Paper No: 17PESGM2685

Empowering Renewable Energy Prosumers through Big Data Analytics

Prof Gary Taylor [1,2], Prof Panos Louvieris [1,2]
Smart Power Theme[1]
Big Data Analytics Cluster[2]
Brunel University London

Gareth.Taylor@brunel.ac.uk
Panos.Louvieris@brunel.ac.uk

The Paris Climate Agreement Is Now International Law (4th November 2016)

EU Key Targets for 2030

2030 Climate & Energy Framework

- At least 40% cuts in **greenhouse gas emissions** (from 1990 levels)

- At least 27% share for **renewable energy**

- At least 27% improvement in **energy efficiency**

Changing Energy Landscape in UK

Power Station
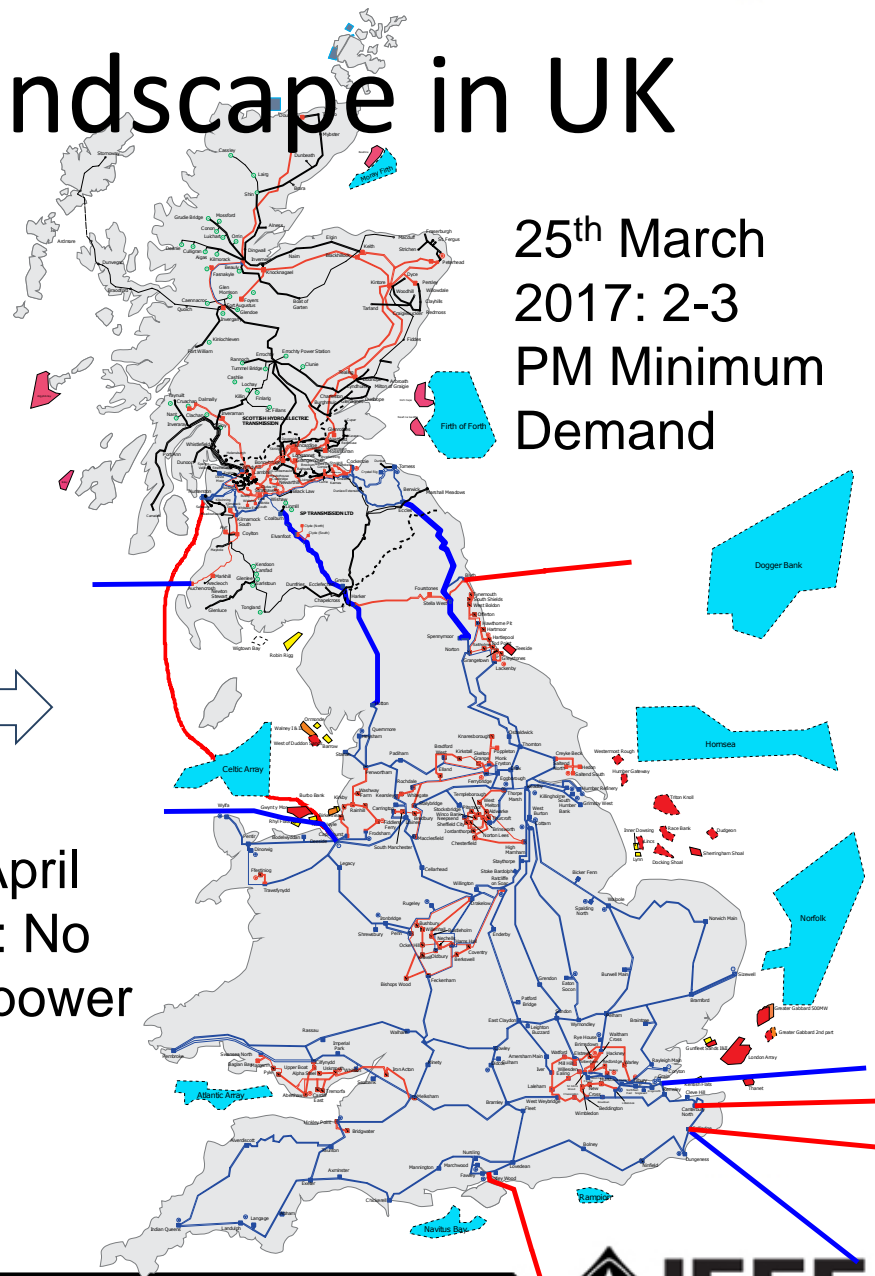Closures
≈ 25%
of total capacity by 2020
vs 2010 levels

Decarbonise
Electricity
80%
CO_2 reduction by 2050

Energy from
Renewables
≈ 15%
of total supplies by 2020

25th March
2017: 2-3
PM Minimum
Demand

21st April
2017: No
coal power

Power & Energy Society®

"Consumers" at the heart

- **EE-06-2016-2017: Engaging private consumers towards sustainable energy (H2020)**
  - "Specific Challenge: Consumers should be considered at the **heart** of the energy system and become **active** market players. The future private consumer should be more aware, active, energy sufficient, as well as being a **prosumer** producing energy for their own consumption, where this is possible."
  - "Empower and facilitate actions for consumers to become **prosumers**, or to form **collective** consumer groups/consumer cooperatives."

- **How do we achieve scale?**
  - **Motivate consumers to participate as energy prosumers**
  - **Highly distributed energy resources (flexible demand and pricing)**
    - **Intelligence through Big Data Analytics**
    - **ICT for Smart Grids: Cloud Computing, Edge Computing, IoT, Blockchain, etc.**

IEEE PES Power & Energy Society®

IEEE

Integrated Energy System
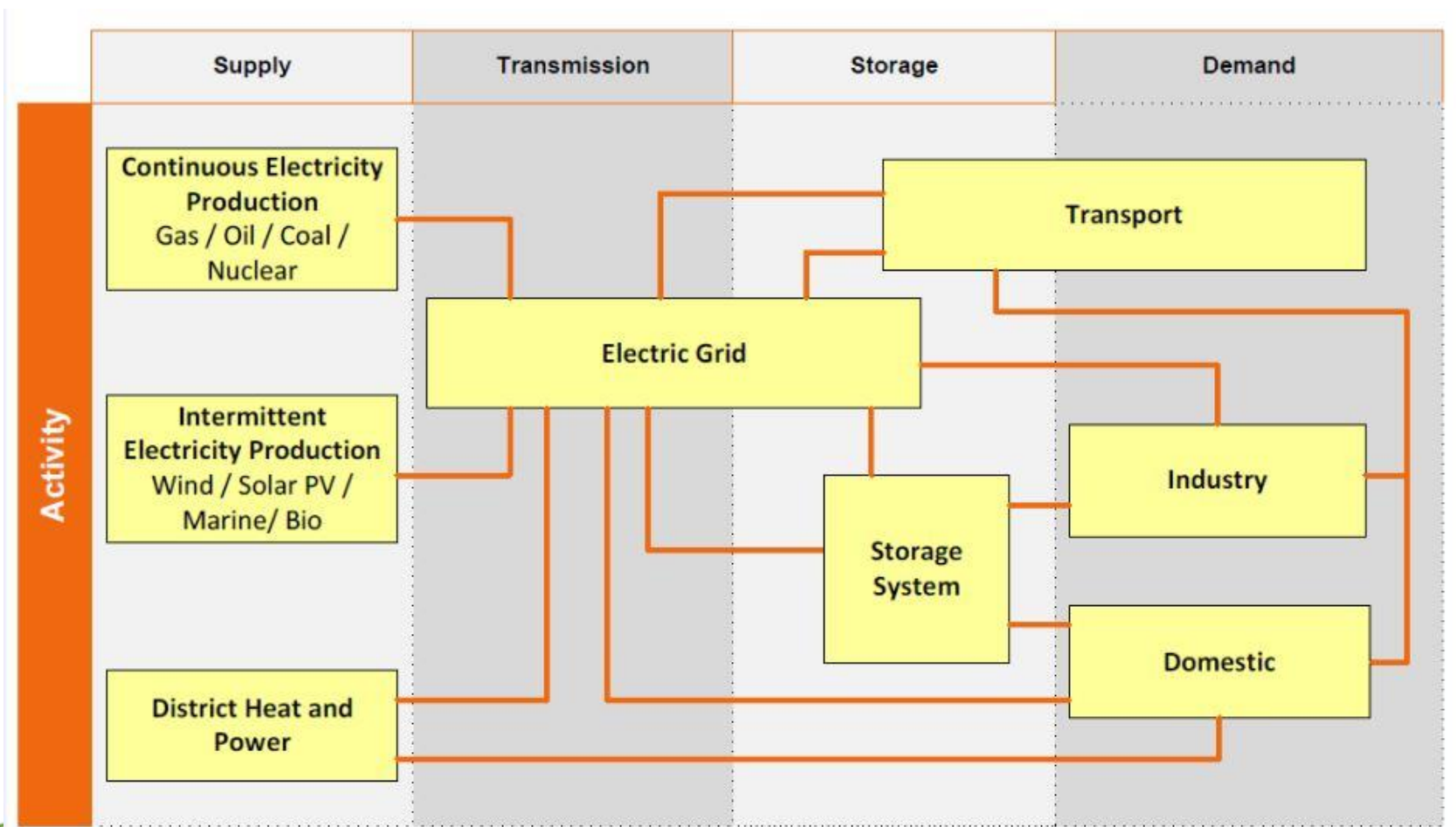
EPSRC Digital Prosumer – Trading data futures

- EPSRC funded project

- Project Aim:

  "Empower citizen prosumers by utilising and exploiting the value of their digital self and to create a tradable futures market in digital personhoods."
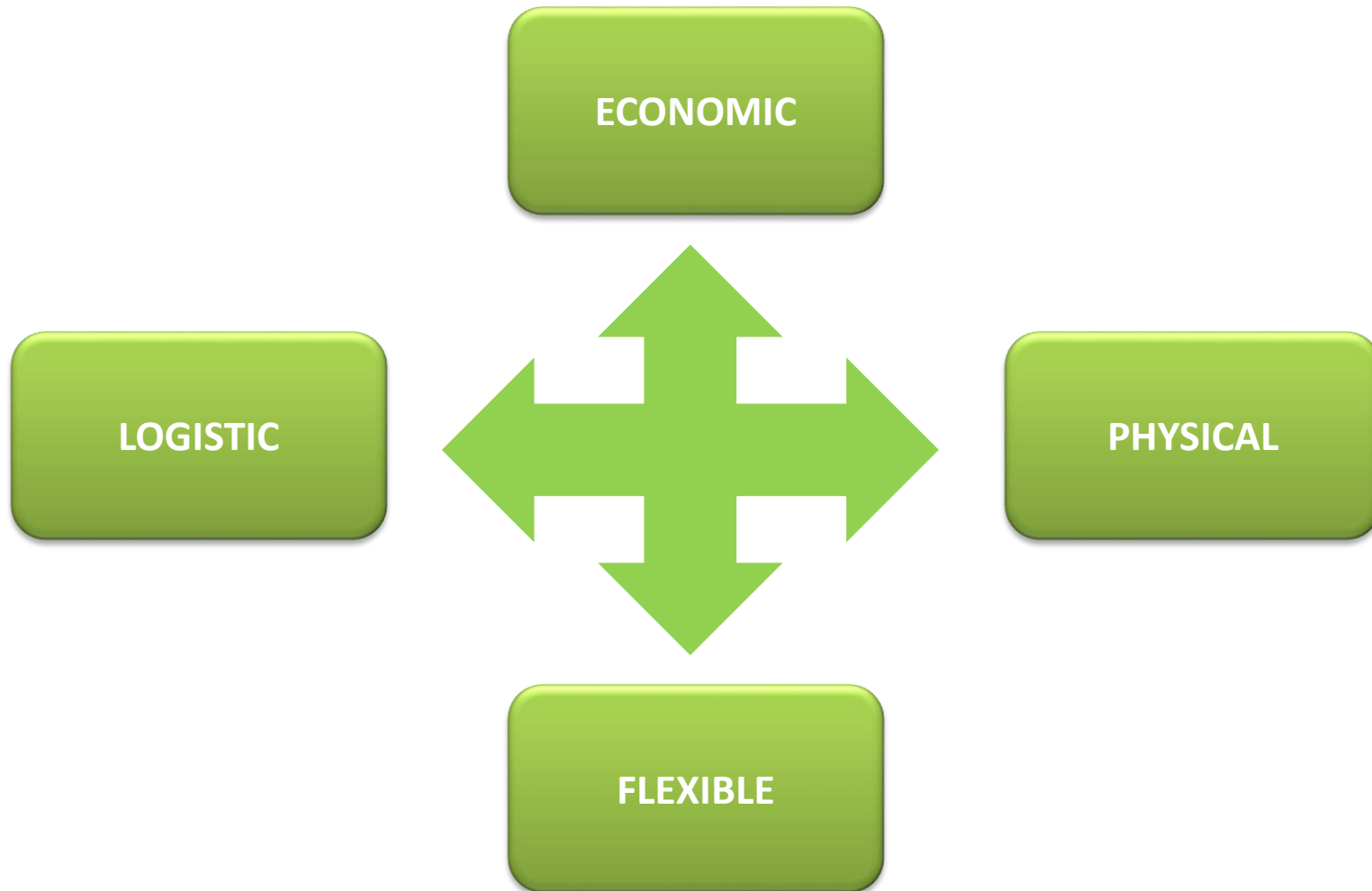
- Research areas addressed:
  - **System Build** – developed an exchange platform for trading personal data as a futures product
  - **Trading** – empowers citizens to control and trade their personal data
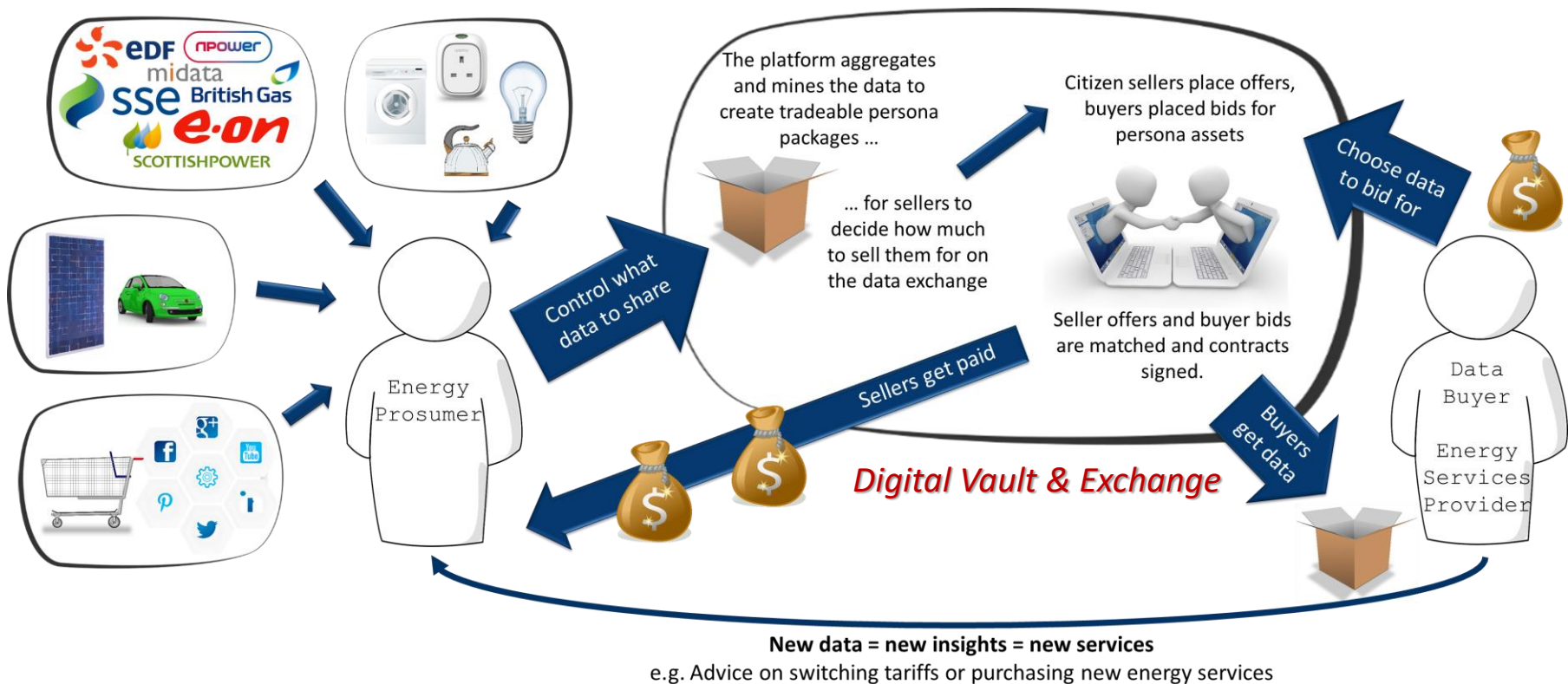 - **Legal** – developed legal framework to trade personal data

Energy Prosumer-oriented Demand Side Response Factors

Digital Prosumer Trading Platform: Empowering Energy Prosumers

The platform aggregates and mines the data to create tradeable persona packages …

… for sellers to decide how much to sell them for on the data exchange

Citizen sellers place offers, buyers placed bids for persona assets

Seller offers and buyer bids are matched and contracts signed.

Control what data to share

Sellers get paid

Choose data to bid for

Buyers get data

Digital Vault & Exchange

Energy Prosumer

Data Buyer

Energy Services Provider

New data = new insights = new services
e.g. Advice on switching tariffs or purchasing new energy services

Big Data Analytics for Smart Power Networks: Science & Technology Effects

- Smart meters and big data analytics ++

- Security and privacy, authentication, provenance, how we establish assurances for data and energy futures

- Big Data Framework for connected IoT

- Smart energy governance → Smart meters, contracts and distributed ledger technologies (Blockchain)

- Batteries 15-20% annual reduction in cost → Next generation batteries are a catalyst for trading renewable energy

- Scalable ICT infrastructure for for highly distributed energy resource management

We, Low Carbon Energy (LCE) Partners

- Current customer experience is outdated.
- Big data analytics in secure smart power networks is providing new ways to engage both customers/suppliers.
- Empowering integrated consumer and supplier decision making.
- New economic model and trading paradigm for energy and data futures.
- Sustainability through smart, flexible, distributed renewable energy and power where:

  I, Prosumer → We, LCE Partners

We, LCE Partners

References

- EPSRC Grant No: EP/L005859/1 'Digital Prosumer'

- http://digitalprosumer.wordpress.com

- http://www.digitalprosumer.co.uk