LowCVP – Beyond the Tailpipe: Powering e-Mobility

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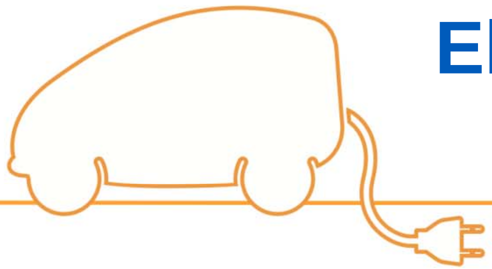


EDF Energy

"We bring affordable low-carbon energy solutions home to everyone"

- Over 50 years of e-Mobility experience within EDF SA
- Pan European co-operation between Group companies across France, UK, Switzerland, Austria, Belgium and Italy
- Significant R&D investment: battery storage, power line communication, induction charging
- A partner in Low Carbon London Smart Grid project
- Board Member of the Energy Technologies Institute – incorporating Smart Homes and Electric Vehicles
- Partners with the Energy Saving Trust to provide end to end service for Plugged in Fleets (PIFI)
- Technical Partner for Induction Charging Trial
- Provides Industry/Technical Expertise to BSI, IET, SMMT

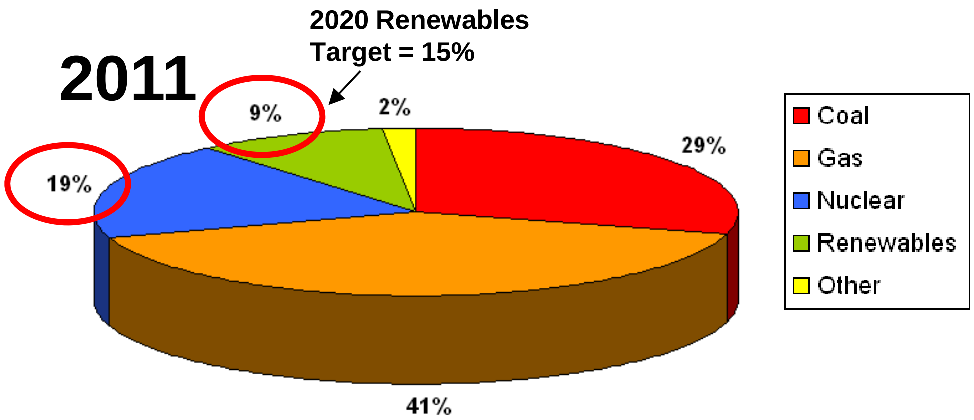
20%
We generate around one fifth of the UK's electricity

8
We own 8 nuclear power stations; coal, CCGT & CHP plants, and wind farms

5.8m
We supply Gas and Electricity to 5.8 million business and residential accounts

60%
We are reducing the carbon intensity of our legacy electricity generation activities: 60% by 2020

Generation – PIV Opportunity



Country	B2C (€)	B2B (€)
EU27	0.19	0.14
Germany	0.26	0.17
UK	0.17	0.14
EU High	0.30	0.27
EU Low	0.08	0.07
Retail Price Per kWh		

Market Driver	Solution	Stakeholders	Timescales
• Utilise baseload generation, while achieving a flatter profile (net of wind)	• Charging management	• EDF Energy, Centrica	• Simple solutions deployed in short term in preparation for sophisticated medium to long term solution
• Energy storage of intermittent generation	• V2G • 2^{nd} life battery use • Hydrogen (excess capacity)	• All Generators	• Long term: technology to be developed and high volumes of cars needed

Transmission/Distribution – PIV Opportunity

In Great Britain (broad terms):

- Transmission: 400/275/132kV grid – owned and operated by National Grid plc
- Distribution: 14 network areas, each connected to the grid – owned and operated by 8 companies
- Grid can handle EVs - 10% drop in annual UK demand (30 TWh) since 2007
  - Equivalent to powering 15m PIVs doing 6000 mpa
- Challenges arise in networks due to localised volume: a few PIVs per substation is no problem, every dwelling having one charging simultaneously certainly would be, without Demand Side Management
- Drive to understand Smart Grids via projects e.g. Low Carbon Networks Fund

Market Driver	Solution	Stakeholders	Timescales
• Load balancing (National & Local)	• Controlled charging • Smart charging	• National Grid • Distribution Network Operators • Consumers	• Medium term: c. 10 years
• Frequency Modulation (keeping to 50hz AC)	• Response Services	• National Grid	• Established service today; requires higher car volumes and intelligent charging

Supply – PIV Opportunity

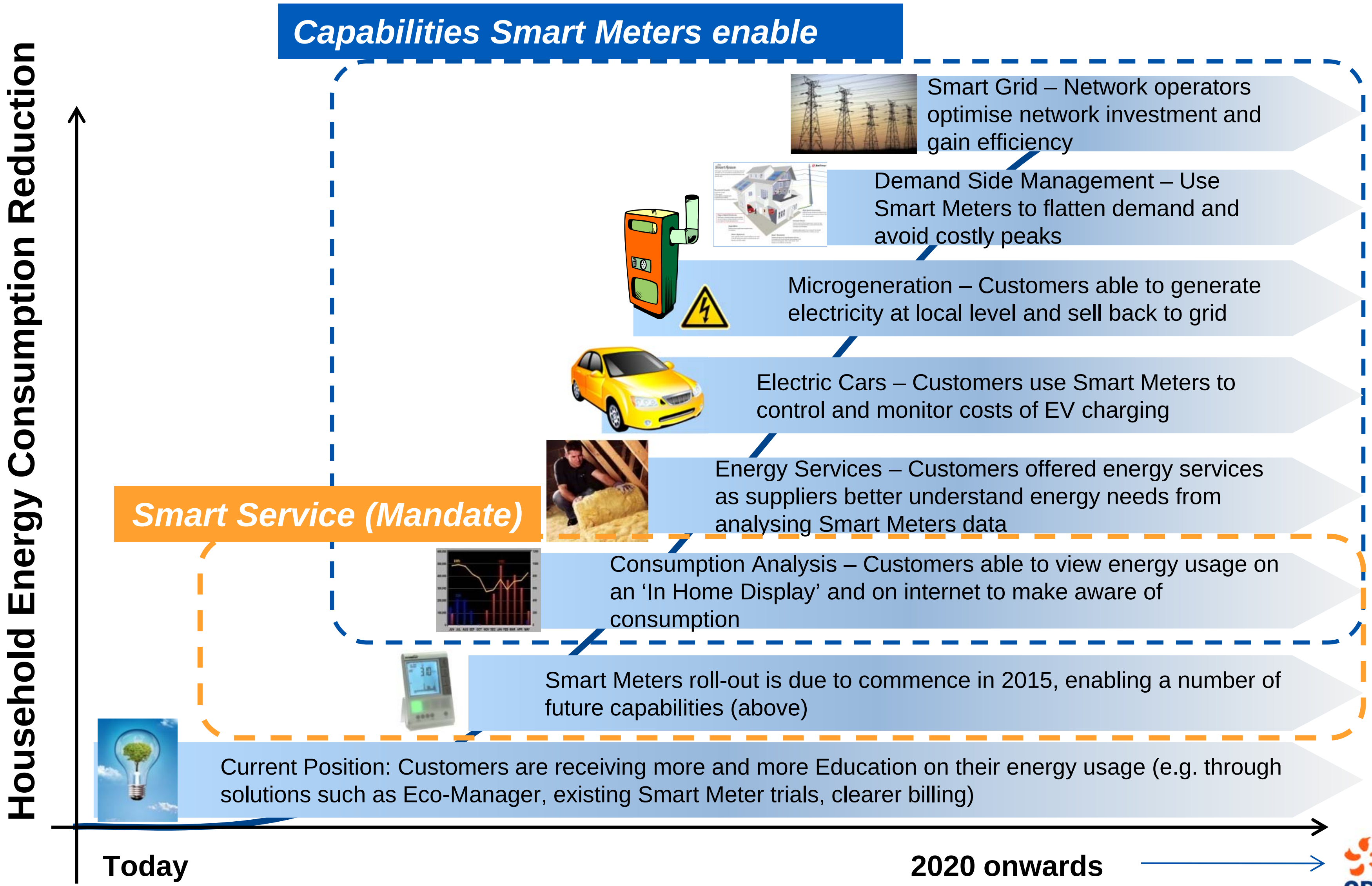
- Competitive supply market: high switch rates (17% - among highest in EU)
- Below EU average prices (15c per kWh)
- Microgeneration market in early phases – clear link being made by both consumers and OEMs between PIVs and Microgen

- Retail Market Review
- Consumer Trust
- Energy Efficiency to be delivered through ECO/Green Deal
- Smart meter mandate to roll out meters to all domestic/SME consumers by end of 2020 (current penetration 4.2%)

	EDF Energy	British Gas	SSE	npower	e·on	ScottishPower	UK Average
Avg CO_2 (g/kwh; 2011/2012)	253	330	512	490	519	n/a	430

Market Driver	Solution	Stakeholders	Timescales
• Acquire/retain customers • Electrification	• Cost-effective home/work charging • ToU tariffs (RMR?) • Renewables /Nuclear	• Suppliers • Consumers	• Now: taking advantage of current car sales to learn, and then ramp up over time
• Smart Future	• Whole House/Building approaches • Facilitation	• Suppliers • Consumers • National Grid • Distributors	• Smart Meter rollout completes 2020 • Just the beginning…

The Smart Future – Industry Evolution



thank you