New Hampshire Energy Efficiency Calculation of Lost Base Revenue

For Measures installed beginning in 2019

Report Issued by the NH Lost Base Revenue Working Group, Docket No. ##-###.
June 13, 2018

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I. Introduction

A. Lost Base Revenue (LBR) Working Group Background

The scope of the LBR Working Group's activities is defined by Commission Order No. 26,095 in Docket DE 17-136, which approved the Settlement Agreement. The Settlement Agreement adopts the method of calculating the average distribution rate proposed by the Utilities (where the average distribution rate used in the calculation blends the kW and kWh rate components) for energy efficiency upgrades installed in 2017 and 2018. For upgrades installed in 2019 and thereafter, the method proposed by Staff will be used, whereby the average distribution rate is disaggregated into kW and kWh components. Per the Settlement Agreement, the LBR Working Group was established in 2018 to determine the kW values to be used in that calculation and to consider the general impact of customer peak load and the general impact of demand charge ratchets on those kW values.

The members of the LBR Working Group are as follows:

- Jim Cunningham, NH PUC
- Paul Dexter, NH PUC
- Jay Dudley, NH PUC
- Elizabeth Nixon, NH PUC
- Leszek Stachow, NH PUC
- Brian Buckley, Office of Consumer Advocate
- Donald Kreis, Office of Consumer Advocate
- Rebecca Ohler, NH DES
- Tomas Fuller, Eversource
- Christopher Goulding, Eversource
- Miles Ingram, Eversource
- Marc Lemenager, Eversource
- Karen Asbury, Unitil
- Deborah Jarvis, Unitil
- Eric Stanley, Liberty
- Heather Tebbetts, Liberty

B. Summary of LBR Calculations

The utilities' LBR calculations for 2019 and 2020 are disaggregated for kWh and kW, as agreed to in the Settlement Agreement. The derivation of the key components of these calculations—kWh, kW, and Average Distribution Rates (ADR)—are described in sections III, IV and V. The impact of ratchets is discussed in section VI. The utilities' calculations result in the forecasted kW and kWh savings amounts for 2019 and 2020 shown in Table 1 below, using the customer peak kW approach detailed in section IV, and based on planned measure installations from the 2018 – 2020 New Hampshire Statewide Energy Efficiency Plan. In addition, the template in appendix B provides the 2019 forecasted kWh and kW savings values and detailed calculations for customer peak kW savings for the Commercial & Industrial Sector.

Table 1. Forecasted Lost Base Revenues for Measures Installed in 2019 and 2020

Program	kWh Savings	kW Savings
Measures installed in 2019		
Large C&I Retrofit		
Large C&I New Equipment and Construction		
Large C&I Energy Rewards RFP		
Sub-total Large C&I		
Small C&I Retrofit		
Small C&I New Equipment and Construction		
Small C&I Direct Install		
Municipal		
Sub-total Small C&I and Municipal		
ESHomes		n/a
ESProducts		n/a
HEA		n/a
HPwES		n/a
Home Energy Reports		n/a
Sub-total Residential		
Total, 2019 Measures		
Measures installed in 2020		
Large C&I Retrofit		
Large C&I New Equipment and Construction		
Large C&I Energy Rewards RFP		
Sub-total Large C&I		
Small C&I Retrofit		
Small C&I New Equipment and Construction		
Small C&I Direct Install		
Municipal		
Sub-total Small C&I and Municipal		
ESHomes		n/a
ESProducts		n/a
HEA		n/a
HPwES		n/a
Home Energy Reports		n/a
Sub-total Residential		
Total, 2020 Measures		

Table 1 represents savings based on planned measure installations. As in 2017 and 2018, LBR collections for 2019 and 2020 will be based on actual monthly measure installations, as detailed in this document.

II. Glossary of Terms

A. **Annual Energy Savings:** The reduction in electricity use (kWh) or in fossil fuel use (therms/MMBtus) associated with energy efficiency activities in a given year.

B. **Average Distribution Rate:** The Average Distribution Rate (ADR) is equal to the distribution revenue of a utility (e.g., revenues from kWh and kW rates) divided by consumption (e.g., kWh and kW consumption). In calculating an ADR for determining lost base revenue, customer, meter, and luminaire charges are excluded from distribution revenue.

C. **Billing Determinants:** Customer data used for billing during a specified period of time, including but not limited to number of customers, kWh usage, and kW usage by rate class.

D. **Coincidence Factor:** Coincidence factors represent the fraction of connected load expected to occur at the same time as a particular peak period (e.g., ISO-NE summer and winter system peak periods; or customer-specific peak periods) on a diversified basis. Coincidence factors are normally expressed as a percent. See Coincident Demand.

E. **Coincident Demand:** The demand of a device, circuit, or building that occurs at the same time as the peak demand of a utility's system load or at the same time as some other peak of interest. Examples of peak demand include:

(1) Demand coincident with a utility system annual peak load

(2) Demand coincident with ISO/RTO summer or winter peak, or according to performance hours defined by wholesale capacity markets

(3) Demand coincident with a customer's monthly peak demand days.

F. **Connected Load:** The maximum instantaneous power required by equipment, usually expressed as kW. Connected load kW savings generally reflect the difference in the maximum power draw of baseline and efficient equipment.

G. **Degradation:** The extent to which the unit energy consumption (UEC) of equipment increases as it ages. See Persistence.

H. **Demand (electric):** Demand refers to the amount of electric energy used by a customer or piece of equipment at a specific time, expressed in kilowatts (kW equals kWh/h).

I. **Demand Charge:** Bill charges based on a customer's monthly maximum demand. For example, Eversource rate GV and rate LG customers are charged a per kW rate based on their highest 30-minute period of kW demand in a given month.

J. **Demand Savings:** The reduction in electric or gas demand from a baseline to the demand associated with the higher-efficiency equipment or installation. In the customer billing context, demand savings determine customer cost savings—and utility lost revenues—associated with monthly demand charges.

K. **Demand Ratchet:** Demand ratchets are a form of billing that is used to ensure that customers pay a fair share of the distribution system cost on a year-round basis. For example, a seasonal customer on demand billing may pay the higher of their current months demand or a specific percentage of their highest demand in the previous eleven months. This is a form of a demand ratchet.

L. **Distribution Rates:** Per unit costs necessary to recover the costs associated with an electric distribution system.

M. **Distribution System:** That part of the electric system that delivers electric energy to consumers.

N. **End-Use:** The specific purpose for which electricity is consumed (e.g. heating, cooling, lighting, etc.).

O. **EPRI:** Electric Power Research Institute

P. **Equipment Life:** The number of years that a measure is installed and will operate until failure. See Measure Life.

Q. **Expired kW:** kW associated with measures that have been retired from service. The retirement could be due to equipment age, renovation/removal, breakage, etc.

R. **Annual Hours of Use:** The number of hours a system or unit of equipment is in use (i.e. "on") during a year.

S. **In-Service Rate:** The percentage of measures incented by an efficiency program that are installed and operating. The in-service rate is calculated by dividing the number of measures installed and operating by the number of measures incented by an efficiency program in a defined period of time.

T. **Kilowatt (kW):** The electrical unit of power equal to 1,000 watts.

U. **Kilowatt-Hour (kWh):** The basic unit of electric energy equal to one kilowatt of power supplied to or taken from an electric circuit for one hour.

V. **Maximum Demand (kW):** The customer's maximum demand, in kW, during a specified interval. For the purposes of demand charges, maximum demand is typically determined on a monthly basis. For example, demand charges for Eversource rate GV and rate LG customers are based on the customer's highest 30-minute period of kW demand in a given month.

W. **Maximum Demand Factor (MDF):** The ratio of the maximum demand during an assigned period upon an electric-power system to the load actually connected during that time usually expressed in percent. The demand factor is always less than or equal to one.

X. **Measure Life:** The average number of years (or hours) that a group of new high-efficiency equipment will continue to produce energy savings or the average number of years that a service or practice will provide savings. Lifetimes are generally based on experience or studies. For retrofit or early retirement measures, the measure life may be altered to account for a change in baseline over time, more accurately reflecting the lifetime energy savings. Measure Life is a function of equipment life (see Equipment Life) and measure persistence (see Measure Persistence).

Y. **Net-to-Gross Ratio (NTG):** A factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts. The factor itself may be made up of a variety of factors that create differences between gross and net savings, commonly including free riders and spillover. In New Hampshire, the NTG ratio is assumed to be 1.0, per the New Hampshire Energy Efficiency Working Group Report, 1999.[1] .

Z. **Peak Demand:** The maximum level of demand used during a specified period. The peak periods most commonly identified are annual, seasonal (summer and winter), and monthly peaks.

AA. **Persistence / Measure Persistence:** The duration of an energy consuming measure, taking into account business turnover, early retirement of installed equipment, and other reasons measures might be removed or discontinued. Measure persistence is generally incorporated as part of the measure life.

BB. **Realization Rate:** The ratio of measure savings developed from impact evaluations to the estimated measure savings derived from savings algorithms. Realization rates are based on various impact factors measured in evaluations, including in-service rates, coincidence factors, and hours of operation.

CC. **Sector:** Broad groups of electricity customers with similar characteristics and usage patterns. Residential, Commercial and Industrial (C&I) and Municipal are the primary sectors in the NH Saves programs.

[1] As the report states, "although Group members agree that program designs should attempt to minimize free-riders, the Group concluded that the methodological challenges and associated costs of accurately assessing free-riders no longer justifies the effort required to net these out of cost-effectiveness analyses." The same report allowed inclusion of spillover, but to date the utilities have not measured spillover or included it in the cost-effectiveness test. See https://www.puc.nh.gov/Electric/96-150%20%20NH%20Energy%20Efficiency%20Working%20Group%20Final%20Report%20(1999).pdf

DD. **Tariff:** A schedule of rates, charges and terms and conditions under which a regulated and tariffed service is provided to customers, filed by a utility and either approved by the commission or effective by operation of law.

III. Derivation of kWh Savings

The utilities will continue to use the same method for calculating kWh savings that has been used for prior years' LBR reporting and collections. Although the method for kWh calculations is not within the scope of the LBR Working Group,[2] the method is described below so that this document provides a complete accounting of LBR calculations and inputs.

The following kWh calculation is applied for each measure type within the utilities' C&I and residential programs.

$$LBR\ kWh\ Savings = Gross\ kWh\ Savings * \ Net\ to\ Gross\ Percentage * \ In\ Service\ Rate * Realization\ Rate - \ Retirement\ Adjustment$$

The calculation is applied on a monthly basis, for the cumulative measures installed year-to-date. To account for the fact that measures are installed over the course of a month (not all on the first day of the month), the utilities take the conservative approach of claiming savings beginning in the month of the *paid date or later*—which is generally around two months after measures are installed and generating savings.[3] This ensures the utilities are conservative in their calculation to avoid overstating LBR. For LBR forecasts, the utilities divide total annual planned kWh savings by 12 to determine the average monthly kWh savings. Each component of the calculation is described in detail in the following sub-sections.

A. Gross kWh Savings

The gross kWh savings for energy efficiency measures are determined on a project-specific basis at the time of project installation/implementation. The savings are determined by project engineers and implementation contractors based on equipment specifications and information on baseline conditions at the project site. For an example of project-specific kWh savings calculations, see appendix A.

[2]Per Order No. 26,095 approving the Settlement Agreement, the LBR Working Group was established in 2018 to determine the kW values to be used in LBR calculations and to consider the general impact of customer peak load and the general impact of demand charge ratchets on those kW values.

[3]For example, in 2017, Eversource's small business projects were installed 67 days prior to their paid date, on average, and Eversource's large business projects were inspected 59 days prior to their paid date, on average.

B. Net to Gross Percentage – See description in Section IV below.

C. In Service Rate – See description in Section IV below.

D. Realization Rate – See description in Section IV below.

E. Retirement Adjustment – See description in Section IV below.

F.

IV. Derivation of kW Savings

The calculations used to derive kW savings resulting from energy efficiency measures installed through the NHSaves programs are detailed below. The amount of kW savings resulting from any specific efficiency measure depends on how and when that measure is used. Therefore, kW savings vary significantly depending on the type of measure and the point in time for which savings are calculated.

The utilities' LBR calculations were developed to identify the kW savings resulting from different efficiency measures *at the time of customers' monthly peak demand*—i.e., the demand used to determine customers' monthly demand charges. The NH utilities' demand charges and other components of their tariffs are available at https://www.puc.nh.gov/Regulatory/companies-regulated-tariffs.htm.

The following kW calculation is applied for each measure type within the utilities' C&I programs, as only these customers are currently assessed kW rates and therefore see bill reductions due to kW savings.

$$LBR\ kW\ Savings = Connected\ Load\ kW\ Savings * Customer\ Peak\ Coincident\ Factor * Net\ to\ Gross\ Percentage * In\ Service\ Rate * Realization\ Rate - Retirement\ Adjustment$$

The calculation is applied on a monthly basis, for the cumulative measures installed year-to-date. To account for the fact that measures are installed throughout a month (not all on the first of the month), the utilities take the conservative approach of claiming savings beginning in the month of the *paid date*—which is generally around two months after measures are installed and generating savings.[4] This ensures the utilities are conservative in their calculation to avoid overstating LBR. For LBR forecasts, the utilities divide total annual planned kWh savings by 12 to determine the average monthly kWh savings and apply a maximum demand factor (see section A below) to determine planned monthly kW savings.

Each component of the calculation is described in detail in the following sub-sections, and a template with the calculations for the C&I programs' 2019 planned installations is provided in appendix B.

A. Connected load savings (kW)

The connected load savings for energy efficiency measures are determined on a project-specific basis at the time of project installation/implementation. The savings are determined by project engineers and implementation contractors based on equipment specifications and information on baseline conditions at the project site. For an example of project specific kW savings calculations, see appendix A.

Planning assumptions: The project specific kW savings calculations, such as those shown in appendix A, are used to determine *actual* kW savings and lost revenues, but for *forecasted* kW savings, the utilities

[4] For example, in 2017, Eversource's small business projects were installed 67 days prior to their paid date, on average, and Eversource's large business projects were inspected 59 days prior to their paid date, on average.

use several assumptions in the planning model to arrive at planned connected load savings for measures installed each year, by program and measure type (lighting, heating, cooling, etc.). These include:

1. **Measure quantities.** Planned quantities for each measure type, based on prior years' actual measures installed.
2. **Gross annual kWh savings per unit.** Planned savings per unit, based on actual savings per unit from prior years' installed measures.
3. **Maximum demand factor.** Ratio of kWh to kW (connected load), based on the ratio of kWh to kW savings for prior years' projects
4. **Maximum load reduction kW.** Equal to the product of gross annual kWh savings per unit and the maximum demand factor.

These assumptions and values are included in blue text in the template in appendix B.

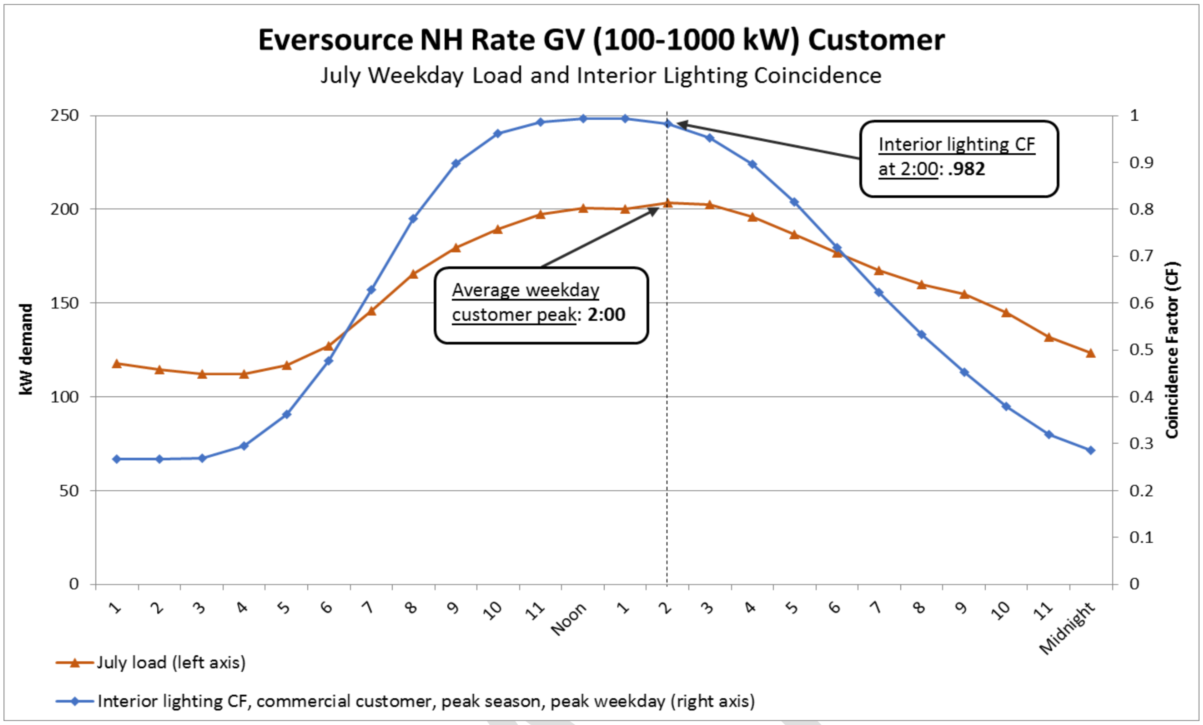
B. Customer peak coincident factor (CF)

The kW demand reduction at customer peak is derived by multiplying the connected load kW savings by a factor representing the coincidence of usage (i.e., "percent on") for each measure type at the peak hour for average customers in Eversource's service territory for each month of the year.[5]

Figure 1 below illustrates this concept, by combining (1) usage data for Eversource NH Rate GV customers and (2) end use load shape data from the Electric Power Research Institute (EPRI) to identify the coincidence factor (CF) for a specific end use—in this case interior lighting—at the average customer's peak hour in July. The figure shows an average Rate GV customer peak of 2:00 PM in July, at which time 98.2% of interior lighting is in use.

[5]Eversource NH Rate GV customers were chosen for determining average C&I customers' peak hour, because they are a large, varied group of C&I customers over a similar geographic range as other utilities' customers, and recent data were available on their hourly usage for each month.

Figure 1. Eversource NH Customer Load and Interior Lighting Coincidence Factor (CF)



Source: Eversource NH average hourly KW demand by month and day-type, based on all Rate GV customers' usage from September 2015 – August 2016. Downloaded from https://www.eversource.com/content/nh/about/about-us/doing-business-with-us/energy-supplier-information/electric---new-Hampshire. Indoor lighting coincidence from EPRI end use load shapes at http://loadshape.epri.com/enduse, for commercial customers in the Northeast Power Coordinating Council region, during a peak weekday in the peak season (summer).

The utilities chose this approach for calculating customer demand impacts—including the use of EPRI load shape data in particular—because (1) it is the most accurate methodology and data currently available for determining the impacts of energy efficiency measures on customer demand charges, and (2) it was the approach and the data source recommended in the January 23, 2018 memorandum from Optimal Energy to NHPUC staff.[6] The EPRI load shape data are a web accessible database of best-available U.S. end-use load data for each customer sector (e.g., commercial and industrial) in each region of the country (e.g., Northeast). According to EPRI, the data are drawn from multiple sources, including EPRI's field pilots, regional utility studies (e.g., BPA's Pacific Northwest Residential Building Stock Assessment) or through historical collaborative activities such as the EPRI CEED (Center for End-Use Energy Data) PowerShape™ data of 2000-01. As stated on the EPRI website, "the objective of the Load Shape Library is to facilitate the collection, use and functionality of a library of representative electric load shapes by climate zone, geography or by utility. Representative load shapes are a challenge to acquire due to the cost to collect end use level load data. While EPRI and the utility membership work towards acquiring national and regional statistically representative load data, EPRI Program 170 A (End-Use Energy Efficiency and Demand Response Analytics) has developed an analytical framework with a web accessible database of *best-available* U.S. load data." Based on Optimal's recommendation, as well

[6] See https://www.puc.nh.gov/EESE%20Board/EERS_WG/013118_optimal_oca_lbr_wg_memo.pdf

as our review of the data, the NH utilities believe these data are the most suitable set of end use load shape data available for determining customer peak kW impacts of energy efficiency measures.

In applying these data to customer's monthly load shapes, the utilities made several assumptions. First, EPRI's load shape data are available for peak (summer) and off-peak (winter) seasons. The utilities' calculations take the conservative approach of applying peak values to June, July, and August—the months of ISO-NE summer peak period—and off-peak values to all other months. Second, the data are available for average and peak weekdays. The utilities applied the peak weekday values, to reflect those days when customer's individual monthly peaks were more likely to occur. Third, the EPRI load shapes available for commercial customers are more comprehensive than those available for industrial customers—e.g., commercial end use load shapes are available for interior lighting and exterior lighting, whereas industrial lighting load shape data are available for a lighting in general (not separated for interior/exterior). As a result, the utilities applied commercial load shapes rather than industrial load shapes for most end uses. Finally, to determine end use CF values for custom projects, the utilities used an average of the CF values for all other end uses.

Table 2 below shows the average customer peak hour for Eversource Rate GV customers for each month, the CF values based on EPRI's data for each end use in that month, and the annual average CF. The template in appendix B illustrates how these values are applied to the LBR calculations.

Table 2. C&I Weekday Peak Hour End Use Coincident Factors (CFs)

			End Use Coincident Factors (CF), Based on EPRI Load Shapes										Custom (average of other columns)
Month	Season	Peak (Hour Ending)	Cooling	Heating	Lighting Internal	Office Equipment	Refrig.	Ventilation	Water Heating	Lighting External	Machine/ Drives	Process/ Heating	
Jan	OffPeak	11	0.0097	0.7217	0.9700	0.9562	0.7592	0.9893	0.9820	0.0584	0.9939	0.9950	0.7435
Feb	OffPeak	11	0.0097	0.7217	0.9700	0.9562	0.7592	0.9893	0.9820	0.0584	0.9939	0.9950	0.7435
Mar	OffPeak	11	0.0097	0.7217	0.9700	0.9562	0.7592	0.9893	0.9820	0.0584	0.9939	0.9950	0.7435
Apr	OffPeak	12	0.0099	0.6158	0.9957	0.9874	0.7672	0.9893	1.0000	0.0500	0.9945	0.9953	0.7405
May	OffPeak	14	0.0105	0.5063	1.0000	1.0000	0.7714	0.9821	0.9889	0.0500	1.0000	1.0000	0.7309
Jun	Peak	14	1.0000	0.0001	0.9820	0.9837	1.0000	0.9254	0.5748	0.0500	1.0000	1.0000	0.7516
Jul	Peak	14	1.0000	0.0001	0.9820	0.9837	1.0000	0.9254	0.5748	0.0500	1.0000	1.0000	0.7516
Aug	Peak	14	1.0000	0.0001	0.9820	0.9837	1.0000	0.9254	0.5748	0.0500	1.0000	1.0000	0.7516
Sep	OffPeak	14	0.0105	0.5063	1.0000	1.0000	0.7714	0.9821	0.9889	0.0500	1.0000	1.0000	0.7309
Oct	OffPeak	14	0.0105	0.5063	1.0000	1.0000	0.7714	0.9821	0.9889	0.0500	1.0000	1.0000	0.7309
Nov	OffPeak	12	0.0099	0.6158	0.9957	0.9874	0.7672	0.9893	1.0000	0.0500	0.9945	0.9953	0.7405
Dec	OffPeak	11	0.0097	0.7217	0.9700	0.9562	0.7592	0.9893	0.9820	0.0584	0.9939	0.9950	0.7435
Annual Average			**0.2575**	**0.4698**	**0.9848**	**0.9792**	**0.8238**	**0.9715**	**0.8849**	**0.0528**	**0.9970**	**0.9975**	**0.7419**

C. Net to Gross Percentage

This percentage is assumed to be 100%, per the New Hampshire Energy Efficiency Working Group Report, 1999.[7] As stated in the report, "although Group members agree that program designs should attempt to minimize free-riders, the Group concluded that the methodological challenges and

[7] See https://www.puc.nh.gov/Electric/96-150%20%20NH%20Energy%20Efficiency%20Working%20Group%20Final%20Report%20(1999).pdf

associated costs of accurately assessing free-riders no longer justifies the effort required to net these out of cost-effectiveness analyses." The report also allowed inclusion of spillover, but to date the utilities have not measured spillover or included it in cost-effectiveness analyses. The utilities have made numerous efforts to design programs to minimize free-ridership by requiring customer investment of time and resources, such as through conservative, judicious use of up-stream and mid-stream offerings.

D. In-Service Rate

This rate reflects the percentage of incented measures that are installed and operating. Per program design, and consistent with other jurisdictions, C&I projects are inspected post-installation, and incentives are provided based on successful installation. Therefore, installation rates for C&I programs are 100%.

E. Realization Rate

This rate reflects the ratio of evaluated savings measured in impact evaluations to claimed savings based on utilities' savings algorithms. Realization rates reflect various impact factors measured in evaluations, including in-service rates, coincidence factors, and hours of operation. Therefore, applying realization rates and other impact factors from the same study may result in double-counting these impacts.

As shown in the template in appendix B, the utilities' calculations apply realization rates for each measure type from the best available, most recent impact evaluation of the New Hampshire C&I program, completed by DNV-GL in September 2015.[8] Because these realization rates account for the impact of in-service rates, the utilities did not separately apply in-service rates from this evaluation.

F. Retirement Adjustment

The utilities' kW savings will be adjusted by subtracting savings for measures that reach the end of their measure lives, using the same mechanism the utilities currently use as required by ISO-NE for forward capacity market reporting. Bates 237 and 238 provides a schedule of measure lifetimes for Eversource's C&I programs. As shown, the shortest measure life in these programs is a 9-year measure life for Retrofit Occupancy Sensors, meaning retirement adjustments for these measures installed in 2019 would not occur until 2028. Measure lives are adjusted on a prospective basis, meaning whenever a measure's life is altered via an EM&V study, all measures installed in the subsequent calendar year will have the new measure life applied, while all measures installed up to that point will have the old measure life applied.

[8] DNV-GL, *Large C&I Retrofit and New Equipment & Construction Impact Evaluation*, Sep 25, 2015. http://www.puc.state.nh.us/Electric/Monitoring%20and%20Evaluation%20Reports/New%20Hampshire%20Large%20C&I%20Program%20Impact%20Study%20Final%20Report.pdf, p.68, table 34.

V. Derivation of Average Distribution Rates (ADR)

A. Description: How is ADR calculated

The Average Distribution Rate (ADR) is equal to the distribution revenue of a utility (e.g., revenues from kWh and kW rates) divided by consumption (e.g., kWh and kW consumption). For lost base revenue calculated with savings from measures installed in 2018, kWh and kW revenue will be combined and divided by kWh to calculate a single ADR for each sector. For lost base revenue calculated based on savings for measures installed in 2019 and 2020, there will be separate kWh and kW Average Distribution Rates for each sector. Note that the Average Distribution Rates differ from utility to utility.

B. Discuss Distribution Rates and Billing Determinants used in the ADR calculation (i.e.: vintage)

Generally, distribution rates in effect at the time of the forecasted LBR plan shall be used for creating the LBR forecast. The forecast will also include the most recent calendar year of billing determinants. Upon reconciliation of LBR and calculating the actual LBR to be recovered, billing determinants and rates in effect during the calendar year covered shall be used. Thus, 2017 billing determinants and rates will be used for calculating actual 2017 LBR. The lost revenue calculation for 2017 will use 2017 EE savings (the first year lost revenue is assessed) and 2017 rates and tariffs. The 2018 lost revenue calculation will use 2017+2018 EE savings and 2018 rates and tariffs, if different, as all of these savings would have been billed under 2018 rates and tariffs. Future years will continue to be calculated in a similar manner, less any retired measures' savings.

C. Summarize LBR and ADR schedules (attached in Appendices B and C).

Calculation of forecasted LBR for the Commercial & Industrial sector for 2019 is provided by utility in Appendix B. As shown, LBR is calculated using a single ADR for savings for measures installed in 2017 and 2018 and using separate kWh and kW Average Distribution Rates for savings for measures installed in 2019.

The calculation of Average Distribution Rates is provided by utility in Appendix C for illustration. As indicated above, generally, distribution rates in effect at the time of the forecasted LBR plan shall be used for creating the LBR forecast as well as the most recent calendar year of billing determinants.

As shown, the Average Distribution Rates are calculated by sector by taking the sector's distribution revenue divided by the sector's usage. For lost base revenue calculated with savings for measures installed in 2017 and 2018, kWh and kW revenue are combined and divided by kWh to calculate a single ADR for each sector. For lost base revenue calculated based on savings for measures installed in 2019 and 2020, there are separate kWh and kW Average Distribution Rates for each sector.

When actuals are calculated for LBR, the relevant period for both rates and billing determinants will be used. For example, 2017 LBR will use 2017 billing determinants and 2017 distribution rates.

VI. Discussion of Ratchets

The working group was tasked with considering the general impact of demand charge ratchets. A description of each utility's ratchet provision and discussion of impact to kW savings from energy efficiency measures is provided below.

Eversource: For Eversource, only LG customers are potentially impacted by a ratchet. Please refer to page 67 of Eversource's Tariff No. 9 for how demand is billed for these customers. Eversource's analysis of customers billed under its ratchet concluded that ratchets had a 0% impact from energy efficiency measures. No ratchet adjustment is necessary.

Unitil: For Unitil, only its G1 class (customers with average use equal or in excess of 200 kVA and generally greater than or equal to 100,000 kWh each month) includes a ratchet provision. G1 customers are billed the highest of a) current month's peak 15 min. kVA or b) 80% of previous 11 month's peak 15 min. kVA. The data provided in Appendix D shows the effect of the ratchet on kVA billed to G1 customers who participated in energy efficiency in 2017.

As shown, ratcheted kVa for these customers is 5% higher than the metered kVa. Note that sector demand savings also include the G2 class which does not have a demand ratchet. However, this does not necessarily mean that installed energy efficiency demand savings were 5% lower due to the ratchet. For instance, a customer could be billed on a ratchet in the early part of the year and then complete an energy efficiency project in the middle of the year. The impact of the ratchet is still included in the percentage calculation although the ratchet and energy efficiency project have no relation to each other. In a second example, suppose a customer completes an energy efficiency project early in the year, but then later in the year, is billed on a ratchet due to a high summer peak caused by weather. The summer peak was still lower by the amount of the installed energy efficiency project thus the Company still lost revenue even though the ratchet was implicated. Even in instances where a ratchet may be billed for an entire year, an energy efficiency project would have had an impact on what that ratcheted demand was -- if not during the current year, then in the following year, since the ratchet only looks back 11 months. As agreed to in the settlement establishing this working group, it is not feasible to identify the impacts with precision and not feasible to track demand charge impacts on a customer by customer basis. Overall, the ratchet only comes into play for 4 months on average, and is very small in percentage terms, thus it has been determined that no ratchet adjustment to demand savings is necessary.

Liberty: For Liberty, its G-1 and G-2 rate classes include a monthly ratchet. The Company is in the process of reviewing whether or not it is appropriate for the G-2 rate class (customers with monthly usage of 20 kW to 200 kW) to include the ratchet and will be addressing the ratchet in its next rate case, to be filed in 2019. The calculation of the ratchet is provided in Granite State Electric's Tariff No. 20 on page 98 for Rate G-1 and page 101 for Rate G-2.

Appendices

A. Example of Lighting Project Worksheet with kW Savings

PRISM
ENERGY SERVICES

1150 Hancock Street, Suite 400 ▲ Quincy, MA 02169
T 617 328-9898 ▲ F 617 328-0496
www.prismenergyservices.com

Unitil Municipal Program

UTILITY INVOICE
USB 1002

Customer Name	[redacted]	Auditor	[redacted]
Address			*PRISM ENERGY SERVICES*
Town, State, Zip		Date	5/11/2017
Contact			
Phone			
Account #			

REPLACEMENT DESCRIPTION	QTY	TOTAL COST	UNIT COST	UTILITY INCENTIVE	OUT-OF-POCKET EXPENSE
1L4' 12W LED T8/LP L&B, 3500K	81	$3,631.11	$44.83	$1,815.55	$1,815.56
2L2' 8.5W LED T8/LP L&B, 3500K	54	$3,496.15	$64.74	$1,748.07	$1,748.08
2L2' 8.5W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	13	$2,273.46	$174.88	$1,136.73	$1,136.73
1L2' 8.5W LED T8/LP L&B, 3500K	60	$3,893.08	$64.88	$1,946.53	$1,946.55
2L4' 12W LED T8/LP L&B, 3500K	107	$6,134.89	$57.34	$3,067.43	$3,067.46
2L4' 12W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	11	$1,849.06	$168.10	$924.53	$924.53
7W LED CFL REPLACEMENT - VERTICAL PLUG-IN LAMP BYPASS BALLAST, 3500K	44	$1,851.38	$42.08	$925.69	$925.70
8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 3500K	27	$1,161.83	$43.03	$580.91	$580.92
8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 4000K	9	$387.28	$43.03	$193.64	$193.64
17W LED SCREW IN LAMP, 4000K	10	$393.85	$39.38	$196.92	$196.92
52W LED KNUCKLE MOUNT NARROW FLOOD, 4000K	2	$1,104.62	$552.31	$552.31	$552.31
4L4' 12W LED T8/LP L&B, 3500K	12	$5,393.85	$449.49	$2,696.91	$2,696.93
8W LED BR30 SCREW IN LAMP, 2700K	4	$85.85	$21.46	$42.92	$42.92
7W LED PAR20 SCREW IN LAMP, 2700K	8	$179.20	$22.40	$89.60	$89.60
PERMIT FEE		$105.00		$52.50	$52.50
WASTE PACKAGING		$723.40		$361.70	$361.70
TOTALS	442	$32,664.00	N/A	$16,331.94	$16,332.06

10.29.02.52908.5440

PLEASE PAY THIS AMOUNT: ***$16,331.94*** A

PRISM
ENERGY SERVICES

AUDIT AND SAVINGS ANALYSIS AS INSTALLED
[illegible] MUNICIPAL PROGRAM

CUSTOMER NAME:
DBA:
ADDRESS:
CONTACT:
PHONE:
ACCOUNT #:
[redacted]

Auditor: [redacted]
Prism Energy Services
Audit Date: 2/26/2017

LINE	ROOM	HT	EXISTING: DESCRIPTION LAMPS/BALLAST	FIXTURE QTY	WATTS/FIXTURE	KW	HOURS	KWH/YR	PROPOSED: DESCRIPTION	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	INTERIOR															
2	MAIN ENTRANCE	10'	1L4' T8/ELIG WALL MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	2	30	0.0905	287	297	1L4' 12W LED T8/LP L&B, 3500K	2	13	0.026	3,287	85	0.034	112
3	MAIN LOBBY	12'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	3	37	0.1853	287	608	2L2' 8.5W LED T8/LP L&B, 3500K	5	20	0.100	3,287	329	0.085	279
4	MAIN LOBBY	12'	1L2' 17WT8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	8	17	0.1361	000	136	1L2' 8.5W LED T8/LP L&B, 3500K	8	10	0.080	1,000	80	0.056	56
5	MAIN LOBBY - EMERGENCY	12'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	3	37	0.1113	287	365	2L2' 8.5W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	3	20	0.060	3,287	197	0.051	168
6	MAIN LOBBY	12'	26W CFL/ELIG RECESSED 10" I.D. 11" O.D. CAN	2	28	0.0562	000	56	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 3500K	2	8	0.016	1,000	16	0.040	40
7	MAIN LOBBY	12'	18W CFL RECESSED 8" I.D. 9" O.D. CAN	2	20	0.0400	287	131	7W LED CFL REPLACEMENT - VERTICAL PLUG-IN LAMP BYPASS BALLAST, 3500K	2	7	0.014	3,287	46	0.026	85
8	DVD/MUSIC SECTION	12'	2L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	22	60	1.3202	287	4,338	2L4' 12W LED T8/LP L&B, 3500K	22	25	0.550	3,287	1,808	0.770	2,531
9	DVD/MUSIC SECTION	12'	1L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	24	30	0.7201	000	720	1L4' 12W LED T8/LP L&B, 3500K	24	13	0.312	1,000	312	0.408	408
10	DVD/MUSIC SECTION - EMERGENCY	12'	2L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	2	60	0.1200	287	394	2L4' 12W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	2	25	0.050	3,287	164	0.070	230
11	DVD/MUSIC SECTION	12'	26W CFL ELIG RECESSED 10" I.D. 11" O.D. CAN	4	28	0.1120	287	368	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 3500K	4	8	0.032	3,287	105	0.080	263
12	CIRCULATION DESK	14'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	1	37	0.0373	287	122	2L2' 8.5W LED T8/LP L&B, 3500K	1	20	0.020	3,287	66	0.017	56
13	CIRCULATION DESK	14'	1L2' 17WT8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	2	17	0.0341	000	34	1L2' 8.5W LED T8/LP L&B, 3500K	2	10	0.020	1,000	20	0.014	14
14	CIRCULATION DESK - EMERGENCY	14'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	1	37	0.0373	287	122	2L2' 8.5W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	1	20	0.020	3,287	66	0.017	56
15	CIRCULATION DESK	14'	26W CFL ELIG RECESSED 10" I.D. 11" O.D. CAN	6	28	0.1683	287	552	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 3500K	6	8	0.048	3,287	158	0.120	394
16	CENTER AREA	10'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	3	37	0.1113	287	365	2L2' 8.5W LED T8/LP L&B, 3500K	3	20	0.060	3,287	197	0.051	168
17	CENTER AREA	10'	1L2' 17WT8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	3	17	0.0511	000	51	1L2' 8.5W LED T8/LP L&B, 3500K	3	10	0.030	1,000	30	0.021	21
18	CENTER AREA	10'	26W CFL ELIG RECESSED 10" I.D. 11" O.D. CAN	3	28	0.0843	287	276	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 3500K	3	8	0.024	3,287	79	0.060	197
19	CENTER AREA	10'	1L4' T8/ELIG WALL MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	1	30	0.0301	287	99	1L4' 12W LED T8/LP L&B, 3500K	1	13	0.013	3,287	43	0.017	56
20	[redacted]	14'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	8	37	0.2981	000	298	2L2' 8.5W LED T8/LP L&B, 3500K	8	20	0.160	1,000	160	0.138	138
21		14'	1L2' 17WT8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	8	17	0.1361	000	136	1L2' 8.5W LED T8/LP L&B, 3500K	8	10	0.080	1,000	80	0.056	56
22		10'	2L4' T8/ELIG WALL MOUNT 8' 80 UP/20 DOWN DIRECT/INDIRECT	4	60	0.2401	000	240	2L4' 12W LED T8/LP L&B, 3500K	4	25	0.100	1,000	100	0.140	140
23		10'	1L4' T8/ELIG WALL MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	3	30	0.0901	000	90	1L4' 12W LED T8/LP L&B, 3500K	3	13	0.026	1,000	26	0.034	34
24	FICTION/NON FICTION SECTION	12'	2L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	31	60	1.8605	287	6,115	2L4' 12W LED T8/LP L&B, 3500K	31	25	0.775	3,287	2,547	1.085	3,566
25	FICTION/NON FICTION SECTION	12'	1L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	34	30	1.0201	000	1,020	1L4' 12W LED T8/LP L&B, 3500K	34	13	0.442	1,000	442	0.578	578
26	FICTION/NON FICTION SECTION - EMERGENCY	12'	2L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	3	60	0.1803	287	593	2L4' 12W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	3	25	0.075	3,287	246	0.105	345
27	FICTION/NON FICTION SECTION	14'	18W CFL RECESSED 8" I.D. 9" O.D. CAN	4	20	0.0801	000	80	7W LED CFL REPLACEMENT - VERTICAL PLUG-IN LAMP BYPASS BALLAST, 3500K	4	7	0.028	1,000	28	0.052	52
28	CONFERENCE ROOM	14'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	4	37	0.1481	000	148	2L2' 8.5W LED T8/LP L&B, 3500K	4	20	0.080	1,000	80	0.068	68
29	CONFERENCE ROOM	14'	1L2' 17WT8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	4	17	0.0681	000	68	1L2' 8.5W LED T8/LP L&B, 3500K	4	10	0.040	1,000	40	0.028	28
30	CONFERENCE ROOM	10'	2L4' T8/ELIG WALL MOUNT 8' 80 UP/20 DOWN DIRECT/INDIRECT	4	60	0.2401	000	240	2L4' 12W LED T8/LP L&B, 3500K	4	25	0.100	1,000	100	0.140	140
31	CONFERENCE ROOM	15'	50W Halogen WALL MOUNT PAR30 SCREW IN LAMP	8	50	0.4001	000	400	7W LED PAR30 SCREW IN LAMP, 2700K	8	7	0.056	1,000	56	0.344	344
32	GAME ROOM	12'	2L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	2	60	0.1200	000	120	2L4' 12W LED T8/LP L&B, 3500K	2	25	0.050	1,000	50	0.070	70
33	GAME ROOM	12'	1L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	2	30	0.0601	000	60	1L4' 12W LED T8/LP L&B, 3500K	2	13	0.026	1,000	26	0.034	34
34	STUDY ROOM	14'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	4	37	0.1481	000	148	2L2' 8.5W LED T8/LP L&B, 3500K	4	20	0.080	1,000	80	0.068	68
35	STUDY ROOM	14'	1L2' 17WT8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	4	17	0.0681	000	68	1L2' 8.5W LED T8/LP L&B, 3500K	4	10	0.040	1,000	40	0.028	28
36	DIRECTOR'S OFFICE	14'	26W CFL ELIG RECESSED 10" I.D. 11" O.D. CAN	4	28	0.1121	000	112	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 3500K	4	8	0.032	1,000	32	0.080	80
37	DIRECTOR'S OFFICE	10'	2L4' T8/ELIG WALL MOUNT 8' 80 UP/20 DOWN DIRECT/INDIRECT	2	60	0.1200	287	394	2L4' 12W LED T8/LP L&B, 3500K	2	25	0.050	3,287	164	0.070	230
38	DISPLAY CASE 1	8'	13W CFL RECESSED 4" I.D. 5" O.D. CAN	1	15	0.0151	500	23	7W LED CFL REPLACEMENT - VERTICAL PLUG-IN LAMP BYPASS BALLAST, 3500K	1	7	0.007	1,500	11	0.008	12
39	DISPLAY CASE 2	8'	13W CFL RECESSED 4" I.D. 5" O.D. CAN	1	15	0.0151	500	23	7W LED CFL REPLACEMENT - VERTICAL PLUG-IN LAMP BYPASS BALLAST, 3500K	1	7	0.007	1,500	11	0.008	12
40	MEN'S RESTROOM	8'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	1	37	0.0371	000	37	2L2' 8.5W LED T8/LP L&B, 3500K	1	20	0.020	1,000	20	0.017	17
41	WOMEN'S RESTROOM	8'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	1	37	0.0371	000	37	2L2' 8.5W LED T8/LP L&B, 3500K	1	20	0.020	1,000	20	0.017	17
42	CHILDREN'S LIBRARY	8'	1L2' 17WT8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	2	17	0.0341	000	34	1L2' 8.5W LED T8/LP L&B, 3500K	2	10	0.020	1,000	20	0.014	14
43	CHILDREN'S LIBRARY - EMERGENCY	8'	2L2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	2	37	0.0745	287	245	2L2' 8.5W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	2	20	0.040	3,287	131	0.034	112
44	CHILDREN'S LIBRARY	8'	26W CFL ELIG RECESSED 10" I.D. 11" O.D. CAN	3	28	0.0843	287	276	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 3500K	3	8	0.024	3,287	79	0.060	197
45	CHILDREN'S LIBRARY	10'	2L4' T8/ELIG WALL MOUNT 8' 80 UP/20 DOWN DIRECT/INDIRECT	14	60	0.8405	287	2,763	2L4' 12W LED T8/LP L&B, 3500K	14	25	0.350	3,287	1,150	0.490	1,610
46	CHILDREN'S LIBRARY - EMERGENCY	10'	2L4' T8/ELIG WALL MOUNT 8' 80 UP/20 DOWN DIRECT/INDIRECT	2	60	0.1201	287	394	2L4' 12W LED T8/LP L&B WITH EMERGENCY BALLAST, 3500K	2	25	0.050	3,287	164	0.070	230
47	CHILDREN'S LIBRARY	14'	13W CFL RECESSED 4" I.D. 5" O.D. CAN	34	15	0.5108	287	1,679	7W LED CFL REPLACEMENT - VERTICAL PLUG-IN LAMP BYPASS BALLAST, 3500K	34	7	0.238	3,287	782	0.272	894
48	CHILDREN'S LIBRARY	14'	65W INC RECESSED BR30 SCREW IN LAMP	4	65	0.2601	287	854	8W LED BR30 SCREW IN LAMP, 2700K	4	8	0.032	3,287	105	0.228	749
49	CHILDREN'S LIBRARY	12'	2L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	8	60	0.4801	287	1,578	2L4' 12W LED T8/LP L&B, 3500K	8	25	0.200	3,287	657	0.280	920
50	CHILDREN'S LIBRARY	12'	1L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	10	30	0.3001	000	300	1L4' 12W LED T8/LP L&B, 3500K	10	13	0.130	1,000	130	0.170	170
			2L4' T8/ELIG CABLE MOUNT 4' 80 UP/20 DOWN						2L4' 12W LED T8/LP L&B WITH EMERGENCY							

53	STORY/CRAFTS ROOM	10'	DIRECT/INDIRECT	4	60	0.240	1,000	240	2/4' 12W LED T8/1P L&B, 3500K	8	25	0.100	1,000	100	0.140	140
54	STORY/CRAFTS ROOM	10'	1/4' T8/ELIG WALL MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	2	30	0.060	1,000	60	1/4' 12W LED T8/1P L&B, 3500K	2	13	0.026	1,000	26	0.034	34
55	STORY/CRAFTS ROOM BEAMS	15'	4/4' T8/ELIG SURFACE MOUNT 8' NARROW STRIP	11	112	1.232	1,000	1,232	4/4' 12W LED T8/1P L&B, 3500K	11	50	0.550	1,000	550	0.682	682
56	STORY/CRAFTS ROOM BEAMS	15'	4/4' T8/ELIG SURFACE MOUNT 8' NARROW STRIP	1	112	0.112	1,000	112	4/4' 12W LED T8/1P L&B, 3500K	1	50	0.050	1,000	50	0.062	62
57	STORY/CRAFTS ROOM STORAGE	8'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	2	60	0.120	1,000	120	2/4' 12W LED T8/1P L&B, 3500K	2	25	0.050	1,000	50	0.070	70
58	CHILDRENS LIBRARY MENS RESTROOM	8'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	1	37	0.037	1,000	37	2/2' 8.5W LED T8/1P L&B, 3500K	1	20	0.020	1,000	20	0.017	17
59	CHILDRENS LIBRARY WOMENS RESTROOM	8'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	1	37	0.037	1,000	37	2/2' 8.5W LED T8/1P L&B, 3500K	1	20	0.020	1,000	20	0.017	17
60	DISPLAY CASE 3	6'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	1	60	0.060	1,500	90	1/4' 12W LED T8/1P L&B, 3500K	1	25	0.025	1,500	38	0.035	53
61	DISPLAY CASE 4	6'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	1	60	0.060	1,500	90	2/4' 12W LED T8/1P L&B, 3500K	1	25	0.025	1,500	38	0.035	51
62	FAMILY RESTROOM	8'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	1	37	0.037	1,000	37	2/2' 8.5W LED T8/1P L&B, 3500K	1	20	0.020	1,000	20	0.017	17
63	STAFF AREA	14'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	9	37	0.333	3,287	1,094	2/2' 8.5W LED T8/1P L&B, 3500K	9	20	0.180	3,287	592	0.153	503
64	STAFF AREA	14'	1/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	12	17	0.204	1,000	204	1/2' 8.5W LED T8/1P L&B, 3500K	12	10	0.120	1,000	120	0.084	84
65	STAFF AREA - EMERGENCY	14'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	3	37	0.111	3,287	365	2/2' 8.5W LED T8/1P L&B WITH EMERGENCY BALLAST, 3500K	3	20	0.060	3,287	197	0.051	168
66	STAFF AREA	14'	26W CFL ELIG RECESSED 10" I.D. 11" O.D. CAN	3	28	0.084	3,287	276	8W LED CFL REPLACEMENT - HORIZONTAL PLUG IN LAMP BYPASS BALLAST, 3500K	3	8	0.024	3,287	79	0.060	197
67	STAFF AREA	14'	18W CFL RECESSED 6" I.D. 7" O.D. CAN	2	20	0.040	3,287	131	7W LED CFL REPLACEMENT - VERTICAL PLUG-IN LAMP BYPASS BALLAST, 3500K	2	7	0.014	3,287	46	0.026	85
68	TELECOM ROOM	10'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	1	60	0.060	1,000	60	2/4' 12W LED T8/1P L&B, 3500K	1	25	0.025	1,000	25	0.035	35
69	TELECOM ROOM - EMERGENCY	10'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	1	60	0.060	1,000	60	2/4' 12W LED T8/1P L&B WITH EMERGENCY BALLAST, 3500K	1	25	0.025	1,000	25	0.035	35
70	ELECTRICAL ROOM	10'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	1	60	0.060	1,000	60	2/4' 12W LED T8/1P L&B, 3500K	1	25	0.025	1,000	25	0.035	35
71	ELECTRICAL ROOM - EMERGENCY	10'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	1	60	0.060	1,000	60	2/4' 12W LED T8/1P L&B WITH EMERGENCY BALLAST, 3500K	1	25	0.025	1,000	25	0.035	35
72	BREAKROOM	14'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	5	37	0.185	1,000	185	2/2' 8.5W LED T8/1P L&B, 3500K	5	20	0.100	1,000	100	0.085	85
73	BREAKROOM	14'	1/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	5	17	0.085	1,000	85	1/2' 8.5W LED T8/1P L&B, 3500K	5	10	0.050	1,000	50	0.035	35
74	STORAGE/MECHANICAL ROOM STAIRS	14'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	2	60	0.120	1,000	120	2/4' 12W LED T8/1P L&B, 3500K	2	25	0.050	1,000	50	0.070	70
75	KITCHEN	8'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	2	37	0.074	1,000	74	2/2' 8.5W LED T8/1P L&B, 3500K	2	20	0.040	1,000	40	0.034	34
76	MEETING ROOM	14'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	8	37	0.296	2,000	592	2/2' 8.5W LED T8/1P L&B, 3500K	8	20	0.160	2,000	320	0.136	272
77	MEETING ROOM	14'	1/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	12	17	0.204	2,000	408	1/2' 8.5W LED T8/1P L&B, 3500K	12	10	0.120	2,000	240	0.084	168
78	MEETING ROOM - EMERGENCY	14'	2/2' 17W T8/ELIG RECESSED 2X2 VOLUMETRIC TROFFER	4	37	0.148	2,000	296	2/2' 8.5W LED T8/1P L&B WITH EMERGENCY BALLAST, 3500K	4	20	0.080	2,000	160	0.068	136
79	MEETING ROOM	10'	2/4' T8/ELIG WALL MOUNT 8' 80 UP/20 DOWN DIRECT/INDIRECT	6	60	0.360	2,000	720	2/4' 12W LED T8/1P L&B, 3500K	6	25	0.150	2,000	300	0.210	420
80	MEETING ROOM	10'	1/4' T8/ELIG WALL MOUNT 4' 80 UP/20 DOWN DIRECT/INDIRECT	4	30	0.120	2,000	240	1/4' 12W LED T8/1P L&B, 3500K	4	13	0.052	2,000	104	0.068	136
81	CHAIR STORAGE	8'	2/4' T8/ELIG SURFACE MOUNT 4' STANDARD STRIP	2	60	0.120	1,000	120	2/4' 12W LED T8/1P L&B, 3500K	2	25	0.050	1,000	50	0.070	70
82	EXTERIOR															
83	MAIN ENTRANCE CANS	14'	50W HPS RECESSED 6" I.D. 7" O.D. CAN	6	65	0.390	4,338	1,692	17W LED SCREW IN LAMP, 4000K	6	17	0.102	4,338	442	0.288	1,249
84	FRONT WALL SCONCE	8'	26W CFL ELIG WALL MOUNT ROUND - HORIZONTAL SCONCE	3	28	0.084	4,338	364	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 4000K	3	8	0.024	4,338	104	0.060	260
85	STREETSIDE CANS	14'	50W HPS RECESSED 6" I.D. 7" O.D. CAN	4	65	0.260	4,338	1,128	17W LED SCREW IN LAMP, 4000K	4	17	0.068	4,338	295	0.192	833
86	REAR WALL SCONCES	8'	26W CFL ELIG WALL MOUNT ROUND - HORIZONTAL SCONCE	4	28	0.112	4,338	486	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 4000K	4	8	0.032	4,338	139	0.080	347
87	RIGHT SIDE WALL SCONCES	8'	26W CFL ELIG WALL MOUNT ROUND - HORIZONTAL SCONCE	2	28	0.056	4,338	243	8W LED CFL REPLACEMENT - HORIZONTAL PLUG-IN LAMP BYPASS BALLAST, 4000K	2	8	0.016	4,338	69	0.040	174
88	FLAG FLOODS	1'	175W MH KNUCKLE MOUNT NARROW FLOOD	2	205	0.410	4,338	1,779	52W LED KNUCKLE MOUNT NARROW FLOOD, 4000K	2	52	0.104	4,338	451	0.306	1,327
			TOTALS	442		17.181		40,812	TOTALS	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]

Flags 5k → 63W

[illegible]	Energy		
	kWh	[illegible]	@ $0.1422 / kWh*
	kW	[illegible]	
	Total Project Cost		[illegible]
	Incentive		[illegible]
	Out-of-Pocket Cost		[illegible]

5/26 Post-Install

Flag Lights 63W not 52W as reported.

$\Delta kW = 10.258$

$\Delta kWh = 24,197.992$

B. 2019 LBR savings calculations for the Commercial & Industrial Sectors.

LBR template, Eversource - May 16.

LBR template, Unitil - May 16.xlsx

C. Sample ADR calculations

Eversource Illustrative ADR.xlsx

Unitil Illustrative ADR.xlsx

D. Ratchet Support Analyses

Eversource Ratchet Analysis.pdf

Unitil Ratchet Analysis.pdf