

**PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE  
D/B/A EVERSOURCE ENERGY**

**GEOGRAPHIC INFORMATION SYSTEM PROJECTS  
SUMMARY REPORT**

**JANUARY 2010 – SEPTEMBER 2016**

**October 7, 2016**

*For Submission to the New Hampshire Public Utilities Commission.*

## 1. INTRODUCTION

In the April 30, 2010 settlement agreement in Docket No. DE 09-035, which was approved by the Commission in Order No. 25,123 (June 28, 2010), Public Service Company of New Hampshire d/b/a Eversource Energy (“Eversource”) agreed to initiate and complete a design for the implementation of a geographic information system (“GIS”) by July 1, 2011, and to have the GIS installed and operational by December 31, 2014. Moreover, Eversource was to incorporate into the designs of the GIS the implementation of a new outage management system (“OMS”). Based upon that agreement Eversource undertook to design and implement the new GIS and OMS. During the initial design and implementation, Eversource accelerated the project to finish by December 31, 2013 rather than December 31, 2014, following on one of the recommendations contained in the Commission’s October 2011 Snowstorm Report. See October 2011 Snowstorm Report at page 10, Corrective Action 1 ([http://www.puc.state.nh.us/2011OctSnowstorm/October%202011%20Snowstorm%20\(11-20-12\)%20final.pdf](http://www.puc.state.nh.us/2011OctSnowstorm/October%202011%20Snowstorm%20(11-20-12)%20final.pdf)).

Since that time Eversource has undertaken a series of projects related to the GIS and OMS – some of which have been on an enterprise-wide basis (such as the OMS), and others have been focused on New Hampshire operational needs (such as the Connectivity Project). Metrics, achievements, and expenditures relating to the GIS and OMS implementation projects have been reported to the Commission at various times throughout their lifecycles. Those reporting dates are identified further below.

This submission provides a summary report of the expenditures and major project milestones relating to the various GIS and OMS projects from the inception of those projects following Order No. 25,123 in 2010, through the middle of 2016. As noted in Eversource’s September 30, 2016 compliance report in Docket No. DE 09-035, Eversource anticipates some additional expenditures relating to the completion of the Connectivity Project, which is anticipated to be complete in early to mid-2017. Those additional expenditures will be included in the quarterly reports that Eversource submits following the Company’s agreement to such reporting, which was confirmed by the Commission in Order No. 25,913 (June 28, 2016).

**2. CAPITAL INVESTMENT SUMMARY**

<u>Year</u>	<u>GIS Conversion</u> Capital	<u>OMS Data Readiness</u> Capital	<u>Connectivity Project</u> Capital
2010	\$71,706		
2011	\$1,266,400		
2012	\$3,482,300		
2013	\$3,734,076		
2014		\$708,088	
2015		\$760	\$428,180
Jan-Aug 2016			\$1,128,026
Total 2010 -Aug 2016	\$8,554,482	\$708,848	\$1,556,206

**3. Geographic Information System (GIS) Conversion Project**

**January 2010 – December 31, 2013**

The project included integrating the following data sources into the company’s new enterprise GIS:

- Poles located in 34kV distribution Rights-of-Way (ROW) derived from:
  - Mile sheets
  - Power line end points, end poles, knee poles
  - Poles from the Company’s poles database
- Primary circuit maps:
  - Underground, overhead, and network circuits
  - Transformers correlated to poles from transformer database
  - Poles, capacitors, regulators, reclosers, and switches assigned to locations based on pole reference

Data gaps were filled in the following manner:

- When poles did not exist on a map, pole locations were located via ortho-photography. If pole locations were still undetermined, locations were estimated at reasonable intervals based on map numbering and databases, and placed on the same side of the road as the preceding pole.
- Underground network connectivity was represented with simple electric connectivity and schematic drawings
- Office-based validation of electrical routes was validated using commercially available land base, ortho-photos, DistriView Engineering tool, and University of New Hampshire “Granit” land base data.

A data source matrix was created to guide the data conversion process. This matrix identified where the data originated, described the electrical equipment represented, and described the manner in which it is mapped into Eversource’s GIS data model. The data conversion magnitude is presented below:

- Approximately 500,000 customers / meters
  - Rural 48%
  - Suburban 27%
  - Urban 25%
  - 9% of customers have an underground service delivery
- 4,738 primary maps (includes overhead and underground)
- 11,000 miles of distribution lines along the road
- 900 miles of distribution lines in ROW
- 176 substations
- Over 600 circuits
- 420,000 poles
- 500,000 customers

Table 1 provides a count of the primary and underground residential distribution (URD) source maps. Eversource had many key maps that reference primary and URD maps, as well as, approximately 1,000 mile sheets, representing Distribution ROW circuits.

Table 1: Map Counts

		Primary Maps	URD Maps	Total
Western	Hillsborough	123	43	166
	Keene	173	74	247
	Monadnock	106	38	144
	Newport	212	39	251
	Pittsfield	48	15	63
	Franklin	83	82	165
	Laconia	125	72	197
Southern	Bedford	209	298	507
	Derry	150	497	647
	Hooksett	232	253	485
	Milford	109	153	262
	Nashua	170	215	385
Seacoast Northern	Berlin	61	9	70
	Chocorua	108	52	160
	Epping	143	62	205
	Lancaster	136	33	169
	Portsmouth	101	98	199
	Rochester	191	225	416
<b>TOTAL</b>		<b>2480</b>	<b>2258</b>	<b>4738</b>

In addition to successfully integrating infrastructure data into the GIS, Eversource also achieved the following key milestones as part of the project:

1. Employee Outreach – Eversource implemented organizational change management and communications plans, educating and informing employees of the new tools, data access, and processes.
2. Completed paperless map solution - Replaced paper map books in line trucks with tablets containing GIS representation of Eversource electric infrastructure. This provides more current map updates to field resources.
3. GPS rollout – Eversource loaded GIS assets in Garmin GPS devices. These devices provide navigation to field equipment with the ease of a consumer electronics product. Garmin devices have been placed in field vehicles, including line trucks.
4. Business Process Improvement – Engineering and Field Personnel have been trained on the new processes and applications.

Eversource complied with the Commission’s need for progress reports by submitting the following compliance documents with the Commission, relating to the GIS project:

Distribution Geographic Information System High Level Design and Plan	06/24/2011
Distribution Geographic Information System July - December 2011 Progress Report	12/29/2011
Distribution Geographic Information System January -June 2012 Progress Report	06/28/2012
Distribution Geographic Information System July - December 2012 Progress Report	12/11/2012
Distribution Geographic Information System January -June 2013 Progress Report	06/21/2013
Distribution Geographic Information System July - December 2012 Final Report	12/17/2013

**4. Outage Management System (OMS) Data Readiness:**

**January 1, 2014 - December 31, 2015**

For installation of the enterprise OMS, Eversource worked on a tri-state team accomplishing:

- (1) Configuration and additional coding of the GIS data extractor. The extractor exports from the GIS required information, then imports that information to the OMS.
- (2) Configuration of the preprocessor to properly create the infrastructure model for GIS export / OMS importation. The preprocessor works in conjunction with the extractor.
- (3) Several large GIS data reconfigurations were completed. These reconfigurations (described below) were not a result of GIS data errors, rather the OMS has specific and different data requirements in order to function properly and maximize the benefit of OMS reporting.
  - a. Eversource populated location details for all customer carrying devices on structures.
  - b. Changes in how looped and paralleled circuits were represented in GIS.
  - c. Completed all data validation and data preparation for OMS. This included ensuring all OMS mandatory data fields are set properly and completely.
  - d. Renaming of circuits as required by OMS.
  - e. Substation device reconfiguration: Eversource has many circuits that are taps and do not initiate at a substation (examples: 340X1, 340X2, and 340X3 circuits). The supply nodes for these are represented inside GIS as virtual substations. Changes were required to ensure proper OMS recognition for the beginning of these circuits.
  - f. Additional device classes and OMS symbology for New Hampshire specific devices.
- (4) Boundary changes for the elimination of the Hillsborough AWC.

The new Outage Management System was an enterprise-wide initiative undertaken to integrate all of the Eversource Energy operating companies. Accordingly, Eversource’s share of the costs of the OMS was not charged to the REP.

Compliance Report filed with the NH Public Utilities Commission relating to the OMS

Eversource Reliability Enhancement Program Docket DE09-035 2014 Year End Report	04/01/2015
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## 5. Connectivity Project:

### August 1, 2015 – September 30, 2016

During the initial GIS conversion, determining which customer was connected to which transformer data sources required the use of generic formulas, through which customers fed from an overhead unit were deemed connected in the GIS to the nearest transformer. In most instances such designations corresponded to the actual characteristics in the field. However, for some customers it is incorrect. Recognizing that correct customer connectivity is vital for optimal power restoration performance Eversource began its Connectivity Project as an extension of the GIS as contemplated in its December 2013 Distribution Geographic Information System July to December 2013 Final Report. The increased accuracy following the Connectivity Project significantly improves communication with customers, community leaders, media, and regulators during storms. Moreover, it improves identification of fault locations and priorities for outage response, resulting in shorter outage durations. It will also provide better data to support post storm analysis and reporting. The Connectivity Project includes: establishing GPS locations for all overhead transformers; phase validation for customer and transformer; validation of customer to overhead transformer connectivity; and correct association within GIS

The scope and scale of the project is as follows:

1. 150,000 Overhead transformers.
  1. Obtain GPS coordinates.
  2. Record transformer size.
2. 420,000 customers connected to overhead transformers.
  1. Validate phasing of customers and transformers.
  2. Validate customer to overhead transformers connectivity.
3. 72,000 secondary poles.
  1. Verify and capture secondary pole path.
4. Update GIS accordingly.

The project tracks to the schedule and budget reported, with an anticipated project completion date in the second quarter of 2017.

Compliance Reports filed with the Commission relating to the Connectivity Project:

Geographic information System & Field Connectivity Survey Project August 2015 – July 2016 Progress Report	08/02/2016
Reliability Enhancement Program - Compliance Filing - GIS Procedures	09/01/2016
Geographic information System & Field Connectivity Survey Project August 2016 – September 2016 Progress Report	09/30/2016
Eversource Reliability Enhancement Program 2016 Report to the NH Public Utilities Commission	09/30/2016