementary to NREAP	2012-2020

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Technical					
IPTO's Ten year Development Program of Hellenic Electricity Transmission System 2014-2023	Technical		Energy administrative authorities, energy companies /investors, end users	Complementary to NREAP	2014-2023
10-year Plan for the Development of the Electricity Transmission System, elaborated by the System Operator	Technical		Investors, public administration	Complementary to NREAP	2014-2023
Financial schemes					
Amendment of the special program for the deployment of photovoltaics on buildings and especially roofs	Financial		Investors, public administration	Complementary to NREAP	2013-2020
Feed-in tariffs for electricity produced by photovoltaics,	Financial		Investors, public administration	Complementary to NREAP	2012-2020
Amendment concerning the feed-in tariffs for electricity produced by photovoltaics, as applicable	Financial		Investors, public administration	Complementary to NREAP	2013-2020
Amendment of the special program for the deployment of photovoltaics up to 10kW on buildings and especially roofs	Financial		Investors, public administration	Complementary to NREAP	2012-2020
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Greece NREAP 2014/15

- Greece has achieved both its 2013 NREAP target and the interim target 2013/14.
- The growth rate in the RES-E sector is enough to achieve the 2020 target if it can be maintained. For RES-H&C, the 2020 target share has already been achieved. However, the growth rate in the RES-T share has to be increased significantly to achieve the 2020 target.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	21.2%	26.5%	1.1%	15.0%
2013 NREAP target	21.8%	16.8%	4.8%	9.9%
2013/2014 interim target set by RES Directive	-	-	-	10.2%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Theme	Barrier
Political and economic framework	• **The reliability of the general RES-E strategy and that of the existing support scheme**, highlighted as a major barrier, is still considered an obstacle for the further development of RES-E in Greece**.** The explosive growth mainly of the PV sector had grave consequences and was not carefully handled by the State. Consequently, a period of instability and uncertainty followed and this situation was described in detail in KoT (2014). The so-called "New Deal" on RES approved by the Law No. 4254/2014 (amendment of Law No. 3468/ 2006) on May 2014 provided a viable solution so as the RES-E sector can be stabilised. • Nevertheless, the "New Deal" on RES was not seen as the final solution to the instability of the sector. The "New Deal" on RES has succeeded in solving the unstable RES-E landscape. However, a coherent RES-E strategy is urgently needed in the context of an updated "Strategic Energy Roadmap" (Seimanidis, GAREP). Such an updated "Strategic Energy Roadmap" should not only take into consideration the current situation of the Greek RES-E sector but also the latest developments at the European level (Seimanidis, GAREP). • In addition, the prospective introduction of the PV net metering support scheme has not been received unanimously with acceptance. On the one hand, it is advocated, that the net metering scheme should be implemented with great caution since the sectoral NREAP 2020 PV target has already been reached seven (7) years earlier. It has also been argued that by definition, net metering should aim at covering the electricity needs of the autonomous producer and that no excess electricity from those producers should be fed into the grid (Loumakis, SPEF). The details of the net metering scheme were open twice for public consultation and the Greek Regulatory Authority on Energy has issued its opinion on it47, it has also been noted that the net metering scheme will indirectly subsidize new PV autonomous producers, as the electricity netting will be carried out once a year (Loumakis, SPEF). Apart from that, questions are raised as to how the Greek distribution grid can manage a new wave of small PV electricity producers, thus raising questions of grid stability (Loumakis, SPEF). On the other hand, it has been advocated that the net metering scheme can finally restart the PV industry sector on a more stable basis bringing an end to the two year crisis that plagued the PV sector (Kapellos, HELAPCO). Nevertheless, the delay of the issue of the Ministerial Decree is a major barrier as the public will necessarily need time (at least a year) so as to be informed on the new support scheme in place48 (Kapellos, HELAPCO). • Concerns over the general RES-E strategy have also been raised for other RES technologies such as geothermal energy (Karytsas, CRES). 12 licenses for the exploration of geothermal energy potential in specific areas of Greece and their potential for electricity production have been issued and 8 of them were obtained by the Public Power Corporation S.A. Nevertheless, there seems to be no further prospects for realising such an

	investment. Furthermore, it should be noted that a general discontent was expressed as far as geothermal energy is concerned (Karytsas, CRES). Despite a number of structural advantages geothermal energy has, certain regions of Greece have some specific characteristics (low depth of rich geothermal potential) that could lower the initial investment cost for the creation of a geothermal power plant (Karytsas and Mendrinos, 2013) and are in every case considerably lower than in other EU countries (Karytsas, CRES). However, there is no electricity production from geothermal energy in Greece. • **Revenue risk under the existing support** scheme persists as even after the introduction of the "New Deal" on RES. The Electricity Market Operator (LAGIE), established as a public entity under the provisions of Law No. 4001/2011 (known as "Energy Law")49, is responsible for clearing the daily electricity market and for paying the renewable electricity producers on a monthly basis according to their contractual feed-in tariffs and the electricity they have provided to the national electrical system. This is done through a Special Account (Art.40 Law No.2773/ 1999), set up solely for that reason (RES Integration, 2011). Though the deficit of the Special Account for RES is starting to decrease since the introduction of the "New Deal" on RES, a four month delay of LAGIE's payment to the RES producers can still be observed (Seimanidis, GAREP) In addition, the Electricity Market Operator's commitment to eliminate its deficit by the end of 201450 cannot be surely achieved until the need of the next year. This is mainly due to the fact that the Special Account's deficit is decreasing "on paper" (in accounting numbers) but not in reality (Kapelos, HELAPCO). This is due to the complicated process the Electricity Market Operator (LAGIE) receives the Special Account's revenues: Public Power Corporation receives the revenues of the Special Account from the electricity bills and transfers them to the Greek TSO, which finally gives them to the Electricity Market Operator (LAGIE). Due to excessive amount of unpaid electricity bills, Public Power Corporation is unable to give the necessary amount to the Electricity Market Operator (LAGIE) and this is why the Electricity Market Operator (LAGIE) is expect to use legal means so as Public Power Corporation can pay off a considerable amount of money to the RES-E producers (Ημερησί α, 2014). This situation is also aggravated by the current unstable political situation in Greece, thus restricting the prospects of a further development of RES-E sector. • Finally, **access to finance for RES-E projects**, a barrier mentioned in KoT (2014), cannot be considered as a barrier as major firms have initiated to secure finance for new projects and it is estimated that € 6.5 billion can be invested in the Greek wind energy sector (Papastamatiou, HWEA). However, the problem remains for other RES such as geothermal (Karytsas, CRES).
Market structure	• The "New Deal on RES" has without any doubt signalled a new era as far as the development of RES-E in Greece is concerned (Papastamatiou, HWEA). This is why the fair & independent regulation of the RES-E sector has been emerged as a new barrier or as a new challenge concerning the development of RES-E. Furthermore, the emergence of the fair and independent regulation of the electricity market is also fueled by the

	latest developments on the European level. • Firstly, the Greek Electricity Market should be reformed along with the EU Target Model. Public consultation on the reform of the Greek Electricity Market has already been initiated by the Greek Regulatory Authority on Energy51. Such a radical requires time but primarily a clear framework that will enable the equal and just participation to the electricity market. • Secondly, the recent "guidelines on State aid for environmental protection and energy 2014-2020"52 foresees the gradual introduction of market based mechanisms such as feed-in premium (EU Commission, 2014). • Both parameters contribute to the emergence of that barrier. More specifically, two prerequisites are essential for the development of an independent electricity market. The first one is the careful design of the electricity market (Papastamatiou, HWEA). This is a presupposition of technical nature that has to do with the establishment of a suitable model of an electricity market. • The second and the more important one, is the assurance that the new electricity market will be competitive. More specifically the market should set clear rules concerning its operation and it should facilitate the entrance to new participants (Papastamatiou, HWEA). This is not only a question of policy but it has a so-called "psychological effect" (Papastamatiou, HWEA). In other words, the electricity market should not only be structured but it should also operate as a competitive market, so as all participants are treated equally and indiscriminately (Papastamatiou, HWEA). • Such concerns are raised due to the insufficient progress of unbundling in Greece (Law No. 4001/2011- known as "Energy Law")53 and RES-E sector is concerned that the Public Power Corporation will retain its monopolistic role in the newly established electricity market, thus impeding the fair & independent regulation of the RES-E sector. • Additionally, it is considered that it is the RES-E sector will have serious problems competing in the new electricity market, as the substitution of the current feed-in tariff with the more market based feed-in premium mechanism with auctions does not necessarily allow serious financial margins for RES investors (Seimanidis, GAREP). This is why a delayed and conditional entry of the RES-E sector, e.g. four years from the date the new market becomes operational is proposed by a number of national RES stakeholders (Papastamatiou, HWEA).
Grid regulation and infrastructure	• The obstacle relating to the *electrical interconnections and grid stability*, or more specifically the uncertainty for infrastructure development remains as a problem. • The "Ten Year Programme for the Development of the Greek Transmission Grid 2014- 2024"54 was finally approved by the Regulatory Authority on Energy and has been issued by the Greek (RES Legal Europe, 2013). However, there are currently some problems concerning the upgrading of the existing electricity infrastructure, as many regions such as Peloponnesus in southern Greece are still characterised as "congested" (AEON, 2010) However, this is mainly due not to the real installed RES-E capacity, but to the number of grid connection submissions i.e. to prospective RES-E (Kapellos, HELAPCO). Further problems have also been emerged with the interconnection of the island of Euboia located closely to continental Greece with the continental transmission grid, leaving 500Mw of wind parks unexploited

	(Papastamatiou, HWEA). In general, it has been argued that grid development in Greece lacks coherence (Kapellos, HELAPCO).
Administrative processes	• The cost and complexity of administrative procedure was highlighted in the previous report as one of the persistent barriers to the development of RES-E. Nevertheless, it should be underlined that there is the capacity, built through the previous years, to tackle such problems (Papastamatiou, HWEA). Mainly the complexities as far as the administrative processes are concerned have been relocated to latter levels of RES-E project development (Papastamatiou, HWEA). Surely, the stabilisation of the legislative framework has considerably contributed to that direction. • Duration of administrative procedure remains a barrier for the development of biomass/ biogas technologies which is mainly due to the inefficient training of professionals that could not fully understand the character of such an investment that is basically an investment of environmental value (Zafeiris, CRES). Characteristically, despite the fact the Regulatory Authority on Energy (RAE) has allowed the connection of biomass/ biogas plants with a cumulative capacity of 1,000 MW, only 30 MW could finally reach the last stage of their realisation (Zafeiris, CRES). The same problem can also be found in geothermal energy, where the administrative can exceed four years (Karytsas, CRES). Characteristically, one of the licenses that were issued for the exploitation of a geothermal field could not be realised due to that barrier and despite the fact that it was partly financed by structural funds (Karytsas, CRES).
Other	• The mixed **public perception,** manifested on a general- public level and on a local level remains, however on a lesser level. As far as the “New Deal on RES” has settled in a more decisive and permanent matter the subsequent increases of the Special Levy for the reduction of GHGs (ETMEAP), imposed on all electricity consumers, the negative stance towards RES-E on that matter is no longer apparent. • Nevertheless, a critical stance towards RES-E remains on a local level. This is mainly caused by environmental organisations that oppose the installation mainly on wind parks, putting nature conservation as a central argument (Papastamatiou, HWEA). However, it should be noted that the respective legislative framework foresees the installation procedure of wind parks near NATURA 2000 Habitats (Papastamatiou, HWEA). • Negative public perception is also considered a serious obstacle for the development of biomass/ biogas. Basically, there is a negative stance towards the realisation of such projects emerging not only from the local community but also from the local administration (Zafeiris, CRES). Concerns related to the possible impacts through the construction of such plants, environmental but also purely economic are risen, thus impeding the further deployment of biomass (Zafeiris, CRES). • Additionally, further problems related to the *training* of professional on the biomass/ biogas sector (Zafeiris, CRES). The inefficient specialisation is basically mirrored in the public sector. As public servants lack the necessary skills, they cannot assess the potential of an investment on that sector. This is why the Environmental Impact Assessment submitted for the construction of an investment is not approved, thus impeding such

	investments (Zafeiris, CRES). However, it should be advocated that in contrast with other RES technologies, biomass necessitates constant training so as to remain updated on the latest developments on that sector. • Apart from that, a new barrier mentioned is the *communication between relevant stakeholders*. This is mainly the case for the PV sector, as an unnecessary abundance of PV associations have been established. Surely, every association was aiming at promoting its own interests and could not finally promote their agenda. Finally, the socalled “polyphony” had the opposite effects from those the associations were expecting (Kapellos, HELAPCO).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Greece

The recent development of RES in Greece was marked by the parliamentary approval of a revised support framework called “New Deal” in April 2014.

The “New Deal” imposed significant retroactive/ retrospective reductions in the FITs for all existing RE projects in exchange for an extension of the duration of their PPAs. It also set new, reduced FITs for all new RES projects. Moreover, it lifted a previously imposed moratorium on PV projects and allowed for the implementation of an additional 1.5 GW of PV, excluding small rooftop PV systems, on top of the 2.2 GW 2020 national PV target, which had already been reached in 2014.

The Greek government submitted the revised support framework to the EU Commission for approval in December 2014. The decision of the Commission is expected to profoundly influence the further implementation of RES in Greece.

The provisions of the “New Deal” resulted in a significant reduction of the short /medium term revenues of all operating RES projects. It exacerbated the already serious liquidity problems of RES IPPs, threatening their viability. Having intended to reduce the deficit in the account balance of the National Electricity Market Operator, the tariff reductions failed to ensure the viability of the account, and thus the serious delays in the payments of RES producers persist. This situation is expected to deteriorate unless the liquidity of the dominant market player, the PPC, improves. No changes relevant to the support of RES-H or RES-T projects occurred in 2014.

Electricity Sector

- Improve the liquidity of the PPC: The PPC controls 98% of the electricity supply in Greece. Currently, unpaid electricity bills to the PPC account for more than € 1.7 billion. This causes, among other market viability problems, serious delays in the contracted payments of RES electricity producers. Incentives have to be provided to debtors in the form of the possibility to pay back their debts in flexible monthly instalments. Moreover, the PPC must further reduce its operational costs and seek more loans so as to strengthen its financial base and, thus, be able to pay RES IPPs.

- Change the way in which the support for RES in electricity is calculated and collected: Despite efforts to improve it, the methodology to calculate and collect the support for RES-E in Greece remains flawed. It overestimates the amounts of public support required to finance RES projects, it reduces the cost for electricity suppliers and favours fossil fuels. The calculation needs to be based on the principle of avoided environmental cost. Furthermore, the existing corresponding levy has to be integrated in the suppliers’ cost and should not be treated like a separate charge.

- Prepare to respond to the Commission’s request to establish a new support framework for RES based on the new EU guidelines for State Aid: The new guidelines foresee the establishment of a feed-in premium system with auctions for all new RES-E projects exceeding a certain capacity threshold after 1/1/2017. The implementation of such a system is expected to face serious barriers in Greece as there is no representative reference market price and the conditions for the successful organization of auctions for the premium are unfavourable. The Government needs to organize consultations with the market stakeholders at the national level to arrive at a viable plan to deal with this

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		2160	1880	2360	2120		
2	**% Energy dependence -** all products	68.6	84.9	86.6	89.1	85.3	88.6	69.1
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			619.6	756.5	853.6	985.1	972.8
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			242	390.5	442	565.2	528.7
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0	0.1	0.1	0.1	0.4
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: IRELAND

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		10.8	12	10.8	10.8	11.2	11.6
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3818.9	3333.4	2983.8	2944.7		
8	**Share of RE in gross final energy consumption** (%) combined			5.7	7.7	8.7	9.2	9.5
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			14.6	21	22.9	25.2	27.2
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	123.99	111.97	104.84	104.94	109.17	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	20.8	22.7
Overall share of energy from renewable sources (including transport)	%	7.6	8.6
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	501	550
Gross total energy from RE consumption (including transport)	Ktoe	847	947
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	1.02	1.38
Wind onshore	MW	1916	2186
Total wind (inc offshore)	MW	1941	2211
Sub-total (variable sources)	**MW**	**1942**	**2212**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**2538**	**2811**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Regulatory/Financial support regimes					
Planning & Development (Amendment) Act 2010	Legislative/Regulatory	The Act provides for changes to the planning system, some of which have implications for the renewable energy sector (e.g. projects over a certain size will now automatically be treated as strategic infrastructure under the Strategic Infrastructure Act. The time period relating to initial planning consent is now longer.)	Developers who have to go through the planning process	Now in place	The legislation was enacted in 2010. Renewable generators may now extend the duration of a planning permission for up to 10 years which is generally more satisfactory and projects over a certain size now automatically seek consent under the Strategic Infrastructure Act.
Intra-day Trading (ШТ) in the Single Electricity Market	Regulatory/ financial	Intra-Day Trading (IDT) was introduced in SEM in 2012. The new system promotes more competition in the market by allowing electricity trading closer to real time and enabling the use of increasing amounts of variable renewable generation. The project was launched in July 2012 on time and within budget	SEMO, Regulators, Policy makers, Industr	Existing	2012 and remains in place
SI 666 of2006 Part 2 Alternative Energy Systems Replaced by SI 243 of2012 Part 2 Alternative Energy Systems	Regulatory	Ensure before work commences that consideration is given to the technical, environmental and economic feasibility of installing alternative energy systems: this measure should help increase renewables in large buildings	Owners / Designers of Large new buildings (over 1000m2)	Existing	006 onwards. The 2006 arrangements were replaced in 2012 - Statutory Instrument No. 243 of2012.

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Statutory Instrument (SI) 83 of 2007and SI 235 of 2008	Regulatory	Conditional planning exemptions for renewable technologies that meet specified criteria-expected to encourage uptake of energy from renewable technologies	Domestic, business and agricultural sectors	Existing	2007 and 2008 onwards
Revised simplified application procedures for authorisations to construct and licences to generate	Regulatory	CER/10/098 (energy regulator's decision) introduced a simplified procedure for generators with installed capacity up to 40MW to make obtaining authorisation to construct and licence to generate easier.	Those constructing generating stations with installed capacity not exceeding40MW and generating electricity	Existing	New procedure came into effect in June 2010 and remains in place.
Principles of Dispatch and the Design of the Market Schedule in the Trading & Settlement Code	Regulatory	The Single Electricity Market (SEM) Committee undertook a 2 year consultation (2009- 2011) prior to reaching a decision. The policy has important implications for the treatment and dispatch of renewable generation in the SEM.	All participants in the SEM (mandatory pool for those generators over 10MW)	New	SEM Committee Decision published in 2011 (SEM 11-062)
Treatment of Price Taking Generation in Tie Breaks in Dispatch in the Single Electricity Market (SEM) & Associated Issue	Regulatory	The SEM committee is currently consulting with a view to reaching a decision on this. This policy will have important implications for the treatment and dispatch of renewable generation in the SEM.	All participants in the SEM (mandatory pool for those generators over 10MW)	New	SEM Committee Consultation SEM 11-063 published in August 2011. Decision SEM Committee decision published March 2013 (SEM- 13-010)
Accelerated Capital Allowances (ACA) for Energy Efficient Equipment (SI 393 of 2009)	Financial (tax relief)	Specifies certain technical standards to be met by renewable energy products to be eligible for the ACA tax relief. Technologies covered include wind turbines >5kw, solar PV, CHP, biomass	Companies paying corporation tax	Existing	Existing from 2009 onwards. It has been extended until the end of2017

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
		boilers, electric vehicles.			
REFIT 2	Financial	4000MW of new onshore wind, hydro and landfill gas sufficient to cover our 2020 RES-E target.	Generators and suppliers of electricity from renewable sources	Existing	The scheme was formally opened in Quarter 1,2012.
Relief for investment in renewable energy generation Section 486B, Tax Consolidation Act (TCA) 1997	Financial (tax relief)	The relief for investment applies to corporate equity investments in solar, wind, hydro or biomass technology generation projects. The relief is given in the form of a deduction from a company's profits for its direct investment in new ordinary shares in a qualifying renewable energy company.	Companies paying corporation tax, Generators of solar, wind, hydro and biomass generation	Existing	Introduced: 1999 and extended in 2012 to 31/12/14
Renewable Energy RD &D Programme	Financial Financial support is available in three categories: Category 1 : Shared cost Demonstration Category 2: Shared cost R&D Category 3: Commissioned Public Good Activities	Programme focused on stimulating the deployment of renewable energy technologies that are close to market, and on assessing the development of technologies that have prospects for the future and on overcoming barriers to renewable energy deployment and informing national and local policies.	Developing solutions relevant to developers of renewable energy technologies, local authorities, spatial planners and government authorities.	Existing	July 2002 onwards

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
BES (Business Expansion Scheme)	Financial	A tax relief incentive scheme that provides tax relief for investment in certain corporate trades. There is no tax advantage for the company in receipt of the BES, but securing this funding may enhance their ability to attract other external funding	Renewable Energy Developments meeting the qualifying conditions	Existing	Replaced by EΠ scheme (No. 46)
Relief for investment in renewable energy generation Section 486B, Tax Consolidation Act (TCA) 1997	Financial (tax relief)	The relief for investment applies to corporate equity investments in solar, wind, hydro or biomass technology generation projects. The relief is given in the form of a deduction from a company's profits for its direct investment in new ordinary shares in a qualifying renewable energy company	Companies paying corporation tax. Generators of solar, wind, hydro and biomass generation	Existing. Commencement order required	Introduced: 1999 In 2012 the scheme was extended to 31/12/14
Employee Investment Incentive (EΠ) Scheme	Financial (tax relief)	Employee Investment Incentive (EII) gives individuals relief from income tax for investment in renewable energy generation. The EII scheme has the added benefit of being linked with the provision of additional employment. The legislative basis for the EII (incorporating the Seed Capital Scheme (SCS)) is Part 16 of the Taxes Consolidation Act 1997, as amended.	Individuals and companies	Existing	Introduced in Budget 2011. Replaced the Business Expansion Scheme (BES)and still in place
Technical/Soft					
GIS resources	Technical	Updated wind atlas available on the Sustainable Energy Authority of Ireland (SEAI) web site.	General Public, County Councils, Wind Energy Project	Planned	Available since Q2, 2015

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
			Developers, Academic Researchers, Consultants and Government bodies		
DS3: Delivering a Secure, Sustainable Power System	Technical	The overall aim of the DS3 Programme is to put in place the required changes to system policies, tools and performance to allow the electricity system operate safely with a high penetration of renewable g	TSO, regulator, policy makers, industry	Existing and ongoing	2011 and remains in place
LARES (Local Authoritiy Renewable Energy Strategies)	Technical/soft	This methodology facilitates a consistency of approach in the preparation of LARES, and to assist local authorities in developing robust, co-ordinated and sustainable strategies in accordance with national and European obligations.	Planning authorities and the Planning Appeals Board	Existing	2013-2020
SFI research programmes (suitable for recruitment, early/mid-career researchers, outstanding individuals, large scale centres, enterprise and industry. infrastructure, international and networking & external engagement).	Soft/Research	Research in the area of Energy builds research capacity, scientific expertise, and collaborative relationships between academia, international collaborators and industry	Researchers in Irish Higher Education Institutions, collaborating industry partners, collaborating international academic partners.	Planned and existing	Ongoing
Guidelines for Planning Authorities on Wind Energy Development (DECLG) being reviewed, in relation to noise, setback distance and shadow	Soft	Facilitate a consistency of approach by planning authorities, both in identifying areas suitable for wind energy development and having regard to potential impacts, inter alia on nature and	Planning authorities and the Planning Appeals Board.	Existing. Guidelines have existed since 2006	2013-14 Draft for consultation issued end of2013

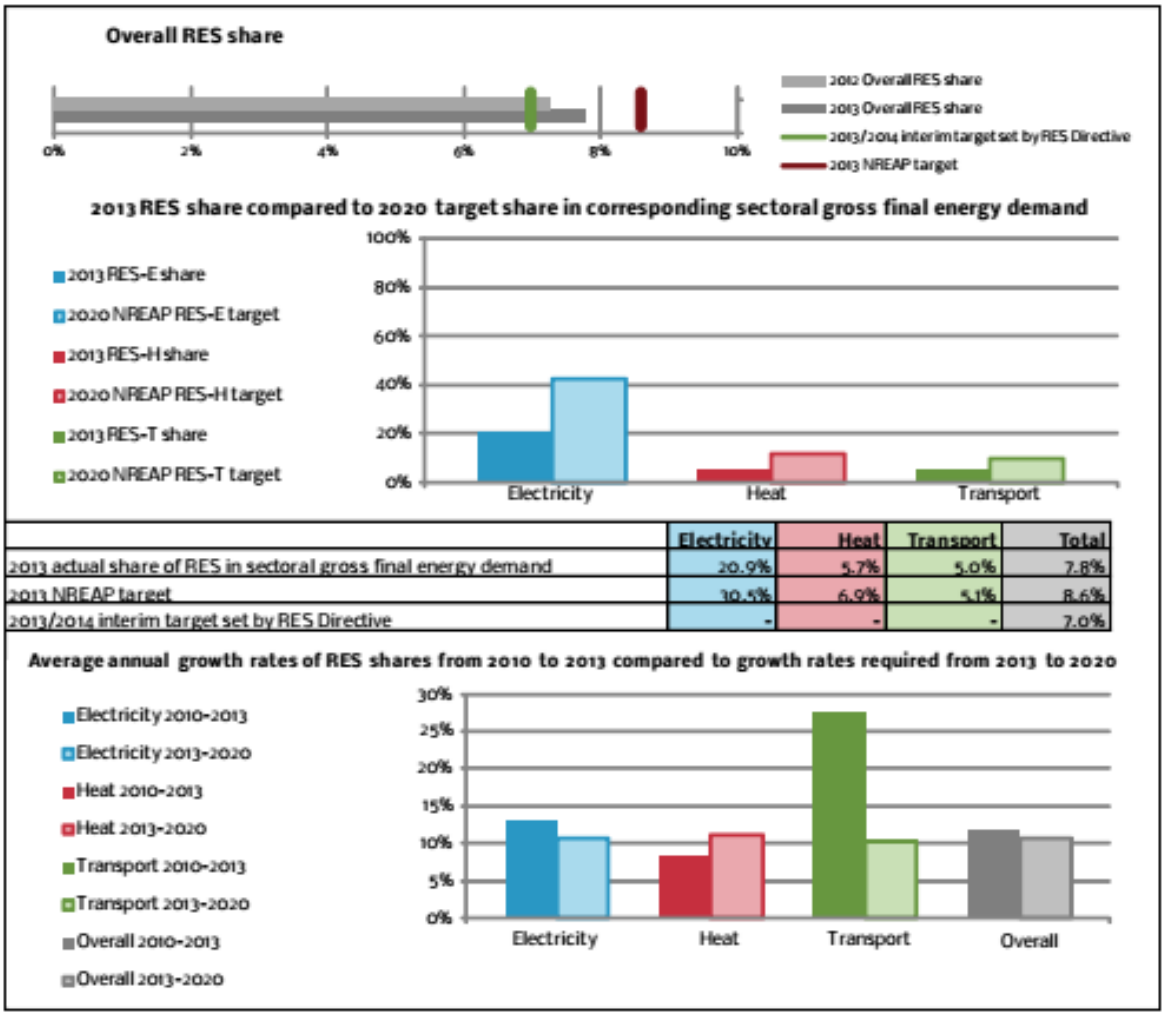
Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
flicker		diversity		and are currently under review.	
Social acceptance activities Engaging with ШA Wind Task 28 on Social Acceptance	Soft	Disseminated best practice on international social acceptance activities.	Wind energy practitioners and developers, utilities, communities and policy makers in Ireland	Existing	Ongoing
Social acceptance activities Commission policy oriented and public good research under National Energy R&D Programme	Soft	Provide reliable evidence and information on options and approaches to facilitate enhanced societal acceptance of renewable energy	Wind energy practitioners and developers, industry federations, academics and policy makers in Ireland	Existing	Ongoing since 2011
Local energy agencies	Soft	The network of local energy agencies collective goal is to support the development and implementation of energy policy. Information, advice and skills provided through the local agencies can enhance knowledge on options for increased renewable energy at local level	General public, industry, business	Existing	Ongoing
The Gate process is a fundamental part of reaching the renewable target. 'Gate' is a term used to refer to the processing of batches of	Soft	Approximately 4,000 MW of renewable generation capacity received connection offers in the Gate 3 process. The uptake of Gate 3 offers is particularly high with 82% of offers accepted, 7% under	Generators of RES-E	Existing	All Gate 3 grid connection offers have now issued to those included in the Gate 3 direction. At time of writing circa 3,263MWof Gate 3

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
connection applications received prior to a Gate closure date. The Gate3 process issued offers to 4,000 MW of renewable generation. When added to Gates 1 and 2 (330 MW and 1400 MW), there is sufficient renewable generation to meet the targets		consideration and only 11% have been declined. The rollout and implementation of Gate 3 by the regulator, TSO and DSO will ensure that Ireland can reach its 40% RESE target.			renewable connection offers have been accepted
Infrastructural					
The continuing rollout of EirGrid's grid development programme	Infrastructural	Grid 25 provides the framework to improve grid which will help to facilitate the integration of increasing amounts of renewable generation EirGrid is engaging with communities around the country on the roll out of the programme	Generators of RES Energy security and conventional generation	Existing and planned (Grid 25 is in the implementation and rollout phase.)	Grid 25 was launched in 2008 and was revised in 2015.
Small, Renewable, Low carbon generation connecting to the grid outside the 'Gate' process	Infrastructural	A policy that facilitates small scale renewables by providing for grid connections outside the gate process for certain small, renewable, low carbon generators	Small, renewable and low carbon generators such as small bio-energy, wave, tidal generators	Existing	Introduced in July 2009. Continues to remain open to certain small generators as a means to connect to the grid
East West Interconnector	Financial/ Infrastructural	The East West Interconnector (EW1C) went into full commercial operation on I*1 May 2013. This project represents a significant investment that has	Transmission System Operator, Generators of RESE	Existing	Construction phase 2009-2012 Operating on a commercial basis since 2013 Further information is

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
		considerable benefits for Ireland by helping the country reach its renewable electricity targets, by improving security of supply, and by increasing competition in the market.			available at: http://www.eirgrid.com/eastwest
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Ireland NREAP 2014/15

- Ireland has not achieved its 2013 NREAP target, but is on track regarding the less ambitious interim target 2013/2014.
- Growth in the RES-E share is enough to achieve the 2020 target. Growth in the RES-H&C share needs to accelerate, however.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	20.9%	5.7%	5.0%	7.8%
2013 NREAP target	30.5%	6.9%	5.1%	8.6%
2013/2014 interim target set by RES Directive	-	-	-	7.0%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Ireland's RES-E share was 6.9% in 2005 according to the National Renewable Energy Action Plan. Wind power was the dominant RES-E technology with an installed capacity of 494MW and 1,588MWh gross electricity production. Hydro power followed with 234MW and 766GWh. Finally, biomass had a small share with 20MW and 128GWh.

Ireland has succeeded in increasing its RES-E share annually since 2005 and it surpassed 20% in 2013. It should be noted that RES-E was the second largest source of electricity after natural gas (SEAI, 2014b).

Support scheme

In Ireland, electricity from renewable sources is mainly promoted through a feed-in-tariff scheme (REFIT) that operates as a floor price. The entities entitled to this tariff are those suppliers that purchase electricity from renewable sources from generators with whom they have entered into a commercially negotiated REFIT Power Purchase Agreement (PPA). This regulatory system incentivises the generation of electricity from renewable sources (RES Legal Europe, 2014).

Additionally, a tax relief scheme for corporate investments in projects generating electricity from renewable sources (solar, wind, biomass, and hydro) aims to encourage investments in RES. The scheme was introduced in 1998 and was recently extended until 31 December 2014 (section 486B TCA 1997 amended by section 25 Finance Act 2012) (RES Legal Europe, 2014).

Ireland first announced the REFIT scheme in 2006 to promote the construction of wind energy, biomass and hydro plants. The scheme, now called 'REFIT 1' to distinguish it from the other schemes, obtained state aid clearance in 2007 and allowed new applications to be accepted until 31/12/0985. Currently, two new schemes (REFIT 2 and REFIT 3) obtained state aid clearance and opened in 2012 for new applications. REFIT 286 covers small and large scale onshore wind, small hydro (≤ 5MW), and biomass landfill gas whereas REFIT 3 covers only biomass technologies. Both schemes cover new projects built and operational between 2010 and 2015 (RES Legal Europe, 2014).

Regarding the tax relief scheme, projects generating electricity from solar, wind, biomass, and hydro (including ocean, wave or tidal energy) are eligible for the support. (RES Legal Europe, 2014).

Theme	Barrier
Political and economic framework	• One of the newly emerged barriers concerning RES-E is the existence & reliability of general RES-E strategy & support scheme. This was expressed mainly by the PV sector in Ireland. In its submission to the "Green Paper on Energy Policy in Ireland" the Irish Solar Energy Association expressed its discontent that solar energy is the sole energy source not applicable for a FiT under REFIT 3 (ISEA, 2014). ISEA argues that solar energy can be effectively deployed in Ireland as Ireland solar radiation levels are 78% of the levels found in southern European countries such as Madrid (ISEA, 2014). Apart from that, ISEA to best practice examples such as UK and Germany that have successfully deployed solar energy. Furthermore, ISEA estimates that

	500MW of solar energy can be installed in Ireland and this can be achieved with an average FiT of € 0.15 per kWh in 2015 (with a 5% reduction per year) (ISEA, 2014). This will result in the creation of approximately 3,000 jobs and will have incremental effects on the taxpayer (€ 0.02 per kWh for 20 years) (ISEA, 2014). • Remuneration level of RES-E and more specifically the way this is calculated (KoT, 2014) continues to be seen as a problem as no further changes to that direction have been made. However, there seems to be further uncertainty concerning the future of RES-E support with the design of the Integrated Single Electricity Market (I-SEM). • In 2013 the Department of Enterprise, Trade and Investment (DETI) and the Department of Communications, Energy and Natural Resources (DCENR) endorsed recommendations of the Single Electricity Market Committee (SEMC) in its implementation of the European Target Model for the "Single Electricity Market". Consequently, the Decision Paper proposed the development of a High Level Design of the SEM in light of the requirement of the European Target Model. • In October 2014 the Single Electricity Market Committee (SEM Committee) published its Final Decision Paper on the High Level Design of the new wholesale electricity market, I-SEM. Nevertheless, RES-E sector has openly expressed its doubts during the public consultation process, as the decision contains as number of arrangements that are expected to hinder the development of RES and more specifically, wind power, in Ireland. • It was mainly criticised that although SEMC should design a market that adequately complies with the EU Target Model, derived from the 3rd package, the Renewables Directive should also be respected (IERNE, 2014b). • One of the basic points of criticism was the proposal concerning the Integrated Single Electricity Market (i-SEM) that Day Ahead Market (DAM) price is used as the reference for renewable supports. The thesis of wind energy stakeholders is that FiTs should be decided by the relevant government departments, as they are in charge of the support mechanisms. A possible decision to that direction will undermine the effectiveness of the support scheme in the Ireland and it will pose a serious threat to both existing as well as proposed renewable energy projects. Surely market reference price are required to be implemented for the ex-ante payment of supports, however, the Day Ahead Market does not qualify as a reliable proxy for settlement. Instead support should be based on actual revenue received as is currently stipulated by the relevant legislation (IERNE, 2014a). To that direction, it was criticised that the current I-SEM proposal would introduce a whole new set of costs, uncertainties and complexities (IWFA, 2014).

	• Apart from that, remuneration level of RES-E remains a problem for biomass technologies as the current REFIT 3 scheme does not provide the necessary incentive for the deployment of biomass technologies. This is why IrBEA has proposed that REFIT 3 should be harmonised with the respective regime in Northern Ireland, so as to avoid any market distortions in "single all-Ireland Market" (IrBEA, 2014).
Grid regulation and infrastructure	• The barrier concerning the duration of RES-E grid access which can get as much as 6-9 years so as to get a connection and 10-15 years to be connected to the grid remains as a structural problem of the RES-E sector. Furthermore, the cost of RES-E grid continues to be as a barrier for the further deployment of RES-E. as the ineffective "backwards development model", described in KoT(2014) continues to be implemented. • Although treatment of priority dispatch (curtailment) have been underlined as a barrier for the further deployment of wind energy (KoT, 2014) and wind sector stakeholders have proposed technical solution to avoid curtailment (IERNE, 2014b). However, the new Integrated Single Electricity Market Model (I-SEM) foresees that curtailment compensations should be removed. This why stakeholders objected to that possibility by advocating that compensation for curtailment constitutes a "necessary economic signal to the TSO and the regulators for mitigation of curtailment, through grid development" On the contrary, removal of compensation is considered premature (IWEA, 2014), can lead to a market failure and a continuation of the existing deficiency (IWFC, 2014). Characteristically, wind stakeholders urged to realize to 'guaranteed transmission', by criticising that instead of implementing guaranteed transmission authorities use "the threat of curtailment in this debate as a lever to get the renewables sector to accept your potentially damaging proposal" (IERNE, 2014a). Nevertheless, SEM Committee has included priority dispatch as one of the themes that will be discussed further in the next phase of the detailed design the Integrated Single Electricity Market (I-SEM) (SEM Committee, 2014). However, it was also criticised that priority dispatch, as a priority under the RES-E Directive should not be discussed along other issues such as the subject of firm access and losses as it is scheduled (IWEA, 2014).
Administrative process	• The duration and the complexity of the administrative processes that has been observed in KoT (2014) continue to exist. Lengthy delays for grid connection along with the problems with the expiration of the planning permission are still apparent. Consequently, the existence of the "backward development model" mentioned in KoT (2014) lowers the effectiveness of wind energy projects.
Other	• Negative public perception for RES-E continues to be seen as a barrier to the development of wind power, at least to a certain degree. Anti-wind energy groups along with other so-called "anti-pylon" groups join forces so as to halt the Grid 25 project, aiming to upgrade the existing transmission system in Ireland and ease the interconnection with

	Northern Ireland (The Journal.ie, 2014). Furthermore, the protest groups are expected to prepare a national plan of legal action against project developers (RTE, 2014) and they accuse Eirgrid that it continues the planning and realisation of Grid 25 project without taking into consideration engagement with local communities (Independent, 2014). This is why Eirgrid is pressed to publish a report on how to deal with local community reactions as it re submits its planning application to An Bord Pleanala, an independent, statutory, quasi-judicial body that decides on appeals from planning decisions made by local authorities in Ireland (Independent 2014).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Ireland

Ireland operates a feed-in tariff scheme (called REFIT) which in effect operates as a floor price to commercially negotiated Power Purchase Agreements. In additions, corporate RES-E investments (solar, wind, biomass, hydro) benefit from a tax relief scheme. Adaptations to the scheme are underway and will expose some producers, especially wind power operators, to more market risks by paying them a premium instead of a fixed tariff.
Ireland's RES strategy focuses on wind, around 12,000 GWh of wind (onshore and offshore) electricity production are planned for 2020. The electricity act ensures non-discriminatory access by all power plants to the transmission grid. The cost of grid expansion are borne by final consumers (shallow cost approach), but RES plant operators face additional connection costs (such as technical and maintenance costs) which can make investments unattractive. In addition, long delays have been observed in the connection of wind farms. The "group processing approach" for RES along with the number of applications submitted results in lengthy timelines concerning the processing of those applications.

Electricity Sector

- Minimise insecurities for investors regarding grid access: For wind energy, payments under the feed-in tariff scheme are based on metered output. Consider introducing clear provisions such as compensation payments for forced curtailment due to local grid congestion.

- Simplify and streamline planning and permitting procedures, especially for wind parks: For instance, planning permissions have sometimes already expired by the time a RES project developer has obtained a grid connection offer. The procedures should be shortened, and ideally, a one-stop-shop should be created which handles all relevant procedures.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

ENERGY PROFILE: ITALY

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		28490	33070	36860	36810		
2	**% Energy dependence -** all products	84.7	86.5	82.6	76.8	75.9	77.1	77.5
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			19394.7	23499.8	23644.1	23563.9	23820.5
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			784.7	1280.9	1305.1	1276.4	1521
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			163.9	1856.3	1918	1972.7	1900.6
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		124.7	128.5	118.5	113.3	116.2	115.9
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3060.6	3006.0	2672.6	2484.7		
8	**Share of RE in gross final energy consumption** (%) combined			13	16.7	17.1	17.5	17.4
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			20.1	31.3	33.4	33.5	34
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	107.02	98.1	85.77	82.52	84.48	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	31.3	33.4
Overall share of energy from renewable sources (including transport)	%	16.7	17.1
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	8665	9001
Gross total energy from RE consumption (including transport)	Ktoe	20736	20245
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	18420	18609
Wind onshore	MW	8542	8683
Total wind (inc offshore)	MW	8542	8683
Sub-total (variable sources)	**MW**	**26962**	**27292**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**53462**	**53930**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Measures in the energy efficiency sectors					
Energy Efficiency Securities	Regulatory-Financial	Annual energy saving targets: 4.6 Mtoe of primary energy in 2013; 6.2 Mtoeof primary energy in 2014; 6.6 Mtoe of primary energy in 2015; 7.6 Mtoe of primary energy by 2016	Obligated parties: • Electricity distributors having more than 50 000 final customers; • Natural gas distributors having more than 50 000 final customers. Parties joining the scheme on a voluntary basis: • Energy service Companies (ESCOs); • Companies required to appoint an energy manager (SEM); • Companies under the control of obligated distributors; • Gas or electricity distributors not under the obligation; • Undertakings in the industrial, civil, services commercial, agricultural, transport and public services sectors, including public bodies, which appoint the energy	*Implemented measure, set out in the NAP* Updates in 2012 • inclusion of annual national quantitative targets for energy savings for the four-year period 2013-2016; • inclusion in the scheme on a voluntary basis of new entities meeting the requirements; the role and activities of the institutional entities involved in establishing the guidelines and assessing the projects designed to meet the annual targets to be achieved by electricity and natural gas distributors; • the eligibility to the scheme, from 1 January 2014, only of projects 'still to be implemented' or 'in progress' and the introduction of a ban on cumulating the white certificates issued for projects submitted after the entry into force of the Decree with other incentives, howsoever named, charged on electricity and gas tariffs or with other government incentives; introduction of 18 new technical data sheets to quantify the primary energy savings eligible for submitting verification and certification applications; • the introduction of 'large-scale projects', i.e. energy upgrading projects implemented on infrastructure, industrial processes or in the transport sector, generating savings of 35 000 toe or higher over one year; Updates in 2014 The designation of white certificates as the energy efficiency obligation	2005 – n.a

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
			manager or are ISO 50001 certified.	scheme referred to in Article 7 of Directive 2012/27/EU, achieve a cumulative end-use energy savings target by 31 December 2020 of not less than 60% of the national cumulative energy saving target. The obligation from 19 July 2016 to hold a certification under standard UNI CEI 11352 for energy services companies and UNI CEI 11339 for energy managers.	
Measures in the electricity sector					
Premium tariff for photovoltaic plants ('PV Feed-in scheme')	Financial	25 000 MW by 2020 (indicative target subject to an annual expenditure ceiling of EUR 6-7 billion)	Investors/end users	Implemented measure, set out in the NAP. The PV plant incentive scheme (Feed-in scheme) ceased to have effect on 6 July 2013, i.e. 30 calendar days after the ceiling of EUR 6.7 billion of cumulative cost of the incentives was reached (maximum expenditure ceiling). As at 31 December 2014, 18 609 MW were installed in Italy; 17 713 MW were covered by the Feed-in Scheme.	2005 - 2013
New incentive schemes	Financial	Achievement of the RES electricity targets	Investors/end users	Implemented measure, supplementing the NAP. Legislative Decree No 28/2011 provided that plants (**excluding solar**) commissioned from 2013 onward would be supported by new incentives replacing the Green Certificates and the all-inclusive tariffs. The Ministerial Decree of 6 July 2012 established new types of incentives for electricity generated from renewable sources other than PV solar. The incentives under the Decree apply to installations that are: newly built, entirely rebuilt, reactivated, upgraded or renovated, commissioned from l January	2013 – n.a

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
				2013. The Decree sets a ceiling for the indicative cumulative cost of all the incentives granted to the plants, which cannot exceed the total value of EUR 5.8 billion per year. Annual quotas of supported capacity have been introduced for each year from 2013 to 2015, divided by type of source and plant and broken down according to manner of access to the incentives (auctions; registers for new construction, complete reconstruction, reactivation, upgrading and hybrid systems; registers for refurbishments). The incentives are granted on the net generation of electricity fed into the grid by the plant: consequently, self-consumed electricity does not benefit from the incentives. The Decree has two separate incentive schemes, according to type of renewable source, installed capacity and type of installation: A) an all-inclusive feed-in tariff (To) for plants with installed capacity of up to 1 MW; B) an incentive (I) for plants with power output in excess of 1 MW and for those with power output of up to 1 MW which do not opt for the all-inclusive tariff, calculated as the difference between the base feed-in tariff and the hour zone price of energy (in the zone where the electricity produced by the plant is fed into	

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
				the grid). The energy produced by the plants eligible for the incentive (I) remains available to the producer. Access to the incentives laid down in the Ministerial Decree of 6 July 2012 is alternative to the net metering and simplified purchase and sale arrangements systems. Review of the Decree of 2012 is under discussion, inter alia to ensure 2013 - n.a.18 consistency, with the new EU rules on State aid for environmental protection and energy	
Measures for electricity grids					
Authorisation of works to connect to the electricity grids	Regulatory	Coordination between development of power-generating installation and that of the electricity grid	Grid operators	Implemented measure, supplementing the NAP. The construction and operation of certain grid development works are authorised by the competent Region via a single procedure. This authorisation process applies to works for the feeding in and collection of the electricity generated by several plants and not covered by the connection quotations signed by the grid operator and the power installation owners. The single procedure also applies to distribution grid works and infrastructure designed to improve the dispatching of the energy generated by already operating installations.	March 2011 – n.a.
National transmission grid development plan	Regulatory	Planning of the development of the national transmission grid	National transmission grid operator (Terna SpA)	Implemented measure, set out in the NAP. TERNA SpA has set out in a section of the National Transmission Grid Development Plan, the actions eligible for the above-mentioned single procedure, taking into account the current procedures for issue of plant construction and operating licences. March 2011	March 2011 – n.a.

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
				- n.a.20 In the same section of the Plan, TERNA also sets out the grid upgrading works necessary to ensure the full feed-in and off-take of the electricity generated by renewable energy installations. **These works include storage systems to facilitate the dispatching of electricity from non-programmable RES.** As **to investments in storage systems set out in the Development Plan, the Ministry for Economic Development has approved an experimental programme for a total installed capacity of 35 MW classified as eligible by the Electricity, Gas and Water Authority (AEEGSI). The programme consists of six pilot projects located at critical points of the national transmission grid, where the level of power generation from renewable sources is especially low.**	
Updating of the technical and economic conditions for accessing the networks	Regulatory	Ensure the integration of the renewable sources in the electricity grid to the degree necessary to achieve the objectives set for 2020	Producers and grid operators	Implemented measure, supplementing the NAP. Every two years, AEEG updates the Consolidated text of the economic and technical conditions for connections to grids subject to third-party connection obligation (TICA, Consolidated text of active connections) and performs quantitative analysis of the imbalance costs weighing on the electricity system as a consequence of the dispatching of each nonprogrammable renewable source, assessing the impact of the provisions set out in the TICA.	March 2011 – n.a.

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
				In the event of changes in market conditions, the regulator shall update the measures on the connection of power generation plants at shorter intervals than required by Legislative Decree No 28/2011.	
Construction of storage systems by the grid operator	Regulatory	Ensure the integration of nonprogrammable renewable sources into the electricity system	Grid operators	Implemented measure, supplementing the NAP. Legislative Decree No 28/2011 allows Terna to include in its Grid development plan electricity storage systems designed to facilitate dispatching from non-programmable RES systems. Legislative Decree No 93/2011 provides that these systems can also be installed by distribution system op	June 2011 – n.a.
Ministerial Decrees of 2011 and 2012 to incentivise electricity generation from PV	Regulatory	Ensure system modernisation to supply network services	Producers	Implemented measure, supplementing the NAP. To favour the development of PV systems while ensuring the safety and security of the electricity system, those installations not equipped with the appropriate devices must be upgraded so as to provide the network services required by the applicable technical standards and rules.	May 2011 – n.a.
Simplification for connection of PV plants	Regulatory	Favour the connection of buildingintegrated PV systems	Producers and grid operators	Implemented measure, supplementing the NAP. The Ministerial Decree of 19 May 2015 provides for the adoption of a single form for the installation, connection and operation of small PV plants on the roofs of buildings, with an output of less than 20kW	May 2015 – n.a.
Aggregation of generation systems and users	Regulatory	Improve the efficiency of the electricity market by avoiding the interruption of RES electricity	Producers/consum ers/grid operators	Planned measure, supplementing the NAP. Legislative Decree No 102/2014 introduced the possibility of setting up clusters of generation plants and users for access to aggregate supply and to provide flexibility services, to be managed by operators guaranteeing	July 2014 – n.a.

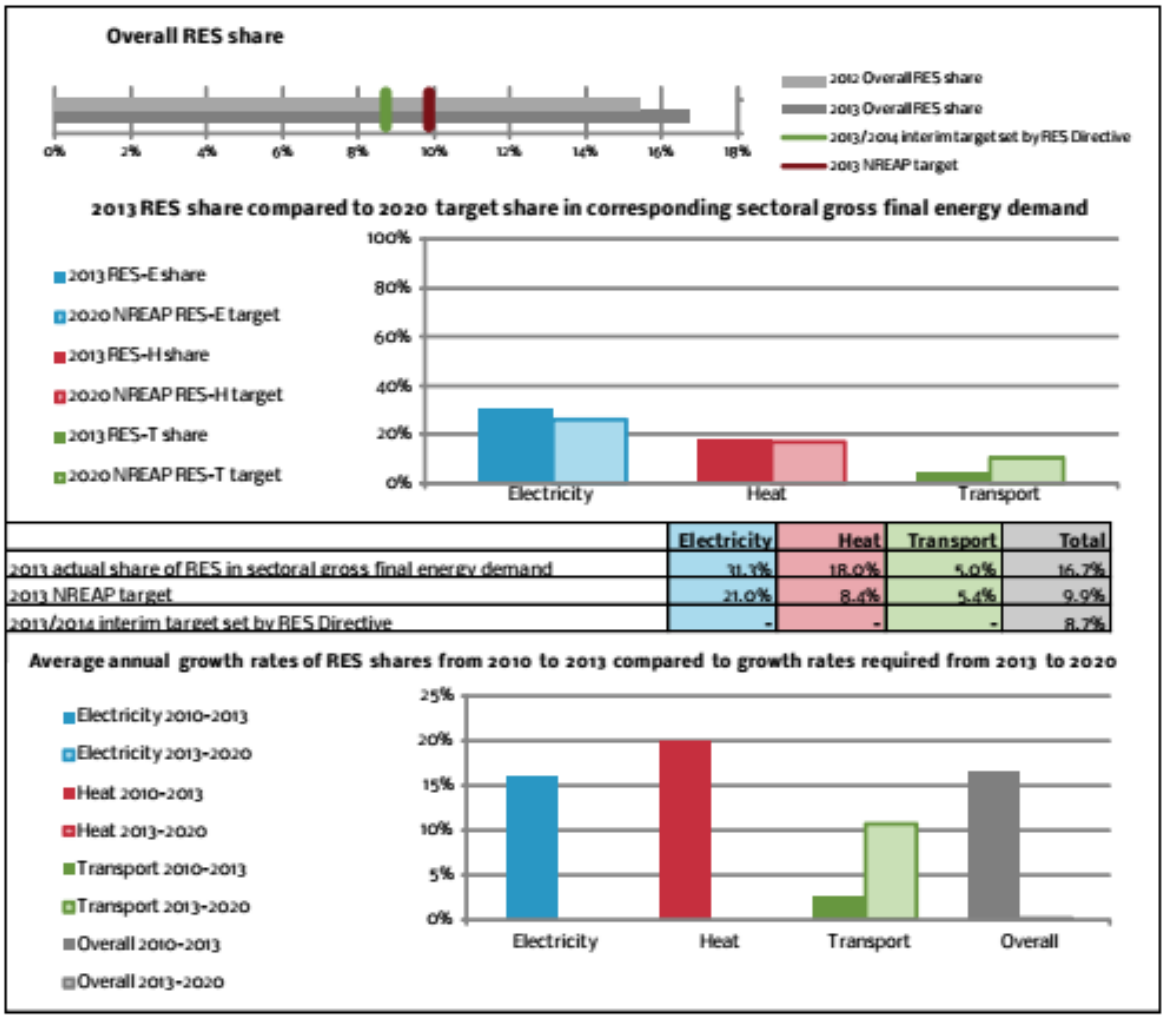
Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
		generation		efficient aggregation. The grid operators must establish the rules for organising the participation of these new clusters.	
Cross-cutting measures					
Streamlining of authorisation procedures	Regulatory	Simpler and faster authorisation procedures	Investors/end users/Public Administration	*Existing and implemented measure, set out in the NAP.* Legislative Decree No 28/2011 cuts down red tape for the authorisation of RES power plants: it simplified the framework by establishing three types of authorisations: • single authorisation • simplified authorisation procedure • notification to the municipality for minor works not requiring a building permit. For certain plant types and sizes, the Regions may simplify authorisation procedures even further (several Regions have already issued legislation to this effect)	March 2011 – n.a.
Rationalisation measures	Regulatory - finanical	Rationalisation of procedures	Investors/end users	Planned measure, provided for by the NAP. Legislative Decree No 28/2011 provides for the adoption of simplification measures to reorganise economic and financial burdens and the different forms of guarantees required for connection, construction and operation of RES power plants and for the granting of incentives.	2013 – n.a
Training and information	Non-binding	Information, changing people's behaviour	Operators, project designers, Regions, local authorities, citizens, undertakings, etc	Implemented measure, supplementing the NAP. Legislative Decree No 28/2011 provided for the creation by GSE (the energy services operator) of an	October 2011 – n.a.

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
				information portal on renewable sources and energy efficiency. The portal contains, inter alia, information on incentives, authorisation procedures, good practices, steps to take for sustainability and energy saving, etc.	
Installer qualification schemes	Regulatory	Quality assurance in the installation of RES power systems	Installers	Implemented measure, supplementing the NAP. The professional qualification for the installation and extraordinary maintenance of biomass-fired boilers, fireplaces and stoves, PV and thermal solar systems on buildings, low-enthalpy geothermal systems and heat pumps can be obtained by means of specific courses organised by the Regions	August 2013 – n.a.
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Italy NREAP 2014/15

- Italy is comfortably above both its 2013 NREAP target and the interim target 2013/2014.
- The target RES-E and RES-H&C shares for 2020 have already been achieved, and growth is still strong.

On the other hand, growth needs to accelerate regarding the RES-T share.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	31.3%	18.0%	5.0%	16.7%
2013 NREAP target	21.0%	8.4%	5.4%	9.9%
2013/2014 interim target set by RES Directive	-	-	-	8.7%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Support scheme

In Italy, electricity generated from renewable energy sources is promoted through a feed-in tariff, tax exemptions and a tendering system. Depending on the source and the size, RES-E plant operators may be obliged to opt for a certain system or may choose between the available ones. Electricity not promoted through a FiT system may be sold on the free market or through “Ritiro Dedicato” (purchase by Gestore dei Servizi Energetici). This scheme is applicable to all plant sizes for non-programmable RES (PV, wind, wave, marine, geothermal, run-off-river hydropower plants) and to programmable RES (bioenergy and storage hydropower plants) under 10 MVA. Under certain conditions, electricity producers can make use of "scambio sul posto" (net-metering) (RES LEGAL Europe database). These last two mechanisms are not compatible with new support scheme introduced by the Legislative Decrees of 5 and 6 July 2012 (the first for PV sector, now phased out, the second one for the other RES).

Theme	Barrier
Political and economic framework	• The issues of **virtual saturation and speculation**, two major barriers in Italy in the past few years, have been strongly reduced last year by two factors: the introduction of Deliberation 328/2012 of AEEG (the regulator) and the reduction of the incentives’ level. Deliberation 328/2012, specifically aimed at reducing the virtual saturation phenomenon, has allowed the elimination of purely speculative projects from the queue of connection requests. The incentives’ reduction, instead, has caused a general decline of connection requests. Overall, these effects have allowed a stabilisation of the system. In previous years, in fact, the strong growth of renewables, in part related to the high level of incentives, helped to create bottlenecks in the authorisation and connection procedure. Now, thanks to the above-mentioned effects, the regulatory framework is able to better manage the system, and the connection lead times are better aligned with the provisions of the network codes. Long lead times persist, however, with respect to the authorisation procedure when dealing with local authorities. • A negative note, however, is the fact that in 2013 and 2014, there were **very few connection requests**. This can be considered in part a side-effect of the two factors mentioned above and as a result of the administrative barriers posed by the access to the new incentive scheme (registries and auctions) and retroactive effects of new laws. This overall framework has been mentioned as a barrier that may cause problems to the sector in the long run. So far, there have been two changes in the PV Sector’s settings following this situation. Firstly, the amount of capacity installed in 2014 appears to be lower than the amount installed in 2013, which was in turn lower than the one installed in 2012. The amounts went from 3.6 GW in 2012 to 1.1 GW in 2013 to an (estimated) 800 MW for 2014 (and a large part of 2013 connections results from processes that had already started in 2012). Secondly, the type of equipment installed is focusing on smaller sizes, i.e. below 20 kWp. The reduction of incentives, in fact, has discouraged the realisation of large photovoltaic plants on land (above 200 kW), Previously, larger plants could cover the operating costs fairly easily through the incentive schemes. Following these changes,

however, this proves to be now more difficult. It is likely that for this reason installations will focus on plants below 200 kW in the future.

- Changes have also been detected in the context of the **Ritiro Dedicato** scheme. Roughly, this scheme can be defined as follows: GSE (Energy System Manager) purchases electricity from producers and resells it to the market thus simplifying bureaucratic procedures and partially lowering market exposure. In fact, for small plants with a capacity under 1 MW, minimal guaranteed tariffs were paid for the first 2 million kWh. With such a setting, even producers using marginal RES were able to operate. At the time in which the scheme had been established (2008), these prices were equal for all plants below 1 MW. In 2011, however, a diversification process depending on the source started taking place, aiming to link the level of the received guaranteed price to the level of actual management cost of each RES and to gradually increase RES-E's market exposure. Starting from 1 January 2014, the minimum guaranteed tariffs has been lowered for all RES sources and the threshold itself for their application has been lowered to the first 1.5 million kWh. Furthermore, at the end of February 2014 the so called "Destinazione Italia" law entered into force. This law establishes that the electricity already subsidised through one of the support schemes in force cannot be eligible for the Minimum guaranteed tariffs within the Ritiro Dedicato scheme, with the exception of PV plants up to 100 kW and hydropower plants up to 500 kW (electric capacity). A legal process against this decree is currently ongoing.

- Currently, the **support scheme environment** presents a quite complex structure, counting on several instruments which include feed-in and premium tariffs, net metering, bidding schemes and tax incentives; the premium tariff for PV (Conto Energia V) has been phased out, as the cap had been reached in summer 2013, tax incentives for the installation of small PV and solar thermal systems have instead been stabilised and regulated until the end of 2015. In last few years there have been continuous modifications of incentive system for RES (CIP6/92 old incentive system, Tradable Green Certificates - TGC - from 2008, the feed in tariff, I,II, III, IV, V Conto Energia from 2005 to now only for PV) which has created some uncertainty among operators. The introduction of a bidding scheme (DM 6 luglio 2012) has further pushed in this direction, as the final incentive level for producers (or whether authorised plants can access the incentive at all) is not known in advance. Changes in support schemes have been brought forward by Law 116/2014, which provided the following, starting from 1 January 2015;

    - For PV Plants, the law provides the reorganisation of incentives for plants whose capacity is higher than 200 kW. This reorganisation can take three forms: a) Redistributing the incentive on 24 years instead of 20; b) Leaving the entitlement period unchanged at 20 years with a reduced amount in a first period (to be still quantified/defined) and increased at a later time. c) Reducing of the incentive of 6/7/8% (depending on size), for the remaining incentive period.

    - For other (non-PV) plants, the Law offers the operators two alternatives

	regarding the incentive system: a) leaving the incentive level and period unchanged, but losing the right to any other type of support for 281 refurbishments or maintenance at the end of the incentive period, or b) accepting a redistribution of the incentive for an extra 7 years. • Retroactive impacts of specific measures have been outlined as a possible barrier. This is a critical issue especially with regard to changes in the Ritiro Dedicato (Minimum guaranteed tariffs) and the taxation system (a specific additional fiscal measure – the so-called Robin Hood Tax – has been expanded via Art.5 of Decree-law 69/2013 and can now impact medium/large RES-E plants). This also holds valid for the provisions of Law 116/2014. According to producers, the effect of these interventions has substantially changed the situation for several operators, who are now having to deal with a very different reality from the one assumed at the time of the investment. This retroactive aspect of has been indicated by producers as likely to create a negative environment for the sector, and damage the credibility of the country. • Problems have also been outlined with respect to access to finance. Some contacted stakeholders, in fact, have outlined how the Decrees introduced in July 2012 (new support schemes) have introduced more demanding administrative requirements as well as a limit to the amount of plants that could receive the incentive. Because of this limit, then it may be that not all plants that apply would be granted access to the support scheme at the end. Considering that in general the economic viability of a RES-E investment still depends on support schemes, stakeholders have reported that banking institutions are being more cautious to grant loans for such investments, making it in turn more difficult for producers to actually undertake the investment for a new plant
Market structure	• The issue of **imbalance payments** presents two points in Italy: 1. Whether it is right that non-programmable RES participate in imbalance adjustments 2. What the amount of these payments should be • As for the first point, the European Commission and the Authority have issued a positive opinion as well as the Lombardy Regional Administrative Court. As for the second point, according to the Authority, imbalances should be valued on the basis of their market price, which represents the value of electricity delivered in real time and not subject to programming, and therefore there should be no difference between the sources. It is up to producers and traders to promote forms of aggregation to manage the imbalance risk, avoiding that the risk is fully transferred on to the final consumer. Producers, on the other hand, claim instead that they would be able to take part in imbalance payments only as far as technically possible to each of them in relation to the type of plant, transferring the remaining part on consumers. According to some contacted experts, the perspective on the topic could also be enlarged: on the one hand, in fact RES participation to imbalance costs is justifiable, on the other hand it is also fair that they can, if they have the opportunity, offer balancing services and gain from it. Following a decision of the Lombardy Regional Administrative

	Court, the previous imbalance payment setting had been deemed unfair and suspended, although it was welcomed and deemed necessary in general terms. With Regulation 522/2014, the regulator re-introduced the payments, differentiating them by source.
Grid regulation and infrastructure	• Sistemi Efficienti di Utenza – SEU can be roughly defined as generating installations directly connected to a consumption point, thus allowing a producer to consume directly the electricity it produces, without having to pass through the grid. In this context, the regulator has reported that in the future there may be problems related to the coverage of the general system charges if SEUs and similar systems will remain exempt from the payment of such charges. At the moment, in fact, system charges are paid only by consumers who draw power from the grid. SEUs, not drawing power from the grid, do not pay such charges. From the point of view of the Authority, should SEUs become widespread, the electrical system may have difficulties to cover its costs – unless a different allocation of such system costs is established. These costs, in fact, are fixed and independent from the number of subjects taking electricity from the grid and the amount of electricity taken. From the point of view of producers, on the other hand, if the coverage of the general expenses of the system was extended to SEUs, the cost of electricity generated from renewable sources would increase, creating difficulties in the development of the sector. • In the producers' eyes, the vision of the Authority has been reported as exaggerated, as the calculations of the regulator to forecast the SEU growth were deemed to have assumed an excessively rapid growth rate. Furthermore, producers indicate that it would also be advisable to adopt a larger perspective and to consider SEUs an integral part of the electrical system in the future, even for purposes of accumulation and balance the system. In any case, it remains difficult to precisely predict how SEUs will develop. • A further delicate point is the inclusion of the AE component in the electricity bill. The AE component has been inserted to allow the coverage of the costs of energy-intensive customers, who are entitled to certain costs exemptions by law. With Deliberation 340/2013/R/EEL, however, the authority amended the definition of energy intensive customer, expanding it and thus increasing the amount of costs that need covered. Some producers deem the application of this new component in parallel to the modifications in the Ritiro dedicato and guaranteed minimum prices to be favouring energy-intensive customers too much and to be damaging the renewable energy sector.
Administrative process	• Authorisation procedures play a relevant role in terms of posing a barrier to RES-E development, deployment and integration. As regards grid connection, the main issue still appear to be the **time-consuming grid connection procedures**. This is mainly due to the fact that authorisation procedures are to a large extent regulated at regional level, thus plant operators need to deal with different regulations and procedures, depending on the area in which they need to build a plant. This may be particularly relevant in case the plant and the connecting line range across

	two regions with different regulations. Although the issues linked to virtual saturation and speculation have been solved, administrative authorisation issues of this kind remain relevant. • Grid operators, also face **difficulties in the expansion and reinforcement of the grid** because of existing blockages linked to authorisation procedures. This barrier concerns in turn also RES-E plants, as reinforcing and expanding the grid is a necessary step to accept additional RES-E capacity. Given their steep growth, PV and wind are the most affected technologies. Because of the current regulatory framework for grid expansion and reinforcement, grid operators need to obtain permission to construct or reinforce the line from all local authorities affected by the project. With respect to the previous situation, Legislative Decree 387/2003 managed to simplify the procedure to a large extent, although it was not fully able to solve the issue and problems linked to the administrative procedure for grid expansion and reinforcement still persist. • Although in the last years there were some progresses to simplify procedures, with Legislative Decree 387/2003 and especially for small plants, experts indicated that the **complexity of the authorisation process** does not yet entirely allow full certainty in programming timing and investment costs for developers. Specifically, this complexity is caused by some lack of clarity of procedures and by the delay experienced in the release of documents from authorities. In addition, laws may be interpreted differently in different areas of the country and different documents may be required for the same process, further adding to this complexity. An example of this is the non-homogeneous application, across the country, of Legislative Decree 115/08, related to buildingintegrated PV panels and small wind turbines. According to the law, in case a building is located in an area not subject to regulatory constraints, no Activity Start-up Notice (ASN) should be required for installing a RES-E plant. According to stakeholder, however some small municipalities are not aware of this decree and still require and ASN application required even if no restriction is present. The main consequence is a delay (the 30 days required for the tacit approval) and an increase in the costs of the authorisation process for the ASN application, thus again contributing to longer lead times, and causing additional costs for the authorisation process.
Other	• Clarity in terms of taxation is a further aspect that has been outlined as problematic. Specifically, the tax structure is quite complex and many bureaucratic fulfilments are necessary at this stage. In addition, at times local tax agencies may provide different interpretations for the rules, thus leading to different treatments of operators. Experts outlined that a revision of the laws, providing a clearer, unambiguous rule, could be advisable. • Local opposition also remains as an issue with respect to plant constructions, and is not always sufficiently dealt with at administrative level.
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Italy

In 2014, the number of connection requests decreased, mainly due to:

- the inadequacy of the support scheme - with many different instruments, fast modifications of already existing rules or introduction of new ones.
- retroactive impacts of specific measures, affecting the setting of several operators, forcing them to deal with different conditions from those in place at the time of the investment.
- difficult access to financing - several decrees were enacted in July 2012, restricting access to the support scheme, which reduced the possibility to obtain bank loans.
- the length of authorization procedures and grid connection, which is mainly regulated at the regional level. There are different regulations and procedures depending on the area in which the plant will be built.
- unclear taxation - a complex tax structure, many bureaucratic requirements and different rule interpretations by local tax agencies confuse the operators.

Due to the abolition of support schemes for new PV installations and other RES plants, the incentive to invest in RES has decreased significantly. “Conto Termico” (Ministerial Decree 28/12/2012), continues to be in force: it provides subsidies for thermal energy from RES and energy efficiency in buildings through conversion projects.

Electricity Sector

- Guarantee clear and stable incentives over time Frequent modifications to support scheme, uncertainty about eligibility and the amount of the incentive have a negative effect on market stability. Investors need a clear and longlasting support framework with predictable changes.
- Avoid the modification of existing support schemes with retroactive effects Besides removing barriers, establish a gradual decrease in the incentive amount so as to guarantee the economic sustainability of the investment (i.e. a different based on energy source).
- Simplification of administrative procedures through centralization of energy competences The distribution of competences among different public bodies (national, regional, local) and the inhomogeneous implementation of national laws at the local level cause uncertainty and an excess of bureaucracy. The decisional power in the energy sector should be kept at the national level, while the implementation of transparent and consistent administrative procedures should be kept at the regional level.
- Provide clearer measures regarding taxation to avoid ambiguous interpretation A complex and unclear tax structure (especially for raw materials affecting the biomass sector), many bureaucratic requirements and different interpretations of the same national rule by local tax agencies lead to an unequal treatment of operators. A revision of the laws, providing clearer and unambiguous rules, is strongly advisable.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

ENERGY PROFILE: LITHUANIA

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		3300	1300	1400	1500		
2	**% Energy dependence -** all products	71.7	59.4	81.8	78.3	78	78.4	77.4
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			1184.7	1288.4	1358.2	1466.1	1498.4
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			19.3	51.8	54.9	69.6	97.7
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0	3.9	6.3	6.3	5.7
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: LITHUANIA

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		3.8	4.8	4.8	4.9	4.9	5.1
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		2011.1	2160.1	2250.1	2274.5		
8	**Share of RE in gross final energy consumption** (%) combined			19.6	22.7	23.6	25.8	25.6
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			7.4	13.1	13.7	15.5	16.8
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	40.61	43.2	41.62	41.5	41.99	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	13.14	12.7
Overall share of energy from renewable sources (including transport)	%	22.95	23.86
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	125	132
Gross total energy from RE consumption (including transport)	Ktoe	1137	1201
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	68	69
Wind onshore	MW	279	288
Total wind (inc offshore)	MW	279	288
Sub-total (variable sources)	**MW**	**347**	**357**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**1282**	**1300**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Regulatory measures					
(A) National Strategy for the development of energy from renewable sources (approving the National Renewable Energy Action Plan). Main objective: by increasing the share of renewable energy resources in the country's energy balance, to meet energy needs in the electricity, heating and transport sectors to an optimal extent using domestic resources, to phase out imported polluting fossil fuels, and thus to enhance energy security and energy independence and to contribute to international efforts in reducing greenhouse gas emissions. (***B) 2010-2015 Plan of implementing measures for the National Strategy for the development of energy from renewable sources.***	Regulatory	Increased use of renewable energy sources	Energy producers and consumers, public and local authorities, institutions of science and higher education	Ongoing	(A) 2010-2020 (B) 2010-2015
Law of the Republic of Lithuania on energy from renewable sources. The objective of this law is to ensure the coherent development of energy use from renewable sources, to promote further development and the introduction of new technologies, and the consumption of energy produced	Regulatory	Increased use of renewable energy sources	Energy producers and consumers, public and local authorities	Ongoing	Since 2011
Priority transport of RES electricity in electricity transmission and distribution systems Electricity grid operators must give priority to the acceptance, transmission and/or distribution at transparent and non-discriminatory rates of the full amount of RES electricity offered by a producer. Such priority with regard to the	Regulatory	Increase in electricity generation from renewable energy sources	Transmission system operator and distribution system operator, RES electricity producers	Ongoing	Since 2011

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
acceptance, transmission and/or distribution of electricity is conferred on producers in relation to electricity produced by other electricity producers using non-renewable energy sources.					
Ensuring power grid access and grid optimisation ***(***A) List of public-interest services in the electricity sector stipulates that public-interest services in the electricity sector include preparation of distribution systems for the integration of production from renewable energy sources. (B) Procedure for the use of electricity grids which lay down the general principles and procedure for the development of the Procedure for grid use.	Regulatory	Improved access to the electricity grid for installations generating electricity from renewable energy sources	Transmission system and distribution system operators	Completed Ongoing	(A) 2011-2013 (B) Since 2011
Electricity balancing and reservation of electricity generating plant capacity where renewable energy sources are used The Procedure for the promotion of the use of renewable energy sources in energy production lays down the general criteria, requirements, procedure and conditions for the application of promotional measures under the support scheme for energy production in the Republic of Lithuania, which sets out that, during the promotion period, electricity producers using renewable energy sources to generate electricity are exempt from the liability to reserve generating capacity at their plants and to balance the electricity generated.	Regulatory	Increased generation of electricity from renewable energy sources	RES energy producers	Ongoing	Since 2012
Priority transport of electricity generated from renewable energy sources The Procedure laying down	Regulatory	Wider use of renewable energy	RES energy producers	Ongoing	Since 2012

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
the general criteria, requirements, procedure and conditions for the application of promotional measures under the support scheme for energy production in the Republic of Lithuania sets out that any electricity generated from renewable energy sources and supplied to the power grid is to be transported as a priority, irrespective of other incentive measures applicable to the electricity producer and of the period of validity of such incentives.		sources			
Guarantees of origin for electricity generated from renewable energy sources Rules on the provision of guarantees of origin for electricity generated from renewable energy sources approved by Order No 4-346 of the Minister for the Economy of the Republic of Lithuania of 7 October 2005 approving the Rules on the provision of guarantees of origin for electricity generated from renewable energy sources which lay down the general criteria, conditions, requirements and procedure for guarantees of origin issued for electricity generated from renewable energy sources. The institution responsible for issuing guarantees of origin for electricity produced from renewable energy sources is the transmission system operator	Regulatory	Issuing of guarantees of origin for electricity generated from renewable energy sources	Persons generating electricity in power plants using renewable energy sources , purchasing and/or selling electricity generated from renewable energy sources, distribution network operators and transmission system operators	Ongoing	Since 2005
Training of specialists installing small-scale installations for producing energy from renewable sources This Procedure regulates the training and certification of installers establishing whether installers meet the relevant requirements for certified installers installing small-scale	Regulatory	Procedure and conditions for the training, certification and quality monitoring of specialists installing facilities for the	Specialists installing small-scale installations for the production of energy from renewable sources	Ongoing	2012-14

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
production facilities for energy from renewable sources (up to 100 kW nominal output capacity): biomass boilers and non-stonework heaters, geothermal systems and heat pumps, solar installations and solar energy facilities for producing heating energy.		production of energy from renewable sources			
Simplification of the construction permit issuance procedures for installations generating energy from renewable energy sources (A) 'Simple structures' contains a list of simple structures and specific conditions for classifying structures as simple; features and technical parameters of buildings classified as simple structures and simple structures of engineering facilities; qualification requirements for non-certified persons supervising the design and construction of simple structures and the implementation of construction design projects. (B) Procedure for issuing construction and operation permits for power plants in the territorial seas of the Republic of Lithuania, the exclusive economic zone of the Republic of Lithuania in the Baltic Sea and the coastal zone having regard to the general requirements for the promotion of electricity from renewable energy sources laid down in that Law and in accordance with the principles of objectivity and non-discrimination. That Law also legally regulates other matters relating to the procedures for issuing construction permits for facilities producing energy from renewable energy resources.	Regulatory	Improved procedures for issuing construction permits	Producers of energy from renewable energy sources	Ongoing	(A) Since 2010 (B) Since 2011
Rules on the issuing of permits for activity in the electricity sector (recast)	Regulatory	Improvement of conditions for the	Producers of electricity from renewable energy	Ongoing	Since 2015

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
		issuing of development permits	sources		
Financial measures					
The prices of buying-in of electricity from renewable energy sources (A) and (B)	Financial	Increase in electricity generation from renewable energy sources	Producers of electricity from renewable energy sources	Completed	(A) Since 4 October 2012 Buying-in tariff different for different quarters of the year (B) Since 1 March 2013 Buying-in tariff different for different quarters of the year
Reduced grid connection rates for power plants using renewable energy sources (A) The Procedure for promoting the use of renewable energy sources to produce energy stipulates that electricity producers are to be reimbursed grid connection costs for plants using renewable energy sources, such costs being apportioned between the electricity producer and the grid operator in the manner, subject to the conditions and to the extent provided for in the Law on energy from renewable sources. Reimbursement of costs of connecting power plants to electricity grids applies to all electricity producers using only renewable energy sources, except in the cases	Financial	Increase in electricity generation from renewable energy sources	Producers of electricity from renewable energy sources	Ongoing	(A) Since 2012 (B) Since 2011 (C) Since 2011

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
specified in the Law of the Republic of Lithuania on energy from renewable sources and cases where fossil fuel is used at a power plant to the extent necessary for its operation and/or to ensure the functioning of the electricity production process. (B) Article 21 of the Law of the Republic of Lithuania on energy from renewable sources states that connection of power plants to electricity grids is a public-interest service and the costs associated with connecting power plants to electricity grids are to be apportioned amongst the producer and the grid operator, having regard to grid ownership boundaries. Before 1 February 2013 costs are allocated as follows: • where the installed capacity of the producer's power plant being connected exceeds 350 kW, the producer is to pay 40 % of the grid connection costs and the connecting operator is to pay 60 % of the connection costs; • where the installed capacity of the producer's power plant being connected exceeds 30 kW but is not above 350 kW, the producer is to pay 20 % of the grid connection costs and the connecting operator is to pay 80 % of the connection costs; • where the installed capacity of the producer's power plant being connected does not exceed 30 kW, the producer’s plant is to be connected free of charge and the connecting operator is to pay 100 % of the connection costs.					

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
As of 1 February 2013 costs are allocated as follows: • where the installed capacity of the producer's power plant being connected exceeds 350 kW, the producer is to pay 40 % of the grid connection costs and the connecting operator is to pay 60 % of the connection costs; • where the installed capacity of the producer's power plant being connected does not exceed 350 kW, the producer is to pay 20 % of the grid connection costs and the connecting operator is to pay 80 % of the connection costs. (C) The National Control Commission for Prices and Energy approved the Methodology for setting tariffs for connecting electricity installations to the electricity grid, which lays down the arrangements for setting tariffs for connecting electricity installations to the electricity grid.					
Support mechanisms for electricity generated from renewable energy sources by promoting the introduction of the most efficient technologies The main legislative instruments include: • Approving the Methodology for the pricing of public-interest services in the electricity sector; • approving the methodology for setting tariffs for electricity generated by using renewable energy resources; • approving the methodology for setting tariffs for connecting electricity installations to the electricity	Financial	Increase in energy generation from renewable energy sources	Producers of energy from renewable energy sources	Ongoing	Since 2011

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
grid; • determining the maximum level of the fixed tariff					
Reservation of electricity grid capacity The Procedure for the promotion of the use of renewable energy sources in energy production sets out that: electricity grid operators must reserve capacity in the electricity grids which they manage to the extent that is required for the connection of electricity generating plants that use renewable energy sources and for the transport of electricity generated at such plants. The costs incurred by electricity grid operators as a result of reserving electricity grid capacity for the connection of power plants that use renewable energy sources are considered to be additional costs for grid operators relating to the development of the use of renewable energy sources, and they are to be approved by the National Control Commission for Prices and Energy in the manner and under the conditions laid down by law.	Financial	Ensuring electricity grid capacity for the transport of electricity generated from renewable energy sources	Producers of energy from renewable energy sources	Ongoing	Since 2012
Buying-in of surplus electricity generated using renewable energy sources Procedure laying down the general criteria, requirements, procedure and conditions for the application of promotional measures under the support scheme for energy production sets out that any electricity which has been produced at power plants in an electricity user's electricity network where renewable energy sources are	Financial	Increased generation of electricity from renewable energy sources	RES electricity producers	Ongoing	Since 2012

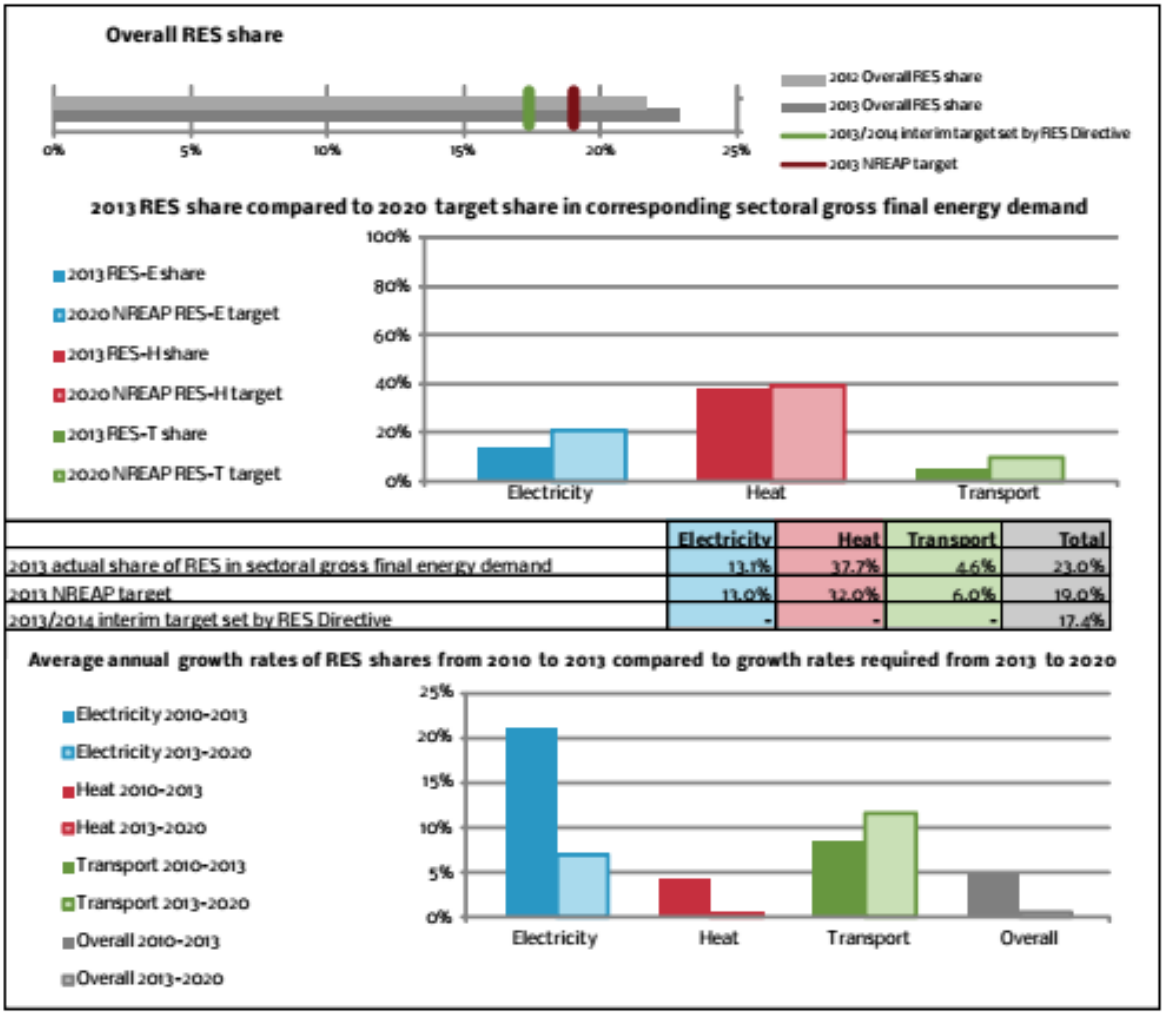
Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
used to generate electricity and has been fed into the electricity network and remains after electricity consumption to meet own and/or business needs ('surplus electricity') is to be traded in the manner and under the conditions laid down in the Procedure. An electricity user's electricity network is considered to comprise all electrical installations operated by the user which are intended for the use and/or for the production of electricity to meet own needs and are connected to the electricity distribution system at a single connection point. The installed capacity of power plants in an electricity user's electricity network must not exceed the capacity which the user is authorised by the electricity grid operator to use. A maximum of 50 % of the electricity generated in power plants in an electricity user's electricity network where renewable energy sources are used to generate electricity per calendar year may be regarded as surplus electricity.					
To create financial support schemes For projects of integrating electricity network operators, transforming electricity transmission and distribution networks into a smart active electricity network and integrating the production of renewable energy in the power grid and to allocate financial support from the European Union structural funds.	Financial	Upgrading of electricity transmission and distribution networks	Transmission system and distribution system operators	Ongoing	2011-15
Planned measure "RES industry LT+" Measures of the Operational Programme for Investments of the EU Structural Funds for 2014-2020 Priority 4 "Promoting energy efficiency and renewable energy	Financial	Installing the capacity for producing energy from renewable energy sources and	Small and medium sized enterprises and large industrial undertakings	Planned	2016 - 2020

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
production and use”		developing new more efficient technologies and installing them at industrial enterprises			
Informational					
‘Renewable energy sources in Lithuania’ website Joint project by the Lithuanian Energy Agency, the Lithuanian Ministry of Energy and Danish Energy Management A/S, a Danish consultancy. The website presents up-to-date information on the legal framework for renewable energy sources (RES) in Lithuania and the funding mechanisms. It offers calculators that help determine possible energy outputs from specific RES and estimate the energy demand. The website has an interactive map of the RES power plants operating on Lithuanian territory which allows user-friendly searching by location or specific RES type. It also provides statistics on RES use in Lithuania and the European Union. http://www.avei.lt	Informational	Public awareness raising	Energy producers and consumers, scientific and higher education institutions, public and local authorities	Ongoing	Since 2011
'Energy of the Future' national research programme The purpose of the programme is to address the most pressing scientific issues confronting Lithuania: energy security, how to increase energy efficiency, energy production in the future and how to improve supply technologies and optimise their application in the country's energy industry. The programme objective “Developing research facilities for future energy production, supply and efficiency” is to be implemented through the following measures: development of materials	Informational	The final report of the programme “Energy of the future” has been updated on the basis of comments and suggestions put forward by participants of public consultations, experts and stakeholders	Lithuanian Scientific Council and selected groups of researchers representing various science and educational establishments	Ongoing	2010-14

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
and technologies required for future energy production in Lithuania; development of materials and technologies saving, accumulating and transforming energy; development and optimisation of systems improving heat and light energy efficiency in buildings.					
To draw up, provide and publish information on the issuance of permits, licences and authorisations relating to renewable energy facilities and support provided to applicants	Informational	Accessibility of information on the issuance of permits, licences and authorisation	Investors	Ongoing	2010 - 2015
Applied research of RES employment opportunities (wind energy)	Informational	Development of vertical components of low-speed wind plants and justification of use opportunities	Investors and final consumers	Ongoing	2015
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Lithuania NREAP 2014/15

- Lithuania has achieved both its 2013 NREAP target and the interim target 2013/2014.
- Growth rates in both the RES-E and the RES-H&C share are more than enough to achieve the 2020 target, if they can be maintained.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	13.1%	37.7%	4.6%	23.0%
2013 NREAP target	13.0%	32.0%	6.0%	19.0%
2013/2014 interim target set by RES Directive	-	-	-	17.4%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Support scheme

In Lithuania, electricity from renewable sources is supported mainly through a feed-in tariff. The tariffs for renewable electricity generating plants with a capacity exceeding 10 kW are awarded through tenders. The National Control Commission for Prices and Energy quarterly sets tariff rates for renewable power producing plants with a generating capacity of up to 10 kW and maximum tariff levels for RES plants exceeding 10 kW. RES plant operators are entitled against the electricity company designated by the Ministry of Energy - a public electricity supplier serving the area in which the RES producer is operating or an independent electricity supplier - to payment for electricity exported to the grid. There is a technology-specific cap for the total amount of electricity eligible for promotion through the feed-in tariff. The caps are set in the Law on Energy from Renewable Sources (hereafter - RES Law) that was adopted in May 2011. Until 2020 the following caps are fixed: 500 MW for wind power, 10 MW for solar power. In addition, renewable electricity is eligible for subsidies by the Lithuanian Environmental Investment Fund (LEIF) as well as subsidies and loans from the Fund for the Special Programme for Climate Change Mitigation, and is granted a relief from the excise tax (RES LEGAL Europe Database).

Theme	Barrier
Political & economic framework	• At the end of 2014, lacking long-term vision for renewable energy sources constitutes a barrier that negatively affects deployment of renewable energy sources in the Lithuanian electricity, heating and transport sector (Pikšrys, LVEA, 2014b; Niedvaras, Lithuanian Business Confederation, 2014b). In June 2010, the National Strategy on Renewable Energy Development by 2020 along with the action plan with the implementing measures covering the period between 2010 and 2015 was adopted. However, according to the Lithuanian Wind Power Association, these documents are quite old and require an urgent update. In addition, a number of strategic documents envisaged in the Law on Energy from Renewable Sources (RES Law) which is in force since May 2011 are still not in place. These include for example the National Renewable Energy Development Programme that would set out policy directions for renewable energy sources in the electricity, heating and transport sector and would cover the period from 2011 to 2020 and the Programme implementing Inter-institutional Action Plan. The National Renewable Energy Development Programme is currently under development. In March 2014, the Ministry of Energy launched a public consultation for the draft Programme. In April, the Lithuanian Confederation of Renewable Sources submitted its comments, saying that the draft Programme simply describes projects already in progress and lacks new measures to encourage renewable energy development in Lithuania (Lithuanian Confederation of Renewable Sources, 2014). • At the end of 2014, lack of political will to create attractive and stable conditions for the investment in renewable technologies is still perceived as one of the key barriers in the electricity and heating sector (Pikšrys, LVEA, 2014b; Niedvaras, Lithuanian Business Confederation, 2014b). As communicated during the last survey almost a year ago, this barrier adversely affects all renewable technologies, except biomass. Thus promotion of the green energy in Lithuania remains to be merely of a declaratory nature (Pikšrys, LVEA, 2014b). In practice, politicians seem to be not interested in increasing the share of renewables and becoming an

	energy independent country. However, the industry is convinced that politicians have no real appetite in renewables, most probably due to a strong influence of interest groups in the renewable energy policy making (Pikšrys, LVEA, 2014b; Niedvaras, Lithuanian Business Confederation, 2014b). • Just limited improvements could be observed with regard to a further barrier indicated at the beginning of 2014, namely the incomplete renewable energy sources regulating legislative framework hindering growth of renewables in both electricity and heating sector (Pikšrys, LVEA, 2014b; Niedvaras, Lithuanian Business Confederation, 2014b). As indicated above, despite the fact that the RES Law entered into force in May 2011 certain implementing regulations are still missing. • At the beginning of 2014, the renewable industry in Lithuania was concerned about the unstable legal framework that regulates renewable energy sources in the electricity and heat sector. In February 2013, tariff rates for the electricity generated from solar power were reduced significantly (e.g., tariff rates for solar power plants with installed capacity above 100 kW decreased from around €0.33/kWh to around €0.24/kWh. Moreover, amendments to the RES Law of 17 January 2013 restricted permitting of solar power facilities applied for after July 2013 (ecologic/eclareon, 2013). With regard to renewable energy regulating legislation, the year 2014 was quite a stable one. No controversial decisions like those taken in 2013 have been observed over 2014. As a consequence, unstable legal framework was no longer perceived as a barrier by the renewable industry at the end of 2014 (Pikšrys, LVEA, 2014b; Niedvaras, Lithuanian Business Confederation, 2014b). • In Lithuania, municipal action plans for the use of renewable energy sources were expected to significantly encourage their deployment in municipal territories. The adoption of such plans with the renewable energy targets and measures for their achievement for the period 2011-2020 is envisaged in the RES Law and is mandatory. According to the law, first action plans were due to be adopted by municipalities by the end of August 2012. However, by now only a few municipalities have adopted action plans, mainly the bigger ones and those who are in favour of renewable energy (Pikšrys, LVEA, 2014a; Pikšrys, LVEA, 2014b). The remaining ones are waiting for the instructions or guidelines from the responsible ministries (Pikšrys, LVEA, 2014b). • In the last “Keep on Track!” report, caps for financial support set in the RES Law were communicated as one of the key barriers for the expansion of renewables in the Lithuanian RES-E sector. Some positive developments could be observed with regard to this barrier in 2014. As given above, state is committed to support 500 MW of wind power by 2020. From these, 282 MW were already installed in October 2014. Further around 200 MW have been allocated through tenders organised by the National Control Commission for Prices and Energy and the projects are currently being implemented (Pikšrys, LVEA, 2014b). Thus, the quota of 500 MW for wind power has already been exhausted and without financial support no new projects will be developed in this field. According to the Lithuanian Wind Power Association, the cap for wind power should be increased to at least 800 MW for onshore and 800 MW for offshore wind power, since the electricity generated by wind is currently the cheapest electricity in Lithuania. The feed-in tariff rate set for wind power during last tenders amounts to around € 0.07, while electricity generated by Elektrėnai Power Plant fired with natural gas, heavy fuel oil, and a bitumen-based fuel costs

twice more (around € 0.14). The Government claims that further development of renewables, including wind power, depends on two documents currently being drafted – the amended National Energy Strategy and the feasibility study on renewable energy development (Pikšrys, LVEA, 2014a). The draft National Energy Strategy was prepared by the Lithuanian Energy Institute on 5 April 2014 and is awaiting its approval by the Parliament (LEI, 2014). On 4 September 2014, the Lithuanian Academy of Sciences presented to the public the feasibility study for the connection of power plants which use renewable energy resources to the high-voltage electricity transmission network by 2030. The study was commissioned by the Lithuanian electricity transmission system operator Litgrid and carried out by experts from the Kaunas University of Technology (KTU, 2014). The experts explored three scenarios for developing renewable energy in Lithuania by 2030 – the basic, intermediate, and ambitious one. Under the basic scenario the share of renewable electricity would amount to 24%. Under intermediate and ambitious scenarios the share of electricity coming from renewable energy sources would amount to 30% and 35% respectively. According to the feasibility study, wind farms and biomass power plants have the greatest potential among renewable technologies in Lithuania. Both technologies are expected to produce 84-93% of the electricity generated from renewable energy sources. According to the feasibility study, an additional 500 MW onshore wind capacity could be installed in Lithuania by 2030, reaching a total capacity of 1,000 MW (MoEn, 2014; KTU, 2014). As indicated above, the RES Law foresees 500 MW cap for onshore wind power by 2020. However, if this capacity is reached by January 2015, the law allows the Government to decide if to increase this cap. Thus with the feasibility study in place, the renewable industry is now expecting that the Government will choose one from the three suggested scenarios and take appropriate decisions to encourage further development of renewable energy in Lithuania (Pikšrys, LVEA, 2014b).

- During the last survey, the renewables industry complained about tenders which are obligatory for renewable electricity generating plants above 10 kW, seeking guaranteed feed-in tariff for 12 years. Investors reported tendering procedure as an irrational and financially unattractive scheme (Mažylis/Pikšrytė, 2013; Pikšrys, LVEA, 2014a; Riškus, EnviTec Biogas AG Baltics). To be able to participate in a tender, a company needs to submit a letter of intent signed by the grid operator. To get the letter of intent signed, the company needs to pay a guarantee amounting to € 14,48 per installed kW. Moreover, detailed plan has to be prepared and approved in advance. Thus in case of a bigger project, a company willing to participate in a tender already has huge investments and there is no guarantee that it will eventually win the tender. In addition, not all successful projects can be implemented later on, e.g. due to lacking funds. If within two years less than 50 % of the project is implemented, the Ministry of Energy has the right to revoke the permission for capacity expansion (in this case a new tender has to be organized by the National Control Commission for Prices and Energy) or to extend the permission for further 6 months (Pikšrys, LVEA, 2014a). By the end of 2014, tendering procedure is not seen as a huge barrier anymore. According to the Lithuanian Wind Power Association, tenders are currently functioning fairly well in Lithuania, especially for the big renewable generators. However, deadlines for the project implementation are still perceived as an obstacle. The industry is of the opinion that in some cases extension of the permission for capacity

	expansion for just 6 months is not enough. Especially in case of a huge renewable project there should be an option for extending the permission for 12 months (Pikšrys, LVEA, 2014b). In addition, the RES Law establishes separate authorisation procedure for offshore wind energy projects. It stipulates that permission to use Lithuanian territorial sea, exclusive economic zone of the Baltic Sea and (or) its coastal strip for the construction and maintenance of power plants shall be issued by the Government or its authorised institution. The permission gives the project developer an exclusive right to conduct research within the specified area that is essential for the decision on plant construction. This exclusive right may be acquired for a maximum of 4 years. Also here the Lithuanian Wind Power Association thinks that the responsible institution shall be granted the right to extend the 4-year period, because in Lithuania neither institutions nor project developers have experience with offshore wind so far (Pikšrys, LVEA, 2014b). • In early 2014 the share of EU structural funds for developing renewable energy between 2014 and 2017 (approx. € 318.7 million) was seen as being insufficient by the renewable industry. It was indicated that alone the development of cogeneration from biomass to the optimal 350 MW capacity in the biggest Lithuanian cities would require similar amount of money (Lithuanian Confederation of Renewable Resources, 2013; Pikšrys, LVEA, 2014a). At the end of 2014, it was reported that part of these funds is planned for the construction of two biomass cogeneration power plants (CHP) in the cities Vilnius and Kaunas. While the planned CHP is still necessary in Vilnius, there is no need to construct a CHP in Kaunas because there are already plenty of small biomass producers to meet the energy demand of the city. The Lithuanian Wind Power Association therefore suggests reallocating the funds envisaged for the CHP in Kaunas to other renewable technologies (Pikšrys, LVEA, 2014b). • During the survey at the beginning of 2014 the renewable industry communicated that deployment of small-scale solar power systems in Lithuania could be greater, if net metering, which is already used in some other countries, would be adopted (Pikšrys, LVEA, 2014a). By amending the RES Law in December 201498, the net metering is now available in Lithuania for small solar power plants (up to 10kW for solar power plants integrated in residential buildings and up to 50kW for solar power plants integrated in state or municipality-owned buildings). The net metering is now expected to accelerate the use of small-scale solar power in Lithuania (Pikšrys, LVEA, 2014b).
Other	• At the end of 2014 the Lithuanian Wind Power Association reported that onshore wind power in Lithuania still faces opposition of local communities (Pikšrys, LVEA, 2014b). For example in Klaipėda district, the local community was so vocal and active that it was able to convince the local government to act against wind power development in the region. As a result, land areas for onshore wind farms were not envisaged in the General Plan of the Klaipėda district, the district with the highest potential for wind energy (Pikšrys, LVEA, 2014a). However, the local opposition decreased in past year. The best way to overcome this barrier is talking with the local community and explaining environmental, social and economic benefits of the wind power. Sometimes, however, beliefs of local communities are so strong that they cannot be changed even by means of reasoned discussions (Pikšrys, LVEA, 2014a; Pikšrys, LVEA, 2014b).

	• Misleading statements concerning renewable energy sources were quite often in the media also over 2014. Such statements are usually made by politicians (Pikšrys, LVEA, 2014b). It is often claimed that renewables are characterised by instability and their balancing requires huge cost. However, according to the industry, renewables can perfectly perform the balancing role themselves. For example electric cars can act as a great surplus power battery. Biomass CHP produces more electricity during the cold season, when the demand for power is greater. Thus, by complementing each other, renewable energy resources may generate the greatest benefit for the country and totally replace expensive imported fossil fuels (Lithuanian Confederation of Renewable Resources, 2013). Moreover, politicians often refer to renewable energy as one of the most expensive types of energy. However, according to the Lithuanian Wind Power Association, the tariff rate set for the wind power during last tenders amounts to around € 0.07, while electricity generated by Elektrėnai Power Plant fired with fossil fuels costs twice more (around € 0.14) (Pikšrys, LVEA, 2014a). To refute various false statements and to inform the public the Lithuanian Power Association regularly publishes articles and gives lectures on topics like the balancing of renewable electricity, prices of electricity generated from renewable sources and from fossil fuels, economic, environmental and social benefits of renewable technologies and good practice examples from abroad (Pikšrys, LVEA, 2014b)
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Lithuania

The main instrument to promote RES-E in Lithuania is a feed-in tariff, for which the level is set administratively for plants below 10kW and through a tendering mechanism for plants exceeding 10kW. There are technology-specific capacity caps which are in line with the capacities planned in the NREAP for 2020. However, judging from recent deployment trends, the caps will be reached much earlier than that. The feed-in scheme is accompanied by investment grants, a loan programme, and an exemption from excise tax. Next to the well-established hydro power, the NREAP foresees an important role for onshore wind in Lithuania

Electricity Sector

- Decrease investor insecurity by completing delayed elements of the regulatory framework for renewables, including secondary legislation for offshore wind and regulation regarding purified biogas injected into the gas grid

- The capacity caps are expected to be hit long before 2020, but are currently under revision. Consider increasing the capacity caps especially for low-cost technologies such as onshore wind. Announce cap extensions early to minimize stop-and-go effects.

- Explore possibilities to let local populations benefit financially from wind farms built in their vicinity. This has been shown to improve public acceptance in other countries, for instance Denmark.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

ENERGY PROFILE: NETHERLANDS

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		61950	74420	73350	62900		
2	**% Energy dependence -** all products	24.1	38	30.2	26.2	33.4	51.8	45.2
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			3063.7	4373.4	4553.8	4752.9	4710.5
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			343.4	483.8	498.5	649.2	702.5
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			4.8	41.9	67.5	96.4	134.1
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: NETHERLANDS

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		52.1	55.1	51.6	47.3	48.5	49.5
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		4923.4	5193.4	4793.3	4563.9		
8	**Share of RE in gross final energy consumption** (%) combined			3.9	4.8	5.5	5.8	6
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			9.6	10	10	11.1	12.5
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	101.6	99.29	91.19	87.81	91.44	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	10.0	10.0
Overall share of energy from renewable sources (including transport)	%	4.8	5.5
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	997	979
Gross total energy from RE consumption (including transport)	Ktoe	2498	2639
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	746	1048
Wind onshore	MW	2485	2637
Total wind (inc offshore)	MW	2713	2865
Sub-total (variable sources)	**MW**	**3459**	**3913**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**4579**	**4863**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

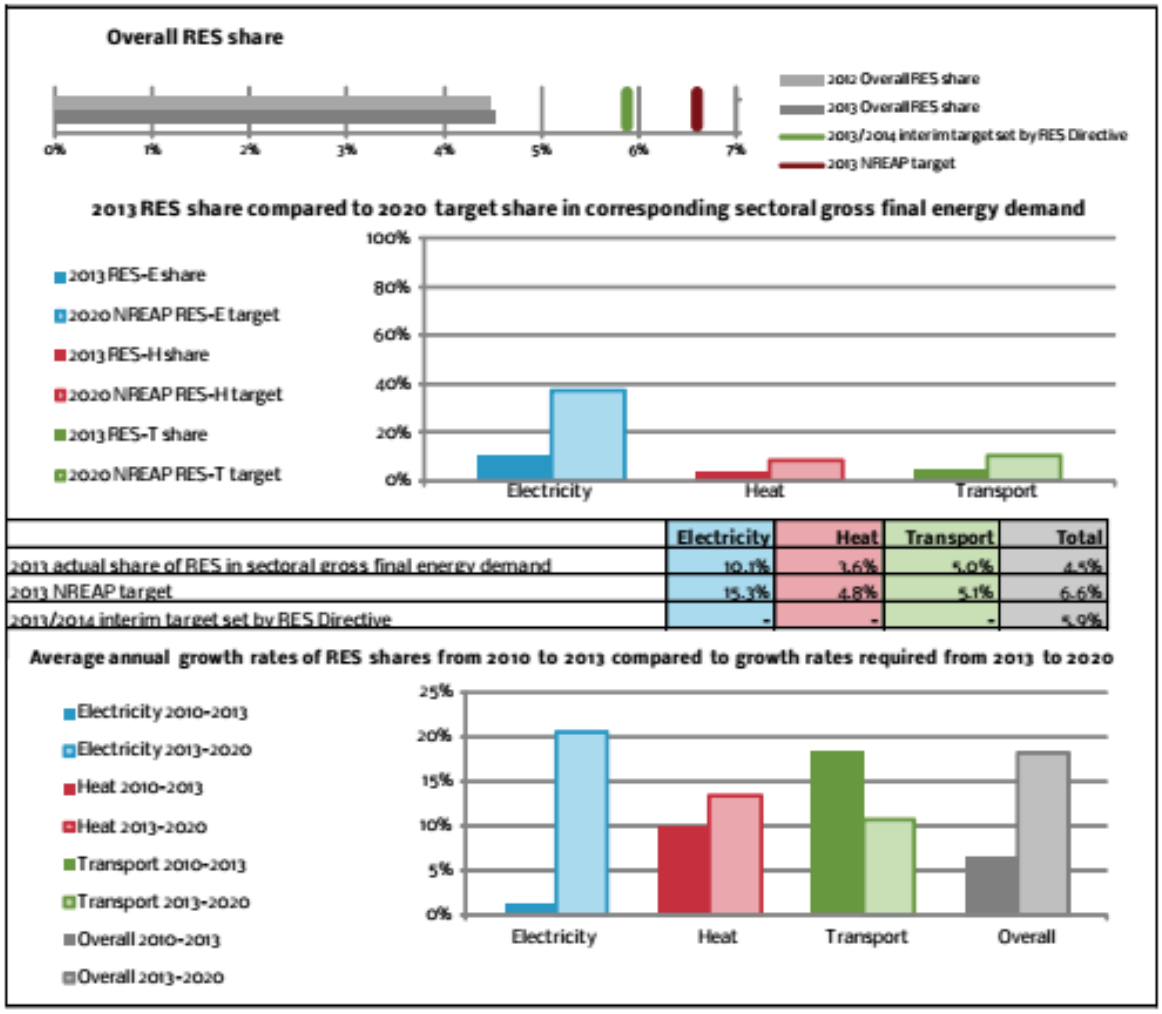
Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Financial support regimes					
National incentive scheme for sustainable energy production - plus (SDE+)	Financial	Generated energy	Energy producers	Existing	2011 -
National incentive scheme for sustainable energy production (SDE)	Financial	Generated energy	Energy producers (incl. consumers)	Existing	2008–2010 (payment over max. 15 years)
Environmental quality in the electricity production sector	Financial	Generated energy	Energy producers	Existing	2003–2006 (payment over max. 10 years)
Environmental quality in the electricity production sector – transition scheme	Financial	Generated energy	Energy producers	Existing	2006-2007 (payment over 10 years)
Energy investment relief scheme	Financial (tax)	Installed capacity	Energy producers	Existing	2001 -
Environmental investment relief scheme/unspecified depreciation of environmental investments (MIA/VAMIL)	Financial (tax)	Installed capacity	Energy producers	Existing	MIA: 2000– VAMIL: 1991–
Green investment scheme	Financial (generic financing)	Installed capacity	Energy producers and investors	Existing	1995 -
Innovation loan scheme	Financial (generic financing)	Energy innovation	Energy producers	Existing	2008 -
Entrepreneurial financing guarantee	Financial (generic financing)	Installed capacity	Energy producers	Existing	2008 -
Government backed SME loan scheme	Financial (generic financing)	Installed capacity	Energy producers	Existing	2008 -

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Energy innovation agenda	Financial	Installed capacity, generated energy, energy innovation	Energy producers	Existing	2008 - 2012
Topsector energy	Financial	Installed capacity, generated energy, energy innovation	Industry and research institutions, government	Existing	2011 -
Regulatory					
Planning vision for onshore wind	Regulatory	Installed capacity	Various	Existing	2014 -
Priority for sustainably generated energy	Regulatory	Generated energy	Energy producers	Existing	2010 -
Certification scheme and training in sustainable energy for installers	Regulatory	Change in behaviour	Installers of sustainable energy systems	Existing	2012 -
Package of measures under the Environmental Management Act	Regulatory	Installed capacity, energy-saving measures	Businesses, property owners	Existing	2014 -
Requirements for 'virtually energy-neutral buildings' (BENG) programme	Regulatory	Installed capacity, energy-saving measures	Designers and principals (including local authorities) of new utility buildings	Planned	Starts 2019 (local authorities) and 2021 (rest of the market)
Soft measures					
Energy report 2011	Soft	Change in behaviour; installed capacity and generated energy	Various	Existing	2011 -
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Netherlands NREAP 2014/15

- The Netherlands have missed their 2013 NREAP target and not yet achieved their interim target 2013/2014. The Netherlands had already failed the 2011/2012 interim target.
- Growth in RES-E and RES-H&C shares needs to be increased significantly if the 2020 targets are to be achieved.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	10.1%	3.6%	5.0%	4.5%
2013 NREAP target	15.3%	4.8%	5.1%	6.6%
2013/2014 interim target set by RES Directive	-	-	-	5.9%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Support scheme

In the Netherlands, electricity from renewable energy sources is mainly promoted through a premium tariff (premiums on top of the wholesale price). Furthermore, RES-E is promoted through a net-metering scheme for PV installations as well as tax benefits.

As far as the premium tariff is concerned, the SDE+ scheme is granting a premium on top of the market price to producers of renewable energy in order to compensate for the difference between the wholesale price of electricity from fossil sources and the price of electricity from renewable sources. The sum of the premium, paid on top of the market price, is variable and depends on the annual electricity market price development and is adjusted by a correction value accordingly (art. 13 (5) SDE+). The premium is paid for a period of up to 15 years. The support is made available in 6 stages (in 2015 even in 9 stages) and is allocated on a 'first come, first serve' basis. The amount of the tariff increases with each stage, but since there is only one overall budget for the whole support scheme foreseen, applicants applying at a later stage run the risk of being rejected due to a lack of funds. In general, the SDE+ scheme gives an advantage to less cost-incentives technologies, applying for lower tariffs at an early stage of the allocation process. The maximum base rate eligible under the SDE+ scheme corresponds to the maximum base rate in phase 6 to 9 (RES LEGAL Europe Database)

Net-metering applies to electricity customers (only private individuals, not to commercial customers) who are at the same time producers of electricity and which are connected to the electricity grid through a connection with a throughput value smaller than or equal to 3*80A. Customers need to apply for an offer from the responsible grid operator for injecting electricity to the grid and are required to pay a grid use charge (art. 95(a) and (c) in conjunction with art. 31(c) Electricity Act). For small scale customers, energy taxes only apply to the net electricity consumption, defined as the difference between electricity obtained from and electricity fed-in to the grid (art. 50 (1) and (2) WBM) (RES LEGAL Europe Database).

In addition, the consumption of electricity and natural gas is subject to the Act on the Environmental Protection Tax (art. 48 (1) in conjunction with art. 50 (1) WBM). A given consumer is exempt from this tax if the electricity consumed is electricity from renewable energy sources and was generated by the consumer himself (own consumption clause) (art. 64 (1) in conjunction with art. 50 (4), (5) WBM). Furthermore, the Energy Investment Allowance (EIA scheme) entitles entrepreneurs based in the Netherlands to write off investments in renewable energy plants against tax (art. 3.42 Wet IB 2001). The eligibility criteria are extensively described in the Energy List. The level of funding depends, among other things, on the source of energy and the type of plant used. Investments of less than 450 Euros are ineligible (art. 3.45 (1) (a) Wet IB 2001). Furthermore, a total of at least 2,300 € (and at most €116 million) must be invested in eligible projects within one year (art. 3.42 Wet IB 2001). (RES LEGAL Europe Database)

Finally, investors in RES-E projects (excluding Biomass/Biogas) are eligible for a reduction of the interest rate on the basis of a Green project declaration (RES LEGAL Europe Database).

Theme	Barrier
Political and economic framework	• The reliability of the general RES-E strategy and support scheme is the first dominant barrier, which still persists. A consistent policy for the support of renewables is essential in order to stimulate new clean technologies. In the past however, every new cabinet in the Netherlands introduced its own support scheme and strategy and adapted or stopped previous ones, resulting in conditions, where a long term planning

concerning the revenue stream was difficult for investors and developers in renewable technologies (De Vries, Holland Solar; Hirdes, NWEA; Peeters, Energy Matters).

- The concluded Energy Agreement for Sustainable Growth, which was signed between the Dutch government and representatives from the energy sector (inter alia associations, DSOs/TSO, NGOs, labour unions, organisation of employers), is envisaged to provide a more stable framework for the development of renewable energies in the Netherlands until 2020, respectively 2023. The agreement sets inter alia guidelines for the definition of mechanisms for financial and non-financial support schemes. These mechanisms are being defined and negotiated throughout the upcoming months and shall result in a further support of the renewable market within a longer term scope. Subject to the concrete results of the upcoming negotiation within the Energy Agreement, the Agreement might help to overcome identified shortcomings regarding the reliability of the general RES-E strategy and support scheme; thus, mitigating the before described barrier (De Vries, Holland Solar; Hirdes, NWEA; Peeters, Energy Matters).
- There are however also voices, which underline the fragility of the Energy Agreement, especially considering the series of upcoming elections on municipal as well as provincial level. To this end, it was highlighted that several political parties, which are predicted to receive considerable shares of votes, have declared their reluctance in regards to the renewable support, especially regarding wind energy. Depending on the outcome of the elections, future municipal or provincial governments could challenge the Energy Agreement, resulting once more in instable conditions for renewables and the required investments (Hirdes, NWEA).
- In addition, stakeholders also highlighted the strong focus of the general RES strategy on bioenergy and the heating sector as a further barrier for the RES-E sector (particularly for solar); this also in light of the limited national biomass resources.
- In 2012, over 95% of supported projects under the SDE+ scheme came from the renewable heating sector. In 2013, the figure slightly decreased but remained still high with a total share of around 65% of renewable heating projects (Schepers/Aarnink, CE Delft). In 2014, the renewable heating share decreased slightly further with a total share of around 60% (SDE+ 2014, RVO).
- Stakeholders especially underlined the limited availability of biomass resources in the Netherlands, leading to the necessity to import substantial shares of biomass feedstock; also described in the Dutch NREAP (Van der Elst/Bosch, Rabobank; De Vries, Holland Solar; Peeters, Energy Matters). Considering the fact that the Netherlands are having the lowest percentage of forest land cover in the EU as well as the high population density of the country, the Dutch NREAP is estimating that by 2020, 38% of the required biomass would have to be imported (NREAP NL, p. 109; Van der Elst/Bosch, Rabobank). The import is however subject to changing global market conditions for biomass feedstock, with a current tendency of highly increasing prices.
- While high shares of costs for biomass projects are feedstock related and thus require for a substantial financial investment also after the construction of the installation to fuel the system; renewable technologies such as wind and solar have a peak in investment costs at the beginning of the project lifetime, in regards to the development and construction of the system; but do not require for major ongoing investments, especially

not concerning any “fuel” to run the installation. This makes wind and solar much more predictable in terms of investment costs (Van der Elst/Bosch, Rabobank).

- While wind energy has always been a central element of the RES-E strategy of the Netherlands, solar energy was for a long time not embraced by the Dutch government as a viable renewable energy source on the short term. This perception has changed over the last years; not at least due to a growing deviation of renewable growth rates from the predicted development path towards the 2020 targets (De Vries, Holland Solar).
- As already flagged in last year’s report, a barrier was detected regarding the reliability of the support scheme in form of the future existence of the net-metering scheme for solar installations as well as of the purchase subsidy for private individuals. Stakeholders expressed their fear already in last year’s report that the support for solar PV in form of the 15% subsidy for private individuals on the purchase of PV systems would be stopped even though they had a decisive effect on the development of small scale residential systems in the Netherlands (Bosselaar, RVO; De Vries, Holland Solar). This fear has now materialised.
- The Dutch government decided not to renew the subsidy after the original budget was exhausted. Stakeholders underlined the negative impact of such a stop and go policy on the solar market (De Vries, Holland Solar). The subsidy in the SDE+ scheme for large systems has been very successful in 2014, but the interest was a lot higher than the available budget (Bosselaar, RVO).
- In addition, the Dutch government also announced that the net-metering scheme (saldering) for small scale solar PV installations will not infinitely be available (currently planned until 2020) and that the scheme will be subject to revisions (at from 2017). Considering that the net-metering scheme is the only available (indirect) support for small scale residential PV systems at the moment as well as recalling the impressive impact that this support had on the development of the small scale residential PV sector throughout the last years, a revision or at worst the additional disappearance also of this support scheme might have further substantial effects on the Dutch solar sector (Bosselaar, RVO; De Vries, Holland Solar).
- In addition, stakeholders also flagged the latest modification of rules concerning the cumulating of support scheme options for large solar installations as a further issue for the development of this technology. To this end, developers of large scale commercial PV systems are no longer allowed to cumulate the SDE+ support scheme with the EIA tax reduction scheme. This change has resulted in conditions, where developers may opt for the EIA scheme and are excluded from the eligibility of the SDE+ scheme. This restriction of the support scheme options is decisively reducing the financial feasibility of large scale commercial PV systems (De Vries, Holland Solar).
- In this context, the general access to finance has additionally been identified as a dominant barrier for the RES-E sector in the Netherlands. Developers of large scale commercial PV systems, wind developers, biogas & biomass operators as well as geothermal developers have flagged their issues concerning the realisation of financial closures with commercial banks. Credit institutions remain reluctant to finance renewable projects and show a high risk aversion towards new technologies and projects. This behaviour is not at least based the experiences of the financial crisis (Bosselaar, RVO; De Vries, Holland

	Solar; Peeters, Energy Matters). • The "Green Deal" between the Dutch government and several commercial (green) banks aims at increasing the financeability of sustainable energy projects that were until now difficult to finance. The approach could play an important role to overcome existing financial shortages. • Furthermore, stakeholders pointed out that the Energy Agreement also requires for a substantial reduction of costs for the development of offshore wind energy, which could become a major barrier for this technology and its development. To this end, the Energy Agreement is foreseeing a 40% reduction of costs over a period of 10 years; being a decrease of 5€/MWh per year until 2013. The reduction of costs is depending on a multitude of factors (inter alia technology innovation, policy decision, financing options, scale of roll-out), for which different stakeholders are responsible. If the envisaged reductions cannot be realised in the foreseen time, there is the risk that in 2018/2019 the Dutch government might reduce the offshore objective for 2023; not at least to adapt the prognoses to the real conditions. Such a reduction of the overall offshore target would ultimately lead to the noncompliance of the Netherlands with the European 2020 targets, as there is hardly another renewable technology that could fill the then existing capacity gap in such a short period of time (Hirdes, NWEA).
Administrative process	• A central barrier regarding the integration of RES-E in spatial planning is the interference of wind turbines with (military) radar installations. Due to the constant motion of rotor blades, wind installations are impacting differently on radar installation than other immobile buildings or natural obstacles. This constitutes a problem for (military) radar installations, which are having difficulties to locate flying objects correctly, respectively are confronted with "blind zones" on the radar, for which a reliable positioning of objects is not possible. The issue is currently leading to an increasing share of zones, in which a development of wind installations is no longer allowed; thus limiting the development potential of wind energy in general. The problem is not limited to military radar systems, but also occurs for the civil aviation and their radar systems. Furthermore, the issue is identified for a number or European Member States and constitutes a growing barrier for onshore wind installation on a European scale. Generally, the military case differs from the civil one, as both sides have different specifications and needs. In the Netherlands, it was tried to meet the military concerns through a revision of rules, respectively through new calculation methods, which only very partially solved the issue; leaving eventually more problems than expected. In addition, a further approach is foreseeing the installation of an additional radar port in the North of the Netherlands to minimize "blind zones"; still, this solution requires for a substantial financial investment and sufficient realisation time. It is thus questionable if this approach can actually be considered as a suitable short term option (Hirdes, NWEA). • A further issue for the development of onshore wind installations is the provincial spatial planning. The Dutch provinces received more competencies in the development procedures for onshore wind installations, to regionalise the process. To this end, the provinces are inter alia responsible for the allocation of wind development zones and the associated spatial planning procedures. Formally, the provinces allocated sufficient zones for the development of the targeted 6.000 MW from onshore wind installations, accorded in the Energy Agreement. In reality however, many of the assigned locations are not possible for the

	development of onshore wind. The allocation of new wind development areas is a time consuming process and will delay the envisaged realisation period of a number of projects. The occurring delays can also substantially impact on the achievement of the foreseen onshore capacities for the European 2020 objectives (Hirdes, NWEA). • In regard to the spatial planning there is also an issue for large scale commercial PV installations, which are now eligible under the SDE+ support scheme. For the installation of these systems, there is a need for a revision of existing land utilisation plans of municipalities through the dedicated spatial planning procedures. This process can be very time consuming and could delay projects decisively, resulting in higher realisation costs for developers and investors. The SDE+ scheme generally calls upon developers of large scale commercial ground mounted installations to use conversion areas for the realisation of systems (De Vries, Holland Solar). • Concerning the financial feasibility of PV development, a new zip code related model (the so called 'Postcoderoos') has been introduced, allowing developers of PV systems to attract private equity for their projects. The benefit of the zip code model for the private investor is a reduction on the energy tax (generally related to the energy consumption). The reduction is insofar related to the investment sum. This model can however not been accumulated with the SDE+ scheme. The benefit of the zip code model for the PV developer is to be able to attract investments from private investors to present a financially viable project. There are however geographical limitation of the zip code model regarding the involvement of private investors, which are only very partially compatible with the development of large scale commercial installations. To this end, the private investors need to be located with their permanent residences in the same zip code area where the system will be build or in adjacent zip code zones. Recalling again that large scale commercial systems shall use conversion areas for their projects and that these areas are not necessarily located adjacent to the large urban cities, there is a limitation as far as the circle of potential investors is concerned. This limitation of the zip code model is limiting the development opportunities of solar in the Netherlands in general (De Vries, Holland Solar). • For the time being, only a handful of projects based on this zip code model have been or are being realized. The limited financial feasibility of projects under this scheme is the main root cause for this low number of projects. Stakeholders outlined that they see a high chance that the model will be revised if the application level remains as low. Here, stakeholders expressed their concern that the revision would not necessarily result in an amendment of the scheme, but could also lead to a phase out of the scheme (De Vries, Holland Solar).
Grid regulation and infrastructure	• A minor barrier exists regarding the development of grid infrastructure in the Netherlands. The envisaged development of the onshore and offshore wind energy will require for a further development of the grid to allow for additional connections of installations. Stakeholders however qualified this barrier as minor, due to the fact that the Dutch TSO as well as the Dutch DSOs are parties to the Energy Agreement and have acknowledged the 6.000 MW onshore wind target, respectively the 4.500 MW offshore target for 2020; including the inherent grid reinforcements and extensions (Hirdes, NWEA). • In addition, another minor barrier is identified in form of the curtailment of wind installations. Stakeholders reported that curtailment of wind

	installations is taking place in times of overcapacities to the grid; however only at a minor scale. In this context, stakeholder especially highlighted that overcapacities in the Dutch grid are manly caused by the fact that neighbouring states (especially Germany) are “dumping” their excessive energy on to the Dutch grid, forcing grid operators to take stabilising measures for their responsible grid parts (Hirdes, NWEA).
Other	• A further barrier for the RES-E sector in the Netherlands is the (growing) NIMBY resistance against onshore wind installations as well as against biogas and biomass systems. • For onshore wind energy, the issue of local disagreement has to be identified as the biggest issue for the development of this technology. More and more local citizens are revolting against a development of wind installations in their direct neighbourhood or their community. The NIMBY resistance is making the realisation of projects extremely challenging; especially considering the high population density of the Netherlands (Van der Elst/Bosch, Rabobank). Onshore wind developers are having more and more difficulties in identifying suitable development locations. In addition, processes are decisively extended and delayed due to objections of neighbours in the administrative processes, respectively due to lawsuits of neighbours before courts. The resistance against onshore wind is further aggravated by nationally operating anti-wind platforms, which are supporting local citizens in their ambitions to prevent a further wind development. The background of these antiwind lobbying groups’ remains unclear; stakeholders qualified them as “non-believers in climate change” (Hirdes, NWEA). The NIMBY resistance is only partially able to entirely stop onshore projects; yet, the severe delays of projects are resulting in substantial extra costs for developers and investors, which are substantially constraining the development of onshore wind in general; ultimately also impacting on the achievement of the European 2020 targets (Hirdes, NWEA). • As a way to overcome the onshore NIMBY objections, it was proposed to focus on repowering existing onshore wind turbines; not at least as the bulk of the Dutch turbines now installed are of a relatively small size (Van der Elst/Bosch, Rabobank).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for the Netherlands

Support scheme

The main support instrument in the Netherlands is the SDE+, a combined support scheme for RES-E, biogas, and heating technologies. The SDE+ is in principle a feed-in premium allocated via a tendering procedure. The tender is organised in steps, starting with the cheapest options and moving on to more expensive ones until the budget limit is reached. All RES technologies are generally covered under the scheme, but due to the stepwise tendering on first-come-first-served basis, low-cost RES-H and biogas options are favoured by the scheme, rather than RES-E options like wind power. Preferential loans and tax benefits serve as secondary instruments to incentivise RES investments. The Dutch support scheme in the past was characterised by frequent adaptations and changes of the support instrument. This led to investor confidence being rather low. The national Energy Agreement on Sustainable Growth of 2012 shall provide for a more long-term view, improving reliability. The Dutch NREAP focuses on solid biomass and onshore wind as the most prominent technologies, with some ambitious deployment also planned for biogas.

Electricity Sector

- Maintain long-term reliability for investors: Frequent changes in the combined RES-E and RES-H support scheme (SDE+) have damaged investor confidence. The Energy Agreement of 2012 was a good step to increase transparency and reliability of national RES strategies. The objectives and measures in the Agreement should now be realised. This includes, for instance, the timely introduction of an appropriate policy framework to allow annual offshore wind tenders to start in 2015 as planned.
- Improve spatial planning for onshore wind farm development: Development zones designated to wind by provincial administrations are often not actually suitable for wind farms.
- The SDE+ allocates subsidies to new applicants once a year: This cycle is too long especially for RES-H&C projects in the building sector with much shorter development cycles, causing delay or non-realisation of such projects.
- Improve access to finance: The Green Deal is a first step in helping RES projects access banks' resources. Still, financing remains a central issue for the development of renewable project in the Netherlands. The Green Deal scheme should be closely monitored, and further research should be done regarding the reasons why some banks are so reluctant to provide credit to RES installations, and how this could be changed.
- Develop strategies to address the lack of public acceptance: Developers of RES projects often face significant public opposition. This is especially the case for wind farms, but seems to be on the increase regarding biogas and solid biomass installations as well. Strategies shall be developed to address the lack of public acceptance, for instance by ensuring that local communities benefit financially from wind parks in their vicinity. Include the public at an early stage in the planning process to integrate their views. Consider repowering older wind parks to increase installed capacities.
- Re-evaluate the strong biomass/biogas focus of the Dutch Renewable Energy Action Plan: Some stakeholders have expressed concern about the focus of the Dutch NREAP on solid biomass and biogas, rather than more wind and PV. The Netherlands produce little biomass themselves due to limited natural resources and are thus dependent on world market prices of biofuels. While there may be opportunities for trade and job creation, some stakeholders would like to see a more concrete vision for biomass use in the future.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

ENERGY PROFILE: PORTUGAL

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		268550	148030	110290	107560		
2	**% Energy dependence -** all products	84.1	85.1	75.1	72.4	71.2	77.3	73.5
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			5641.5	5607	5834.8	5182	5823.3
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			789.5	1033	1041.4	998	1072.6
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			18.2	41.2	53.9	68.5	70.7
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		17.9	18.1	15.9	15.8	16	16.1
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)							
8	**Share of RE in gross final energy consumption** (%) combined			24.2	25.7	27	28	28.5
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			40.7	49.1	52.1	52.6	54.1
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	138.26	117.97	110.16	110.23	117.92	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	49.1	52.1
Overall share of energy from renewable sources (including transport)	%	25.7	27.0
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	2237	2354
Gross total energy from RE consumption (including transport)	Ktoe	4197	4376
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	296	415
Wind onshore	MW	4608	4854
Total wind (inc offshore)	MW	4610	4856
Sub-total (variable sources)	**MW**	**4906**	**5271**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**11105**	**11534**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

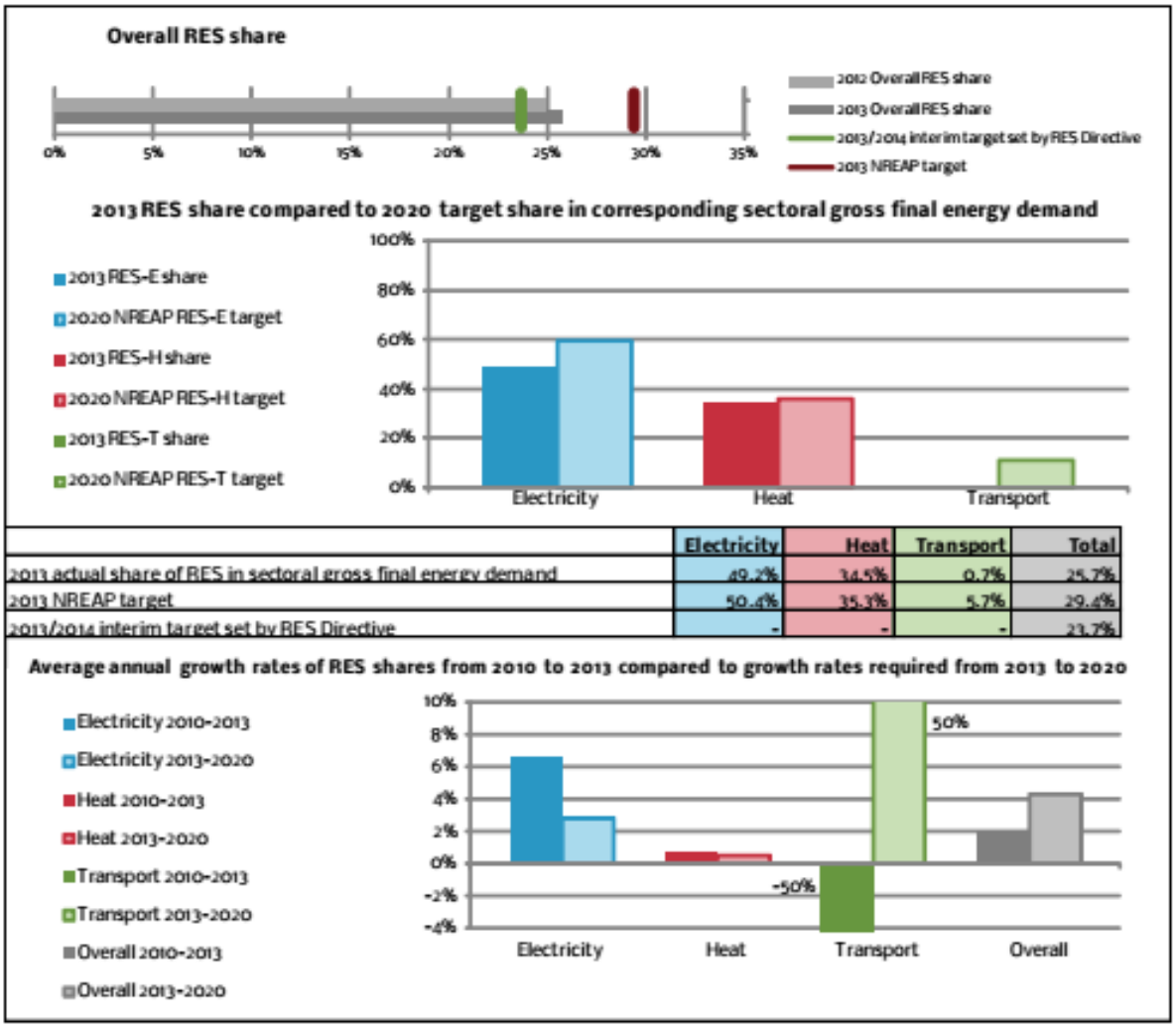
Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Completed measures					
Redesigning and merging current micro- and mini generating programmes	Regulatory	Streamline and harmonise administrative procedures. Rationalisation of support granted.	End user (residential, services and industry)	Completed	2012 - 2014
Measures planned and in force for the Electrical (E) sector					
Introduction of a general remuneration system which enables producers of electricity from RES to carry out their activity in accordance with the terms included in the PRO	Regulatory	Stimulate investment in mature technologies with an order of merit which enables it to be carried out under market conditions	Renewable Energy Producers	Existing	2003 - 2020
Implementation of the role of market facilitator, required to acquire energy produced by electricity producing centres using RES wishing to sell that energy under market conditions	Regulatory	Creating effective conditions to make trading by small operators viable on the market.	Renewable Energy Producers	Existing	2013 - 2020
Setting up an Issuing Office for Guarantees of Origin	Regulatory	Helping ensure the economic viability of projects generating electricity using RES and increasing transparency through the trading of guarantees of origin arising from the production of this type of electricity.	Renewable Energy Producers	Existing	2013 - 2020
Ensuring the viability of energy through over-	Regulatory	Increase installed capacity from RES by 400MW in an economically efficient manner	Renewable Energy Producers	Existing	2010 - 2020

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
equipment of wind farms		and by improving the management of the electricity generating system and security of the supply.			
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Portugal NREAP 2014/15

- Portugal has missed its 2013 NREAP target, but has met the less ambitious interim target 2013/2014.
- Growth in the RES-E share and the RES-H&C share is enough to achieve the 2020 target share. However, growth in the RES-T share has been negative. This trend needs to be reversed.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	49.2%	34.5%	0.7%	25.7%
2013 NREAP target	50.4%	35.3%	5.7%	29.4%
2013/2014 interim target set by RES Directive	-	-	-	23.7%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

According to data released by the Portuguese TSO (*Redes Energéticas Nacionais - REN*), approximately 62% of electricity consumption in Portugal mainland was supplied by renewable energy sources (RES) between January and October 2014, a small increase compared to the 58% achieved in 2013, but still the highest value since there is available data. The increase in the first ten months was a result of more production from water and wind sources - with the former accounting for 32% and the latter accounting for 24% of domestic consumption.

Due to the budget deficit and macroeconomic imbalances that Portugal has been addressing in the past years, the country has conducted a comprehensive structural reform in several sectors. The legal framework of the electric sector together with the policies that support renewables have been reviewed and a new regulation for self consumption and small production units has been published in October 2014.

Support scheme

In Portugal, a feed-in tariff system is in place for existing installations and for installations under the micro and mini generation regime (until December 2014). New installations can receive support through specific power granting tenders. A new regulatory framework addressing Small Production Units (UPP) and self-consumption was published in October 2014 and will come into force in January 2015. The new framework for UPP introduced by Decree-law 153/2014, revises the one that existed for micro and mini generation. The remuneration will be based on a bidding model in which producers offer discounts to a reference tariff, which has not been published yet (as of 11 November 2014). An alternative regime for wind farms was introduced in 2013.

Theme	Barrier
Political and economic framework	• Within this category, barriers are related to the existence & reliability of general RES-E strategy & support scheme. The uncertainty regarding new support mechanisms can be mentioned as a barrier with severe effects, bearing in mind that support schemes have been extinguished in 2014 and new projects are to be paid according to market prices, which might push RES-E project developers into a market that has not been completely defined yet. In addition, the development of emerging technologies may have been compromised as there is no feed-in tariff that can attract investment in emerging technologies (e.g. offshore wind) (National profile of Portugal, re-frame.eu). • Other barriers are related to access to finance and revenue risk. The country risk due to the economic and financial crises induced a decrease in the capital available to finance RES projects and the fluctuation of the biomass fuel cost and the lack of opportunities to sign long term contracts with biomass suppliers have hampered the financing of new biomass power plants' projects. In terms of revenue risk, the last allocation tender for SHP was considered to be poorly structured and most of the projects have not been licensed and none is under construction or operation. In addition, there are insecurities about the overpowering regime as it consists of installing additional capacity in existing wind farms, without increasing the grid connection power. A new legal framework for overpowering was established in June 2014; however, an ordinance with relevant technical details of this new regime that should already been published is still being negotiated (National profile of Portugal, re-frame.eu).

	• Finally, it can be said that the implementation of the self-consumption regime has a question mark. Decree-law 153/2014 putted together under the same regime self-consumption and small production units (previously regulated under the micro and mini generation regimes). The regulation of self-consumption is seen as positive and as an effort to facilitate the integration of renewables in a decentralised manner; however, for its implementation, ordinances and regulations still need to be published and it is yet to be seen whether the decree will be successfully implemented (Freitas, APISOLAR; Joyce, LNEG). In fact, the decree-law is very technical and it will be important to have communication/educational campaigns to explain to consumers the benefits of the self-consumption regime and how to implement it (National profile of Portugal, re-frame.eu).
Grid regulation and infrastructure	• The barriers in this category were related to foreseeable grid development, predictability/transparency of connection procedure, and treatment of RES-E dispatch (curtailment). As highlighted in the previous report, there is a limited interconnection capacity between Spain and France, which actually prevents the export of renewable electricity out of the Iberian Market and limits the development of RES-E projects in Portugal (KoT (2013):192-5; National profile of Portugal, re-frame.eu). Additionally, there is no definition for offshore regarding grid access and connection procedures and there is a lack of definition of curtailment rules for RES-E. • Another barrier mentioned within this category was the cost of RES-E grid access. The newly established self-consumption regime provides several benefits for grid management, such as reduction of grid losses - as production is closer to consumption, as well as peak shaving - as most of small scale production comes from solar power plants that produce during the peak hours. Nonetheless, in case of units above 1.5 kW and once total self-consumption installed capacity exceeds 1% of total system installed capacity, units will be subject to a tax to bear the electricity system costs (National profile of Portugal, re-frame.eu). In addition, as the concept behind self-consumption is to cover its own needs and avoid excess of production, to set the right scale to the system is very important as the remuneration of the excess sold to the grid is penalised with a 10% deduction in order to compensate the costs with the injection (Freitas, APISOLAR; Joyce, LNEG).
Administrative process	• The majority of the barriers within this category are related to the integration of RES-E in spatial and environmental planning, followed by complexity and duration of administrative procedures. In Portugal, the regulation of RES-E production has been spread over many documents, which sometimes hampers the understanding of the rules to which producers are subjected to (KoT (2013):192-5;). The lack of compatibility of RES-E projects to spatial planning instruments in the municipalities (e.g. Municipal Master Plans) and incompatibilities of RES-E projects with forest areas might delay the issue of permits. In addition, difficulties to find grid connection points at distances compatible to the dimension of the project were also reported as existing barriers. Moreover, it would be important to conduct studies on technical, environmental and economic potential of RES sources to allow for better quantification of the remaining potential and identification of appropriate sites still available (National profile of Portugal, re-frame.eu). • Concerning the administrative procedure for grid connection, it is considered long, complex and expensive, especially when it is necessary to assess the environmental impact of the activity. Actually, the complicate

	and time consuming procedure to obtain a permit, as well as the absence of a one-stop-shop have been extensively mentioned in previous studies (e.g. KoT (2013):192-5, RES Integration, 2011:23; Ragwitz et al., 2011:82; AEON (2010):9) as a central barrier and still continue to exist, being urgent the implementation of the one-stop-shop as predicted in the NREAP's measures (National profile of Portugal, re-frame.eu). It can also be added that the new regulation on capacity allocation and licensing procedure is not considered clear and transparent and might compromise the development of new RES-E projects (National profile of Portugal, re-frame.eu). Finally, as producers are not entitled to a special expropriation regime like grid operators are, they usually pay high prices to land owners for land rental in order to install the aerial lines. In some cases, they even have to use longer lines to contour conflict areas (KoT (2013): 192-5; National profile of Portugal, re-frame.eu). The situation regarding the aforementioned barriers has not substantially evolved since January 2014.
Other	• Other barriers related to operational issues, communication between stakeholders, tax regime, and transparency of energy statistics should also be mentioned. In terms of operational issues, there is a lack of detailed urban wind assessment tools and methodologies applied to the generality of urban areas (National profile of Portugal, re-frame.eu). Concerning communication between stakeholders, Decree-Law 67/2014 determines that the manufacturers and importers of electric and electronic equipment (REEE), including photovoltaic modules and inverters, are obliged to establish a contract with a manager entity in an integrated system of REEE. The main problem is related to a duopoly of firms that practice very high costs penalising the business sector of PV (National profile of Portugal, re-frame.eu). • With regards to tax regime, questions related to tax depreciation of equipment for the production of electricity from renewable sources, restrictions in the fiscal deductibility of the financial costs, the incidence of Municipal Real Estate tax (IMI) and fines applicable to micro producers that don't declare annually the profits are also in place (National profile of Portugal, re-frame.eu). Moreover, the inexistence of long term policies to each sector leads to constrains, such as the limits to the fiscal deductibility of financial costs that were introduced by the State Budget 2013 that might discourage future investments in the sector and jeopardize existing ones (National profile of Portugal, reframe.eu). Energy statistics in Portugal are considered hard to analyse due to different approaches chosen by official entities, which might lead to incompatible data between available sources and even jeopardize the transparency of the statistics (National profile of Portugal, re-frame.eu).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Portugal

Since 2013, all new RES-E projects have been integrated in the liberalised electricity market (except small units) and remunerated according to market prices.
The government has established an over-taxation for wind power plants to reduce electricity tariff debt and, as compensation, extended the validity period of FiTs for another five or seven years. The government has decided to reduce the FiT period for SHPs installed before 2005, but the owners contested the decision.
The new RES-E licensing regime from August 2013 renders the accreditation process more difficult regarding the time stages for environmental impact studies.
An overpowering scheme was published allowing wind farms to install an additional capacity of up to 20%, although the ordinance regarding the technical issues has not yet been issued.
The new self-consumption and small production unit's regulation allows for the sale of surplus production from self-consumption units and sets a new reference tariff for small production units.

Electricity Sector

- Review existing support schemes with special emphasis on the market competition rules, redirecting subsidies to meet the binding targets and reduce fossil energy dependency.

- Reduce the regulatory instability introduced by the new licensing schemes, through an enhanced dialogue amongst stakeholders avoiding retroactive changes, and promote a redefinition of the current regulation.

- Speed-up and create the conditions (environmental, financial and political) for the implementation of the National Hydroelectric Power Plant Plan, which will double the current hydro pumping/storage capacity, creating thus more competitive conditions to meet demand using variable renewable sources like wind and solar.

- Improve public awareness regarding RES-E, including the clarification of the actual costs and benefits and the coordination of energy statistics.

- Set a clear strategy and binding targets for RES-E in 2030. Continue the promotion of the cross-border interconnections capacity between Portugal and Spain and between the Iberian Peninsula, Europe and North Africa to create a more extensive, competitive and sustainable market, improving security of supply and allowing for further renewable energy development.

- Promote R&D projects to encourage public and private investment into less mature technologies such as solar, bioenergy, marine energy and offshore wind technologies. Create a green tariff option for final electricity consumers.

- In 2014, Portugal reached a share of renewable energy in electricity generation of 51.7%, still far from the 2020 target of 60%. So, it will be necessary to review the current mechanism and define new approaches to promote private investment into large-scale projects.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		31490	34530	34730	35100		
2	**% Energy dependence -** all products	63.1	76.6	76.7	70.4	72.9	73.3	71.9
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			14634.6	17562.1	18002.8	16872.9	17685.1
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			3806.6	4784.7	4472.3	4241.2	4205.2
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			552.4	716	706.6	710.8	693.8
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: SPAIN

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		79.9	89.1	80.8	79.2	80.5	82.5
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3087.2	2801.9	2553.7	2508.6		
8	**Share of RE in gross final energy consumption** (%) combined			13.8	15.3	16.1	16.2	17.3
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			29.8	36.7	37.8	37	36.6
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	134.87	125.94	114.68	115.28	119.41	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	36.7	37.8
Overall share of energy from renewable sources (including transport)	%	15.3	16.2
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	8551	8704
Gross total energy from RE consumption (including transport)	Ktoe	12828	13295
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	4785	7087
Wind onshore	MW	22958	22975
Total wind (inc offshore)	MW	22958	22975
Sub-total (variable sources)	**MW**	**30043**	**30062**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**44996**	**45043**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

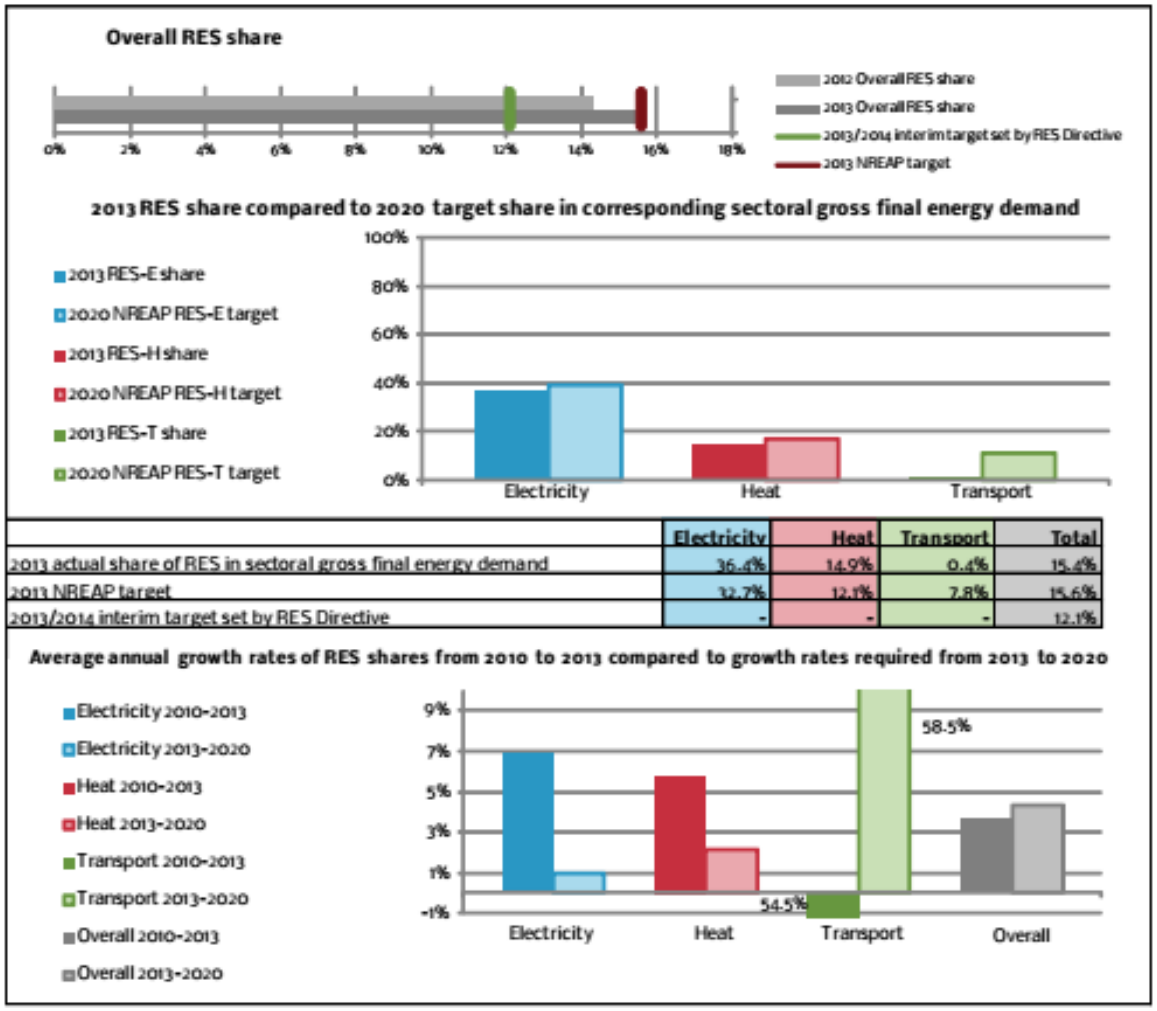
Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Electricity sector renewable measures					
Further development of international interconnections.	Soft	Increase security of supply, promote integration of greater unmanaged renewable energy production and move away from Spain's current status as an energy island.	Electricity system operators, operators and holders of power generation plants.	Existing and planned	2012 - 2020
Adaptation of the legal framework for energy generation from renewable energy sources (Different legislation approved from 2013).	Regulatory	Improve the financial efficiency of the system according to the principle of reasonable profitability.	Holders of plants for the production of electricity from renewable sources.	Existing	2013 -
Improvement of monitoring by the Special System Control Centre (CECRE)	Soft	Maximise the production of electrical energy in the special system, preserving the security of the electricity system.	Electricity system operators and operators of power generation plant	In process of implementation	2011
State Secretariat for Energy Decision issuing a public tender for the allocation of a specific remuneration system for new plants producing energy from biomass located in the mainland electricity system and wind technology plants, and establishing the tender procedure and rules.	Regulatory	Increase security of supply, promote integration of higher renewable electricity production.	Electricity generation plant promoters.	Completed	2015 -
Royal Decree regulating the administrative, technical and economic conditions of modes of electricity supply with self-consumption and production with self-consumption	Regulatory	Set the administrative, technical and financial conditions for the supply and production of electricity in self-consumption mode.	Sponsors of electricity generation plants	Completed	2015 -

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
State Secretariat for Energy Decision establishing criteria for participating in system adjustment services and approving certain operating and testing procedures for adaptation to Royal Decree of June 2014 regulating the activity of electricity production from renewable energy sources, combined power and heat generation and waste.	Regulatory	To enable the participation of renewable technologies, combined power and heat generation and waste in system adjustment services.	Holders of renewable energy, co-generation and waste-to-energy power plants	Completed	Feb 2016 -
Specific measures in the solar sector					
Proposals to encourage professionalisation of the sector.	Information/ training	Improving overall plant quality. Changing attitudes to solar energy	Installers, promoters and end-users	Under development	2011 - 2020
Training courses for the energy certification of existing buildings that incorporate best practices for solar energy	Training	Promoting the integration of renewable energy sources, particularly solar energy, in existing buildings as a measure to improve the energy rating of the buildings	Certifying technicians (architects, engineers, etc.)	Completed	2012 - 2014
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Spain NREAP 2014/15

- Spain did not meet its 2013 NREAP target, but achieved the less ambitious interim target 2013/2014.
- The growth rates in the RES-E and RES-H&C shares are enough to achieve the 2020 target if maintained. Growth in the RES-T share needs to be increased significantly.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	36.4%	14.9%	0.4%	15.4%
2013 NREAP target	32.7%	12.1%	7.8%	15.6%
2013/2014 interim target set by RES Directive	-	-	-	12.1%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

The Spanish RES-E sector has come to a complete stop. Because of the barriers below, no investments are currently taking place. In addition, investors have seemed to lose trust in the market and are directing investments elsewhere or not investing and spending all their resources and effort in lawsuits to avoid facing the uncertainty of the Spanish regulatory framework. Loss of trust has also been flagged with respect to the European Commission, as investors in Spain would have appreciated a stronger involvement from their side to protect renewable investments in Spain as part of the European strategy. Actually there are hundreds (>400) of appellant on the Spanish Supreme Court, Audiencia Nacional and Economic Administrative Court plus several appeals in the International Arbitration and European Commission against this regulatory changes.

Support scheme A complementary retribution scheme is currently in place for RES-E in Spain. This, however, presents quite a few issues in the market, as outlined in the table below.

Theme	Barrier
Political and economic framework	• The new electricity sector law, (24/ 2013) establishes that new incentive schemes for renewable energy will be developed only exceptionally and solely for achieving European Goals (it can also be granted in insular territories as long as the RES energy supported is cheaper than the conventional one in those territories). The law establishes a capacity-based specific retribution system based on the profits from market sales of electricity (competing in equal conditions than fossil energies) plus a complementary retribution provided to cover costs that RES would not otherwise be able to recover and allowing for a "reasonable return on investment (ROI)" of about 7,5% (defined in the law as the average yield of Spanish 10-year Government Bonds in the secondary market, plus a spread of 300 basic points, which should lead to an average ROI of 7.5% before taxes). The complementary retribution is based on a set of standard projects, that is, theoretical project models that respond to certain characteristics, such as proper management, and capability to guarantee the identified ROI. • This formula is applied to investments following a competitive process (investors bid for €/MW). No such processes, however, have been called by the Government. Furthermore, as this new calculation method for the ROI applies for the overall lifetime of existing RES-E installations, existing installations that could have had higher profit margins in the past for being more efficient or because they benefited from good entrepreneurship of their owners (i.e. for using innovative and very efficient technology, etc.), see those additional revenues subtracted from the financial support they are to receive in the future. • As this payment scheme is based on installed capacity and sustained costs, for each standard project the government has calculated what the producer's revenue should have been in each year, and gears the complementary retribution accordingly. In other words, the additional retribution is calculated based on the initial investment and on the installed capacity, not on the generated electricity, and is based on theoretical costs calculated in the laws, not on the real costs that each investor had to face. In other words, this law applies to all plants, regardless of their WACC at the time the investment was made. A list of such standard project has been

	presented with more than 1000 different parameters on which to base the retribution for eight RES technologies. • These parameters will be extremely influential as, if are too far from reality (which is the case in the eyes of the producers), they could cause a cut in producers' revenues so large that many RES systems would risk default. Specifically, if the actual ROI of the investor is less than 7.5%, this retribution system would cause the investor to receive a sum by the government that is lower than what would be needed in his specific case. This perspective is worrying for both large plants and small plants in family units. A large plant default will result in job loss for the employees. Family units, instead, have often given their house as a guarantee for the bank loan needed for the installation. This has two main consequences: • If producers cannot repay the loan that they received to install their plant, the plant itself would be taken back by the bank. This could cause the plant to be managed in a less-than-optimal way, as banks' primary business is not in the energy sector. • Furthermore, should this plant be paid for but be uneconomical, owners may choose to detach it from the grid and halt the investment. • Because of these two points, there currently is a real, tangible risk that the progress towards the 2020 goals for Spain will be altered or blocked: it may well be, in fact, that if producers chose to disconnect their plant from the grid, the total installed capacity would be brought down. Furthermore, this system does not incentivise generation, as it is dependent solely in the initial investment. Furthermore, the parameters are to be revised every 3 and 6 years, adding further uncertainty to potential future investments. • In an enlarged perspective, the whole system settings appears to have a strong damaging potential for the entire RES sector in Spain, including existing RES plants, as adopted measures have retroactive effects on them. The new system has in fact completely wiped out the previous incentive scheme (Régimen Especial), even for plants that were to receive it for some more years. • As regards the Régimen Especial, PV producers have challenged the legitimacy of the Government's decisions to cut down tariffs in court. At the end of January 2014, however, the Spanish Supreme Court ruled in favour of the government for the cuts, indicating that investors should have been aware of the economic unsustainability of the system. The court also indicated that such a stable and fixed retribution would have eliminated completely the entrepreneural risk for RES producers, which would not have been acceptable in the current conditions. The 200 Supreme Court has also ruled out the possibility of citizens to appeal to the European Court on this topic (see paragraph below). Legal issues regarding the support scheme environment in Spain are however far from being solved: as of now there are already more than 400 claims presented against the new schemes, most of which are just starting the legal process. • Attitude of the government - The content of the new laws is not the only point that creates massive tension between the sector and the government. The law type and the process used to approve these changes is also a very strong topic of debate. Most of these acts, in fact, are "Royal Decree Laws". These acts are approved directly by the Government in case urgent approval of some matters is deemed necessary, and are not debated in the Parliament prior to approval. Because of this lack, producers lament a

	strong lack of investment security, which would have the consequence of driving away potential investments in the area, as the situation could be likely to change drastically without warning. Unfortunately in this case the choice of a Royal Decree Law makes any access to jurisdiction very difficult because there is not an administrative act to appeal and, at the same time, the Spanish Supreme Court (SSC) is denying to open a preliminary ruling before the European Court of Justice. According to stakeholders, this can be considered to be a clear infringement of article 24 of the Spanish Constitution and thus several law firms will lead this issue before the SSC and European institutions. • Autoconsumo / Self-Consumption - A proper self-consumption regime could have been a solution for smaller RE plants, but changes in the legislation turned this into an uneconomical possibility. Namely, the government has raised the fixed component of the electricity bill and lowered the variable component (63% and -10% in 2013), bringing the bill closer to a flat rate, and thus making energy saving unattractive. Furthermore, right now the self-consumption regime does not allow for net-metering, but only for direct sale in the market. In case a producer wishes to do so, he or she must comply with the same requirements of large plants, which poses a massive barrier to entry. In addition, in case a selfconsumption installation connects to the grid, not only must it pay a new ad-hoc fee charged on the amount of energy self-consumed instantaneously ("peaje de respaldo") but it must also pay a generation fee ("peaje de generación") – in other words it is more expensive for such plants to connect to the grid (except in the case of cogeneration, which has been exempted from the peaje de respaldo until the end of 2019). Fines for noncompliance with the law (even just for not declaring a rooftop installation) have been fixed between € 6 million and 60 million. • Background - The official reason that has been given for such policies is the fact that the tariff deficit is still too high and costs must be cut in order to reduce it. It is also argued, however, that the real reason is to be found in the overcapacity of gas plants that are operating in Spain, which are all operating at 10% to 30% of their potential (27,000 MW installed). In summary a long list of costs in the electrical system that have to be paid even in the case of massive 201 self-consumption could occur, which is tried to be avoided. This gas plants situation mentioned, however, needs to be considered also in light of the shrinking energy demand, due to the crisis, and of the rising costs for electricity, putting pressure on the Government and Market for finding solutions rapidly. The following paragraph describes the situation in further detail.
Grid regulation and infrastructure	• Experts indicated that overcapacity in the Spanish electricity market is an overarching barrier which has similar consequences for future RES-E installations as the ones linked to the tariff deficit. Overcapacity has existed for several years, but has clearly aggravated with the decrease in electricity consumption due to the current economic crisis and to the increase of conventional power capacity (+ 27 GW combined cycle gas plants, CCG, during the last 10 years, being roughly a quarter of the overall installed capacity). Whereas at the beginning CCG could be understood as a smart back-up strategy for the increasing wind capacity in Spain, apparently this investment strategy was not combined/accompanied by a realistic scenario analysis for future electricity consumption development. Not only was a

	decrease in consumption not expected, but on the contrary a high annual load factor of CCG plants of 5,000 – 6,000 operating hours was used to calculate each business case. As these plants currently only run with 1,000 – 2,000 hours per year, but their owners must pay for the ordered natural gas anyway due to the fact that the gas supply is based on “take or pay” contracts, large amounts of money are being lost. This fact has put a lot of pressure on the Spanish Government from the side of the gas industry to slow down (or even stop) the further growth of RES-E installations, as those dispose of priority access and of a purchase guarantee for their RES electricity produced. An additional problem is the fact that the Spanish Government in 2010 introduced the obligation to use domestic coal, which even aggravated the problem for the CCG plant owners. • The new Electricity Sector Law, just approved on 19 December 2013, replacing the former one which dated back to 1997, amongst others, includes a formulation that restricts priority access and dispatch for RES-E to "equality of economic conditions in the market", which means that such priority would be granted only when RES-E producers would offer their electricity in the market at lower or equal prices as conventional players. This would signify a clear breach of article 16 of the European RES Directive (2009/28/CE) which stipulates priority access and dispatch for RES-E independently of the price offered in the wholesale power market or the (degree of) dispatchability of certain power sources. • In terms of interconnections, Spain is an energy island. The low level of interconnection capacities between Spain and mainly France – Spain´s access to the European transmission grid – are caused mainly by the strong delay to construct new lines due to financing problems or disputes between the involved national governments as well as local opposition, both based on NIMBY phenomena and nature / landscape protection issues. It should be pointed out that, although a goal of a 10% interconnection capacity with France was established, such strong problems impeded its achievement. The missing interconnection capacities and in parallel the strong increase of wind power production capacities has led to an increasing number of curtailment of wind power. Although after decades of delay a new transmission line (440 kV) between Bescansó in the Catalan Pyrenees and Baixas (France) 202 is currently under construction. Once operational, it will double the existing interconnection capacity between Spain and France from 1,400 MW to 2,800 MW.
Administrative processes	• Administrative and permitting procedures are deemed very complex in Spain. The barrier is caused mainly by the fact that competences for the permission & connection of RES-E plants are highly dispersed between the State, regional (autonomous communities) and local/municipal level. According to the Windbarriers project, grid connection lead-times are estimated at 34 weeks, with differences at regional level with lower and upper limits of 3 and 120 weeks. Most of this time is imputable to the administrative processes, and to the varying attitudes and resources put in place by the Spanish Regional Administrations. • According to the EU project “PV GRID”, Spain is one of the countries with the longest waiting periods (129 weeks on average) related to receiving a

	reply from all the administrations bodies involved in the permitting procedures. In the case of wind energy, up to 25 different permits may be needed from regional and national authorities. Regarding small hydro power plants, six years would be required on average to obtain the permits for construction and operation, and there are numerous requests for hydropower concessions pending for longer time, even reaching 20 years, resulting mainly from the lack of coordination between the different authorities responsible for the permit procedures. In November 2011, through Royal Decree 1699/2011 of 18 November, the Spanish Government, at least simplified part of the permit procedures for small installations. Considering the current status of the RES-E market, however, it is difficult to assess positive effects related to it. Additional measures could be a simplification of permit procedures also for bigger RES-E plants as well as a one-stop shop approach and the principle of administrative silence for all RES-E installations. • Even longer permit and construction periods have been outlined also for the realisation of (small) hydropower projects. It takes 6-10 years in average to obtain the permits for construction and operation, and there are numerous requests for hydropower concessions pending for longer time, even reaching 20 years, resulting mainly from the lack of coordination between the different authorities responsible for the permit procedures.
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Spain

The economic crisis in Spain hugely impacted the RES sector. The lack of investors' confidence in the energy reform and the country's legal stability is leading Spain to be the world leader in the number of disputes at arbitration courts against government reforms.

Due to the economic crisis, the electricity demand decreased to the 2005 level in 2013, which had an impact on government revenue. As a result, the government launched an electricity reform in 2013, mainly focusing on a cost reduction for RES, cogeneration and waste.

The new electricity reform package (retroactive establishment of a new economic regime) has radically changed the support system for RES, moving from a feed-in tariff (paid for the generated energy) to a support per installed capacity, based on economic parameters, standardized installations and a "reasonable return on investment". The return on investment will be redefined every 6 years, which decreases the stability of the support scheme.

Electricity Sector

- Show political willingness to re-establish and guarantee a clear and stable political framework promoting RES, with no retroactive changes, fully respected priority access and dispatch for RES-E in the electricity regulation and create specific regulatory developments for each technology.

- Undertake deep political interventions for a truly liberalized and transparent electricity market and impose audits on electricity companies in order to understand the real costs of the electrical system, so prices can be democratically discussed and reviewed, increasing transparency of and trust in the whole market.

- Thoroughly revise the national electricity planning or a democratic national model without the hidden influence of electricity companies and increase interconnection capacities with the EU transmission grid.

- Simplify the administrative procedures and allow for transversal coordination between the involved administrations. There is a big fragmentation of competences among national, regional and local bodies.

- Unblock the approval of the Self-Consumption & Net Metering law and establish positive measures to promote it.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

ENERGY PROFILE: SWEDEN

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		30050	32760	34800	34270		
2	**% Energy dependence -** all products	38.2	40.7	36.9	31.5	32	29.9	31.9
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			16823.7	16670.3	16692	18367.4	17391.8
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			301.1	846.3	966	1398.8	1331
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0.7	3	4	8.3	12.3
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: SWEDEN

Section 1: Consumption statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		35	34.1	31.6	31.2	31.7	32.6
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		5518.1	5436.8	5141.7	4994.3		
8	**Share of RE in gross final energy consumption** (%) combined			47.2	52	52.5	53.8	53.8
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			56	61.8	63.2	65.8	64.9
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	96.8	91.37	79.2	76.91	76.57	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes	
6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	61.8	63.3
Overall share of energy from renewable sources (including transport)	%	52.0	52.6
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	7461	7369
Gross total energy from RE consumption (including transport)	Ktoe	17887	17833
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	43	60
Wind onshore	MW	3981	4884
Total wind (inc offshore)	MW	4194	5097
Sub-total (variable sources)	**MW**	**4237**	**5157**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**24404**	**25406**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

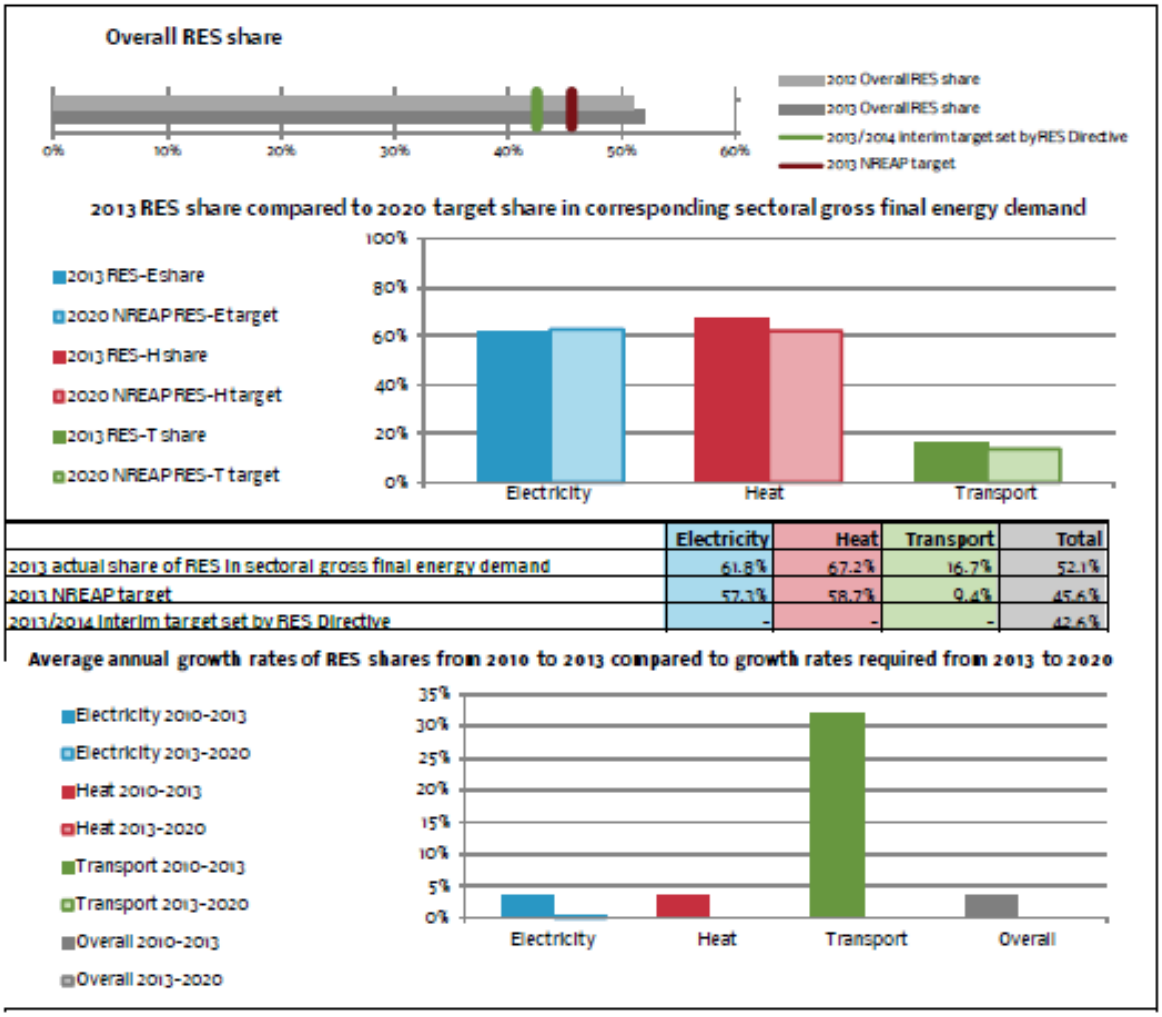
Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Financial support regimes					
Changed levels of energy taxes Act	Financial	Fiscal and steering tax designed primarily to reduce energy consumption but also to guide the choice of energy carrier	All activities	Complements existing. Amendment planned	Latest amendment in force as of 2015
Changed levels of carbon taxes Act	Financial	Reduced CO2 emissions	All activities	Complements existing. Amendment planned	Latest amendment in force as of 2015
Common electricity certificate scheme with Norway Act and bilateral agreement with Norway	Financial/ administrative	26.2 TWh of new renewable electricity production by 2020	Quota-bound electricity suppliers/consumers and producers of renewable electricity	Existing	2012–2035 (scheme introduced to Sweden in 2003)
Enhancement s for renewable energy (electricity certificate scheme) Bill and bilateral agreement with Norway	Financial/ administrative	28.4 TWh of new renewable electricity production by 2020	Quota-bound electricity suppliers/consumers and producers of renewable electricity	Planned	As of 1 Jan 2016
Tax reduction for microscale electricity production Income Tax Act	Financial	Stimulate micro-produced renewable electricity	Private individuals and enterprises	New	2015 -
Investment aid for solar photovoltaic cells connected to the grid	Financial	Larger number of stakeholders in Sweden, lower system costs, and greater electricity production from	Enterprises, local authorities and private individuals. Relates to solar photovoltaic cell	Complements existing. Amended aid	2009 - 2019

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Ordinance on State aid for solar photovoltaic cells		solar photovoltaic cells	systems connected to the grid.	levels. Planned extension.	
Aid for energy storage Bill 2015/16:1	Financial	Opportunity for micro-producing households to store electricity. Commercialisation and development.	Households and enterprises	Planned	2016 - 2019
The 'Klimatklivet' local climate investment programme on aid for local climate investments	Financial	Reduced greenhouse gas emissions	All, other than private individuals	New	2015 - 2019
EU-ETS Act (2004:1199) on Emissions Trading	Financial, administrative	Fuel conversion to renewable energy and improvements to energy efficiency	Plants within the ETS	Complements existing	2013 - 2020
Project resources under the Regional Fund Programme 2014-2020	Financial	Improvements to energy efficiency among small and medium sized enterprises, Increased consumption of renewable energy. More enterprises having products and services that could contribute to reduced climate impact	Public-sector stakeholders, universities, civil society, and small and medium sized enterprises.	Planned	2015 - 2023
Soft					
Wind Power Network	Soft (financial)	Promote the development of wind power	Local authorities and County Administrative Boards, universities and colleges, local business, etc	Existing. Planned extension.	2008 - 2019
Smart Electricity Grid Forum Bill	Soft	Promote dialogue on opportunities for a smart grid	Authorities, industry and consumers	Planned	2016 - 2019

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Extended aid for energy and climate advice Ordinance (1997:1322) on municipal energy and climate advice	Soft (financial)	Enhanced awareness of energy and climate issues	Enterprises and private individuals	Complements existing	1997 - 2017
Extended aid for regional energy offices	Soft (financial)	Greater use of renewable energy and more efficient energy consumption at the regional level	Energy and climate advisers, County Administrative Boards, Regional Councils, local authorities, business	Complements existing	2002 - 2017
Conditional loans and business development aid for seed enterprises in the energy sector	Soft (financial)	Contribute to a greater share of renewable energy and/or increased energy efficiency, as well as growth and competitiveness	Seed enterprises in a pre-commercial stage close to the market	Existing	2006 -
Administrative					
Extension and aid for the energy research sector Bill	Administrative	Contribute to achieving the set climate and energy targets	Universities and colleges	Complements existing	2013 - 2019
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

Section 3. Analysis of deviations and barriers in Sweden NREAP 2014/15

- Sweden has achieved both its 2013 NREAP target and the interim target 2013/2014.
- Growth in the RES-H&C and RES-T shares has been more than enough, as the 2020 target shares have already been reached. Sweden has also already surpassed its 2013 target share for RES-E and is close to the 2020 target share.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	61.8%	67.2%	16.7%	52.1%
2013 NREAP target	57.1%	58.7%	9.4%	45.6%
2013/2014 interim target set by RES Directive	-	-	-	42.6%

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

Common barriers

Support scheme

In Sweden the main incentive for the use of renewable energy sources is a quota system in terms of quota obligations and a certificate trading system. Energy suppliers are obliged to prove that a certain quota of the electricity supplied by them was generated from renewable energy sources. Energy suppliers shall provide this evidence by presenting tradable certificates (Green Certificates – GC) allocated to the producers of electricity from renewable sources. The rule governing the certificate receipt is identical to all RES technologies – one certificate is obtained for 1 MWh of energy produced from a licensed/registered source and confirmed with the proper readings of the measuring devices. Since 2012 Sweden and Norway introduced a common electricity certificate market. The producers of RES electricity receive certificates in their own country. These certificates can be traded on both the Swedish and Norwegian markets.

Furthermore, Sweden grants subsidies for photovoltaic installations (RES Legal Europe).

Theme	Barrier
Political & economic framework	• Although Sweden already reached its 2020 RES-target (50%), there are still some barriers for further development of renewable energy sources. • Currently in Sweden there is no clearance on further development of national policy. The Swedish government resigned at the beginning of December as a consequence of lack of consensus among parties in the Parliament on the budget for 2015. New elections were scheduled for March 2015, however at the end of the year 204, they were cancelled again. An agreement between political parties in the Parliament was met, to support the minority government. Yet, this agreement is under a lot of criticism and it is still unclear how the political situation will develop in the next months.. This has major consequences also on the energy policy and policies regarding renewable energy sources (Dahlquist, Mälardalens högskola). • The most severe barrier for renewable energy sources in Sweden is low profitability of RES-E investments. The possible investors are reluctant to start an investment in new RES-E installations because the profitability is too low. This barrier concerns all RES-E technologies. However, especially the development of smaller, not market mature technologies is hindered. Prices of both electricity and of the Green Certificates are too low, making new investments in RES economically less feasible (Andrén, Svensk Solenergi) The reason for the low electricity price the surplus of electricity generated among others in old nuclear power plants (Persson, Danielsson, Bryntse and Grusell, SERO). The situation regarding the aforementioned barriers has not evolved since January 2014. • This current surplus of electricity may in the future become a problem for the renewable energy sources. The Swedish Transmission System Operator (Svenska Kraftnät) is not willing to buy reserve capacity, of which Sweden has plenty and which is based on fossil fuels (mainly oil condensing power plants and gas turbines). At the same time, some of the political parties – most of all the Green Party – want to phase out nuclear power in Sweden. If these two developments come to life, renewable electricity may face problems with possible lack of back up capacity in times of lower wind strength. The impact of these decisions might be even stronger, since the same discussions on reserve capacity are taking place in Sweden's neighbouring countries – Finland, Denmark and Norway

	(Dahlquist, Mälardalens högskola). • As already mentioned above, Sweden already reached its 2020 RES-target of 50% in year 2012. This on one hand can be seen as a success, but at the same time, this fact constitutes a barrier for further development of RES in the country. It is estimated that Sweden has a potential to reach 70% renewable energy by 2020. The Government's unwillingness to aim higher causes lack of efforts to further support the deployment of RES and lack of measures to reduce existing barriers (Mattison, SERO). • The design of the support scheme supports primarily big investors and only the market-mature technologies like on-shore wind. This support scheme is not designed to promote development of smaller, not market-mature technologies; their development is hindered (Dahlquist, Mälardalens högskola). • In general, small RES installations are not enjoying the support from the side of the Swedish government as much as the large scale electricity producers (e.g. wind power). As an example, there is no political plan for solar power in Sweden, covering issues like economical support, educational measures and research investments (Andrén, Svensk Solenergin). • The share of RES in electricity generation may fall in the nearest future, because the parliament plans to cause closing of some smaller hydro power plants and reducing the hydro power generation by 10% through introducing stricter environmental regulations (Dahlquist, Mälardalens högskola).
Administrative processes	• Another barrier concerns only wind energy plants, both on-shore and off-shore. The first obstacle is caused by the Swedish Armed Forces, which states that wind turbines may interfere with their aviation or radar and radio infrastructure. The Swedish military forbids erecting wind power plants in a distance of less than 40 km from military airports and 5 km from military radars (Steen, Svensk Vindenergi). Total area affected is around 50% of Sweden's surface. The concerned part is the southern part of Sweden, which is the area with most cities and industries – the electricity consumers. The expansion of wind turbines in southern Sweden is severely hampered.
Other	• Although there is not much local opposition to wind power plants in Sweden, the regulations allow even a very weak and small group of opponents against wind power plants to stop or cause a delay in the development of project. Opposition can demand to stop the development of project even if the developer already gathered all necessary permissions (Dahlquist, Mälardalens högskola). • Also, the county administrative boards and municipalities may withdraw already granted permission for establishment and building permits for the construction of wind turbines even after the erection of turbines. In such cases wind farms need to be dismantled, which discourages developers in investing in new wind power plants. The Swedish Armed Forces has the right to demand this withdrawal with the justification that it was not informed (Karlsson and Grusell, SERO).
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

Section 4: Policy Recommendations for Sweden

The government has appointed a parliamentary commission to design proposals for new policies to ensure long-term energy supply. The Energy Commission's task will be to review the future energy needs based on current and existing research.

The industry in Sweden has a high RES potential, a high willingness to develop RES and also understands the vital importance of RES. However, as long as the Swedish government does not set higher targets, the current barriers to RES deployment will most likely not be removed.

Renewable electricity is supported by an inefficient system of green certificates. The system has led to a rapid expansion for some years, but the risk is now high that the technological development in the industry is hampered by the low price of electricity and green certificates for the producers.

The Swedish armed forces are questioning the use of wind turbines and believe that they among other things might interfere with important radio communications during major accidents.

Small RES-E installations, e.g. solar PV installations, do not enjoy as much support as the larger scale electricity producers.

The government should urgently raise the target for renewable energy corresponding to what Sweden can actually deliver, i.e. 70% or higher.

The government should establish clear and ambitious targets as well as interim targets, and further adapt the legislative and regulatory framework to achieve the targets in all sectors.

Electricity Sector

- A further increase in the quota will have a positive effect on the demand for electricity certificates. Provide electricity intensive industries a certain quota, which they currently lack, to graze the huge surplus of certificates. This quota obligation for electricity-intensive industries can be gradually increased so that a continuous adaptation can take place. It is strongly recommended to continuously evaluate the electricity certificate system and make adjustments, if necessary. Introduce feed-in tariffs as in most other European countries, with a guaranteed minimum price.

- Clearly define the areas in which the wind power is permitted and in which it is not, e.g. due to military requirements, habitat or landscape views.

- Introduce a political plan for solar power in Sweden, covering issues like financial support, educational measures and research investments. This energy source has great potential and needs a sound support system to be developed.

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		268550	148030	110290	107560		
2	**% Energy dependence -** all products	2.4	-16.9	29	47.1	46.1	37.3	35.3
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			5700	8900	9800	11800	12400
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			880	2400	2700	3500	3200
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			3.5	173	349	649	896
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		153.2	143	136.8	130	132.3	133.7
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3922.1	3399.0	3163.7	2942.3		
8	**Share of RE in gross final energy consumption** (%) combined			3.7	5.7	7	8.5	9.3
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			7.5	13.8	17.8	22.3	24.6
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	91.43	79.59	73.9	68.7	66.36	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 2: National Renewable Energy Action Plan Progress 2013-14

Progress in RE deployment 2013-4

	Unit	2013	2014
% contribution from renewable energy sources			
% contribution from RES to Electricity	%	13.8	17.8
Overall share of energy from renewable sources (including transport)	%	5.6	7.0
RE contributed from each sector to final energy consumption			
Gross final consumption of electricity from RES	Ktoe[1]	4317	5376
Gross total energy from RE consumption (including transport)	Ktoe	7636	8931
Contribution towards electricity (installed capacity & gross generation) from RES broken down by technology type			
Solar pv	MW	2851	5377
Wind onshore	MW	7519	8486
Total wind (inc offshore)	MW	11215	12988
Sub-total (variable sources)	**MW**	**14066**	**18488**
Total (all sources including Hydro, Tide/wave/ocean, Waste and Biomass)	**MW**	**22487**	**27284**
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports			

[1]Ktoe = '000 tonnes of oil equivalent

Overview of relevant policies and measures

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Financial support regimes					
Renewables Obligation	Regulatory	Increase generation of renewable electricity from a range of technologies by setting obligations on electricity generators to ensure they generate electricity from renewable sources.	Primarily large scale renewable electricity generation by licensed generators.	Existing	Started in 2002. Support is provided for up to 20 years from the time of accreditation. Scheme expected to close in 2017 with different closure dates for different technologies; this will ensure technologies which need support will receive it whilst those able to compete in the open market can do so.
Contracts for Difference mechanism (CfDs) under Electricity Market Reform	Financial Regulatory	Increase generation of a range of renewable and other low carbon Technologies and drive down costs for consumers through technology competition. Scheme provides efficient long term revenue support for low carbon forms of generation.	Primarily targeted at medium and larger scale renewable electricity generation by licensed generators. Smaller/new entrants also encouraged to participate	Existing	The scheme was launched in October 2014 and the first CFD allocation round was successfully completed in March 2015. Three further CfD rounds were announced in November 2015 and these are due to take place within this parliament. CFD contracts have a lifetime of 15 years from the point of contract award.
Feed in Tariffs	Financial Regulatory	Incentivise generation of low carbon electricity from a range of smaller scale technologies by paying for electricity from renewable sources which is fed back into the grid.	Households, communities, organisations and businesses investing in projects up to 5MW	Existing	Introduced on 1 April 2010. New entrants will be eligible for 10-25 years, dependent upon the technology and time of application. Review of scheme, through a public consultation, completed in November 2015
Other funding and grants to encourage deployment and innovation					
Green Investment Bank	Financial	Mobilising private sector investment into green	Developers and investors	Existing	Government has made £3bn of funding available since 2012 which has backed

Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
		infrastructure. The programme provides funding			nearly 60 green infrastructure projects in the UK to new green infrastructure projects which de risks them to allow more funding to be raised.
Planning related measures					
Good practice guidance and registers on community engagement and benefits for renewables developments	Soft	To encourage greater community support for renewables projects.	Renewables developers, planning authorities, local communities.	Existing	Good practice guidance was published in October 2014. A register for England was launched in 2015.
Unblocking barriers					
Radar and aviation programme.	Infrastructure	Government working wit Industry to invest in R&D and implement solutions that would address aviation related objections to wind turbines in the planning system.	Wind Developers, Aviation Technology Providers, Air Navigation Service Providers.	Existing and Planned	75% of R&D projects now complete, the other 25% expected to complete in the next x months. Implementation of findings from R&D will take place over next 2-3 years.
Northern Ireland					
Funding for Grid Infrastructure for Renewables	Regulatory	Current grid development plans valued at £44m, of which £27.8m have been approved by the NI Regulator, should allow penetration to reach 27% of generation from renewables (approx.1000MW installed capacity)	Investors End Users Renewable Industry	New for 2013	2013 to 2017.

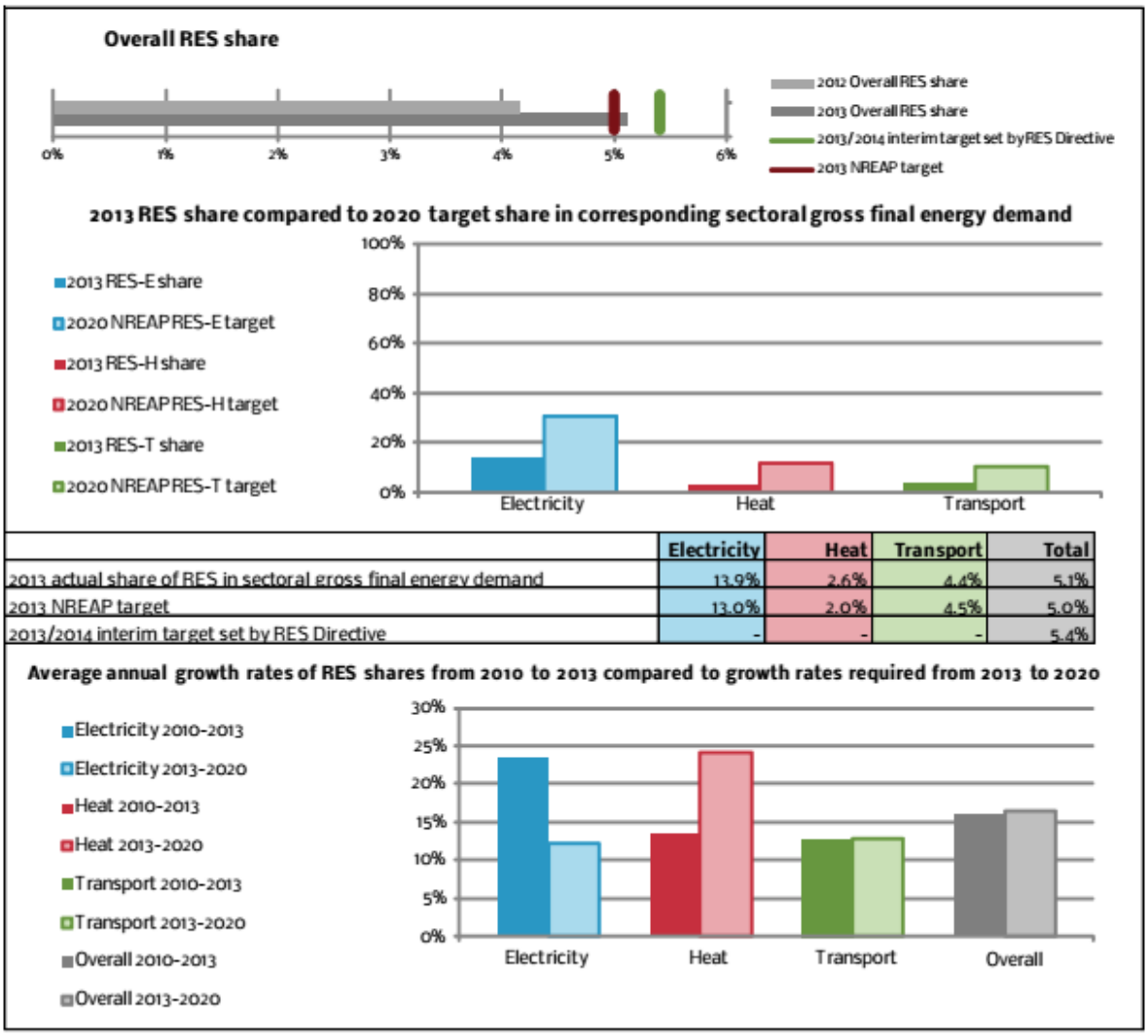
Name and reference	Type of measure	Expected result	Targeted group and/or activity	Existing or planned	Start and end date of measure
Northern Ireland Planned policy statement	Regulatory	Planning Policy Statements set out the planning policies which Department of Energy Planning, local councils and developers are expected to take into account in planning or preparing and determining planning applications. Specifically, Planning Policy Statement 18 (PPS18) creates a positive framework for renewable energy to help facilitate greater renewable energy installation.	DoE Planning, local councils, developers	Existing	In force from August 2009
Source: https://ec.europa.eu/energy/en/topics/renewable-energy/progress-reports					

ENERGY PROFILE: UK

Section 3. Analysis of deviations and barriers in UK NREAP 2014/15

Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf

- The UK has not yet achieved its interim target 2013/2014. The 2013 NREAP target was achieved. However, the UK NREAP foresees its NREAP trajectory to be slightly lower than the interim target trajectory, which contradicts its original purpose.
- Growth in the RES-E share is enough to achieve the 2020 target. The RES-H&C target share for 2013 has been exceeded, but the growth rate still has to be increased in order to achieve the 2020 target.



	Electricity	Heat	Transport	Total
2013 actual share of RES in sectoral gross final energy demand	13.9%	2.6%	4.4%	5.1%
2013 NREAP target	13.0%	2.0%	4.5%	5.0%
2013/2014 interim target set by RES Directive	-	-	-	5.4%

ENERGY PROFILE: UK

Common barriers

Theme	Barrier
Political & economic framework	• Policy risk & uncertainty in the market stemming from continually changing policies and financial support schemes eg Feed-in Tariff. • Uncertainty surrounding details of future policies create further risks for investors and this is exacerbated by BREXIT. • Existing policies are very complex and especially difficult for small scale generators to understand. • UK Governments focus on short term costs leading to compromise and jeopardising projects. • Unbalanced financial support schemes favouring some technologies more than others. • Insufficient budget for large scale renewables support • Energy regulator Ofgem's objectives are not aligned with national and European RE and green economic objectives, which is a barrier for the sector. • Access to finance, especially for emerging high risk, high cost technologies.
Employment in the sector	• Lack of a skilled workforce for installation of microgeneration technologies • Cost and complexity of the Microgeneration Certification Scheme (MCS). • Phasing out of the Renewables Obligation so that there will be no direct financial incentive for electricity suppliers to source renewables. • Problem that new Contract for Difference mechanism creates competition between technologies such that costlier ones may lose out. • Lack of incentive or strategy for energy storage. • Lack of clarity in the definition of energy storage.
Market structure	• Complexity of contract for difference mechanism creates a barrier for small/independent generators to gain access. • Ofgem is not playing its role in helping to create a sustainable energy industry.
Grid related issues	• Costly administrative procedures surrounding grid connection applications. • Lengthy application delays. • High and uncertain costs and unclear timeframes in connecting to the grid for some technologies (including solar). • Differing network technical practices, over-voltage and the lack of on-line availability of high voltage network data hinder renewables deployment. • Over-voltage is a specific PV barrier.
Administrative processes	• Planning permission is a key barrier; guidance for renewables has been reduced and planning procedures are time consuming and costly.

	• The effects of the Localism Act and NIMBYism. • Competing public interests eg aviation and wind power. • There is currently no way to ensure that the UK's 15% national renewable energy target is reflected in local planning policies.
Source:http://www.keepontrack.eu/contents/publicationsanalysisdeviationsbarriers/kot_deviations-and-barriers-report-2015.pdf	

ENERGY PROFILE: UK

Section 4: Policy Recommendations for the UK

Policy risk and uncertainty in the market remain the key barriers affecting all renewable technologies across all sectors and directly or indirectly impact all project development steps. This stems from continually changing policies and financial support schemes.
2014 saw an ever-increasing emphasis placed on the costs of energy politically, in the run up to the election in 2015.

The electricity sector has mostly been preparing itself for the first auction-based allocation round in Q1 2015. Large digressions in the Feed-in Tariffs (FiT) and a solar Feed in Tariff review have created uncertainty.

Electricity Sector

- Fix the problems with allocating and administrating Contracts for Difference.
- Allow the UK Green Investment Bank to borrow in the market and permit funding of more technologies, especially emerging technologies.
- Implement standardised Power Purchase Agreements.
- Incentivise the DSOs to offer timely grid connections at fair, transparent costs as part of a strategic approach to grid reinforcement.
- Ensure 'minima' budget for emerging technologies in the proposed new Contracts for Difference (CfD) allocation policy.
- Ensure favourable solar PV FiT review in 2015

Source:http://www.keepontrack.eu/contents/publicationspolicyrecommendations/policy_recommendations_2015.pdf

9. Appendix 2 Non-focus group Member State production and consumption energy profiles

ENERGY PROFILE: AUSTRIA

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000 toe)		9790	11920	12140	12070		
2	**% Energy dependence -** all products	68.5	65.4	63.2	61.3	65.8	60.5	62.4
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000 toe)			8608.9	9535.5	9267.6	9330	9769.4
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000 toe)			177.5	271.1	330.7	416.2	450.1
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			7.6	50.1	67.5	80.6	94.2
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		23.7	27.9	28	26.7	27.5	28.1
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3626.9	4113.0	3984.7	3840.5		
8	**Share of RE in gross final energy consumption** (%) combined			30.2	32.4	33	32.8	33.5
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			65.7	68	70.1	70.3	72.6
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	103.2	109.32	103.07	98.34	101.63	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		4260	5160	4510	4430		
2	**% Energy dependence -** all products	39.8	48.4	46.6	47.1	43.8	48.3	47.8
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			2166.9	2312.7	2289.3	2225.8	2281.6
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			12	44.5	62.8	68.4	87.2
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0	1	3	4.9	5.6
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		6	7.2	6.6	6.2	6.6	6.6
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		1872.5	2190.9	2014.5	1929.7		
8	**Share of RE in gross final energy consumption** (%) combined			25.1	28	27.8	29	28.3
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			37.6	42.1	45.3	45.4	46.7
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	80.43	87.28	76.74	73.99	75.38	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes	
6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: CYPRUS

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		40.0	90.0	110.0	120.0		
2	**% Energy dependence -** all products	98.3	98.6	100.8	96.3	93.2	97.7	96.2
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			81.6	108.9	111	118	124.1
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			2.7	19.9	15.6	19	19.4
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0.5	4.1	7.2	10.9	12.5
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics								
		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		1.6	1.9	1.6	1.6	1.7	1.8
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3494.6	3345.0	2523.5	2592.1		
8	**Share of RE in gross final energy consumption** (%) combined			6	8.1	8.9	9.4	9.3
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			1.4	6.6	7.4	8.4	8.6
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	144.08	163.77	138.83	144.73	144.45	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes	
6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: CZECH REPUBLIC

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		30540	31580	30080	29220		
2	**% Energy dependence -** all products	15.3	22.8	25.5	27.7	30.3	32	32.8
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			3251	4117.5	4197.5	4279.3	4278.9
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			28.8	41.4	41	49.3	42.7
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			52.9	174.8	182.5	194.7	183.3
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		25.1	25.4	24.3	23.6	24.2	24.8
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3998.2	4269.8	4011.9	3943.5		
8	**Share of RE in gross final energy consumption** (%) combined			10.5	13.8	15	15	14.9
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			7.5	12.8	13.9	14.1	13.6
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	75.56	70.82	66.22	64.24	64.9	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes	
6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: FINLAND

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		15160	17990	18670	18670		
2	**% Energy dependence -** all products	61.2	55.1	47.8	48.6	48.9	47.4	45.3
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			9432.6	9929.8	10118.4	10394.4	10516.5
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			25.3	66.6	95.2	200.1	263.8
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0.4	0.6	0.7	0.8	1.5
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: FINLAND

Section 1: Consumption statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		24.3	26.2	24.7	24.5	24.2	25.2
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		6272.3	6939.8	6288.6	6345.7		
8	**Share of RE in gross final energy consumption** (%) combined			32.4	36.7	38.7	39.2	38.7
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			27.7	30.9	31.4	32.5	32.9
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	98.3	106.94	90.12	84.45	79.58	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes	
6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		11600	11060	10200	10110		
2	**% Energy dependence -** all products	49	55.2	56.4	49.6	59.3	53.3	55.6
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			2744.3	3314	2980.1	3248	3194.1
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			45.9	61.7	56.5	59.6	58.8
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0.1	2.1	4.8	10.5	17.3
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		16.1	17.4	16.6	16.2	17.4	17.9
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		2474.9	2567.5	2289.0	2305.6		
8	**Share of RE in gross final energy consumption** (%) combined			12.7	16.2	14.6	14.4	14.2
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			7.1	6.6	7.3	7.3	7.2
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	78.58	70.05	61.35	61.88	65.3	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: LATVIA

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (Mtoe)		1470	1980	2140	2380		
2	**% Energy dependence -** all products	88.9	61	45.5	55.9	40.6	51.2	47.2
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			1964.3	2137	2371.2	2330.1	2437.4
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			4.2	10.3	12.1	12.6	11
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0	0	0	0	0
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: LATVIA

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		3.3	4.1	3.9	3.9	3.8	3.8
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		1622.4	2183.0	2206.7	2224.4		
8	**Share of RE in gross final energy consumption** (%) combined			30.4	37.1	38.7	37.6	37.2
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			42.1	48.8	51.1	52.2	51.3
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	39.55	47.63	44.09	43.73	44.12	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: LUXEMBOURG

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (Mtoe)		60	120	140	160		
2	**% Energy dependence -** all products	99.5	99.6	97.1	97.1	96.5	95.9	96.1
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			87.5	98.1	119.4	115.2	125
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			4.7	7.1	6.9	8.8	8.7
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			1.8	6.3	8.1	8.9	8.6
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: LUXEMBOURG

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		3.5	4.3	4.1	4	4	4
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		8427.1	9243.8	8077.6	7668.1		
8	**Share of RE in gross final energy consumption** (%) combined			2.9	3.5	4.5	5	5.4
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			3.8	5.3	5.9	6.2	6.7
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	80.75	102.58	94.15	91.42	88.93	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: MALTA

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)			0.0	10	10		
2	**% Energy dependence -** all products	100	100.3	99	104.1	97.7	97.3	100.9
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			4.5	9.1	12.7	14.8	17.7
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			0	0	0	0	0
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0.1	2.5	5.9	8	10.8
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: MALTA

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		0.4	0.5	0.5	0.5	0.6	0.6
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		2106.8	2260.7	2071.8	2082.8		
8	**Share of RE in gross final energy consumption** (%) combined			1	3.7	4.7	5	6
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			0	1.6	3.3	4.2	5.6
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	116.57	127.96	123.92	125.73	99.23	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: POLAND

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		79590	67380	71470	67890		
2	**% Energy dependence -** all products	0.8	9.9	31.3	25.6	28.6	29.2	30.3
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			6847.1	8520.9	8072.3	8837.2	9026.5
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			143.1	516.3	660	933.6	1082.4
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0	0.1	0.6	4.9	10.7
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: POLAND

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		55.2	66.3	63.3	61.6	62.3	66.7
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		2316.8	2647.8	2574.1	2480.6		
8	**Share of RE in gross final energy consumption** (%) combined			9.3	11.4	11.5	11.7	11.3
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			6.6	10.7	12.4	13.4	13.4
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	83.54	87.17	84.75	82.11	82.76	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: ROMANIA

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		28470	27820	26190	26660		
2	**% Energy dependence -** all products	34.3	21.8	21.9	18.5	17.1	17.1	22.3
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			5708.4	5560.8	6089.6	5935	6095.6
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			26.3	388.7	533.2	607.3	566.6
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			0	36.1	139	170.4	156.5
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: ROMANIA

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		22.8	22.6	21.8	21.7	21.9	22.3
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		1632.1	1764.0	1619.8	1618.8		
8	**Share of RE in gross final energy consumption** (%) combined			23.4	23.9	24.8	24.8	25
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			30.4	37.5	41.7	43.2	42.7
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	56.91	49.14	46.91	46.97	47.68	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		6390	6350	6820	6720		
2	**% Energy dependence -** all products	77.5	65.5	63.1	59.2	60.9	58.7	59
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			1403.8	1466.7	1440.8	1591.6	1603.3
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			0.5	0.5	0.5	0.5	0.5
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			1.5	50.6	51.3	43.5	45.8
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: SLOVAKIA

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		11	11.5	10.6	10	10.1	10.4
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3990.1	3312.4	3141.1	2987.7		
8	**Share of RE in gross final energy consumption** (%) combined			9.1	10.1	11.7	12.9	12
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			17.8	20.8	22.9	22.7	22.5
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	66.97	62.65	57.69	54.74	55.57	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

ENERGY PROFILE: SLOVENIA

Section 1: Production statistics								
		1990	**2000**	**2010**	**2013**	**2014**	**2015**	**2016**
1	**Energy production total** in thousands of tonnes of oil equivalent (1000toe)		3090	3790	3610	3690		
2	**% Energy dependence -** all products	45.7	52.8	48.7	46.9	44.5	48.8	48.4
	EU (28 countries)	44.3	46.7	52.7	53.2	53.5	54	53.6
3	**Primary production of renewable energy by type - all** (in 1000toe)			1091.4	1115.2	1157.5	1021.8	1105.1
	EU (28 countries)			169.2	195.2	197.9	205.8	210.7
4	**Primary production of RE by type - wind** (in 1000toe)			0	0.3	0.3	0.5	0.5
	EU (28 countries)			12.8	20.4	21.8	25.9	26.0
5	**Primary production of RE by type - solar PV** (in 1000toe)			1.1	18.5	22.1	23.6	23
	EU (28 countries)			1.9	6.9	7.9	8.8	9.0

Notes	
1	**Energy production total** Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
2	**Energy dependency** shows the extent to which an economy relies upon imports in order to meet its energy needs. The indicator is calculated as net imports divided by the sum of gross inland energy consumption plus bunkers. Source: Eurostat (last updated) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc310
3	**Primary production of renewable energy by type all renewable energies** - biomass, hydropower, geothermal energy, wind and solar energy are included in renewable energies. Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
4	**Primary production of renewable energy by type -wind energy** (in 1 000 tonnes of oil equivalent) Source: Eurostat last updated 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081
5	**Primary production of renewable energy by type -solar PV** (in 1 000 tonnes of oil equivalent) Source: Eurostat last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=ten00081

ENERGY PROFILE: SLOVENIA

Section 1: Consumption statistics

		1990	2000	2010	2013	2014	2015	2016
6	**Final energy consumption** million tonnes of oil equivalent (Mtoe)		4.5	5	4.8	4.6	4.7	4.9
	EU (28 countries)		1132.7	1163.2	1108.2	1063.1	1086.2	1107.7
7	**Energy per capita** in kg oil equivalent/capita (kgoe/cap)		3245.4	3587.2	3338.3	3242.0		
8	**Share of RE in gross final energy consumption** (%) combined			20.4	22.4	21.5	21.9	21.3
	EU (28 countries)			12.9	15.2	16.1	16.7	17
9	**Share of RE in gross final energy consumption** (%) in electricity			32.2	33.1	33.9	32.7	32.1
	EU (28 countries)			19.7	25.4	27.4	28.8	29.6
10	**Greenhouse gas emissions** (in CO_2 equivalent), base year 1990 = 100	100	102.78	105.54	98.77	89.48	90.68	
	EU (28 countries)	100	92.21	85.89	80.45	77.39	77.88	

Notes

6	**Final energy consumption** measures the total energy demand of a country excluding all non-energy use of energy carriers (e.g. natural gas used not for combustion but for producing chemicals). Final energy consumption only covers the energy consumed by end users, such as industry, transport, households, services and agriculture, it excludes energy consumption of the energy sector itself and losses occurring during transformation and distribution of energy. Source: Eurostat (last update) 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_11
7	**Energy per capita in** (kgoe/cap) Source: EU Energy Statistical Pocketbook 2016 https://ec.europa.eu/energy/sites/ener/files/documents/pocketbook_energy-2016_web-final_final.pdf
8	S**hare of renewable energy in gross final energy consumption combined** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
9	**Share of renewable energy in gross final energy consumption in electricity** The indicator measures the share of renewable energy consumption in gross final energy consumption according to the Renewable Energy Directive. The gross final energy consumption is the energy used by end-consumers (final energy consumption) plus grid losses and self-consumption of power plants. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_07_40
10	**Greenhouse gas emissions** This indicator shows trends in total man-made emissions of the 'Kyoto basket' of greenhouse gases. It presents annual total emissions in relation to 1990 emissions and also related to emissions in the Kyoto base year. The 'Kyoto basket' of greenhouse gases are aggregated into a single unit using gas-specific global warming potential (GWP) factors. The aggregated greenhouse gas emissions are expressed in units of CO2 equivalents. The indicator does not include emissions and removals related to land use, land-use change and forestry (LULUCF); nor does it include emissions from international maritime transport. Greenhouse gas emissions from international aviation are not included in the data which is indexed to the Kyoto base year because these emissions are not covered by the Kyoto Protocol. However, they are included in the data indexed to 1990. CO2 emissions from biomass with energy recovery are reported as a Memorandum item according to UNFCCC Guidelines and not included in national greenhouse gas totals. Source: European environment agency (EEA) last update 14.02.2018 http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdcc100

10. Appendix 3 Thematic analysis of barriers

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Political & economic framework																
European policies																
EU2030 framework for climate and energy policies sets no binding targets for RES for Member States indicating that the incentive for RES is not as strong as before			✓													
Low price of carbon credits on European market means Emissions Trading Scheme is failing to drive green transition in member states			✓													
European State Aid rules threaten RE support schemes			✓	✓												
Lack of protection of investors at Member State level by European Commission													✓			
National policies																
Lack of political unity regarding energy policy/Lack of long-term vision for RES/ Lack of political will to finalise energy strategy/ Uncertainty surrounding details of future policies/ Decreasing political continuity of climate and RES policy targets/ Uncertainty caused by continually changing policies/ No Political plan for solar power	✓✓					✓	✓			✓	✓			✓	✓✓	
Unstable and unpredictable legislative climate/Instability of legal framework for wind energy - frequency of successive reforms/Government instability impacting policy development/ Lack of transparency in political decision-making process/Unstable political situation/ Lack of transparency in the judicial system		✓✓ ✓		✓			✓							✓		
Existing policies complex to understand															✓	

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Policy changes removing financial incentives for suppliers to source RE															✓	UK Renewables Obligation
Reduction in RE generation targets/Early achievement of 2020 target barrier to aiming higher	✓													✓		
Introduction of abrupt and retroactive legislation regarding grid access and revenue fees for RE projects		✓														
Policy for increased use of RES conflicts with revenue generation from fossil fuel taxes/ Political support for RES development less sure when conflict between economic growth and money spent on RES investments			✓✓													
Unrealistic cost reduction expectations for new technologies impede development											✓					Netherlands - offshore wind
Energy regulator not aligned with national & European RE objectives															✓	
Lack of incentive or strategy for energy storage/ Lack of clarity in definition of energy storage															✓✓	
Only few municipalities have adopted action plans for use of RES										✓						
Finance and investment																
Government focus on short term costs/ Lack of political will to create attractive and stable conditions for investment in RES										✓					✓	
Insufficient budget for large scale renewables support/ Access to finance for emerging, high risk/cost technologies											✓				✓✓	
Very poor access to local finance because of unpredictable investment climate/Banks cautious about lending because of uncertainty of support scheme/Private equity scheme model* limiting solar development opportunities/Decrease in capital available to RES projects due to economic and financial crises		✓							✓		✓	✓				*Netherlands - zip code related private equity model (Postcoderoos)

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Lack of foreign investment in RE because of unpredictable investment climate/Complicated procedures for foreign investors		✓		✓												
Lack of a pattern for tender calls and the introduction of modified criteria each time are a source of industry instability/ Allocation of production capacity by tender doesn't guarantee sufficient development of installed capacity/Timeframe for roll out of pilot tendering process causing uncertainty and revenue risks for market/ Introduction of tendering procedure causing uncertainty for investors and negatively influencing new installations				✓✓		✓✓										
Conventional energy producers have strong political lobby/Overcapacity of conventional fuel plants/Low electricity prices making RES investment unprofitable		✓											✓	✓		
Ambiguous, complex tax structure (that may also be subject to local interpretation)									✓			✓				
Support mechanisms																
Uncertainty of RE support mechanism - reduction in financial support /Quarterly digressive revision of financial support based on numbers of new installations/Unknown modifications and amendments expected/Reduction or modification of incentives discouraging large PV installations/Withdrawal of support scheme compromising both existing installations and development of emerging technologies*/ Uncertainty of RE support mechanism - uncertainty about fairness of new support scheme and ability of grid to cope	✓			✓	✓		✓		✓		✓	✓	✓		✓	*Spain - Electricity Sector law 2013 establishes that new incentive schemes for renewable energy will be developed only exceptionally and solely for achieving European Goals
Support scheme complex combining several instruments									✓							
Caps for financial support are barriers to expansion of RES projects										✓						
Revenue risk of existing support scheme - excessive payment delays to RES producers							✓									

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Uncertainty of RE support mechanism - retroactive measures undermine the confidence of investors and developers		✓		✓	✓	✓			✓				✓			
Uncertainty of RE support mechanism - support withdrawn for certain installations/Uncertain reliability of some support mechanisms	✓										✓					
Uncertainty of RE support mechanism - support recalculated annually	✓															
Uncertainty of RE support mechanism - proposals for reform on cost effectiveness basis	✓															
Support scheme causing increased competition amongst RE producers	✓				✓										✓	Belgium - Green Certificates Obligation/ UK Contract for Difference/Estonia Least -bidding system
Support schemes unbalanced - favouring some technologies more than others/Not supporting some technologies/RES-E strategy biased towards some technologies over others						✓		✓			✓			✓	✓	Netherlands - RES strategy biased towards biomass even though domestic availability of biomass sources limited
RES-E disadvantaged as remuneration level does not take into account positive externalities of RE	✓															
Grid regulation and infrastructure																
Long timeframe for grid access and connection/Lengthy application delays/ Grid connection permit process extremely complex	✓			✓	✓			✓					✓		✓	
High & uncertain costs and unclear timeframes in grid connection for some technologies/Lack of transparency from DSOs regarding costs and duration of connection proposals/ Uncertain connection contracts	✓			✓		✓		✓				✓			✓	

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Insufficient grid connection capacity/Lack of coherence in grid development/Lack of transparent and foreseeable grid development/Insufficient investment or financial incentives/Risks of installing additional capacity in existing wind farms without increasing the grid connection power	✓			✓		✓	✓					✓				
Curtailment conditions (actual or potential) on connections without compensation/priority curtailment of renewables/Lack of prior information from grid operators on curtailment/Curtailment due to overcapacity caused by neighbouring nation states dumping excessive energy onto domestic grid or domestic grid having no access to European transmission grid to share excess production	✓	✓				✓		✓			✓	✓	✓			
Lack of access to European transmission grid												✓	✓			
Unfair distribution of costs for grid reinforcement between producers and grid operators				✓												
Potential introduction of grid system charges for producers consuming own electricity off grid									✓							
Costly administrative procedures surrounding grid connection applications															✓	
Differing network technical practices, over-voltage and lack of on line high voltage network data hinder RE deployment/ Over-voltage a barrier to PV															✓✓	
Moratorium on large scale RES-E installations because of lack of allocated budget for grid reconstruction and development		✓														
Administrative procedures																
Juridical uncertainty - challenges at State level of regional permits (esp wind)	✓															

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Lack of co-ordination between decision making levels/Lack of co-ordination between the competent authorities involved in planning and permitting procedures/ Lack of connection between national RE targets and local planning policies/ Authorisation procedures differ in each region adding complexity to cross-regional applications/ Multi-layered legislation and permits/ Unclear rules leading to unpredictable decision making processes	✓✓			✓✓					✓					✓	✓	
Local taxes on RES production compromising profitability/Tax load is unduly high on solar and wind power compared to conventional power	✓			✓												
Lack of coherence between administrations leads to unclear, excessive environmental constraints	✓															
Planning permission for RE hampered by lack of guidance															✓	
Planning/authorisation procedures time consuming/costly /complex/ Delays in grid connection and expiration of planning permission/Absence of a one-stop shop/ Lack of readily available information to support planning of new RE installations/Lack of information exchange between relevant stakeholders in wind developments		✓		✓				✓	✓✓	✓		✓✓	✓		✓	
Authorisation of processes for grid reinforcement complex, lengthy and resisted by the public/Grid operators need to get permission to construct or reinforce line from all local authorities affected by the project.						✓			✓							
The effect of local regulations and NIMBY-ism/Multiplicity of appeal proceedings especially for opponents of wind energy					✓										✓	
Integration of RES-E in spatial and environmental planning																
Length of spatial and environmental planning process unbearably long causing financial distress					✓						✓					

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Aeronautical (Air Traffic Control) exclusion zones excessively stringent and impact development of onshore wind	✓															
Lack of clarity regarding installation conditions near military radars greatly impedes onshore wind development/Powerful restrictions arising from the military regarding aviation, radar and radio infrastructure installations	✓				✓						✓			✓		
Competing public interests eg aviation (air traffic control), weather services and wind power						✓					✓				✓	
Ungrounded ecological bans for certain territories		✓														
Ungrounded urban ban on small wind and ground PV		✓														
Spatial planning rules differ between individual regions/Few wind areas designated or areas with little power potential/Individual region's rules eradicate nearly all wind development/Allocation of areas with potential for wind power in each province causing severe delays and may impact achievement of 2020 targets						✓					✓					
Lack of compatibility of RES-E projects to spatial planning instruments in municipalities												✓				
Need to conduct studies on potential of RES sources to quantify potential sites and identify appropriate ones												✓				
Market structure																
Production and grid operation have not been separated at national level		✓														
Energy market manipulated and RES plant operators charged fees to bail out state owned energy company/ Electricity distributors in severe debt		✓✓														
Energy regulator not playing its role in helping to create sustainable energy industry															✓	

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Lack of skilled workforce for installation of microgeneration technologies/Lack of technical experts - foreign developers must import own staff					✓										✓	
Cost and complexity of certification scheme needed to receive support scheme payments															✓	UK Microgeneration Certification Scheme
Establishment of adequate technical and regulatory framework for integrating wind power into energy and transport systems as well as electricity			✓													Denmark - fluctuating wind power more than 50% of Danish electricity consumption
Lack of clarity regarding the future design of the electricity market/ Absence of liberated, working energy market that would encourage small -scale RE projects*/ Fair and independent regulation of the RES-E sector within a reforming electricity market/ Uncertainty regarding future of RES-E support with design of 'single electricity market' (SEM will hinder development of wind)/ Complex market mechanisms create barrier to entry for small/independent generators**		✓				✓	✓	✓							✓	*Bulgaria - RES plants are being curtailed by DSOs and then paying higher balancing costs for not meeting forecasts ** UK - Contract for Difference
Public acceptance/social awareness																
Lack of support/political will for RE from wind from decision makers/ Political doubts cast on solar energy support policy/Demonisation of RE producers by administrations, making them responsible for rising electricity prices/Public criticism of renewables as expensive by politicians/ Public and political debate on fair apportionment of costs for RES-E support system	✓	✓		✓						✓						
Negative media coverage of certain RES technologies	✓	✓								✓						
Bad/negative public perception of RES/Public debates hamper development of solar energy/Public acceptance varies across different technologies/ Lighting provisions regarding wind farms impair their social acceptance*	✓			✓		✓		✓		✓						*France - French legislation requires specific output values for flashing lights for each and every wind turbine

Thematic analysis of barriers	Belgium	Bulgaria	Denmark	France	Estonia	Germany	Greece	Ireland	Italy	Lithuania	Netherlands	Portugal	Spain	Sweden	UK	Notes
Increasing local opposition to wind energy/ Public opposition impacts designation of land for wind farms/Local opposition to wind parks opposed on nature conservation grounds/Local opposition to plant construction/ Anti-RES groups stimulating NIMBY-ism and appeals against permits for projects/ Regulation allows even small groups of local objectors to stop or delay wind power plant development	✓	✓		✓✓			✓	✓	✓	✓	✓✓			✓		
Investment insecurity around issue of ownership shares for local people for near-shore wind installations			✓													Denmark - On-shore turbines give compensation and local ownership schemes to local citizens who then share in revenue
Lack of communication between relevant stakeholders							✓					✓				Greece - due to proliferation of PV associations

Source: EU Keep on Track Deviations and Barriers Analysis 2015