Flexible electricity resources are the ultimate multi-tool

Flexible resources have the scale and capability to add value across the power system

FlexForum and others see opportunities for flexibility to play a greater role in the power system and in everyday life and business activities.

Flexible electricity resources – things able to modify generation injection and consumption patterns in response to an external signal – provide 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. This is the premise underpinning the assessments and estimates by BCG and others[1] about the benefits of developing a smart, flexible, power system.

We already have flex equivalent to 8% of current system peak demand

We calculate that there is at least 590MW – and up to 1,150MW – of dependable and deployable flex used in the system today (8% of current system peak demand), and there could be up to 2.1GW of flex available by 2030 (25% of estimated system peak demand in 2030).[2]

A resource that is equivalent to 25% of peak demand deserves serious consideration and effort to get it online and available to help deliver a more sustainable, reliable and affordable power system. And that is without considering the benefits – faster decarbonisation, more resilient supply and lower power bills – this flexible resource would deliver to households, businesses and communities.

Flex has wide-ranging capabilities to reduce the costs of running the power system

There are four core jobs involved in running a secure, reliable and affordable power system.[3] Each of the jobs are done by tools which can meet specific time-based performance requirements – response speed and duration – ranging from milli-seconds to multiple days.

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1 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.

2 These are rounded figures. See FlexForum, October 2025, How much flex is in the system?.

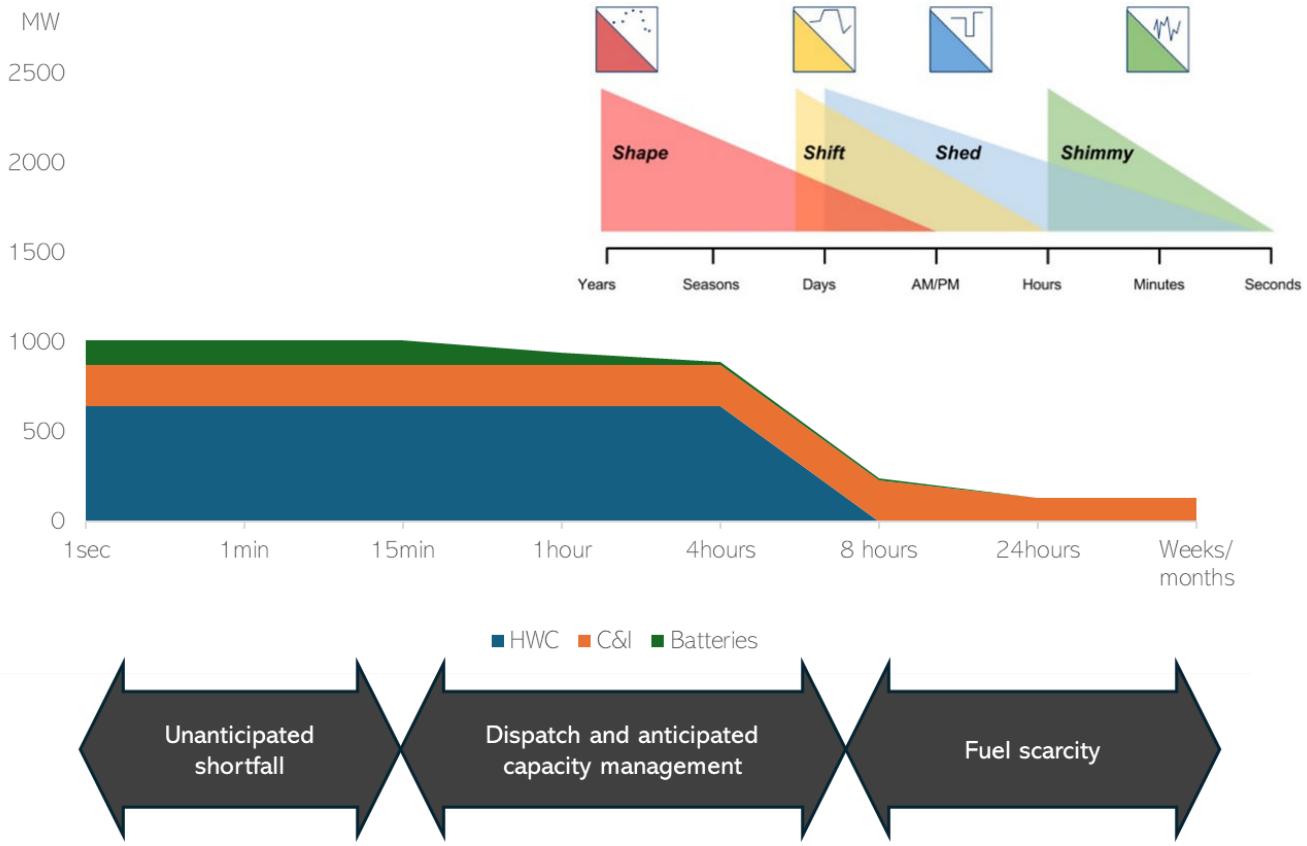
Note: Flex in the system means flex used to do jobs in the power system by being actively deployed to shift, shed or shimmy in response to external signals. It does not include flex used by people, eg, shape-based flexibility in response to time-of-use pricing signals.

3 These job descriptions are adapted with thanks from Whiteboard Energy materials. Detailed job descriptions are provided in the Appendix.

1. Electricity dispatch management. Matching supply and demand for electricity through time in unconstrained conditions.

Figure *1* shows the aggregate flex resource of 1,150MW currently online has the capability to assist with system operation across all four core system jobs within seconds to days and weeks, noting that not all this flex can be used everywhere or for each job.

Figure 1 Response speed and duration of the flex resources being used in 2025 in running the power system



Source: FlexForum and Lawrence Berkeley National Laboratory. The time dimensions align with the four types of flex: shape, shift, shimmy and shed.[4] Note, this chart uses the high estimate of flex in the system today.

We can take three broad insights:

- About 1,000MW of flex can be deployed within milli-seconds for up to 4 hours, representing capability to assist with electricity dispatch management, and both anticipated and not anticipated shortfall management.

2. Supply and capacity shortfall (anticipated) management. Providing adequate electricity and network capacity when a shortfall is anticipated for a specific period.
3. Supply and capacity shortfall (unanticipated) management. Providing adequate electricity and network capacity when a shortfall occurs suddenly.
4. Fuel scarcity management. Supplying electricity during a prolonged scarcity of hydro, wind or gas fuel. The dry year management job focuses on extended fuel shortfall, but a similar scenario could arise from a prolonged shortage of network capacity, eg, an extended HVDC circuit outage. Flex could possibly help in this scenario.

[4] 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.

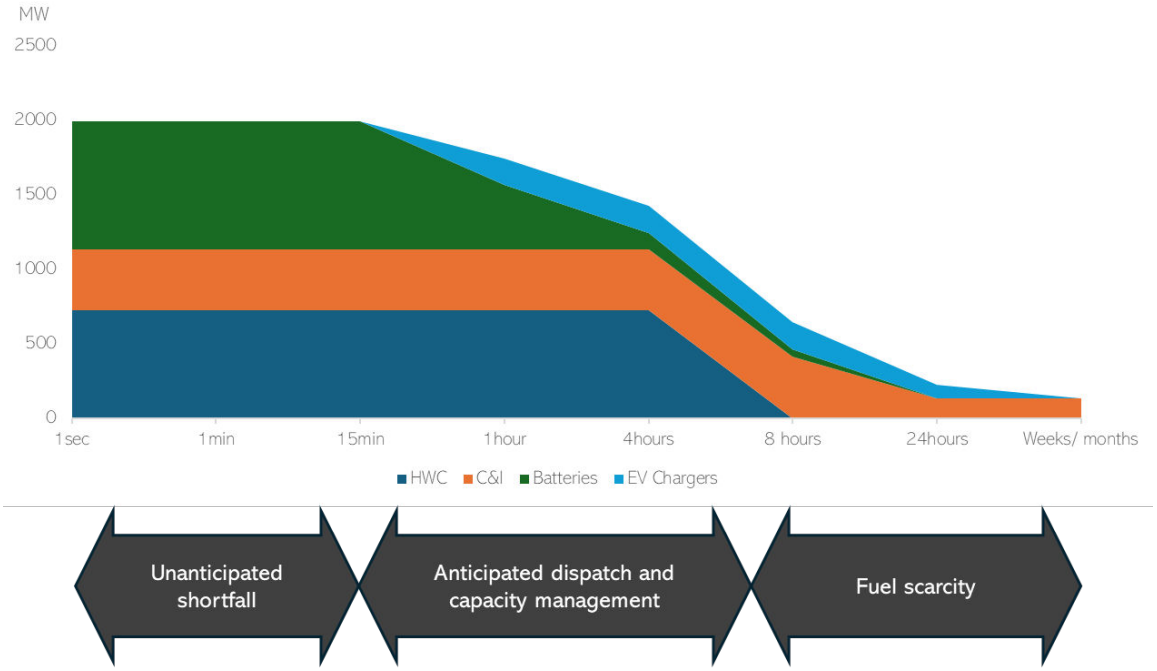
- About 240MW of flex has capability to be deployed for longer periods of up to 8 hours.
- There is currently at least 135MW of long-duration flex with the capability to replace hydro, wind or gas fuels for days to weeks to assist with fuel scarcity management.

The flex resource will get bigger and more capable

FlexForum expects the potential flex resource will become bigger and more capable as we get closer to 2030, particularly due to increasing numbers of standalone batteries and more flexible EV charging.

Figure 2 shows the capability of the potential aggregate flex resource of 2,130MW by 2030. This is an extra 980MW flexibility compared to today and nearly equivalent to adding another Huntly to the system.

Figure 2 Response speed and duration of the flex resources potentially available in 2030 to assist in running the power system



Source: FlexForum.

This potential stock of flex resources in 2030 would be more capable than the current resource, particularly for managing the expected increase in short-term volatility in spot prices and localised network congestion.

- 1,750MW could be deployed within milli-seconds for up to 1 hour.
- 1,425MW could be deployed for up to 4 hours.
- 650MW could be deployed for up to 8 hours.

Flex is doing the jobs it is asked to do but could do more

Flex is doing the jobs it is asked to do but we don't know how much flex is being used to do what. This makes it very unlikely the flex we have is being used to best effect and very unlikely value is being maximised for the system or people.

Focusing just on the amount of flex estimated to be currently doing a system job, there is 1GW of flex available to provide an instantaneous response for up to an hour to dispatch instructions, and both anticipated and unanticipated energy and capacity shortfalls. Nearly 900MW of this resource can respond for up to 4 hours, and 240MW for up to 8 hours.

The increasing scale and capability of the stock of flexible resources provides a practical opportunity to rethink system operation to enable a more secure and reliable power system and put continued downward pressure on system costs and power bills.

Taking advantage of this opportunity – and the economic benefits – is the focus of our Flexibility Plan which lists 41 practical steps and tasks for the electricity ecosystem to develop the capability, processes and practices necessary to make flexibility easy and routine for people and the power system.

Appendix. Flex resource response speed and duration assumptions

Our accounting of flex in the system includes flex from four sources: batteries (stationary); EV charging management; hot water heating management; and commercial/industrial demand management.

These sources provide 3 main ways for curtailing or shifting (flexing) the generation or use of electricity across time:

- storing electricity in a stationary battery or a vehicle battery. Most household stationary batteries will cycle (charge/discharge) frequently (eg, daily) in response to spot prices/TOU pricing to pay back the up-front investment.[5] Vehicle batteries are becoming larger and can provide the equivalent of 500km+ of driving range meaning owners can delay charging for several days.[6]
- storing thermal heat in a water cylinder (or in the air of a space). The limits of thermal storage (ie, insulation) constrain the amount of time that flex can be deployed before the household observes reduced amenity via cooler water (or air).
- shifting the timing of (or curtailing) commercial and industrial activity. Simply Energy and Enel-X have been successfully offering commercial and industrial flex into the reserves market for several years.

We have not counted flex from residential space heating and cooling and batteries (mobile) because there is no official record of these resources and insufficient data to develop reasonable estimates.

Source	Responsiveness	Duration
Water heating	• immediately for devices connected via modern communications or ripple signal.	About 4 hours once a day.
Space heating/cooling	• immediately for devices connected via modern communications.	Situation specific depending on space size, insulation, starting temperature, outside temperature and air leakage.
Stationary batteries	• immediately for devices connected via modern communications.	Maximum discharge constrained by inverter capacity, while duration constrained by usable storage. Within these parameters we expect 2-4 hours of discharge is possible twice a day.
Mobile batteries	• immediately for devices connected via modern communications.	Instantaneous charge that is interruptible constrained by charger, while duration of interruption constrained by usable storage and driver requirements. Within these parameters we expect 4+ hours of interruption to usage (charging) is possible.

[5] For example, a behind-the-meter battery would have to arbitrage a $10,000/MWh wholesale market price over 100 times to pay back its capital.

[6] The increase in battery size and extended driving range could affect owner charging behaviour. Existing retail TOU pricing is designed around owners charging outside 'peak' times (mostly up to 4 hours). The degree of 'shift' implied by these structures is debateable; the tariffs currently provide the lowest cost charging after 9pm. On the assumption that a typical driver will arrive home at 6pm with a partically depleted battery, the tariff is effectively incentivising a 3 hour shift from what might be considered 'convenience' charging. However, this view of the world is probably anchored around short-range vehicles (Nissan Leafs) and very limiting relative to today's reality of battery range. Few drivers who drive petrol cars would aim to top up the fuel tank every day, unless purely out of convenience (the petrol equivalent of living at a service station).

Source	Responsiveness	Duration
		For Vehicle-to-Grid use cases, maximum discharge constrained by inverter capacity, while duration constrained by usable storage. Within these parameters we expect 2-4 hours of discharge is possible twice a day.