

Sustainability *first*

Inside the smart home and workspaces

**Welsh Government - Smart Living Technical Group
14 March 2017. Cardiff**

People and Reactions ?

Households & electricity demand-side flexibility

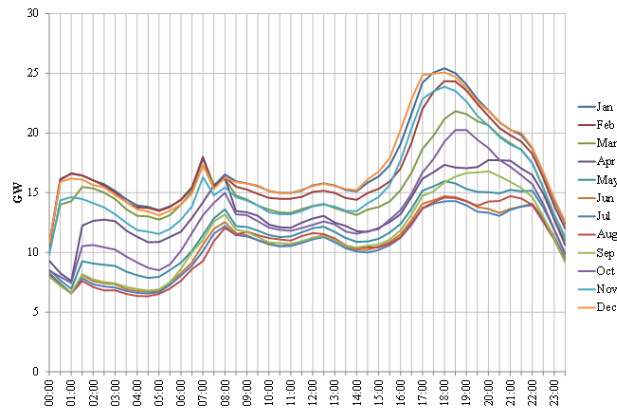
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Why household flexibility ?

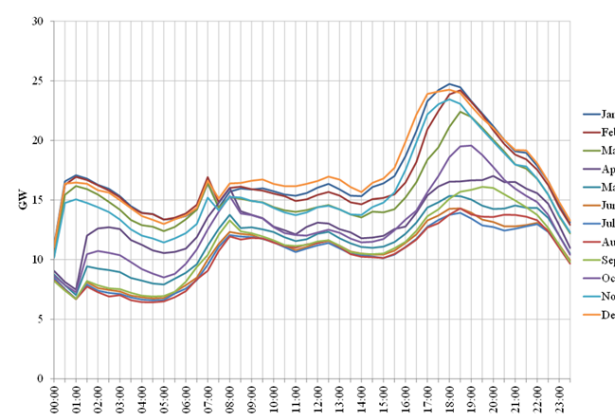
Daily household electricity load profile (generic, by month, 24-hour)

Household - Weekdays



Source : Brattle Model. Sustainability First. GB Electricity Demand project. Paper 2

Household - Weekends



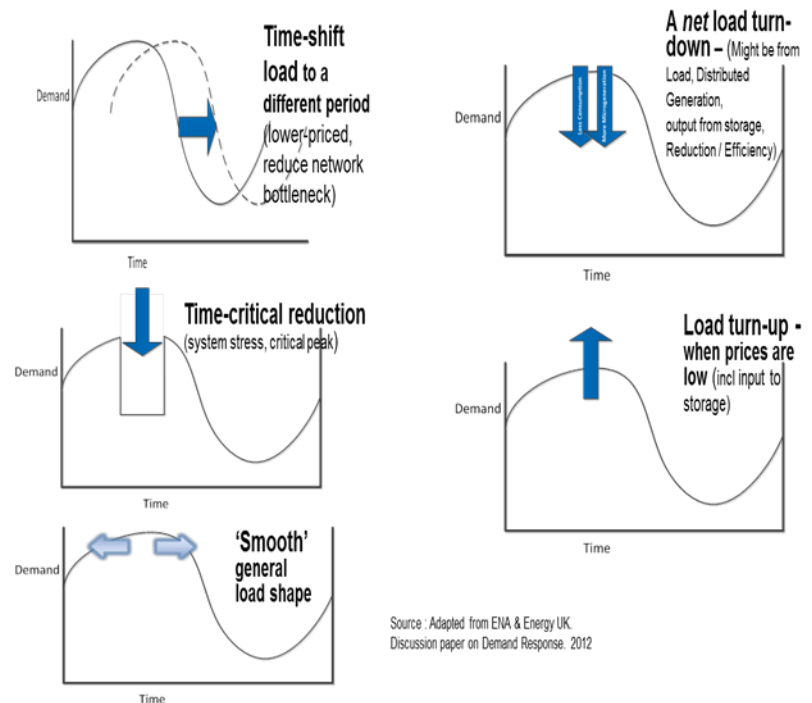
- **~90% of all customers (~ 25 million). Distinctive morning & evening peak.**
- **Households ~one-third of annual electricity by volume.**
- **Significant contribution to total evening peak (~one-half).**
 - = Mostly, lights, cooking, consumer electronics. Some flexibility – but limited.
- **Impact for the power system of new peak-loads ? Heat ? EVs ?**
- NIC estimate (2016) :
 - Total consumer savings in 2030 from electricity demand-side flexibility ~ **£3-8bn pa** (I&C, households).
 - If 5% of current peak demand met by demand-side solutions, the power system would cost £200m p.a. less to run – plus a £790m consumer benefit.

Will households get lower electricity bills from their flexibility ?

This is a journey. To get the benefit of *lower bills* from their flexibility, household customers may need some or all of these characteristics :

- Flexible load
- Large electric loads (heat, hot-water, a/c, EVs)
- Flexible 'habits' (wet appliances, cooking, consumer electronics).
- Ability to be flexible *at peak*
- Ability to shift *sufficient* load when prices are high / low / both.
- Load which can be automated
- 'Up for' for automation / control
- Capability to produce / store power

Customer demand-side flexibility actions can take many forms



Source : Adapted from ENA & Energy UK Discussion paper on Demand Response. 2012

Smart tariffs : from the consumer angle

- **Smart meters support smart tariffs** - but, today, only limited tariff offers to GB households.
- **ToU tariffs** : trial evidence so far suggests bill savings relatively modest (on average).
- **Customers need to know** : what cash-savings their flexibility could bring ; **what to do - & what not to do - to get these savings.** (One large GB ToU trial : 40% wld have lost-out).
- **Safeguards & complexity** - ToU price comparison sites ?
- **Fairness issues. Sharper price signals for end-customers have pros- & cons –**
 - We need to understand the distributional impacts of greater cost-reflection.
 - Consumers not ‘average’ – some customer segments may suffer adverse impacts. Some impacts could be significant - intended / unintended. Some customers may be winners ***without needing to change their behaviour***. Losers may be inflexible - & may / may not be vulnerable.
- **Smart tariffs - in practice, who might choose ToU, if only small customer savings ?**

75 % of customers could *already* save £200 p.a. on average by switching – *but they don't switch.*

Automation : from the consumer angle

- Studies suggest ‘worthwhile’ cost-savings for individual household consumers from their future flexibility (esp from 2030).
- **Once automation - plus half-hourly settlement - customers can be more responsive to dynamic / market-linked price signals** – and in theory make greater bill-savings.
- For successful automation, households may need :
 - Large ‘single-point’ electrical loads (EVs, heat, hot water, a/c).
 - Willingness for ‘control’ (DIY or third-party)
 - Electrical load which is flexible - & readily controlled.
 - Ability to produce / store power (PV, battery)
 - Attractive customer incentives via retail tariffs / price signals - **including ‘flat’ / simple p/kWh load-management tariffs.**
- **Suitable customer safeguards** e.g. over-ride switchesto no long-term ‘lock-in’ to kit-purchase ..or tariff . Plus, still be able to switch supplier...

Automated household flexibility : ‘technical’ enablers

- The ‘technical’ enablers for **automated household flexibility** are in view :
 - **Smart meters** (SMETS 2)
 - **Billing software** : suppliers can send accurate bills for smart tariffs (ToU, other).
 - **Data access** : *with customer consent* - to **half-hourly customer data** (& up to 10-second).
 - **Settlement System Reform** : universal half-hourly settlement - permits a better match of underlying industry costs – against *actual* usage of *every* customer.
- **We also have scope to automate control of load & home appliances – via**
 - Smart meter-linked control switches - & / or
 - Consumer Access Devices - paired w in-home smart meter communications hub – & / or
 - Direct into the home via internet – & not linked to smart meter (e.g. smart thermostats).
- **Plural routes for households to provide flexibility services to GB electricity demand-side markets.** Smart-meter not sole route.

Buying 'flexibility services' from households – market actor angle

The business case needs to 'work' for market actors. Reality check includes :

- **Their degree of direct exposure to** : volatile costs & prices in the power markets (high / low); significant extra network costs.
- **An investable proposition.** A 'sufficient' future view of the cost-savings that *predictable* household flexibility could deliver for their business.
- **Confidence of obtaining a 'collective' household response**
- **Confidence that procuring customer flexibility – will cost less than supply-side alternatives.** Costs of securing household customer flexibility - **not 'nil-cost'**.
[e.g : product development; marketing / sales ; communications into the home; in-home connectivity; data management; software upgrades; settlement & billing ; costs of kit; home install & maintenance; customer contact & redress].
- **New commercial propositions / acceptable customer contracts**

Future markets for household flexibility

– market actor angle

- Market actors *will* wish to develop simple / ‘marketable’ propositions for the customer.
- But, to create ‘sufficient’ value - for both actor & customer - may need to ‘value-stack’ several ‘technical’ services. (As now, for I&C sector).
- **Household customers may therefore provide a mix of flexibility services - to several actors - across different parts of the power system value chain** (wholesale, capacity, balancing, networks).
- **New business models will evolve.** Actors will contract with :
 - Households to buy their flexibility – and to sell them electricity (maybe)
 - With other market actors – to ‘sell-on’ different technical flexibility services
- **New & old actors – will compete as ‘gate-way’ to buy flexibility services from households :** suppliers ; supplier/aggregators ; aggregators ; brokers ; networks ; communities ; other new ‘middle-players’ .
- **But, in a world of 50+ energy retailers, new ‘bundled’ models will emerge. Energy retail will increasingly combine with sale of other goods & services.**

New actors will sell energy to households. They may also sell connected-home services and / or health monitoring. Or, ‘other stuff’. *It is too early to tell whether such actors would also seek to sell household services into electricity demand-side / flexibility markets.*

Future markets for household flexibility – from the customer angle

- To access the benefits of their flexibility, households will need to :
 - Offer the ‘right kind’ of technical flexibility
 - Make informed choices on who to contract with (i.e their ‘routes to market’).
 - Contract to ‘value-stack’ - to secure a worthwhile benefit
 - Perhaps contract *separately* for energy supply and for flexibility
 - Be ‘up-for’ automation / third-party control
 - Be unphased by the complexity in the small print.
- Customers stand to benefit if they are able to sell their flexibility. But, **market actors must ‘sufficiently’ and transparently share the benefits.**
- For regulators, how to judge whether customers get a ‘**fair-share**’ of any benefit created ?
 - **As an individual customer ?**
 - **For consumers generally ?** i.e. do we have a *lower-cost* power system overall
- **Some households simply may not be able to be flexible.** At risk of being ‘left behind’. In particular, picking up ever-more of the ‘fixed-costs’ of a future system (so, peak-related / network related costs).

Sustainability First – our proposal for a ‘standing group’ on household flexibility w BEIS & Ofgem

- Energy still an ‘essential service’. Much uncertainty & complexity lies ahead for customers & consumers → our proposal for a new standing group for a more systematic overview.
- **Household flexibility, ‘smart’ & connected homes** : need to be market-led, not undue regulation. But, lets also understand **wider outcomes : intended / unintended.**
- Sustainability First initial ‘menu’ for a standing group :
 - **Future tariffs** – impacts of greater cost reflection ; principles of ‘fairness’ for all customers ; retailer responses (cherry-pick non-peaky ?; price comparisons ?) ?
 - **Customer safeguards & protections** – unexpected bills ; pre-pay – debt calibration ; kit ‘lock-in’ ; third-party roles (aggregators, brokers) ;
 - **Customers in vulnerable circumstances** – Sustainability First ‘**Project Inspire**’ - looking at how smart innovation needs to serve these customers well !
 - **Community & local flexibility** - local / group approaches to supply. A ‘right’ balance for supply licence requirements.
 - **Smart appliances** – requirements (if any ?); standardisation ?; proprietary set-up ?
 - **Privacy & data** – customer consents on use of their data
 - **Cyber issues** – minimising customer / system risk
 - **Export metering** – future metering requirements for PV, Storage
 - **Trials** – what do we still need / want to know ?

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See our smart demand & other publications

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