Introducing a new guidebook to improve consumer engagement with demand-response initiatives
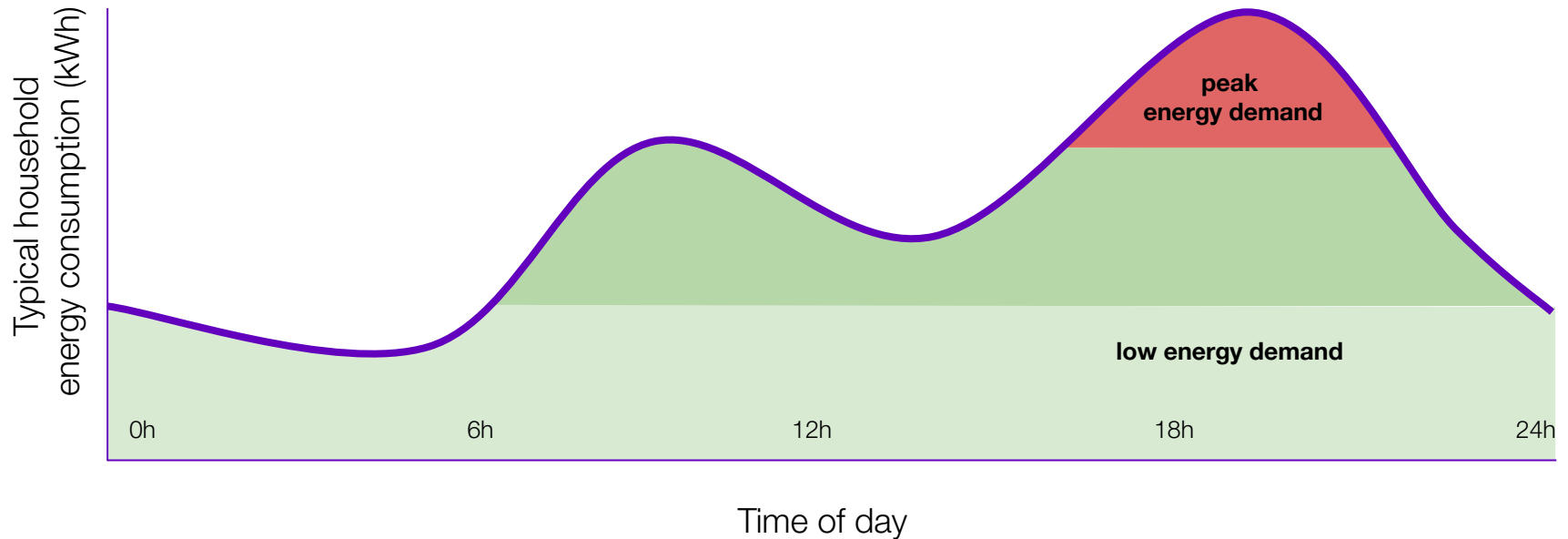
Jesper Akesson, Ondrej Kacha

Welcome!

Jesper Akesson
Managing Director
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What is demand flexibility?
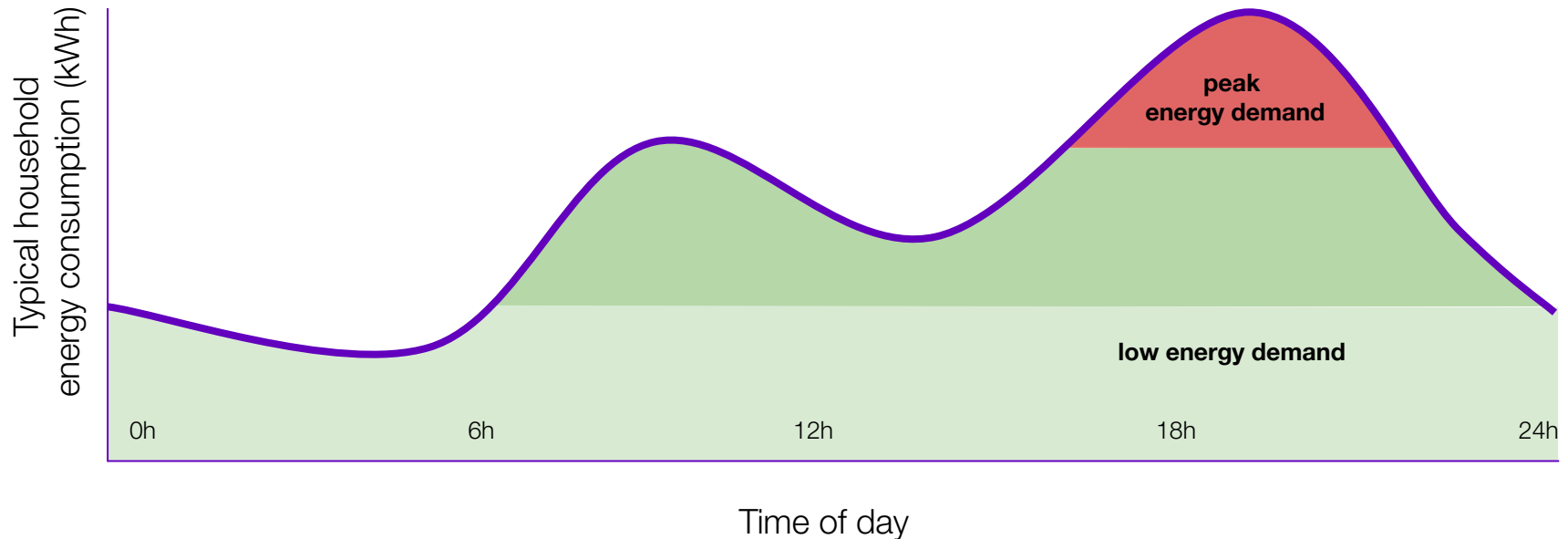
What is demand flexibility?

Demand flexibility = capability, motivation and willingness of consumers to adjust their energy usage in response to the needs of the grid
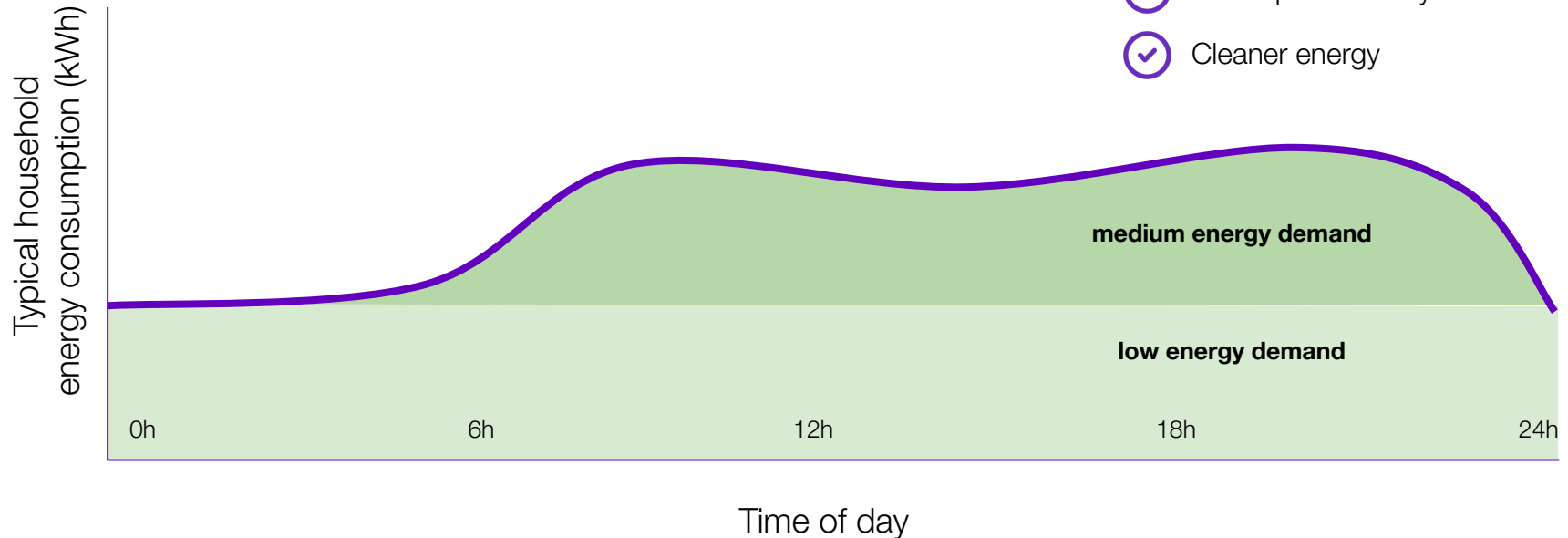
High risk of black outs

"Dirty" power plants turned on to meet the demand

Typical household energy consumption (kWh)

peak energy demand

low energy demand

0h   6h   12h   18h   24h

Time of day

What is demand flexibility?

Demand flexibility = capability, motivation and willingness of consumers to adjust their energy usage in response to the needs of the grid

✓ Lower strain on the grid

✓ Better predictability of demand

✓ Cleaner energy

Typical household energy consumption (kWh)

0h   6h   12h   18h   24h

medium energy demand

low energy demand

Time of day

What do flexible households look like?

A few examples

Flexible household 3:
Uses its solar and home battery system to store energy during off-peak hours and use it (or even sell it back to the grid) during peak hours.

Flexible household 1:
Voluntarily reduces its energy consumption at a given time in response to an email alert from its utility provider.

Flexible household 2:
Allows their utility company to remotely adjust their home's thermostat a few times a year when demand is highest. Receives a reward for doing so.

Why do we need more flexibility now?

20% → 50%

Countries are becoming more dependent on electricity

The IEA expects electricity's share of total energy demand to rise from 20% to 50% by 2050.

29% → 60%

Switching to renewables makes power supply less predictable

The share of renewables in energy production is expected to increase from 29% to over 60%. However, this brings with it the risk of reduced energy stability.

10x

**Consumers play a vital role in creating demand flexibility**

The IEA Net Zero report identifies a need for a tenfold increase in demand flexibility by 2030.

Consumers have a key role to play in achieving this goal.

How can behavioural science help

The guidebook

Applying behavioural insights to
unlock residential demand flexibility:
Guidebook for practitioners
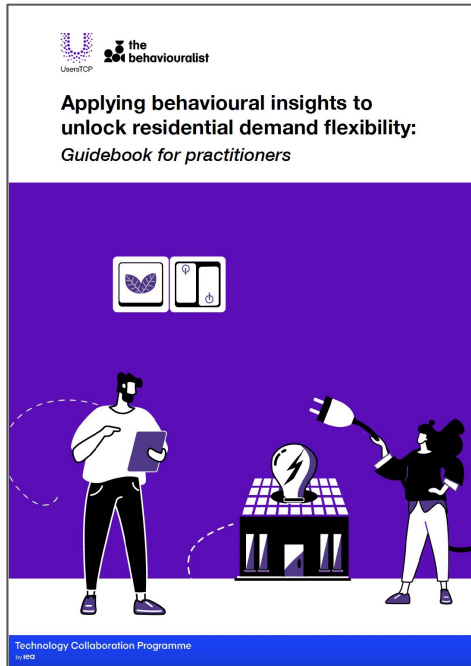
- **A new free resource for policymakers and energy suppliers who design and implement demand-response programmes.**

- **Provides advice based on a synthesis of 120+ behavioural science articles and nine expert reviews.**

- **Developed by The Users TCP Behavioural Insights Platform.**

A behavioural perspective on the problem
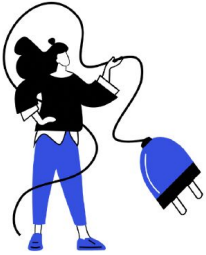
Consumer habits

How can we motivate consumers to **change their consumption habits** (e.g. shifting the use of appliances to off-peak times)?

Program enrollment & participation

How can we increase consumer **enrollment to demand response programs and tariffs** (e.g. time of use tariffs) and how can we support continuous participation in these?

Tech adoption

How can we encourage consumer **adoption of technology that enables greater flexibility** (e.g. home battery storage, EVs)?

Applying behavioural insights
≠ nudging

System-Design-Communication framework
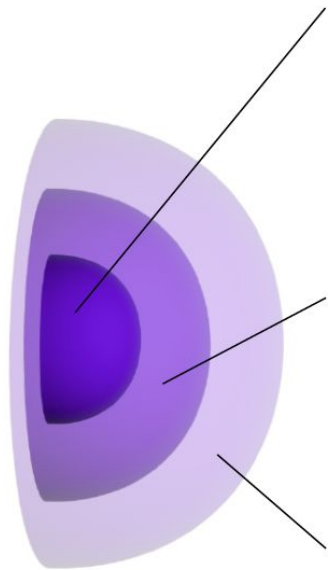
System level
Building community endorsement, ensuring collaboration of energy stakeholders, implementing behaviourally informed policies etc.

6
strategies

Design (choice architecture) level
Simplifying interfaces, increasing availability, reducing hassle during installation etc.

13
strategies

Communication level
Improving understanding, emphasising the right benefits of technology, combating misinformation, etc.
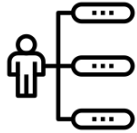
10
strategies

Using the guidebook
Two illustrative cases

The intended users of the guidebook

Policymakers

particularly teams responsible for:

- Energy regulatory frameworks & standards that involve residential consumers
- Public acceptance of new energy infrastructure and smart grids
- Incentive schemes and education campaigns to boost energy efficiency
- implementation of consumer-facing energy policies

Energy suppliers

particularly teams responsible for:

- Services and products related to domestic demand flexibility
- Customer engagement and communications
- Collaborating with regulators and technology manufacturers

Use case 1
Developing a new policy

Developing a new policy

Policy objective: How to encourage solar-powered households to <u>consume less from the grid</u> during peak hours?

Behavioural changes that might be needed:
→ changing habits (e.g. shifting appliance use to off peak times)
→ adopting new technologies (e.g. batteries)
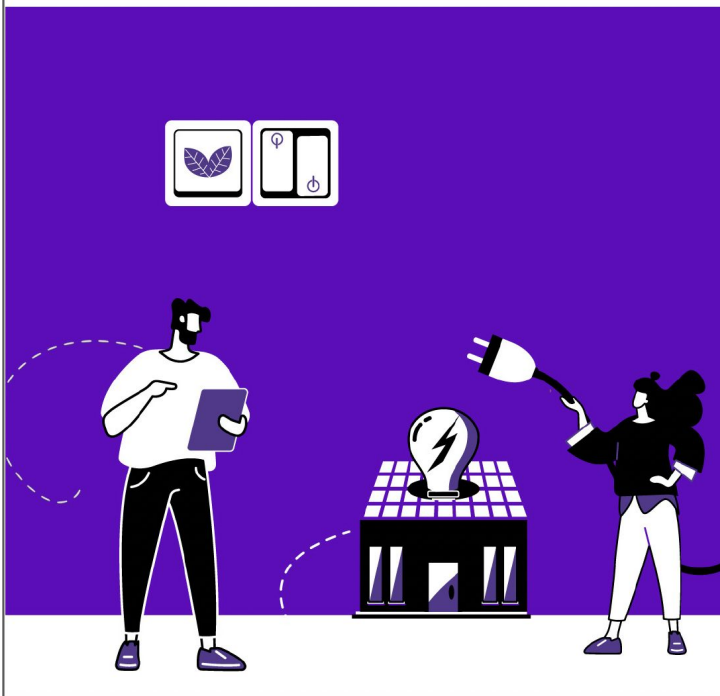
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UsersTCP

the behaviouralist

Applying behavioural insights to unlock residential demand flexibility:

Guidebook for practitioners

1 Changing energy consumption habits

Households can start consuming energy more flexibly and boost energy efficiency by changing their current energy consumption habits. This approach is widely accessible, as it doesn't require additional investments in sophisticated demand-response technologies such as solar panels and heat pumps, or participation in demand flexibility programmes.

Although changing behaviours is challenging and may have a limited impact on energy consumption – especially without access to programmes or technologies – this approach can serve as the foundation for introducing demand flexibility to households. When programmes and demand-response technologies are not readily accessible, changing consumption habits may represent the only feasible approach. It can also lay the groundwork for a comprehensive strategy that later encourages households to participate in demand-response programmes and install technologies, working together to further reduce energy consumption.

Key behavioural changes that households can adopt in their day-to-day life include:

1. **Delaying Usage of Electrical Appliances During Off-Peak Times:** This includes activities such as operating washing machines, dishwashers, and cooking appliances powered by electricity during periods of lower demand.

2. **Adjusting Home Heating or Cooling Temperature:** Households can reduce electricity consumption by modifying heating or cooling settings in the home.

3. **Adopting Energy-Saving Habits:** Simple actions like turning off appliances in standby mode and switching off lights when not in use contribute to overall energy savings.

While these energy-saving behaviours may seem straightforward, they are often deep-seated habits that are challenging to change. The next section explores system-level, design-level and communication-level strategies to foster the adoption of energy-saving habits.

System level

1.1 Use regulations to make energy-saving habits easier to perform

Design level

1.2 Leverage moments of change

1.3 Reward consumers that adopt new energy-saving habits

1.4 Make energy-saving habits easier to adopt

Communication level

1.5 Help consumers identify the most impactful energy-saving actions

1.6 Reward consumers that adopt new energy-saving habits

1.7 Use reminders

1.1 Use regulations to make energy-saving habits easier to perform

To facilitate the adoption of new energy-saving habits, it is important to make them more accessible and easier to perform and to discourage energy-intensive behaviours. This can be achieved by implementing regulations that support demand flexibility behaviours, such as incorporating user-friendly features in electrical appliances or banning certain appliances that are energy-intensive.

What you can do:

- **Embed demand flexibility functions in appliances:** Mandate manufacturers of household appliances to embed demand flexibility functions into their appliances. For example, appliances such as smart thermostats, or washing machines could prompt users to schedule their heating or washing during off-peak times.
- **Mandate appliance energy rating:** Require technology manufacturers to use energy labels to nudge consumers towards energy-efficient appliances.
- **Public disclosure of emissions:** Require businesses to disclose their carbon emissions and publicly state their strategies for improving demand response in self-reported assessments.
- **Incentivise demand flexibility:** Offer incentives, such as tax breaks or subsidies, for homeowners who actively replace energy-inefficient appliances or upgrade to more energy-saving options.
- **Provide real-time feedback:** Collaborate with energy providers to provide real-time feedback on energy usage, making homeowners aware of the energy consumed by their existing habits and encouraging behaviour change. Alongside feedback on energy usage, consumers could also receive actionable tips to help them adopt energy-saving actions in their day-to-day lives.

Tips

- Help build public support for the policy by clearly communicating the reasons behind regulations and incentives to homeowners, emphasising the benefits of adopting new energy-saving habits.
- Provide resources and guidance on energy-saving alternatives and options that homeowners can adopt to replace their old habits.

Example

Requiring carbon emission self-reporting to increase compliance

A 1999 study identified that requiring firms to self-report pollution levels led to higher levels of compliance with pollution-related policies, even when the consequences of non-compliance were relatively minimal.[18] Making the undesirable behaviour publicly visible can lead to fewer instances of non-compliance.
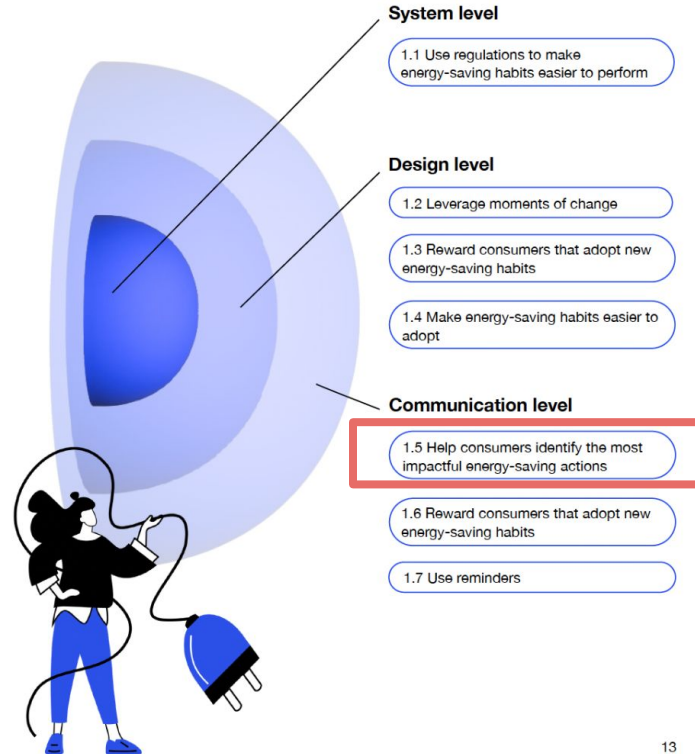
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1.5 Help consumers identify the most impactful energy-saving actions

People often lack knowledge of how much energy various daily behaviours, like turning on lights, using appliances, or charging devices[29] consume. As a result, they tend to overestimate the impact of low-impact activities, underestimate the high-energy ones and therefore often prioritise less impactful actions. Limited feedback and information on specific energy consumption and a lack of understanding of varying energy prices during on- and off-peak times, contribute to this knowledge gap.

To encourage more flexible energy consumption, you should help households understand which actions yield the most significant energy savings and when to perform them during the day to achieve the most benefits.

What you can do:

- **Facilitate knowledge sharing:** Encourage energy-saving during peak times by organising Q&A sessions, webinars, or community meet-ups where individuals can share insights. Designate "energy champions" within the community to guide and inspire others in implementing simple energy-saving measures. These champions serve as valuable resources, fostering a shared commitment to sustainability.
- **Provide feedback on consumers' energy consumption:** Educate people on energy consumption associated with various activities during peak times, such as operating appliances or using lighting. Highlight the potential energy savings achievable by modifying their behaviour, emphasising actions with the greatest impact. Keep communications concise and straightforward, prioritising the most energy-efficient behaviours for clarity.
- **Provide how-to guides:** Inform people about how they can shift their use of electrical appliances to other times of the day. This might include explaining how to practically change the settings of their appliances, for example, by setting a timer function on washing machines and dishwashers. Providing visual guides and images might be particularly helpful here.[30]
- **Start with small changes:** Begin by focusing on simple energy-saving actions that require minimal effort, such as turning off lights when leaving a room or unplugging electronics when not in use. Once people get used to these simple changes, they are likely to be more inclined to embrace more demanding energy-saving practices.

Tips

Couples and single individuals residing in homes are likely more capable of curbing energy usage during peak times compared to larger families who tend to have more established set routines. Consequently, for a more impactful and targeted approach, efforts could be initially concentrated on identifying and engaging with couples and single occupants to encourage and support their energy-efficient practices.

Example

Providing key information online to help households conserve energy

In collaboration with local authorities from Kent and Medway and the NHS, The Behaviouralist co-designed a behavioural intervention to help households learn about the most effective energy-saving actions through an online platform called Share the Warmth.[31]

While measuring the effect of the intervention on energy consumption was beyond the scope of the trial, it was found that sharing energy-saving tips significantly improved participants' energy-saving knowledge. The treatment group scored, on average, 39% higher than the control group in the knowledge assessment. Interestingly, while most participants only spent a short amount of time reading the tips, it was sufficient to improve their energy-saving knowledge considerably.

These findings suggest that online information provision can help improve households' knowledge about energy-saving actions and increase their demand flexibility.

Know someone who is worried about energy bills?

#sharethewarmth

KENT GREEN ACTION

share the warmth
Help keep your loved ones warm

A few remarks

- **The provided solutions are meant to serve as starting points.**

- **Piloting the proposed solutions in your own setting is essential - what worked elsewhere might not need work in your specific context.**

- **The evidence we reviewed comes mostly from WEIRD samples - potentially limited applicability to other populations**

Use case 2
Improving an existing service

Improving the uptake of a demand flexibility programme

Objective: How do we encourage more households to sign up for <u>voluntary turn-down events</u>?

Behavioural changes might be needed:
→ **encourage enrollment to a demand-response programme**

Improving the uptake of a demand flexibility programme

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Applying behavioural insights to unlock residential demand flexibility:

Guidebook for practitioners

Technology Collaboration Programme
by iea

Contents

Executive summary   Introduction

1 Changing energy consumption habits

2 Encouraging enrolment and participation in demand-response programmes

3 Increasing adoption of demand-response technologies

2.1 Encouraging enrolment in demand-response programmes

By enrolling consumers into demand-response programmes, energy providers can send signals to consumers to adjust their electricity consumption at specific times to improve grid stability. Consumers who positively respond to these signals obtain lower electricity prices or other incentives. Though demand-response programmes can be effective in unlocking flexibility, their uptake among households remains low.
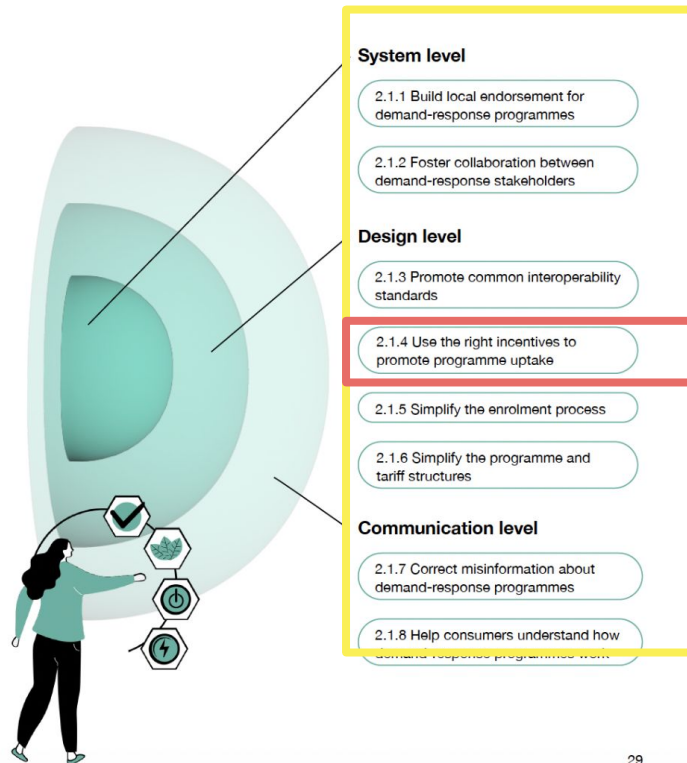
Demand-response programmes typically fall into one of three categories:

1. **Manual response programmes** - Consumers are notified by their energy provider about a peak event in advance (e.g. through an email or a text message a day ahead of the event) and asked to manually adjust their consumption during the event.
2. **Automated response programmes** - Energy supplier remotely controls consumers' heat pumps, EV chargers, smart thermostats or other smart devices for a certain period (usually 1-3 hours) to reduce energy load when the supply is low.
3. **Time-of-use tariffs** - Consumers who sign up for the tariff pay lower electricity rates in off-peak times (i.e., when the overall energy demand is low and the supply is high) and higher rates during peak times (i.e., when there is a high demand).

Existing research suggests that demand-response programmes can reduce peak energy demand. For example, a meta-analysis of more than 60 studies involving 337 treatments found that households who opted into time-of-use tariffs decreased their energy usage during peak times.[36] Further, a recent trial by the UK's Energy System Operator showed that simply inviting people to take part in a manual demand-response programme reduced their consumption by 10%, regardless of whether they signed up or not. Households that opted into the programme and participated in the events reduced their peak consumption by 40% on average.[37]

Despite the effectiveness of demand-response programmes, historical evidence shows that only a minority of people enrol in them.[38] This is often due to behavioural frictions: People might not enrol if they feel that the programme is hard to understand, not user-friendly or difficult to sign up into. Some people hold misconceptions, such as that programmes enable energy providers to collect additional personal data and use them for profiteering purposes.

In this section, we illustrate how behavioural insights can be applied on the system, design and communication level to increase the uptake of residential demand-response programmes.

System level

2.1.1 Build local endorsement for demand-response programmes

2.1.2 Foster collaboration between demand-response stakeholders

Design level

2.1.3 Promote common interoperability standards

2.1.4 Use the right incentives to promote programme uptake

2.1.5 Simplify the enrolment process

2.1.6 Simplify the programme and tariff structures

Communication level

2.1.7 Correct misinformation about demand-response programmes

2.1.8 Help consumers understand how demand-response programmes work

2.1.4 Use the right incentives to promote programme uptake

People might not sign up for a demand-response programme because they do not find it appealing. Different people are motivated by different factors; some may join if the programme reduces their energy bills, while others may be driven by environmental concerns or attracted by a fun-to-use app connected to the demand-response programme.

While many programmes emphasise financial benefits like bill reductions, credits and discounts, these may only attract specific customer groups. There is a much broader range of factors that can motivate programme enrolment, including hedonistic, gain and normative motivators.[57] You should explore what motives drive the main interest in the programme among your customer segments and then leverage these findings in the programme design.

What you can do:

- **Understand what drives your programme uptake:** Conduct interviews, focus groups, or customer surveys to explore the role of gain, normative and hedonistic motivators.
  - *Gain motivators* refer to protecting and increasing a household's resources (e.g., saving money, reducing one's bills, obtaining access to a new technology, improving one's understanding of energy consumption, improving control of appliances, obtaining health-related advice and increasing property value)
  - *Normative motivators* refer to meeting the expectations of others (e.g., being among energy-efficient neighbours, being part of an innovative community that shapes a new demand-response programme, and feeling like "doing the right thing" for environmental reasons)
  - *Hedonistic motivators* refer to enjoyment here and now (e.g. having fun when completing energy-saving challenges and using a gamified app in connection to the programme)
- **Design the programme so that it adequately responds to customer needs:** Based on research findings, this can mean changing the information that is communicated to households, developing new functionalities of the programme, or removing less relevant programme components.

Tips

- High-usage, high-income households tend to be less attracted by the prospect of reduced energy bills and are more driven by normative motives (e.g., being an energy-efficient and environmentally conscious neighbour).[58]
- Similarly, people who are new to the concept of demand flexibility tend to be more sensitive to what other people say about the programme. To get these people on board, think about how you can expose them to positive programme reviews and community champions who are enthusiastic about the programme.
- Many customers own smart home devices. Explore how you can enable customers to connect their smart devices to the demand-response programme to obtain a richer experience, such as gaining deeper energy-related insights.

Example

Using philanthropical elements to increase willingness to participate

A study in Japan examined different factors that influence households' willingness to participate in demand-response programmes.[59] It found that altruism can serve as a key driver to promote programme enrolment. Specifically, households were more likely to participate in a demand response programme when it allowed the households to donate money they saved through demand response to reduce the electricity bill of low-income households.

A few remarks

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- Piloting the proposed solutions in your own setting is essential - what worked elsewhere might not need work in your specific context.

- The evidence we reviewed comes mostly from WEIRD samples - potentially limited applicability to other populations

Sneak peek
**Next steps:
field experiments**

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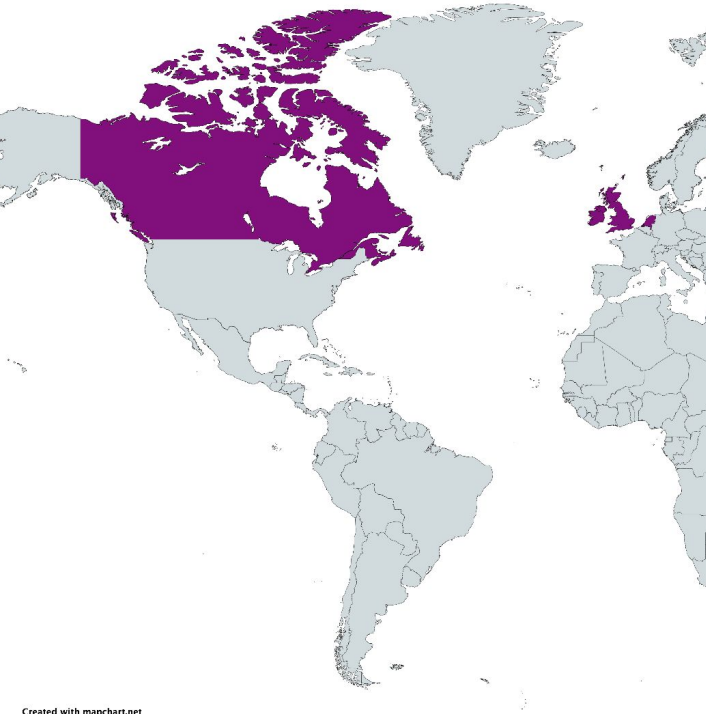
A collaboration programme under the umbrella of the **International Energy Agency (IEA)**.

BI Platform's objective in 2023-25: Run **five field experiments** to improve residential demand flexibility in partner countries.

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Behavioural
Insights
Platform

Users TCP Behavioural Insights Platform

With the
support of

Trials that we will run in 2024

Increasing uptake of smart thermostats & program enrollment
Canada

Developing a new demand response programme for SMEs
UK

Motivating PV owners to help balance the grid
The Netherlands

+ more in preparation (one trial in Ireland, two more in the UK)

Q & A

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Guidebook download

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User-Centered
Energy Systems

About Us

The User-Centred Energy Systems mission is to provide evidence from socio-technical research on the design, social acceptance and usability of clean energy technologies to

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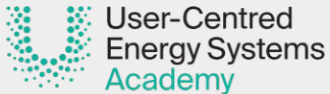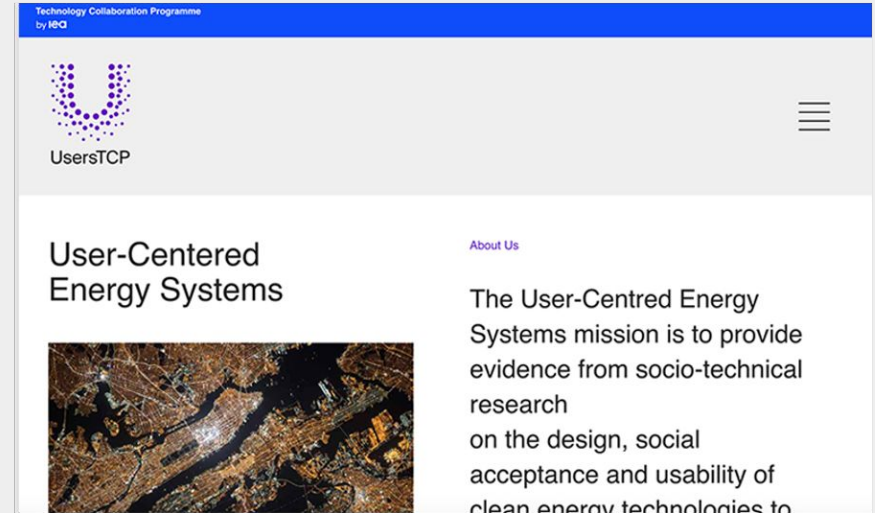
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