# PEAK SHAVING & SHIFTING | ROADMAP TO FLEXIBILITY

BARRIERS

SOLUTIONS



-Ò̈́ TRIGGER		Stage 1 CONSIDERATION & PLANNING		Stage 2 ACTION		Stage 3 SUSTAINING FLEXIBLE BEHAVIOUR
Any energy user can start the journey. Users are prompted to start by information campaigns or promotions, by having a smart meter installed or by an increase in electricity bills (e.g. after adopting a high-consumption appliance).	BEHAVIOURS	Energy users review their bills to understand their use and pin- point what activities they can reduce or shift to off-peak times, making use of tools like apps or in-home displays if available. They also research automation tools and explore how to operate existing smart appliances more effectively.	BEHAVIOURS	Users start changing their consumption at peak times, including by reducing their use of non-essential appliances (e.g. air- drying clothes rather than using the dryer), using more efficient appliances (e.g. using an air fryer rather than the oven) and shifting their use of large appliances to off-peak times (e.g. using timers to run laundry overnight).	BEHAVIOURS	Users incorporate changes into daily routines and refine settings on smart appliances and automation tools to optimise the balance between reducing peak consumption and convenience, while also responding to seasona changes.
<ul> <li>Lack of awareness &amp; status quo bias</li> <li>Scepticism about impact of individual actions &amp; perceived lack of fairness</li> <li>Educate users about the need for demand flexibility and the multiple benefits of reducing peak demand</li> <li>Ensure that flexibility policies and measures directed at large energy users are communicated to the public</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Poor understanding of appliance consumption</li> <li>Confusion &amp; information overload</li> <li>Lack of access to enabling tools (e.g. in-home displays)</li> <li>Help users understand which appliances use the most electricity through real-time feedback</li> <li>Target behaviours that are easy to shift</li> <li>Highlight collective benefits</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Lack of immediate feedback or rewards</li> <li>Pushback from other household members</li> <li>Time constraints &amp; competing priorities</li> <li>Make feedback &amp; financial rewards more immediate</li> <li>Promote community peak challenges</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Difficulty maintaining motivation</li> <li>Lack of visible savings</li> <li>Change in household circumstances or routines</li> <li>Foster emotions of pride by highlighting households' contributions to reducing emissions</li> <li>Support the integration of automation technologies</li> <li>Incorporate gamification to in home displays and apps</li> <li>Improve financial incentives for peak shifting</li> </ul>

# **ELECTRICITY TARIFF SWITCHING** | ROADMAP TO FLEXIBILITY



	-Ö		Stage 1 CONSIDERATION & PLANNING		Stage 2 ACTION		Stage 3 SUSTAINING FLEXIBLE BEHAVIOUR
	An energy user must have a smart meter installed to start. Users are usually prompted by smart meter installation. Other triggers include adoption of a high-consumption appliance (e.g. EV, heat pump), a bill shock, a recommendation from friends or family and utility notifications around contract renewal or new products.	BEHAVIOURS	Energy users assess which tariffs best align with their energy usage habits. They get information and advice online, from utility customer services teams, price comparison websites, or from their peers. Some users may use consumption data from their smart meter to help them estimate how much they could save by switching.	BEHAVIOURS	Energy users select the tariff that best suits their needs and make the switch. This involves gathering information and filling out the necessary forms. They also need to inform other household members of the change, and the behavioural adjustments needed, and may set up monitoring tools such as a mobile app.	BEHAVIOURS	After switching, users refine their electricity consumption habits to maximise the savings they make on their new tariff.* They might use monitoring tools to help track their usage and respond to notifications and feedback from their provider. *see peak shaving and shifting roadmap
SOLUTIONS BARRIERS	<ul> <li>Lack of awareness of the need to switch tariff to avail of off-peak rates</li> <li>Perceived complexity &amp; information overload</li> <li>Lack of perceived relevance &amp; insufficient cost savings</li> <li>Provide simple, consistent communication about how time-based tariffs work</li> <li>Standardise tariff naming &amp; terminology</li> <li>Pilot different communication frames</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Lack of data literacy &amp; difficulty assessing fit</li> <li>Lack of data integration with price comparison websites</li> <li>Complexity aversion</li> <li>Introduce an education process for customers before they enrol in time-based tariffs</li> <li>Promote the development of standardised consumer tools that are easily integrated with smart meter data</li> <li>Highlight both the financial and environmental benefits of time-based tariffs</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Difficulty gaining buy-in from other household members</li> <li>Concerns about lifestyle adjustments</li> <li>Loss aversion &amp; fear of higher bills</li> <li>Provide simple time-based pricing structures for energy users without past experience</li> <li>Reduce risk of switching using trial periods or price guarantees</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Difficulty assessing savings due to price fluctuations</li> <li>Difficulty sustaining motivation &amp; habits</li> <li>Support the adoption of automation technologies</li> <li>Display the savings achieved from switching to a time- based tariff on bills</li> </ul>

### **DEMAND RESPONSE PROGRAMME PARTICIPATION** | ROADMAP TO FLEXIBILITY



	-̈̈́Ųָ- TRIGGER		Stage 1 CONSIDERATION & PLANNING		Stage 2 ACTION		Stage 3 SUSTAINING FLEXIBLE BEHAVIOUR
	Any energy user can start the journey. Users are first prompted by recommendations from friends or family, utility notifications or ad campaigns.	BEHAVIOURS	Energy users seek further information and evaluate whether participation aligns with their usage patterns and lifestyle. More in-depth consideration is required for direct load control contracts. Users research the potential for service disruption and their ability to override direct control, weighing the risks against the benefits.	BEHAVIOURS	Enrolment involves signing up and sharing required information. Users must also set preferences and agree to the programme's terms and conditions. Direct load control often requires the installation of new smart technologies.	BEHAVIOURS	Energy users continue to respond to requests to voluntarily reduce their demand. In the case of direct load control, they do not override their utility's operation of appliance to curtail consumption.
SOLUTIONS BARRIERS	<ul> <li>Misunderstanding programme purpose</li> <li>Raise awareness of the financial and environmental benefits of participating in demand-side flexibility programmes</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Status quo bias</li> <li>Privacy concerns</li> <li>Reluctance to cede control</li> <li>Address concerns about privacy &amp; trust (e.g. data security assurances)</li> <li>Address concerns about loss of control (e.g. emphasise ease of override)</li> <li>Offer smart home appliances that have been pre-enrolled to direct load control</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Complicated enrolment procedures</li> <li>Worry about service disruption</li> <li>Lack of buy-in from other household members</li> <li>Provide meaningful financial incentives and market frameworks for energy users to participate in demand-side flexibility programmes</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Limited visibility of savings &amp; rewards</li> <li>Declining motivation</li> <li>Lack of verification of actions using meter data</li> <li>Help energy users understand how they can shift their energy use</li> <li>Implement mechanisms to verify real actions taken by customers during demand response requests</li> </ul>

# SMART APPLIANCE ADOPTION & USE | ROADMAP TO FLEXIBILITY



	-ÒÒ		Stage 1 CONSIDERATION & PLANNING		Stage 2 ACTION		Stage 3 SUSTAINING FLEXIBLE BEHAVIOUR
	An energy user must have stable internet access and basic levels of energy literacy to start. Renters have less control over appliance choice than homeowners. The need to replace an existing appliance often acts as a trigger. Rising energy costs combined with awareness of time-of-use tariffs can also encourage users.	BEHAVIOURS	Users compare models in terms of cost, potential savings, compatibility with existing home systems. Engaged users may explore flexibility features of appliances such as auto-demand response capability in more detail.	BEHAVIOURS	Energy users purchase, install and set up their smart appliance, connecting it their home network. They may enrol their appliance in demand side flexibility or direct load control programme, switch to a flexible tariff or install additional devices like smart hubs.	BEHAVIOURS	Energy users optimise their smart appliances for comfort and efficiency. They may need to adjust settings with changes in routines and energy needs. Users may also track usage and savings (e.g. through in-home displays) and learn from this feedback.
SOLUTIONS BARRIERS	<ul> <li>Low awareness</li> <li>Narrow focus during distress purchases</li> <li>Incentivise smart enabled appliances and run campaigns that highlight the associated benefits</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Higher upfront cost</li> <li>Flexibility potential of appliances not considered</li> <li>Complexity aversion</li> <li>Position smart devices as enhancers of comfort and energy efficiency</li> <li>Address concerns about security and loss of control</li> <li>Educate retail salespeople on the flexibility potential and associated savings of smart appliances</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Complexity of installation</li> <li>Unclear instructions for enrolling in demand response programmes</li> <li>Ensure interoperability standards between smart appliance manufacturers and utility providers</li> <li>Standardise real-time feedback provided by smart appliances and in-home displays</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Lack of feedback on performance &amp; savings</li> <li>Waning interest</li> <li>Create user-friendly dashboards for smart appliances with visual cues</li> <li>Send personalised notifications based on energy usage</li> <li>Implement gamification elements</li> </ul>

#### **HEAT PUMP ADOPTION & OPERATION**

BARRIERS

SOLUTIONS

### ROADMAP TO FLEXIBILITY



-̈̈́Ųָ- TRIGGER		Stage 1 CONSIDERATION & INSTALLATION		Stage 2 SUSTAINING FLEXIBLE BEHAVIOUR
Homeowners in adequately insulated homes with sufficient financial resources are best placed to start this journey. Hearing about government incentives can act as a trigger, as can undertaking a broader home renovation or recommendation from family, friends or an energy audit.	BEHAVIOURS	Energy users evaluate whether a heat pump is suitable for their home, comparing with alternatives in terms of cost and efficiency. Ideally the flexibility potential of the heat pump and relevant tariffs will factor into people's decision.	BEHAVIOURS	To maximise flexibility, heat pump owners can integrate them with smart thermostats and enrol in demand flexibility programmes. Switching to a flexible tariff can help users benefit and keep their running costs down.
<ul> <li>Lack of awareness of heat pumps as a heating system</li> <li>Exposure to misinformation</li> <li>Run nationwide awareness campaigns based on a thorough understanding of the relevant audience</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Lack of understanding of how heat pumps work</li> <li>High upfront cost &amp; uncertainty over long-term performance</li> <li>Lack of awareness of demand flexibility considerations</li> <li>Educate installers &amp; encourage provision of flexibility advice during installation</li> <li>Customise outreach strategies to different consumer segments</li> <li>Offer increased subsidies and trial opportunities</li> </ul>	► SOLUTIONS BARRIERS	<ul> <li>Complexity of heat pump controls</li> <li>Conflicting advice on optimal operation</li> <li>Lack of specific financial incentives</li> <li>Develop tailored customer outreach programmes to educate owners about the benefits of integrating heat pumps with smart meters and time-based tariffs</li> <li>Implement performance-linked financial incentives</li> </ul>

#### **EV ADOPTION** ROADMAP TO FLEXIBILITY & CHARGING





required.

EV models

need

# SOLAR PV ADOPTION & USE | ROADMAP TO FLEXIBILITY

BARRIERS

SOLUTIONS



-̈̈́̈́Ųָ- TRIGGER		Stage 1 CONSIDERATION & PLANNING		Stage 2 ACTION		Stage 3 SUSTAINING FLEXIBLE BEHAVIOUR
Homeowners with suitable roof space and sufficient financial resources are best placed to start this journey. Becoming aware of decreasing installation costs or government incentives can be a trigger, as can seeing others installing the technology. Renovating the home can also prompt consideration.	BEHAVIOURS	Energy users begin researching the benefits of solar PV, compare different providers and investigate financing options. As part of this process they may consider the potential for solar PV to enhance flexibility and the opportunity presented by flexible tariffs, feed-in tariffs and battery storage.	BEHAVIOURS	Once they decide to proceed, energy users consult with experts to determine optimal system size and panel placement. Ideally, they also install battery storage to maximise their flexibility potential. Once installed, users set up basic solar energy monitoring tools and connect the system to the grid to meter or export surplus energy.	BEHAVIOURS	Once the system is operational Users continue to monitor their electricity generation and usage patterns, adjusting their behaviour and appliance settings for maximum efficiency. Some users may automate appliance usage to align with solar production hours or participate in demand response events using stored energy.
<ul> <li>Perceived high upfront cost &amp; lack of awareness of incentives</li> <li>Lack of awareness of ability to sell back to grid</li> <li>Expand access to solar through community-based and shared ownership models</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Information overload &amp; lack of clarity on return on investment</li> <li>Low trust in providers</li> <li>Concerns about legislation &amp; permissions</li> <li>Provide grants and subsidies specifically aimed at low-income households</li> <li>Develop specific policies for solar PV adoption in multi-unit residential buildings, such as shared PV systems for apartments</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Complexity of installation</li> <li>Lack of awareness of flexibility benefits of battery storage</li> <li>Limited installer availability &amp; support</li> <li>Promote battery storage as a key component of solar PV investments</li> <li>Promote installer training programmes that focus on provision of expert accurate advice to the public</li> </ul>	SOLUTIONS BARRIERS	<ul> <li>Lower than expected savings</li> <li>Habits overriding automated settings</li> <li>Conflicting advice on best time to use electricity</li> <li>Encourage in-home-display set-up alongside PV installation</li> <li>Introduce tariffs that benefit customers who use battery storage alongside solar PV</li> <li>Integrate provision of demand flexibility information into the grant approval process</li> </ul>