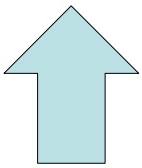
Key questions

- Why is demand side response important?
- How much potential is there?
- How might it be deployed and by whom?
- What are the policy and regulatory enablers to wide-scale deployment of flexible demand?

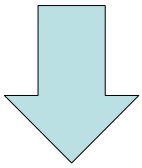
Increasing need for flexibility

Requirement for flexible plant



- Increasing variability on the system – potentially 30 GW of wind by 2020

Supply of flexible plant



- Closure of 11 GW of flexible plant under LCPD by end of 2015
- Further flexible plant closures associated with IED after 2020

Potentially limits power sector de-carbonisation unless demand side can respond

Flexibility from the demand side

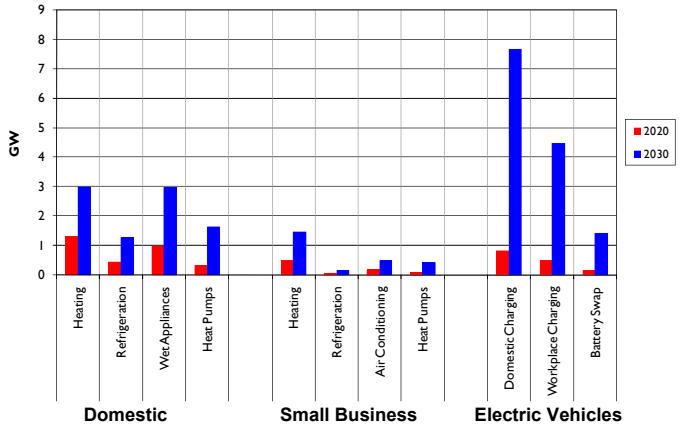
New sources of flexible demand (and supply)

- Shifting of existing loads
- Electric vehicles
- Heat pumps
- Electricity storage
- Microgeneration

Enablers

- Roll-out of advanced and smart meters to all customers by 2020
- Central communications infrastructure
- Smart grids
- Smart appliances
- In-home technologies

Potential for demand side response from mass market



Sources: DECC, IHS Global Insight, MTProg, NERA, Element Energy, Redpoint assumptions

Different roles for demand side response

Role	Approximate potential by 2020	Approximate potential by 2030
Flattening demand profile (by expanding baseload)	1 GW	10 GW
Providing within-day swing	1.5 GW (9%)	8 GW (32%)
Providing responsiveness (reserve, frequency response)	1.5 GW (17%)	8 GW (81%)

Assumptions
EVs: 16m by 2030 split - 50% domestic (25% EV, 25% PHEV), 50% urban (35% workplace trickle, 15% battery swap)
Requirement for within-day swing based on Redpoint modelling
Requirement for reserve based on National Grid 2020 consultation

Access methods

Role	Timescale	Access method
Flattening demand profile (by expanding baseload)	<1 year	Static time of use tariffs
Providing within-day swing	<1 day	Dynamic time of use tariffs/in-home technologies
Providing responsiveness (reserve, frequency response)	<4 hours	Direct control e.g. frequency relays

Implications for networks

Typical loading

Electric vehicles

- Trickle charge: ~1.3 kW over 6 hours
- Fast charge: ~9.6 kW over 2 hours

Heat pumps (domestic)

- Ground source: ~2.4 kW electric load
- Air source: ~4 kW electric load

Domestic connection

- Typical connection is 20 kW
- But after diversification max demand assumed to be 2-3 kW
- Typical overnight demand (unrestricted) is around 0.4 kW

Implications

- High proportion of EV vehicles could be accommodated if trickle charged overnight
- **But** cannot easily accommodate EVs ***and*** heat pumps (especially if fast charged) without significant distribution network reinforcement

Who will want to deploy demand side response?

Entity	Purpose	Level
Suppliers?	To balance their positions	National
System Operator?	To provide balancing services (e.g. reserve)	National
DNOs?	To manage loading on their networks	Local

How to resolve these potential conflicting objectives?

Key policy questions

- The arrangements will need to ensure:
  - Correct signals to invest in demand side response capability
  - Correct signals to expand networks versus invest in smart grids
  - Correct signals to invest in flexible generating capacity
  - Efficient use of the available demand side response
- Need to co-ordinate transport and energy policy?

Initiatives and issues

Existing initiatives

- Smart meter mandate
- Low Carbon Network Fund (LCNF)
- Electricity Demand Research Project (EDRP) trials
- Smart grid vision
- 2050 Roadmap

Outstanding issues

- Price signals (see Ofgem Project Discovery)
- Detailed design of smart meter and central comms roll-out
- Reforms to settlement
- Ownership/access to data
- Commercial relationships between DNOs/Suppliers/SO
- Customer engagement

Conclusions

- Demand side can play an important role in managing variable renewable generation
- At the same time new electrical loads will need to be accommodated on the system increasing the requirement for flexible demand
- Potential for demand side response from mass market could be 10 GW or more by 2030 enabled by smart meters and new technologies
- Enablement and effective deployment of DSR critical to decarbonising the energy system ***and*** security of supply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