FOREWORD

The purpose of this document is to outline the Distributed Energy Resource (DER) projection process.

Any questions or inquiries regarding information provided in this document should be referred to the Manager, Distribution Engineering.

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REVISION HISTORY

Revision #	Date	Description of Changes
0	3/12/2020	Initial Issue
1	7/6/2021	Changed from five year projections to ten year projections and updated size range for large and medium facilities.
2	10/24/2021	General updates to clarify process.

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1.0 Introduction

1.1 Purpose

The intent of this document is to provide a guideline to assist Distribution Engineering personnel in the process of forecasting the ten year installed capacity of distributed energy resources for each distribution operating center and each distribution circuit and substation transformer.

The results of the DER forecasts should not be used as the sole justification for system upgrades, instead they are intended to be used as a tool to assist in determining when system upgrades could be needed.

This guideline is not intended to be an all-inclusive, step-by-step procedure and should not replace sound engineering judgment.

1.2 Applicability

This document applies to the forecasting of the capacity of distributed energy resources on distribution circuits operating at nominal primary voltages of 34.5kV or less and substation transformers operating at nominal primary voltages of 69kV or less. Additionally, this document details the procedure for forecasting the capacity of distributed energy resources on each distribution operating system as a whole.

1.3 Responsibilities

This procedure is written and maintained by the Distribution Engineering Department to whom any questions relating to its content or application should be addressed.

1.4 Availability

Current copies of this procedure can be found on the Engineering Department Only Drive. Hard copies are not version controlled.

NOTE: Only up-to-date versions of the documents are posted on the Engineering Department Only Drive. All other revisions (both electronic and hardcopy) should not be referenced.

2.0 General Information

2.1 Abbreviations and Acronyms

DER	Distributed Energy Resources

2.2 Definitions

Utility Scale DER Facility	Any DER facility with a nameplate capacity of 1,000kW or more
Large DER Facility	Any DER facility with a nameplate capacity less than 1,000kW and up to and including 500kW
Medium DER Facility	Any DER facility with a nameplate capacity less than 500kW and greater than 60kW
Small DER Facility	Any DER facility with a nameplate capacity of 60kW or less
DER Projections	Incremental future DER capacity per Circuit/Transformer/System based on historical DER installations. DER Projections do not include existing in-service and approved for installation DER.
DER Forecasts	Total DER capacity per Circuit/Transformer/System forecasted that include the existing in-service DER capacity and DER approved for installation as well as the DER Projections.

3.0 Scope

To assist with the analysis of DER interconnection application review and support the need for system upgrades due to DER penetration ten year DER Forecasts shall be developed annually for each distribution operating company. DER Forecast shall include forecasts for each distribution circuit and distribution substation transformer as well as overall system DER Forecasts.

The process for creating DER Forecasts requires the development of ten year DER Projections for the installations of small and medium DER facilities. These DER Projections are then added to all sizes of DER facilities that are installed or approved for installation at the time the DER Forecast is developed for each distribution circuit, distribution substation transformer and the overall system. The overall system DER Forecasts also include the projected penetration of large DER facilities.

Due to the limited number and uncertainty of location of Large DER Facilities, these are not included in the circuit and substation transformer DER Projections. Similarly, Utility Scale DER Facilities are not included in circuit, substation transformer, nor system DER Forecasts.. Instead these facilities will be treated similarly to how new large customer load additions are incorporated into distribution load projections in that they will be added to the DER Forecasts as actual customer applications are received per the project schedule and engineering judgement.

The DER Forecasts are then compared to the rating of the limiting equipment to assist in determining when system upgrades could be needed.

It is important to note that the projections and forecasts developed per this guideline are utilized for planning purposes to assist in the direction of system improvements and are not a “prediction” of specific DER capacity levels that will ultimately be experienced.

4.0 Forecasting Methodology

It is understood that the DER forecasting methodology described below is conservative. In the event that these projections or forecasts indicate the need for system improvements, additional analysis shall be performed and field measurements (application of load loggers, installation of additional metering, etc.) taken to determine the severity of the identified concern.

4.1 Distribution Circuit DER Projections

Distribution circuit DER Forecasts are developed using two similar methods and utilizing the higher result of the two methods as the ultimate DER Forecasts for each circuit.

Method 1 – Forecast Based on Nominal DER Capacity:

Method 1 utilizes the nominal capacity of small and medium DER facilities installed on the circuit and "normalizes" this to the three year historical circuit peak load. A five year and three year historical slope is calculated based on the five year normalized DER capacity growth on the circuit. This is done for all distribution circuits on each of Unitil's distribution operating systems.

Based on the calculated slopes engineering judgement is used to create four growth rate ranges for each distribution operating company.

- N – slope of zero
- L – flat slope
- M – moderate slope
- A – aggressive slope

Each circuit is assigned a historical growth rate. Based on the historical growth rates future growth rates are calculated for each of the rate types. The future rate for each type is the maximum of the three year average and five year average of each historical rate of that rate type.

After reviewing the assigned historical rate type for both the three year and five year slopes engineering judgement is used to assign the desired future growth rate (slope) to each circuit. This slope is then used to calculate the small and medium DER Projections that is added to the total amount of DER installed and approved for installation on each circuit to get the method 1 DER Forecasts.

Method 2 – Forecasts Based on Number of DER Facilities Installed:

Method 2 is very much the same as method 1 with one exception.

Method 2 utilizes the number of small and medium DER facilities on each circuit and "normalizes" this to the average number of customers supplied by each circuit. The same process described in method 1 is then used to project the number of small and medium units that will be installed on the circuit. The projected number of units is then multiplied by the five year average size of small and medium units to determine the DER Projections of small and medium

DER facilities for each circuit. This is added to the total amount of DER installed and approved for installation on each circuit to get the final method 2 DER Forecasts.

4.2 Distribution Substation Transformer DER Forecasts

DER Forecasts for distribution substation transformers should be calculated for both method 1 and method 2 above by summing the distribution circuit DER Forecasts for each of the circuits supplied by the transformer. The ultimate substation transformer DER Forecasts shall be the higher of the method 1 and method 2 DER Forecasts.

4.3 System DER Projections

DER Forecasts for each distribution operating system shall be calculated in the same manner as distribution circuit DER Forecasts utilizing system-wide data opposed to individual circuit information.

Once the DER Projections of small and medium DG facilities is determined and added to the total amount of installed and approved for installation DER facilities the DER Projections of large DER facilities is added to the projection to determine the ultimate system DER Forecasts.

The large DER Projections should be determined based on the growth rate (slope) calculated from the previous five years of large facility installations. In the event five years of data establishes an unrealistic or negative slope then engineering judgement shall be used to determine if a three year slope, yearly historical average or other method is used to calculate the projected yearly capacity of large DER facilities that will be added to each year to get the ultimate system DER Forecasts.