



Delivering a Smart Energy System

Peer-to-Peer Energy Markets

From Economy of Scale to Economy of Sharing

- Delivering Value to Renewables and Flexibility

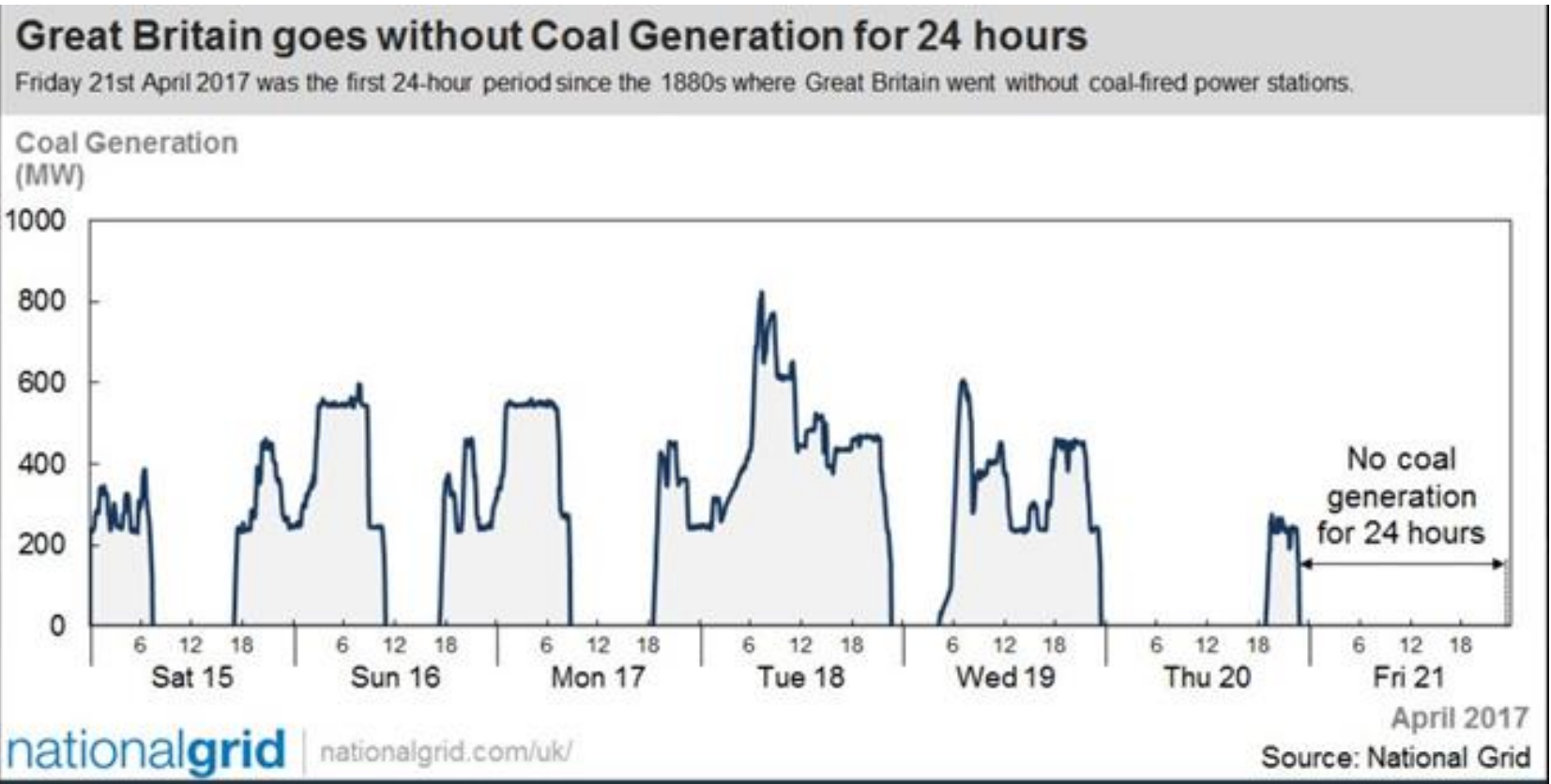


Professor Furong Li/Dr Seyed Fazeli

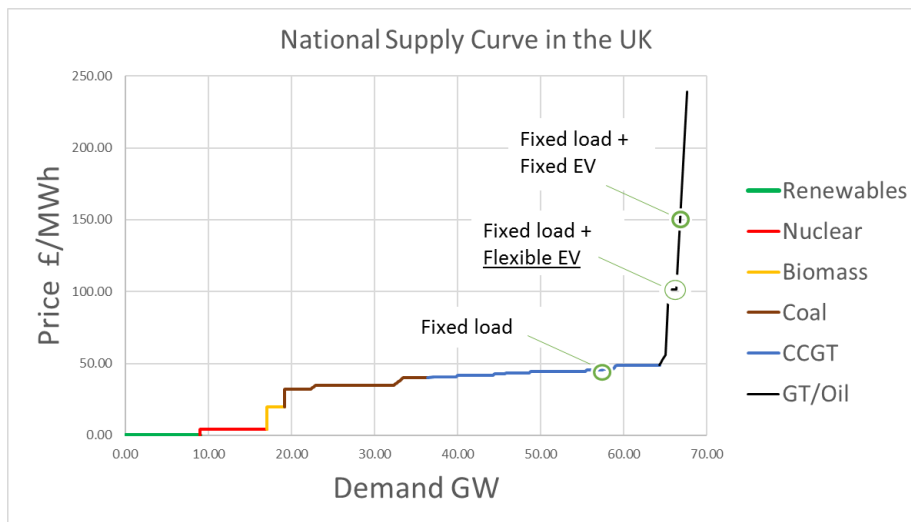
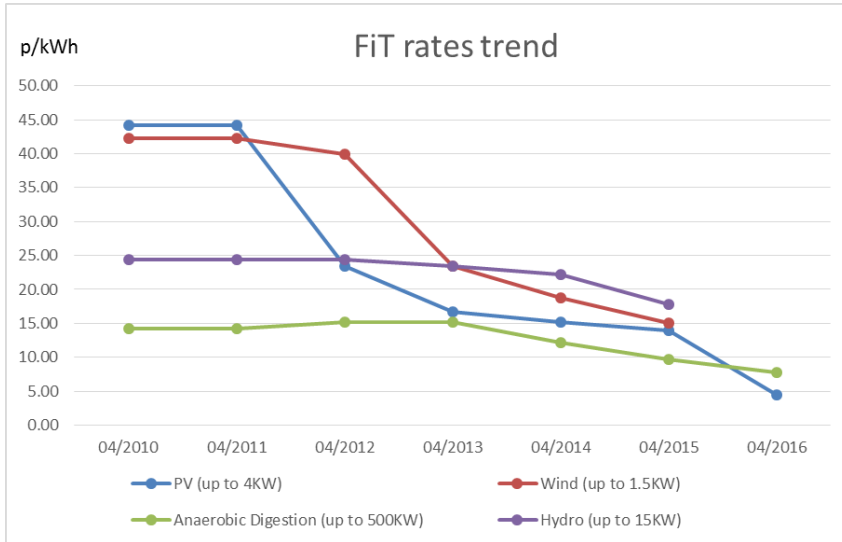
University of Bath, UK

4th July 2017

Milestone in Our Low Carbon Transition

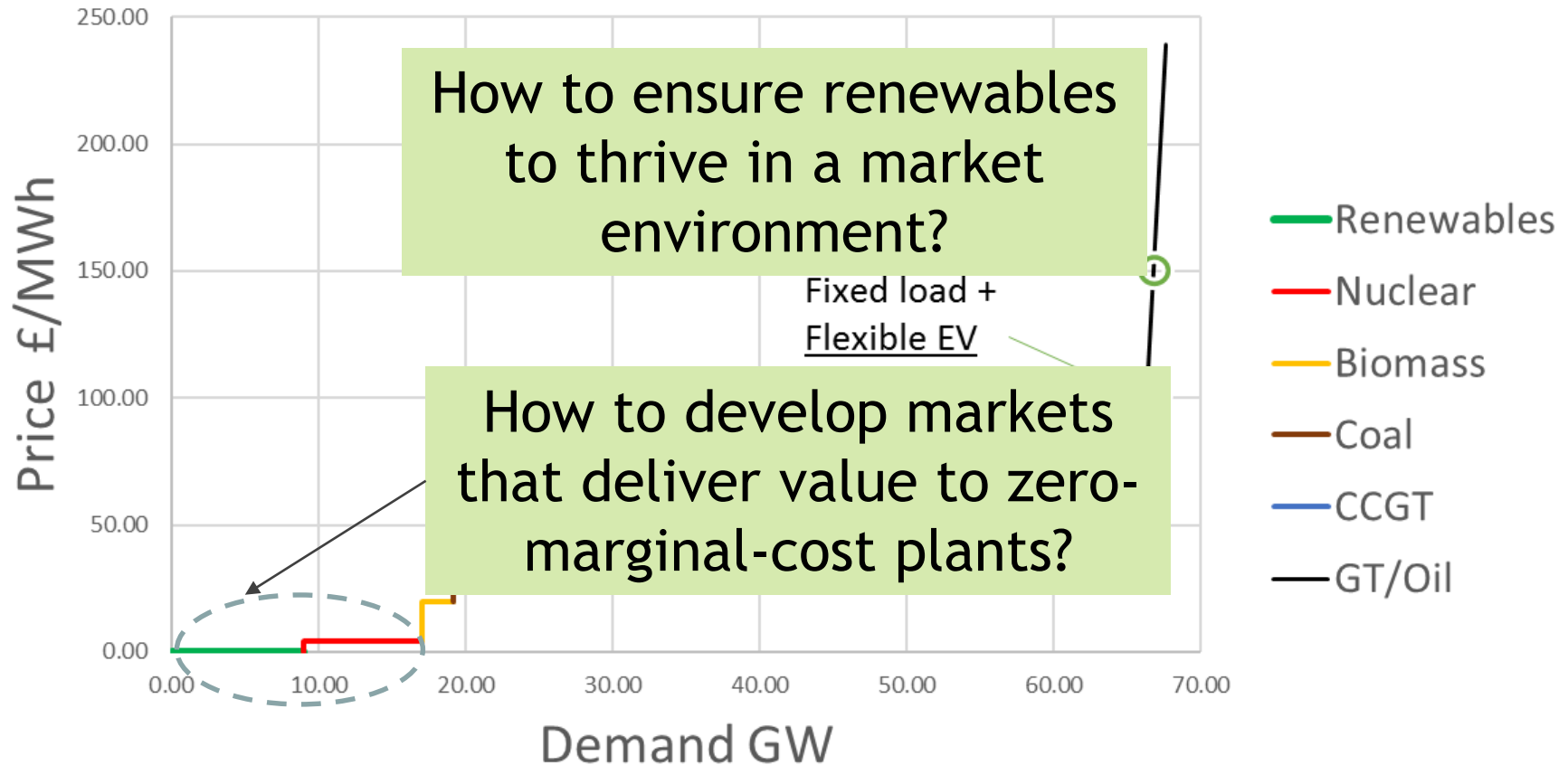


Next Milestones - No Gas Day, No Carbon Day

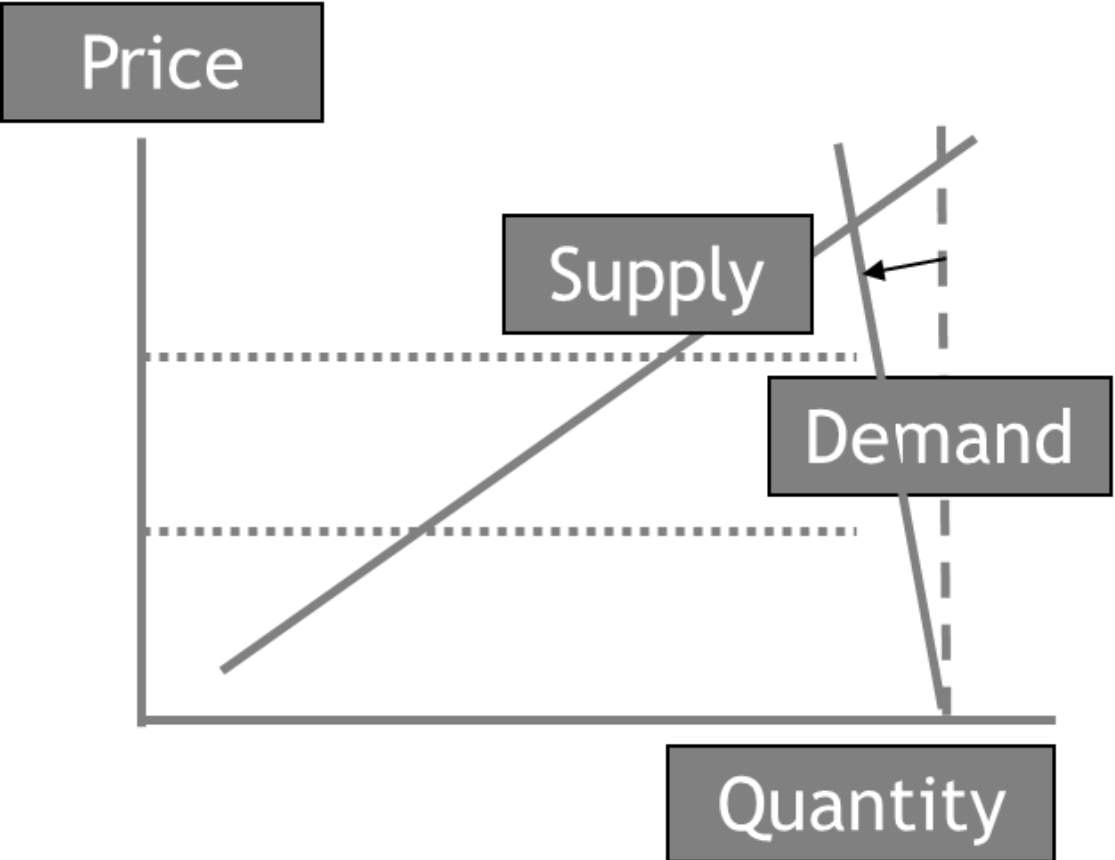


Next Milestone - No Gas Day - No Carbon Day

National Supply Curve in the UK

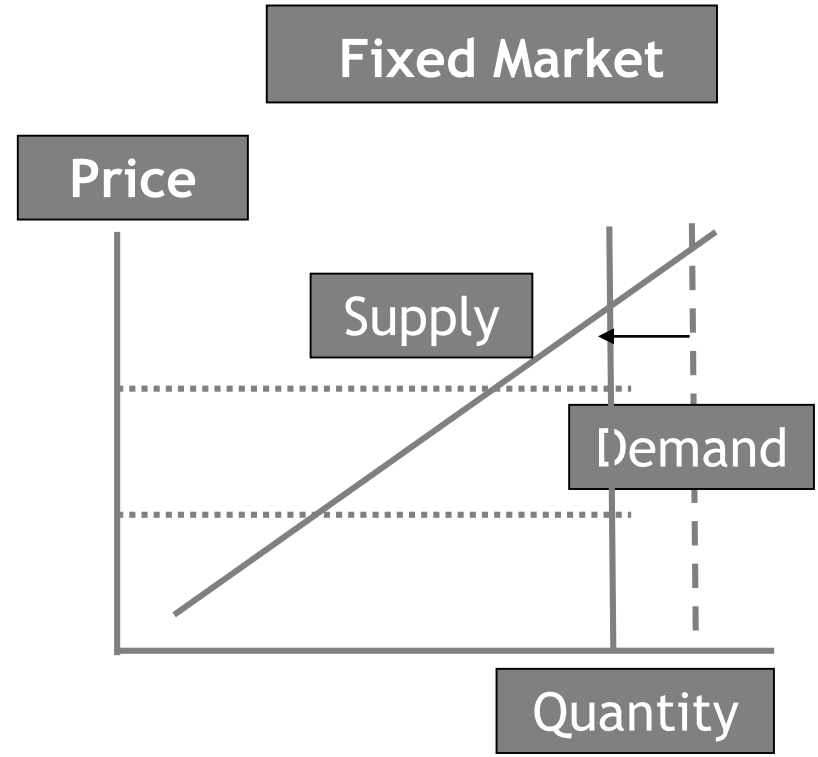
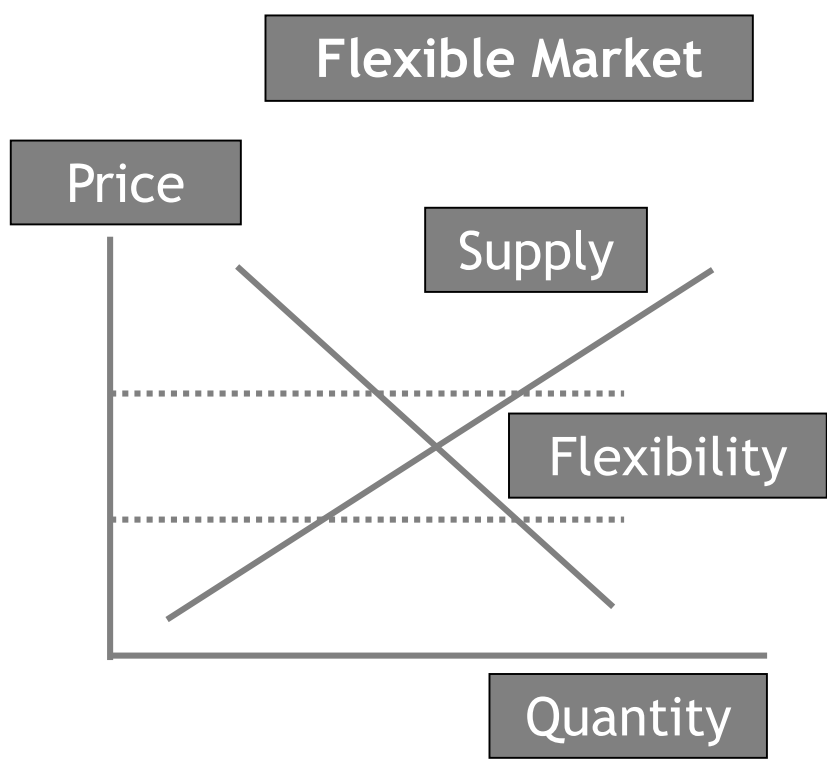


Traditional Market for Flexibility

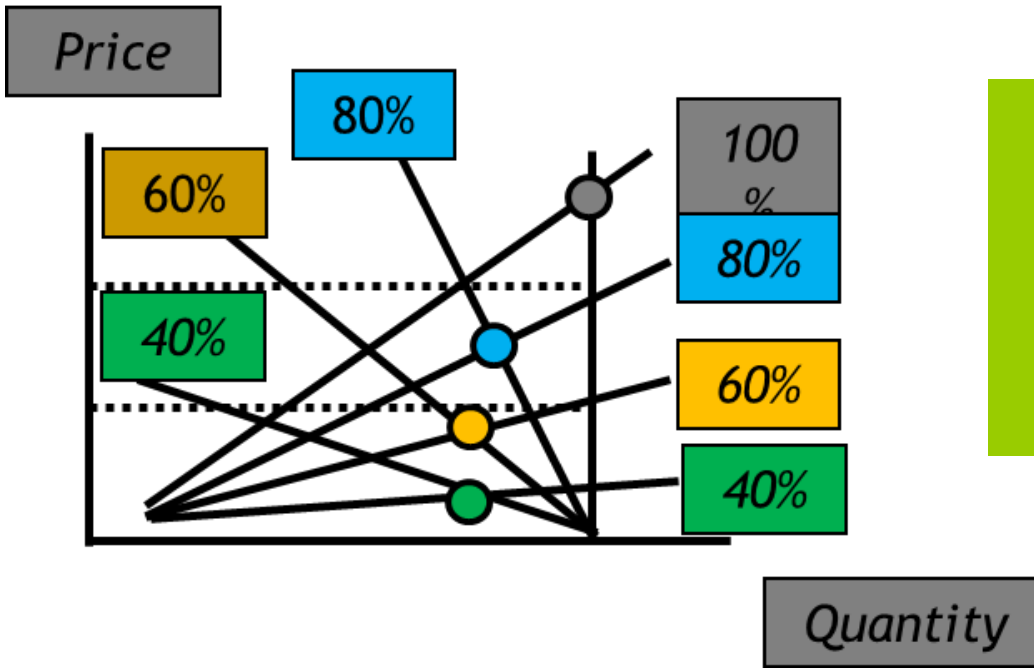


Fixed and Flexible Demand

Split Fixed and Flexibility Market



Flexibility Market - Sharing Economy



Mass Customisation
More Energy Choices for Differing Degrees of Flexibility

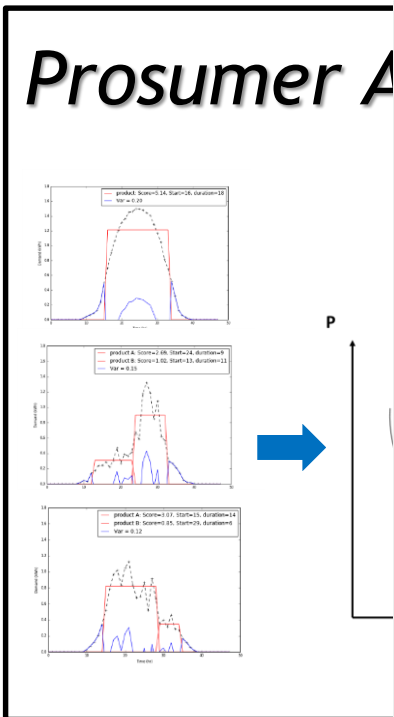


Economy of Scale:
Increase Demand for Energy



Economy of Sharing:
Increase Demand for Energy & Uncertainty

Sharing Economy - P2P Market



Shop by category

Electricity

All Categories

Search

All listings

Auction

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Best Match

123,456 results for Best Matches

United Kingdom - UK

Postcode

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Prosumer A1

Prosumer B4



1. What do we trade?
2. How do we trade?



Show more Best Matches

123,456 results for Single Prosumer



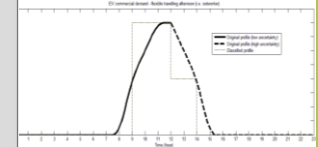
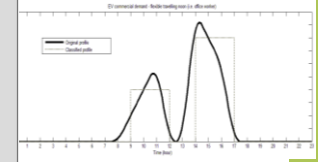
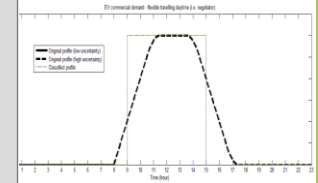
Prosumer A1



Prosumer B1

Show more Single Prosumer

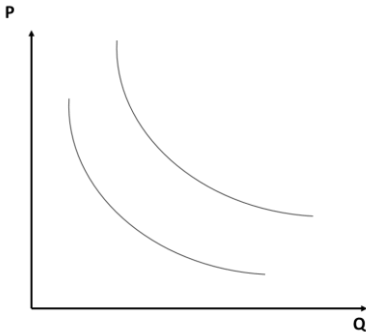
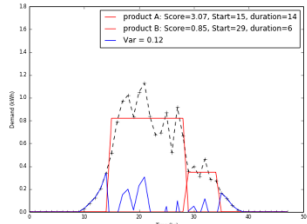
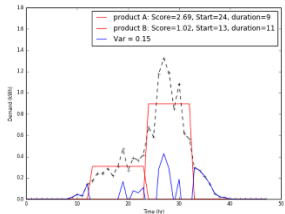
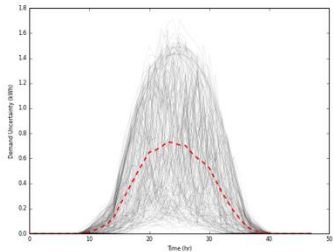
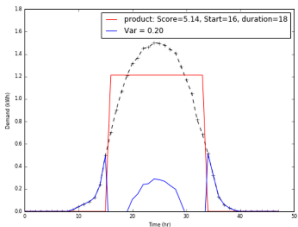
Prosumer B



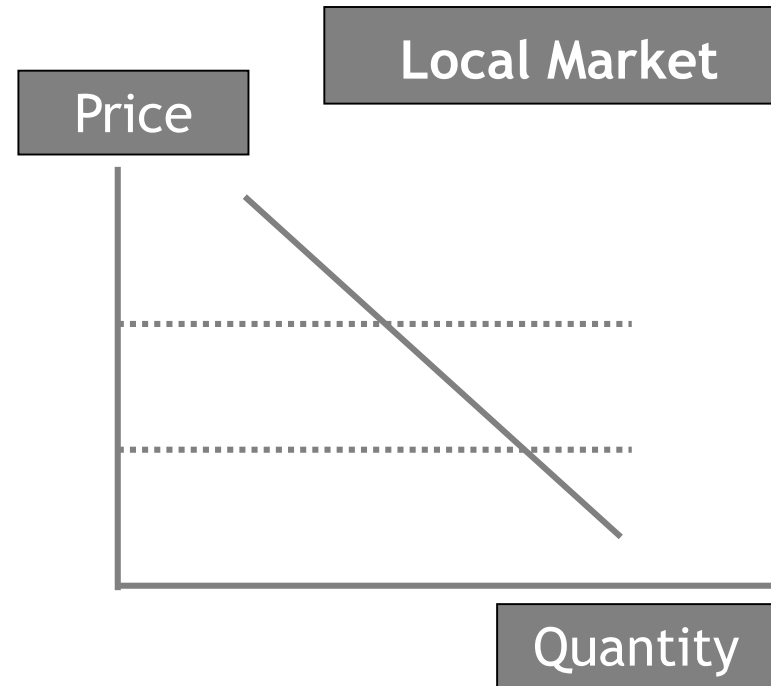
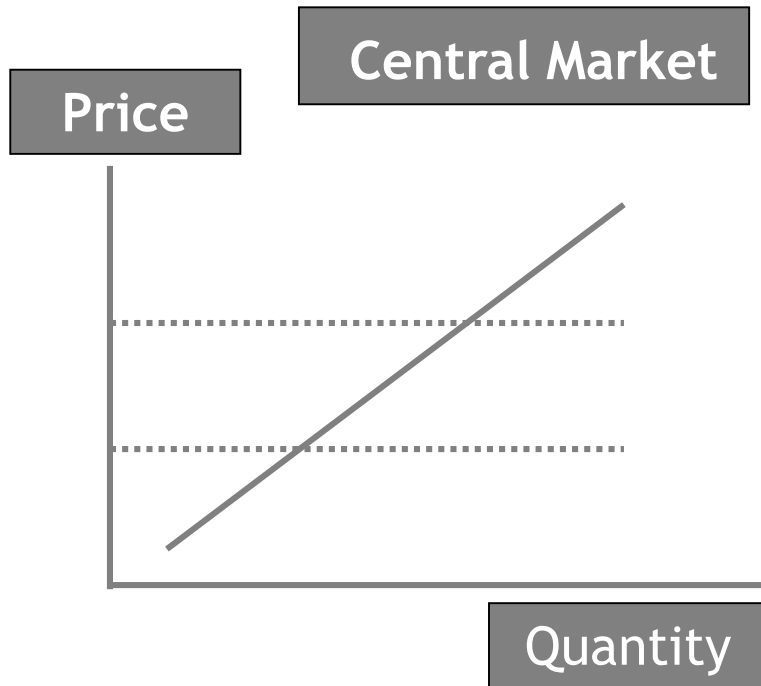
What Do We Trade?



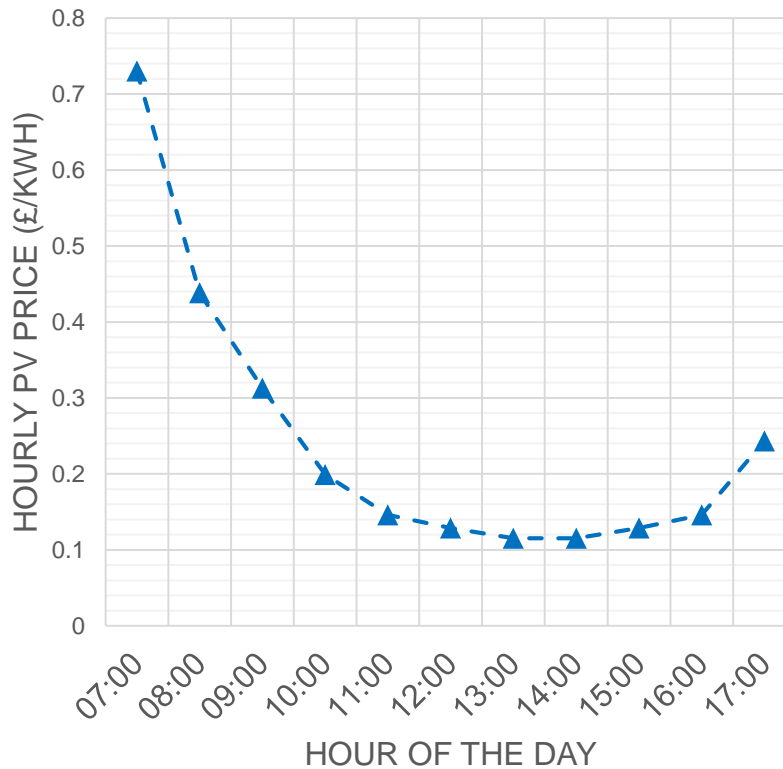
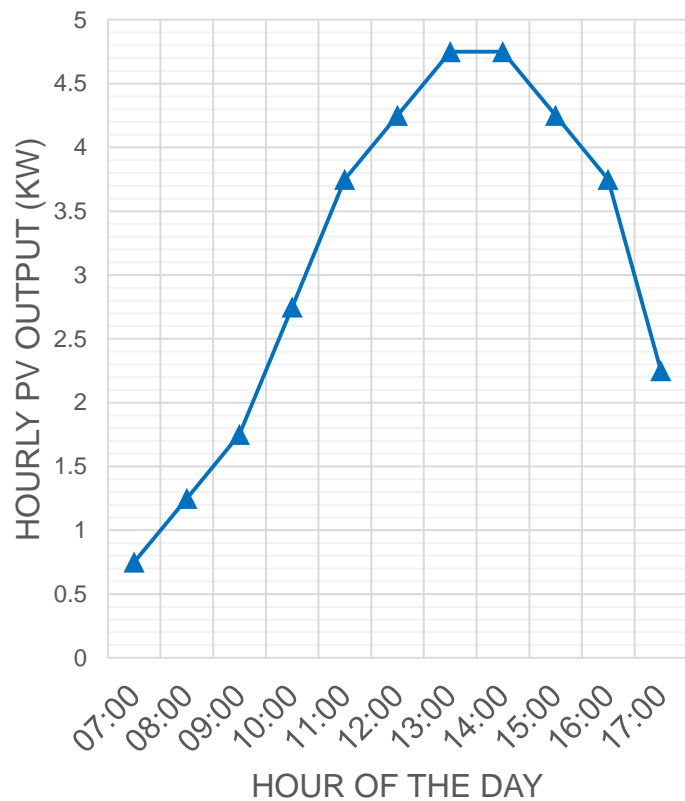
Prosumer A



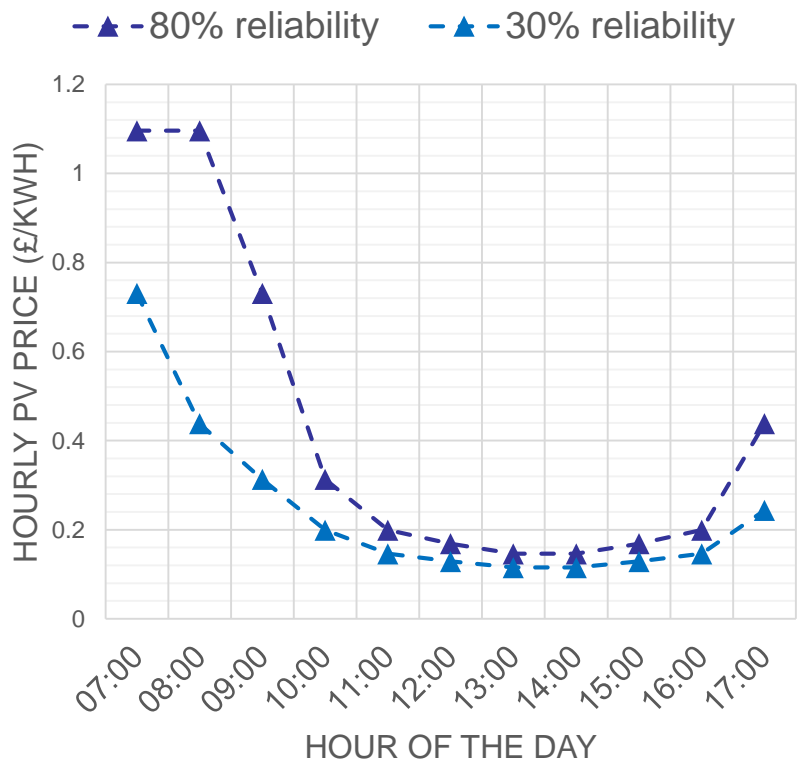
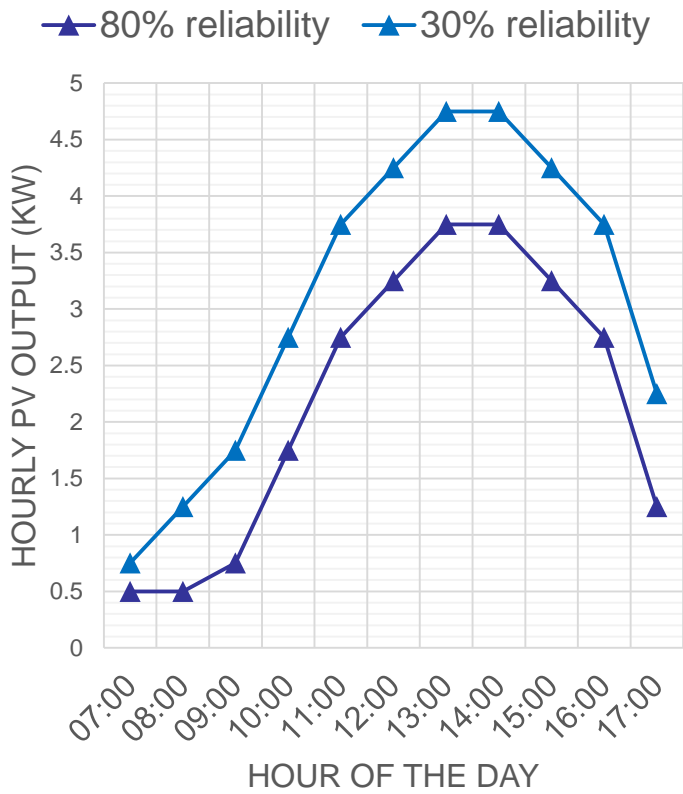
Supply Curve: Fossil versus Renewables



What Do We Trade - PV Pricing



What Do We Trade? - Stochastic Pricing

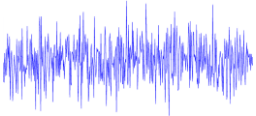
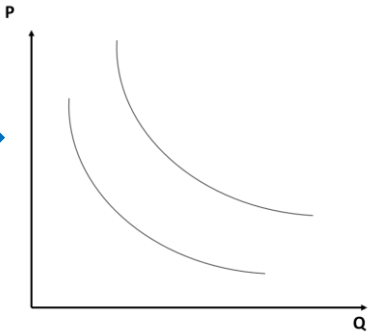
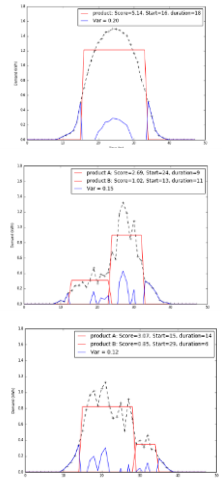


- Increase Demand for Renewables
- Deliver Value to Flexibility

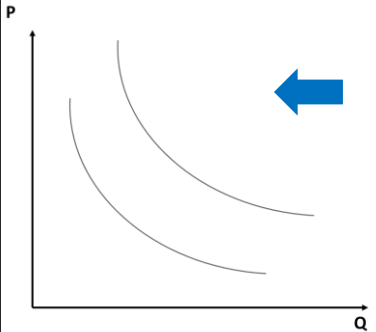
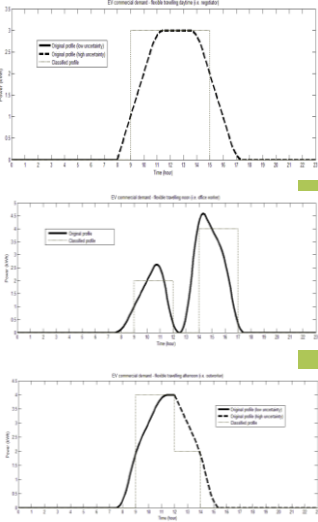
How Do We Trade?



Prosumer A



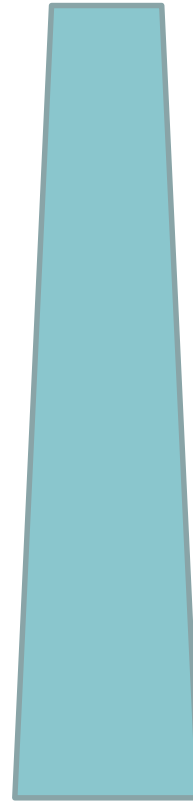
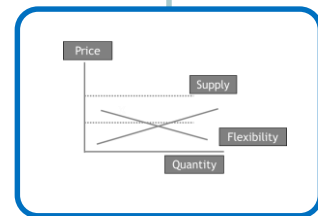
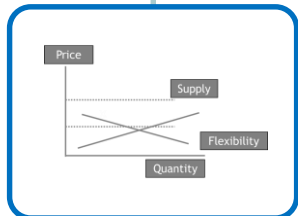
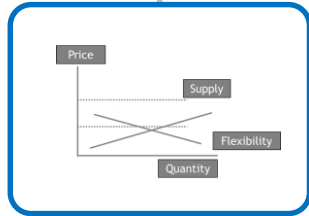
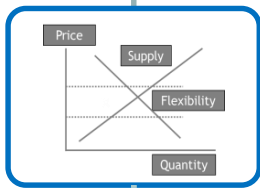
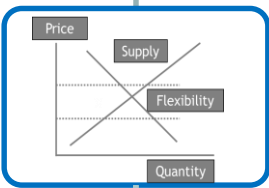
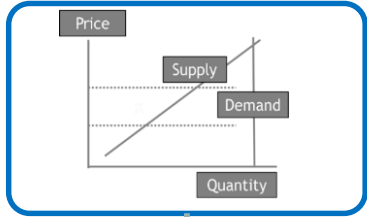
Prosumer B



Intelligent
Automated
Forecasting
Pricing
Matching



Horizontal and Vertical Markets



Uncertainty

Current Project

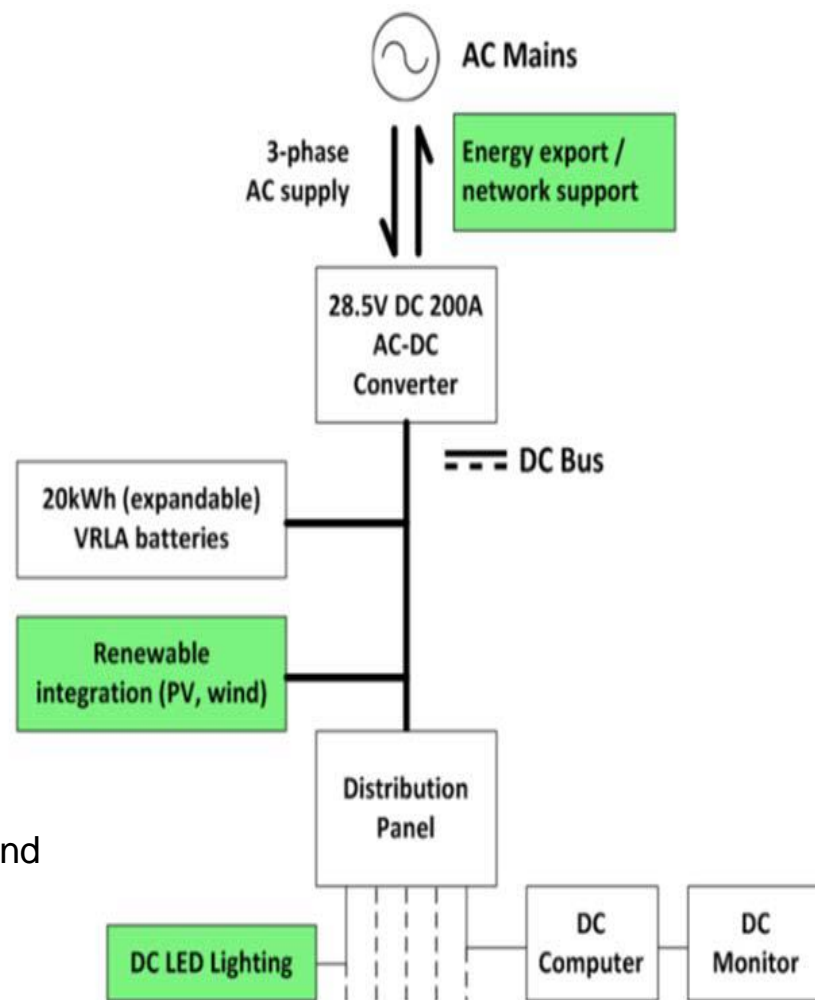


Peer-to-Peer Energy Trading and Sharing - 3M (Multi-times, Multi-scales, Multi-qualities)



DC Library (2010-2014)

- Motivation : Examining a local DC Networks in terms of flexibility, efficiency, reliability, Power density (potential benefits).
- Details : A local DC Network was installed on the fifth floor of the library with a centralised AC/DC converter and then used to run a suite of 50 specially adapted DC computers and DC monitors.
- Key Findings:
 - i) Simplifying the design using fewer parts
 - ii) Reducing the cost and carbon emissions
 - iii) Increasing the reliability by installing batteries
 - iv) Improving the efficiency by reducing the distortions and harmonics
 - v)



Structure of DC Library Project

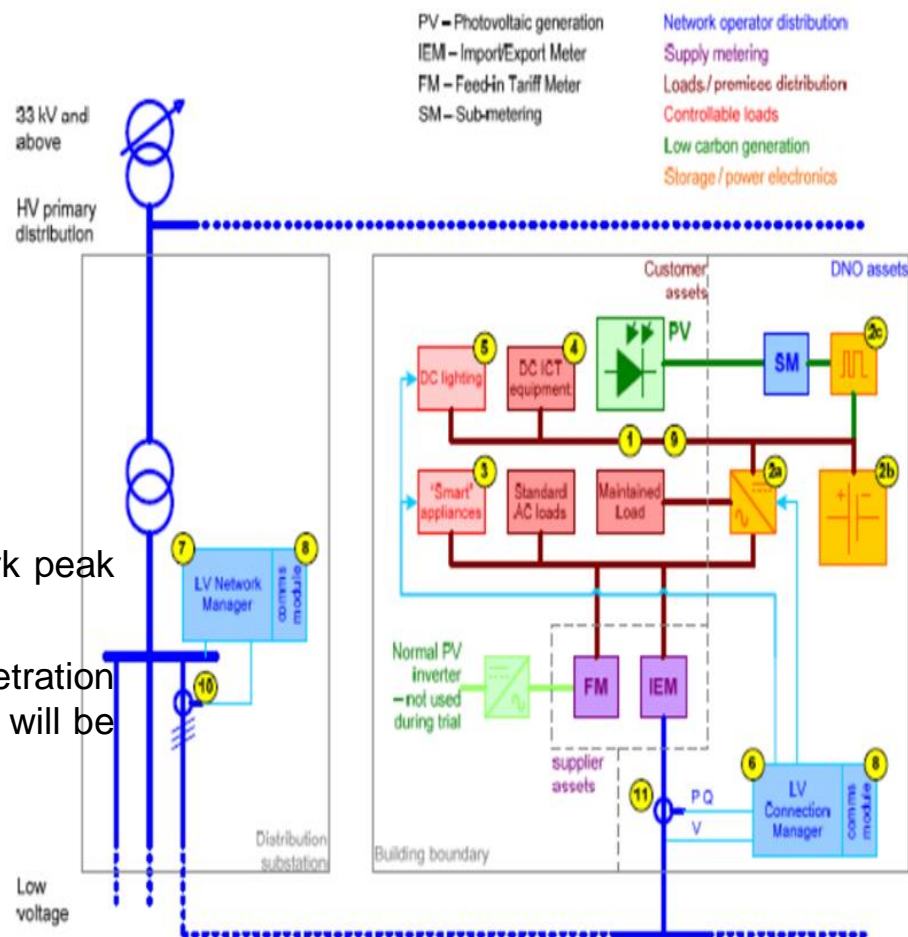
Williamson, Benjamin J., et al. "Project Edison: SMART-DC." Innovative Smart Grid Technologies (ISGT Europe), 2011 2nd IEEE PES International Conference and Exhibition on. IEEE, 2011.

Sola Bristol Project (2010-2014)

- Motivation : Address the technical constraints that DNOs expect to arise on LV Network as a result of the adoption of solar PV.
- Details : Twenty-six households, five schools and an office were commissioned with solar PV, battery storage and energy management systems.

Key Findings:

- i) Increasing the bill saving up to 67% and network peak demand reduction for 233%.
- ii) Deferring the network investments (With the penetration of EMS increased to 30% and 50%, the deferral will be 4 years and 6.5 years respectively)
- iii)



Structure of Sola Bristol

R & D Platform

- Motivation : i) Hardware-in-the-loop assessment of supply security, ii) Examine the proposed model accuracy, iii) Perform the proposed controllers,....

HEAPD project (UK & India)

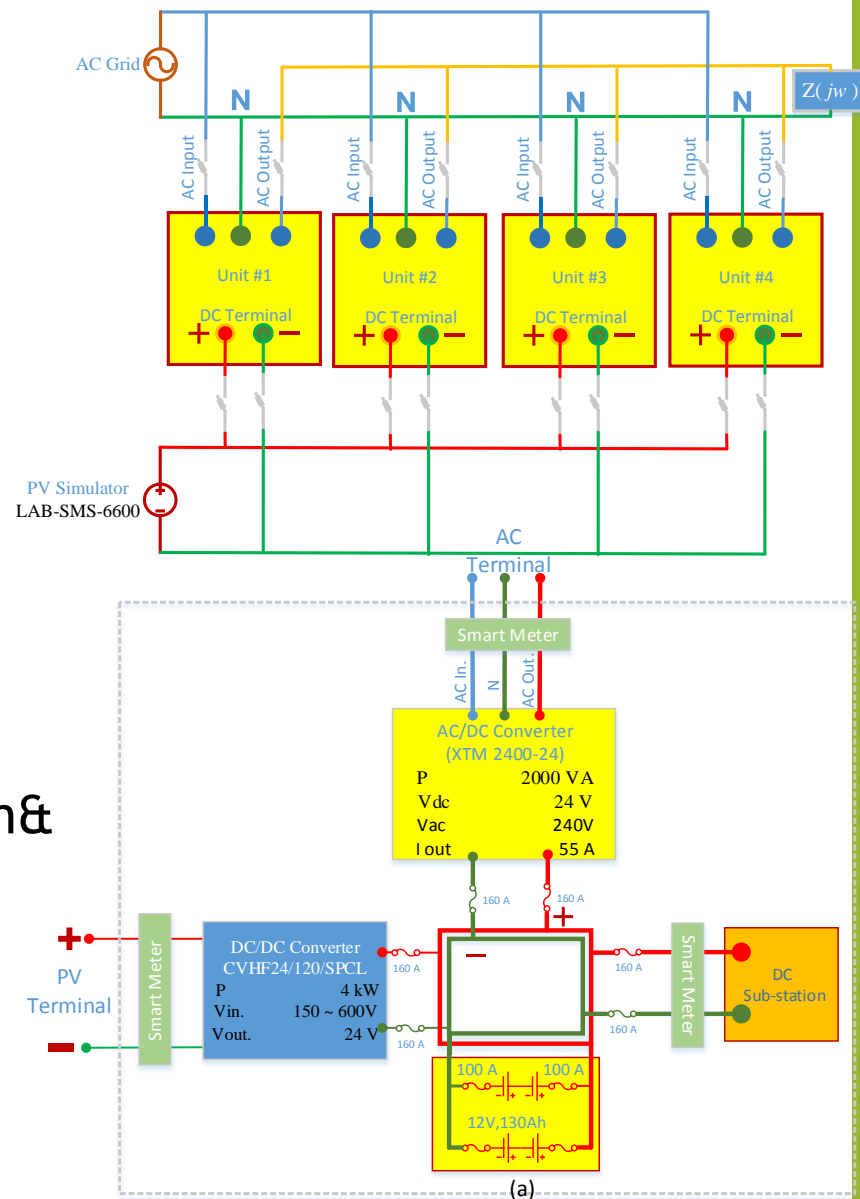
- Motivation : Investigate on local DC capabilities such as demand reduction, demand shifting, demand security, and i) Hardware-in-the-loop assessment of supply security, and system operation costs,..

<https://heapdproject.com/>

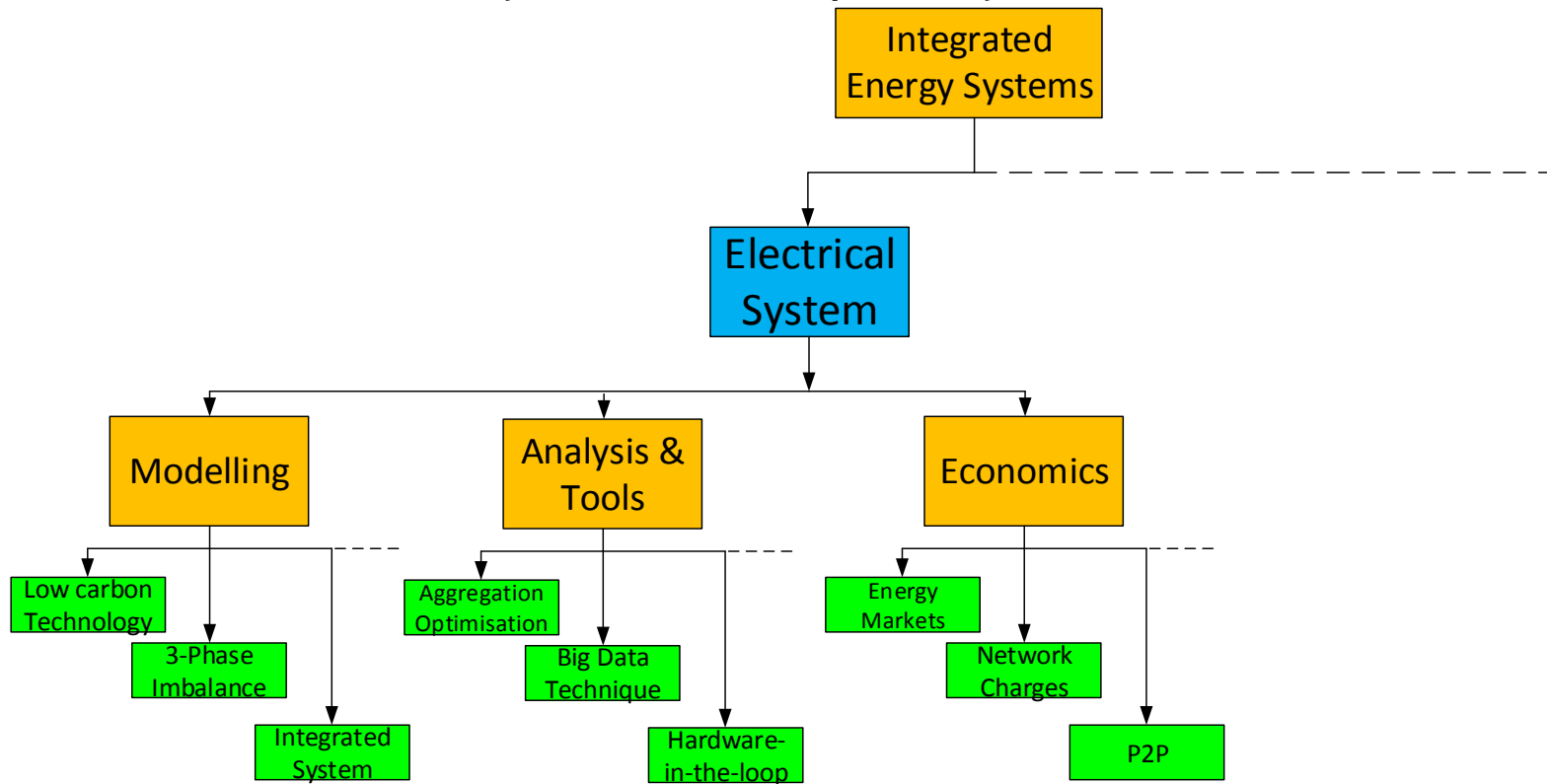
P2P Smar-Test (UK & Finland & Spain & Belgium)

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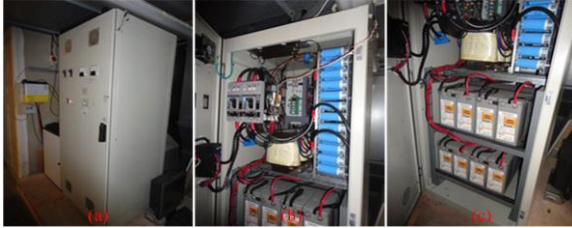
EMBOSSA Project (UK & South Africa)



Key Research Capability



Research and Projects in CPSD



DC Library



Solar Bristol

Thank you



R&D Platform