

2003 Integrated Resource Plan



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Overgrown substation areas are being cleared out to discourage animals from coming in contact with energized equipment.

2. Power Delivery System Planning

a. Planning Criteria

Green Mountain Power has developed the following planning criteria intended to assure that its power delivery system achieves satisfactory performance. It uses 4/0 ACSR and 477 KCM ACSR for its main overhead three phase lines. The standard conductor sizes for underground lines include 1/0, 350 KCM AL and 750 KCM AL. The Company's standard transmission system voltage in the Western and Central division areas is 34.5 kV. The 34.5 kV system delivers power from the VELCO delivery points to GMP's distribution substations, wholesale customers and large industrial customers. Forty-six and sixty-nine kilovolt systems are used in the Southern Division.

The Company's standard distribution system voltage is 7.2/12.5 kV grounded wye. It has a limited amount of 19.9/34.5 kV distribution system facilities in service, but it is restricting its use to high growth industrial areas because of operating difficulties with underground 34.5 kV equipment.

Green Mountain Power allows 5-8% maximum voltage drop on the transmission system during normal operation and 10% maximum voltage drop during first contingency operation. Distribution system voltage drop is limited to 5% during all types of operation.

Each element in the power delivery system has a design load limit, which reflects the load at which the element begins to overheat and fail. The Company applies a 100% maximum load limit on all elements during normal operation. Overloading is allowed in specific cases for limited periods of time during first contingency operation, when it is necessary to maintain or restore service.

b. Internal Studies

Green Mountain Power desires to provide consistent, reliable service throughout its distribution system. Adequate reliability often requires additional contingency capacity, system interconnections and back-up circuits in areas where reliability problems have become significant. There may be situations where the existing facilities

require replacement because of poor physical condition, even though capacity is still adequate. Alternatives involving enhanced system protection and distribution system automation will be evaluated to provide improved reliability where needed.

The Company's current approaches to power delivery system planning include five-year load studies and annual reliability reviews. The guidelines and recommendations from the 1999 system efficiency study are being incorporated into future planning studies. Green Mountain Power will work toward further integrating these system planning efforts into the comprehensive IRP planning process in the future.

c. Area Specific Collaboratives

Where a delivery system constraint has been identified, the Board requires an analysis of whether an ASC planning process is required. Areas currently subject to the ASC planning process are identified below. In addition, an ASC may be required if a proposed upgrade addresses a capacity constrained area or meets certain cost benchmarks in a non-constrained area. The analysis performed under an ASC must consider all feasible alternatives including joint facilities with neighboring utilities, on-site generation, and DSM. The ASC analysis must consider environmental impacts, societal costs and other public concerns in the evaluation of alternatives and final plan selection.

Green Mountain Power is currently involved in or planning the following ASC studies:

1. White River Junction DUP Target Area, served by GMP's 1302 line and GMP's White River Junction (#70) substation located in Hartford.
2. Tafts Corner Substation DUP Target Area, served by a potential new substation in Williston that would be supplied by the VELCO 115 kV Essex to Williston transmission line, potential new 12.47 kV distribution lines that would be supplied by this substation, and the area served by the existing Digital substation (#43), the 43G2 and 43G3 feeders, the Town Line substation (#44), the 44G1 feeder, the Essex substation (#19) and the 19G3 feeder.
3. Digital Injection Line DUP Target Area, a potential project that is made up of two components and the area that would be served by those components. The first component would consist of newly constructed 115 to 34.5 kV substation facilities in

2007
Integrated Resource Plan

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F: Transmission and Distribution Planning

Described in this section are completed, open, and on-going area specific collaboratives (ASCs); upgrade projects; and other planning initiatives surrounding Green Mountain Power's transmission and distribution planning.

The results for the ASCs listed here (docket numbers 6797: Digital Injection Project; 6798: White River Junction; 6799: Lamoille County Loop; 6800: Mount Snow; 6801: Tafts Corner, and the Burlington Waterfront Area: Phase I) were essentially all the same.

These projects could not be deferred by reducing loads with energy efficiency or serving local loads with distributed generation; therefore the five projects had no energy supply impact on GMP's IRP. The projects — whether completed, not yet in service, or on-going — did result in a more efficient and robust T&D system with less system loss. While the loss achieved by these projects was generally significant for the specific study, the savings when compared to GMP's overall supply resource needs was very small and was not specifically accounted for when determining GMP's overall need for future generation resources.

These projects also resulted in a more robust T&D system, making the system more capable of accepting and transmitting generation at more locations. This increased capability was somewhat mitigated in dockets 6798 (White River Junction), 6800 (Mount Snow), and 6801 (Tafts Corner) since these three projects only affected the distribution system.

Completed ASC Projects In Service

The following is a description of ASC's involving GMP that have been terminated, including a summary of the resolution reached and how the resolution is reflected in the IRP.

Docket No. 6797: Digital Injection Project

The ASC. Could the proposed substation to be located in Williston at Tafts Corners be avoided or deferred through DSM or distributed generation options?

Participants. Green Mountain Power, Vermont Electric Cooperative, Department of Public Service

Board Status Report. A March 28, 2003 report concluded that the project could not be cost effectively avoided or deferred.

Board Action. The Board terminated the ASC on April 4 2003.

About the Project. This project provided electric support to the sub transmission line that serves the area. Constructing a new 115 kilovolt/34.4 substation at Tafts Corners and a sub-transmission line from the new substation to the existing GMP Digital Substation #43 (located near Technology Park just west of Tafts Corners) proved to cost the least. The project was completed in 2004 and is now operational.

Completed ASC Projects Not In Service

Docket No. 6799: Lamoille County Loop Target Area

The ASC. Addressed potential solutions for serving load in the Lamoille County area.

Participants. Green Mountain Power, Department of Public Service. The Vermont Electric Power Corporation (VELCO) and Vermont Electric Cooperative, although both were never formal parties to the ASC, attended many of the meetings and contributed technically to the process.

Board Status Report. An August 13, 2004 report indicated (among other things) that various T&D, DSM, and distributed generation options for addressing capacity constraints had been identified, and that it was appropriate to conclude the ASC.

Board Action. On September 8, 2004 the Board closed the docket.

About the Project. After Docket 6977 was closed, VELCO, the Stowe Electric Department, and GMP applied for a certificate of public good to construct a 115 kilovolt line and related facilities to serve the area. As part of the resulting proceeding (Docket No. 7032), the petitioners updated the ASC analysis of the distributed generation and DSM alternatives. The analysis demonstrated that neither DSM nor distributed generation, individually or in combination, could defer need for the project.

On March 16, 2006, the Board issued a certificate of public good for the transmission project.

Docket No. 6800: Mount Snow

The ASC. Addressed potential solutions for serving load growth in the Mount Snow area.

Participants. Green Mountain Power, the Department of Public Service, and Mount Snow Ltd. (Mount Snow).

Board Status Report. A March 18, 2005 report stated, in part, that based on the information presented and discussed in the ASC, the need for additional T&D resources could not be cost-effectively avoided or deferred by DSM or distributed generation. The report indicated that the DPS did not necessarily agree with all assumptions and methodologies used in the DSM and distributed generation analysis, but agreed that the results of the analysis were reasonable.

Board Action. The Board terminated the ASC on April 5, 2005.

About the Project. The recommended T&D project be completed in two stages and be supplied with an additional 5.5 megawatts for Mount Snow's ski area planned expansion of snowmaking and lift facilities as well as an additional 2.5 megawatts for future growth at the Haystack resort area. The first stage includes replacing an existing 14 MVA transformer at GMP's Dover Substation #90 with a 22 MVA transformer and building a 12.5 kilovolt dedicated express circuit to Mount Snow. The second stage includes two components:

so that it can be served from either the Tafts Corner substation or the Essex substation, thus eliminating East Avenue outages for any single contingency line failure.

- Constructing a 34.5 kilovolt subtransmission line from East Avenue Substation to McNeil substation, upgrading the McNeil Substation to accept the new line, and upgrading the East Avenue substation by installing a 115 – 34.5 kilovolt transformer. These components are needed to provide another source for the 34.5 sub transmission system at the McNeil Substation. The new source is needed to feed Burlington Electric Department's load relocated from Lake Street and to maintain an N-1 criterion for the area 34.5 kilovolt system. For a loss of one of the Essex 115-34.5 kilovolt transformers, the remaining transformer needs to remain within rated capacity.
- Relocating the Lake Street Substation. The relocation of Burlington Electric Department's Lake Street substation is an integral part of the 34.5 kilovolt circuit (described above). It allows any two substations to back feed the third substation in case of an outage, failure, or regular maintenance.

East Avenue Loop – Phase II

The East Avenue Loop – Phase II project is a component of the twenty-year plan for the area discussed in the Burlington Water Front ASC. Phase II will be required when reliability criteria dictate, currently projected for 2010. Phase II is made up of four components:

- Constructing a new 115 – 34.5 kilovolt substation on the west side of Airport Parkway in the existing VELCO K-25 and GMP 3307 – 3308 line corridor (Gorge VELCO substation).
- Reconstructing approximately 2,500 feet of the existing 3307 and 3308 34.5 kilovolt line between the new Gorge VELCO substation and the existing Gorge GMP substation.
- Upgrading the Gorge GMP substation.
- Reconstructing the existing 3307 34.5 kilovolt line between Gorge GMP and McNeil Substation.
- Removing GMP's 3323 and 3328 lines (Waterfront Lines).

GMP has targeted the area served by this project with additional EEU funds. The Board has approved the use of a portion of those funds.

East Avenue Loop – Phase III

The East Avenue Loop – Phase III project is a component of the twenty-year plan for the area discussed in the Burlington Waterfront ASC

Phase III will be required when reliability criteria dictate, currently projected for 2016. Phase III is made up of three components:

- Replacing the two existing 115 – 34.5 kilovolt 50 MVA transformers at the Essex VELCO substation with 75 MVA transformers.
- Reconductoring the two 34.5 kilovolt (3350 – 3351) lines between Essex VELCO and Essex GMP to accommodate the new transformers.

Non-ASC Transmission and Distribution Upgrade Projects

We did not identify the following projects when the MOU in Docket 6290 was signed, or they were identified as not requiring formal DUP analysis. Some of these projects are still in the early planning stages, so we cannot determine if they will evolve into formal ASCs. Even if these projects do not evolve into an ASC, GMP is still required to demonstrate whether the projects could be deferred with DSM or distributed generation.

For some of these projects still in the early planning stages, GMP has recommended — and the Board has approved — that the EEU can target some of its increase funding in those areas that will be served by these projects. The IRP's load forecast does not specifically account of the impact each of these areas targeted by the additional EEU funding. However, the IRP accounts for increased EEU funding through 2008 and analyzes a scenario where this increased funding continues beyond 2008 to 2026.

Ethan Allen Conversion

The Ethan Allen 4 kilovolt feeder is being converted to 12 kilovolt to address concerns about drops in voltage. Once converted, the new 12 kilovolt circuit can convert pieces of the Gorge circuit 16J1, thereby deferring the Gorge conversion project discussed below. This project has not undergone a formal DUP analysis, but GMP has recommended — and the Board has approved — that the EEU increase funding in the area served by this project.

Gorge Substation Rebuild and Conversion

This project converts distribution feeders served by the Gorge Substation from 4 kilovolt to 12 kilovolt. The timing of this project will depend on load growth, rather than the 34.5 kilovolt system's capacity and is therefore independent of the East Avenue Loop project. This project also involves a major Gorge GMP substation renovation that is required to interconnect with the proposed Gorge VELCO substation (part of the East Avenue Loop Phase II). GMP has not determined if this project will be subject to a formal DUP analysis and be the subject of an ASC.

GMP had recommended — and the Board has approved — targeting EEU funds for this area.

Third Winooski 35.4 Kilovolt Feeder

Future load growth in the City of Winooski and the surrounding area (served by two 34.5 kilovolt feeders) will create the need for a third feeder so that outages can be avoided when a contingency occurs on an existing feeder. This third feeder will be sourced from the Gorge GMP substation. GMP cannot begin this project until we renovate the Gorge substation. We have not determined if this project will be subject to a formal DUP analysis and an ASC. GMP has recommended — and the Board has approved — using targeted EEU funds.

Waterbury

Once the Waterbury Center Substation is rebuilt, we will convert the Waterbury 4 kilovolt circuits to 12.5 kilovolt distribution voltage so that they are electrically compatible with Waterbury Center Substation. Once this work is complete, GMP will seek Section 248 approval to construct a new Waterbury Substation (directly adjacent to the existing substation) to provide full feeder back-up capability in the Waterbury and Waterbury Center service areas. Because the primary reason for this project is to increase reliability rather than load growth, this project will not be subject to DUP analysis.

Other Planning Efforts

Location-Specific Planning: Hinesburg Area

We find that a new substation in the Hinesburg area will likely be needed because, eventually, area load will no longer be reliably served by the 28G2 circuit from Charlotte. GMP is currently examining whether DUP analysis will be required to identify the optimum solution.