VELCO

vermont electric power company

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)
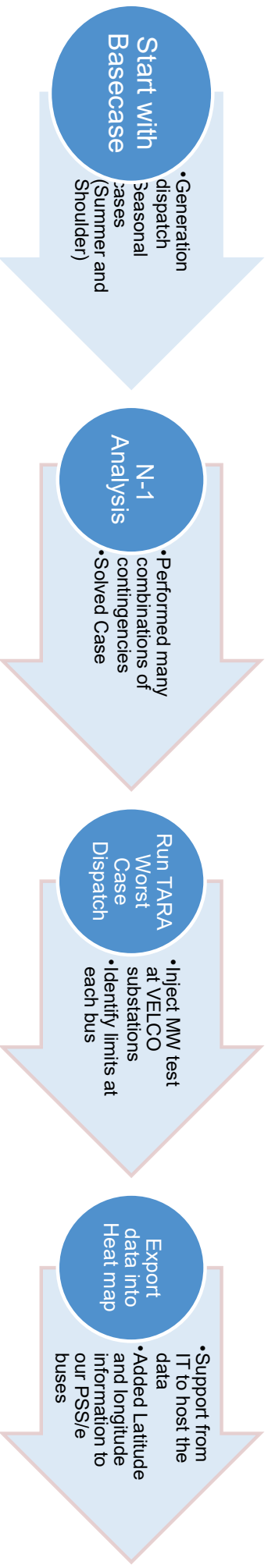- Benefit :Integrate PSS/E planning buses with VELCO GeoNet Data

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
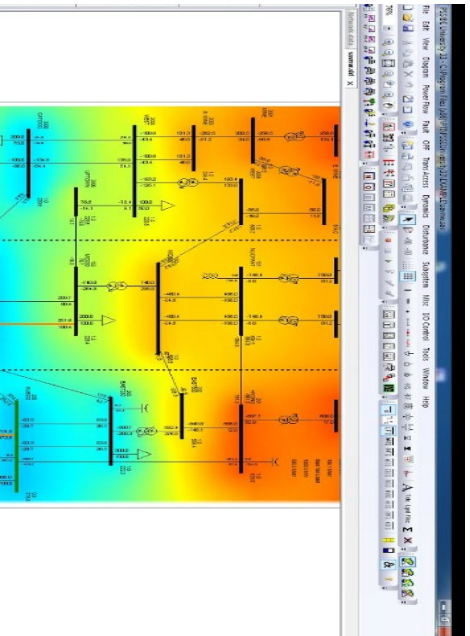 - Includes more contingencies relevant to the VELCO system

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
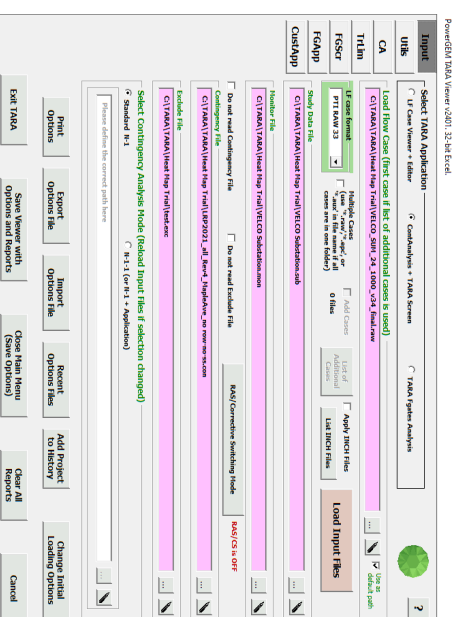
Basecase topology
Siemens PSS/E

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
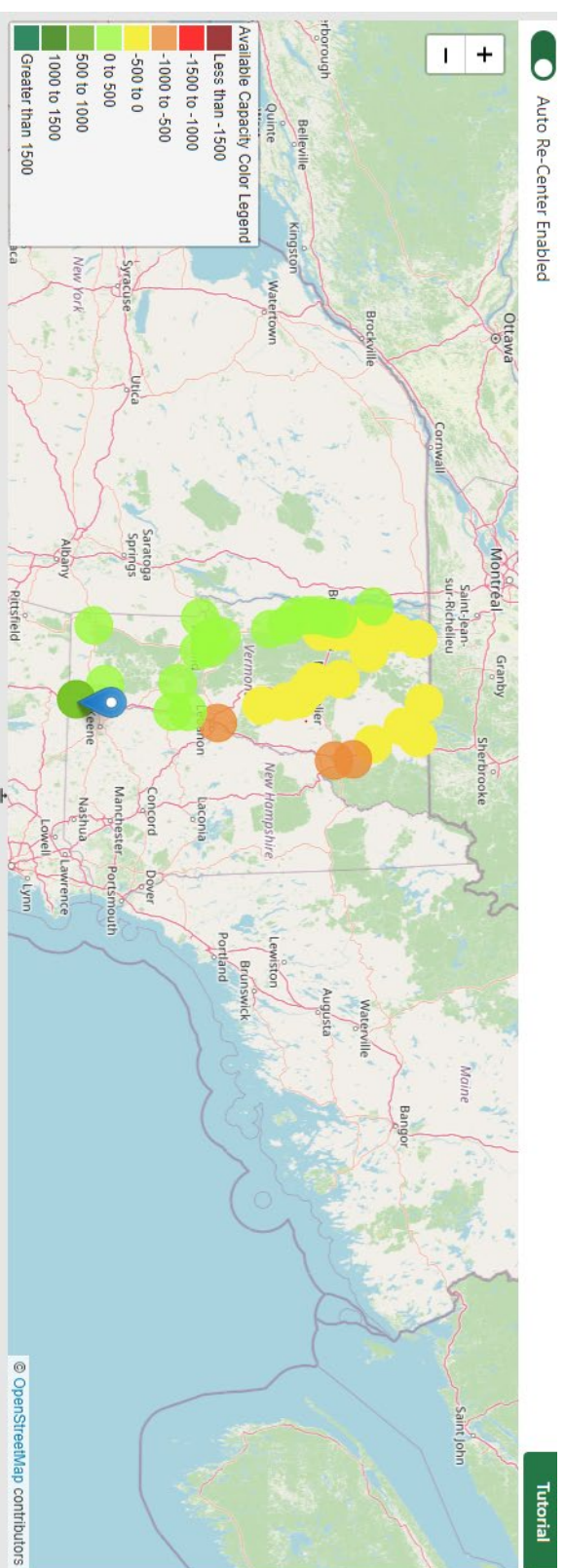
Map Overview, continued

- 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	Trilim	Bus	Bus #	KV	Area
1	1,000	VT YANKEE	107,000	345	ISO-NE
41	488.47	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	BUSSVILLE	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

Trilim	Dfax	MW In...	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 Harners
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	109.142	CAVENDISH_P2	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
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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: 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 1071....	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

Max MW at each bus

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