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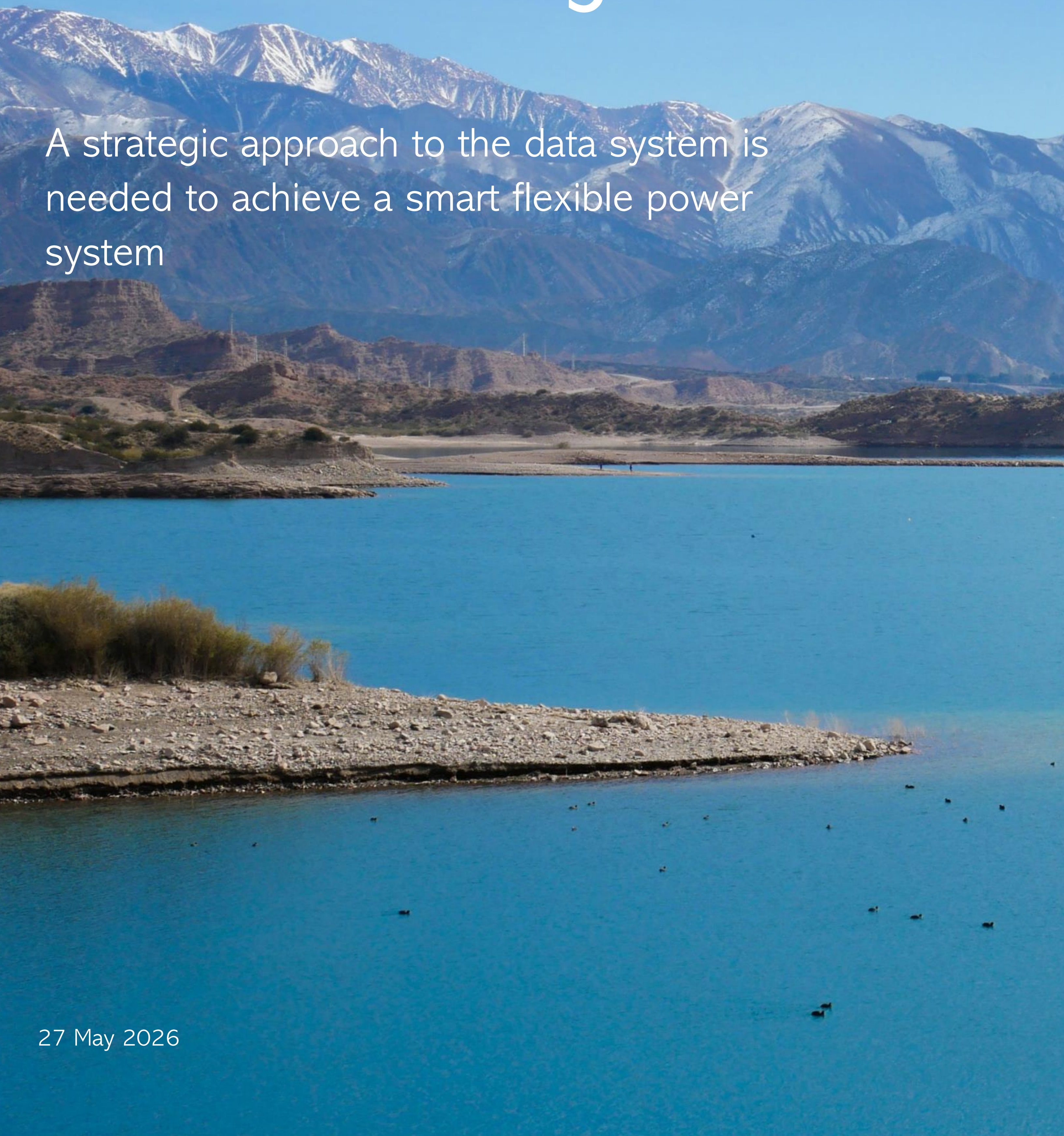
FlexForum Insights



A strategic approach to the data system is needed to achieve a smart flexible power system

27 May 2026

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This FlexForum Insights provides the FlexForum perspective on upgrading the electricity data system drawing on the experiences and views of FlexForum Members. Each Member may have their own perspectives and positions.

Contact info@flexforum.nz with questions or to find out more.

A strategic approach to the data system is needed to achieve a smart flexible power system

FlexForum is an incorporated society with Members from across the electricity ecosystem committed to sharing knowledge and collaborating to enable households, businesses and communities to easily and routinely maximise the value of their flexible electricity resources.[1]

Households, businesses and communities increasingly have electric vehicles (EVs), solar, battery storage, electric heating and cooling equipment and diverse electric machines and appliances.

These flexible[2] resources give people more options and control over where they get power, and when and how it gets used, providing more sustainable, reliable, resilient and cheaper power.[3] This flexibility also provides the electricity ecosystem with another tool for operating a reliable and efficient power system.

We consider flexibility integral to the smart power system that Aotearoa New Zealand must develop to underpin a productive growing economy, reduce carbon emissions, and provide households, businesses and communities with a reliable, resilient and affordable power supply.

The pace of flex progress is tied to the evolution of the data system

This FlexForum Insights outlines our perspective on the foundational features of a future fit data system that ensures easy and routine access to the data and information required by a smart flexible power system.

These Insights leverage the advice and practical experience within FlexForum on collecting, communicating, processing, storing, exchanging and using the wealth of data and information currently and potentially available from the power system and market. [4]

We previously outlined the relationship between flexibility, a flexible power system and digitalisation in the April 2023 FlexForum Insights 'A digitalised electricity system is needed for flexibility to fully play its part'. These latest Insights build on that work.

We intend these Insights to assist the thinking and decision-making of regulatory bodies about regulatory interventions and market and system upgrades, plus inform investment decisions made across the supply chain and by people in information technology and communication capabilities, cyber-security and in the functionality of their flexible resources.

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1 FlexForum is an incorporated society with 49 Members from across the electricity ecosystem. Members include: gentailers, retailers, metering services suppliers, electric vehicle charger manufacturers, energy management software firms, Transpower, distributors, solutions providers, universities, and some real people.

2 For readers looking for a technical definition, we think flexibility is the modification of generation injection and consumption patterns, on an individual or aggregated level, often in reaction to an external signal, to provide a service to the owner or within the power system.

3 FlexForum refers to 5 outcomes people can get using flexibility: Minimise energy-related ongoing costs; Minimise connection costs; Manage reliability and resilience; Reduce emissions; and monetise flexible resources. See the Flexibility Plan.

4 Members discussed digitalisation and the characteristics of a digitalised power system in dedicated workshops on 30 June, 1 and 2 July, and 15 October 2025. As well as local experience, these sessions advised consideration of international thinking and practice particularly in the United Kingdom.

Main points

FlexForum considers that an inclusive, open, cybersecure and adaptive data system and data sharing infrastructure is a prerequisite for a smart, flexible power system which maximises the value of flexible resources for people, the power system and the economy.

Digitalisation and cybersecurity must run ahead of physical electrification, not be a byproduct or afterthought, particularly as the flood of cheap flexible 'edge' devices become part of each home and business. The electricity sector talks about spending $10's of billions on electrification and sees opportunities for $100's of millions in flexibility benefits, but there is less focus on the investments in the digital nervous system required to efficiently deliver a smart, flexible power system.

A future fit data system is needed to enable electricity data (and information) to quickly and easily get to all existing and prospective electricity data users, but developing it requires major upgrades to the existing data system. The electricity ecosystem needs:

- **a consistent data system architecture** for establishing and maintaining data touchpoints between the firms and entities that make up the electricity ecosystem
- **default trust frameworks** which define, implement and govern the rules underpinning accessibility (open or restricted) of each dataset across the data system and costs (public or commercial) of accessing a dataset
- **a presumption of dataset openness** supported by clear rules and criteria for requesting and incorporating new datasets into the data system as they emerge or are needed by data users.
- **standardised default data formats and (cyber) secure, automated exchange mechanisms** for all datasets in the data system.

The approach explicitly treats the data system as a system rather than a collection of functionally focused data exchanges by providing the architecture for systematic access to datasets and exchange of data. Developing this architecture should be treated as a major system upgrade, not just tweaks to the existing data system by attempting to fit the square peg of 1990s data use cases into the round hole of the future. Fortunately, the upgrade can draw together work already underway, such as to implement the consumer data right for the retail electricity sector.

These Insights identify six key tasks required to upgrade the data system.

1. Catalogue the electricity datasets currently in the data system, the use cases, existing users, and their access rights and terms. This data catalogue would allow users to search and identify useful datasets. The list could also identify emerging use cases and users who are not part of the data system.
2. Scope and undertake a small-scale test run of the proposed data sharing infrastructure using a single dataset, perhaps outside the existing data system, with multiple existing or prospective users, to identify a minimum viable data sharing infrastructure product.
3. Develop a model default data use trust framework, aligned with existing frameworks including the Customer and Product Data Act 2025, to manage privacy and consent at scale across the data sharing infrastructure.
4. Develop a whole-of-system framework for cybersecurity requirements to underpin the security and safety of the evolving data system with an increasingly critical role in operating physical power infrastructure including the Benmore power station, the Cook Strait HVDC link and the EV parked next door. The cyber trust framework(s) would complement the data use trust framework.
5. Develop a default minimum operable data standard and data exchange mechanism to support automated (cyber) secure machine-to-machine data exchanges.
6. Design and implement a digitalisation coordination function for the data system and digital sharing infrastructure – using the principles governing the UK digitalisation programme as the starting point – to ensure a technically competent, independent entity is providing sector wide architectural coherence.

Increasing complexity in the power system and market requires a more digitalised and joined up data system

The existing data system is the combination of the data sets and data exchanges between data holders, creators and users required to operate the power system and market.

It is a creature of its time designed to minimise the transactions costs of coordinating system and market participation of a few, large and sophisticated generators, retailers, networks and industrial customers operating under predictable system conditions.

However, conditions across the power system – from the transmission to the 400V level – are becoming less predictable. Weather events increasingly impact network operation. The generation fleet is shifting from highly controllable fossil fuels to more variable sources such as wind and solar.

At the same time, the number and types of participation in the electricity market are increasing with the emergence of distribution system operators and flex coordinators, a steady scaling up of distributed generation, and people changing how and when they use power.

A consequence of the changing system and market conditions is the need for the data system to evolve to provide more accurate physical and pricing data (and information) to the increasing number of power system users – people, flex coordinators, retailers, network operators, generators etc – for them to make efficient choices which support a secure, reliable and cost-effective power system.

The next evolution of the data system involves more digitalisation to ensure the wealth of electricity data is in digital and machine-readable formats that can be processed, intermingled, stored, shared and transmitted efficiently and securely between data creators, holders and users as…

'*A digitalised energy system is one where:*

- *Presumption of data openness is the industry default;*
- *Data is adequate, standardised, and interoperable across the sector;*
- *The required infrastructure, processes, technologies and skills are appropriately deployed;*
- *The relevant rules and regulations, costs and benefits, and roles and responsibilities are clear.*[5]

A more digitalised data system enables greater use of data, more innovation and more efficient decisions

The objective of this more digitalised data system is to enable data (and information) to quickly and easily be used by an increasing range of users – including people with flexible resources, flexibility coordinators and flexibility users across the power system – to enable them to make the efficient decisions (and innovation) required for a smart, flexible power system.

Table 1 is a high-level non-exhaustive list of data users, use cases and datasets needed in a future power system and market.

The list focuses on the flexibility-related use cases of old and emerging 'participants', plus a potential user from outside the electricity sector to illustrate how a siloed approach (ie, the current state) prevents realising the benefits and economic opportunity of a digitalised data system.

[5] Department of Business, Energy and Clean Growth and Ofgem, Digitalising our energy system for net zero Strategy and action plan 2021, July 2021, page 10.

Table 1 A high level list of data users, use cases and datasets

Data user	Use cases	Datasets needed
A household	The household use cases include easily and confidently discovering 'Is this the right investment for me, here and now? and easily and routinely realising the full benefits of their flex resources to: lower electricity costs; lower network access (connection) costs; improve reliability and resilience; reduce carbon emissions; or earn revenue from their flexibility.	- their historical usage - retail, spot and contract prices on offer in their location - network feeder historical reliability - power quality (historical network voltage) - network capacity (forecast) - network capacity (operational, ie, real time).
A flex coordinator	The use cases for an entity coordinating flex resources – eg, a portfolio of in-home and public EV charging sites – include: - identifying optimal site locations for public EV chargers - providing households and businesses with advice on cost effective EV charging infrastructure options (eg, charger capacity, flexible usage, flexible connections etc) - developing competitive customer propositions – eg, a hardware and ongoing service package – which maximises the value of the owners flexible resource (their EV charger) - integrating the flexible resource portfolio securely and easily into the market and system to make the resource available to flex users.	- the customers' historical usage - retail, spot and contract prices on offer in their location - network historical reliability (low and high voltage layers) - power quality (historical network voltage) - network capacity (forecast) - network capacity (operational, ie, real time).
A retailer	The use cases for an electricity retailer include: - identifying opportunities to access distributed flexible resources to reduce input costs, eg, reducing spot price exposure, reduce distribution charges (and share the cost reduction value with the customer) - offering competive customer propositions which reduce power costs by harnessing the customers' flexible resources - integrating the flexible resource portfolio securely and easily into the market and system to make the resource available to flex users.	- the customers' historical usage - retail, spot and contract prices on offer in their location - network historical reliability (low and high voltage layers) - power quality (historical network voltage) - network capacity (forecast) - network capacity (operational, ie, real time) - flex resource capacity, capability and location.
A distributor	The use cases for a distributor include: - more accurate forecasting of network use in an environment with a higher proportion of price-responsive (flexible) use and variable generation. - optimising use of network capacity by providing pricing signals and orchestration which motivates efficient flexible responses to conditions, eg, shaped or dynamic operating envelopes.	- aggregate historical usage by low voltage and high voltage layer - flex resource capacity, capability and location.
The system operator	The use cases for the System Operator include - more accurate forecasting of system use in an environment with a higher proportion of price-responsive (flexible) use and variable generation. - obtaining access to a wider range of flexible tools for managing system security in an environment with a higher proportion of price-responsive (flexible) use and variable generation.	- aggregate historical usage by low voltage and high voltage layer - network historical reliability (low and high voltage layers) - network capacity (forecast) - network capacity (operational, ie, real time) - flex resource capacity, capability and location.
A local council	The use cases for a local council responsible for developing and managing an efficient, low emissions transport network include: - assessing the cost and benefits of electrifying public transport projects and delivery - identifying optimal site locations for electric transport charging infrastructure	- road and public transport network(s) capacity and usage - individual site/building connection capacity - network capacity (forecast) - network historical reliability (low and high voltage layers) - flex resource capacity, capability and location

Data user	Use cases	Datasets needed
	- identifying flexibility upgrades (eg, solar, batteries etc) to public facilities and infrastructure.	- aggregate historical usage by low voltage and high voltage layer - flex resource capacity, capability and location (EVs).

Source: FlexForum. Inspired by Appendix C Use cases of the feasibility study undertaken by a consortium of Ove Arup, Energy Systems Catapult and University of Bath, Digital spine feasibility study: Developing an energy system data sharing infrastructure, September 2023. This table is indicative. A useful initial step to develop a future fit data sharing infrastructure would be to complete a use case and user journey exercise similar to what is described in the feasibility study.

The greater use of electricity data is a global focus

The need to upgrade the data system to account for changing conditions is not just a local challenge. The United Kingdom Clean Flexibility Roadmap states, *'A decarbonised energy system will look very different to the one we have today. Much of our energy will be generated by distributed, renewable sources. Many of these sources will be assets owned and managed by consumers.* ***This will require a step-change in the way these assets communicate within the energy system.***[6]*'* ***(emphasis added)***

Back in 2016, the Utility of the future report from the MIT energy initiative stated '*the level of granularity in space, time, and the disaggregation of services reflected in these economic signals will depend on several factors, including: trade-offs among the efficiency gains associated with increased granularity;* ***the availability of communication and computational technologies and implementation costs necessary to increase granularity****; and the acceptance of different prices and charges by various agents*.'[7] (**emphasis added**)

Here in Aotearoa New Zealand ten years on…

- More granular temporal and locational data about power system conditions is a necessary condition for realising a chunk of the efficiency gains expected from a smart flexible power system.[8]
- There are clear calls from across the electricity ecosystem – system and network operators, flex coordinators, retailers and humans – for more granular physical and pricing data to provide inputs to their day-to-day operational decisions and longer term investment decisions.
- The communication and computational technologies required for increased granularity are commercially available. There is no technical barrier to collecting, processing, storing or exchanging the data required for a more digitalised data system.

6 DESNZ, OFGEM and NESO, Clean Flexibility Roadmap, July 2025, p67, available at: https://assets.publishing.service.gov.uk/media/68874ddeb0e1dfe5b5f0e431/clean-flexibility-roadmap.pdf

7 MIT Energy Initiative, December 2016, Utility of the future, page 86, available at: https://energy.mit.edu/wp-content/uploads/2016/12/Utility-of-the-Future-Full-Report.pdf

8 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.

A future fit data system has three core features

The existing data system was fraying at the edges a decade ago, and the inadequacies are becoming ever more evident and harmful to efforts to maximise the benefits of flexibility.[9]

Much of the data needed for decisions about flexibility is not easily accessible to users or does not exist, and the lack of standardised formats, data dictionaries and structures, materially increases the transaction costs of accessing and using data.

The consequences and impacts of the current state of the data system on the electricity system and market highlight three foundational features and design principles[10] required for a future fit-for-purpose data system.

1. Data users across the electricity system and market need to easily and routinely get the data they need for their decisions and actions.
2. The data system needs to be adaptive and easily incorporates new datasets when these are needed by data users.
3. Data needs to be exchanged securely and efficiently between data creators, holders and users. Standardised formats and automated secure exchange should be the default.

These 3 features are a must have for an enduring, adaptive data system which delivers the gamut of outputs and outcomes desired today or tomorrow from a smart flexible power system. The practical impacts of this view are discussed in the Road-testing the features section.

Feature 1: Data users easily and routinely get the data they need

The number one feature of a future fit data system is all electricity data users can easily and routinely get the data they need for their decisions and actions.

The existing data system is designed to support operation of the market and system as they were in the late 1990's. These functionally focused arrangements obliged specified participants to create and hold specified types of data, and to exchange that data with other specified participants. For example, retailers are obliged to create and hold usage data and provide that data for wholesale market settlement and reconciliation and also provide it to distributors for network planning.

Most data-related problems wrestled over by the electricity sector over the years are a consequence of parties not specified in the data rules (ie, non-traditional participants) not being able to easily and routinely get the data they need for decision-making or to deliver a service.

The most obvious example is the difficulties that households and businesses face(d) in enabling their chosen agents to easily access their usage data and retail tariff options.[11] The root cause of this difficulty is that neither consumers' nor their chosen agents are recognised by the data system as 'official' recipients of either type of data and no official dedicated data exchange pathways exist(ed).

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9 We will not recount the history of the data debates in Aotearoa New Zealand here. History buffs can look back at the many regulatory consultations since 2011 relating to 'access to data' by distributors, humans and others. However, we will reflect on some of the inadequacies in the examples and case studies in the Road-testing the features section.

10 Note the Electricity Authority Our future is digital project proposed digitalisation principles: data visibility; interoperable systems and customer centricity (changed from simple solutions) and adaptive ecosystem. The visibility principle is broadly analogous to feature 1 (users easily get access). The FlexForum perspective is the customer centricity principle is an output of feature 1, rather than a fundamental design principle. The interoperability principle is broadly analogous to feature 3 (efficient exchange).

11 Or, turning this around, the difficulties prospective agents face(d) obtaining usage and tariff data to develop and scale energy management services. For reference, Flexibility Plan 2.0 step # 2 is 'Determine if people can easily get information about the existing electricity retail rates and charges', and step # 9 is 'Introduce rules to require data holders (eg, retailers) to instantaneously respond to requests by a person or their agent for usage data from the data holder.'

Another example is the difficulty that distributors faced obtaining customer usage data from the retailers which procured data services to produce the data for billing purposes. This was addressed by codifying default terms for an agreement between a distributor and a retailer for providing historical consumption data to the distributor (for network planning and operation). Again, the root cause of the problem is distributors were not recognised as official recipients of the dataset for the intended use case.

In both examples, solutions have or are being implemented. However, these solutions are tweaks and do not address the underlying problem that the data system does not easily accommodate new data users or uses.

The data system should be designed around inclusive and adaptive data sharing infrastructure

An enduring solution to the perennial access to data question is to establish a data sharing infrastructure which is inclusive, open and adaptive.

A handy model is being developed in the United Kingdom to provide '*a set of responsibilities, processes and technical functions that deliver secure data exchange for organisations in the energy sector. In practice, this manifests as a socio-technical solution which enable any energy sector participant to share information and data between each other using standardised approaches, comprising of the legal and technical enablers of sharing data at scale*.'[12]

The wheel does not need to be reinvented… the United Kingdom digitalisation programme developed from several years of thought and discussion provides a a model which can guide the evolution of the data system in Aotearoa New Zealand.[13]

Figure 1 Conceptual overview of the UK's proposed data sharing infrastructure

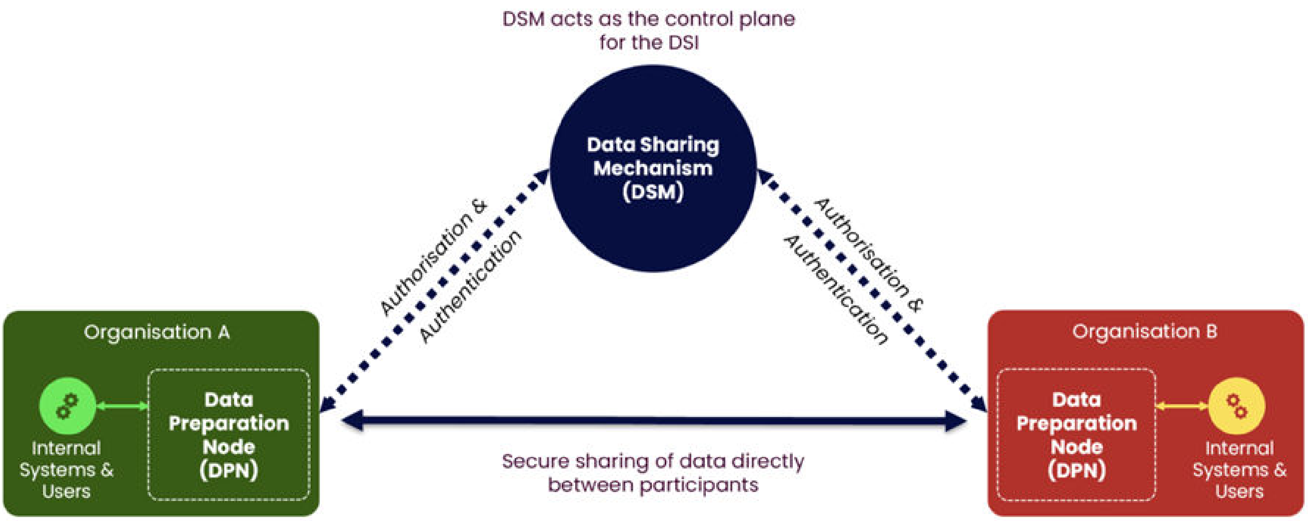

Figure 5 – DSI Conceptual Overview

Source: National Energy System Operator, September 2025, Energy Sector Digitalisation Plan (iteration one), page 67.

12 National Energy System Operator, September 2025, Energy Sector Digitalisation Plan (iteration one), page 67, available at: https://www.neso.energy/document/367551/download.

13 A potted history of the evolution of digitalisation thinking in the UK is provided on page 66 of the Energy Sector Digitalisation Plan, but also in the final section of this Insights Approaches to digitalisation elsewhere.

The UK is upgrading its electricity data system to establish a data sharing infrastructure which enables decentralised data sharing across the energy sector, with participants retaining ownership over their data and having a trusted mechanism for sharing data.[14] The purpose and functions were developed in 2023 through a stakeholder-led, collaborative, and consultative approach.[15]

The infrastructure is now being developed, with coordination occurring through the Energy Sector Digitalisation Plan under the stewardship of the National Energy System Operator (NESO).[16]

Designing and implementing a digitalisation coordination function for the data system and digital sharing infrastructure – using the UK digitalisation programme as the starting point – should help to ensure a technically competent, independent entity is providing sector wide architectural coherence.

Because, '*…without effective coordination, multiple digitalisation activities may overlap and create new digital silos, additional complexity and administrative burdens for third parties attempting to access data and provide innovative services to consumers.*'[17]

Drawing on that work, and guided by the views of FlexForum Members, a future proofed data system designed to enable data users to easily and routinely get the data they need includes…

… taking a consistent approach to data access and sharing across the electricity ecosystem

The data sharing infrastructure would establish a consistent approach to establishing data touchpoints between the IT systems of each individual firms in the electricity ecosystem and the wider data system – called a data preparation node in the UK – with each node configured according to defined rules regarding the specific data – market data, physical data, customer data etc – that the firm wishes, or is obliged, to share.

The architecture of the data sharing infrastructure is intended to make connecting firms and datasets to the data system simpler and cheaper by minimising changes to internal IT systems.

Each data holder (ie, firm) creates a data preparation node as a bridge between its internal datastores, the wider data system and data users. "*Organisations deploying a node will require a deployment environment (cloud, on premise, hybrid) to deploy the node. Their datastores will need to connect to the node for the transformation and publishing of data, and they will need identity management services for internal security authentication and authorisation for their users*."[18]

Each data user accesses the datasets they need (after showing their access pass) using standard *"…API endpoints and message brokers i.e., data streaming and publish-subscribe sharing*."[19], and subject to "*Security controls and techniques to facilitate the secure sharing of data across nodes*."[20]

The approach explicitly treats the data system as a system rather than a collection of functionally focused data exchanges and so provides an architecture for systematic access to datasets and exchange of data.

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14 Action 12 of the Energy Sector Digitalisation Plan is NESO will determine a proposed service model for the digital shared infrastructure by the end of the minimum viable product period (April 2027).

15 The feasibility study was undertaken by a consortium of Ove Arup, Energy Systems Catapult and University of Bath, Digital spine feasibility study: Developing an energy system data sharing infrastructure, September 2023, available at: https://www.arup.com/globalassets/downloads/projects/digital-spine-feasibility-study/digital-spine-developing-an-energy-system-data-sharing-infrastructure.pdf. The UK Government response to the energy system 'digital spine' feasibility study (August 2024) included tasking the National Energy System Operator to develop a minimum viable product, and the various recommendations from the study were subsequently included into the Energy Sector Digitalisation Plan.

16 Energy Sector Digitalisation Plan. Coordination-related actions are listed on page 75. Action 15 is NESO to undertake further work in early 2026 to help scope what a digital coordination role should achieve. And action 16 is NESO to assume stewardship of the plan and establish a clear governance framework to guide future annual iterations.

17 Energy Sector Digitalisation Plan, page 75.

18 Digital spine feasibility study, September 2023, page 32.

19 Ibid, page 32.

20 Ibid, page 32.

…providing an inclusive open pathway for parties wanting to access and use the data system

Importantly, the data sharing infrastructure can be designed to explicitly recognise that the data system must accommodate new data users and use cases… '*the emergence of new market propositions for flexibility and the possibility of organisations becoming licensed to operate in this space will need the transfer of interoperable data to facilitate the new markets. The current lack of standards across the sector is however a limiting factor in decarbonisation efforts'*.

Trust frameworks are needed for each dataset to define, implement and govern the rules underpinning data sharing between parties (ie, data users) with rights, where required, to share and receive data.

The trust framework concept is analogous to the ruleset (ie, the Electricity Industry Act and Electricity Industry Participation Code) for the existing data system and defines the functional elements of the framework: identify management, role management, user certification, registration, data usage policies, and legal terms and conditions.

Starting points for developing electricity sector trust frameworks are the existing ruleset and the Consumer Data Right for the retail electricity sector established through the Customer and Data Product Act 2025.[21]

An architecturally consistent trust framework approach explicitly acknowledges the elastic nature of data users and use cases over time by providing a transparent and consistent way of setting rules relating to data privacy, security and ownership and for bringing new data users – both individual and classes of users – into the data system.

The approach should address the dual concern raised by FlexForum Members that unscrupulous parties should not be able to request data they have no rights to, but this should not involve arbitrary, inconsistent and onerous 'authorisation' requirements.

The UK work noted there '*can be more than one of these [trust frameworks] in the sector. For example, a 'network' instance, a 'regulation' instance, and a 'privately' owned and operated instance. These would be designed from the same blueprint, so would be architecturally identical*'.[22]

Having multiple (yet consistent) trust frameworks enables the separate treatment of datasets with differing characteristics. FlexForum Members identified two dimensions.

- Accessibility of a dataset: open (generally available) or restricted (available to specific users for specific purposes)
- Cost of accessing a dataset: not commercial (no cost for access) or commercial (available on a commercial basis).

A consistent approach to developing trust frameworks for the range of datasets across the electricity ecosystem will ensure each separate trust framework calibrate the effort involved in assessing 'trustworthiness' based on the characteristics of the data – open or restricted, free or commercial – and the relative privacy and security needs.

A further advantage of the data sharing infrastructure is participation does not need to be exclusive to the electricity sector. The UK feasibility study considered use cases including 'transport electrification enablement' requiring datasets outside the power sector, eg, transport infrastructure, held by local councils etc.[23]

Feature 2: The data system is adaptive and easily incorporates new datasets

A second feature of a future fit data system – and complementary to feature 1 – is that 'new' electricity datasets can be easily and routinely created and incorporated into the data system as they emerge or are needed by data users.

21 The Consumer Data Right being developed for the electricity retail sector includes a trust framework including security and authorisation protections.

22 Digital spine feasibility study: Developing an energy system data sharing infrastructure, September 2023, page 18.

23 Digital spine feasibility study, September 2023, from page 145.

Datasets are incorporated into the existing data system when mandated by a rule, eg, in the Code or Information Disclosure regime.[24] Many datasets have multiple use cases with each having its own set of access rights and terms, data formats and exchange protocols (sometimes imposed by separate regulators and legislation).

Again, the existing data system is designed to support the operation of the system and market in the late 1990's. At the time, datasets were established to operate the wholesale market, transmission and sub-transmission networks, to assign responsibility for connections, and to calculate monthly power bills.

A further set of data-related problems the electricity sector has grappled with are a consequence of parties wanting access to data and datasets which do not 'routinely' exist, and there not being a consistent approach for adding a new dataset to the data system.

A commonly discussed example of 'missing' datasets relates to the lack of data about low-voltage network conditions. Distributors and other network users have increasingly wanted granular regularly updated time series data including voltage, day-to-day and forecast network capacity (ie, headroom), outages and curtailment.[25]

Datasets of granular temporal and locational power system information – operating conditions for lower voltage networks, for example – were not created because this data was not wanted or needed because network operators were able to plan and invest based on predictable network usage profiles.

The root cause of the missing dataset problem is that new datasets have struggled to be recognised as officially incorporated into the data system. This results in ad hoc development of new datasets – if they are developed at all – which reduces the pool of users sharing the dataset development costs and makes the service less attractive to prospective data services providers.

For network operators subject to price regulation, the costs of creating, storing and using a new dataset are not part of the historical cost base which largely determine forward looking revenue requirements. As such, the cost of a new dataset is an extra, potentially discretionary expense which may require doing less of something else.[26]

Retailers and others operating in a competitive environment are likely to require a proprietary commercial advantage from investing in a new dataset. The commercial advantage means these datasets (if created) are unlikely to be readily incorporated into the data system or available to others, even if there is a net economic benefit of wider access and use.

A further impact of the ad hoc development of new electricity datasets is the ad hoc development of data formats and exchange protocols which increases the transaction costs of obtaining and exchanging the data.

Clear rules are needed for deciding when a dataset should be added to the data system

The data sharing infrastructure can provide a catalogue of datasets currently in the data system and clear rules for how to request and include new datasets into the data system.

The UK feasibility study of a proposed data sharing infrastructure[27] stepped through expected interactions with a data sharing infrastructure. The process includes each data provider 'identifying data for sharing' given regulatory requirements and the types

[24] See the information disclosed by electricity distributors under requirements of the Commerce Commission. There is no consolidated list of the datasets required to be created under the Electricity Industry Participation Code.

[25] For an overview of the network visibility issue, refer Electricity Authority, Exploring network visibility: costs, benefits and value discussion paper, September 2025, available at: https://www.ea.govt.nz/documents/8309/Exploring_network_visibility_costs_benefits_and_value_-_Discussion_paper.pdf. Appendix D outlines datasets required to improve network visibility.

[26] Examples of these problems are described in this Commerce Commission report (paragraphs 41-47) on Visibility of low voltage networks across electricity distribution businesses, February 2025.

However, several of these problems should be addressed by the Commerce Commission DPP4 decision allowing distributors to recover costs for low voltage monitoring and smart meter data due to a step change (ie, new) in costs for the access of low voltage network data, the cost for the software for storage and analysis, and the costs of additional staff for assessment and application of the analysis.

[27] Digital spine feasibility study, September 2023, from page 122.

and terms of access and expects datasets to be added based on both regulatory requirements and at the discretion of a data creator, taking an incremental use case driven approach.[28]

Use case-driven development supports the design of a system that focuses on what the user needs and, consequently, what the system needs to do, rather than how it is done. This approach ensures the data sharing infrastructure meets user needs and remains focused. Additionally, a use case driven approach facilitates incremental development, enabling early realisation of value through the delivery of the use cases, and provides tangible information to help participants understand the opportunities presented.[29]

Providing a data user (or class of users) with a pathway for requesting a new common dataset and specific criteria for assessing its inclusion in the data system would complement the inclusive open pathway for adding new classes of data users.

A standalone pathway – within the existing Code change and Information disclosure development processes – should remove many of the difficulties encountered with getting new datasets included into the data system via existing processes.

A consistent approach for assessing the merits of adding datasets would empower prospective data users and give prospective data creators with confidence about the ongoing development of the data system.

The critical requirement of the approach is a (mandated) presumption of openness[30] that requires electricity datasets to be accessible by default, subject to the rights and terms of access required through each trust framework. This puts the trust framework arrangements (and administration) at the heart of the data sharing infrastructure by providing the process and criteria for determining the accessibility of a dataset and cost of access.

The decision to add a new dataset requires a neutral assessment of the costs of creating the data and the benefits of using the data.

- The data creator(s) may not want to incur the costs of creating the data because they will not realise an immediate private benefit or could face a competitive disadvantage.
- The benefits of using the data may not always be evident, particularly if the use case is for a new market proposition or involves a new class of user, eg, a flexibility coordinator.

Adding new datasets would be simplified, and lower cost, due to the presumption of openness and the architecture of data sharing infrastructure, with each data holder able to connect the dataset to their data preparation node and share it based on the requirements of the associated trust framework.

Feature 3: Data is exchanged efficiently because standard formats and secure automated exchanges are the default

A third feature of a future fit data system is that electricity data is exchanged securely and efficiently. The existing data system allows data to be exchanged in a range of formats, using a range of protocols. Some are mandated. Some are determined through bilateral agreements, sometimes with the option of adopting a standardised approach.

Formats for many datasets are defined through electricity information exchange protocols (EIEPs) which provide standardised formats to support the secure sharing of routinely exchanged and large datasets between market participants, and participants and other parties.

[28] The non-exhaustive list of the data assets proposed for the data sharing infrastructure include: network topology and constraint data; network fault and outage data; wholesale and other market data; system monitoring data; consumer data; and meter data. Digital spine feasibility study, September 2023, pages 108-109.

[29] Digital spine feasibility study, September 2023, page 22.

[30] The UK Energy Digitalisation Strategy (July 2021) described a digitalised energy system as one where: presumption of data openness is the industry default…, page 10.

Figure 2 Examples of EIEP content

Format name	Description	Send → Receive	Frequency used	Type
EIEP1	Detailed ICP billing and volume information Trader to distributor: • As billed (for HHR ICPs) Replacement RM normalised (for MM ICPs[2]) Distributor to trader: • Separate billing files for MM ICPs and HHR ICPs; or • Single billing file for all ICPs	Trader → Distributor Distributor → Trader	Monthly	Regulated
EIEP2	Aggregated billing and volume information • Summary of EIEP1 for ICP prices • Variable volumes and charges for GXP prices (Distributor to Trader only)	Trader → Distributor Distributor → Trader	Monthly	Regulated

Source: Electricity Authority, Electricity information exchange protocols overview.

EIEPs also specify exchange mechanisms with most automated interfaces using electronic file transfer either via File Transfer Protocol (FTP) or Secure File Transfer Protocol (SFTP) connectivity. Other exchange options in use include email and fax.

The Commerce Commission information disclosure requirements define the format and exchange mechanisms for network-related datasets.

Right now, standardised data formats, even when regulated, are not consistently used, and data can arrive in spreadsheets, PDFs or needing cleaning to be machine-readable. Response timeframes do not consistently align with the use case. Manual exchange mechanisms are used when automated exchanges are cheaper and faster.

However, standardised data formats and automated exchanges are at the heart of a future fit data system and, noting there are set up costs, would lower lifetime IT system ownership costs, accelerate digital tool adoption, and enhance planning and investment efficiency by facilitating data exchange with external parties.

Standardised data formats and secure automated exchange mechanisms should be the default

Standardised machine-readable data formats and secure automated exchange mechanisms should be the default for all datasets in a future fit data system.

The standardisation of data formats is a familiar topic for the electricity ecosystem. However, the conversation is anchored to the structure and purpose of the existing data system and its 1990's paradigm. The consequence is a status quo bias which discounts the value and benefits of data system operating on interoperable data sharing infrastructure.

A data sharing infrastructure designed for inclusive, open access (subject to appropriate rights and terms) to the wealth of electricity data should drive the identification of where standards exist, where they are lacking, and require agreement around a common implementation of standard data formats and exchange mechanisms.

The UK feasibility study of a proposed data sharing infrastructure[31] identified several conditions for effective exchange of data, all of which are applicable to developing our own data sharing infrastructure.

[31] Digital spine feasibility study, September 2023, page 107.

- *re-using existing standards where applicable* [ie, No need to throw out the EIEP formats]
- *adopting consistent metadata standards (e.g. Dublin core) and re-using existing energy sub-domain metadata terms where applicable*
- *creating the 'lightest' or 'thinnest' possible standard to get started, if no standard is currently present*
- *ensuring that the data becomes easily understandable by non-experts*
- *ensuring the data is structured, machine readable, and well documented.*

The desired outcome is each data preparation node (ie, the interface between a data creator or holder and the data system) provides easy and routine access to the relevant electricity data…

- aligning that data to a minimum operable data standard (specific to each data type and use case)
- securely presenting the standardised data to data users through standard APIs, access controls, and security procedures. The standard should use the NCSC Malware free networks service as a model for automated threat disruption.[32]

A useful reference point for standardisation is the Data Best Practice Guidance developed by OFGEM for network operators and the parties using network data.[33]

The practical result should be a low integration overhead with… '*the data preparation nodes should be decoupled from the organisations' data pipelines and applications, thereby allowing siloed and legacy data to be pulled into a data preparation node for standardisation*.' And, '*The data preparation node should also be deployed using well-understood APIs and connectors. This is crucial as a solution that requires significant change will create barriers to adoption*.'[34]

Cybersecurity should be integral to the design of the data sharing infrastructure and data system, not a standalone siloed exercise. Cybersecurity is critical to day-to-day data exchange and should be part and parcel of the data system.

This figure in a discussion document on enhancing the cyber security of New Zealand's critical infrastructure system indicates cascading failures that a cyber incident can trigger due to the interdependencies of the electricity system with other critical infrastructure sectors.[35] At the same time, the electricity system is potentially letting itself become more vulnerable – absent a whole-of-system approach to cybersecurity – as a flood of flexible devices are connected to the power and data systems.

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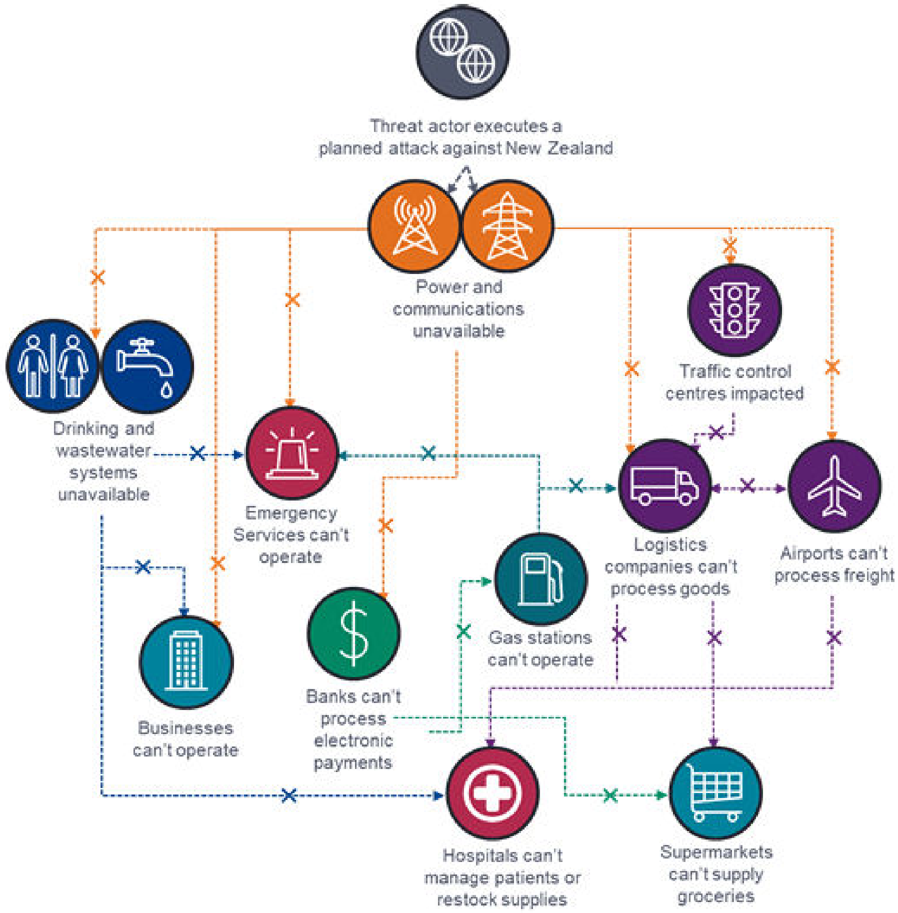
32 The national cyber-security centre offers a Malware Free Network (MFN) service uses near real-time threat intelligence to protect New Zealand businesses and organisations against a broad range of cyber threats and malicious activity.

33 More detail is available here: https://www.ofgem.gov.uk/guidance/data-best-practice-guidance

34 Digital spine feasibility study, September 2023, page 105.

35 Department of Prime Minister and Cabinet, Enhancing the cyber security of New Zealand's critical infrastructure system, Discussion document, February 2026, Figure 1, page 5.

Figure 3 Implications of a cyber incident give the interdependences of critical infrastructure sectors



Source: Department of Prime Minister and Cabinet, Enhancing the cyber security of New Zealand's critical infrastructure system, Discussion document, February 2026, Figure 1, page 5.

Road-testing the 3 features

To summarise, FlexForum considers the future fit data system must enable electricity data (and information) to quickly and easily get to all existing and prospective electricity data users to maximise the value of flexible resources for people, the power system and the economy.

This can be achieved by upgrading the data system by developing an inclusive, open and adaptive data sharing infrastructure:

- a consistent data system architecture for establishing and maintaining data touchpoints between the firms and entities that make up the electricity ecosystem
- consistent (default) trust frameworks to define, implement and govern the rules underpinning accessibility (open or restricted) of each dataset across the data system and costs (public or commercial) of accessing a dataset
- a presumption of dataset openness supported by clear rules and criteria for requesting and incorporating new datasets into the data system as they emerge or are needed by data users.

- ensures data is securely and efficiently exchanged by making standardised data formats and (cyber) secure, automated exchange mechanisms the default for all datasets in the data system.

We road-test these core features and design principles using two case studies of real-world data-related problems the electricity sector has struggled with in recent years.

1. Access to retail price and usage data by a 'new' data user acting on behalf of a client.
2. Access to usage and power quality data by a distributor.

Case study: access to retail price and usage data

Context….

A firm developing an innovative service to assist households and businesses to minimise their power bills needed to access retail price data and the historical usage data of each client to provide the best possible service offering. The service is expected to enable each household client to save an average $400 on their annual power bill.

To meet customer expectations and minimise transaction costs the firm wants the datasets to be provided through a standard machine-to-machine protocol in standard machine-readable formats.

The firm – not a traditional electricity market 'participant' – found that both datasets exist and are accessible to various parties:

- historical usage data is created by metering providers on behalf of electricity retailers. In addition to the retailer (customer billing), this data is accessible to, and used by, the reconciliation and clearing managers (wholesale market settlement), distributors (network charges, network planning), and individual customers.

  The data is exchanged between the metering provider and retailers on terms (including cost) agreed under bilateral contracts. The data is exchanged between the retailers and other users at no cost through automated and manual mechanisms using both standard and bespoke formats depending on the user and use case.
- retail price data is created by each retailer, and a subset of the data is accessible to, and used by, a price comparison service provider and individual customers. The data is exchanged between the retailers and users at no cost through manual mechanisms, eg, websites, telephone and emails, using bespoke formats.

The firm finds it has three options to access the datasets. None provide easy and routine access:

1. use the regulated process to access the usage dataset or ask each client to get their usage data and collect retail price data from public sources (scraping websites, cold calling etc). The regulated option for accessing usage data is not fit for purpose as data takes up to 5 days to arrive. The DIY access options do not meet customer expectations and involves high transaction costs.
2. ask and agree commercial terms and costs for automated access for both datasets with each retailer. This option involves high transaction costs and does not result in access due to conflicting incentives of the data holders and the data user.
3. ask to be incorporated into the data system as a user of the datasets, subject to codified access rights and terms (including cost). This option involves high transaction costs and does not result in access due to the vagaries of the regulatory code-change process.

The service does not get developed. Households and businesses are worse off because they do not benefit from innovation and an extra option for minimising their power bills.

…replaying the scenario with a future fit data system

Replaying the situation with a future fit data system is more likely to enable the firm to access the desired datasets.

Feature	Outcome
A data sharing infrastructure provides an open, inclusive and adaptive data system with transparent rules for connecting to and accessing datasets.	The firm reviewed the catalogue of electricity datasets and found: • the usage dataset was part of the data sharing infrastructure, held by electricity retailers and the trust framework classifies the data as restricted (available to specified parties for specified uses) and not commercial (no or incremental costs). • the retail pricing dataset was not part of the data sharing infrastructure.
Clear rules and criteria for requesting and incorporating datasets into the data system	The firm applied to the regulator via the dedicated pathway to incorporate the retail pricing dataset into the data sharing infrastructure. Using the specified criteria, the firm assessed the dataset as open and not commercial given its public characteristics (ie, on websites, from phone calls). This assessment was confirmed by the regulator, and the dataset was incorporated into the data system. Retailers as data holders added the dataset to their individual data node in the agreed standard (machine-readable) format. Note: this aligns with the approach expected for the Consumer Data Right for the retail electricity sector.
Consistent (default) trust frameworks for each dataset define accessibility and costs of access for each dataset	The firm completed the authorisation process specified in the usage dataset trust framework confirming its identity, access rights etc, particularly that it gets authorisation from its clients (the customers who own the data). The firm completed the authorisation process required once the retail pricing trust framework was developed (which didn't take long because it was based on the default trust framework template). As trust frameworks are consistent, the process was straight-forward and involved minimal transaction costs. More so because the retail pricing dataset had lower access thresholds than the usage dataset.
Standardised data formats and automated exchange mechanisms is the default for all datasets	The firm connected to the data nodes providing each dataset using the standard API and starts receiving the requested data in the standard format according to the rights and terms of the trust framework for each dataset.

Case study: access to usage and power quality data by a distributor

Context….

A distributor working to upgrade its network operation and planning practices needed to access more granular historical usage data and power quality data for its low voltage layer to improve its forecasting and to better understand and manage network performance.

The distributor found that neither dataset existed in the specification it required, but capability existed to either access or create the data it needed.

- historical usage data at half hour granularity for each connection point on its network is created by metering providers for some electricity retailers operating on its network, with the other retailers receiving the monthly accumulated usage data.
- power quality data – voltage, frequency, harmonics and phase balance – for the low voltage layer was not being created but could be, by either existing advanced meters at each connection point, or using metering devices (to be installed) at key points on each feeder.

The distributor finds it has options to access the datasets. Each has challenges which block easy and routine access:

1. no regulated access pathway exists for either dataset. The distributor gets the usage dataset for a specific use (calculating network charges) but is not permitted to use it for planning or operational uses without the explicit agreement of each retailer. Retailers do not collect power quality data, so it is not covered in their services agreements with metering providers.
2. ask and agree commercial terms and costs with retailers for access to the usage dataset for planning and operational uses. This option involves high transaction costs by requiring bespoke negotiations with each retailer, unanticipated opex due to some retailers charging for the data, and incomplete access because some retailers have concerns about the use of the dataset.
3. A quirk of the ruleset means the distributor must get permission from each retailer to negotiate terms with each metering provider to access a power quality dataset, raising transaction costs. This is moot however as the distributor opex allowance does not cover data services (unless it stops doing something else).
4. ask to be incorporated into the data system as a user of the datasets, subject to codified access rights and terms (including cost). This option involves high transaction costs and does not result in access due to the vagaries of the regulatory code-change process.

…replaying the scenario with a future fit data system

Replaying the situation with a future fit data system is more likely to enable the distributor to access the desired datasets.

Feature	Outcome
A data sharing infrastructure provides an open, inclusive and adaptive data system with transparent rules for connecting to and accessing datasets.	The distributor reviewed the catalogue of electricity datasets and found • the usage dataset was part of the data sharing infrastructure, held by electricity retailers, and the trust framework classifies the data as restricted (available to specified parties for specified uses) and not commercial (no or incremental costs). • the power quality dataset was not part of the data sharing infrastructure.
Clear rules and criteria for requesting and incorporating datasets into the data system	The distributor applied to the regulator via the dedicated pathway to incorporate the power quality dataset into the data sharing infrastructure.

Feature	Outcome
	Using the specified criteria, the firm assessed the dataset as restricted (available to specified parties for specified uses) and commercial (ie, available on commercial terms). This assessment was confirmed by the regulator, and the dataset was incorporated into the data system, with metering providers identified as the data creators.
Consistent (default) trust frameworks for each dataset define accessibility and costs of access for each dataset	The distributor completed the authorisation process specified in the usage dataset trust framework confirming its identity, access rights etc. The distributor completed the authorisation process required once the power quality dataset trust framework was developed. As trust frameworks are consistent, the process was straight-forward and involved minimal transaction costs.
Standardised data formats and automated exchange mechanisms is the default for all datasets	The distributor connected to the retailer and metering provider data nodes using the standard API and starts receiving the requested data in the standard format according to the rights and terms of the trust framework for each dataset.

Approach to digitalisation in the United Kingdom

This Insights draws heavily on the digitalisation journey taken in the United Kingdom. Although the context is quite different between the United Kingdom and Aotearoa New Zealand, and we should not slavishly adopt the specific arrangements being adopted there, it is worth noting the milestones of that journey – starting with the most recent – to highlight the drivers and road travelled.[36]

- The Energy Sector Digitalisation Plan, iteration 1 (September 2025) details the digital capabilities and specific actions needed to deliver Clean Power 2030.[37] The plan recognises 'The journey to a clean, resilient and affordable energy system by 2030 is both ambitious and urgent – and impossible without digitalisation.'
- The Clean Flexibility Roadmap (July 2025)[38] commits accountable organisations to actions that will unblock barriers to greater flexibility capacity and sets out a governance framework for monitoring and adding to these actions – chapter 8 is devoted to digitalisation and smart data recognising digital tools and applications will need to be developed to support data exchanges necessary for a power system to operate flexibly and responsively whilst giving people the opportunity to engage with their energy usage, saving them time and money.
- The UK Government Clean Power 2030 Action Plan (December 2024) identified the steps and actions required to deliver a clean power system by 2030. The Action Plan was informed by the Clean Power 2030 (November 2024) advice to the UK government from National Energy System Operator (NESO) practical pathways for achieving clean power by 2030.[39]
- The Digital Spine Feasibility Study (September 2023) outlined a proposed energy system data sharing infrastructure.[40] The study was completed on the recommendation of the Energy Digitalisation Taskforce (January 2022) to develop a 'digital spine' or (the more preferred) data sharing infrastructure for the sector.[41] The UK Government response (July 2022) highlighted progress already made on delivering the recommendations and a digitalisation work programme.[42]
- The Energy Data Taskforce recommended a Strategy for a modern digitalised energy system (June 2019) for data to assist unlocking the opportunities of a modern, decarbonised and decentralised energy system.[43]
- The Digitalising our energy system for net zero Strategy and action plan 2021 (July 2021) was '*the first of its kind in the UK and one of the first in the world, provides a vision, approach, and suite of actions for digitalising the energy system so that we can meet our net zero ambitions*.'[44]

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[36] No mixing of metaphors here!

[37] NESO developed the Digitalisation Plan in partnership with Energy Systems Catapult, supported by Digital Catapult, Connected Places Catapult, and the Royal Academy of Engineering, and in close collaboration with Ofgem and DESNZ.

[38] The Clean Flexibility Roadmap was developed by the UK government, Ofgem and NESO as a requirement of the Clean Power Action Plan… 'Publication of a Low Carbon Flexibility Roadmap in 2025 to consolidate existing and further new actions to drive both short and long-duration flexibility for clean power in 2030 and net zero by 2050.' (Clean Power 2030 Action Plan, p94)..

[39] The advice includes… 'To deliver clean power, we need a sector-wide strategic digitalisation plan that is actionable and delivered. This needs clarity of required outcomes, prioritisation of digital solutions and an aggressive delivery programme backed by policy and regulation to drive adoption and investment where it's most urgently needed.' (NESO Advice, p64).

[40] The feasibility study was undertaken by a consortium of Ove Arup, Energy Systems Catapult and University of Bath, Digital spine feasibility study: Developing an energy system data sharing infrastructure, September 2023, available at: https://www.arup.com/globalassets/downloads/projects/digital-spine-feasibility-study/digital-spine-developing-an-energy-system-data-sharing-infrastructure.pdf.

[41] The Energy Digitalisation Taskforce was established by the Department for Business, Energy and Industrial Strategy, Ofgem and Innovate UK to develop ways to deliver a digitalised energy system. Its report Delivering a digitalised energy system, January 2022, is available here: https://esc-production-2021.s3.eu-west-2.amazonaws.com/2022/01/ESC-Energy-Digitalisation-Taskforce-Report-2021-web.pdf.

[42] A virtual energy system data sharing infrastructure pilot concluded in July 2025. 'The project purpose was to develop the DSI capability and demonstrate whether or not it can support scalable data sharing through an outage planning use case.'

[43] The taskforce was "*part of the Smart System strategy being developed by Government, is in line with the Industrial Strategy, Clean Growth Strategy, and the Government and Ofgem's Smart Systems & Flexibility Plan." See page 2 of the taskforce report.*

[44] The strategy and action plan set out the case for digitalisation, barriers and what actions the government, Ofgem and industry intended to address them. An action including establishing the Energy Digitalisation Taskforce. The strategy noted the role digitalisation played as a component and enabler of the Smart Systems and Flexibility Plan published at the same time (July 2021).