

DRAFT REPORT

# Franchise Controls Deemed Savings Study

MA20C07-E-DUN

Date: March 12, 2021



# MA20C07-E-DUN EXECUTIVE SUMMARY

The purpose of the Franchise Controls Deemed Savings Study was to develop measure-level deemed savings estimates for a building automation system (BAS) measure that controls small individual food service appliances, such as toasters and coffee makers, at small franchise coffee and donut shops.

## RESULTS

Site Number/ Comparison Group	Billing Analysis (kWh)	M&V Analysis (kWh)
Site 1*	18,727	9,388
Site 2*	20,924	1,737
Site 3*	1,468	8,367
Site 4*	6,018	8,207
Site 5*	1,120	13,923
Site 6	N/A	10,562
Site 7	N/A	11,760
Avg. pre-post difference/savings	9,651	9,135
Tracking estimate	18,700	18,700
Avg. realization rate	52%	49%
Avg. consumption of sites 1-5	105,439	105,439
Percent of consumption saved	9.2%	8.7%
Full billing analysis estimate with comparison group**	5,344	N/A

\*Site-level results excluding impacts from the comparison group.

\*\*Average result for full population of billing analysis including the comparison group.

## Overview of methodology

To narrow focus on the BAS measure, we isolated five sites that had only installed BASes that controlled appliances and which were in both the M&V and billing analysis samples. In isolating the M&V sites within the billing analysis dataset, we could compare the small sample of M&V and billing results, and examine the influence of a comparison group on the billing results. Though the selection of these five sites was not representative, they provided a basis to compare the M&V and billing analysis methods, which provided more confidence that the billing analysis with the control group, which is representative, was the correct value to use.

## Implications of findings

The recommended deemed savings estimate for the BAS measure of 5,344 kWh is significantly lower than the current estimate of 18,700 kWh. This decrease is mostly due to operational changes impacting hours of use, which are mostly influenced by users overriding the BAS controls to use equipment during periods of equipment shutdown.\* The change in savings will need to be analyzed through means of cost-effectiveness to determine if the measure should be considered for future energy efficiency implementation.

\*Information on site-level discrepancy analysis can be found in the MA19C07-E-CUSTELEC study report.

## Conclusions and Recommendations

The five sites common to the two studies have average impacts of the same magnitude when viewed as a percentage of consumption. However, this comparison assumes that the pre-to-post consumption changes in the billing analysis column and the accompanying average for these five sites are all program driven. DNV GL makes the following recommendations:

- Given the similarity of savings as a percent of consumption between pre-post billing analysis and M&V savings results among this subset and the larger billing analysis study, use the overall billing analysis study results to inform the deemed savings estimate.
- Ensure the appliances planned to be packaged into the BAS are appropriate for the control measure, rather than applying the controls to the 8 greatest loads. Appliances such as ice machines, which do not benefit from controls, and appliances that were previously controlled in a similar fashion before the BAS installation should not be included in the BAS package.

The overall recommendation for the deemed savings estimate per BAS installed in a franchise site is **5,344 kWh**, or **4.0%** of site consumption.

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## List of acronyms used in this report

PA: Program administrator  
EEAC: Energy Efficiency Advisory Council  
BAS: Billing automation system  
RTU: Rooftop units  
DCV: Demand control ventilation  
NAC: Normal annual consumption

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## 1 INTRODUCTION

DNV GL carried out the Franchise Controls Deemed Savings Study for the Massachusetts Program Administrators (PAs) and Energy Efficiency Advisory Council (EEAC) Consultants from June through November 2020. The study's overall purpose was to develop measure-level deemed savings estimates for a building automation system (BAS) measure offered for small franchise coffee and donut shops, which are often installed with multiple other efficiency measures such as lighting retrofits and refrigeration controls. The measure applies time switch-based scheduling of small individual food service appliances (e.g., toasters and coffee makers), and often HVAC setback and exterior lighting. In this study we define Franchise Controls projects as those associated with a single vendor's BAS installed in small franchise coffee and donut shops. It is known that at least 124 unique sites across Massachusetts have installed this measure, and there are likely more.

This study's primary objective was to compile data from past evaluation studies to develop a recommended approach in handling the franchise control measures, and to provide a new measure-level savings value of the aggregated impact of the BAS controls independent of other measures installed concurrently, which is typically lighting and HVAC. The measure-level BAS result will be applied to the food service equipment controls portion of the measure, as it excludes lighting and HVAC impacts. Exposition on previously completed evaluation studies are given in the following sections.

Previously, these measures were analyzed through billing analysis in study P71<sup>1</sup> and most recently as part of the impact evaluation work for PY2017 small business (MA19C03-E-SBIMPCT)<sup>2</sup> and PY2017/18 custom electric (MA19C07-E-CUSTELEC)<sup>3</sup>. These prior studies found that the energy savings realization rates for these measures were low, which drove the need to better understand the actual achieved savings and potential for correcting issues that are causing the reduction in savings. This study conducts a deep dive of the savings at seven sites as a cross-check of the P71 results. We concluded that the P71 billing analysis results provided the most reliable estimates of savings for the BAS controls.

### 1.1 Study background

This study leveraged three different recent evaluation studies, where results from those studies were used as a basis to determine the optimal deemed savings estimate for the BAS measure. The historic studies are summarized in some detail in the following sections.

Currently, the program implementers use deemed savings estimates developed from the results of a small pilot study sponsored by program administrators to report savings for the BAS measure. The pilot study estimated savings using BAS trending of the on/off status of individual appliances with and without the scheduling control for a few weeks. Using this method, the deemed savings being claimed by the program was estimated to be 18,700 kWh saved per year. However, subsequent impact estimates from three ex-post evaluations suggest this deemed value is significantly over-estimated.

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<sup>1</sup> [http://ma-eeac.org/wordpress/wp-content/uploads/P71\\_Controls\\_ECDA\\_Memo\\_20190722.pdf](http://ma-eeac.org/wordpress/wp-content/uploads/P71_Controls_ECDA_Memo_20190722.pdf)

<sup>2</sup> <http://ma-eeac.org/wordpress/wp-content/uploads/Final-Report-MA19C03-E-SBIMPCT-03202020.pdf>

<sup>3</sup> [http://ma-eeac.org/wordpress/wp-content/uploads/MA\\_CIEC\\_Stage5\\_Report\\_C07\\_Custom\\_Electric\\_Impact\\_Evaluation\\_PY2017\\_18\\_FINAL-2020-06-01.pdf](http://ma-eeac.org/wordpress/wp-content/uploads/MA_CIEC_Stage5_Report_C07_Custom_Electric_Impact_Evaluation_PY2017_18_FINAL-2020-06-01.pdf)

### 1.1.1 Billing analysis project background

The P71 billing analysis project was driven by the search for a cost-effective way to estimate BAS savings in a sample of participants (customers who installed the BAS measure, and who may have also installed other measures concurrently such as lighting, HVAC and refrigeration) using readily available utility consumption data. Sites were compiled that included 12 months of pre-installation data and at least 11 months of post-installation data.

In preparation for the billing analysis, DNV GL developed comparison groups for the analysis. The goal of the consumption data analysis is to measure changes in consumption pre- to post-installation without including natural changes in consumption not due to the program. The use of the comparison group in the savings analysis removes these other changes in consumption—often referred to as exogenous changes—resulting from changes in fuel prices, general economic conditions, and the like. A matched comparison group method was used to develop the control group. Comparison group development used a minimal distance algorithm to find optimal non-participant matches for each participating site among eligible comparison group sites. Comparison group sites were matched to participants based on pre-installation electrical consumption and then assigned the same installation date as the participants with which they matched so that the same pre-post periods could be compared.

For the sites with sufficient post-installation data, a second stage regression model compared normal weather consumption from the pre-and post-installation customer-specific models for both participants and comparison groups to develop an estimate of savings under any weather condition. These results were aggregated to yield an average site-level estimate of savings across the population or broken out to measure-level estimates. The site-level savings approach estimates savings related to all measures installed at the site, addressing all interactive effects between BAS and other measures.

Table 1-1 shows the billing analysis results for BAS measures from the P71 larger billing analysis study, including the use of a comparison group to account for non-program-related changes in consumption. The comparison group and overall billing analysis population both comprised 124 franchise sites in the original study. The billing analysis result including the comparison group estimates savings of 5,344 kWh at 76% precision at a 90% confidence interval. That result represents only 4.0% of consumption. Finally, the realization rate of the final billing analysis result is 28.6%.

**Table 1-1. Full billing analysis results**

Values	Results (kWh)
Full billing analysis estimate with comparison group	5,344
Precision	76%
Full billing analysis consumption	133,911
% of consumption	4.0%
<b>RR vs ex ante of 18,700 kWh</b>	<b>28.6%</b>

It is essential to remember that this precision reflects variation across sites, including site consumption and site-level savings. Unlike sample precisions, this is not an expression of whether a small sample can be understood to meaningfully represent the population. In this case, the billing analysis includes a substantial portion of the population of customers who installed this measure. This precision passes typical statistical tests of significant difference than zero and shows with 90% confidence that the savings are between 1,274 and 9,414, with the mean at 5,344.

## 1.1.2 Engineering-based impact evaluation projects background

The franchise control projects found in both the MA19C03-E-SBIMPCT and MA19C07-E-CUSTELEC impact evaluation studies were consolidated into a coordinated analysis approach for analytical consistency, and to leverage a broader set of metered appliances across all appliance groups. This study used typical evaluation on-site EM&V methods to develop savings attributed to the BAS measure.

The baselines for the kitchen appliance BAS were derived from the PA Pilot using two weeks of baseline data. The baselines from this pilot date back to February/March 2016, with the assumption that the general consumption patterns for appliances are not subject to seasonal variations. That may be true relative to weather-related dependencies, but we suspect that some appliances, such as coffee makers, may exhibit seasonal variations, with more iced coffee consumed during the summer months and more hot coffee in the colder months of the year. DNV GL developed a baseline profile for each applicable equipment type from EMS data supplied as part of the PA Pilot. This data was then used to develop utilization profiles for each appliance type by taking the average hourly kW divided by the maximum hourly kW value in the PA Pilot data set. Average utilization profiles were developed for each group of similar appliance types.

The post-install appliance operating profiles were developed predominantly from data downloaded from the vendor EMS system. A full calendar year of hourly kW data was downloaded for all appliances involved with the controls scheme. From this data, the evaluator generated post-install profiles, using the same methodology that was used for the baseline profiles. In cases where the EMS data was bad or missing, post-implementation profiles were generated from the long-term M&V data. With baseline profiles generated from the PA Pilot data and post-install profiles generated from the actual, site-specific, EMS data, the pre and post energy consumption was calculated from the following relationship, where an 8,760 spreadsheet-based calculation model was built to calculate pre and post consumption for each hour of the year.

**Figure 1-1. Savings relationship**

$$\text{Savings} = \left[ \text{Appliance kW} \times \text{Baseline Profiles} \right] - \left[ \text{Appliance kW} \times \text{Post-Install Profiles} \right]$$

Table 1-2. Impact Evaluation Results lists the kWh savings and the realization rate determined for the BAS measure for each of the sites that conducted on-site EM&V.

**Table 1-2. Impact Evaluation Results**

Project	Site	BAS Savings (kWh)	Realization Rate
MA19C03-E-SBIMPCT	2017EH0091	9,388	50%
MA19C03-E-SBIMPCT	2017EH0159	10,562	56%
MA19C03-E-SBIMPCT	2017EH0128	8,207	44%
MA19C03-E-SBIMPCT	2017EH0141	11,760	63%
MA19C03-E-SBIMPCT	2017EH0129	13,923	74%
MA19C03-E-SBIMPCT	2017EH0102	8,367	45%

Project	Site	BAS Savings (kWh)	Realization Rate
MA19C03-E-SBIMPCT	2017EH0094	1,737	9%
MA19C07-E-CUSTELEC	2017-NGRID-1867	9,001	48%
MA19C07-E-CUSTELEC	2017-NGRID-2164	15,876	85%

The evaluated savings above differed from the pre-evaluation deemed or tracking savings for the measure mostly due to the reduced difference in assumed operating profiles for the appliances. Key details to discuss explaining measure shortcomings are as follows:

- The equipment selected for control differ among the PA Pilot sites and differ from the equipment mix being controlled in each site present in the M&V dataset. The installation vendor indicated that the top eight loads are selected for control (described in the PA Pilot program as the base + measure).
- The evaluators found instances where equipment controls did not work as intended or the energy consumption monitoring available in the EMS portal was missing or considered faulty. For example, at one site, we found the EMS data for the toaster to be invalid. Further investigation concluded that the toaster was not controlled, and therefore, the long-term metering of this toaster served as a proxy for toaster baseline operation.
- The BAS system turns appliances off during low-traffic hours. However, the system is equipped with override switches for the appliances, believed to be 30 minutes per instance. Differences between actual post-install operation with overrides and predicted operation could be a contributing factor in the deviations from evaluated to tracking savings estimates.
- There were instances where the pre and post operating schedules were similar for some appliances, negating savings for the controlled appliance. This was a key finding for certain appliance types such as ice machines, which were consistently found to be included within the BAS chosen appliances to be controlled, but which were not controlled. These uncontrolled appliances produced no savings in the evaluated sites.

## 1.2 Future research

There is potential to revisit the HVAC portion of the BAS measure when there is enough data gathered to make a more informed decision.

## 1.3 Organization of report

The remainder of this report is organized as follows:

- Section 2: Methodology and Approach
- Section 3: Data Sources
- Section 4: Analysis and Results
- Section 5: Conclusions, Recommendations, and Considerations

## 2 METHODOLOGY AND APPROACH

This study leveraged food service equipment control savings results from the MA19C03-E-SBIMPCT and MA19C07-E-CUSTELEC impact evaluations conducted in MA, as well as whole facility and measure-level savings conducted through a billing analysis done as part of P71, to inform on an updated deemed savings estimate for the food service appliance portion of the BAS. DNV GL performed a thorough review of the franchise controls measure to verify energy savings profiles for the food service equipment. Table 2-1 below summarizes each of the studies that were part of the review, showing the number of sites used in the original studies and the number of sites from those studies that were used in this study.

**Table 2-1. Study summary**

Study Name	Study Method	Number of Sites in Original Studies	Sites Included in this study
<b>P71</b>	Billing analysis with control group	N=124	N=5
<b>MA19C03-E-SBIMPCT</b>	On-site M&V	N=7	N=7
<b>MA19C07-E-CUSTELEC</b>	On-site M&V	N=2	N=0

### 2.1 Billing analysis review

Initially, one of the goals for the P71 study was to determine the feasibility of isolating the BAS measure within the billing analysis population. Data obtained from the billing analysis project was further analyzed under tighter restrictions, by re-running analysis using end-use descriptors with the intention to further isolate the BAS appliance measure from any other control type that may be integrated into it in the tracking data. Looking back into tracking data, it appears the measure description of BAS captures more than simply appliance BAS controls. For example, some sites lumped demand control ventilation (DCV) into BAS savings as well. Better understanding of the measure following the impact evaluations allowed the team to revisit the billing analysis sites and re-run the analysis by identifying appliance-specific BAS sites within the population utilizing the end-use descriptions from the tracking data. The end-use description was found to clearly identify measures within the project. Although HVAC measures were included with this BAS measure, the end-use descriptions also allowed us to filter out certain HVAC controls measures (such as DCV) that did not belong in the BAS category we were focusing on. Ultimately, we determined that there were no additional regressions that could be performed to pull the HVAC from the kitchen appliance portion of the BAS further than what was previously done as part of the original billing analysis.

### 2.2 M&V and billing analysis comparison

To narrow focus on the BAS measure, we isolated five sites that only installed BAS systems that controlled appliances and overlapped in both the M&V and billing analysis samples. There were originally nine sites that had M&V savings (two in the custom study and seven in the small business study). The two custom sites were removed as they contained additional measures (lighting and refrigeration). The remaining two small



business sites were not in the final billing analysis dataset but are included within the summary in Section 4. The final summary of sites included in the study can be observed in Table 2-1. In isolating the M&V sites within the billing analysis dataset, we were able to compare the small sample of M&V and billing results and further examine the influence of a comparison group on the billing results.

It should be noted that the BAS measure includes control savings for both kitchen appliances through scheduling and for RTUs for setpoint setback. Though the M&V analysis was able to calculate savings for these sub-measures individually, the billing analysis measure encompassed both sub-measures within the BAS measure. The RTU setback controls consisted of roughly 5% of total tracking measure savings. The site M&V findings indicated that savings from the RTU controls were marginal at best. With these points in mind, we determined that the billing analysis measure results were largely reflective of kitchen appliance BAS impacts.



### 3 DATA SOURCES

The data used in this study comprised datasets used in the previous evaluation efforts involving franchise controls. Additional data was not collected for this study. Information on data sources for those studies could be found in the respective memos for the billing analysis study (P71)<sup>4</sup>, PY2017 small business study (MA19C03-E-SBIMPCT)<sup>5</sup>, and PY2017/18 custom electric study (MA19C07-E-CUSTELEC)<sup>6</sup>.

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<sup>4</sup> Ibid., 1.

<sup>5</sup> Ibid., 1.

<sup>6</sup> Ibid., 1.

## 4 ANALYSIS AND RESULTS

We compared savings estimated from two sources:

- Site specific results:
  - Pre/post billing results for five of the P71 sites
  - MA19C03-E-SBIMPCT impact study results for seven sites, five of which were also in the P71 analysis dataset
- Aggregate billing analysis results from P71

### 4.1 Site-specific results

Table 4-1 below presents the P71 pre-post consumption changes and the MA19C03-E-SBIMPCT M&V analysis results for the five sites common to both studies, plus the two additional MA19C03-E-SBIMPCT M&V sites that were not present in the P71. All sites included only installed BAS controls as no other measures were installed concurrently. It should be noted that the current tracking deemed savings tracking estimate for the BAS measure is 18,700 kWh.

**Table 4-1. Billing and M&V analysis site-level results and comparison**

Site # / Comparison Group	Site-Specific Billing Analysis		M&V Analysis	
	kWh	RR	kWh	RR
Site 1*	18,727	100%	9,388	50%
Site 2*	20,924	112%	1,737	9%
Site 3*	1,468	8%	8,367	45%
Site 4*	6,018	32%	8,207	44%
Site 5*	1,120	6%	13,923	74%
Site 6	N/A	N/A	10,562	56%
Site 7	N/A	N/A	11,760	63%
<b>Average pre-post difference/savings</b>	9,651	52%	9,135	49%
<b>Average consumption of sites 1-5</b>	105,439	N/A	105,439	N/A
<b>Percent of consumption saved</b>	9.2%	N/A	7.9%	N/A

\*Results of billing analysis sites with the comparison group excluded.

Average pre-post normal annual consumption (NAC) results from the billing analysis are roughly similar to the M&V savings for the five common sites examined, as shown in the averages below the series of site-level results. We do note that the billing analysis average masks substantial variability in the site-level pre-post NACs. Despite this, the billing analysis average pre-post consumption difference is 9,651 kWh, or roughly 6% higher than the M&V average of 9,135 kWh. These results represent an approximate 50% realization rate (52% for BA and 49% for M&V sites) compared to the current deemed savings value. As a percent of average consumption, these values are nearly the same, at 9.2% for the billing analysis group and 7.9% for the M&V sites (comprising of the five sites common to both studies). It should be noted that the results shown in the table above are not directly used to update the deemed savings estimate, but are used to inform the final result.

## 5 CONCLUSIONS, RECOMMENDATIONS, AND CONSIDERATIONS

### 5.1 Conclusions

The five sites common to the two studies have average impacts (pre-post difference in consumption from the billing analysis and average savings from the M&V analysis) that are similar at 9,651 kWh and 9,135 kWh and of the same magnitude when viewed as a percent of consumption. However, this comparison assumes that the pre to post consumption changes in the billing analysis column and the accompanying average for these five sites are all program driven.

One possible conclusion from these results is that the M&V sites are on the higher end of the savings spectrum compared to the billing analysis sites given the small sample of M&V sites compared to the full billing analysis population. There is possibility that the savings across a larger subset of M&V sites would have a lower average that might approach the billing analysis results after adjusting for the comparison group as is illustrated in the P71 results. We examined this possibility and found no evidence that the M&V sites were biased high. In fact, when comparing this subset of five M&V sites to the overall context of the billing analysis population, the M&V sites had lower savings in comparison.

Another possibility is that the baseline in the M&V sites does not reasonably capture the operation of controlled systems absent the BAS. Before the controls were activated at these sites included as part of the PA pilot, baseline energy consumption was collected, on average, for 14 days. We developed evaluated baseline utilization profiles for each applicable equipment type from EMS data supplied as part of the PA pilot. Utilization profiles were developed for each appliance type by taking the average hourly kW divided by the maximum hourly kW value in the PA pilot data set. For each similar appliance type, we calculated an average utilization profile. Based on this information, we believe the M&V baselines provide an accurate representation of their pre-control operation.

Given our confidence in the representativeness of the small sample, the methods to develop the M&V baseline, and that the billing analysis does not present evidence the M&V savings are incorrect, we are inclined to deem the M&V results reasonable.

The similarity of savings as a percent of consumption between the pre-post billing analysis and M&V savings results among the overlapping subset indicates the two analyses are in agreement regarding individual site-level effects. The full billing analysis, incorporating far more sites and a comparison group, produces a result that is grounded in both more participant data and a consideration of non-program, exogenous trends. Given the parallels between the two analyses, but the ultimate overall strength of the billing analysis result, we recommend using the overall billing analysis study results to inform the deemed savings estimate.

As a quick sanity check to vet the results, we can use the P71 billing analysis results for the overall site savings (BAS system plus other measures including lighting savings), where the results showed a much better precision, to back out an estimate of the BAS realization rate as follows:

- The P71 billing analysis resulted in an overall site level (BAS system plus other measures including lighting savings) evaluated savings of 18,421 kWh (with a 14% relative precision at a 90/10 confidence interval), yielding a 49% realization rate when comparing to average tracking savings of 37,908 kWh.
- Overall lighting evaluation realization rates typically yield at least 85%.

- After applying the 85% realization rate to all lighting savings in the billing analysis data set and adding them up, site level savings yield roughly 14,000-15,000 kWh.
- This leaves about 4,000-5,000 kWh for the BAS in order to achieve the 49% realization rate for the billing analysis results mentioned above,
- This result lines up well with the 5,344 kWh presented in this study.

## 5.2 Recommendations and considerations

### 5.2.1 Recommendation 1: Deemed savings of 5,344 kWh per site with franchise controls

The primary recommendation is to use the full P71 billing analysis result for the BAS measure alone to inform the updated deemed savings estimate. Accordingly, we recommend a deemed savings estimate per BAS system installed in a franchise site of 5,344 kWh, or 4.0% of site consumption.

### 5.2.2 Consideration 1: Implementers should monitor RTU baseline setpoint to estimate savings and verify setback

Though this study aimed to develop a recommended approach for the kitchen appliance portion of the BAS measure, there was also an HVAC control portion packaged in the measure. Both M&V studies were consistent in the finding that savings from the RTU controls were marginal at best. Current deemed RTU savings (500 kWh per RTU controlled) were developed through a separate pilot study at a different quick-serve restaurant chain. Savings were averaged between the site participants and rolled into a general savings package based on the number of RTUs incorporated. Savings were then arbitrarily reduced for the coffee shops because they are smaller than the quick-serve restaurant chain from the pilot study.

Savings for the RTUs were based on setback/set forward where the average setpoints were 72 for cooling and 68 for heating. Both M&V studies were consistent in the finding that sites were not setting back/forward the equipment as intended. Instead, RTU setpoints were found to be fairly similar, if not set beyond the pre-established setpoints (e.g., setting to 67 for cooling). If HVAC savings are to be pursued, we recommend monitoring baseline setpoints more closely and ensuring controls are setting back in order to claim savings.

### 5.2.3 Consideration 2: Implementers should exclude equipment for which scheduled control is inappropriate

The vendor package includes adding BAS controls to the eight largest loads at each location. There were some appliances, such as ice machines, that were consistently included in the BAS package but were found not to be following a controlled schedule. By the nature of the machine, a controlled schedule would cause formed ice to defrost, resulting in poor ice machine performance and result in the measure being disabled. This was troublesome as some sites included multiple ice machines within this BAS package, and not all were controlled. Situations like this immediately reduce the savings potential for the site. Some sites also installed BAS controls to outdoor lighting. This would be appropriate if the site did not have a similar control strategy, such as a timeclock, in place already, resulting in no incremental savings. All sites analyzed through M&V protocol were found to control the outdoor lighting, where all sites had a timeclock already in the baseline condition.



We recommend ensuring the appliances planned to be packaged into the BAS are appropriate for the control measure, rather than applying the controls to the eight largest loads. Appliances such as ice machines that do not benefit from controls, and appliances that were previously controlled in a similar fashion, should not be included in the BAS package.

#### 5.2.4 Consideration 3: Perform longer-term pre and post metering as part of the next ex ante evaluation process

The BAS measure requires extensive end-use level monitoring to support savings for the controls claim. Part of the PA Pilot captured two weeks' worth of pre-installation data for site participants. To continue supporting this measure, after some of the above recommendations are taken, it is worth considering the pursuit of a longer period of baseline data as well as more post data to produce actual site-level measure savings. At least six months of baseline data will provide insight into seasonality differences between appliance operation. Additional ex-ante metering could be included as part of a commissioning process for some installations.

#### 5.2.5 Consideration 4: Require independent commissioning for installed projects

During the impact evaluation studies, the evaluators found instances where equipment controls did not work as intended or the energy consumption monitoring available in the EMS portal was missing or considered faulty. As mentioned previously there was an example for one site where EMS data for the toaster was found to be invalid. Further investigation concluded that the toaster was not controlled. This is an issue presented where the vendor installing the work also commissions their own work where issues like these are often lost or overlooked. The PAs should consider the requirement of independent commissioning when installing projects to ensure the measure is operating as intended and of sufficient rigor.



## About DNV GL

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