Electricity Network Standards:

ESS900 Distributed Energy Resource Management System Connection Standard

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I. Document Control

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II. Document Revisions

Approved Versions	Date	Revision Notes
0.1	25/01/2023	Draft

III. Glossary of Terms

Term	Description
DER	Distributed Energy Resource
DERMS	Distributed Energy Resource Management System
EV	Electric vehicle

1. Overview

Introduction

The Auckland electricity peak demand is forecasted to increase rapidly due to growth in the service industry, digitalisation, and electrification of the transport and heating sectors. Smart network management utilising a Distributed Energy Resource Management System (DERMS) allows active management of the demand when the network is constrained and reduces the need for traditional network reinforcement. This improves affordability for customers in the form of reduced connection costs and line charges. Smart network management via DERMS is therefore a key element to enable a cost-efficient and reliable transition towards decarbonisation of the energy sector (Figure 1).

Customers with distributed energy resources[1] (DERs) can connect with Vector's DERMS platform using a supported communication protocol and benefit from different commercial arrangements. For the network operator, visibility and management of DERs is required to ensure network reliability for all customers and avoid traditional reinforcement. For customers, the DERMS connection provides a forecasted dynamic operating limit based on network conditions, so that they can maximise the value of DER accordingly.

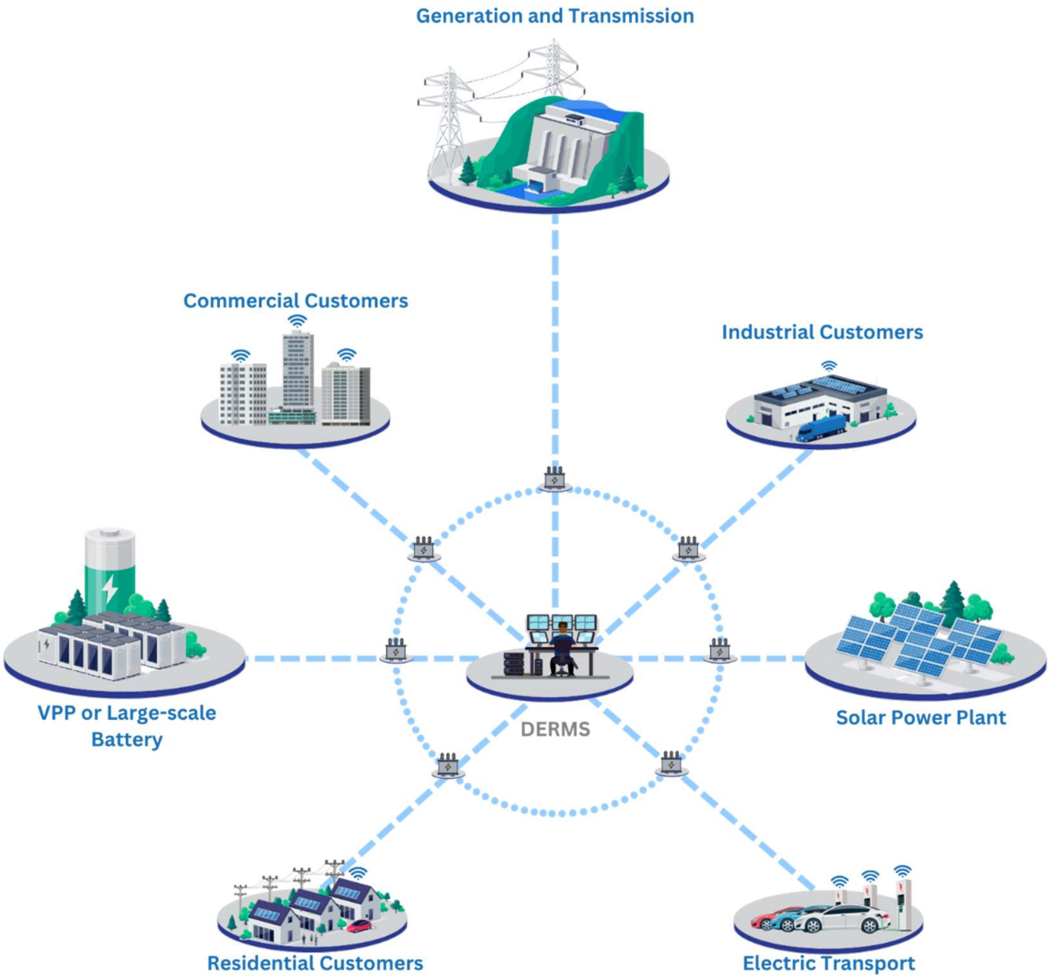

Figure 1: Customer and network integration via DERMS for cost-efficient and reliable decarbonisation

[1] Distributed energy resources is an umbrella term which includes connected devices such as distributed solar panels, batteries, heat pumps, pool pumps, electric vehicles as well as more aggregated load types such as smart buildings, large-scale batteries, data centres or e-Transport fleet depots.

A major benefit of a DERMS connection is that Vector can provide safe operating limits to customers who don't have visibility of the surrounding electrical infrastructure. I.e., An e-Transport charging hub includes several charging stations with a peak capacity that would require a traditional network upgrade to ensure sufficient capacity for every instance of the year. For such a customer, a DERMS connection may be a viable alternative as full load may not be required during the short amount of year that the network is constrained. DERMS provides Vector with visibility of the near future network conditions and an operating limit is then sent to the customer who can optimise and prioritise its charging needs accordingly. Similarly, a large battery customer will be provided with operating limits which take into account network loading and can then optimise its position in the wholesale market or providing ancillary services without causing network constraints. For early applications and new business models, this is particularly useful as it provides the customer the opportunity to get connected and, when the business is established, to re-assess whether reinforcement is necessary or if the flexible DERMS connection is sufficient.

Purpose

The purpose of this document is to provide customers with DERs a guideline on Vector's preferred connection methodologies based on the type of DER and the supported communication protocols. Both residential and commercial DERs connected to Vector's DERMS platform may benefit from a cost-effective load control tariff and a lower connection cost.

The document reflects Vector's currently preferred architecture and protocols. However, DER protocols are rapidly evolving, and customers are encouraged to discuss the need for alternative solutions with Vector.

2. DERMS and DER interface

DERMS is part of the Network Management System. It gets live network information from the Advanced Distribution Management System (ADMS) and the DERs it is connected to. It can forecast the network loading, identify network constraints, and alleviate them by managing the DERs.

DERMS works on time steps in the range of minutes (e.g., 15 minute time step). It recalculates the network condition and communicates any changes to the DERs every few minutes.

Figure 2 below shows the data flows between DERMS and DERs. Flexibility providers can be a DER aggregator or the control unit of a group of DERs (e.g. E-Transport charging hubs have multiple charging units but only one point of contact).

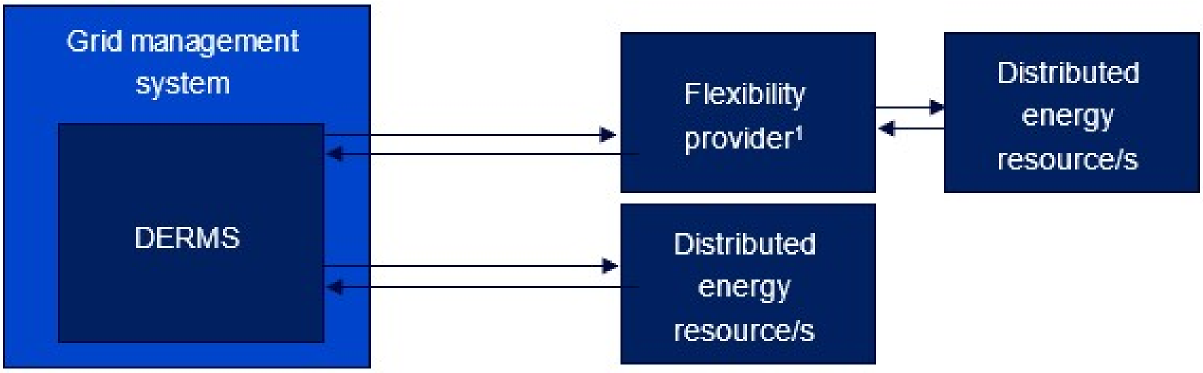

Figure 2 : DERMS and DER interface
[1]Flexibility provider can be such as the control unit of distributed generation or EV charging management system.

DER type	**Load**	**Inverter**
Protocol	OSCP/OCPP, OpenADR	IEEE 2030.5
DER to DERMS data transfer	maximum, average, and minimum demand (kW)	maximum, average, and minimum import/export power at its ICP (kW)
DERMS to DER data transfer	Maximum available capacity forecast for the next 24 hours A command to reduce demand to the minimum allocated	Maximum power export forecast for the next 24 hours A command to stop exporting power to the grid

Table 1: Communication with different DERs

3. Communication protocols

Depending on the type of DER, a different set of real time data and control will be exchanged with DERMS for load forecasting and prediction purposes. Based on the analysis provided by DERMS, DERs will be managed to keep the distribution infrastructure within local and global constraints across the network. Figure 3 gives a high-level overview of communication protocols suited for different types of DER.

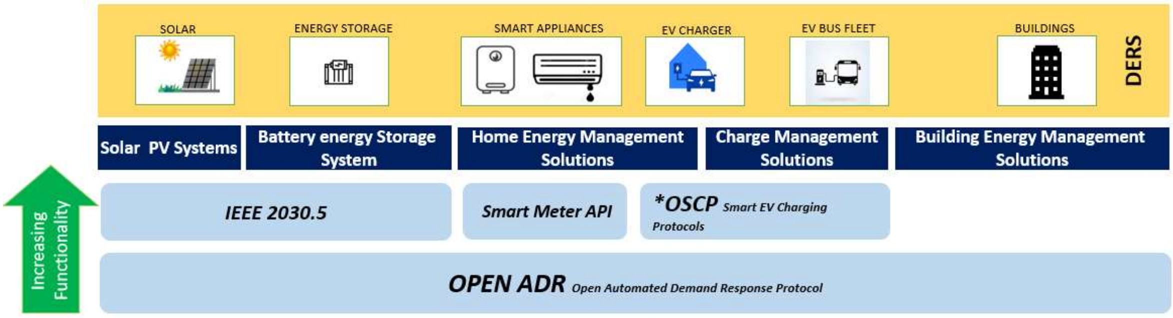

Figure 3 : Type of DERs and suited Communication protocols

Open Smart Charging Protocol (OSCP/OCPP)

OSCP is utilised to connect EV chargers to DERMS as default and OCPP integration is also available.

IEEE 2030.5

IEEE 2030.5 is utilised to connect to Inverter based DERs.

OpenADR

OpenADR can be used for all DERs (including building management systems and local energy management systems).

Smart meter API

A Smart meter API is utilised to communicate with smart meters, that are wired to the hot water cylinders. Unlike other DERs the hot water cylinder can only be set to ON or OFF.

4. Connection process

DER connection applications will be submitted by customers through a distributed energy resource (DER) approval process where the type of DER, capacity, integration protocol and other information are provided as part of the submission process. Applications will be reviewed and assessed by Vector based on the network location, feasibility, and integration capabilities. Once approved, the DER will be added onto Vector's DERMS followed by integration testing, connection confirmation and finally deployment.