NAVIGANT CONSULTING

FINAL REPORT
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Process and Impact Evaluation of Efficiency Vermont's 2007-2009 Geotargeting Program

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1. Executive Summary

In August of 2006, pursuant to 30 V.S.A. § 248(b)(2), the Vermont Public Service Board ("PSB" or "Board") modified the 2006-2008 Efficiency Vermont (EVT) contract to direct a significant portion of the state's energy efficiency investments to specific geographic areas in the state. This became known as the "geotargeting" program also referred to as "GT", and the objective was to concentrate additional efficiency investments into areas that participating utilities identified as good candidates to possibly defer or delay transmission and distribution ("T&D") upgrades. Table ES-1 presents the total Vermont Energy Efficiency Utility (EEU) budget and allocation for geotargeting by year, which shows GT represented approximately 40% of the overall 2009 budget.

Table ES-1. Total Vermont Energy Efficiency Utility (EEU) Budget- and Percent Dedicated to EVT's Geotargeting Program

Year	Total EEU Budget ($ Mil)	Amount of Budget Allocated to Geotargeting ($ Mil)	Percent of Total EEU Budget Allocated to Geotargeting
2006	$19.5	$2.0	10%
2007	$24.0	$6.5	27%
2008	$30.75	$12.2	40%
2009	$30.75	$12.2	40%

Source: From pg 18 of http://www.state.vt.us/psb/document/ElectricInitiatives/eeu_budget_order.pdf

Four geographic areas were "geotargeted" for 2007-2008 within the distribution utility service territories of Central Vermont Public Service, Green Mountain Power, and the Vermont Electric Cooperative. Three of the original geographic areas, and one new area, were geotargeted for the 2009-2011 period. The PSB requested that the Department of Public Service (DPS) "work with Efficiency Vermont and the Vermont electric utilities to develop evaluation measurements that will verify that geographically targeted energy-efficiency can achieve the intended result of deferring transmission and distribution upgrades."

The Navigant team divided this evaluation effort into four majors tasks, two of which addressed process issues, and the other two focused on impact issues. The evaluation focused on four major tasks.

1.1.1. Task 1 Process Evaluation – Target Area Selection and Collaboration

Task 1 is a process review of the GT target area selection and collaboration in the past, as well as how to improve these aspects of the GT programs in the future.

1.1.2. Task 2 Process Evaluation – Program Implementation

Task 2 focused on a review of the effectiveness of Efficiency Vermont's program design and delivery strategy in the GT areas. Attention was focused on the pre-conditions for program delivery, such as the process of establishing specific MW savings goals (overall and prescribed by PSB) and for specific GT regions (not required), as well as the feedback from trade ally stakeholders. Navigant also conducted a customer satisfaction phone survey with approximately 120 commercial and industrial (C&I)

participants, and 120 C&I nonparticipants as to their experience working with Efficiency Vermont and reasons for participating, or not participating in the GT program.

1.1.3. Task 3 Impact Evaluation – Savings Results

Task 3 focused on a review of the targeted additional analyses for the EVT program verification analysis previously conducted for the Vermont DPS (both through its annual verification process as conducted for the Board and in compliance with Forward Capacity Market M&V requirements) , an analysis of the incremental program effects relative to statewide energy efficiency programs in Vermont, as well as program benefit-cost analysis.

1.1.4. Task 4 Impact Evaluation – At the System Level

Task 4 was an impact analysis focused on a review of representative utility substation load data in the GT and non-GT areas. The analysis took into account weather, economic factors, and the movement of large customers into or out of GT areas in developing program savings estimates. And the work for this task includes assessing if a close review of billing data and peak load data indicates whether the impact of GT is observable on utility peak load reports. Conclusions about GT program effectiveness are presented.

The remainder of this Executive Summary presents summarized key findings from each of the four major tasks.

1.2. *Task 1: Process Evaluation – GT Area Selection & Collaboration Process*

Navigant examined the decision making process that resulted in the initial selection of geotargeted areas in 2006 and 2007 and further modifications for the 2009-2011 period. Fourteen interviews were conducted with key stakeholders such as Efficiency Vermont, DPS, and utilities focused on three primary questions:

1. How were decisions made to determine what constrained areas are best suited for Geotargeted efficiency resources (both initially and for 2009-2011 period)?

2. How could the decision-making process have been improved?

3. What methods of communication are being employed?

1.2.1. The Geotargeting Area Selection Process

In 2006 the Vermont Public Service Board (PSB) approved the Northwest Reliability Project under docket 6860, emphasizing that some aspects of that project could have been avoided or delayed with a substantial investment in energy efficiency. Following that project approval, the legislature and the PSB undertook a number of actions that led to the development of a geotargeting experiment that would test whether such reliability projects could be delayed or avoided in whole or in part through concentrated energy efficiency efforts in constrained areas.

These efforts were experimental in nature, covering much new ground without a lot of experience in Vermont or other states to guide the efforts. The geotargeting selection process was informed, but still relatively informal, and enabled the utilities and Efficiency Vermont to quickly put the geotargeting experiment in motion. The first designations in late 2006 were built from the bottom up, by experienced staff in the larger utilities: Green Mountain Power, Central Vermont Public Service, and Vermont Electric Company. Among the municipal utilities Burlington Electric Department took part in early discussions but did not go further.

By early 2007, the PSB approved four initial geotargeted areas. The working group that proposed the geotargeted areas also began work on a set of principles which guided them in the 2009 selection process:

» The geotargeted areas were generally areas in which population and/or economic activity experienced the most growth in previous decades.

» The selected areas were known areas of concern with respect to specific utility systems' transmission and distribution capacity.

» Stakeholders agreed that the minimum planning horizon to attempt to defer an upgrade was two to three years, with preferred horizons of at least five years.

» There were no other circumstances requiring immediate investment.

These principles were sensible as a base upon which stakeholders could build further rigorous geotargeting selection and evaluation protocols. Indeed, the geotargeting selection process was intended to move to the larger venue of the Vermont Systems Planning Committee (VSPC), which the wholesale electric system entity, Vermont Electric Company (VELCO) was charged by the PSB with initiating. In practice, however, although the VSPC was formed and has been functioning, for all intents and purposes the selection process remained with the founding geotargeting utilities. It is not clear from the various stakeholder interviews why the selection process has not advanced further. The best explanation may be that many parties regard geotargeting an experiment waiting for an evaluation to determine its "proof of concept".

The VSPC holds regular meetings and has provided opportunity for public comment in person and through various communications channels. The VSPC Energy Efficiency and Planning subcommittee meets regularly but thus far has not further developed the geotargeting process to produce rigorous, systematic methods for further geotargeting selection. Subcommittee meetings are attended by the committed utility stakeholders and by the representatives of some of the municipal utilities. Public VSPC meetings have been aggressively advertised and held in multiple locations around the state, but have experienced sparse attendance and little public comment.

Some smaller utilities have participated only minimally in the VSPC and many have not proposed any geotargeted areas of their own. There are broad but untested perceptions that there are few or no potential geotargeting areas within municipal utility territories and that view may be correct. But currently there are no analytical tools or the motivations to test further for geotargeting potential among the municipal utilities.

Further, as of 2009, approximately 40 percent of EVT's efficiency funds were directed to the geotargeted areas. These additional resources are collected from all ratepayers but are used to reduce demand only in the geotargeted areas. This raises equity related questions which go beyond the scope of this evaluation, but are worth noting.

1.2.2. Findings and Recommendations

The early GT designations were in large part a proof of concept experiment to determine the extent to which increased, focused energy efficiency could produce demand reductions on a scale that could result in transmission upgrade deferrals. In the rushed and experimental environment that existed in the earliest days of geotargeting (2006), all parties did a good job of developing basic principles and quickly implementing them to select the first geotargeted areas. This work continued in the same vein in 2009, adding one GT area (Rutland) and making some changes in others.

During the period covered by this evaluation (2006-2010), the stakeholders did not significantly advance the geotargeting selection methodology process beyond the initial experimental frame. The work of systematizing a set of rigorous protocols and procedures remains to be done if the geotargeting strategy continues.

Navigant recommends a number of actions that should aid the further development of geotargeting procedures and criteria:

1) If geotargeting is to continue, then the informal selection and planning process used in the first experimental rounds of geotargeting selection and goal setting should evolve into a systematic, consistent set of guidelines, protocols and timelines that will set the entire process into an more comprehensive and transparent format. Utilities suggest that a minimum 5 year horizon is optimal. The important point is to move from a selection approach built substantially on individual utility needs and capabilities to a planning framework that can accommodate individual utility assessments within a standard set of rules and processes, and which also addresses equity concerns.

2) The rigor of the decision-making process should be strengthened and standardized. This should include examining and establishing cost-effectiveness guidelines for geotargeting, in terms of comparing the geotargeting resource choice with other options to address a particular constraint. A standardized process should also include lower voltage segments of the distribution system attuned to the particular needs of those systems, as well as addressing the equity resource question for smaller municipal utilities. If feasible, establish standard time frames specifically for non-emergency geotargeting determinations, considering the process from initial proposal to implementation and evaluation.

3) Although there is now a centralized, long-range transmission planning process within the VSPC, the PSB, DPS, VSPC and other stakeholders need to “connect the dots” so that geotargeting, if found to be a viable long-term strategy is in fact fully incorporated within the planning and implementation of both energy efficiency and transmission planning as intended.

1.3. *Task 2: Process Evaluation - Program Delivery*

Navigant conducted a program process evaluation and examined the following key questions:

» What are the substantive differences between services offered in geotargeted areas versus statewide efficiency programs?

» Do geotargeted (GT) interventions create lost opportunities, where quickly achieved efficiency might prevent future, more comprehensive efficiency upgrades from being cost effective?

» How did C&I participants/ non-participants perceive the GT initiative and their experience with Efficiency Vermont?

» Why did some C&I customers choose not to participate, and what might change their minds?

» What future opportunities are there for EVT to improve the effectiveness or efficiency of its geotargeting delivery?

1.3.1. Comparison of Efficiency Programs in Geotargeted Areas and the Rest of the State

When the first geotargeted areas were selected, EVT conducted an internal assessment of customers and the geotargeted areas and decided to quickly launch a new direct installation lighting program for business customers called Lighting Plus. This turnkey program was designed to rapidly reduce demand through targeted replacement of lighting fixtures primarily for medium-sized business customers, initially targeting customers whose annual usage ranged from 40-500MWh, later dropping the minimum threshold to 10MWh .. Initially the program offered incentives of 100 percent of the installation costs but after a year the incentives were reduced to provide a one year payback to participants, averaging incentives of 90 percent of installation costs. The program brought in many new participants; 71 percent of participants Navigant surveyed were first time participants in energy efficiency programs, and customers were very satisfied with the program. Neither this program nor incentive level was offered in other areas of the state but in other respects, the other EVT programs in the geotargeted areas were similar,, differing only in program size, incentive levels and marketing intensity.

As of late 2010, EVT reported that high transaction costs and lower per customer savings is necessitating a change in the direct installation program. Starting in 2011, the direct install program model is changing, and will be replaced with a more trade-ally-oriented program delivery method that will be offered statewide. Whether these new programs will produce comparable volumes of savings in geotargeted areas remains to be seen.

1.3.2. Did EVT's GT Program Design Limitations Leave Savings on the Table?

The Lighting Plus program captured a great deal of savings in a very short period, more savings than were captured in comparable areas of the state (see Task 3 Impact Analysis). Lighting Plus was intended to capture more than just lighting savings through audits offered by the Lighting Plus contractor and referrals to other EVT programs but this strategy was not as successful as initially envisioned. The imperatives of neighborhood-based intensive customer recruitment and rapid installation appeared to work against achieving comprehensive savings. EVT had more success in working toward comprehensive savings with larger customers served by EVT account representatives.

One program area where savings may have been left on the table is demand reduction load control. EVT was not permitted to directly engage in load control programs (demand response or "DR"). EVT may recommend or even make arrangements with DR providers but currently may not provide incentives or claim savings from DR. That responsibility is left to distribution utilities and it is possible that distribution utilities are adequately addressing the load control opportunities in the geotargeted areas, but Navigant do not have any indication what those opportunities are or what plans there are for providing DR services. EVT may engage in "demand control" measures such as control systems but few measures pass cost effectiveness screening on demand savings alone and there is little activity in this area. Considering that geotargeting is a demand reduction strategy, the lack of a concerted DR effort but for the coincident reductions that arise from the energy efficiency programs appears to miss an opportunity to reduce demand. At a minimum DR assessment and delivery coordinated with energy efficiency and accounted for in the geotargeted areas seems a strategy that should be more seriously considered in the future.

1.3.3. Participant and Non Participant GT Programs Perceptions

The survey of 135 business GT program participants and 121 non participants in the geotargeted areas produced very high rates of satisfaction with the program and with EVT's delivery. The survey revealed the following:

- 71% were first time participants in energy efficiency programs, so EVT was very successful in bringing new participants into the efficiency programs.
- Both participants and non participants had a very high awareness of EVT's programs.
- Most participants came into the program through some form of direct outreach from EVT or its installation contractor.
- Very few of the participants had any onsite generation or participated in any demand response programs.
- In general the participants were larger businesses than non participants with respect to revenues and number of employees
- Overall 12 percent of non participants participated prior to the geotargeting efforts beginning in 2007. Ninety-three percent of those prior participants said the programs satisfied all their energy needs.
- For non participants overall, the greatest reasons for non participation was the belief there was nothing further to do or they didn't own the building (14 percent of 106 responses).

1.3.4. Recommendations

1. If the GT programs are to continue beyond 2011, more attention should be focused to more clearly define specific peak kW reduction goals, by individual GT area, that are both a) realistically achievable given available budget and time for resource acquisition and; b) are anticipated by the utilities to be of a magnitude that will achieve stated goals of deferring or delaying T&D upgrades cumulatively over the period defined in any future GT planning process. Navigant would also recommend that any such GT-area-specific goals be based upon a potential

study analysis of the achievable demand reduction potential in any selected area to ensure that area-specific goals are realistic.

2. Efficiency Vermont should continue its work to increase both the comprehensiveness and penetration of existing efficiency programs in the geotargeted areas, as well as statewide. More attention should be paid to GT nonparticipants who said prior efficiency work satisfied all their needs; that may not be true with the passage of several years.
3. The current energy efficiency potential study or a similar study should assess the DR potential in the current and potential GT areas. Since geotargeting would no longer be in the experimental phase if it continues, geotargeting programs should be built from potential estimates and assessments of the most cost-effective approaches to addressing that potential over a fixed horizon. The horizon would be set such that there would be sufficient time to determine whether the demand reductions possibly achieved will be sufficient to delay or avoid any given T&D expansion project.
4. All avenues for reducing peak load should be explored, including demand response if found to be a viable and cost-effective strategy given target area peak load characteristics.

1.4. Task 3: Impact Evaluation - Program Savings

The fundamental assumption behind the GT programs is that achieving targeted demand savings in a relatively short period of time may allow utility planners to defer or avoid T&D investments. In evaluating the performance to date, the Navigant team considered the following questions regarding GT programs compared to statewide programs:

- Are the GT programs achieving higher participation?
- Are the GT programs acquiring deeper and more comprehensive savings?
- Are the GT programs accelerating the savings?
- Is the level of GT program implementation sustainable?
- What level of peak savings can reasonably be expected to be achieved?
- How much lead time is necessary to achieve the GT savings?

The analysis of EVT's program activity as adjusted by the DPS's previous impact evaluations provides some useful observations.

Overall, EVT acquired savings in the GT areas at a substantially faster rate than through the statewide non-GT programs, about three times faster in some GT regions. This success has been driven largely by high participation rates in the GT areas in the C&I sector. The average savings per C&I participant were slightly higher in the GT areas than the statewide non-GT programs; further investigation suggests that these additional savings are coming primarily from lighting measures. Focusing on the C&I lighting market may provide savings in a short time frame. However, this focus raises a possibility that other end uses may not be adequately addressed; resulting in difficulty and cost in efforts to obtain more comprehensive savings in the future.

GT areas with more commercial and industrial customers have a better record at achieving savings. Rutland and North Chittenden consistently outperformed the other GT regions. In contrast, the Southern Loop, covering a large area that is largely rural, had the worst performance and certain indicators show that the GT programs were only a marginal improvement over the statewide non-GT programs. For example, the winter kW peak acceleration rate is 1.5 for the initial period and 1.2 for PY 2009, indicating that the rate of program implementation during the latter period was similar to the statewide programs. Difficulties in achieving savings in this area were apparently compounded by the high level of seasonal activity in and around the resort areas and a larger concentration of electrically heated resort homes.

In comparison to the overall MW peak reduction goals established by the PSB, EVT's verified savings met 84 percent and 57 percent of the summer peak MW goals and 38 percent of the goal for winter peak MW during both implementation periods (for PYs 2007/2008 and PY 2009, respectively) as summarized in Table ES-2.

Table ES-2. Summary of Winter and Summer Peak MW Goals

Implementation Period	EVT /PSB Negotiated Goal Peak (MW)	EVT Reported Savings Peak (MW)	EVT Reported % of Goal Achieved Peak (MW)	Verified EVT Savings Peak(MW)	Verified % of Goal Achieved Summer Peak (MW)
Winter Peak MW					
PYs 2007/2008	7.74	3.10	40%	3.00	38%
PY 2009[1]	2.40	0.97	40%	0.92	38%
Summer Peak MW					
PYs 2007/2008	7.10	7.10	100%	5.97	84%
PY 2009	7.10	4.62	65%	4.03	57%

In the first two-and-a-half years of program implementation, the GT regions reduced the loads during the designated peak periods by 3.8 percent to 6.7 percent of the 2007 utility peak, indicating that realistic goals for a two- to three-year period are in this range. The greatest percent reduction in comparison to the 2007 utility peak kW occurred in the North Chittenden region.

There are signs that the initial high level of savings in the GT regions may not be sustainable over a longer time horizon as the programs are currently implemented. For some areas, falling participation rates and lower savings per utility premise suggest that it will be more difficult to achieve these

[1] EVT's most recent three-year contract cycle began in 2009 and performance goals are set for the three-year period. The 2009 GT goal is a interim target rather than a firm goal.

accelerated savings in the future. Although the analysis period covers the recent economic downturn, the drop in participation rates was higher in the GT regions, especially Saint Albans and the Southern Loop, than for the statewide non-GT programs.

This analysis provides insight that may be useful for the planning of GT programs. Given the program delivery mechanisms used by EVT, it appears that the accelerated pace can be maintained for two to three years, suggesting that a lead time of three years may provide substantial benefits depending on the level of reduction required. Transmission and distribution (T&D) deferrals that are planned ten years in the future may benefit equally from the statewide programs and not require accelerated implementation. It is possible that modifications to program design, such as focusing on end uses other than lighting or the addition of new lighting technologies, may allow for greater savings through future programs activities. More information about the remaining efficiency potential would need to be collected to support further program planning.

The GT programs as implemented are cost effective using the statewide avoided costs and other Vermont screening tool assumptions. With benefit/cost ratios around 2, there is room to pursue more comprehensive savings that may be more costly to obtain. Modification to program designs to target more comprehensive savings at each site may open up further opportunities for savings in the existing GT regions.

Some of the key findings that form the basis for these conclusions are discussed below.

1. **Verified demand savings are lower than EVT reported savings.** EVT's verified savings met 84 percent and 57 percent of the summer peak MW goals and 38 percent of the goal for winter peak MW, as first negotiated with the PSB, during both implementation periods for PYs 2007/2008 and PY 2009.

2. **The GT programs achieved substantial peak summer and winter reductions incremental to the statewide non-GT efforts.** In aggregate, based on initially reported by EVT and adjusted through a verification review, the programs achieved 1.09 MW of winter peak and 3.94MW of summer peak reduction during the two-and-a-half-year implementation period over and above what would have been achieved at the statewide non-GT implementation rate.[2]

3. **GT programs achieved substantially higher savings per utility premise than the statewide non-GT programs.** Winter and summer peak kW reductions per utility premise in the GT programs were more than twice (100 percent greater than) the non-GT peak savings. This outcome is predominantly due to activity in the C&I sector, where the GT savings per utility premise on average were more than four times greater than the statewide non-GT peak savings during the initial implementation period. In the residential sector, the average GT peak savings per premise were about 25 percent higher than the non-GT statewide peak savings.

[2] The winter peak savings are aggregated only for the GT regions with winter peak PSB goals; the same procedure was used for the summer peak.

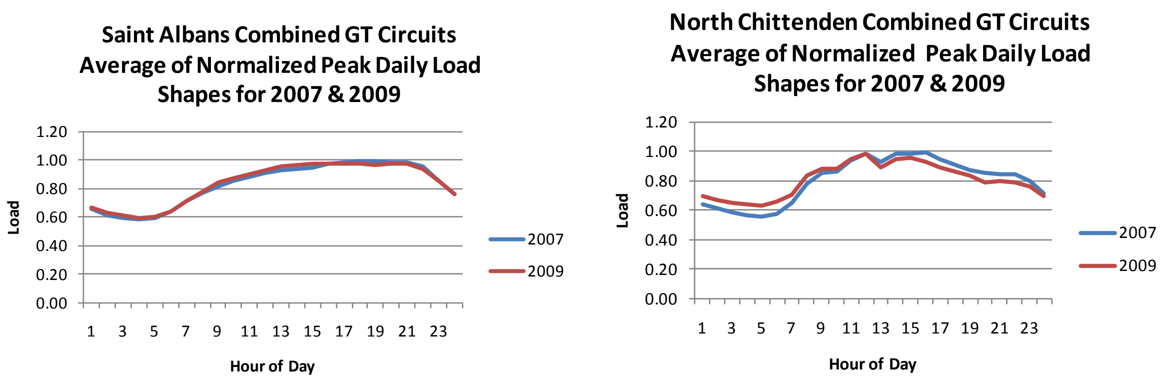
4. **During the initial implementation period, 12 percent of C&I customers in the GT areas participated in an EVT program and installed measures during PYs 2007/2008, as compared with 3 percent in the statewide non-GT areas.** The participation rates among the GT regions were fairly consistent during PYs 2007/2008 (in the range of 10 percent to 13 percent), with the exception of Newport, with a participation rate of 22 percent. This finding indicates that EVT achieved broader savings in the GT regions (i.e., reached a wider range of the customer base).
5. **Increased GT savings are primarily from lighting measures.** Review of EVT's program data indicates that 67 percent of the C&I savings from the GT programs were from lighting as opposed to 49 percent for the statewide non-GT initiatives. In addition, 73 percent of GT participating sites installed only lighting measures as compared to 55 percent for the statewide non-GT activity. These results were reasonably consistent across all GT regions, and not surprising given the program's emphasis on lighting direct install as the core delivery method. In the statewide non-GT programs, 74 percent of sites installed measures in only one end use, as compared to 78 percent in the GT regions. More research would be needed into the remaining potential in each GT region to determine whether there are substantial savings in other end uses.
6. **It would take over twice as long at the statewide implementation rate to meet the level of savings achieved by the GT programs in PY 07/08.** In Chittenden, Saint Albans and Newport, it would take almost three times as long to achieve the summer peak kW reduction through the statewide non-GT initiatives.
7. **Higher GT savings may not be sustainable in some areas as programs are currently implemented.** In PY2009, there was a dramatic decrease in participation across the board, however the drop was more precipitous in the three GT regions with consistent participation over the two-and-a-half years of implementation. Overall, the statewide non-GT participation rate dropped from 3.2% to 2.2% between PY 07/08 and PY 2009 (a reduction of 32%). The three GT regions with implementation during both periods show an average decrease from 11.4% to 4.1% (a reduction of 64%). Further research is needed to assess whether program design changes may result in achieving further savings.

1.5. Task 4: Impact Evaluation - System Level

Task 4 presents Navigant's impact evaluation of the demand savings reported for each of the utilities that have adopted Geotargeting (GT) energy efficiency (EE) programs at the utility system level. The primary goal of the Navigant team's impact evaluation were (1) to determine if it is possible to detect GT program impacts at the utility system (e.g., feeder or substation) level, and if so (2) to examine how customer-level verified savings correlate with observed substation data. The evaluation time frame is from 2007 to 2008. A related goal is to determine what conclusions can be drawn about the relative effectiveness of each of the programs and strategies (in terms of affecting system level load) in the GT areas. In summary, Navigant found that under certain conditions, it appears the GT implementation impacts are detectable at the system level, and that the observed data, in aggregate, appears to correlate with verified data.

As a first step, the team examined peak load day hourly profiles for GT area feeders, normalized to enable a comparison of pre- and post GT program loads. Results indicate minor upward shifts in off-peak usage, but these differences are likely too small to draw definitive conclusions.

Figure ES-1: GT Area Feeder Peak Day Profiles



Similarly, comparison of pre- versus post program GT area load factors appear to support a premise that GT demand reduction can be detected at the system level, as the following table shows a slight upward trend for most areas. A higher load factor indicates the peak demand of the GT area feeders is growing at a slower rate than total energy consumption, which suggests geotargeting programs designed to reduce demand are working as intended. However, these differences are minor and may be due, in part, to other factors such as weather. Continued upward trends as penetration levels increase over time would confirm this observation.

Table ES-3: Load Factors

GT Area	Load Factor (2007)	Load Factor (2009)
Chittenden North	60%	64%
St. Albans	59%	61%
Southern Loop (Winter Only)	53%	54%
Rutland*	53%	51%

To further investigate whether it is possible to detect GT program demand reduction at the system level, the Navigant team compared GT area peak pre- and post-program demands for 3 to 5 feeders in each GT area. The feeders selected generally included those with the highest GT EE participation levels. A critical step in this process was to normalize measured demand reductions to ensure results were not biased due to customer migration, weather effects and economic conditions. In addition, the team examined the impact of demand response and distributed generation on peak demand reduction; preliminary findings indicate neither DR nor DG appeared to have a material impact on measured savings, but additional investigation may be warranted.

Use of normalized factors derived from billing data in each GT area enabled the team to compare participant and non-participant demand and energy usage between 2007 (pre-program) and 2009 (post-program) demand and energy trends during the peak load months.[3] The following table summarizes the results of the normalization analysis for small and large commercial customers, which accounts for customer migration, temperature and economic impacts during this period. The decline in energy consumption in the participant and non-participant groups differs by almost 10 percent, clearly supporting the expectation that GT participants should have a higher reduction in energy consumption (changes in demand shows similar trends), thereby justifying use of GT area billing data for normalizing peak load measurements to account for temperature and weather affects.

Table ES-4a: Billing Analysis Results: Percent Change in Energy Consumption in GT areas *(2009 minus 2007)*

	Participants		Nonparticipants	
GT Area	Total No. of Participants	Change in Average Energy Use (%)	Total No. of Non-Participants	Change in Weighted Average Use (%)
Chittenden	439	-4.6%	2620	-2.3%
Southern Loop	362	-20.3%	2745	-0.6%
*Southern Loop (Less 16i)**	*360*	*-10.5%*	*2745*	*-0.6%*
Saint Albans	279	-4.3%	1953	2.9%
Rutland	220	-8.9%	2168	-1.5%
Total-All Areas	**1300**	**-9.6%**	**9486**	**-0.9%**
Total (Less SLOOP 16i)	**1298**	**-10.7%**	**9486**	**-0.9%**

**Rate class 16i in the Southern Loop represents two commercial customers excluded due to unusually high increases in energy consumption*

[3] June through August for the summer peak, and December through March for the winter peak.

Table ES-4b: Billing Analysis Results: Percent Change in Peak Demand in GT areas
(2009 minus 2007)

	Participants		Nonparticipants	
GT Area	Total No. of Participants	Change in Average Demand (%)	Total No. of Non-Participants	Change in Weighted Average Demand (%)
Chittenden	358	-6.3%	987	-2.2%
Southern Loop	335	-6.6%	1137	-0.7%
*Southern Loop (Less 16i)**	*333*	*-7.9%*	*1137*	*-0.7%*
Saint Albans	262	-2.3%	967	0.1%
Rutland	212	-7.7%	1318	-1.3%
Total-All Areas	**1167**	**-0.6%**	**4409**	**-1.3%**
Total (Less SLOOP 16i)	**1165**	**-5.3%**	**4409**	**-1.3%**

**Rate class 16i in the Southern Loop represents two commercial customers excluded due to unusually high increases in energy consumption*

The following table compares the savings reported by EVT, Task 3 verified savings and the Task 4 demand savings for 2007 and 2008 combined, with Task 4 savings normalize to account for customer migration and the billing analysis data presented above. The comparison indicates that in aggregate, total GT area demand reduction estimates compare favorably to Task 3 verified savings, but with greater uncertainty at the feeder level. The latter finding is not unexpected, as the level of savings (7 MW) is a small percentage of the total GT area load (180 MW) – less than five percent. The small percentage savings introduces a greater likelihood of variability in measured results compared to savings that would be achieved for a higher number of participants.

Table ES-5 Composite Demand Reduction for Representative GT Area Feeders

GT Area	EVT 2007/08 Reported Savings (MW)	Task 3 Verified 2007/08 Net Summer Savings (MW)[1]	Task 4 2007/08 Observed Savings (MW)
Chittenden North	2.6	2.5	2.4
St. Albans	2.3	2.1	0.6
Southern Loop	2.0	1.5	3.8 [1]
Newport/Derby	0.8	0.6	-
Rutland[2]	1.6	1.6	1.3
Total (Non-Coincident)	**9.3**	**8.3[3]**	**8.2**

1) Winter savings only are reported for CVPS Southern Loop

2) 2009 savings only
3) Task 3 reports coincident peak (CP) savings only

Navigant also conducted a similar analysis that compared statewide EE programs savings in non-GT areas to those obtained in GT areas. Findings indicate the level of demand savings from GT programs versus statewide programs do not show a high level of variance in demand savings for the summer peak months. This preliminary finding suggests only modest enhanced savings have been achieved from GT versus statewide EE programs.

1.5.1. Conclusions

Navigant's impact evaluation of GT area load patterns indicates savings from customers participating in the program can be detected at the utility system level, but with some uncertainty, particularly in areas with large shifts in electric consumption among customers. It is critical that factors that could influence or bias measured load reductions are identified, and normalization methods applied to adjust these savings to account for customer migration, economic factors, and where relevant, temperature variances at peak. From its analysis of these factors Navigant determined that:

- Use of utility billing records that specify participants versus nonparticipants provides data that can be used to normalize measured load reductions over time, particularly for customer migration and where local economic factors impact electric demand, and;

- The relatively low level of demand reduction versus total GT area load for this impact evaluation—less than five percent—introduces potential anomalies or errors that can distort demand trends that would otherwise have less impact for a larger population of participants.

In summary, study results indicate that at the system level, in aggregate, energy and demand savings are being achieved and correlate with calculated savings derived from verified reported savings (e.g., EVT reported savings adjusted for forward capacity market factors). However, at the feeder level, energy and demand savings are less easily observed due to other factors that affect feeder load, including economic conditions, weather, customer migration, and load transfers between feeders. Prospectively, distributed generation and demand response programs increasingly may impact demand at the time of the feeder peak.

Further, the Task 4 scope of this study was limited to an 18 month period. Studying the effects of GT at the feeder level over a longer period may produce more conclusive observations, recognizing that a longer time period also allows for other factors such as customer migration and the economy to impact feeder loads. Accordingly, the best course of action may be to begin GT programs in a constrained area far enough in advance of the need date (e.g., 5 years at minimum) and track loads annually to assess the combined effect that GT and non-GT factors have on the feeders (without trying to disaggregate these effects) and adjust plans for T&D upgrades accordingly.

2. Introduction

In August of 2006, pursuant to 30 V.S.A. § 248(b)(2), the Vermont Public Service Board ("PSB" or "Board") modified the 2006-2008 Efficiency Vermont (EVT) contract to direct a significant portion of the state's energy efficiency investments to specific geographic areas in the state. This became known as the "geotargeting" program, and it targeted specific areas of the state that according to utilities were good candidates to possibly defer or delay transmission and distribution ("T&D") upgrades through energy efficiency. The Board's directive to focus efficiency investments in specific areas was to assess how quickly energy and demand savings could be acquired in a concentrated area, and in so doing, implement a real world experiment to see if these larger efficiency investments can actually defer or delay anticipated future T&D upgrades. [4] Four geographic areas were "geotargeted" for 2007-2008 within the distribution utility service territories of Central Vermont Public Service, Green Mountain Power, and the Vermont Electric Cooperative. Three of the original geographic areas, and one new area, were geotargeted for the 2009-2011 period. The PSB requested that the Department of Public Service (DPS) "work with Efficiency Vermont and the Vermont electric utilities to develop evaluation measurements that will verify that geographically targeted energy-efficiency can achieve the intended result of deferring transmission and distribution upgrades."

This process and impact evaluation report is a response to the PSB's directive, and was completed under the direction of the DPS by Navigant Consulting, along with their subcontractors West Hill Energy and Computing and Grimason Associates, referred to hereafter as "Navigant". All parties interviewed for this evaluation repeatedly mentioned the "experimental" and "proof of concept" context of the entire geotargeting effort, and by association, emphasized that this should considered in the evaluation review.

With that in mind, the purpose of this evaluation is to aid Vermont stakeholders in efforts to determine whether geographic targeting of energy efficiency services can be an effective option for deferring or avoiding transmission and distribution projects and will provide observations and recommendations with respect to the process employed for target area selection, collaboration, and program delivery. The valuation also makes observations related to the measured impacts and analyzes effects on specific circuits. The work contemplated here necessarily includes the input and participation from a number of affected parties. Efficiency Vermont; the affected Distribution Utilities; Vermont Electric Power Company, Inc. ("VELCO"); and the Vermont System Planning Committee ("VSPC") played a significant role in providing data and feedback to this evaluation effort.

2.1. *Evaluation Tasks*

The Navigant team divided this evaluation effort into four majors tasks, two of which addressed process issues, and the other two focused on impact issues. Overall, the study seeks to address the researchable

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[4] Order at 3, *Order Re Geographic Targeting of EEU Funds*. January 8, 2007. See: publicservice.vermont.gov/energy-efficiency/orderregeographictargetingoriginal.pdf

questions in the Evaluation Plan for the Geographically Targeted Energy Efficiency Programs in Vermont.[5]

The four major task headings, and a summary of the key research questions are presented below.

2.1.1. Task 1 Process Evaluation – Target Area Selection and Collaboration

Task 1 is a process review of the GT target area selection and collaboration in the past, as well as how to improve these aspects of the GT programs in the future. Specific research questions are:

4. How were decisions made to determine what constrained areas are best suited for Geotargeted efficiency resources (both initially and for 2009-2011 period)?
5. How could the decision-making process have been improved?
6. What methods of communication are being employed?

2.1.2. Task 2 Process Evaluation – Program Implementation

Task 2 focused on a review of the effectiveness of Efficiency Vermont's program design and delivery strategy in the GT areas. Attention was focused on the pre-conditions for program delivery, such as the process of establishing specific kW savings goals (overall and prescribed by PSB) and for specific GT regions (not required), as well as the feedback from trade ally stakeholders, and a phone survey with approximately 120 commercial and industrial (C&I) participants, and 120 nonparticipants as to their experience working with Efficiency Vermont and reasons for participating, or not participating in the GT program. Other research questions of this task include:

1. What are the substantive differences between services offered in Geotargeted areas versus statewide efficiency programs?
2. What is the perceived remaining potential for cost-effectively achievable energy efficiency savings in each area?
3. What is the identified timeframe necessary for GT to be effective at deferring T&D upgrades?
4. What future opportunities, if any, are there for EVT to improve the effectiveness or efficiency of its Geotargeting?
5. Do GT interventions create lost opportunities, where quickly achieved efficiency might prevent future, more robust efficiency measures and/or generation additions from being cost-effective?

2.1.3. Task 3 Impact Evaluation – Savings Results

This task focused on a review of the targeted additional analyses for the GT program verification analysis previously conducted for the Vermont DPS (in compliance with Forward Capacity Market M&V requirements) , an analysis of the incremental program effects relative to statewide energy efficiency programs in Vermont, as well as program benefit-cost analysis. Research questions addressed:

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[5] Filed by the Vermont Department of Public Service, May 11, 2010, pages 4-8.

1. What were the verified energy, demand, and TRB savings in each of the targeted areas over the initial 18 month implementation period? In 2009? What was the overall and winter and summer levelized cost per kW in each area? Per kWh?
2. To what extent did EVT accomplish its specific 2007-2008 objectives for geographically targeted areas, and for 2009.
3. What were the peak demand reductions, incremental to statewide savings that would have been achieved absent GT policy, by GT area monthly, annually, and over the initial 18 month implementation period?
4. How do savings impacts compare in both magnitude and cost with savings achieved contemporaneously in non-GT areas?
5. What do results suggest about how cost-effective are the GT electricity savings achieved in each of the GT areas?
6. Beyond overall impacts, what can be determined about the relative impacts and cost-effectiveness of the various specific GT strategies, programs, and measures? What do these results suggest about future GT efforts?
7. What do the results suggest about whether Geotargeted energy efficiency interventions are a "no-regrets" strategy? (I.e., is it a cost-effective and beneficial investment even if it turns out not to be a least-cost T&D alternative or unable to defer or eliminate a particular T&D upgrade?).

2.1.4. Task 4 Impact Evaluation – At the System Level

Task 4 was an impact analysis focused on a review of representative utility substation load data in the GT and non-GT areas. The analysis took into account weather, economic factors, and the movement of large customers into or out of GT areas in developing program savings estimates and assessing if a close review of billing data and peak load data indicates if the impact of GT is observable on utility peak load reports. Conclusions about GT program effectiveness are presented- which address representative questions like:

1. What are the trends shown by analysis of hourly substation data?
2. Is it possible to detect GT program impacts at the utility system level?
3. How do verified achieved savings correlate with the observed substation data?
4. What conclusions can we draw about the relative effectiveness of each of the programs/strategies (in terms of affecting system level load) in the GT areas?

2.2. Report Organization

The remainder of this report is organized as follows, consistent with the four major tasks of the evaluation:

- » Section 3. Process Evaluation: Target Area Selection and Collaboration
- » Section 4. Process Evaluation: Program Implementation

» Section 5. Impact Evaluation- Program Savings

» Section 6. Impact Evaluation –System Level Savings

» Appendices

3. Task 1: Process Evaluation- Target Area Selection and Collaboration

3.1. Introduction

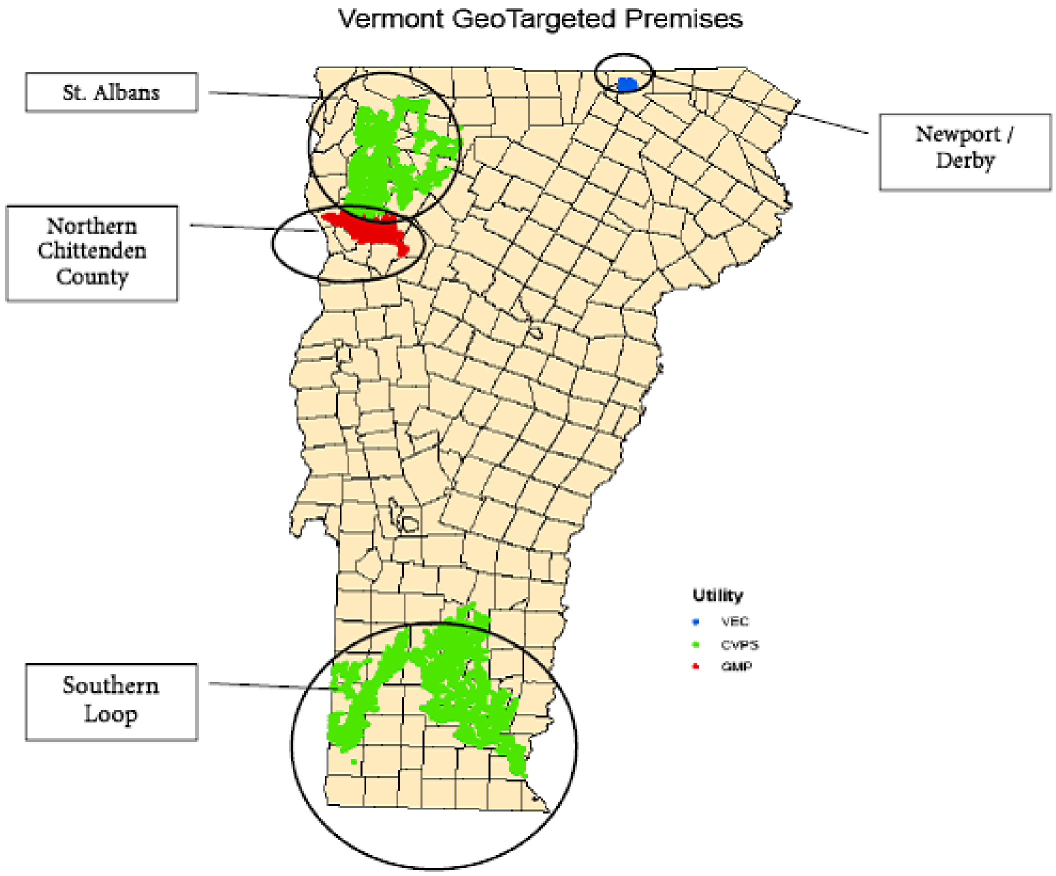
In 2006 and 2007, the Vermont Public Service Board (PSB) issued Orders that increased Efficiency Vermont's (EVT) overall budget from $17.5 million to $19.5 million in 2006, $24 million in 2007, and $30.7 million in 2008. The PSB stipulated that the increased budget amount be dedicated to programs in soon to be defined specific geographic areas, "geotargeted", with a stated goal of attempting to defer or delay transmission and distribution (T&D) upgrades[6]. The first four geotargeted areas were chosen in early 2007 and Efficiency Vermont responded in the same year with a variety of initiatives aimed at reducing peak load. Although demand reductions were key to the geotargeting concept, Efficiency Vermont did not directly engage in any direct load control efforts in geotargeted areas. EVT may recommend or even make arrangements with DR providers but currently may not provide incentives or claim savings from DR. EVT may engage in "demand control" measures such as control systems but few measures pass cost effectiveness screening on demand savings alone and there is little activity in this area. . As such, EVT's strategy to reduce peak demand was exclusively focused on savings through energy efficiency programs.

Facing an aggressive timeline to select target areas, design, and launch efficiency programs, EVT, utilities, DPS, and other stakeholders convened a series of meetings and selected four geotargeted areas, which were later approved by the PSB. This chapter focuses on the context, history, and decisions which led to the target area selections and the collaboration process used by stakeholders to work jointly on this new initiative.

Figure 1 shows the 2007–2008 map of geotargeted areas.

[6] "It is expected that the targeting of energy efficiency funds in the four areas identified can defer the need for transmission and distribution upgrades in these areas,.." PSB Order January 8, 2007, p5

Figure 1. Map of 2007–2008 Geotargeted Areas



Source: Efficiency Vermont 2007–2008 Annual Plan

The DPS, in their evaluation plan scope of work, identified the following three specific sets of questions relevant to this chapter[7]:

1. How were decisions made to determine what constrained areas are best suited for geotargeted efficiency resources (both initially and for the 2009–2011 period)?
2. How could the decision-making process have been improved?
3. What methods of communication are being employed?

[7] *Evaluation Plan for the Geographically Targeted Energy Efficiency Programs in Vermont*, filed by the Department of Public Service, May 11, 2010.

The DPS Evaluation Plan also tasked the evaluator to note additional issues uncovered during the examination of the decision-making process and to look forward at barriers and opportunities that might affect additional geotargeting initiatives and suggest improvements. This chapter addresses these issues and makes recommendations for improving the processes.

3.2. Methodology

The Navigant team conducting a series of semi-structured, in-depth interviews with 14 stakeholders who were involved in the initial and/or subsequent GT target area selection process. The interviews also focused on both minimum and optimal time- planning horizons for GT target area identification, and the communication process with stakeholders, particularly with respect to members of the general public and their representatives.

The DPS and the Navigant team jointly determined which specific stakeholders should be interviewed, seeking both depth and breadth among the parties involved. The final list of 14 interviews included representatives from:

- Vermont Department of Public Service (DPS)
- Vermont Systems Planning Committee (VSPC)
- Efficiency Vermont (EVT)
- Central Vermont Public Service (CVPS)
- Green Mountain Power (GMP)
- Vermont Electric Cooperative (VEC)
- Vermont Public Power Supply Association (VPPSA)
- Regulatory Assistance Project (RAP)
- Morrisville Water and Light Department

In presenting the findings of these interviews, Navigant has chosen to characterize responses primarily by issues, noting consensus where there was broad agreement. Where there is some diversity of opinion, Navigant has generally characterized the perspective from which the observations and recommendations were made but has not always identified a statement or characterization as the official position of Organization A or Organization B, unless it was communicated as such to Navigant. Navigant has taken this approach to reporting because roles and perspectives have changed over time, some people in the same organization differ in their views, and these issues continue to be the subject of discussion. The intent of this evaluation was for key stakeholders to speak frankly and reflectively, not simply state positions of their respective organizations. Navigant believes this format for presenting the issues and perspectives will assist all parties in making further determinations about geotargeting.

In addition to the stakeholder interviews, the Navigant team reviewed a number of key documents, including PSB Orders, Efficiency Vermont Annual Reports, 2006 and 2009 Long-Term Transmission Planning reports, documents describing the Vermont System Planning Committee's structure, operations, and meeting notes.[8] The Navigant team conducted this research for background and better contextual understanding of the perspectives offered by geotargeting stakeholders.

3.3. Initial Target Area Selection Process

This section of the report addresses the following evaluation questions:

1. How were decisions made to determine what constrained areas are best suited for geotargeted efficiency resources (both initially and for the 2009–2011 period)?
    a. What criteria were used to determine constraints that made an area a potential candidate for geotargeted efficiency?
    b. What information was available at the time decisions had to be made?
    c. What were the obstacles encountered in the decision-making process?
    d. Have any changes to the decision-making process for target area selection been made? If so, how have they improved or worsened the ability to determine candidates for geotargeted efficiency efforts?

Based on conversations Navigant team members had with a range of stakeholders and a review of Public Service Board documents, it appears that one of the primary reasons for creation of the geotargeting program was the negative public reaction to the building of a major transmission line upgrade, referred to as the Northwest Reliability Project under Public Service Board (PSB) Docket 6860. In that docket, the PSB approved the project but noted that Vermont Electric Company (VELCO) had not made sufficient efforts over time to find alternatives that might have delayed or avoided parts of the project. Subsequent actions, including legislative passage of 30 V.S.A. § 218c(d) as part of Act 61, resulted in extensive PSB-guided planning for the implementation of what came to be known as geotargeting throughout 2006 in a series of informal workshops open to a variety of stakeholders. These workshops led to proposals by Vermont utilities that led to the initial geotargeting efforts.

The PSB also issued several orders in this time period discussing and providing direction on, among other topics, how Efficiency Vermont's budget increases should be employed with respect to geotargeting, and how the DPS, utilities, and Efficiency Vermont should determine which areas would be geotargeted. In January 2007, PSB issued an order authorizing the four areas selected for geotargeting by the utilities and other parties.[9]

Finally, the PSB issued Order 7081 (June 6, 2007), which required VELCO *"to establish and to prepare a transmission-system plan jointly with any other electric companies that own or operate these facilities, after public hearings and opportunity for input by the distribution utilities, the state's Energy Efficiency Utility (the "EEU"),*

[8] A comprehensive listing of related PSB documents on geotargeting is available at: http://psb.vermont.gov/docketsandprojects/eeu/geographictargeting

[9] *Order Re Geographic Targeting of Energy Efficiency Utility Funds*, January 8, 2007. This order recapitulates the planning process and accepts the four geotargeted areas proposed in a December 4, 2006, joint utility proposal, and directs Efficiency Vermont to implement the targeted energy efficiency program.

the Vermont Department of Public Service ("DPS" or the "Department"). The order recognized and adopted a joint Memorandum of Understanding (MOU) supported by all Investor-Owned Utilities and all but three municipal utilities. The MOU laid out goals and a detailed structure for developing long-range, comprehensive transmission plans as well as the public, transparent processes to be used by Vermont System Planning Committee.

3.4. Initial Geotargeting Area Selection Was Informal and Collaborative

Under DPS guidance, the initial selection process began with the technical working group (ordered by the PSB on September 25, 2006) in October 2006, in which Green Mountain Power proposed a template for assembling data to make selections. The utilities held another workshop in November 2006 and in December, a group of four utilities—GMP, CVPS, VEC, and VPPSA (representing municipal utilities), proposed the PSB approve four geotargeted areas, including two in CVPS service territory, one in GMP service territory and one in VEC service territory.

The participants in the 2007 workshops had several data sources to rely upon in making their geotargeting selections. These data sources included first, the assessments of current and future needs that drove the Northwest Reliability Project. Several people interviewed for the GT evaluation stated that this project satisfied major bulk power needs for the foreseeable future (although no one provided a time frame).

VELCO's *2006 Vermont Transmission System 10 Year Long Range Plan Analysis, Volume 1,* principally focused on transmission needs at 115-kilovolt (kV) levels and higher. A six-stage analysis looked at bulk power needs throughout the system, including a number of reliability-based generation and interconnect issues involving in-state and Independent System Operator New England (ISO), as well as considering generation and other non-transmission alternatives. This analysis assumed the level of demand-side management (DSM) funding would continue at approximately 2006 levels, providing roughly 30–35 MW savings over the study horizon. Approximately 20 projects were considered overall, and the report states that DSM alternatives were considered but did not detail them.

In addition to the bulk system analyses and scenario planning that VELCO performed, the larger Vermont utilities had internal planning resources in the form of sophisticated analysis tools and the staff resources to make use of those tools. Each of the larger utilities employed a variety of analytical tools, though not the same tools, to consider upgrade and replacement needs in their systems. The utility staff performing system needs analyses were experienced in these operations, though load planning was only a part of their responsibilities. Thus, the larger utilities had a strong internal sense of their system planning needs. CVPS and GMP also had experience with prior DSM programs and believed they could account for increased energy efficiency impacts in their estimation of where geotargeting could do the most good in deferring or delaying upgrades. There was a simple form that all the utilities used that answered very basic questions for any proposed GT area. However, there was no standard methodology, used by all the stakeholder utilities in making these estimations. The stakeholders making the geotargeting decisions looked at the energy efficiency resources that would become available and estimated the likely energy efficiency impacts by projecting ramp-up rates of the existing programs.

Municipal utilities participated in the workshops for the first geotargeting cycle but did not propose any GT areas in any of their service territories. Anecdotal responses of individuals interviewed for this study generally reflected the opinion that smaller municipalities were not likely to be good geotargeting candidates because few municipal utilities have or expect to experience significant growth in population or other economic activity. This conclusion may be correct; however, it may also partly reflect the lack of a rigorous approach that addresses the needs of municipal systems.

Table 1 shows the proposed areas as well as transmission and distribution (T&D) constraints as identified in 2006.

Table 1. Initial Utility Geotarget Selections

	Distribution Constraint	Transmission Constraint
CVPS	Southern Loop - DSM has the potential to defer distribution line loading problems on the Manchester 12.47-kV circuits.	This targeting will also positively impact constraints on the Southern Loop 46-kV sub-transmission.
Utility	Distribution Constraint	Related Transmission Constraint
GMP	Colchester, Winooski, Essex, Williston, South Burlington Area- DSM has the potential to defer the (2010) New Gorge VELCO Substation and related infrastructure improvements, the (2014) third distribution feeder in Winooski, and the (2016) Essex VELCO Substation Upgrade and related infrastructure improvements.	This targeting could also positively impact numerous problems identified in the VELCO's Long Range Transmission Upgrade List.
VEC	Newport and Derby Area - DSM has the potential to extend the useful life of VEC's Newport 20 MVA transformer (located within VELCO Newport Substation) and a 5 MVA transformer at VEC's Derby Substation.	This targeting also helps reduce demand when the Newport-Derby area load is served by VELCO. This benefit is secondary to the benefit of reducing the potential distribution constraint.
Total*	4	205
Large Customers	1	500

*One customer in S. Loop did not know their kW generation capacity, so the total and average are based on 3 responses.

The meetings that were held in late 2006 were primarily discussions among the largest Vermont utilities. Efficiency Vermont sometimes participated, as did DPS staff. PSB staff did not participate in the discussions, since the matter was before the PSB, The PSB subsequently reviewed and approved he proposals that came out of them[10]. Under the circumstances, with a very limited time frame until implementation of geotargeted energy efficiency (June 2007), the process employed to screen and select GT areas was accepted by the PSB.

[10] Op Cit PSB Order 1/8/2007.

3.5. *Criteria Used for Target Area Selection*

The parties conducted the above described workshops as explorations. Geotargeting was new and unproven but potentially, according to a rational theory, it could be expected that the targeted DSM activities could help to defer or avoid system T&D upgrades and could be a much cheaper way to meet these utilities' reliability needs than the construction of additional transmission lines, substations, or similar high-cost upgrades. (Note – Task 4 of this evaluation considers this theory) Some utilities favored the lower cost energy efficiency investments that in theory should defer or delay expensive infrastructure investment, and as such, more enthusiastically supported the GT experiment. The utilities selected priority areas based on known areas of historical system constraints or areas currently experiencing rapid load growth, with little or no new formal and detailed quantitative analysis. CVPS proposed a "bullseye" approach. A bullseye area would be one that experienced or anticipated distribution, transmission, and sub-transmission needs. This characterization applied to varying degrees to three of the selected geotarget areas, though not to Chittenden. GMP did not characterize its constraints in a similar fashion.

In this first round of geotargeting, all parties interviewed in this study were aware they were embarking on a new and untested experiment at this scale. Vermont is not the first state to try a geotargeted approach, with some of the parties having experience attempting to defer T&D upgrades in Vermont's Mad River Valley in the 1980s. However, relatively speaking, in late 2006 and early 2007 there was little experience in other states to draw upon. And some of that recent experience, such as Con Edison's targeted DSM implementation in New York City, involved very different environments. Lacking existing established objective standards or criteria to guide the parties in their selections, or the time to prepare such criteria given the urgent nature of the directive to geotarget, the utilities relied heavily upon their experience and understanding of their own systems to select likely targets. The utilities were rich in this experience; staffs who were involved in the geotargeting selection typically had more than 20 years' experience with their systems. Additionally, the larger utilities had staff resources and planning tools at their disposal (utilities varied considerably in this respect) that allowed them to project changes in load expected over time because of expected population growth, increased economic activity in their service territories, and other system factors. Finally, there were commonalities in the areas selected:

- The geotargeted areas were generally areas in which population and/or economic activity experienced the most growth in previous decades.
- The selected areas were known areas of concern with respect to specific utility systems' transmission and distribution capacity.
- Stakeholders agreed that the minimum planning horizon to attempt to defer an upgrade was two to three years, with preferred horizons of at least five years.
- There were no other known circumstances requiring immediate investment.[11]

As a result of the target area selection process, the stakeholders jointly selected four geotargeted areas with a focus on either summer or winter peak reductions. The initial areas designated were Chittenden

[11] Green Mountain Power's "Gorge Area Reinforcement project", though falling within the informal criteria, was ultimately required for reliability concerns.

North (summer peak), St. Albans (summer and winter peak), Newport/Derby (summer peak), and the Southern Loop (winter peak). Three of the four areas were within the service territory for Vermont's two largest utilities, CVPS and GMP. Of these areas, the Newport/Derby area was subsequently dropped after one year of targeted DSM when the Vermont Electric Cooperative determined that it must replace existing transformers because of destabilization of the substation property due to river flooding.

Subsequent to the December 2006 target recommendations, a group consisting of CVPS, GMP, VEC, DPS, Efficiency Vermont, and PSB met in February 2007 to consider specifics of the geotargeting programs in the proposed areas, the goals for the programs and protocols for developing geotargeting selection, as well as ongoing communication and coordination. Following the February meeting, a preliminary proposal was drafted delineating likely protocols for future geotargeting selection, including cost-effectiveness concerns with respect to planning and evaluation, among other issues. The draft proposes ongoing work with EVT to continue to report and refine targeting; however, it's not clear that this has happened with any consistency.

The 2009 target selection process did not appear to differ substantially from the 2006 process. Utilities performed there in house analyses and following workshops, CVPS and GMP jointly proposed additions in the Chittenden area, as well as adding Rutland to the Southern Loop and a new area in Brattleboro. In August 2008, the PSB had authorized geotargeting to continue through 2011, with the exception of the Newport area, which had been dropped, authorized the existing geotargeting areas to continue and accepted the addition to Chittenden and the Rutland area but not Brattleboro in its November 4, 2008 Order. The utility submissions for 2009 did not appear to differ significantly from the 2006 proposals and those interviewed for the evaluation study did not indicate there were significant differences in the process or presentation compared with 2006. A group of municipal electric utilities did not recommend geotargeting expansion, saying it was a transitional time and with the planning process transitioning to the VSPC, this was not the right time to consider further changes. The PSB, however, commented favorably on the early geotargeting results and desired geotargeting to continue to gain a full understanding of what it could accomplish.

3.6. Planning Horizons

The active workshop participants did not have a clear set of time-line criteria and worked from their own experience in assessing what planning time lines were needed to consider a geotargeting designation and the delay or deferral of a transmission upgrade.

The absolute minimum time line for which a geotargeting designation for deferral should be made was set by everyone interviewed at no less than two to three years. However, that short time line often comes with the concern that a project that close to construction may well need to be built regardless of any efforts to defer or avoid it.

A more realistic time line for properly assessing a geotargeting project was set by respondents at five years. A five-year time line would allow full analysis and consideration of all alternatives in addition to the usual planning, certificate of need, and permitting needed for infrastructure improvements.

Navigant notes, however, that decisions by individual large customers, such as ski areas, can have significant impacts on system planners, sometimes without sufficient notice being provided to the distribution utility to be able undertake the sort of planning needed for transmission alternatives. Local generation and combined heat and power appear to be good solutions for such outlier facilities. However, the reality of incorporating these approaches into complicated development of physical and financial plans is often a much greater challenge than it might appear

3.7. GT Target Area Selection and Efficiency Vermont

Efficiency Vermont was a party to the early GT selection discussions and fully participated but was not a determinative player. The direction from the PSB was to determine the extent to which geotargeting could defer or delay infrastructure investments and to implement the efforts quickly, beginning in 2007.

Only in the Southern Loop were prior formal studies conducted of the potential peak demand savings in the selected GT areas before those areas were selected. Historically, EVT's most heavily weighted goals and performance standards were tied to achieving primarily energy reductions; demand savings were not as heavily weighted in performance metrics as energy savings, nor were they evaluated with as much rigor. EVT's program planning and annual reporting determined demand reductions coincident with the energy savings they achieved with their programs. EVT staff said they were not compensated for achieving load shifting that occurred without accompanying energy savings and EVT did not and does not offer demand response (DR) programs as per a contract agreement with Public Service Board, EVT may recommend or even make arrangements with DR providers but currently may not provide incentives or claim savings from DR.

The process of determining kilowatt (kW) goals in each of the four GT areas was to a considerable extent guided by the allocation of budget to the GT areas. Previously, EVT was required to allocate its entire budget for program services by population, to ensure that all areas of the state had equal access to the EVT efficiency programs. However, under Order 7081, the PSB determined that additional EVT budget above its previously approved level of $17.5 million should be allocated to the GT areas. EVT was not provided with specific guidance as to GT budgets per specific area, but rather overall budget across all designated GT areas. Expenditures in the GT areas are allocated to GT for the purposes of reporting. Table 2 indicates total budget approved by the PSB for 2006–2008 and the "difference" assignable to geotargeting, which as of 2009 represented 40% of total EVT budget.

Table 2. Total Vermont Energy Efficiency Utility Budget- and Amount Dedicated to EVT's Geotargeting Program

Year	Total EEU Budget ($ Mil)	Amount of Budget Allocated to Geotargeting ($ Mil)	Percent of Total EEU Budget Allocated to Geotargeting
2006	$19.5	$2.0	10%
2007	$24.0	$6.5	27%
2008	$30.75	$12.2	40%
2009	$30.75	$12.2	40%

Source: From pg 18 of http://www.state.vt.us/psb/document/ElectricInitiatives/eeu_budget_order.pdf

Vermont Created the System Planning Committee to Produce a Centralized, Accessible, and Transparent Forum to Develop Long- Range Transmission Policy and Implementation

On June 6, 2007, the Public Service Board ordered VELCO to create the Vermont System Planning Committee (VSPC) in Order 7081. This proceeding was an outgrowth of the earlier Docket 6860, as well legislative enactments in Act 61 that required transmission owning companies that have no retail service to prepare transmission plans jointly with other electric utilities. In the 7081 proceeding, settling parties, which included all but three of Vermont's investor-owned and municipal utilities, offered an MOU, which proposed the creation of the VSPC.

3.7.1. Broader Participation

The VSPC was intended to serve as an accessible central planning organization to anticipate future transmission needs and to provide utilities and all other stakeholders adequate time and opportunity to thoroughly examine transmission and non-transmission alternatives, appropriately value them in a least-cost framework, and finally present them to the public with ample opportunity for public comment and input into the final decisions. In order to promote openness and transparency, the MOU establishing the VSPC provided for voting and nonvoting participants.

Municipal utilities are required to take part in the VPSC planning activities. However, the appearance of overwhelming voting power by municipal utilities is somewhat misleading. In general, most individual municipal utilities do not participate actively. They are represented by the Vermont Public Power Supply Authority, because most municipal utilities do not have the resources to participate. Even then the VPPSA chair says there are too many meetings and the meetings are too long to allow for active participation on issues of interest to VPPSA members. Resource constraints remain a problem with respect to municipal utilities' ability to participate in both the full committee and the Energy Efficiency and Forecasting subcommittee. The VSPC has played a role in GT discussions, and will be referenced further in this report.

3.8. The 2009 Geotargeting Selection Planning Process

The 2009 VSPC Transmission planning process brought more parties to the table and had a more formalized process that included public posting of plans and significant opportunity for public comment. However, the process did not significantly differ in its end results with respect to because its focus was on Non Transmission Alternatives and not specifically geotargeting. Geotargeting work went on in a parallel but apparently a somewhat unconnected process in which utilities conducted their internal analyses and then jointly proposed new GT areas and modifications to some existing areas directly to the PSB.

Efficiency Vermont has historically operated on a three-year contract, budget, and program cycle. The PSB increased the EVT annual program budgets in 2006 and changed the equitable allocation of program funds to provide for expenditures focused on the geotargeted areas. The next budget cycle began in 2009, which was also the time of the next planned revision of the long-range transmission plan, the first such plan to be developed under the Vermont System Planning Committee. This coincidence of requirements provided the opportunity to revisit the geotargeting programs as well as the allocation of program dollars to the geotargeted areas.

The VSPC initiated a process in 2009 that attempted to explicitly define some criteria for considering non-transmission alternatives (NTAs). These alternatives included the following screening questions:

1. Is the proposed project's cost expected to exceed $2,000,000?

2. Could elimination or deferral of all or part of the upgrade be accomplished through the use of non-transmission alternatives?

3. Is the likely reduction in costs from the potential elimination or deferral of all or part of the upgrade greater than $1,000,000?[12]

Under these screening criteria, the VSPC listed eight projects that might have Non Transmission Alternatives ranging from 15 to 100 MW, with expected in-service dates ranging from 2013 to 2021.

Having identified these projects as possible NTA projects, the plan did not suggest what sort of alternatives might be employed, putting those off for further analysis. The plan discussed additional factors that would affect decisions in any particular instance where NTAs are considered, including the following:

» The proposed transmission alternative must be in the "right" place, relative to the deficiency it would ameliorate.

» The alternative must be available when it's needed to resolve deficient conditions.

» An alternative may address more than one type of deficiency, such as a demand response program or local generator that addresses both transmission and transformer concerns.

However, the key statement in the 2009 Long-Term Transmission Plan appears to be the following:

> *Vermont distribution utilities are responsible for integrating consideration of non-transmission alternatives into the analysis of solutions to reliability deficiencies related to transmission facilities. The affected distribution utilities will supply the human and financial resources and information necessary to conduct or oversee the detailed analyses, including identification of alternatives, with respect to the reliability deficiencies identified in the plan.* ***The affected utilities must identify a lead distribution utility that is responsible for ensuring that detailed non-transmission alternatives analyses are completed in a timely manner.***[13] *(emphasis added)*

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[9] Source: *2009 Vermont Long-Range Transmission Plan, Attachment X, Form for Selection of Transmission Analysis Identified Projects for Non Transmission Alternative Evaluation.*

[13] *2009 Vermont Long-Range Transmission Plan*, pp 31-32.

The ultimate burden for moving forward with the critical work to determine non-transmission alternatives, including increased energy efficiency programs, demand response programs, and local renewable or fossil generation, rests with the distribution utilities. These determinations are highly technical assessments within the context of traditional utility planning. They do not open the process to systematically incorporate the perspectives reflected in the 6860 and 7081 proceedings and in the many public comments recorded on the VSPC website regarding the 2009 plan. However the connection between the transmission planning activity and renewed geotargeting in this period remains unclear.

Geotargeting is not mentioned in the 2009 Long-Range Transmission Plan. The plan does discuss demand side management and energy efficiency generally, and it notes that the state's energy efficiency programs have reduced electric usage by 460 gigawatt-hours, an eight percent reduction in electric use (nearly the generation of the Vermont Electric Cooperative).

Meanwhile, the PSB revisited geotargeting in a November 11, 2008 Order. The PSB entertained CVPS' petition to add three new geotargeted areas and accepted only Rutland. However, the PSB said that that EVT "should consider" expanding its Lighting Plus commercial lighting direct installation program to Brattleboro, one of the proposed areas because of anticipated future constraints, which seems somewhat contradictory to focusing efforts on the GT areas. GMP proposed the expansion of the Chittenden geotargeted area, which was accepted. The DPS and the municipal utilities opposed the geotargeting expansion the DPS believed the Lighting Plus program had saturated its target areas and that more cost-effective energy efficiency would be realized if the EVT funds were allocated statewide. The PSB, in approving some of the expansion and continuing geotargeting, noted "As long as the programs are cost effective, the investment will be a benefit to Vermont even if the geographic targeting does not ultimately defer a particular transmission project."

3.9. VSPC's Role Is Still Developing with Respect to Geotargeting

Despite the centrality of the VSPC and the Energy Efficiency and Forecasting subcommittee's workload and output, stakeholder consensus appears to be that the VSPC has not yet been successful in achieving the purposes of having a fully operable and implemented approach, methodology, and process for additional geotargeting beyond the narrow band in which it has so far functioned. There is no consensus about why this is the case. The range of people interviewed believe the elements of a consistent, comprehensive approach to geotargeting are in place. They also believe, however, that the whole has not yet come together despite the efforts of a range of individuals and organizations.

The VSPC has not developed clear, consistent criteria for designating areas for geotargeting. The larger utilities continue to work with the forecasting and management tools they have employed for many years; however, they have not collectively reached for the principles and practical approaches that would guide a consistent approach across the state. The VSPC has expanded its planning horizon to 20 years as required by the PSB, but has not yet produced the overall vision of its mandate. At this writing a DPS-sponsored overall Demand Resources Plan is in development and although it is not connected to the VSPC, perhaps the findings of that plan will provide some data and context for future geotargeting planning. VSPC has not reached into the lower voltage municipal systems to closely examine the potential for geotargeting on those systems. Some have argued that there is no mandate for the VSPC to consider anything but the bulk power transmission system; however, the municipal utilities are included within the scope of the VSPC.

The VSPC has not captured public attention with its plans, despite making efforts to make the plans and the opportunity for comment known to the public. There are a number of explanations offered for the difficulties encountered by the VSPC process in its attempt to capture public attention in the aftermath of a very robust public process that arose out of the NW Reliability Project proceedings. These explanations include:

- The NW Reliability Project addressed a substantial portion of Vermont's long-term needs. There are no more large projects on the horizon that will capture public attention in the same manner or degree. In addition, there has been little to no load growth in recent years, which is most often attributed to the depressed state of the economy, weather, and Efficiency Vermont activities. Evidence cited for this view is that similar load conditions exist throughout New England and much of the rest of the country as well.

- Because GT impacts have not been measured by an outside evaluator until now, the stakeholder interviews uncovered some uncertainty about the extent to which the geotargeting should be encouraged or even continued beyond the current cycle of programs. The absence of evidence in either direction has not helped motivate stakeholders to produce the robust approach to geotargeting that is needed to analyze individual opportunities and to engage the larger discussions about planning.

- Another explanation offered by some is that the discussion about system planning that takes place in the VSPC may be too narrow in scope, too focused on the individual utility distribution systems, and not focused enough on the broader concerns that were raised in Docket 7081.

However, some believe GT energy efficiency efforts have already had a lasting impact on the need for additional transmission and facilities; achieving the full GT impacts requires sustained efforts over time. In their proposal to the PSB of February 2007, the utility supporters of geotargeting stated that geotargeting would not produce real impacts in the first 18 months of operation. The real impacts would be cumulative; long-term demand reductions would accumulate from Efficiency Vermont's year-by-year installation of energy efficiency measures.

3.10. GT Equity Considerations

Amendments to Acts 61 and 208 following the Northwest Reliability Project required the PSB to balance, among others, three objectives when approving energy efficiency programs:

- Providing the opportunity to for all Vermonters to participate in efficiency programs;

- The value of targeting efficiency efforts to locations, markets or customers where they may provide the greatest value; and

» Limiting the need to upgrade the state's transmission and distribution infrastructure.[14]

Prior to the legislative changes and the September 25, 2006 PSB Order, Efficiency Vermont's budget was structured to allocate its services proportionally across the state according to population, to achieve equity of service to energy efficiency contributions by ratepayers. In light of the added requirement to limit the need for transmission and distribution upgrades, the PSB concluded in this Order that increases in the Energy Efficiency Utility's budgets should be dedicated to this new requirement, and in this and subsequent budget orders, continued the practice of dedicating efficiency funds above the base amount to what became geotargeting. Thus in 2006, an additional $2 million was dedicated to achieving "peak capacity reductions and ultimately toward energy and capacity reductions in targeted geographic areas"[15]. That amount increased to $6.5 million in 2007, and $12.2 million for 2008-2009, ultimately dedicating 43% of the EVT budget to geotargeting.

This level of resource dedication has drawn some concern, particularly from municipal utilities, whose ratepayers are paying for the added GT programs, but are not seeing the direct investment of efficiency in their territories, the municipal utilities do not currently have any GT areas. Despite expressing support for the original areas selected in the December 2006 joint GT designation proposal to the PSB some municipalities feel locked out of the process. They feel they are in effect subsidizing the larger utilities and their ratepayers because a large percentage of municipal utility ratepayers' contributions to the energy efficiency funds for EVT.

A central question which this evaluation could not assess is the extent to which this efficiency resource allocation benefits all ratepayers including municipal ratepayers and the extent to which the geotargeting savings benefit only the ratepayers of the affected distribution utilities. Understanding that question in discrete quantitative terms with respect to kW saved and more important, the value of the statewide and individual GT participant utilities' savings, would allow the PSB and stakeholders to address some critical questions that were beyond the scope of this evaluation:

» What is the balance of benefits among the geotargeted areas and all other ratepayers?

» If other distribution utilities join geotargeting efforts, how will the balance of benefits be affected? With a rigorous planning and valuing methodology, the balance of benefits can be estimated for any proposed GT area or the GT areas as a whole. Is the current allocation of all efficiency resources above the base amount appropriate relative to the level of benefits derived?

» How and when should the designation of efficiency resources be determined for both the target areas and the state as a whole going forward? The balance of funds designated for GT areas would be a dynamic relationship that may vary over time depending upon the extent of GT efforts, known performance in achieving demand reductions as GT continues and the state's energy efficiency goals. The determine of the relationship factors is a matter for further work.

» Are the potential T&D deferrals from the GT programs in the specific GT region of statewide benefit, or simply of benefit to the utility in the GT area, and if so- would it make sense for

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[14] Cited in PSB *Order Re: Targeting of Portion of Energy Efficiency Utility Budget*, September 25, 2006

[15] Op Cit PSB Order 9/25/2006

ratepayers in the GT area to cover costs of enhanced GT programs, versus all ratepayers statewide?

3.11. Target Area Selection and Collaboration: Key Findings and Recommendations

This chapter section summarizes the strengths and weaknesses of the geotargeting selection and collaboration processes undertaken by all parties during the initial geotargeting selection period in 2006 and 2007, and during the subsequent period in 2009.

A) Target Area Selection – First Cycle (2007–2008)

3.11.1. Strengths

» Ad hoc, the larger Vermont utilities quickly and efficiently jointly selected a set of four areas in which to initiate the geotargeting experiment. They made these decisions based upon their long history of managing their systems and intimate knowledge of them. They quickly specified the particular circuits to be included and provided Efficiency Vermont with the locational information necessary to begin EVT geotargeting programs within four months of selection.

» The PSB ordered VELCO to establish the Vermont System Planning Committee to be a central body incorporating all long-range transmission planning activities for all public and private entities in the state. Non-Transmission Alternatives, including energy efficiency, are an important part of the VSPC's mandate.

» The utilities made progress in developing high-level criteria through early 2007 in the expectation those criteria would be further developed by the Vermont System Planning Committee. The utilities quickly determined minimum time lines for considering geotargeting against the need to build distribution and transmission improvements.

» Efficiency Vermont conducted an internal assessment of potential in the geotargeted areas and set reasonable but aggressive program goals based upon the available budgets. Efficiency Vermont quickly mobilized geotargeting through expansion of existing energy efficiency programs in the selected areas and quickly implemented the programs.

3.11.2. Weaknesses

» Geotargeting was considered to be a potentially important aspect of the state's electric energy planning process; however, in their urgency to begin the experiment, stakeholders did not complete a robust estimation of the potential for demand reductions through geotargeting, or a robust planning process to set other parameters to measure success. There was no prior assessment, for example, of demand reduction potential in the targeted areas or statewide to consider their impacts. Geotargeting was set in motion to see what it would produce in the way of demand reductions in the selected areas.

- Smaller municipal utilities were not fully engaged in the initial geotargeting selection, though a representative of the VPPSA did participate in workshop meetings in early 2007. Nonetheless, smaller municipals continue to feel somewhat locked out of the geotargeting process.

- The PSB's assignment of energy efficiency budget allocations in excess of Efficiency Vermont's prior authorized budget to the geotargeted areas was somewhat arbitrary. There was no prior clear analysis of what could be expected from that allocation. The individual geotargeted area budgets were proportional to their percentage of the system need; however, the energy and demand reduction goals were determined from the budget allocated to each area, rather than from some assessment of potential. It was generally assumed that geotargeted savings would come at a higher cost than Efficiency Vermont's other programs because of the goal of quickly generating substantial savings; however, there was no formal analysis, that we discovered, as to the cost and benefit trade-offs of such an approach prior to directing Efficiency Vermont to spend its budget over its prior base on geotargeting. This analysis is still needed in no small part because on an equity basis, smaller municipal utilities remain concerned that they are in effect subsidizing efficiency for the larger utilities.

B) Target Area Selection Second Cycle (2009–2011)

3.11.3. Strengths

- The 2006 utility workgroup developed a set of general principles that guided the follow-up 2009 proposals. These general principles made sense within the experimental framework as overall guidelines and appeared to have effectively served their purpose for this period.

- The VSPC produced its first Long-Range Plan under new legislation and regulatory orders to consider NTAs.

3.11.4. Weaknesses

- Geotargeting remained the province of the larger utilities. There was little to no participation by smaller municipals in selection of additional geotargeting in their service territories or participation in the VSPC.

- The VSPC 2009 Long-Range Plan announced some high-level requirements of NTA consideration and named eight potential projects in which NTAs could be further explored, but did not mention geotargeting as a specific strategy.

- The connection of the VSPC planning process and PSB decisions on 2009 areas remains unclear. Although the PSB's intention seems to have been that the VSPC would be the center of transmission related planning activities, which of necessity would include the gamut geotargeting of geotargeting-related decisions, when the first opportunity to engage came in 2008, the selection process appears to have again happened in a workshop environment outside the VSPC. This seems a distinct disconnection from one of the VSPC's intended functions.

3.11.5. Recommendations

- Demand reduction potential assessment is needed in considering extending or expanding geotargeting. If this assessment is not part of ongoing potential assessments it should be studied for this application, with particular emphasis on cost-effectiveness under an appropriate cost-effectiveness framework that considers, on a unified basis, the costs of potential physical improvements against the cost of efficiency. Given that the utilities recommend lead times of at least five years to determine if energy efficiency can avoid a given upgrade, and costs will not be fully known, there is an element of uncertainty in such estimates or any planning framework with a horizon of that length. However with increased experienced with geotargeting the uncertainties are likely to decrease and the projection of costs and benefits to become more accurate over time. That there are uncertainties should not in itself be reason not to engage in the assessment of proposed geotargeting projects.

- The equity question should be reexamine**d**. Consideration should be given to whether any continued or expanded geotargeting should be allocated a proportional amount of the total EVT budget based upon potential savings, cost of saved energy, and/or similar metrics, in preference to the current assignment of geotargeting funds. If for example GT areas represent 30% of statewide sales and revenue, but are receiving 40% of statewide EVT budget, then a proportional system benefit charge plan, tied to collections by geographic region, could be established to compensate for the 10% added investment in the GT areas compared to other statewide investment spending percentages. The details of such a process will be far more complex but the principles are straightforward.

3.12. Collaboration Process – Summary Conclusions

Geotargeting was initiated as policy and implemented with a selection process that very rapidly designated four geotargeted areas (and later modified them). These efforts were experimental in nature, covering much new ground with little relevant experience in Vermont or other jurisdictions available to guide the efforts. The geotargeting selection process was relatively informal and enabled the utilities and Efficiency Vermont to quickly and efficiently put the geotargeting experiment in motion, in an effort to determine what savings could be realized in an intensive, focused effort where there were known transmission and distribution constraints.

If geotargeting is to continue, it is recommended that stakeholders move from an experimental environment into a more systematic approach to planning, implementation and evaluation. The need for reliable data about the potential savings that can be realized and the value of geotargeting is especially important if Vermont is to realize the best value from the combination of transmission planning and energy efficiency. The need for broadly applicable, transparent protocols and procedures is important to providing the sort of information that stakeholders can analyze and compare among the choices that developed for transmission planning. Navigant concludes there is room for considerable improvement in the geotargeting decision-making process and that a truly systematic policy and analytic framework would increase the likelihood of effectively delaying or avoiding transmission and distribution upgrades through investment in geographically targeted energy efficiency efforts.

- If geotargeting is to continue as a Vermont strategy to delay or avoid transmission and distribution upgrades, then the informal selection and planning process used in the first experimental rounds of geotargeting selection and goal setting should evolve into a systematic, consistent set of guidelines, protocols and timelines that will set the entire process into a comprehensive, transparent format. Utilities suggest that a minimum 5 year horizon is optimal, which seems reasonable. The important point is to move from a selection approach built substantially on individual utility needs and capabilities to planning framework that can accommodate individual utility assessments within a standard set of rules and processes.

- Although there is now a centralized, long-range transmission planning process within the VSPC, the PSB, DPS, VSPC and other stakeholders need to "connect the dots" so that geotargeting, if found to be a viable long-term strategy is in fact fully incorporated within the planning and implementation of both energy efficiency and transmission planning as intended.

- The geotargeting process is still too limited even within the utility world. If GT continues, efforts are needed to extend the planning process to smaller distribution utilities and facilitate their effective participation up to and including initiating any geotargeting efforts of their own. DPS and the PSB should explore a proceeding to determine the most equitable and cost-effective means of allocating geotargeting resources and costs across all utilities. Stakeholders need to address the equity resource question for smaller municipal utilities with respect to assessing and planning possible geotargeting in their service territories.

- The decision-making process should be strengthened and standardized in the following ways:

    a) Review and enhance the systematic cost-effectiveness analysis of efficiency as one part of overall integrated resource planning.

    b) Establish standard time frames specifically for non-emergency geotargeting determinations, considering the process from initial proposal to implementation and evaluation as described in the overall recommendation.

    c) Review and if necessary improve coordination with state agencies that have planning responsibilities so distribution utilities are informed that large impact development projects such as ski area expansions or new manufacturing or data-intensive facilities are on the utility planners' radar as early as possible.

    d) Establish and implement an evaluation methodology for monitoring and verifying the impacts of geotargeting activities. Establish a periodic review by the DPS on behalf of the PSB of the entire geotargeting process as a part of the three-year budget cycle. Consider the cumulative effects of demand reductions in the geotargeted areas compared to the cumulative effects of demand reductions achieved in the rest of the state through EVT efficiency programs. Time this evaluation to inform area selection and funding decisions.

e) Address the equity issues through a systematic assessment of the balance of geotargeting benefits among the geotargeted areas and the rest of the state addressing at least the following questions:

- What is the balance of benefits among the geotargeted areas and all other ratepayers?
- If other distribution utilities join geotargeting efforts, how will the balance of benefits be affected?
- Is the current allocation of all efficiency resources above the base amount still appropriate to the level of benefits derived?
- How and when should the designation of efficiency resources be determined going forward?
- Complete a financial analysis which reviews in detail actual vs. theoretical financial benefits of potential T&D delay or deferral in specific GT areas, versus the overall benefits of statewide demand reductions.

f) Ensure that adequate oversight resources are in place on an ongoing basis for planning, oversight and evaluation necessary to ensure that all geotargeting aspects are executed at the highest standards, maximizing geotargeting value to Vermont ratepayers.

4. Task 2: Process Evaluation -Program Implementation

4.1. *Introduction*

This evaluation task focused on a process review of EVT's program design and implementation of efficiency programs in the geotargeted areas. The Navigant team conducted interviews and reviewed background materials related to the program designs, organization, and implementation experience to date from the perspective of Efficiency Vermont, the primary implementation subcontractor, Rise Engineering (RISE), participating trade allies, and phone surveys with commercial and industrial (C&I) participant and nonparticipant customers. This process review covered the period of 2007- present.

4.2. *Key Questions*

The process evaluation review examined the following key questions:

» What are the substantive differences between services offered in geotargeted areas versus statewide efficiency programs?

» Do geotargeted (GT) interventions create lost opportunities, where quickly achieved efficiency might prevent future, more comprehensive efficiency upgrades from being implemented, either because they are not cost effective or customer cost is too great a barrier?

» How did C&I participants/ non-participants perceive the GT initiative and their experience with Efficiency Vermont?

» Why did some C&I customers choose not to participate, and what might change their minds?

» What future opportunities are there for EVT to improve the effectiveness or efficiency of its geotargeting delivery?

4.3. *Methodology*

The Navigant team conducted the process evaluation using the following techniques:

» A review of program documents, including Efficiency Vermont annual plans and annual reports, PSB Orders and other docketed materials, marketing materials, the Efficiency Vermont website, online forms, and related materials

» In-depth interviews with key Efficiency Vermont program staff

» In-depth interviews with EVT's Lighting Plus program subcontractor RISE Engineering, and five other participating trade allies.

» A telephone survey with approximately 120 C&I program participants and 120 C&I nonparticipants, distributed evenly among the four initial geotargeted areas (30 participants and 30 nonparticipants in each GT area), covering the period 2007 through 2009. The survey examined attitudes toward the geotargeting program, experience for participation and nonparticipation, and customer perspectives on program improvements.[16]

The Navigant team completed process interviews with the program administrator, the Lighting Plus implementation contractor and five other participating trade allies. The complete list is found in Appendix.

4.4. What Are the Substantive Differences Between Services Offered in the Geotargeted Areas Versus Statewide Programs?

The most significant difference in program design for the GT regions was EVT's decision to launch a large-scale and aggressive C&I direct-install lighting program and briefly a refrigeration programs that was soon made statewide. Additionally, EVT implemented early in the launch of the GT program a one-time large scale direct-mailing CFL coupon initiative to residential customers in the GT area. EVT also heavily promoted the sale of compact fluorescent lamps (CFLs) in the GT areas through numerous community campaigns in the GT regions and more aggressive marketing. Aside from these efforts, Efficiency Vermont essentially offered the same programs and services throughout the state as offered in the geotargeted areas. EVT did offer higher incentives in programs delivered in the GT areas.

4.4.1. Programs in the Geotargeted Areas

Following the PSB Orders to launch the geotargeting program, Efficiency Vermont initiated a number of changes in its business programs. Efficiency Vermont developed a new business program, Lighting Plus, a direct installation program offered solely in the geotargeted areas. This is the first program of its kind offered by EVT. In Lighting Plus, EVT issued a request for proposal and competitively selected a single contractor to be responsible for all phases of program promotion and administration. EVT selected Rise Engineering, to be the implementer of Lighting Plus. Under direction from EVT, Rise Engineering opened a Vermont office and implemented the program by using a large team of independent Vermont-based trade allies (participating contractors) to install lighting measures as specified in the Rise initial facility on-site audit. EVT also required that lighting equipment be sourced from Vermont-based lighting suppliers, which was reported to yield price discounts in equipment due to volume sales. To kick-start participation in the GT program, the initial 18 months of the Lighting Plus program (2007/2008) was offered at 100 percent incentive, with no cost to the customer at all; starting in 2009, incentives were calculated for one-year payback, which generally required a customer contribution of 10 percent of the cost of the project. This policy continues through 2010 and the program's expected termination in the first quarter of 2011. EVT expressed the belief that requiring some customer contribution reinforces the energy-saving message to the customer—having some "skin in the game"—even though participation in 2009 decreased, partially as a result of the change in incentive structure. According to EVT, participation has declined as the program has reached willing large customers in the targeted areas. Remaining customers who have not been served are generally smaller businesses that are not as cost effective to

[16] Given constraints of the evaluation, surveys were not conducted with residential customers.

serve with this model program. Traditional EVT lighting programs offered in the rest of the state offered significantly lower incentive levels.

Lighting Plus savings have been the primary savings driver in the summer peaking geotargeted areas. The initiative was designed to quickly capture lighting savings in the expectation that these savings would also be coincident with the system peaks, thus meeting the geotargeting demand reduction goals. The Lighting Plus contractor was also expected to identify additional savings opportunities while completing initial on-site audits, and to refer customers to EVT's other programs, as well as notify EVT. However, EVT reports that one of the biggest challenges with the Lighting Plus program has been to adequately capture additional energy saving leads, beyond lighting, through the initial on-site audit, and the mechanism did not yield the volume of comprehensive efficiency projects EVT envisioned.

Express Refrigeration was initially focused on the geotargeted areas, but is now available statewide. Express Refrigeration targeted economizers and was initially focused on the winter peaking areas; however, its target area was first expanded to the summer peaking areas and then to the entire state. Refrigeration savings are particularly important in the Southern Loop winter peaking geotargeted area, where many savings opportunities are relatively small. With paybacks set at a one-year buy-down (approximately 75 percent incentive), the program was attractive but the need for economizers was limited. Efficiency Vermont packaged Lighting Plus and Express Refrigeration into a statewide convenience store initiative, seeking to install multiple measures while keeping transaction costs low. This strategy was successful until it reached saturation with respect to the number of eligible facilities that could be served, as reported by EVT and the implementation contractor.

With respect to residential programs, EVT sought to rapidly increase the penetration of CFLs. EVT initiated a number of community-based events and promotions in geotargeted areas, and also undertook direct outreach to residential customers. Statewide, EVT negotiated a number of cooperative agreements with lighting distributors and retailers to provide upstream incentives to further encourage CFL purchases, especially focused in the GT regions.

4.5. Program Changes and Marketing

New programs and changes to existing programs were primarily statewide but had particular marketing and recruitment emphasis within the geotargeted areas. Thus, Key Account Management focused on large customers generally, first starting at 1,000 annual MWh and later reduced to 500 MWh annual consumption.. EVT noted in its 2007 annual report that large geotargeted customers accounted for almost 60 percent of all savings reported for the business sector in that year. Statewide, Efficiency Vermont initiated a Compressed Air program, which also operated within the geotargeted areas and was heavily marketed there. In winter peaking areas, EVT similarly directed intensive efforts to ski areas and process improvements in any manufacturing facilities where efficient motors, pumps, and similar equipment and control strategies could produce savings coincident with the winter peaks.

In sum, for the most part, the range of program offerings provided to customers in the geotargeted areas did not significantly differ from the offerings provided in the rest of the state, with the notable exception of Lighting Plus and early on, Express Refrigeration. EVT's approach was to implement the special lighting programs and to supplement those savings by scaling up its other programs in the GT areas Starting in 2011, the Lighting Plus program is scheduled to be terminated and be replaced with new programs called newLIGHT and RELIGHT, which will be offered statewide. The Lighting Plus direct installation effort undertaken by EVT in the geotargeted areas has, in the opinion of both RISE and EVT, saturated the target market for this type of program design. Beginning with customers having 50,000 annual kWh, the program progressively targeted smaller and smaller users throughout the geotargeted areas.

Part of the value of Lighting Plus was the ability of the turn key contractor to focus on specific localities and blanket them with concentrated outreach. Such efforts can create a local "buzz" as businesses see their neighbors getting their lighting replaced at very little cost. As the Lighting Plus program progressed and areas were saturated, the remaining non participants were often physically further apart, losing some of the economies of scale and effort of the neighborhood approaches. As time went by, the remaining non participants were resistant to multiple solicitations. RISE reports that nonparticipants have been approached many times and does not see likely recruitment of businesses that have thus far declined to participate or not responded at all to continued marketing. The non participant survey supports this conclusion, showing a very high awareness of the EVT programs (85%), so Navigant must conclude that those who did not participate did not want to or did not believe they could participate. According to EVT, savings opportunities are still present in the original GT target areas, but program designs and delivery tactics need to evolve.

4.6. GT and Lost Opportunities

As described in Chapter 3, geotargeting was ordered by the PSB in 2007 with a sense of urgency, in order to quickly test whether it is possible to effectively delay or reduce the need for constructing costly new transmission and distribution infrastructure through increased energy efficiency. EVT's decision to implement a large-scale direct installation program, specifically focused on lighting, was a purposeful strategy to achieve immediate GT peak demand reduction goals. Although peak demand reduction goals have, in large part, been met, the question of whether GT, as currently implemented, creates lost opportunities, is an appropriate topic for review and raises the following question:

» Are all achievable savings opportunities being identified during the audit phase and are effective efforts being made to capture additional savings beyond the direct installation offerings?

» Should measures and approaches that are currently off the table due to PSB directives, particularly load control and other forms of demand response, be included within the scope of EVT's efficiency services (or some other provider or purview of the utilities directly) in the interest of achieving peak savings?

» Can the pace of the direct installation programs be sustained over time in the same GT areas, given that there is a finite population of small businesses and the outreach and marketing have been intensive for more than three years?

4.6.1. Are Savings Left on the Table in Geotargeted Areas?

In seeking to answer the question of lost opportunities, the Navigant team focused principally upon the Lighting Plus direct installation program because it was the largest program and acquired the most savings. Direct installation programs are employed by many program administrators across the country and they have a number of attractive features. They are relatively simple to administer and they do not require excessive involvement from customers, particularly when the program administrators offer to pay 90-100 percent of the total installation cost. The Lighting Plus program did not redesign lighting. Fixtures may be repositioned, but the common practice was one for one fixture replacement, often with de-lamping (e.g., four-lamp fixtures changed to three-lamp fixtures). This type of program is particularly adaptable for concentrated-area and neighborhood-intensive marketing and installation campaigns. This strategy is therefore effective for rapidly and economically acquiring lighting savings. It also inherently sacrifices some lighting savings that could be achieved with more attention to lighting design, proper lighting densities for the spaces being lit, and overall attention to the most efficient lighting use.

Similarly, although EVT attempted to address more end use improvements through audits conducted by its implementation contractor, the goals of speed, efficiency and comprehensiveness were somewhat contradictory to EVT's program design. The Lighting Plus program called for auditors to assess the comprehensive savings opportunities in each facility and make recommendations to the client and/or referral to EVT for follow-up. As described above, EVT, RISE, and trade allies report that this did not happen as much as they all would have liked. Examination of the participant databases showed many geotargeted customers received lighting improvements but no other services.

As a result of the termination of Lighting Plus initiative and the implementation of newLIGHT and RELIGHT, there will no longer be a single turnkey implementation subcontractor soliciting work and performing lighting audits in the GT areas. These new programs will place the auditing responsibilities on local trade allies (e.g., electricians) who will have the responsibility of soliciting customers as well as determining optimal lighting retrofits in existing and new facilities. Unlike Lighting Plus, RELIGHT will include lighting design services. The programs will be available throughout the state as well as the geotargeted areas. Refocusing commercial lighting programs to more of a trade-ally-driven model is anticipated to reduce administrative delivery costs of the program, as well as provide better value to customers through incentives for optimized lighting designs.

However, in Navigant's opinion, the delivery tactic change still does not fully address the goal of providing more comprehensive, multi-end-use approaches that Efficiency Vermont generally desires. In addition, EVT will have a greater challenge to achieve its savings targets in GT areas, unless the new programs offer preferred contractor incentives for work completed in the GT regions or some other compensating mechanism to spur targeted installations, because it may take more time and contractor and customer effort to develop and complete installations under the new programs than it did under Lighting Plus. The existing lighting trade ally community will now have to generate their own leads for installations in the GT regions, where before, they were provided with customer-accepted jobs via RISE. However, this challenge to the trade allies may also result in trade allies building their energy efficiency capabilities to meet the particular requirements of their customers. It's easy to be an installer providing a one- size-fits-all solution; however, that approach is narrow and may be missing opportunities that the more design-oriented environment provided by the new RELIGHT program will offer. If trade allies respond aggressively, they may well penetrate the market of very small businesses that has so far not participated in lighting programs, or participated long enough ago that with aggressive incentives newer and more energy-efficient lighting will be available and attractive.

Customers who came under the Key Accounts Management practices, may have fared better with respect to receiving multiple types of measures, with more contact between EVT customers and better knowledge of facility needs. The Key Accounts Management was intended initially only for the largest customers; however, the threshold was dropped to 500 MWh/yr, taking in a larger segment of the business population.

4.7. Load Control

It is Navigant's assessment that load control and other demand response initiatives are the largest reservoir of potential demand savings that is not being explicitly and purposefully sought after in the context of geotargeting. Aggressive promotion of load control technologies, targeted to specific summer or winter peaking end uses in the relevant GT area, could provide significant demand reduction, at a cost that is likely to be significantly less than EVT's current strategy of securing demand reductions through efficiency measures only.[17] Navigant recognizes that demand response programs defer peak loads only temporarily, by design, and serve only to shift peak periods and by themselves do not reduce energy consumption to a significant degree. Additionally, if the load profile of peak consumption is of a sustained multi-hour duration (e.g. >6 hours), the effectiveness of load control may be of limited value. All the same, if the intent of the GT program is to reduce system peak, load control is a strategy for consideration.

Navigant also recognizes that there has been a historic limitation on load control and other demand response strategies under the Energy Efficiency Utility structure. EVT states that load control strategies are in fact permitted but under the existing cost-effectiveness screening there are not that many opportunities that pass, and load control has not been actively pursued in any event. The Navigant team is aware that under proceeding 7466, parties have discussed instituting changes in this policy and that there is an interim policy in place through 2011, and that there is the expectation that there will be further development of load control policies and strategies once the PSB issues a new Order of Appointment in this proceeding. All the same, given that the goal of the GT program is targeted peak demand reductions, it's unclear to Navigant why demand response is not authorized by the PSB as a least-cost mechanism that EVT (or some other entity/entities) could use to defer peak loads even for the interim period.

Distribution utilities and independent entities are active in Vermont in recruiting customers to participate in demand response programs, and bidding these savings into the Independent System Operator-New England (ISO-NE) Forward Capacity Market (FCM). In June 2010, the PSB ordered EVT to work with these entities to coordinate demand response activities that affect the customer side of the meter[18]. However, the specific locations, size, and scale of existing demand response activities are not clearly

[17] See "Benchmarking of Vermont's 2008 Electric Energy Efficiency Programs: A Comparative Review of Efficiency Vermont and Burlington Electric Department". Submitted to Vermont Dept. of Public Service, Prepared by Navigant Consulting. May 21, 2010.

[18] Order Re Phase 2 Issues, Appendix A, Appendix B, Appendix C, issued June 25, 2010.

known, as these demand response aggregators are not required to report detail to the PSB or share such information with EVT. Additionally, capacity prices in the FCM have dropped dramatically, which may seriously impact recruitment of further capacity savings in the future.

Rather than wait another year, at minimum, if the PSB desires coordination among EVT, distribution utilities, and merchant demand response providers, that work should move forward at least for the established GT areas. The PSB should also consider piloting direct load control (either via EVT directly, or through the utilities, or some other entity, working in coordination with EVT) in the GT areas where EVT expects the greatest challenges in meeting required demand reduction goals. The potential savings in the GT areas may well justify the efforts and set models for similar efforts in other areas identified for future geotargeting. Navigant makes this recommendation because currently there is no way to know what the Demand Response potential is in existing geotargeted areas that could impact further program planning and implementation, and whether the Distribution Utilities are maximizing the opportunities that do exist. There may be a market failure that could be ameliorated by a variety of activities, including the cooperation between EVT and Distribution Utilities that should be in place but also with more active EVT efforts if the demand resource is being under-utilized. Geotargeting is being undertaken as a societal strategy and therefore should be maximized through all available cost effective channels. At minimum Navigant recommends that considering these options where the load shapes in any current or future GT area may hold the promise that such options could be effective.

4.8. Remaining Opportunities

Are there sufficient savings available to maintain the level of energy efficiency and demand reduction with the current tools available for geotargeting?

To meet GT savings targets, Efficiency Vermont chose a reliable savings path, concentrating on lighting, refrigeration, and air conditioning/ventilation in summer peaking areas and process improvements. The effort was particularly intensive with respect to commercial lighting, which produced 64 percent of the commercial kWh savings, 68 percent of winter peak kW savings, and 72 percent of summer peak kW savings in 2007-2009.[19] The pace of geotargeting continues in all areas, and EVT personnel expressed the belief that they could continue to meet their respective energy and coincident demand reduction goals for the 2009-2011 time period in summer peaking GT areas. EVT has concerns about the winter peaking Southern Loop, where opportunities are more limited in number, and larger projects, such as ski area expansions, are subject to the uncertainties of the current economic climate. New geotargeting was initiated in Rutland and the Chittenden area has expanded. These areas are both summer peaking. ISO-NE has identified residential air conditioning as a prime contributor to increased summer peaks across its system and that is likely a relevant concern for the geotargeted areas as well.

To the extent there are challenges with continuing to pursue geotargeting goals in the existing core areas, it is apparent that the winter peaking Southern Loop is the most problematic area. In the Southern Loop, which is more rural, there are fewer lighting opportunities. However, there are large individual opportunities for motors, drives, other controls, and HVAC in both manufacturing facilities and ski areas.

[19] Source: Review of EVT installation database by Navigant. Savings are unadjusted, but should be regarded as indicative with respect to the overall proportion of savings by measure.

This is clearly an area in which additional measures and comprehensive approaches should be pursued to continue to generate energy savings in this area. Addressing the needs of large developments is also highly dependent upon the overall state of the economy and the economics of recreational industries. Even in poor economies, ski areas may continue to refurbish existing equipment or expand while costs are stable, if they can obtain sufficient capital. Developing performance goals on very large projects is risky, as project delays and cancellations can seriously disrupt program activities and goal attainment. Adding to the measure tool kits and focusing on winter-peak-oriented demand reductions seems a vital aspect of continuing to meet expectations in the Southern Loop and any other winter peaking geotargeted areas that may be designated in the future.

Marketing efforts are intensive but trade allies are concerned that awareness of all the business programs opportunities and customer motivation to participate are not high enough to maintain the high level of savings acquired to date.

The Lighting Plus program has been the flagship of the geotargeting programs and its operations have included intensive marketing by the implementation contractor over protracted periods. In addition, Efficiency Vermont regularly advertises on radio, generates earned media through newspaper and public radio segments, has an active Internet presence, and works with trade allies and suppliers to improve the stocking of energy-efficient products for all customer sectors. However, with termination of the flagship program in early 2011, the intensive implementation contractor outreach will also end. The new lighting programs will depend upon lighting contractors selling lighting efficiency improvement work to their customers, which they have not needed to do since mid-2007 in GT areas.

Lighting trade allies contacted by Navigant expressed some concern that their efforts could not produce the same levels of work they've enjoyed in recent years. They are also concerned that the new lighting programs will not be as attractive for customers. Customer capital constraints may be too much a barrier even with generous incentives. In the short term, EVT is offering newLight program bonuses to lighting contractors for completed work through the end of the calendar year 2010, which should spur contractor interest in participating. EVT may provide other contractor inducements as the new programs are ramped up. Still, the marketing challenge will be significant. Where EVT previously had a single contractor to provide all the program services, EVT will now have to depend on a network of contractors to provide the largest source of savings in the geotargeted areas. Navigant finds that while the program was popular with participants and produced high savings levels, increasing saturation means that customers who have so far not participated will be harder to reach, more costly to serve and less likely to participate in any event.

EVT may benefit from the very high awareness of EVT in general and its programs, shown by both the participant and non participant surveys conducted for this evaluation. Participants in the geotargeted areas reported their primary pathways into the programs were through direct approaches, presumably from RISE, the Lighting Plus implementation contractor. But 85% of nonparticipants overall were also aware of EVT and its programs, with a range of 79-100% awareness when broken out by GT region. This high level of awareness tells us that those who have not yet participated tells us that this attractive program does not appeal to some segment of the customer population. Further, non participants tend to have smaller businesses, likely with fewer energy efficiency opportunities, so more customers, perhaps many more, would have to participate to generate needed savings, and we would expect that other program models would deliver savings more slowly than the direct installation Lighting Plus program.

4.9. *Commercial and Industrial Participants' Views of the Geotargeting Program*

Working with an experienced survey company, the Blackstone Group, Navigant surveyed 135 participants and 121 non-participants (all located in the geotargeted areas), including all customers with more than 1 MW demand, across the four initial geotargeted areas. The target was to complete 30 participant and 30 non- participant surveys in each of the original four geotargeted areas. The surveys (appended) asked participants about their experience with the geotargeting programs, the equipment installed, their reactions to program delivery, and recommendations for program improvements. Nonparticipants were asked about their awareness of the programs, their reasons for nonparticipation, their own energy efficiency and conservation actions, and recommendations for program improvements.

4.9.1. Participant Survey Results

» The survey found very high levels of awareness of the programs and satisfaction with the ease of participation and the results.

» Overall, 71% of 131 respondents were first time participants, which Navigant attributes to the direct solicitation and neighborhood program focus in Lighting Plus. Those who had participated previously credited their prior experience and past results as the most important factors in their decisions to participate again. (See Table 3 below). On average 72% of all customers and 86% of large customers said they would participate in EVT programs again.

» There was a surprising amount of failure/poor poor product performance recorded, 14% lighting, though most of the failed product, 85% was replaced with similar efficiency product. The high failure rate is not readily explained and requires some further inquiry.

» Very few customers of any size had onsite generation and very few in absolute numbers reported being enrolled in a demand response program. Seven out of nine total large customers responded to this question and 57% of those were enrolled in demand response. While large customers may be enrolled in load control programs the total demand response potential was outside the survey scope.

» The average participant had revenues of $3.2 million while the average non-participant had revenues of only $0.09 million. Similar disparities were observed in the number of employees in participant and non participant businesses. Navigant filtered the survey sample to remove customers with less than 100 kWh/day of consumption because they seemed less likely to enroll in the geotargeting programs as designed. Even with that filtering the business size disparity remained.

4.9.2. Awareness and Participation

The majority of participants in the GT program were first-time participants. As shown in Table 3, approximately 70% of participants were new to the program. Conversely, of the large customer participants, nearly 85% were previous program participants.

Table 3. Distribution of Previous EVT Program Participation- GT Participant

	Chittenden (n=35)	St Albans (n=33)	S. Loop (n=37)	Newport (n=30)	Total (n=135)	Large Customers (n=7)
Previous participant	29%	27%	35%	23%	29%	86%
First-time participant	71%	73%	65%	77%	71%	14%

Table 4 shows how participants first became aware of the GT program. The most common source of program awareness was direct outreach: either contact from Efficiency Vermont or one if its contractors, or by canvassing phone calls. Suppliers and contractors also effectively promoted the GT program, particularly in the Chittenden and St. Albans regions. The majority of large customers had existing relationships with EVT through prior program participation.

Table 4. Distribution of Source of Program Awareness- GT Participant

	Chittenden (n=28)	St Albans (n=31)	S. Loop (n=36)	Newport (n=25)	Total (n=120)	Large Customers (n=7)
In person approach from EVT or one of their contractors	36%	26%	25%	40%	31%	14%
Canvassing phone call	29%	16%	25%	20%	23%	0%
Supplier or contractor I do business with	14%	10%	6%	4%	8%	0%
Information delivered to my workplace	0%	3%	6%	8%	4%	0%
Previously participated in an Efficiency VT program	4%	16%	3%	0%	6%	57%
Story in newspapers, TV or radio, Efficiency VT's website	0%	6%	6%	0%	3%	0%
Friend, relative	0%	0%	3%	8%	3%	0%
Community event	0%	0%	0%	0%	0%	0%
Other	18%	23%	28%	20%	23%	29%

4.9.3. Measure Failure/Removal

Survey results revealed that of all of the measures installed through the GT program, only lighting measures had been replaced after installation. The 135 participants who were surveyed had installed 274 lighting measures. Of those 274 installed measures, 44 had been replaced, or 14% of the installed measures, as shown in Table 5 below. These lighting measures included CFLs, T5 and T8 high bays, occupancy sensors, relamp/reballast to super T8s, as well as other measures. All of the other measure types installed through the program were still in place at the time of the surveys.

Table 5. Percent of Measures that were Replaced after Installation- GT Participant

	Chittenden	St Albans	S. Loop	Newport	Total
Lighting	14%	19%	16%	14%	16%
Air Conditioning	0%	0%	0%	0%	0%
Compressed Air	0%	0%	0%	0%	0%
Design Assistance	0%	0%	0%	0%	0%
Efficient Equipment	0%	0%	0%	0%	0%
Fuel Switch Boiler	0%	0%	0%	0%	0%
Fuel Switch	0%	0%	0%	0%	0%
Hot Water	0%	0%	0%	0%	0%
Industrial	0%	0%	0%	0%	0%
Insulation	0%	0%	0%	0%	0%
Motors	0%	0%	0%	0%	0%
Other	0%	0%	0%	0%	0%
Power Meter	0%	0%	0%	0%	0%
Refrigeration	0%	0%	0%	0%	0%
Space Heating	0%	0%	0%	0%	0%
Ventilation	0%	0%	0%	0%	0%
Washer	0%	0%	0%	0%	0%

Though 14% of installed lighting measures that were replaced, this does not mean that all of the lights in each of these installations were removed and replaced. Further examination of the 14% of lighting measures that were replaced shows that only an average of 25% of these lights were replaced. These results are shown in Table 6. When compared by GT region, Newport has the highest percentage of total lights that were replaced, at 55% of the total installations.

Table 6. Distribution of Percentage of Lighting Measures Replaced After Installation- GT Participant

Percent of Installed Lighting Equipment Removed	Chittenden (n=9)	St Albans (n=13)	S. Loop (n=13)	Newport (n=9)	Total (n=44)
0%	0%	0%	0%	0%	0%
1-10%	56%	77%	83%	22%	63%
11-20%	11%	0%	0%	0%	2%
21-30%	11%	0%	0%	11%	5%
31-40%	0%	8%	0%	0%	2%
41-50%	11%	0%	17%	22%	12%
51-60%	0%	8%	0%	0%	2%
61-70%	0%	0%	0%	11%	2%
71-80%	0%	0%	0%	0%	0%
81-90%	0%	0%	0%	11%	2%
91-100%	11%	8%	0%	22%	9%
Average Percent Replaced	23.2%	18.3%	13.42%	55.4%	25.7%

The rationale for replacing lighting measures was primarily because the equipment burned out or stopped working. Participant's reasons for replacement are presented in Table 7.

Table 7. Reason for Replacing Lighting Equipment- GT Participant

	Chittenden (n=9)	St Albans (n=13)	S. Loop (n=13)	Newport (n=9)	Total (n=44)
Equipment burned out/stopped working	67%	69%	77%	89%	75%
Equipment did not perform satisfactorily	11%	31%	15%	11%	18%
Complaints from individuals using the equipment	0%	0%	0%	0%	0%
No longer use it – business needs changed	0%	0%	0%	0%	0%
Other	22%	0%	8%	0%	7%

4.9.4. Satisfaction

Respondents who had previously participated in the GT program were surveyed about their motivation for participating again in this program cycle. As shown in Table 8, past participation experience and program results were cited as the most important effects from their prior experience. Verbatim responses detailing their past participation experience include positive interaction with Efficiency Vermont representatives, professionalism of the contractors and thoroughness of the audit. Program results include cost reduction and energy savings.

Table 8. Most Important Effects of Prior Program Participation- GT Participant

	Chittenden (n=8)	St Albans (n=8)	S. Loop (n=12)	Newport (n=6)	Total (n=34)	Large Customers (n=5)
My past participation experience	13%	38%	58%	50%	41%	20%
My program results	75%	25%	25%	33%	38%	40%
Overall feeling about energy efficiency	13%	13%	8%	0%	9%	0%
Other	0%	25%	8%	17%	12%	40%

Overall, the majority of program participants found participation in the program reasonably or very quick and easy, as shown in Table 9. These results were consistent across all GT regions.

Table 9. Ease of Participation- GT Participant

	Chittenden (n=35)	St Albans (n=33)	S. Loop (n=37)	Newport (n=29)	Total (n=134)	Large Customers (n=7)
Very quick and easy	63%	58%	54%	59%	58%	43%
Reasonably quick and easy	31%	36%	30%	31%	32%	43%
It took some effort on my part to sign up	6%	3%	14%	10%	8%	14%
It took a lot of effort to sign up for the program	0%	3%	3%	0%	1%	0%
Not at all quick or easy	0%	0%	0%	0%	0%	0%

Program satisfaction is very high among all participants and GT regions. As presented in Table 10, over 80% of participants in each region ranked their satisfaction as 7 or higher.

Table 10. Overall Program Satisfaction- GT Participant

	Chittenden (n=35)	St Albans (n=33)	S. Loop (n=37)	Newport (n=30)	Total (n=135)	Large Customers (n=7)
10 - Extremely Satisfied	46%	58%	59%	43%	52%	57%
9	29%	6%	5%	17%	14%	0%
8	14%	18%	5%	20%	14%	14%
7	6%	0%	16%	10%	8%	29%
6	0%	3%	3%	0%	1%	0%
5 - Neither Satisfied nor Dissatisfied	3%	9%	5%	7%	6%	0%
4	0%	0%	0%	0%	0%	0%
3	0%	3%	3%	0%	1%	0%
2	0%	0%	0%	3%	1%	0%
1 - Not at all Satisfied	3%	3%	3%	0%	2%	0%

Similarly, Table 11 shows that the participants' likelihood of participating in the program in the future is very high. Over 80% of participants in each GT region ranked their likelihood of participating again as 8 or higher. This suggests that participants motivations are likely to be favorable if they are offered more savings opportunities.

Table 11. Likelihood of Participating Again- GT Participant

	Chittenden (n=35)	St Albans (n=33)	S. Loop (n=37)	Newport (n=30)	Total (n=135)	Large Customers (n=7)
10 - Extremely Likely	83%	73%	70%	60%	72%	86%
9	6%	6%	8%	7%	7%	14%
8	6%	12%	3%	17%	9%	0%
7	3%	0%	8%	10%	5%	0%
6	0%	0%	3%	3%	1%	0%
5 - Neither Likely nor Unlikely	3%	9%	5%	0%	4%	0%
4	0%	0%	0%	0%	0%	0%
3	0%	0%	0%	0%	0%	0%
2	0%	0%	3%	0%	1%	0%
1 - Not at all Likely	0%	0%	0%	3%	1%	0%

Approximately 11% of participants were given a recommendation to install additional equipment, but chose not to install it. This percentage is even higher among large customers, as shown in Table 12. This could be attributed to the high percentage of large customers who previously participated in the GT program and may have already installed the easier, less expensive measures. Table 13 and Table 14 show further detail about the measures not installed.

Table 12. Whether Efficiency Vermont Recommended Any Equipment Not Installed- GT Participant

	Chittenden (n=31)	St Albans (n=31)	S. Loop (n=37)	Newport (n=27)	Total (n=126)	Large Customers (n=7)
Yes	6%	13%	14%	11%	11%	29%
No	94%	87%	86%	89%	89%	71%

The efficiency measures that were most often recommended but not installed are lighting, compressed air and refrigeration equipment. Table 13 shows the distribution of measures not installed by GT region.

Table 13. Equipment that was Recommended but Not Installed- GT Participant

	Chittenden (n=2)	St Albans (n=3)	S. Loop (n=5)	Newport (n=2)	Total (n=12)	Large Customers (n=2)
Lighting	50%	0%	60%	0%	33%	50%
Compressed Air	0%	33%	40%	0%	25%	0%
Refrigeration	0%	33%	0%	100%	25%	50%
Motors	0%	33%	0%	0%	8%	0%
Replace or tune-up heating system	0%	0%	20%	0%	8%	0%
HVAC System Upgrade/Replacement	0%	0%	0%	0%	0%	0%
Ventilation	0%	0%	0%	0%	0%	0%
Process improvements	0%	0%	0%	0%	0%	0%
Other	50%	0%	0%	0%	8%	0%

Table 14 shows the reasons for not installing recommended equipment. One of the most-cited reasons was the high cost of the equipment, reporting the equipment was too expensive, it didn't seem worth the money, or the participant doesn't have enough capital. Aesthetics was another concern, specifically in the Southern Loop region, but there were few responses to this question so there are no generalizations that can be made from them.

Table 14. Reasons for Not Installing Recommended Equipment- GT Participant

	Chittenden (n=2)	St Albans (n=3)	S. Loop (n=5)	Newport (n=2)	Total (n=12)	Large Customers (n=2)
Too Expensive	0%	33%	20%	50%	25%	50%
Didn't seem worth the money	0%	33%	0%	0%	8%	0%
Not enough capital to do more than we are doing	0%	33%	0%	0%	8%	50%
May not be in this facility long enough	0%	0%	0%	0%	0%	0%
Payback too long to pay for itself	50%	0%	0%	0%	8%	50%
Other priorities for available capital	50%	33%	0%	0%	17%	50%
Unsure about Efficiency Vermont's qualifications to make the improvements	0%	0%	0%	0%	0%	0%
Aesthetics/brightness of lights	0%	0%	40%	0%	17%	0%
Didn't want to substantially change the facility	50%	0%	0%	0%	8%	0%
Had already made the improvements/upgrades	0%	0%	0%	50%	8%	0%
Other	0%	33%	40%	0%	25%	0%

4.9.5. Demographics

Retail customers are the largest segment of total program participants. Factories, offices and other buildings are the next largest segments. Table 15 shows the distribution of participants by building type. The distribution is similar across all four GT regions.

Table 15. Distribution of Building Types - GT Participant

	Chittenden (n=35)	St Albans (n=33)	S. Loop (n=37)	Newport (n=30)	Total (n=135)	Large Customers (n=7)
Office	9%	21%	3%	13%	11%	0%
Retail	31%	15%	35%	33%	29%	0%
Apartment Building	3%	0%	0%	0%	1%	0%
Educational Institution	6%	9%	5%	3%	6%	14%
Restaurant	6%	6%	11%	10%	8%	0%
Lodging/Hotel/Motel	0%	0%	16%	0%	4%	0%
Factory	14%	24%	5%	10%	13%	57%
Other	31%	24%	24%	30%	27%	29%

The distribution of participants by annual revenue is shown in Table 16. The largest percentage of participants falls into the $2-5 million revenue range, with a mean of $3.2 million. Large customers have a significantly higher mean revenue of $8.9 million.

Table 16. Distribution of Annual Revenue - GT Participant

	Chittenden (n=29)	St Albans (n=29)	S. Loop (n=32)	Newport (n=28)	Total (n=118)	Large Customers (n=6)
Under $100,000	0%	3%	6%	14%	6%	0%
$100,000 - $500,000	17%	17%	22%	18%	19%	0%
$500,000 - $1 Million	0%	17%	22%	21%	15%	0%
$1 Million - $2 Million	14%	21%	19%	4%	14%	0%
$2 Million - $5 Million	45%	17%	16%	18%	24%	0%
$5 Million - $10 Million	10%	10%	6%	14%	10%	50%
More than $10 Million	14%	14%	9%	11%	12%	50%
Mean ($Million)	$4.0	$3.3	$2.5	$3.1	$3.2	$8.9

As shown in Table 17, businesses of all sizes were program participants. Staff sizes range from less than 10 to more than 100, with the highest percentage of participants having 10-26 employees. The mean staff size is 34.6 employees, which differs slightly by GT region. The majority of large customers have more than 100 employees, with a mean of 107.6.

Table 17. Number of Employees by Firm - GT Participant

Number of Employees	Chittenden (n=35)	St Albans (n=33)	S. Loop (n=37)	Newport (n=29)	Total (n=134)	Large Customers (n=7)
Less than 10	29%	24%	35%	28%	29%	0%
10-26	46%	36%	41%	34%	40%	0%
26-100	14%	21%	16%	34%	21%	14%
More than 100	11%	18%	8%	3%	10%	86%
Mean	32.7	42.8	29.7	34.1	34.6	107.6

Participants with on-site generation were not very common. Table 18 shows that only 3% of total participants have on-site generation. The percentage of large customers with on-site generation is much higher than the total population. Table 19 shows the average kW generated for those customers with distributed generation.

Table 18. Distribution of On-site Generation - GT Participant

	Chittenden (n=35)	St Albans (n=33)	S. Loop (n=37)	Newport (n=29)	Total (n=134)	Large Customers (n=7)
Customers with on-site generation	3%	0%	5%	3%	3%	14%
Customers without on-site generation	97%	100%	95%	97%	97%	86%

Table 19. Mean On-site Generation (kW) - GT Participant

	Number of Customers with On-site Generation	Mean kW Generated
Chittenden	1	15
St Albans	0	0
S. Loop	2	500
Newport	1	100
Total*	4	205
Large Customers	1	500

*One customer in S. Loop did not know their kW generation capacity, so the total and average are based on 3 responses.

Table 20 shows the distribution of participants enrolled in a demand response (DR) program. Of the total program participants, 6% are enrolled in a DR program. This percentage is slightly higher in the Southern Loop region. Large customers, however, have over 50% of their participants enrolled in a DR program. Table 21 shows the average kW of DR program participants.

Table 20. Enrollment in Demand Response Program - GT Participant

	Chittenden (n=34)	St Albans (n=32)	S. Loop (n=36)	Newport (n=29)	Total (n=131)	Large Customers (n=7)
Yes	6%	6%	11%	0%	6%	57%
No	94%	94%	89%	100%	94%	43%

Table 21. Average kW Enrolled in Demand Response Program- GT Participant

	Chittenden (n=1)	St Albans (n=1)	S. Loop (n=1)	Newport (n=0)	Total (n=3)	Large Customers (n=1)
Average kW	1000	225	1000	0	741.67	1000
Number of customers in DR program*	2	2	4	0	8	1

*Only one customer in each of the three regions reported their kW, so these average numbers include only one customer for each region.

4.10. *Commercial and Industrial Nonparticipants' Views of the Geotargeting Program*

4.10.1. Non-Participant Survey Results

- As noted above non participants were very aware of EVT's programs.
- Although most had never participated, some non participants had participated before 2007 and believed their energy efficiency needs were fully satisfied at that time but others reported efficiency needs, particularly in lighting indicating more opportunity may be available in this end use, and perhaps the new lighting programs will be better positioned to capture the remaining savings.

» Non participant businesses were smaller than participants, which may mean they were not targeted by Lighting Plus or that they represented a stratum of customers who did not wish to or feel able to participate.

» Reasons for non participation varied by region, with most common overall reasons being "Other", Feeling their facility was already energy efficient, not owning the building, and not being aware of the program being the most commonly offered reasons

» When asked what EVT could do to get their participation, the most frequent responses were "Offer the Equipment and Services I need" and "More education and awareness". Overall 20% were not interested, a fairly high percentage for generous incentive programs.

» Non participants were sensitive to costs, with 30% citing total cost as a concern and the same percentage overall having payback as their primary consideration for an energy efficiency investment This response is not entirely consistent with non participants thoughts about what Efficiency Vermont could do to get them to participate but such non participant inconsistencies are not uncommon..

» The overwhelming majorities of those who identified needing energy efficiency improvements identified lighting (62% of 71 question respondents), followed by refrigeration and HVAC, suggesting there is still opportunity in lighting.

4.10.2. Awareness and Participation

The majority of non-participants are aware of Efficiency Vermont programs. As shown in Table 22 program awareness was over 70% in each of the four GT regions. The Southern Loop had 100% program awareness. This indicates that Efficiency Vermont is successful in spreading awareness through its marketing and outreach efforts.

Table 22. Awareness of Efficiency Vermont Programs- Nonparticipant

	Chittenden (n=29)	St Albans (n=29)	S. Loop (n=25)	Newport (n=27)	Total (n=112)
Yes	86%	79%	100%	74%	85%
No	14%	21%	0%	26%	15%

The most effective marketing efforts are shown in Table 23 below. Approximately 60% of non-participants recalled seeing or experiencing promotions for Efficiency Vermont programs. TV, radio and newspaper ads, as well as direct mail from Efficiency Vermont were the most recalled marketing techniques.

Table 23. Efficiency Vermont Marketing Efforts Noticed in 2007-2009- Nonparticipant

	Chittenden (n=29)	St Albans (n=29)	S. Loop (n=23)	Newport (n=29)	Total (n=109)
Ad on TV, radio, newspaper	39%	34%	26%	34%	34%
Direct mail from Efficiency VT or a contractor	25%	21%	30%	24%	25%
In Person contact from Efficiency VT or a contractor	11%	17%	0%	14%	11%
Phone call from Efficiency VT or a contractor	7%	14%	9%	3%	8%
Internet	7%	7%	9%	0%	6%
Other	11%	10%	4%	10%	9%
None	29%	45%	48%	38%	39%
Was not aware there was a program available to me	7%	3%	0%	0%	3%

Some non-participants reported participating in an Efficiency Vermont program prior to the start of the GT program in 2007. Table 24 shows that 12% of non-participants had previously been participants in Efficiency Vermont programs. At 21%, the Chittenden region has a higher concentration of past program participants.

Table 24. Participation in an Efficiency Vermont Program Prior to 2007- Nonparticipant

	Chittenden (n=28)	St Albans (n=30)	S. Loop (n=28)	Newport (n=29)	Total (n=115)
Yes	21%	3%	14%	10%	12%
No	79%	97%	86%	90%	88%

Of those who previously participated in an Efficiency Vermont program, nearly 100% reported that the past program satisfied all of their energy efficiency needs. Table 25 reveals that of each GT region, all were 100% satisfied, with the exception of Newport, which indicates existing opportunity in that region.

Table 25. Whether Previous Program Results Satisfied all Energy Efficiency Needs- Nonparticipant

	Chittenden (n=9)	St Albans (n=1)	S. Loop (n=4)	Newport (n=3)	Total (n=14)
Yes	100%	100%	100%	67%	93%
No	0%	0%	0%	33%	7%

4.10.3. Reasons for Not Participating

Non-participants were surveyed about their reasons for not participating in the GT program. Table 26 presents the top-ranked reasons for not participating. The most reported reasons were the facility is already energy efficient, and the customer does not own their building. Further, many customers were unaware that there was a program.

Table 26. Reasons for Not Participating in an Efficiency Vermont Program from 2007-2009-Nonparticipant

	Chittenden (n=26)	St Albans (n=27)	S. Loop (n=28)	Newport (n=25)	Total (n=106)
Facility is already energy efficient (nothing left to do)	19%	19%	14%	4%	14%
Don't own the building	23%	11%	11%	12%	14%
It was not convenient at the time	8%	0%	18%	4%	8%
Didn't know the details of the program	15%	7%	7%	4%	8%
Didn't know I could participate	0%	7%	4%	8%	5%
Couldn't afford to participate	0%	0%	7%	16%	6%
Not in business at the time	4%	7%	11%	0%	6%
Too much paperwork/hassle	4%	0%	0%	0%	1%
Concerned about other related repair costs, such as wiring or code compliance that might have to be done	4%	0%	0%	0%	1%
Didn't want the interruption	0%	0%	0%	0%	0%
Don't like people coming in my facility	0%	0%	0%	0%	0%
Too restrictive on what you could and could not do	0%	0%	0%	0%	0%
Other	12%	30%	11%	44%	24%
Was not aware there was a program	12%	19%	18%	8%	14%

When asked about ways that Efficiency Vermont can encourage participation, the most reported suggestion was to offer the equipment and services that the customer needs. These respondents were asked for specific suggestions of additional equipment and services; suggestions included direct contact from Efficiency Vermont representatives, using online applications, and working with property owners to get buy-in. Other reported suggestions were more education and awareness and offering higher incentives. These results are shown in Table 27.

Table 27. Ways Efficiency Vermont can Encourage Participation- Nonparticipant

	Chittenden (n=23)	St Albans (n=25)	S. Loop (n=26)	Newport (n=23)	Total (n=97)
Offer the equipment and services I need	39%	28%	38%	48%	38%
More education and awareness	35%	32%	19%	48%	33%
Nothing – Not interested	13%	28%	27%	9%	20%
Offer higher incentives	26%	16%	15%	9%	16%
Make it easier to sign up	4%	8%	0%	13%	6%
Minimize, simplify paperwork	4%	0%	0%	0%	1%

When considering making energy efficiency upgrades to equipment, total cost and payback were the largest concerns for these customers. Table 28 presents the distribution of most important issues customers consider when making equipment changes.

Table 28. Most Important Consideration when Deciding to make EE Equipment Changes-Nonparticipant

	Chittenden (n=30)	St Albans (n=28)	S. Loop (n=27)	Newport (n=28)	Total (n=113)
Total cost required	43%	21%	15%	39%	30%
Payback in electric bill savings	30%	36%	33%	21%	30%
Minimum internal rate of return	7%	14%	4%	11%	9%
Lowest cost among alternative investments	0%	11%	11%	11%	8%
Life-cycle analysis	3%	4%	11%	0%	4%
Other	17%	14%	26%	18%	19%

Of those customers that reported total cost is their most important consideration before making energy efficiency upgrades, approximately 85% of respondents will accept a maximum project cost of $10,000. Table 29 shows the distribution of maximum total project costs. Non-participants in the Southern Loop were more accepting of higher cost projects, permitting a maximum total project cost of $95,000. When all four regions are included, the average maximum project cost is $17,423. However, removing the Southern Loop outliers yields $3,318 as the maximum acceptable project cost for the remaining three regions.

Table 29. Maximum Total Project Cost Permitted- Nonparticipant

	Chittenden (n=4)	St Albans (n=4)	S. Loop (n=2)	Newport (n=3)	Total (n=13)
$100 - $1000	0%	75%	0%	67%	38%
$1001 - $10000	100%	25%	0%	33%	46%
$10001 - $50000	0%	0%	0%	0%	0%
$50001 - $100000	0%	0%	100%	0%	15%
$100001 - $500000	0%	0%	0%	0%	0%
$500001+	0%	0%	0%	0%	0%
Mean ($)	$6,375	$1,250	$95,000	$2,000	$17,423

Of those customers that reported payback is their most important issue when deciding to make energy efficiency upgrades, over 75% of respondents require a payback of less than 3 years. Table 30 shows that nearly 90% of respondents will accept a maximum payback of 6 years. On average, the maximum payback period that is accepted is 3.3 years.

Table 30. Maximum Acceptable Payback- Nonparticipant

	Chittenden (n=9)	St Albans (n=8)	S. Loop (n=7)	Newport (n=5)	Total (n=29)
1-3 years	78%	88%	57%	80%	76%
4-6 years	11%	13%	29%	0%	14%
7-9 years	0%	0%	14%	0%	3%
10 or more years	11%	0%	0%	20%	7%
Mean (in years)	3.4	2.4	3.7	4	3.3

Of those customers that reported minimum internal rate of return (IRR) is their most important consideration before making energy efficiency upgrades, the average IRR that is required is 15%. Table 31 shows the distribution of the minimum IRR that is acceptable to these customers.

Table 31. Minimum IRR for Making an EE Investment- Nonparticipant

	Chittenden (n=1)	St Albans (n=3)	S. Loop (n=0)	Newport (n=2)	Total (n=6)
1%-10%	0%	67%	-	50%	50%
11-20%	100%	0%	-	0%	17%
21-30%	0%	0%	-	50%	17%
31-40%	0%	0%	-	0%	0%
41-50%	0%	33%	-	0%	17%
51-60%	0%	0%	-	0%	0%
61-70%	0%	0%	-	0%	0%
71-80%	0%	0%	-	0%	0%
81-90%	0%	0%	-	0%	0%
91-100%	0%	0%	-	0%	0%
Greater than 100%	0%	0%	-	0%	0%
Mean (in %)	15%	17%	-	12.5%	15%

Approximately one third of non-participants had made energy efficiency improvements on their own, prior to the start of the GT program. This indicates a potentially smaller pool of businesses who would benefit from making additional energy efficiency upgrades through the program. These results are shown in Table 32.

Table 32. EE Improvements Made in 3 Years Before 2007- Nonparticipant

	Chittenden (n=27)	St Albans (n=29)	S. Loop (n=30)	Newport (n=27)	Total (n=113)
Yes	33%	28%	60%	26%	37%
No	67%	72%	40%	74%	63%

Of those respondents who made improvements in the three years before the start of the GT program, the majority of improvements (48%) were lighting measures. Other measures include windows and heating system upgrades. Table 33 shows this distribution by region and for total non-participants. The Newport region had a significantly larger percentage of lighting upgrades than the other three regions.

Table 33. EE Equipment Installed in 3 Years Before 2007- Nonparticipant

	Chittenden (n=9)	St Albans (n=8)	S. Loop (n=18)	Newport (n=7)	Total (n=42)
Lighting	44%	50%	33%	86%	48%
Windows	33%	25%	17%	14%	21%
Replace or tune-up heating system	0%	25%	22%	14%	17%
Insulation	22%	0%	22%	0%	14%
HVAC system upgrade/replacement	0%	0%	11%	14%	7%
Ventilation	0%	13%	6%	0%	5%
Refrigeration	11%	0%	6%	0%	5%
Compressed Air	0%	0%	0%	0%	0%
Process Improvements	0%	0%	0%	0%	0%
Motors	0%	0%	0%	0%	0%
Other	0%	25%	28%	57%	26%

The majority of non-participants reported that there are still opportunities for energy efficiency improvements to be made in their facilities. Table 34 shows that at least 50% of respondents in each region indicated that other energy efficiency improvements are needed.

Table 34. Opportunity for Other Improvements to Facility- Nonparticipant

	Chittenden (n=30)	St Albans (n=30)	S. Loop (n=29)	Newport (n=29)	Total (n=118)
Yes	60%	70%	52%	79%	65%
No	40%	30%	48%	21%	35%

Of those that reported an opportunity for additional improvements, lighting was the largest reported measure-type that is needed. As shown in Table 35, approximately 60% of the respondents in each region said that lighting was an area that could be upgraded. Other need improvements are refrigeration measures and HVAC system upgrades.

Table 35. Types of Improvements Needed in Facilities- Nonparticipant

	Chittenden (n=17	St Albans (n=19)	S. Loop (n=15)	Newport (n=20)	Total (n=71)
Lighting	65%	58%	60%	65%	62%
Refrigeration	18%	42%	33%	10%	25%
HVAC system upgrade/replacement	29%	16%	7%	25%	20%
Replace or tune-up heating system	12%	11%	13%	10%	11%
Insulation	6%	0%	7%	10%	6%
Appliances	6%	0%	7%	5%	4%
Compressed Air	0%	5%	7%	5%	4%
Ventilation	6%	0%	0%	5%	3%
Motors	6%	0%	0%	5%	3%
Process Improvements	0%	0%	7%	0%	1%
Other	24%	16%	20%	20%	20%

4.10.4. Demographics

Similar to the participant demographics, retail customers are the largest segment of total non-participants. Offices and other buildings are the next largest segments. Table 36 shows the distribution of participants by building type. The distribution is similar across all four GT regions.

Table 36. Distribution of Building Types - Nonparticipant

	Chittenden (n=30)	St Albans (n=31)	S. Loop (n=30)	Newport (n=30)	Total (n=121)
Office	30%	26%	20%	23%	25%
Retail	13%	39%	27%	37%	29%
Apartment Building	13%	6%	0%	7%	7%
Educational Institution	0%	0%	3%	0%	1%
Restaurant	3%	10%	3%	0%	4%
Lodging/Hotel/Motel	0%	3%	10%	0%	3%
Factory	7%	0%	3%	0%	2%
Other	33%	16%	33%	33%	29%

The distribution of non-participants by annual revenue is shown in Table 37. The largest percentage of non-participants fall into the $100-500 thousand revenue range, with a mean of $0.9 million. Nearly 80% of non-participants have annual revenues below $1 million. This indicates that these customers have less available capital to use for energy efficiency improvements, in contrast with program participants who had average annual revenues of $3.2 million.

Table 37. Distribution of Annual Revenue - Nonparticipant

	Chittenden (n=29)	St Albans (n=29)	S. Loop (n=32)	Newport (n=28)	Total (n=118)
Under $100,000	14%	28%	29%	46%	30%
$100,000 - $500,000	48%	32%	38%	23%	34%
$500,000 - $1 Million	14%	20%	17%	19%	18%
$1 Million - $2 Million	10%	20%	13%	8%	13%
$2 Million - $5 Million	5%	0%	0%	4%	2%
$5 Million - $10 Million	5%	0%	0%	0%	1%
More than $10 Million	5%	0%	4%	0%	2%
Mean ($Million)	$1.5	$0.6	$1.0	$0.5	$0.9

As shown in Table 38, non-participants were primarily smaller businesses. Staff sizes range from less than 10 to up to 100 employees, with the highest percentage of non-participants falling into the smallest category. The mean staff size is 10.6 employees, which differs slightly by GT region.

Table 38. Distribution of Size of Staff - Nonparticipant

	Chittenden (n=30)	St Albans (n=31)	S. Loop (n=30)	Newport (n=30)	Total (n=121)
Less than 10	70%	87%	97%	87%	85%
10-25	20%	13%	3%	13%	13%
26-100	10%	0%	0%	0%	3%
More than 100	0%	0%	0%	0%	0%
Mean	15.4	9.23	8.33	9.27	10.56

Similar to participant survey results, non-participants with on-site generation were not very common. Table 39 shows that only 2% of total non-participants have on-site generation. Table 40 shows the average kW generated for those customers with distributed generation.

Table 39. Distribution of On-site - Nonparticipant

	Chittenden (n=30)	St Albans (n=31)	S. Loop (n=30)	Newport (n=30)	Total (n=121)
Customers with on-site generation	0%	6%	3%	0%	2%
Customers without on-site generation	100%	94%	97%	100%	98%

Table 40. Mean On-site Generation (kW) - Nonparticipant

	Number of Customers with On-site Generation	Mean kW Generated
Chittenden	0	0
St Albans	0	0
S. Loop	1	7
Newport	0	0
Total*	1	7

*Two customers in St. Albans did not know their kW generation capacity, so the total and average are based on 1 response.

As shown in Table 41, no surveyed non-participants are enrolled in a demand response (DR) program. This is similar to participant survey results, showing very few participants enrolled in a DR program.

Table 41. Enrollment in Demand Response Program - Nonparticipant

	Chittenden (n=30)	St Albans (n=30)	S. Loop (n=30)	Newport (n=29)	Total (n=119)
Yes	0%	0%	0%	0%	0%
No	100%	100%	100%	100%	100%

4.11. Extension of Current Efforts

What Future Opportunities Are There for Efficiency Vermont to Improve the Effectiveness and Efficiency of its Geotargeting Delivery?

The non participant survey results suggest there is still a need for lighting improvements. Efficiency Vermont's programs have been generally successful in achieving a high level of coincident peak demand given negotiated savings goals with the PSB. Participants and non- participants are well aware of the program. Trade allies who have long-established relationships with the energy efficiency programs are positioned to continue their sales to customers and will have increased responsibilities for generating leads with customers, although, they will have new incentives to offer to provide lighting design assistance. In the RELIGHT program, participants can choose from a list of prequalified lighting designers, to optimize total lighting designs for their facilities. Efficiency Vermont will cover up to the full cost of the lighting designer audit (maximum of $2,000).

Key Accounts Management will continue for larger customers at 500 annual MWh and above. Navigant suggests the customer threshold periodically be reexamined. More to the point, multi-year planning for customer energy efficiency investment should continue to reflect mixes of short- and long-term investments. Those customers who can plan with longer horizons should be encouraged to do so, much as the transmission system looks at its needs over the long term.

The toughest markets to penetrate for the geotargeting programs are small businesses, of which Vermont has many. The Lighting Plus program reached a large number of customers; however, that program is ending. Efforts like Express Refrigeration for convenience stores and other small retail should be redoubled, particularly in winter peaking areas. To the extent lost opportunities are minimized, direct install programs such as these can quickly acquire efficiency resources, and should be considered in other end uses.

There is a real question whether the newLIGHT and RELIGHT programs will result in similar lighting activity participation and savings within the geotargeted areas, compared to what Lighting Plus achieved. And the pathways to more comprehensive work for small business customers are not clear either. The burden to participate continues to rest largely with the customers who can easily access rebates forms on the Internet, if they choose to do so, and with the trade allies who will be marketing the programs across the geotargeted regions and statewide.

If geotargeting programs continue, EVT should consider:

- time-limited, business-oriented efforts similar to its residential PURL (Personal URL) effort in 2007, reaching out to customers for which it has email contact. Such approaches should be designed to drive business owners to a person at Efficiency Vermont who can assist them with comprehensive guidance to determine their energy efficiency needs and the best sets of measures and incentives to satisfy those needs. The challenge for EVT is to find administratively efficient approaches that effectively generate guided and comprehensive energy savings.
- in the winter peaking Southern Loop, in which there are some concerns about meeting ongoing goals, continuing existing outreach efforts with local trade allies to inform, educate, and recruit business customers. These sorts of intensive and personal outreach efforts are expensive and may raise the cost of saved kWh and kW, but should nevertheless be considered.

4.12. *Trade Ally Response*

Trade Allies are Predominately Pleased with Efficiency Vermont.

The Navigant team interviewed several trade allies for their perceptions of the GT program offerings and processes. Trade ally reactions were generally highly favorable with respect to the range and quality of programs offered. Trade allies praised Efficiency Vermont’s turn around on prescriptive rebates, quality of promotional and educational materials, and overall fairness in working with them.

4.13. *Planning, Demand Reduction Goal Setting, and Demand Response*

The geotargeted programs were initiated with urgency, without the opportunity to systematically and rigorously estimate the range of demand reduction potential possible within the initially selected areas. Efficiency Vermont did an in-house estimation of potential MWh savings in the geotargeted areas, and from that forecasted potential MW reductions given available time and budget for implementation. EVT’s process was informed by utilities with respect to forecasted load reduction goals to defer or delay transmission and distribution (T&D) upgrades. However, it appears to Navigant that the actual processes the distribution utilities used in target area selection, and EVT’s decisions on where and how intensively to focus GT efforts, could have been more systematic and coordinated.

It's Navigant's opinion that more attention should have been paid to more clearly defining specific objectives with respect to demand savings targets per GT area before implementation of targeted programs in areas began. For example, instead of basing EVT performance incentives on total GT performance (all areas combined), individual area goals should have been developed to direct EVT's focus on each targeted demand reduction. Such attention should be paid to defining objectives for any future efforts.

The lesson that should be brought forward into future geotargeting energy efficiency programs and the designation of new or revised geotargeted areas is that geotargeting planning needs to be a comprehensive, forward-looking process. Geotargeting planning should include:

» The achievable savings level for any area considered for any geotargeting designation, as well as the kinds of savings required to meet the identified transmission and distribution constraint. These elements should be an integral part of the geotargeting planning and designation process, and incumbent on all stakeholders.

» Results from energy efficiency potential studies should specifically address geotargeting concerns but not be limited to just the current geotargeted areas or those that are imminently on the table. Assuming geotargeting as a strategy goes forward and includes areas of the state not currently involved in geotargeting, statewide potential studies should recognize an approach within the overall studies for assessing the specific geotargeting needs for areas already identified by distribution utilities as likely geotargeted areas. Considering the resources devoted to geotargeting as a whole, it does not seem unreasonable to focus a part of potential study efforts specifically on geotargeting. One area that should be specifically included is the existing extent of merchant load control and demand reduction in any area and the potential for expansion through merchant or other channels. Only a truly integrated approach can fully assess the potentials for demand savings and benefits and costs. It might be that geotargeting as a strategy is no better than providing the same level of investment throughout the state when all costs and benefits are considered. This will be discussed more in Tasks 3 and 4 of this report.

4.14. Summary of Findings- Process Evaluation- Program Delivery

The program process review finds that overall, given the aggressive goals and mandates from the PSB to quickly launch the GT programs, as well as the challenges inherent in EVT's performance contract to meet multiple performance indicators, beyond just demand reductions, that Efficiency Vermont has done a remarkable job of implementing the program.

Residential programs have concentrated on compact fluorescent bulb adoption through direct and upstream promotions and incentives, as well as limited promotions on energy-efficient appliances.
Business programs have been characterized by very heavy emphasis on lighting, particularly in the Lighting Plus direct install program, providing savings coincident with summer and winter peaks in the respective geotargeted areas. Savings from Lighting Plus are substantial but there are concerns about saturation among larger customers in those GT areas that have been in the program since the beginning. Moreover, the Lighting Plus program did not provide the broader pathway for participants to be exposed and educated to undertake other opportunities as initially hoped. New contractor-driven approaches

may be more suitable for the small savings per customer that can be captured from thousands of small businesses in the geotargeted areas. In addition to the recommendations highlighted throughout this report, this section presents Navigant's final compilation of the most important summary recommendations with respect to the process evaluation of this report.

- **Better estimation of the demand reduction potential for current and future geotargeted areas would help set goals and inform the geotarget area selection process and prioritization of investment**. The first geotargeting determination had the advantage of a recent potential study for a part of the Southern Loop but other areas did not have that level of assessment available to Efficiency Vermont for its planning purposes. Ongoing and future potential studies are costly; however, wherever possible, potential studies should look specifically at geotargeted areas and examine the range of demand reductions applicable to geotargeting.
- **More coordination between EVT and the utilities is required to maximize the impact of GT investment.** The planning process for geotargeting beyond 2011 should *systematically* incorporate an integration of distribution utility estimations of future demand reduction requirements to defer or avoid T&D upgrades with EVT's estimation of the demand reduction that can be achieved in each continued geotargeted area given available time and budget. Specific demand reduction goals and resources should be targeted to each geotargeted area, if the decision is made to continue the GT strategy at all. While there has been movement toward a systematic approach Navigant does not see that there is a true set of protocols in place that can consider GT approaches in other parts of the state involving other distribution utilities besides those that participated in the 2007-2011 geotargeting efforts.
- **Demand response is a missing piece of the current GT delivery strategy.** Demand response programs may represent a viable option to achieve specific demand reductions in the GT areas. The current GT delivery design is focused exclusively on generating peak demand savings via efficiency. Because the aim of geotargeting is reduction of summer and winter peak demand, the PSB should empower Efficiency Vermont (or some other delivery entity/entities) to effectively employ DR as a resource toward meeting the demand reduction goals, if analysis and planning work forecasts it to be a viable and cost-effective tool for specific GT areas of interest, of today, or for the future.
- **Efficiency Vermont needs to continue emphasizing comprehensive solutions for customers in geotargeted areas, particularly small businesses.** Lighting programs will continue to dominate savings in the geotargeted areas but other end uses and measures should continue to be emphasized. The new programs, newLIGHT and RELIGHT, will capture some small business lighting savings that Lighting Plus was too costly to pursue; however, marketing these contractor-driven lighting programs will continue to be a challenge. Efficiency Vermont should work with and compensate lighting and other measure contractors for cross-measure referrals, using a variety of low-cost mechanisms (e.g., postcard leave-behinds, and internal cross-referencing in measure-specific rebate programs).
- **Timely responses in complex custom projects are vital to capturing lost opportunities.** Although the Navigant team may have heard only an isolated example, it's important for Efficiency Vermont to respond rapidly to custom proposals, especially when efficiency proposals

are not made by the customer or contractor until late in the process. Customers and their contractors should be timely; however, too often there are very limited response windows available for EVT to receive, analyze, and respond. EVT should recognize that some time-limited lost opportunity situations should go to the head of the line or at minimum be in fairly constant contact if response times cannot be shortened.

4.15. Recommendations

5. If the GT programs are to continue beyond 2011, more attention should be focused to more clearly define specific peak kW reduction goals, by individual GT area, that are both a) realistically achievable given available budget and time for resource acquisition, and; b) are anticipated by the utilities to be of a magnitude that will actually achieve stated goal of deferring or delaying T&D upgrades. Navigant would also recommend that any such GT-area-specific goals be based upon a potential study analysis of the achievable demand reduction potential in any selected area to ensure that area-specific goals are realistic.

6. Efficiency Vermont should work to increase both the comprehensiveness and penetration of existing efficiency programs in the geotargeted areas Possible strategies include increased incentives to trade allies for generating comprehensive projects beyond their own particular specialties, time-limited promotions, increased internal customer-centered approaches that assess current energy needs and develop multi-measure-multi-year approaches for customers with complex needs.

7. Efficiency Vermont should closely monitor the progress of its new lighting programs, particularly the penetration and the rate of penetration among small businesses in achieving demand reductions through energy efficiency, and continue to adjust incentives and various other features of its offerings.

8. The current demand response potential should assess the DR potential in the current and potential DR areas. Since geotargeting would no longer be in the experimental phase if it continues, geotargeting programs should be built from potential and assessments of the most cost-effective approaches to addressing that potential over a fixed horizon. The horizon would be set such that there would be sufficient time to determine whether the demand reductions achieved will be sufficient to delay or avoid any given project.

9. If the PSB's goals is to genuinely reduce peak demand to defer or delay T&D upgrades, then all avenues for reducing peak load should be explored, including demand response if found to be a viable and cost-effective strategy given target area peak load characteristics.

10. Taking the impact and other findings from this evaluation and from ongoing potential studies, the PSB and the DPS should closely examine the entire geotargeting concept with respect to the extent to which geotargeting provides a greater societal benefit than the prior equitable distribution of efficiency funds, or has to the potential to do so with appropriate adjustments that include substantial demand response components. This investigation should also look at whether the allocation of EVT funds between the geotargeted and the remainder of the state is appropriate given the current geotargeting goals and attainment.

5. Task 3: Impact Evaluation- Program Savings

The purpose of this component of the impact evaluation is to determine the verified savings reported by Efficiency Vermont (EVT) for each geotargeting (GT) region and to compare the GT program performance to EVT's activities in non-GT regions and among the GT regions. The verification of savings leverages the recent evaluations conducted by the Department of Public Service (DPS) in the context of EVT's annual savings verification and the Independent System Operator-New England (ISO-NE) Forward Capacity Market (FCM). The Navigant team used results from the annual verification reports of Efficiency Vermont's claimed savings for program years 2007, 2008, and 2009, coupled with monitoring and verification data from the FCM report (covering program years 2007 and 2008) to verify savings for each geotargeted area. Although the peak demand savings represented below have been verified using standard measurement and verification (M&V) methods, including on-site measurements for commercial and industrial (C&I) custom measures, they have not been compared to actual billing records or circuit loads; this direct measurement of program impacts is detailed in Task 4 and will be described in the following chapter.

The GT programs were designed to meet a specific targeted megawatt (MW) reduction in a fairly short time. In comparison to the statewide programs implemented by EVT, this objective can be achieved by pursuing faster savings, broader savings, and/or deeper savings. The definitions of these key terms are given below.

» Faster savings: Program implementation is accelerated (i.e., the overall savings may be the same as from the statewide non-GT programs, but they are achieved faster).

» Broader savings: Savings are acquired from a wider range of participants than may be reached through the statewide non-GT programs While the per participant savings are roughly equivalent, the GT program savings in total are higher due to the additional participation.

» Deeper savings: More comprehensive savings are achieved at each site served, and the GT programs produce higher savings than the statewide non-GT programs.

Although these strategies are not mutually exclusive and actual implementation may employ two or even all of these approaches, reviewing EVT's program performance in this context provides a conceptual foundation for the analysis. Table 42 summarizes the key characteristics of these strategies.

Table 42. Summary of GT Strategies in Comparison to Statewide Initiatives

Approach	Key Characteristics	Participa-tion Rate	Average Savings per Participant	Accelera-tion Rate	Levelized Costs	Total Impacts
Faster Savings	Same participants, faster rate	Higher	Same	High	Same	Same overall impact
Broader Savings	Wider range of participants	Higher	Same	Same	Same	Higher overall impact
Deeper Savings	More savings per site	Same	Higher	Same	Higher	Higher overall impact

Another critical issue is how long the savings can be sustained. Sustainability is a function of program design and implementation. If the primary strategy of achieving the GT savings is accelerating current program implementation, the savings will drop off sharply once the GT program has achieved the overall savings that would have been acquired through the statewide non-GT programs. If the goal is to increase savings through achieving deeper savings at each site rather than accelerating the rate of existing programs, then the higher level of GT savings would persist for a longer period.

The first step in interpreting EVT's program activity within this context is to consider how the program implementation fits into this framework. As discussed previously in Task 2, EVT's approach to GT program implementation included the following components:

1. Launching a new and large-scale business direct installation lighting program called "Lighting Plus"
2. Expanding the key account approach for larger customers
3. Initiating the now statewide Express Refrigeration program
4. Implementing community-based initiatives
5. Ramping up existing programs and aggressive promotion of compact fluorescent light bulb (CFL) sales

These activities indicate that EVT was employing all three strategies, with faster savings through bolstering existing programs, broader savings through Lighting Plus, Express Refrigeration, and community-based initiatives, and deeper savings through the key account approach for large customers. Assessing EVT's success in these areas through a review of verified savings necessarily has some limitations. The metrics for the three approaches to GT savings are overlapping, which tends to limit our ability to tease out the success of one strategy over another. Some of the key metrics to assess GT program performance used in the following sections are discussed in Table 43.

Table 43. Metrics for Measurement of GT Program Impacts

Metric	Measurement Method	Issues
Normalized Savings	Savings per utility premise MWh savings as % of utility sales Savings per participant	Savings per participant are difficult to measure in the residential sector as the number of participating households is not available. Variations among regions in the savings per participant may be driven by characteristics of the population as well as program implementation.
Participation Rate	Participants per utility premise	Higher participation rates may reflect a broader range of participants or accelerated participation by those who would have installed measures through non-GT statewide efforts at a later date.
Acceleration Rate	Savings per utility premise GT/ Savings per utility premise non-GT	The acceleration rates estimate the number of years it would take to achieve the same level of savings through the non-GT statewide efforts as was acquired through the GT programs in one year. The acceleration rate incorporates all of the reasons for higher savings, not only acceleration of current statewide efforts in the GT regions.
Costs	Levelized costs EVT costs/peak kW	Levelized costs will be higher for more comprehensive efficiency initiatives designed to acquire deeper savings at each site. EVT costs/peak kW provides a comparison among GT regions; however, all of the costs are loaded on the peak kW reduction, leading to higher values.

The results from this analysis are grouped into nine major categories and discussed in this chapter, as delineated below.

1. **Overview of Program Performance:** This section covers the total savings (energy and peak kW) for the GT regions and statewide non-GT programs for the initial GT period (July 2007 through December 2008) and for program year 2009.
2. **Normalized Savings:** To make a comparison among GT areas and to the statewide non-GT program accomplishments, savings were normalized by utility premise and by participant. The savings per premise are presented for the two GT periods by region and for the non-GT statewide efforts. Savings per participant are also included for the C&I sector. These comparisons demonstrate that North Chittenden and Rutland consistently showed the highest savings and the Southern Loop the lowest.
3. **Participation Rates:** Participation is measured in comparison to the number of utility premises and also to total utility sales for each GT region and the statewide non-GT regions by implementation period. Participation rates in the GT regions were found to be substantially higher in comparison to the statewide non-GT programs.
4. **Acceleration of Savings:** The acceleration rate represents the period of time it would take to acquire the same level savings through the non-GT statewide efforts as was achieved through the GT programs. This discussion includes the "acceleration" factor (i.e., the number of years of implementation of EVT's entire portfolio [GT and non-GT programs] that would be required to acquire the level of savings already achieved through the GT programs). The results of this analysis show that it would take over twice as long at the statewide implementation rate to meet the level of savings achieved by the GT programs in PY 07/08.
5. **Comprehensiveness of Savings:** This section discusses the primary mechanisms for achieving savings and comprehensiveness of the programs in comparison to the statewide initiatives. Generally, it appears that the GT programs were not more comprehensive than the statewide initiatives in terms of the range of end uses treated and tended to rely more heavily on lighting savings than the statewide initiatives.
6. **Implementation and Levelized Costs:** This section provides an overview of these key metrics and a more detailed discussion of the levelized costs. The analysis shows that EVT's levelized program costs are higher for programs implemented in the GT regions as compared to the statewide non-GT initiatives; however, the total levelized costs (including participant and third-party costs) are about the same for GT and non-GT regions.
7. **Incremental Savings**: This section covers overall incremental savings. Assuming that the statewide initiatives (GT and non-GT) would have the same impacts on a per-premise basis, the extrapolated statewide impacts for each GT region were estimated and compared to the actual GT program accomplishments. In aggregate, the programs achieved 1,090 kW of winter peak and 3,935 of summer peak reduction during the two-and-a-half-year implementation period over and above what would have been achieved at the statewide non-GT implementation rate.
8. **Benefit/Cost Analysis and TRB:** A benefit/cost analysis was conducted using the verified savings, and the GT programs were found to be cost effective, with benefit/cost ratios in the

range of 1.8 to 2.2. The total resource benefits (TRBs) for each GT region are also reported in this section.

9. **Comparison to Goals Among GT Regions:** The PSB and EVT developed negotiated goals for the GT program implementation. In this section, the verified achievements are compared to these goals and the performance within each region is discussed. This process produced overall summer and winter MW goals, i.e., the goals were not explicitly set for each GT region as discussed in Section **Error! Reference source not found.** above. Although EVT made substantial progress by many standards, verified kW peak reduction did not meet the established goals.

Given that the implementation of the GT initiatives was fairly consistent over the five GT regions, the differences in outcome among the GT regions are more likely to be associated with the characteristics of the areas and the issues associated with each region are explored.

As the framework for this study, the DPS's evaluation plan posed a series of questions to be considered. The answers to these questions are interspersed throughout the remainder of this chapter. The discussion of results is organized into the broad categories as described above. In each section, the discussion includes a comparison of the performance in the GT regions to the statewide non-GT regions as well as the performance among GT regions. A brief description of each section and how the discussion related to the DPS questions are provided below.

Table 44. Organization of Impact Results

	DPS Question	Section of Report
1	What were the verified energy, demand, and TRB savings in each of the targeted areas over the initial 18-month implementation period? In 2009? What were the overall and winter and summer levelized costs per kW in each area? Per kWh?	Overview of Program Performance Cost / Benefit Analysis (TRB) Costs (levelized costs)
2	What were the peak demand reductions, incremental to statewide savings, that would have been achieved absent GT policy, by GT area monthly, annually, and over the initial 18-month implementation period?	Incremental Savings
3	How do savings impacts compare in both magnitude and cost with savings achieved contemporaneously in non-GT areas?	Normalized Savings Costs
4	What do results suggest about how cost effective are the GT electricity savings achieved in each of the GT areas? Related questions include: a. How much did it cost to achieve the electricity savings in each area? b. What are the estimated benefits of the actual GT electricity savings in each area? c. Were there any significant differences across the four areas? Why?	Cost/Benefit Analysis (TRB)
5	Beyond overall impacts, what can be determined about the relative impacts and cost-effectiveness of the various specific GT strategies, programs, and measures? What do these results suggest about future GT efforts?	Comparison to Goals
6	What do the results suggest about whether geotargeted energy efficiency interventions are a "no-regrets" strategy? (i.e., is it a cost-effective and beneficial investment even if it turns out not to be a least-cost T&D alternative or unable to defer or eliminate a particular T&D upgrade?)	Cost/Benefit Analysis (TRB)

The next section provides a brief description of the process for determining the verified savings, with more detail provided in Appendix C. The remainder of this chapter is organized as described above. The critical findings from these analyses are summarized in the conclusions. Throughout this chapter, unless otherwise noted, energy and demand savings are reported as net at generation.[20]

[20] For demand savings, the net peak demand savings at generation was calculated by comparing the gross savings at the customer meter to the net savings at generation from EVT's annual reports for each GT region and applying these factors to the verified gross peak demand savings. The adjustment was made for each GT region, each program year, and each peak period.

5.1. Methods

This section covers the estimation methods for the energy and demand impacts used to represent EVT's program performance in this report. This component of the impact evaluation relied on EVT's annual savings claims and the DPS's previous verification and impact evaluation activities. There were three subtasks that required substantial review and manipulation of the data:

1. Developing the verified savings to be used in the analyses
2. Determining implementation costs and calculating levelized costs
3. Conducting the benefit/cost analysis

A brief description of these three steps is provided below and additional detail is provided in Appendix C. In addition, there is a brief discussion regarding the timing of the peak period. Other calculations made as part of the analyses described below are described in the relevant section.

5.2. Verifying EVT's Savings

The impact evaluation of EVT's geotargeted program was based on the program tracking system data and utility billing records provided by Efficiency Vermont, in conjunction with DPS's verification and impact evaluation activities. This study focuses on the two periods of GT program implementation (i.e., July 1, 2007, through December 31, 2008, and all of calendar year 2009).

The DPS conducted two types of M&V and impact evaluation activities to assess the reliability of EVT's savings claims:

» Annual savings verification, as part of EVT's contract with the Public Service Board of Vermont (PSB)

» Impact evaluation for purposes of the ISO-NE Forward Capacity Market

Throughout the study period, EVT operated under a performance contract with the PSB. Efficiency Vermont annually provides a summary of claimed savings that compiles all of the savings achieved during the previous program year by program and other categories, including geotargeted regions. The annual savings verification process is a check on EVT's claimed savings in relation to their performance goal. This evaluation activity consists of a review of EVT's algorithms and inputs used to calculate energy and demand savings and TRBs resulting from the installed measures.

The DPS conducted the FCM impact evaluation to verify EVT's savings in the context of the ISO-NE Forward Capacity Market. This evaluation met the rigorous guidelines issues by ISO-NE and included direct, on-site measurement. The evaluation cycle completed in 2010 covered program years (PYs) 2007 and 2008; the evaluation of PY 2009 is currently in progress.

Both of these evaluation activities produced realization rates to be applied to EVT's annual savings claim. Following the DPS's annual saving verification process, EVT updates the savings claims and produces its annual report. The FCM impact evaluation results are currently used only to adjust the savings reported to ISO-NE for the FCM.

Because the FCM evaluation was based on on-site measurements, the realization rates were considered to be more reliable.[21] Although the FCM evaluation has not been completed for PY 2009, the realization rates from the 2007/2008 evaluation were applied as they represent the best information available at the time of this analysis. However, only the winter and summer kW peak reductions were verified through the FCM evaluation. Thus, the realization rates developed through the annual savings verification for each year were used for the energy savings and other inputs into the TRB.[22]

The FCM realization rates should be applied to the original EVT claimed savings (prior to the adjustments identified through the DPS's annual verification process). For this reason, these original savings estimates were used as the foundation of the analysis and the realization rates from either the FCM (for winter and summer peak kW) or the DPS's savings verification (for energy and other TRB inputs) were applied to these values. A summary of the original claimed savings and the verified savings used for purposes of this evaluation is provided in Table 45.

[21] The California Energy Efficiency Evaluation Protocols lists the allowable impact evaluation methods used in California and is considered to set the industry standard. The "basic" level of rigor requires International Performance Measurement and Verification Protocol (IPMVP) Option A at a minimum, and the "enhanced" level of rigor requires Option B, which requires direct on-site measurement and/or development of stipulated values through primary research. The lowest level of rigor is "measure installation verification," which also involves on-site visits for verification purposes. Verification through paper review without on-site visits (as conducted for the DPS's annual savings verification process) is not listed as an acceptable approach for measurement and verification. ("California Energy Efficiency Evaluation Protocols: Technical, Methodological and Reporting Requirements for Evaluation Professionals," prepared by TecMarket Works, et al., April 2006, Chapter on M&V Protocol)

[22] The winter and summer peak kW reductions are the critical variables in the context of this evaluation, and the realization rates from FCM impact evaluation are based on direct measurement and meet the ISO-NE standard. Because the source of the realization rates applied to the energy savings and other TRB inputs is the less rigorous annual verification process, there is greater uncertainty in these savings estimates. It is not possible, however, to determine whether the verified energy savings are biased in one direction or another.

Table 45. Original and Verified EVT Savings

Region	Original Claimed Net Annual MWh Savings	Verified Net Annual MWh Savings	Original Claimed Gross Winter Peak kW Reduction	Verified Gross Winter Peak kW Reduction	Original Claimed Gross Summer Peak kW Reduction	Verified Gross Summer Peak kW Reduction
PYs 2007/2008						
North Chittenden	25,756	24,599	3,356	3,118	3,216	2,491
St. Albans	19,192	18,003	2,500	2,172	2,722	2,065
Southern Loop	16,919	15,866	2,365	2,022	2,057	1,544
Newport	5,525	5,139	693	586	866	625
Total GT Regions	67,391	63,614	8,915	7,898	8,861	6,726
PY 2009						
North Chittenden	11,435	10,232	1,612	1,602	1,647	1,426
St. Albans	6,441	5,710	925	887	863	729
Southern Loop	5,233	4,539	886	839	740	667
Rutland	8,910	7,845	1,280	1,212	1,541	1,384
Total GT Regions	32,019	28,384	4,703	4,554	4,791	4,213

5.3. Uncertainty Due to Upstream CFL Incentives

A significant portion of EVT savings in the GT regions (roughly 37 percent of winter peak kW savings and 24 percent of summer peak kW savings) is attributable to residential savings derived from upstream market initiatives in the Efficient Products Program, which provides incentives to retailers, distributors, and other market actors rather than directly to the end user. In terms of savings, most of this upstream activity is related to the purchase of CFLs. This strategy, used by many efficiency programs, allows program providers to address market barriers directly and more effectively at all levels of the market. Unfortunately, the direct connection between the purchase and the individual making the purchase is broken, and it is no longer possible to identify the ultimate purchaser of the product or their exact physical address.

To overcome this limitation, EVT assigned products that received upstream rebates to zip codes surrounding the store where the product was purchased based on historical coupon data for the same-store sales in 2005. In other words, products such as CFL lamps and ENERGY STAR appliances are assumed to be purchased by various communities in the same pattern that they were purchased in the past when retail rebates and coupons were used to drive the market. The use of historical coupon data allows EVT to provide an estimate of the geographical distribution of the products sold through the upstream market initiatives.

Although it is not possible to quantify the potential impact of this uncertainty within the budget and time constraints of this study, it is unlikely to be large. The products in question were sold in the area and some errors in assignment would only result in a product being assumed to be in one GT town rather than another. There is also the possibility that products that were assigned to non-GT areas were actually purchased for GT accounts.

5.3.1. Levelized Costs

The GT program delivery costs represented in the following sections were taken from EVT's annual reports. The costs for PY 2007 for the GT regions were prorated by the portion of savings achieved during the last six months of the year, to match the GT implementation period that began on July 1, 2007. The Navigant team estimated levelized cost of energy savings for PY2008 as follows:

$$\frac{\text{2008 Program Spending \$}}{\text{2008 Energy Savings kWh}} \times \frac{\text{Disc Rate} \times (1 + \text{Disc Rate})^{\text{WAML}}}{(1 + \text{Disc Rate})^{\text{WAML}} - 1}$$

where

WAML is the weighted average measure life
Disc Rate is the real societal discount rate from the Vermont screening tool (0.057)

The cost-effectiveness analysis was conducted by the Navigant team using the verified annual net energy savings with direction from EVT and the DPS in the use of Vermont's screening tool.[23]

5.4. *Timing of the Peak Period*

The target reduction was tied to the system peak during a specific season for all GT regions combined, i.e., a winter peak and a summer peak goal were set. For most of the GT regions, the summer peak kW reduction was the most critical. For the Southern Loop (Central Vermont Public Service [CVPS]), the target reduction was associated with the winter peak. For Newport (Vermont Electric Cooperative [VEC]), reductions to both winter and summer peak were targeted.

The winter and summer peak kW reported by EVT and evaluated as part of the DPS's FCM evaluation are calculated based on the ISO-NE peak periods of 5:00 to 7:00 p.m. weekdays in December and January and 1:00 to 5:00 p.m. weekdays from June through August (non-holidays). These are the only peak kW values available for EVT's programs and are used in this report to compare peak kW target reduction with EVT's actual impacts.

[23] Efficiency Vermont, in the course of its operations, annually updates some assumptions in the Department's screening tool for its own use, and submits to the DPS for approval. EVT's contractor, Green Energy Economics, provided the version of the Vermont screening tool used for use in this study. This screening tool is available upon request from the Department of Public Service.

As part of the analysis conducted in Task 4, the Navigant team assessed whether the ISO-NE peak periods corresponded to the actual system peaks in the GT areas. In general, the correspondence is reasonably good. The exception is the Southern Loop, which seems to have its winter peak earlier in the afternoon (before 5:00). Since the winter peak savings are verified for the 5:00 to 7:00 PM time periods, when many businesses have closed for the day, and the preponderance of savings is in the commercial lighting sector, it is likely that the estimated winter peak kW reduction for EVT's programs underestimates the actual winter peak savings available at the actual system peak.

5.5. Overview of Verified Savings

An overview of the GT program verified savings and EVT-reported costs by GT region as compared to the total statewide (both GT and non-GT) savings and costs by implementation time period is provided in Table 46. From a broad-brush perspective, about half of EVT's costs went to the GT regions and a little more than one-third of the savings were attributed to the GT components of EVT's portfolio in aggregate during the initial period of July 1, 2007, through December 31, 2008. Peak kW savings are reported for both winter and summer periods, regardless of the specific period targeted for the GT region.

The North Chittenden GT region absorbed the largest share of the costs and also produced the highest savings, with about 20 percent of the statewide costs and 13 percent of total portfolio summer peak kW reduction attributed to this single GT region. Newport accounted for the least expenditures and lowest portion of the savings. In PY 2009, approximately 40 percent of EVT's statewide costs were spent on the GT regions, resulting in 31 percent of the energy savings and almost 40 percent of the summer peak kW reduction.

Table 46. EVT Verified Savings and Costs by Region

Region	Verified Net Annual MWh Savings	% of Statewide Annual MWh Savings	Verified Net Summer Peak kW Reduction	% of Statewide Summer Peak kW Reduction	EVT Costs (thousands $)	% of Statewide EVT Costs
PYs 2007/2008						
North Chittenden	24,599	14%	2,915	13%	$7,231	19%
St. Albans	18,003	10%	2,349	11%	$5,023	13%
Southern Loop	15,866	9%	1,786	8%	$4,807	12%
Newport	5,139	3%	708	3%	$1,964	5%
Total GT Regions	63,607	35%	7,759	36%	$19,025	49%
ALL STATEWIDE (NON-GT and GT) TOTAL PYs 2007/2008	**180,964**		**21,782**		**$38,763**	
PY 2009						
North Chittenden	10,232	11%	1,647	13%	$3,314	13%
St. Albans	5,710	6%	829	7%	$1,960	8%
Southern Loop	4,539	5%	749	6%	$1,583	6%
Rutland	7,845	9%	1,558	13%	$3,506	14%
Total GT Regions	28,384	31%	4,783	39%	$10,363	41%
ALL STATEWIDE (NON-GT and GT) TOTAL PY 2009	**91,481**		**12,320**		**$25,093**	
GT GRAND TOTAL PYs 2007/2008/2009	**91,990**		**12,542**		**$29,387**	
STATEWIDE GRAND TOTAL PYs 2007/2008/2009	**272,445**		**34,102**		**$63,856**	

5.6. *Normalized Savings*

Total megawatt-hour (MWh) savings or peak kW reduction are insufficient to compare performance in the GT regions to statewide efficiency activities, because differences may be due to a wide range of external factors outside of the EVT's influence, such as population sizes and presence of large C&I customers.

For this component of the analysis, two approaches were used to normalize the savings:

- Savings were estimated per utility premise.[24]
- Savings were estimated as a percentage of total utility sales.

In addition, the results were separated into three periods: (1) the initial implementation period for the GT programs in 2007 and 2008, (2) program year 2008 only, and (3) the second implementation period starting in 2009. [25] Data for Newport is available only for the initial period of PYs 2007 and 2008, because it was removed from the GT program in 2009. Rutland was added in 2009; thus, no data is available for the earlier period. (Savings per participant in the C&I sector are discussed in 5.8, Comprehensiveness of Savings.)

This analysis was conducted for the verified annual net energy savings and peak demand savings at generation. The results of these analyses are summarized in Figure 2 and some of the key findings are discussed below.

- Most of the savings during the initial implementation period occurred during 2008, which would be expected given that the GT programs were being ramped up during last half of PY 2007.
- EVT achieved higher savings in the GT regions, in aggregate and individually, when compared to the initiatives promoted in non-GT areas.
    - For the combined GT regions, per premise energy savings are more than twice the savings achieved in the non-GT areas over all three time periods (about 0.100 net summer peak kW reduction for the GT regions on average as compared to about 0.035 kW for the non-GT regions during PY 2008).
    - The pattern of higher savings per premise homes also holds for winter peak kW, summer peak kW, and kWh savings.
- Higher savings per utility premise were predominantly due to activity in the C&I sector.
    - The GT savings per utility premise on average in the C&I sector were more than four times (400 percent) greater than the statewide non-GT peak savings during the initial implementation period.
    - In the residential sector, the average GT peak savings per premise were about 25 percent higher than the non-GT statewide peak savings.

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[24] For utility premises, the total number of premises was used (participants and non-participants). This approach allowed for direct comparison to the statewide initiatives using the DPS's compilation of utility sales data.

[25] Program year 2008 was separated from the initial implementation period to be able to remove the potential impacts of the ramp-up period, and also to be able to make a more direct comparison of first-year MWh savings to annual utility savings. Because the vast majority of the savings were acquired during 2008, the PYs 2007/2008 savings were normalized by the number of utility premises and MWh utility sales in 2008.

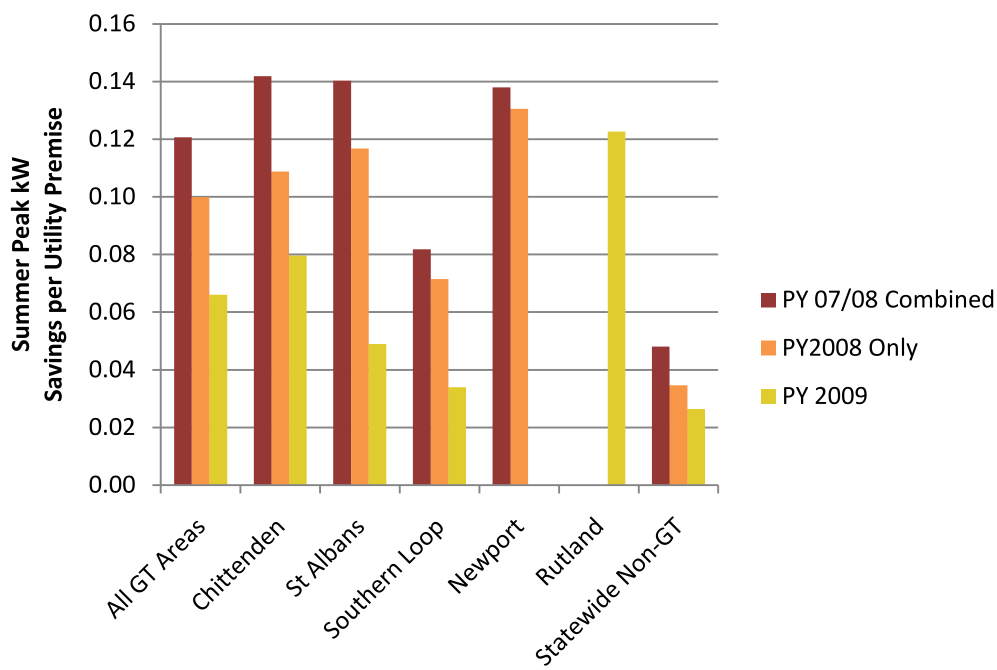
» There was a substantial drop in savings between 2008 and 2009.

  o Overall for the statewide non-GT programs, there was a reduction of 24 percent in summer kW savings per utility premise and 39 percent for kWh in 2009 as compared to 2008.

» The GT areas on average experienced a greater decline in savings of 34 percent in the summer peak kW for the three GT regions with implementation in both years. However, the impact was not even across GT regions.

  o The reduction in savings in North Chittenden (27 percent) was in a similar range with the statewide non-GT programs.
  o Both Saint Albans and the Southern Loop experienced a more precipitous decrease in savings (58 percent and 52 percent, respectively).

Figure 2. Verified Net Summer Peak kW Reduction per Utility Premise by Region



Given the sharp reduction in the savings in 2009, further analysis of the differences between the PY 2008 and PY 2009 savings was conducted and found to provide some additional insights. The Efficient Products program suffered a large loss statewide in terms of participants and savings in 2009.

» During 2008, the program reached 47,466 participants and achieved net savings of 13.3 winter and 8.7 summer peak MW.

» The following year, these numbers dropped to 29,455 participants, 8.4 winter and 4.7 summer MW, and a decrease of 38 percent in participation and 46 percent in summer peak MW.

This decline is due primarily to fewer CFL purchases. In addition, EVT and the DPS agreed to lower savings assumptions for 2009 to reflect changing market conditions.[26]

Another known change in program design is that EVT changed their incentive design for "Lighting Plus" from a 100 percent free direct-install program to one requiring the customer's portion of first costs is be based on an estimated one-year payback.

The pattern of the decrease in savings during PY 2009 was not consistent between the GT regions and non-GT statewide programs. Because the Efficient Products program affects only the residential sector, the relative impacts of changes in the residential and C&I sectors provide some indication of the differences between the two sets of programs, as explained further below.

- For non-GT regions, the reduction in the savings for the Efficient Products accounts for about two-thirds (67 percent) of the difference between the magnitude of the PY 2008 and PY 2009 gross summer peak kW.
- In the GT regions, the lower EP savings account for less than 15 percent of the total reduction in gross summer peak kW.
- Although the winter and summer gross peak kW savings decreased substantially in 2009 in both the residential and C&I sectors, the reduction was much greater in the C&I sector (50 percent to 60 percent, as compared to 20 percent to 25 percent).

These results indicate that the lower participation and change in assumptions for the Efficient Products program were the primary drivers of the drop in savings from the statewide non-GT initiatives. In contrast, the reduction in savings in the GT regions was largely due to lower activity in the C&I sector, which could be related to the change in the RISE program incentives, the economic downturn, having reached the more accessible parts of the C&I market during the initial implementation period, or other factors.

Program results were also compared to utility MWh sales.[27] By this metric, the GT programs had a substantial impact, as shown in Figure 3.

- For PY 2008, the verified net annual MWh savings were in the range of 5 percent of utility sales for the GT programs, as compared to less than 2 percent for the statewide non-GT initiatives.
- For PY 2009, the percentage of MWh savings to total utility sales dropped to 2.5 on average for the GT regions and 1.2% for the statewide non-GT programs.

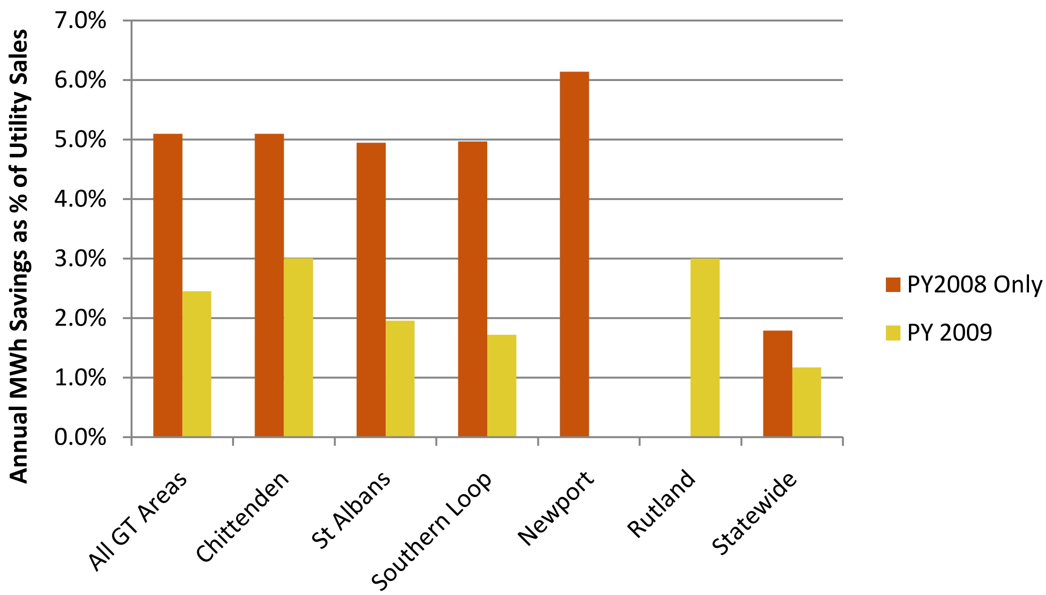
To put these findings into perspective, Navigant's recent benchmarking study found energy savings as a percentage of sales ranges widely from 0.1 percent to 3.5 percent, with the median at 1.0 percent among

[26] In 2009, the percentage of CFLs assumed to be installed in commercial locations with higher per bulb savings was lowered from 15% to 10.5%. Adjustments were also made to the net-to-gross factors.

[27] The source of the sales data was the annual compilation of utility accounts and sales maintained by the DPS. Sales data were only available for MWh. There was no equivalent information for kW.

the 27 utility demand side management (DSM) programs included in the analysis.[28] EVT's verified performance in the GT areas in PY 2008 clearly exceeds this typical range.

Figure 3. Verified Net Annual MWh Savings as a Percentage of Utility Sales by Region



When comparing the GT and non-GT regions, the baseline MWh sales are not static and the intensive activity in the GT regions may have reduced the utility MWh sales further than in the other non-GT regions, thus resulting in a higher percent savings. Given that the savings from the efficiency programs are still a small percent of overall sales, this effect should be minor and the wide difference between the savings as a percent of utility sales in GT and non-GT regions (5 percent to 2 percent in the initial implementation period) suggests that the GT programs are indeed achieving substantially higher sales by this metric.

The fact that the savings in the GT regions are higher in terms of savings per utility premise and energy savings as a percentage of utility MWh sales is not clearly associated with one specific GT strategy. This outcome could be a result of faster savings (increasing participation rates), broader savings (reaching a wider range of participants), or deeper savings (higher savings per participant). These issues are explored further in the following sections.

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[28] *Benchmarking of Vermont's 2008 Electric Energy Efficiency Programs: A Comparative Review of Efficiency Vermont and Burlington Electric Department*, prepared for the Vermont Department of Public Service by Navigant Consulting, Inc., May 2010, Figure 4-3.

5.7. *Participation Rates*

The purpose of targeting projects to the GT areas is to achieve greater peak kW savings faster than would be achieved through typical statewide program implementation, and higher participation rates can be a key factor in achieving higher savings. Comparing participation rates is relatively straightforward in the C&I sector, but more complex for the residential sector.

In the C&I sector, direct information is collected for most participants; thus, there is sufficient information to determine participation rates and savings per participant. The primary complicating factor is that there may be multiple EVT projects at the same site over time. To address this issue, EVT participation was counted at the site level, and the participation rate was calculated as the number of sites served through EVT's program divided by the total number of utility premises.

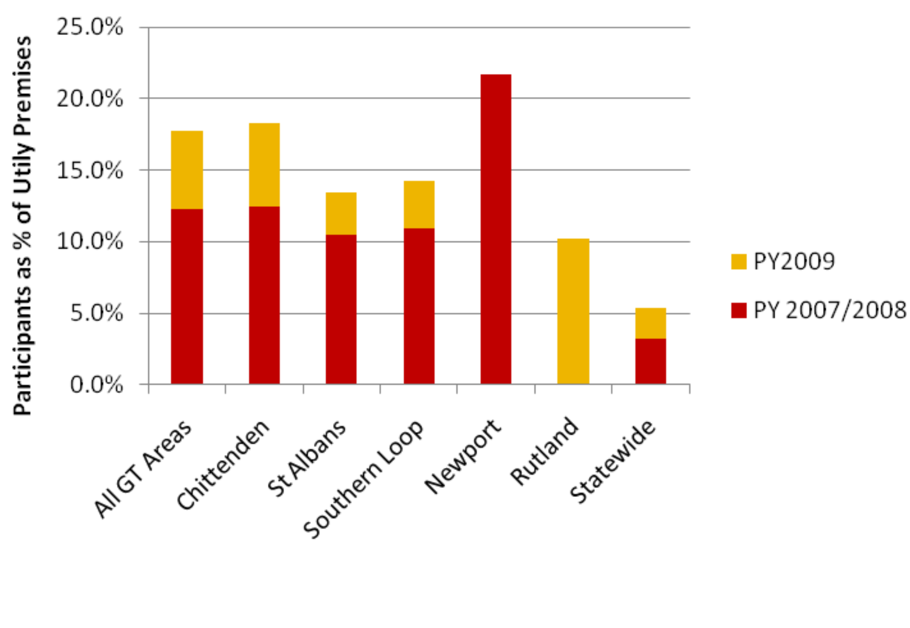
The results of this analysis are illustrated in Figure 4 and discussed below.

» EVT increased program participation in the GT regions by almost fourfold over the statewide non-GT programs.

» On average, 12 percent of C&I customers in the GT areas participated in an EVT program and installed measures during PYs 2007/2008, as compared with 3 percent in the statewide non-GT areas.

» The participation rates among the GT regions were fairly consistent during PYs 2007/2008 (in the range of 10 to 13 percent), with the exception of Newport, with a participation rate of almost 22 percent.

Figure 4. C&I Participation Rates



This analysis also showed a dramatic reduction in participation rates between the two implementation periods.[29] This trend is consistent with the overall drop in savings in 2009, as discussed in Section 5.6 Normalized Savings.

It is possible that the lower participation rates could signal that the more accessible savings have been obtained during the first implementation period. Rutland, for example, was added as a GT region in PY 2009 and achieved a participation rate of 10 percent in 2009, which is only slightly less than the PYs 2007/2008 participation rates for North Chittenden, Saint Albans, and the Southern Loop, the three regions with consistent implementation since 2007. In contrast, the participation rates for these three regions in PY 2009 were lower than Rutland's rate by 50 percent or more. Additional information, such as a potential study, and further analysis of the economic conditions, would be necessary to determine the characteristics of the remaining energy efficiency opportunities and the impacts of the economic downturn.

Table 47 shows the participation rates in the C&I sector for the two periods for North Chittenden, Saint Albans, and the Southern Loop (the three regions with implementation during both periods). Although the participation rate for these three GT regions is still twice the statewide non-GT rate in PY 2009, the drop in the rate between the two periods is greater in the GT regions than the statewide non-GT areas.

- Overall, the statewide non-GT participation rate dropped from 3.2 percent to 2.2 percent between PYs 2007/2008 and PY 2009 (a reduction of 32 percent).
- The three GT regions with implementation during both periods show an average decrease from 11.4 percent to 4.1 percent (a reduction of 64 percent).
- Saint Albans and the Southern Loop clearly affected the GT average, with reduction rates of about 70 percent.
- For North Chittenden, the reduction rate (53 percent) is almost at the midpoint between the other two GT areas (70 percent) and the statewide non-GT areas (32 percent).

These results suggest that the pace of accelerated GT savings over statewide savings levels for the programs as implemented is slowing in Saint Albans, the Southern Loop, and North Chittenden.

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[29] Although the first implementation period spanned 18 months and is being compared to the 2009 calendar year, 2007 was a ramp-up year and the vast majority of the PYs 2007/2008 savings occurred during 2008.

Table 47. C&I Participation Rates by Implementation Period

Region	Participation Rate PYs 2007/2008	Participation Rate PY 2009	% Reduction
North Chittenden	12.4%	5.8%	53.4%
St. Albans	10.5%	3.0%	71.7%
Southern Loop	11.0%	3.3%	69.7%
THREE GT REGIONS COMBINED	11.4%	4.1%	63.7%
STATEWIDE NON-GT PROGRAMS	3.2%	2.2%	32.0%

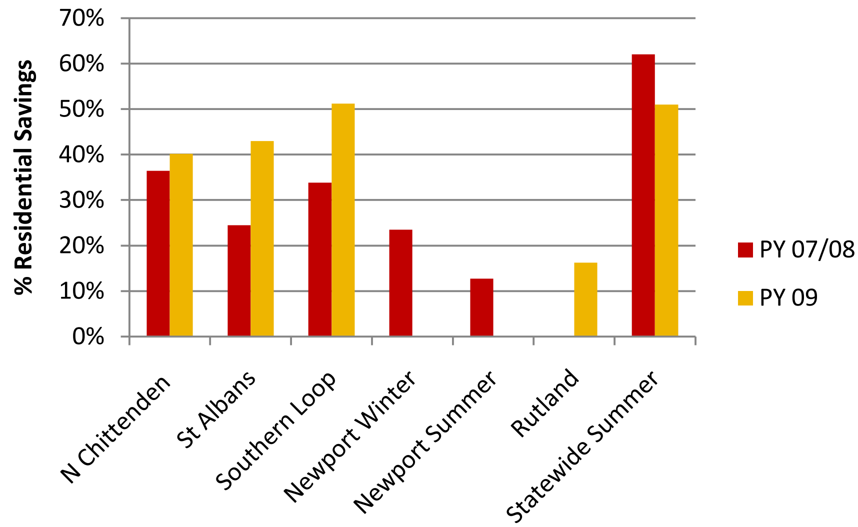
In the residential sector, measuring participation rate is complicated by the preponderance of savings from the Efficient Products Program (EP). About 95 percent of the residential savings are a direct result of the Efficient Products Program in both the GT regions and the statewide non-GT programs, and most of the EP savings are from the purchases of CFLs.

As described above, the Efficient Products Program is designed to promote higher visibility and increased purchases of efficient products. The activity is largely performed by retailers and, in many cases, no direct information on purchasers is collected. Thus, for the EP program, it is possible to determine how many CFLs were purchased, but not how many homes were served.[30] The analysis is further complicated by the differences in percentage of bulbs sold through the buy-down program in each GT region. In addition, the total number of participants in EVT's annual reports for the GT regions combined the residential and C&I sectors; therefore, there is no direct reference to the number of residential participants using EVT's estimation method. (Please refer to Appendix C for more detail on EVT's estimation method.) Consequently, the Navigant team concluded that is not possible to develop a clear and reliable method to estimate participation rates for the residential sector.

To illustrate the relationship between activity in the C&I and residential sectors, the ratio of residential savings to total savings was calculated. This analysis provides insight into the relative importance of the two sectors, and conducting the analysis by GT region highlights the differences among the GT programs. Figure 5 shows the proportion of the gross peak kW savings from the residential sector. Only the designated peak period with PSB goals is included in this graph (summer peak for North Chittenden, Saint Albans, Newport, and Rutland, and winter peak for the Southern Loop and Newport). The ratio of residential savings for the statewide non-GT programs reflects the summer peak period, because the goals for four out of the five regions were established for the summer peak.

[30] Where coupons are provided, EVT reports the number of participants based on the actual site information. For the EP lighting buy-downs, which represent a large portion of the EVT CFL savings, EVT counts one participant for each unique combination of offer code (i.e., item code), report date, zip code, and city; EVT informed the Navigant team that this approach is likely to undercount actual participants.

Figure 5. Residential vs. C&I Designated Peak kW Savings



During the GT initial implementation period, the percentage of residential savings was lower in the GT regions in comparison to the statewide non-GT programs. In PY 2009, percentage of residential savings increased over the previous period for the three regions, with consistent implementation from 2007 through 2009. Statewide non-GT programs show the opposite trend.

These results are linked to the characteristics of the GT region and participation levels in the Efficient Products Program. (Please refer to Table 56 in Section 5.13 below for an overview of the characteristics of the GT regions.) The Southern Loop is the only region with more residential than commercial accounts, and also has the highest percentage of residential savings in PY 2009. North Chittenden is an urban center with large C&I customers and many residential customers, and about 30 percent of the savings are from the residential sector. Rutland, in comparison, has the higher preponderance of C&I accounts and the lowest percentage of residential savings in PY 2009 (16 percent).

The results in Newport seem counterintuitive in that this region has the lowest number of large C&I accounts and also the lowest percentage of residential savings. However, Newport had the highest participation rate in the C&I market (22 percent of C&I utility premises), suggesting that the low ratio of residential savings is a result of high participation in the C&I programs and low participation in the Efficient Products Program.

Overall, C&I participation rates are higher for the GT regions in comparison to the statewide non-GT programs, and residential savings as a percentage of total savings are lower. This result is supported by the focus of EVT's GT efforts on C&I programs such as Lighting Plus.

5.8. *Comprehensiveness of Savings*

A possible concern is that higher participation could be achieved at the expense of less comprehensive installations at each site. To address this issue, the Navigant team considered whether the GT programs are acquiring comprehensive savings at each site. This analysis was necessarily limited by time and resources, and additional information is needed to complete a thorough analysis.

Two approaches were used to assess how the GT programs compared to the statewide non-GT initiatives in terms of comprehensives: 1) determining the level of savings per participant and 2) reviewing the range of end uses treated in the C&I sector. These analyses were conducted for the initial implementation period.

For both the C&I and residential sectors, the GT programs in aggregate achieved higher savings per participant than the statewide non-GT programs, as explored further below.[31]

- Gross peak demand savings per C&I participant in the GT regions were in the range of 20 to 25 percent higher as compared to the statewide programs during the first implementation period.
    - The average savings per participant in the GT regions were 38.2 MWh, and 4.3 kW at summer peak.
    - In comparison, 32.6 MWh and 3.4 kW per participant on average were saved through the statewide programs.
- The residential sector shows similar results, with savings around 30 percent higher for the GT regions in aggregate on a per-participant basis for PYs 2007/2008.

Although this analysis shows clear differences between GT and statewide non-GT programs on average, there was substantial variation among GT regions in both sectors. For example, gross summer peak kW savings per C&I participant range from 3.1 kW/participant in Newport (below the statewide average) to 6.8 kW/participant in Saint Albans. Since Newport has the lowest number of large C&I customers among the five GT regions, this result is not surprising. Thus, the variations may reflect differences in demographics, program saturation, and other factors; this result suggests that the data does not support drawing distinctions among GT regions on this basis.

The other approach to assessing comprehensiveness of program implementation was to determine the number of participating sites that installed a range of measures associated with different end uses and compare the GT and statewide non-GT areas.

[31] As most of the residential savings are from the EP and there is no clear method to determine the number of households serviced, savings per participant does not accurately reflect the savings per household and should be considered only in the context of comparison among the GT regions. The number of residential participants for the GT regions was estimated by subtracting the number of C&I participants in EVT's tracking system from the total number of participants with installations as claimed in EVT's annual report. See the previous footnote for details on EVT's method of determining the number of residential participants.

EVT's C&I measures were assigned to seven major end uses (lighting, refrigeration, air conditioning, industrial process, ventilation, motors, and hot water), with the categories as defined in EVT's annual reports[32]. The remaining small end uses were grouped together as "other." The savings were aggregated by site and the GT participants compared to non-GT participants. This analysis covers comprehensiveness in terms of the number of end uses addressed, not the depth of savings achieved within a single end use.

As shown in Table 48, the results suggest that EVT's GT initiatives are slightly less comprehensive than the statewide non-GT programs in terms of the range of end uses installed.

- In the statewide non-GT programs, 74 percent of sites installed measures in only one end use, as compared to 78 percent in the GT regions.
- Review of EVT's program data further indicates that 67 percent of the savings from the GT programs were from lighting as opposed to 49 percent for the statewide non-GT initiatives, and 73 percent of GT participating sites installed only lighting measures as compared to 55 percent for the statewide non-GT activity.

These results were reasonably consistent across all GT regions.

Table 48. Comparison of Number of End Uses Installed per Participant

	# of Sites		% of Sites	
# of End Uses Installed Per Site	GT Regions	Statewide Non-GT	GT Regions	Statewide Non-GT
1	920	1,130	78%	74%
2	229	218	19%	14%
3	25	124	2%	8%
4	11	46	1%	3%
5	0	8	0%	1%
6	0	1	0%	0%
7	0	0	0%	0%
TOTAL	1,185	1,527		

[32] This analysis was conducted only for the C&I sector. Since residential savings are primarily associated with the Efficient Products program, the bulk of the savings are from CFL purchases.

For the residential sector, the vast majority (more than 90 percent) of both the GT savings and statewide non-GT savings are from the EP, and the purchase of CFLs accounts for most of those savings. Thus, the residential savings are heavily weighted toward lighting, as is consistent with the program design.

This component of the analysis suggests that EVT is achieving moderately higher savings per participant and that the majority of these savings are from lighting rather than a wider range of types of end uses.

5.9. Acceleration of Savings

Although the GT programs are designed to increase savings in these specific areas through higher participation and possibly more comprehensive savings at each site, this approach may simply accelerate implementation of measures that would have been installed at a later date, or it may generate additional savings by achieving more comprehensive savings at each site, or some combination of the two. If high-use customers are targeted in the initial stages or comprehensive savings are not achieved, it may be that the programs could reach a saturation point, at which point incremental savings become more expensive and difficult to obtain. Thus, it is possible that the initial high savings for the GT programs may not be sustainable over a longer time frame.

An acceleration factor (years to achieve same level of savings as the statewide programs) was estimated to investigate the potential impact of the GT programs. The acceleration rates were calculated by comparing the verified savings per premise for the GT regions to the same metric for the statewide programs during the specified time period.[33] The Navigant team also compared the acceleration factor between the two GT implementation periods. These results are displayed in the figures below. Although the two-and-a-half-year period is short for assessing trends over time and it may not be possible to draw firm conclusions at this point, this analysis may provide some early insights into future program implementation.

Figure 6 shows the acceleration rates by GT region for the initial program implementation period. Overall, it would take over twice as long at the statewide implementation rate to meet the level of savings achieved by the GT programs in PYs 2007/2008. North Chittenden, Saint Albans, and Newport have acceleration rates of almost three for summer peak kW.

[33] The acceleration factor for energy was calculated as the GT MWh/utility premise divided by the statewide MWh/utility premise. The same approach was used for the winter and summer kW peak. This approach ensures that the acceleration rate is based on the same period and removes the effects of differences between the PYs 2007/2008 and PY 2009 periods.

Figure 6. Acceleration Rate by GT Region for PYs 2007/2008

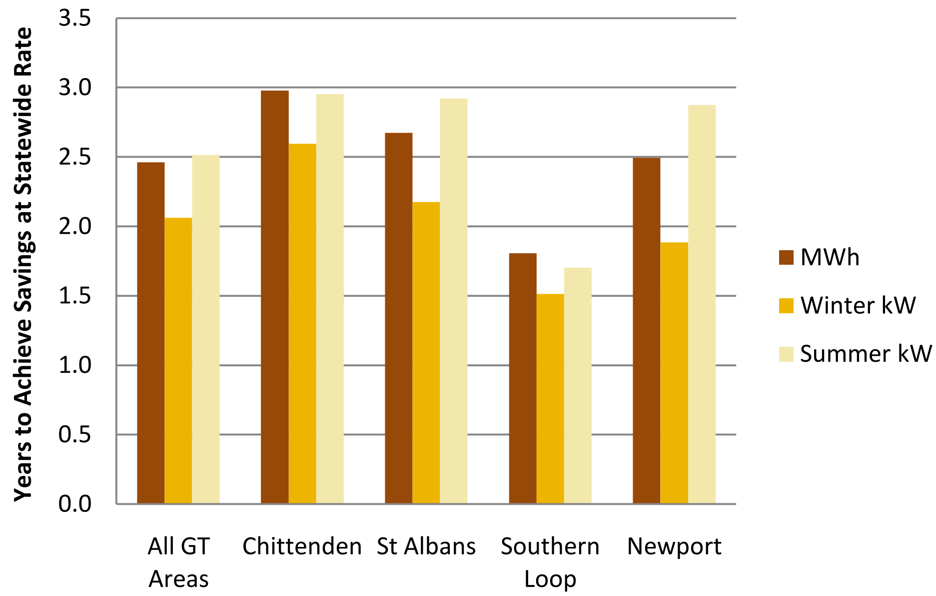
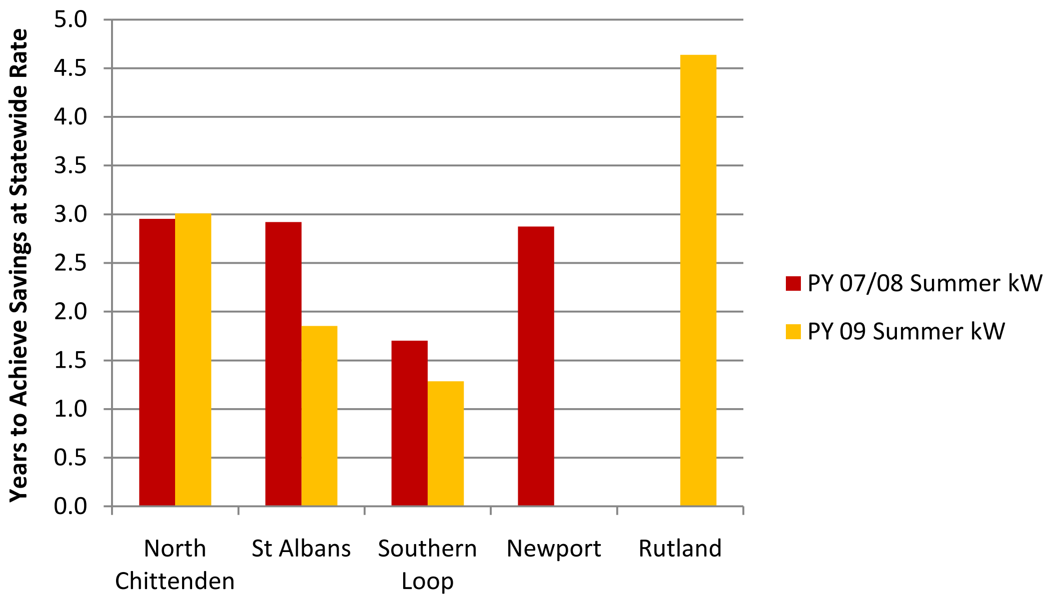


Figure 7 compares the acceleration rates over the two time periods for summer peak kW. Some of the trends are noted below.

- For North Chittenden, the acceleration rate remains consistent, suggesting that there may be potential for continued GT accelerated savings in that area.
- The Rutland market was added in 2009 and shows the highest acceleration rate for all of the GT regions.
- Saint Albans seems to be showing a major slowdown in activity in PY 2009.
- The Southern Loop shows consistently lower savings than the other GT regions and also a lower acceleration rate.

Figure 7. Acceleration Rates by Region and Time Period[34]



Overall, this analysis suggests that there are early signs of decreasing returns for some GT regions. Early indicators suggest that North Chittenden did not show signs of reaching its potential for accelerated savings by the end of 2009. However, Saint Albans and the Southern Loop may be starting to see diminished returns within the context of the current GT program implementation strategies.

This analysis provides insight that may be useful for the planning of GT programs. Given the program delivery mechanisms used by EVT, it appears that the accelerated pace can be maintained for two to three years, suggesting that a lead time of three years may provide substantial benefits depending on the level of reduction required. Transmission and distribution (T&D) deferrals that are planned ten years in the future may benefit equally from the statewide programs and not require accelerated implementation. However, changes to program implementation may extend the time period for acquiring accelerated savings.

5.10. Implementation and Levelized Costs

This part of the analysis provides a summary of the verified total savings (energy and demand), the levelized costs (based on the verified savings) for the GT programs, and the cost per peak kW acquired. Because a simple comparison of overall savings is affected by the number of participants served and many other factors, levelized costs are a common method of measuring efficiency program activity that

[34] The Southern Loop is the only GT region that was specifically targeted to achieve winter peak kW savings. Since, the acceleration factors for the summer and winter kW peak savings in the Southern Loop were extremely close in magnitude, only the summer kW peak savings were included in the figure. Saint Albans was targeted for both winter and summer peak kW reductions, and also shows similar acceleration rates for the two metrics.

can allow valid comparisons across programs and also allow energy efficiency to be compared to supply side options.

Given that EVT expended substantially more effort, offered higher incentives, and fielded additional programs in the GT regions, one would expect EVT's levelized costs in the GT regions to be higher than the non-GT regions. In particular, if the GT programs are acquiring comprehensive savings at each site, one would expect both EVT's and the total program levelized savings to be higher for the GT regions. To the extent that the GT programs broaden the program outreach and achieve higher penetration in the same markets, EVT's higher costs would likely be offset by higher savings to some extent.

Table 49 summarizes verified net annual MWh savings and peak kW reductions at generation, levelized cost per lifetime MWh saved, and EVT cost per winter and summer peak kW reduction by implementation period (PYs 2007/2008 and PY 2009), GT region, GT regions as a whole, and for the statewide non-GT initiatives. The peak demand savings for the designated peak period for each GT region are indicated in bold italics.

Table 49. Summary of Verified GT Savings and Levelized Cost

Region	Verified Net Annual MWh Savings	Verified Net Winter Peak kW Reduction	Verified Net Summer Peak kW Reduction	Levelized EVT Cost/ Verified Lifetime kWh	EVT Cost/ Verified Winter kW	EVT Cost/ Verified Summer kW
PYs 2007/2008						
North Chittenden	24,599	3,690	***2,915***	0.036	1,960	2,480
St. Albans	18,003	2,520	***2,349***	0.036	1,993	2,138
Southern Loop	15,866	***2,286***	1,786	0.037	2,102	2,691
Newport	5,139	***669***	***708***	0.045	2,937	2,774
TOTAL GT REGIONS 07/08	**63,607**	9,166	7,759	0.037	8,992	2,452
STATEWIDE NON-GT TOTAL 07/08	**117,350**	20,190	20,190	0.024	978	1,408
PY 2009						
North Chittenden	10,232	1,861	***1,647***	0.041	1,780	2,012
St. Albans	5,710	1,021	***829***	0.045	1,919	2,363
Southern Loop	4,539	***919***	749	0.047	1,724	2,113
Rutland	7,845	1,370	***1,558***	0.051	2,560	2,251
TOTAL GT REGIONS 2009	**28,326**	5,171	4,783	0.046	2,004	2,166
STATEWIDE NON-GT TOTAL 2009	**50,787**	10,272	7,538	0.035	1,434	1,954

To gain a better understanding of how the components of the program contribute to the efficiency of the program, the levelized cost was calculated in three ways: 1) with EVT's total costs of delivery, 2) with only EVT's incentive costs, and 3) with the total costs of program implementation (including participant and third-party costs).

Table 50 provides this additional detail on the levelized cost. The levelized cost is presented in these three categories by GT implementation period. This type of analysis allows us to draw comparisons among the GT regions and the types of expenditures.

Table 50. Levelized Cost by Geotargeted Area ($)

	EVT Total Costs		EVT Incentive Costs Only		All Costs (EVT, Participant, and Third Party)	
Region	**PYs 07/08**	**PY 2009**	**PYs 07/08**	**PY 2009**	**PYs 07/08**	**PY 2009**
North Chittenden	0.036	0.041	0.016	0.016	0.058	0.067
St. Albans	0.036	0.045	0.018	0.019	0.055	0.073
Southern Loop	0.037	0.047	0.019	0.020	0.058	0.078
Newport	0.045		0.027		0.054	
Rutland		0.051		0.026		0.066
Total GT Regions	0.037	0.046	0.018	0.020	0.057	0.069
STATEWIDE NON-GT TOTAL	0.024	0.035	0.008	0.010	0.054	0.072

Some of the findings are discussed below.

- For the initial GT implementation period, the average levelized EVT total cost for the GT regions was $0.037, with three of the regions clustered around $0.036 and Newport the highest at $0.045.
- Levelized cost was lower for the statewide non-GT regions at $0.024. In program year 2009, the levelized cost went up across the board.
- For EVT's costs, the value for the statewide non-GT programs for the initial implementation period was $0.024, and the GT regions are clustered around $0.037, with Newport the highest at $0.045.
- EVT's levelized cost for the statewide non-GT programs was about 32 percent lower than the GT programs during PYs 2007/2008 and 24 percent lower in PY 2009.
- Newport and Rutland have the highest levelized EVT cost in their respective implementation periods.

However, when total costs are taken into account (EVT's implementation and incentive costs, participant costs, and third-party costs), the relationship between the GT and statewide non-GT programs changes, as explained below.

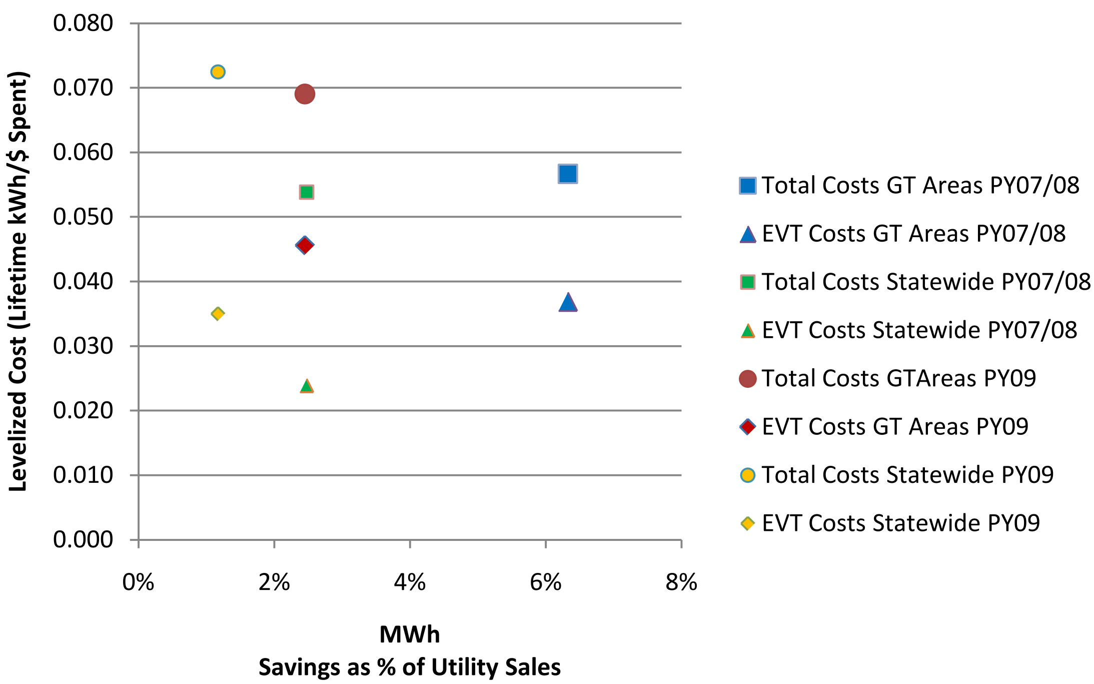
- The statewide non-GT levelized cost is similar to the GT costs for both time periods, and slightly higher during PY 2009.
- For both time periods, the levelized costs for EVT incentives in the GT regions are approximately twice the value of the statewide non-GT areas, suggesting that increased incentives is the primary driver of the higher EVT costs for the GT programs.

» Although Rutland and Newport have the highest levelized EVT costs of the five GT regions, they also have the highest levelized incentive costs and lowest levelized total program costs.

This result suggests that the higher incentives offered in the GT region may motivate more participants and raise EVT's overall costs while reducing the magnitude of the participant and third-party costs, with the net result that the levelized total implementation costs are fairly similar.

Figure 8 compares the levelized costs to the MWh savings as a percentage of the utility MWh sales. By normalizing the savings to utility sales, it is possible to compare the GT programs to the statewide non-GT initiatives on an equal footing. This analysis also shows that the GT programs in 2009 achieved the same level of savings as the statewide non-GT programs in PYs 2007/2008, but at a higher cost to EVT. The trend of higher levelized EVT cost in the GT regions and roughly equivalent levelized total cost for the GT and non-GT regions can also be seen in this graph.

Figure 8. Levelized Costs and Savings as a Percentage of Utility Sales



It is clear that EVT's higher incentive costs in the GT regions were the primary reason for the higher levelized EVT costs in the GT region. The combination of higher levelized EVT costs and similar levelized total program costs is consistent with accelerated program implementation and higher participation rates. It also suggests that the GT programs are not achieving deeper, more expensive savings at each site, which would tend to drive up both the levelized EVT and the total program cost in the GT regions.

5.11. Incremental Impacts in GT Regions as Compared to Statewide Non-GT Programs

Estimating incremental impacts over EVT's standard implementation of the statewide programs is one method to measure the value of the GT programs. The baseline non-GT savings were estimated as the kW peak reduction per utility premise and compared to the GT regions to estimate the incremental savings. This process involved the following steps:

1. Calculate the net KW winter and summer peak savings per utility premise (including all utility premises, both participants and non-participants) for the GT regions and the statewide non-GT programs
2. Determine the total estimated statewide impacts in each GT region by multiplying the statewide non-GT savings per utility premise by the number of premises in each GT area
3. Subtract the estimated statewide savings from the total savings for each GT regions

It must be noted that the statewide non-GT savings were based on the program performance during mid PY 2007 through 2009, when the GT programs were in operation.

This comparison removes confounding factors due to external influences that occur over time, such as weather, economic conditions, overall EVT funding levels, and awareness and penetration of specific energy-efficient technologies. However, it is based on the premise that the EVT's activity in the non-GT areas would have been constant even in the absence of the GT programs. If the GT approach has not been implemented and the same level of funding had been evenly allocated throughout the state during PY 2007 through 2009, then the statewide activity would most likely have been higher and the incremental GT savings in comparisons would be overstated in Navigant's analysis.

Table 51 shows the incremental peak demand savings of the GT programs beyond the statewide non-GT initiatives for the initial implementation period by year. The incremental savings are included for the designated peak for the region (winter, summer, or both). This analysis shows that most of the savings in the GT regions were incremental to the statewide non-GT efforts (42 percent for winter peak and 68 percent for summer on average for all GT regions during the PYs 2007/2008 implementation period).

Table 51. Incremental Savings of GT Programs over Non-GT Statewide Initiatives

	Total Net Peak kW Reduction from GT Initiatives		Incremental Net Peak kW Reduction over Statewide non-GT Initiatives		Incremental Peak kW as % of Total Peak kW	
Region	**Winter**	**Summer**	**Winter**	**Summer**	**Winter**	**Summer**
PY 2007						
North Chittenden		678		431		64%
St. Albans		329		128		39%
Southern Loop	292		210		72%	
Newport	36	33	17	-29	47%	-87%
TOTAL GT REGIONS	**328**	**1,040**	**227**	**529**	**69%**	**51%**
PY 2008						
North Chittenden		2,237		1,525		68%
St. Albans		1,956		1,376		70%
Southern Loop	1,952		848		43%	
Newport	624	669	365	492	58%	73%
TOTAL GT REGIONS	**2,576**	**4,863**	**1,213**	**3,393**	**47%**	**70%**
PYs 2007/2008						
North Chittenden		2,915		1,928		66%
St. Albans		2,349		1,545		66%
Southern Loop	2,286		776		34%	
Newport	669	708	314	462	47%	65%
TOTAL GT REGIONS	**2,955**	**5,973**	**1,090**	**3,935**	**37%**	**66%**

Over the initial 18 months, about 66 percent of the summer peak kW for North Chittenden, Saint Albans, and Newport was incremental over the level achieved through the statewide non-GT initiatives. The Southern Loop had the lowest percentage of incremental savings at 34 percent for the winter peak period.

In 2007, Newport and the Southern Loop showed lower savings than were achieved on average for the statewide non-GT programs, which shows up as negative incremental savings in Table 51. This result suggests that there was overall lower participation in these areas prior to GT program implementation.

5.12. *Benefit/Cost Analysis and TRB*

The benefit/ cost analysis clearly demonstrates that the GT initiatives are a cost-effective strategy, regardless of whether any specific local T&D investments are deferred or avoided. The analysis used the current assumptions in the 2009 Vermont screening tool regarding such factors as avoided costs, inflation, discount rate, and fuel escalators. These are the same assumptions that EVT is using to make investment decisions throughout the state. The analysis also incorporated the verified savings, incorporating realization rates from the FCM and annual verification. Overall, this approach represents a conservative "no-regrets" analysis of the benefits and costs of these initiatives.

Table 52 shows the results of this analysis, including the TRBs, total benefits, total cost, and benefit/cost ratio (BCR). As can be seen from Table 53, the BCR across all of the GT areas is a robust 2.03. All of the BCRs for the five GT areas are within a relatively narrow range. The lowest BCR of 1.92 is in the Rutland area where the initiative only started in 2009, whereas the highest BCR, 2.17, is in the St. Albans area.

Table 52. Summary of Benefit/Cost Analysis by Region

Region	Total Resource Benefits (TRB) (x 1,000)	Total Benefits (x 1,000)	Total Cost (x 1,000)	Benefit/Cost Ratio
North Chittenden	$30,768	$33,458	$17,362	1.93
St. Albans	$22,175	$24,042	$11,085	2.17
Southern Loop	$20,864	$22,687	$10,868	2.09
Newport	$4,911	$5,334	$2,678	1.99
Rutland	$7,709	$8,340	$4,343	1.92
All Areas	$86,427	$93,861	$46,335	2.03

5.13. *Relative Impacts Among GT Regions and Comparison to Target Reductions*

This section discusses the relative impacts among GT regions and also compares actual program accomplishments to the goals established by the Public Service Board (PSB). As part of the GT program planning process, the PSB and EVT established negotiated goals for the GT program as a whole. This section discusses the relative impacts among GT regions and also compares actual program accomplishments to the goals established by the PSB.[35]

Table 53 and Table 54 show the total reduction from the GT areas during PYs 2007/2008 and PY 2009 as compared to the PSB goals. Although it is clear from the previous analysis that EVT achieved higher

[35] The adjustment was made for each GT region, each program year, and each peak period by comparing EVT's reported net savings at generation to the reported gross savings at the customer meter. This ratio was then applied to the gross kW peak savings at the customer meter to estimate net savings.

participation in the C&I sector and substantially accelerated the savings in comparison to the statewide non-GT programs, the overall impact was not sufficient to meet the goals. For winter peak, verified program performance met less than 40 percent of the target in both implementation periods. However, it must be noted that the actual timing of the system peak on the Southern Loop is earlier in the day than the peak period definition used for estimating savings; therefore, it is possible that actual program impacts are understated in this analysis.

EVT's GT programs came closer to meeting the reduction in summer peak MW, with 84 percent of the goal met in the initial implementation period and 57 percent in PY 2009. Overall, these results suggest that more lead time is required to acquire the magnitude of peak reduction desired from the GT programs.

Table 53. GT MW Reduction Achieved vs. Target Winter MW by Region

Region	EVT /PSB Negotiated Goal Net Winter Peak (MW)	EVT Reported Savings Net Winter Peak (MW)	EVT Reported % of Goal Achieved Net Winter Peak (MW)	Verified EVT Savings Net Winter Peak(MW)	Verified % of Goal Achieved Net Winter Peak (MW)
PYs 2007/2008					
Southern Loop	N/A	2.409		2.286	
Newport	N/A	0.689		0.669	
TOTAL	**7.74**	**3.098**	**40%**	**2.955**	**38%**
PY 2009					
Southern Loop	2.40	0.969		0.919	
TOTAL	**2.40**	**0.969**	**40%**	**0.919**	**38%**

Table 54. GT MW Reduction Achieved vs. Target Summer MW by Region

Region	EVT /PSB Negotiated Goal Net Summer Peak (MW)	EVT Reported Savings Net Summer Peak (MW)	EVT Reported % of Goal Achieved Net Summer Peak (MW)	Verified EVT Savings Net Summer Peak (MW)	Verified % of Goal Achieved Net Summer Peak (MW)
PYs 2007/2008					
North Chittenden	N/A	3.42		2.92	
St. Albans	N/A	2.83		2.35	
Newport	N/A	0.86		0.71	
TOTAL	**7.10**	**7.10**	**100%**	**5.97**	**84%**
PY 2009					
North Chittenden	N/A	1.90		1.65	
St. Albans	N/A	0.98		0.83	
Newport	N/A	1.74		1.56	
TOTAL	**7.10**	**4.62**	**65%**	**4.03**	**57%**

In the initial stages of the planning process, the utilities provided the 2007 peak MW for the four original GT regions, the predicted escalation in MW load, and a discussion of potential T&D projects in the pipeline. For context, Table 55 compares the verified MW peak savings from EVT's GT programs to the 2007 peak MW as provided by the utilities. This analysis indicates the EVT's GT programs saved between 3.8 percent and 6.7 percent of the utility 2007 MW peak.

Table 55. GT Verified MW Reduction and Utility 2007 MW Peak

Region	2007 Peak MW	Total Net Peak MW Reduction Achieved (2007 - 2009)[36]	MW Reduction as % of 2007 Peak MW
North Chittenden	64	4.30	6.7%
St. Albans	78	3.07	3.9%
Southern Loop	70	3.15	4.5%
Newport	18	0.69	3.8%

The strategies used for the GT programs were reasonably consistent over the five regions, although the timing of specific initiatives and incentive levels varied. Express Refrigeration, targeted to reducing

[36] Peak reductions are reports as gross at generation for the purposes of this comparison, i.e., the peak demand savings include line losses but is not adjusted for free riders or spill over.

winter kW peak, was initially implemented in the Southern Loop and then expanded to the other GT regions. Also, EVT's strategy of working with large customers varies by region with the number and types of large customers.

Although implementation strategies were fairly consistent, the outcomes were certainly different across the GT regions, suggesting that other factors are affecting the impacts in each region. A review of the map of the GT regions provided in the chapter on Task 2 illustrates the geographical characteristics of the regions. Because the difference in outcome is more likely to relate to the characteristics of the regions than program implementation, some key descriptive factors of the regions are provided in Table 56.

Table 56. Key Characteristics of GT Regions

Characteristic	North Chittenden	Saint Albans	Southern Loop	Newport	Rutland
Urban vs. Rural	Urban	Largely Urban	*Largely Rural*	Urban	Urban
Size of Territory Covered	Small	Moderate	*Large*	Small	Small
C&I vs. Residential : C&I % of Sales	65%	64%	*48%*	64%	78%
C&I Large Customers: # of Premises with > 500 MWh annually	72	42	*38*	15	52

From this review, the Southern Loop stands out as covering a large area that is largely rural, residential, and has fewer large C&I customers. In contrast, the Rutland GT region is more predominantly commercial/industrial, with a high percentage of C&I customers and second only to North Chittenden in the number of large C&I accounts. These factors can be seen in the outcomes of the GT programs by region.

5.13.1. North Chittenden

This region is part of the largest urban area in Vermont and has the highest number of large C&I customers of the five GT regions. Savings per premise in the North Chittenden region were the highest among the GT regions in PYs 2007/2008 and only exceeded by Rutland in 2009. The acceleration rate was consistent between the two time periods and indicates that it would take about three times longer for the statewide programs to achieve the same levels of savings as the GT programs.

In the two and half years of GT program implementation, the verified summer peak MW reduction accounted for almost 7 percent of the 2007 peak. With more lead time, reducing the summer peak MW by 10 percent may be within striking distance.

The analysis through PY 2009 shows mixed results for future implementation. Although the PYs 2007/2008 acceleration rate (amount of time required to achieve the statewide non-GT level of savings through the GT programs) persisted through PY 2009, suggesting that more GT savings may be available, North Chittenden also experienced a drop in the C&I participation rate in PY2009 that was more pronounced than the overall decrease in statewide non-GT participation. These factors suggest that there are still savings to be acquired, but they may be more difficult and costly to obtain.

5.13.2. Saint Albans

The Saint Albans GT region is geographically larger than the GT regions established for the other urban centers and has fewer large C&I customers than Rutland and North Chittenden. Overall, Saint Albans was second to North Chittenden in terms of savings per utility premise during PYs 2007/2008. In the C&I sector, Saint Albans had the highest savings per utility premise (energy, winter and summer kW) of all of the GT regions during the original implementation period and about 11 percent of the C&I customers installed measures through the program. Total verified kW peak reduction accounts for about 3.9 percent of the 2007 MW peak.

However, in PY 2009 the pace of accelerated implementation slowed and Saint Albans achieved less than half of the savings per premise in comparison to North Chittenden. Although it is possible that the PY 2009 performance was affected by the worsening economic conditions, the C&I participation rate decreased by 70 percent, as opposed to 32 percent for the statewide non-GT programs. This result suggests that there may be diminishing returns with continued pursuit of the current implementation methods. More information would need to be collected to determine the remaining potential available in this region.

5.13.3. Southern Loop

In comparison to the 2007 utility MW peak, the GT programs saved 4.1 percent, which is in the same range as the other GT regions. By all other standards, the Southern Loop shows consistently lower impacts from the GT programs. The energy, winter and summer kW peak savings per utility premise are the lowest of the five GT regions in both time periods. The winter kW peak acceleration rate is 1.5 for the initial period and 1.2 for PY 2009, indicating that the program implementation during the latter period was similar to the statewide programs. It must also be acknowledged the EVT's verified winter peak savings for the Southern Loop may be underestimated due to the difference in the time of day of the ISO-NE system peak (used to verify EVT's saving) and CVPS's actual winter peak in the Southern Loop. However, this potential understatement could not fully explain the lower performance in the Southern Loop.

Discussions with EVT highlight the complexities of providing services to this largely rural region dominated by a major ski resort. The seasonal nature of the activity in this region can make it logistically difficult to reach the potential participant base. For example, condominium management organizations often meet once a year and all major decisions are made at the meeting, providing a limited window of opportunity for EVT to promote efficiency. Although EVT's experience suggests that there is some remaining electric space heating in the residential sector, fuel switching does not screen well with the current avoided costs. Also, a major community effort was launched in Manchester prior to the start of the GT effort, thus possibly reducing the potential for savings in this area.

In combination, it appears that acquiring GT savings in the Southern Loop may continue to be a challenge. Achieving intensive savings in this rural area with high levels of seasonal activity may require modifications to the program design.

5.13.4. Newport

Newport is a smaller and more isolated urban center, and has by far the lowest number of large C&I customers of the five GT regions. In terms of C&I participation as a percentage of C&I utility premises, verified kW peak savings per utility premise, and verified net annual MWh savings as a percentage of utility sales, Newport ranks at the top, along with North Chittenden and Rutland. During the initial implementation period, the verified peak savings come to 3.5 percent of the 2007 utility MW peak.
Because the program was terminated after the initial implementation period, there is no way to assess the impacts of continued GT activities in this region. However, the presence of few large C&I customers (15) suggests that planning for future GT efforts would need to consider how to address the specific distribution of small and large customers in this region.

5.13.5. Rutland

Rutland was added to the GT portfolio in PY 2009. Of the five GT regions, Rutland has the highest percentage of C&I utility premises (78 percent) and the second highest number of large C&I customers (52).

The initial program implementation efforts appear to have made solid inroads based on verified savings and costs. Of the GT regions, Rutland had by far the highest savings per utility premise (energy, winter and summer kW) of all of the GT regions during PY 2009. Rutland also had the lowest levelized value ($0.066) for total program implementation costs. In combination, these findings suggest that there may be easier savings to reach in this recently identified area than GT regions where implementation had already been in place for 18 months prior to the start of 2009.

5.14. Conclusions

The fundamental assumption behind the GT programs is that achieving targeted demand savings in a relatively short period of time may allow utility planners to defer or avoid T&D investments. In evaluating the performance to date, the Navigant team considered the following questions:

- Are the GT programs achieving higher participation?
- Are the GT programs acquiring deeper and more comprehensive savings?
- Are the GT programs accelerating the savings?
- Is the level of GT program implementation sustainable?
- What level of peak savings can reasonably be expected to be achieved?
- How much lead time is necessary to achieve the GT savings?

The analysis of EVT's program activity as adjusted by the DPS's previous impact evaluations provides us with some useful observations.

Overall, EVT acquired savings in the GT areas at a substantially faster rate than through the statewide non-GT programs, about three times faster in some GT regions. This success has been driven largely by high participation rates in the GT areas in the C&I sector. Although the average savings per C&I participant were slightly higher in the GT areas than the statewide non-GT programs, further investigation suggests that these additional savings are coming primarily from lighting measures. Focusing on the C&I lighting market may well provide savings in a short time frame however, the concern remains that other end uses may not be adequately addressed and it may be more difficult and costly to obtain more comprehensive savings in the future.

GT areas with more commercial and industrial customers have a better record at achieving savings. Rutland and North Chittenden consistently outperformed the other GT regions. In contrast, the Southern Loop, covering a large area that is largely rural, had the worst performance and the GT programs were only a marginal improvement over the statewide non-GT programs by some measures. Difficulties in achieving savings in this area were apparently compounded by the high level of seasonal activity in and around the resort areas.

In comparison to the MW peak reduction goals established by the PSB, EVT's verified savings met 84 percent and 57 percent of the summer peak MW and 40 percent of the goal for winter peak MW during both implementation periods for PYs 2007/2009 and PY 2009, respectively, as summarized in Table 57.

Table 57. Summary of Winter and Summer Peak MW Goals

Implementation Period	EVT /PSB Negotiated Goal Peak (MW)	EVT Reported Savings Peak (MW)	EVT Reported % of Goal Achieved Peak (MW)	Verified EVT Savings Peak(MW)	Verified % of Goal Achieved Summer Peak (MW)
Winter Peak MW					
PYs 2007/2008	7.74	3.10	40%	3.00	38%
PY 2009	2.40	0.97	40%	0.92	38%
Summer Peak MW					
PYs 2007/2008	7.10	7.10	100%	5.97	84%
PY 2009	7.10	4.62	65%	4.03	57%

In the first two-and-a-half years of program implementation, the GT regions reduced the loads during the designated peak periods by 3.1 percent to 6.1 percent of the 2007 utility peak, indicating that realistic goals for a two- to three-year period are in this range. The greatest percent reduction in comparison to the 2007 utility peak kW occurred in the North Chittenden region and is estimated to be about 6 percent of the 2007 peak load. Saint Albans lowered its summer peak MW by almost 4 percent over the 2007 peak.

There are signs that the initial high level of savings in the GT regions may not be sustainable over a longer time horizon as the programs are currently implemented. For some areas, falling participation rates and lower savings per utility premise suggest that it will be more difficult to achieve these accelerated savings in the future. Although the analysis period covers the recent economic downturn, the drop in participation rates was higher in the GT regions, especially Saint Albans and the Southern Loop, than for the statewide non-GT programs.

This analysis provides insight that may be useful for the planning of GT programs. Given the program delivery mechanisms used by EVT, it appears that the accelerated pace can be maintained for two to three years, suggesting that a lead time of three years may provide substantial benefits depending on the level of reduction required. Transmission and distribution (T&D) deferrals that are planned ten years in the future may benefit equally from the statewide programs and not require accelerated implementation. It is possible that modifications to program design, such as focusing on end uses other than lighting or the addition of new lighting technologies, may allow for greater savings through future programs activities. More information about the remaining potential would need to be collected to support further program planning.

The GT programs as implemented are cost effective using the statewide avoided costs and other screening tool assumptions. With benefit/cost ratios around 2, there is room to pursue more comprehensive savings that may be more costly to obtain. Modification to program designs to target more comprehensive savings at each site may open up further opportunities for savings in the existing GT regions.

Some of the key findings that form the basis for these conclusions are discussed below.

1. **Verified demand savings are lower than EVT reported savings.** EVT's verified savings met 84 percent and 57 percent of the summer peak MW goals and 38 percent of the goal for winter peak MW, as first negotiated with the PSB, during both implementation periods for PYs 2007/2009 and PY 2009.

2. **The GT programs achieved substantial peak summer and winter reductions incremental to the statewide non-GT efforts.** In aggregate, based on initially reported by EVT and adjusted through a verification review, the programs achieved 1.09 MW of winter peak and 3.94MW of summer peak reduction during the two-and-a-half-year implementation period over and above what would have been achieved at the statewide non-GT implementation rate.[37]

3. **As may be expected, the levelized EVT cost is higher for the GT programs in comparison to the statewide non-GT initiatives.** EVT's levelized cost of saved energy is about $0.037 per

[37] The winter peak savings are aggregated only for the GT regions with winter peak PSB goals; the same procedure was used for the summer peak.

lifetime kWh for the GT regions during PYs 20007/2008 as compared to $0.024 for the statewide non-GT programs. In PY 2009, the levelized costs increased across the board to $0.046 for the GT regions and $0.035 for the statewide non-GT areas**.**

4. **The levelized total cost (including participant and third-party costs) is about the same for the programs implemented in the GT regions as compared to the statewide programs.** During the initial implementation period, total levelized cost (including EVT, participant, and third-party costs) were $0.057 and $0.054 for the GT regions and statewide non-GT areas, respectively. In 2009, the total levelized cost was higher for the non-GT regions ($0.072 to $0.069). This result suggests that the GT programs were similar to the non-GT statewide programs in terms of the depth of the savings achieved (i.e., more comprehensive savings at each site would most likely result in higher levelized total costs).

5. **GT programs achieved substantially higher savings per utility premise than the statewide non-GT programs.** Winter and summer peak kW reductions per utility premise in the GT programs were more than twice (100 percent greater than) the non-GT peak savings. This outcome is predominantly due to activity in the C&I sector, where the GT savings per utility premise on average were more than four times greater than the statewide non-GT peak savings during the initial implementation period. In the residential sector, the average GT peak savings per premise were about 25 percent higher than the non-GT statewide peak savings.

6. **During the initial implementation period, 12 percent of C&I customers in the GT areas participated in an EVT program and installed measures during PYs 2007/2008, as compared with 3 percent in the statewide non-GT areas.** The participation rates among the GT regions were fairly consistent during PYs 2007/2008 (in the range of 10 percent to 13 percent), with the exception of Newport, with a participation rate of 22 percent. This finding indicates that EVT achieved broader savings in the GT regions (i.e., reached a wider range of the customer base).

7. **In the C&I sectors, the GT programs in aggregate achieved somewhat higher savings per participant than the statewide non-GT programs during the initial implementation period, although this variation could be due to the external factors.** Gross peak demand savings per C&I participant in the GT regions were in the range of 20 to 25 percent higher as compared to the statewide non-GT programs during the first implementation period. The wide range of the savings per participant among the GT regions suggests that the characteristics of the area, such as the number of large C&I customers, may be a critical factor.

8. **Increased GT savings are primarily from lighting measures.** Review of EVT's program data indicates that 67 percent of the C&I savings from the GT programs were from lighting as opposed to 49 percent for the statewide non-GT initiatives, and 73 percent of GT participating sites installed only lighting measures as compared to 55 percent for the statewide non-GT activity. These results were reasonably consistent across all GT regions. In the statewide non-GT programs, 74 percent of sites installed measures in only one end use, as compared to 78 percent in the GT regions. More research would be needed into the remaining potential in each GT region to determine whether there are substantial savings in other end uses.

9. **It would take over twice as long at the statewide implementation rate to meet the level of savings achieved by the GT programs in PY 07/08.** In North Chittenden, Saint Albans and Newport, it would take almost three times as long to achieve the summer peak kW reduction through the statewide non-GT initiatives.

10. **Higher GT savings may not be sustainable in some areas as programs are currently implemented.** In PY2009, there was a dramatic decrease in participation across the board, however the drop was more precipitous in the three GT regions with consistent participation over the two-and-a-half years of implementation. Overall, the statewide non-GT participation rate dropped from 3.2% to 2.2% between PY 07/08 and PY 2009 (a reduction of 32%). The three GT regions with implementation during both periods show an average decrease from 11.4% to 4.1% (a reduction of 64%). Further research is needed to assess whether program design changes may result in achieving further savings.

11. **GT verified peak savings were in the range of 3.8% to 6.7% of the 2007 utility MW peak for the four original GT regions; however, they fell short of the goals set by the PSB.** The verified savings were less than 84% of the PSB goal for the summer period and 40% of the goal for the winter period in the initial implementation period.

12. **The GT programs in Saint Albans achieved high participation and the highest savings per participant in the C&I sector.** Saint Albans was second only to North Chittenden in terms of savings per utility premise during PY 07/08. In the C&I sector, Saint Albans had the highest savings per utility premise (energy, winter and summer kW) of all of the GT regions during the original implementation period and about 11% of the C&I customers installed measures through the program. In PY 2009 the pace of accelerated implementation slowed and Saint Albans achieved less than half of the savings per premise in comparison to North Chittenden.

13. **The two largest urban areas, North Chittenden and Rutland, consistently ranked high among all of the metrics. These areas also had the highest number of large C&I customers and covered a compact geographic region.** Savings per premise in the North Chittenden region were the highest among the GT regions in PY 07/08 and only exceeded by Rutland in 2009. The acceleration rate for North Chittenden was consistent between the two time periods and indicates that it would take about three times longer for the statewide programs to achieve the same levels of savings as the GT programs. Although the acceleration rate was similar throughout the two implementation periods, North Chittenden also experienced a drop in the C&I participation rate in PY2009 that was more pronounced than the overall decrease in statewide non-GT participation. These factors suggest that there are still savings to be acquired, but they may be more difficult and costly to obtain.

    Rutland had by far the highest savings per utility premise (energy, winter and summer kW) of all of the GT regions during PY2009 and a participation rate per utility premise that was similar to the PY 07/08 rates for the other GT areas. For Rutland, the data for these program periods suggest that the pace of implementation had not yet started to slow as of the end of 2009.

14. **The Southern Loop is the most rural and largest in terms of area, and also had the lowest performance.** The energy, winter and summer kW peak savings per utility premise are the lowest of the five GT regions in both time periods. The winter kW peak acceleration rate is 1.5 for the initial period and 1.2 for PY 2009, indicating that the program implementation during the latter period was similar to the statewide programs. Actual system peak performance for the GT programs may be somewhat better than estimated due to the difference between the timing of the Southern Loop peak and the ISO-NE system peak (used to verify EVT's savings), but this potential understatement could not fully explain the lower performance in the Southern Loop. EVT indicated that this area is difficult to reach due to the seasonal, residential nature of the territory. Future GT efforts may require modifications to program design to address the characteristics of this region.

15. **Newport has by far the fewest number of large C&I customers and also the lowest savings per participant for the C&I sector**. Newport also has the highest participation as percent of C&I utility premises at 22%. Verified kW peak savings per utility premise and verified net annual MWh savings as percent of utility sales are similar to North Chittenden and Rutland. During the initial implementation period, the verified peak savings come to 3.5% of the 2007 utility MW peak. The presence of few large C&I customers (15) suggests that future GT efforts will need to be designed to account for the actual distribution of small and large customers in this region.

16. **The GT programs are cost-effective using the same avoided costs and assumptions as for the statewide programs, indicating that the GT programs are a "no regrets" strategy.** The benefit/cost ratios for the GT programs range from 1.92 to 2.17, with an average of 2.03. This analysis was based on EVT's verified savings and is likely to represent a estimate of the program benefits.

6. Task 4: Impact Evaluation –System Level Savings

This section presents Navigant Consulting, Inc.'s impact evaluation of the demand savings reported for each of the utilities that have adopted Geotargeting (GT) energy efficiency (EE) programs. The GT program was developed to explore the potential for targeted energy efficiency to defer transmission and distribution (T&D) capacity investments.[38] The goal of the first phase of implementation of the GT program focuses on "proof of concept"; that is, whether targeted, intensive EE could be successfully implemented, and if significant peak demand savings could be produced in a specific geographic area in a relatively short period of time. Utilities participating in the program include Green Mountain Power (GMP), Central Vermont Public Service (CVPS), and Vermont Electric Cooperative (VEC).

In Chapter 5, verified demand savings were derived by applying FCM adjustment factors to GT program savings provided by EVT. Savings in Chapter 5 included 2009 as requested by the Department. In Chapter 6, demand savings are derived by comparing pre- and post-program GT and non-GT area load data at the electric utility system level (substation and distribution feeder). The pre- and post-program GT load data also was normalized to account for customer migration, temperature and economic impacts. For this task, the Navigant team evaluated the first phase of the GT program, which included implementation of GT energy efficiency measures in 2007 and 2008.

For the load analysis, the Navigant team chose to limit its evaluation to GMP's and CVPS' programs, as the GT efforts in VEC's territory were terminated in 2009 when a substation proposed for deferral in Newport was ultimately needed for due to reasons not associated with load growth. All GT areas, except for CVPS' Southern Loop, peak during the summer months of June through August.

6.1. *Evaluation Objectives*

The primary goals of this portion of the Navigant team's impact evaluation were (1) to determine if it is possible to detect GT program impacts at the utility system (e.g., feeder or substation) level and (2) examine how customer-level verified savings correlate with observed substation data.[39] The evaluation time frame is from 2007 to 2008; however, the Navigant team elected to substitute CVPS' Rutland area for

[38] In consideration of this objective, the Vermont Public Service Board in its January 8, 2007, Order Regarding Geotargeting of Energy Efficiency Utility Funds directed the Department, the utilities, and EVT to "develop evaluation measurements that will verify that geographically targeted energy-efficiency can achieve the intended result of deferring transmission and distribution upgrades" for programs implemented in 2007 and 2008. At the time, four GT areas were identified as opportunities for T&D deferrals. These include the Southern Loop (CVPS), Chittenden County North (GMP), Newport (VEC), and St. Albans (CVPS) areas. In its November 4, 2008, Order approving continuation of the GT program from 2009 to 2011, the board expanded the program to include a fifth area, Rutland, and two additional substations in Chittenden County, to the list of projects approved for GT funding.

[39] In a broader sense, the goal of Geotargeting programs is to implement or accelerate energy efficiency programs to provide peak demand reduction in amounts sufficient to defer, or help defer electric utility transmission and distribution investments. A related objective is to establish the viability and applicability of GT as an option in planning studies that could compete with traditional utility capital investments.

VEC Newport, in part due to the decision to end targeted efficiency programs in the Newport and Derby area. A related objective was to compare the impacts of the GT programs versus the existing statewide energy efficiency programs, both to estimate the net incremental impact of the GT programs and to assess whether the incremental benefits justify the incremental costs. To address that latter objective, the Navigant team estimated demand reduction for representative distribution feeders in GT areas versus comparable feeders in non-GT areas.

In Chapter 5, analytical methods were applied to estimate demand savings for each GT area. In Chapter 6, described herein, actual utility load data is analyzed and measured to derive the level of achieved savings. The Navigant team also examined differences in load shapes to assess whether such reductions can be reliably detected via evaluation of utility substation or feeder load patterns.

6.2. *Background*

In order to identify geographic areas suitable for testing the Geotargeted energy efficiency concept, the utilities identified four constrained T&D areas targeted for new capacity additions.[40] Table 58 describes T&D project deferrals and costs proposed by the electric utilities in 2006 and 2007, developed just prior to GT program implementation.

Table 58. Utility T&D Capacity Deferrals

GT Area/Utility	Distribution Deferral(s)	Transmission Deferral(s)	Cost ($ Millions)
Chittenden North (GMP)	• New Velco Gorge (2010) & Essex Substations (2016) • 3rd Distribution feeder (2014)	• VELCO Long-Term Plan – Several potential upgrades along East Avenue Loop	$9.10
Saint Albans (CVPS)	• New 34/12kV substation transformer: St. Albans (2010)	• Several Velco upgrades • 34kV sub-transmission reliability	$0.70
Southern Loop (CVPS)	• New Manchester 12kV feeders to relieve future overloads	• Relieve 46-kV Subtransmission Loop constraints (new 115kV line: Stratton to Bennington)	$75–$100
Newport/Derby (VEC)	• Transformer life extension at Newport & Derby Substations	• Reduced area transmission demands (viewed as a secondary benefit)	$1.5–$ 1.75

While the GT programs were underway, the utilities continued to update load forecasts to ensure there was sufficient lead time to construct new T&D facilities and avoid the risk of capacity deficits. Recognizing the goal of the pilot was to test the concept of geotargeting, the utilities did not necessarily plan or commit to defer T&D capacity based on GT program savings alone. Notably, one project in the original four GT areas, a new Velco Substation at GMP's Gorge site in Chittenden County, is currently

[40] Page 3 of the Board's January 8, 2007 Order. The utilities identified both distribution and transmission levels constraints for each of the four GT areas. Velco, in a prior letter to the Board, indicated Geotargeting of energy efficiency to the four constrained areas could "in aggregate, potentially defer large-scale transmission projects."

under construction, as current demand and area reliability justified project need. The date for the next major substation upgrade deferral candidate in Chittenden County is between 2016 and 2018.

Table 59 presents each of the GT area T&D capacity need dates set by utilities at the onset of the program in 2007.[41] Since program inception in 2007, some GT areas have experienced lower than expected demand, which has extended some of the need dates. Most important, changes in demand due to economic conditions, customer migration, and weather each suggest the GT evaluation must include adjustments to properly account for these impacts to avoid bias and inaccurate savings estimates.

Table 59. GT Area Demand Reduction Targets

GT Area	Existing Peak (2007 MW)	10-Year Load Forecast (MW)	Targeted Reduction (MW)	Date GT EE Needed	Peaking Interval
Chittenden North	64	75	11	2007 - 2009	Summer
St. Albans	29	39	2-3	2007 - 2009	Summer
Southern Loop	70	94	3-20	2007 - 2016	Winter
Newport/Derby	18	21	3-4	2007 - 2012	Summer/Winter
TOTAL	**181**	**229**	**19 - 38**		

The load analysis presented in this section focuses on the first phase of the GT program approved by the Vermont Public Service Board (VPSB), covering the years 2007 and 2008, inclusive, and the year 2009 for the Rutland area. Later, the Navigant team compares Chapter 5 demand reductions to those derived via the load analysis to determine whether GT savings can be measured at the utility level, and how these results compare to those cited in Chapter 5.

6.3. Methodology

All methodologies that the Navigant team considered to evaluate demand reduction have inherent challenges, as EVT's claimed savings for the combined GT areas in 2007 and 2008 (7 MW) is small relative to the composite GT area peak of about 180 megawatts (MW)—slightly less than five percent of total GT area load. Accordingly, pre- and post-GT loads must be carefully normalized to ensure demand savings estimated from distribution feeder recorded data are unbiased and do not overstate or understate demand reductions associated with Geotargeting.

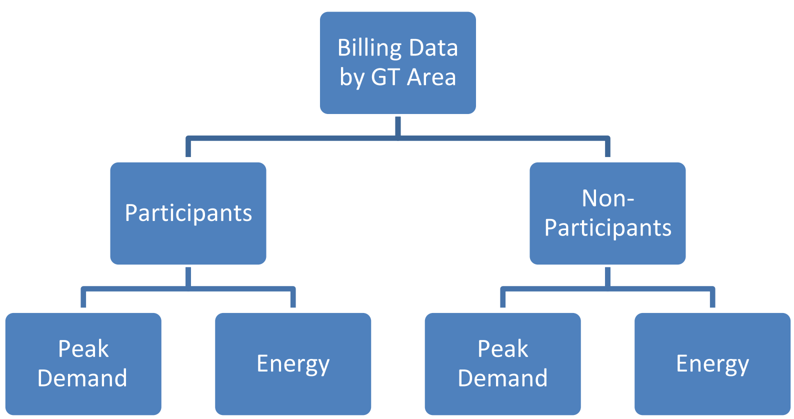
Key factors that the Navigant team considered in the normalization process included customer migration (i.e., new customers added after 2007 or those that departed before 2009), temperature variations, and economic conditions. The latter ensures that actual savings are not overstated due to the likelihood that the economic downturn in Vermont may have contributed to reduced electric demand and energy consumption among GT participants. Billing records for GT area participants and nonparticipants were

[41] GT area demand reduction targets cited in the table were set by the utilities, and do not represent EVT savings targets. Targeted reductions for each GT developed by EVT were based on what EVT determined they could accomplished based on implementation timeframe, available budget, past efficiency savings achieved in the areas, and type of customers within the GT areas.

relied upon to develop normalization or adjustment factors. The Navigant team also evaluated the impact of behind-the-meter distributed generation (DG) and demand response (DR) to determine if either caused demand reduction during the peak load periods, including DG additions or DR participation after 2007. These latter analyses were mostly qualitative, as utilities did not collect all DG and DR programs at the customer level.[42]

A high-level overview of the normalization methodology using billing data is illustrated in Figure 9. The Navigant team limited the system level evaluation to the first phase of the GT program authorized by the Board, and therefore used early to mid-2007 as the pre-GT period, and mid-2009 as the post-GT period for all GT areas. One exception is Rutland, where 2008 and 2010 data, respectively, was analyzed due to a later launch for that program by CVPS. Using billing data, the Navigant team based its normalization process on use of control groups consisting of nonparticipant changes in demand and energy use between 2007 and 2009, normalized to exclude new customers added after 2007 or that departed before 2009. For the normalization process, only commercial and industrial (C&I) customers were used in the analysis, as the majority of residential participants purchase compact fluorescent light bulbs (CFLs), which as described earlier are not tracked by participant in the EVT database. Also, demand data was only available for commercial customers, so a meaningful comparison could not be obtained using residential billing data. Use of commercial data only may bias results slightly; however, residential savings are smaller and their exclusion is not likely to significantly change the results presented herein. A detailed description of the billing analysis methodology is described in Appendix A and the GT Area load analysis that follows.

Figure 9. Billing Analysis Normalization Process Diagram



To the extent practicable, the Navigant team considered participant and nonparticipant responses from the Task 1 and 2 surveys to confirm assumptions and methods used to normalize GT savings estimates.

Lastly, predicted savings derived from the load analyses were compared to calculated savings from Chapter 5 to identify and assess differences in savings between the two approaches. A high level of comparability in predicted savings derived using different methods increases the likelihood that the verified demand savings achieved by the GT program are reasonably accurate, and that such methods

[42] The Department now collects customer-installed DG via its SPEED database,

can be relied upon for use in future impact studies. Such a high level of comparability may also support the premise that GT is a viable supply alternative that utilities can and should be considered as an option in T&D planning studies. It also addresses the question of whether statewide programs provide a comparable level of savings compared to GT programs.

6.3.1. Study Assumptions

Key study assumptions include the following:

- **"Pre"-GT** program savings began in June 2007 for summer-peaking areas.[43]
- **Summer peak months** – June through August, inclusive
- **Winter peak months** – November through March, inclusive
- **GT area removed (Newport/Derby)** – Program terminated in VEC's territory
- **GT area added (Rutland)** – Program added in CVPS's territory
- **2 to 3 feeders** – Per GT area
- **1 to 2 feeders** – Per non-GT area

6.3.2. Normalization Methods

The availability of utility billing records for GT area participants and nonparticipants proved to be a valuable data source for normalizing pre- and post-program savings.[44] Normalization for customer migration was obtained from the billing databases, whose lists included customers who terminated electric service after summer 2007, and those who initiated electric service after 2007. Once the Navigant team identified these customers, it was able to remove them from each of these groups to ensure the impact analysis was conducted for participants (and non-participants) that received electric service from the utility during 2007, before GT programs were implemented and during 2009, the last year that a full year's data was available.

For customers that departed prior to 2009, demand (for demand-metered customers) and energy use for all customers were identified by rate class and by feeder. Similarly, customers that initiated service after 2007 were identified and composite demand and energy use totals were derived for these customers. By estimating the differences in demand for these customers, the Navigant team was able to adjust the actual peak load data measured at the substation level by removing the composite demand from those customers who initiated or terminated electric service after summer 2007 and before 2009.

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[43] The Navigant team chose 2007 over 2006 to minimize the impact of customer migration and economic factors. Also, few customers participated in the GT program by mid-2007, thereby offering a reasonable trade-off to using older 2006 load data.

[44] EVT was able to provide a comprehensive database of customer billing data – with names redacted – that included premise ID, mapping of premise ID with the distribution feeder number, monthly demand and energy data, and tariff rate class.

6.4. GT Area Load Analysis

The analytical methods that the Navigant team used to evaluate utility load data are presented in the following step-by-step description, including the rationale used to support the specific methods and assumptions the team used to determine whether GT program impacts can be detected at utility level.

6.4.1. Methodology

To determine if GT impacts can be detected at the utility level and if results correlate with verified savings, the Navigant team performed the following ten steps.

1. Selected two to three representative feeders for each of the GT areas for evaluation; collected hourly load data for 2007 and 2009 from the utilities for these feeders (2008 and 2010 for Rutland area).
2. Identified unadjusted winter and summer hourly peaks for each representative feeder; developed normalized (per unit) hourly load profiles for the top five peak days.
3. Collected GT participant and nonparticipant billing data by rate class for 2007 and 2009 for each of the GT areas; removed customers that began service after 2007 or terminated service before 2009 (i.e., to account for customer migration into and out of the GT areas).
4. Identified differences in 2007 and 2009 composite demand and energy usage for small commercial, and large commercial and industrial customers; applied billing data to develop adjustment (normalization) factors for each GT area to reflect weather and economic conditions.
5. Adjusted winter and summer peaks from Step 2 by the normalization factors developed in Steps 3 and 4.
6. Adjusted Step 5 results for demand response and distributed generation, where applicable.
7. Worked with utilities to identify and select one to two representative feeders in non-GT areas comparable to the representative feeders selected in Step 1.
8. To the extent practicable, performed billing analysis for the non-GT areas and adjusted non-GT area 2007 and 2009 peak demand savings.
9. Compared GT area program savings derived from load analysis (Chapter 6) to the verified savings (Chapter 5) and assessed how well these results correlate.
10. Compared normalized GT peak demand savings on selected circuits with non-GT savings on selected representative circuits.
11. Described other factors influencing GT program performance and area load impacts; also assess the ability of GT programs to achieve targeted peak demand reductions.

For Step 1, the Navigant team selected representative feeders to compare pre- and post-GT demand for load evaluation.[45] Notably, more than 50 feeders in the GT areas serve customers participating in the GT program, leading to a decision to focus on a representative set of feeders. Initial studies confirmed that many of these feeders had few participants and therefore, were not good candidates to compare pre- and post GT demand savings because the peak demand on these feeders likely would be two orders of magnitude higher than predicted GT demand savings and those savings would be masked by normal load variances.[46]

Feeder selection criteria included number of GT participants as a percent of total customers on the feeder (e.g., higher participation is preferable) and collective demand savings claimed by EVT on the feeders. Once the feeders selected for evaluation were confirmed, all utilities[47] provided hourly data for those feeders and load data for comparable feeders in non-GT areas for the years 2007 and 2009.[48] Table 60 presents the feeders the Navigant team selected as the best candidates for evaluation.

Table 60. Representative GT Feeders

Utility	GT Area	Feeder ID	Number of Customers	GT Program Participation (%)
GMP	Chittenden North	46Y1	3,543	4%
GMP	Chittenden North	36Y5	286	15%
GMP	Chittenden North	33Y3	1,583	4%
GMP	Chittenden North	33G2	1,692	1%
CVPS	Southern Loop	34	397	5%
CVPS	Southern Loop	12	1,165	7%
CVPS	Southern Loop	26	2,914	2%
CVPS	Southern Loop	52	410	13%
CVPS	Rutland	72	877	3%
CVPS	Rutland	71	488	2%
CVPS	Rutland	48	246	8%
CVPS	St. Albans	36	1,939	4%
CVPS	St. Albans	26	1,546	3%
CVPS	St. Albans	92	1,883	4%

The total number of participants from Table 60 represents approximately 27 percent of total area participants, unadjusted for customer migration.

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[45] The Navigant team selected three to five representative feeders within each GT area for detailed analysis and evaluation, recognizing that feeders with low participation levels would not likely yield meaningful results. In some cases, after such detailed analysis, a determination was made that the feeder was not suitable for use in the final analysis, due to insufficient participation, holes in the data, or other limitations.

[46] Although not part of Task 4, these findings indicate there may be EE opportunities on many other feeders.

[47] Navigant recognizes the extensive effort and support all utilities and EVT provided throughout the study to support our efforts and help produce the results presented herein.

[48] In the case of the Rutland area, 2008 and 2010 data were provided

6.4.2. Representative Feeder Demand Savings (Unadjusted)

Table 61 presents winter and summer peak demands for 2007 (pre-program) and 2009 (post-program) for the representative feeders, unadjusted for customer migration, temperature, or economic conditions (Step 2). The unadjusted winter savings of 1.6 MW and 5.2 MW include 0.4 MW and 1.5 MW for winter and summer peak demand reduction, respectively, for the Rutland area in 2009.

Table 61. Unadjusted Demand Savings for Representative Feeders

		Winter Peak			Summer Peak		
GT Area	Feeder	2007 MW	2009 MW	Peak Differ.	2007 MW	2009 MW	Peak Differ.
North Chittenden	33G2	3.76	3.25	-0.51	3.04	2.44	-0.60
	33Y3	4.05	4.16	0.11	3.9	3.80	-0.14
	46Y1 & 365	12.67	12.53	-0.14	16.35	15.74	-0.61
	Combined Ckts	**19.11**	**18.17**	**-0.94**	**22.2**	**19.29**	**-2.91**
Southern Loop	Stratton	1.51	1.61	0.09	0.33	0.36	0.03
	Manchester	6.84	5.42	-1.42	7.2	6.1	-1.15
	E. Arlington	3.70	3.95	0.25	3.78	3.61	-0.17
	N. Brattleboro	6.93	6.79	-0.14	8.97	8.57	-0.40
	Combined Ckt	**16.34**	**17.10**	**0.76**	**20.12**	**18.30**	**-1.82**
Saint Albans	Milton 36	4.37	4.37	0.00	4.45	4.63	0.18
	Nason St. 26	5.79	6.03	0.24	6.63	6.62	-0.01
	W. Milton 92 Total	7.81	7.42	-0.39	8.17	8.12	-0.05
	Combined Ckts	**17.35**	**17.17**	**-0.18**	**19.08**	**18.86**	**-0.22**
		2008	**2010**		**2008**	**2010**	
Rutland	S Rutland 72	6.03	6.06	0.03	7.42	7.19	-0.23
	S Rutland 71	6.48	6.19	-0.29	8.05	6.2	-1.85
	Gas Turbine 48	0.77	0.68	-0.09	0.84	1.73	0.89
	Combined Ckts	**12.88**	**12.51**	**-0.37**	**14.9**	**13.38**	**-1.52**
Combined Totals		**82.09**	**80.52**	**-1.57**	**92.69**	**87.45**	**-5.24**

6.4.3. GT Area Adjustment Factors (Normalization Analysis)

Table 62 summarizes the results of the normalization analysis for each GT area (Steps 3 and 4), which includes development of adjustment factors to account for customer migration, temperature and economic impacts. Results are presented for small and large C&I customers. All participating and non-participating customers that are demand metered are classified as Large Commercial, whereas all non-demand metered customers are classified as Small Commercial.[49] Table 62 lists the number of

For the yellow highlighted text, was there any difference in verified savings between those two groups (i.e., groups with demand data vs. those without)? You want to make sure that using the smaller population for the demand analysis didn't introduce a bias.

[49] Although customers classified as Small Commercial are not billed for demand, utilities nonetheless recorded customer demand data for load research purposes and entered the data into the billing database. However, not all customers on a non-demand rate were equipped with meters capable of measuring demand; hence, the billing analysis for demand includes a smaller population of participants than results presented for change in energy consumption.

participants and non-participants and the change in average summer billing demand between 2007 and 2009 by small and large commercial customers. It presents results with CVPS' "16i Large Commercial" rates, which showed major load shifts for the two customers in the rate class. Utility feedback indicates this may be due to rate incentives.

Table 62. GT Area Billing Analysis - Demand

		Participants			Non Participants		
GT Area	Rate Class	Total No. of Participants **	Change in Average Peak Demand (MW)	Change in Average Peak Demand (%)	Total No. of Non-Participants **	Change in Weighted Average Peak Demand (MW)	Change in Weighted Average Peak Demand (%)
			(2009 minus 2007)			*(2009 minus 2007)*	
CHIT	Small Commercial	172	-0.39	-13.7%	770	-0.07	-0.8%
	Large Commercial	186	-1.26	-5.4%	217	-0.55	-2.8%
	Total	**358**	**-1.66**	**-6.3%**	**987**	**-0.62**	**-2.2%**
SLOOP	Small Commercial	313	-0.52	-5.6%	1,134	-0.10	-0.8%
	Large Commercial	22	3.62	21.4%	3	0.003	0.5%
	Large Com. (Less 16I)	20	-0.55	-6.6%	3	0.003	0.5%
	Total	**335**	**3.10**	**11.8%**	**1,137**	**-0.09**	**-0.7%**
	Total- (Less 16I)	**333**	**-1.07**	**-7.9%**	**1,137**	**-0.09**	**-0.7%**
STAC	Small Commercial	239	-0.72	-8.5%	960	-0.03	-0.3%
	Large Commercial	23	0.10	0.5%	7	0.05	1.3%
	Total	**262**	**-0.62**	**-2.3%**	**967**	**0.02**	**0.1%**
RUTL	Small Commercial	201	-0.45	-8.3%	1,339	-0.27	-1.3%
	Large Commercial	11	-0.92	-7.5%	25	-0.15	-1.4%
	Total	**212**	**-1.37**	**-7.7%**	**1,318**	**-0.42**	**-1.3%**
Total-All Areas		**1,167**	**-0.55**	**-0.6%**	**4,409**	**-1.11**	**-1.3%**
Total (Less SLOOP 16I)		**1,165**	**-4.71**	**-5.3%**	**4,409**	**-1.11**	**-1.3%**

* Analysis period is 2007 and 2009 for all areas except Rutland, which is 2008 and 2010. Billing data includes the summer months of June, July, and August for all areas except the Southern Loop, which covers December, January, and February.

** Excludes customers added after 2007 or those that departed the system before 2009 (2008 and 2010 for Rutland)

Results of the billing analysis indicate a clear trend among virtually all GT areas: the change in average billing demand among GT participants was measurably higher than that of non-participants; collectively, the downward change in participant average billing demand (5.3 percent) is greater than that for nonparticipants (1.3 percent) by a factor of three. Further economic and weather conditions can be assumed to be the same for participants and non participants on the feeder, allowing the differences between participants and non-participants to be attributed to GT efforts.

To further test the premise that nonparticipant billing data could be used to estimate the impact of economic impact on electric consumption for non-GT customers, the Navigant team compared total 2007 versus 2009 energy consumption by all C&I rate classes. If the change in energy consumption for the nonparticipants (versus GT participants) follows the same trend as demand, it is reasonable to conclude the use of billing data is sufficiently accurate and robust to support its use for development of adjustment (i.e., normalizing) factors. Underscoring this assertion is the assumption that the impact of economic and temperature adjustments is most accurate when the control group – the nonparticipants –is within the same control area. Such is the case for the billing analysis used in this study. Good.

Table 63 presents the results of the comparison of C&I energy consumption by GT areas. Similar to the billing analysis performed for demand, energy consumption for the control group of non-participants, in aggregate, was higher than that of the participant group. Because of the greater number of nonparticipants in the control group, the Navigant team determined that the energy data was more appropriate for use to normalize recorded feeder demand.

Table 63. GT Area Billing Analysis - Energy

		Participants			Nonparticipants		
GT Area	**Rate Class**	**Total No. of Participants ****	**Change in Average Energy Use (MWh)**	**Change in Average Energy Use (%)**	**Total No. of Non-Participants****	**Change in Weighted Average Energy Use (MWh)**	**Change in Weighted Average Use (%)**
			(2009 minus 2007)			*(2009 minus 2007)*	
CHIT	Small Commercial	252	-119	-15.0%	2394	-33	-1.2%
	Large Commercial	187	-337	-3.7%	226	-205	-2.8%
	Total	**439**	**-456**	**-4.6%**	**2620**	**-238**	**-2.3%**
SLOOP	Small Commercial	340	-281	-9.1%	2742	-23	-0.6%
	Large Commercial	22	-1900	-24.7%	3	-1	-0.3%
	Large Com (Less 16I)	20	-391	-11.8%	3	-1	-0.3%
	Total	**362**	**-2181**	**-20.3%**	**2745**	**-24**	**-0.6%**
	Total- (Less 16I)	**360**	**-672**	**-10.5%**	**2745**	**-24**	**-0.6%**
STAC	Small Commercial	256	-363	-13.2%	1946	-11	-0.3%
	Large Commercial	23	-144	-1.6%	7	161	8.4%
	Total	**279**	**-507**	**-4.3%**	**1953**	**149**	**2.9%**
RUTL	Small Commercial	209	-110	-7.2%	2143	-58	-1.1%
	Large Commercial	11	-566	-9.3%	25	-84	-2.1%
	Total	**220**	**-676**	**-8.9%**	**2168**	**-142**	**-1.5%**
Total-All Areas		**1,300**	**-3820**	**-9.6%**	**9486**	**-254.61**	**-0.9%**
Total (Less SLOOP 16I)		**1,298**	**-2311**	**-10.7%**	**9486**	**-254.61**	**-0.9%**

* Analysis period is 2007 and 2009 for all areas except Rutland, which is 2008 and 2010. Billing data includes the summer months of June, July, and August for all areas except the Southern Loop, which covers December, January, and February.

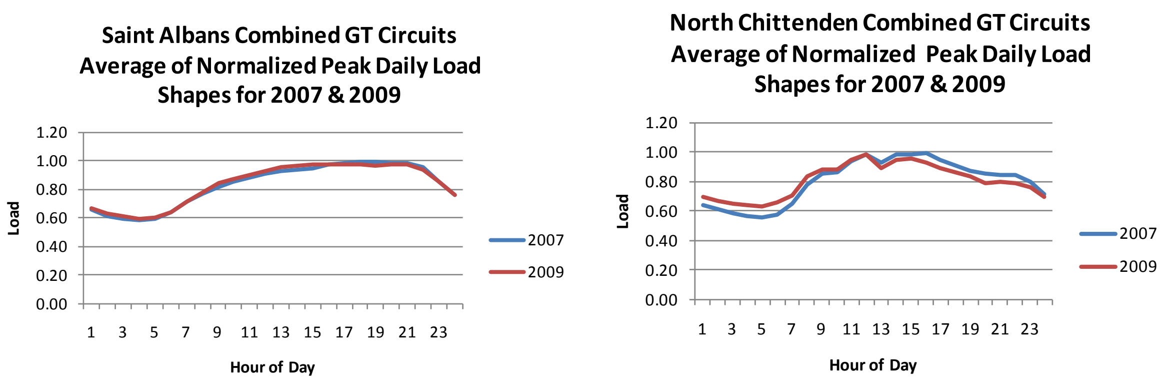
** Excludes customers added after 2007 or those that departed the system before 2009 (2008 and 2010 for Rutland)

6.4.4. GT Area Load Profiles

In addition to normalizing 2007 and 2009 load data to account for customer migration, temperature, and economic factors, the Navigant team compared peak day load shapes for the days with the highest five hourly peaks. Any significant shift in load patterns such as unusual shifts in peak demand hours, expectedly high (or low) load factors, or other nonconformities each would suggest that findings could be biased. However, the Navigant team did anticipate that load factors for the representative feeder sample could increase due to focused GT programs, as greater savings likely would be achieved during the daily peak hours.

Presented in Figure 10 are 2007 and 2009 normalized hourly loads for combined GT area feeders, including those in Saint Albans (CVPS) and those in the Chittenden North area (GMP).[50]

Figure 10. GT Area Feeder Peak Day Profiles*



*The load curves for other GT area feeders are included in Appendix B.

Results from Figure 10 confirm that 2007 and 2009 GT area peak day load shapes are comparable for both Chittenden North and Saint Albans, with modest increases in load factor for each. The latter finding, if confirmed in future impact evaluations (assuming program continuation with higher participant rates), suggests GT measures installed are meeting the program objective of reducing area peaks, as load factors would be expected to remain constant absent GT program savings. The other GT area feeders exhibit similar load patterns (Appendix B), lending further support to the assumption that the load analysis is not biased due to shifts in loads due to non-GT factors. Results also support a preliminary finding that peak day load patterns appear to confirm that maximum program savings occur at peak.

Actual GT area load factors for the pre and post analysis period are presented in Table 64. The load factors increased in all cases except for Rutland. Although some of the increase may be due to weather—average summer peak day temperatures for the five highest peak days, on average, were about five degrees lower—the results suggest GT EE programs likely contributed to the increase.

Table 64. GT Area – Representative Feeder Load Factors

GT Area	Load Factor (2007)	Load Factor (2009)

[50] The hourly load curves are normalized on a per unit basis, where the highest daily peak is set to 1.0, and all remaining hours are lower by a ratio of the hourly load by the peak day load. The use of per-unit data enables hourly load data for different years to be compared on a common scale.

Chittenden North	60%	64%
St. Albans	59%	61%
Southern Loop (Winter Only)	53%	54%
Rutland*	53%	51%

* 2008 versus 2010

6.4.5. Distributed Generation and Demand Response

Initial feedback from the utilities indicates that only nominal amounts of DG have been installed on the representative feeders selected for detailed load analysis, mostly small photovoltaic (PV) under the Vermont Sustainably Priced Energy Enterprise Development (SPEED) program. Survey data shows up to _ percent of customers surveyed indicated some form of DG, particularly larger customers. The Navigant team consulted with the utilities and is not aware of any significant large DG on these feeders operating at peak.[51]

For demand response, utilities have not implemented DR programs, although third-party services could market such programs to consumers. However, the peak day load shapes displayed in Figure 10 show minimal load shift during peak hours, suggesting the absence of any significant demand response during 2007 or 2009. Further, utilities and the ISO report that few, if any major DR events were initiated in the last few years. Lastly, major DR events do not necessarily correspond to feeder peaks.

6.5. GT Area Demand Reduction (Adjusted)

The results of the Navigant team's load analysis are described below, including estimated demand reduction achieved by GT programs for representative feeders. The analysis compares these demand reductions for comparable feeders in non-GT areas. The Navigant team then offers conclusions regarding the likely accuracy of the results, and the ability to detect GT impacts at the utility level. Lastly, the Navigant team provides observations on the effectiveness and efficacy of GT as a viable option when planning for T&D capacity additions based on the results of this evaluation and findings from other tasks.

6.5.1. GT Area Adjusted Savings

Using adjustment factors derived from the billing analysis of C&I customers described earlier, the Navigant team developed adjusted estimates of demand reduction achieved for each of the

[51] This finding has been qualitatively verified with GMP. CVPS provided a list of DG renewable projects that came on-line between 2006 and 2010. Most are small (<50kw in aggregate) in any one GT area in any year. One exception is a 375kW methane project that came on line in Saint Albans in 2007; however, CVPS provided data indicating it is unlikely this unit operated at the time of the feeder peak. Survey results also suggest many customers with behind-the-meter DG use these devices for back-up when outages occur, which would be highly coincidental if they were to occur at the time of the feeder peak.

representative feeders in the GT areas (Step 5). Table 65 presents the total estimated demand reduction for the representative feeders selected for load analysis and evaluation in Steps 1 and 2[52].

Table 65. Composite Demand Reduction for Representative GT Area Feeders

GT Area	Unadjusted Savings (MW)	Adjusted Savings (MW)	Difference
Chittenden North	2.9	1.5	-1.4
St. Albans	0.2	0.4	0.2
Southern Loop	0.8	0.8	0.0
Rutland	2.6	2.4	-0.2
Total (Non-Coincident)	6.5	5.1	-1.4
Total (Adjusted for Losses)	6.2	4.9	-1.3

Table 65 indicates the Navigant team's analysis of GT program performance as of mid-year 2009 for the selected feeders yields a net adjusted composite peak savings of approximately 5 to 6 MWs.[53] These savings represent about a 4 - 6% savings relative to the post period load observed on those selected feeders. The savings for the representative feeders constitutes about 50 percent of composite GT area load, and about 27 percent of the total number of GT participants. Extrapolating these results to include total GT area participants produces a total estimated demand savings of approximately 8 MW. Although not part of the system level load analysis, results from Chapter 5 and EVT indicate GT programs continued beyond mid 2009 have produced additional savings above those reported in Table 65. For example, Table 54 in Section 4 shows an increase in summer peak demand savings increasing from about 6 MW for 2007 and 2008, to about 10 MW at the end of 2009 for the three summer-peaking GT areas.

Reported savings for each GT area for EVT (from EVT's 2008 Annual Report), the results from Chapter 5 (verified demand reductions as described in Section 4) and the results from this chapter are presented in Table 66.[54] Reported savings are from July 2007 to end-of-year 2008, the same period of evaluation presented in the load evaluation presented herein.

Initial results from the EVT report and Chapter 5 indicate the program appears to have produced noticeable demand reductions for the GT areas. Significantly, data reported in Chapter 5 raise the possibility that savings opportunities in some GT areas may be reaching saturation due to customer disinterest or limited new opportunities, although other factors (e.g., the economic recession) are also at play and further research is needed in order to draw conclusions about remaining potential and need for changes in program design

[52] Values includes a 4 percent downward adjustment (at the composite level) to reflect distribution losses from the customer meter to the substation bus where utility hourly load data were obtained via supervisory control and data acquisition (SCADA).

[53] As noted, for Rutland, whose GT efforts started in 2009, the Navigant team compared 2010 summer loads to 2009 to estimate demand savings. Also, the Southern Loop is winter peaking; hence, winter 2006/2007 demand was compared to winter 2008/2009 to derive savings estimates.

[54] In its 2008 Annual Report to the DPS, EVT reported annual firm demand reduction and energy savings achieved by end use (about 15 end-use categories).

Table 66. Comparison of GT Area Demand Savings

GT Area	EVT 2007/08 Reported Savings		Chapter 5 Verified 2007/08 Net Summer Savings (MW)	Chapter 6 2007/08 Net Savings (MW)
	Net Winter Savings (MW)	Net Summer Savings (MW)		
Chittenden North	2.7	2.6	2.5	2.4
St. Albans	2.1	2.3	2.1	0.6
Southern Loop	2.0	2.0	1.5	3.8 [1]
Newport/Derby	0.6	0.8	0.6	-
Rutland[2]	1.3	1.6	1.6	1.3
Total (Non-Coincident)	**8.7**	**9.3**	**8.3[3]**	**8.2**

1) Winter savings only
2) Task 3 reports coincident peak (CP) savings only
3) 2009 savings only

These results are comparable to those derived in Chapter 5 for the same reporting period. Although the analysis does not include savings for most of 2009, the level of robustness associated with results reported for the load analysis suggests a reasonable level of comparability.

6.6. *Non-GT Area Load Analysis*

To assess the effectiveness and level of savings achieved by GT EE programs compared to those of statewide programs, the Navigant team compared non-GT area feeder loads for the same time period as the GT programs. By comparing statewide EE program savings in non-GT areas to savings achieved in GT areas, it is possible to confirm the premise that GT program performance should yield greater net savings. To ensure comparability, billing data was used to develop adjustment factors for the non-GT loads, using the same methodology as used for GT loads.

6.6.1. Non-GT Area Feeder Selection

To the extent possible, utilities selected non-GT feeders with similar load profiles, as well as customer mix and usage patterns, as those selected for the GT areas. A minimum of one to two feeders were selected for each GT area. Tables 67 through 70 compare the GT feeders to the comparable non-GT area feeders.

Results indicate that for all areas, except Saint Albans, normalized GT area loads declined at a greater rate (in percent of demand reduction achieved) than normalized loads in non-GT areas.

6.6.2. Non-GT Area Normalization Analysis

The billing analysis for the non-GT areas follows the same methodology as that performed for the GT-areas. For GMP, the non-GT feeders were located adjacent or close to the GT area; hence, the billing data for the GT area was applied. For CVPS, Navigant utilized demand and energy readings for C&I customers in CVPS' entire service territory, excluding GT areas. Results are presented in Table 67 and Table 68, which present demand and energy reduction for small and large commercial participants and non-participants for winter and summer months, respectively. For the non-GT areas, participants include all customers that participated in EVT programs during the study period; in contrast, this data was available at the feeder level for GT areas.

The results of the non-GT billing analysis indicate that the change in participant average summer billing demand (7.3 percent) is greater than that for the non-participants (1.4 percent) by a factor of five. The change in participant average summer energy use (8.2 percent) is also greater than that for the non-participants (1.7 percent) by a factor of five. However, a comparison of average billing demand and energy consumption for the winter months indicates non-participant usage remained relatively flat, while participant demand decreased by 1.6% and participant energy use decreased by 9.8%.

Table 67. Non-GT Area Billing Analysis –Demand

		Participants			Non Participants		
Area	Rate Class	Total No. of Participants*	Change in Average Peak Demand (MW)	Change in Average Peak Demand (%)	Total No. of Non-Participants*	Change in Weighted Average Peak Demand (MW)	Change in Weighted Average Peak Demand (%)
			(2009 minus 2007)			*(2009 minus 2007)*	
Non-GT Areas Summer	Small Commercial	1032	-3.46	-10.5%	5596	-1.17	-1.5%
	Large Commercial	89	-3.38	-5.5%	44	-0.15	-1.1%
	Total	**1121**	**-6.84**	**-7.3%**	**5640**	**-1.32**	**-1.4%**
Non-GT Areas Winter	Small Commercial	1033	-4.17	-12.5%	5601	-0.18	-0.3%
	Large Commercial	89	2.59	4.1%	44	0.00	0.0%
	Total	**1122**	**-1.58**	**-1.6%**	**5645**	**-0.18**	**-0.2%**

* Excludes customers added after 2007 or those that departed the system before 2009

Table 68. Non-GT Area Billing Analysis –Energy

		Participants			Non Participants		
Area	Rate Class	Total No. of Participants*	Change in Average Energy Use (MWh)	Change in Average Energy Use (%)	Total No. of Non-Participants*	Change in Weighted Average Energy Use (MWh)	Change in Weighted Average Use (%)
			(2009 minus 2007)			*(2009 minus 2007)*	
Non-GT Areas Summer	Small Commercial	1554	-1202	-12.2%	12410	-307	-1.4%
	Large Commercial	1730	-1813	-6.7%	41	-176	-3.3%
	Total	**1643**	**-3030**	**-8.2%**	**12455**	**-469**	**-1.7%**
Non-GT Areas Winter	Small Commercial	1554	-1809	-16.4%	12410	-27	-0.1%
	Large Commercial	1730	-1279	-4.3%	40	-56	-0.9%
	Total	**1643**	**-3999**	**-9.8%**	**12454**	**-111**	**-0.4%**

* Excludes customers added after 2007 or those that departed the system before 2009

The non-GT billing analysis results provides adjustment factors to account for customer migration, temperature and economic impacts to be applied to the recorded feeder demand for non-GT feeders; the analysis is presented in the following section.

Comparing the findings from the non-GT billing analysis to the results of the GT-area analysis shown in provides the following observations:

- Participant summer demand decreased by 5.3% in GT areas and 7.3% in non-GT areas
- Non-participant summer demand decreased by 1.3% in GT areas and 1.4% in non-GT areas
- Participant winter demand decreased by 7.9% in GT areas and 1.6% in non-GT areas
- Non-participant winter demand decreased by 0.7% in GT areas and 0.2% in non-GT areas

- Participant summer energy use decreased by 10.7% in GT areas and 8.2% in non-GT areas
- Non-participant summer energy use decreased by 0.9% in GT areas and 1.7% in non-GT areas
- Participant winter energy use decreased by 10.5% in GT areas and 9.8% in Non-GT areas
- Non-participant winter energy use decreased by 0.6% in GT areas and 0.4% in non-GT areas

The non-GT area billing analysis shows results that are comparable to GT areas for the summer months; however, participants in statewide programs experienced fewer savings on a percentage basis than GT area programs.

6.6.3. Non-GT Area Adjusted Savings

Results indicate that for all areas, except Saint Albans, normalized GT area loads declined at a greater rate (in percent of demand reduction achieved) than normalized loads in non-GT areas.

Table 69. Saint Albans Feeders Compared to Representative Non-GT Feeders

North Chittenden Feeders	# Custs. (C,I & R)	2006-2007 Winter Peak	2009-2010 Winter Peak MW	Peak Diff.	2009-2010 Winter Peak as a % of 2006-2007 Peak	2007 Summer Peak	2009 Summer Peak Normalized	Peak Diff.	2009 Summer Peak as a % of 2007 Peak
GT Feeders									
Milton 36	1,939	4.02	4.31	0.29	107%	4.45	4.62	0.17	104%
Nanson St. 26	1,546	6.01	5.78	-0.23	96%	6.63	6.60	-0.03	100%
W. Milton 92 Total Bank	1,883	7.02	7.25	0.23	103%	8.17	8.11	-0.06	99%
Combined	5,368	16.73	17.38	0.65	104%	19.08	18.70	-0.38	98%
Non-GT Feeders							**Normalized**		
Non-GT Middlebury Bank 2 7616		5.87	5.10	-0.77	87%	6.51	7.07	0.56	109%
Silk Rd. 7565		3.83	3.80	-0.03	99%	5.27	4.83	-0.44	92%
S. Bratt. 7769		9.51	9.68	0.17	102%	10.60	10.44	-0.16	99%

Table 70. North Chittenden Feeders Compared to Representative Non-GT Feeders

North Chittenden Feeders	# Custs. (C,I & R)	2006-2007 Winter Peak	2009-2010 Winter Peak MW	Peak Diff.	2009-2010 Winter Peak as a % of 2006-2007 Peak	2007 Summer Peak	2009 Summer Peak Normalized	Peak Diff.	2009 Summer Peak as a % of 2007 Peak
GT Feeders									
33G2	1,663	3.30	3.39	0.09	103%	3.04	2.74	-0.30	90%
33Y3	1,560	3.94	3.92	-0.02	99%	3.94	3.87	-0.07	98%
46Y1 & 36Y5	3,400	12.67	12.07	-0.60	95%	16.35	15.98	-0.37	98%
Combined		19.11	18.42	-0.69	96%	22.20	20.68	-1.52	93%
Non-GT Feeders							**Normalized**		
32G4	556	4.79	5.62	0.83	117%	6.87	6.21	-0.66	88%
53G1	2,019	6.58	6.45	-0.13	98%	6.50	6.34	-0.16	95%

Table 71. Rutland Feeders Compared to Representative Non-GT Feeders

North Chittenden Feeders	# Custs. (C,I & R)	2006-2007 Winter Peak	2009-2010 Winter Peak MW	Peak Diff.	2009-2010 Winter Peak as a % of 2006-2007 Peak	2007 Summer Peak	2009 Summer Peak Normalized	Peak Diff.	2009 Summer Peak as a % of 2007 Peak
GT Feeders									
S. Rutland 72	877	6.05	6.06	0.01	100%	7.42	7.18	-0.24	97%
S. Rutland 71	488	4.82	7.87	3.05	163%	8.05	6.25	-1.80	78%
Gas Turbine 48	246	0.73	0.68	-0.05	93%	0.84	1.73	0.89	206%
Combined	1,611	11.33	12.51	1.18	110%	14.19	13.39	-0.80	94%
Non-GT Feeders							**Normalized**		
Non-GT Middlebury Bank 2 7616		5.10	5.97	0.87	117%	6.46	8.86	2.40	137%
Silk Rd. 7565		3.80	3.74	-0.06	98%	5.48	5.09	-0.39	93%
S. Bratt. 7769		9.68	9.88	0.20	102%	10.92	11.51	0.59	105%

Table 72. Southern Loop Feeders Compared to Representative Non-GT Feeders

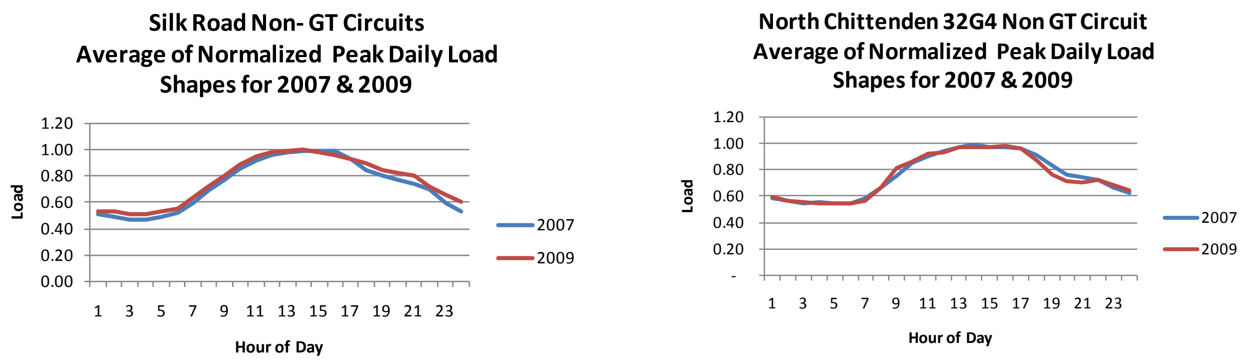
North Chittenden Feeders	# Custs. (C,I & R)	2006-2007 Winter Peak	2009-2010 Winter Peak MW	Peak Diff.	2009-2010 Winter Peak as a % of 2006-2007 Peak	2007 Summer Peak	2009 Summer Peak Normalized	Peak Diff.	2009 Summer Peak as a % of 2007 Peak
GT Feeders									
Stratton 34	397	1.51	1.71	0.20	113%	0.33	0.36	0.03	109%
Stratton 35		13.43	12.76	-0.67	95%	2.87	2.40	-0.47	84%
Manchester 12	1,165	6.84	4.93	-1.91	72%	7.25	6.10	-1.15	84%
E. Arlington 26	2,914	3.68	3.88	0.20	106%	3.78	3.61	-0.17	96%
N. Brattleboro 52 Total Bank (NT)	410	6.93	6.81	-0.12	98%	8.97	8.57	-0.40	96%
Combined	4,886	28.54	26.12	-2.42	92%	20.41	18.55	-1.86	91%
Non-GT Feeders							**Normalized**		
Brownsville 7810		4.02	4.40	0.38	109%	2.13	2.23	0.10	105%

Snowshed 7672		8.59	7.88	-0.68	92%	4.40	4.50	0.10	102%

6.6.4. Non-GT Area Load Shapes

Similar to the GT area load profiles, the pre- and post-program peak day load profiles for two feeders, one in the North Chittenden area, the other is in Saint Albans (Figure 11). Each show a high degree of comparability; that is, 2009 peak decline slightly and off-hour loads increase slightly compared to 2007.

Figure 11. GT Area Peak Day Feeder Load Profiles



The load curves for other non-GT area feeders in included in Appendix B.

6.7. Conclusions

Navigant's impact evaluation of GT area load patterns indicates savings from customers participating in the program can be detected at the utility system level, but with some uncertainty, particularly in areas with large shifts in electric usage. The analysis also confirms measured savings are comparable with calculated savings at the system level. However, it is critical that factors that could influence or bias measured load must be identified in a system level analysis, and normalization methods applied to recognize customer migration economic factors, and where relevant, temperature variances at peak.

Specific findings include the following:

1. The use of substation or feeder hourly load when coupled with normalization factors derived from billing data appears to support demand savings estimates derived from calculated savings (Chapter 5). A higher number of participants would confirm this finding.
2. The level of demand reduction detected at the feeder level was relative small compared to total feeder maximum demand (7MW versus 180MW total). However, the level of variability in achieved savings may be viewed as consistent with uncertainties associated with load projections.

3. The impact of GT programs for CVPS' Southern Loop is somewhat indeterminate, as shifts in customer usage and low savings relative to the GT area peak resulted in demand reduction estimates with a high level of uncertainty.
4. Results from Chapter 5 suggest that GT opportunities or customer interest, or both, may be in decline in some areas. If this premise were to be confirmed, the use of GT as a viable planning alternative may be limited in some areas. However, the observed results may also be due to other factors, such as the economic recession. Additional research is needed to offer conclusions about remaining potential for GT impact in those areas.
5. Findings indicate the level of demand savings from GT programs versus statewide programs do not show a high level of variance in demand savings for the summer peak months. This preliminary finding suggests only modest enhanced savings have been achieved from GT versus statewide EE programs.

In summary, study results indicate that at the system level, in aggregate, energy and demand savings are being achieved. However, at the feeder level, energy and demand saving is less easily observed due to other factors that affect feeder load, including economic conditions, weather, customer migration, load transfers between feeders. Prospectively, distributed generation and demand response programs increasingly may impact demand at the time of the feeder peak.

Further, the scope of this study was limited to an 18 month period. Studying the effects of GT at the feeder level over a longer period may produce more conclusive observations, recognizing that a longer time period also allows for other factors such as customer migration and the economy to impact feeder loads. Accordingly, the best course of action may be to begin GT programs in a constrained area far in advance of the need date (e.g., 5 years at minimum) and track loads annually to assess the combined affect GT and non-GT factors have on the feeders (without trying to disaggregated the effects), and plan T&D upgrades accordingly.

Appendix A-Task 1: Process Evaluation- GT Selection & Collaboration

Table A-1. Task 1 Geotargeting Selection Interviews

Interviewee	Organization	Role/ GT Perspective
Blair Hamilton	Efficiency VT	EVT Policy Director
Michael Wickenden	Efficiency VT	EVT Policy Manager, former EEU contract administrator for PSB
Terry Cecchini	Green Mountain Power	System Planner
Ken Couture	Green Mountain Power	Manager, Planning and Distribution
Harry Abendroth	Vermont Electric Cooperative	Manager, Planning, Regulatory, Engineering
Hantz Presume	Vermont Electric Company/VSPC	Team Lead Energy Efficiency
Deena Frankel	Vermont Electric Company/VSPC	VSPC Facilitator, former DPS Consumer Affairs Dir.
Riley Allen	Regulatory Action Project	Research Manager, former DPS Planning Dir.
Walter (TJ) Poor	Vermont Department of Public Service	Energy Programs Specialist, chair VSPC Energy Efficiency Subcommittee
David Mullet	Vermont Public Power Association	Gen Mgr VPPSA
Craig Myotte	Morrisville Water & Light/VPPSA	Muni Manager/VPPSA member
Bruce Bentley	Central Vermont Power System	Director IRP and Transmission
Kim Jones	Central Vermont Power System	Manager, Planning and Distribution
Carol Welch	Vermont Department of Public Service (Ret)	Former Evaluation Manager DPS

Appendix B-Task 2: Process Evaluation – Program Delivery

Table B-1. Task 2 Geotargeting Process Evaluation Interviews

Interviewee	Organization	Role/ GT Perspective
Jim Massie	Efficiency VT	Acting Operations Manager
Richard Fleury	Efficiency VT	Lighting Plus Program Manager
Rick Galipeau	RISE Engineering	Lighting Plus Implementation Contractor
Adam Fortier	Mike's Electric	Lighting Plus subcontractor
Adam Hammond	Hammond Electric	Lighting Plus subcontractor
Nate Laber	Green Mountain Supply	Lighting products supplier
Dick Wilcox	Vermont Heating and Ventilating	HVAC custom and design/build
Tom Whitney	Vermont Mechanical	HVAC custom and design/build

Appendix C-Task 3: Impact Evaluation – Program Savings

Impact Evaluation Program Savings Detailed Methods

Overview

This Appendix provided details regarding the estimation methods for the energy and demand impacts used to represent EVT's program performance in Chapter **Error! Reference source not found.Error! Reference source not found.**. The first section discusses the source of the savings and the realization rates applied to determine the verified savings. The second part discusses the source of the costs used for estimating levelized costs and cost-effectiveness. The third section includes an explanation of the uncertainty associated with the GT savings due to the imperfect methods available to connect EVT program activity to actual utility customers in the GT regions for programs based on upstream initiatives. The final section covers the cost/benefit analysis.

Description of FCM Evaluation

In 2006, the Independent System Operator of the New England electric grid (ISO-NE) created a Forward Capacity Market (FCM) to ensure that the region has sufficient capacity to meet its peak demand needs. Efficiency Vermont bid its entire portfolio of energy efficiency initiatives into the FCM. The FCM impact evaluation was designed to verify the winter and summer peak kW reduction and to meet the rigorous standards required by ISO-NE, including on-site measurements for custom C&I projects. The FCM impact evaluation has been completed for PY 2007 and 2008. ISO-NE requires that measure impacts be verified by one of four methods (1) Option A: Partially Measured Retrofit Isolation/Stipulated Measurement, (2) Option B: Retrofit Isolation/Metered Equipment, (3) Option C: Whole Facility/Regression or (4) Option D: Calibrated Simulation. [55] For EVT's custom C&I measures, the appropriate method was selected on a site-by-site basis and all of the allowable methods were employed. For the most part, other measures were verified using Option A.

The NCI team conducted an analysis to determine whether a *post hoc* stratification could be conducted using the data from the FCM impact evaluation with the purpose of calculating GT-specific realization rates. The sample size in the GT regions was sufficient to calculate realization rates, but the precision was such that the GT realization rates were not found to be statistically different from the statewide realization rates.[56] The NCI team also considered whether information acquired during the FCM site visits could be used to update the realization rates for energy savings developed through the savings verification process. However, since the FCM evaluation did not include the estimation of energy impacts, the options were severely limited. While one could remove savings for facilities that were not using the efficient equipment at all, it would have required additional engineering review to adjust savings upward for projects found to be using the equipment more than expected. Consequently, any non-engineering adjustment would be likely to have a downward bias.

[55] *ISO New England Manual for Measurement and Verification of Demand Reduction Value from Demand Resources Manual M-MVDR*, Revision: 1, Effective Date: October 1, 2007

[56] This analysis suggested that the realization rates in the GT regions may be lower than the statewide programs. However, since the precision was insufficient to draw any firm conclusions, this analysis was not used in any of the results presented in this report.

Thus, the statewide realization rates from the Department's savings verification and FCM evaluation were applied. to energy and demand savings, respectively. In general, the NCI team started with EVT's original savings claims and made the realization rate adjustments to these values. This approach was taken since the FCM realization rates were intentionally designed to be applied to these original values rather than the post-annual verification savings. The resulting savings estimates were checked against EVT's corrected and final annual reports, and the energy (MWh) savings were found to be quite close (within the expected range of rounding error), indicating that NCI's approach was consistent with EVT's adjustment process.

Realization Rates

As discussed in the main body of the report, realization rates from the FCM evaluation were used to adjust the peak kW reductions and energy savings were verified using the results of the Department's annual savings verification process. Residential custom measures were not verified through the FCM evaluation and account for a small percentage of EVT's total savings (less than 5%), and thus there was no FCM realization rate to apply to these measures. The peak kW reduction for residential custom measures were included in the impact evaluation, as adjusted by the realization determine through the Department's annual savings verification. **Error! Reference source not found.**

Table C-1 and Table C-2 below presents the realization rates applied to EVT verified peak demand and energy savings for the impact analysis presented in Chapter **Error! Reference source not found.**. The winter and summer peak kW reported by EVT and evaluated as part of the Department's FCM evaluation are calculated based on the ISO-NE peak periods of 5:00 to 7:00 PM weekdays in December and January and 1:00 to 5:00 PM weekdays from June through August (non-holidays).

Table C-1: Realization Rates for Peak kW Reduction

Measure Category	Winter kW Peak Realization Rate	Summer kW Peak Realization Rate
C&I New Construction/MOP	83.1%	67.31%
C&I Retrofit	70.6%	73.43%
C&I Stipulated Lighting	118.8%	111.0%
C&I Custom Not Sampled	76.2%	70.5%
Prescriptive (Other eShapes)	96.5%	93.3%
Prescriptive (Other non-eShapes)	100.0%	100.0%
Prescriptive HVAC	100.0%	97.3%
Prescriptive Lighting w/Cooling Bonus	112.7%	94.9%
Prescriptive Lighting	108.4%	94.7%

Table C-2: Realization Rates for Energy Savings

Year	Program Category	kWh	Mmbtu	Natural Gas Savings	Propane Savings	Oil Savings
2007	Efficient	99.9%	100.0%	100.0%	100.0%	100.0%
2008	Efficient	100.1%	100.0%	100.0%	100.0%	100.0%
2009	Efficient	85.5%	100.0%	100.0%	100.0%	100.0%
2007	C&I New Con	97.4%	100.0%	100.0%	100.0%	100.0%
2008	C&I NC/MOP	92.9%	89.4%	93.4%	80.4%	68.9%
2009	C&I NC/MOP	99.4%	100.0%	98.6%	100.0%	106.8%
2007	C&I	100.0%	100.0%	100.0%	100.0%	100.0%
2007	Res Retrofit	98.5%	100.0%	100.0%	100.0%	100.0%
2008	Res Retrofit	95.3%	100.0%	100.0%	100.0%	100.0%
2009	Res Retrofit	99.5%	100.0%	100.0%	100.0%	100.0%
2007	C&I Retrofit	92.2%	100.0%	100.0%	100.0%	100.0%
2008	C&I Retrofit	89.4%	72.0%	-12.2%	252.5%	93.0%
2009	C&I Retrofit	79.0%	34.4%	17.0%	77.4%	59.9%
2007	Res New Con	100.0%	100.0%	100.0%	100.0%	100.0%
2008	Res New Con	100.0%	100.0%	100.0%	100.0%	100.0%
2009	Res New Con	100.0%	100.0%	100.0%	100.0%	100.0%
2008	C&I Stip Light	94.6%	99.6%	100.0%	100.0%	99.5%
2009	C&I Stip Light	100.0%	100.0%	100.0%	100.0%	100.0%

Implementation Costs

The GT program delivery costs represented in the following sections were taken from EVT's annual reports. The costs for PY 2007 for the GT regions were prorated by the portion of savings achieved during the last six months of the year, to match the GT implementation period that began on July 1, 2007. The cost-effectiveness analysis was conducted by the NCI team using the corrected savings as described above with direction from EVT and the DPS in the use of Vermont's screening tool..

The target reduction for each GT area was tied to the system peak during a specific season. For most of the GT regions, the summer peak kW reduction was the most critical. For the Southern Loop (CVPS), the target reduction was associated with the winter peak. For Newport (VEC), reductions to both winter and summer peak were targeted.

Details on Distribution of Savings for Initiatives with Upstream Incentives

In terms of savings, most of the upstream activity is related to the purchase of CFL's. This strategy, used by many efficiency programs, allows program providers to directly and more effectively address market barriers at all levels of the market. Unfortunately, it also results in not knowing exactly who the ultimate purchaser of the product is or their exact physical address.

EVT assigns products that received upstream rebates to zip codes surrounding the store where the product was purchased based on historical coupon data for the same store sales in 2005. The use of historical coupon data allows EVT to provide an estimate of the geographical distribution of the products sold through the upstream market initiatives.

This approach naturally creates some uncertainty as there is no way to know the extent that the real distribution of upstream initiative products to the GT and non GT areas varies from the assumed distribution. To understand the amount of uncertainty this introduces into the impact analysis, the study team examined the percent of realized savings that are associated with these products. Table C-3 provides a breakout of MWh and winter and summer kW for each GT area and all of the areas combined.

The greatest uncertainty is in the winter kW, where overall 37% of savings are attributed to measures that were assigned to the GT area are from upstream incentives.

Table C-3: GT Savings from Upstream Incentive Initiatives With Uncertainty of Confirmed Installation in GT Areas

Region	Net MWh	% Net MWh	Gross Winter kW	% Gross Winter kW	Gross Summer kW	% Gross Summer kW
All GT Areas	91,998	100.0%	12,453	100.0%	10,940	100.0%
Premise Known	66,178	71.9%	7,825	62.8%	8,341	76.2%
Assigned to Zipcode	25,820	28.1%	4,629	37.2%	2,598	23.8%
North Chittenden	34,831	100.0%	4,720	100.0%	3,917	100.0%
Premise Known	22,506	64.6%	2,535	53.7%	2,700	68.9%
Assigned to Zipcode	12,325	35.4%	2,185	46.3%	1,217	31.1%
St Albans	23,714	100.0%	3,059	100.0%	2,794	100.0%
Premise Known	17,517	73.9%	1,951	63.8%	2,176	77.9%
Assigned to Zipcode	6,197	26.1%	1,108	36.2%	618	22.1%
Southern Loop	20,404	100.0%	2,861	100.0%	2,212	100.0%
Premise Known	15,462	75.8%	1,971	68.9%	1,718	77.7%
Assigned to Zipcode	4,942	24.2%	890	31.1%	494	22.3%
Newport	5,139	100.0%	586	100.0%	625	100.0%
Premise Known	4,268	83.1%	470	80.2%	542	86.6%
Assigned to Zipcode	871	16.9%	116	19.8%	116	18.5%
Rutland	7,845	100.0%	1,212	100.0%	1,384	100.0%
Premise Known	6,424	81.9%	898	74.1%	1,205	87.1%
Assigned to Zipcode	1,421	18.1%	315	25.9%	179	12.9%

Costs/Benefit Analysis

The Vermont Statewide screening tool was used to determine the cost effectiveness of the programs run in each of the geo-targeted regions would be cost effective. The screenings used the verified savings values as discussed above and the current screening assumptions for the avoided costs of electricity and fossil fuels. All costs and benefits were converted to the 2009 Present Value used in the current statewide screening process.

In order to complete this task in an efficient manner, savings were grouped by GT region, the year of installation and the measure life. This approach lowered the number of "measures" to screen to 482 combined measures from the 61,153 actual measures. This method required the creation of custom load profiles for each of the groups of measures in order to correctly calculate the electric benefits.

Electric and Fossil Fuel Benefits

The sum of the gross kWh savings for each group of measures was entered into the Vermont screening tool along with the measure life, year installed, customer class, kW load reduction and custom load profiles for energy and capacity savings. Reductions in fossil fuel use and water were also entered as described below. The benefits calculated by the tool were then used in the benefit cost analysis.

The custom load profiles for the groups of measures were created as follows for energy and capacity.

- Energy is stored in the EVT database for each of the four costing periods in the year. For any measure, adding the energy savings across the costing periods equals the total annual kWh verified savings for the measure. For each group of measures, the kWh savings in each costing period was summed, as was the total kWh claimed. The load profile was then derived as follows:

$$\%\, Winter\ Peak = \sum kWh\ Winter\ Peak / \sum kWh\ Total$$

$$\%\, Summer\ Peak = \sum kWh\ Summer\ Peak / \sum kWh\ Total$$

$$\%\, Winter\ Off\ Peak = \sum kWh\ Winter\ Off\ Peak / \sum kWh\ Total$$

$$\%\, Summer\ Off\ Peak = \sum kWh\ Summer\ Off\ Peak / \sum kWh\ Total$$

- The percent of kW load reduction that is coincident with winter or summer peak periods varies greatly by measure. In order to derive the verified capacity benefits from the screening tool, the sum of the verified winter and summer capacity savings for each group of measures was devided by the sum of the kW load reductions to obtain the aggregated load profile, as follows:

$$\%\, Winter\ Coincident = \sum Winter\ kW / \sum kW\ load\ Reduction$$

$$\%\, Summer\ Coincident = \sum Summer\ kW / \sum kW\ load\ Reduction$$

The statewide tool is limited to one type of fossil fuel per measure. Since the measures were aggregated, some group of measures had savings or extra use associated with more than one type of fossil fuel. On the benefit side (measures that resulted in a decrease in fuel usage), this limitation was overcome by combining the savings across the fuel types for each group of measures and screening the result as the fuel type that provided the highest proportion of savings. The sum of the water savings for each group of measures was entered directly into the tool.

Costs

There are several components of cost associated with the implementation of the geo-targeted initiatives. For the purpose of this analysis, we needed to consider the aggregated installation cost of the groups of measures, the aggregated O&M cost associated with the groups of measures, any increase in fossil fuel use that the statewide screening tool treats as a cost and program overhead cost that was attributed to the geo-targeted regions. How each of these elements of cost were treated for the benefit cost analysis are discussed in this section.

Installation costs and O&M cost fall into two categories. Those costs reported by EVT in the 2007 or 2008 reporting years are in the present value (PV) of cost field in 2006 dollars. These costs needed to be escalated to the 2009 PV basis used in the current Vermont screening tool. Installation and O&M costs reported in 2009 are already in 2009 dollars and did not require adjustment. The escalator, 1.18, was derived by entering a $1000 of cost in for 2006 into the screening tool and include the embedded discount rate, inflation rate and risk adder that is applied by the tool. This insures that all cost are adjusted by the same factors.

Similarly the cost associated with the increased use of fossil fuels that results from the installation of some measures needed to be updated for the 2007 and 2008 measures only. Not only were the costs for this fossil fuel component in 2006 dollars in the EVT program tracking data, but the values derived were based on the previous assumptions for the value of fossil fuels over the study period and were significantly lower than the assumptions in the current screening. However, these costs were embedded in the present value of the measure costs and could not be easily separated.

To make the costs of the increased fossil fuel use consistent with screening method, the costs of the increased fuel use in 2006 dollars were backed out of the measure costs in the EVT program tracking database, and the corrected 2009 PV was added back in. This process was accomplished by developing a set of screening inputs that only contained the increase in fossil fuel use. This data set was used to calculate the present value of the costs of the increased fuel use. The increased use was screened with both the previous 2006 VT screening tool and the current one used for this evaluation. The value obtained from the 2006 tool was subtracted from the reported PV of cost for 2007 and 2008 in EVT's tracking database before escalating those values to a 2009 PV. The cost calculated for the increase in fossil fuel from the current tool were then added to the 2009 PV resulting in a value that included all of the measure level components in 2009 dollars.

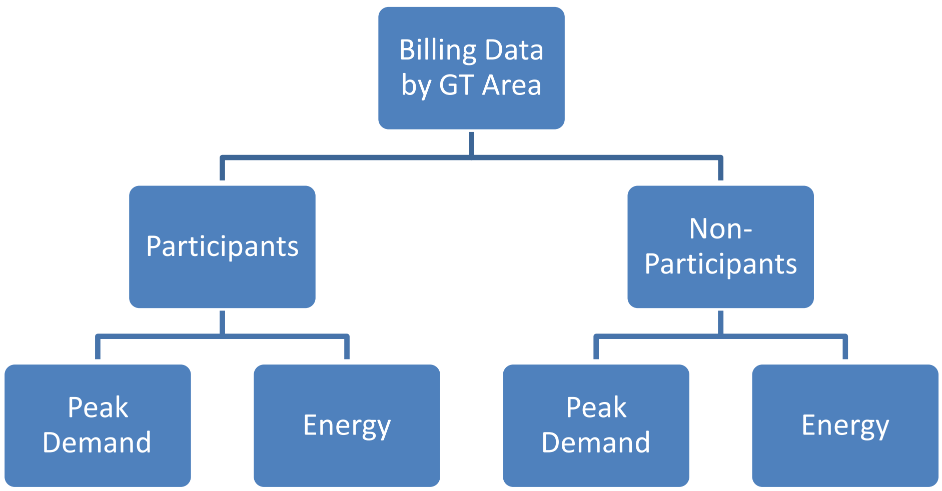
Program overhead costs are those not associated with either measure incentives or direct participant cost for installation, such as marketing and administration. These costs were taken from EVT reports for 2007 through 2009 and appropriate escalators were applied to adjust them to the 2009 dollar basis in the overall analysis.

Appendix D-Task 4: Impact Evaluation- System Level

Billing Analysis Methodology

Overview

The following describes the data collection and normalization processes employed in the Task load analysis.



Billing Analysis Details

1. The billing analysis was performed on data made available to Navigant Consulting, Inc., by Efficiency Vermont.
    a. The data includes several Access database files grouped by year, including 2006—2010, and including four GT areas:
        i. Chittenden North (CHIT)
        ii. Rutland (RUTL)
        iii. St. Albans (STAC)
        iv. Southern Loop (SLOOP)
    b. Key data points included in the databases are:
        i. Utility
        ii. Utility Premise ID
        iii. Rate Class
        iv. GT Area
        v. Sector (Commercial, Industrial, or Residential)
        vi. Read Date

    vii. Read Type (KWPEAK, KWHTOT, etc.)
    viii. Quantity (kWh or kW)
  c. All areas except Rutland utilized 2007 and 2009 data. Rutland uses 2008 and 2010 data.
2. Only commercial and industrial sector customers were pulled from the database.
3. The billing data was mapped to a list of projects and measures provided by Efficiency Vermont.
4. The number of participants and non-participants per GT area was calculated by mapping the premise ID to the project list.
5. The data was normalized so that customers that had new premise IDs after 2007 and customers whose premise IDs no longer existed in 2009 (e.g., out of business, or moved) were excluded from the analysis.
    a. This includes both participants and non-participants.
    b. The total demand and energy use represented by the excluded customers was quantified in separate tables.
6. Demand and energy use were tabulated for the summer months of June, July, and August for Chittenden, Southern Loop, and Rutland areas, and the winter months of December, January, and February for the Southern Loop. To ensure contiguous data, December 2006 and December 2008 were utilized for the Southern Loop.
    a. Demand readings utilize the KWPEAK Read Type and energy readings utilize the KWHTOT Read Type (see examples below).
    b. Not all customers that have an energy reading also have a demand reading, as that depends on their rate class.

Table D-1. Example of Peak Demand Data for Chittenden Area

Provider Code	UPremise	GT Area	Rate Code	EEU Sector	Read Date	Read Type	Quantity
GMP	17541	CHIT	E06	C	6/7/2007	KWPEAK	20
GMP	17608	CHIT	E65A	C	6/7/2007	KWPEAK	74
GMP	203657	CHIT	E06	C	6/13/2007	KWPEAK	3
GMP	203826	CHIT	E65A	C	6/18/2007	KWPEAK	53
GMP	203918	CHIT	E65A	C	6/27/2007	KWPEAK	14

Table D-2. Example of Energy Data for St. Albans Area

Provider Code	UPremise	GT Area	Rate Code	EEU Sector	Read Date	Read Type	Quantity
CVPS	95-10717	STAC	2N	C	24-Jun-09	KWHTOT	187
CVPS	95-10717	STAC	2N	C	27-Jul-09	KWHTOT	219
CVPS	95-10717	STAC	2N	C	26-Aug-09	KWHTOT	202
CVPS	95-11232	STAC	2N	C	24-Jun-09	KWHTOT	156
CVPS	95-11232	STAC	2N	C	27-Jul-09	KWHTOT	163
CVPS	95-11232	STAC	2N	C	25-Aug-09	KWHTOT	151

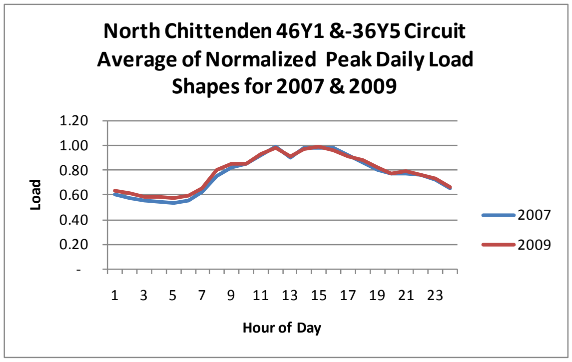
7. Demand readings represent non-coincident peak demand.
    a. Demand totals for one month (i.e., June) might be from several different days, depending on the date the meter was read.
    b. Some customers have multiple meters with multiple reads on the same day.
    c. The average demand for the season (summer or winter) was utilized to minimize the impact of (a) and (b) above.
8. The total demand and energy use were summed by rate code for each GT area and the difference between 2007 and 2009 (2008 and 2010 for Rutland, as described above) was calculated.
9. Summary tables highlight the change in average seasonal demand and energy use for the following categories:
    a. Participant and non-participant
    b. Rate class per GT area and utility
    c. Small commercial and large commercial (e.g., aggregate of the appropriate rate classes)
    d. Total across all areas
10. Percent change in demand and energy use is calculated as shown below. (Percent change in energy is calculated in the same fashion.)

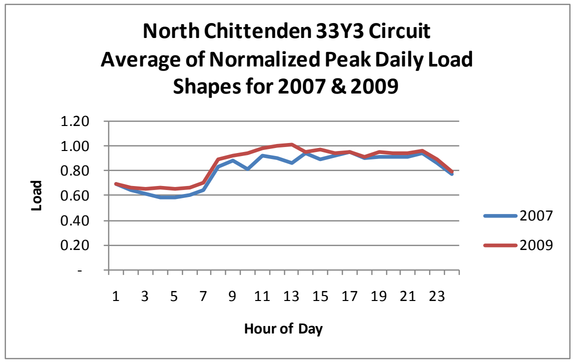
$$\%\ Change = \frac{Change\ in\ Demand}{Total\ Demand\ for\ 2007}$$

11. The nonparticipant demand and energy use was weighted by rate class according to the percent contribution to total 2009 demand or energy use for the participant group. This allows the nonparticipant group to accurately reflect the makeup of customers participating in the GT program.
    a. For example, if the E06 rate class for GMP contributed 10 percent to the total 2009 peak demand, then the change in demand for the nonparticipants in rate class E06 was multiplied by 10 percent.

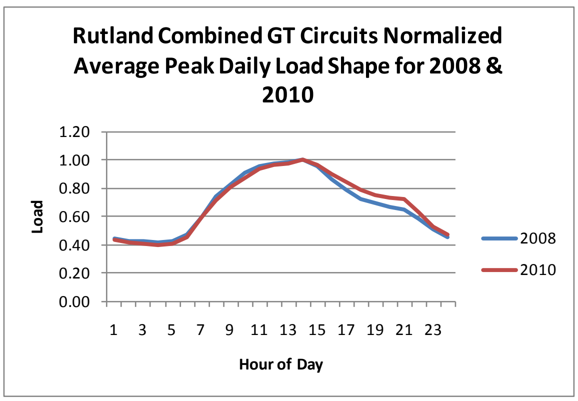
GT Area Normalized Loads

Chittenden North (GMP)

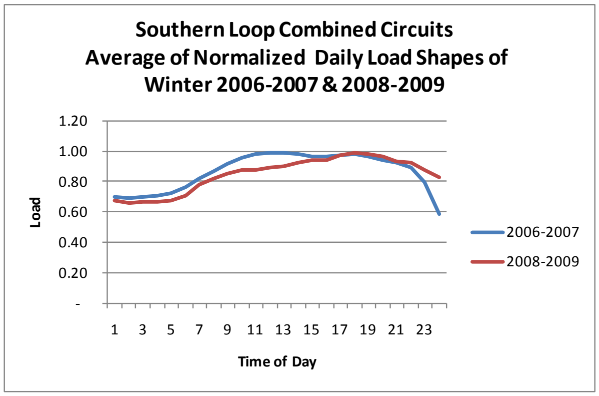


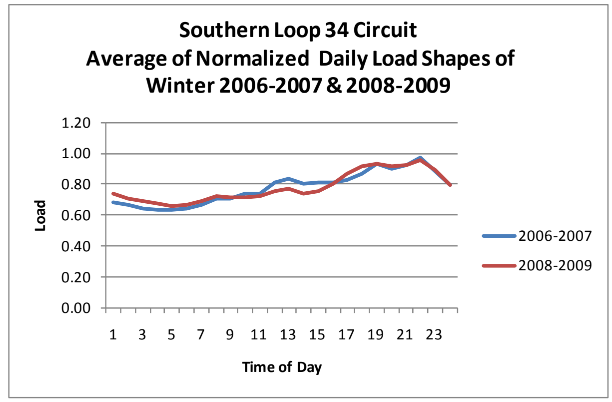


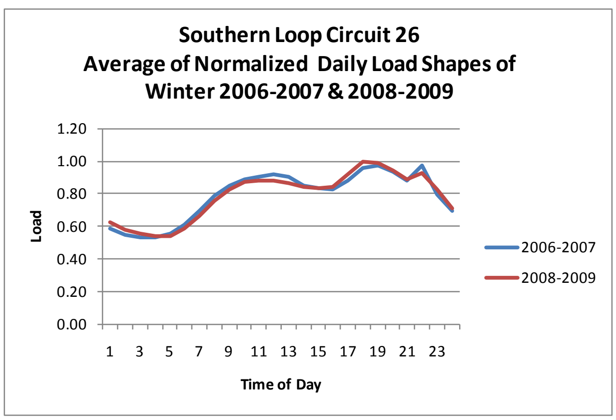
Rutland (CVPS)

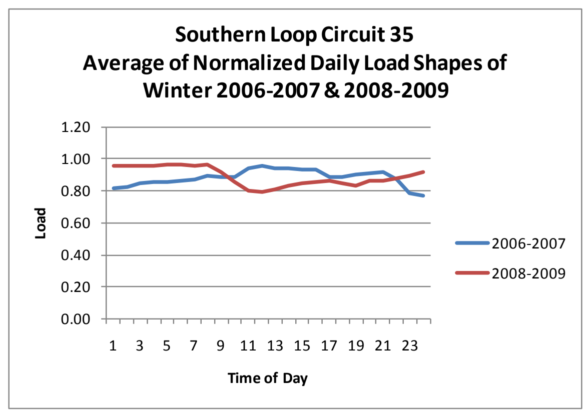


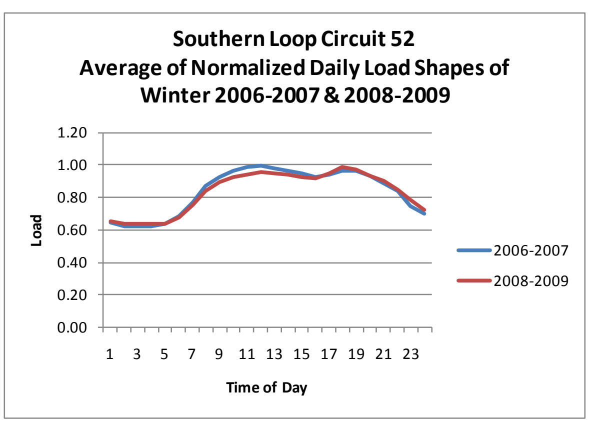
Southern Loop (CVPS)



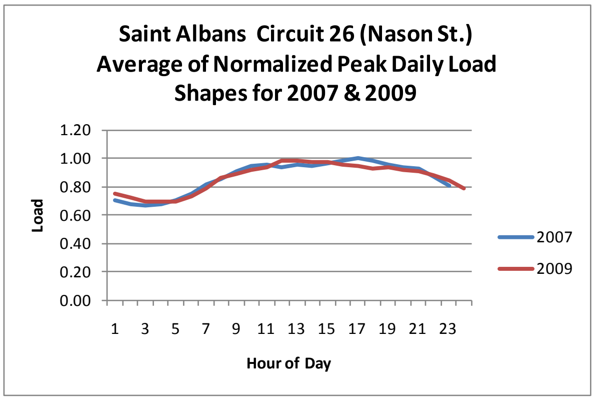


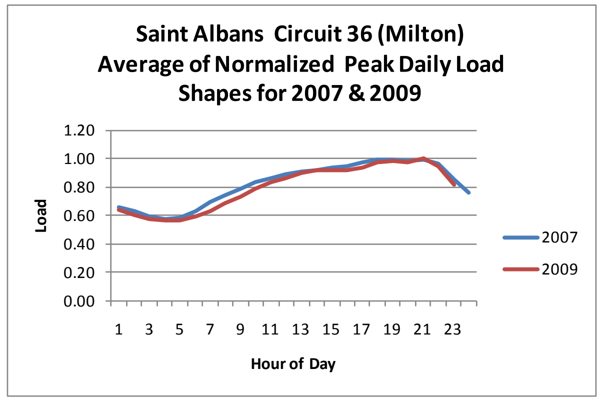


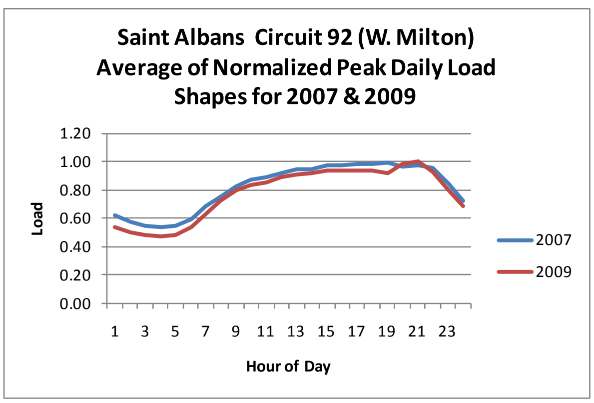




Saint Albans (CVPS)

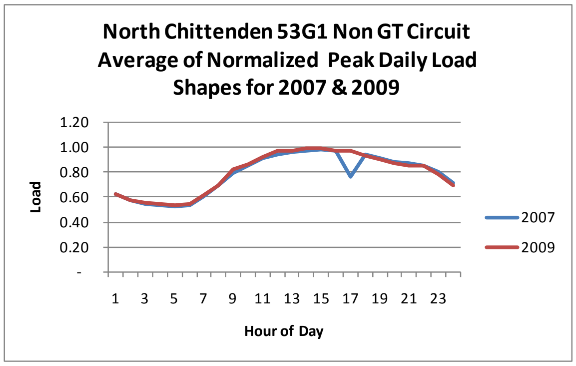






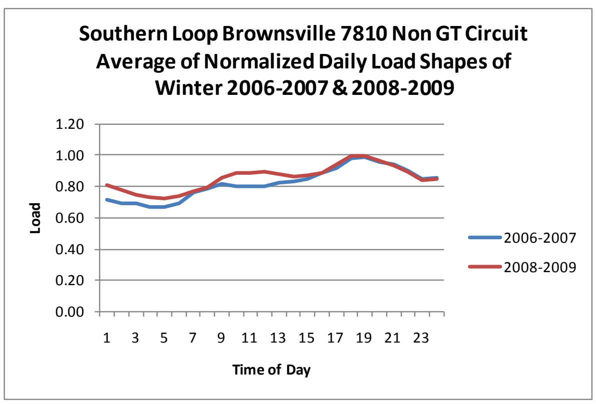
B.3 Non-GT Area Normalized Load Profiles

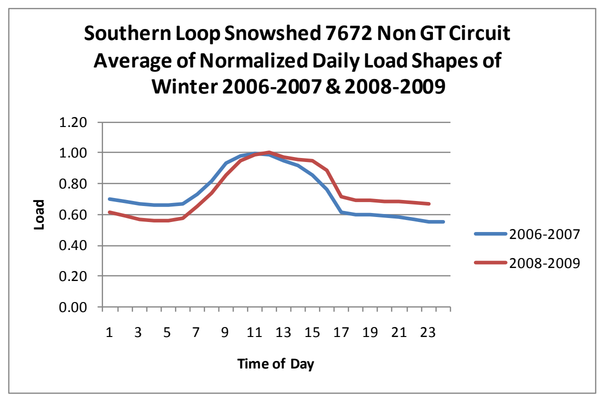
Chittenden North



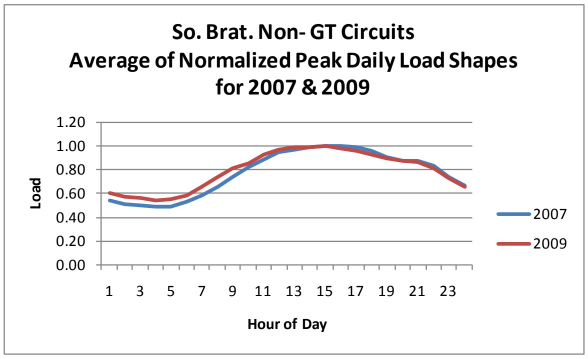
A drop in the 2007 mid-afternoon load on the 53G2 feeder is likely due to a temporary drop or temporary transfer in a major customer load or line section, and not likely representative of other peak load days.

Southern Loop

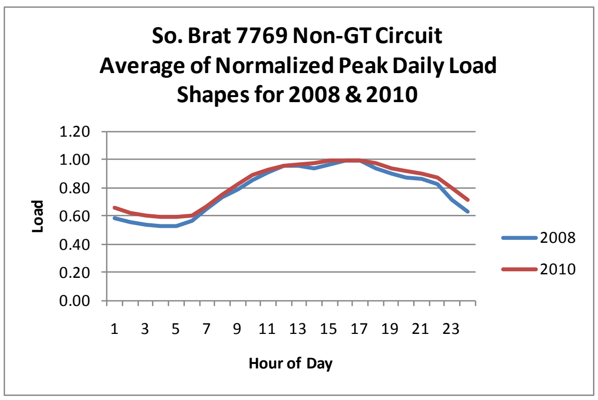


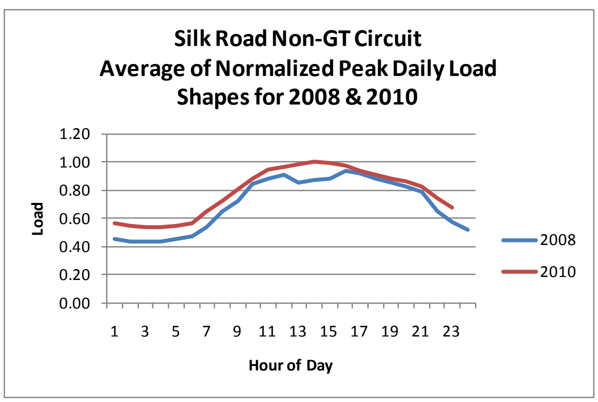


Saint Albans


So. Brat. Non- GT Circuits
Average of Normalized Peak Daily Load Shapes
for 2007 & 2009
Load
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1 3 5 7 9 11 13 15 17 19 21 23
Hour of Day
2007
2009

Rutland


So. Brat 7769 Non-GT Circuit
Average of Normalized Peak Daily Load
Shapes for 2008 & 2010
Load
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1 3 5 7 9 11 13 15 17 19 21 23
Hour of Day
2008
2010


Silk Road Non-GT Circuit
Average of Normalized Peak Daily Load
Shapes for 2008 & 2010
Load
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1 3 5 7 9 11 13 15 17 19 21 23
Hour of Day
2008
2010

NAVIGANT

Appendix E-Commercial Participant Survey

Screener and Introduction

Hi, my name is _______, and I'm calling on behalf of the Vermont Department of Public Service regarding your experience with Efficiency Vermont. We are conducting an evaluation of Efficiency Vermont and our records indicate that your company participated in a energy efficiency program sponsored by Efficiency Vermont between 2007 and 2009. If you have any questions about this survey, you can contact Walter Poor at the DPS at (802) 828-0544.

Could I please speak with the person at your facility who would have been the most involved in the decision to install the new energy-efficient equipment to ask them some survey questions? The survey will take approximately 15 minutes and the responses will be confidential. The name we have is (**READ NAME FROM SAMPLE LIST**).

(IF THIS INDIVIDUAL HAS BEEN REPLACED, ASK TO SPEAK TO THAT PERSON. HOWEVER, IF THE FIRST TWO QUESTIONS SHOW THAT THE PERSON DOES NOT KNOW ABOUT THE MEASURES THAT WERE INSTALLED, THANK THE PERSON AND TERMINATE THE CALL.)

1. According to Efficiency Vermont's records, (**READ MEASURE LIST FROM RECORD**) was installed in your facility at (**ADDRESS SHOWN IN SAMPLE LIST**) on or around (**READ DATE FROM SAMPLE LIST**). Do you recall having these equipment upgrades made?

Yes	**GO TO DISCLOSURE**
No/Don't know	**ASK:** "Might someone else at your facility have been involved in having these equipment upgrades made? It is very important that we speak with the person who knows about the equipment upgrades." **ASK TO SPEAK TO APPROPRIATE PERSON OR SCHEDULE CALLBACK, AS NEEDED. IF NEW PERSON COMES TO PHONE, REPEAT INTRO AND Q1, AND THEN CONTINUE SURVEY. IF ANSWER IS DEFINITIVE:** "No, they did not receive the equipment upgrades", **NOTE THIS, THANK RESPONDENT AND TERMINATE CALL.**

Disclosure

I need to ask you some questions about your experience with a specific Efficiency Vermont energy efficiency program which you may have known as "Geotargeting", (**IF NECESSARY, SAY: Our records indicated you participated in this special program.**) The survey will take about 15 minutes. We would like to thank you in advance for your cooperation and patience in helping us with this evaluation. Your answers will be kept confidential and will help us determine ways to make the program better serve the needs of customers like you. Can I ask you those questions now or would like to reschedule for a time that is better for you?

Yes	**GO TO Q2**
No	**SCHEDULE CALLBACK, THANK RESPONDENT AND TERMINATE CALL.**

Measure Types

(INSTRUCTIONS: EACH PARTICIPANT WILL HAVE ONE TO THREE MEASURE TYPES LISTED: LIGHTING, PROCESS, REFRIGERATION, HEATING, MOTORS, ETC. ASK Q 2- 9 FOR EACH MEASURE TYPE LISTED)

2. Participants in this program have had one or more types of energy-efficient equipment installed – the survey will look at up to 3 types.
According to our records efficient (**MEASURE TYPE 1, THEN MEASURE TYPE 2, THEN MEASURE TYPE 3)** equipment was installed at your facility at (**STREET ADDRESS FROM SAMPLE LIST**) on (**DATE OF INSTALLATION FROM SAMPLE LIST)** with financial support from Efficiency Vermont. Is that correct?

Yes	Installed all measure types **(GO TO Q3, ASK Q3- Q9 FOR EACH MEASURE TYPE)**
No	Did not install any of these measures.**(THANK AND TERMINATE)**
No	Did not install ____________ measures **(DO NOT ASK Q3-Q9 FOR THOSE MEASURES)**
No	Did not install ____________ measures **(DO NOT ASK Q3-Q Q9 FOR THOSE MEASURES)**

I'm going to ask a few questions about the equipment installed for (**MEASURE TYPE 1**).

3. Have you replaced any of this equipment installed under the program since it was installed?

1	Yes **(CONTINUE)**
2	No **(SKIP TO Q9)**

4. What percentage of this equipment have you replaced?

_____ % of the installed equipment has been replaced already
(If 0%, SKIP TO Q7)

5. Why did you replace this equipment? **(DO NOT READ LIST.)**

1	Equipment burned out/stopped working
2	Equipment did not perform satisfactorily
3	Complaints from individuals using the equipment
4	No longer use it – business needs changed
6	Other:
7	Other:
8	Don't know

6. To the best of your knowledge, when you replaced the equipment did you replace it with equipment of higher, lower or the same efficiency?
(IF RESPONDENT INDICATES THAT EQUIPMENT WAS REPLACED WITH THE TYPE OF EQUIPMENT THAT WAS THERE BEFORE THE EFFICIENCY VERMONT INSTALLATION, RECORD THE RESPONSE AS "LOWER EFFICIENCY.")

1	Replaced it with higher efficiency equipment
2	Replaced it with lower efficiency equipment
3	Replaced it with equipment of the same efficiency
4	Replaced some with higher efficiency and some with lower efficiency
5	Don't know

7. On a typical day during the normal work week (Monday-Friday), what is the total number of hours most of the new equipment installed with the Efficiency Vermont incentives is on?

_____ hours for typical day of the work week

8. What percentage of that equipment is typically on for that number of hours?

_____ % of the equipment is on for that number of hours

9. Please think carefully about all the places in your facility where the efficient equipment is still installed. About what percentage of this equipment, if any, is typically **on** between:

1 to 5PM weekdays from June through August _________%

5-7PM weekdays December-January __________&

10. Since the Efficiency Vermont Geotargeting efficiency improvements were installed in your facility have any of the following happened?

11. Increased or decreased weekly business operating hours

1	Increased the number of facility weekly operating hours ASK: By how many hours? ______
2	Decreased the number of facility weekly operating hours ASK: By how many hours? ______
3	No change
9	Don't know

12. Changed the type of operations you do?

1	Yes
2	No
9	Don't Know

13. Did the change increase or decrease your use of the equipment installed under the Efficiency Vermont program?

1	Yes
2	No
9	Don't Know

(IF MORE THAN ONE TYPE OF EQUIPMENT WAS INSTALLED IN Q2, REPEAT Q3-9 FOR EACH MEASURE TYPE –MAXIMUM 3 MEASURE TYPES)

Marketing and Participation

14. How did you first learn about the Efficiency Vermont offer? **(DO NOT READ, BUT PROMPT IF NEEDED; SINGLE MENTION)**

1	Story in newspapers, TV or radio, Efficiency VT's website
2	Previously participated in an Efficiency VT program
3	Community event
4	Friend, relative
5	Supplier or contractor I do business with
6	Information delivered to my workplace ______________________________

7	Canvassing phone call
8	In person approach from EVT or one of their contractors
9	Other (Specify): ______________________________
10	Don't know

15. When Efficiency Vermont was introducing the efficiency opportunity to you and seeking your participation, what were the most important reasons that you agreed to participate? **(DO NOT READ BUT PROMPT IF NEEDED. ACCEPT ALL THAT APPLY.)**

1	Low cost: How inexpensive or free the efficiency improvements would be
2	Quick payback: How quickly the efficiency improvements would pay for themselves
3	Annual savings/Lower energy costs: How much you would save each year due to the efficiency improvements
4	Delaying or eliminating expensive electric system upgrades such as new transmission lines or substations.
5	Environmental: How the improvements would help the environment
6	Ease of participation: How easy it would be to have the efficiency improvements made ______________________________
7	Improved aesthetics/work environment due to better equipment
8	Other (Specify): ______________________________
9	Don't know

16. Prior to July 2007 did your company previously participate in any Efficiency Vermont Programs?

1	Yes
2	No **(GO TO Q20)**
9	Don't Know **(GO TO Q20)**

17. Did your prior experience make you more or less inclined to participate in the Efficiency Vermont Geotargeting program?

1	More
2	Less
3	Made no difference **(GO TO Q19)**
9	Don't Know **(GO TO Q19)**

18. (**IF ANSWERED 1 OR 2 IN Q17**) What about your previous participation influenced you? **(DO NOT READ BUT PROMPT IF NEEDED. ACCEPT ALL THAT APPLY.)**

1	My participation experience
2	My program results
3	Overall feeling about energy efficiency
4	Other (**SPECIFY**)
9	Don't Know **(GO TO Q20)**

19. (**IF GAVE MORE THAN ONE ANSWER IN Q18**) And could you tell me what about your experience was most important, next most important, 3rd most important?

		MOST	NEXT	3RD
1	My participation Experience			
2	My program results			
3	Overall feeling about energy efficiency			
4	Other (specify)			
9	Don't Know			

20. Moving on to your actual participation in this program, how quick and easy was it for you to participate in this program offering? **(READ LIST)**

1	Very quick and easy
2	Reasonably quick and easy
3	It took some effort on my part to get signed up
4	It took a lot of effort to sign up for the program
5	Not at all quick or easy
9	Don't Know **(DON'T READ)**

21. In the following aspects of the program, how clearly were the features, benefits and costs of the program explained, using a scale of 1 to 5, where 1 is very unclear and 5 is very clear? **(READ ITEMS; RANDOMIZE)**

ITEMS	1	2	3	4	5	9 (Don't know)
Eligible equipment available to you						

How long it will take to install the equipment						
Disruption to your business						
Your costs						
Your savings						

21b. **RECORD ANY VOLUNTEERED COMMENTS DURING ADMINISTRATION OF Q21**

____

22. Did Efficiency Vermont recommend any equipment you did <u>not</u> install?

1	Yes
2	No **(GO TO Q25)**

23. What type of equipment? **(DO NOT READ BUT PROMPT IF NEEDED. ACCEPT ALL THAT APPLY.)**

	Equipment Type
1	Lighting
2	Compressed air
3	HVAC system upgrade/replacement
4	Ventilation
5	Replace or tune-up heating system
6	Refrigeration
7	Process Improvements
8	Motors
9	Other: ______________________
99	Don't know **(GO TO Q25)** ______________________

24. Why didn't you make this/these improvement(s)? **(DO NOT READ BUT PROMPT IF NEEDED. ACCEPT ALL THAT APPLY.)**

1	Too expensive
2	Didn't seem worth the money
3	Not enough capital to do more than we were doing
4	May not be in this facility long enough
5	Payback too long; too long to pay for itself/themselves
6	Other priorities for available capital
7	Unsure about Efficiency Vermont's qualifications to make the improvement
8	Other: ______________________
9	Don't know

25. Did you experience any difficulties in participating in the program?

1	Yes
2	No (**GO TO Q27)**

26. What were they? **(DO NOT READ BUT PROMPT IF NEEDED. ACCEPT ALL THAT APPLY.)**

1	Lack of clarity about what would be installed
2	Delays in the installation process
3	Confusing program agreements
4	Cost was not what was expected
5	Quality concerns about measures installed
7	Other_____________
8	Don't know

27. Since the efficient equipment has been installed, have your operation and maintenance costs associated with the new equipment increased, decreased, or stayed the same?
Increased (1)
Decreased (2)
Stayed the same (3)
Don't know (9)

28. Have you noticed any change in the level of your electricity consumption since the measures were installed? Has it increased, decreased, or stayed the same?
Increased (1)
Decreased (2)

Stayed the same (3)
Don't know (9)

29. Has the quality of any lighting installed by the program increased, decreased, or stayed the same? Don't know (9)? (**TAKE "No Answer" IF NO LIGHTING**)
Increased (1)
Decreased (2)
Stayed the same (3)
Don't know (9)
No Answer (0)

30. On a scale of 1-10, with "1" meaning "not at all satisfied," and "10" meaning "extremely satisfied," how would you rate your satisfaction with the Efficiency Vermont program?

1	2	3	4	5	6	7	8	9	10
Not at all Satisfied			Neither Satisfied Nor Dissatisfied				Extremely Satisfied		

31. Also using a scale of 1 to 10, where "1" means extremely unlikely and "10" means extremely likely, how likely are you to participate again in an Efficiency Vermont incentive program to address additional energy efficiency opportunities in your facility?

1	2	3	4	5	6	7	8	9	10
Not at all Likely			Neither Likely Nor Unlikely			Extremely Likely			

32. How do you think this Efficiency Vermont program could be improved, so that organizations such as yours would make even more efficiency improvements to their facilities? **(DO NOT READ BUT PROMPT IF NEEDED. ACCEPT ALL THAT APPLY.)**

1	Efficiency Vermont should offer to do more comprehensive efficiency improvements
2	Efficiency Vermont should provide financing for efficiency improvements
3	Minimize interruptions of my business when installing equipment
4	Eliminate post-installation inspections
5	Efficiency Vermont should guarantee the contractors' work
6	No improvements could be made
7	Higher incentives or free installation
8	Other (SPECIFY): ______________________________
9	Don't know/Refused ______________________________

33. Thinking about your facility and equipment as they exist now, do you think there are additional things that could still be done to save more electricity?

1	Yes
2	No (**GO TO Q35)**

34. What additional things could still be done to increase the electrical energy efficiency in your facility? (**CLARIFY AND PROBE**)

35. O.K. I have just a few categorization questions to ask. First, does your organization own or lease your space?

1	Own
2	Lease/rent
8	Refused
9	Don't know

And which of the following categories best describes your facility? **(READ in order)**

1	Office
2	Retail
3	Apartment building
4	Educational institution
5	Restaurant
6	Lodging/hotel/motel
7	Factory
8	Other: ______________________________
9	Other
99	Don't know

36. How many years has your organization been in business <u>at this location</u>? **(READ LIST)**

1	Less than 2
2	2 to 5
3	6 to 10
4	More than 10
8	Refused
9	Don't Know

37. Do you have specific plans to move from your current location any time in the next four years?

1	Yes
2	No
8	Refused
9	Don't know

38. Are you participating in any in Demand Response Programs offered by a utility or commercial vendor which might pay you to shut off equipment occasionally during peak electrical demand hours?

1	Yes
2	No **(GO TO Q42)**
9	Don't Know **(GO TO Q42)**

39. Can you tell me approximately the amount of electricity in kilowatts or kW that you agreed to shut off? ______ (**USE 0 FOR DON'T KNOW**)

40. About how many times in the past <u>three</u> years was your participating equipment shut off? _____(**USE 0 FOR DON'T KNOW**)

41. Does your facility use any electricity generated on site, such as solar, wind, diesel generator, but not including emergency backup used only for power failures?

1	Yes
2	No **(GO TO Q44)**
9	Don't Know **(GO TO Q44)**

42. What is the amount of on-site generation in use, in kilowatts? _____kW (kilowatts) (**USE 0 FOR DON'T KNOW**)

43. I'd like to ask you two more questions about your company. Approximately how many staff does your organization have <u>at this facility</u>? (**DO NOT READ LIST**)

1	Less than 10
2	10-25
3	26-100
4	More than 100

8	Refused
9	Don't know

44. Which of the following best describes your organization's annual revenues? Is it typically . . . (**READ LIST**)? (**IF NO REVENUES, E.G., NON-PROFIT, ASK FOR ANNUAL BUDGET**)

1	Under $100,000
2	$100,000-$500,000
3	$500,000 - $1 million
4	$1 million - $2 million
5	$2 million - $5 million
6	$5million -$10 million
7	More than $10 million
8	Prefer not to say/Refused
9	Don't Know

45. Do you have any other final closing comments or suggestions based on your experience with the Efficiency Vermont program? (**ACCEPT VERBATIM**)

Thank you very much for sharing your time and thoughts with us. They will help us refine this program and others to help reduce customer energy bills.

First Name:____

Last Name:____

Company: ____

Appendix F-Commercial Non-Participant Survey

Hi, my name is _______, and I'm calling on behalf of the Vermont Department of Public Service. We are conducting an evaluation of an energy efficiency program sponsored by Efficiency Vermont which is available in your area. Could we speak with the person at your company most involved in making decisions regarding installing new equipment (e.g. lighting, motors, etc.). Who would that be? **(When appropriate person is on phone, repeat introduction and continue.)** This survey is for research purposes only. It should take less than 15 minutes. Can we begin? **(If person is hesitant)** If you have any questions about this survey, you can contact TJ (Walter) Poor at the Department of Public Service at (802) 828-0544. Can we continue?

1. First, can you confirm that you are located at (**read street address from sample list**)?

Yes	**Continue**
No	**Thank respondent and terminate call.**

2. And which of the following categories best describes your facility? **(READ in order)**

1	Office
2	Retail
3	Apartment building
4	Educational institution
5	Restaurant
6	Lodging/hotel/motel
7	Factory
8	Other: ______________________________
9	Other
99	Don't know

NOTE: Use these types for the participant survey

3. There's an organization in Vermont called Efficiency Vermont that provides technical assistance and financial support to help Vermont residential and business customers be more energy efficient. Have you heard of Efficiency Vermont before?

1	Yes
2	No
99	Don't know

4. Are you aware that Efficiency Vermont offers special financial support and technical assistance to Vermont businesses to help them install energy efficient equipment and processes in your area?

1	Yes
2	No
99	Don't know

5. In this survey we are concentrating on the years 2007 through 2009. According to our records your organization did **NOT** install any energy efficient equipment or other energy efficiency improvements funded through Efficiency Vermont between 2007 and 2009. Is that correct?

1	Yes **(Go to Q8)**
2	No **(Continue)**
99	Don't know **(Go to Q8)**

6. Are you certain your organization did not participate between 2007-2009?

1	Yes **Thank and terminate**
2	No **(Go to Q 7)**
99	Don't know **(Go to Q 7)**

7. If you're not certain or don't know can you check and we will call back to continue? This survey is important for improving energy efficiency, which is why we're asking for your valuable time.

1	Yes **. Will check – ask for call back date :______________**
2	No Thank and terminate
99	Don't know **- ask for call back date: _________**

8. Have you ever participated in an Efficiency Vermont program before 2007? Do you recall which year that was?___ **(Take year. Use 99 for Don't know)**
   (If answer to Q6 is "2010" say "And before 2010," GO To Q12)

9. **(If answer in Q8 is "2006" or earlier)** Did this participation satisfy all your energy efficiency needs at the time?

1	Yes
2	No
99	Don't know

10. How satisfied were you with that participation, using a scale of 1 to 5, where 1 is Very Unsatisfied and 5 is Very Satisfied ______ **(Take #. Use 99 for Don't know/Don't recall)**

11. Did your level of satisfaction with that earlier participation influence your decision to participate again during 2007-2009? **(Don't Read but Prompt if needed)**

1	It affected my decision a lot
2	It affected my decision to participate in 2007-2009 some
3	Did not affect my decision to participate in 2007-2009 at all
99	Don't know/Don't remember

12. During 2007-2009, do you recall any of the following marketing efforts by Efficiency Vermont to motivate commercial organizations like yours to participate in energy efficiency programs?: **(Read 1-6Take all that apply)**

1	Ad on TV, radio, newspaper
2	Internet
3	Direct mail from Efficiency VT or a contractor
4	Phone call from Efficiency VT or a contractor
5	In Person contact from Efficiency VT or a contractor
6	Other **(Specify)**
7	None
8	Was not aware there was a program available to me **(Go to Q15)**
99	Don't Remember

13. Can you tell me why you didn't participate in a Efficiency Vermont program between 2007-2009? **(Don't read: Prompt if necessary, Take all)**

1	It was not convenient at the time
2	Didn't want the interruption
3	Too much paperwork/hassle
4	Didn't know the details of the program
5	Didn't know I could participate
6	Don't like people coming in my facility
7	Too restrictive on what you could and could not do
8	Facility is already energy efficient (nothing left to do)
9	Couldn't afford to participate
8	Other: (specify) ______________________________
9	Concerned about other related repair costs, such as wiring or code compliance that might have to be done.
9	Was not aware there was a program **(Go to Q15)**
99	Don/t know/don't remember **(Go to Q15)**

14. Which of these reasons would you say was the most important reason for not participating? **(Don't read: Prompt if necessary)**

1	It was not convenient at the time
2	Didn't want the interruption
3	Too much paperwork/hassle
4	Didn't know the details of the program
5	Didn't know I could participate
6	Don't like people coming in my facility
7	Too restrictive on what you could and could not do
8	Couldn't afford it.
9	Facility is already energy efficient (nothing left to do)
10	Concerned about other related repair costs, such as wiring or code compliance that might have to be done. ____
11	Other:(specify
99	Don/t know/don't remember

15. What could Efficiency Vermont do, in your opinion, to convince you to participate in their energy efficiency programs? **(Don't read: Prompt if necessary)**

1	Make it easier to sign up
2	Minimize, simplify paperwork
3	Offer higher incentives
4	Offer the equipment and services I need like: **(Take up to 3)**
5	More education and awareness
6	Nothing – Not interested
99	Don't know

16. Generally, when you decide about whether to make an energy efficiency equipment change in your facility, which of the following do you base your decision on? (**Take all. Read list but vary the order for 1-5.)**

1	decision is based on how quickly it will pay for itself in electric bill savings (payback)
2	Lowest cost among alternative investments
3	Life cycle analysis
4	Total Cost
5	Internal Rate of Return (IRR)
6	Other______
99	Don't know **(Skip to Q21)**

17. Which of those factors is the most important to you? **(Don't Read. Prompt if necessary)**

1	Lowest cost among alternative investments (
2	Life-cycle analysis **(Go to Q21)**
3	Minimum internal rate of return (IRR) **(Go to Q19)**
4	Total cost required **(Go to Q20)**
5	Payback in electric bill savings **(Go to Q 18)**
6	Other: ____ **(Go to Q21)**
99	Don't know/Refuse **(Go to Q21)**

18. What is the maximum payback period that is acceptable to you – how many years?

_____ years **(Go to Q21)**

19. What is your minimum internal rate of return for making an energy efficiency investment?

______ % **(Go to Q21)**

20. What is the maximum total project cost that you wouldn't exceed, regardless of how quickly the investment paid for itself in bill savings?

$_________ **(Go to Q21)**

21. In the 3 years before 2007, did you make any energy efficiency improvements that you paid for or financed without involving Efficiency Vermont's financial support?

1	Yes
2	No **(Go to Q 23)**
99	Don't know **(Go to Q23)**

22. What kinds of efficiency improvements did you make? (**Don't' read. Prompt if necessary)**

	Equipment Type
1	Lighting
2	Compressed air
3	HVAC system upgrade/replacement
4	Ventilation
5	Replace or tune-up heating system
6	Refrigeration

7	Process Improvements
8	Motors
9	Other: ______________________________
99	Don't know ____________________________

23. Do you think there are still other electric efficiency improvements that could be made to your facility, including lighting, cooling equipment, refrigerators, motors or something else?

1	Yes **Continue**
2	No **(Go to Q25)**

24. What types of electric efficiency improvements could be made to your facility? (**Don't read. Prompt if necessary.)**

25.

	Equipment Type
1	Lighting
2	Compressed air
3	HVAC system upgrade/replacement
4	Ventilation
5	Replace or tune-up heating system
6	Refrigeration
7	Process Improvements
8	Motors
9	Other: ______________________________
99	Don't know

26. Are you participating in any in Demand Response Programs offered by a utility or commercial vendor which might pay you to shut off equipment occasionally during peak electrical demand hours?

1	Yes
2	No **(Go to Q28)**
99	Don't Know **(Go to Q28)**

27. Can you tell me approximately the amount of electricity in kilowatts or kW that you agreed to shut off? ______ (**Use 0 for "I don't know."**)

28. About how many times in the past <u>three</u> years was your participating equipment shut off? _____ (**Use 0 for "I don't know."**)

29. Does your facility use any electricity generated on site, such as solar, wind, diesel generator, but not including emergency backup used only for power failures?

1	Yes
2	No **(Go to Q30)**
99	Don't Know **(Go to Q30)**

30. What is the amount of on-site generation in use, in kilowatts? _____kW (kilowatts) (**Use 0 for "I don't know."**)

31. O.K. Finally, I have just a few general questions to ask. First, does your organization own or lease your space?

1	Own
2	Lease/rent

32. How many years has your organization been in business?

1	<2
2	2-5
3	6-10
4	>10
8	Refused
99	Don't know

33. How many of those years have been at this facility at this address?

1	<2
2	2-5
3	6-10
4	>10
8	Refused

99	Don't know

34. Do you have specific plans to move from your current location any time in the next four years?

1	Yes
2	No
8	Refused
99	Don't know

35. Approximately how many full time employees or full time equivalents does your organization have at this facility?

Full-time Staff	
1	<10
2	10-25
3	26-100
4	>100
8	Refused
99	Don't know

36. Which of the following best describes your organization's annual revenues? (**If no revenues, e.g., non-profit, get annual budget.**) Is it typically . . . (**Read list**)

1	Under $100,000
2	$100,000-$500,000
3	$500,000 - $1 million
4	$1 million - $2 million
5	$2 million - $5 million
6	$5million -$10 million
7	More than $10 million
8	PREFER NOT TO SAY/REFUSED
99	DON'T KNOW

37. And finally, do you have any additional thoughts or comments concerning Efficiency Vermont's programs? (**Take Verbatim)**

Thank you very much for sharing your time and opinions with me. Your responses will help plan to meet future Vermont's electric energy needs.