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Stage 3 Hosting Capacity Update – Follow-up Session

(October 1st Release)

NYSEG nationalgrid Orange & Rockland Rockland Electric Company conEdison People. Power. Possibilities. Central Hudson A FORTIS COMPANY RG&E

Engagement Group Ground Rules*

- All stakeholder engagement (Advisory Group and Engagement Group) meetings, webinars and information exchange are designed solely to provide an open forum or means for the expression of various points of view in compliance with antitrust laws.

- Under no circumstances shall stakeholder engagement activities be used as a means for competing companies to reach any understanding, expressed or implied, which tends to restrict competition, or in any way, to impair the ability of participating members to exercise independent business judgment regarding matters affecting competition or regulatory positions.

- Proprietary information shall not be disclosed by any participant during any stakeholder engagement meeting or its subgroups. In addition, no information of a secret or proprietary nature shall be made available to stakeholder engagement members.

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- AG & EG discussions will be open forums without attribution and no public documents by the AG or EG will be produced unless publication is agreed upon by the group.

**Ground Rules adapted from the JU Advisory Group*

Agenda - October 23, 2019 (12:00 – 4:30PM)

Time	Topic
12:00 – 12:15	Introductions
12:15 – 1:00	Discuss JU/Industry Goals & Problem Statements for the Hosting Capacity Map
1:00 – 1:30	Q&A and Open Discussion on Stage 3.0 Maps
1:30 – 2:30	Presentation from EPRI on the DRIVE tool and how sub-feeder hosting capacity is derived
2:30 – 3:30	Industry Priority List Walkthrough/Dissection and Roadmap for Addressing Grievances
3:30 – 4:30	Next Steps: Industry Discussion on Wants for Stages 3.X and 4.0

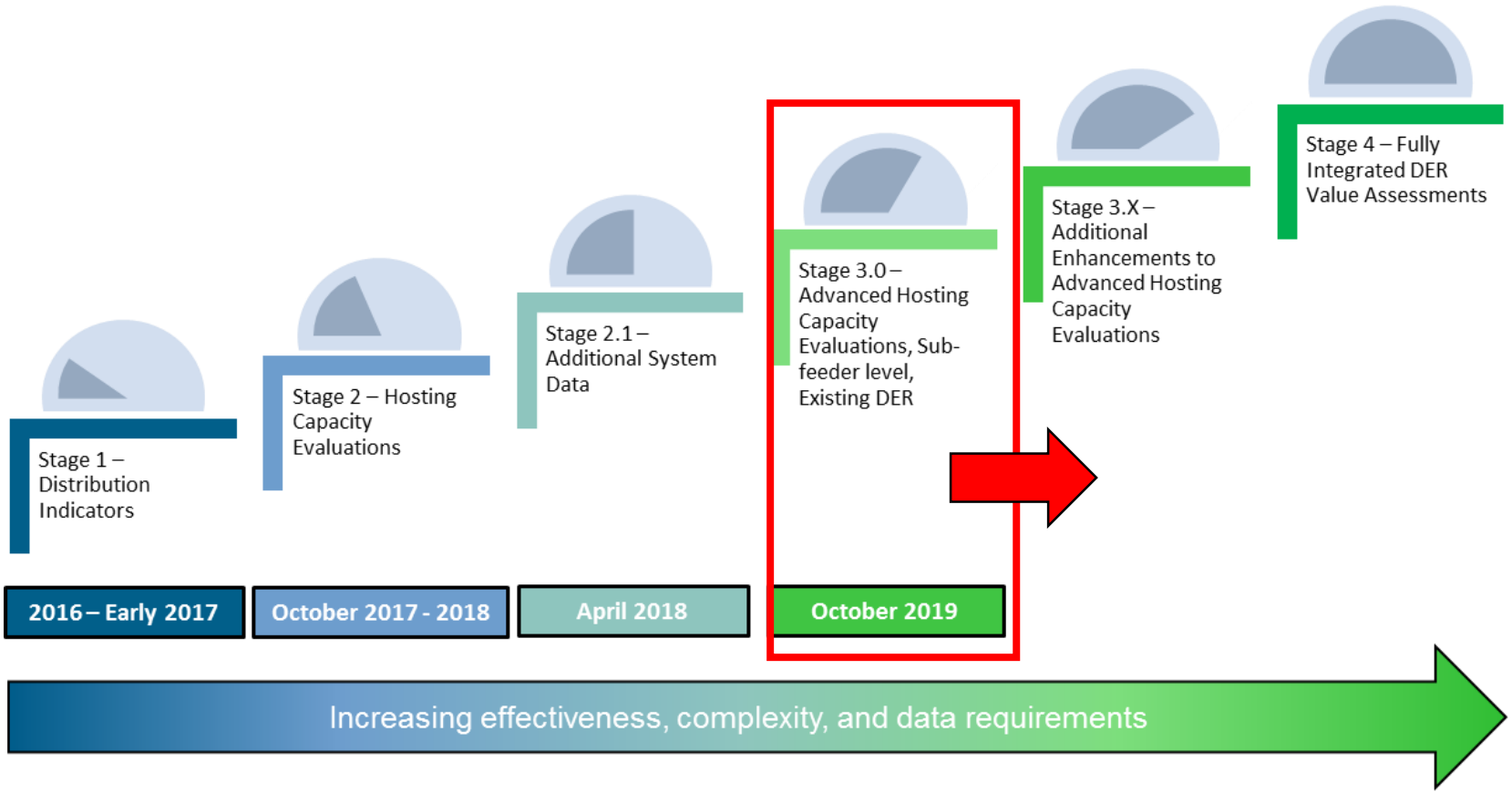
Background

- To drive greater consistency, the utilities all conduct their hosting capacity analysis using EPRI's DRIVE tool and present their results in the ESRI mapping environment.

- DRIVE allows each utility to calculate the hosting capacity for their distribution system using EPRI's streamlined methodology.

- The HC Data portal includes additional elements of data based on inputs to the stakeholder process in the System Data working group. Today we are focusing on the Hosting Capacity displays.

Hosting Capacity Implementation Roadmap



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Stage 3.0 Release

- Each of the utilities Stage 3.0 hosting capacity displays were released on October 1st, 2019.

- The major enhancements made in Stage 3 are focused on including existing DER in the analysis and providing sub-feeder level hosting capacity.

- The following additional data pop-up items were also included as part of the Stage 3.0 release:
  - Local Voltage kV
  - Local Maximum Hosting Capacity
  - Local Minimum Hosting Capacity
  - Load Zone
  - Anti-Islanding Hosting Capacity Limit (MW)
  - Substation Backfeed Protection

JU/Industry Goals & Problem Statements for the Hosting Capacity Map

- Developers have requested the JU better define the goal of the hosting capacity maps and what metrics Joint Utilities are using to determine the level of success.
- The hosting capacity displays are intended to be an informational tool available to developers prior to submitting an interconnection request.
- The displays highlight areas with significant hosting capacity, and alert developers to areas where interconnection upgrade costs could be higher due to limited hosting capacity.
- The hosting capacity displays are not intended to replace the interconnection screens or CESIR within the SIR.
- Up to now the HC maps have been primarily for the developer; potential utility value will be considered as we discuss and think through Stage 3.X.

Questions for Discussion: JU/Industry Goals & Problem Statements for the Hosting Capacity Map

- Are developers using the maps?
- What are the developers using the maps for and what value is being provided in the current version of the maps?
- Are applications typically still submitted when hosting capacity is low?
- Have the maps saved developers from pursuing multiple sites due to potentially high costs?
- Has the additional pop-up data aided in making decisions? If so, how?

Q&A and Open Discussion on Stage 3.0 Maps

Resources:
https://jointutilitiesofny.org/utility-specific-pages/hosting-capacity/

Distribution Resource Integration and Value Estimation (DRIVE)

JU Overview

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Technical Leader, Power Systems Studies
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2019 October 23

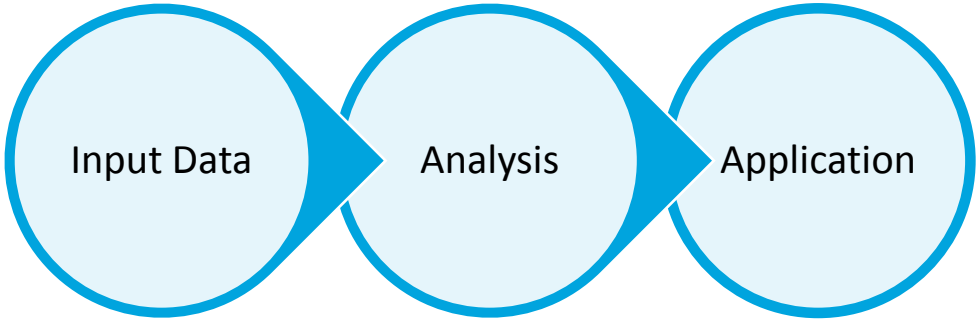
DRIVE

Overview

- The Hosting Capacity Process
- DRIVE
  - Inputs
  - Functionality
  - Results
- Example Validation

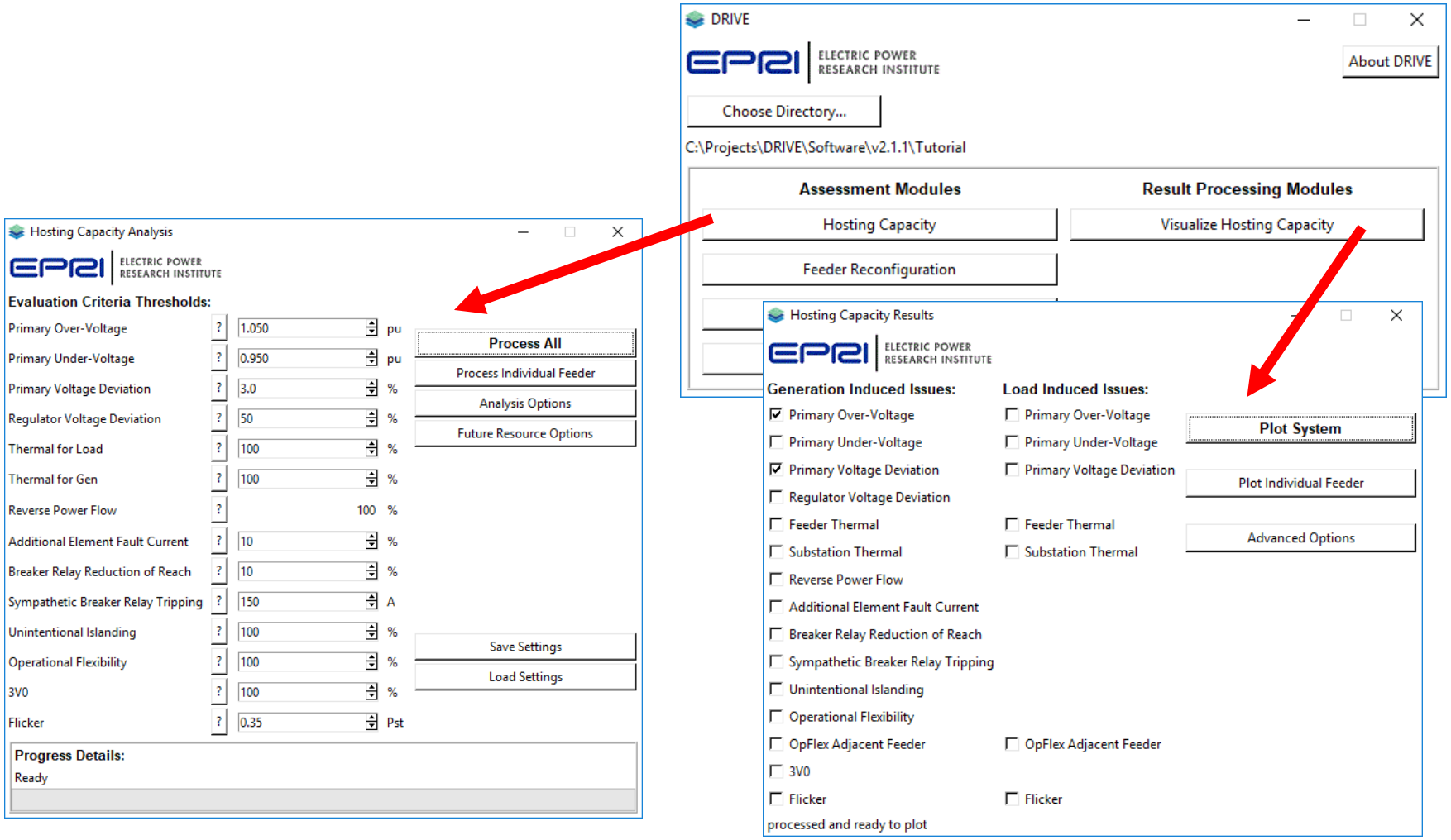
Hosting Capacity is a Process

Hosting capacity is not just an analysis, but rather a complex process that combines the collection of input data and the selection of analytical parameters that ultimately define how the results can be applied.



DRIVE Main Interface

Version 2.1

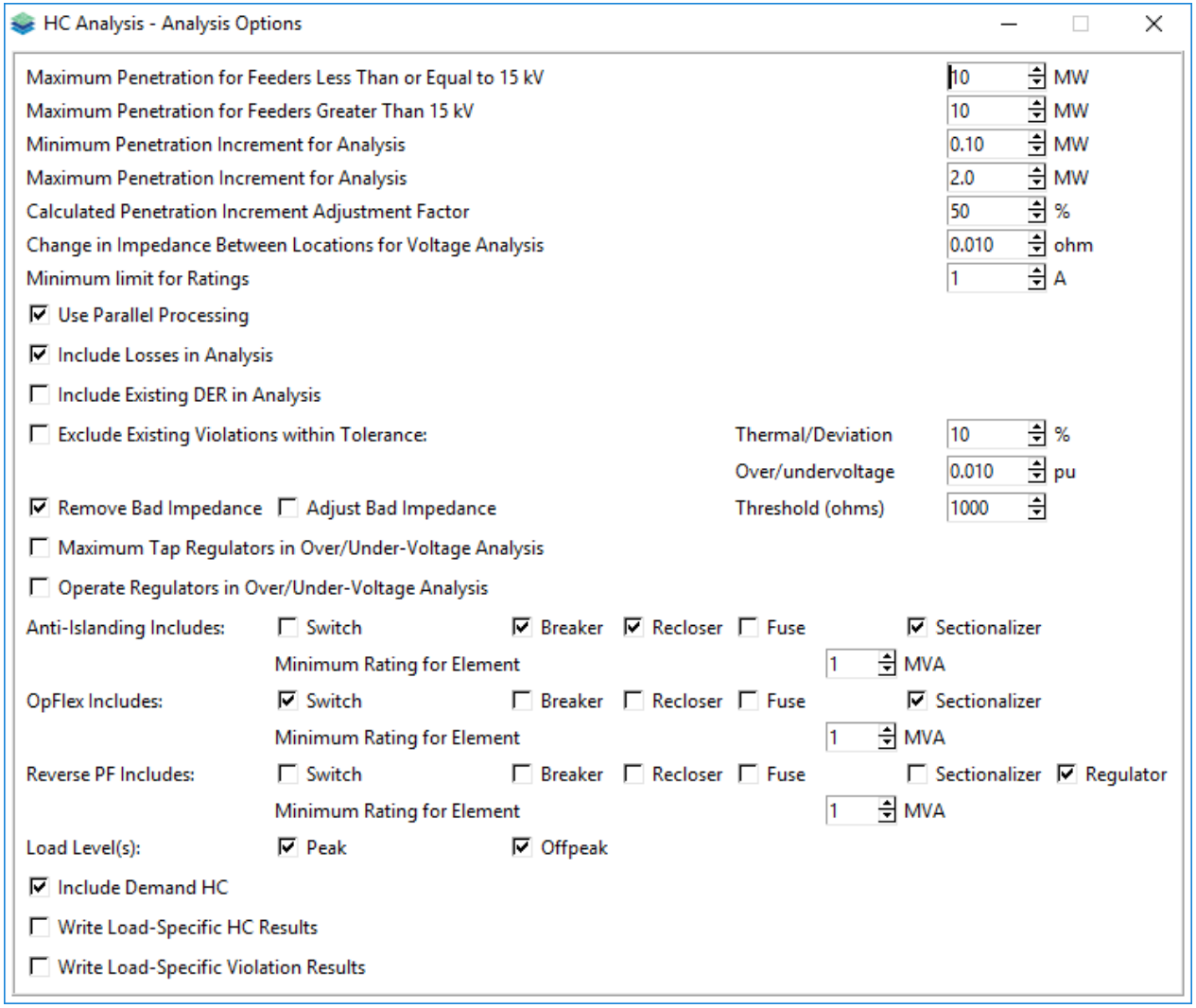


Evaluation Criteria and Thresholds

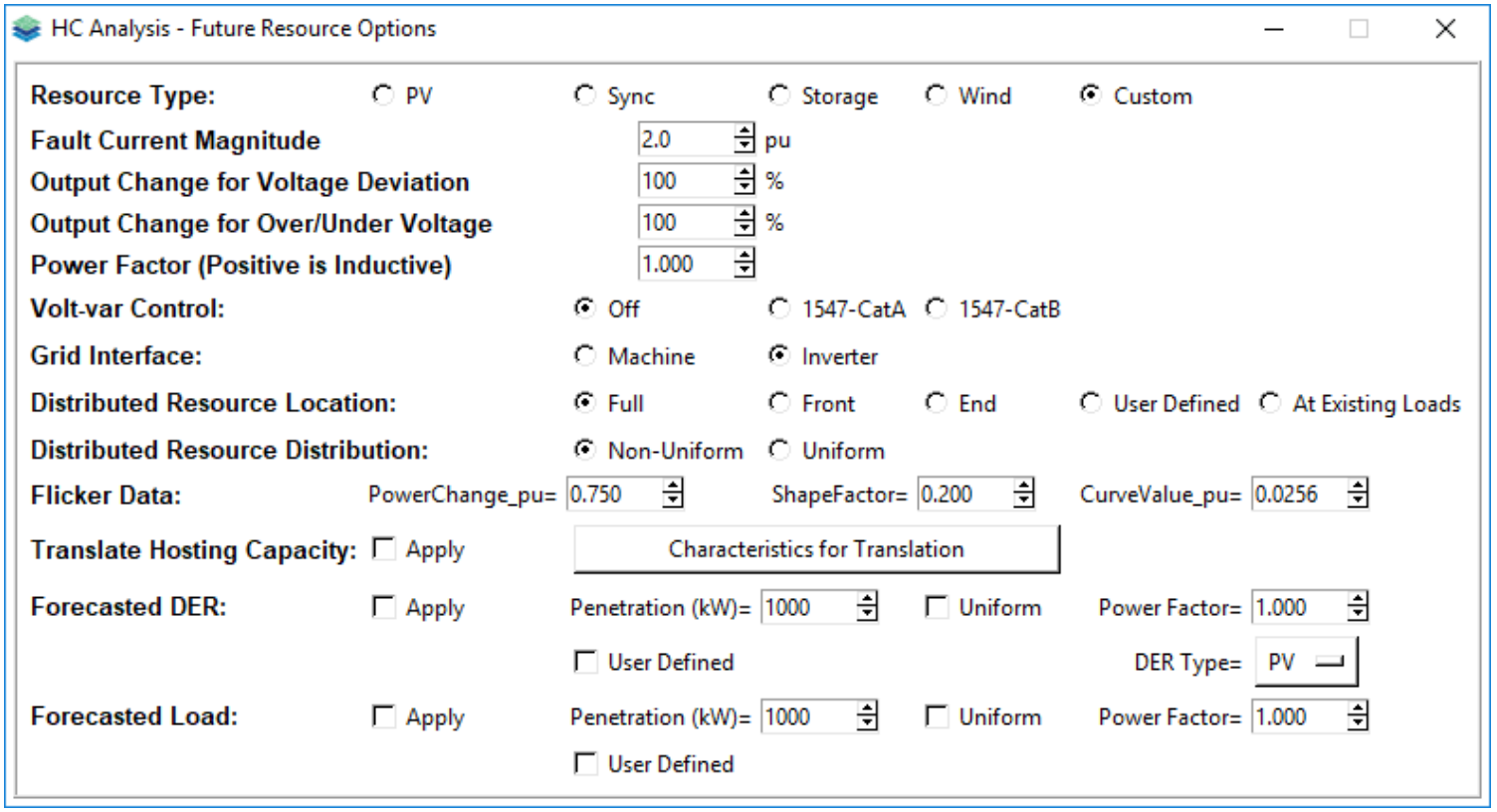
Category	Criteria	Threshold
Voltage	Primary Over-Voltage*	Feeder voltage at any location not to go above a specified voltage magnitude
	Primary Under-Voltage*	Feeder voltage at any location not to go below a specified voltage magnitude
	Primary Voltage Deviation*	Feeder voltage at any location not to change by more than a specified amount
	Regulator Voltage Deviation	Feeder voltage observed at any regulating device not to change by more than a specified amount of the regulating devices bandwidth
Thermal	Feeder Thermal*	Power flow through any element not to exceed a percentage of the elements normal rating
	Substation Thermal*	Power flow through substation not to exceed a percentage of the substation's normal rating (requires knowledge of additional feeders served from substation)
Protection	Additional Element Fault Current	Feeder fault current not to increase by more than a percentage of fault current prior to generation
	Sympathetic Breaker Relay Tripping	Breaker zero sequence fault current not to exceed a specified amount in amps
	Breaker Relay Reduction of Reach	Breaker fault current not to decrease by more than a percentage of fault current prior to generation
	Reverse Power Flow	Power flow through specified elements not to flow in the direction toward the feeder head
	Unintentional Islanding	Power flow through specified elements not to be reduced by more than a percentage of minimum load power flow
	Ground Fault Overvoltage (3V0)	Power flow through substation not to be reduced by more than a percentage of minimum load power flow (requires knowledge of additional feeders served from substation)
Reliability	Operational Flexibility	Maintain ability to reconfigure by 1) Power flow through specified elements not to be reduced by more than a percentage of minimum load power flow 2) Hosting capacity based on adjacent feeders (requires knowledge of additional feeders and the sections that switch) 3) Reanalysis with reconfigured feeders
Power Quality	Flicker	Pst not to exceed the defined value

* Load induced voltage and thermal issues are due to active power flow in the direction away from the feeder head, while generation induced issues are due to active power flow toward the feeder head.

Hosting Capacity Analysis Options

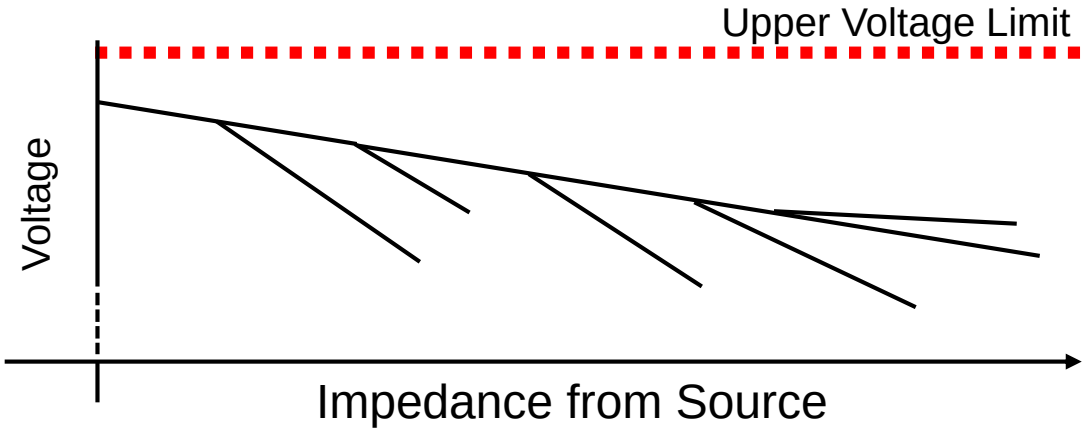


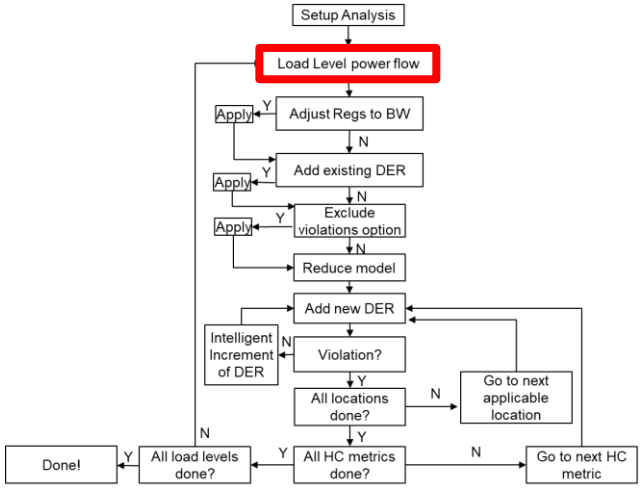
Hosting Capacity Future Resource Options



Solving Hosting Capacity: Primary Overvoltage

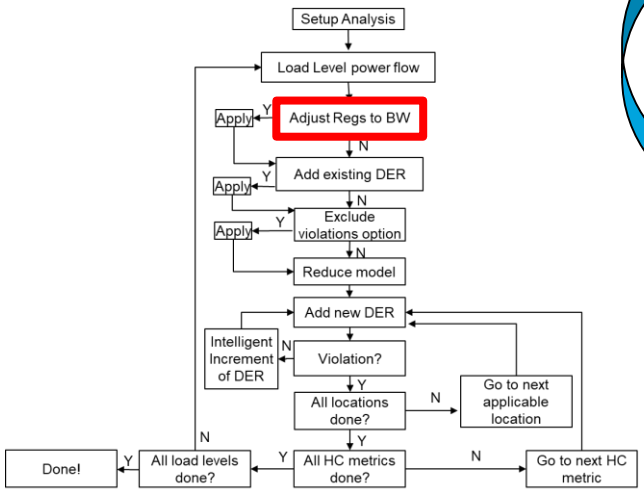
- Upper voltage limit
- Power flow voltage profile

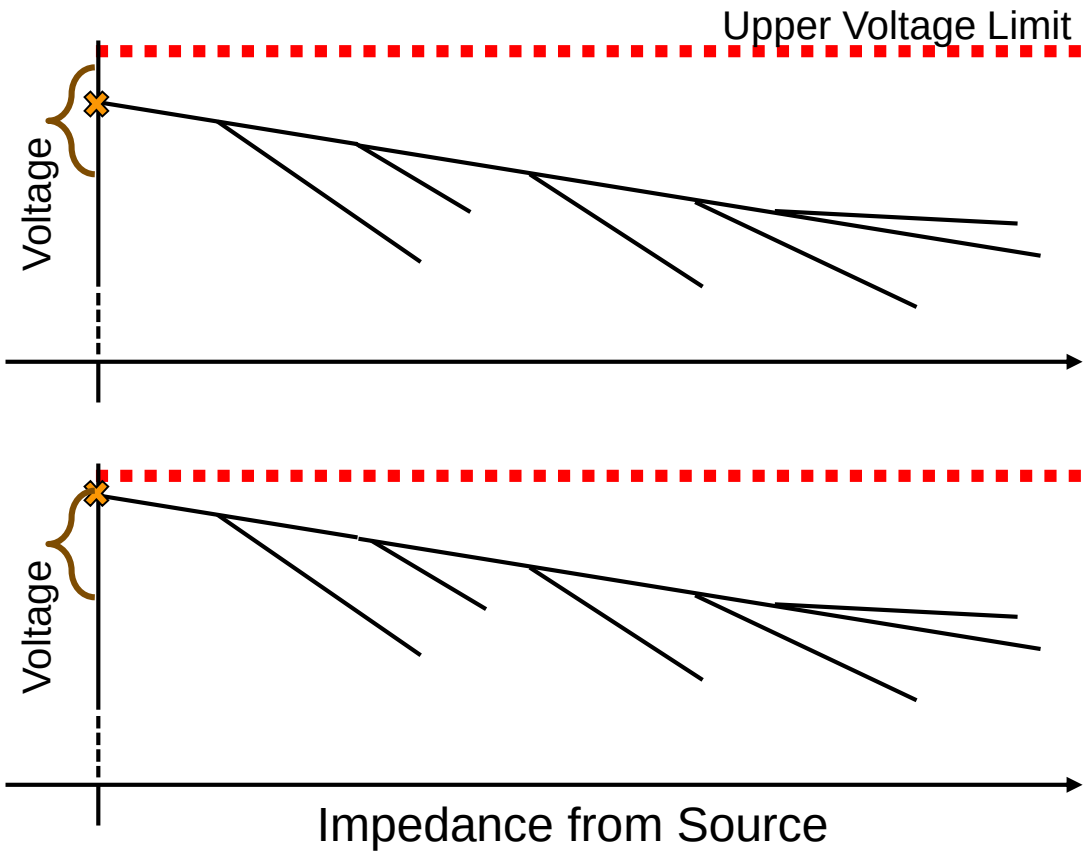




Solving Hosting Capacity: Primary Overvoltage – Adjusting for Regulator Bandwidth

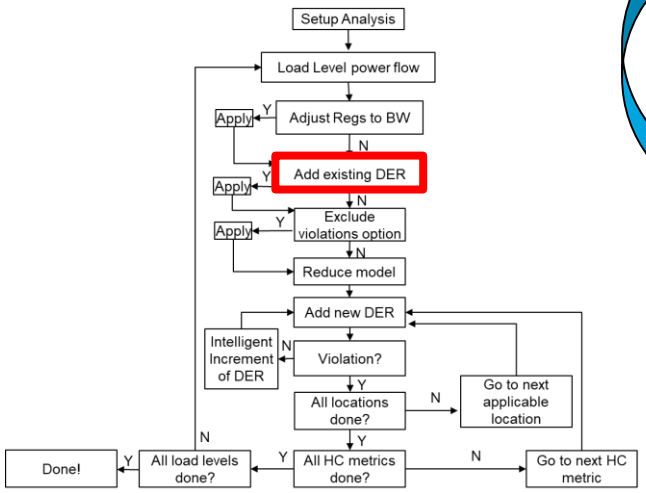
- Voltage profile can be adjusted to acknowledge that the voltage profile might be higher

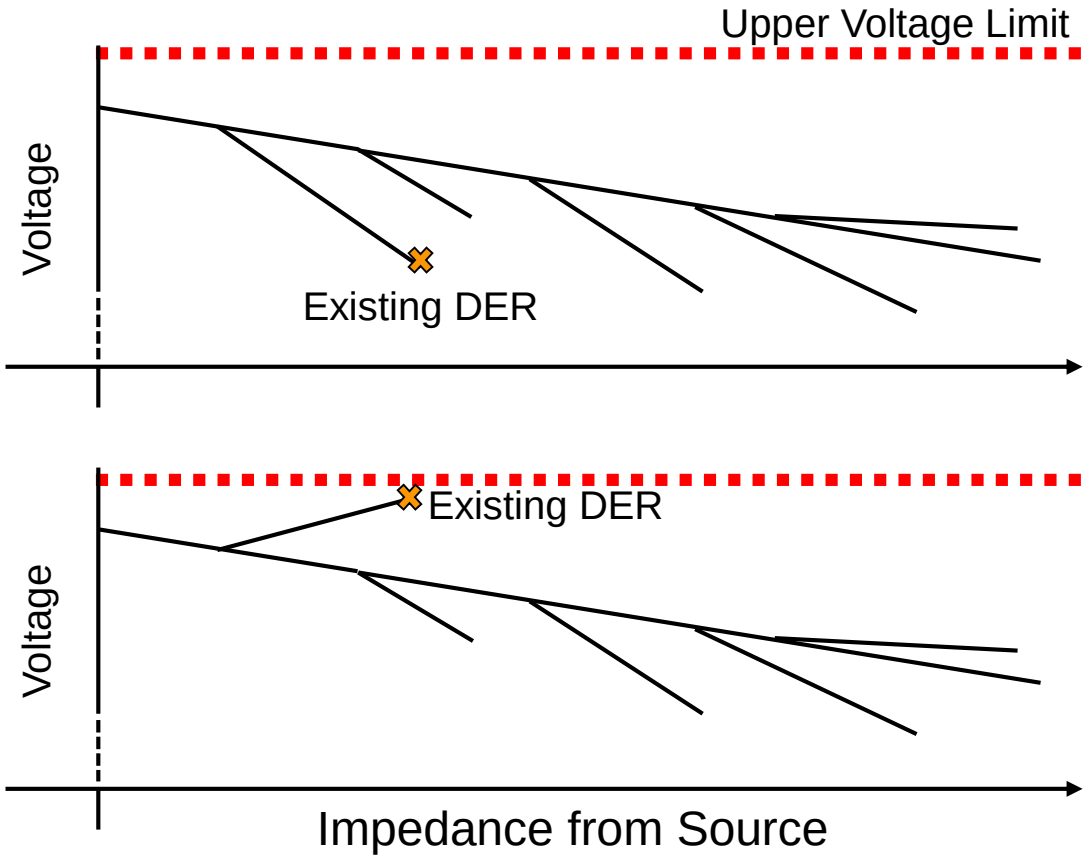




Solving Hosting Capacity: Primary Overvoltage – Including Existing DER

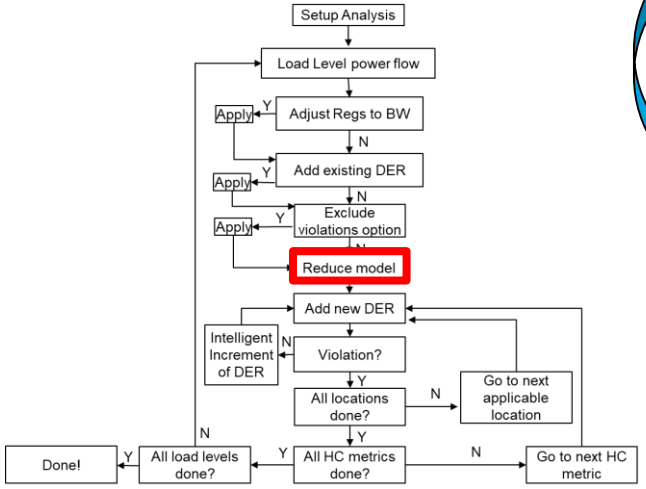
- Voltage profile can be adjusted to include existing DER at the point of coupling

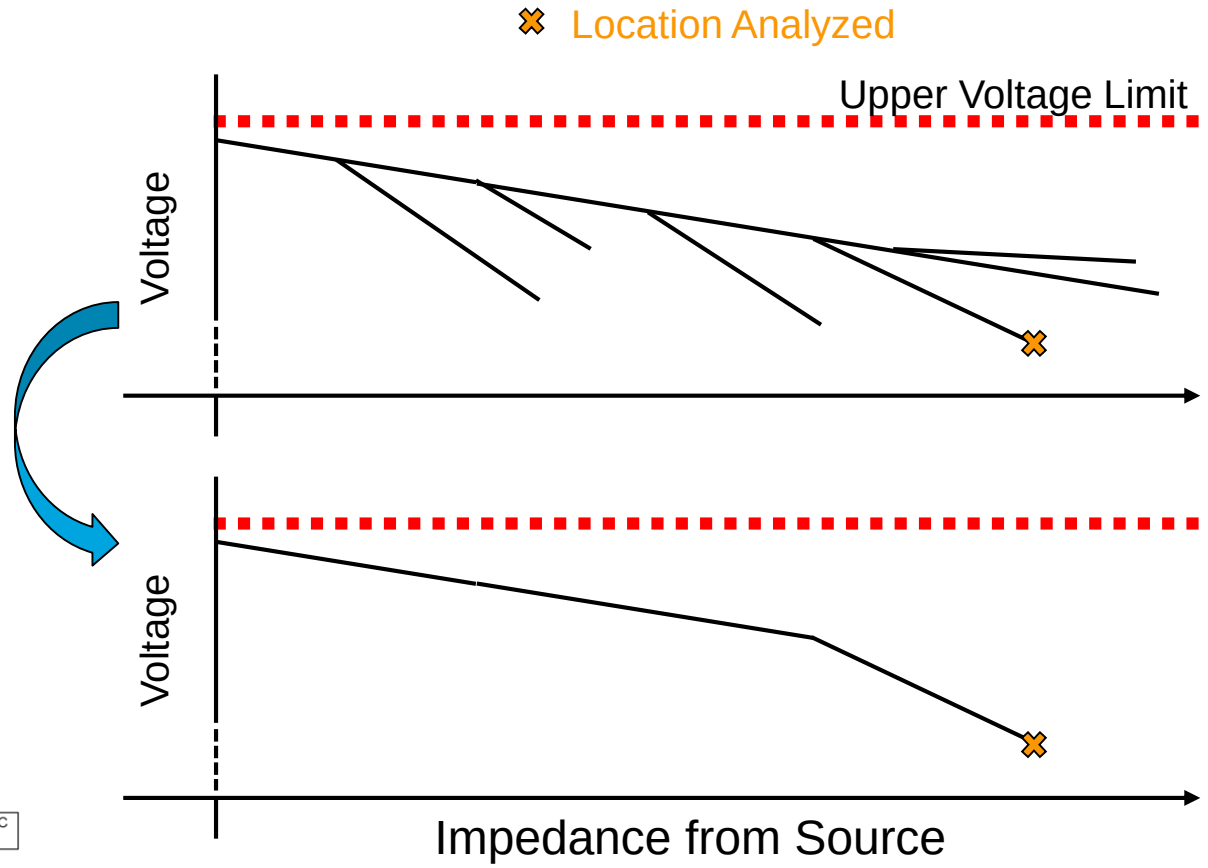




Solving Hosting Capacity: Primary Overvoltage – Feeder Simplified

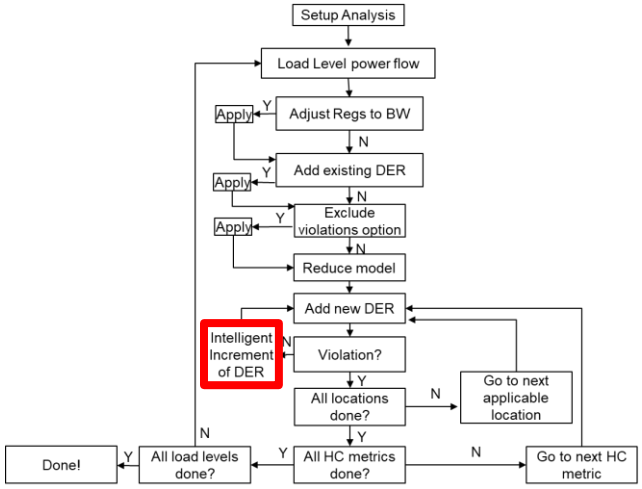
- Feeder simplified based on location analyzed
- Full topology considered

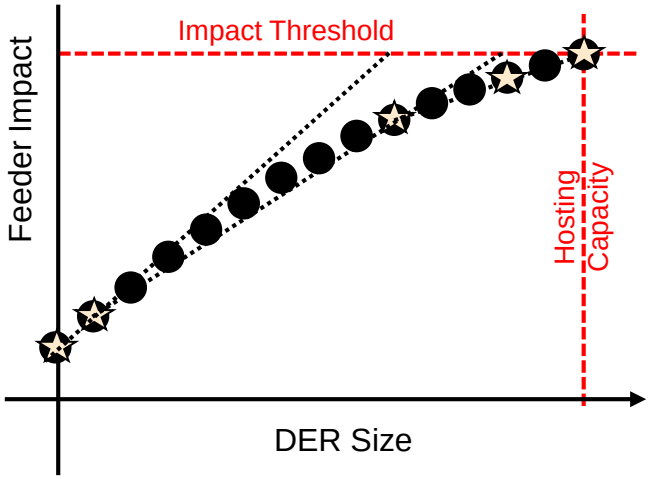




Algorithm to Expedite Analysis

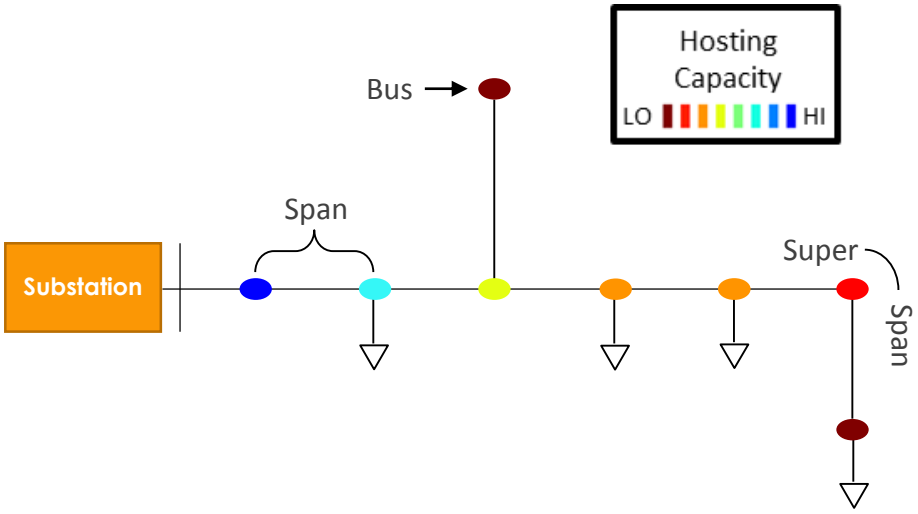
- Intelligent increment of DER
  - ☆ Penetration Increments Analyzed with Impact-based Routine
  - ····· Projected Impact vs DER size
  - ● All Penetration Increments Analyzed





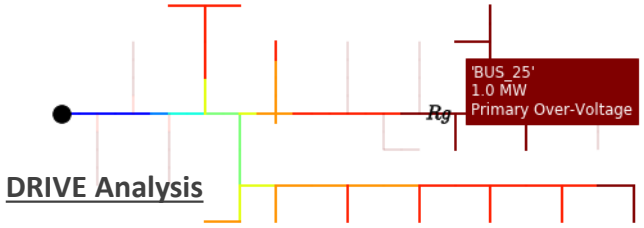
DRIVE Hosting Capacity Analysis

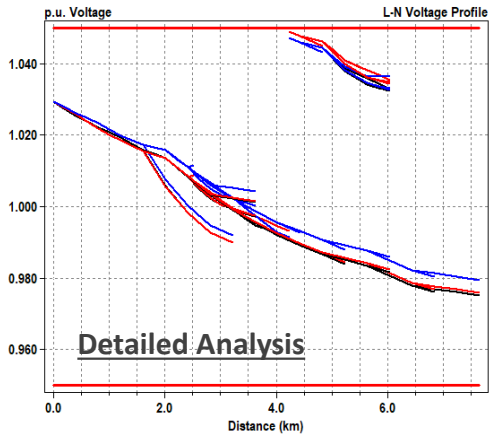
- Bus level analysis
- Conducted at all buses represented in the original model
  - Could be a location with a customer
  - Could be a pole without a customer
  - Could be a location just with equipment
- Span represents the line between at least two buses
- Super-spans might represent sections spanning multiple poles



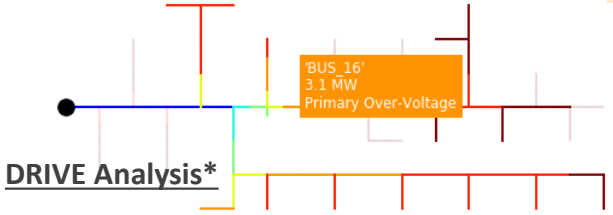
DRIVE Output and Validation

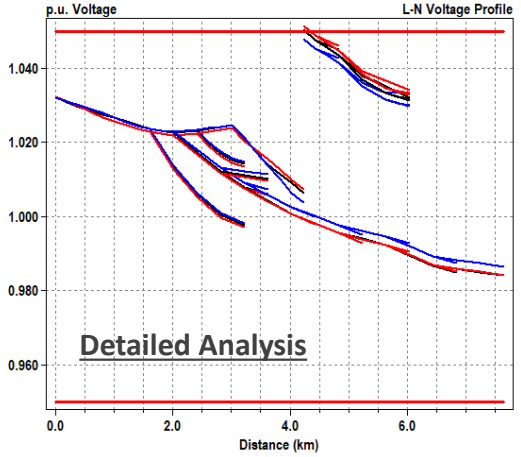
DER Below Regulator





DER Above Regulator





*Different model input has different HC results

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Industry Priority List Walkthrough/Dissection and Roadmap for Addressing Grievances

1. Location Accuracy (e.g. territory bounds, circuit locations, etc.)
2. Distributed Generation Queue and Frequency (Substation, Transformer Bank, & Feeder Level, *More Frequent/Daily*)
3. IDs/Names of Circuits, Substations, and Transformer Banks
4. Circuit Configuration (e.g. Radial, Network, etc.)
5. Hosting Capacity at the Sub-Feeder Level
6. NYISO Load Zone
7. Distributed Generation Queue Inventory (Substation, Transformer Bank, and Feeder Level) (i.e. complete and frequently updated queue inventory accessible directly from HCM)
8. Equipment Ratings (e.g. conductor thermal capacity @ POI and feeder head, distribution equipment backfeeding capacity)
9. Hosting Capacity of the Substation and Transformer Banks
10. Map Filterability*

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*Provided for utilities with an attribute table

Categories of Data in Order of Industry Prioritization

1. Data Accuracy (e.g. location, territories, etc.)
2. Data Update Frequency
3. Downloadable Data (i.e. csv, kml, etc.)
4. User Interface (i.e. usability, search features, formatting)
5. Additional Distribution Data Points
6. More Advanced Analysis (i.e. iterative methods)

Next Steps: Industry Discussion on Wants for Stages 3.X and 4.0

- Looking to get further stakeholder input on Stage 3.X items to focus on at the November meeting (potential survey?).

- Possible enhancements discussed to date include:
  a) HCA for other DER types (storage, CHP, EVs, hybrid solar + storage)
  b) Forecasted hosting capacity
  c) Time varying hosting capacity
  d) Increased granularity of the HCAs
  e) Increased analysis refresh rate
  f) Upstream substation/bank level constraints
  g) Abnormal circuit configurations
  h) Additional data pop-up items:
     i. HCA violation criteria type
     ii. Circuit equipment ratings
  i) Additional map functionality
     i. Downloadability
     ii. Filterability
  j) Better communication of available reference materials and supporting documentation

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Thank you!

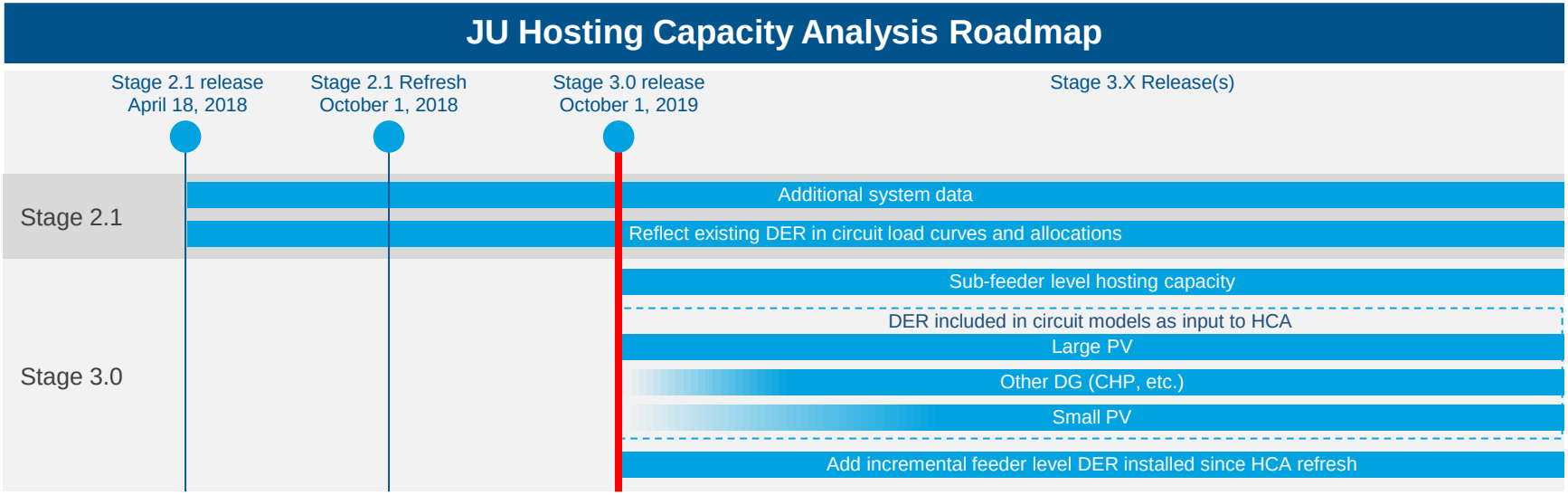
www.jointutilitiesofny.org

http://jointutilitiesofny.org/utility-specific-pages/hosting-capacity/

Appendix – Relevant September 2019 Stakeholder Presentation Slides

Hosting Capacity Implementation Roadmap

- The major enhancements made in Stage 3 are focused on including existing DER in the analysis and providing sub-feeder level hosting capacity.
  - Existing DER are reflected in the circuit load curves and load allocations. Stage 3 will now include solar PV and other installed DG as an explicit input into the hosting capacity analysis.
  - The hosting capacity displays will now include sub-feeder level hosting capacity. The new sub-feeder level granularity will be based on the heat mapping breakpoints and will be referred to as the "Local Hosting Capacity for PV" when line segments are selected in the displays.
  - The data pop-ups will be updated to include a "Local Hosting Capacity for PV" tab for the sub-feeder level line segments, as well as add the "DG Installed Since HCA" at the substation/bank level.



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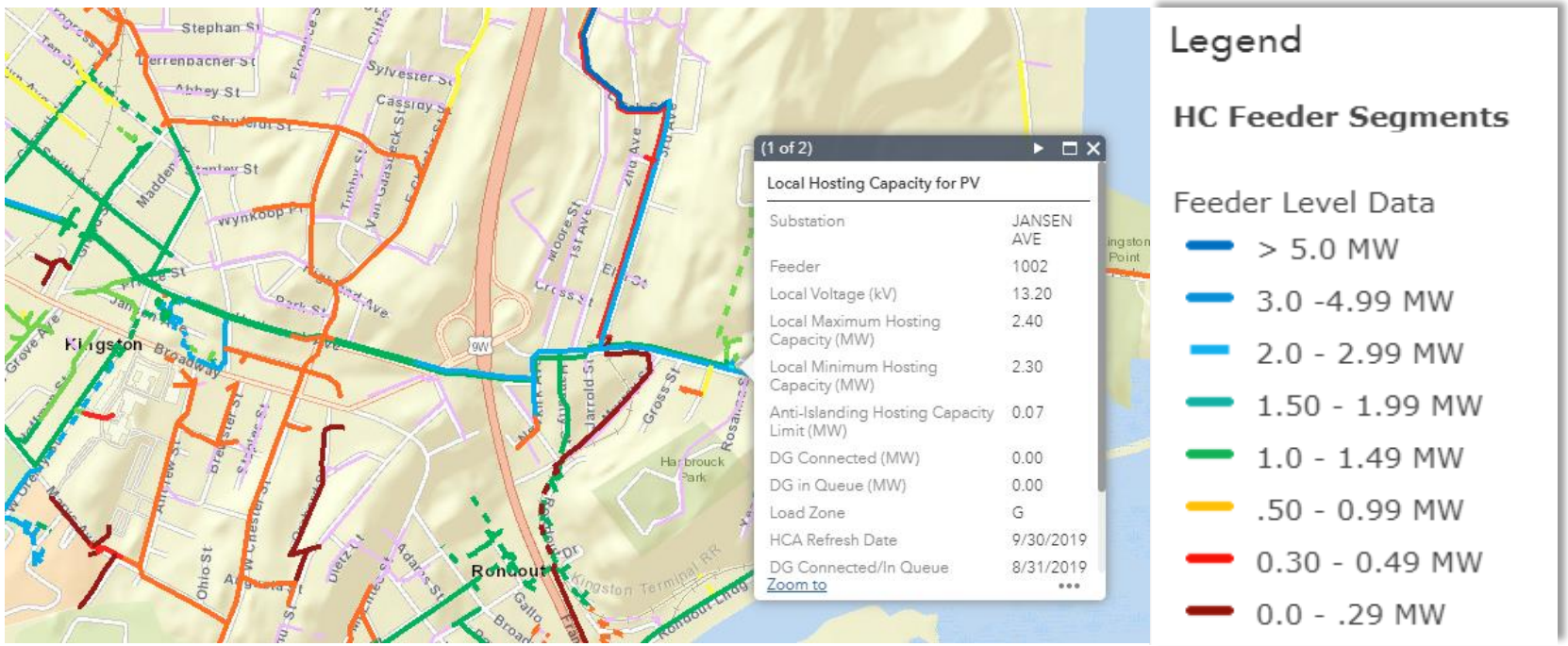
Hosting Capacity Heat Maps for Centralized PV

- Heat maps of the gross hosting capacity by feeder calculated using large centralized solar PV scenarios. Stage 3.0 will provide more location-specific sub-feeder level information by displaying the local hosting capacity across a feeder.



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Stage 3 Additional Pop-up Definitions

Local Voltage kV: Voltage level of the selected line segment.

Local Maximum Hosting Capacity: Maximum Hosting Capacity value of the selected line segment.

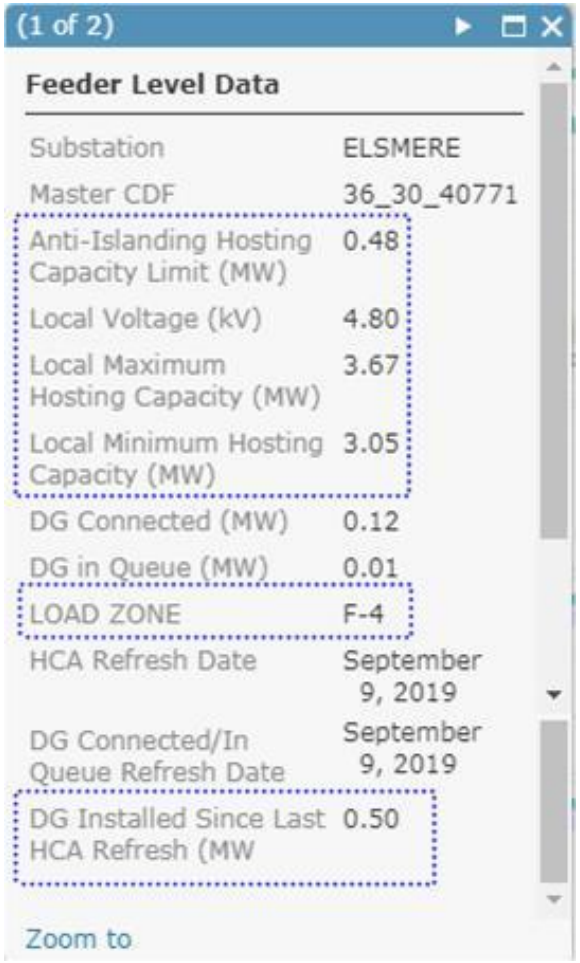
Local Minimum Hosting Capacity: Minimum Hosting Capacity value of the selected line segment.

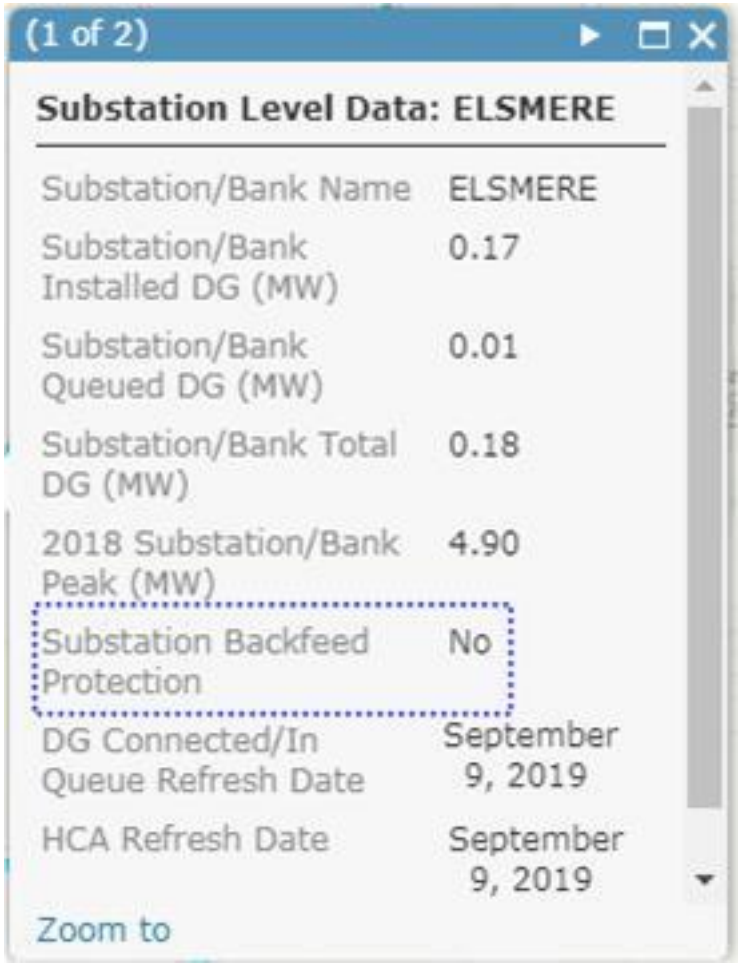
Load Zone: NYISO Load zone and/or utility load zone when applicable.

Anti-Islanding Hosting Capacity Limit (MW): Circuit hosting capacity according to the anti-islanding hosting capacity criteria used (67% of the light load recorded at the feeder head).

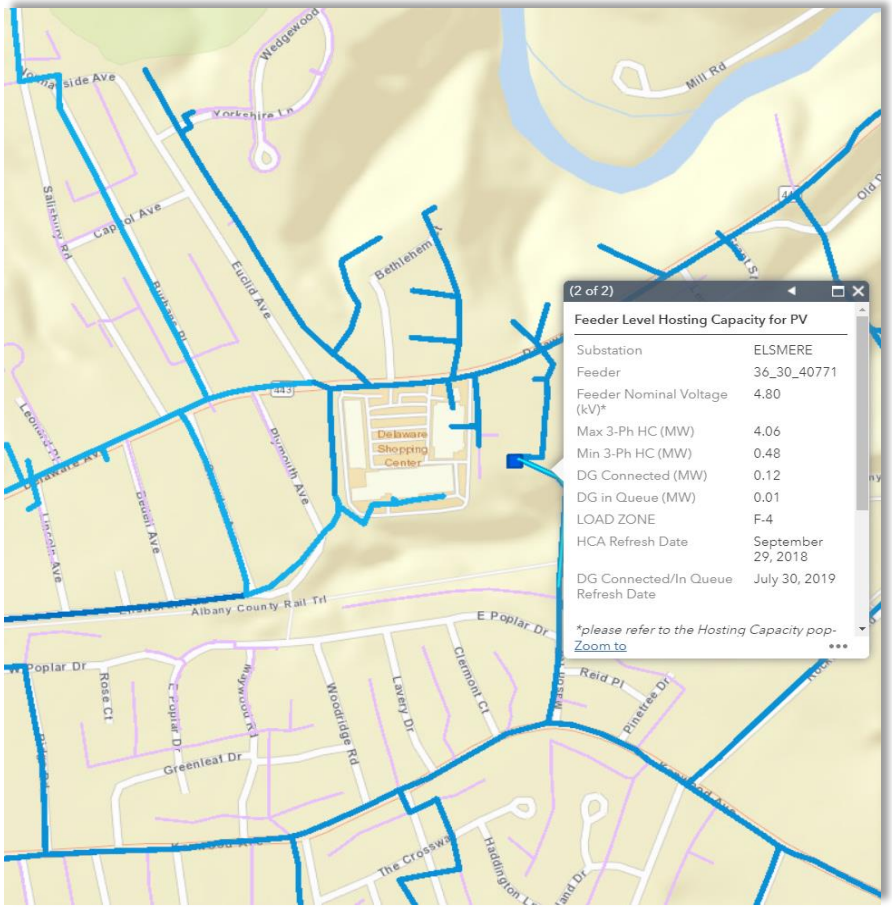
Substation Backfeed Protection: Renamed from “Substation 3V0 Protection” to include other forms of Backfeed protection such as direct-transfer trip.

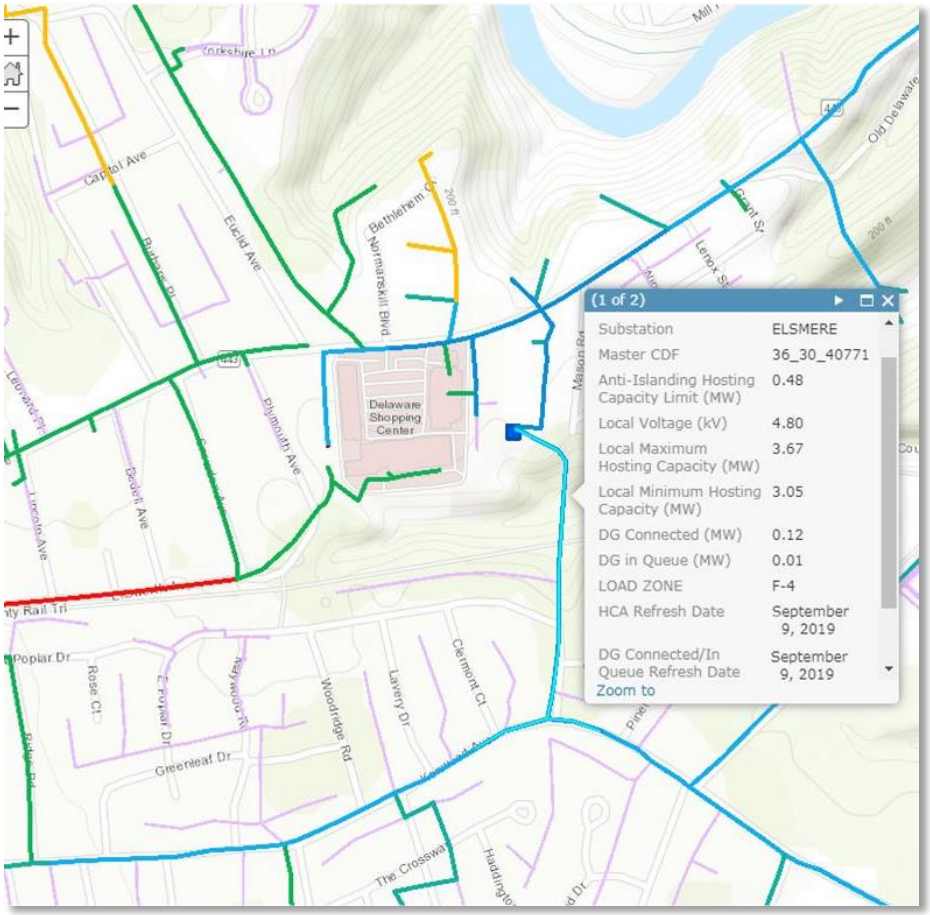
Stage 3 Additional Pop-up Definitions





Hosting Capacity Maps – Stage 2 VS. Stage 3





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Meeting Notes

Questions for Discussion: JU/Industry Goals & Problem Statements for the Hosting Capacity Map

Questions for Discussion	Discussion Points	Next Steps
Are developers using the maps? What are the developers using the maps for and what value is being provided in the current version of the maps?	• Developers are using the maps to identify towns where DER penetration is low to help direct them to areas for future land acquisition e.g. filtering the map to determine there a potential area where the substations are not already saturated with DER . • Some developers noted they use the maps for 100% of their projects and in their decision making if they should really stick with a certain location or not. The same developer noted they generally use all the information being provided to think through potential challenges and direct potential land acquisitions. • Map accuracy with visualization between sub-feeder level sections vs entire circuits or neighboring circuits is an area for improvement. • Developers with slightly different business models focused more on real estate portfolio owners use the maps to help with operational organization, e.g. identifying sites that can more easily accommodate DER within those customers' real estate portfolios. • As an example of the go-no-go decision making the displays can help inform when estimating the potential for costly substation upgrades, one developer explained the first thing they look for is distance to the substation. Checking DG queue data and the SIR inventory is a complimentary next step to that evaluation.	**OPEN** – The Joint Utilities have a better understanding of how exactly developers are using the maps, where the maps are currently providing the most value, and where those areas of improvement are. This feedback will serve as input for further discussion with stakeholders at the November/January sessions.

Questions for Discussion: JU/Industry Goals & Problem Statements for the Hosting Capacity Map

Questions for Discussion	Discussion Points	Next Steps
Are applications typically still submitted when hosting capacity is low? Have the maps saved developers from pursuing multiple sites due to potentially high costs?	• Developers noted that they have submitted several applications even when the hosting capacity is low. The main reason for this is because of the potential uncertainty in how well of an indicator are the hosting capacity maps compared to a detailed study. The developer community still has questions on how the analysis is conducted that more available reference and background material could help address. Providing the violation criteria in the data pop-up is another high priority means for helping address this. • Developers want to better understand the goals of the of these displays are. Providing more information and a common tool/document to reference in those initial discussions with utilities could help improve confidence in the hosting capacity displays during developers' decision-making process. • Related to this issue is the topic of flexible interconnection, and how utilities can start to consider more temporally granular analyses i.e. moving away from a single minimum daytime load scenario to include more seasonal variability. Some utilities have tried piloting this approach but have yet to receive applications.	**OPEN** – The Joint Utilities will prepare additional draft reference material aimed at addressing these concerns for discussion with stakeholders at the November session.

Questions for Discussion: JU/Industry Goals & Problem Statements for the Hosting Capacity Map

Questions for Discussion	Discussion Points	Next Steps
Has the additional pop-up data aided in making decisions? If so, how?	• Being able to see that local voltage was huge improvement for developers in the context of potentially trying to interconnect to 4kV line sections downstream of a step-down bank that were previously unable to be identified. • Providing 3V0 data is a great improvement in the fact that it could be a ~ $600k upgrade, but there could be further improvements e.g. the N-1 screen for determining 3V0 requirements would provide a lot of value. • ISO market nodal pricing is another data item that will add value to developers once those ISO nodes with market pricing is finalized. • Noting areas with the potential for multiple revenue streams to help alert developers to areas where they can maximize their value to the grid would be valuable. • Providing a downloadable files of the data pop-up items is a priority item for developers (.csv or .xlsx), especially in the context of the queue/installed DG values and inventory. Other downloadable data files such as .gdb or .kmz maps layers and API integration were also suggested for consideration. • Stakeholders recommended adding an additional comments/notes line item to note when circuits are split between different service territories.	**OPEN** – The Joint Utilities will add this information to the list of potential additions to the data pop-ups for further discussion on prioritization at the November session.