St Albans Reliability Plan

February 7, 2014

Executive Summary - On December 27, 2012, the Vermont System Planning Committee (VSPC) filed a report with the Vermont Public Service Board (VPSB) indicating that up to 3.2 MW of additional St. Albans area peak load reductions would be required now to keep loads under the critical load level of 28MW. The magnitude of required load reductions gradually declined over time to 2.5 MW in 2020.

Since that report was filed Green Mountain Power (GMP), with the help of the VSPC, conducted additional studies to refine the load forecast and better understand the magnitude and timing of the reliability deficiency. These additional studies indicate that, even with aggressive assumptions for load growth, the earliest date that additional measures would be required is 2021. Even at that point it is questionable whether the magnitude of the deficiency would require any significant new measures.

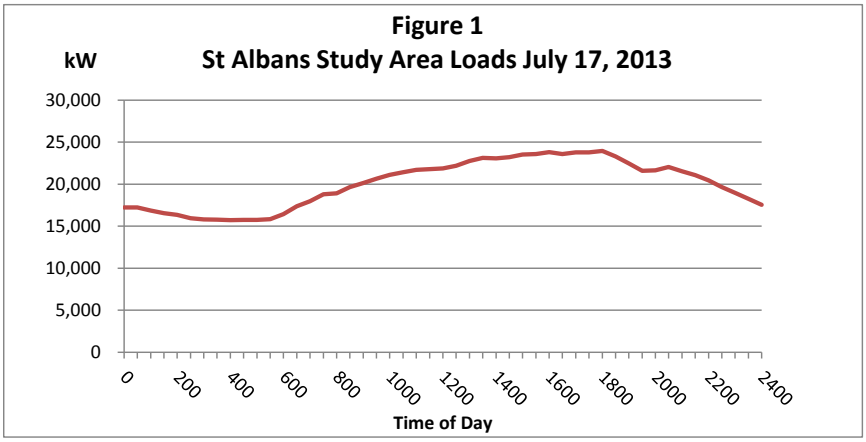
Based on the foregoing findings, no additional new measures to address reliability are warranted at this time. GMP is proposing to collect empirical data over the next two summer peak seasons to verify the refined analysis and adjust the input assumptions as necessary.

A description of the additional studies and resulting findings are presented below.

Load Forecast – The December 2012 report assumed a 90/10 forecast of 26.35 MW plus 5.80 MW of new peak load for a total load of 32.15 MW. The new 5.8 MW of new load would come from "Ability to Serve" letters with an assumed 75% peak coincidence factor.

As a check on the forecast, GMP evaluated peak loads during the 2013 summer season and determined that the peak load for the study area occurred on July 17, 2013. Referring to Figure 1, a peak of 23,960 kW occurred between 6:00 and 6:30 PM. Although this is just one year of data, the extreme weather during this period strongly suggests that this level represents the new 90/10 peak load for the St Albans study area.

Figure 1
St Albans Study Area Loads July 17, 2013



GMP also checked with customers and reviewed the latest available information to confirm the magnitude and timing of the new load associated with the "Ability to Serve" letters. GMP has determined that the Ability to Serve letters now represent 6.0 MW of additional gross load; and that the majority of this load came on line by the end of 2013. The actual peak coincidence factor, however, will

not be known until the entire load comes on line and sufficient empirical data are collected during peak summer conditions.

Using the 75% peak load coincidence factor assumed in the December 2012 analysis, the 6.0 MW of additional load would contribute 4.5 MW to the peak load. As a sensitivity, the analysis was also run with a 90% peak load coincidence factor (5.4 MW of new peak load) to band the uncertainty associated with the new peak load coming from the "Ability to Serve" letters.

With the help of the VSPC, GMP also reconstituted the December 2012 load forecast to explicitly model the following three variables: 1) background load growth; 2) the 1.8 MW of EE earmarked for St Albans for the period 2012 – 2014; and 3) the EE that would come into St Albans for the period 2015 – 2023 under the statewide DRP. To provide modeling flexibility, variable input parameters were created for the peak coincident load factor, the background load growth factor and the solar coincidence factor. Supporting analyses for the 1.8 MW of EE earmarked for St Albans and the EE that would come into St Albans under the statewide DRP are presented in Attachment 1.

Assuming 2% background load growth[1], reconstituted forecasts were developed for two scenarios: a 75% peak load coincidence factor and a 90% peak load coincidence factor. The reconstituted load forecasts are presented below in Tables 1 and 2.

[1] Background load growth refers to the underlying growth that would have occurred if no additional demand side measures were implemented.

Table 1: Sensitivity of Reconstituted Load Forecast and Resulting Gaps (MW)

Critical Load (MW)		Peak Load Coincid. Factor	Bckgrnd Load Growth Factor (%)		Solar Coincid. Factor[2]					
28		75%	2.0%		35%					
Year	Current Forecast MW	Ability to Serve Letters Peak Coincid. Load	Bckgrnd Load Growth[1]	Total Estimated 90/10 Load	Resources Needed	Total EE Statewide + Incr = 1.8MW 2012-2014	2.6% of Statewide 20-yr DRP	Cumulative EE Statewide + Incr	Estimated Gap MW	
2013	23.96	4.50	0.00	28.46	0.46				0.46	0.46
2014	28.46	0.00	0.00	28.46	0.46	0.75		0.75	(0.29)	(0.29)
2015	28.46	0.00	0.57	29.03	1.03	0.35	0.21	1.31	(0.28)	(0.28)
2016	29.03	0.00	0.58	29.61	1.61		0.45	1.76	(0.15)	(0.15)
2017	29.61	0.00	0.59	30.20	2.20		0.47	2.22	(0.02)	(0.02)
2018	30.20	0.00	0.60	30.81	2.81		0.49	2.72	0.09	0.09
2019	30.81	0.00	0.62	31.42	3.42		0.50	3.22	0.20	0.20
2020	31.42	0.00	0.63	32.05	4.05		0.50	3.72	0.33	0.33
2021	32.05	0.00	0.64	32.69	4.69		0.50	4.21	0.48	0.48
2022	32.69	0.00	0.65	33.35	5.35		0.50	4.72	0.63	0.63
2023	33.35	0.00	0.67	34.01	6.01		0.50	5.22	0.79	0.79

Notes;

1 Assumes load from Ability to Serve Letters takes care of background load growth for 2013 and 2014.

2 With the summer peak ocurring later in the day (2013 peak ocurred after 6 PM), use a 35% coincidence (load shape) factor.

Table 2: Sensitivity of Reconstituted Load Forecast and Resulting Gaps (MW)

Critical Load (MW)		Peak Load Coincid. Factor	Bckgrnd Load Growth Factor (%)		Solar Coincid. Factor[2]					
28		90%	2.0%		35%					
Year	Current Forecast MW	Ability to Serve Letters Peak Coincid. Load	Bckgrnd Load Growth[1]	Total Estimated 90/10 Load	Resources Needed	Total EE Statewide + Incr = 1.8MW 2012-2014	2.6% of Statewide 20-yr DRP	Cumulative EE Statewide + Incr	Estimated Gap MW	
2013	23.96	5.40	0.00	29.36	1.36				1.36	0.46
2014	29.36	0.00	0.00	29.36	1.36	0.75		0.75	0.61	(0.29)
2015	29.36	0.00	0.59	29.95	1.95	0.35	0.21	1.31	0.64	(0.28)
2016	29.95	0.00	0.60	30.55	2.55		0.45	1.76	0.79	(0.15)
2017	30.55	0.00	0.61	31.16	3.16		0.47	2.22	0.93	(0.02)
2018	31.16	0.00	0.62	31.78	3.78		0.49	2.72	1.06	0.09
2019	31.78	0.00	0.64	32.42	4.42		0.50	3.22	1.20	0.20
2020	32.42	0.00	0.65	33.06	5.06		0.50	3.72	1.35	0.33
2021	33.06	0.00	0.66	33.73	5.73		0.50	4.21	1.51	0.48
2022	33.73	0.00	0.67	34.40	6.40		0.50	4.72	1.68	0.63
2023	34.40	0.00	0.69	35.09	7.09		0.50	5.22	1.87	0.79

Notes;

1 Assumes load from Ability to Serve Letters takes care of background load growth for 2013 and 2014.

2 With the summer peak ocurring later in the day (2013 peak ocurred after 6 PM), use a 35% coincidence (load shape) factor.

Referring to Table 1, above, the reconstituted forecast based on the peak load observed on July 12, 2013 measurably changes the reliability need from what was reported in December 2012. There is no reliability deficiency through 2017. A 0.09 MW gap appears in 2018 and then slowly increases to 0.79 MW in 2023. By comparison, the December 2012 analysis indicated a 2.64 MW gap in 2014 which increased to 3.22 MW in 2017 and then decreased to 2.52 MW in 2020.

Applying a 90% peak load coincidence factor increases the peak load by 0.90 MW, resulting in a 0.61 MW gap in 2014 which increases to 1.87 MW in 2023.

Resources – The December 27, 2012 filing stated that GMP "consider cost-effective technologies that are not currently supported by Efficiency Vermont (such as ice storage) and encourage the development of generation that has a high on-peak coincidence." GMP assessed five other technologies and the results are summarized below.

3. Small DR – residential customers constitute only ~25% of the load in the study area. We assumed any further savings would be negligible.
4. Large DR – the VELCO Long-Range Plan (LRP) includes 2.5 MW for the study area. Since the LRP was filed, the ISO market rules have changed and the DR provider has withdrawn from ISO-NE. These 2.5 MW came from only two customers. Absent a DR provider GMP could explore contracting with these two customers to secure up to 2.5 MW of DR. Although this corresponds to 10% penetration of the total 25 MW C&I load, it represents only two customers. Therefore, we assumed up to an additional 2 MW of Large DR could be obtained for the Reliability Plan –if needed.
5. Ice storage – based on the pilot program in the Rutland area it appears that up to 1 MW of additional resource would be available in the St Albans study area.
6. Net metering – GMP surveyed the study area and determined 0.269 MW of net metering capacity is currently installed. Using the existing 4% legislative cap as a guide, we assumed an additional 1.128 MW would be available for the 28.46 MW forecasted peak (4% of (28.46-0.269) MW) and 1.164 MW for the 29.36 MW peak forecast. We assumed a 35% coincidence factor (35% of 1.128MW = 0.39MW) to account for the peak occurring later in the day and the existence of rooftop PV solar in the net metering program. The resources were uniformly distributed over the next ten years (0.39MW/10 = 39kW).
7. SPEED – GMP has been able to confirm that a new 2.2 MW PV solar project came on-line on November 3, 2013. A review of the 2013 solicitation indicates no resources are being proposed in the study area. Further, GMP conferred with the SPEED facilitator who indicated no knowledge of future projects being planned for the study area.

In addition, GMP engaged Green Energy Economics Group (GEEG) to develop an EE Calculator to estimate the costs of acquiring additional geo-targeted EE resources to include in the Reliability Plan. Using the calculator, a trial solution was developed to estimate the cost of geo-targeting an additional 300 kW of peak savings for the St Albans study area. The 300 kW would be implemented in 100 kW increments over the years 2015, 2016 and 2017.

Results from the trial solutions indicate that the total program spending over the three years would be approximately $2.2 million. The corresponding total resource cost would be approximately $1.9 million. Because the program targets peak kW savings, energy savings would actually decrease[2] each year by approximately 600 MWH.

The EE Calculator along with the trial solution for geo-targeting an additional 300 kW is presented in Attachment 2. A description of the EE Calculator along with user instructions is presented in Attachment 3.

Gap Analysis – The gap template from the December 2012 analysis was revised to incorporate the above five resources plus incremental geo-targeted EE. A gap analysis was then performed for both load scenarios, the 75% peak load coincidence factor, and the 90% factor. The results are presented in Tables 3 and 4, below. For simplicity the gaps are expressed in terms of kW instead of MW.

[2] EE programs typically target MWH savings. Geo-targeting peak kW savings would shift the emphasis from energy savings to kW savings during the peak, the net MWH savings decreases.

		Table 3: Gap Analysis		28,460	kW				
		Non-Reoccurring Resources (kW)			Resources That Accumulate (kW)				
Year	Resources Needed kW	Small DR[3]	Large DR[4]	Ice Storage[5]	Net Meter[6]	Existing SPEED[7]	Incrmental SPEED	Incrmental GT EE	Gap kW
2014	(287)	0	0	0	39	770			(1,097)
2015	(278)	0	0	0	39				(1,127)
2016	(148)	0	0	0	39				(1,036)
2017	(21)	0	0	0	39				(949)
2018	89	0	0	0	39				(878)
2019	203	0	0	0	39				(804)
2020	334	0	0	0	39				(712)
2021	477	0	0	0	39				(609)
2022	629	0	0	0	39				(496)
2023	795	0	0	0	39				(370)

The footnote references above refer to the resources on page 5.

		Table 4: Gap Analysis		29,360 kW					
		Non-Reoccurring Resources (kW)			Resources That Accumulate (kW)				
Year	Resources Needed kW	Small DR[3]	Large DR[4]	Ice Storage[5]	Net Meter[6]	Existing SPEED[7]	Incrmental SPEED	Incrmental GT EE	Gap kW
2014	612	0	0	0	41	770			(198)
2015	640	0	0	0	41				(211)
2016	789	0	0	0	41				(104)
2017	934	0	0	0	41				1
2018	1,064	0	0	0	41				90
2019	1,197	0	0	0	41				182
2020	1,348	0	0	0	41				293
2021	1,511	0	0	0	41				415
2022	1,684	0	0	0	41				547
2023	1,870	0	0	0	41				693

The footnote references above refer to the resources on page 5.

There is no deficiency during the 10-year study period for the 75% peak load coincidence factor case. Under the 90% peak load coincidence factor case there is no deficiency for the first three years of the study period. A 1 kW gap appears in 2017 increasing to 293 kW in 2020 and to 693 kW in 2023.

Conclusion - GMP performed a detailed analysis of loads, load forecasts and resources to refine the reliability need in the St Albans area. A key unknown in the analysis is the peak load coincidence factor for the 6.0 MW of additional load identified in the "Ability to Serve" letters.

Assuming a 75% peak load coincidence factor and 2% background load growth indicates no deficiency through the 10-year study period. A sensitivity analysis was performed where the coincidence factor was increased to 90% resulting in a 1 kW gap in 2017 which increases to 293 kW in 2020 and then to 693 kW in 2023.

An initial evaluation of substation ratings in the St Albans study area indicates that deficiencies of up to 300 kW can be accommodated through operational measures. Even under the aggressive scenario of 2% background load growth and a 90% peak load coincidence factor, no additional measures would be required until at least 2021 to address the deficiency, if then. Consequently, GMP is not proposing any additional measures at this time. GMP will collect empirical data during the 2014 and 2015 summer peak seasons to confirm the input assumptions and revise the analysis as appropriate.

ATTACHMENT 1

Supporting Analyses

St Albans EE Resources

Analysis of St Albans GT Target 2012 - 2014

St. Albans	2012*	2013				2014				Total Program
	Annual	1st Q	2nd Q	3rd Q	4th Q (Est)	1st Q (Est)	2nd Q (Est)	3rd Q (Est)	4th Q (Est)	
Cumulative savings (kW)	**584**	610	705	805	1,105	1,279	1,453	1,626	**1,800**	
Quarter net savings (kW)	584	26	95	100	300	174	174	174	174	**1,800**
Annual net savings (kW)	**584**	121		221	**521**	174	348	521	**695**	**1,800**

*2012 savings value from EVT Annual Report doc, page47(59)

Statewide DRP

	2015	2016	2017	2018	2019	2020	2021	2022	2023
Summer Peak kW (@ generator @ 10% losses)									
Incremental	16,307	17,326	17,911	18,976	19,325	19,131	19,160	19,287	19,288
Cumulative	16,307	31,996	48,449	65,627	82,203	93,879	110,883	127,493	144,096

Source: 2011 DRP Analysis, February 28, 2012 update. File name "COMBO DRP PST update.xlsm", tab name "Energy Summary".

Notes: Cumulative savings in the source file included savings from 2012-2014. Two methods were used to estimate the cumulative savings beginning in 2015 and then averaged.

The first method was simply to sum the incremental annual savings, which overstates the savings due to not accounting for measure savings decay.

The second method subtracts the 2014 cumulative savings, which understates the savings due to double counting the measure savings decay.

ATTACHMENT 2

EE Calculator

and

Trial Solution

ATTACHMENT 3

EE Calculator

Description and Instructions