LV Disclosure 2024, cl 2.6.1B

Centralines is required to publicly disclose qualitative information in narrative form that describes its practices in a manner that complies with clause 17.2.2 (monitoring load and injection constraints) of the electricity information disclosure document. Clause 17.2.2 has the following subclauses:

a) any challenges, and progress, towards collecting or procuring data required to inform us of current and forecast constraints on our low voltage network, including historical consumption data; and

b) any analysis and modelling (including any assumptions and limitations) of the above data we have undertaken or intend to undertake.

Centralines included this information in its Director certified 2024 Asset Management Plan disclosure Asset Management Plan (centralines.co.nz). Each subclause is addressed separately below:

17.2.2.a Data collection

Any challenges, and progress, towards collecting or procuring data required to inform us of current and forecast constraints on our low voltage network, including historical consumption data; and

Section 4.2.3 *Preparing the Network for the Future* covers Centralines' recent focus on preparing for an Electrified and decarbonised New Zealand. Low Voltage Visibility is a key enabler to this and is covered in 4.2.3.2-1:

4.2.3.2-1 Low Voltage (LV) Network Visibility

Increased penetration of distributed energy resources in the distribution network has the potential to create issues on low voltage (400 volt) circuits which traditionally have less mature levels of asset information quality and are not remotely monitored. Centralines has developed and is undertaking a program of work to enhance both static and dynamic asset information for low voltage networks. This initiative supports safety, investment efficiency, and the capability of the network to host distributed energy resources.

Centralines has created a low voltage data framework and is developing strategies to cost-effectively capture both static and dynamic data.

Section 4.3.2 provides an overview of the Network constraints Forecasting process. 4.3.2.1 Data inputs provides a list of data required for this process and is quoted below:

4.3.2.1 Data inputs

The data required to complete Network Constraint Forecasting is summarised in Table 0-7.

Information Type	Information
Historical Load Data	• *ICP demand records (e.g., smart meter data)* • *Network demand records*
Network Model	• *Connection of assets* • *Open points*
Asset Attribute Information and Master Data	• *Impedance* • *Maximum rating*
Economic Projections	• *Population* • *Number of dwellings*
Consequence of Failure	• *Financial information about assets and potential penalties for the cost of non-supply*

Table 0-7: NCF Data Inputs

In addition, consumption data is used to undertake load estimation 4.3.3.2 illustrates this process.

4.3.3.2 Load Estimation

The objective of load estimation is to estimate the peak load and peak diversity at a distribution transformer level.

Estimation of the distribution transformer peak load is achieved through either the summation of smart meter data or the calculation of the After Diversity Maximum Demand (ADMD).

ADMD calculations bridge the gap where:

- *consumers have yet to convert to the smart meter system, or*
- *data from the retailer is not available.*

The methodology used in Network Constraint Forecasting works (with a defined margin of error), over a wide range of customer types. These calculations are also relevant for combinations of customer types, e.g., residential commercial, light industrial.

Section 4.3.5 outlines specific continual improvement activities in Network Constraints Forecasting. The improvements targeted at data collection are highlighted below:

4.3.5 Constraint Forecasting Improvements

4.3.5.1 Low Voltage Visibility

Centralines has started an LV Visibility project that will identify the likely information required by the business in relation to the LV network in the future. This will allow the development of strategies and processes to enable this information to be efficiently collected. This project is expected to improve the accuracy and confidence of LV modelling in NCF.

4.3.5.2 Smart Meter Data

Consumption data from smart meters significantly improves the accuracy and confidence of load estimation. Better load estimations enhance constraint identification allowing more prudent investment decisions. Centralines has prepared its systems and processes to make full use of smart *meter data as it becomes available. A project is underway with the goal of obtaining a regular and complete update of smart meter data from retailers.*

4.3.5.3 Load Forecasting

Centralines is continuing to improve its load forecasting capabilities. A prototype load forecasting algorithm is being developed that will estimate unique organic load growths driven by demography and environmental factors. Technology and customer driven load changes will be considered in future models.

4.3.5.5 Stakeholder Engagement

While new connections and consent data provide strong independent predictors of growth, these tend to be clustered towards the first three years. Engaging with developers, major customers, councils, and mana whenua allows Centralines to more accurately model and plan for growth in the three-to-ten-year window. This is crucial to optimise network investment and reduce the risk of asset stranding. Centralines formalised this data through the Energy Efficiency & Conservation Authorities (EECA) DETA study on decarbonisation and in 2024 will utilise the EECA Regional Energy Transition Accelerator (RETA) study to further refine outputs. Centralines understands that its stakeholders are driving changes in energy usage and existing relationships will become more critical in a dynamic energy future.

17.2.2.b Data Analysis

Any analysis and modelling (including any assumptions and limitations) of the above data we

have undertaken or intend to undertake.

Section 4 covers the Network Development Process including Centralines' approach to LV data and modelling

Section 4.2.3.*2-4*

4.2.3.2-4 4. Updating Centralines' Planning Process

Centralines' existing planning process is reliant on new connections, consent applications, assumptions on organic growth and long-term council plans for the region. It is based on a singular view which has worked well in the past when household loads were stable and could be predicted with reasonable accuracy.

Advancements in technologies such as electric vehicles and DER will have a significant impact on network loading if they are not understood and managed accordingly. With uncertainty surrounding uptake rates for electric vehicles and small-scale DER, having a singular view of future demand on the network is no longer adequate.

In the 2022/23 financial year, a one-off scenario planning exercise was carried out to understand how planning could be implemented in the Centralines context.

One of the key learnings was that the existing planning process is inadequate for scenario planning, and a new process is required which is shown conceptionally below. The yellow boxes and text highlight new capabilities that will need to be developed. The new capabilities being developed are:

- *Monitoring and forecasting macro-inputs such as uptake rates of electric vehicles and DER*
- *Generation of scenario-based load forecasts down to the low-voltage network*
- *Scenario-based constraints forecasting and resource modelling, and*
- *Flexibility service as an option in the solutions toolset.*

4.3.3.4 Low Voltage Modelling

A representation of the current low voltage (LV) network is needed to identify constraints. Centralines' approach involves simplifying the LV model to a single equivalent impedance model that can be run alongside an HV model. Monte-Carlo analysis is used to simplify the LV model to a single equivalent impedance.

4.3.3.7 Constraint Forecasting Case Studies

The timing and severity of constraints are identified by performing the case studies as per Table 4-8.

Case Studies	***Description***
Maximum Load	*Maximum peak loads applied over the entire network for the full load forecast period. This case study is used to determine undervoltage and overload constraints.*
Minimum Load	*Minimum peak loads applied over the entire network for the full load forecast period. This case study is used to determine overvoltage.*
Security of Supply	*Maximum peak loads applied to 33kV and 11kV feeders to determine where the network does not comply with the security of supply criteria. These studies are carried out manually when there is a significant change in load or network architecture.*

Table 0-81: Constraint Forecasting Case Studies