FLEXFORUM

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FlexForum advice on enabling flex capable residential end-use products

FlexForum exists to support coordinated and collaborative action across the electricity ecosystem and speed up progress to make it easy and routine for households, businesses, communities to maximise the value of their distributed and flexible resources.

We are an incorporated society with 46 Members from across the electricity ecosystem.[1] Our touchstone is the Flexibility Plan which is a whole-of-system list of the practical steps and actions required for people to routinely and easily maximise the value of their flexible resources and support the affordable and reliable operation of the electricity market and system.

This advice draws on FlexForum experience, the insights coming from Flex Day 2025, and Flexibility Plan 2.0.

We have the following points.

- Flexibility is expected to play a greater role in delivering electricity for people and the power system. The benefits are expected to be significant.
- Flexibility is the modification of electricity usage or production in response to an external price or physical signal. This means demand flexibility and demand response are types of flexibility, though suited to differing use cases.
- There are individual and system use cases (or jobs) for flexibility. Each individual and system use case will rely on the flexible resource(s) doing the job - including end-use residential products - to have specific technical functionality such as: to receive instructions, acknowledge receipt and respond accordingly, and potentially provide operational updates.
- Technical functionality decisions are best made with explicit reference to the performance specifications of the various use cases for flexibility which a device or product is suited to provide. These performance specifications, and the associated pricing and orchestration mechanisms, are still being developed. As such, reasonable guesses are possible about technical functionality, but mandating a functionality now when the power system has little to no experience with using the full range of flexible resources and capabilities would run the risk of getting something wrong.

[1] The list of FlexForum Members is available here. Members include: gentailers, retailers, metering services suppliers, electric vehicle charger manufacturers, energy management software firms, Transpower, distributors, solutions providers, universities, and some real people.

- A consistent or standard minimum functionality is desirable for each system use case so the same device can provide the same flexibility outcome across the country. **The critical task is to develop consistent requirements and functionality for each flexibility use case**. This would then inform the R&D and product design choices by manufacturers. It may not be necessary or appropriate at this time to specify a minimum functionality for every type of end-use device given flexibility use cases are nascent.
- Communication protocols are the key functionality to standardise to enable flexibility. The product response is a function of the device and the flexibility use case (and any messages). Operational information is a function of each flexibility use case and market settings.
- FlexForum Members look forward to contributing to a process to identify minimum functionality for flexible resources (including end-use devices), noting that this process should take explicit account of the performance specifications of the various flexibility use cases.

Flex is expected to have a bigger role in the power system

Flexibility is expected to have a bigger role in the system and in everyday household and business activities as an extra tool to efficiently keep the lights and everything else on, and as a way for people to lower their emissions, improve their reliability and resilience and reduce their electricity costs.

Our Flexibility Plan lists 41 practical steps and tasks for the electricity ecosystem to develop capability, processes and practices which will make flexibility easy and routine for people and the power system. Put another way, the Flexibility Plan provides a checklist for addressing the barriers to using and benefiting from flex.

The role of flex in the power system has been considered by a range of parties including Transpower, the Market development advisory group, and in the BCG Climate change in New Zealand: the future is electric report.

The estimated benefits of flex are significant. For example, BCG said in 2022 that developing a smart, flexible, power system would save households, businesses and the economy billions of dollars, compared to other potential futures.

Flexibility is the modification of usage or production in response to an external price or physical signal

Flexibility is the result of households, businesses and communities modifying their electricity usage (eg, demand) and production (eg, generation or battery discharges) in response to external price and physical signals.[2]

This modification occurs via four types of flex: shape, shift, shimmy or shed.[3] Each type of flex is suited to differing use cases or jobs that are activated by specific price or physical signals.

Shape-based flex (eg, 'demand response') is suited to use cases relying on shaping aggregate use or production over time as a way to manage predictable system conditions. This flex is activated via a one-way signal, eg, the retail price structure communicated via the power bill, and the flex user (eg, a distributor) will never know how or whether the flex owner will respond at any particular time.

The shift, shed and shimmy-based flex types (eg, 'demand flexibility') are suited to use cases relying on more dependable responses to specific unpredictable or unusual system conditions, eg, a network capacity

[2] The United Kingdom Clean Power 2030 Action Plan (p97) says 'Consumer-led flexibility involves voluntary actions taken freely by energy consumers – or on their behalf by Demand Side Response Service Providers (DSRSPs) with consumers' consent – to shift some of their electricity use when they choose to be rewarded for this flexibility while still having their energy needs met. And, 'These voluntary offers of flexibility by energy consumers (whether households or industries) can also be referred to as demand side response (DSR) or demand flexibility.

[3] These response types have been adapted by FlexForum for the framework developed by Lawrence Berkeley National Laboratory. See the 2025 California Demand Response Potential Study - Charting California's Demand Response Future: Final Report on Phase 2 Results, March 2017. The [flexible] demand responses are described in section 3.4. The framework has also been used by Racefor2030 in its October 2021 Flexible demand and demand control opportunity assessment.

constraint or energy shortfall on a cold winter night. This flex is activated via either one-way[4] or two-way signals, but technology improvements mean two-way communication is becoming more prevalent because the exchange of messages with status (operational) information and instructions supports more dependable responses to system conditions.

There are several individual and system flexibility use cases, but these use cases are under-used

People can use flexibility for 5 jobs: to reduce power costs, reduce network connection costs, monetise their flexible resources, manage their reliability/resilience, and reduce emissions.[5] Check out a more detailed explanation in the Flexibility Plan.

The ability and incentive to use flexibility for each of these human jobs depends in some way on how flex is activated and motivated by the power system through pricing or physical signals. Because these signals are currently inadequate or underdeveloped, there is less motivation to say yes to flex or invest in flexible devices.[6]

Customer propositions are key to unlocking flexibility. They should make complex systems simple, highlight tangible benefits, and show how customers' actions create value. Clarity and fairness are critical for building confidence in flex offers.

We think there are 4 key jobs or roles that flexibility does or can do for the power system. Each of these jobs has or requires a price or physical signal to motivate a flexible response, but as just mentioned the existing signals are inadequate or underdeveloped to do this yet.

These are high level descriptions of the 4 main jobs involved in operating the power system.[7] Flex can help with each of the 4 jobs. The 2 use cases identified in the green paper are parts of job 1 (ie, optimising intermittent renewable energy use) and jobs 2 and 3 (ie, reducing peak demand to manage anticipated or sudden generation or network constraints).

1. Electricity provision. Matching supply and demand for electricity through time in unconstrained conditions.
2. Supply and capacity shortfall (anticipated) management. Delivering electricity and network capacity when a shortfall is anticipated for a specific period.
3. Supply and capacity shortfall (unexpected) management. Delivering electricity and network capacity when a shortfall occurs suddenly.
4. Fuel scarcity management. Delivering electricity during a prolonged scarcity of hydro, wind or gas fuel.

Flexibility functionality depends on the device and the use case requirements

Each job - for humans and the system - requires the flexible resources doing that job - including end-use products - to have certain functionality.

FlexForum agrees there is '…a need to create a minimum level of standardisation at an end-use product level' and the Flexibility Plan includes steps:

- #19 Develop a common minimum functionality for each flexibility use case so the same device can provide the same services across the country. There currently is limited information available to device manufacturers about what functionality is required for an end-use device to do the flexibility jobs it has the capability to deliver.

[4] The ripple control system for controlling residential hot water cylinders is an example of one-way communication which activates a dependable flexible response. This system is being complemented (or supplanted?) by two-way communication using metering infrastructure.

[5] These 'jobs' are the 5 energy-related outcomes people can get from using flexibility. The jobs were defined through a series of FlexForum workshops between April and August 2022. Starting with outcomes was a deliberate effort to ensure the Flexibility Plan reflects the perspective of a household, business or community – who may have flexible resources either now or in the future – making choices about flexibility and wanting to maximise the value of their resources for themselves, their community and for the wider economy.

[6] FlexForum considers the highest priority action to activate flex is to establish pricing (cash) signals which fill the holes in the value stack and provide the foundations for a much wider range of flexible customer propositions.

[7] We are partway through developing a more detailed description of these jobs and the role of flex in each.

- #20 Ensure technical standards establishing minimum functionality for flexible devices remain up to date. People need to be confident that an end-use device has the required minimum functionality to do the applicable flexibility jobs.

FlexForum considers the critical task is to clearly define the various flexibility use cases and identify the associated functionality a device needs to deliver a use case. This information would then inform the R&D and device design choices of manufacturers.

It may prove necessary to specify or mandate a minimum functionality for end-use devices. However, mandating a functionality now - when the power system has little to no experience with using the full range of flexible resources and capabilities - would run the risk of getting something wrong.

The Green paper identifies 3 types of functionality for a flexible device.

- **Communication functionality** determines how information and instructions are exchanged between the device, the owner, coordinator, flex user and others.
- **Response functionality** determines what response the device is capable of providing, eg, raising/lowering usage or production/discharge.
- **Information functionality** determines the information the device creates, holds and provides, eg, about its past, current, or future operation.

We think the communication functionality is the key functionality to 'standardise'. Flexibility Plan step #36 is 'Develop a common approach to connectivity which easily integrates and maximises the value of flexible resources.'

The higher value flex use cases rely on the communication flows between flex resources, sellers and buyers enabling the easy and routine exchange of information and messages.

A set of open communication methods or protocols need to be defined to provide flex buyers and sellers and device manufacturers with certainty about what functionality to build into devices, and what processes and systems they need to develop.

Not all end-use devices are going to need the same communication functionality, so requirements should be developed with explicit recognition of the various use case performance specifications requirements and resource capability.

We think the response functionality depends on the device capability and the use case requirements.

Different devices have their own flex capabilities. In this context, the key task is Flexibility Plan step #37 to Develop a common approach for deploying flexibility with consistent use case triggers and messaging structures.

Having a common set of instructions for the response wanted from a device will enable these to be pre-programmed, eg, turn on/off, raise/lower usage by a pre-defined amount, or ignore the instruction.

The instructions should be developed with explicit recognition of the various use case performance specifications requirements and resource capability.

We think the information functionality depends on what operational information needs to be created and available from flexible devices under each flexibility use case.

Flexibility Plan step #38 says Develop common methods and the associated capability sets for measuring, validating and settling flexibility transactions across the use cases. These methods and capability will be decided by the requirements of each use case, and will in turn decide what information needs to be available from a device.

Not all devices will need to create and have available the same operational information. It will depend on which flexibility job(s) they are used for. As such, the operational information depends on the use case requirements and market operation.

We note Flexibility Plan step #14 is to Understand device features which may frustrate people from maximising value. This is about enabling people to easily identify features of different device brands which might prevent them from maximising the value of any flexibility. An example is proprietary software which impacts what information is created.

Concluding comments

At Flex Day 2025 FlexForum Members discussed the details of what it will take to make flexibility a practical, trusted and routine part of the power system and everyday household decisions.

A key insight was the electricity sector should provide a 'package deal' when talking to people about the opportunities and benefits of them saying yes to flex. This means things like clearly presenting what saying yes to flex requires and the impacts, including monetary and other benefits, trade-offs and the ease of being flex-y.

Residential devices - EV chargers, heat pumps, electric hot water systems which use a storage tank, fridges/freezer, clothes washers, dishwashers, clothes dryers, inverters for solar and battery systems, and HEMS - all have various flexibility capabilities.

We consider that harnessing this potential flexibility requires people to have clear answers to questions like 'what is in it for me?', 'what flex is valuable?', 'what are the benefits?, and **'what will I need to do?'** to enable people to confidently assess their options when purchasing residential devices.

Decisions about technical functionality cannot be made without a reasonable view of the performance specifications of the various use cases for flexibility. These specs will inform what functionality is required for a flexible resource - including end-use devices - to do these jobs, and begin the process of identifying a set of standard minimum functionalities.

The FlexTalk programme is providing useful experience and other flexibility projects kicking off provide an excellent and timely opportunity to develop initial specifications and identify functionality requirements.

FlexForum Members look forward to contributing to a process to identify minimum functionality for flexible resources (including end-use devices), noting that this process should take explicit account of the performance specifications of the various flexibility use cases and learning-by-doing.

This is FlexForum advice. Individual FlexForum Members will have their own perspectives and positions. You can contact FlexForum at info@flexforum.nz with any questions and to arrange further discussion.