# Lessons from Norway

- Gert Nielsen
- Managing Geek at Xrgy AS

- Working with heat pumps since 1998
- Especially the behaviour of the heating system

# Update on the presentation held at IoR on the 7th of April 2011 (1)

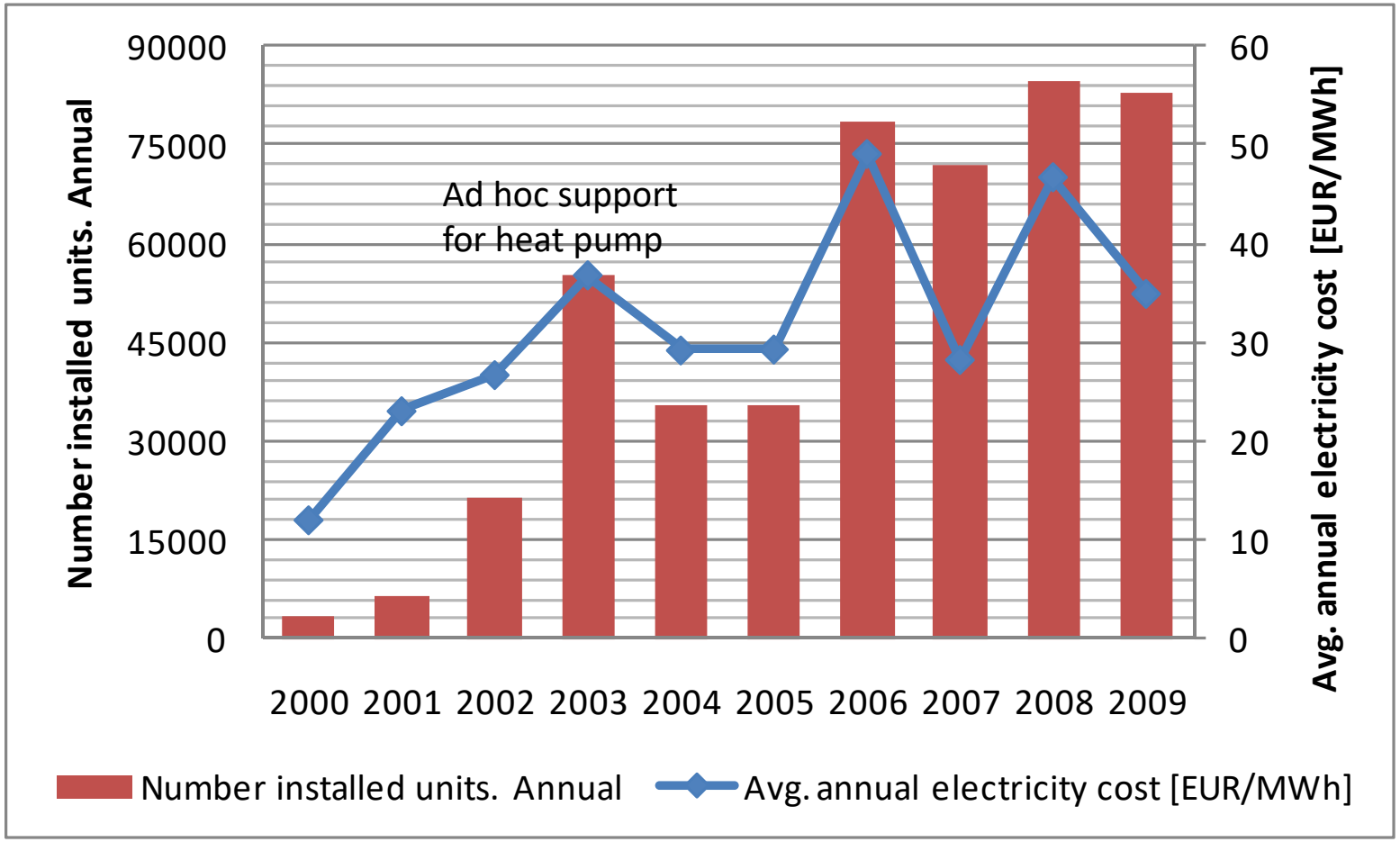
**Almost 10 years to the day**

- Then the dominating type was air-to-air heat pumps.
- 80% of heating was direct electric, 90% in dwellings.
  - Explains the domination of air-to-air.
- A new national building code (TEK10) required 60% of the heating demand to be covered by renewables => hydronic systems in buildings larger than 1 000 $m^2$.
- Does not directly affect the house building industry, but solutions migrate, like underfloor heating with water.

# Update on the presentation held at IoR on the 7th of April 2011 (2)

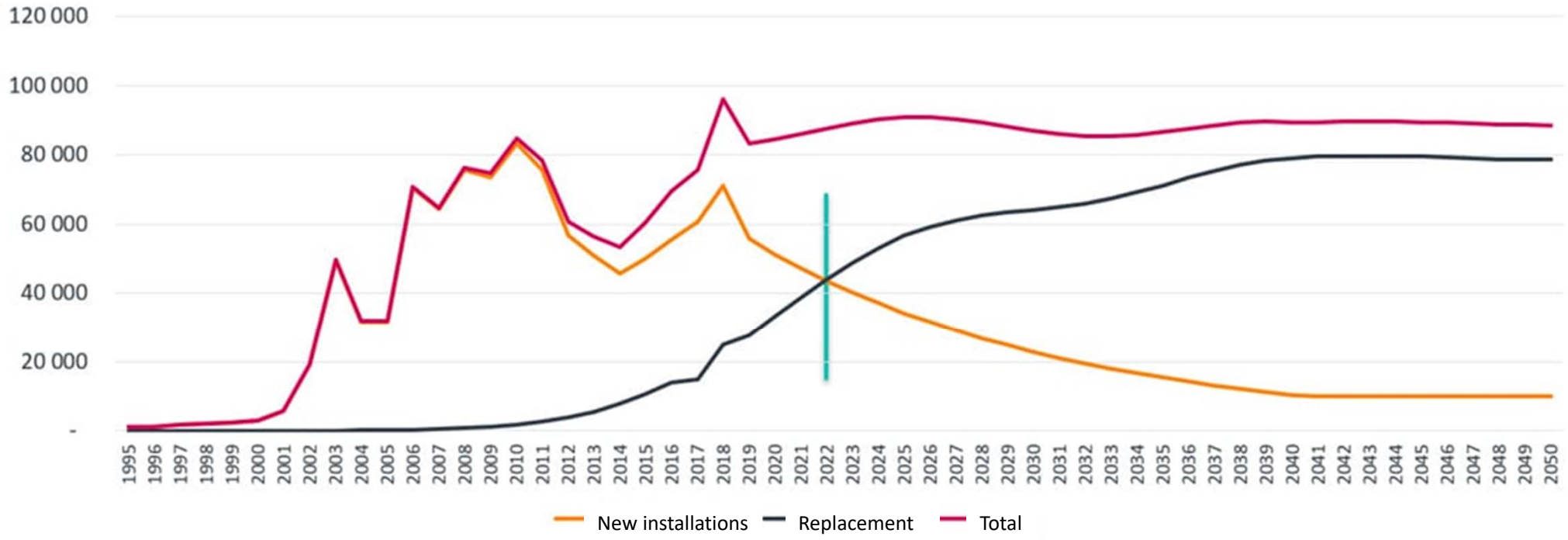
- A short term subsidy on heat pumps made the market boom, resulting in equipment being sold that should not have been on the market.
- Sales and reputation took a hit.
- Rising electricity prices helped turn this around.
- Competence on how heat pumps work was poor in the HVAC-designers, treating heat pumps as an elaborate boiler, leading to poor system performances

# The Norwegian energy system.



# Trends today

Number of installed heat pumps in households per year



# Trends today. Heat pump types

- Naturals are gaining ground, both in the commercial buildings and in households.
- Problem has been that naturals has not been available in sufficiently small equipment.
- For households predominantly R290 (Propane) is the natural choice.
- Otherwise R32
- In commercial buildings propane, $CO_2$ or ammonia.
- $CO_2$ only where the DHW share of the heating demand is above app. 50% of the total

- We are some that try to fight off HFO's, as their long term impact has been poorly understood.
- We need new chemicals in the environment as much as we need a hole in the head.

# Trends today. Heat pump types

Photo from website of ABK / Qviller (www.abkqviller.no)

Self contained units with their own ventilation. Charge of app. 4.5 kg.
Location type IV from EN378. Can basically be placed everywhere

# Trends today. Heat pump types


Ammonia room – in – room solution. During build and ready for shipping. EN378 only applies inside the box.

Photos courtesy of NH3 Solutions (http://nh3solutions.com)

# Trends today. Building codes

- A recent revision (TEK17) set demands on the energy efficiency of new buildings so strict, that they are app. 80% of a passive house.
- A step decline in building and ventilation heating demand has actually triggered debate whether the demand for hydronic heating systems should be upheld.
- Fossil fuels are banned, both from new and existing buildings

# Trends today. HVAC competence

- The competence of the heating systems designers are still a problem but slooooowly getting better.
- A key problem is the understanding that
  1. A heat pump is a process plant. Its performance and efficiency is very much influenced by what happens around it.
  2. The design point of the heat pump is NOT the same as the designpoint for the heating system.

# Trends today. Low temperature heat source

- In Norway the use of boreholes as low temperature heat source is widespread.
- Based on Mushroom-theory that this is the most economical solution
  - Mushrooms grow in the dark and lives on horse shit.*
- Studies have shown that this is not the case.
- It is hassle-free and energy efficient, but not economically efficient.
- More solutions are now turning to ambient air as heat source.

* Expression borrowed from Terry Pratchett “Making Money”

# Conclusion

- Heat pumps today are an integral part of heating systems design.
- The Norwegian energy system never had the need for "degassing"
- What Andy Pearson refers to as the spark gap on energy prices does not exist in Norway, so the implemation has been easier.