

# An electricity market design for a 21<sup>st</sup> century electricity system

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22.10.2019

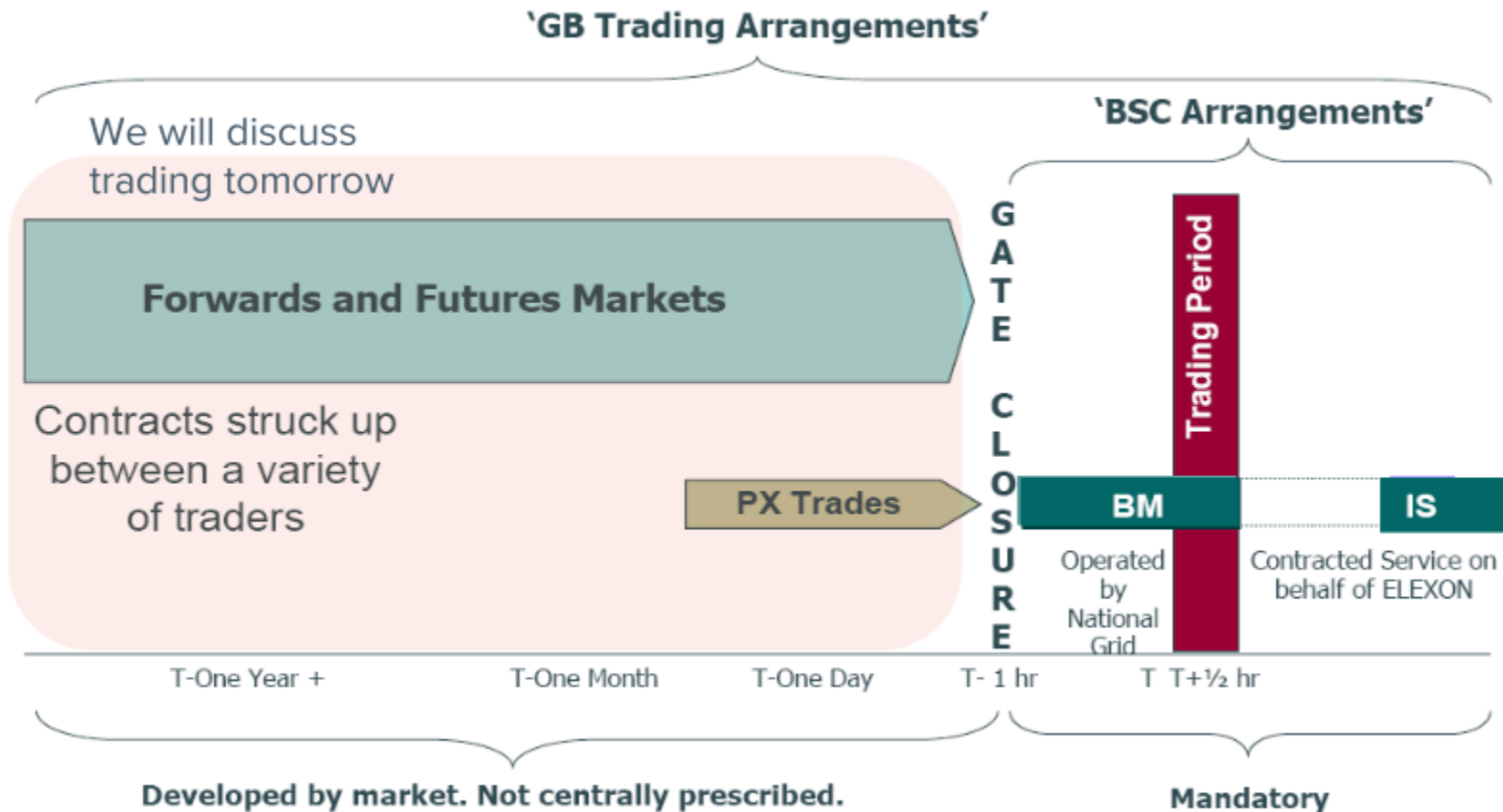
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- Background on the UK's current electricity market design
- The changing electricity system
- How the current electricity market design is not outdated
- Issues that are arising as a consequence
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# Background on the UK's current electricity market design

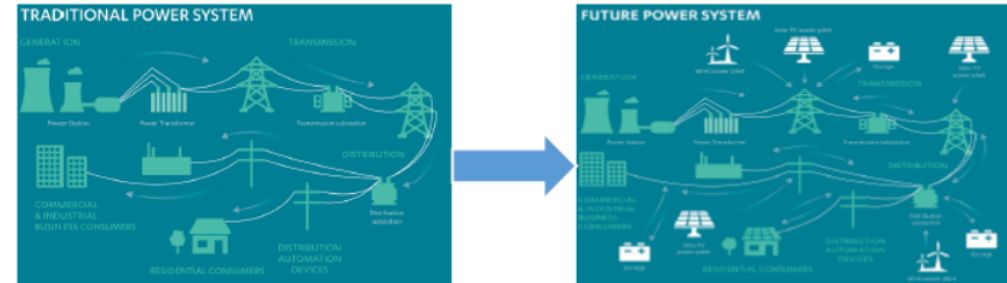
- Post privatisation 1989-1998
  - Pool market mechanism
  - Scheduled the day-ahead
  - Majority of trades struck in 'forward markets'
  - Market manipulation
- NETA -1998
  - Bilateral trading (~85%)
  - Remainder traded on the SPOT market or through the other markets: Capacity, Ancillary and the Balancing market

# Timeline of events



# The characteristics of this new electricity system

- The GB's electricity system is undergoing fundamental changes.
- Thus, the institutions which govern the electricity system need to evolve in parallel.
- The electricity market design is one of these.



Traditional Electricity System Characteristics	Emerging Electricity System Characteristics
Centralised	More Decentralised
Fossil and nuclear based, large scale	Decarbonised, multiple scales
Supply based, load following	Supply and demand
Firm power	Smart and flexible
Linear, top-down system operation	Two way, dynamic, digitalised system operation
Passive consumers	Spectrum of consumer behaviour
Clear lines between power, heat and mobility sectors, supply chain activities and business models	Breaking down of demarcation lines and coalescing at distribution level, and particularly domestic level
Distant from use	Often local
Energy focused stakeholders	Multiple stakeholders – data / IT, car manufacturers etc

# The Electricity Market Design: Clarification of terms

- What is an *Electricity Market Design*?

The formal and informal rules which guide the buying and selling of electricity, providing stability for all members involved

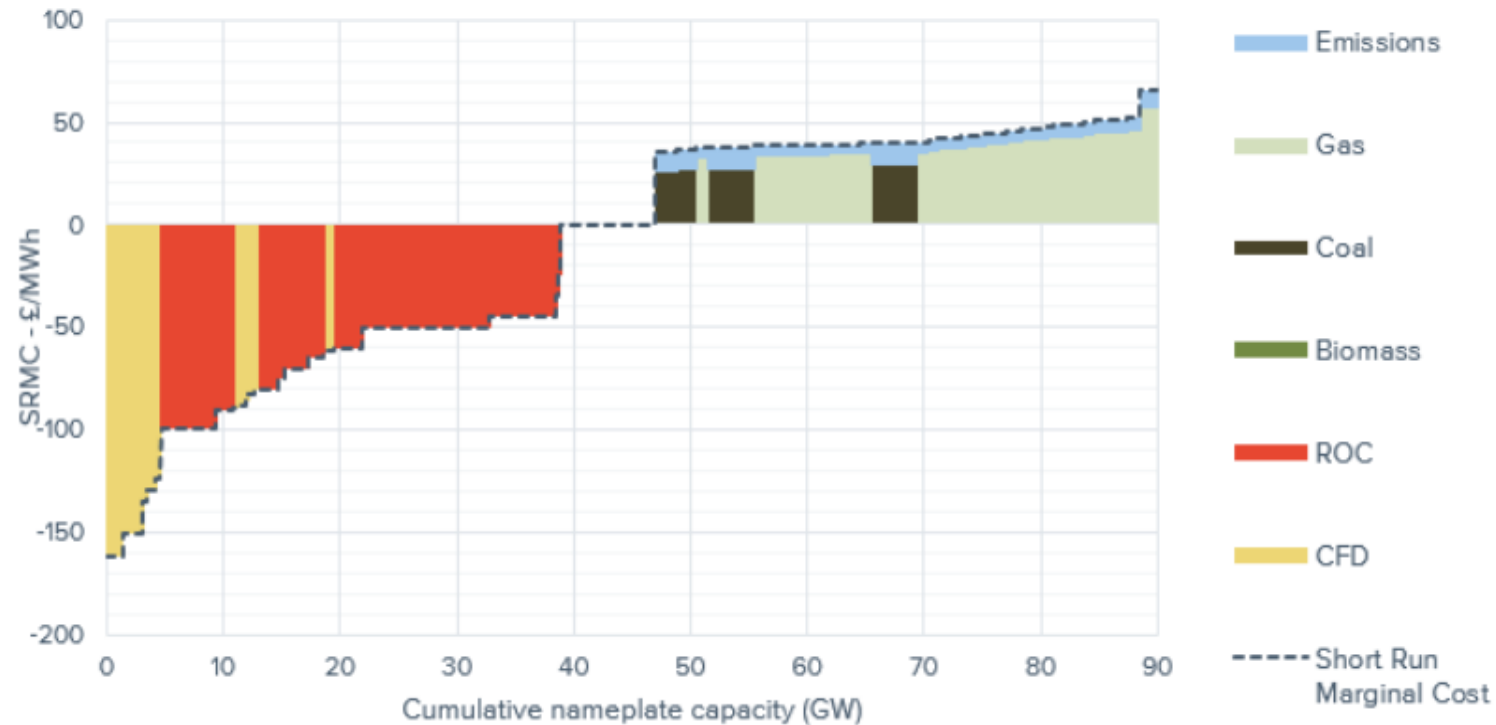
- The importance of clarification

# Importance of the electricity market design

- Determines access to value
- This 'access' will shape the future electricity system
- To decarbonise, the electricity market design needs to provide value to specific technologies
  - i.e. Flexibility, DSR, Storage etc.

# Why does our electricity market design need to evolve?

- Market design no longer reflects the electricity system
- Leading to many issues
  - Price depression
  - Price cannibalisation
  - Missing money
  - Lacking necessary flexibility





# Many calls for a new electricity market design

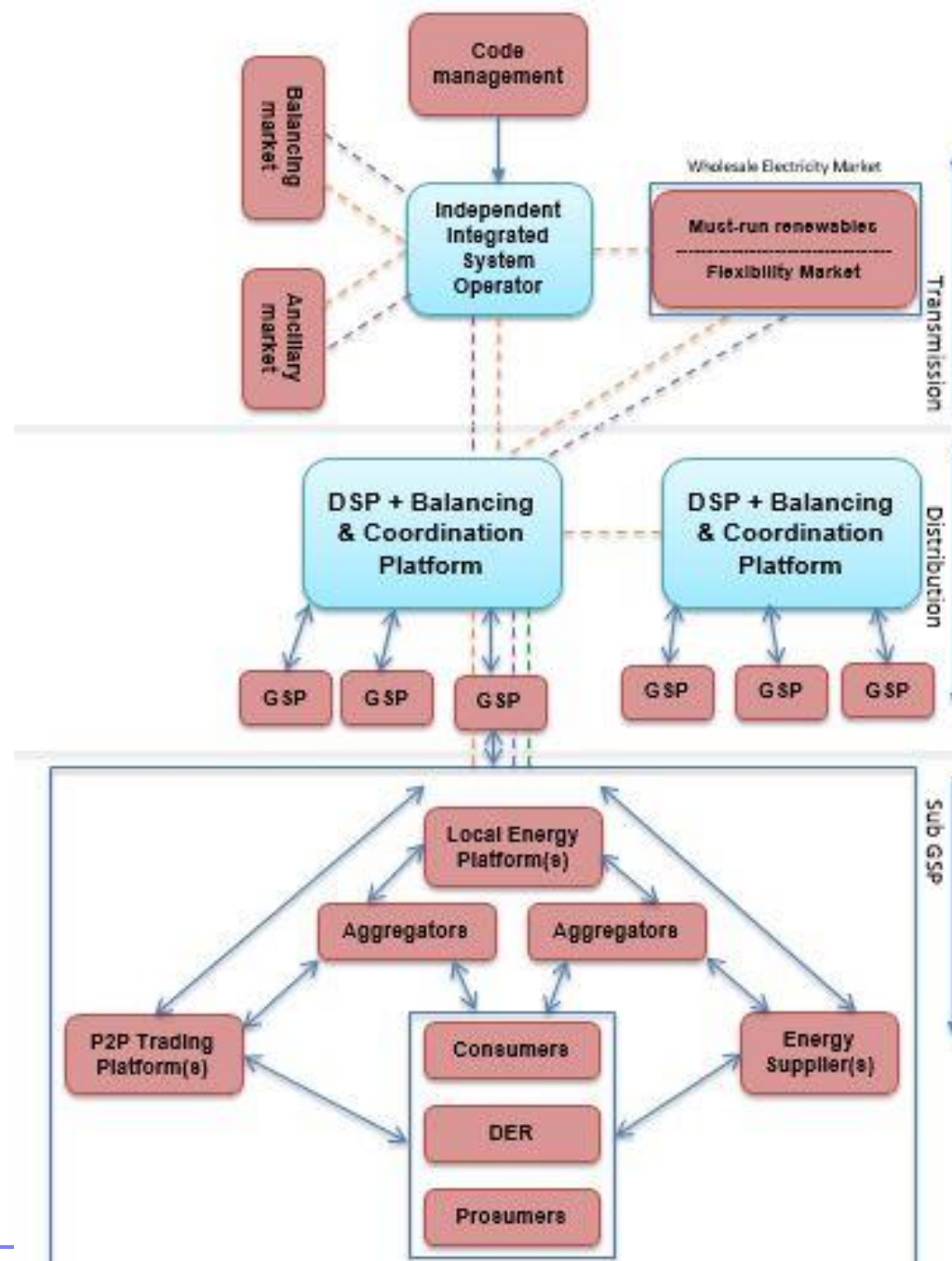
Feature	The Two Tier Market. Keay and Robinsion	Smart Energy Service Proviser (SESP). Rosell	Energy and Delivery Market. Nelson and Pierpont	The Future Proof Model. De Wit	Two Visions: Grand Central. Kristov, Martini, Traft	Two Visions: Layered Decentralised Kristov, Martini, Traft
Wholesale Market	✓	✓	✓	✓	✓	✓
Capacity Market	?	✓	✓	?	X	X
Ancillary Market	✓	?	✓	X	✓	✓
Balancing Market	✓ X	✓	✓	X	✓	✓
Futures Market	?	✓	✓	X	✓	✓
Bilateral Trading	✓	✓	?	✓	✓	✓
Exchange (Merit Order)	?	✓	?	X	✓	✓
Day-ahead Market	?	?	✓	X	✓	✓
Intraday Market	?	✓	✓	X	✓	✓
Two-tier Market	✓	?	✓	X	X	✓

# My proposal: Goals

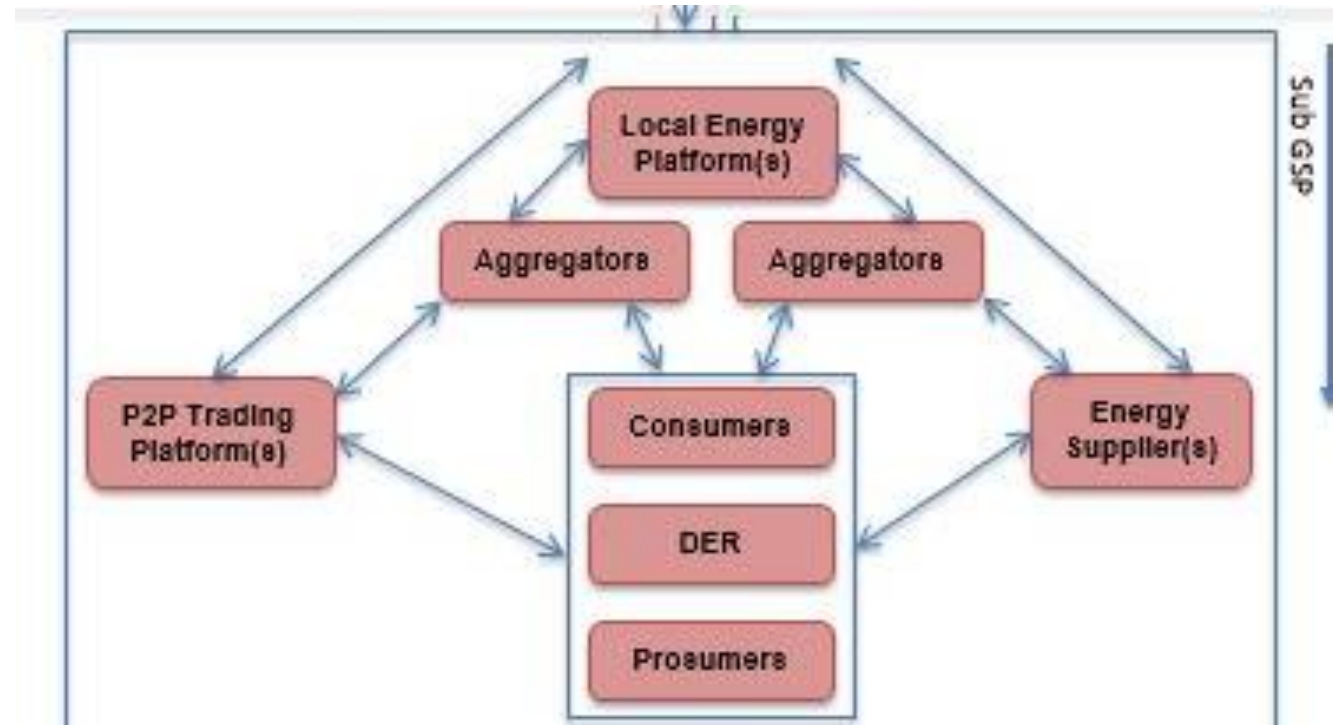
- An energy efficient system based primarily on renewable generation requires an electricity market design which values, and incorporates, their characteristics.
- Assets should be able to trade with whomever they wish, be this in their local neighbourhood or into national markets
- Reduction of overall GHG emissions stemming from the electricity system (to include heat or mobility when via electricity) should be delivered i.e. to meet decarbonisation targets
- Consumer protection should be in place, whether prices, security of supply, equity or data.
- All assets – transmission or distribution / supply, demand and storage / energy or system - should have their value revealed

# My proposal: methodology

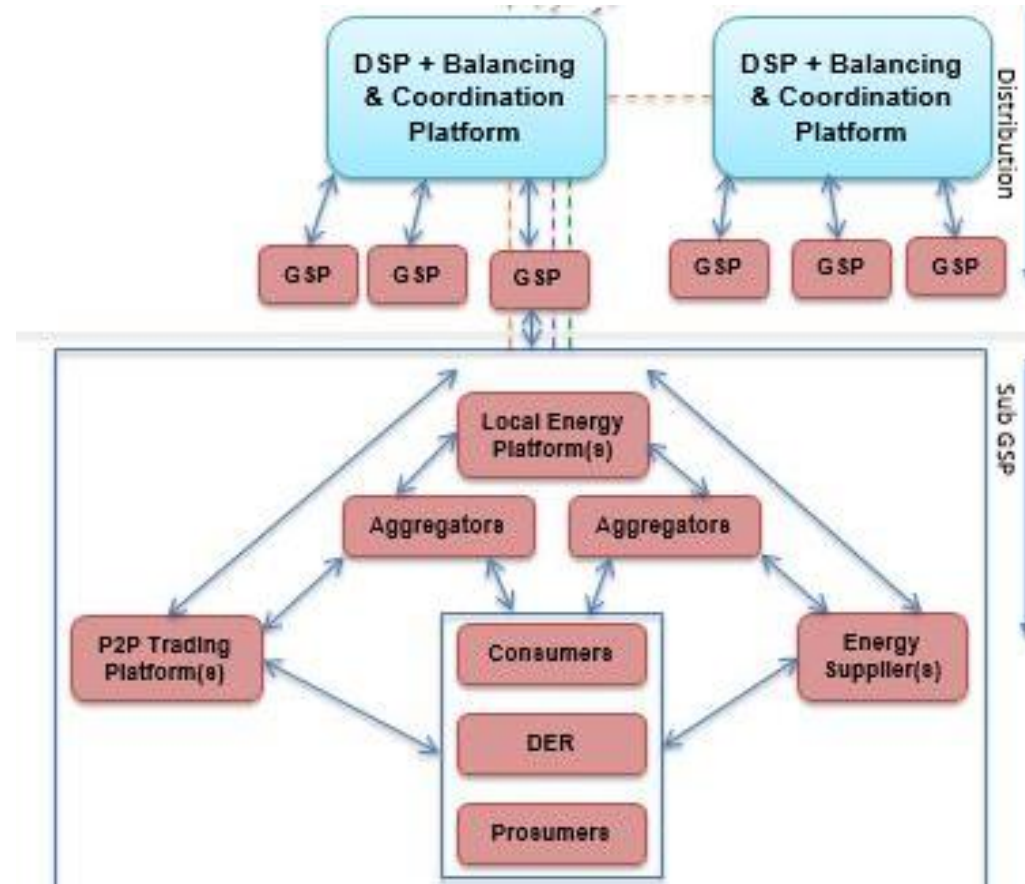
- Reviewing current electricity market design proposals
- Creating a design based on the ‘features’ of these proposals
- Proposing this design to key electricity market design experts in Great Britain

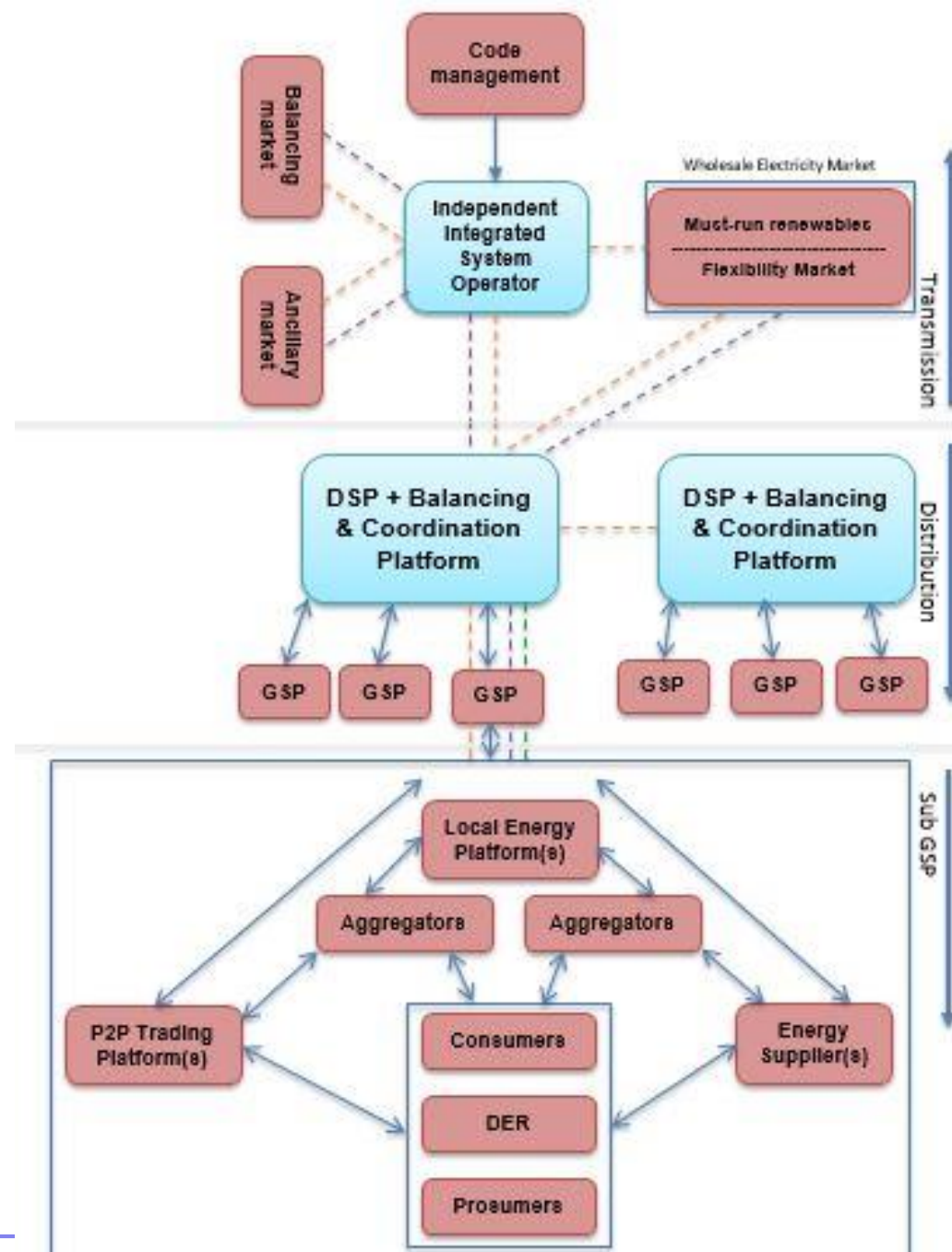


# Sub-Grid Supply Point



# Distributed Service Provider (DSP)





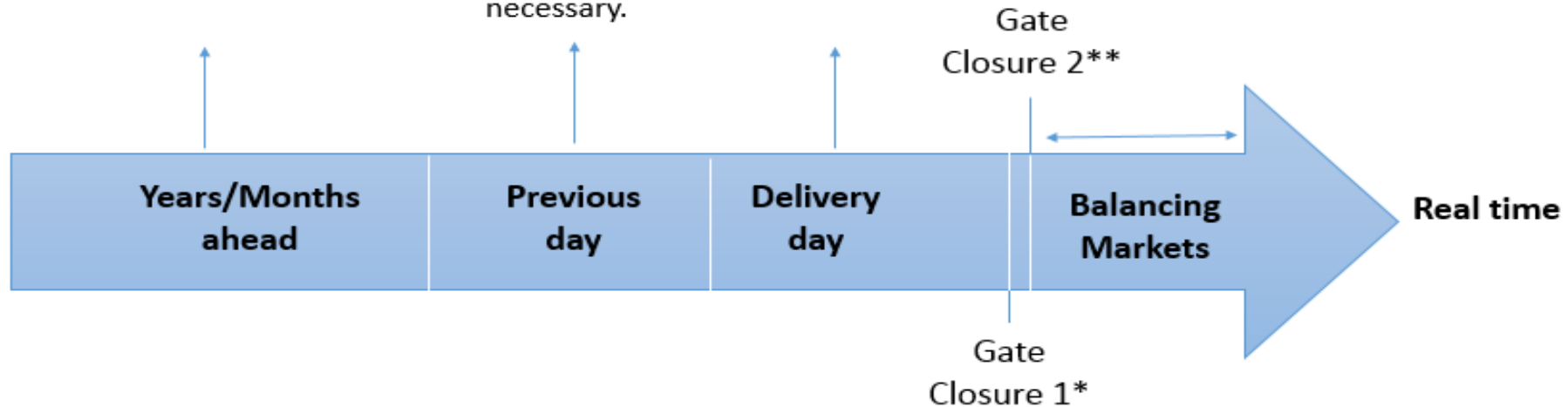
# Timeline

**Dx:**  
Long-term contracts set up between parties. i.e. energy suppliers, P2P, prosumers and consumer

**Tx:**  
Assets contract into the wholesale market


**Dx:**  
Forecasts sent to DSP.  
DSP considers if actions are needed. P2P, aggregators, consumers etc. strike contracts. All info sent to DSP.


**Tx:**  
Renewable forecasts to the market operating body. Firm market participants make preparations as necessary.





# Tak!

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## Thank you for listening

## Questions?

Please contact me at [t.pownall@exeter.ac.uk](mailto:t.pownall@exeter.ac.uk) to discuss this  
further