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GO  **Boldly.**

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**It's all about the customer –
developing an effective electricity
demand side**

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Outline of presentation

- **Demand flexibility**
- **Response to flexibility incentives by business and household customers**
- **Lessons from some trials on demand response of customers - UK and Ireland**
- **Conclusions**



What is the demand side ?

- Supply side of electricity - in UK fewer than 100 large actors – networks, retailers, generators, aggregators
- Demand side – in UK is 29 million customers – I&C uses two-thirds of elec (2 m meters); households, one third (27 m meters) – so much more complicated to engage
- Customers may increasingly have new forms of electricity consumption (e.g. heat pumps, electric vehicles) and also be generating electricity (e.g. PV)– so :
- Where can demand from customers and supply by customers create flexibility – demand response by active customers ?



Demand flexibility, smart meters and smart tariffs

- Demand flexibility likely to have increasing value in the electricity system over the next 10-15 years to reduce peak demand growth and costs
- Smart meters will facilitate price signals to customers - new smarter tariffs to help deliver demand flexibility
- Demand flexibility offers potential for cost-efficiency in the electricity system overall, including, potentially, in the networks (e.g. locational and peak charging).
- Demand flexibility could offer benefits throughout the electricity supply chain, including to customers
- But - customers have to see some benefit (and, perhaps more importantly, no inconvenience or other downsides) if they are to be willing to provide demand flexibility



Types of smart tariffs

- Some customers (in UK and Australia) have had experience of time of use tariffs for many years - typically for electric storage heating and water heating
- Time of use tariffs trials in many countries – typically 3 rates, off-peak, shoulder and peak
- Critical peak pricing – high peak rate for very high demand – mainly in countries with a lot of air conditioning (e.g. California, Australia) used on very hot days
- Dynamic tariffs – to enable responses to short term changes in demand/supply balance, (e.g. when more wind on the system) and avoid high wholesale prices
- With all forms of smarter tariffs scope for automation/direct control, to make response more certain and potentially more convenient for customers



Response to smart tariffs - I

- A wide range of trials of time of use (TOU) and critical peak pricing (CPP) worldwide
- Average peak response is around 5% but in some cases responses of up to 30% have been seen
- Higher responses tend to be realised with automation and with CPP
- Good information provision to customers (e.g. via in home displays, information on bills etc) can help improve the response



Response to smart tariffs - II

- Responses tend to be greater (in percentage terms) amongst household rather than business customers
- But because the latter use more electricity the absolute effect will be greater from business customers
- Some recent experience in the UK and Ireland is the subject of the next group of slides



Low Carbon Networks Fund (LCNF)

- LCNF introduced by Ofgem for the electricity distribution price control period 2010-15
- Up to £500 m over 5 years for projects sponsored by distribution network operators (DNOs) to try new technology, operating and commercial arrangements for smart grids.
- DNOs have to bid in competition with each other for the funding and in partnership with others such as electricity retailers
- Objective is to help all DNOs understand what they need to do to provide security of supply at value for money as Great Britain (GB) moves to a low carbon economy.
- First projects started 2011



Northern Powergrid Customer Led Network Revolution (CLNR) project

- Project funded under the LCNF and contributions from British Gas (electricity retailer). Project runs from 2011-13
- British Gas installs the smart meters and recruits the customers to the trial
- Aim is to test the scope for customer demand response, for customers in general and also for those with heat pumps, electric vehicles and solar PV
- Customers offered different options – time of use tariffs, direct load control etc (and some in a control group where usage – half hourly and total – is just monitored)
- Households, small businesses and larger industrial and commercial customers



CLNR project – early findings – households - I

- Customers positive about time of use tariffs and drop-out rate low (6% to Nov 2012)
- Getting a smart meter has proved an incentive to sign up
- Less keen on automatic control products
- Majority signed up because they believe they will save money on bills (even without the sign up incentive)
- Half of those who have signed up say they already use little electricity at peak times – will be interesting to see what the monitoring of actual usage reveals



CLNR project – early findings – households - II

- Solar PV customers very engaged- want to see what they are generating when – will be interesting to see whether they try to maximise appliance use when generating their own electricity
- Electric vehicle customers difficult to recruit – take up of EVs is behind industry and Government estimates at the time the project was being planned
- Heat pump recruitment has been difficult because take up is slow – but may increase now as Government is providing an incentive scheme



CLNR project – early findings – small business customers - I

- Recruitment of small business customers has proved challenging (similar in Ontario, Canada)
- Some small business customers enthusiastic - feel they will save money and/or support environmental objectives
- But many have concerns about smart meters and other technology being installed in their business (size, impact)
- Direct control not attractive to these customers



CLNR project – early findings – small business customers - II

- Many not operating or have limited usage in the peak (4-8pm)
- Customers signing up for ToU tariff appear unwilling to change behaviour to any great extent, particularly if there is an impact on business operation.
- Rewards may need to be much higher to drive change.
- Many have reduced usage through energy saving measures (to save money) and this limits scope for demand response
- Some lack decision making power – part of larger organisations, landlord/tenant split, buying electricity through a broker



Ireland : Electricity Smart Metering Customer Behaviour Trials

- One of the largest and most statistically robust trials to date
- Run by the Commission for Energy Regulation (CER)
- 5000 households
- 650 business customers
- 2 years - 2009-10



Ireland : Electricity Smart Metering Customer Behaviour Trials – Households

- TOU tariffs households – several tested, shoulder rates typically 20-40% more than off-peak rates; peak rates 50-300% more than shoulder rates;
- Some groups also received information stimuli (billing, displays etc) and/or demand reduction incentives (financial reward)
- Households results - ToU tariffs and DSM stimuli reduced overall electricity usage by 2.5% and peak usage by 8.8% (both results statistically significant)
- The actual rates on the ToU tariff were found to have limited impact on the extent of the switching effect – the fact of being on a ToU tariff was more important than detailed tariff design



Ireland : Electricity Smart Metering Customer Behaviour Trials – SME customers - I

- TOU tariffs SMEs – shoulder rates 7% or 100% more than off-peak; peak rates 40% or 50% more than shoulder;
- Some groups also received DSM information stimuli (billing, displays etc)
- 41% of SME participants believed that they reduced overall usage with 59% stating they reduced peak usage. 71% said the peak cost forced their business to attempt to reduce usage at this time.
- 13% of SME participants said they increased regular monitoring of their electricity usage compared to 8% among the control group
- However...



Ireland : Electricity Smart Metering Customer Behaviour Trials – SME customers - II

- ToU tariffs and DSM stimuli reduced overall SME electricity usage by 0.3% and peak usage by 2.2% - neither result statistically significant
- For SMEs, the main barrier was perception that it was not possible to move usage to other times. Rated very important by 72% of businesses who stated they did not reduce peak usage
- This trial illustrates the need to clarify how DSM can deliver value (to customers and the electricity system) in this sector



Conclusions

- Demand side (DSM) initiatives such as smart tariffs and automatic control can deliver flexible electricity demand and demand reduction, with potential benefits to electricity networks, the supply/demand balance (and hence wholesale costs) and to electricity customers
- Trials to date have shown customer interest and some good responses, but also some challenges with some customer groups and some types of DSM
- Considerable work may need to be done to convince some customers to take up DSM products and deliver their potential.
- It's all about the customer !