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BANKABLE ENERGY ASSETS, IN LONDON'S SOUTH BANK

SIRACH Event

4th July, Islington

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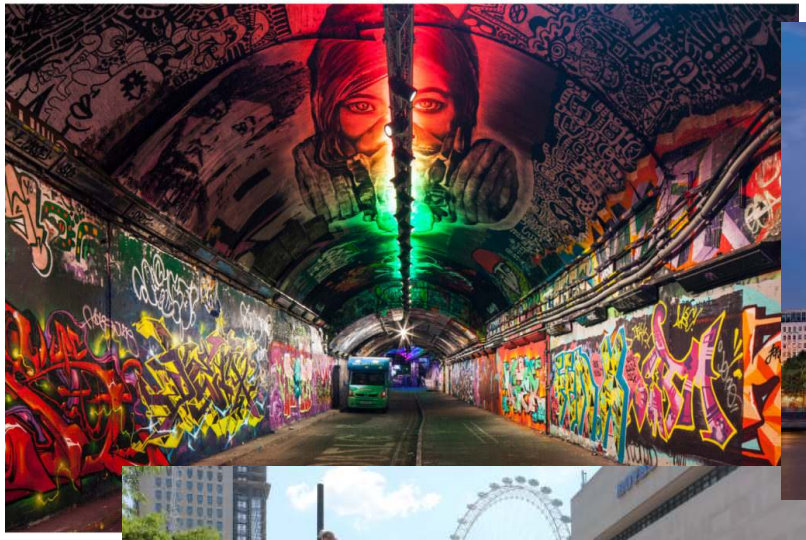
Rajvant Nijjhar - BankEnergi



Partners: ‘’PFER’’ Design & Concepts (Stage 1)

Why local energy is key:

- Tackling climate change through projects or initiatives that local area benefits from

- Transition to a fossil – free economy

- Meeting & challenging UK & Global Carbon Budgets

- At local level - focus on people and engagement: trading to reduce, manage, generate or purchase energy

What it means for South Bank energy users:

- Asset utilisation = fewer power stations

- Local resilience & security of supply

- Local energy trading means greater price stability

- Smarter building management = better use of energy tariffs

- Impact on mitigating climate change in growing population

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Vision

Create local energy marketplace whilst achieving wider socio-economic and environmental outcomes of alleviating fuel poverty, improving air quality and reducing carbon emissions.

Mission

ASSET SELECTION:

Identify local assets and building to trade heat, power and install EV superchargers

TECHNOLOGY DEPLOYMENT:

Optimising energy use. Maximising energy storage. Maximising generation.

LOCAL ENERGY TRADING:

Forecasting demand. Trading surpluses. Assessing capacity and balancing demand.

What's the story so far

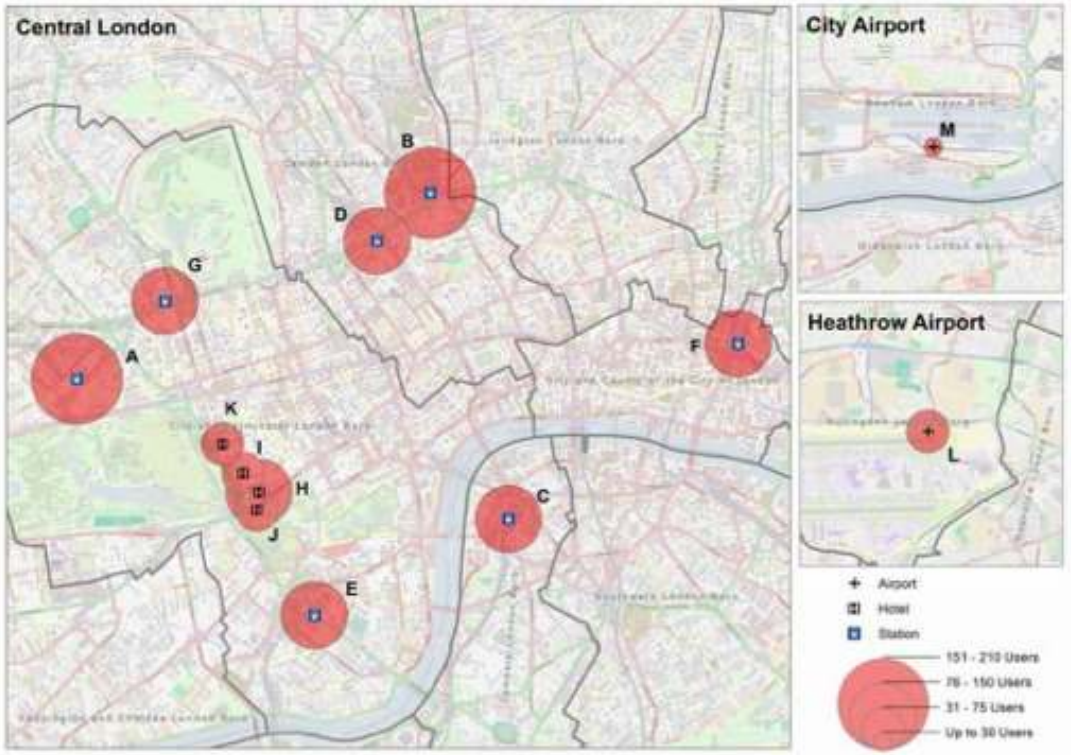
- Need to act now for Climate mitigation
- London Climate action week
- Limited opportunity for trading on a local level
- What happens with additional spill if you have generation assets such as Solar PV?
- How do we manage the grid demand – EV Explosion
- What do you do with the waste heat we have?

How do we meet carbon budgets and air quality goals

What's the EV story

London is leading with its Ultra Low Emissions Zones. ULEZ. 50,000 charging point aspiration by 2025

- Taxis electrifying: LEVC & Addison Lee, Uber
- 8000 surveyed, 1.3% current EV users.
- Waiting time most important (60%) followed by:
- Retail, Environmental issues, location, availability of chargepoint and cost (all at 30% each)
- At least 2 charges / break per day



Frequently used ranks in central London

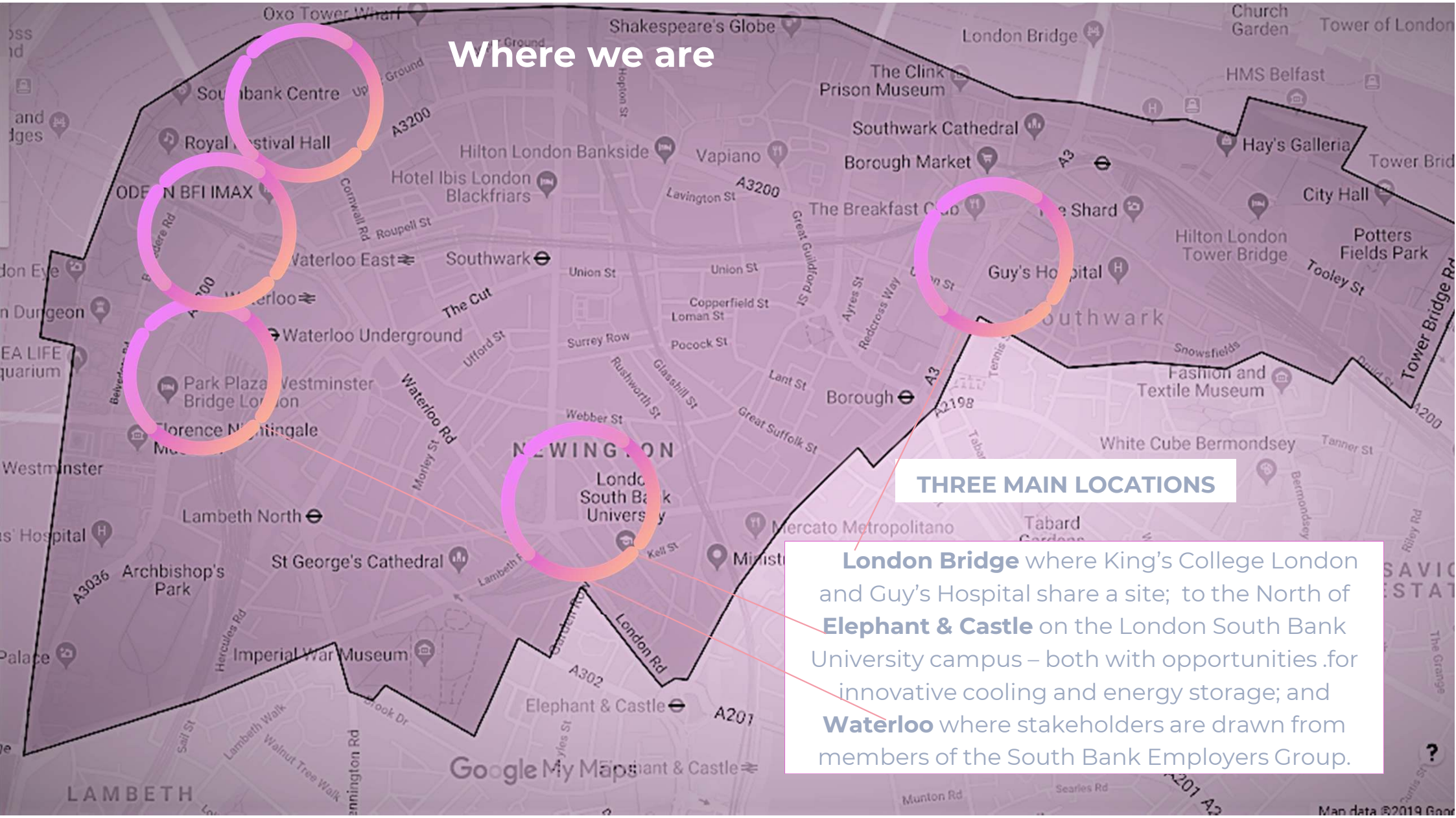
The ranks displayed on the map are:

- Stations:
  - Paddington (A), King's Cross / St. Pancras (B), Waterloo (C), Euston (D), Victoria (E), Liverpool Street (F), Marylebone(G).
- Hotels:
  - In W1 postcode area.
- Airports:
  - Heathrow (L), London City (M).

What we are:

- Developing a Local market for trading energy
- Micro-grid and aggregation to macro-grid
- Buy BankEnergi energy - Local, independent and green is brand
- Using existing assets, or new (CHP, batteries, solar PV generation)
- Working in grid constrained areas
- EV charger agnostic - energy supplier agnostic
- EV & ASHP demand will make sub-stations more constrained

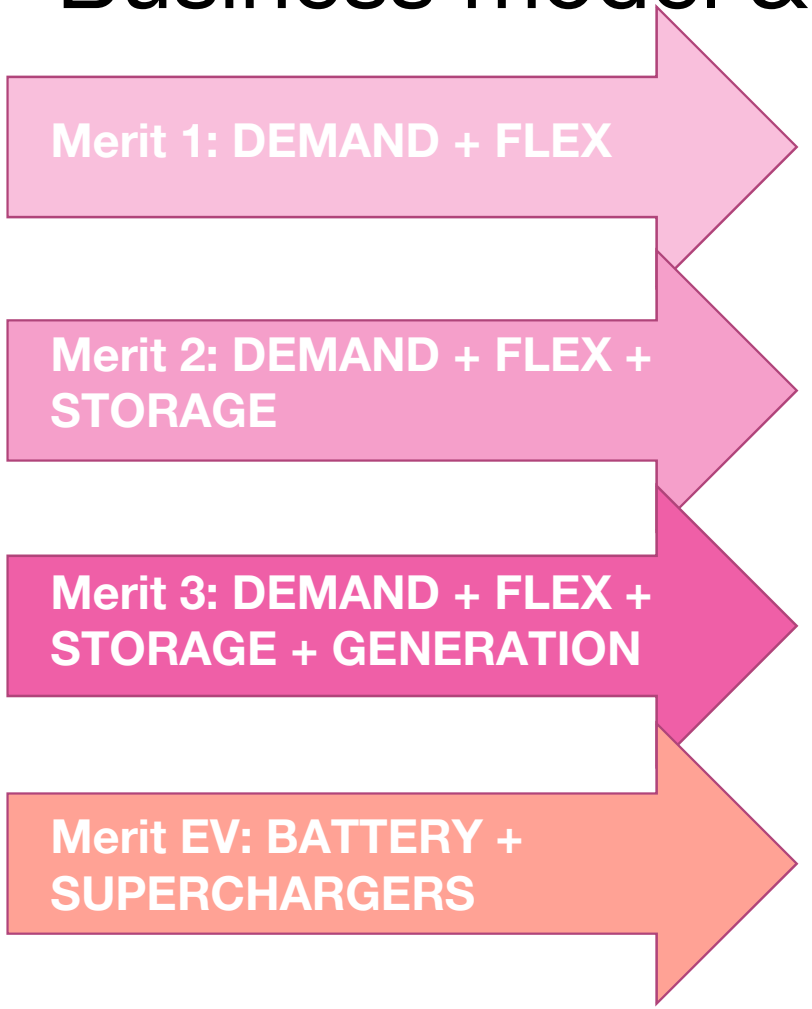
Where we are



THREE MAIN LOCATIONS

London Bridge where King's College London and Guy's Hospital share a site; to the North of **Elephant & Castle** on the London South Bank University campus – both with opportunities .for innovative cooling and energy storage; and **Waterloo** where stakeholders are drawn from members of the South Bank Employers Group.

Business model & data integration

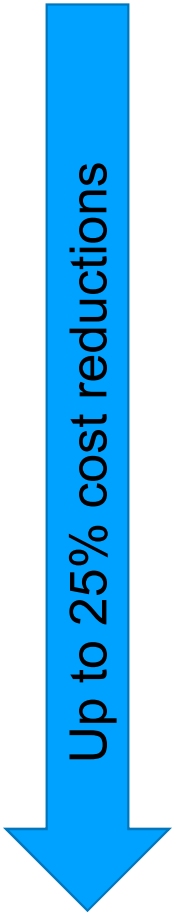


E.g. Building – level data:

- Half-hourly energy for profiling
- Peak demands
- BMS information, operational data
- Space and land for asset deployment

E.g. Grid – level data:

- Forecasting demand to half hour.
- Substation level data e.g. headroom
- Generation assets data
- EVs : time, routes & length of use
- Locations of charge points



OPTIMISING ASSETS | MAXIMISING STORAGE | MAXIMISING GENERATION

Trading realms

Virtual:

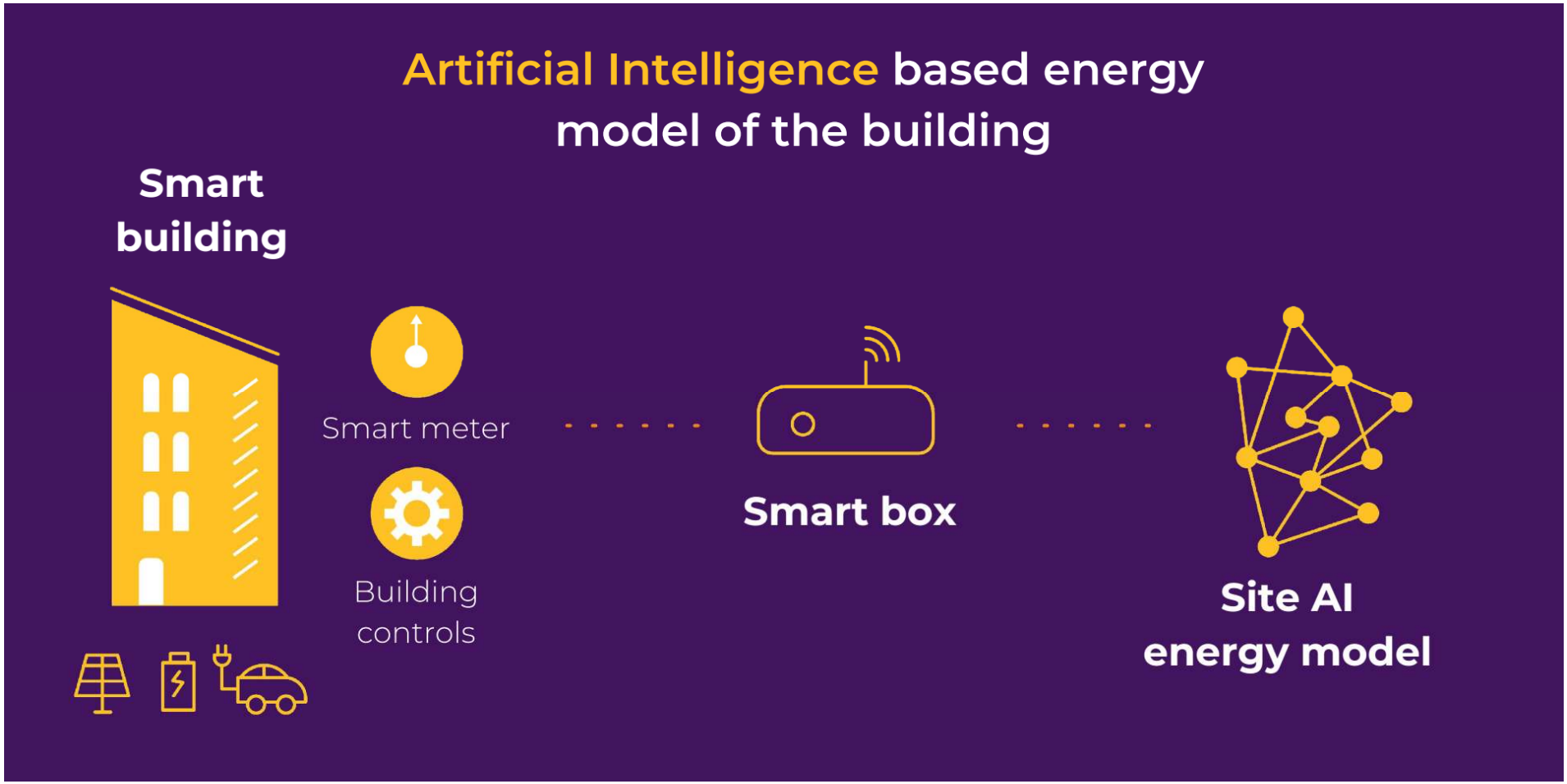
- Platform that will enable signals from the Merit Order to take priority – which is trading first:

  Heat, power or EV.
- Billing system to collect revenues customer and client side
- The Algorithms to predict demand and use

Physical

- The intelligent linking of buildings and infrastructure. E.g. using same trenching for cables to batteries as well as district heating (waster heat recovery)
- Using physical space to store energy
- Energy & Flex

Site level architecture



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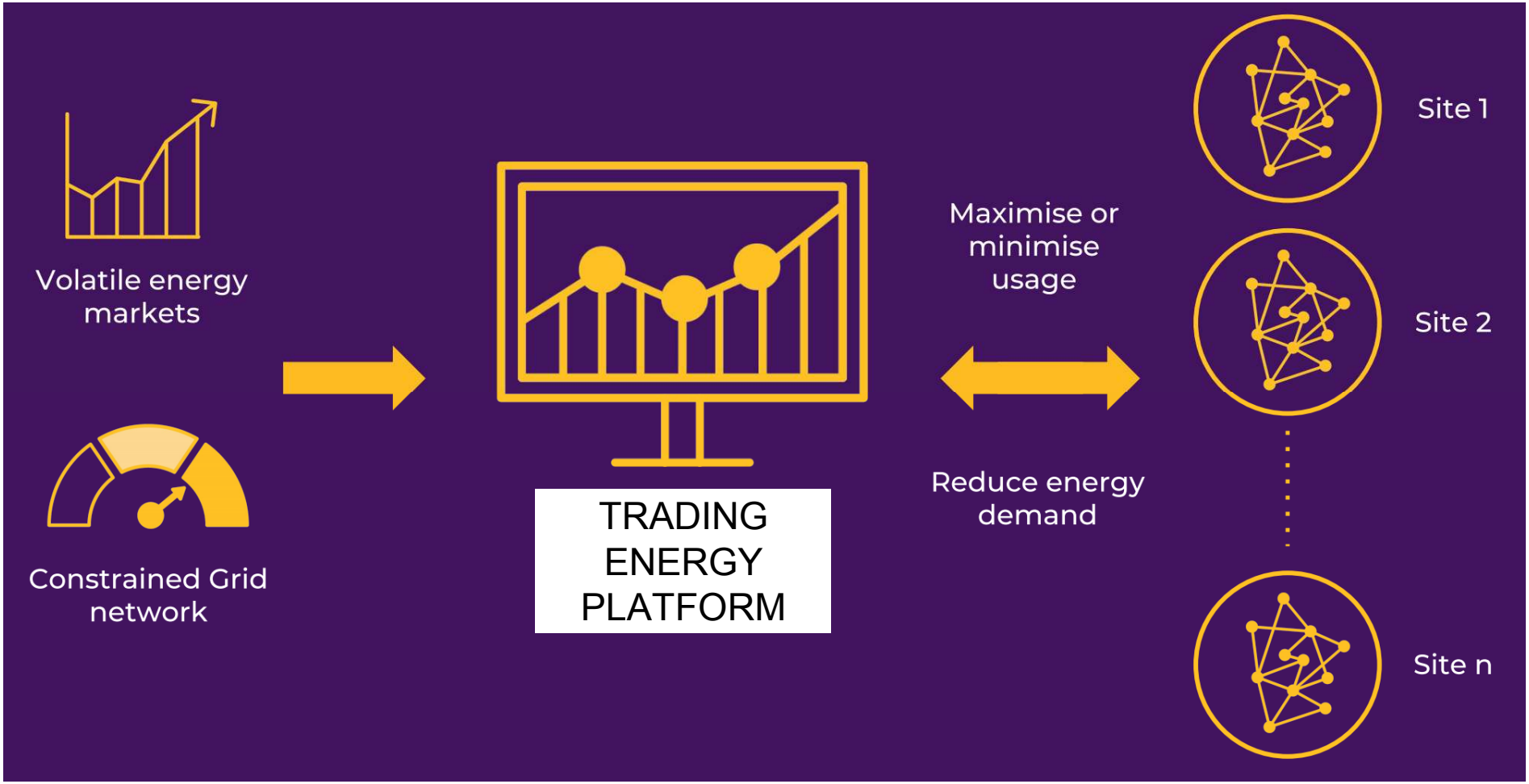
Co-ordination across sites

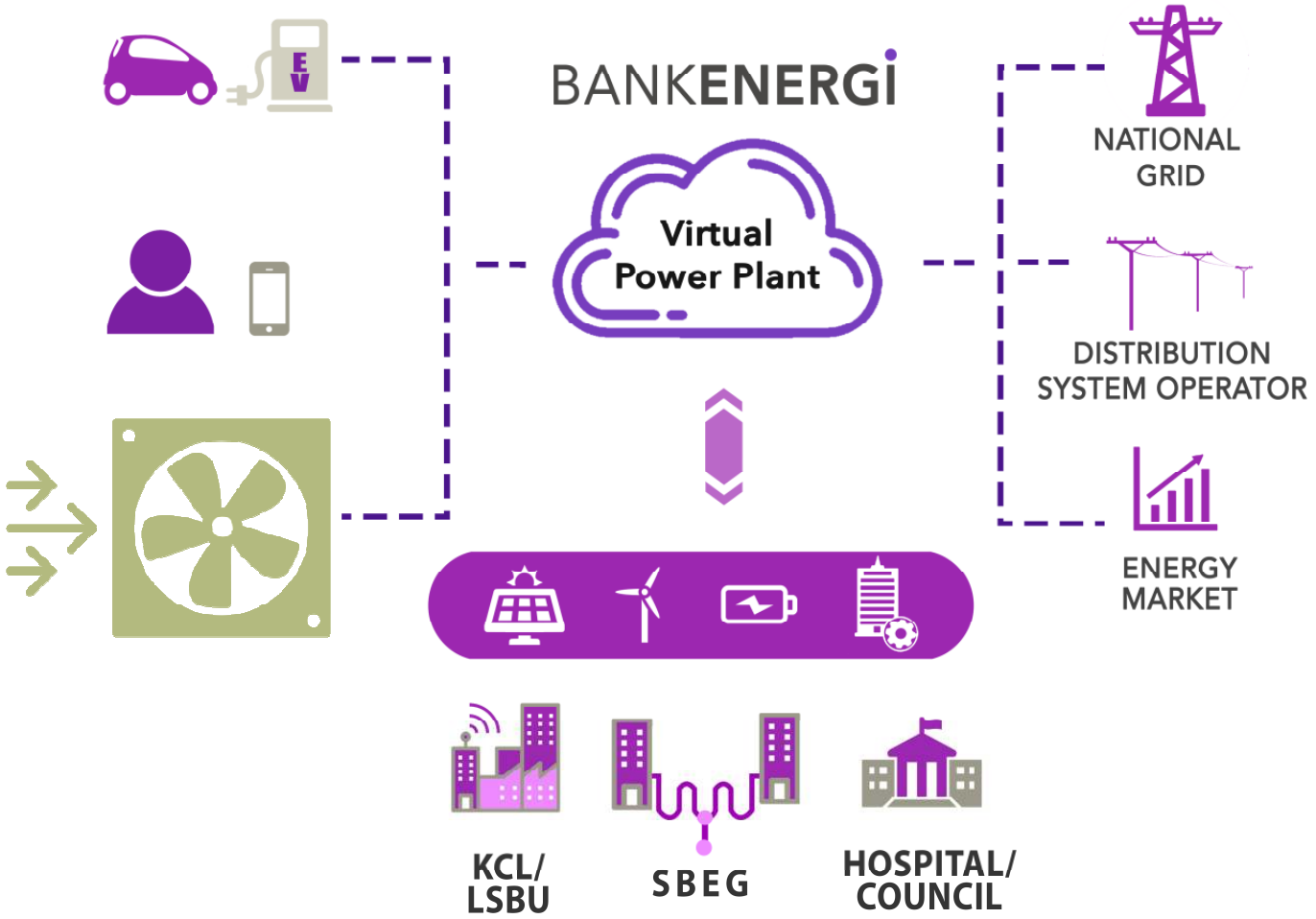


Technology to Support local trading

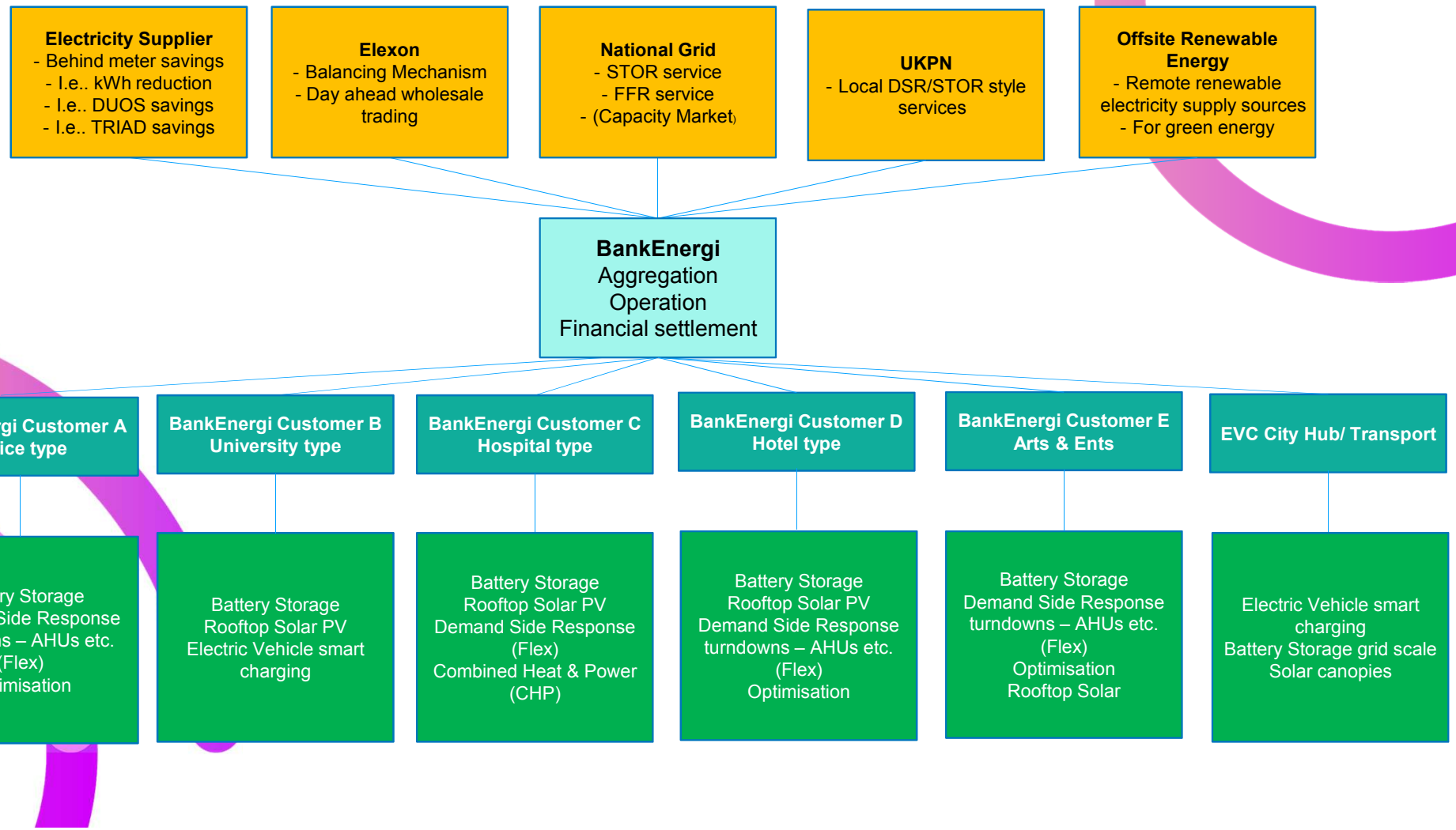
EVs and Air Source Heat Pumps will increase demand and constrain sub-station level.

Battery can help to store energy and use at the right times of day.

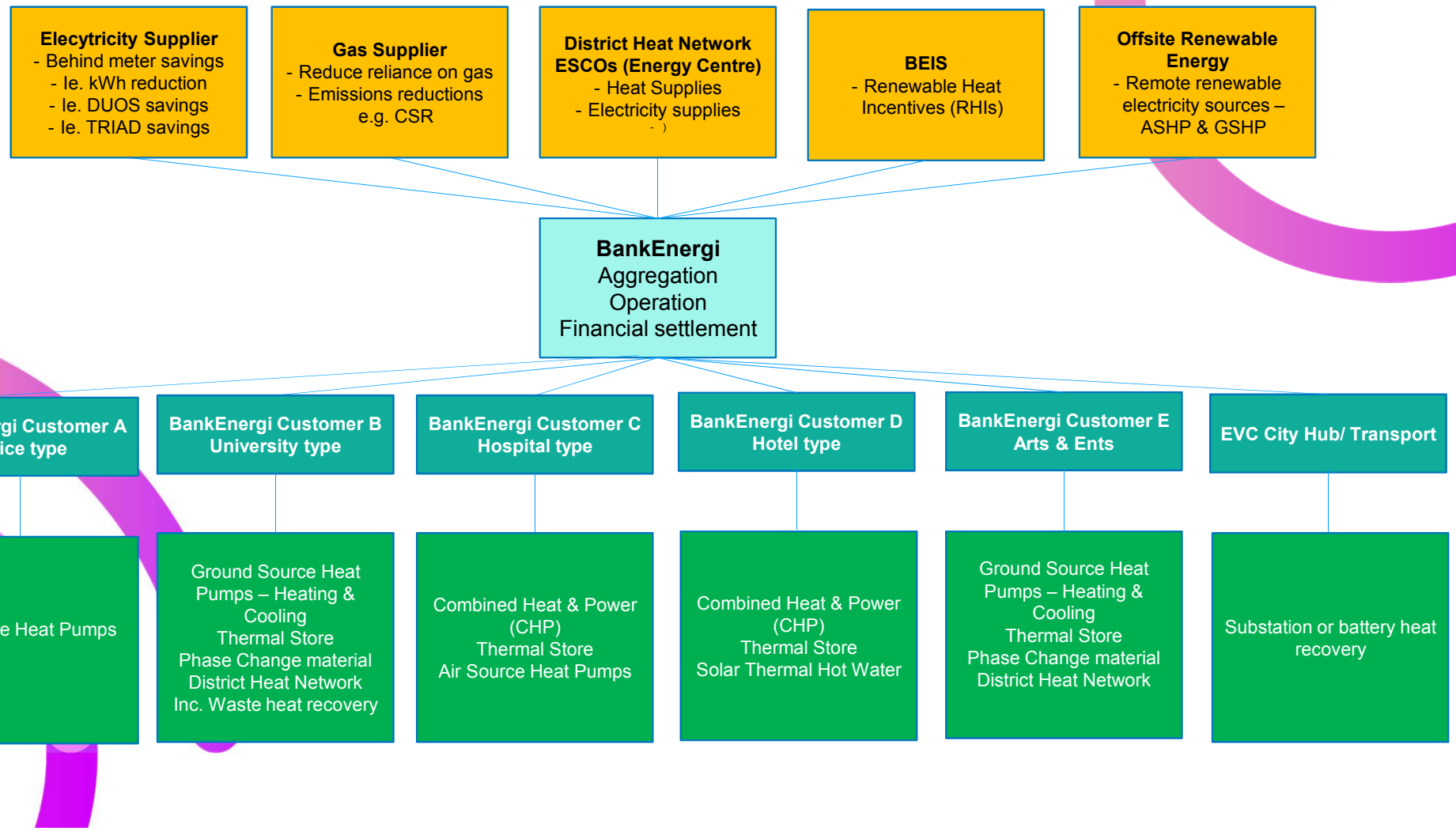
Buy and Sell signals will be key to earning revenues.



Revenue Derivation - Power



Revenue Derivation – Heat & Mechanical



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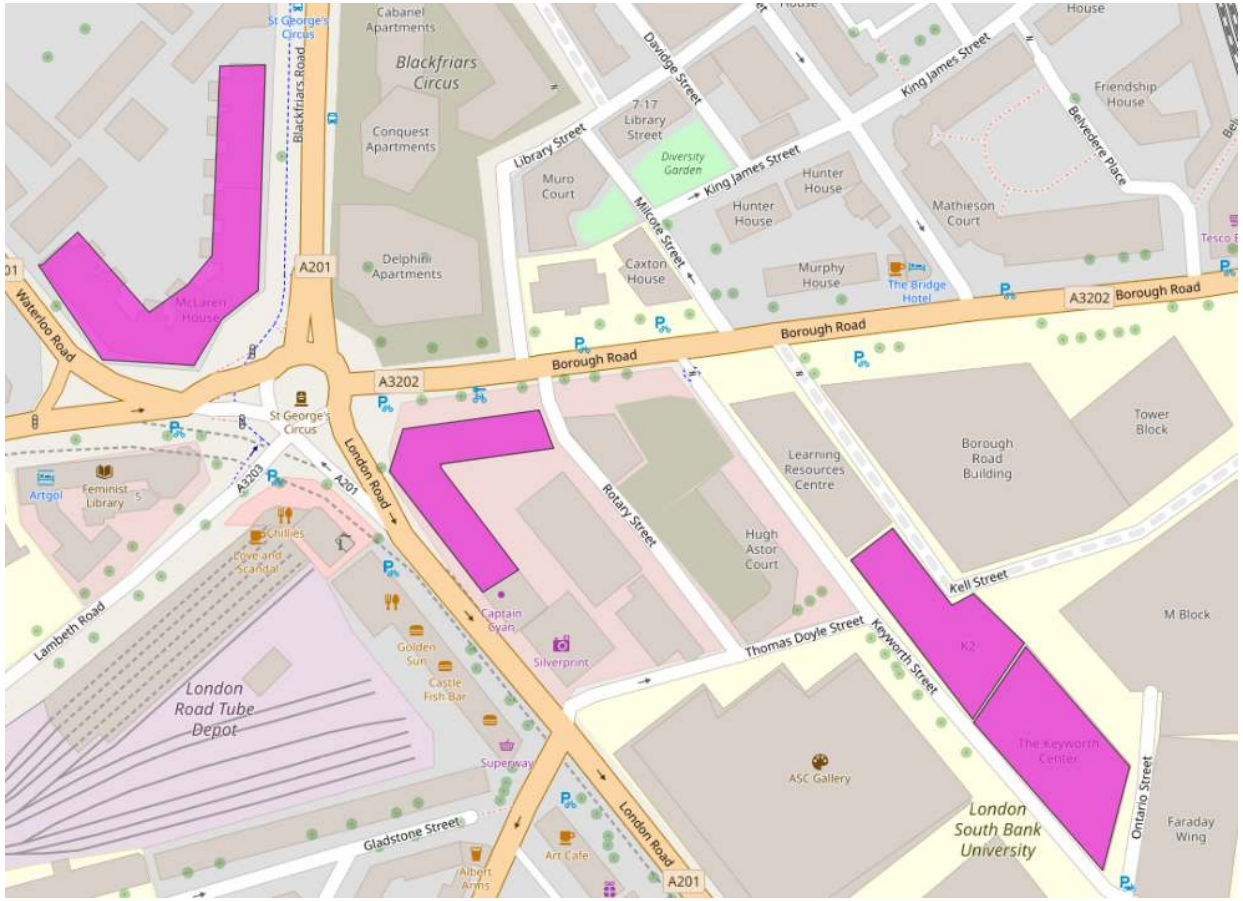
Use Case 1: LSBU Campus



Electrical demand

Electricity demands (not including electricity consumed by energy units):			
	Clarence Electricity demand	267.7	MWh
	McLaren Electricity demand	326.3	MWh
	K2 Electricity demand	1,322.50	MWh
	Keyworth Electricity demand	628.1	MWh
	Total	2,544.50	MWh
	Max electricity demand	**0.6**	**MW**

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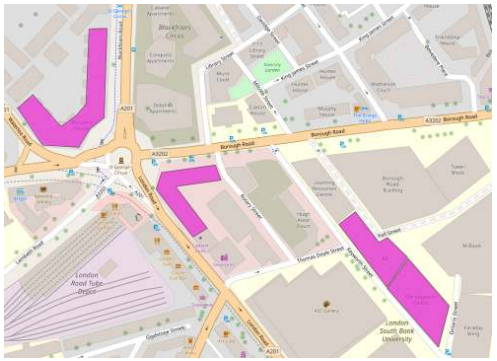
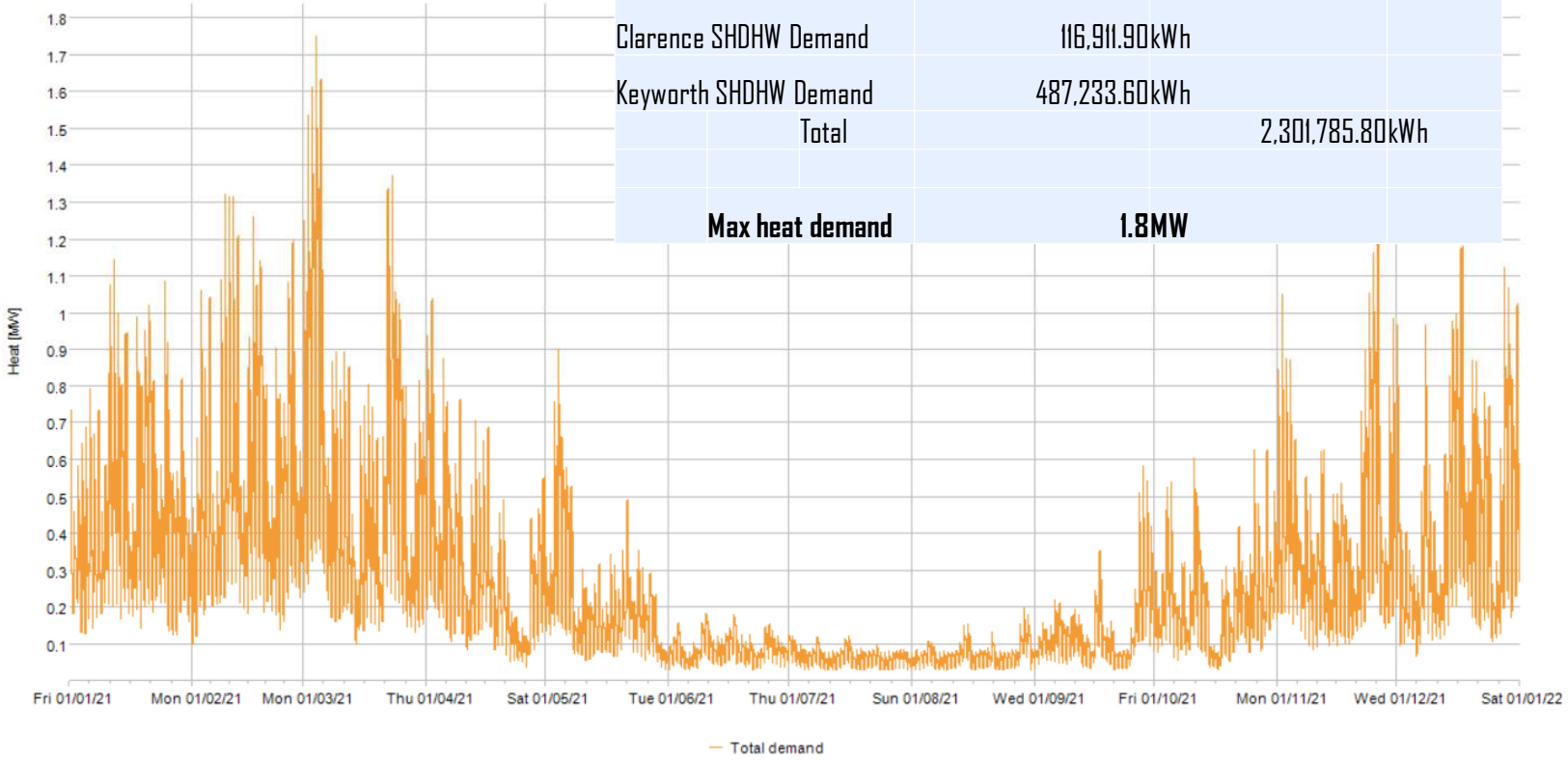
Use Case 1: LSBU Campus



Combined heat demand profile

Heat demands:		
McLaren SHDHW Demand	1,697,640.30kWh	
Clarence SHDHW Demand	116,911.90kWh	
Keyworth SHDHW Demand	487,233.60kWh	
Total		2,301,785.80kWh
Max heat demand	**1.8MW**	



Use Case 1: LSBU Campus

Options investigated:

A – Heat network with waste heat recovery from London Underground ventilation shaft

B – Heat network + PV

C - Heat network + PV + Battery

D - EVs

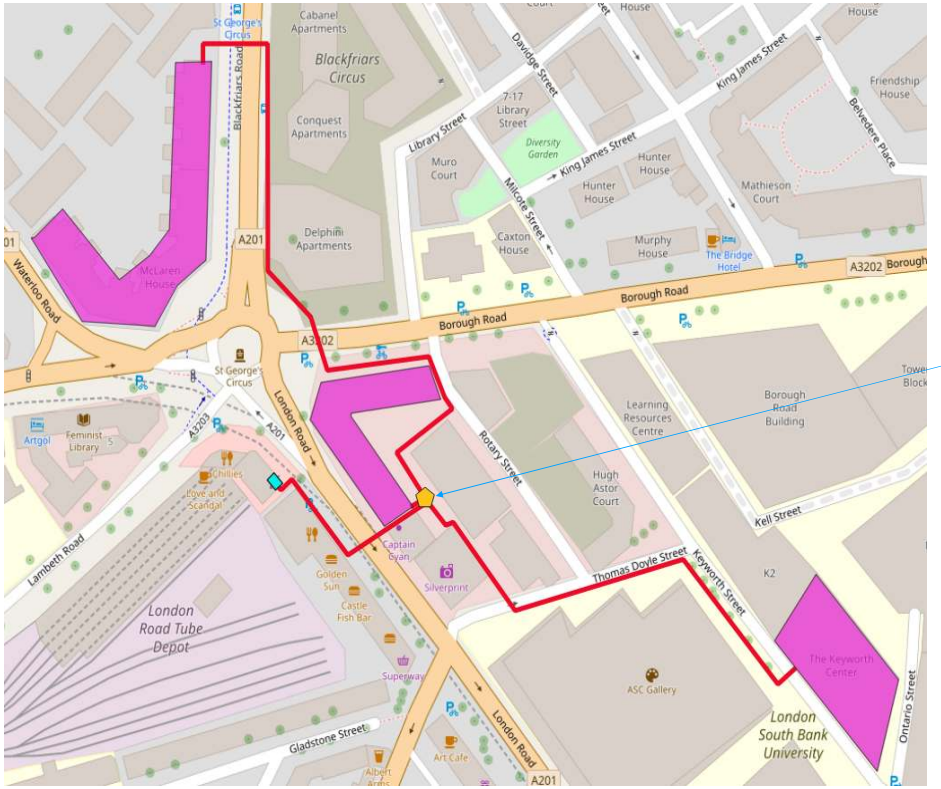
Use Case 1: LSBU Campus

Option A - Heat network opportunities (with zero gas use)

Heat source: TfL ventilation shaft

LU ventilation shaft building at London Road

Infrared picture of the London Road vent shaft



Heat network

Buildings connected

TfL vent shaft

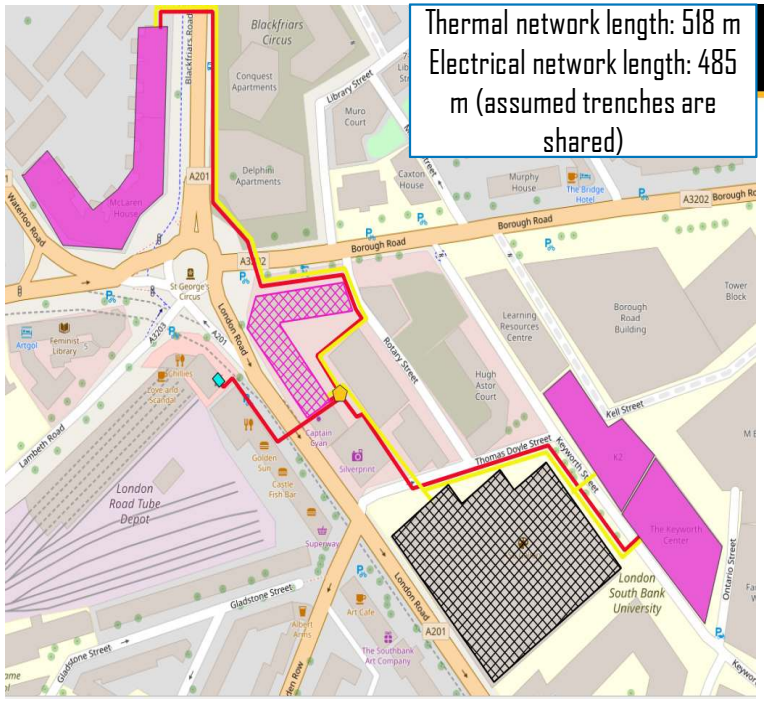
Vent shaft could easily supply all 3 buildings.

Following pavement for trenches rather than digging up roads

Energy Centre:
- HP
- Thermal store

Use Case 1: LSBU Campus

Option B – Heat network + PV



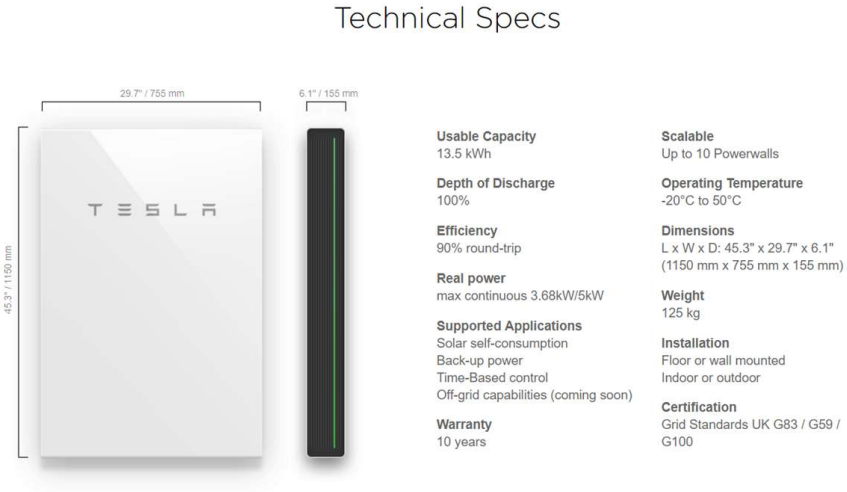
Thermal network length: 518 m
Electrical network length: 485 m (assumed trenches are shared)

- Free roof area: 2000 m2
- Total capacity: 250 kW

Heat network
Electrical network
Buildings connected
TfL vent shaft
PV installation

Option C – Heat network + PV + Battery

Clarence basement + surrounding space – Allows approximately 1.35 MWh energy storage capacity
100 Tesla batteries



Tesla Powerwall 2 has double the **capacity** of the original **Powerwall**. Therefore it has 13.5 kWh of usable energy storage **capacity**. It also has a much greater **power** output capability of 7kW peak and 5kW continuous. The **battery** has a 90% round-trip efficiency.

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Use Case 1: LSBU Campus

Options ABC – CAPEX comparison

	Amount	Cost per unit		Option 1A Vent shaft	Option 1B Vent shaft_with PV	Otion 1C Vent shaft_with PV_Battery
HP size	1000	500	500000	500000	500000	500000
Store	200	50	10000	10000	10000	10000
cold store	100	50	5000	5000	5000	5000
Network metres	518	1000	518000	518000	518000	518000
vent shaft	1	200000	200000	200000	200000	200000
Total			1473000	1233000	1233000	1233000
Other	20%			246600	246600	246600
Total				1479600	1479600	1479600
Fees	22%			325512	325512	325512
Grand Total				**£1,805,112**	1805112	1805112
Pv	250	1000			250000	250000
battery	100	5000				500000
Grand Total					**£2,055,112**	**£2,555,112**

Option ABC – OPEX comparison

	Simple payback (Years)	IRR (25 years)	NPV (£ x 1000) (25 years) - Improvement Over Base Case	Operating Surplus 2021 (£ x 1000)	Opex Revenue Increase 2021 (£ x1000)	CO_2 Saving (Tonnes/yr) (SAP10) Annual Avge over 25yrs
BASE CASE Existing Boilers	0	0.0%	0	-352	0	0
A - Vent Shaft WSHP	11.1	6.5%	474	-190	162	786
B- Vent shaft +PV	10.9	8.3%	1,163	-164	188	907
C - Vent shaft +PV+ Battery	10.8	8.4%	1,464	-115	237	877

Use Case 2: Office type building, Merit Order 1, Power only

Multi- tenanted single office building:

- Flexibility services
- Couple of EV charging points
- Location next to St. Thomas Hospital
- Revenues shared with BankEnergi and lower customer bills

Business Case:

- Based on Capacity markets, FFR, DUOS, TNUOS, Triads (or their future replacement)
- Potential to tie-up to St. Thomas' unexplored as yet.
- Potential to incorporate an external containerised battery for load shifting for EV charging

Use Case 3: KCL, London Bridge

Private wire Hospital / Uni campus, Merit Order 3, Heat & Power

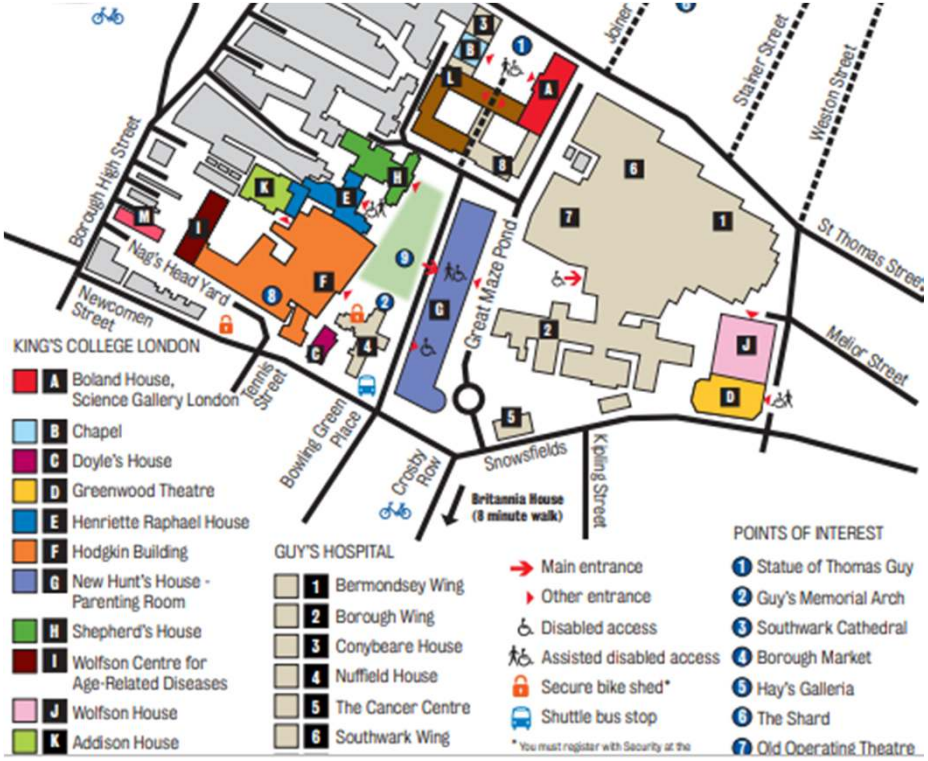
Space in Disused swimming pool basement:

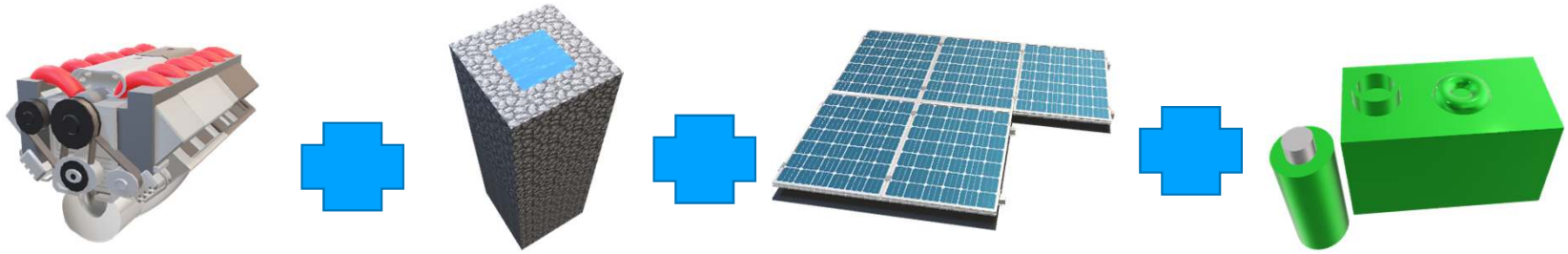
- Flexibility services
- Couple of EV charging points
- Location next to Guys Hospital (other branch)
- Revenues shared with BankEnergi and lower customer bills

Use Case 3: Cont.

Business Case:

- Based on Capacity markets, FFR, DUOS, TNUOS, Triads (replacement of)
- Heat recovery in sumps pumps – borehole / battery
- Possible CHP





Use Case 4: EV – Merit Order EV

Rapid Chargers – 50kW in locations that are convenient and offer retail

- Flexibility services
- Couple of EV charging points
- Location next to Guys Hospital (other branch)
- Revenues shared with BankEnergi and lower customer bills
- Talking to an organisation to use spare headroom on Available Supply capacity

Use Case 4: EV – Merit Order EV cont.

Uptake - TfL license 21,000 licensed black cabs in London - 2,100 already EV 1,700 new EV cabs a year is the current run rate. 115,000 Private Hire Vehicles New vehicles will need to be Zero Emission Compliant by 2023

Electricity - kWh Cost to cabs has to be below 30p otherwise it becomes economic to run petrol range extender. kWh buy price – must be below 14p for IRR 9%. BankEnergi Ltd. (commercialization of project) will go for Energy Supply licence to supply energy to cabs.

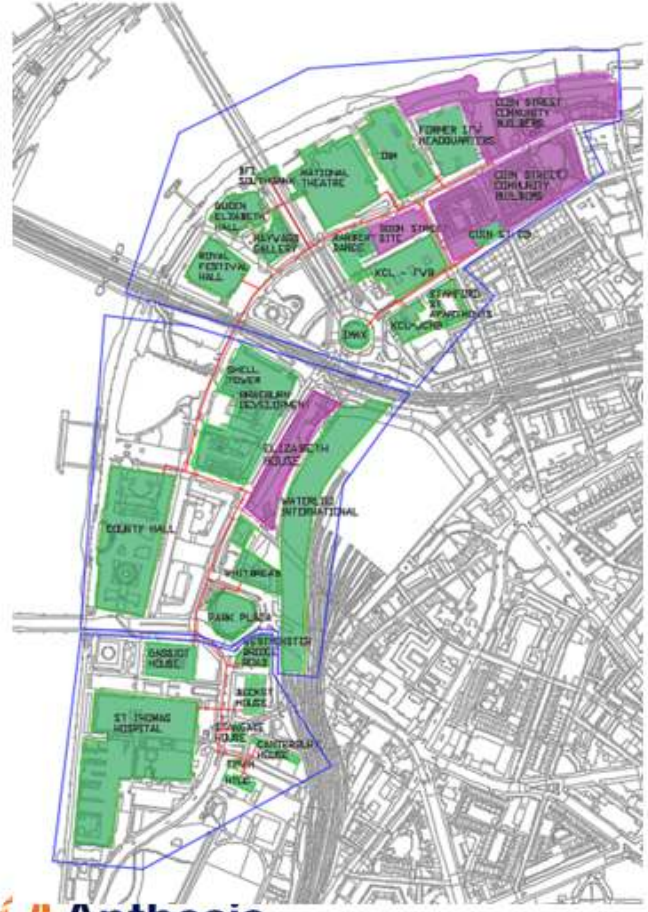
Electricity Distribution Connection Cost - new sub-stations maybe show stopper

Parking - Unlocking under-utilised parking. Offer £20 per day per parking space

Charge points - New points required in order keep charge sessions to under 20 per day to avoid congestion

Potential scheme development

3 development zones



Anthesis

Southern scheme

- St. Thomas, Stangate, Beckett, Canterbury and Gassiot House, Westminster Bridge Road, Guys and St Thomas development
- 88k MWh annual heat demand
- 60% met by LZC source operating 5,500 hrs

Central scheme

- County Hall, Braeburn Development, Shell Tower, Elizabeth House development, Park Plaza, Whitbread, Waterloo International
- 21k MWh annual heat demand
- 60% met by LZC source operating 5,500 hrs

Northern scheme

- Royal Festival Hall, Queen Elizabeth Hall, National Theatre, Hayward Gallery, IBM, ITV, Coin Street development, Doon Street development, Stamford Street Apartments, IMAX, King's College London, Rambert dance
- 37k MWh annual heat demand
- 60% met by LZC source operating 5,500 hours

SUMMARY – Benefits of BankEnergi

UP TO 25 %
ENERGY COST REDUCTION

LOW CARBON
ENERGY SYSTEMS TO COMBAT CO2 EMISSIONS

NEW REVENUES
DSR FFR DUOS TNUOS LOCAL TARIFFS

COMMUNITY BENEFITS
ECONOMIC & ENVIRONMENTAL

RESILIENT
SECURITY OF SUPPLY

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