STATE OF VERMONT
PUBLIC SERVICE BOARD

Docket No. 6479

Petition of Vermont Electric Power Company, Inc. for a Certificate of Public Good authorizing the construction of certain additions to its high-voltage transmission facilities located in the Towns of West Rutland, Proctor and Cavendish, Vermont, to be known as the Rutland Regional Reliability Project

VELCO NORTHWEST RELIABILITY PROJECT

ASSESSMENT OF ECONOMICALLY DELIVERABLE TRANSMISSION CAPACITY FROM TARGETED ENERGY-EFFICIENCY INVESTMENTS IN THE INNER AND METRO-AREA AND NORTHWEST AND NORTHWEST/CENTRAL LOAD ZONES

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I. SUMMARY

A. Background

This report assesses the potential for investments in end-use energy efficiency improvements as a demand-side management ("DSM") strategy to reduce growing peak loads in northwestern Vermont, an area where the growth in demand for electricity is outstripping the capacity of local generation and the regional transmission system to serve it. The study examines the contribution that an aggressive energy efficiency investment campaign targeted at this capacity constrained region could make during the next ten years to reduce peak loads and thereby help defer or eliminate the need to build new transmission and/or generation capacity to serve this economically vital region of Vermont. The analysis considers impacts through 2014 of DSM programs that begin in 2003 and end in 2012.

The area of study defined by the VELCO transmission planning process consists of the Burlington area (comprising the Inner and Metro-Area zones) and its outer regions (comprising the Northwest and Northwest/Central zones). The study estimates the summer peak load reductions that could be achieved by highly aggressive DSM initiatives targeting key residential, commercial and industrial markets in these planning regions. These initiatives would extend and expand on programs Efficiency Vermont ("EVT") is now implementing statewide and in conjunction with Burlington Electric Department ("BED"). Such an ambitious effort presumably would be undertaken jointly with any targeted DSM that emerges from the current distributed utility planning assessments.

To achieve these aggressive load reduction goals, the study contemplates a large ambitious investment campaign over a decade, utilizing the most aggressive proven market implementation strategies proven to acquire widespread participation by all market sectors:

- Sustained marketing to consumers and equipment suppliers;
- Generous financial incentives covering the full cost of retrofit measures and the full incremental cost for new construction/renovation measures;
- Comprehensive technical and information services for market participants; and
- Complete customer service delivery.

All the technologies and market intervention strategies contemplated in the analysis have proved effective in New England and elsewhere. It bears noting, however, that no utility has ever sustained such large efficiency investment commitments for so long in so many markets simultaneously and actually achieved the relative magnitudes of peak demand savings projected over the next decade in this report.

The study estimates potential savings in three residential markets – retail products and appliances, retrofit applications and new construction – and two commercial/industrial ("C&I") markets – existing and new construction. For the three residential markets, the study further provides separate estimates for measures that alternately contribute comparatively high and low peak load kW savings. The C&I existing market is further broken down into three segments – retrofit, renovation and remodel/replacement.

Drawing on a statewide potential study completed by Optimal Energy in 2002 for the Department of Public Service ("DPS"), this analysis considers dozens of efficiency technologies applied to all major end-uses across the full range of building types.[1] The savings estimates consider both the energy savings each efficiency technology offers and the time required to get the technology in place (i.e., market penetration rates) using very aggressive DSM program efforts in the two VELCO planning zones (the Inner and Metro-Area zones, and the Northwest and Northwest/Central zones.)

The analysis specifically sought to ensure that the estimates of potential peak demand savings are realistic, considering how difficult it may be to get consumers to replace inefficient existing equipment or choose high efficiency options in new construction. This aggressive campaign would pursue comparatively high levels of peak load reductions, considering the history of energy efficiency programs in Vermont and other places in the nation. The analysis recognized this by lowering projected penetration rates to reflect what VELCO could really expect to count on for transmission planning purposes with a high degree of confidence. The statewide potential estimates were developed as expected values (with a 50-50 chance the actual value will fall above or below the prediction). Given the objective of a more conservative assessment for a specific resource planning problem, this study used lower achievable market penetration rates for some measures and markets than those used in the DPS statewide analysis.

B. Overview of Analysis Results

The study estimates savings both from an aggressive campaign in the target zones by VELCO and those expected to materialize due to statewide programs already underway by Efficiency Vermont and Burlington Electric Department. The impacts of existing programs are included in the base case forecast VELCO is

[1] The residential market analyzed measures for two building types: single- and multi-family buildings. The C&I market included 11 building types: agriculture, education, grocery, health, industrial, lodging, office, restaurant, retail, warehouse and other.

using to assess the need for new transmission capacity. The net impact of the VELCO aggressive campaign examined here is the difference between this targeted campaign (which includes the VELCO and BED/EVT impacts) and the projected savings from existing EVT/BED programs.

1. Demand and Energy Savings Impacts

Table 1 presents detailed estimated of electric impacts from the VELCO campaign and EVT/BED programs.[2] These are expressed as cumulative annual savings through 2014 from transmission-targeted initiatives in the Inner and Metro-Area and Northwest and Northwest/Central load zones. Projected outcomes are expressed in terms of summer peak demand and energy savings during the summer and winter peak and off-peak periods. For the first four years, from 2003 through 2006, the Inner and Metro-Area load zones account for a greater share of cumulative demand and energy savings. Thereafter, the Northwest and Northwest/Central load zones accrue greater cumulative shares of targeted savings.

Table 1: VELCO Only Campaign Savings Estimates

VELCO NORTHWEST RELIABILITY PROJECT
ELECTRICITY SAVINGS AT END-USER METER
NET DELIVERABLE POTENTIAL
Cumulative Annual Load and Sales Reductions

		INNER AND METRO-AREA LOAD ZONES					
YEAR		Summer Peak Demand kW	Summer Peak Energy MWh	Summer Off-Peak Energy MWh	Winter Peak Energy MWh	Winter Off-Peak Energy MWh	Total Annual Energy MWh
1	2003	1,187	2,078	1,414	1,906	544	5,943
2	2004	6,357	12,370	7,297	11,341	2,826	33,833
3	2005	15,425	29,578	17,383	28,173	6,746	81,881
4	2006	27,084	51,007	28,018	47,159	10,795	136,979
5	2007	39,723	73,713	38,200	66,274	14,600	192,787
6	2008	49,685	90,709	44,552	79,548	16,910	231,718
7	2009	58,288	105,289	50,039	90,920	18,909	265,158
8	2010	65,232	116,616	54,027	99,209	20,300	290,150
9	2011	70,514	124,948	56,722	104,714	21,172	307,551
10	2012	74,191	130,750	58,505	107,908	21,687	318,843
11	2013	72,535	127,463	56,768	103,685	20,856	308,764
12	2014	70,469	123,407	54,415	98,857	19,784	296,451

		NORTHWEST AND NORTHWEST/CENTRAL ZONES					
YEAR		Summer Peak Demand kW	Summer Peak Energy MWh	Summer Off-Peak Energy MWh	Winter Peak Energy MWh	Winter Off-Peak Energy MWh	Total Annual Energy MWh
1	2003	1,359	2,154	1,083	1,586	448	5,385
2	2004	6,314	11,334	5,913	9,443	2,349	29,268
3	2005	14,291	26,060	13,140	21,899	5,171	66,618
4	2006	26,163	47,678	23,256	40,155	9,109	120,664
5	2007	41,300	76,148	37,473	64,581	14,610	193,395
6	2008	54,585	100,684	49,280	85,393	19,191	255,249
7	2009	66,589	122,889	60,173	105,006	23,476	312,363
8	2010	76,851	140,857	68,853	120,717	26,843	358,199
9	2011	84,460	153,850	74,414	131,494	28,973	389,769
10	2012	90,358	165,052	79,465	141,009	30,927	417,603
11	2013	88,625	142,554	69,648	122,945	27,073	363,324
12	2014	86,421	156,773	74,513	131,774	28,632	392,726

[2] Table numbers in sections I through III of the report correspond to those in section IV, Results.

Table 2A presents the cumulative annual summer peak kW load reductions through 2014 by sub markets from the combined VELCO plus EVT/BED efforts in the Inner and Metro-Area and Northwest and Northwest/Central load zones. The C&I sectors provide the largest amount of demand savings. In both the residential and C&I sectors, the retrofit market segment provides the majority of the demand savings.

The analysis considered impacts through 2014 of DSM programs that begin in 2003 and end in 2012. The cumulative annual values account for timing effects from efficiency measures installed over the analysis period, such as expiration of shorter-lived measures and changes in savings during the lifetimes of installed measures due to underlying changes in baseline efficiency levels. Both Table 1 above and Table 2A below show cumulative annual savings declining after 2012, since measure retirements and other timing impacts take effect after targeted (VELCO plus EVT/BED) initiatives cease producing new incremental savings after their tenth year of operation.

Table 2A: Transmission-Targeted (VELCO plus EVT/BED) Peak Demand Savings Estimates

VELCO NORTHWEST RELIABILITY PROJECT
ELECTRICITY SAVINGS AT END-USER METER

PROJECTED SAVINGS FROM TRANSMISSION-TARGETED DEMAND-SIDE INITIATIVES
CUMULATIVE ANNUAL SUMMER PEAK DEMAND kW LOAD REDUCTIONS

INNER AND METRO-AREA LOAD ZONES

		RESIDENTIAL							COMMERCIAL AND INDUSTRIAL					TOTAL
	YEAR	Retail High	RNC High	Retrofit High	Retail Low	Retrofit Low	Retail Low	Total	New	Retrofit	Remodel Replace.	Renovation	Total	Res/C&I
1	2003	151	39	404	214	74	98	981	430	935	615	461	2,441	3,421
2	2004	325	78	2,047	429	147	477	3,503	1,070	3,577	1,607	1,139	7,393	10,897
3	2005	524	120	4,789	646	226	1,082	7,387	1,661	8,302	2,946	2,014	14,923	22,309
4	2006	759	180	6,837	866	337	1,515	10,493	3,169	15,016	4,586	3,054	25,826	36,319
5	2007	989	233	8,187	1,059	423	1,789	12,680	4,361	23,589	6,456	4,213	38,619	51,299
6	2008	1,232	285	8,187	1,243	508	1,785	13,240	5,340	31,542	8,222	5,265	50,368	63,608
7	2009	1,480	336	8,187	1,445	591	1,769	13,809	6,518	38,152	9,876	6,210	60,756	74,565
8	2010	1,717	382	8,173	1,554	663	1,704	14,193	7,790	43,390	11,395	7,053	69,628	83,821
9	2	1,9281	409	8,120	1,686	706	1,554	14,403	9,247	47,162	12,797	7,810	77,016	91,419
10	2012	2,002	451	8,040	1,831	760	1,377	14,460	10,929	49,412	14,104	8,493	82,938	97,398
11	2013	2,002	450	7,913	1,732	757	1,222	14,075	10,879	47,756	13,892	8,483	81,011	95,086
12	2014	2,002	449	7,588	1,642	754	1,050	13,486	10,828	45,557	13,604	8,471	78,461	91,947

NORTHWEST and NORTHWEST/CENTRAL ZONES

		RESIDENTIAL							COMMERCIAL AND INDUSTRIAL					TOTAL
	YEAR	Retail High	RNC High	Retrofit High	Retail Low	Retrofit Low	Retail Low	Total	New	Retrofit	Remodel Replace.	Renovation	Total	Res/C&I
1	2003	271	20	291	528	40	79	1,229	499	975	612	463	2,549	3,777
2	2004	574	45	1,470	1,052	89	382	3,613	1,194	3,689	1,595	1,145	7,623	11,235
3	2005	914	80	2,937	1,575	154	742	6,402	1,870	8,532	2,918	2,025	15,345	21,746
4	2006	1,301	143	4,686	2,101	265	1,153	9,649	3,500	15,409	4,536	3,072	26,517	36,166
5	2007	1,691	213	7,597	2,560	371	1,810	14,242	4,796	24,180	6,378	4,236	39,591	53,833
6	2008	2,096	288	9,921	2,991	483	2,314	18,094	5,847	32,311	8,118	5,294	51,570	69,664
7	2009	2,513	366	12,252	3,464	599	2,792	21,987	7,136	39,091	9,746	6,244	62,218	84,205
8	2010	2,935	441	14,578	3,700	710	3,208	25,572	8,552	44,493	11,239	7,093	71,378	96,950
9	2011	3,355	490	15,988	3,990	781	3,369	27,974	10,160	48,422	12,617	7,854	79,053	107,027
10	2012	3,439	570	17,397	4,306	882	3,503	30,097	11,993	50,824	13,900	8,541	85,258	115,355
11	2013	3,439	569	17,305	4,065	880	3,323	29,580	11,934	49,226	13,694	8,530	83,384	112,964
12	2014	3,439	569	17,037	3,843	877	3,068	28,833	11,874	47,071	13,420	8,516	80,880	109,713

Projected electricity savings are above and beyond what would occur naturally in the marketplace in the absence of future market intervention. These projected savings are subtracted from the DPS regional sales forecast to produce estimates of the resulting loads in each planning zone.[3]

2. Economic Impact

The campaign outlined here contemplates a budget of $569 million over ten years; a $479 million increase in the EVT and BED statewide investments projected over ten years at $90 million. All dollar figures are reported in 2003 present worth with future values discounted at 4%.

Tables 13A through 14A present economic information about the projected savings for the targeted VELCO campaign and EVT/BED programs. Table 13A disaggregates utility and societal benefits and societal costs for all the initiatives over the two areas combined. Table 14A shows how non-transmission savings are applied to the societal costs of targeted (VELCO plus EVT/BED) initiatives to determine net societal costs of peak demand and energy reductions delivered to the transmission system.

Tables 13A and 14A show all the targeted (VELCO plus EVT/BED) initiatives taken together result in:

- $872 million in utility net present value benefits;
- $335 million in non-utility societal net present value benefits;
- $1,207 million in total net present value benefits;
- $618 million in societal net present value costs;
- $589 million in net present value benefits; and
- A 1.95 societal benefit-cost ratio.

This study did not count the value of risk-mitigating advantages of energy-efficiency resources recognized by the Public Service Board (PSB). These include the ability to acquire resources in stages, and the tendency of efficiency savings to vary directly with hourly load fluctuations. The relative risks of different transmission resource options are discussed in a companion report.

[3] The analysis assumed a mid-year 2003 start date and lower penetration rates for the first year. Delaying the start date of the programs to a future date would require the results to be shifted accordingly. In other words, if the programs were assumed to begin in 2004, then the results currently reported for the first year, 2003, would become the results for 2004.

C. Overview of Achievable Penetration Rates

Efficient technology market penetration is expected to rise over time in both the DPS sales forecast and this assessment. The VELCO assessment used baseline efficiency assumptions consistent with energy intensities in the DPS sales forecast, which the DPS adjusted to remove the future effects of past DSM programs. This enabled VELCO to account directly for expected savings from currently planned statewide initiatives by subtracting these estimates from the VELCO area load forecasts. (Both the underlying load forecast and this assessment both assume that more stringent building efficiency codes and equipment efficiency standards will raise market penetration of some efficiency technologies, due largely to past market intervention).

1. Residential Sector

In the residential sector, the achievable market penetrations were estimated assuming that for all measures, except compact fluorescent lamps ("CFLs"), consumers would either be provided the measure at no cost (retrofit) or provided a rebate equal to 100% of the incremental cost of the measure (retail or new construction).[4] In the new construction market, those market penetration estimates are generally lower than the previous 2002 DPS statewide potential study assumptions. Of the homes reached, 75% of the targeted measures are installed, except for fuel switch measures, where only 60% of measures are installed. In the case of the retrofit analysis, it was assumed that 60% of all households would be visited and treated over the 10-year analysis period. It is also less than the roughly 70% of homes that were assumed could be reached in the DPS statewide analysis. In the retail markets, achievable penetration rates varied by measure. Measures with substantial rebates were assumed to reach high market shares within a few years (e.g. 75% penetration rate for ENERGY STAR® clothes washers by year 5). Measures with more moderate rebate levels (e.g. $25 to $50) were assumed to have penetration rates closer to 50% by year 5. Finally, it is important to note that many measures available through retail channels have very low (close to zero) incremental costs. Since the analysis assumed that incentives would not exceed 100% of incremental cost, the consumer marketing became the primary factor driving up market share for those products. This was assumed to result in slower increases in market share (typically only 5% points above the baseline market share).

[4] Incentives for retail purchases of CFLs were assumed to be only 75% of incremental cost to increase the likelihood that they are actually installed shortly after being purchased. The presumption is that CFLs are more likely to be used immediately if customers have to pay something for them.

2. Commercial and Industrial Sectors

In the commercial and industrial sectors, for interior lighting retrofit measures, a maximum cumulative achievable penetration rate of 60% of eligible opportunities by the end of a decade was assumed. For all other retrofit end-uses a maximum cumulative achievable penetration of 40% was assumed. This contrasts to program experience for some of the best retrofit programs in North America that have achieved around 80% penetration, and various potential studies that estimate between 70-80% achievable penetration.[5] However, it also recognizes that the comprehensive list of technologies analyzed goes beyond what most programs have strived to get installed in participating buildings. Market driven (non-retrofit) measure penetrations are estimated individually, taking into account current baseline practices, pending and likely impacts of state and national codes and standards, and experience of other North American programs.

D. Comparison with Other Savings Potential Studies

The following chart on page 11 compares several studies of potential electricity (or all fuels) savings from energy-efficiency investments. These studies encompassed one or more of four types of potential analysis: technical; economic; achievable potential of technical or economic potential; and program funding-constrained potential. The type of analysis conducted and other issues specific to each study preclude a simple numeric comparison of the studies.

Noteworthy highlights of the studies include:

- Summer peak demand savings as a percentage of total capacity was estimated only in the VELCO, Vermont statewide, California and national studies.
- Only the VELCO and Vermont statewide studies considered fuel switching measures.

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[5] For example, National Grid Transco's Design 2000plus C&I new construction program typically reaches 75-90% of new buildings built in National Grid's territory. Buildings with comprehensive measures perform 40-50% better than a typical building (Personal communication with Michael McAtteer, Program Manager, November 20, 2002). In Vermont, Citizens Utilities offered a Small C&I Retrofit Program that captured roughly 80% adoption of measures among targeted customers. Other Small C&I programs have enjoyed even higher penetration rates. See Mosenthal, P. & Wickenden, M., *The Relationship Between Financial Incentives and Measure Adoption in the Small C&I Retrofit Market,* Proceedings of the ACEEE Summer Study, 2000., at: http://www.aceee.org/. For more details on typical participation rates of some of the best programs in North America, see Nadel, Pye & Jordan, *Achieving High Participation Rates: Lessons Taught by Successful DSM Programs,* ACEEE, January 1994. Examples of other potential studies that have assumed maximum achievable penetration rates of 70-80% include: Consolidated Edison Biennial DSM Plans for 1991 and 1993, and *California's Secret Energy Surplus: The Potential for Energy Efficiency*, Xenergy, Inc., September 2002.

- The VELCO 10-year zonal analysis excluded numerous measures included in the Vermont statewide study and used lower penetration rates.
- The California 10-year study did not consider integrated efficiency measures.
- The Massachusetts 5-year study did not address residential low-income potential impacts.
- The NJ, NY, PA 14-year study, conducted in 1997, addressed the residential impact for all fuels (not for electricity only).
- The Southwest regional study was for an 8-year period.
- The nationwide 13-year study, conducted in 1997, addressed all fuels.

Regarding the VELCO study:

- The 23% and 17% total VELCO summer peak demand and energy savings, respectively, are reasonable when compared to the 37% and 31% total Vermont statewide demand and energy savings, respectively, given the differences between the two analyses.
- The VELCO total demand and energy savings (23% and 17%, respectively), which are achievable of technical potential, correspond closely to that of the California study technical potential savings scenario (25% and 19%, respectively).[6]

E. Other Report Sections

The remainder of this report is presented in three more sections plus two Appendices. Section II explains the assessment's analytical approach. Section III outlines the market strategies employed in the targeted efficiency initiatives. Section IV presents detailed electricity impacts by zone by year for the residential, and the commercial and industrial initiatives, combined and separately, along with a breakdown of gross and net societal costs and total budgets for each targeted initiative. Appendix A presents details of the residential analysis. Appendix B presents corresponding information for the commercial and industrial sectors.

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[6] Vermont's per capita electricity consumption is considerably higher than that of California, 9400 vs. 7200 kWh per person, respectively. California has a relatively higher baseline level of energy consumption from which to pursue energy efficiency, in part due to very aggressive implementation and enforcement of its statewide energy codes.

Summary of Electricity (or All Fuels) Savings Potential Studies

Note: the following definitions are listed in order from higher to lower estimates of savings potential

Technical potential is defined as the complete penetration of all measures analyzed in applications where they were deemed to be technically feasible from an engineering perspective.
Economic potential refers to the technical potential of those energy conservation measures that are cost-effective when compared to supply-side alternatives.
Achievable potential is defined as the amount of technical or economic potential that could be achieved over time under the most aggressive program scenario possible.
Program funding constrained potential refers to the amount of savings that would occur in response to specific program funding and measure incentive levels.

Area(s) Covered	Type of Savings Potential	Year Completed	Author(s)	Estimated Consumption Savings as % of Sales				Estimated Summer Peak Demand Savings as % of Total Capacity	Years to Achieve Estimated Savings Potential	Comments
				Res.	Comm.	Indus.	Total			
VELCO	Achievable of Technical	2002	OEI/VEIC	18%	17% - C&I		17%	23%	10	Excludes measures with little peak demand, that require regional coordination, and emerging technologies; includes fuel switching; also 5-year scenario
California	Tech./Econ./Ach. of Econ./Prog.Fund.Constr.	2002	Xenergy	21%/15%/10%/8%	17%/13%/10%/7%	19%/12%/11%/4%	19%/14%/10%/6%	25%/16%/10%/6%	10	Integrated measures not addressed; agricuture included in industrial sector
Massachusetts	Achievable of Economic	2001	RLW Analytics/SFMC	25%	16% - C&I		N.A.	N.A.	5	Excludes non-utility impacts & low income savings/sales
New York	Technical / Economic	2002	OEI/VEIC/ACEEE	37%/26%	41%/38%	22%/16%	37%/30%	N.A.	10	Also 5- and 20-year scenarios
NJ, NY, PA	Achievable of Economic	1997	ACEEE	35%	35%	41%	N.A.	N.A.	14	Residential savings are for all fuels, not just electricity
AZ,CO,NV,NM,UT,WY	Achievable of Economic	2002	SWEEP/ACEEE/Tellus	14%	20%	19%	18%	N.A.	8	Also 18-year scenario
Vermont	Achievable of Technical	2002	OEI/VEIC	30%	32% - C&I		31%	37%	10	Includes fuel switching; also 5-year scenario
National	Program Funding Constrained	1997	U.S. DOE	9%	8%	11%	10%	14%	13	Addresses all fuel; also 23-year scenario

II. APPROACH

This assessment extends the recent 2002 update to the DPS 1997 Power to Save analysis, "Electric and Economic Impacts Of Maximum Achievable Statewide Efficiency Savings 2003-2012," performed by Optimal Energy for the Vermont Department Of Public Service. The same methodology and many of the same assumptions used in that analysis were used as the foundation for this assessment. Three important differences between the two studies are worth noting.

The first major difference concerns the level of uncertainty associated with the savings estimates. The statewide analysis provided the most likely estimate of maximum achievable savings. The savings estimates in the statewide analysis were equally likely to be too high or too low. By contrast, the VELCO assessment provides savings estimates that VELCO could count on with a high degree of certainty, i.e. a high likelihood that the predicted outcomes will be achieved). Analytically, this resulting approach was to reduce and slow the measure penetration rates projected over time in the DPS statewide analysis.

The second difference is the narrower scope of technology and market intervention options necessary for the VELCO assessment. The statewide analysis considered efficiency potential that could be realized from current and emerging technologies, relying on concerted market intervention efforts on the part of Efficiency Vermont, Vermont's distribution and transmission utilities, and regional and national entities. The VELCO assessment is limited to technologies readily available in Vermont over the next decade, and to market strategies that could be legitimately considered within VELCO's sphere of influence if not direct control (i.e. in conjunction with EVT and with distribution utilities via Area-Specific Collaboratives (ASCs).

The third difference from the DPS statewide analysis is the geographic focus of VELCO's assessment. We separately analyzed achievable electricity savings potential for two distinct load zones. The first area included the combination of VELCO's "Inner" and "Metro-Area" zones, which include most of Chittenden County (including all of the city of Burlington; excluding only the northern most towns in the county) and the northern portion of Addison County. We estimate that the "Inner and Metro-Area" zone grouping contains approximately 22% of the state's residential customers, and 44% of its commercial and industrial electricity sales. The second region encompassed the combination of VELCO's "Northwest" and "Northwest/Central" zones, which together include most of the rest of the state except for the Northeast Kingdom and most of Windham and Bennington Counties in the south. We estimate that the "Northwest-Northwest/Central" zone grouping contains approximately 54% of the state's residential customers and 44% of commercial and industrial ("C&I") electricity sales. This assessment therefore does not include savings potential for roughly one-quarter of the state's population and 16% of C&I electric usage.

A. Residential Savings Analysis

The residential analysis is built "from the ground up". It starts by characterizing a variety of efficiency measures – their typical costs, typical annual electricity savings, typical peak demand savings and typical duration of the savings (i.e. the measure life). The size of the market for each measure was then assessed – i.e. how many of them could technically be installed. This typically boils down to either how many new homes are built each year, how many appliances are purchased each year and/or how many electric appliances are currently in use in each home and (therefore) available for "replacement" with efficient alternatives. The third key step is estimating how often each of the efficiency measures examined would be installed without any new market intervention (i.e. baseline penetration rates). The fourth step is estimating how often the efficiency measures would be installed through an aggressive market intervention (maximum achievable penetration rates). The costs of such an intervention were estimated. What follows is a more detailed discussion of each of these steps. Further detail on assumptions used in the residential analysis can be found in Appendix A.

1. Markets and Measures Analyzed

The residential analysis organizes savings potential into three distinct market intervention opportunities: new construction, retail equipment/product sales (alternatively referred to as "time-of-purchase"), and retrofit. To provide VELCO with a greater range of options for assessing the relative costs and benefits of efficiency alternatives, each of these three market segments were further divided into two groups – a "high peak savings" group and a "low peak savings" group (leaving a total of six market segments). Efficiency measures with relatively high ratios of summer peak kW savings to total annual kWh savings were put into the "high peak savings" groups; those with low kW to kWh ratios were put into the "low peak savings" groups.

All told, 70 different efficiency measures – representing 36 different efficiency technologies and/or technology "bundles" – were analyzed in these six market segments (some measures were analyzed in more than one segment). This represents a 20-25% reduction in the number of measures analyzed relative to the previous statewide efficiency potential analysis. Consistent with the more conservative approach summarized above, measures were excluded from this analysis for one of three different reasons. First, "emerging" technologies, e.g. efficient power supplies and heat pump water heaters, were not included in this analysis, because they are not yet currently widely available in the market so there is greater uncertainty about the savings they could potentially provide. Second, measures requiring regional coordination to change current market practices, e.g. convincing manufacturers to use more efficient power supplies, were excluded from this analysis. Finally, this study focused exclusively on measures that could provide at least some summer peak demand savings. Thus, it did not include purely winter electricity saving measures such as space heat fuel switching and furnace fans.

2. Measure Costs and Savings

Another key component to the analysis was estimates of the average savings, incremental costs and other key "per unit" characteristics of each of the efficiency measures. Where appropriate, such assumptions were the same as those currently used by Efficiency Vermont (EVT) in its Technical Reference Manual. For efficiency measures not currently promoted by EVT or for which EVT estimates savings on a custom, site-specific basis, several other sources were used. These include data from the U.S. Environmental Protection Agency's (EPA's) ENERGY STAR® program office; the U.S. Department of Energy (both from analyses to support establishment of various appliance efficiency standards and the Energy Information Administration's ("EIA") Residential Energy Consumption Survey (RECS)); and the Vermont Energy Investment Corporation's ("VEIC") historical experience with programs – particularly delivery of retrofit programs. These assumptions were generally the same as those used in the previous 2002 statewide analysis update.

For a couple of measures (i.e. central air conditioners and clothes washers) estimates of per unit savings and costs in future years were adjusted downward to reflect the impacts of new federal efficiency standards.[7]

3. Size of Eligible Markets

Estimates of the size of the markets were also developed for each efficiency measure. Estimates were developed separately for each of the two load zone groupings of interest to VELCO. Wherever possible, the estimates were based on data specific to each area.

New Construction

In the case of new construction, the number of new homes estimated to be built each year was based largely on changes in population incorporated into the DPS forecast that VELCO was using to assess future transmission needs. The DPS estimated changes for the state as a whole. It also estimated changes for two sub-sections of the state, one being Chittenden, Franklin and Grand Isle counties (which it estimated would account for about 55% of growth in the state's population over the next 10 years). Estimates of single family new construction

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[7] The federal minimum efficiency standard for clothes washers increases significantly in 2007 (to an MEF of 1.26). The minimum standard for central air conditioners is supposed to increase to SEER 12 in 2006.

by county that were incorporated into a "Preliminary RNC Market Characterization" report prepared for the DPS were also examined. Using these two sources resulted in an estimate that approximately 40% of the state's new construction activity would occur in the "Inner-Metro-Area" load zone grouping, 45% would occur in the "Northwest-Northwest/Central" load zone grouping and 15% would occur in the remainder of the state.

Retrofit

The key to developing estimates of the size of retrofit markets for many efficiency measures was to estimate existing appliance saturation rates for various electric end uses. For most key end uses – room air conditioners, refrigerators, electric water heaters, electric dryers, etc. – estimates of saturation rates that were specific to the load zone groupings of concern to VELCO were developed. This was accomplished through analysis of the raw data from the Vermont Fuel Wood Assessment 1997-1998 conducted by the DPS, which contained information from a random sample of nearly 500 homes throughout the state. It was considered important to analyze the raw data (rather than just use statewide averages provided in DPS' report) because of the possibility that the presence of Vermont Gas in the northwest part of the state and/or the greater level of new construction in the same region in recent years would make regional saturations different from statewide averages. However, in the end, the data suggest that saturation of key electric appliances was not much different in the "Inner and Metro-Area" load zone grouping than in other parts of the state.

Retail Products

Estimates of the size of the retail markets for efficiency measures generally relied on the same appliance saturation data to first estimate how many of each appliance was in use in existing homes. Then an estimate of the annual sales of those appliances was made by dividing the number of appliances currently in use by its assumed life. For example, clothes washers were assumed to have a life of 14 years. That led to an assumption that $1/14^{th}$ (i.e. 7.1%) of all consumers who currently own a clothes washer are in the market to buy a new model every year. For several appliances (e.g., computers, electronics TVs, and humidifiers) which local saturation data were not available, (since they were not addressed by the DPS fuel wood study), New England saturation estimates from the 1997 Residential Energy Consumption Survey (published by the U.S. Department of Energy's Energy Information Administration) were used.

Some of the efficiency measures analyzed compete for the same efficiency upgrade opportunities (e.g. a fixture with an incandescent bulb can either be replaced with a hard-wired fluorescent lighting fixtures or have its bulb replaced with a compact fluorescent light bulb - CFL). In such cases, estimates of the size of the eligible market were adjusted to ensure that savings were not overstated. Similarly, some efficiency measures could be installed through different market channels. Particularly important is potential overlap between retail markets and retrofit markets (e.g. as retrofit programs directly install CFLs in more and more homes, the potential for retail sales of CFLs decreases). Where the potential for such overlap existed, the number of efficiency measures predicted to be installed through retrofit activity reduced the size of the retail markets.

4. Penetration Rates

Base case market penetrations – the portion of the market that would buy or install the efficiency measure absent any new efficiency programs – were developed using several sources, including current EVT assumptions regarding "free rider" rates and the EPA's estimate of current and future market shares for a wide range of ENERGY STAR®-rated products.

The achievable market penetrations, listed on Table A-2 were estimated assuming that consumers would either be provided the measure at no cost (retrofit) or provided a rebate equal to 100% of the incremental cost of the measure (retail or new construction). The only exception to this rule was retail sales of CFLs, where rebates were assumed to be equal to 75% of incremental cost. This exception was designed to ensure that the efficient product was not essentially free (this provides some assurance that products purchased will actually be used to generate savings). Consistent with the objective of a more conservative assessment, the achievable market penetration rates used in this analysis were lower for some measures and markets than the penetration rates used in the statewide analysis.

New Construction

In the new construction market, for the Inner and Metro-Area zone it was assumed that the program could reach 80% of the homes by the fifth program year and 90% by the 10^{th} year. For the Northwest-Northwest/Central zone it was assumed that the program could reach 50% of the homes by the fifth program year and 80% by the 10^{th} year. Those estimates are generally lower than the previous DPS statewide assumption of 75% penetration by the fifth year and 95% by the 10^{th} year. Of the homes reached 75% of the targeted measures are installed, except for fuel switch measures where only 60% of measures are installed.

Retrofit

In the case of the retrofit analysis, it was assumed that 60% of all households would be visited and treated over the 10-year analysis period. That is less than the roughly 70% of households Washington Electric Cooperative households to which VEIC has provided retrofit services over the past decade. It is also less than the roughly 70% of homes that were assumed could be reached in the DPS statewide analysis update.

Of the homes visited, it was assumed that 50-75% of most major measures are installed. In the case of hot water fuel-switches, for example, VEIC has experienced acceptance rates of roughly 60% (e.g. in a program implemented for Citizens Utilities) when offering incentives equal to less than half of the measure cost (rather than the full measure cost assumed for this analysis). Nevertheless, this level of retrofit activity was assumed to require a significant effort to recruit staff or contractors, train them and establish marketing efforts to generate job leads. Thus, savings in the first few years were assumed to be lower than savings in later years. Since the "Inner and Metro-Area" load zone grouping was viewed as most important, it was also assumed that greater emphasis on retrofit activity would be place on that area first.

Retail Products

In the retail markets, achievable penetration rates vary by measure. Measures with substantial rebates were assumed to reach high market shares within a few years (e.g. 75% penetration rate for ENERGY STAR® clothes washers by year 5). Measures with more moderate rebate levels (e.g. $25 to $50) were assumed to have penetration rates closer to 50% by year 5. Finally, it is important to note that many measures available through retail channels have very low (close to zero) incremental costs. Since the analysis assumed that incentives would not exceed 100% of incremental cost, the consumer marketing became the primary factor driving up market share for those products. This was assumed to result in slower increases in market share (typically only 5% points above the baseline market share).

5. Residential Analysis Example

Retail sales of ENERGY STAR® room air conditioners was used as an example to show how each of the steps outlined above generate an estimate of savings potential.

First, based on EVT's Technical Reference Manual, an estimate was made if a customer was to buy a new ENERGY STAR®-rated room air conditioner instead of a new standard-efficiency alternative, it will cost an additional $40. For that additional expense, the customer will realize 45.69 kWh in annual energy savings. This assumption can be found in Table A-3 of Appendix A. The customer's contribution to system summer peak demand will be 0.118 kW. This figure is a product of the assumed maximum load reduction of 0.122 kW (also in Table A-3) and a summer coincidence factor of 0.97 (a weighted average of the single and multi-family values provided in Table A-4. Those savings are projected to last 12.5 years (the estimated typical life of a room air conditioner, also shown in Table A-3).

Also estimated was that there are 54,108 households in the "Inner and Metro-Area" load zone grouping and that there are an average of 0.3956 room air conditioners ("A/Cs") per household in that zone grouping (29.7% had at least one, but many of those have two and a few have three). That yields an estimate of 1,712 room air conditioners sold each year to households in the Inner and Metro-Area zone (54,108 times 0.3956 room A/Cs per home, divided by the measure life of 12.5 years). This figure can be found in Table A-6.

Data from EPA's ENERGY STAR® program suggest that 24.5% of national sales of room air conditioners in the first half of 2002 were ENERGY STAR®-rated. However that includes the effects of several states' energy efficiency programs. The analysis assumed the average absent those programs would be approximately 15% in 2003. Thus, it was assumed that 257 of the 1,712 room air conditioner sales to residential customers in the Inner and Metro-Area zone would be ENERGY STAR® qualified absent any programs. This figure can be found in Table A-8. Both the assumed market share and, therefore, the absolute number of units sold meeting the ENERGY STAR® standard were projected to grow gradually (to 20% in 2007 and 30% in 2012) absent any DSM program. With an aggressive program that (among other things) paid a rebate equal to the assumed incremental cost of $40, it was assumed that market share would be 80% in 2003 and grow to 90% in 2007 (staying there through 2012). This is based largely on evidence that the market share in Vermont grew to nearly 70% in 2002 following introduction of a $25 rebate by EVT in May of 2002. Thus, it was estimated that sales of ENERGY STAR®-rated room air conditioners in the Inner and Metro-Area zone would total 1,370 in 2003. This figure can be found in Table A-10.

The net effect of these assumptions is that an aggressive program would influence 1,113 room air conditioner sales (1,370 minus 257 in the baseline). That would generate savings in 2003 of 50,853 kWh and 131 kW. That output can be found in Table A-5. Similar calculations apply to subsequent years. Note that since retail room air conditioner savings are assumed to last for 12.5 years, savings generated from sales influenced in 2003 are added to savings generated from sales influenced in 2004 and so on through the end of our analysis period (2012).

B. Commercial and Industrial Savings Analysis

In the commercial and industrial ("C&I) sector, the analysis estimated savings for 54 efficiency technologies or technology combinations for 11 building types in new construction, renovation, replacement and retrofit markets. For each combination of technology, building type and market (1,573 individual measures) base-case, budget and maximum achievable market penetrations over the next decade were estimated. Table B-1 shows the list of technologies and technology bundles, along with the markets analyzed for each.

Optimal Energy developed individual technology cost and performance characteristics using public and private information sources, including the EVT Technical Reference Manual developed and continually updated and maintained at EVT since 2000. Also used were: VELCO forecast data; EIA Commercial Building Energy Consumption Survey (CBECS); California Energy Commission measure cost and savings database; publications from national organizations such as American Council for an Energy Efficient Economy ("ACEEE"), Lawrence Berkeley Laboratory ("LBL"), and New Buildings Institute ("NBI"); utility, statewide, and regional technology, baseline and market assessment studies for areas in the Northeast United States; and communications with manufacturers and vendors.

The C&I analysis takes a "top-down" approach that begins with the total electric sales forecast for each VELCO zone analyzed. In summary, the energy savings potential for each measure (percent of existing measure load) is multiplied by the existing and forecast load attributable to that measure for each building type to arrive at measure potential. Below is described this process and the major assumptions and data sources used. Appendix B provides detailed measure-level analysis inputs and source notes.

1. Eligible Electric Sales

VELCO provided forecasted electric sales for the Inner, Metro-Area, Northwest and Northwest/Central zones based on a disaggregation of the most current DPS statewide forecast. These were then bundled into two "combined zones:" Inner and Metro-Area; and Northwest and Northwest/Central. Each zonal forecast was broken out into new and existing construction vintage, and then further disaggregated into 11 building types (10 commercial plus industrial) and 9 end-use categories. The breakout by vintage assumes 90% of forecasted load growth is attributable to new construction based on regional forecast assumptions used by the EIA.

The disaggregation by building type relied on 2001 electric sales data from BED and Central Vermont Public Service ("CVPS"). No Green Mountain Power data was available by building type. When applied outside of the City of Burlington, the BED data (which includes the University of Vermont and thus a high percentage of education-related sales in comparison to CVPS) was adjusted to more reasonably represent the mix of building types in the Inner Zone. The Inner zone was represented by a weighted average mix of BED and CVPS building shares of 2001 electric load. The straight CVPS building type shares was used for the Metro-Area, Northwest and Northwest/Central zones.

Finally, the breakout by end-use relied on end-use-level energy intensities (kWh/sq. ft.) for each building type and 2001 end-use from Regional Economic Research ("RER"), calibrated to the DPS overall end-use forecast estimates. The

RER data is based on simulation modeling with upstate New York weather of prototypical buildings developed based on data from over 20,000 energy audits conducted in the U.S. Tables B-2 and B-3 show the disaggregated electric sales forecast for the Inner and Metro-Area, and Northwest and Northwest-Central zones, by vintage, building type and end use, respectively.

2. Application and Development of Measure Level Factors

Various technology factors to the forecasted new or existing building-type/end-use sales by year were applied to derive the maximum achievable potential for each of the 1,573 separate measures for each of 10 years. The basic methodology for developing kWh savings by measure is summarized by the following equation. Section 5 provides an example of this method for a selected measure.

Annual Measure Maximum = Achievable Potential	New or Existing Building End Use kWh Sales Per Year	X Applicability Factor	X Feasibility Factor	X Turnover Factor	X Baseline Adjustment Factor (Retrofit only)	X Savings Factor	X Annual Net Penetration (Achievable - Base Case)

where:

- **Applicability Factor** is the fraction of the end-use level sales for each building type that is attributable to equipment that could be replaced by the high efficiency measure (e.g., for packaged air conditioner it is the portion of total building type cooling electrical load consumed by packaged systems.) These data came from a variety of baseline and market assessment data. Table B-4 shows each applicability factor and cell notes describing the factor sources.
- **Feasibility Factor** is the fraction of the applicable end-use that is technically feasible for conversion to the high efficiency technology. Numbers less than 100% reflect engineering or other technical barriers that would preclude adoption of the measure. (e.g., cold temperature applications might preclude certain lighting technologies.) These data are based on various studies or engineering judgment. Table B-5 shows each feasibility factor and cell notes describing the factor sources. It should be noted that feasibility is not reduced for economic or behavioral barriers that would reduce penetration estimates. Rather, it reflects technical or physical constraints that would make measure adoption impossible or ill advised.
- **Turnover Factor** is the portion of existing equipment that will be naturally replaced each year due to failure, remodeling, or renovation. This only applies to renovation, remodel and replacement. These data are based on the equipment measure lives, developed from various sources including Efficiency Vermont, other utilities, DOE, EPA and American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

("ASHRAE"). The estimated measure lives reflect both engineering service life and estimated renovation and remodel activity. In general, turnover factors are assumed to be 1 divided by the measure life. (e.g., assuming that 10% (1/10) of existing stock of equipment is replaced each year for a measure with a 10 year estimated life.) Table B-6 shows each turnover factor.

- **Baseline Adjustment Factor** adjusts the savings downward in future years for retrofit measures to account for the fact that current standard practice equipment efficiencies are higher than existing stock efficiencies. These were developed based on the relative baseline efficiencies of new and existing stock equipment, from current and historical technology, baseline and market assessment studies. Table B-7 shows each baseline adjustment factor.
- **Savings Fraction** is the percent savings (as compared to either existing stock or new baseline equipment for retrofit and non-retrofit markets, respectively) of the high efficiency technology. Savings fractions are calculated based on individual measure data and assumptions about existing stock efficiency, standard practice for new purchases, and high efficiency options. Table B-8 and B-9 show savings fractions for market driven and retrofit measures, respectively. Table B-10 provides detailed work papers of measure savings calculations and cell notes describing the sources.
- **Annual Net Penetration** is the difference between the Base Case measure penetration underlying the VELCO zonal forecasts and the measure penetrations that could be achieved with maximum sustained efficiency initiatives. These are estimated based on DPS forecasting inputs and review of past programs and market assessments, combined with professional judgment.

As described above, penetration estimates reflect a higher level of certainty that they can be achieved than statewide estimates developed for the DPS. For interior lighting retrofit measures, a maximum cumulative penetration rate of 60% of eligible opportunities by the end of a decade was assumed. For all other retrofit end-uses a maximum cumulative penetration of 40% was assumed. This contrasts to program experience for some of the best retrofit programs in North America that have achieved around 80%, and various potential studies that estimate between 70-80% achievable penetration.[8] However, it also recognizes that the comprehensive list of technologies considered goes beyond what most programs have strived to get installed in participating buildings. Tables B-11 through B-12 show base case and achievable penetrations for retrofit measures and notes describing the basis for these estimates.

[8] See footnote #5 above on page 9.

Market driven (non-retrofit) measure penetrations are estimated individually, taking into account current baseline practices, pending and likely impacts of state and national codes and standards, and experience of other North American programs. Tables B-13 through B-14 show base case and achievable penetrations for market-driven measures and notes describing the basis for these estimates.

The product of the above factors provides measure level kWh savings by year. These kWh savings are then applied to hourly load shape data to derive energy impacts by rating period. Separate RER hourly loadshape data were used for each of the 99 building type/end use combinations. Table B-15 shows the loadshapes.

Table B-16 shows the ratio of kWh savings to diversified kW impacts for each measure. Each measure kWh savings was divided by these ratios to produce summer and winter diversified peak demand savings. These diversified kW impacts were then multiplied by the coincident factors (in Table B-15) to estimate summer and winter coincident, diversified peak impacts.[9]

In addition to the direct measure impacts, a "cooling bonus" and "heating penalty" were calculated for all interior lighting and office equipment measures. These reflect the effects of reductions in waste heat generated within the building shell as a result of improved efficiency. The cooling bonus increases the kWh savings by 12% and the summer peak kW savings by 28% from reductions in cooling load. The heating penalty results in an increased use of fossil fuel for heating of 0.00175 MMBtu per measure kWh saved. These factors were calculated based on an ASHRAE method, taking into consideration Vermont weather characteristics, load profiles for lighting, cooling and heating, and typical existing HVAC efficiencies.[10]

3. Eligible Stock, Measure Penetration Model and Measure Interactions

New measures can be installed in existing buildings either on an early retirement (retrofit) basis, at the time of natural replacement, or at the time of renovation or remodeling. To avoid double counting, our model tracks the eligible stock of equipment over time, based on the assumed measure penetrations for each existing construction market. For example, if 10% of existing lighting fixtures are retrofitted with high efficiency models in 2003, then only 90% of the original population of lighting remains eligible for efficiency upgrades in non-retrofit

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9 Note that coincident factors in many cases are higher than typical because diversity is already included in the kW impacts they are applied to. Typically, "coincident factors" are the product of coincidence and diversity and are applied to undiversified connected load reductions.

10 Rundquist, R., "Calculating lighting and HVAC interactions", *ASHRAE Journal*, November 1993.

markets during 2004. However, assuming the fixtures had only a 5-year measure life, the original 10% of lighting fixtures would again become eligible for replacement in 2008 (five years after original installation date). Similarly, once a building is renovated or remodeled, the opportunity for retrofit is diminished until the end of the measure lives for those measures installed under the market-driven scenarios.

Some of the technologies modeled are mutually exclusive – that is one or the other could be installed, but not both. For example, standard metal halide high-bay fixtures can be replaced with pulse start metal halides or fluorescent high-bay fixtures. When two or more measures compete with one another, an estimate of the penetration of the measure offering the most per unit savings was first estimated. The penetration of the next competing measure is then estimated based on the remaining potential.

Individual measure savings are not additive. Because of interactions between measures, the total potential for all measures is less than the sum of individual measure opportunities. For example, installing window film to reduce cooling load will lower the savings opportunities for installing a high efficiency air conditioner because the air conditioner will not run as long as it otherwise would have. The total potential estimates take into account all the interactions between measures. This therefore represents the total savings achievable with maximum measure adoption. Note however, that if some measures were eliminated, the potential for remaining measures might increase depending on their original interactions with the removed measure. Table B-17 provides interaction factors separately for existing and new construction measures.

4. Measure Costs and Savings

Measure costs for each of the 54 technologies were developed based on a variety of sources, including but not limited to, Grainger, Efficiency Vermont, other utility studies or data, R.S. Means, Northeast Energy Efficiency Partnerships ("NEEP"), and a California Energy Commission ("CEC") database of equipment costs. Measure costs obtained outside the region to Vermont were adjusted based on R.S. Means location factors. Separate measure costs were estimated for retrofit and non-retrofit markets. Retrofit measure costs include the total equipment and labor cost. Non-retrofit market measure costs reflect the incremental equipment and labor cost of high efficiency (as compared to standard practice).

Because hours of use and other factors vary by building type, the per unit technology costs were divided by the per unit technology kWh savings for each building type to develop measure costs per unit of savings ($/kWh) for each of the 1,573 measures analyzed. Tables B-18 and B-19 show the retrofit and market driven (non-retrofit) measure costs, respectively. Table B-10 provides work papers for measure cost estimation and notes on data sources and assumptions.

In addition to measure costs, any incremental effects on operation and maintenance costs for each measure were taken into account. Operation and Maintenance ("O&M') cost impacts take into account changes in measure and replacement component lives and costs. For example, installation of Light Emitting Diode ("LED") traffic signals results in labor and material savings from elimination of incandescent bulb replacements over the measure life. O&M baseline and high efficiency replacement component lives and costs per kWh saved and corresponding notes are shown in Tables B-20 through B-27.

Related to O&M costs, the time value of permanently deferring the equipment purchase cycle for early retirement measures was accounted for. For example, a high efficiency motor typically last 20 years. If a motor that is expected to only last another 10 years is retrofitted with a new high efficiency one, then the customer no longer has to purchase a new one in 10 years. Rather, the next motor purchase will be in 20 years. Thus, all future motor purchases have now been shifted out by 10 years in perpetuity. This delay in future motor replacement purchases provides a societal benefit by lowering present value replacement costs. The cost-effectiveness analysis recognizes this societal value through a "deferral credit." Table B-28 shows the baseline retrofit equipment costs used to calculate the deferral credit.

It was assumed the remaining life of all existing equipment to be retrofitted was, on average, equal to one half of the total measure life (i.e., for a motor with a 20 year life, it was assumed the average existing motor was 10 years old and would normally be replaced in 10 more years). 64 of the 1,573 measures (4%) included retrofit measures with this deferral credit. The impact of the deferral credit could be significant for an individual measure, as this effect has the potential to make the difference whether an individual measure is cost-effective. In terms of the savings impact from all of the measures analyzed, the measures with a deferral credit are roughly equal to the number of these measures, or 4% of the cumulative annual energy savings and the cumulative peak summer demand savings in 2012.

To estimate societal cost-effectiveness the impacts on fossil fuel and water were also calculated. Table B-29 shows fossil fuel impacts (MMBTU/kWh saved). Water impacts were only counted for clothes washers and were 376 gallons/kWh saved.

Initiative budgets were developed to reflect the potential costs to a program administrator of delivering initiatives to capture the maximum achievable potential. These include fully loaded staff costs, marketing, tracking, technical assistance, monitoring and evaluation ("M&E") and measure incentives.

Initiatives were developed based on estimated number of participants, review of other initiatives in the Northeast (most prominently EVT initiatives) and professional judgment. These are based on Efficiency Vermont cost, organization and program delivery structures. Measure incentive costs by initiative are estimated using a set of "achievable budget" penetration curves. These estimate the subset of the overall market activity for each measure that would participate directly in initiatives and collect incentives. Generally, as markets transform, this fraction declines. Tables B-30 through B-33 show initiative budgets for existing and new construction and the two zones analyzed. Table B-34 lists measure life.

5. Commercial and Industrial Measure Analysis Example

The following example shows the basic approach to estimating C&I potential, for a T8 fluorescent fixture installed in lieu of a T12 fixture at time of remodel in an office building. Note the actual values were selected for illustrative purposes and do not necessarily represent the exact values in the analysis.

Parameter	Description	Value	Result
Building type/ end use electric forecast	Electricity sales for interior lighting for offices.	100,000 MWh	100,000 MWh
Applicability factor	% of interior office lighting energy use from linear fluorescent fixtures	x 80%	80,000 MWh
Feasibility factor	% of linear fluorescent fixtures that could be replaced with T8 technology	x 100% (all linear fluorescents could feasibly be replaced with T8s)	80,000 MWh
Turnover factor	% of existing office space that will naturally replace lighting as a remodel in given year	x 6.7% (typical T12 fixture life of 15 years would result in 1/15 or 6.7% replacement/year on average)	5,333 MWh
Savings fraction	% energy savings from shifting from T12 to T8 technology (represents weighted average for different fixture sizes and number of lamps)	x 20%	1,067 MWh
Net penetration	The increase in penetration of T8 fixtures as a result of the initiative. This is the achievable penetration – base case penetration. Assume achievable is 75% and base case is 65%.	x 10%	106.7 MWh

In this example, installing T8s in place of T12s in offices at the time of remodel offers 106.7 MWh of potential for the year in question. Note that because this technology market has largely been transformed already, base case penetration is already very high, and opportunities to expand it are limited. Given the above result, for this measure:

Demand impact = (106.7 MWh * 1,000 kWh/MWh) / 4000 kWh/kW = 26.7 kW
Total incremental cost = (106.7 MWh * 1,000 kWh/MWh) * $0.10/kWh=$10,670

C. Future Effects of EVT and BED Programs

It is important to recognize that Efficiency Vermont ("EVT") and the Burlington Electric Department ("BED") are already managing programs that include some of the efficiency measures whose regional savings potential we have analyzed for VELCO. The estimated savings and costs for these programs must be subtracted from the overall potential to determine the *incremental* cost and savings – above what is already likely to occur as a result of EVT and BED activities – that VELCO would need to address in any effort to defer transmission upgrades.

A three-step process was used to estimate the likely future effects of EVT's and BED's programs. First, EVT and BED's most recent projections of savings and costs for 2002 were reviewed and these were divided into the market groupings that were analyzing for VELCO. Second, the differences between projected EVT and BED spending in 2002 and likely budget levels (in aggregate, across all programs) for the next three years (2003-2005) were reviewed. EVT/BED savings in 2003 through 2005 were assumed to increase by the same percent as their budgets were assumed to increase. These increases were assumed to occur at the same rate across all market segments. Finally, it was assumed that EVT and BED spending and savings in 2006 through 2012 would be the same as in 2005.

It should be noted that there are differences between the EVT/BED program and the VELCO analysis. The VELCO analysis did not include the following groups of measures: emerging technologies, winter peak reduction measures, and measures that require a regional effort for successful implementation. The EVT/BED programs do include some of these measures. In addition, this analysis does not use the same achievable penetration rates for each region. For example, the retrofit market analysis assumes efforts would target primarily the "Inner and Metro-Area" load zone grouping in the first 5 years of the program and the primarily "Northwest and Northwest/Central" load zone grouping in the second 5 years of the program. The Efficiency Vermont/BED programs do not have specific geographical targets over their program life. The result is that for this analysis, estimates of EVT/BED savings for some market segments, in some load zone groupings in some years, is higher than the estimates of achievable potential for VELCO in those same segments, load zone groupings and years.

However, this occurs in only a small number of cases. Moreover, cumulative aggregate savings across all market segments are always greater for the full VELCO potential estimate than for the EVT/BED estimate.

III. INITIATIVE CONCEPTUAL DESIGNS FOR MAXIMIZING EFFICIENCY SAVINGS

Following are summaries of conceptual designs for initiatives to realize maximum achievable savings with strategies that this analysis believes would be successful and sustainable over the next decade. These designs form the foundation for projecting the future market penetration in the savings analysis. Each initiative is designed to realize maximum efficiency savings in key residential and commercial and industrial markets throughout the VELCO zones analyzed. Residential initiatives focus on new construction, retail product purchases and retrofit of existing homes. Commercial and industrial initiatives concentrate on efficiency decisions in new construction, and in building and equipment retrofit, replacement, remodeling and renovation among existing customers.

As described above, the measures and initiatives analyzed are restricted to those activities that VELCO, its member utilities or some other program administrator could implement relatively quickly and independently. In other words, the measures and initiatives are restricted to measures that do not rely on longer-term market transformation strategies that depend on regional or national involvement, and/or include coordination with manufacturers.

A. Residential Initiatives

1. Residential New Construction

This initiative aims to capture savings by increasing the efficiency of residential new construction – both single-family and multi-family. The initiative would aim to increase both the efficiency of the building itself and the efficiency of the various products installed within it. The focus of the initiative would be on efficiency measures that can be promoted – at least in part – through builders. These include:

- Building shell upgrades;
- Hot water equipment efficiency upgrades and fuel choice;
- Fluorescent lighting (both within housing units and in common areas);
- Ventilation fans;
- Dryer fuel type;
- Refrigerators;
- Clothes washers (both within housing units and in common rooms); and
- Dishwashers.

Other products that would ultimately be used in new homes, but whose selection is generally driven solely by the building owner or occupant (e.g. audio-visual equipment, home office equipment, power supplies) would be addressed through the Retail Products Initiative.

The initiative would generally rely on the ENERGY STAR® standard as the definition of efficiency. For example, with respect to building shell and HVAC systems the initiative would promote construction to the ENERGY STAR® performance standard. The initiative would also aggressively promote the use of ENERGY STAR® rated products in the home (ventilation fans, light fixtures, appliances, etc.). It is presumed that the ENERGY STAR® standard will be raised as the market begins to change and baseline efficiencies increase.

Market Barriers

The barriers to efficient new construction are considerable. Chief among them are:

- Builders lack of knowledge or skill regarding both efficient practices and efficient products;
- Mistaken perceptions that some efficient products (e.g. fluorescent light fixtures) are necessarily prone to operating problems or aesthetically unappealing;
- Split incentives – builders have little incentive to focus on energy efficiency since they will not ultimately be paying the energy bills;
- Consumers inability to differentiate between efficient and inefficient homes and products; and
- Limited availability for some efficient products (e.g. fluorescent recessed cans that do not contribute air leakage problems or other types of fluorescent fixtures that are considered aesthetically appealing).

Initiative Strategies

The initiative would employ a variety of strategies to overcome these barriers:

Financial Incentives

The initiative would offer financial incentives to builders for the construction of efficient residential buildings. The incentives would cover approximately 100% of the incremental cost of a comprehensive set of efficiency upgrades – including thermal shell/HVAC system upgrades, selection of non-electric fuels for water heating and drying and installation of efficient light fixtures and appliances.

In the case of multi-family buildings, incentives would also be offered to offset the full incremental cost of efficiency upgrades to common area lighting and clothes washers in shared laundry facilities. The incentives would be structured to encourage comprehensiveness (i.e. lower payments for adoption of only some upgrades, larger payments for implementing all upgrades).

The initiative would also offer a free home energy rating (market value of ~$400 for a single family home) to document attainment of the ENERGY STAR® standard for building shell, HVAC systems and water heating efficiency. The rating would also enable the builder to document compliance with the state residential building energy code.

Consumer Marketing

Direct consumer marketing would be limited. Greater emphasis would be placed on helping builders market to consumers (see below). The focus of most consumer marketing that does take place would be on promoting the ENERGY STAR® brand.

Trade Ally Marketing

The initiative would conduct extensive and regular outreach to builders to explain the initiative, educate them on efficient construction practices and recruit them into the initiative. The initiative would offer to cost-share consumer advertising conducted by builders who participate in the initiative. The initiative would pay for outfitting of model homes with a full range of efficiency measures, along with materials explaining the measures and their benefits to consumers. The initiative would continue EVT's recent tradition of sponsoring an annual buildings conference.

Other Key Strategies

The initiative would work closely with the Vermont Gas Residential New Construction program (as EVT's program has in recent years) to ensure consistency of offerings and messages to builders and consumers. Promotion of efficiency in new mixed-use developments would be done with one point of contact for the developer, offering the appropriate combination of residential and commercial efficiency services.

Opportunities for Integration with Existing Initiatives

EVT and BED currently run a residential new construction program that has many of the elements outlined above. The main differences from EVT and BED programs:

- Do not actively address fuel choice for water heating and drying;
- Have much lower incentives; and
- Spend less on marketing.

2. Retail Efficient Products

This initiative aims to capture savings by increasing the efficiency of products bought and sold through "retail" channels. "Retail" is defined broadly, to include both traditional retail stores and contractors who are primary distribution channels for some products (e.g. central air conditioners). The initiative would address a wide variety of different products:

- Lighting (lamps, hard-wired fixtures, ceiling fans, torchieres, etc.);
- Appliances;
- HVAC equipment (i.e. central A/Cs);

- Audio-visual equipment (i.e. TVs, VCRs, DVDs, stereos);
- Home office equipment (i.e. computers, printers, fax machines); and
- Other products (e.g. dehumidifiers).

The initiative would place great emphasis on leveraging of the U.S. federal government's ENERGY STAR® program – relying wherever possible on the ENERGY STAR® standard as the initiative's definition of efficiency and basis for determining eligibility for initiative offerings. Energy efficient versions of all of the products listed above currently participate in the ENERGY STAR® program.

Market Barriers

The barriers to investments in efficiency for these products are numerous. While they vary somewhat from product to product, there are a number of common problems:

- Consumers lack of information or misinformation – most consumers are unaware of the differences in energy consumption and (often more important because efficient products are often higher quality) other performance characteristics of efficient and inefficient products;
- Uninformed retail sales staff – many sales people also do not understand the differences in efficiency between different products;
- Poor sales skills – many retail sales people are not skilled at "selling up" to higher priced, higher quality products (a problem exacerbated by high turnover in sales staff);
- Limited availability for some efficient products (e.g. fluorescent recessed cans that do not contribute air leakage problems or other types of fluorescent fixtures that are considered aesthetically appealing);
- Small magnitude of savings for many consumer products makes it hard to get consumers attention – although the absolute magnitude of savings available from many products is modest (20-200 kWh/year for all but a few), the percentage savings are often large and the cumulative effect of numerous purchases could be substantial; and
- High incremental costs for some products (e.g. clothes washers).

Initiative Strategies

This initiative would employ several different strategies to overcome these barriers:

Financial Incentives

The initiative would offer 100% incremental costs incentives for most products. The sole exception would be lighting products where incentives would be limited to roughly 75% of incremental cost (to increase the likelihood that consumers would use the products to generate savings). Incentives would be offered directly to consumers through "instant rebate" coupons.

Consumer Marketing

The initiative would use a wide variety of tools to market to and educate consumers. Chief among these would be:

- Point-of-purchase materials;
- Utility bill inserts;
- Direct mail;
- A central web-site;
- Booths at Home Shows;
- Public relations events;
- Outreach to media;
- 800 number consumers can call for expert advice; and
- Limited media advertising.

Trade Ally Marketing

The initiative would conduct regular "outreach" visits to all retail stores likely to sell products to consumers in affected regions of concern to keep them informed of initiative developments, answer questions, provide point-of-purchase marketing materials, etc. The initiative would also periodically provide sales training to sales staff of key trade allies. The initiative would offer to cost-share advertising focusing on efficient products. The initiative would support (financially and otherwise) enhanced displays of efficient products by key trade allies (e.g. lighting & appliance showrooms).

Other Key Strategies

The initiative would focus primarily on opportunities presented by consumers who have entered the market to purchase an electricity-consuming product on their own accord. However, in the case of refrigerators and freezers it would also attempt to convince consumers with old, inefficient models that are still operating to replace (and recycle) them earlier than they otherwise may have. The initiative would provide technical training to HVAC contractors on proper sizing and installation of equipment. This effort would have benefits across multiple initiatives (e.g. RNC and small commercial).

Opportunities for Integration with Existing Initiatives

EVT and BED currently run an Efficient Products program that has many of the elements outlined above. The main differences are that EVT and BED programs:

- Focus on fewer products (primarily on lighting and appliances);
- Do not actively promote early retirement of inefficient refrigerators and freezers;
- Offer lower (in some cases – i.e. clothes washers – much lower) incentives; and
- Spend less on marketing.

3. Residential Retrofit

In contrast with the Retail and New Construction initiatives, this approach does not attempt to influence market transactions that are already occurring. Instead, it aims to create new transactions. The program does this by assessing efficiency potential within a home and then attempting to persuade the building owner to address the cost-effective opportunities identified. Among the efficiency opportunities to be addressed are:

- Direct installation of fluorescent lighting products, hot water conservation measures, waterbed insulating pads and pool pump timers;
- Replacement of inefficient old refrigerators, room air conditioners and waterbeds (where consumers can be persuaded to change to standard mattresses);
- Removal of second refrigerators and/or freezers (where consumers can be persuaded to do so);
- On site HVAC system efficiency improvements (e.g. duct sealing and charge/airflow correction); and
- Fuel-switching of electric water heaters and electric dryers.

Market Barriers

There are a number of barriers to investments in efficiency in retrofit markets. These include:

- Consumers lack of knowledge of the nature and benefits – energy and non-energy (e.g. reduced fire hazards, better indoor air quality, greater durability of the home) – of efficiency measures;
- Limited infrastructure of quality contractors who can address efficiency opportunities (particularly outside Chittenden County);
- Consumers inability to identify quality contractors who can address efficiency opportunities;
- Limited availability for some efficient products (e.g. fluorescent fixtures that are considered aesthetically appealing);
- Split incentives between building owners who make investment decisions and renters who pay energy bills; and
- High cost of some efficiency measures and many consumers lack of access to capital to cover those costs.

Initiative Strategies

This initiative would employ several different strategies to overcome these barriers:

Financial Incentives

The initiative would directly install all low cost measures – e.g. CFLs, hot water conservation measures – free of charge. The initiative would also provide incentives covering 100% of installed cost for high cost measures, including early retirement of inefficient appliances and fuel-switching.

Consumer Marketing

The initiative would endeavor to educate consumers on the potential for efficiency improvements in their home through software designed to assess home energy use and a toll-free number consumers could call with questions regarding their efficiency. Initiative services would be directly marketed to consumers in several ways. Most important would be direct telemarketing. Other strategies include bill inserts, web site notices and limited use of media. In the first year, the initiative would demonstrate the potential for efficiency improvements through comprehensive retrofit of an example home (or two). The home would then be extensively monitored – energy savings and non-energy benefits such as improvements in comfort would be carefully documented. The results of this effort would be widely publicized as part of an effort to educate consumers of the potential for and benefits of efficiency.

Other Key Strategies

Custom strategies would be developed for treating gut rehab and/or major remodeling opportunities. The initiative would also work closely with a variety of government and non-profit agencies that promote housing conservation and affordable housing to incorporate efficiency improvements into their projects.

Opportunities for Integration with Existing Initiatives

EVT and BED currently run a couple of residential retrofit programs that have many of the elements outlined above. The main differences are that EVT and BED programs attempt to:

- Reach a relatively small fraction of the market (due to budget limitations) that would likely be targeted under the VELCO effort contemplated here;
- Address a somewhat more limited range of efficiency measures (e.g. do not address central air conditioning and dryer fuel choice); and
- Offer much lower incentives for major measures.

B. Commercial and Industrial Initiatives

The commercial and industrial initiatives are designed to achieve the maximum market penetration of high-efficiency technologies in existing and new commercial and industrial customer's facilities. The C&I initiatives would deploy distinct but integrated market approaches to existing and new construction efficiency opportunities to fully procure comprehensive and lasting savings.

The initiatives would pay the full incremental cost of high-efficiency building and equipment choices in the design of new buildings, purchase of new equipment, or early retirement of inefficient equipment and replacement with high-efficiency alternatives. In some cases the initiative would substitute and/or supplement end-user financial incentives with specially tailored payments to upstream market actors (e.g., equipment manufacturers, distributors and vendors) to motivate the production, stocking and placement of the highest-efficiency choices. These incentives would be much more aggressive than the financial strategies currently used under Energy Efficiency Utility ("EEU") funding, and therefore would result in much higher and more rapid deployment of the most far-reaching energy-efficient options.

Opportunities for Integration with Existing Initiatives

Efficiency Vermont and Burlington Electric Department provide separate but virtually similar commercial and industrial efficiency programs to new construction and existing customers in the Inner and Metro-Area and Northwest and Northwest/Central load zones. Because of the geographic nature of the transmission constraints faced by VELCO, the initiatives envisioned could be delivered as enhancements to existing EVT and BED initiatives. Current EVT and BED efforts address both prescriptive and custom efficiency opportunities, cover all of the categories of measures considered in this analysis and provide a ready framework upon which to build off of to deliver additional targeted efficiency services to Vermont businesses.

The main differences between the VELCO effort contemplated here for new and existing facilities and EVT and BED programs are that EVT and BED:

- Attempt to reach a relatively small fraction of the market (due to budget limitations);
- Typically address a somewhat more limited range of efficiency measures;
- Offer much lower incentives; and
- Spend much less on marketing.

1. New Customers

The C&I new construction initiatives would promote the installation of comprehensive efficiency measures using a systems approach that capitalizes on interactions between technologies serving multiple end-uses. For example, buildings would be "commissioned" to ensure that the installed systems perform according to the intended design.

This initiative would structure customized financial incentives to offset the full incremental installed costs for the optimal package of cost-effective measures. It would also provide incentives or direct payment to cover the full cost of design assistance and commissioning, where appropriate. The C&I new construction initiative would pay the full incremental design cost associated with efficiency measures incurred by the customer's design team in order to ensure that efficiency options are fully addressed during the design stage. At the customer's option, to maintain quality control the program could also facilitate and manage design services using a third party subcontractor. This would include, where appropriate, full interactive simulation modeling to fully account for measure and system interactions and develop comprehensive design solutions.

Measures would comprehensively address efficiency opportunities in new buildings, including:

- Improved interior and traffic lighting equipment, controls and design; including high efficiency fluorescent fixtures, pulse start metal halide and LED traffic lights;
- Heating, ventilating and air conditioning (HVAC) equipment and controls; including high efficiency window and central air conditioning units, air and water source heat pumps, chillers; optimization of HVAC distribution and control systems, energy management systems; and stove hoods;
- Premium motors and variable frequency motor drive controls in agricultural and industrial buildings only;
- Hot water equipment efficiency upgrades and fuel choice;
- High performance window glazing;
- Appliances, including high efficiency clothes washers and vending machine "miser" control;
- High efficiency refrigeration equipment;
- Whole building commissioning and integrated building design; and
- Industrial processes.

2. Existing Customers

The initiative targeting existing customer facilities would promote high-efficiency, discretionary retrofit opportunities and equipment replacement at the time these events naturally occur, including equipment replacement upon failure, building remodeling and renovation activities. As with new construction efforts, financial incentives would be designed to cover the full incremental installed costs of efficient measures (i.e., the full labor and equipment installation costs for retrofit measures, and the incremental labor and equipment costs associated with replacement).

The initiative would facilitate direct installation of all retrofit measures, either by using a network of private contractors solicited to develop and manage measure installations; or by allowing customers to rely on their own contractors with construction management assistance from program technical staff. The initiative would cover all construction management and project facilitation costs and also underwrite all technical and design assistance for retrofit and replacement measures, as well as for retrocommissioning and commissioning, where appropriate.

The initiative would cover the full incremental design costs for projects requiring redesign of existing facilities and systems. At the customer's option, the initiative would reimburse costs related to: extra efforts undertaken by the customer's designers/vendors, added project facilitation and/or design management, the procurement of additional technical assistance, or engaging retrocommissioning and commissioning services. Initiative staff or subcontractors would provide services as appropriate if competitive solicitations are unsuccessful.

Measures would comprehensively address efficiency opportunities in existing buildings, including retrofit, renovation and remodel/replacement situations, including:

- Improved interior and traffic lighting equipment, controls and design; including high efficiency fluorescent lamps, ballasts, reflectors and fixtures; pulse start and high efficiency metal halides and LED traffic lights;
- Heating, ventilating and air conditioning (HVAC) equipment and controls; including high efficiency window and central air conditioning units, air and water source heat pumps, chillers; optimization of HVAC distribution and control systems, energy management systems; and stove hoods;
- Premium motors and variable frequency motor drive controls in agricultural and industrial buildings only;
- Hot water equipment efficiency upgrades including fuel choice;
- High performance window glazing;
- High efficiency clothes washers;
- High efficiency refrigeration equipment;
- Retrocommissioning and commissioning of buildings; and
- Industrial processes.

While all building types and electrical efficiency opportunities would be eligible for inclusion in the initiative, specific target markets might be addressed to achieve rapid and significant savings, particularly summer coincident peak impacts. These markets might include: hospitals; schools and colleges; groceries and other refrigeration users; water and wastewater treatment facilities; electric hot water fuel switching; and customers with high levels of cooling energy intensity.

IV. RESULTS

Table 1 presents detailed estimates of electric impacts from the (VELCO only) aggressive energy efficiency campaign. Tables 2 through 12 present detailed estimates of electric impacts from targeted efficiency initiatives (VELCO campaign and EVT/BED statewide programs). The top panel of each of these tables displays the cumulative annual savings through 2014 from transmission-targeted (VELCO plus EVT/BED) initiatives in the Inner and Metro-Area and Northwest and Northwest/Central load zones. Projected outcomes are expressed in terms of summer peak demand and energy savings during the summer and winter peak and off-peak periods. These projections are directly comparable with zonal electricity forecasts that do not account for DSM impacts from past and current DSM program impacts beyond 2002.

The cumulative annual values account for timing effects from efficiency measures installed over the analysis period, such as expiration of shorter-lived measures and changes in savings during the lifetimes of installed measures due to underlying changes in baseline efficiency levels. The bottom panel shows only the incremental savings added each year from the operation of the initiative in that year, i.e. it does not reflect the timing effects during the lifetimes of installed measures included in the cumulative annual savings. All these tables show cumulative annual savings declining after 2012, since measure retirements and other timing impacts take effect after targeted initiatives cease producing new incremental savings after their tenth year of operation.

Table 2 presents this information for all targeted initiatives combined, including VELCO, EVT and BED programs. Table 2A breaks out the results into residential and C&I sub markets by zone for the targeted initiatives, including VELCO, EVT and BED programs. Tables 3 and 10 provide electricity savings by year by zone for all the residential and commercial and industrial initiatives, respectively, including VELCO, EVT and BED programs. Tables 4 through 9 present electricity impacts for each targeted residential initiative, including VELCO, EVT and BED programs. Tables 11 and 12 present this information for each of the two commercial and industrial initiatives, including VELCO, EVT and BED programs. Tables 12A, 12B and 12C provide a breakout of the existing C&I market into the retrofit, remodel/replacement and renovation sub markets.

Tables 13A through 16B present economic information about the projected savings in the preceding tables. Tables 13A through 13C disaggregate utility and societal benefits and societal costs for all the initiatives over the two areas combined and for each area separately. Tables 14A through 14C show how non-transmission savings are applied to the societal costs of targeted (VELCO plus EVT/BED initiatives to determine net societal costs of peak demand and energy reductions delivered to the transmission system. Table 15 provides annual budgets for each initiative by year.

Tables 17 through 27 present electricity savings VELCO can expect to realize in the two areas under study from statewide initiatives administered by EVT and BED. These tables are directly comparable with Tables 2 through 12. The values in Table 18 for the residential sector and Table 25 for the commercial and industrial sectors are subtracted from VELCO's area load forecasts to determine the base case load forecast for transmission planning purposes. Table 28 indicates the expected spending levels associated with statewide efforts in each of the market segments covered by the targeted (VELCO plus EVT/BED) initiatives. The difference between targeted initiative budgets and expected statewide spending in each market segment indicates the additional expenditures needed by VELCO to generate additional savings beyond EVT/BED statewide efforts.