flextalk

SOLAR HOTWATER HOME EV WIND CHARGE

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Standardisation: The key to connectivity and interoperability

Aotearoa New Zealand's electricity industry currently faces a set of challenges and opportunities as it progresses toward a net-zero carbon economy. Growing competitive pressures, capacity constraints, changing customer and environmental expectations, aging infrastructure, and rapid technological changes have all become key considerations for the sector. This has led to a greater reliance on recognised international, national, and regional standards related to system safety, reliability, compatibility, efficiency, cost-effectiveness, and performance in order to manage change and adoption of best practice. The adoption of standards is critical to the successful deployment of demand flexibility across the electricity industry and is a focus of the FlexTalk projects.

SUMMARY

New Zealand has 29 electricity distribution businesses (EDBs) and one transmission business, each of whom will need to decide what technology to use to enable demand flexibility.

Without a standardised approach, at various levels (such as business-to-business communication) each could implement different technology and communicate using bespoke methods which risks limiting or vastly under-utilising demand flexibility and impeding effective grid integration.

Standardisation simplifies the integration of different systems and components, reducing complexity and ensuring consistency in communication and information.

It enables any new supplier entering the market to develop capabilities that seamlessly 'plug and play' without the creation of bespoke solutions.

An international example highlighting the importance of standards in integrating DER into the energy system is the IEEE 1547 standard in California where they mandated Rule 21 to incorporate IEEE 1547 into its DER interconnection policies. This standard outlines the requirements for the interconnection and interoperability of DER with the electric power system and includes specifications for performance, safety, and communication requirements to ensure DER can seamlessly interact with the grid.

WHAT DO WE MEAN BY STANDARDS?

Standards are an approved set of rules intended for repeated use that aim to ensure industry operational consistency.

WHY ARE STANDARDS IMPORTANT?

Standards are a key enabler of flexibility because they ensure consumer-owned distributed energy resources (DER) can work together (interoperability) and integrate seamlessly within the wider electricity system.

Performance is optimised when there are standardised approaches adopted to resource installation, connectivity and communication.

WHY DO WE NEED INTEROPERABILITY?

Interoperability is the ability of equipment, systems, apps or products from different suppliers to operate together in a coordinated way.

Communication interoperability is the ability of different systems and software applications to exchange and use data accurately, effectively, and consistently.

Within the energy system, there are many devices operating independently of each other behind trade-protected proprietary hardware or software. In most cases, these technologies are neither visible to, nor controllable by, the electricity system operator or network operator.

When deployed in large numbers and in an non-visible and unmanaged way, devices known as behind-the-meter equipment, such as EV chargers or rooftop solar systems, can also have a detrimental effect on the stability of electricity supply.

With consumer demand for electricity expected to increase as consumers switch from conventional technologies to alternatives, additional stress will be placed on the electricity supply system.

WHAT IS THE SOLUTION?

To ensure the resilience of the electricity system, all embedded technologies should work together – that is, achieve interoperability – at a technical, syntactic and semantic level, as outlined below.

THE KEY ASPECTS REQUIRED TO ACHIEVE INTEROPERABILITY	
Technical interoperability	Devices are capable of both physical and digital integration. **Basic connectivity is a foundational element** to enable technologies to speak to one another.
Syntactic interoperability	Devices should use a **common digital language**. Communicating between and among technologies and devices requires using the same language, which fosters semantic interoperability.
Semantic interoperability	Understanding specific instructions using a **standardised set of recognised commands** between and among technologies ensures semantic interoperability.

This means taking action to ensure all devices connecting to the electricity system have an integrated interface to enable the device to receive and react to external signals.

The interface will need to be integrated to meet regulated communication requirements or any simple firmware change to the device control system to ensure communication is always maintained.

To achieve this, international cooperation in the development of common standards and protocols is required.

WHAT STANDARDS WILL NEED TO BE COVERED?*

CONNECTION STANDARDS

Vitally important for safe electrical connection. These describe how connections are made safely between electrical equipment and the electricity grid or other equipment. It also includes standards for how equipment should be designed and installed to avoid or reduce hazards.

EQUIPMENT BEHAVIORAL STANDARDS

These describe the expected behaviour of electrical equipment. They often include components and capabilities designed to protect the equipment itself, or the things connected to it.

COMMUNICATION, DATA AND CYBERSECURITY STANDARDS

These describe ways to communicate with equipment, to observe or control its operation, or both. These include:

- Physical interface standards which involve a hardware connection to the equipment
- Network protocol standards (including APIs) which define how to communicate with equipment via a computer network

INFORMATION MODEL STANDARDS

These define concepts and describe how to represent concepts as data. These are useful building-blocks when defining network protocols.

RECOMMENDATIONS FROM FLEXTALK

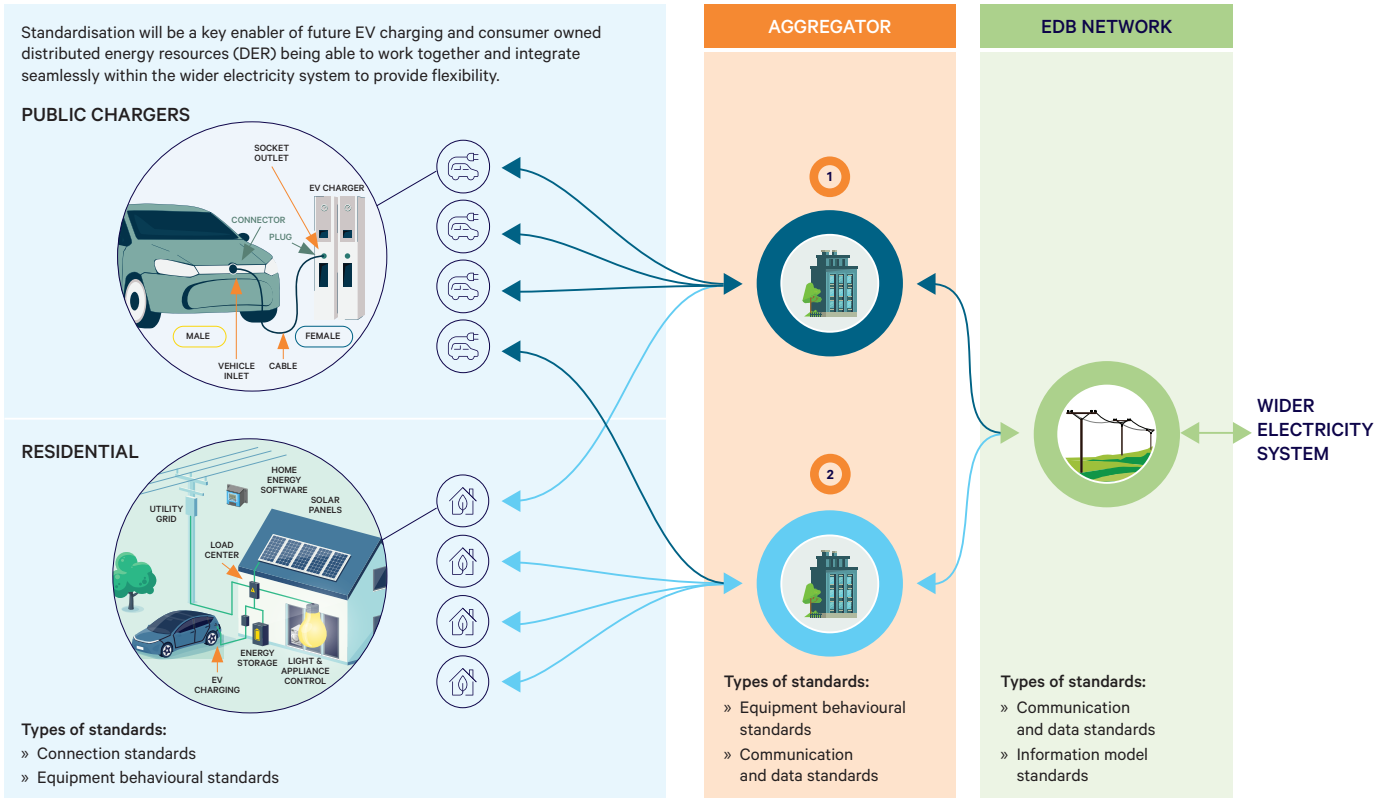
A gap analysis should be undertaken to identify any gaps in standards required to enable distributed energy resource integration in the New Zealand power system.

Based on the outcomes of the gap analysis, industry, regulators and key bodies (ie government) should establish a **work programme** to evaluate and make recommendations regarding other technical characteristics required to enable flexibility that may require standardisation. These could include data, cyber security, interoperability and health and safety standards.

In addition, development of a **distributed energy resource interoperability assessment framework** is recommended, to provide policy makers with an objective set of criteria to assess potential standards or features of technical standards to be considered for adoption in New Zealand.

THE IMPORTANCE OF STANDARDISATION

Standardisation will be a key enabler of future EV charging and consumer owned distributed energy resources (DER) being able to work together and integrate seamlessly within the wider electricity system to provide flexibility.



Types of standards:

- Connection standards
- Equipment behavioural standards

Types of standards:

- Equipment behavioural standards
- Communication and data standards

Types of standards:

- Communication and data standards
- Information model standards

* Source: https://www.aer.gov.au/system/files/GreenSync%20-%20Submission%20to%20AER%20assessing%20distributed%20energy%20resources%20integration%20expenditure%20-%20Appendix%20B%20-%20January%202020.pdf

WANT TO LEARN MORE?

- FlexTalk is an industry programme of work that aims to maximise participation in electricity demand flexibility services. It is led by the EEA (Electricity Engineers' Association) in partnership with EECA (Energy Efficiency and Conservation Authority). In its May 2024 report for the Demand Flexibility Common Communication Protocols project, FlexTalk found that 'agreed industry standardisation of protocols will provide enhanced interoperability, real-time data exchange, improved scalability and flexibility'.
- Published May 2024 – The FlexTalk reports on the demand flexibility common communication protocols project assessment and findings, the technical insights (a practical guide for starting an OpenADR implementation) and the EA Technology international review of open communication protocols.
- An example of a standard in Australia and New Zealand is AS 4777, which standardises the functions, behaviours and compliance of inverter-based technologies. This ensures that any entity can connect to the inverter and communicate using a common method.

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EECA TE TARI TIAKI PŪNGAO ENERGY EFFICIENCY & CONSERVATION AUTHORITY