# Interactive Map Project

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# Acknowledgment


- Several people have contributed to this project including the following:
  - Hantz Presume: Director of Planning, Marc Allen, and the planning team
  - Dan Kopin: Manager of Innovation
  - IT Team: Darrin Goodrow, Jarrod Harper, John Atwood, Andrew Flynn, Tingkuan Hsieh (TK), Alexia Brokop.
  - Project Management Team: Danielle Dansereau and Stephen Cheung, Dave Fenrich
  - Communication Team: Shana Louiselle, Ellyana Carl

# Agenda

- Compliance Requirement
  - FERC Order 2023 Review
- Solutions Analysis
- Process Review
- TARA Heat map Geo-Information Presentation Service (GIPS)
- Maps Overview (Demo)
    - Map Limitation
    - MW injection
    - Map Navigation

# Compliance Requirement, continued

- The primary requirements of FERC Order 2023
  - Calculates MW impact
  - Requires a public map
  - Calculates Distribution Factors
  - Considers N-1 conditions
  - Includes proposed projects by simulating projects impacts based on users' inputs
  - Includes Percentage of flow on monitored facility before and after the injection of the proposed project

# Solutions Analysis

- Planning Team started looking at the development of the map last year
- VELCO Planning reviewed several options for implementing the map using the following factors:
  - Peer Review, Industry Trends
  - Use by other utilities and ISOs
  - Long-term cost, ease of implementation to reduce time spent on integration
- Solution: PowerGEM Geo-Information Presentation Service (GIPS)
- Benefit :Integrate PSS/E planning buses with VELCO GeoNet Data

# VELCO Map vs ISO-NE Map

- VELCO discussed with ISO-NE the development of the map
- ISO-NE Map focuses on the entire New England area
- VELCO Map is specific to the VELCO system
  - Include sub transmission system information
  - Provides more insights to the VELCO system
  - Includes more contingencies relevant to the VELCO system

# Current Map vs Interactive Map

- The current transmission map is a static map included in the VELCO Long Range Plan report
- New Map provides a high level of interactivity based on users' input
- New Map integrate planning data with VELCO GeoNet data
- Open the door for more innovation in the future
- Utilizes existing VELCO GeoNet information
  - Substations latitudes and longitudes Information
- New Map is still under development

# Planning Team Process Overview

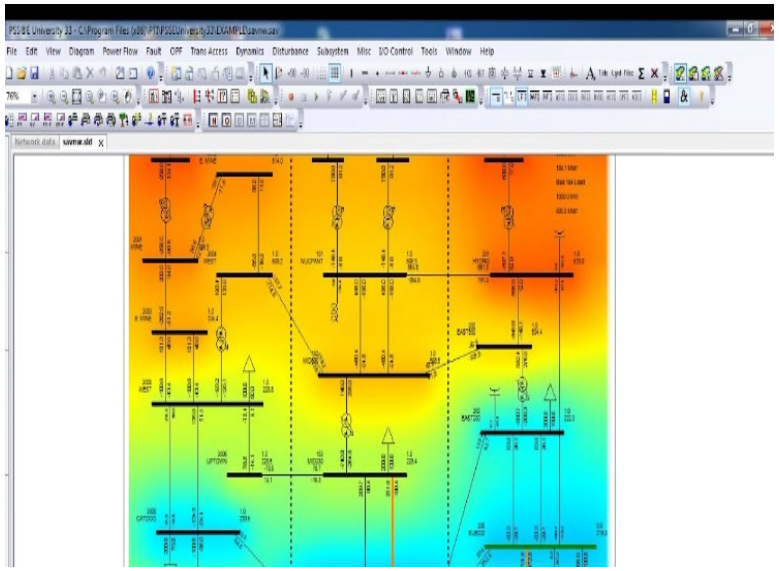
**Start with Basecase**
- Generation dispatch Seasonal cases (Summer and Shoulder)

**N-1 Analysis**
- Performed many combinations of contingencies
- Solved Case

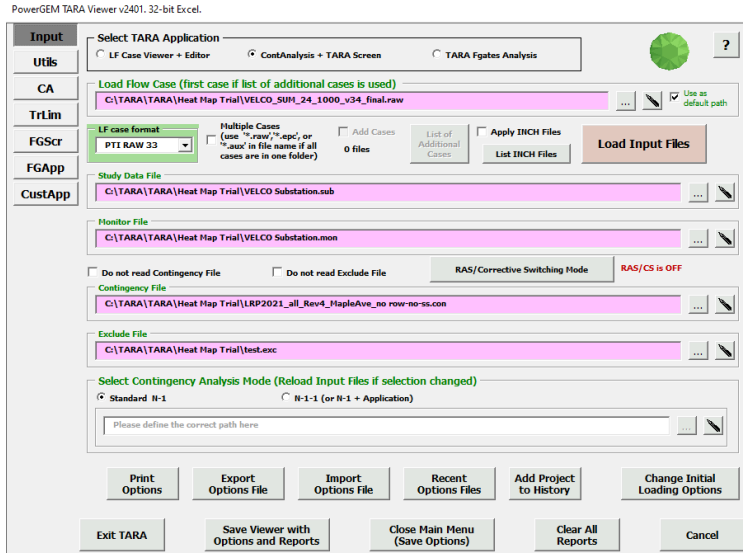
**Run TARA Worst Case Dispatch**
- Inject MW test at VELCO substations
- Identify limits at each bus

**Export data into Heat map**
- Support from IT to host the data
- Added Latitude and longitude information to our PSS/e buses

Basecase topology Siemens PSS/E

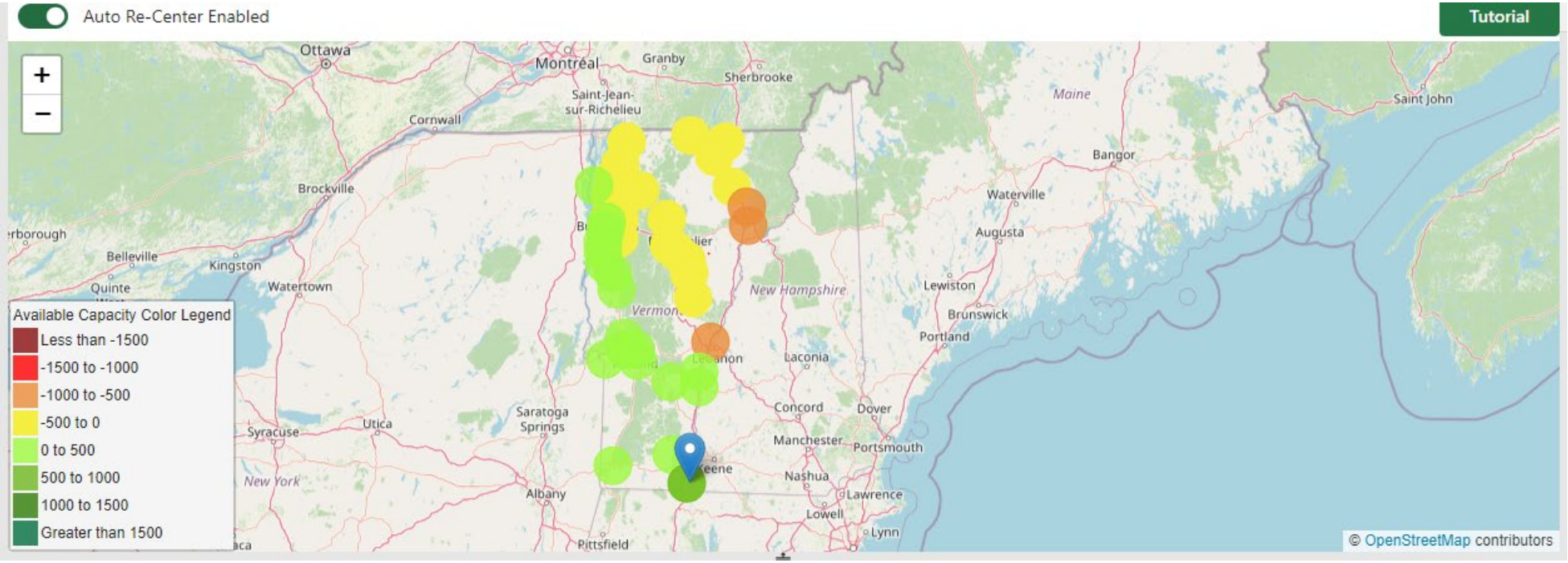


TARA Fast contingency Processing



# Map Overview

- The map is available on the following link: http://pinnitutil/interactivemap/
- Initial testing version published internally within VELCO on September 2024
- The map is color-coded based on injection capacity



# Map Overview, continued

- Injection capabilities of VELCO buses are listed under the Trilim columns ranked from highest to lowest
- Monitored elements, contingency and line loading before and after the injection are listed

| Index | TrLim | Bus | Bus # | KV | Area |
|---|---|---|---|---|---|
| 1 | 1,000 | VT YANKEE | 107,000 | 345 | ISO-NE |
| 41 | 466 | VT YANKEE | 107,880 | 115 | ISO-NE |
| 27 | 292.14 | WEST RUTLND | 107,730 | 115 | ISO-NE |
| 24 | 256.43 | COOLIDGE | 107,700 | 115 | ISO-NE |
| 21 | 249.93 | ASCUTNEY | 107,650 | 115 | ISO-NE |
| 25 | 246 | COLD RIVER | 107,710 | 115 | ISO-NE |
| 26 | 233.04 | NORTH RUTLND | 107,720 | 115 | ISO-NE |
| 13 | 180.86 | SOUTH HERO | 107,430 | 115 | ISO-NE |
| 43 | 162.72 | BENNINGTON | 107,930 | 115 | ISO-NE |
| 31 | 157.42 | NEW HAVEN | 107,780 | 115 | ISO-NE |
| 29 | 156.41 | FLORENCE | 107,760 | 115 | ISO-NE |
| 32 | 141.90 | VERGENNES | 107,790 | 115 | ISO-NE |
| 33 | 138.34 | N FERRISBURG | 107,800 | 115 | ISO-NE |
| 34 | 124.40 | CHARLOTTE | 107,810 | 115 | ISO-NE |
| 35 | 107.70 | SHELBURNE | 107,820 | 115 | ISO-NE |
| 36 | 97.50 | QUEEN CITY | 107,830 | 115 | ISO-NE |
| 42 | 76.05 | NEWFANE | 107,920 | 115 | ISO-NE |
| 28 | 74.96 | BLISSVILLE | 107,740 | 115 | ISO-NE |
| 30 | 60.51 | MIDDLEBURY | 107,770 | 115 | ISO-NE |
| 23 | 25.67 | WINDSOR | 107,690 | 115 | ISO-NE |
| 37 | -27.78 | WILLISTON | 107,840 | 115 | ISO-NE |
| 38 | -47.54 | TAFTS CORNER | 107,850 | 115 | ISO-NE |
| 39 | -122.93 | LIME KILN | 107,860 | 115 | ISO-NE |

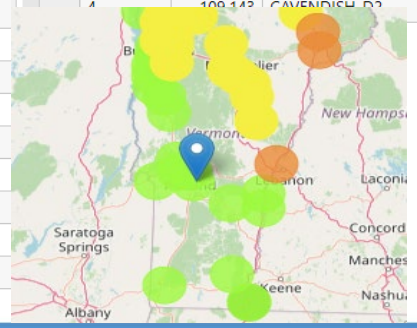
Bus Selected: COLD RIVER 115 KV

| Trlim | Dfax | MW Im... | Mon Facility | Contingency | Rating | Before %Loading | After %Loading |
|---|---|---|---|---|---|---|---|
| 246.00 | 0.8756 | 0 | 107710 COLD RIVER 115 107720 NO... | BF_COOL_K2-6 | 218 | 1.19 | 1.19 |
| 246.76 | 0.8463 | 0 | 107720 NORTH RUTLND 115 10773... | BF_COOL_K2-6 | 217 | 3.76 | 3.76 |
| 246.85 | 0.8773 | 0 | 107710 COLD RIVER 115 107720 NO... | BF_COOL_K32 | 218 | 0.66 | 0.66 |
| 248.27 | 0.8493 | 0 | 107720 NORTH RUTLND 115 10773... | BF_COOL_K32 | 217 | 2.83 | 2.83 |
| 260.10 | 0.5886 | 0 | 107710 COLD RIVER 115 107700 CO... | BF_COOL_350 | 245 | 37.51 | 37.51 |

Top Harmers

107710 COLD RIVER 115 107720 NORTH RUTLND 115 1 for cont BF_COOL_K2-6

| Rank | BusN... | Name | KV | Area | Dfax | MWChange | MWImpact | Pmax | PgenBaseC... |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 109,079 | PATCH HYDRO | 2.30 | ISO-NE | 0.1833 | 0 | 0 | 0.30 | 0.30 |
| 2 | 109,051 | GLEN HYDRO | 13.20 | ISO-NE | 0.1769 | 0 | 0 | 1.85 | 1.85 |
| 3 | 109,077 | E PITTSFORD | 2.30 | ISO-NE | 0.1527 | 0 | 0 | 3.35 | 3.35 |
| 4 | 109,143 | CAVENDISH_D2 | 12.47 | ISO-NE | 0.1205 | 0 | 0 | 1.19 | 1.19 |



# Map Overview, continued

- Users have the ability to test desired level of MW using the MW Injection option
- Scenario option provide the ability to test different cases (Summer vs Shoulder)
- Loading % before and after MW addition

Scenario

Scenario 6: No Extreme or NF Contingecies, Scale generation for export

MW Injection

200

Clear All Filters

| Index | TrLim | Bus | Bus # | KV | Area |
|---|---|---|---|---|---|
| 1 | 1.000 | VT YANKEE | 107,000 | 345 | ISO-NE |
| 41 | 466 | VT YANKEE | 107,880 | 115 | ISO-NE |
| 27 | 292.14 | WEST RUTLND | 107,730 | 115 | ISO-NE |
| 24 | 256.43 | COOLIDGE | 107,700 | 115 | ISO-NE |
| 21 | 249.93 | ASCUTNEY | 107,650 | 115 | ISO-NE |
| 25 | 246 | COLD RIVER | 107,710 | 115 | ISO-NE |
| 26 | 233.04 | NORTH RUTLND | 107,720 | 115 | ISO-NE |
| 13 | 180.86 | SOUTH HERO | 107,430 | 115 | ISO-NE |
| 43 | 162.72 | BENNINGTON | 107,930 | 115 | ISO-NE |
| 31 | 157.42 | NEW HAVEN | 107,780 | 115 | ISO-NE |
| 29 | 156.41 | FLORENCE | 107,760 | 115 | ISO-NE |
| 32 | 141.90 | VERGENNES | 107,790 | 115 | ISO-NE |
| 33 | 138.34 | N FERRISBURG | 107,800 | 115 | ISO-NE |
| 34 | 124.40 | CHARLOTTE | 107,810 | 115 | ISO-NE |
| 35 | 107.70 | SHELBURNE | 107,820 | 115 | ISO-NE |
| 36 | 97.50 | QUEEN CITY | 107,830 | 115 | ISO-NE |
| 42 | 76.05 | NEWFANE | 107,920 | 115 | ISO-NE |
| 28 | 74.96 | BLISSVILLE | 107,740 | 115 | ISO-NE |
| 30 | 60.51 | MIDDLEBURY | 107,770 | 115 | ISO-NE |
| 23 | 25.67 | WINDSOR | 107,690 | 115 | ISO-NE |
| 37 | -27.78 | WILLISTON | 107,840 | 115 | ISO-NE |
| 38 | -47.54 | TAFTS CORNER | 107,850 | 115 | ISO-NE |
| 39 | -122.93 | LIME KILN | 107,860 | 115 | ISO-NE |

Max MW at each bus

Bus Selected: WEST RUTLND 115 KV

| Trlim | Dfax | MW Im... | Mon Facility | Contingency | Rating | Before %Loading | After %Loading |
|---|---|---|---|---|---|---|---|
| 292.14 | 0.4529 | 90.57 | 107730 WEST RUTLND 115 107720 ... | BF_COOL_350 | 217 | 39.03 | 80.77 |
| 292.14 | 0.4529 | 90.57 | 107730 WEST RUTLND 115 107720 ... | LN_350 | 217 | 39.03 | 80.77 |
| 311.01 | 0.4243 | 84.87 | 107720 NORTH RUTLND 115 10771... | LN_350 | 218 | 39.46 | 78.39 |
| 311.01 | 0.4243 | 84.87 | 107720 NORTH RUTLND 115 10771... | BF_COOL_350 | 218 | 39.46 | 78.39 |
| 352.51 | 0.4343 | 86.86 | 107710 COLD RIVER 115 107700 CO... | BF_COOL_350 | 245 | 37.51 | 72.97 |

Monitored Facility

# Map Limitation

- The map should be used to provide general guidelines as it does not represent all possible system conditions.
- Additional studies are required according to ISO-NE procedures and NERC standards.
- Results should be viewed for information purposes, with the understanding of the need to perform interconnection studies.

# Cyber Security Review

- The following Critical Energy Infrastructure Information (CEII) was removed from the map to protect the VELCO system from potential threats:
  - Hide Planning PSS/E Software Bus Number
    - Complete
  - Hide Contingency Detail (loss of a line or an element)
    - Complete
  - Hide Monitored element detail (line or transformer)
    - Complete