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Welcome to the EA Technology Communication Protocol Collaboration Webinar

Please mute your mic and turn off your camera.

Thank you to our presenters and to you our audience for your attendance. EEA value your support.

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eea Electricity Engineers' Association

EECA TE TARI TIAKI PŪNGAO ENERGY EFFICIENCY & CONSERVATION AUTHORITY

Please note. This webinar will be recorded and shared on the EEA website.

Introduction

The core focus of this collaboration webinar with be on the report EA Technology have produced for EEA/FlexTalk to contextualise Open protocols.

Yogendra Vashishtha
EA Technology

Esther Dudek
EA Technology

Stuart Johnston
EEA

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Agenda

Welcome

- Scene setting – decarbonization and why FlexTalk?
- FlexTalk project update

EA Technology

- Project scope
- Project methodology
- Key findings (Conclusions)
- Project recommendations

Q&A

Please write any questions you have for the presenters into the webinar chat.

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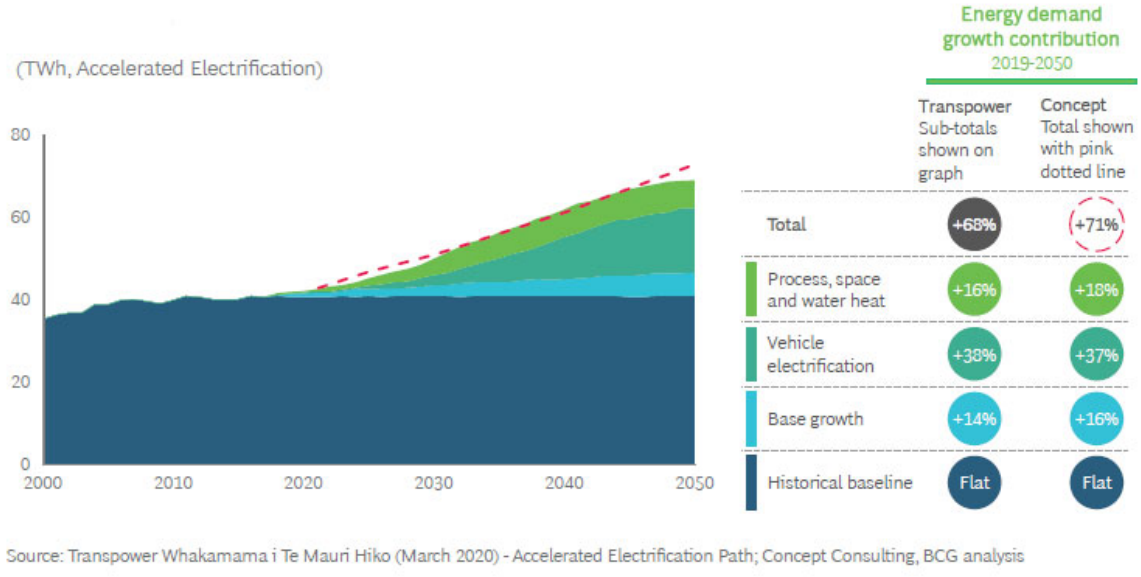
Background

- Aotearoa's journey to meet our net zero by 2050 decarbonisation goals will be challenging.
- Electrifying transport and heat, and increasing renewable electricity, will be the most significant contributors to New Zealand achieving net zero carbon by 2050.
- One of the key enablers to support electrification will be the establishment and implementation of demand flexibility mechanisms.



Source: Transpower Whakamama i Te Mauri Hiko (March 2020) - Accelerated Electrification Path; Concept Consulting, BCG analysis

Increase in Aotearoa's gross electricity demand by 2050

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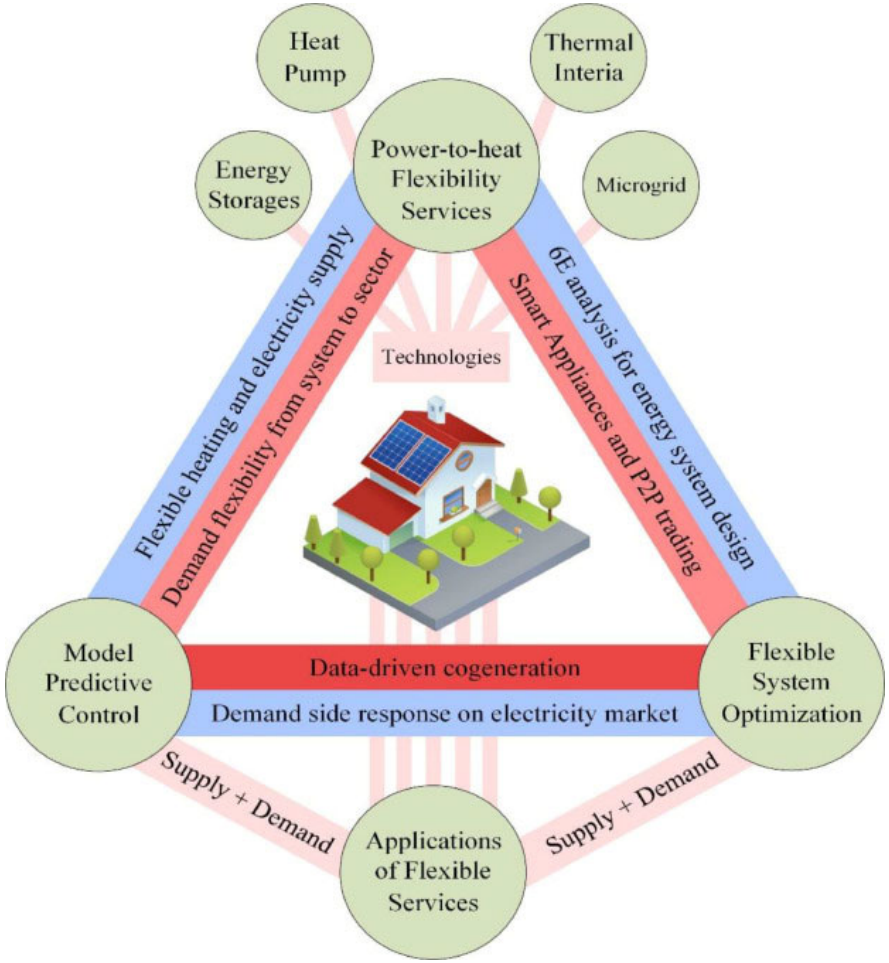
Flexibility

- Flexibility services provided from Distributed Energy Resources (DER) can provide a range of benefits across the electricity system that will support an increasing levels of electrification of Aotearoa whilst ensuring that the system continues to be secure and affordable.

- Enabling consumers with the choice to participate in providing flexibility services will also put them at the center of Aotearoa's future electricity system.



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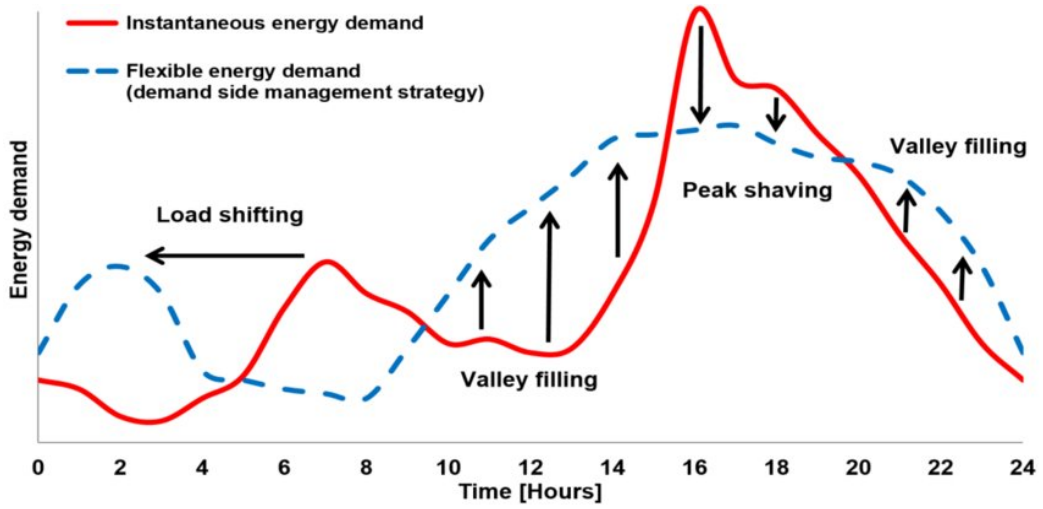
What is FlexTalk?

- An industry initiative to define and evaluate the processes that need to be in place to apply the OpenADR® 2.0 communication protocol to achieve interoperability between EDBs and flexibility suppliers, for the active, managed charging of EVs.



The ***Electricity Engineers' Association (EEA)*** is leading FlexTalk in partnership with industry and ***Te Tari Tiaki Pungao / the Energy Efficiency and Conservation Authority (EECA)***

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FlexTalk - Strategic Goals

1.

Demonstrate active managed charging of EV's through the implementation of a common communication protocol

2.

Illustrate that this protocol can be extended more generally to manage different loads and distributed generation across any platform or system (facilitating flexibility and interoperability)

3.

Assess the suitability of OpenADR in the NZ context to facilitate these services

4.

Working with the industry to create a guide that achieves consistency in NZ and is adopted by the electricity industry

5.

Achieving user acceptance, demonstrated by customers using and investing in smart infrastructure

6.

Enabling intermittent renewable generation to be integrated into the electricity industry to assist in enabling NZ's renewable generation targets

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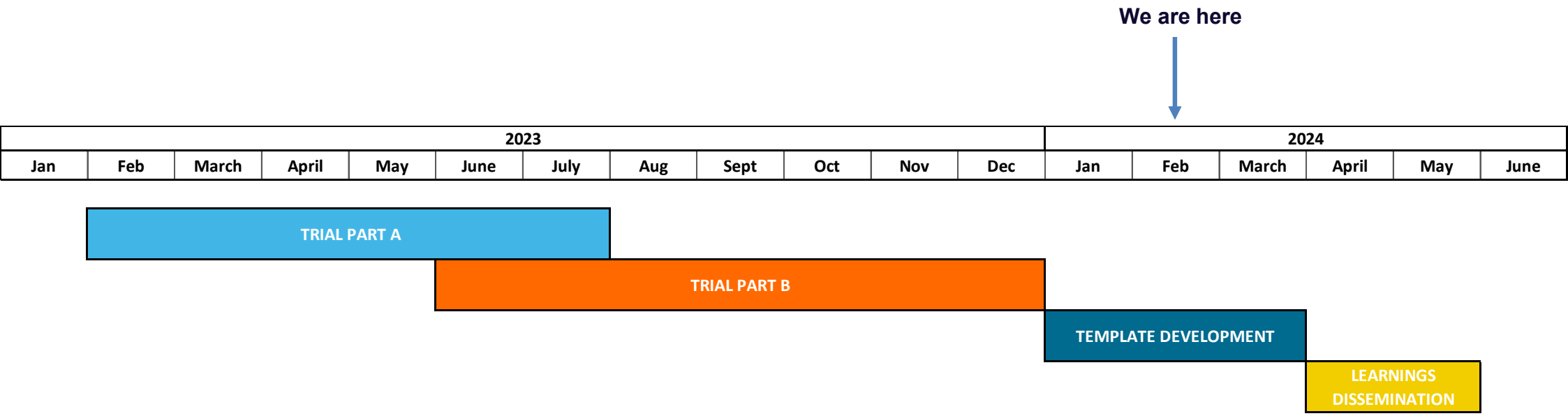
FlexTalk – Learnings Roadmap



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EA Technology

Engaged to conduct international scan of comms protocols….

Yogendra Vashishtha
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Esther Dudek
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Communication Protocol Project Scope

1. Standards/protocols developed/implemented for the exchange of information between EDBs and Flexibility suppliers in UK, Europe, USA and Australia.

2. Use cases for the information exchange e.g., procurement, dispatch, control or managing solar PV, EVs or providing resilience or point to point control vs. broadcast etc.

3. Rationale or drivers behind adoption of standards/protocols in various jurisdictions including current and future perspectives.

4. Suitability for the New Zealand context

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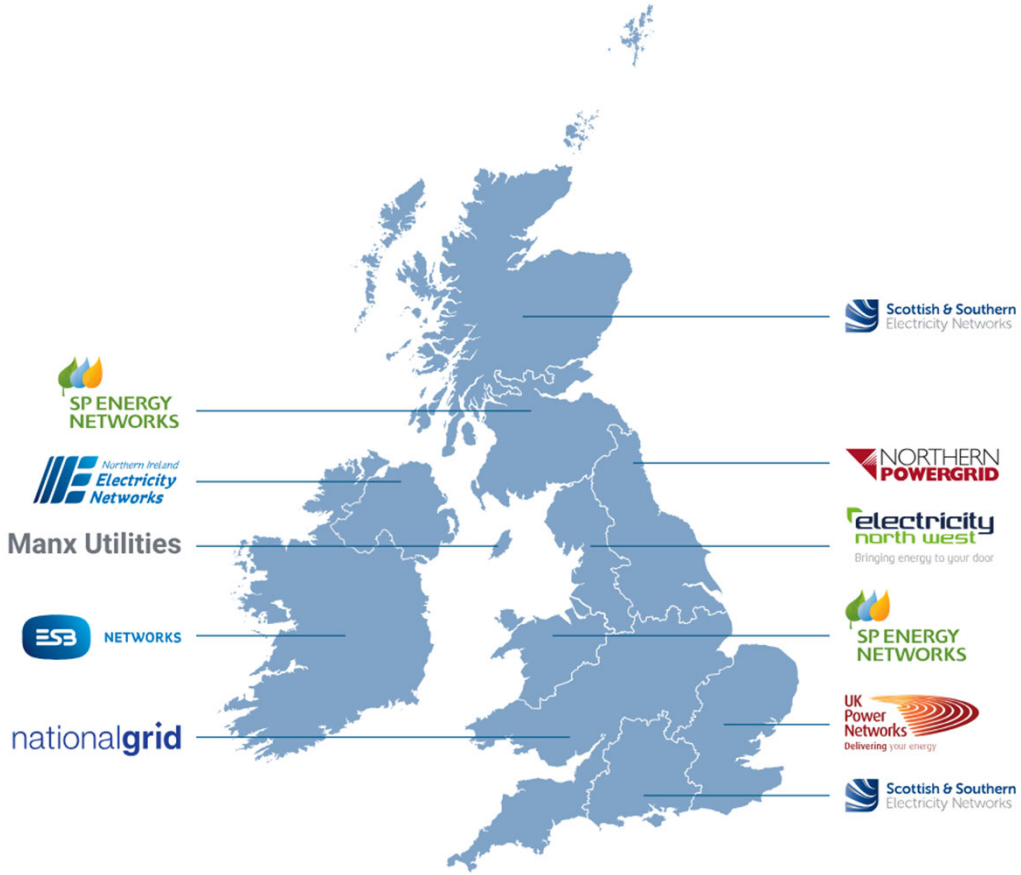
Methodology

- Four jurisdictions selected for literature search based upon similarities in the electricity market construct and regulations:
    - UK
    - Europe
    - Australia
    - USA
- Focus: understand the rationale behind their approach and understand suitability in the New Zealand context.
- Identify available pathways and ‘ no regret actions’ for New Zealand EDBs.

GB Landscape

- Six Distribution Network Operators (DNOs) operating in Great Britain
- 14 ‘licence areas’ – most network operators operate more than one
- Smallest DNO (Electricity North West) serves 2.4 million customers
- Regulated by Ofgem
- Five-year price review periods - current, ED2 runs 2023-2028
- Well established innovation funding with DSR trials since 2010



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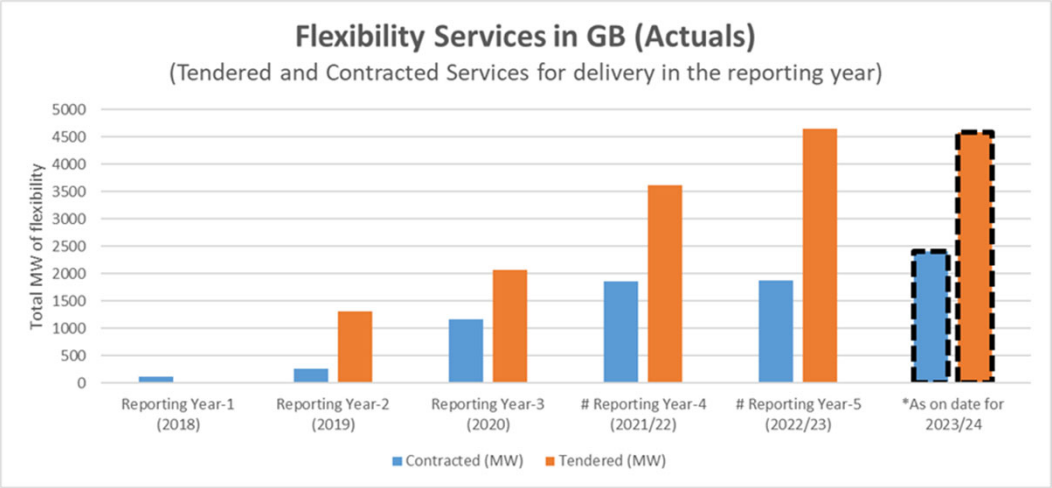
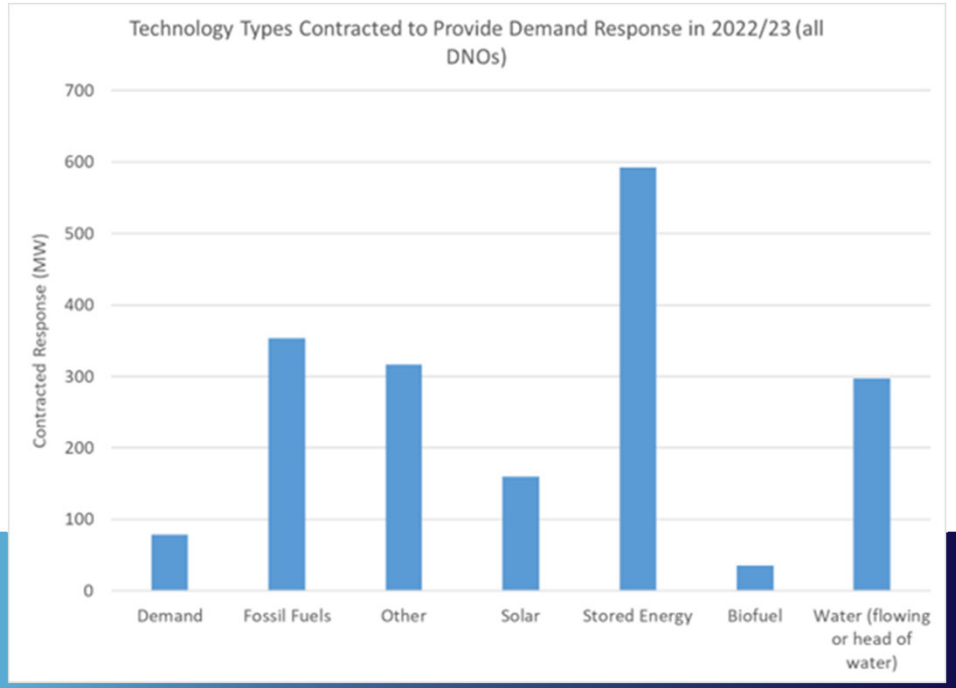
GB Landscape

- Increasing procurement of flexibility services by DNOs – although there is a significant gap between what is tendered for and what is procured
- This includes all sources of flexibility, not just consumer energy resources
- Breakdown in contracted response by type is in the second graph (stored energy includes EV charging)
- All DNO ED2 business plans include a commitment to a ‘flexibility first’ approach, with significant savings attached to this





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Sources identified

Initial stakeholder workshop:

- Interoperable Demand Side Response Programme
- The Future of Distributed Flexibility
- Open Networks project
- Energy Systems Catapult *(no relevant information)*
- Energia *(Irish energy supplier – no relevant information)*

Also reviewed:

- GB DNO plans
- Smart Systems and Flexibility Plan
- National Grid ESO Demand Flexibility service
- Commercial portals – Piclo Flex and Flexible Power
- European projects: INTERRFACE, Flexible Power Alliance Network, Equigy, Int:net

Findings: Government and Regulatory

Smart Systems and Flexibility Plan (2021, UK Government and Ofgem)

- Sets out a vision, analysis and work programme for delivering a smart and flexible electricity system.
- Identifies a need for standardisation, but does not go into the route by which this would be achieved, or which standards to use

Interoperable Demand Side Response Programme:

- Aims to support the development and demonstration of energy smart appliances for the delivery of interoperable demand side response
- Supporting development and demonstration of energy smart appliances (CER) to deliver interoperable DSR – does consider use of OpenADR functionality
- Main focus is on the interfaces ‘downstream’ of the aggregator

Findings: Government and Regulatory

The Future of Distributed Flexibility (Ofgem, 2023)

- Proposing a “common end vision for distributed flexibility… a common digital energy infrastructure”.
- Specific standards are not identified within the main Call for Evidence
- Even the minimum level of digital infrastructure (labelled ‘thin’) includes establishing “common communication standards” between participants.
- Accompanied by a separate report which evaluated five potential standards to “enable the interfaces of a common digital energy infrastructure” – results are shown in report and appendix to these slides

GB: Current status of DNO

- DNOs began dispatching flexibility via phone and email during innovation trials
- Flexibility services now being widely used (“flexibility first approach”) by all – at all voltage levels
- Rules have been changed (e.g. minimum contract volume) to allow easier participation by aggregated CER
- Two main commercial platforms being used by GB DNOs – Piclo Flex and Flexible Power
  - Both offer a central point of reference to bid for and contracts for DNO flexibility services and include the facility to be dispatched via the platform
  - API details have been published – but these are not using a particular international standard

GB: Current status of DNO

	Using Piclo Flex?	Using Flexible Power?	Dispatching via:
Electricity North West	Yes	Yes	API, email
National Grid Electricity Distribution	Yes	Yes	API (Flexible Power)
Northern Powergrid	Yes	Yes	API (Flexible Power), telephone (early stages of contract)
Scottish Power Energy Networks	Yes	Yes	API (Flexible Power)
Scottish and Southern Electricity Distribution	Yes	Yes	API (Flexible Power), email, phone
UK Power Networks	Yes	No	API or email

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Open Networks Project – Looking Ahead

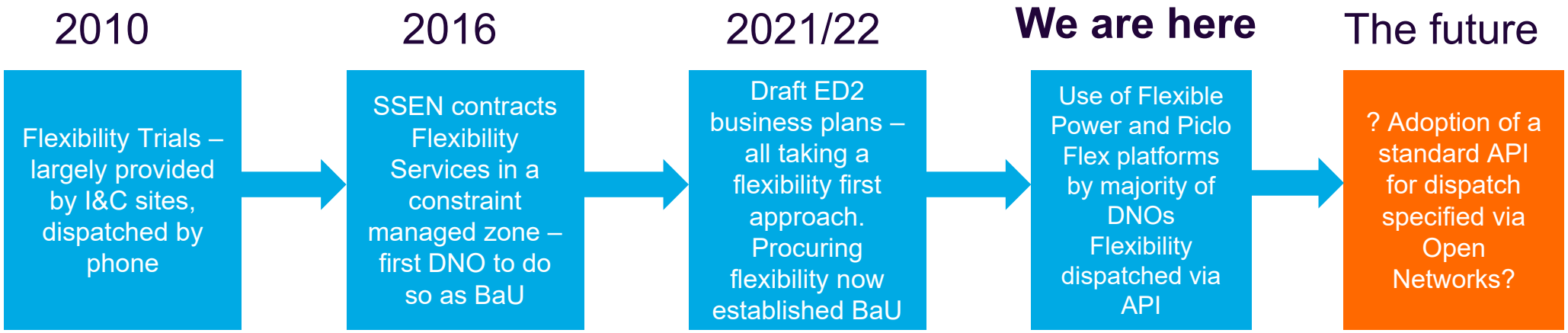
- Purpose: “to work together to standardise customer experiences and align processes to make connecting to the networks as easy as possible and bring record amounts of renewable distributed energy resources, like wind and solar panels, to the local electricity grid.”
- In operation since 2017, including all six GB DNOs
- Ongoing flexibility programme includes work to make it for providers to access the flexibility market, including via standardisation.

Open Networks Project – Looking Ahead

Open Networks have identified that:

- There is alignment through the use of Flexible Power but this was not as a decision across DNOs to do so
- The group agree “in principle that the adoption of a common API for dispatching of services should be a long-term goal of dispatch interoperability, however, such as API would need to be designed in an appropriately flexible manner to provide future proofing”
- P3 group have identified international dispatch standards (e.g. including IEEE 2030.5) but these are not in use by GB DNOs currently
- OpenADR has been identified as “the only evaluated API standard that could be modified to meet the requirements of a flexibility dispatch standard for the UK energy market”
- Most recently they have also identified the criteria against which APIs should be evaluated – more details in the report

GB Summary



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Europe

INTERRFACE

- Purpose: “design, develop and exploit an Interoperable pan-European Grid Services Architecture to act as the interface between the power system (TSO and DSO) and the customers and allow the seamless and coordinated operation of all stakeholders to use and procure common services”
- A much wider scope than just considering the standards for dispatch of flexibility – however, they identified IEC CIM as the primary standard for information exchange.

Flexible Power Alliance Network

- Established in 2013 in the Netherlands, aiming to “provide open standards for unlocking flexible energy in energy systems”
- Focus appears to be on device communications, rather than between EDB/DNO and aggregators

Europe

Equigy:

- a European crowd balancing platform owned by leading European transmission system operators.
- Their mission: “support energy transition by enabling smaller distributed flexibility assets to participate in the energy system through aggregation.”

Int:net

- Working on “developing, testing and deploying interoperable energy services”.
- “The int:net-interoperability network will be formally established to exist beyond our project life-time. With a comprehensive, FAIR knowledge platform and a series of attractive events, the int:net-community guides those who deal with the heterogeneous interoperability landscape of energy services.”
- Concerned with multiple aspects of interoperability across the energy system – wider scope

Australia

Overview of the various approaches the trials and pilots are exploring

	AEMO PROJECT EDGE	WESTERN POWER PROJECT SYMPHONY	AUSGRID PROJECT EDITH	EVOENERGY PROJECT CONVERGE
METERING POINT	Connection Point or **Sub-metering**	Connection Point	Connection Point	Connection Point
ENERGY MARKET BIDDING	**Model consistent with scheduled BDU from IESS**	Bids into balancing and **contingency reserve raise** markets	Current bidding process for FCAS	**Bids first sent to DSO**
DOE ALLOCATION	Various	Various	**Subscription model**	**Bid-optimised**
LOCAL CONSTRAINTS	DOE	DOE	DOE	DOE
NETWORK SUPPORT	**Local services exchange**	**Contracted network services**	**Dynamic network price**	**Real-time RIT-D**
DATA TRANSFER	**Data-hub**	**Platform integrations**	**Point-to-point**	Point-to-point
LOCAL CONSTRAINTS COMMUNICATION PROTOCOL	CSIP-AUS (only using schema)	CSIP-AUS	**CSIP-AUS extended with pricing)**	CSIP-AUS

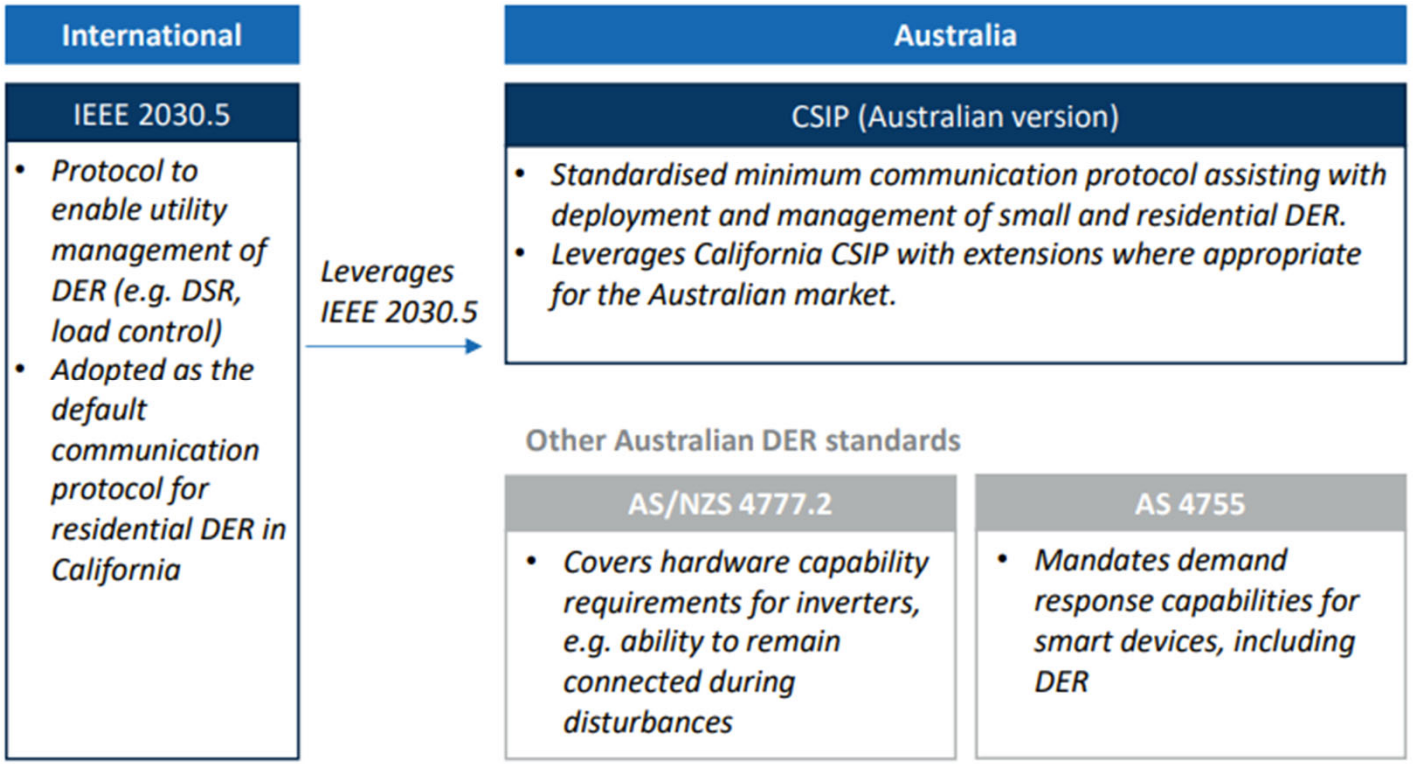
Table 1. Technical settings of the market integration trials. Bold denotes a novel approach.

Source DEIP report

Australia

High level summary of interlinkages between DER communications standards and protocols applicable to Australia:

Figure 6: Selected Australian DER communication standards/protocols



Source: FTI analysis

Australia

- Australia is experiencing an ever-increasing uptake of DER leading the world in rates of household solar.
- To better support the growth in solar generation and its impact on network system security, distribution networks are transitioning away from fixed site export limits towards dynamic export limits and dynamic operating envelopes (DOEs).
- CSIP-AUS/ IEEE2030.5 provides a suitable framework for network-client communication - CSIP-AUS/ IEEE2030.5 is being adopted by various DOE trials underway and provides a suitable framework for network-client communication.
- New Zealand does not currently have high residential solar PV penetration issue and foresee EV and residential batteries as biggest challenges in the near future.

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USA-Pacific Gas and Electric Company

- The two protocols considered for EPIC 2.02 DERMS project were OpenADR 2.0b and IEEE 2030.5.
- Smart Inverter Working Group (SIWG) recommended IEEE 2030.5 to be used as the default communication protocol for utility-aggregator interfaces for smart inverter-enabled DERs.
- Custom extensions were needed for implementing the day-ahead market, the hourly ad hoc market, time series controls, and flexibility reporting.

Table 5: Pros and Cons of Using IEEE 2030.5 and OpenADR 2.0b for DERMS Demo in Early 2016

	IEEE 2030.5	OpenADR 2.0b
Pros	• Supported by SIWG • Base protocol already supported by DERMS vendor and one aggregator – Less cost and shorter schedule to implement	• Well established for Demand Response use cases • Well suited for market environments
Cons	• Market functions more difficult to implement	• Did not support reactive power • Did not leverage smart inverter functionality –
	• **Custom extensions required**	meaning a separate translation layer was needed to harmonize with vendor inverter systems • Not supported (at the time) by either aggregator - Additional cost and schedule length to implement • **Custom extensions required**

USA-Southern California Edison

OpenADR, IEEE 2030.5 and CTA-2045 have advanced sufficiently to be included in DR and DER grid codes, manufacturer standards, and regulations.

- OpenADR is the leading protocol for standards-based DR, accommodating both utility-supplied or utility-specified devices as well as “Bring Your Own Device” programs. Its focus has been on managing DR in the form of generalized resources (via grid condition codes, prices, etc.).
- IEEE 2030.5 was built around information models that describe specific device types and is typically used to modify the detailed behaviours or responses of such equipment (such as power factors and Volt-VAR curves in smart inverters). Although in principle IEEE 2030.5 could be used to manage “pure” DR via load control and pricing feature sets that have been defined for it, this has not received much attention.
- CTA-2045 is not a wide-area protocol at all. Rather, it provides a physical, electrical, and logical standard for attaching universal communication modules to smart-grid DR devices.

Conclusions

1. **Inherent flexibility in the DER/CER can support networks by enabling them to manage constraints through the utilisation of non-network solutions and allowing enhanced access to electricity markets.**

2. **Open communication standards / protocols are one of the key enablers of flexibility i.e., to exchange network information, pricing signals, and control signals.**

3. **Establishing interoperability is an important enabler for establishing:**

   a) common language between networks, DSO, and aggregators/flexibility service providers/market facilitators;

   b) controllability of devices from different OEMs e.g., PV inverters, EV chargers etc.

4. **International open access standards can help boost market participation, cost efficiency, and easy access, as defined common protocols and standards allow for faster and more seamless connection and exchange of data.**

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Conclusions

5. **The two most mature communication protocols for flexibility currently being considered for adoption internationally are OpenADR and IEEE2030.5.**

a) Currently, OpenADR is more mature in Demand Management (DM) market functions while IEEE2030.5 is stronger in smart control functionality.

6. **Whilst each have strengths, both require further progression to meet all the requirements of demand flexibility, with some components still in development to provide end to end functionality. Current enhancements being developed include:**

a) Open ADR 3.0 offering more dynamic price structures, as well as capacity management (DOE); and

b) IEEE2030.5 using site EMS/aggregator to translate DM requirements into specific device commands

Conclusions

7. **From the international scan it was observed that currently no jurisdiction is following a single pathway on communication protocols and instead are moving down different protocol pathways due to their specific requirements.**

- For example, ENA UK is currently investigating the development of a separate communication standard (leveraging current knowledge) as they consider it may be more suited to their market structure and may provide the adaptability they require as the system continues to transform.

8. **Use of APIs can support basic functionalities such as enabling communication between flexibility providers and networks (SCADA/ADMS/DERMS).**

Recommendations

1. **Continue to monitor closely international developments, with particular emphasis on**

a) Australia due to their market proximity and speed of advancement in managing high penetration levels of DER within their distribution systems.

b) The UK due to similarity in structure and drivers in terms of DER/CER penetration, and regulations'

2. **Build on existing knowledge of communication protocols and map the capabilities against New Zealand's requirements as it moves through the energy transition, before finalising any specific standard / protocol.**

Recommendations

3. Consider the following least-regrets actions

a) Establishment of a DER/CER integration working group to monitor the New Zealand market, scan global developments, and help design and undertake future trials

b) Connect and collaborate with similar DER integration and flexibility working groups in other jurisdictions such as the UK, USA, Europe and Australia.

c) Establish a taskforce/study immediately to

i. design and obtain consensus on future energy scenarios for New Zealand;

ii. combine knowledge from local trials.

d) Design and implement an ‘’regulatory sandbox” to enable trials (innovation with flexible rules) and work with government, industry and regulatory bodies to identify gaps and develop solutions in technology, regulation, functionality and consumer education to ensure industry preparedness.

Q and A

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Webinar

Diversity – Statistical Modelling at Low Voltage
Online

7 March 2024	**8:00am - 9:00am**	**AEST**
	11:00am - 12:00pm	**NZST**

https://events.teams.microsoft.com/event/c57518fb-23dd-41e3-a12f-d93f71919ed2@7d1ccd0f-0319-490f-9ca9-45c132600d50

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Thank you

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Appendix of Additional Material

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The Future of Distributed Flexibility – Review of Candidate Standards

- ‘The Future of Distributed Flexibility’ report was accompanied by a separate report which evaluated five potential standards to “enable the interfaces of a common digital energy infrastructure”
- CIM identified as the recommended option

	IEC CIM	ebIX	OpenADR	IEC 61850	IEEE 2030.5
Data Domains	8	4	5	3	3
Data Model	Semantic Model	Message Model	Message Model	Semantic Model	Semantic Model
Development Process	Curated	Curated	Community	Curated	Curated
Message Library	Rich	Developed	Developed	Developed	Developed

- However, Open Networks view of CIM when evaluating standards for dispatch signals was “CIM is a popular standard for an information model to communicate structured information through, but **it is not in itself a transport protocol, API or architecture for a wider cross-organisation IT interface for dispatch commands** to be sent over the public internet”.

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