

Sustainability *first*

Judith Ward
Sustainability First

**Enabling domestic demand-side flexibility :
what issues still need to be tackled ?**

BEIS / Ofgem Smart Systems Forum

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Our Projects

New-Pin – New Energy & Water
Public Interest Network

Inspire – Innovation & Energy
Customers in Vulnerable
Circumstances

**Smart meter energy data – Public
Interest Advisory Group** (w CSE &
UCL).

Power Responsive – strategic support

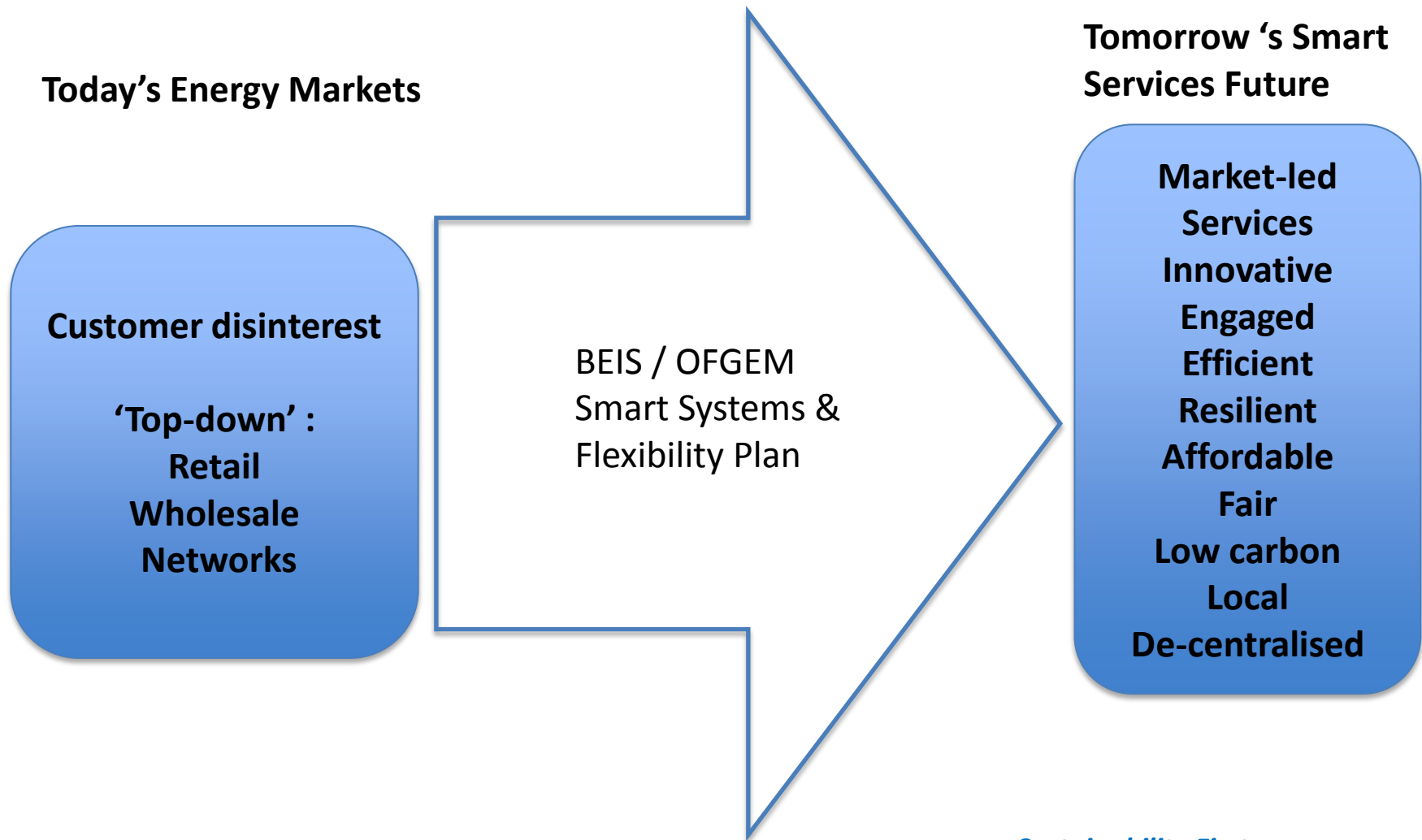
Discussion Papers - Smarter, Fairer;
'Sticky' Customers & Smart

Smart GB Electricity Demand Project
(2010-14)

Innovation projects

Demand-side & smart meter studies

Household 'smart' energy – a broad consensus on 'desired outcomes'...



Household retail : delivering ‘desired outcomes’ will need detailed reform *plus* coherence

Today

Customer confidence
– prices, service

‘Sticky’ customers -
market disinterest

Price caps -
unclear

Vulnerable customers
– struggling

Energy efficiency –
Appliances = Eco-Design Dir.
Thermal = ECO. Otherwise,
low priority (policy, funding)

– **Energy Retail Transition** –
very many jigsaw pieces

- **Energy retail regulation** – 50+ retailers. Principles-based. Focus on vulnerability.
- **Affordability** – Price-caps ; Helm Review – I&C, households
- **Multiple supply-side measures** – Renewables & Low-Carbon, Capacity, Local, Technology & Customer Trials
- **Smart Systems & Flexibility Plan**
 - **Technologies & markets** : actors ; market access; third party roles; new business models (e.g. ‘values-led’ – social L/L, green, local); customers; supply chain.
 - **Market reforms** : Enhanced SO; Settlement; Data access; Ofgem strategy
 - **Networks** : Charging Reviews ; RII02
- **Heat** – RHI ; Future thermal insulation ? Future pathways to low-carbon heat ?
- **CC Act - Clean Growth Plan**
- **Industrial Strategy** – Transpt, EVs, Batteries, Energy Efficiency – at scale ?

Tomorrow

Smart services –
Power, Transport, Heat
Local Energy
Active Customers
Bundled, Bespoke,
Utility / Non-utility.
Investable.

Resilient services –
secure, low-carbon,

Fair services –
affordable,
energy efficient

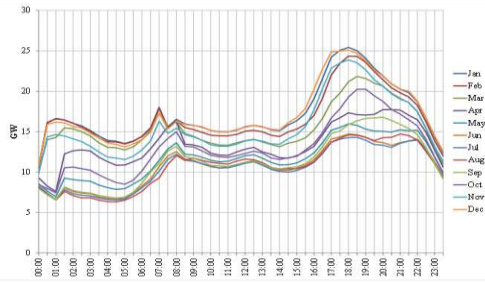
Many actors & initiatives. Need shared view of how ‘big picture’ fits together – & priorities.

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Why household flexibility ?

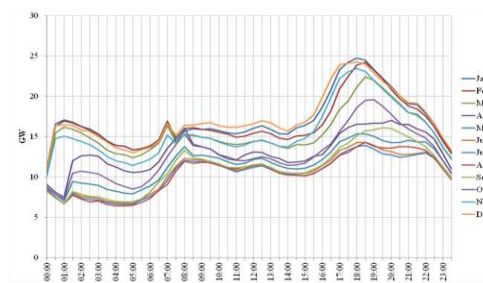
Daily household electricity load profile (generic, by month, 24-hour)

Household - Weekdays



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

Household - Weekends



Expectation for household flexibility to support a more efficient & resilient power system.

So, lower-cost than otherwise – incl cost of low-carbon.

- **Households ~90% of all customers (~ 25 million). Use ~1/3 annual electricity by volume** (115 TWh – 2015)
- **Distinctive morning & evening peak – all year round**
- **Households - ~ 40 % contribution to winter evening peak** (Estimated. 23.8 GW in 2016 - Stable / slightly ↑).
- = Mostly, lights, cooking, consumer electronics. Some flexibility – but limited.
- **In future, household flexibility → mitigate power-system impacts of :**
 - **Volatile / spiking prices** (so, Balancing, Wholesale)
 - **Peak-loads – esp once EVs & Heat**
- **Cost-saving projections 2030 (NIC 2016) :**
 - Total est consumer savings 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.**

Today : Household Smart Tariffs

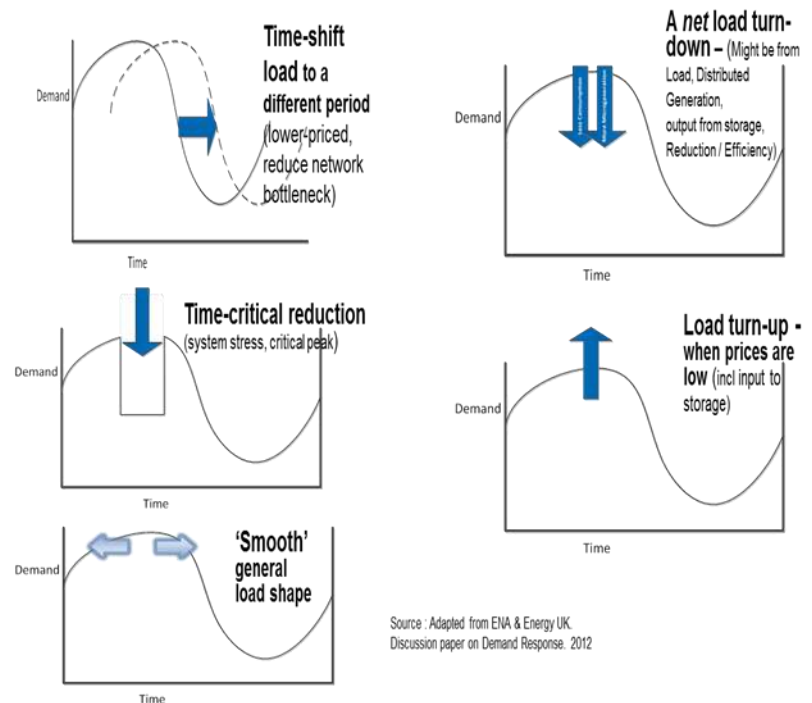
- **Smart meters** – customers like (Smart EnergyGB). **But smart tariff offers – currently very limited.**
(Current settlement can support basic smart tariffs).
- **ToU trial evidence so far** : bill savings relatively modest (on average) - turn-down/ up.
- **Customers need to know** : what cash-savings their flexibility could bring ; **what to do - & what not to do - to get bill savings.** (One large GB ToU trial : 40% wld have lost-out).
- **Customer safeguards, complexity, confidence – still ‘work in progress’ for smart tariffs.**
E.g principles-based retail regulation ; vulnerable customer principle ; data comparison tools ; engagement.
- **Distributional impacts of greater cost-reflection in tariffs - have we got to grips ?**
Sharper price signals to change customer usage – have pros- & cons:
 - Consumers not ‘average’ → some customers 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.**
 - Prosumers – what charging ‘opt-outs’ ? Which costs remain shared across **all** customers ?
- **In practice, who might choose ToU, if only modest customer saving ?**
~50% could *already* save £200 p.a. on average by switching either supplier or tariff – but don’t.

What will it take for households to get lower electricity bills from their flexibility ?

To get the benefit of *lower bills* from their flexibility, individual household customers may need some or all of these characteristics :

- Flexible load
- Large electric loads (EVs, heat, hot-water, storage, A/C)
- Flexible 'habits' (wet appliances, cooking, consumer electronics).
- Ability to be flexible *at peak and / or at times of system stress*
- Ability to shift *sufficient* load when prices are high / low / both.
- Capability to produce / store power
- Load which can be readily automated / controlled
- 'Up for' for it !

Household flexibility may take many forms



Where is 'customer pull' for household flexibility ?
New business models / smart services ? EVs – game-changer ?

Household flexibility : technical enablers now ‘in view’

- ‘Technical’ enablers for **non-automated & automated** household flexibility :
 - **Smart meters** (SMETS 2)
 - **Billing software** : suppliers can send accurate bills for smart tariffs (ToU, dynamic, 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.
- **Also, scope to automate control of household load – via**
 - **Smart meter-linked control switches** - & / or
 - **Consumer Access Devices** - paired w in-home smart meter communications hub – & / or
 - **Direct into home via internet** – & not linked to smart meter
(Tech Giants or small actors → smart home, thermostats, lights, security etc).



New opportunity. New complexity

(1) Plural routes to market for household flexibility. Smart meter not sole route.

(2) Means for ‘despatched’ / ‘self-despatched’ household response – & potentially -

(3) Multiple service providers into home : energy, flexibility, connected-home, heat etc

Market actors : why buy household 'flexibility services' ?

Business case for automated flexibility must 'work' for market actors.

Reality check (retailers, aggregators) :

- **Extent of their direct exposure to** : volatile costs & prices (high / low) in the power markets (balancing / wholesale) ; and / or to significant new network costs (i.e new connections & new loads).
- **An investable proposition.** A 'sufficient' future view of the cost-savings / revenues that *predictable* household flexibility could bring to their business. Scale = critical (customer contracts/ volumes- MW / MWh).
- **Business confidence in :**
 - Obtaining a 'collective' household response
 - Procuring customer demand-side flexibility for x years = *cost less than supply-side alternatives.*
 - Pay-backs & returns. Securing household customer flexibility *not 'nil-cost'*

Household flexibility - actor up-front / ongoing costs include :

- Market participation
- Product development / design
- Marketing / sales activity
- Communications into home
- In-home connectivity
- Data management
- Software development - & upgrades
- Settlement & billing
- Costs of kit
- Home install & maintenance
- Customer contact - & redress

Household flexibility – takes two to benefit

Market actors must have ability to :

- **Access customers**
- **Value-stack**
- **Control load - & aggregate**
- **Contract w customer - & 'sell-on' - h/hld flexibility services into several demand-side markets**
- **Develop simple / attractive customer propositions**
- **Write acceptable customer contracts / T&Cs**
- **Successfully compete against other actors - as a main 'gate-way' to home flexibility.**

Households will need to :

- Be keen
- Offer 'right' load characteristics
- Make informed choices on :
 - **Kit – & –**
 - **With whom to contract**
- Consent to 'value-stack'
- Be 'up-for' automation / control
- Be un-phased by complexity in small print.
- Perhaps contract **separately for energy supply - and for offering their flexibility services**
- Have confidence as these markets grow

- (1) ***These are complex markets***
- (2) ***Significant third-party roles. Still evolving***
- (1) ***'Low-carbon' may not be a main business driver for every actor e.g. selling connected home / 'bundled' services.***

So, what will eventual success look like for household demand-side & flexibility markets ?

- **Customers who are flexible to receive a clear benefit** (bill-savings, life-choice etc).
- **Market actors demonstrate transparency – & ‘sufficiently’ share benefits.**
- **Government & regulators – confident that :**
 - **Individual customers** - receive a **‘fair’ benefit** from their flexibility
 - **Consumers in general** - benefit from a lower-cost power system overall
 - **Household flexibility markets are ‘healthy’** (so, metrics beyond price or switching)
- **Some households simply may not be able to be flexible.** So, need to ensure **vulnerable customers** :
 - **Not ‘left behind’ / excluded from benefits of smart services** – and –
 - **Not funding ever-more of the ‘fixed-costs’ of the future energy system** (so, peak-related capacity / network costs).

Clear understandings around ‘fair’ & ‘decent’ conduct – and who able to benefit / not benefit.

I&C demand-side flexibility.
Lessons from Power Responsive (2015-)

nationalgrid

power responsive

‘Market Making’ -
Actors & Customers

Awareness

Simplify →
Confidence

Demonstrate delivery

Understand :
Desired outcomes
Unintended outcomes
Barriers & Enablers



But, household customers not same as I&C...

- **Household energy** - an 'essential service' for the foreseeable future. Lets get the **safeguards** right – esp for vulnerable customers – but not just.
- **Household flexibility, 'smart' & connected homes** : Market-led. Not undue regulation.
- Significant **uncertainty, complexity**. **Some early wins & some mis-steps** → anticipate & understand.
- **Engagement / customer 'pull'** – what focus for initial 'market-making' ? Early adopters ? (EVs, PV, storage ?) 'Values-led' business models (social L/L, green, local ?) Service-models ? All at once ?
- Need a **coherent overview** – from consumer *and* a market viewpoint. Deep & rapid change. Winners & Losers (actors & customers). Lets **understand & shape wider outcomes : intended / unintended**.

*Good antennae – & clear 'feedback loops' .
Vital to market success - & future customer confidence*



Household flexibility : 'initial watch-list'

- Tariffs
 - Half-hourly settlement
 - Role for 'market-making'
 - Customer safeguards & protections
 - Customers in vulnerable circumstances
 - Network charges
 - Levies
 - EV Charging
 - Household PV & storage
- Third party roles
 - Community & local flexibility
 - Low carbon delivery
 - Supply chain
 - Smart appliances
 - Smart services
 - Data Access, Automation & AI
 - Data Privacy
 - Cyber Security
 - Engagement focus
 - Future Innovation Trials

*View of timelines. Understand dependencies.
Others doing valuable work – draw on that.*

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See our smart demand & New-Pin publications

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