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May 18, 2018

VIA HAND DELIVERY
Ms. Carlotta S. Stauffer
Division of the Commission Clerk and Administrative Services
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Re: Docket No. 2018000-EI
Florida Power & Light Company's 2017 Demand Side Management Annual Report

Dear Ms. Stauffer:

I enclose for filing in the above docket Florida Power & Light Company's ("FPL's") Request for Confidential Classification of Information Provided in Response to Staff's First Data Request (No. 7). The request includes Exhibits A, B (two copies), C and D.

Exhibit A consists of the confidential documents, and all the information that FPL asserts is entitled to confidential treatment has been highlighted. Exhibit B is an edited version of Exhibit A, in which the information FPL asserts is confidential has been redacted. Exhibit C is a justification table in support of FPL's Request for Confidential Classification. Exhibit D contains the declaration in support of FPL's request.

Please contact me if you or your Staff has any questions regarding this filing.

Sincerely,

AWright for William P. Cox
William P. Cox

Enclosure
cc: Nathan Whitchurch (w/ copy of FPL's Request for Confidential Classification)

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BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Florida Power & Light Company's 2017 Demand Side Management Annual Report	Docket No. 20180000-EI Filed: May 18, 2018

FLORIDA POWER & LIGHT COMPANY'S
REQUEST FOR CONFIDENTIAL CLASSIFICATION
OF INFORMATIONPROVIDED IN RESPONSE TO
STAFF OF THE FLORIDA PUBLIC SERVICE COMMISSION'S
<u>FIRST DATA REQUEST (NO. 7)</u>

Pursuant to Section 366.093, Florida Statutes, and Rule 25-22.006, Florida Administrative Code, Florida Power & Light Company ("FPL") requests confidential classification of certain information provided in response to the Staff of the Florida Public Service Commission's ("Staff") First Data Request (No. 7) ("Confidential Discovery Responses"). In support of its Request, FPL states as follows:

1. On April 29, 2018, Staff served its First Request (Nos. 1-9) on FPL. FPL's Response to Staff's First Data Request No. 7 contains information of a confidential nature within the meaning of Section 366.093(3), Florida Statutes.

2. FPL served its responses to Staff's First Data Request (Nos. 1-9) on May 18, 2018. This request is being filed contemporaneously with the service of the responses to Staff's discovery in order to request confidential classification of the Confidential Discovery Responses consistent with Rule 25-22.006, Florida Administrative Code.

3. The following exhibits are included with and made a part of this request:

a. Exhibit A consists of a copy of the Confidential Discovery Responses on which all information that FPL asserts is entitled to confidential treatment is highlighted.

b. Exhibit B consists of an edited version of the Confidential Discovery Responses on which all information that FPL asserts is entitled to confidential treatment is redacted. For the documents that are confidential in their entirety, FPL has included only identifying cover pages in Exhibit B.

c. Exhibit C is a table containing a page-and-line identification of the information highlighted in Exhibit A and a brief description of the Confidential Information. Exhibit C also references the specific statutory bases for the claim of confidentiality and identifies the declarants who support the requested classification.

d. Exhibit D contains the declaration of Thomas R. Koch in support of this Request.

4. FPL submits that the highlighted information in Exhibit A is proprietary confidential business information within the meaning of Section 366.093(3), Florida Statutes. This information is intended to be and is treated by FPL as private, and its confidentiality has been maintained. Pursuant to Section 366.093, such information is entitled to confidential treatment and is exempt from the disclosure provisions of the public records law. Thus, once the Commission determined that the information in question is proprietary confidential business information, the Commission is not required to engage in any further analysis or review such as weighing the harm of disclosure against the public interest in access to the information.

5. As the description included in Exhibit C and the declarations included in Exhibit D indicate, the Confidential Discovery Responses provided by FPL contains information concerning bids or other contractual data, the disclosure of which would impair the efforts of FPL to contract for goods and services on favorable terms. This information is protected by Section 366.093(3)(d), Fla. Stat.

6. Additionally, certain information relates to the competitive interests of FPL and its vendors, the disclosure of which would impair their competitive interests. This information is protected by Section 366.093(3)(e), Fla. Stat.

7. Upon a finding by the Commission that the Confidential Information remains proprietary and confidential business information, the information should not be declassified for at least an additional eighteen (18) month period and should be returned to FPL as soon as it is no longer necessary for the Commission to conduct its business. *See* § 366.093(4), Fla. Stat.

WHEREFORE, for the above and foregoing reasons, as more fully set forth in the supporting materials and affidavits included herewith, Florida Power & Light Company respectfully requests that its Request for Confidential Classification be granted.

Respectfully submitted,

William P. Cox
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Email: @Will.P.Cox@fpl.com

By: ______________________
William P. Cox
Florida Bar No. 0093531

CERTIFICATE OF SERVICE
Docket No. 20180000-EI

I HEREBY CERTIFY that a true and correct copy of the foregoing Request for Confidential Classification* has been furnished by electronic service this 18th day of May 2018 to the following:

Nathan Whitchurch
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399

By: [signature]
William P. Cox
Florida Bar No. 0093531

* The exhibits to this Request are not included with the service copies, but copies of Exhibits B, C and D are available upon request.

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EXHIBIT A

CONFIDENTIAL

FILED UNDER SEPARATE COVER

EXHIBIT B

REDACTED COPIES

1

FPL Smart Thermostat Trial Final Report

1.1 Executive Summary

Florida Power and Light (FPL) performed a Smart Thermostat Trial (STT) to explore the effects of the installation of smart thermostats in residential homes. In addition to providing trial participants with the ability to control their thermostats through smart phone applications, the smart thermostats allowed FPL to conduct load control events by controlling the cycling of the homes' heating, ventilation, and air conditioning (HVAC) systems. Roughly half of the homes in the STT were randomly given the ability to override the load control while the rest could not. These two segments are referred to henceforth as the Override and No Override groups. To assess the effects of the thermostats on the pilot's participants, Itron completed an impact evaluation to determine the level of energy conservation achieved by the smart thermostats, estimate the impact of the load control on the event days, and characterize participants based on their thermostat set-points and override behavior.

A summary of the key energy impact metrics for the STT developed by the impact evaluation is presented below in Table 1-1. With respect to conservation effects, the analysis found statistically significant energy savings in both the winter and summer months. [redacted]

One aspect of the winter savings estimates is that heating degree days were not used in the model, so none of the savings is explicitly associated with heating. [redacted]

[redacted]

[1] This metric carries some important caveats. First, whereas the total household consumption comes directly from the interval data, the air conditioning kWh are estimated based on the coefficient for cooling degree days from the same daily consumption regression models used to estimate energy savings. It is possible that some cooling-related consumption is included in the baseline usage – or intercept – from this model. Second, there are likely some savings associated with heating. Because heating degree days were not included in the energy savings analysis – either for determining baseline usage or for estimating impacts – there is no way to estimate what portion of either savings or household consumption are associated with heating.

[redacted]

The impact of the load control on the event days showed substantial load curtailment during the event hours in the summer months. [redacted] The impacts for all load control hours and overall are presented in Table 1-2, with the summer peak hour in a shaded column.

Table 1-2: Summary of Hourly Summer Load Control Reductions

Group	3 PM – 4 PM	4 PM – 5 PM	5 PM – 6 PM	6 PM – 7 PM	Average
[redacted]					

To provide a visual representation of the average event impacts, Figure 1-1 shows for both groups the average observed hourly kW for the summer event days along with the hourly reference kW, which represents an estimate of what would have happened in the absence of an event. The four hours of the control period from 3 PM to 7 PM are shaded in light gray and FPL's peak hour of 4 PM to 5 PM is shaded in dark gray. The annotated values show the kW load reduction or increase for the four control hours and the two hours after, when snapback occurs as homes resume HVAC use. The peak hour impacts are easily discernible in the plots. For example, the 0.63 kW load reduction for the No Override group is represented by the difference between the reference and

[2] The differences in impacts for the load control hours between the Override and No Override groups shown in the tables and graphs were not statistically significant at the 0.05 level.

observed loads for the two points in the dark gray area. The average hourly kW reduction is less clear, as it is based on the difference between the average values for the reference and observed loads during the control period. Overall, the differences between the two groups are small, though the Override group does show a more marked decrease in load reduction in the last hour of the event and a substantially lower snapback effect in the two hours following the event. If anything, a more substantial impact of the ability to override is that it appears to mitigate the snapback effect. The larger snapback effect in the No Override group is likely due to a larger share of the HVAC systems resuming operation at the same time. In general, each summer event showed a similar pattern across all event days. These individual event-specific plots are provided in Appendix 1.

[redacted]

In contrast to the clear influence of the summer curtailment events, the analysis of the winter events did not produce any evidence for savings. This lack of winter impacts appeared to have two related root causes, which were ascertained by analyzing 15-minute interval data on equipment operation from the smart thermostats. First, few of the homes were using any heat whatsoever on the event days. Second, of those that were using heat, most were already cycling their heat at 50% or less so the event had no effect other than to synchronize all the homes' cycling schedule. Itron analyzed the winter events separately because the conditions associated with each of them were substantially different. For example, the first winter event on January 17, 2014 occurred on the second day of a cold spell and approximately 40% of homes were using their heating. In contrast, the second winter event on February 14, 2014 occurred following a relatively warm day and only about 22% of homes where using their heating systems. While the limited heating on both event days was not promising, the intent in modelling the events separately was to see if at least the first event on the colder day would result in statistically significant impacts. Nevertheless, neither event resulted in any evidence for savings for winter load control. In spite of not having any impacts, in the interest of completeness, Figure 1-2 and Figure 1-3 provide visual representations for the January 17 and February 14 events, respectively.

[redacted]

[redacted]

1.2 Introduction

FPL performed the STT to test the performance of smart thermostat technology in residential homes. The smart thermostats employed had the potential for energy savings by offering participants the ability to control their thermostats through smart phone applications. The smart thermostats also allowed FPL to conduct load control events by controlling the cycling of the homes' heating, ventilation, and air conditioning (HVAC) systems, providing opportunities for better management of the power grid. While programmable thermostats (PTs) are not new, FPL believes that the technology associated with the pilot (thermostat and broadband and mobile communications) has evolved significantly since last testing programmable communicating thermostats in 2009. This study investigated the impact of the smart thermostats in a sample of residential homes running through 2014.

The objectives of this study were threefold. First, the study sought to measure the energy conservation savings associated with smart thermostats. Second, the study attempted to measure the demand impacts of HVAC cycling events facilitated by the smart thermostats. Finally, the study looked to assess the customers' response to having smart thermostats installed in terms of programming behavior.

[redacted]

[redacted]

[redacted]

The effect of the thermostats was estimated by using both a dummy variable (Treatment = 1 × Post = 1) and this same dummy variable interacted with CDD for the winter and summer months separately. Itron included the interaction of participation with weather since the regulation of cooling by the thermostat is assumed to be the source of energy savings.

Summer Energy Savings

The overall summer model was statistically significant. The parameter estimates for key variables are presented in Table 1-6. The variables of interest are in red. The parameter indicating the effects of the treatment had the correct sign to indicate savings was statistically significant. The parameter indicating the effects of the CDD on the treatment group has the correct sign to indicate savings but was not statistically significant. The lack of significance in that variable suggests that the level of CDD during the summer months is not a factor in energy savings, yet simply having the thermostat installed resulted in savings. This is likely due to the thermostat set point of the treatment group compared to the control group which is discussed in more detail later in this report.

Table 1-6: Key Parameter Estimates from Summer Daily kWh Regression Model

Parameter	Estimate	Standard Error	t Value	Pr > |t|
[redacted]				

To calculate the estimated savings, one must multiply the estimate for the interacted variable by the average CDD during the treatment period and then add it to the estimate for the simple dummy for program participation. Following these steps, the model estimates 1.65 kWh per day savings in the summer, which is similar to what the simple DiD approach produced. However, because variables in the model account for so much more of the variability ($R^2 = .67$) in the dependent variable, the standard errors for these impacts are substantially lower.

Table 1-7: Summer Daily Energy Savings of Smart Thermostats

Season	Treatment	Treatment × CDD	Average Daily CDD	Total Daily Savings	% of Average Daily kWh
[redacted]					

Hourly Energy Savings

The energy savings models based on daily consumption generate more reliable estimates of energy savings due to less unexplained variability, but for two reasons Itron estimated hourly models of energy savings. First, the effects of the thermostats should vary by the time of the day, so there was value in characterizing the impacts to verify that they conform to expectations. Second, to the extent that there are savings that occur during FPL's summer peak hour, such an analysis helped to quantify those impacts.

The model specification to estimate hourly energy savings was the same as that used for the daily model except that they were done separately for weekends and weekdays. In terms of a general characterization of the hourly energy savings, Figure 1-6 and Figure 1-7 show the hourly impact on the average weekday and weekend, respectively. As expected, the hourly impact on weekdays show substantial savings during the day when people likely have their thermostats set higher while they are at work. Later in the evening, their observed consumption goes higher than the reference line[4] indicating higher consumption, due to either a small snapback effect or the more intentional programming of the thermostat. In contrast, the weekend hourly impact is not as substantial. For example, there is no obvious thermostat set back in the morning as one would see around 8 AM on the weekday.

[4] Reference line is often referred to as the baseline. In this analysis, this is the household load profile in the absence of the treatment effect; i.e., no smart thermostat programming and load control.

[redacted]

[redacted]

Given the apparent energy savings during the afternoon and early evening on summer weekdays, of greater interest to FPL are the savings during the peak hour from 4 - 5 PM, and particularly on hot days. Table 1-8 shows the hourly reference and observed kW along with the impacts for average summer weather and peak hot days. The average summer day impacts are based on the average cooling season (April through October) weekday temperatures. The peak day impacts were based on averages for the top 20 non-holiday and non-event weekdays in terms of maximum temperature.

Table 1-8: Summer Weekday Energy Savings for Average Day and Peak Hot Day

[redacted]

[redacted]hough as one saw in Figure 1-6, this is an hour where the thermostat savings are starting to diminish relative to the other afternoon hours. Of the two parameters used to estimate savings, only the variable associated with base savings was statistically significant[5]. It is worth noting the savings for peak day weather, while larger in absolute terms, are lower as a percentage of baseline usage than the average summer day, which is due to the higher temperatures resulting in substantially higher baseline consumption.

[redacted] In spite of this, it is important to note that the goodness-of-fit statistics from many of the hourly models are quite low, with very poor precision. For the results of this study, while the hourly profiles are both informative and intuitive – and certianly useful in certain hours – Itron has far more confidence in using the estimates from the daily energy savings models for the reported evaluated impacts.

Winter Energy Savings

Similarly, the overall winter model was statistically significant. The parameter estimates for key variables are presented in Table 1-9. The variables of interest are in red. In the winter months, both parameters of interest indicate savings occurred and both parameters were statistically significant. The significance of the treatment interacted with CDD suggests that temperature had an effect on the savings resulting from the smart thermostat. The hypothesis is that during the summer months, air conditioning is continually running because it is always hot, so the level of heat has less effect. In the winter months, air conditioning is only turned on when it is warm enough to need it, which results in more of an effect due to CDD. As noted early, there did not appear to be an effect on kWh as the temperature decreased in the winter months. Therefore, no HDD was used in the winter model, which means that there are no savings explicitly associated with heating.

Table 1-9: Key Parameter Estimates from Winter Daily kWh Regression Model

Parameter	Estimate	Standard Error	t Value	Pr > |t|
[redacted]				

As with the summer impacts, to calculate the estimated savings one must multiply the estimate for the interacted variable by the average CDD during the treatment period and then add it to the

[5] The impacts are based on two variables in the regression model. The first is a dummy variable intended to capture base impacts, which for the peak hour had a parameter estimate of -0.152 (t = -5.290, p. <.001). The second was a dummy variable interacted with CDH, which had a parameter estimate of -0.002 (t = -0.721, p. = 0.471). The precision of the estimated savings with 90% confidence is +/- 14%.

estimate for the simple dummy for program participation. Following these steps, the model [redacted] which is similar to what the simple DiD approach produced. However, because variables in the model account for so much more of the variability (R^2 = .61) in the dependent variable, the standard errors for these impacts are substantially lower.

Table 1-10: Winter Daily Energy Savings of Smart Thermostats

Season	Treatment Estimate	Treatment × CDD Estimate	Average Daily CDD	Total Daily Savings (kWh/day)	% of Average Daily kWh
[redacted]					

A common concern with a program using a new technology such as smart thermostats is that the effect will decrease over time as the customer's interest in the product wanes. To test the energy savings persistence, Itron estimated the effects of the winter months of January, February, and March when the thermostats were newly installed separately from November and December after the customers had been using the thermostats for almost a year. The results of this comparison are presented in Table 1-11, which shows the model parameters, and Table 1-12, which shows how the results translate into daily energy savings. As expected, the estimated savings from conservation decreased later in the year, although significant savings were still found. This is not conclusive evidence that persistence could be a problem, but does suggest that it is a worthy research question for future studies.

Table 1-11: Key Parameter Estimates from Early vs. Late Winter Daily kWh Regression Model

Winter Period	Parameter	Estimate	Standard Error	t Value	Pr > |t|
Early	Treatment × Post	-0.75	0.22	-3.36	0.0008
Early	Treatment × Post × CDD	-0.17	0.07	-2.60	0.0094
Late	Treatment × Post	-0.46	0.27	-1.68	0.0921
Late	Treatment × Post × CDD	-0.11	0.06	-1.81	0.0696

Table 1-12: Winter Daily Energy Savings of Smart Thermostats by Early vs. Late in the Program Year

Winter Period	Treatment	Treatment × CDD	Average Daily CDD	Total Daily Savings (kWh/day)	% of Average Daily kWh
[redacted]					

To further investigate the impact of the smart thermostats on energy savings during the winter, Itron ran the regression for each hour. Figure 1-8 and Figure 1-9 show the hourly impact on the average weekday and weekend, respectively. Similar to the hourly impact on weekdays in the summer months, the winter shows the most savings during the day when people are at work. Around the 8 AM hour, there is a spike in observed consumption followed by the thermostat set back. Unlike the summer months, there is no apparent snapback effect in the evening likely due to the lower temperatures. The weekend hourly impact is not as substantial as the weekday, though it is still clearly visible in the plots. Again, there is no obvious thermostat set back in the morning but there are visible savings at mid-day.

[redacted]

[redacted]

1.7 Demand Impacts from Load Control

On specific days, FPL controlled either air conditioning or electric space heating by sending a signal to the smart thermostats to cycle the HVAC equipment in question. The control took the form of cycling the HVAC equipment off 50% of the time; often referred to as 50% cycling. As long as the actual duty cycle of the HVAC during the controlled hours was greater than 50%, the cycling resulted in a reduction in load. A list of the ten events for 2014 is presented in Table 1-13, along with the event start and end times, the HVAC equipment controlled, and the number of participants included in the analysis.

is that it mitigates this day to day variability to allow the model to more accurately capture program impacts.

[redacted]

The influence of the type of variability illustrated in Figure 1-10 was apparent in the results from the models for individual households. Consequently, the estimated impacts presented here are based on the models that used aggregated data. The analysis of the aggregate data was further divided in two ways. First, the analysis was conducted separately for the two types of treatment groups (Override and No Override). Second, the analysis was done separately for summer and winter events.

The final regression model used in this analysis for both summer and winter events for the two treatment groups was as follows:

[redacted]

Where:

[redacted]

Note that for estimation of winter impacts, due to markedly different weather conditions on the two event days, each event was modeled separately.

1.7.1 Summer Impacts by Override Group

The regression models for the Override and No Override group both resulted in similarly high goodness-of-fit statistics, with adjusted R^2 statistics of .916 and .914, respectively. Summaries of the hourly impact parameters and how they translate into average day impacts are presented in Table 1-14 and Table 1-15 for the two treatment groups. The hours of interest are those of the control period from 3 PM to 7 PM (presented in the darkly shaded rows with FPL's peak hour of 4 PM to 5 PM in bold text) and the two hours following, which help to assess any snapback effects (in lightly shaded rows). For both treatment groups, the regression models resulted in statistically significant negative parameter estimates during the four event hours, which are indicative of load reductions. In the two hours following the event, the models resulted in statistically significant positive parameter estimates, indicating a snapback effect. These parameter estimates represent the kW per CDH, so to convert these into impacts for the average event day they are multiplied by the average hourly CDH across the event days.

At the bottom of the table are summary rows showing the total kWh for the entire day, the event hours, the snapback hours, and the event and snapback hours combined. While the summary of the entire day is presented primarily for thoroughness, the final three summaries provide the total energy savings, the energy consumption associated with snapback, and the net energy savings, respectively.

Table 1-14: Average Summer Hourly Load Impact on Event Days in kW for the No Override Group

Regression Model Statistics	Average Event Day Summary
[redacted]	[redacted]

Table 1-15: Average Summer Hourly Load Impact on Event Days in kW for the Override Group

Regression Model Statistics					Average Event Day Summary				
Hour Ending	Parameter Estimate	t Value	Pr > |t|	Standard Error	Mean °F	Reference kW	Observed kW	kW Impact	Percent Load Reduction
[redacted]									

The effects of the load control events are presented graphically in Figure 1-11. This shows the average observed load, which is the average of the actual loads on event days, and the average reference load, which represents an estimate of what would have occurred in the absence of the event. It is apparent by the increased slope of the Override group that they begin overriding roughly one hour into the event. Once the event is over, the No Override group shows a larger snapback effect which is likely the result of additional cooling that must occur compared to the group who had the ability to override during the event. In addition to this figure for the average event day, Itron calculated the observed and reference loads for each of the individual event days, which are presented in graphical representations in Appendix 1.

[redacted]

[redacted] so one should be hesitant to ascribe any meaning to these counter-intuitive differences. As an illustration of this, Figure 1-12 shows the estimated impacts by group for the control period and the three hours before and after along with the 90% confidence bands. These bands (shaded with dotted outline for the No Override group and no shading with a solid outline for the Override group) indicate the range where the impacts would likely fall 90% of the time given the variability in the data. The third hour of the control period – which is when one would expect overrides to show more influence – is annotated with an arrow and text as to emphasize that the impact for the No Override group falls well within confidence band for the Override group. In contrast, the first hour after the event is also annotated, showing that the estimated snapback effect for the No Override group falls outside of confidence band for the Override group.

[redacted]

[redacted]

As a final observation on the summer event impacts, the ability of participants to opt out would seem to be a potentially significant factor. In the case of this STT, however, the influence on impacts appears to be marginal at most. For one, relatively few participants used their override capability during the summer event. As shown in Table 1-16, the August 21 event had the most participants opting out, yet just 15 of 95 elected to override the event. Additionally, the overrides were rarely for the full duration of the event. For example, the average time at which participants opted out was always after 4 PM, or at least one hour after the event start time of 3 PM. For several events, the average time to opt out was after 5 PM. The small number of homes opting out along with timing of the overrides meant that the number of minutes overridden was only a small percentage of the total, ranging from low of 2.3% to a high of 10.3%.

gradual rollout of the control preferable from a system perspective. Note that this phenomenon appears for the Override group as well, although there is also the influence of event overrides to consider.

[redacted]

[redacted]

[redacted]

the kWh scale, the defined slope is not as obvious. These data are presented in tabular format in Table 1-17.

[redacted]

Table 1-17: Average 15-Minute Snapback During Summer Events

[redacted]

1.7.2 Winter Impacts by Override Group

Unlike the summer event days, the winter events did not show any obvious impact on load curtailment. The regression results for the final models, which estimated impacts separately for the treatment groups and the two event dates, are presented in Table 1-18, Table 1-19, Table 1-20, and Table 1-21. For the sake of consistency with the summer impacts, the results are presented for the entire day, but the key results are for hours ending 7 AM and 8 AM, which represent the event period (in dark gray, with FPL's winter peak hour in bold text), and the two hours after, where any potential snapback might occur (in light gray). In the case of the January event day, which was the colder of the two winter events and on the second day of a cold streak, the model did result in negative parameter coefficients for the impact variables, but they were not statistically significant. For the February event, only one of the event hours for the No Override group was negative, but again it was not statistically significant.

Table 1-18: Winter Load Impact on January 17 in kW for the No Override Group

	Regression Model Statistics				Average Event Day Summary				
Hour Ending	Parameter Estimate	t Value	Pr > |t|	Standard Error	Mean °F	Reference kWh	Observed kWh	kWh Impact	Percent Load Reduction
[redacted]									

Table 1-19: Winter Load Impact on January 17th in kW for the Override Group

	Regression Model Statistics				Average Event Day Summary				
Hour Ending	Parameter Estimate	t Value	Pr > |t|	Standard Error	Mean °F	Reference kWh	Observed kWh	kWh Impact	Percent Load Reduction
[redacted]									

Table 1-20: Winter Load Impact on February 14th in kW for the No Override Group

	Regression Model Statistics				Average Event Day Summary				
Hour Ending	Parameter Estimate	t Value	Pr > |t|	Standard Error	Mean °F	Reference kWh	Observed kWh	kWh Impact	Percent Load Reduction
[redacted]									

Table 1-21: Winter Load Impact on February 14th in kW for the Override Group

	Regression Model Statistics				Average Event Day Summary				
Hour Ending	Parameter Estimate	t Value	Pr > |t|	Standard Error	Mean °F	Reference kWh	Observed kWh	kWh Impact	Percent Load Reduction
[redacted]									

The winter events are presented graphically in Figure 1-15 and Figure 1-16. In contrast to the summer events, the reference and observed series do not present an intuitive portrayal of what one would expect for an event. Throughout the day, the loads are less predictable and the observed loads do not show the same clear drop at the start of the event that was visible in the summer events. Overall, the series suggest that the differences during the event hours are as likely due to noise as they are any event effects.

[redacted]

[redacted]

[redacted]

[redacted]

Thermostat Set Point Analysis

For this study's third objective, Itron conducted an analysis of the thermostat set points and indoor temperatures on event days to better understand how customers used the smart thermostats and how indoor temperatures might be related to override behavior.

With respect to scheduling, a report generated by EnergyHub indicated that all but six participants had gone through a Scheduling Wizard to set up a schedule of set points. In spite of this, analysis of the actual thermostat data suggests that some of those homes scheduled a single set point that did not vary throughout the day and, therefore, are not truly programming their thermostats. To illustrate this, Figure 1-18 presents the distribution of average daily set point changes by month. The left columns show the percentage of homes that did not change their set point on average throughout the month. The data do not indicate if the set point change was manual or due to a pre-defined schedule. However, it can be noted that more homes altered their set points more frequently during the early summer months.

[redacted]

[redacted]

In the analysis of energy savings presented in the previous section, there was an obvious setback around 8:00 AM during the week. The thermostat data concurred with this finding as shown in the percentage of active thermostats (only thermostats in the cooling or heating settings) changed by hour during the week versus weekend in Figure 1-19. This shows that the most set point changes are occurring from 7 AM to 9 AM as people are waking and leaving the home for the day, from 5 PM to 6 PM as people are arriving home, and again from 10 PM to 11 PM when they are going to bed.

[redacted]

The thermostat data also provided more insight into the temperatures observed within homes during the event periods. Figure 1-1 presents the average indoor temperature of the No Override Group compared to the Override Group. For the Override Group, the dashed line indicates the average indoor temperature on the event days when the overrides took place and the solid line indicates the average on days when the participants did not override. All groups have a similar indoor temperature at the start of events – roughly 78 degrees. However, the No Override group shows an increase in temperature throughout the event, but more noticeably in the first two hours. For the Override group, those who actually overrode show a logical drop in temperature as their air conditioning systems resume operation. For those that did not override, there is an initial increase in temperature in the first half hour and then they exhibit a steady temperature for the remainder the event period.

[redacted]

As a final attempt to gain insight into the association between indoor temperatures and override behavior, Figure 1-21 shows the average temperature on event days for Override participants broken out by the number of times they overrode during the summer events. [redacted]

[redacted]

1 ANALYSIS OF ENERGY SAVINGS FOR FPL'S CUSTOMER TRIAL OF THE NEST™ LEARNING THERMOSTAT

1.1 EXECUTIVE SUMMARY

Florida Power and Light (FPL) conducted a customer trial to explore the effects of the installation of Nest™ thermostats in residential homes. The Nest thermostat is a new technology that has two main features that are intended to result in energy savings. The first is an algorithm that learns from occupant behavior so that the Nest can program itself, helping the thermostat to save energy in cases where the residents would not normally set up a schedule. The second is online connectivity that allows the homeowner to control the Nest via a computer, tablet, or smart phone, which can save energy by reducing consumption when the residents are not home at times atypical to the normal routine.

To assess the effects of the Nest thermostats on the trial's participants, Itron performed an analysis of customer interval load data to determine the level of energy conservation achieved by the thermostats. The study examined pre- and post-installation consumption data for FPL's cooling season (April through October) for both trial participants and a control group of nonparticipants with similar energy consumption characteristics. Participants in the trial lived in dwellings categorized as either Single Family or Villa/Duplex, and the analysis was conducted for these home types separately and together.

As the key energy and demand impact metrics in Table 1-1 show, [redacted]

TABLE 1-1: SUMMARY OF ENERGY AND DEMAND IMPACTS

Measure	Villa/Duplex	Single Family	All Homes
[redacted]			

[redacted]

Control) the PSM routine. There are two key takeaways in this table. The first is that the matched control group is much more similar to the participants in terms of average daily usage than the full set of all nonparticipants, though the improvement is far more marked for the Villa/Duplex home type. Average daily kWh for the control group was 96.1% of the participant average daily kWh before matching. This improved to 98.6% after the matching, which is good, but the full set of all participants might have been suitable without the PSM routine for Single Family homes. For the Villa/Duplex, however, the PSM clearly was a critical step on assuring a suitable set of control homes was used in the study.

A B C D E F G H I

TABLE 1-4: COMPARISON OF PARTICIPANTS WITH CONTROL HOMES BEFORE AND AFTER MATCHING

Home Type	Unique Homes Participants	Mean Daily kWh Participants	Unique Homes All Nonparticipants	Mean Daily kWh All Nonparticipants	All Nonparticipants kWh as % of Participant kWh	Unique Homes Matched Control	Mean Daily kWh Matched Control	Matched Control kWh as % of Participant kWh
[redacted]								

The second takeaway is that the number of unique homes in the matched control group is lower than the number of unique participant homes. This means that some control homes were matched to more than one participant during the PSM routine. This number is small, however (e.g. 55 control homes compared to 57 treatment homes for Single Family), meaning that the matched control group still represented a good variety of homes.

1.4 METHODS AND RESULTS

The study assessed energy savings for the Nest trial using two separate analyses based on a Difference-in-Differences (DiD) approach. These two analyses and their results are discussed separately in this section.

Comparison of Means

The first DiD approach for assessing energy savings from conservation was a comparison of means in the pre- and post-installation periods for treatment and control groups. This analysis was performed by comparing the average daily kWh during FPL's cooling season in 2013 (pre) and 2014 (post) for the treatment and control groups. The DiD approach assumed that even though the treatment and control groups were not likely the same in every respect, at least the differences between them over time were likely to be the same absent any treatment (in this case, the installation of the Nest). As a result, the effect of the treatment can be calculated as the difference in each group's difference from the pre-treatment period to the post-treatment period.

Panel Time Series Regression

The second DiD apprcach was a panel time series regression, which was performed to account for more of the variability in consumption due to weather and other behaviors affecting households. This allowed the effect of the program to be estimated with less uncertainty. Of the many models tested, the final model selected based on goodness-of-fit and interpretability of results was as follows:

[redacted]

[redacted]

[redacted]

The effect of the thermostats was estimated by using both a dummy variable (Treatment = 1 × Post = 1) and this same dummy variable interacted with CDD. Itron included the interaction of participation with weather since the regulation of cooling by the thermostat is assumed to be the source of energy savings.

The results from the panel regression models are evaluated first in terms of overall model fit and then for the parameter estimates that were used to estimate the savings. With respect to overall model fit, the Villa/Duplex model had an R^2 of 0.607, which indicates that nearly 61% of the variability in the dependent variable was accounted for in the model. The F statistic for this model, which tests for overall statistical significance was 627.22, which had a p value <.0001. The Single Family model had an R^2 of 0.721 (F = 1,060.34, p. <.0001) and the All Homes model had an R^2 of 0.732 (F = 1,141.69, p. <.0001). Overall, these are indicative of good model fit for this type of analysis.

The results for the impact variables are presented in Table 1-7, which shows the parameters and their estimated values for those variables intended to capture the impacts, as well as how those regression outputs translate into average daily kWh Savings. For all three models, the parameter estimates for the impact variables were negative, indicating that the thermostats resulted in a decline in consumption. The parameter estimates that interacted participation with CDD were statistically significant, as shown in the column "Pr > |t|," which shows the probability that the observed t value could have occurred by chance. For the parameter "Treatment × Post," the interpretation of the estimate is simply the average daily kWh associated with the thermostat installation. For the parameter "Treatment × Post × CDD," the estimate means the average daily kWh per CDD, so it needs to be multiplied by the average daily CDD to calculate the total impact. The kWh savings shown is based on the sum of these two impacts (where the CDD-interacted estimate has been multiplied by the average cooling season CDD).

TABLE 1-7: PANEL REGRESSION OUTPUTS AND ESTIMATED AVERAGE DAILY KWH SAVINGS

Home Type	Parameter	Estimate	Standard Error	t Value	Pr > |t|	kWh Savings	Percent of Whole Home Savings	Percent AC Savings
[redacted]								

For the Villa/Duplex model, the panel regression resulted in savings of [redacted] which represented savings of [redacted] Because the panel model included CDD as an explanatory variable, the parameter estimate for this was used to estimate the consumption associated with air conditioning. The savings for the Villa/Duplex participants represented 21% of this estimated air conditioning kWh. For the Single Family homes, the estimated average daily savings were [redacted] or 2.4% whole house kWh and [redacted] The model for all homes resulted average daily savings of [redacted] which is essentially a weighted average of the other two models.

The results from the panel regression models are very similar to what was produced by the DiD comparison of means; such consistency is generally positive, as it serves to validate the results. The difference is that the panel regression, which explicitly accounted for the variability associated with weather, was able to find statistically significant estimates of savings where the DiD approach could not. It is for this reason that the estimated savings from the panel regression are presented in this report as the official estimates of savings for the Nest trial.

Finally, Figure 1-4 shows the daily savings estimates with 90% confidence intervals by home type. In terms of absolute precision, the bands around each estimate are fairly similar. In terms of relative precision, these confidence intervals are plus or minus 14%, 30%, and 15% for Villa/Duplex, Single Family, and all homes, respectively. The high relative precision for the Single Family savings is due to estimated savings being substantially lower.

[redacted]

[redacted]

The panel regression method was also applied to hourly data separately for weekdays (non-holiday) and weekends. While the hourly data had far greater variability and the overall estimated savings are not as robust as the daily results, these models provided value for estimating Nest impacts in FPL's peak summer hour and for exploring how the thermostats influenced the daily load profiles.

As a characterization of the hourly energy savings, Figure 1-5 shows the average observed and reference loads for the Single Family and Villa/Duplex home types for weekdays and weekends. The reference loads – indicated with the triangle marker – represent what the load would have been without the Nest's impacts in each hour based on the results of the modeling. The observed loads represent that average kW following the installation of the Nest thermostats. The differences between the reference and the observed loads in each hour are the impacts, whether positive or negative.

The load profiles presented in Figure 1-5 have a couple of interesting characteristics. First, they show that the Nest savings for both home and day types occurred during the middle of the day, generally when one would expect to see the impacts as people leave for work or other activities. Second, the load profiles showed clear differences between the Villa/Duplex and Single Family homes. On weekdays, the observed load for the Villa/Duplex homes showed a drop in consumption after the morning hours compared to a reference load that remained steady. In contrast, the Single Family homes had reduced consumption on weekdays, but still showed a steady increase throughout the day and even had an increase in consumption in the evening hours, suggestive of a possible snapback effect. On weekends, the Villa/Duplex homes still showed substantial savings, but the observed load was generally flatter throughout the day without the dip seen on weekdays. For Single Family homes, compared to the weekdays where the reduced usage during the day was followed by an increase in the evening, on weekends the savings were seen in lower consumption during the middle of the day with nearly identical levels of consumption in all other hours.

[redacted]

While the comparison of the load profiles is interesting in terms of seeing the differences in impacts among home and day types, the primary results of interest from the hourly models are the actual regression outputs and estimated impacts for the weekdays for the hour ending at 5:00 PM. These results are what indicate what evidence the analysis showed for savings during FPL's summer peak hour, and they are presented in two separate tables for each of the home types. The first table shows the parameter estimates from the regression model used to determine the effects of the Nest. These impacts were based on a single dummy variable to capture any base impacts and a dummy variable interacted with cooling degree hours to capture any temperature sensitive effects. The parameter estimates for both of these variables are presented along with their t test results and standard errors. The second table shows how these parameter estimates translate into hourly impacts for both an average summer day and for when there are peak day weather conditions. The large amount of information in Table 1-8 through Table 1-13 is presented for thoroughness, but for discussion purposes the emphasis is primarily on the rows for the hour ending at 5:00 PM (17:00 in the tables), which have relevance to FPL's peak hour. As shown in Table 1-8, for the Villa/Duplex homes both base and temperature sensitive impact parameters are negative and statistically significant. [redacted]

The interpretation of these parameters is not always an intuitive matter. The models were specified as they were to capture the different ways in which the Nest impacts might manifest themselves. It was by no means a given that both base and temperature sensitive impacts will be significant or that both will be negative in sign. It is important to note that this particular hour is around the likely transition where the residents of some homes are likely returning from work and the Nest has learned to resume cooling. In general, the other hours during the day have parameter estimates that can be more easily interpreted and also have larger impacts. This makes intuitive sense given how the Nest works with the likely occupancy patterns of most homes.

TABLE 1-8: DUPLEX/VILLA WEEKDAY REGRESSION MODEL IMPACT PARAMETERS

<table>
<tr><th rowspan="3">Hour Ending</th><th colspan="8">Impact Parameter Type</th></tr>
<tr><th colspan="4">Base Impact</th><th colspan="4">Temperature Sensitive</th></tr>
<tr><th>Parameter Estimate</th><th>t Value</th><th>Pr > |t|</th><th>Standard Error</th><th>Parameter Estimate</th><th>t Value</th><th>Pr > |t|</th><th>Standard Error</th></tr>
<tr><td colspan="9">[redacted]</td></tr>
</table>

TABLE 1-9: VILLA\DUPLEX WEEKDAY HOURLY IMPACTS FOR AVERAGE AND PEAK DAY

A	B	C	D	E	F	G	H	I
Hour Ending	Average Day Impacts				Peak Day Impacts			
	kWh Reference	kWh Observed	kWh Impact	Percent Load Reduction	kWh Reference	kWh Observed	kWh Impact	Percent Load Reduction
[redacted]								

TABLE 1-10: SINGLE FAMILY WEEKDAY REGRESSION MODEL IMPACT PARAMETERS

Hour Ending	Impact Parameter Type							
	Base Impact				Temperature Sensitive			
	Parameter Estimate	t Value	Pr > |t|	Standard Error	Parameter Estimate	t Value	Pr > |t|	Standard Error
[redacted]								

A B C D E F G H I

TABLE 1-11: SINGLE FAMILY WEEKDAY HOURLY IMPACTS FOR AVERAGE AND PEAK DAY

	Average Day Impacts				Peak Day Impacts			
Hour Ending	kWh Reference	kWh Observed	kWh Impact	Percent Load Reduction	kWh Reference	kWh Observed	kWh Impact	Percent Load Reduction
[redacted]								

TABLE 1-12: ALL HOMES WEEKDAY REGRESSION MODEL IMPACT PARAMETERS

Hour Ending	Impact Parameter Type							
	Base Impact				Temperature Sensitive			
	Parameter Estimate	t Value	Pr > |t|	Standard Error	Parameter Estimate	t Value	Pr > |t|	Standard Error
[redacted]								

TABLE 1-13: ALL HOMES WEEKDAY HOURLY IMPACTS FOR AVERAGE AND PEAK DAY

Hour Ending	Average Day Impacts				Peak Day Impacts			
	kWh Reference	kWh Observed	kWh Impact	Percent Load Reduction	kWh Reference	kWh Observed	kWh Impact	Percent Load Reduction
[redacted]								

1.5 SUMMARY AND CONCLUSIONS

In spite of the challenge of unidentified home types for the nonparticipants, the PSM routine generated a control group that represented a very good match for the trial participants, which was confirmed by both statistical and graphical comparisons. Energy consumption data for the treatment and control group were analyzed using two separate DiD approaches that resulted in similar estimates for savings. The more robust panel regression models [redacted] With few preconceived notions about how the Nest thermostats might work in different home types, these results are likely to raise questions about why the two home types had such different results. Nevertheless, they are the product of rigorous methodological approaches that minimized bias wherever possible and the preponderance of evidence is that the Nest thermostats are responsible for energy savings in the participant homes.

Executive Summary

This is a field test to compare energy consumptions between the use of the existing (baseline) Danfoss controller and the new Enerfit controller for the existing air conditioning unit at [redacted] site conducted by the University of Miami's Department of Industrial Engineering (UMIE). Enerfit controller modulate the Supply Fan speed, resulting in fewer compressors running and significantly lowering the Supply Fan speed, thus saving a considerable amount of energy when compared to the Standard (baseline) Mode. The vendor has installed both controllers in parallel and is switching the control of the air conditioning unit from the Danfoss controller to the Enerfit controller every two weeks.

The goal of the research is to evaluate energy savings accomplished by upgrading the existing Danfoss Controller with a new Enerfit Controller for the existing air conditioning unit [redacted] site. Florida Power & Light Company (FPL) has retained UMIE to evaluate the energy savings. To measure the impact of the Enerfit technology, the University of Miami, Department of Industrial Engineering team installed, 23 dedicated data loggers and current transformers (CT), 9 loggers at the main A/C disconnect, 2 loggers on each of the four compressors, and 6 loggers on the supply fan at the [redacted] These loggers were installed to acquire the power consumption at the main A/C unit for a full one year. 10 temperature and humidity loggers were also installed to monitor both the indoor and outdoor temperature and humidity of the space. Three Fluke 1735 Power Loggers were installed (One on the Main Unit, One on the Supply Fan, and One on the Compressors) to monitor actual power (kWh) and the power factor on the unit. The Enerfit controller was switched ON/OFF every two weeks to minimize the effect of the weather variation.

We adopted the practices used by FPL to divide the entire year in Winter (November-March) & Summer (April-October) seasons. Results in three data sets representing three periods of data monitored corresponding to Winter, Summer and Combined.

This report explains the methodology followed by the University of Miami team, presents the main results obtained, and explains the analysis techniques followed to investigate the

Logging frequency and duration

Data loggers will record data points every 2 minutes. Each logger has the capacity to record over 2 months of data, therefore they will be replaced every 2 months. To ensure that there are no gaps in the data, redundancy has been added by fitting each current transducer with two data loggers. The data loggers are programmed so that their replacement timing is staggered, i.e. one of the loggers will continue recording while the other is replaced. Table 1 shows the replacement times for all the loggers. The site will be visited every month and one of the data loggers will be replaced for a new 2-month logger. The second logger will be replaced the following month.

Data logger replacement

Data loggers will be replaced alternating between odd-numbered and even-numbered units every month. The plan shown in Table-1 & 2 reflects the scheduling of pick-ups and replacements. Temperature loggers will follow the same scheduale. This plan will allow for continious data collection for the entire logging period.

Data Collection Points

UMIE will be collecting amperage data at seven different points on the RTU. Phase A, B, and C will be logged for the main disconnect panel. The four compressors (1,2,3,& 4) on the unit will be logged. Both the Enerfit and Danfoss fans will also be logged.Temperature and humidity will be monitored at eight different locations i[redacted] Four outside and four inside units will be logging both temperature and humidity at 2 minute intervals.

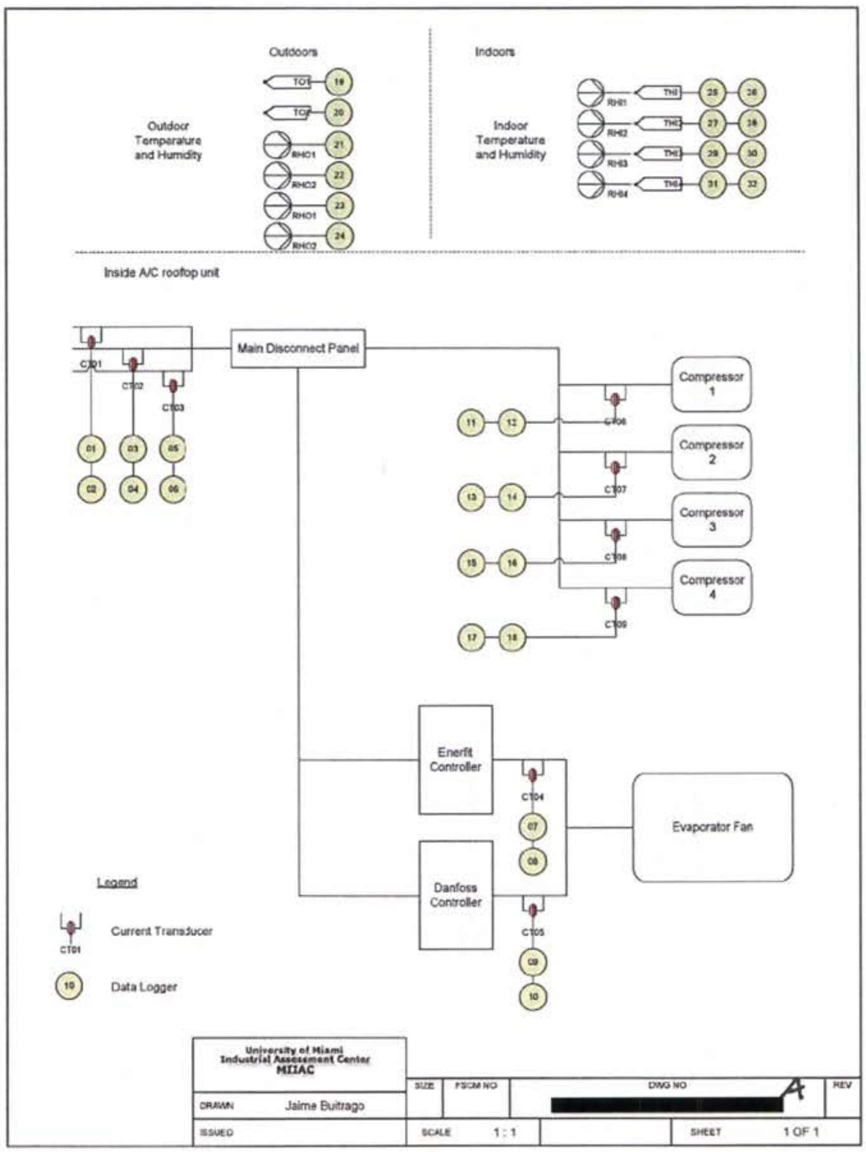


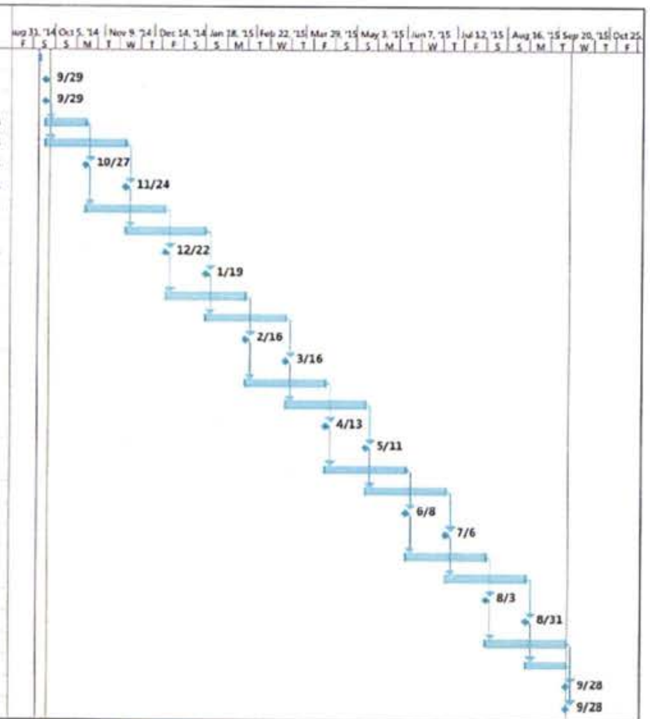
Figure 1 – Vizio Diagram Illustrating Data Logging Strategy

Table-1: Schedule of Data Logging at [redacted] A

Logged Variables	Section	Data Logger	Identifier	Phase	Capacity	1 (Start of Cycle)	2	3	4	5	6	7	End of Cycle
Current	Main Disconnect	1	Main A	A	600 A	9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		2				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		3	Main B	B		9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		4				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		5	Main C	C		9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		6				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
	Evaporator Fan	7	Enerfit Controller	A	100 A	9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		8				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		9	Danfoss Controller	A		9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		10				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
	Compressors	11	Compressor 1	C		9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		12				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		13	Compressor 2	C		9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		14				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		15	Compressor 3	A		9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		16				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		17	Compressor 4	A		9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		18				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
Temperature and Humidity	Outdoor Temperature	19	Thermocouple 1			10/6/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		20	Thermocouple 2			10/6/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		21	RH Outdoor 1			9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		22	RH Outdoor 2			9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		23	RH Outdoor 3			9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		24	RH Outdoor 4			9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
	Indoor Temperature and Relative Humidity	25	Location 1			9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		26				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		27	Location 2			9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		28				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00
		29	Location 3			9/29/2014 0:00	10/27/2014 0:00	12/22/2014 0:00	2/16/2015 0:00	4/13/2015 0:00	6/8/2015 0:00	8/3/2015 0:00	9/28/2015 0:00
		30				9/29/2014 0:00	11/24/2014 0:00	1/19/2015 0:00	3/16/2015 0:00	5/11/2015 0:00	7/6/2015 0:00	8/31/2015 0:00	9/28/2015 0:00

Table-2: Schedule of Data Collection at [redacted]

ID	Task Name	Duration	Start	Finish
1	Install Loggers	1 day	Wed 9/24/14	Thu 9/25/14
2	Start Logging Data on Odd-Numbered Loggers	0 days	Mon 9/29/14	Mon 9/29/14
3	Start Logging Data on Even-Numbered Loggers	0 days	Mon 9/29/14	Mon 9/29/14
4	Data Logging on Odd-Numbered Loggers	28 days	Mon 9/29/14	Mon 10/27/14
5	Data Logging on Even-Numbered Loggers	56 days	Mon 9/29/14	Mon 11/24/14
6	Pick up and Replace Odd-Numbered Loggers	0 days	Mon 10/27/1	Mon 10/27/14
7	Pick up and Replace Even-Numbered Loggers	0 days	Mon 11/24/1	Mon 11/24/14
8	Data Logging on Odd-Numbered Loggers	56 days	Mon 10/27/1	Mon 12/22/14
9	Data Logging on Even-Numbered Loggers	56 days	Mon 11/24/1	Mon 1/19/15
10	Pick up and Replace Odd-Numbered Loggers	0 days	Mon 12/22/1	Mon 12/22/14
11	Pick up and Replace Even-Numbered Loggers	0 days	Mon 1/19/15	Mon 1/19/15
12	Data Logging on Odd-Numbered Loggers	56 days	Mon 12/22/1	Mon 2/16/15
13	Data Logging on Even-Numbered Loggers	56 days	Mon 1/19/15	Mon 3/16/15
14	Pick up and Replace Odd-Numbered Loggers	0 days	Mon 2/16/15	Mon 2/16/15
15	Pick up and Replace Even-Numbered Loggers	0 days	Mon 3/16/15	Mon 3/16/15
16	Data Logging on Odd-Numbered Loggers	56 days	Mon 2/16/15	Mon 4/13/15
17	Data Logging on Even-Numbered Loggers	56 days	Mon 3/16/15	Mon 5/11/15
18	Pick up and Replace Odd-Numbered Loggers	0 days	Mon 4/13/15	Mon 4/13/15
19	Pick up and Replace Even-Numbered Loggers	0 days	Mon 5/11/15	Mon 5/11/15
20	Data Logging on Odd-Numbered Loggers	56 days	Mon 4/13/15	Mon 6/8/15
21	Data Logging on Even-Numbered Loggers	56 days	Mon 5/11/15	Mon 7/6/15
22	Pick up and Replace Odd-Numbered Loggers	0 days	Mon 6/8/15	Mon 6/8/15
23	Pick up and Replace Even-Numbered Loggers	0 days	Mon 7/6/15	Mon 7/6/15
24	Data Logging on Odd-Numbered Loggers	56 days	Mon 6/8/15	Mon 8/3/15
25	Data Logging on Even-Numbered Loggers	56 days	Mon 7/6/15	Mon 8/31/15
26	Pick up and Replace Odd-Numbered Loggers	0 days	Mon 8/3/15	Mon 8/3/15
27	Pick up and Replace Even-Numbered Loggers	0 days	Mon 8/31/15	Mon 8/31/15
28	Data Logging on Odd-Numbered Loggers	56 days	Mon 8/3/15	Mon 9/28/15
29	Data Logging on Even-Numbered Loggers	28 days	Mon 8/31/15	Mon 9/28/15
30	Pick up and Replace Odd-Numbered Loggers	0 days	Mon 9/28/15	Mon 9/28/15
31	Pick up and Replace Even-Numbered Loggers	0 days	Mon 9/28/15	Mon 9/28/15



Project: Project Plan for Winn-D
Date: Thu 10/2/14

Task; Split; Milestone; Summary; Project Summary; Inactive Task; Inactive Milestone; Inactive Summary; Manual Task; Duration-only; Manual Summary Rollup; Manual Summary; Start-only; Finish-only; External Tasks; External Milestone; Deadline; Progress; Manual Progress

Regression Model #1, 2, & 3:

The total energy consumption (kWh) of the air conditioning unit (A/C Unit), the four compressors, and the supply fan were respectively analyzed for five months starting 11/01/2014 at 12:00am and ending 03/31/15 at 11:58 pm. ***Using the average power factor computed when controller is on & off.***

Model #1: Total Cooling Load Power Consumption Savings

The regression equation to correlate the hourly A/C Unit kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted] order to determine the number of independent variables to be included in the model (Table 4).

number of Variables	R-Sq	R-Sq(adj)	SE
1	23.62	23.59	16.0392
1	24.31	24.29	15.9665
2	47.64	47.61	13.2810
Response is Main kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Regression Analysis: Main_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	581182	290591	1647.49	0.000
Temp	1	293098	293098	1661.71	0.000
Controller	1	284664	284664	1613.89	0.000
Error	3621	638686	176		
Lack-of-Fit	3578	628258	176	0.72	0.949
Pure Error	43	10428	243		
Total	3623	1219868			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
13.2810	47.64%	47.61%	47.55%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-54.99	1.97	-27.92	0.000	
Temp	1.0891	0.0267	40.76	0.000	1.00
Controller					
1	-17.726	0.441	-40.17	0.000	1.00

Regression Equation

Controller	
0	Main_kWh = -54.99 + 1.0891 Temp
1	Main_kWh = -72.72 + 1.0891 Temp

Regression Equation including Controller

[redacted]

The above equation means that, by controlling for the outside temperature, and by turning the controller ON, a reduction in the kWh of 17.73 kWh occurs.

The average kWh consumption of the Main unit during the OFF periods (where the controller was turned off) is 24.28 kWh. The regression equation indicates that an average reduction of 17.73 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is OFF) of 73.02% while maintaining the effect of the outside temperature. Figure displays the box plot distribution for Main kWh when the controller is ON vs. OFF.

Model #2: Compressor Power Consumption Savings

The regression equation to correlate the Compressor kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 7).

number of Variables	R-Sq	R-Sq(adj)	SE
1	6.87	6.84	11.7995
1	24.50	24.48	10.6238
2	31.22	31.18	10.1415
Response is Compressor kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Table 8 depicts the ANOVA table obtained. The technique used to perform the ANOVA was the multiple regression procedure.

Model #3: Supply Fan Power Consumption Savings

The regression equation to correlate the Supply Fan kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variab es to be included in the model (Table 10).

number of Variables	R-Sq	R-Sq(adj)	SE
1	77.74	77.73	1.93504
1	0.19	0.16	4.09718
2	77.88	77.87	1.92907
Response is Supply Fan kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Table 11 depicts the ANOVA table obtained. The technique used to perform the ANOVA was the multiple regression procedure.

Regression Analysis: Supply Fan_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	47439.9	23719.9	6374.08	0.000
Temp	1	87.2	87.2	23.44	0.000
Controller	1	47327.1	47327.1	12717.85	0.000
Error	3621	13474.9	3.7		
Lack-of-Fit	3578	13233.2	3.7	0.66	0.984
Pure Error	43	241.7	5.6		
Total	3623	60914.8			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
1.92907	77.88%	77.87%	77.85%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	8.646	0.286	30.23	0.000	
Temp	0.01879	0.00388	4.84	0.000	1.00
Controller					
1	-7.2277	0.0641	-112.77	0.000	1.00

Regression Equation

Controller	
0	Supply_Fan_kWh = 8.646 + 0.01879 Temp
1	Supply_Fan_kWh = 1.419 + 0.01879 Temp

Regression Equation including Controller

[redacted]

[redacted]

The average kWh consumption of the Supply Fan during the OFF periods (where the controller was turned off) is 10.01 kWh. The regression equation indicates that an average reduction of 7.23 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is OFF) of 72.22% while maintaining the effect of the outside temperature. Figure displays the box plot distribution for Supply Fan kWh when the controller is ON vs. OFF.

Regression Model #4, 5, &6:

The total energy consumption (kWh) of the air conditioning unit (A/C Unit), the four compressors, and the supply fan were respectively analyzed for seven months starting 04/01/2015 at 12:00am and ending 10/30/15 at 11:58 pm. ***Using the average power factor computed when controller in on & off.***

Model #4: Total Cooling Load Power Consumption Savings

The regression equation to correlate the hourly A/C Unit kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 13).

number of Variables	R-Sq	R-Sq(adj)	SE
1	29.40	29.38	21.8638
1	26.89	26.88	22.2481
2	54.71	54.69	17.5127
Response is Main kWh			

Regression Analysis: Main_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	1901795	950898	3100.49	0.000
Temp	1	879928	879928	2869.08	0.000
Controller	1	966968	966968	3152.89	0.000
Error	5133	1574256	307		
Lack-of-Fit	5107	1569496	307	1.68	0.053
Pure Error	26	4760	183		
Total	5135	3476051			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
17.5127	54.71%	54.69%	54.66%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-160.16	4.05	-39.56	0.000	
Temp	2.6028	0.0486	53.56	0.000	1.00
Controller					
1	-27.459	0.489	-56.15	0.000	1.00

Regression Equation

Controller

0 Main_kW = -160.16 + 2.6028 Temp

1 Main_kW = -187.62 + 2.6028 Temp

Regression Equation including Controller

Main_kWh = -160.16 + 2.6028 Temp - 27.459 Controller

[redacted]

The average kWh consumption of the Main unit during the OFF periods (where the controller was turned off) is 55.88 kWh. The regression equation indicates that an average reduction of 27.5 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Model #5: Compressor Power Consumption Savings

The regression equation to correlate the Compressor kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 16).

number of Variables	R-Sq	R-Sq(adj)	SE
1	16.53	16.52	19.0549
1	33.10	33.08	17.0599
2	48.32	48.30	14.9953
Response is Compressor kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Regression Analysis: Compressor_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	1079166	539583	2399.63	0.000
Temp	1	709888	709888	3157.02	0.000
Controller	1	339984	339984	1511.98	0.000
Error	5133	1154209	225		
Lack-of-Fit	5107	1149798	225	1.33	0.190
Pure Error	26	4410	170		
Total	5135	2233374			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
14.9953	48.32%	48.30%	48.26%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-155.56	3.47	-44.88	0.000	
Temp	2.3378	0.0416	56.19	0.000	1.00
Controller					
1	-16.282	0.419	-38.88	0.000	1.00

Regression Equation

Controller	
0	Compressor_kW = -155.56 + 2.3378 Temp
1	Compressor_kW = -171.84 + 2.3378 Temp

Regression Equation including Controller

[redacted]

The above equation means that, by **controlling for the outside temperature**, and by turning the controller ON, a reduction in the kWh of 16.28 kWh occurs in the compressors.

The average kWh consumption of the four compressors during the OFF periods (where the controller was turned off) is 38.49 kWh. The regression equation indicates that an average reduction of 16.28 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the

Model #6: Supply Fan Power Consumption Savings

The regression equation to correlate the Supply Fan kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 19).

number of Variables	R-Sq	R-Sq(adj)	SE
1	87.80	87.79	1.26542
1	0.10	0.08	3.62043
2	87.80	87.79	1.26541
Response is Supply Fan kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Regression Model #7, 8, &9:

The total energy consumption (kWh) of the air conditioning unit (A/C Unit), the four compressors, and the supply fan were respectively analyzed for the entire year starting 11/01/2014 at 12:00am and ending 10/30/15 at 11:58 pm. ***Using the average power factor computed when controller in on & off.***

Model #7: Total Cooling Load Power Consumption Savings

The regression equation to correlate the hourly A/C Unit kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 22).

number of Variables	R-Sq	R-Sq(adj)	SE
1	20.82	20.81	23.2242
1	37.54	37.53	20.6280
2	57.99	57.98	16.9179
Response is Main kWh			

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Regression Analysis: Main_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	3459709	1729854	6043.88	0.000
Temp	1	2217340	2217340	7747.09	0.000
Controller	1	1220250	1220250	4263.39	0.000
Error	8757	2506391	286		
Lack-of-Fit	8685	2490941	287	1.34	0.055
Pure Error	72	15451	215		
Total	8759	5966100			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
16.9179	57.99%	57.98%	57.96%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-109.75	1.75	-62.85	0.000	
Temp	1.9312	0.0219	88.02	0.000	1.00
Controller					
1	-23.607	0.362	-65.29	0.000	1.00

Regression Equation

```
Controller
0             Main_kW = -109.75 + 1.9312 Temp

1             Main_kW = -133.35 + 1.9312 Temp
```

Regression Equation including Controller

[redacted]

The above equation means that, by controlling for the outside temperature, and by turning the controller ON, a reduction in the kWh of 23.61 kWh occurs.

The average kWh consumption of the Main unit during the OFF periods (where the controller was turned off) is 42.28 kWh. The regression equation indicates that an average reduction of 23.61 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Model #8: Compressor Power Consumption Savings

The regression equation to correlate the Compressor kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 25).

number of Variables	R-Sq	R-Sq(adj)	SE
1	9.58	9.57	19.2415
1	39.80	39.79	15.7009
2	49.12	49.11	14.4348
Response is Compressor kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Regression Analysis: Compressor_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	1761545	880772	4227.11	0.000
Temp	1	1417888	1417888	6804.90	0.000
Controller	1	334384	334384	1604.82	0.000
Error	8757	1824633	208		
Lack-of-Fit	8685	1815250	209	1.60	0.005
Pure Error	72	9383	130		
Total	8759	3586178			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
14.4348	49.12%	49.11%	49.08%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-94.43	1.49	-63.38	0.000	
Temp	1.5443	0.0187	82.49	0.000	1.00
Controller					
1	-12.358	0.308	-40.06	0.000	1.00

Regression Equation

Controller
0 Compressor_kW = -94.43 + 1.5443 Temp

1 Conpressor_kW = -106.79 + 1.5443 Temp
2

Regression Equation including Controller

[redacted]

The above equation means that, by **controlling for the outside temperature**, and by turning the controller ON, a reduction in the kWh of 12.36 kWh occurs in the compressors.

The average kWh consumption of the four compressors during the OFF periods (where the controller was turned off) is 27.14 kWh. The regression equation indicates that an average reduction of 12.36 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the

Model #9: Supply Fan Power Consumption Savings

The regression equation to correlate the Supply Fan kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 28).

number of Variables	R-Sq	R-Sq(adj)	SE
1	82.39	82.38	1.58799
1	0.22	0.21	3.71012
2	82.55	82.55	1.58068
Response is Supply Fan kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Table 29 depicts the ANOVA table obtained. The technique used to perform the ANOVA was the multiple regression procedure.

Regression Model #10, 11, &12:

The total energy consumption (kWh) of the air conditioning unit (A/C Unit), the four compressors, and the supply fan were respectively analyzed for five months starting 11/01/2014 at 12:00am and ending 03/31/15 at 11:58 pm. ***With unity power factor.***

Model #10: Total Cooling Load Power Consumption Savings

The regression equation to correlate the hourly A/C Unit kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 31).

number of Variables	R-Sq	R-Sq(adj)	SE
1	44.29	44.26	17.1258
1	25.67	25.65	19.7790
2	18.88	18.86	20.6624
Response is Main kWh			

Regression Analysis: Main_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	844193	422096	1439.16	0.000
Temp	1	484341	484341	1651.39	0.000
Controller	1	354942	354942	1210.19	0.000
Error	3621	1062016	293		
Lack-of-Fit	3578	1045923	292	0.78	0.895
Pure Error	43	16093	374		
Total	3623	1906208			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
17.1258	44.29%	44.26%	44.19%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-72.59	2.54	-28.58	0.000	
Temp	1.4000	0.0345	40.64	0.000	1.00
Controller					
1	-19.794	0.569	-34.79	0.000	1.00

Regression Equation

Controller
0 Main_kW = -72.59 + 1.4000 Temp

1 Main_kW = -92.38 + 1.4000 Temp

Regression Equation including Controller

[redacted]

The above equation means that, by controlling for the outside temperature, and by turning the controller ON, a reduction in the kWh of 19.80 kWh occurs.

The average kWh consumption of the Main unit during the OFF periods (where the controller was turned off) is 29.31 kWh. The regression equation indicates that an average reduction of 19.80 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Model #11: Compressor Power Consumption Savings

The regression equation to correlate the Compressor kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 34).

number of Variables	R-Sq	R-Sq(adj)	SE
1	4.25	4.23	15.0622
1	25.28	25.26	13.3061
2	29.41	29.37	12.9348
Response is Compressor kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Model #12: Supply Fan Power Consumption Savings

The regression equation to correlate the Supply Fan kWh consumption with the temperature and the Enerfit con:roller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 37).

number of Variables	R-Sq	R-Sq(adj)	SE
1	64.42	64.39	3.43179
1	0.28	0.25	5.74630
2	64.66	64.64	3.42120
Response is Supply Fan kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Table 38 depicts the ANOVA table obtained. The technique used to perform the ANOVA was the multiple regression procedure.

Regression Analysis: Supply Fan_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	77547	38773.6	3312.68	0.000
Temp	1	275	274.6	23.46	0.000
Controller	1	77216	77215.7	6597.03	0.000
Error	3621	42382	11.7		
Lack-of-Fit	3578	41741	11.7	0.78	0.895
Pure Error	43	642	14.9		
Total	3623	119930			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
3.42120	64.66%	64.64%	64.61%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	13.314	0.507	26.24	0.000	
Temp	0.03334	0.00688	4.84	0.000	1.00
Controller					
1	-9.232	0.114	-81.22	0.000	1.00

Regression Equation

Controller	
0	SupplyFan_kWh = 13.314 + 0.03334 Temp
1	SupplyFan_kWh = 4.082 + 0.03334 Temp

Regression Equation including Controller

[redacted]

The above equation means that, by **controlling for the outside temperature**, and by turning the controller ON, a reduction in the kWh of 9.23 kWh occurs in the compressors.

The average kWh consumption of the Supply Fan during the OFF periods (where the controller was turned off) is 15.74 kWh. The regression equation indicates that an average reduction of 9.23 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Regression Model #13, 14, &15:

The total energy consumption (kWh) of the air conditioning unit (A/C Unit), the four compressors, and the supply fan were respectively analyzed for five months starting 04/01/2015 at 12:00am and ending 10/30/15 at 11:58 pm. ***With unity power factor.***

Model #13: Total Cooling Load Power Consumption Savings

The regression equation to correlate the hourly A/C Unit kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

[redacted]

Enerfit Controller = a dummy variable that is assigned a value **0** when the Enerfit controller is "OFF" and **1** when the controller is "ON".

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 40).

number of Variables	R-Sq	R-Sq(adj)	SE
1	22.52	22.50	27.4896
1	29.38	29.36	26.2449
2	50.45	50.43	21.9854
Response is Main kWh			

Regression Analysis: Main_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	2526090	1263045	2613.07	0.000
Temp	1	1398571	1398571	2893.46	0.000
Controller	1	1055199	1055199	2183.07	0.000
Error	5133	2481069	483		
Lack-of-Fit	5107	2473175	484	1.60	0.072
Pure Error	26	7894	304		
Total	5135	5007159			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
21.9854	50.45%	50.43%	50.39%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-205.84	5.08	-40.50	0.000	
Temp	3.2814	0.0610	53.79	0.000	1.00
Controller					
1	-28.684	0.614	-46.72	0.000	1.00

Regression Equation

Controller	
0	Main_kW = -205.84 + 3.2814 Temp
1	Main_kW = -234.52 + 3.2814 Temp

Regression Equation including Controller

[redacted]

The above equation means that, by controlling for the outside temperature, and by turning the controller ON, a recuction in the kWh of 28.69 kWh occurs.

The average kWh consumption of the Main unit during the OFF periods (where the controller was turned off) is 66.53 kWh. The regression equation indicates that an average reduction of 28.69 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Model #14: Compressor Power Consumption Savings

The regression equation to correlate the Compressor kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 43).

number of Variables	R-Sq	R-Sq(adj)	SE
1	11.38	11.36	23.8856
1	35.13	35.12	20.4351
2	45.40	45.38	18.7509
Response is Compressor kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Table 44 depicts the ANOVA table obtained. The technique used to perform the ANOVA was the multiple regression procedure.

Regression Analysis: Compressor_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	1500428	750214	2133.73	0.000
Temp	1	1124319	1124319	3197.75	0.000
Controller	1	339166	339166	964.65	0.000
Error	5133	1804747	352		
Lack-of-Fit	5107	1797393	352	1.24	0.253
Pure Error	26	7355	283		
Total	5135	3305175			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
18.7509	45.40%	45.38%	45.34%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-198.39	4.33	-45.77	0.000	
Temp	2.9421	0.0520	56.55	0.000	1.00
Controller					
1	-16.262	0.524	-31.06	0.000	1.00

Regression Equation

Controller

0 Compressor_kW = -198.39 + 2.9421 Temp

1 Conpressor_kW = -214.65 + 2.9421 Temp

2

Regression Equation including Controller

[redacted]

The above equation means that, by **controlling for the outside temperature**, and by turning the controller ON, a reduction in the kWh of 16.26 kWh occurs in the compressors.

The average kWh consumption of the four compressors during the OFF periods (where the controller was turned off) is 45.82 kWh. The regression equation indicates that an average reduction of 16.26 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the

Model #15: Supply Fan Power Consumption Savings

The regression equation to correlate the Supply Fan kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 46).

number of Variables	R-Sq	R-Sq(adj)	SE
1	78.29	78.29	2.28503
1	0.13	0.11	4.90103
2	78.30	78.29	2.28474
Response is Supply Fan kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Table 47 depicts the ANOVA table obtained. The technique used to perform the ANOVA was the multiple regression procedure.

Regression Analysis: Supply Fan_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	96680	48340.0	9260.45	0.000
Temp	1	12	12.1	2.31	0.128
Controller	1	96525	96524.7	18491.17	0.000
Error	5133	26794	5.2		
Lack-of-Fit	5107	26745	5.2	2.77	0.001
Pure Error	26	49	1.9		
Total	5135	123474			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
2.28474	78.30%	78.29%	78.27%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	15.217	0.528	28.81	0.000	
Temp	0.00964	0.00634	1.52	0.128	1.00
Controller					
1	-8.6754	0.0638	-135.98	0.000	1.00

Regression Equation

Controller
0 SupplyFan_kW = 15.217 + 0.00964 Temp

1 SupplyFan_kW = 6.542 + 0.00964 Temp
2

Regression Equation including Controller

[redacted]

The above equation means that, by **controlling for the outside temperature**, and by turning the controller ON, a reduction in the kWh of 8.68 kWh occurs in the compressors.

The average kWh consumption of the Supply Fan during the OFF periods (where the controller was turned off) is 16.01 kWh. The regression equation indicates that an average reduction of 8.68 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Regression Model #16, 17, &18:

The total energy consumption (kWh) of the air conditioning unit (A/C Unit), the four compressors, and the supply fan were respectively analyzed for the entire year starting 11/01/2014 at 12:00am and ending 10/30/15 at 11:58 pm. ***With unity power factor.***

Model #16: Total Cooling Load Power Consumption Savings

The regression equation to correlate the hourly A/C Unit kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 49).

number of Variables	R-Sq	R-Sq(adj)	SE
1	15.41	15.40	29.6438
1	40.18	40.17	24.9287
2	55.25	55.24	21.5611
Response is Main kWh			

Regression Analysis: Main_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	5026763	2513382	5406.50	0.000
Temp	1	3625174	3625174	7798.05	0.000
Controller	1	1371591	1371591	2950.41	0.000
Error	8757	4070970	465		
Lack-of-Fit	8685	4046379	466	1.36	0.044
Pure Error	72	24592	342		
Total	8759	9097733			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
21.5611	55.25%	55.24%	55.22%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-143.45	2.23	-64.46	0.000	
Temp	2.4693	0.0280	88.31	0.000	1.00
Controller					
1	-25.028	0.461	-54.32	0.000	1.00

Regression Equation

Controller	
0	Main_kW = -143.45 + 2.4693 Temp
1	Main_kW = -168.48 + 2.4693 Temp

Regression Equation including Controller

[redacted] and by turning the controller ON, a reduction in the kWh of 25.03 kWh occurs.

The average kWh consumption of the Main unit during the OFF periods (where the controller was turned off) is 50.94 kWh. The regression equation indicates that an average reduction of 25.03 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Model #17: Compressor Power Consumption Savings

The regression equation to correlate the Compressor kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 52).

number of Variables	R-Sq	R-Sq(adj)	SE
1	6.04	6.03	24.4551
1	41.59	41.58	19.2824
2	47.42	47.41	18.2954
Response is Compressor kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Table 53 depicts the ANOVA table obtained. The technique used to perform the ANOVA was the multiple regression procedure.

Regression Analysis: Compressor_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	2643456	1321728	3948.76	0.000
Temp	1	2306580	2306580	6891.07	0.000
Controller	1	325194	325194	971.54	0.000
Error	8757	2931143	335		
Lack-of-Fit	8685	2915852	336	1.58	0.006
Pure Error	72	15292	212		
Total	8759	5574599			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
18.2954	47.42%	47.41%	47.38%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-122.36	1.89	-64.79	0.000	
Temp	1.9696	0.0237	83.01	0.000	1.00
Controller					
1	-12.187	0.391	-31.17	0.000	1.00

Regression Equation

Controller	
0	Compressor_kW = -122.36 + 1.9696 Temp
1	Compressor_kW = -134.54 + 1.9696 Temp

Regression Equation including Controller

[redacted]

The above equation means that, by **controlling for the outside temperature**, and by turning the controller ON, a reduction in the kWh of 12.19 kWh occurs in the compressors. The average kWh consumption of the four compressors during the OFF periods (where the controller was turned off) is 32.70 kWh. The regression equation indicates that an average reduction of 12.19 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Model #18: Supply Fan Power Consumption Savings

The regression equation to correlate the Supply Fan kWh consumption with the temperature and the Enerfit controller status (whether it's ON or OFF) is as follows:

[redacted]

[redacted]

First, a best subsets regression was performed in order to determine the number of independent variables to be included in the model (Table 55).

number of Variables	R-Sq	R-Sq(adj)	SE
1	71.18	71.17	2.83294
1	0.38	0.37	5.26671
2	71.49	71.49	2.81752
Response is Supply Fan kWh			

The second step performed was to test if the effects of both the outside temperature and the Enerfit controller are statistically significant. An Analysis of Variance (ANOVA) was performed to determine whether the Enerfit controller reduction in the kWh is statistically significant.

Regression Analysis: Supply Fan_kwh versus Temp, Controller

Method

Categorical predictor coding (1, 0)

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	2	174348	87174	10981.27	0.000
Temp	1	771	771	97.12	0.000
Controller	1	173415	173415	21844.98	0.000
Error	8757	69517	8		
Lack-of-Fit	8685	68825	8	0.82	0.894
Pure Error	72	692	10		
Total	8759	243865			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
2.81752	71.49%	71.49%	71.47%

Coefficients

Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	13.067	0.291	44.93	0.000	
Temp	0.03601	0.00365	9.86	0.000	1.00
Controller					
1	-8.8992	0.0602	-147.80	0.000	1.00

Regression Equation

Controller	
0	SupplyFan_kW = 13.067 + 0.03601 Temp
1	SupplyFan_kW = 4.167 + 0.03601 Temp

Regression Equation including Controller

[redacted]

The above equation means that, by **controlling for the outside temperature**, and by turning the controller ON, a reduction in the kWh of 8.89 kWh occurs in the compressors.

The average kWh consumption of the Supply Fan during the OFF periods (where the controller was turned off) is 15.90 kWh. The regression equation indicates that an average reduction of 8.89 kWh is experienced when the controller is turned ON while controlling for the outside temperature. This results in a percentage savings in the baseline kWh (when the controller is

Conclusion:

In this report the exhaustive description of the methodology and findings of the study conducted by the University of Miami, Department of Industrial Engineering team to quantify the impact of the Enerfit controller installed on the existing air conditioning unit at [redacted] supermarket site is given. First, the total energy consumption (kWh) of the air conditioning unit (A/C Unit), the four compressors, and the supply fan along with the resoective power factor is monitored for the entire year (November 2014- October-2015). We adopted the practices used by FPL to divide the entire year in Winter (November-March) & Summer (April-October) seasons. We analyze the data to find the relation of power consumptions during the controller on/off periods.

Also, daily and hourly average data is computed to display the kW and temperature variation trends in summer and winter seasons based on the controller status. We computed the savings (reduction in kWh) scenario in the Winter, Summer and the combined dataset for the entire year by using the raw average consumptions at the time of controller on & off. Moreover, the multiple regression technique was used for detailed statistical analysis, which gives us more accurate estimation of the savings (reduction in kWh).

Tables 59 and 60 list the results of computed savings in the two methodologies of raw savings and regression savings.

Table 59: Computed Raw Savings

Datasets		Average Power factor	Unity Power factor
Winter(Nov'14-Mar'15)	Main	73.45%	67.99%
	Compressor	53.37%	43.78%
	Supply Fan	72.2%	58.67%
Summer(Apr'15-October'15)	Main	50.49%	44.55%
	Compressor	44.07%	37.36%
	Supply Fan	67.27%	54.18%
Combined (Nov'14-October'15)	Main	56.33%	49.67%
	Compressor	46.15%	37.93%
	Supply Fan	68.56%	56%

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Table 60: Computed Regression Savings

[redacted]

In terms of peak-hour demand, the Enerfit controller managed to reduce the peak demand by 49.13 % when a unity power factor was used and 55.82 % when using varying power factor approach.

Table 61: Peak Demand Savings

Power Factor	Regression Equation (Dataset: Combined: Nov14-Oct15)	Savings
[redacted]		

Four upgrade paths were explored, differentiated by the timing and volume of transponder replacements

Alternatives Evaluated

		Existing Solution	1. iiDEAS software and substation upgrades	2. iiDEAS + replace transponders on failure	3. iiDEAS + replace transponders over 4 years	4. Wireless Mesh Network - 4 year deployment
		Aclara network and switches with FPL built software components (LMS)	• Add iiDEAS software, • required substation upgrades, • use existing transponders	• Add iiDEAS software, • required substation upgrades, • **Gen 2 transponders as existing fail**	• Add iiDEAS software, • required substation upgrades, • **Gen 2 transponder 4 year deployment**	SSN enabled Next Gen switches with new DRMS
Vendors	Software	LMS	LMS and Aclara iiDEAS	LMS and Aclara iiDEAS	LMS and Aclara iiDEAS	Autogrid, Comverge Cooper, Alstom, Others
	Network	Aclara PLC	Upgraded Aclara PLC	Upgraded Aclara PLC	Upgraded Aclara PLC	Silver Spring Network
	Transponder	Aclara LCT Gen-1	Aclara LCT-Gen 1	Aclara DRU-Gen 2	Aclara DRU-Gen 2	Cooper, Comverge
Features		PLC enabled fast latency, visibility into A/C register, 6 months to query A/C loads	New software – much faster testing, improved visibility into connected loads, better reporting	In addition to option 1: Additional visibility, proactive reporting, new load control options	Same as option 2	Proactive visibility into connected loads, eliminate substations, future DR capabilities
CPVRR 30 year			A [redacted]	B [redacted]	C [redacted]	D [redacted]

Investment in Aclara iiDEAS® software is focused on providing near real-time situational awareness

FPL

7 Aclara

8 [redacted]

9 [redacted]

FPL

Aclara

[redacted]

[redacted]

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[redacted]

[redacted]

Software - Aclara Solution

	TWACS EFFICIENCY COMPARISONS: (at "Worst case" SUB & BUS)	1st try read success	Read 1-byte status from REGISTER #99 (error = port stuck O/C)
1.	"As is" FPL software (w/ no "grouping" or FGU options)	98%	>11.0 hours (read ~5600 LCTs 1x1 on Bus 2)
2.	Using iiDEAS software	98%+	[redacted]

[redacted]

[redacted]

FPL

Network – Aclara Solution

	TWACS EFFICIENCY COMPARISONS: (at "Worst case" SUB & BUS)	1st try read success	Read 1-byte status from REGISTER #99 (error = port stuck O/C)
3.	eTWACS (iiDEAS + MIRA/G2 @ sub + IPU per feeder	[redacted]	~1.0 hour (MIRA, SCPA-G2, "Feeder" level)

- MIRA (in each CRU) enables (1) improved search / read reliability (~6 dB avg. improvement in TWACS inbound reception), (2) "noise" filtering (advanced algorithm), and, if FPL installs a 3-phase IPU on every feeder, (3) concurrent-feeder eTWACS capabilities.
- SCPA-G2 (in a CRU) enables (1) fast, efficient, reliable processing of high-volume commands and (2) eTWACS capabilities.

iiDEAS will be used for network testing and LMS will continue to be used for load control execution. iiDEAS for load control will be evaluated in the future along with next gen. DRU (LCT) equipment

FPL

[redacted]

	TWACS EFFICIENCY COMPARISONS: (at "Worst case" SUB & BUS)	1st try read success	Read 1-byte status from REGISTER #99 (error = port stuck O/C)
4.	(Future) Same as 3. along with an eTWACS endpoint	99%+	~0.5 hour (same as 3 .with eTWACS endpoints)

[redacted]

We plan to test the iiDEAS software during 1Q2016

[redacted]

[redacted]

Notes:

1. On, or before, March 31, 2016; FPL must make a decision to move forward with the full implementation or not. If FPL elects to move forward, then the fees indicated in the "Full Implementation" column will be billed. If FPL elects to not move forward with the full implementation, then the iiDEAS software must be uninstalled and no additional fees will be charged.

2. Pricing shown assumes non-hosted (i.e. on FPL premise) iiDEAS deployment. Hosted pricing available, should FPL desire that approach.

3. Excludes server hardware for the iiDEAS software.

EXHIBIT C

JUSTIFICATION TABLE

EXHIBIT C

COMPANY: Florida Power & Light Company
TITLE: List of Confidential Documents
DOCKET NO: Undocketed
DOCKET TITLE: Florida Power & Light Company's 2017 Demand-Side Management Annual Report
DATE: May 18, 2018

Discovery Set	Request No.	Conf. Y/N	Column / Line	Florida Statute 366.093(3) Subsection	Declarant
Staff's First Data Request	7 (Attachment No. 1a)	N	Pg. 1-4	(d), (e)	Thomas R. Koch
		Y	Pg. 5, Lns. 21a, 22-23, 25a, 26-30		
		Y	Pg. 6, Lns. 6-8, 9-15, Cols A-E, Lns.17a, 18-23, 24a, 28-29, Cols A-F		
		Y	Pg. 7, Lns. 11-12		
		Y	Pg. 8, Lns. 7-8		
		Y	Pg. 9, Lns. 2-3		
		N	Pgs. 10-14		
		Y	Pg. 15, Lns. 2-14, 30-34, Cols A-E		
		Y	Pg. 16, Ln. 11, Cols A-F		
		Y	Pg. 17, Lns. 2-5		
		Y	Pg. 18, Lns. 7-36, Cols A-I, 37, 38a		
		Y	Pg. 19, Lns. 5-6, 7a, 26-30, Cols A-E		
		Y	Pg. 20, Lns. 3a, 10, Cols A-F, Lns. 32-33, Cols A-F		
		Y	Pg. 21, Lns. 9-10		
		Y	Pg. 22, Lns. 2-3		
		N	Pg. 23		
		Y	Pg. 24, Lns. 4-5, 14-17		

Staff's First Data Request	7 (Attachment No. 1a)	Y	Pg. 25, Lns. 3-15	(d), (e)	Thomas R. Koch
		Y	Pg. 26, Lns. 5-35, Cols A-J		
		Y	Pg. 27, Lns. 8-35, Cols A-J		
		Y	Pg. 28, Lns. 6-11, 12a		
		Y	Pg. 29, Lns. 2-4		
		N	Pg. 30		
		Y	Pg. 31, Lns. 5-15		
		Y	Pg. 32, Lns. 4-5		
		Y	Pg. 33, Lns. 3-16, Cols A-F		
		Y	Pg. 34, Lns. 7-34, Cols A-J		
		Y	Pg. 35, Lns. 7-34, Cols A-J		
		Y	Pg. 36, Lns. 7-34, Cols A-J		
		Y	Pg. 37, Lns. 7-34, Cols A-J		
		Y	Pg. 38, Lns. 2-5		
		N	Pg. 39		
		Y	Pg. 40, Lns. 2-4		
		Y	Pg. 41, Lns. 5-6		
		Y	Pg. 42, Lns. 2-3		
		Y	Pg. 43, Lns. 2-4, 7a, 8-14		
		Y	Pg. 44, Lns. 2-3		

Staff's First Data Request	7 (Attachment No.1b)	N	Pg. 1	(d), (e)	Thomas R. Koch
		Y	Pg. 2, Lns. 17a, 18-21, 23-27, Cols A-D, 28-32		
		N	Pg. 3-7		
		Y	Pg. 8, Lns. 15-16, Cols A-I		
		N	Pg. 9-10		
		Y	Pg. 11, Lns. 6-17		
		Y	Pg. 12, Lns. 11-16, Cols A-I, Lns. 17a, 18a, 21a, 22a, 23a		
		Y	Pg. 13, Lns. 1-3		
		Y	Pg. 14, Lns. 4-5		
		Y	Pg. 15, Lns. 10a, 11-17		
		Y	Pg. 16, Lns. 6-29, Cols A-I		
		Y	Pg. 17, Lns. 6-30, Cols A-I		
		Y	Pg. 18, Lns. 6-29, Cols A-I		
		Y	Pg. 19, Lns. 6-30, Cols A-I		
		Y	Pg. 20, Lns. 6-29, Cols A-I		
		Y	Pg. 21, Lns. 6-30, Cols A-I 36a, 37, 38, 39a		

Staff's First Data Request	7 (Attachment No. 2)	N	Pgs. 1-2	(e)	Thomas R. Koch
		Y	Pg. 3, Lns. 10a, 11a, 18a, 19a, 23a		
		N	Pgs. 4-7		
		Y	Pg. 8, Ln. 26a		
		Y	Pg. 9, Ln. 31a		
		N	Pg. 10		
		Y	Pg. 11, Ln. 2a		
		Y	Pg. 12, Ln. 2a		
		N	Pgs. 13-16		
		Y	Pg. 17, Lns. 16-25, 26a		
		N	Pg. 18		
		Y	Pg. 19, Ln. 34		
		N	Pg. 20		
		Y	Pg. 21, Lns. 11-20		
		N	Pgs. 22-24		
		Y	Pg. 25, Lns. 4-13		
		N	Pg. 26		
		Y	Pg. 27, Lns. 27-29		
		N	Pgs. 28-37		
		Y	Pg. 38, Lns. 9-18		
		N	Pg. 39		
		Y	Pg. 40, Lns. 28-29		
		N	Pg. 41		
		Y	Pg. 42, Lns. 4-13		
		N	Pg. 43		
		Y	Pg. 44, Ln. 27		
		N	Pg. 45		
		Y	Pg. 46, Lns. 4-13		
		N	Pgs. 47-58		

Staff's First Data Request	7 (Attachment No. 2)	Y	Pg. 59, Lns. 9-18	(e)	Thomas R. Koch
		N	Pg. 60		
		Y	Pg. 61, Ln. 27		
		N	Pg. 62		
		Y	Pg. 63, Lns. 4-13		
		N	Pg. 64		
		Y	Pg. 65, Ln. 28		
		N	Pg. 66		
		Y	Pg. 67, Lns. 4-13		
		N	Pgs. 68-79		
		Y	Pg. 80, Lns. 8-17		
		N	Pg. 81		
		Y	Pg. 82, Ln. 27		
		N	Pg. 83		
		Y	Pg. 84, Lns. 4-13		
		N	Pgs. 85-87		
		Y	Pg. 88, Lns. 4-13		
		N	Pg. 89		
		Y	Pg. 90, Ln. 27		
		N	Pg. 91-100		
		Y	Pg. 101, Lns. 8-15		
		N	Pg. 102		
		Y	Pg. 103, Ln. 27		
		N	Pg. 104		
		Y	Pg. 105, Lns. 4-13		
		N	Pg. 106		
		Y	Pg. 107, Ln. 28		
		N	Pg. 108		
		Y	Pg. 109, Lns. 4-13		
		N	Pg. 110		

Staff's First Data Request	7 (Attachment No. 2)	Y	Pg. 111, Ln. 28	(e)	Thomas R. Koch
		N	Pgs. 112-121		
		Y	Pg. 122, Lns. 8-17		
		N	Pg. 123		
		Y	Pg. 124, Lns, 27, 28a		
		N	Pg. 125		
		Y	Pg. 126, Lns. 4-13		
		N	Pg. 127		
		Y	Pg. 128, Ln. 27		
		N	Pg. 129		
		Y	Pg. 130, Lns. 4-13		
		N	Pg. 131		
		Y	Pg. 132, Ln. 27		
		N	Pgs. 133-145		
		Y	Pg. 146, Lns. 4a, 5a		
		Y	Pg. 147, Lns. 1-10, Cols. A-D		
		Y	Pg. 148, Lns. 7-8		

Staff's First Data Request	7 (Attachment No. 5)	N	Pgs. 1-4	(d), (e)	Thomas R. Koch
		Y	Pg. 5, Lns. 26a, 26b, 26c, 26d		
		N	Pgs. 6-7		
		Y	Pg. 8, Lns. 8-9		
		Y	Pg. 9, Lns. 8-9		
		Y	Pg. 10, Lns. 8-9		
		N	Pgs. 11-16		
		Y	Pg. 17, Lns. 13a, 14a, 16a 16b, 16c, 16d, 16e, 16f, 17a, 18a		
		Y	Pg. 18, Lns. 11a		
		Y	Pg. 19, Lns. 7, 13		
		N	Pg. 20		
		Y	Pg. 21, Lns. 8-13		

EXHIBIT D

DECLARATION

EXHIBIT D

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Florida Power & Light Company's 2017 Demand-Side Management	Docket No: Undocketed

DECLARATION OF THOMAS R. KOCH

1. My name is Thomas R. Koch. I am currently employed by Florida Power & Light Company ("FPL") as a Senior Manager, DSM Strategy, Cost and Performance in the Customer Service Business Unit. I have personal knowledge of the matters stated in this written declaration.

2. I have reviewed the documents and information included in Exhibit A to FPL's Request for Confidential Classification filed this date. The documents I have reviewed and which are asserted by FPL to be proprietary confidential business information, including information reflecting bids, contractual data, and competitive interests. Disclosure of this information would violate FPL's contracts with its vendors, work to the detriment of FPL's competitive interests, impair the competitive interests of its vendors and/or impair FPL's efforts to enter into contracts on commercially favorable terms. Specifically, the documents contain information regarding pricing, operating characteristics and segmentation, and technology trail results. The disclosure of this proprietary confidential business information would disadvantage the vendors and FPL. To the best of my knowledge, FPL has maintained the confidentiality of this information.

3. Consistent with the provisions of the Florida Administrative Code, such materials should remain confidential for a period of eighteen (18) months. In addition, they should be returned to FPL as soon as the information is no longer necessary for the Commission to conduct its business so that FPL can continue to maintain the confidentiality of these documents.

4. Under penalties of perjury, I declare that I have read the foregoing declaration and that the facts stated in it are true to the best of my knowledge and belief.

[signature]

Thomas R. Koch

Date: 5/17/2018