Xcel *Energy*®

Hosting Capacity Map & Sub-Feeder Results

A Guide to Navigating the Hosting Capacity Map and Sub-Feeder Results

Updated December 2020

Contents

Introduction

The hosting capacity map display is a high-level estimate of the available hosting capacity for adding distributed generation. Hosting capacity is defined as the amount of generation that can be accommodated at a point on the distribution system without requiring mitigations such as specialized inverter settings or infrastructure upgrades. This map is one tool you may use to help assess the available hosting capacity in a given general location.

The determination of the amount of generation that can be accommodated at a point in the distribution system can include several steps, with more specific and more accurate information becoming available as the effort and expense to provide that more specific information increases. Based on the size of the proposed project and other qualifying factors, different review and study processes in the Minnesota Distributed Energy Resources Interconnection Process (MN DIP) 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 hosting capacity map is offered free of charge and correspondingly is not as accurate as the next steps for obtaining more specific information. Also, the map is taken from data as of a point in time and updated as of the date indicated in the pop-up display on the map, and therefore may not reflect current conditions in a given area. The map is being provided for informational purposes only and is not intended to be a substitute for the established MN DIP interconnection process.

Additional information or tools to aid your consideration of potential hosting capacity is available on our website under the How to Interconnect section:

Distributed Energy Resources (DER) Interconnection Queue. DER projects in the interconnection queue that have not yet been interconnected may have an impact on available hosting capacity. The hosting capacity map and tabular results reflect DER projects that were in-service as of the date indicated in the pop-up on the map. Projects in the DER interconnection queue that are pending or that went into service after this date are not reflected in the hosting capacity map.   So, using the queue information in conjunction with the hosting capacity map and tabular results will provide you with an updated view of potential hosting capacity for specific portions of the distribution system. This interconnection queue information is updated monthly and available under the Public Distributed Energy Resources Queue prompt on this page.

Pre-Application Data Report. You may also choose to make a Pre-Application Report request for a specific location. The Pre-Application Report is a preliminary screen of a specific site on the distribution system that is based on existing, available distribution system data without any field verification. The fee for the Pre-Application Report is $300.00. For more information on obtaining a Pre-Application Report, see the request form and additional discussion under the Pre-Application Report prompt on this page.

DER Interconnection Request. Finally, you may submit a formal request for DER interconnection at a specific site. More information on submitting an interconnection application under the MN DIP is provided under the Application Engineering Process as well as Technical Requirements and Resources prompts on this page.

Navigation & Menus of Hosting Capacity Map

Main Screen
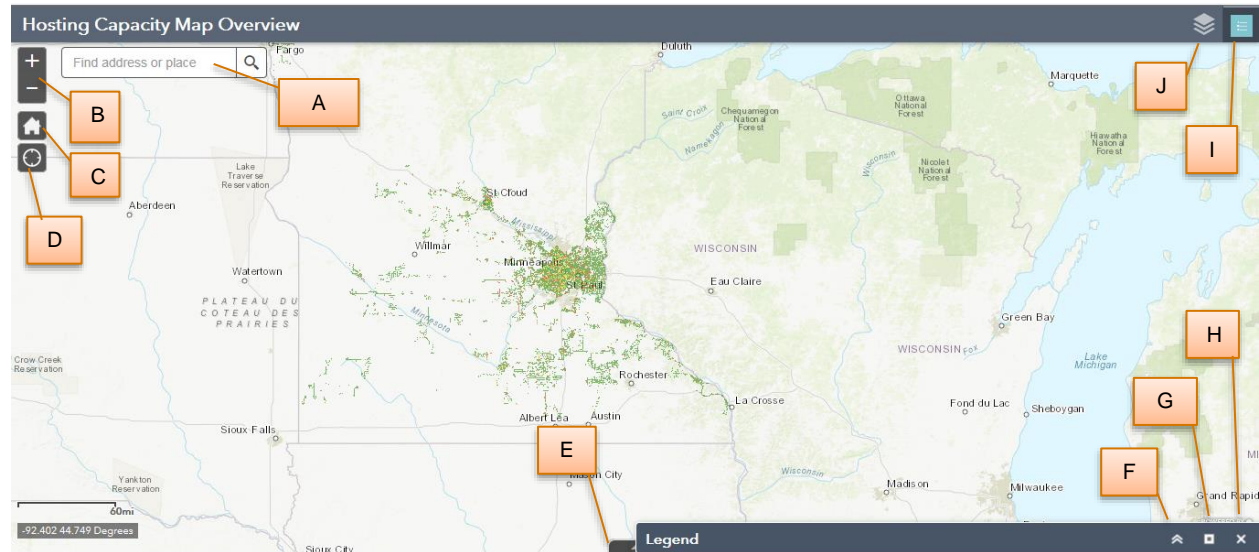
A. Search bar: Allows user to search for a specific location

B. Zoom buttons: Plus allows user to zoom in. Minus allows user to zoom out.

C. Zooms out to the main view.

D. Zooms into the location of the user.

E. Attribute Table: This is a popup menu displaying map data points.

F. Maximizes or minimizes the menu.

G. Toggle between half and full screen menu views.

H. Closes menu

I. Opens/closes Legend Menu.

J. Opens/closes Layers Menu.

Legend Menu
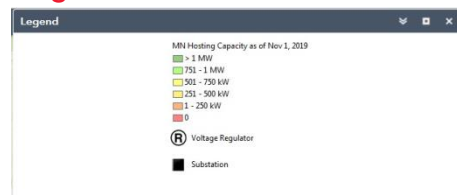
This menu displays the key of how much hosting capacity is available at that section on the feeder. Green refers to good availability, yellow to moderate availability, and orange and red to limited availability. It also gives the key for voltage regulators and substations.
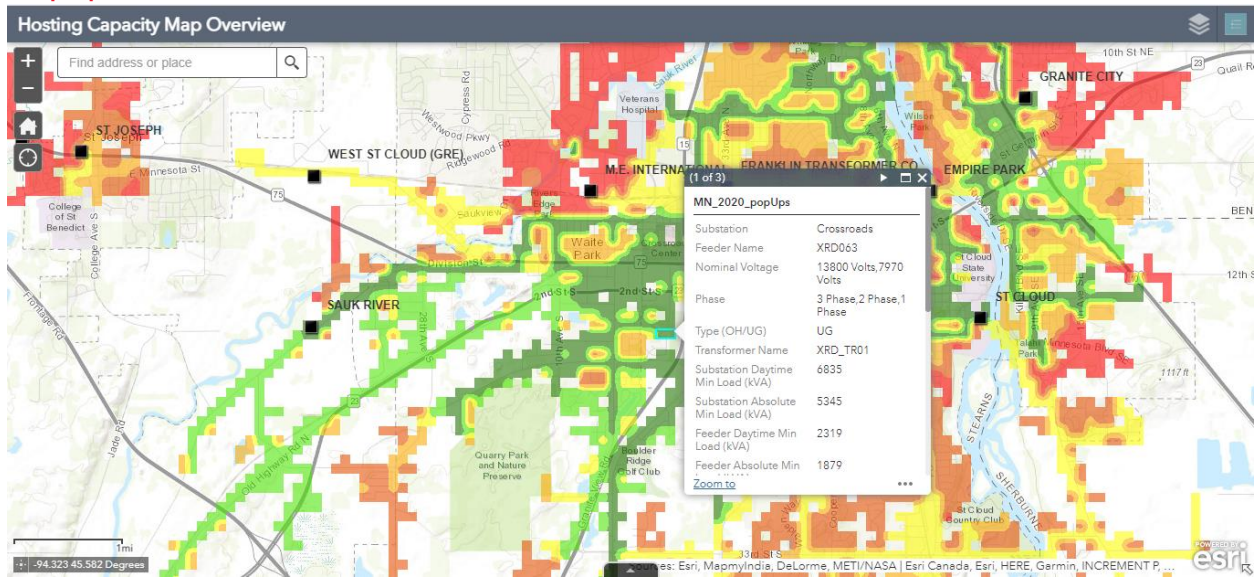
Layer List

L. Check the box to view selected layer.

M. Menu options

N. Search button. Click and a search box appears.

O. Reveals an option menu for the selected layers.

Popup Box

Double click the location of interest and a blue highlight popup box will appear. This box contains details regarding the selection. Selecting the "Zoom To" link at the bottom of the box centers the screen on the selection. Clicking the three dots on the bottom right of the popup box drops a menu giving choices to: Pan to, Add a Marker, and View in Attribute Table.

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Substation: Location where voltage is stepped down from high voltage transmission to a distribution voltage. The conductor system reaching from a substation to the customer is the distribution grid.

Feeder Name: An array of conductors which distribute power from a substation to customers. There is often more than one feeder per substation and transformer.

Nominal Voltage: This lists the conductor voltage at the current location.

Phase: Refers to how many phases (1, 2, or 3) are present on a section of the feeder.

Type (OH/UG): The conductor type (either overhead (OH) or underground (UG)) at the respective location on a feeder.

Transformer Name: This steps down voltage from high voltage transmission to a distribution voltage. This refers to the specific transformer that feeds the selected location.

Substation Daytime Min Load (kVA): The smallest amount of load the substation carries during daytime hours.

Substation Absolute Min Load (kVA): The smallest amount of load the substation carries.

Feeder Daytime Min Load (kVA): The smallest amount of load the feeder carries during daytime hours.

Feeder Absolute Min Load (kVA): The smallest amount of load the feeder carries.

Actual Daytime Minimum Load (Y/N): If Y, the minimum load is calculated using a SCADA (Supervisory Control and Data Acquisition) system rather than estimated data.

LTC or Regulator: An LTC is a load tap changer which can raise or lower the voltage. A regulator maintains voltage within a specified range.

Network or Radial: Refers to whether the feeder is laid out in a network or radial fashion.

Substation Transformer Installed DG (kVA): Total rated kVA of distributed generation (DG) that is installed on the substation.

Substation Transformer Queued DG (kVA): Total rated kVA of distributed generation (DG) that is expected to be installed on the substation.

Feeder Installed DG (kVA): How much distributed generation (DG) is installed on the feeder.

Feeder Queued DG (kVA): How much distributed generation (DG) is expected to be installed on the feeder.

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Date DG Status Updated: When the DG for existing and queued were last updated.

Hosting Capacity: The capacity of a feeder on the distribution circuit to host DG before upgrades are needed.

Limiting Violation: The factor which is the first to exceed operational standards if too much DG is added. This is what limits the hosting capacity.
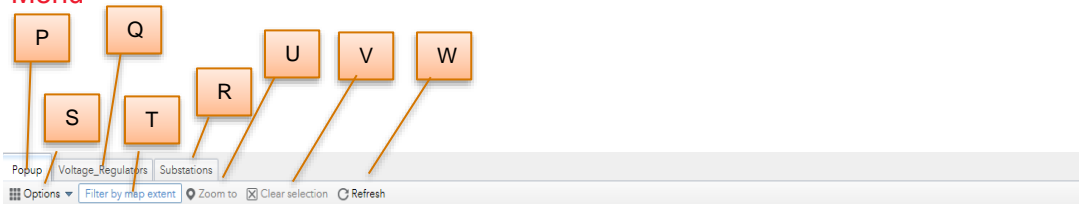
Date Hosting Capacity Updated: When the hosting capacity was last updated.

Date Hosting Capacity Updated   10/27/2020

Zoom to   ...

Attribute Table

Menu

P. Brings Popup Menu to front

R. Brings Substation Menu to front

T. Filters displayed information to only what is viewable in the current map screen

V. Clears selection

Q. Brings Voltage Regulators Menu to front

S. Reveals Options Menu

U. Zooms to selection

W. Refreshes the list

Popup Tab

SUBSTATION	FEEDER_NAM	NOMINAL_VO	TYPE_CONCA	OH_UG_CONC	TRANSFORME	SUB_XFMR_M	XFMR_ABS_M	FEED_DAY_M	FEEDER_ABS	ACTL_DAY_M	LTC_OR_REG	NET_OR_RAD	SUB
Red River	RED091	23900 Volts,13800 Volts	Mainline,1 Phase	OH	RED_TR02	21414	16997	5338	4351	Y	LTC	Radial	0
Red River	RED091	23900 Volts,13800 Volts	Mainline,1 Phase	OH	RED_TR02	21414	16997	5338	4351	Y	LTC	Radial	0

SUB_XFMR_I	SUB_XFMR_Q	FEEDER_I1	FEEDER_QDG	GD_date	NOTES_CONC	HOSTINGCAP	LIMITINGTH	Date
0	39.998	0	39.998	10/27/2020		0.3,0.12	PrimaryOverVolta	10/27/2020
0	39.998	0	39.998	10/27/2020		0.3,0.12	PrimaryOverVolta	10/27/2020

This tab gives a variety of information regarding the area displayed. Clicking the box to the left of the SUB column highlights the selected section on the Feeder and double-clicking will navigate the map to the selection. The selection will be shown with a highlighted blue box and another popup will appear.

SUBSTATION: Location where voltage is stepped down from high voltage transmission to a distribution voltage. The conductor system reaching from a substation to the customer is the distribution grid.

FEEDER NAM: An array of conductors which distribute power from a substation to customers. There is often more than one feeder per substation and transformer.

NOMINAL VO: This lists the conductor voltage at the current location.

TYPE CONCA: The conductor type and phase at the respective location on a feeder.

OH UG CONC: OH refers to an overhead conductor and UG refers to an underground conductor.

TRANSFORME: This steps down voltage from high voltage transmission to a distribution voltage. This refers to the specific transformer that feeds the selected location.

SUB XFMR M: The smallest amount of load the substation carries during daytime hours.

XFMR ABS M: The smallest amount of load the substation carries.

FEED DAY M: The smallest amount of load the feeder carries during daytime hours.

FEEDER ABS: The smallest amount of load the feeder carries.

ACTL DAY M: The minimum load is calculated using SCADA (Supervisory Control and Data Acquisition) rather than estimated data.

LTC OR REG: An LTC is a load tap changer which can raise or lower the voltage. A regulator maintains voltage within a specified range.

NET OR RAD: Refers to whether the feeder is laid out in a network or radial fashion.

SUB XFMR 1: How much distributed generation (DG) is installed on the substation.

SUB XFMR Q: How much distributed generation (DG) is expected to be installed on the substation.

FEEDER IL: How much distributed generation (DG) is installed on the feeder.

FEEDER QDG: How much distributed generation (DG) is expected to be installed on the feeder.

GD DATE: When the DG for existing and queued were last updated.

HOSTING CAP: The capacity of a feeder on the distribution circuit to host DG before upgrades are needed.

LIMITINGTH: The factor which is the first to exceed operational standards if too much DG is added. This is what limits the hosting capacity.

DATE: When the hosting capacity was last updated.

Substations Tab

Popup	Voltage_Regulators	Substations

Options ▾ | Filter by map extent | ⦿ Zoom to | ⊠ Clear selection | ⟳ Refresh

| NAME |
|---|
| AVERILL |
| LAKE PARK (MPC) |
| OSAKIS |
| DOUGLAS COUNTY |
| WEST UNION (STEARNS) |
| WESTPORT |
| VILLARD |

70 features 0 selected

Select a substation by clicking on the box to the left of the desired substation. A blue circle will appear at the substation's location. To navigate to the substation, double-click the box to the left of the substation. The menu populates only the substations that appear within the confines of the area on the screen.

How-To

Place a Marker

To place a marker, first click on the desired location. A popup box appears. On the bottom right side of the box are three dots. Click the dots. From the menu that appears, select "Add a Marker". An icon marker will appear at the location.
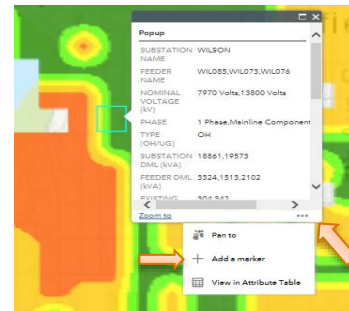
Remove a Marker

To remove a marker, click on the marker and a menu will appear. Click the three dots. From the menu that appears, select "Remove Marker."
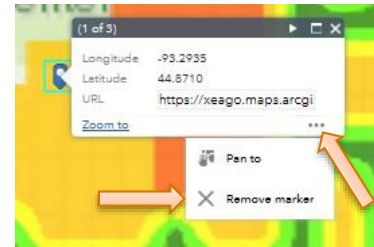
Hosting Capacity Sub-Feeder Results

UniqueID	FeederID	Node	PrimaryOverVoltage	PrimaryVoltageDeviation	RegulatorDeviation	ReversePowerFlow	ThermalDischarging	ElementFault	BreakerReach	Hosting Capacity	Limiting Threshold
1	0	'AIR060__/9478418'	10	10	10	0.856	10	10	0.93	0.856	ReversePowerFlow
2	1	'7814806__/9478418'	10	10	10	0.856	10	10	0.93	0.856	ReversePowerFlow
3	2	'7814805__/7814803'	10	10	10	0.856	10	10	0.93	0.856	ReversePowerFlow
4	3	'7814825__/7814823'	10	10	10	0.856	10	10	0.92	0.856	ReversePowerFlow
5	4	'8849538__/8849535'	10	10	10	0.856	10	10	0.92	0.856	ReversePowerFlow
6	5	'7905877__/8849555'	10	10	10	0.856	10	10	0.92	0.856	ReversePowerFlow
7	6	'7587239__/7905875'	10	10	10	0.856	10	10	0.92	0.856	ReversePowerFlow
8	7	'7587240__/7587237'	10	10	10	0.856	10	10	0.92	0.856	ReversePowerFlow
9	8	'7587260__/7587257'	10	10	10	0.856	10	10	0.92	0.856	ReversePowerFlow
10	9	'8220985__/8220982'	10	10	10	0.856	10	10	0.92	0.856	ReversePowerFlow
11	10	'7587299__/8221002'	10	10	10	0.856	10	10	0.91	0.856	ReversePowerFlow
12	11	'7587300__/7587297'	10	10	10	0.856	10	10	0.91	0.856	ReversePowerFlow
13	12	'7587320__/7587317'	10	10	10	0.856	10	10	0.91	0.856	ReversePowerFlow
14	13	'7587379__/8221062'	10	10	10	0.856	10	10	0.91	0.856	ReversePowerFlow
15	14	'7271749__/7587377'	9.2	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow
16	15	'7271750__/7271747'	8	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow
17	16	'128770342__/128770348'	7	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow
18	17	'400201229__/9166778'	6.6	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow
19	18	'400200894__/37700205'	6.6	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow
20	19	'400201217__/37700093'	6.6	10	10	0.856	4.7	10	0.9	0.856	ReversePowerFlow
21	20	'400201223__/37700100'	6.6	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow
22	21	'400201211__/37700086'	6.6	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow
23	22	'37700180__/7906903'	6.6	10	10	0.856	10	10	0.9	0.856	ReversePowerFlow

Columns

Unique ID: Provides a unique numerical ID for the feeder section it represents.

Feeder ID: Provides a numerical ID for each feeder section beginning with 0 at the feeder head. The ID increases by one for each unique node and resets to 0 at the next feeder head. This ID is not unique as it repeats as one feeder concludes and another begins.

Node: Provides starting and ending node IDs for each feeder section.

Primary Over Voltage: Threshold of generation at which the feeder voltage has risen above a specified voltage magnitude at any location on the feeder. Voltage magnitude is set to 105% standard voltage to comply with ANSI C84.1 Range A.

Primary Voltage Deviation: Threshold of generation at which feeder voltage is not to change more than a specified amount during aggregate DER tripping. The voltage deviation limit is set to 5% standard voltage.

Regulator Deviation: Threshold of generation where voltage observed at any regulating device is not to change by more than a specified amount of the regulating devices bandwidth. The regulator voltage deviation is set to 50% of a regulator's bandwidth.

Reverse Power Flow: Threshold for generation where power flow through the feeder head is not to be reduced by more than a percentage of minimum load flow. The power flow is set to 80% of the daytime minimum load. This corresponds with Xcel Energy's interconnection practices and reduces the potential of temporary islanding conditions.

Thermal Discharging: Threshold of generation at which power flow through any feeder element is not to exceed a percentage of the element's normal rating. This threshold allows power flow up to 100% of the element's normal rating in order to not exceed standard ratings and risk damage to equipment.

Element Fault: Threshold for generation where feeder fault current is not to increase by more than a set percentage prior to presence of generation. Fault current is not to rise above 10% of its native value.

Breaker Reach: Threshold of generation at which breaker fault current is not to decrease by more than a percentage of the fault current prior to generation. Fault current reduction is set to 10% of native current in order to guarantee fault detection.

Hosting Capacity: The capacity of a feeder on the distribution circuit to host DG before upgrades are needed.

Limiting Threshold: The factor which is the first to exceed operational standards if too much DG is added. This is what limits the hosting capacity.

Navigating the Hosting Capacity Sub-Feeder Results

First open the spreadsheet by navigating to the "How to Interconnect" page at the Xcel Energy website and clicking on the link to view the "Hosting Capacity Sub-Feeder Results (XLSX)". Download the excel file. Once the file is opened, each column can be filtered.

To find a specific feeder, filter the FeederID column so that it only contains "0". Then scan the Node column until the feeder is located. This node is the feeder head. Note the id in the UniqueID column and then unfilter the FeederID column. Next, navigate to the corresponding id in the UniqueID column. The entire feeder is listed below the feeder head and listed starting with 0 and ascending in the FeederID column.

The information in each column is explained above in the "Hosting Capacity Sub-Feeder Results" section.