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RI PY2018 Custom Electric Impact Evaluation Interim Results Memo

This memo presents interim results for RI Custom Electric Program, that can be used for National Grid's 2021 plan filing. DNV GL completed 21 sampled sites' desk reviews that were reviewed and approved by National Grid. The overall program results have been calculated using Ratio Estimation of RI PY2016 and PY2018 Custom Electric Sample, and MA C&I Impact Evaluation of PY2017/18 Custom Electric Installations. Please note that this memo does not include any site-specific recommendations. They will be provided when the study is completed in the Final Program Report.

References:

RI PY2016 Site Report (not published but can be provided if needed).

MA PY2017/18 Custom Electric Report@ http://ma-eeac.org/wordpress/wp-content/uploads/MA_CIEC_Stage5_Report_C07_Custom_Electric_Impact_Evaluation_PY2017_18_FINAL-2020-06-01.pdf

1.1 Study Background

The custom electric segment includes custom projects that do not meet the criteria of National Grid's prescriptive or upstream program offerings. These projects generally use custom engineering analysis to generate ex-ante savings estimates rather than deemed savings estimates. Currently, the custom electric segment is evaluated each year with end uses being segmented into lighting and non-lighting sampling categories, and results being pooled with the prior study results to achieve specific precision requirements. The most recent custom impact evaluation in RI was completed on the 2016 program year (PY2016 study). The PY2016 RI study piggybacked with a similar study in MA[1] to achieve the reliable precision targets.

Non-lighting custom electric end-uses include HVAC, process, refrigeration, drives and motors, compressed air, comprehensive design approach (CDA), CHP, and other. CDA and CHP projects were not included in this study.

1.2 Updated Scope

Due to the COVID-19 pandemic, per National Grid's recommendation, all the fieldwork was shut down in March 2020. All the site visits for the RI PY2018 sample were postponed indefinitely, and the results from a complete measurement & verification (M&V) study will not be completed in time for National Grid's annual planning in September 2020. DNV GL, in consultation with National Grid and the EERMC Consultant Team (C-team), amended the scope to provide interim custom electric results for the planning purposes by combining results from in-depth desk reviews of the RI PY2018 study and full M&V results from RI PY2016 and a similar study in MA[1] (PY2017/18).

1.2.1 RI PY2018 Expansion Analysis without fieldwork

Typically, discrepancies in evaluated savings from the tracking savings for every site is characterized into two adjustment factors:

1) Desk review adjustment factor, and
2) Non-desk review adjustment factor

The desk review adjustment factor can be calculated using the results from in-depth desk reviews of the entire sample. And, non-desk review adjustments are calculated from measurement and verification of the measure specific details for every site, which would essentially require an onsite visit. This was not possible due to the pandemic. Therefore, DNV GL developed a methodology to calculate the non-desk review adjustment factor for the PY2018 study by taking advantage of the same factor calculated from the previous study results.

Also note that both of these adjustments are further classified into seven (7) savings parameters at the site-level as shown in Table 1.

[1] http://ma-eeac.org/wordpress/wp-content/uploads/MA_CIEC_Stage5_Report_P80_Custom_Impact_Evaluation_PY2016_Final.pdf

Table 1: Adjustment factors and definitions

Adjustments	Savings Parameter	Definition
Desk Reviews Adjustments	Baseline	Impact of changes due to incorrect measure event type or measure baseline
	Applicant Calculation Methodology	Impact of changes due to differences between application and evaluation approach and calculation methodology
	Tracking & Admin	Impact of any administrative tracking savings errors identified
Non-Desk Review Adjustments	Technology	Impact of changes in installed or baseline measure equipment type (make/model#) identified
	Quantity	Impact of changes in the quantity of the measures installed
	Operational	Impact of changes in annual and peak operating profiles (hours of use, load, etc.)
	HVAC Interactive	Impact of any changes in savings due to HVAC interactive effects of the installed measure on the HVAC systems

The desk-review and non-desk review adjustment factors (or ratios) were then combined to calculate the overall program realization rate (RR) as shown below.

$$RR_{2018} = AR_{Non-Desk\ Review} * AR_{Desk\ Review}$$

Where,

AR = Adjustment Ratio

$AR_{Desk\ Review}$ = Adjustment Ratio calculated using the three factors that fall under desk review adjustments (Table 1) based on the results from the 21 RI PY2018 sampled site desk reviews.

$AR_{Non-Desk\ Review}$ = Adjustment Ratio calculated from a simple weighted average of Non-desk review adjustment ratios of RI PY2016 and MA PY2017/18 study results.

For example:

RI PY2018 Lighting RR = $AR_{Non-Desk\ Review} * AR_{Desk\ Review}$

= 90%*93%

= 84%

Where,

$AR_{Desk\ Review}$ = 90% (calculated using in-depth desk review results of 10 lighting sites)

$$AR_{Non-Desk\ Review} = \frac{(\text{AR Non-Desk Review} * \text{Energy})_{\text{RI PY2016}} + (\text{AR Non-Desk Review} * \text{Energy})_{\text{MA PY2017/18}}}{(\text{Energy})_{\text{RI PY2016}} + (\text{Energy})_{\text{MA PY2017/18}}}$$

And from Table 2,

$$= \frac{(100\% * 19{,}142{,}741)_{\text{RI PY2016}} + (89\% * 40{,}309{,}720)_{\text{MA PY2017/18}}}{(19{,}142{,}741)_{\text{RI PY2016}} + (40{,}309{,}720)_{\text{MA PY2017/18}}} = 93\%$$

Note: Results were calculated for lighting and non-lighting sites individually and presented in Table 2.

Table 2: RR for all three studies

Study/PY	Measure	Sample Size	Energy Savings	AR Desk Review	AR Non-Desk Review	RR
		n	kWh			
RI PY2016	Lighting	3	19,142,741	100%	100%	100%
	Non-Lighting	8	21,044,847	94%	73%	69%
MA PY2017/18	Lighting	10	40,309,720	106%	89%	94%
	Non-Lighting	21	45,495,306	85%	83%	71%
RI PY2018	Lighting	10	13,294,077	90%	93%	84%
	Non-Lighting	14	12,910,679	100%	80%	80%

1.3 Overall RI Custom Electric Results

Overall, the RI Custom Electric RR was calculated by combining realization rates from RI PY2018 (calculated in the section above), RI PY2016, and MA PY2017/18[1] custom electric studies. Table 3 and Table 4 below show the overall program results for lighting and non-lighting measures respectively.

Table 3: Combined interim results for lighting measures.

Parameter	RI		MA	Combined Results
	PY2016	PY2018	PY 2017/18	RI (PY2016+ PY2018) + MA PY2017/18
Tracking Energy Savings (kWh)	19,142,741	13,294,077	40,309,720	72,746,538
Sample Size (n)	3	10	10	23
RR	100%	84%	94%	94%
Relative precision@ 90% CI	±5.6%	±17.2%	±19.4%	±11.3%

Table 4: Combined interim results for non-lighting measures.

Parameter	RI		MA	Combined Results
	PY2016	PY2018	PY 2017/18	RI (PY2016+ PY2018) + MA PY2017/18
Tracking Energy Savings (kWh)	21,044,847	12,910,679	45,495,306	79,450,832
Sample Size (n)	8	14	21	43
RR	69%	80%	71%	72%
Relative precision@ 90% CI	±23.0%	±11.2%	±21.9%	±14.1%

DNV GL recommends using combined results from RI PY2016, PY2018, and MA PY2017/18 for planning and program reporting purposes until the results from a full M&V of PY2018 sampled sites (including Non-desk review results) or a new impact evaluation study results are available. This recommendation was based on:

- When pooled with RI PY2016, PY2018, & MA PY2017/18 results, the study produced an overall RR of 94% for lighting and 72% for non-lighting that met precision targets of ±15% relative precision at 90% confidence (actual: ±11.3% and ±14.1% for lighting and non-lighting respectively at 90% confidence level).

Other site-specific recommendations will be provided in the Final Program Report when a complete M&V of all sampled sites is completed.

1.4 RI PY2018 Desk Review Results

Table 5 below shows the discrepancies in evaluated savings based on desk-review adjustments and the three savings parameters for every site. Key findings of this desk review include:

- Three of the 21 sites had lighting baseline adjustments. All three sites were new construction applications, so a 0.78 lighting power density (LPD) adjustment factor was applied to the appropriate lighting code to represent lighting standard practice at the time of these applications. This lighting adjustment factor was developed as part of a MA impact evaluation of the Comprehensive Design Approach (CDA) program offering[2].
- The savings calculation methodology was updated for five sites. For example, in site RICE18C013-non-lighting, the tracking analysis did not account motor and VFD efficiencies in the calculations.
- Four sites had administrative or tracking error adjustments. For example, the tracking savings entered in the system for RICE18C013-non-lighting did not use the post-inspection/technical review results. This produced an administrative adjustment of +6% i.e., 66,452 kWh.

Desk review analysis spreadsheets are not included in this document but were provided to National Grid for review.

[2] DNV GL, Massachusetts Commercial and Industrial Impact Evaluation of 2014 Custom CDA Installations, April 2018, http://ma-eeac.org/wordpress/wp-content/uploads/MA_CIEC_Stage5_Report_P56_Custom_CDA_Final-Report_180514.pdf

Table 5: PY2018 Sample Desk Review Results and Case Weights.

Site ID	Measure	Tracking Energy kWh	Savings after:				Case Weight
			Baseline Adj.	Methodology Adj.	Admin / Tracking Adj.	Overall Adj. Ratio.	
RICE18C013	Lighting	1,458,742	1,458,742	1,458,742	1,458,742	100%	1.00
	Non-lighting	1,189,622	1,189,622	1,214,356	1,280,808	108%	1.00
RICE18C050	Lighting	14,941	7,000	7,000	7,000	47%	3.00
	Non-lighting	444,875	444,875	444,875	447,605	101%	3.00
RICE18C094	Lighting	14,280	14,280	14,280	14,280	100%	16.00
	Non-lighting	28,501	28,501	28,501	28,501	100%	16.00
RICE18L009	Lighting	155,676	155,676	155,676	155,676	100%	6.50
RICE18L025	Lighting	2,083,156	1,479,782	1,479,782	1,479,202	71%	2.33
RICE18L038	Lighting	778,503	778,503	794,073	794,073	102%	2.33
RICE18L049	Lighting	156,519	156,519	156,519	156,519	100%	6.50
RICE18L065	Lighting	622,407	622,407	622,407	622,407	100%	2.33
RICE18L098	Lighting	150,913	150,913	150,913	150,913	100%	6.50
RICE18L110	Lighting	229,992	229,992	229,992	229,992	100%	6.50
RICE18N002	Non-lighting	25,780	25,780	25,780	25,780	100%	16.00
RICE18N039	Non-lighting	1,700	1,700	1,700	1,700	100%	16.00
RICE18N040	Non-lighting	204,654	204,654	204,654	204,654	100%	5.50
RICE18N048	Non-lighting	156,660	156,660	156,660	156,660	100%	5.50
RICE18N053	Non-lighting	180,699	180,699	180,699	180,699	100%	5.50
RICE18N059	Non-lighting	166,970	166,970	156,330	156,330	94%	5.50
RICE18N084	Non-lighting	46,467	46,467	46,467	46,467	100%	16.00
RICE18N089	Non-lighting	266,504	266,504	254,181	254,181	95%	3.00
RICE18N106	Non-lighting	308,837	308,837	308,837	308,837	100%	3.00
RICE18N115	Non-lighting	541,928	541,928	525,603	525,642	97%	3.00
RICE18N148	Non-lighting	9,635	9,495	9,495	9,495	99%	16.00