VEIC RESPONSES TO VSPC PARTICIPANT QUESTIONS

VEIC Responses to GMP's Questions 1/24/2011

The numbers below refer to GMP's question numbers.

1. GMP's summary table is accurate. The difference is due to:
   A. assumed measure decay,
   B. accelerated measure decay brought about by the intentional shortening of CFL measure life to have all CFL measures "decay" in 2020, and
   C. errors in the modeling of lighting effects in the unadjusted VELCO forecast.

   Forecast 20 (unconstrained) models the savings and costs that accrue from EEU program activity. EEU's savings and costs are narrowly defined as those savings and costs that are a direct result of program activity. Thus, with the advent of federal regulations in 2020 prohibiting the sale of lighting products that are less efficient than today's CFL's, the EEU's are unable to claim any savings and incentive costs from those measures beyond 2019. This inability to claim savings results in the artificial shortening of all installed CFL measure lives in the 2012 to 2019 time period. This shortening results in a large quantity of measure decay in 2020 as all those lighting products reach the end of their saving lives (in contrast to their useful lives).

   This phenomenon creates a disconnect between the traditional method of projecting grid effects resulting from efficiency energy savings:

   (Grid effects = no efficiency grid forecast minus cumulative efficiency savings)

   and grid reality. This unusual event's effects are magnified by the base-case (no efficiency spending) forecast of residential CFL's. Where the residential base-case model shows a continued gradual decline of inefficient lighting (incandescent) from 2020 through the forecast period (2031), VEIC's modeling shows a much more rapid decline. VEIC believes that since incandescent have a measure life of less than a year, and that incandescent will be illegal to sell in 2020, the base-case scenario should reflect a steeper

decline in their energy use. The base-case forecast is intended to capture trends in energy usage. These trends should include those that result from the historical increase in efficient technologies and the historical trends of reductions in energy use that result from the increase in efficiency required by updated codes and appliance standards. Thus, the decrease in claimed savings resulting from decay should be captured by the base-case trend of increased technology or codes and standards.

If VEIC was to not incorporate decay in its savings estimates, those savings would be counted twice: once by VEIC by not excluding them from the cumulative savings and once by the base-case scenario by including them in the historical trends.

Market transformation strategies are extremely important as are direct resource acquisition strategies. Research supports the fact that market transformation is achieved through a variety of means, and one of the primary means is as a result of efficiency resource acquisition programs. The so called " Non-Resource Acquisition Funding" under consideration in the Vermont Public Service Board's Demand Resource Plan Proceeding , is another way in which the EEU's will be funded to bring about market transformation. VEIC believes that this balanced approach is reasonable.

2. VEIC is willing to collaborate but not at its own expense. This sensitivity analysis would not be overly complicated but would take several people (task leader, program specialists, analysts and reviewers) approximately 5 days to complete.

3. This analysis did not calculate Economic Potential which refers to the subset of technical potential that is economically cost-effective. The analysis calculated the achievable potential which is the amount of energy that can be saved with the most aggressive program scenarios while accounting for market barriers. One way to assess Residential sector level achievable is to use our program assumptions as a proxy. For existing homes, the residential analysis assumes 85% homes in Vermont (both low

income and market rate) receive weatherization services from a parallel track “fuel efficiency” program. The electric efficiency program piggy-backs on weatherization to install cost effective electric measures. For each home, we assume that all cost effective measures are replaced and retrofitted with most efficient equipment.

The Efficient Products and Residential New Construction Program ramp up over the course of five years to capture 90% of cost effective available market. The available market is calculated by estimating number of units (e.g. lighting sockets, appliances) and dividing by the measure life to calculate the turnover. By 2016, we assume 90% of the opportunity is captured.

Our method did not first calculate total available savings and then subtract off estimated achievable savings. To calculate that would be beyond the scope of this analysis.

4. Residential measure persistence (i.e. measure life) generally was not changed between F-20 and the present unconstrained study and we do not see any reason why it would. The savings persistence or life for the lighting measures however was adjusted. As we have better understood how to adequately adjust savings estimates due to the impact on incandescents stemming from the Energy Independence and Security Act (2007) regulation, we realized that a CFL installed in 2018, for example, will only provide claimable savings until the baseline (incandescent) is replaced after 2020 - when only CFLs can be purchased. The savings life for all measures with an incandescent baseline therefore is adjusted to equal the number of years remaining to 2020. This adjustment was not included in the original F-20 but its inclusion here, we believe, better represents the impact of this change.

   VEIC applied assumptions of Freerider and Spillover ("realization rates”) to all net savings estimates. There may have been some minor changes to these assumptions between F-20 and the present study but there was no systematic change made. While one might argue that these values could be

affected by such aggressive program activity - we did not have the information available to make any informed change.
For the C&I sector, VEIC had no reason to think the effective useful lives had changed for any of the C&I measures, thus there were no changes in the assumptions for measure persistence.
For the C&I sector we revised the measure net-to-gross ratios to those reported by VEIC for the 2009 program year (in the 2009 annual report). There are no separate realization rates to be applied for estimating net savings, all adjustments are included in the net-to-gross ratios.

5. This question goes above and beyond the scope of the current study.

6. The Electric System Test compares the avoided electric energy and capacity costs with the EEU expenditures consisting of program and portfolio implementation costs and financial incentives paid to customers. It is not the Rate Impact Measure (RIM) test referred to in the question. Though the workbook shows RIM test cost-effectiveness results, they should be ignored because not all of the required inputs for this test have been loaded into the workbook, as this was not required for this analysis.

7. As for the RIM test, not all of the inputs required for calculating the Participant test have been loaded into the workbook, so the Participant test results in the workbook should be ignored.

8. No question (skipped in numbering)

9. The method is reasonable because VEIC believes that it is unbiased. The 50/50 electricity energy and summer peak demand savings forecasts contain a mix of weather- and non-weather related end-use savings, as does the 50/50 Itron energy sales and summer peak demand forecast. It is possible to compare the end-use peak savings breakdown in the savings forecast with the end-use breakdown of Itron's peak demand forecast.

10. The acceleration of more efficient building and equipment standards would bring about a shift in grid usage. This could be modeled as additional efficiency savings and costs, with an associated but not necessarily equal reduction of incentive costs and measure savings. The estimated energy savings and associated cost to bring about the acceleration of more efficient building and equipment standards is recognized by other jurisdictions as quantifiable costs and savings that are attributed to efficiency programs. While this is not currently the case in Vermont, we think this is a reasonable strategy that Vermont may want to consider in the future.

11. For the C&I sector, we did not include any space heat fuel switching, as this has generally not been cost-effective, and has limited opportunity. There may be some potential but it is quite small relative to the overall DSM forecast. DHW fuel switching savings were based on an assumed penetration of 3% per year:
    2012 1,968 MWh (net, at generation)
    2016 2,047 MWh
    2021 2,110 MWh
    2031 2,251 MWh

    There was no switching to solar hot water in the C&I sector.
    For the Residential Sector:

	Residential Incremental MWh (at Gen)				Percent of Total			
	2012	2016	2021	2031	2012	2016	2021	2031
Space heating	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Fuel Switch to Natural Gas	60	350	555	572	0.1%	0.2%	0.5%	0.5%
Solar hot water	139	808	1281	1321	0.2%	0.5%	1.2%	1.1%
Total	72,442				100%	100%	100%	100%

		172,723	107,990	123,119				

12. VEIC considers the unconstrained savings forecast to represent the expected value of savings over the timeframe, i.e., there is a 50/50 chance that the actual outcomes of unconstrained investment would fall above or below the forecast values.

13. Customer contribution is not a hard coded number found in the analysis workbooks but it can be calculated by subtracting numbers found on the PST tab "Meas Cost & Save Yr1". To calculate, subtract Incremental Installed Cost (column M) from "Electric Utility Incentive" (column N).
For the Efficient Products Program we assumed the program paid 90% of the incentive and for Low income and Existing Homes Programs 100% of the cost is paid so customer contribution was zero.
For the C&I sector, we assume incentives paying 100% of incremental costs, so there is no customer contribution. This can be seen in the PST, 'Meas Cost & Save Yr1', columns M and N:
CustomerContribution = IncrementalCost - Incentive

14. No. The modeling of rate and bill impacts was not part of our scope of work.

15. ITRON's forecast notes that this spending path is based upon a $40,000,000 annual expenditure. ITRON developed the savings and load estimates.

16. This question goes above and beyond the scope of the current study.

Burlington Electric Questions and Responses **1/24/2011**

Treatment of savings decay

The data in the table below are from slides 26 and 27 of the VEIC presentation. Between 2020 and 2031, the residential "Cumulative Savings (w/decay)" increases by about 362,591 MWh and over the same period there were a total of 1,375,455 MWh in incremental efficiency savings added. This would suggest a significant amount of decay is happening in the second half of the forecast, and this is after the significant lighting standards adjustment. Aside from lighting programs (which have shorter lifetimes), should we really expect to see that much decay in the last ten years of the efficiency forecast?

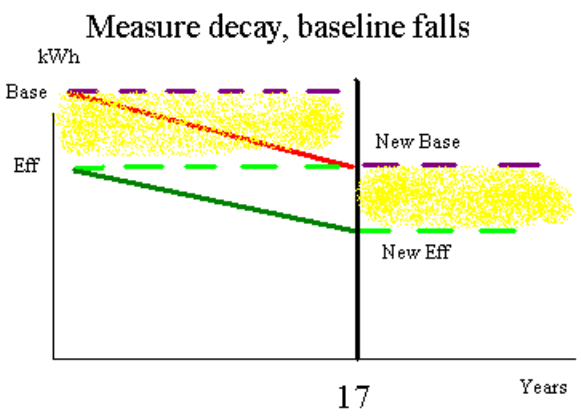
VEIC Response: Yes. In a maximum achievable forecast, one installs the maximum amount of cost-effective efficiency as early in the forecast period as possible. This results in the modeling of the retrofit of all refrigeration and other measures that have long and short measure lives in the first 10 years of the forecast period. As these measures reach the end of their effective useful lives, the savings decay. For example, VEIC models a suite of measures and increases their penetrations to 90% of the available market within the first 5 years of the analysis period, and then holds that penetration rate constant at 90% for the remaining period. If we assume that all measures have a measure life of 10 year, then, for the first ten years, each year you are adding 90% of the available new/replacement market savings. In the 11th year you add another 90% of the available market savings (for purchases that year), but the savings you added in year 1 are now over (measure decay). That is, those measures have come to the end of their life and their replacements are now part of the new 90% penetrations for the 11th year. The "new" savings would almost match the retired savings and so the cumulative savings would be pretty much constant from then on. There are a few measures that we don't model as having significant penetration until the later years, but for the majority of measures, we are ramping up penetrations pretty quickly.

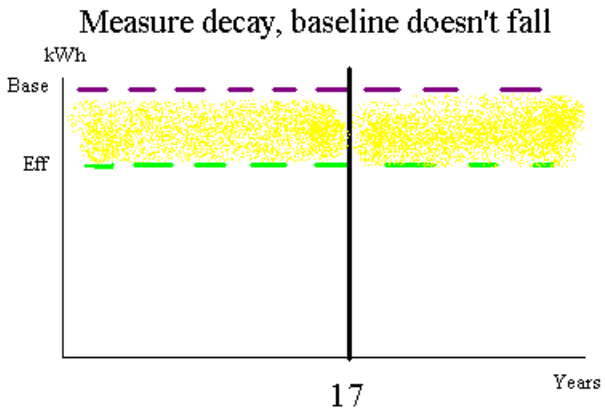
Shouldn't we expect that the 3,600 kWh savings from a EWH fuel switch will not come back on the grid when the new water heater reaches the end of its life after 13 years? And for many other measures (refrigeration, window replacement, etc.), wouldn't you assume that most of the efficiency savings do not "reverse" back onto the grid either? If we allow the savings to decay, aren't we saying that the customer who participates in a refrigerator program will replace their refrigerator 17 years later with one that is at the baseline efficiency level from 17

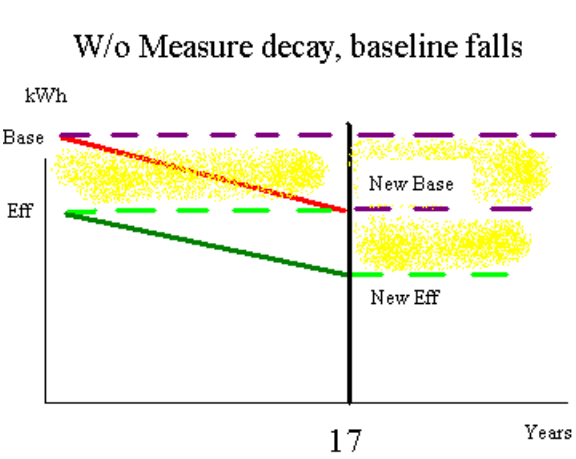
years early if they are not given any incentives? Or would the customer install a refrigerator that is at least as efficient as the one they had, even without incentives?

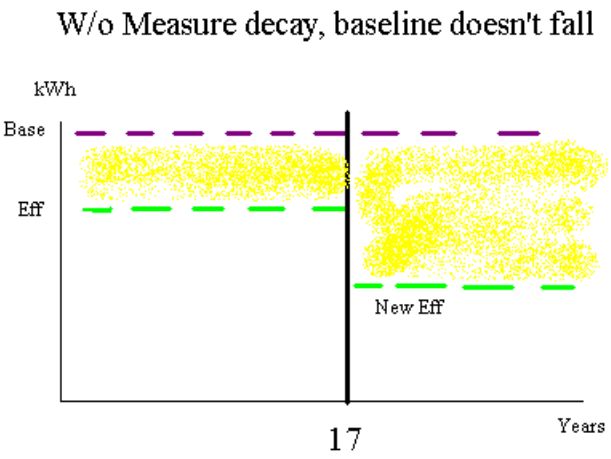
VEIC Response: Savings or measure decay should be accounted for in the baseline forecast. The baseline forecast includes modeling of naturally occurring efficiency or efficiency that results from improved technology, codes and standards. That is, the baseline improvement in efficiency should capture or model the EWH fuel switch "not returning" to the grid.

Imagine the purchase of a refrigerator and the associated consumption in each scenario pictured below. If you have measure decay you end up saving (yellow) a constant amount over the years whether or not the baseline forecast predicts a fall in consumption. Without quantifying measure decay, you end up double counting savings. You count the savings from the first purchase (that don't decay), PLUS savings from the second after 17 years.









I think the one measure that we would typically expect some savings decay would be lighting since the lifetimes are shorter. But lighting standards will eventually prevent customers from buying older technology (e.g., your adjustment necessary in 2019).

Would the actual grid impacts actually be closer to the “Cumulative Incremental Savings” rather than the “Cumulative Savings w/Decay”?

Year	Itron Residential Forecast (GWh)	Incremental Res Savings (MWh)	Cumulative Res Savings (wo/Decay)	Cumulative Res Savings (w/Decay)

2012	2,407	72,478	72,478	72,478
2013	2,393	103,094	175,572	164,613
2014	2,399	127,438	303,010	277,327
2015	2,412	144,458	447,468	407,660
2016	2,433	172,723	620,191	551,791
2017	2,441	197,706	817,897	708,215
2018	2,458	209,080	1,026,977	859,304
2019	2,474	216,376	1,243,353	1,001,600
2020	2,498	106,408	1,349,761	655,531
2021	2,507	107,990	1,457,751	712,041
2022	2,525	109,741	1,567,492	758,603
2023	2,545	111,474	1,678,966	805,067
2024	2,574	111,881	1,790,847	846,923
2025	2,590	113,469	1,904,316	881,773
2026	2,613	115,122	2,019,438	908,282
2027	2,637	116,404	2,135,842	931,553
2028	2,668	118,177	2,254,019	952,950
2029	2,684	119,966	2,373,985	973,310
2030	2,708	121,704	2,495,689	995,875
2031	2,733	123,119	2,618,808	1,018,122

VEIC Response: For this analysis period, VEIC believes the truth lies somewhere in-between. For a full explanation of the CFL lighting effect, please see our response to GMP #1.

Measure "baselines" and "savings" assumptions

On page 63, Residential Market Analysis: Bottom-up Approach, it says that VEIC estimates "*per measure savings each year*". Are the savings per measure constant over the forecast horizon or do the savings

values change (decline) over time? I would expect the baselines will be dropping each year, so if the savings per measure are constant over the next 20 years, the assumption is that the more efficient technology option will stay ahead of the baseline by the same amount each year?

VEIC Response: For some measures, VEIC assumes a constant savings. That includes an assumption of baseline improvement (in the Itron forecast) and a corresponding efficient case improvement such that efficiency saving levels are maintained.

For other measures where we have better information (such as lighting), we model specific changes in saving levels. For other measures, like a clothes washer early replacement, we assume 100% penetrations after 2016 and claim no savings after that.

The slide on page 66 provides a calculation to arrive at "*Total Potential Savings*" for Clothes Washers Tier 3. The calculated annual savings per measure is 186 kWh. This calculation is based on kWh savings from the clothes washer, water heating, dryer, and water pump. I would expect this measure savings estimate has to drop over time since the saturation of electric water heating will be dropping.

VEIC Response: VEIC agrees. However, we did not incorporate a changing mix of domestic hot water fuels in the analysis which may resulted in a slight overestimation of the savings.