

# Electricity market design for a sustainable, secure and efficient electricity system in the UK

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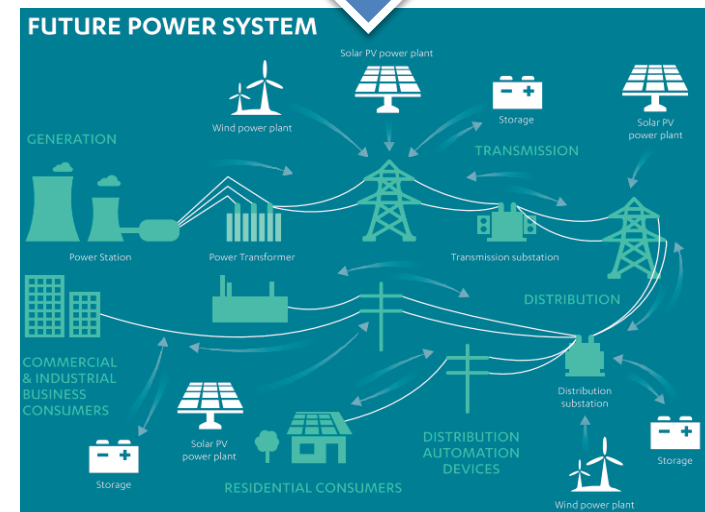
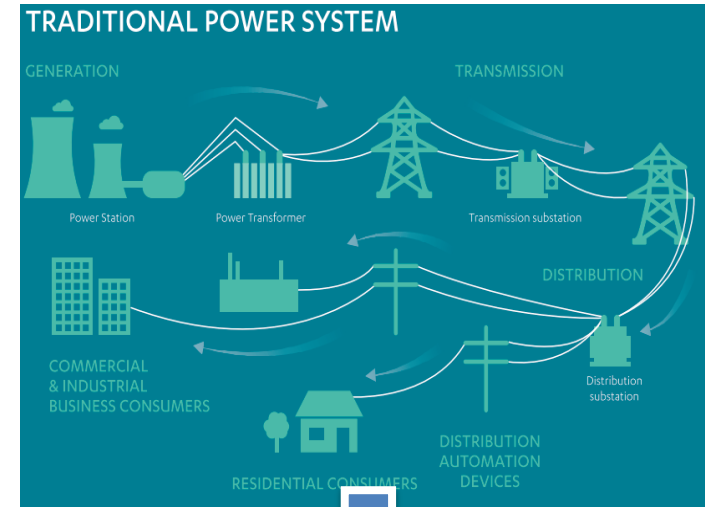
Energy Systems Catapult

# Structure

- The need for a new market design
- Two research interests of my PhD
- Guiding principles for this new design?
- Many ways of designing our electricity market
- My design
- Next steps in my research
- Summary slide

# The need for a new market design and how this would be designed

- Largely unchanged market design since BETTA, however rapid electricity system change.
- Need to see parallel change in how our electricity market is designed.



# Two research interests of my PhD

- Research interest 1:
  - The actual proposal of a Fit for Purpose electricity market design for the UK
- Research interest 2:
  - Institutional barriers to implementing a new electricity market design

# What guiding principles should shape how this design looks?

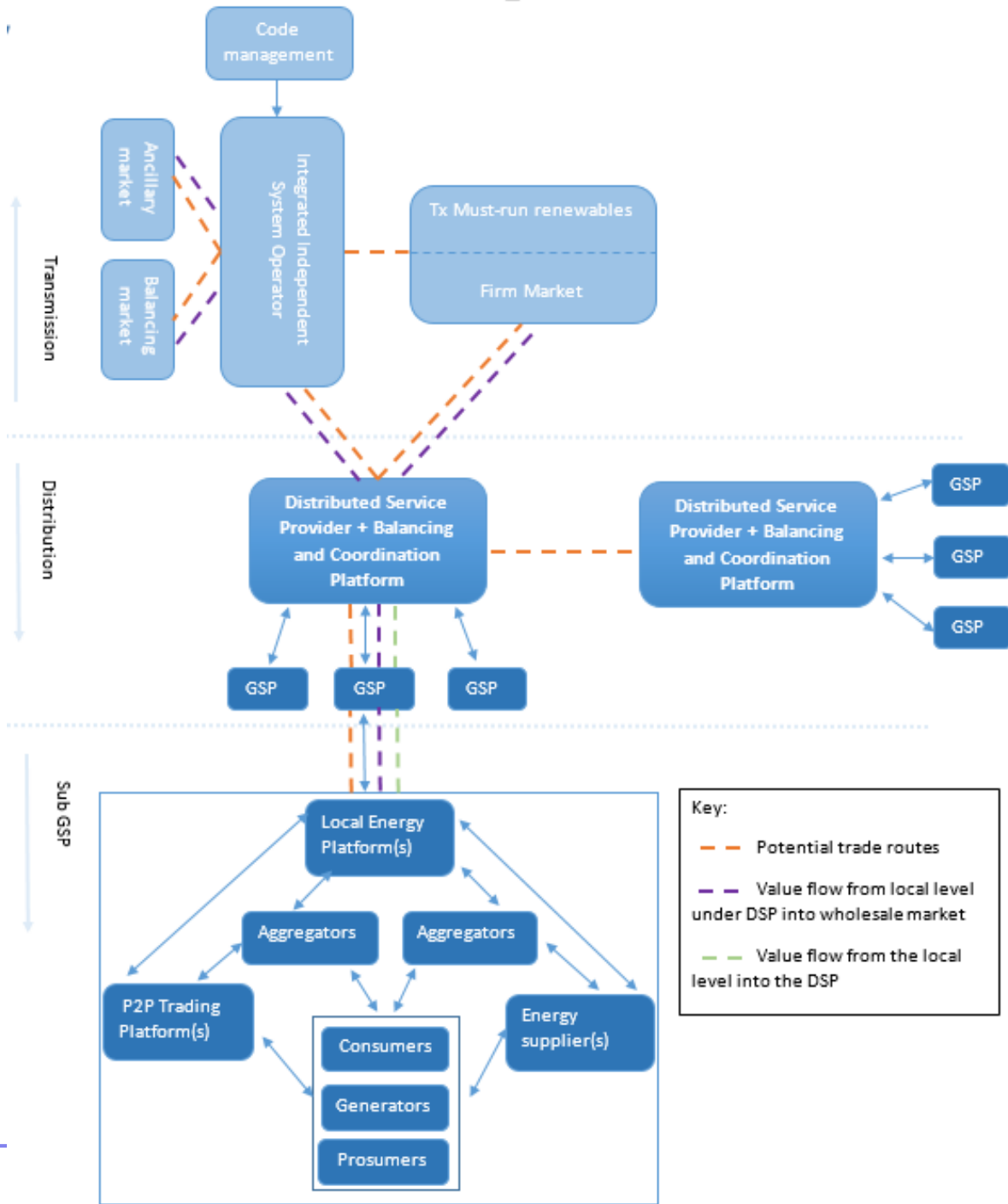
- Correct the market failures as close to their source
- De-risk the financing of low carbon investment
- Promote efficient investment
- Robust to alternative futures
- Increased market liquidity
- Consumer protection and integration into markets
- Foster innovation
  - (Bauknecht et al. 2013; Ilieva et al. 2015; Mitchell 2015; CMA 2016; IEA 2016; Bielen et al. 2017; Newbery 2017)

# Several academics with differing principles and different ways to arrange our electricity market

Feature	The Two Tier Market. Keay and Robnison	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	✓
Power Purchase Agreements	?	?	?	?	✓	?
Aggregation	✓	✓	?	?	✓	✓
Settlement Periods	?	?	?	?	?	?
Clip Size Entry Requirements	?	?	?	?	?	?
Gate Closure	✓ ?	?	?	?	?	?
Imbalance Charge	✓ ?	✓	?	?	?	?
Local Energy Market	X	✓	X	X	X	✓

# My Design

Feature	Current UK market design	Proposed market design
Markets at the wholesale level	✓	✓
Two-tier wholesale market	X	✓
Capacity Market	✓	X
National Ancillary Market	✓	✓
National Flexibility Market	X	✓
National Renewable Pool	X	✓
Grid priority for Renewables (Tx and Dx)	X	✓
National must run renewables (Tx and Dx)	X	✓
National Balancing Market	✓	✓
National Futures Market	✓	✓
Day-ahead Market	✓	✓
Intraday Market	✓	✓
Bilateral Trading	✓	✓





<b>Feature</b>	<b>New or altered?</b>	<b>Backing in the literature?</b>
<b>Two-Tier wholesale market</b>	New	(Gimon 2017; Keay and Robinson 2017; Pierpont and Nelson 2017; Rosell et al. 2018)
<b>Must run renewables (Tx Level)</b>	New	(Pfaffenberger and Chrischilles 2013; Keay and Robinson 2017)
<b>Integrated Independent System Operator.</b>	New	(Mitchell 2015)
<b>Flexibility market (wholesale)</b>	New	(Keay and Robinson 2017; Pierpont and Nelson 2017)
<b>Grid priority for renewables (both Dx and Tx)</b>	New	(Pfaffenberger and Chrischilles 2013)
<b>Balancing market (Wholesale)</b>	altered	(National Grid 2017a; Cornwall Insight 2018)
<b>Gate closure</b>	altered	(Bauknecht et al. 2013)
<b>Settlement Period</b>	altered	(AEMO 2017)
<b>Ancillary market (wholesale)</b>	altered	(National Grid 2017b)
<b>DSP + Balancing market</b>	New	(Mohammadi et al. 2011; Vale et al. 2011; Dietrich et al. 2015)
<b>Local Energy and Ancillary Market</b>	New	(Driesen et al. 2007; Werner and Remberg 2008; Vale et al. 2011; Dietrich et al. 2015; National Grid 2017c; Zhang et al. 2018)
<b>Imbalance charges</b>	altered	(IEA 2016; Mitchell et al. 2016; Elexon 2017; Keay and Robinson 2017; Zhang et al. 2018)
<b>Stacking</b>	altered	(BEIS 2017; National Grid 2017a)

# Next steps for my research

- Interview with experts
- International insights from Denmark
- Feedback on my electricity market design
- Also providing insights into institutional barriers to altering market design

# Summary

- Energy system is changing
- Market design is lagging behind
- Need to change the market design
- There are many ways to design an electricity market
- Proposals for new market design will likely be met with resistance
- These are my areas of research interests.

Thank you for your time, any questions?

# Recommended reading

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