

Distributed Generation Evaluation Map: User Guide

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Introduction

Distributed Energy Resources (DER) are becoming an important aspect of the modern electricity grid. One type of DER is distributed generation (DG) which includes rooftop solar and ground-mounted solar installations. The Distributed Generation Evaluation Map is a high-level display of the PGE distribution system's potential to accommodate distributed generation. This map is one tool you may use to help assess the grid's potential to support distributed generation at the size and location of interest. The map is being provided for informational purposes only and is not intended to be a substitute for PGE's Established Interconnection Process.

The analysis to determine the amount of generation that can be accommodated at a point in the distribution system can include several steps. An individual or organization can use the Distributed Generation Evaluation Map as one tool to gather basic information about the distribution system's ability to accommodate distributed generation. More specific and more accurate information becomes available as an Interconnection Application moves through PGE's Interconnection Process. Based on the size of the proposed project and other factors, different reviews and studies in PGE's Interconnection Process determine the exact amount of generation that can be accommodated at a given location as well as the mitigations required to interconnect the generation capacity under review.

The Distributed Generation Evaluation Map includes information that is publicly available and is intended to enable interested parties to gather interconnection-related information before investing time and energy in the application process. The desired outcomes of providing this information include fewer withdrawn applications and more efficient use of customer and PGE staff time.

The map reflects data at a point in time. This date is indicated in the pop-up display on the map and therefore may not reflect current conditions in each area (a description of the information included in the pop-up can be found on [page 12](#)).

Additional information or tools to aid distributed generation siting/sizing decision can be found at the [Generate Your Own Power section](#) on PGE's website:

Community Solar Queue and Small Generator Queue. Distributed Generation projects in the interconnection queue not yet interconnected may have an impact on the system's ability to accommodate DG. The Distributed Generation Evaluation Map and tabular results reflect DG projects that were in-service as of the date indicated in the pop-up on the map. Projects in the interconnection queues with pending status or projects that went into service after this date are represented by the DG Capacity in Queue value. The Queue information in the map is updated twice per year along with the other data in the map. More up to date queue information is available [here](#) and is updated monthly (Generation Interconnection>>Oregon Small Generator Interconnection).

Pre-Application Data Report. Pre-Application Reports are available for specific locations. The Pre-Application Report is a preliminary screen of a specific site on the distribution system based on existing, available distribution system data without any field verification. The fee for a pre-Application report is \$300. An example of the information available in a Pre-

Application Data Report is located on [page 15](#). For more information on obtaining a Pre-Application Report please send an email to small.power.production@pgn.com.

Interconnection Request. More information on submitting a formal interconnection application is provided [here](#) as well as Technical Requirements and Resources at <https://www.oasis.oati.com/PGE/> (Generation Interconnection>>Oregon Small Generator Interconnection).

How The Map Can Help

The Distributed Generation Evaluation Map is a high-level display of the PGE distribution system's potential to accommodate distributed generation. This map is one tool designated to help assess the grid's potential to support distributed generation, such as rooftop solar or a larger solar installation.

Below are some suggestions as to how the information in the map can be used to support DER decisions.

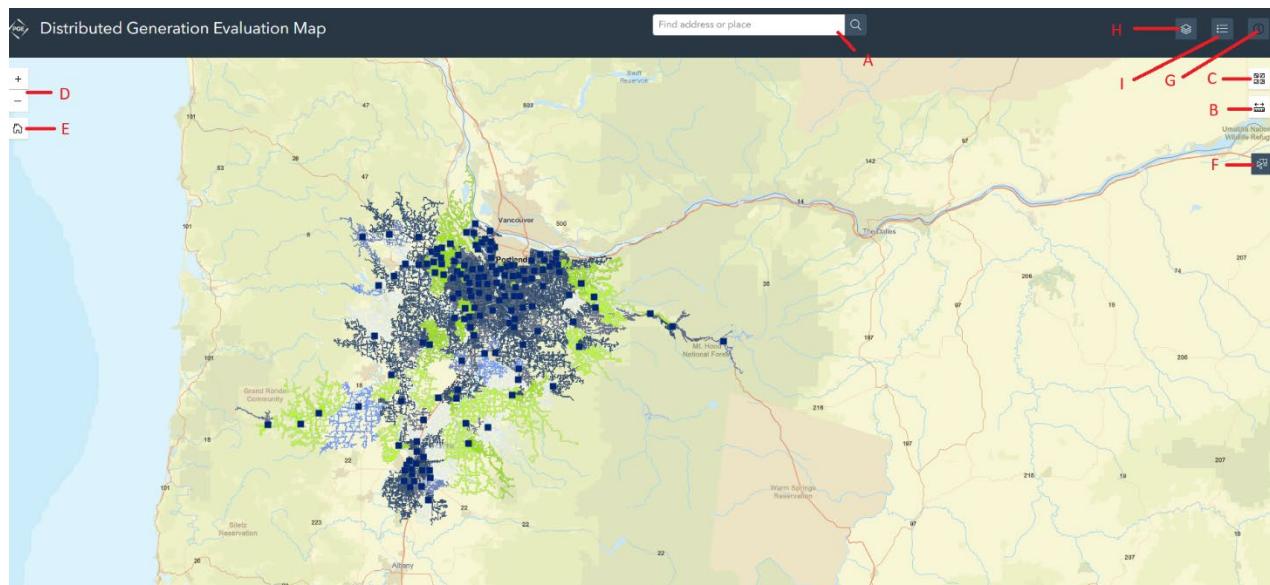
- *DG Ready Feeders and Transformers* - This information is provided in contrast to the Limited Generation Feeders represented in the Net Metering map. The "DG Ready" designation indicates that these feeders and transformers have protection equipment designed to prevent damage during a back feed event. The availability of protection equipment and implementation of protection schemes are cost drivers for DG installations. Knowledge of where protection is in place can help installers and developers identify more cost-effective locations for DG installations.
- *Substation Location* - This is an informational item only. Distance from a substation to the point of interconnection, such as a solar installation, can be an interconnection cost driver. For example, if communication infrastructure (e.g., fiber) needs to be provided to a location, longer distances typically result in more costs to prepare the utility poles for communication attachments.
- *Daytime Minimum Load (DML)* - If a feeder is not identified as DG Ready, then the DML provides an indication of how much generation might potentially be accommodated by a feeder. This information can be used in several ways:
 - DML provides an indication of how much DG potentially could be accommodated on a feeder. If the DML<0, then that feeder likely has adequate protection to allow back feed. In those cases, the feeder might be able to accommodate DG up to 80% of the feeder's thermal rating.
 - On a feeder without adequate protection, DML can provide an indicator for sizing a DG installation so that the DG does not exceed the DML.
 - If DG Capacity in Queue > DML, then it is possible that the DGs in queue are going to pay for upgrades to that feeder and/or substation. Those upgrades might provide adequate protection to accommodate additional DG.
 - DML is a proxy for hosting capacity, but IT IS NOT hosting capacity. Hosting capacity includes other considerations, such as thermal rating of a feeder and

voltage regulation. Therefore, DML can help with screening, but additional analyses are required to evaluate the impact of DG at a location.

- *DG Capacity in Queue* – this represents the amount of generation that was in the interconnection queue as of the date reflected in the Date DG Status Updated field. The number of projects in the queue as well as the amount of proposed generation provides a level of uncertainty to the future state of the associated feeder and transformer. With the possibility of projects removing themselves from the queue (the dropout rate has been as high as 60%), the study process becomes much more complex.

Map Elements and Navigation

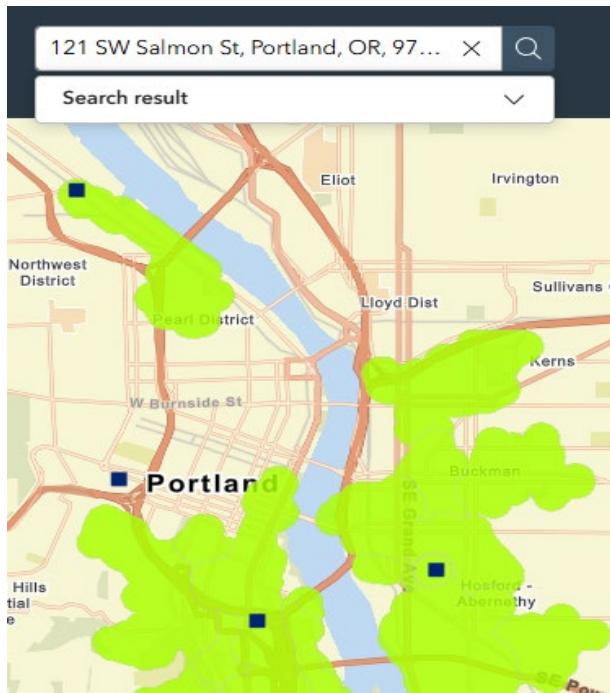
Main Screen



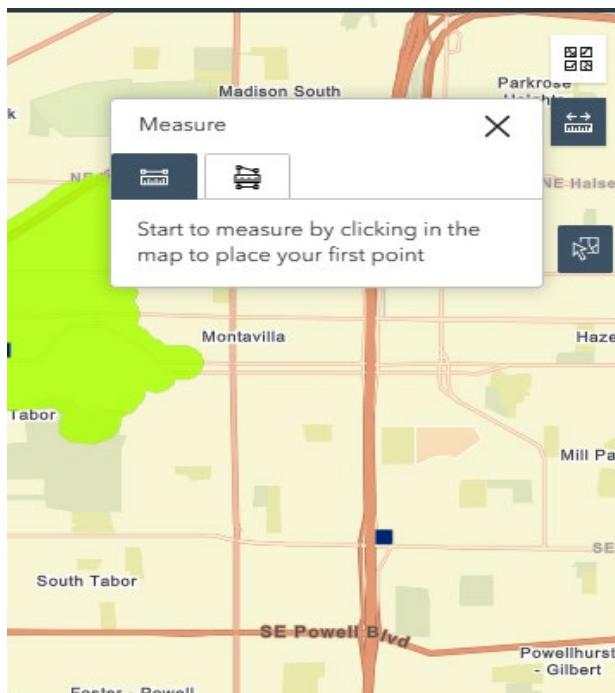
- A. Search bar: Allows users to search for a specific location
- B. Measurement Button: Measure distance or area
- C. Opens/closes Basemap Gallery
- D. Zoom buttons: "+" allows user to zoom in; "-" allows user to zoom out.
- E. Zooms out to the main view (PGE's whole service territory)
- F. Select Button: Select the features within a user-drawn polygon
- G. Opens/closes About Pop-Up window
- H. Opens/closes Layers List
- I. Opens/closes Legend Menu

Search Bar

Search by address



Measurement Button



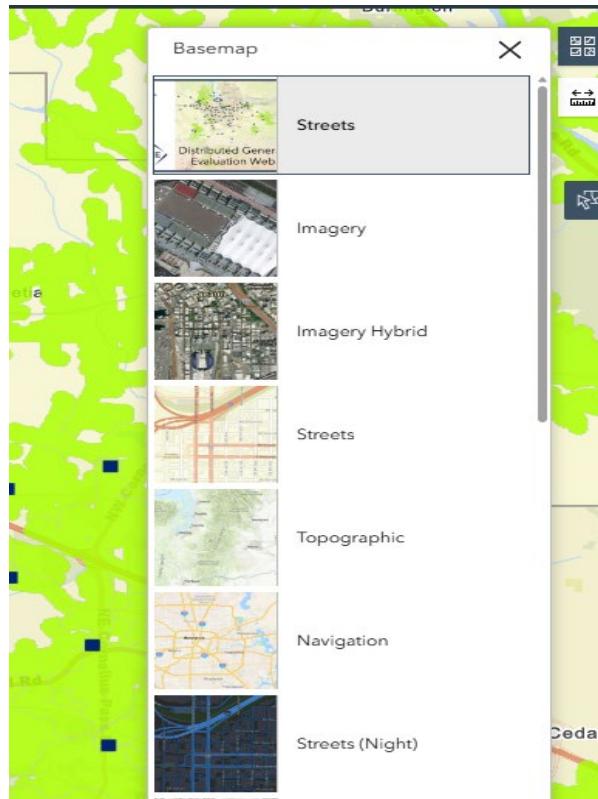
A. Measure a distance: click the **distance** button ->click two or more points on the map to draw a line. When you are finished drawing, double-click to complete the line. The result of your distance measurement appears at the bottom of the Measurement tool. To change the

distance unit, choose a new unit of measurement from the drop-down menu. To measure another distance, click on the map and draw a new line.

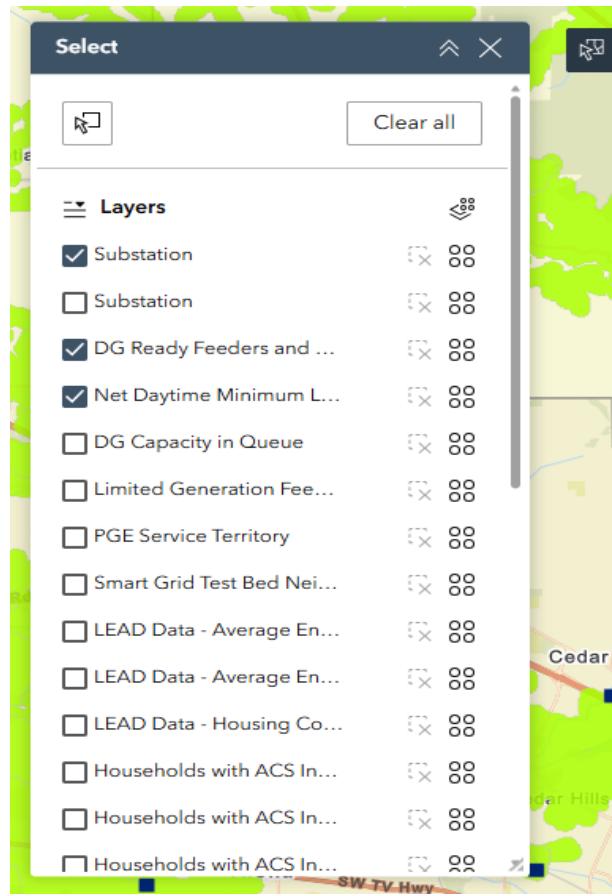
B. Measure an area: click the **area** button -> click three or more points on the map to draw a shape, double-click to complete the shape. The result of your area measurement appears at the bottom of the Measurement tool. To change area units, choose a new unit of measurement from the drop-down menu. To measure another area, click on the map and draw a new shape.

Basemap Gallery

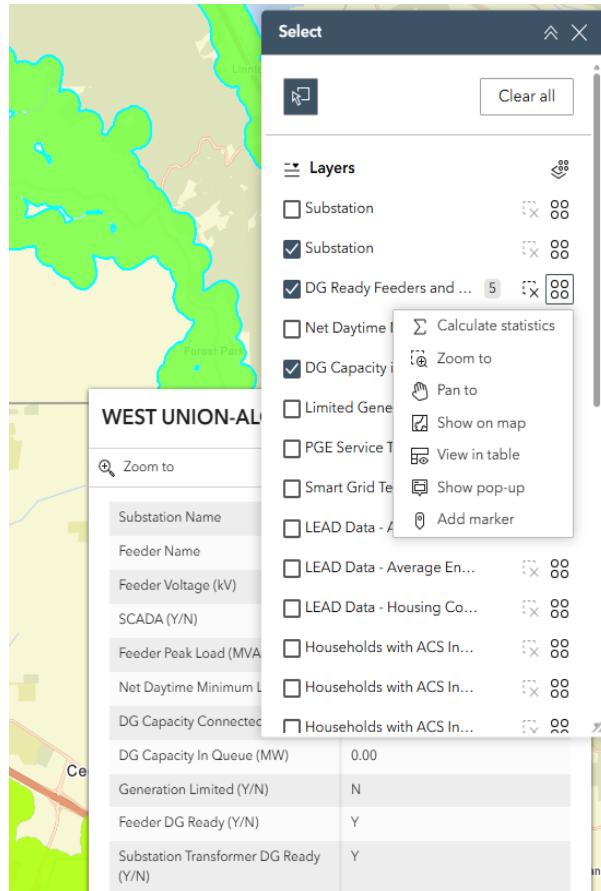
Basemap Gallery - provides options for the background map on which the PGE system is depicted. The Light Grey Canvas is currently selected.



Select Button



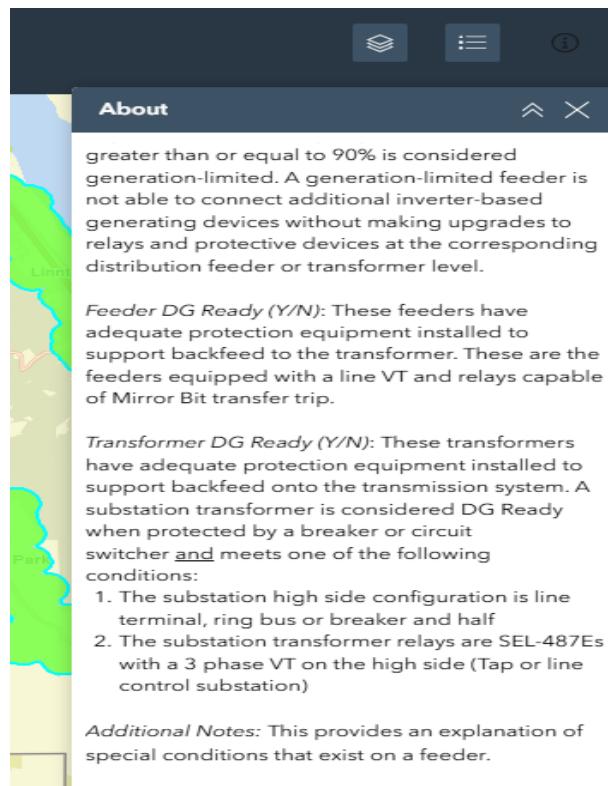
Select the layers you want to select from on the Layer List, click the select button , then click the mouse pointer on the map to start drawing a polygon. After the features are selected, double click to complete. Click the actions  to open the **Selection Actions** menu. You can view the selected features in the pop-up or attributed table.



Click the Clear all button to clear all the selections.

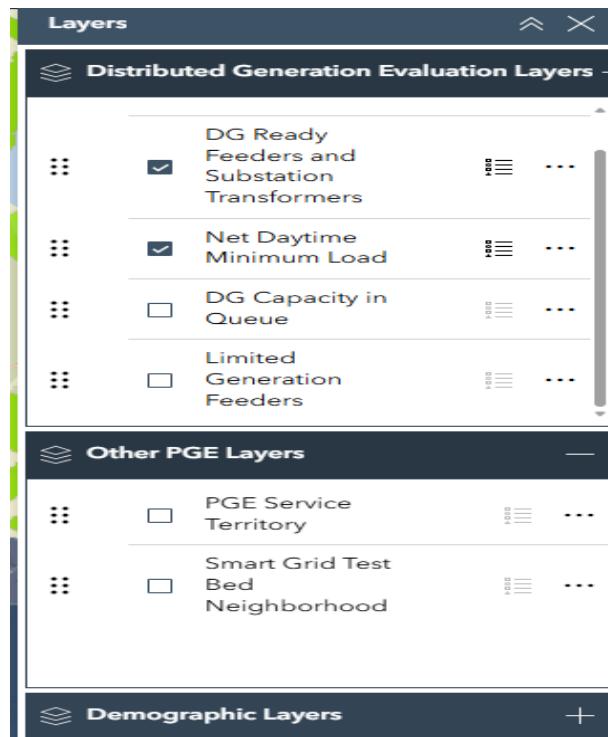
About Pop-Up Window

Shows the definitions for the Feeder Pop-Up window and includes helpful links.



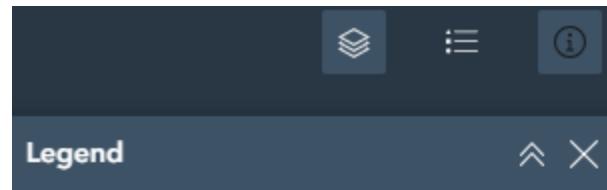
Layers List

The layers show the data that can be displayed and "turned off" on the map.



Legend Menu

This menu displays the color scheme for each layer list chosen.



Substation



DG Ready Feeders and Substation Transformers



DG Capacity in Queue

DG Capacity In Queue (MW)



> 1 MW



0.021 - 1 MW



0.01 - 0.02 MW

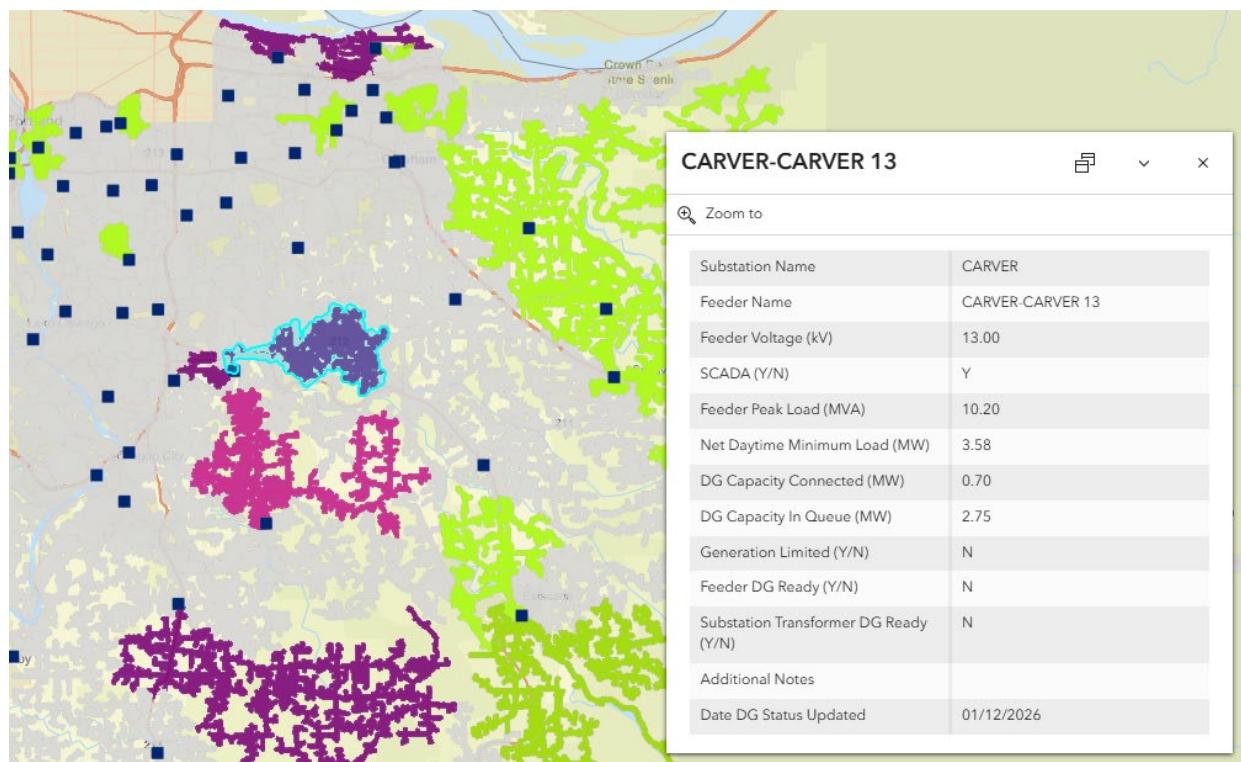


0.001 - 0.009 MW



0 MW

Feeder Pop-Up Window



Click on a feeder of interest and a pop-up window will appear. This window contains details regarding the selected feeder. Selecting the "Zoom To" link at the top of the box centers the screen on the selection. The following data is displayed in the pop-up window:

Substation Name: Name of the substation where electrical equipment is used to step down voltage from transmission-level to distribution-level voltage. The feeder system reaching from a substation to the customer is the distribution grid.

Feeder Name: Unique name of distribution circuit that exits the substation and extends to the distribution customer or distributed generation point of interconnection. Feeders distribute power from a substation to customers. There is often more than one feeder per substation and transformer.

Feeder Voltage: This lists the voltage, or capacity of energy, that a feeder can accept. Feeder voltages range from nominal distribution voltage of 11.1kV to medium voltage level of 34.5 kV.

SCADA (Y/N): Supervisory Control and Data Acquisition. SCADA is used to monitor and operate transmission and distribution equipment.

Feeder Peak Load (MVA): This is the maximum amount of load or power delivered to customers on a feeder during a period of time (currently, PGE measures peak load at the timescale of 3-4 months and the measurement is captured by a metering device placed at or near the designated feeder breaker). This typically occurs during hot summer days between June and September when cooling loads are at their max usage. The summer peak load is typically used for heavy load cases instead of the winter peak load since summer equipment ratings are typically more constraining than winter equipment ratings.

Net Daytime Minimum Load (MW): This is the minimum amount of load or power delivered to customers on a feeder during a period of time (currently, PGE measures DML at the timescale of one year and the measurement is captured by a metering device placed at or near the designated feeder breaker). This typically occurs during spring and fall days when heating and cooling loads are much lower. Net DML includes the load plus any existing generation on that feeder. A positive number indicates the load exceeds the generation on a feeder and power is flowing from the substation to the customers. A negative number indicates the generation exceeds the load on a feeder and power is flowing to the substation and potentially onto the transmission system.

DG Capacity Connected (MW): This represents the aggregate nameplate rating of inverter-based, distributed generation connected to the feeder. This includes both small generation (e.g., Qualifying Facilities (QFs), Community Solar) and net metering (e.g., rooftop solar, biogas).

DG Capacity in Queue (MW): This represents the aggregate nameplate rating of the QFs in the interconnection queue and does not include net metering.

Generation Limited (Y/N): This identifies feeders where the generation to load ratio has exceeded the interconnection limits established on the feeder and adequate protective equipment or schemes are not installed or implemented. Currently, a generation to load ratio greater than or equal to 90% is considered generation limited. A generation-limited feeder is not able to connect additional inverter-based generating devices without making upgrades to relays and protective devices at the corresponding distribution feeder or transformer level.

Feeder DG Ready (Y/N): These feeders have adequate protection equipment installed to support back feed to the transformer. These are the feeders equipped with a line VT and relays capable of Mirror Bit transfer trip.

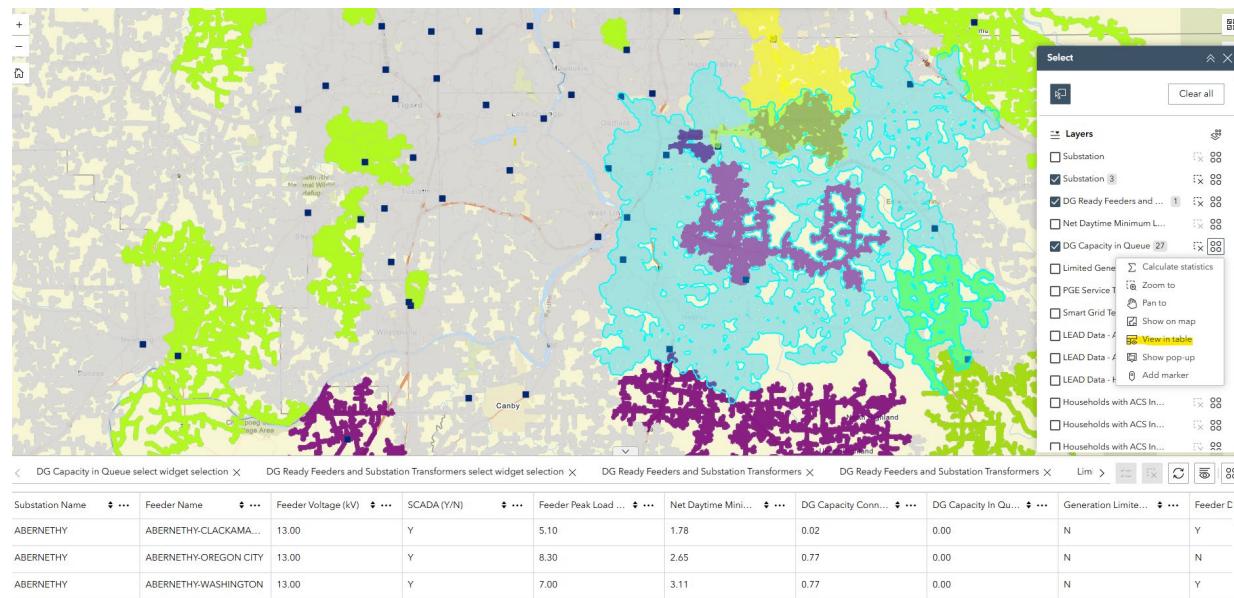
Transformer DG Ready (Y/N): These transformers have adequate protection equipment installed to support back feed onto the transmission system. A substation transformer is considered DG Ready when protected by a breaker or circuit switcher and meets one of the following conditions:

1. The substation high side configuration is line terminal, ring bus or breaker and half
2. The substation transformer relays are SEL-487Es with a 3 phase VT on the high side.
(Tap or line control substation)

Additional Notes: This provides an explanation of special conditions that exist on a feeder.

Date DG Status Updated: This date reflects the point in time when the data displayed in the map, popup and attribute table were updated.

Attribute Table



The Attribute Table can be accessed by clicking the view in table from select button or at the center bottom of the map.



Reveals the Action Menu which allows a user to filter the table, calculate statistics.



Selects the display to include only the information selected in the current map screen



Refreshes the list

Hosting Capacity Analysis Considerations

As noted in the introduction, the Distributed Generation Evaluation Map illustrates the amount of DG that might be accommodated at a particular point in PGE's service territory. Additional analysis is required to validate the available capacity for interconnection. Hosting Capacity Analysis is one of those analyses. In addition to determining the capacity at a point in the system, it evaluates other constraints, such as:

Category	Impacts	Mitigation
Voltage	Over-voltage	Adjust voltage control device settings, add voltage regulating devices, reconductor
	Voltage Deviation	Adjust power factor setting, reconductor
	Equipment Voltage Deviation	Adjust power factor setting, adjust voltage control device settings, reconductor
Loading	Thermal Limits	Reconductor, replace equipment
Protection	Additional Element Fault Current	Adjust relay settings, replace relays, replace protective equipment
	Breaker Relay Reduction of Reach	Adjust relay settings, replace relays, relocate or replace protective equipment

Pre-Application Data Report

A pre-application report is available for potential Small Generator Interconnections for a fee of \$300. The applicant must provide the following information to PGE.

- Applicants Contact information
- Site location (i.e., physical address or GPS coordinates)
- Nameplate Rating of Generator (in MW)
- Service Type (single phase or 3-phase)
- Will a new service be needed?

- Will it be a standalone generator?

The pre-application report will contain the following information about PGE's system.

- Total capacity (in MW) of substation/area bus, bank or circuit based on normal or operating ratings likely to serve the proposed Point of Interconnection substation.
- Existing aggregate generation capacity (in MW) interconnected to a substation/area bus, bank or circuit (i.e., amount of generation online) likely to serve the proposed Point of Interconnection.
- Aggregate queued generation capacity (in MW) for a substation/area bus, bank or circuit (i.e., amount of generation in the queue) likely to serve the proposed Point of Interconnection.
- Available capacity (in MW) of substation/area bus or bank and circuit likely to serve the proposed Point of Interconnection (i.e., total capacity less the sum of existing aggregate generation capacity and aggregate queued generation capacity).
- Substation nominal distribution voltage and/or transmission nominal voltage if applicable. Nominal distribution circuit voltage at the proposed Point of Interconnection.
- Approximate circuit distance between the proposed Point of Interconnection and the substation.
- Annual peak hourly load and minimum load on the substation, circuit, and transmission line; and hourly load shape if available.
- Number and rating of protective devices and number and type (standard, bi-directional) of voltage regulating devices between the proposed Point of Interconnection and the substation/area. Identify whether the substation has a load tap changer.
- Number of phases available at the proposed Point of Interconnection. If a single phase, distance from the three-phase circuit.
- Limiting conductor ratings from the proposed Point of Interconnection to the distribution substation.
- Whether the Point of Interconnection is located on a spot network, grid network, or radial supply.
- Based on the proposed Point of Interconnection, existing or known constraints such as, but not limited to, electrical dependencies at that location, short circuit interrupting capacity issues, power quality or stability issues on the circuit, capacity constraints, or secondary networks.