Dorothy Menasco

From: George Cavros [george@cavros-law.com]
Sent: Wednesday, December 22, 2010 6:03 PM
To: Filings@psc.state.fl.us
Cc: Beth Salak; Katherine Fleming; Larry Harris; John Burnett; Dianne Triplett; Steve Griffin; Jessica Cano; Charles Guyton; Wade Lichtfield; James Beasley; Suzanne Brownless; Rick Chamberlin; Vicki Kaufman; John Moyle; John McWhirter; Jay Brew; John Wilson; Tom Larson
Subject: SACE's Additional Comments for Docket Nos. 100160, 100154, 100155 and 100159
Attachments: SACE's Additional Comments for Docket Nos. 100154-55-59-60.pdf

Dear Commission Clerk,

In accordance with the electronic filing procedures of the Florida Public Service Commission, the following filing is made:

A.
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B. This filing is made in Docket Nos. 100160-EG - Petition for Approval of Demand-side Management Plan of Progress Energy Florida, Inc.; 100154-EG - Petition for Approval of Demand-side Management Plan of Gulf Power Company; 100155-EG - Petition for Approval of Demand-side Management Plan of Florida Power and Light Company, and 100159-EG -Petition for Approval of Demand-side Management Plan of Tampa Electric Company .

C. This document is filed on behalf of Southern Alliance for Clean Energy (SACE).

D. The document is 59 total pages.

E. The attached document is SACE's Additional Comments and attachments on the proposed DSM plans in the above dockets and the related Staff recommendations.

Sincerely,

George Cavros

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12/23/2010

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22 December 2010

Beth W. Salak
Director, Office of Regulatory Analysis
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Re: Docket Nos. 100154-EG (Gulf Power Company) [Order PSC-10-0608-PAA-EG];
100155-EG (Florida Power and Light);
100159-EG (Tampa Electric Company) [Order PSC-10-0607-PAA-EG][1];
100160-EG (Progress Energy Florida) [Order PSC-10-0605-PAA-EG]

Dear Ms. Salak:

We are writing to express continuing concerns with the Demand Side Management (DSM) plans submitted pursuant to Commission Order No. PSC-09-0855-FOF-EG and subsequent related orders and staff recommendations pertaining to the FEECA dockets. We are disappointed with the slow progress in the review of these plans and particularly with the failure of Florida's utilities to submit the best possible plans to serve their customers.

Over a year ago, the staff of the Commission expressed its interest in the "careful consideration of the impact of rates for all customers" in its evaluation of energy efficiency goals and made its initial recommendation at a level that would "minimize any additional rate impacts to customers."[2] The Southern Alliance for Clean Energy (SACE) and our partner Natural Resources Defense Council (NRDC) emphasized a somewhat different point of view in that proceeding, namely "minimizing the total cost to customers of receiving reliable energy services."[3] The Commission reached its decision and set goals for Florida utilities.

Notwithstanding our focus on lower overall costs to consumers as the main reason to pursue aggressive energy efficiency programs, SACE has consistently emphasized that the proper time to consider and minimize rate impacts is during these ongoing proceedings, as directed in F.S. §366.82(7).[4]

Florida's utilities indicated in recent discovery that residential bill impacts will be on the order of 2-11%, not considering the bill savings to program participants. Our analysis strongly suggests that the bill impacts projected by Florida utilities are needlessly excessive.[5] However, we believe poorly designed programs are the reason for the excessive bill impacts.

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[1] SACE recognizes that the Commission has approved TECO's plan. However, the Commission could choose to revisit this plan in a future proceeding.

[2] PSC staff recommendation, Commission review of numeric conservation goals, Dockets Nos. 080407 - 13, October 15, 2009, p. 4.

[3] NRDC-SACE, *Issue Statement and Post-hearing Brief*, Commission review of numeric conservation goals, Dockets Nos. 080407- 13, August 28, 2009, p. 4.

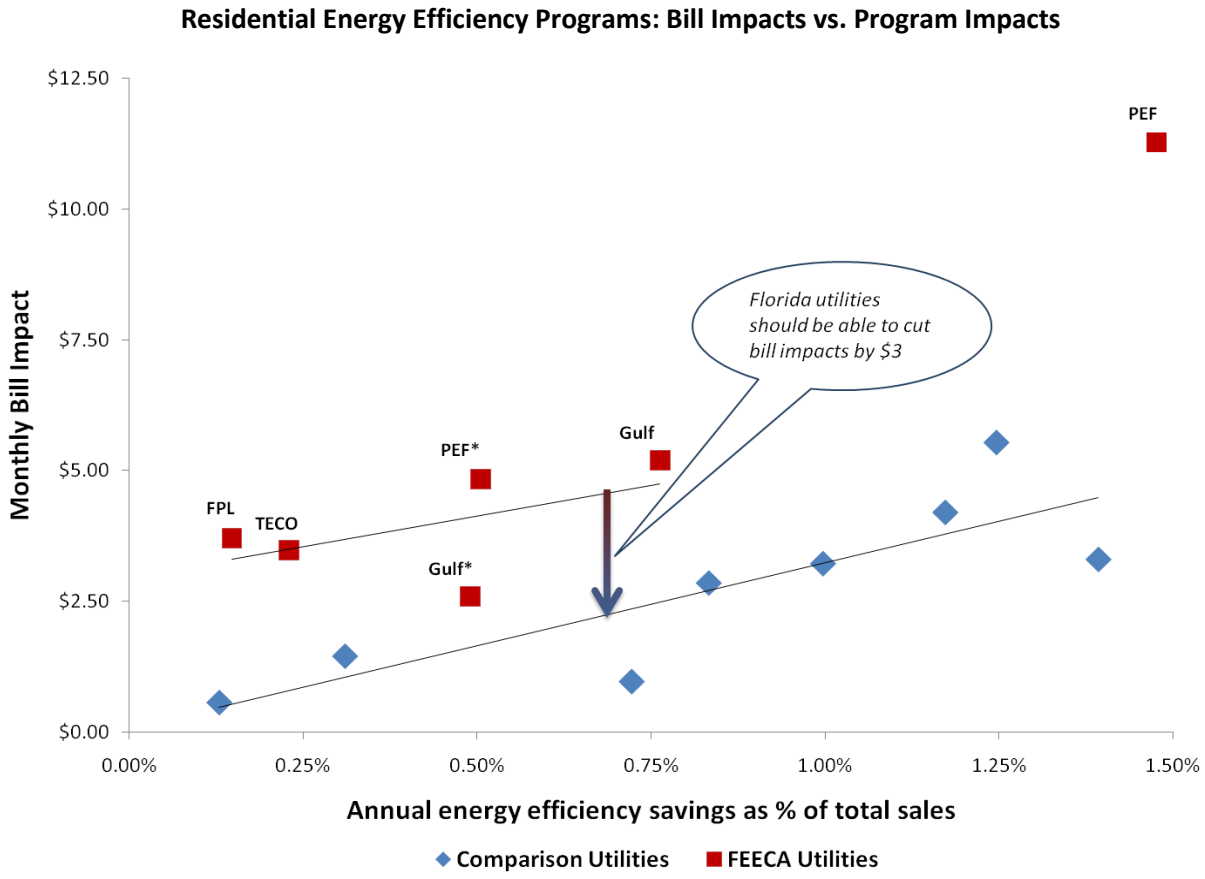
[4] *See* John D. Wilson, *SACE/NRDC Comments*, Commission Workshop on Dockets Nos. 080407 - 13, November 3, 2008.

[5] Richard Spellman, *Direct Testimony of Richard Spellman*, Dockets Nos. 080407-13, July 17, 2009, p. 56. Witness Spellman, discussed a Lawrence Berkeley National Laboratory (LBNL) study that estimated the long term rate impacts of implementing a "Significant Energy Efficiency scenario," defined as saving one percent per year of annual electric sales, would result in a "levelized rate impact of 0.83 percent over a 20-year period." Even a

(continued)

Energy efficiency program bill impacts are higher in Florida than elsewhere

Florida's four largest investor-owned utilities have proposed programs that will cost residential customers about $3 per month more than similar programs offered in other states. We collected bill impact and program impact data from a sampling of peer utilities. We followed Florida convention in assuming 1,200 kWh per household and focused on residential tariffs in effect at the present time.



Sources: See accompanying table and source listing.

Two conclusions are evident from this simple analysis. First, the bill impact of residential energy efficiency programs increases by about $0.75 per month for every 0.25% increase in annual energy savings, with some variation among utilities. Second, the bill impact of programs planned by Florida utilities appears to be about $3 per month more than comparably scaled programs offered by utilities in other states.

To reduce bill impacts to residential customers, Progress Energy Florida (PEF) and Gulf Power propose to reduce the goals that were established by the Commission in prior proceedings.[6] While that is one way to reduce bill impacts, this approach does not appear to affect the $3 per month cost differential between Florida utilities and utilities in other states.

"Moderate" scenario of half that level, according to the LBNL study, results in a "levelized rate impact of 0.14 percent over a 20-year period.

[6] Petition for approval of DSM plan of Progress Energy Florida, Inc, Docket No. 100160-EG, November 29, 2010; Gulf Power Co. 2010 Ten-Year DSM Plan, November 12, 2010. TECO did not present any program cuts in its finalized plan.

This approach, reducing rate impacts by reducing plan impacts, represents re-litigation of the goals decided in the goal-setting proceeding. We would urge the alternative: development of better, more economical plans. As discussed below, there are alternatives to simply removing "rate impact mitigation measures," as proposed by Gulf, or slashing program participation levels, as proposed by PEF.[7]

The other approach to reducing bill impacts is to redesign the programs to achieve results more in line with national norms.

These two approaches are both captured by our "saved energy cost" metric.[8] As we have discussed in our previous letter to Commission staff, "saved energy cost" is simply the cost of the programs divided by the energy savings impact. If the saved energy cost of a utility's portfolio is cut by 50%, there is no ambiguity: the monthly bill impact of the portfolio cost is cut by 50%.[9]

Yet the only method suggested by utilities in this proceeding to reduce rate impacts is to reduce plan impacts. As illustrated below, this means effectively re-litigating the Commission Order establishing energy efficiency goals.

Cost of Saved Energy =	Source for Relevant Data
Plan Costs ÷	Utility Plans
Plan Impacts	Commission Order

As we have previously discussed, the four large investor-owned utilities have proposed energy efficiency programs with a saved energy cost of $0.29 – $1.09 per annual kWh saved. Of these four utilities, the plan proposed by Tampa Electric Company (TECO) is the only plan with an overall cost that is within the range of industry norms, based on the peer utilities we reviewed and other evidence discussed in our letter. Application of best practices in energy efficiency portfolio development should enable every Florida utility to offer energy efficiency portfolios with a saved energy cost in the range of $0.10 – $0.40 per kWh.

Strategies to reduce bill impacts WITHOUT reducing energy savings

In our previous letter, we discussed a number of best practices that Florida utilities could transfer from other states that would result in meeting the Commission's goals at a lower saved energy cost – and hence with lower bill impacts. Among the ideas we brought to the attention of the Commission staff are the use of behavioral programs, low-cost program design alternatives, and re-balancing the portfolio to emphasize lower cost programs. These shortcomings in their plans appear to be driven by the skepticism of Florida utilities that programs developed in other states could be replicated in Florida.

Behavioral programs offer a low-cost alternative to incentive-only programs

Although behavioral programs have been operated for many years, the approach of inducing quantifiable changes in customer behavior to reduce energy use has recently gained more widespread acceptance. The American Council for an Energy-Efficient Economy (ACEEE) has convened three annual conferences to increase the understanding of the nature of individual and organizational behavior and decision-making as it impacts energy use.

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[7] We recognize that PEF's "Revised Goal Plan" does include some positive enhancements, as discussed below, but these improvements offer minimal compensation for the reductions in participation levels.

[8] There has been some dispute about the relevance of the "saved energy cost" metric in these proceedings. At certain points in our previous comment letter, we could have more accurately explained our intent by using the term "unit cost" rather than "cost-effectiveness." Nevertheless, we believe the intent of our analysis is perfectly clear. Any reading that suggests we intended to substitute the "saved energy cost" metric for the Commission's cost-effectiveness tests is clearly contradicted by our discussion of this metric for benchmarking purposes.

[9] The cost savings to program participants would not necessarily be cut by 50%, impacts would vary.

Consider, for example, the building operator certification program discussed in a recent ACEEE report (summary attached). This program has been operating in the Kansas City area since 2007 and is now offered in 25 states. At very little cost to the utility, building superintendents and operators are trained to improve the energy efficiency of their buildings, saving energy and lowering energy costs for the business.

This type of program is not included in Florida utilities' portfolios. While SACE and NRDC recommended that the 2008 Itron technical potential study include a comprehensive building commissioning program, including both this type of training as well as installation of related measures. In response to our recommendation, Itron assured us that several included measures would encompass the potential savings associated with building commissioning. However, subsequent communications that were not fully developed until rebuttal testimony revealed that only about 17% of potential savings associated with building commissioning were evaluated in the technical potential (and hence the achievable potential) portion of the study. In short, a substantial portion of the energy savings that may be achieved through commercial building commissioning was entirely omitted from the Itron studies.

This omission is a good example of a tendency of the big-four Florida utilities to focus on technology measures and typically under-represent verifiable behavioral programs. We were pleased to see that PEF has added a home energy comparison report to its portfolio so that two Florida utilities are now incorporating this approach into their programs.

However, neither Gulf nor PEF are fully exploiting the energy savings opportunity presented by home energy comparison reports.

- Gulf has slightly increased its near-term participation and added additional program years for 2017-19. There is no explanation for Gulf's proposal to temporarily cease offering this program for 2014-16. There is also no explanation as to why Gulf proposes to limit program participation to 9% in 2010-1013 and 4% in 2017-19. As noted in our earlier letter, Gulf could expand this program to serve its entire customer base and meet over 25% of its 478 GWh residential goal for 2019 with this single program.
- PEF has added a home energy comparison report to its portfolio in its Residential Behavior Modification Program.[10] However, PEF limits program participation to only a bit more than 3% of its customer base. If PEF expanded this program to serve its entire customer base,[11] it could increase its "Revised Goal Plan" from 881 GWh in 2019 to 1,268 GWh in 2019.

A further concern is that PEF's cost for this program is excessive. As illustrated below, PEF's program costs are much higher than either Gulf or APS.[12] We did not find any explanation for the higher cost.

[10] The term "behavior modification" in the program title is unclear at best. Why not call it a "home energy comparison report"?

[11] While PEF's cumulative participation table indicates 27% market penetration, we do not believe this is correct. As correctly described in Gulf's program participation table, energy savings from this type of program are not anticipated to be persistent and thus the annual participation rate is identical to the cumulative participation rate.

[12] In its pilot year, APS proposes to serve about 9% of customers with this program. If successful, APS intends to propose expansion of the pilot program.

Comparison of Home Energy Comparison Report program savings and costs

Utility / Program Year	Utility Program Cost ($ million)	Total Savings (million kWh)	Saved Energy Cost (¢/kWh)
Gulf / 2011	$ 0.36	10.5	3.4 ¢
Gulf / 2017	$ 0.23	6.0	3.8 ¢
PEF / 2011	$ 0.85	12.5	6.8 ¢
PEF / 2017	$ 1.15	12.5	9.2 ¢
APS / 2011[13]	$ 1.02	25.0	4.0 ¢

If all four large investor-owned utilities adopted such a program, evidence from similar programs operating across the country suggests they could save 1,900 GWh of energy. These programs could benefit virtually any residential customer and at typical response rates would reduce electric bills by $228 million per year.

Florida utilities have not taken advantage of lowest-cost program design models

Gulf offers a self-install CFL program with a total cost of more than $30 a bulb.[14] An obvious alternative to their current extremely high overhead costs is a market transformation/upstream market program. As discussed in our prior letter, MidAmerican has experience with an upstream market program. When Commission staff asked Gulf how it plans to increase participation in the CFL program, the utility suggested increasing the budget by $4.58 million.[15] If the program were better designed, greater market penetration could be obtained at lower cost, rather than eliminating the program as proposed by Gulf in its "rate mitigation plan."[16]

In contrast, we are aware that Duke Energy Carolinas has simultaneously increased the savings rate and reduced the unit cost of its portfolio of energy efficiency programs.[17] This type of field experience contradicts the typical assumption of Florida utilities that increased participation rates necessarily entail constant or higher unit costs.

Similarly, there are lower cost alternatives for achieving HVAC energy savings in existing homes than proposed by Gulf. Nearly two-thirds of the energy savings that would be dropped from Gulf's plan if the so-called "Rate Impact Mitigation Measures" are removed relate to HVAC retrofit ("early retirement") measures.

In contrast, the HVAC energy savings program design used by APS achieves similar impacts at a far lower cost[18] by offering an integrated program that includes equipment incentives, support for proper installation and maintenance, training and technical assistance for HVAC contractors, and education to consumers. In fact, this program has been successful enough that in 2009 APS shifted 19% of its Consumer Products Program and 25% of its Residential New Construction Home budgets to this

[13] Arizona Public Service Company, *Demand Side Management Implementation Plan for 2011*, Arizona Corporation Commission Docket Nos. E-01345A-10-0219, June 1, 2010.

[14] SACE discussed this issue its previous comment letter; *See also* Gulf Power Co. Response to Staff's Fourth Data Request, Docket 100154, December 7, 2010, No. 7.

[15] Gulf Power Co. Response to Staff's Fourth Data Request, No. 7.

[16] Gulf Power Co. 2010 DSM Plan, Docket 100154-EG, pp. 1-11.

[17] Duke Energy, *Carolinas' Collaborative Meeting–Energy Efficiency Programs Quarterly Update*, November 30, 2010, p. 4.

[18] For example, APS offers a $475 incentive for SEER 16 upgrade, in comparison to the $1,050 incentive proposed by Gulf in its original plan.

program. At this high level of program participation, APS reports that its *cost-effectiveness has increased*.

Comparison of Existing HVAC program savings and costs

Utility / Program Year	Program Costs[19] ($ million)	Total Savings (million kWh)	Saved Energy Cost (¢/kWh)
APS / 2009 [20]	4.6	9.2	50 ¢
Gulf / 2011	6.9	9.1	76 ¢
HVAC Maintenance	2.0	3.1	64¢
Early Retirement T1	2.6	3.7	70¢
Early Retirement T2	0.4	0.6	71¢
Early Retirement T3	0.1	0.1	70¢
Efficiency Upgrade T1	0.6	0.8	75¢
Efficiency Upgrade T2	0.1	0.1	74¢
Efficiency Upgrade T3	0.1	0.1	160¢
Duct Repair	0.8	0.1	57¢
ECM Fan	0.3	0.4	67¢

As this comparison between Gulf and APS indicates, relying on high incentive levels is a path to higher costs, which shouldn't come as a surprise. But high incentive levels are not the only path to higher results, as the success of the APS program suggests.

Nevertheless, in some cases it may be advisable to increase incentives, and that may be possible with little impact on rates. For example, in our prior letter we noted that TECO's Commercial Lighting program "reaches less than 1% of customers over ten years for the major measures. . . . Incentive levels could be increased with little additional pressure on rates since they are less than 5% of the costs in the RIM test."

Florida utilities could re-balance portfolios to emphasize lower-cost programs

Re-balancing investment from high-cost programs to low-cost programs could result in a further reduction in rate impacts. For example, in our prior letter, we noted that TECO's five commercial HVAC programs reach only 1% - 5% of customers over ten years. Other than the Energy Recovery Ventilation program, such programs are so cost-effective that they could reasonably be expanded substantially. The cost-effectiveness results for the four more cost-effective HVAC programs have TRC scores of 3.3 – 7.9 and RIM scores of 0.99 – 1.2. In other words, expanding these programs could result in downward rate pressure and substantially lower overall energy costs for TECO customers.

While we await PEF's response to Commission staff discovery requests to conduct a more thorough analysis, we note a continuing reluctance by PEF to emphasize low-cost, high-impact residential lighting programs in its portfolio. The limited use of short-term CFL offers demonstrates that PEF has not considered the wide range of technologies and program design strategies associated with residential lighting programs across the country. For example, the Consortium for Energy Efficiency has shown that the vast majority of residential lighting programs offer more than just CFLs to their customers.[21] Putting greater emphasis on residential lighting energy savings opportunities is another strategy that PEF could use to attain the residential energy savings goals established by the Commission.

[19] Including utility program costs and utility paid rebates & incentives.

[20] Arizona Public Service Company, *DSM Semi-Annual Progress Report for the Period: July through December 2009*, Arizona Corporation Commission Docket Nos. E-01345A-03-0437 and 05-0526, March 1, 2010.

[21] Consortium for Energy Efficiency, *Summary of Residential Lighting Programs in the United States and Canada*, April 2010.

Florida utilities suggest indifference to successful models in other states

Florida utilities don't appear to be using the lowest-cost program design models or offering portfolios balanced to include the best program models because they seem skeptical that programs developed in other states could be replicated in Florida. Utility responses to interrogatories provide few specific examples of how an in-depth consideration of practices by leading utilities has been incorporated into the expanded efforts necessary to meet the goals established by the Commission.

For example, while FPL indicates that its review included the portfolios of "DSM leaders around the country," it does not appear that FPL utilized this review in setting incentive levels, as FPL feels that benchmarking is not "necessary or appropriate."[22] Although asked, PEF does not indicate whether or not it reviewed any peer utility programs (if any peer utility programs were reviewed, PEF does not provide any description of those reviewed).[23]

However, we do commend the acknowledgement by Gulf Power that it considered non-Florida utility programs in its planning process and that it has joined the Consortium for Energy Efficiency.[24] Gulf is also likely to benefit from the significant expansion of energy efficiency programs at its sister utility, Georgia Power, as directed by the Georgia Public Service Commission. Goals established for Georgia Power are similar in magnitude to those established for several of the Florida utilities.

One further concern raised in the context of low-cost program models is that utilities have sometimes conflated "measures" with "programs." For example, PEF proposed a program that is composed of the "two-year payback" measures identified by Commission staff in the prior proceeding. Establishing programs by simplistic packaging of measures is not a comprehensive approach; and measure-driven, rather than outcome-driven, program designs are contrary to the best practices we have observed in industry reports and individual utility plans.

Progress Energy's use of escalation values is not justified

PEF has not provided a detailed, adequate explanation of why it applied escalation values[25] to estimated program, incentive and participant costs. SACE learned of the escalation values in response to a discovery request, but the response did not include anything beyond simply the application of the values as discussed in our previous letter to staff.[26]

We appreciate that Commission staff followed up on this issue, but SACE is not compelled by PEF's response.[27] PEF responded in two short paragraphs that the escalation value is a "means of calibrating PEF's historical program and incentive costs to the level of cost in the Itron E-TRC High achievable study."

This response provides no detailed explanation of how the specific values were calculated by PEF. Typical escalation values of 2 – 5 are represented in PEF workpapers, although in some cases the underlying program costs are "escalated" by as much as a factor of 39. It appears that 50% to 90% of PEF's program costs in its original plan can be attributed to the escalation values.

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[22] FPL response to SACE's 2nd Set of Interrogatories, Nos. 3, 7.
[23] PEF response to PSC Staff's 6th Data Request, October 1, 2010.
[24] Gulf Power response to SACE's 2nd Set of Interrogatories, No. 3.
[25] In some discussions and discovery correspondence, Commission staff and PEF have referred to "escalation factors." These "factors" were originally referred to as "escalation values" by PEF in its workpapers, neither term was coined by SACE.
[26] SACE's 2nd Request to PEF for Production of Documents, No. 6, October 8, 2010.
[27] PEF response to PSC Staff's 6th Data Request, No. 6, Docket 100160-EG.

Without any supporting detail, it is impossible to understand what PEF means by its assertion that the escalation values are merely a calibration technique. Commission staff may wish to consider whether it is possible that PEF may have "calibrated" costs that were already set at a level used in Itron's high case.

According to PEF's response to Commission staff's 1st data request, PEF used the "ITRON cost projections used in the high case." Its incentive and program costs used in its plans were provided as Exhibit 9 to its response.

Contrasting PEF's response to staff's 1st data request with PEF's explanation of the escalation values, it appears that program costs, incentive levels and participant costs derived from Itron's high case scenario were further escalated during the PEF "calibration."

Further complicating this is that it appears that an additional increase to these costs was applied during the program cost development process. For example, consider the incentive payments forecast for geothermal heat pumps in the Home Energy Improvement program.

- As represented in Exhibit 9 in the response to Commission staff's 1st data request, the incentive payment for a geothermal heat pump is forecast at $1,411 in the original plan.
- However, as represented in the measure matrix workpaper PEF-DSM-00454 provided to SACE in response to our 1st discovery request, the incentive payments range from $2,500 to $10,908 (as reproduced below).

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$2,500	$2,575	$3,245	$4,050	$4,374	$5,449	$6,804	$8,468	$9,569	$10,908

- Furthermore, as explained in our previous letter detailing the formulas used in PEF's workpapers, the program costs developed in the measure matrix are further increased by the "escalation values" provided in the "Summary of Measure Matrices" workpaper PEF-DSM-00501 provided to SACE in the same response (as reproduced below).

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0.82	0.95	1.14	1.36	1.46	1.36	1.46	1.76	2.12	2.57

One can infer from PEF's various responses that its application of Itron's high case resulted in an incentive level of somewhere between $1,411 and $28,033.56 – hardly a clear explanation of how it developed its rate impact estimates.

Furthermore, PEF's explanation of the escalation values doesn't explain why participant costs are also escalated. It does make some sense that an incentive amount and program costs might increase with a higher level of market penetration. Nevertheless, it is hard to imagine a reason that participant costs (after receiving a markedly-inflated incentive) would be 2 or even 3 times higher when reaching customers in the high case compared to the low case.

None of the other utilities used cost escalation values in their cost-effectiveness tests. The Commission staff should consider whether a satisfactory reduction in rate impact would result from simply excluding the escalation value calculation from PEF's portfolio budget.

Sound plans for evaluation, measurement and verification are needed to ensure cost-containment

In addition to failing to be aware of and apply lessons from the leading utility programs around the country, the four Florida utilities do not appear to be offering industry-standard evaluation, measurement and verification (EM&V) plans. As indicated by the comments of PEF's Attorney John Burnett and subsequent elaboration, a utility could utilize a program "that does not require a high-level of verification to confirm

actual energy savings" to meet energy savings goals.[28] Our request for PEF's EM&V plans was met with a two paragraph response, which does not provide evidence of a high level of verification.[29] As an example of the type of document we expected to receive, we attach Duke Energy Carolinas' EM&V plan for North Carolina.

RECOMMENDATIONS: Commission staff should accelerate program approval, while taking steps to control costs

We desire to see Florida's utilities expeditiously implement aggressive energy efficiency programs – but in order to be sustainable, those programs must meet the Commission's goals at the lowest practical cost.

Goals should not be reduced

While some appear to be re-litigating the goals proceeding, SACE has refrained from emphasizing the justification for even higher energy efficiency goals that we advocated during the prior proceeding. While it is within the prerogative of the Commission to approve portfolios that are unlikely to achieve its goals, it should only consider such a step after it has been shown that all program options have been exhausted to meet the goals at a reasonable cost.

In particular, we are not convinced that the PEF Revised Goal Plan is anything more than a re-litigation of the goals proceeding. PEF fails to consider full adoption of cost-effective programs, such as offering the home energy comparison report to all customers or offering a range of residential lighting technologies beyond CFLs. Furthermore, we do not accept that the use of escalation values and the resulting excessive costs represented in the so-called "Original Goal Scenario" were a good-faith effort to achieve the Commission's goals at the lowest possible cost.

Similarly, there is no need to reduce the goals established for Gulf (or FPL) in order to reduce customer bill impacts to reasonable levels. Customers of Florida utilities should not overpay for energy efficiency programs at any level of service. Allowing Florida utilities to overcharge for energy efficiency programs at a lower level of service does not address the fundamental problems in these proposed plans. As we suggest above, there is ample basis for Commission staff to suggest modifications and additional programs that Florida utilities could implement in order to meet the goals established by the Commission.

If, however, the Commission staff decides to recommend reducing any specific goals in an effort to control bill impacts, we recommend that the Commission staff also recommend increasing other goals that can be met without increasing bill impacts. In its original plan and again as part of its "Revised Goal Plan," PEF has proposed programs that would exceed its non-residential goals. We would suggest that re-balancing goals across customer sectors would be preferable to reducing overall goals. Reducing energy efficiency goals would require the acquisition of more costly generation resources to meet this additional demand.

Programs should be expedited

In the interest of avoiding delay, Commission staff could recommend approval of programs that appear to be either well-designed or have the potential to be well-designed if modified based on Commission direction or early program experience. Staff has appropriately begun with an analysis of the standard cost-effectiveness test required by the Commission for all utility plans. We encourage Commission staff to press for further efforts to improve plans to reduce costs without reducing customer benefits. An approach that looks singularly at the rate impact could fail to similarly emphasize the "cost-effectiveness" of the programs, which is of "particular importance" pursuant to § 366.81, Fla. Stat. We urge Commission staff to provide the Commission with information to determine if programs are well designed with best

[28] PEF response to SACE's 2nd Set of Interrogatories, No. 2.
[29] PEF response to SACE's 2nd Set of Interrogatories, No. 5.

management practices, if costs are within national norms (or have some valid reason for operating at a higher cost). For those programs that meet those criteria, we urge the Commission staff to expedite approval so that the utilities may begin offering these services to customers immediately.

Costs should be reduced

However, if the criteria described above are not met, we urge the Commission staff to provide the Commission with ways that it may modify those programs pursuant to § 366.82(7), Fla. Stat. In general, it appears to us that the costs associated with many of the programs proposed by Florida's utilities are excessive. The challenge to Commission staff is that the problems are deeply embedded within the program design process used by the utilities, and cannot be easily extracted and addressed.

Commission staff has the opportunity to recommend that programs be modified, portfolios be re-balanced, and new programs be added to the utility program. If a utility is unwilling or unable to develop new programs, we suggest that the Commission could direct that utility to issue an RFP for energy efficiency program services under direct Commission supervision, and outsource the remaining portion of its goals to vendors who offer programs at competitive costs.

Utilities may need a financial incentive to control costs

We also recommend that the Commission staff reconsider whether to recommend to the Commission that it request proposals for implementing the financial incentive mechanism authorized in Section 366.82(9), Fla. Stat. consistent with the 50 basis point cap, but also incorporating measures to address net lost revenues and a performance-based mechanism that rewards cost control and verified customer savings. We speculate that an underlying issue is that Florida utilities are expected to offer highly complex DSM programs that can potentially result in under recovery of their revenue requirement, without any profit opportunity.

Thank you for taking the time to consider our comments. We would be pleased to expeditiously provide relevant workpapers and documentation to the staff or any party, to the extent it is reasonable, in the interests of advancing understanding of the utilities' plans.

Sincerely,

John D. Wilson

Director of Research

Attachments: ACEEE report review, Residential bill and program impacts, Duke EM&V plan

cc: Parties of record via email

Review of benchmark programs from ACEEE's "Effective Behavioral Approaches to Improving Customer Energy Efficiency" –Report E108, 15-Oct-10

A recent report from ACEEE, *Visible and Concrete Savings: Case Studies of Effective Behavioral Approaches to Improving Customer Energy Efficiency* http://www.aceee.org/research-report/e108, focuses on efforts to influence ongoing EE behavior and habits among individual and/or organizational consumers that affect ongoing energy use, rather than occasional behavior, such as equipment purchases. Several programs of particular interest described in the report are summarized below.[30]

Key observations from the report's recommendations:

> Increasing the visibility of our energy use behavior can facilitate changes that yield s energy efficiency and otherwise reduce energy use. Increasing visibility means putting the evidence "front and center" through some type of visual display—the equivalent of an auto dashboard that displays how much fuel remains in one's gas tank.
>
> Social environments can have a large influence on energy use by individual customers. Knowing what social norms influence their decisions, what social networks allow them to influence others, and what sources they consider credible can change the approaches efficiency programs take.
>
> Companies [with leading EE programs] build their industrial programs in alignment with their existing corporate structures and cultures. . . . Firms need to align energy objectives with other key objectives such as productivity, financial performance, and product quality.

The potential energy savings associated with the programs summarized below were not included in the Itron potential study relied upon during the FEECA goal-setting proceedings.

[30] For a comprehensive review of over 50 residential studies regarding using feedback to influence behavior and energy use spanning 30 years, see Ehrhardt-Martinez, Karen, Kat A. Donnelly, and John A. Laitner. 2010. Advanced Metering Initiatives and Residential Feedback Programs: A Meta-Review for Household Electricity-Saving Opportunities. Report E105. Washington, D.C.: American Council for an Energy-Efficient Economy.

Behavioral Programs Deliver Measurable Energy Savings to Leading Utility Efficiency Programs

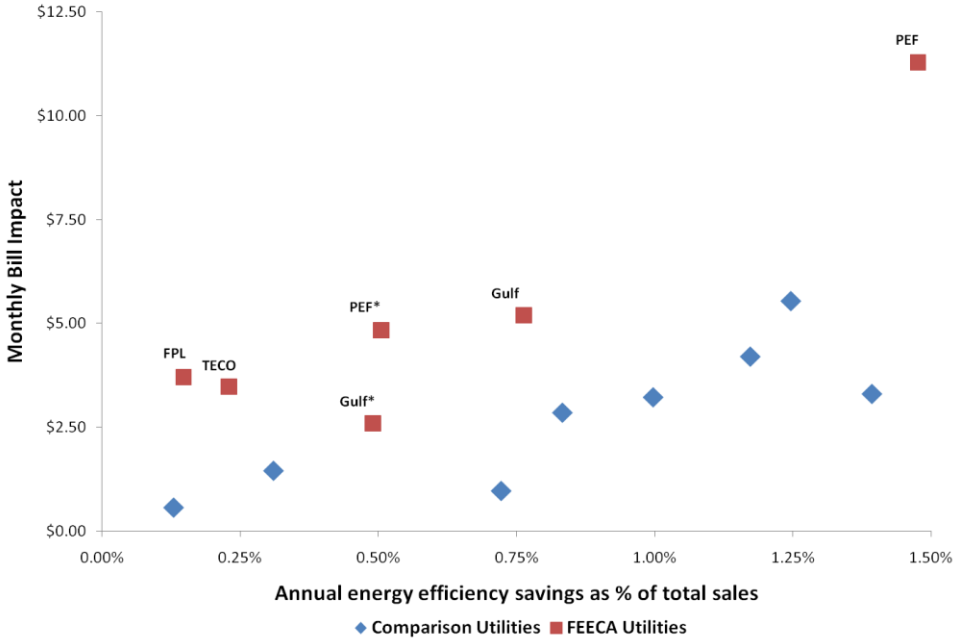
Visible and Concrete Savings: Case Studies of Effective Behavioral Approaches to Improving Customer Energy Efficiency [31]

Program	Implementing Utility	Reported Savings	Reported Costs	FEECA Utility Programs
Building Operator Certification Program	Kansas City Power & Light, Missouri (similar programs in 25 states)	9.2 million kWh 2,300 kW 35,000 therms	$1,150 per trainee	**None similar**
Residential Smart Energy Monitoring Pilot	Cape Light Compact, Massachusetts	9.3%	Free to participant; utility cost not reported	**TECO**: Energy Planner-Residential Price Responsive Load Mgmt.[32] **PEF**: Business Energy Response Program [33]
Home Energy Reporting Program	Sacramento Municipal Utility District, California (similar programs offered by at least 15 other utilities)	2.4%	$0.03 per kWh saved [34]	**Gulf**: Home Energy Reporting [35]
M-Power Program	Salt River Project, Arizona	109,800 MWh	Not available (TRC 1.95; RIM 0.57)	**None similar**
Real Time Monitoring Pilot	Hydro One, Ontario, Canada	6.5% of kWh	Not available	**None similar**

[31] Friedrich, Katherine, Jennifer Amann, Shruti Vaidyanathan, and R. Neal Elliott. 2010. Visible and Concrete Savings: Case Studies of Effective Behavioral Approaches to Improving Customer Energy. Report E108. Washington, D.C.: American Council for an Energy-Efficient Economy.
[32] TECO Ten Year DSM Plan 2010-2019, March 30, 2010, Docket No. 100159, p. 113
[33] PEF Proposed 2010 DSM Program Plan, March 30, 2010, Docket No. 100160, p. 192
[34] OPOWER website, accessed December 16, 2010.
[35] Gulf 2010 DSM Plan, Docket No. 100154, March 30, 2010, p. 2-2

Residential Energy Efficiency Bill and Program Impacts

Residential Energy Efficiency Programs: Bill Impacts vs. Program Impacts



Utility	Monthly Bill Impact ($/1200 kWh)	EE savings as % of sales
Progress Energy (original)	$11.28	1.48%
Puget Sound Energy (Washington)	$5.54	1.25%
Gulf Power (original)	$5.19	0.76%
Progress Energy* (revised)	$4.84	0.51%
National Grid (Rhode Island)	$4.20	1.17%
FPL	$3.70	0.15%
TECO	$3.48	0.23%
MidAmerican (Iowa)	$3.30	1.39%
Arizona Public Service (Arizona)	$3.22	1.00%
Xcel Energy (Minnesota)	$2.85	0.83%
Gulf Power* (proposed deferral)	$2.60	0.49%
Duke Energy (N Carolina)	$1.45	0.31%
Xcel Energy (Colorado)	$0.96	0.72%
Oklahoma Gas & Electric (Arkansas)	$0.56	0.13%

Notes: The "original" PEF plan is the plan as revised to conform to the Commission goals. Gulf Power's proposed deferral plan rate impact is based on statements made in the revised plan that the rate impact of the deferral plan will reduce the rate impact by more than 50%.

Sources:

Progress Energy Florida. Demand-Side Management Revised Goal Plan. Docket 100160-EG. Filed November 29, 2010. p16, Table II-1; p295, Table II-1

Tampa Electric Company's 2010-2019 Ten Year DSM Plan Modifications. Docket 100159-EG. Filed November 3, 2010. p34, Residential Market Sector Demand and Energy Data

Tampa Electric Company's Answers to Second Set of interrogatories (Nos. 2-10) of the SACE. Docket 100159-EG. Filed November 29, 2010. p4, Interrogatory No. 2

Florida Power & Light. Revised Demand Side Management Plan. Docket 100155-EG. Filed July 10, 2010. p11, Table 3, GWh Goals (at the Generator); p147, Table 3, GWh Goals (at the Generator)

Florida Power & Light. SACE's Second Set of Interrogatories. Interrogatory No.2 p2, Table SACE – 2.

Gulf Power Revised Demand Side Management Plan. Docket 100154-EG. Filed November 12, 2010. p 15, Residential Savings at the Generator Table.

Gulf Power Company's response to SACE's second set of Interrogatories (Nos. 2-10).Docket 100154-EG. Filed November 29, 2010. p3, No.2

MidAmerican Energy Company. 2009-2013 Energy Efficiency Plan, Iowa Utilities Board Docket EEP-08-2, April 30, 2008. p87, Savings calculated from Residential Equipment, Residential Audit, Residential New Construction, Appliance Recycling, Low-Income, and MultiFamily Programs.

MidAmerican Energy Company. Iowa Electric Tariffs, Energy Efficiency Cost Recovery. 22nd Revised Sheet No C-3 EIA Form 861, 2009. File 2

The Narragansett Electric Company d/b/a National Grid. Energy Efficiency Program Plan for 2011 Settlement of the Parties. Docket No 4209. p8, Table 1: 2011 Energy Efficiency Program Plan Summary.

The Narragansett Electric Company. Basic Residential Rate (A-16) Retail Delivery Service.

Duke Energy Carolinas. Rider EE (NC) Energy Efficiency Rider. NC Third Revised Leaf No 62.

North Carolina Utilities Commission. Order Approving Agreement and Joint Stipulation of Settlement Subject to Certain Commission Required Modifications and Decisions on Contested Issues. Docket No, E-7, Sub 831. p 16, year 2 savings

Public Service Company of Colorado. Electric Tariff Book. Demand Side Management Cost Adjustment. Sheet No 107.

Public Service of Colorado. 2011 Demand Side Management Plan. July 2010. p14, Table 2a: Public Service's 2011 Electric DSM Program/ Product Budgets and Goals.

Northern States Power Company. Minnesota Electric Rate Book. Conservation Improvement Program Adjustment Rider. 6th Revised Sheet No. 92.

Xcel Energy 2010-2012 Electric and Natural gas Triennial Conservation Improvement Program. Docket No E, G002/CIP-09-198. Filed June 1, 2009. p31, Executive Summary Table – 2011.

Arizona Public Service Company. Demand Side Management Cost Adjustment. Adjustment Schedule DSMAC-1, Revision No. 4.

Arizona Corporation Commission. Demand Side Management Semi-Annual Report Decision 67744. Docket No E-01345A-03-0437. p6. Table 5: Year to Date DSM Electric Savings: January 2009- December 2009. Gross Savings

Puget Sound Energy Ten Year Achievable Conservation Potential and Biennial Conservation Target Report pursuant to WAC 480-109-010(3), Docket No UE100177. Exhibit 1-1

Puget Sound Energy Electric Tariff G. Schedule 120 Electricity Conservation Service Rider. Eighteenth Revision of Sheet No 120

Oklahoma Gas & Electric Company. Direct Testimony of Gary J Marchbanks on behalf of OG&E. Docket 07-75-TF. p44, weatherization, livingwise, custom energy report program savings

Arkansas Public Service Commission. In the Matter of the Application of Oklahoma Gas & Electric Company for Approval of Quick Start Energy Efficiency Programs and the Tariff Related to the Program by OG&E. Docket 07-075-TF. Order 18. Filed May 25, 2010

Evaluation Plans for Duke Energy's Energy Efficiency Programs in North Carolina

Prepared for
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TABLE OF CONTENTS

About This Evaluation Plan

This document presents an overview of all M&V activities that are in progress and/or planned for Duke Energy North Carolina's energy efficiency programs. The North Carolina Utilities Commission approved Duke Energy Carolinas' modified save-a-watt portfolio of DSM and EE measures in Docket No. E-7, Sub 831 on February 26, 2009 ("Portfolio Approval"), and approved the modified save-a-watt compensation mechanism, as set forth in the Agreement and Joint Stipulation of Settlement between the Company, the Public Staff, and Southern Alliance for Clean Energy, Environmental Defense Fund, Natural Resources Defense Council, and the Southern Environmental Law Center ("Settlement Agreement"), in its Order Approving Agreement and Joint Stipulation of Settlement Subject to Certain Commission-Required Modifications and Decisions on Contested Issues issued February 9, 2010 in Docket No. E-7, Sub 831 ("Order"). Ordering Paragraph 7 of the "Portfolio Approval" also approved Duke Energy Carolina's Measurement and Verification Plan.

For evaluations that are currently in progress or slated to start in August 2010 or later, the evaluation plans are provided along with a timeline for the evaluation. Projects dates for planned evaluations are presented in Table 1. These dates represent the current best estimate of the start and finish date for each study; however these dates may shift depending on program status, evaluation requirements and changes to reporting timelines. In addition to the evaluation efforts, the evaluation team will hold early feedback meetings with Duke Energy Program Managers to make sure evaluation findings are conveyed rapidly so that managers do not need to wait for the evaluation reports to act on the evaluation findings.

Where-ever possible, lessons from Duke Energy's experience in other jurisdictions will be leveraged for cost efficacy. For example, where the *same* program is run by the *same* program managers in different states, conclusions and recommendations to improve program execution will be captured and shared between the jurisdictions. Care will be taken to ensure that program participant experiences, e.g. with satisfaction and energy savings are however, jurisdiction specific.

Comments regarding the contents of this plan should be directed to Ashlie Ossege, Manager Market Analytics Duke Energy.[1]

Duke Energy's North Carolina Evaluations in Progress	Estimated Start Date	Estimated Report Date	Progress Summary
Smart Saver CFLs	07/01/10	12/20/10	Participant survey in review, finalizing plan
Residential Smart Saver	11/19/10	02/21/11	(evaluation has not started)
PowerShare	08/15/10	11/01/10	(evaluation has not started)
Power Manager	08/15/10	11/01/10	(evaluation has not started)
Personalized Energy Report	08/02/10	10/25/10	Participant survey finalized, gathering participant contact and participation data.
Non-Residential Smart Saver Prescriptive	09/01/09	08/30/10	Process complete, engineering estimates need adjustments

[1] Ms. Ossege can be reached at Ashlie.Ossege@duke-energy.com

Non-Residential Smart Saver Custom	05/01/09	10/25/10	Interviews are being done as projects and participants are engaged.
Non-Residential Energy Assessments	07/15/10	10/18/10	Participant survey in review, evaluation team has participant data
Low Income CFLs	03/15/10	12/13/10	Draft process evaluation in review, impact analysis to begin in October
K12 Curriculum	03/15/10	08/09/10	Draft report in final stages, will be delivered 08/11/10
OLS EE Survey	Combined with PER evaluation		
Home Energy House Call	05/17/10	09/13/10	Participant surveys completed, analysis in progress. Impact analysis in progress.

Table 1. Specific Dates for Program Evaluations

Table 2 presents a high-level evaluation approach for each of the programs operating under save-a-watt in North Carolina. Table 2 below summarizes the proposed evaluation plans, with more details provided below the table.

Table 2. Summary of Evaluation Approach by Program

Program	Process Evaluation	Impact Evaluation
Residential Programs		
Home Energy House Call	Program manager and implementer interviews. Participant survey (n=70) covering the topics of, at minimum: Free-ridership, operations and their satisfaction with the audit.	Engineering estimates for actions taken as documented via survey with participants and billing analysis to confirm savings when substantial actions taken (enough to be statistically measureable)
Residential Smart Saver Prescriptive	Program manager and implementer interviews. Participant survey (n=30) covering the topics of, at minimum: Free-ridership, operations and their satisfaction with the audit.	DOE-2 modeling calibrated to end-use monitored data used to develop unit savings estimates by SEER for early replacement and normal replacement scenarios. Engineering estimates of early replacement savings trued up to pre/post billing data analysis.
OLS EE Survey	Program manager interviews. Participant survey (n=100) covering the topics of, at minimum: actions taken, changes in household, prior knowledge of measures, intentions to install measures, retention & satisfaction & operations with online tool.	Engineering estimates using survey responses, billing analysis for homes where significant efforts were implemented.
Low Income CFLs	Program manager and implementer interviews.	Billing analysis of participating customers.
Personalized Energy Report	Program manager and implementer interviews. Participant survey (n=70) covering the topics of, at minimum: actions taken, changes in household, prior knowledge of measures,	Engineering estimates of actions reported from survey and billing analysis for homes with enough actions taken.

	intentions to install measures, operation retention & satisfaction	
Power Manager (Residential AC Cycling Control)	Program manager and implementer interviews. Participant and non-participant online surveys covering the topics of, at minimum: comfort, operations, natural thermostat settings, and program satisfaction.	M&V of short-term hourly changes in load due to the appliance cycling activity. Whole-house metering conducted on a random sample, feeding a time-series framework to estimate baseline energy usage. Separate sample to verify controller response to demand shift signal.
Smart Saver CFLs	Program manager and implementer interviews. Participant survey (n=census by mail) covering the topics of, at minimum: number of bulbs purchases, number of bulbs installed, usage patterns of installed bulbs, changes in household, prior knowledge of CFLs, intentions to install CFLs, retention & satisfaction with rebate and bulbs. Retailer survey (n=3) about program satisfaction, operations, promotional placement, customer satisfaction. Review of results from CFL programs in other states.	Surveys to estimate number of lamps and baseline lamp wattage by room type. Data logger samples for estimating hours of use by room type, engineering estimates of savings from survey and light logger data.
K12 Curriculum	Program manager and implementer interviews. Survey of teachers (n=7) and students (n=300) about actions taken, retention of information, and program satisfaction.	Engineering estimates based on survey responses and billing analysis.
Non-Residential Programs		
Non-residential Energy Assessments (online, on-site, telephone)	Program manager and implementer interviews. Participant surveys (n=30) covering the topics of, at minimum: actions taken, prior intentions regarding these measures, changes in technologies or operations that impact usage, persistence of savings and program satisfaction	Billing analysis, engineering estimates, building simulation modeling. On-site surveys and spot metering to verify savings at sites receiving onsite audits as warranted by magnitude of expected savings.
Non-residential Smart Saver (Custom Incentives)	Program manager and implementer interviews. Participant surveys (n=25) covering the topics of, at minimum: what was replaced, prior intentions regarding equipment that was retrofitted, changes in other major end uses that impact electrical usage, changes in hours of operation, persistence and program satisfaction. Vendor interviews (n=5-10) about program satisfaction, promotional placement, customer satisfaction, etc., are optional.	Site visits by experienced energy engineer, engineering estimates, short-term monitoring, billing analysis, and building simulation modeling as appropriate given the nature of custom measure installations.
Non-residential Smart Saver (Prescriptive	Program manager and implementer interviews. Participant surveys	Site visits to verify installations and conditions, short-term end-use metering

Incentives)	(n=15) covering the topics of, at minimum: what was replaced, prior intentions regarding equipment that was retrofitted, changes in other major end uses that impact electrical usage, changes in hours of operation, persistence and program satisfaction. Vendor interviews (n=5) about program satisfaction, promotional placement, customer satisfaction, etc., are optional.	or light loggers, engineering estimates, billing analysis, and building simulation modeling as appropriate for actions taken.
PowerShare	Program manager and implementer interviews. Participant and non-participant survey (n depends on participation levels and events) covering the topics of, at minimum: comfort, natural thermostat settings, program satisfaction, reasons for participation or non-participation.	Short-term hourly changes in load due to the interruption of activity observed from interval billing meter. Submeters installed as necessary in sites with small load shed kW relative to full site kW. Time-series regression analysis applied to hourly metered load to obtain estimate of load reduction. Observations of compliance with interruption requests will be measured through system operations data. Each participant's hourly loads will be analyzed annually.

Introduction

The evaluation plans incorporate two different types of evaluation efforts (process and impact evaluation) into one combined, coordinated study. Essentially these two types of evaluations are coordinated and being planned in a way that allows for independent evaluation planning at the program level, while providing a coordinated effort across all programs. This document provides an overview of the current and planned evaluation efforts; however as with any effort, it is expected that some minor adjustment of the field efforts may occur in order to ensure that all evaluation objectives are met. The purpose of this plan is to present the evaluation efforts to key parties in order to convey the purpose, scope and approach for each specific program evaluation.

These efforts include:

1. A process evaluation that focuses on assessing Duke Energy's programs' operations and making recommendations for program improvements. This effort includes assessing the way in which the programs are designed and implemented, the way they interact within the market, the levels of and drivers for participant satisfaction with the program operations and offerings, and other investigative areas.

2. An impact evaluation that identifies the net energy savings provided by Duke Energy's programs that will work with the process evaluation to identify net impacts and the impacts associated with freeridership, spillover (free-drivers), and other conditions that influence the program's net impacts.

Together these two evaluations, conducted in a highly coordinated approach, will provide Duke Energy with the information they need to understand the impacts of their programs and to make program changes that can be expected to improve operations.

The Process Evaluation Methodology

This part of the plan presents the process evaluation efforts and discusses some of the key issues associated with the process evaluation and the coordination of the process evaluation with the impact assessment.

Overview of the Methodological Approach

The process evaluation efforts will be somewhat different for each program. However, to a certain extent these studies will follow a similar theme and approach. TMW, the independent evaluation administrator, is responsible for overseeing and managing the work efforts of the entire evaluation team so that proper evaluation protocols are followed, that reliable measurements are conducted, that budget spending is appropriate for the desired precision levels, and to ensure that independence and objectivity are maintained throughout the evaluation efforts. From time to time, TMW may leverage the active surveying and customer tracking efforts of the Market Analytics group at Duke Energy, which is organizationally separated from the program implementation efforts, by inserting survey questions for active research efforts, or database queries to understand participation statistics more thoroughly.[2] Regardless of who conducts which tasks, TMW will be responsible for maintaining study objectivity and for approving all work products and efforts. This approach will maintain the reliability of the evaluation efforts, while minimizing the limited evaluation budget that must accomplish all evaluation objectives as reliably as possible.

The process evaluation will consist of program-specific efforts designed to address each program's researchable issues, but will, in general, include the following efforts:

1. Hold an evaluation meeting with Duke Energy to review all study objectives
2. Reviewing programs materials and methods of operation
3. Conducting interviews with program managers and implementers
4. Conducting interviews with trade allies, partners, key managers and implementers
5. Designing interview and survey instruments
6. Conducting surveys with participants and/or non-participants
7. Analyzing process evaluation data
8. Developing process evaluation reports

These tasks are described below and apply to the evaluation efforts associated with the process evaluation for each program being assessed. Again, during the planning process, the specific researchable issues on which each study will focus will be established and the process evaluation plan will be designed to specifically address those issues.

[2] This group is structurally separate from the implementation group at Duke Energy, for example tracking which campaigns generate the largest acceptance rates or conversely when deployment difficulties are encountered such as in CFL stocking capabilities in conjunction with coupon offers, how much customer satisfaction drops.

1. **Hold weekly evaluation meetings with Duke Energy to review all study objectives, conduct evaluation planning, and manage the evaluation logistics and schedule.**

The evaluation team holds a weekly off-site meeting with Duke Energy to review the evaluation efforts and finalize program evaluation efforts. During these meeting we review the upcoming work in detail. We move through the programs and tasks and discuss their design, operation, and timing.

During these meetings the researchable issues are identified and discussed for each active and upcoming program evaluation to reach an agreement on the issues that will be incorporated into each program's final evaluation plan. We identify and prioritize the issues to be assessed.

Once the areas of focus are identified and confirmed, researchable issues can be finalized and the study design confirmed. It is the researchable issues that are the dominant focus of the process evaluation efforts and guide the development of the research plan.

2. **Review programs materials and methods of operation**

This task allows the process evaluation team to become familiar with the detailed operations of the program by reviewing all program-specific documents and incorporating this information with the verbal information obtained during the weekly meetings.

Together, the review of the documents collected, linked with the verbal information obtained from Duke managers, provides the foundation for a number of activities, including: 1) identification of researchable issues for the process evaluation, 2) obtainment of information needed to start the development of interview and survey protocols and instruments, 3) identification of key areas of analysis to be conducted and to support the analysis efforts. Typically we examine between 2 and 6 documents per program during this task.

3. **Conduct interviews with program managers and implementers**

This is one of the critical and most important tasks in the process evaluation effort. At this point in the study, the evaluation team will be familiar with the programs' general program processes and the program managers. We will understand the general operational systems and procedures of the program.

The next step in the evaluation process is to obtain a detailed level of knowledge about each program being evaluated. To accomplish this goal, the evaluation team will conduct detailed interviews with the program managers. During these interviews we will talk through the implementation process associated with each program. We will review program designs, operational procedures, marketing and outreach efforts, tracking and data handling systems, interactions with contractors, allies, participants and non-participants.

To guide these interviews the evaluation team develops interview protocols that identify who will be interviewed, and each of the questions to be asked of each manager. This protocol will be provided to the managers prior to the interview. We have found when managers know the questions they will be asked in advance, they provide more detailed and actionable responses. The interview protocol will be developed in concert with the Duke Energy's evaluation project manager(s). We have found that involving the client in the question construction does not

influence the integrity of objectiveness of the evaluation approach, and in most cases improves the focusing of the questions to be more appropriate for a specific program or for a specific program manager.

While this interview is primarily to serve as the initial detailed program-level process evaluation information gathering task, it is also the time at which we will go over the program theories and logic models (if available) with the program managers to identify needed changes. The interview questions and the manager's responses will serve as one of the data sources for the process evaluation's analysis efforts. The responses will also help set the stage for the identification of the issues to be addressed during the interactions with the trade allies, contractors, participants and non-participants.

4. Conduct interviews with trade allies, partners, key managers and implementers

For a few of the program evaluations, interviews will be conducted with a sample of partners, trade allies and program implementation staff (see program specific efforts in this document). This task is where skilled process interviewers are required. These interviews focus on the program's design, operations, operational conditions, the interaction between the ally, the program and the participant, the service stream and the activities in that stream, the influence of the program and the ally on the participants decision to take actions, and other considerations. In addition, the interviews focus on the interviewee's opinions about which parts of the program work best and least well; and what kind of change recommendations are suggested by the interviewee.

The interviews follow a prescribed protocol that guides the interview to address the key researchable issues. The protocol and the questions to be asked are developed by TecMarket Works and reviewed by Duke Energy managers prior to field implementation. The interviews will be scheduled by TMW staff to be convenient to the interviewee. The interviews may be recorded to preserve a record if required by Duke, however typically detailed notes are taken during the interview and used to drive the analysis efforts. Process evaluation results are typically confidential so that the interviewee will provide opinions and information that are objective and accurate, without concern that their comments will be linked with them as an individual. However, all issues, comments and concerns, as well as interviewee recommendations for program change are reported to Duke Energy. TecMarket Works has developed many of these types of interview protocols with Duke Energy in the past 10 years that have been successfully employed to drive the process evaluation efforts.

5. Design interview and survey instruments

A separate interview or survey protocol and instrument will be drafted for each of the targeted groups (allies, participants and non-participants). The protocols and instruments for the allies will focus on a wide range of design, management and operational issues. The surveys with participants will focus on the participation experience, the ability of the program to help the customer, program and program-component satisfaction, ability of the program to accomplish the reasons for participation, actions that would have been taken without the program, and services that the participants indicated to be of value, among others. The development of the participant survey instruments will also be fed by the results of the program managers' interviews and the trade ally interviews and surveys. Typically these interviews and surveys

identify a range of issues that need to be tested or assessed in the participant survey. The non-participant survey will focus on customer perceptions of the program, the value of the program, the ability of the program to understand and serve a customer need, program design and operational issues, and the reasons for non-participation. This survey will also explore program changes that can be expected to increase participation and satisfaction rates among the non-participants.

For each of these data collection efforts, Duke Energy's managers are given the opportunity to review and comment on the protocols and the interview and survey data collection instruments.

These instruments and protocols are used to guide all data collection efforts. Our primary data collection approaches employ in-depth interviews and surveys, linked to document and records reviews and analysis. All data collection efforts involving key managers or staff, contractors, customers and trade allies are guided by protocols and instruments that will be approved by Duke Energy prior to their use. This step identifies the information that will be collected to feed the process, analysis, and recommendation efforts.

All survey and interview questions and data collection approaches are structured to not guide any response. That is the questions and data collection efforts are neutrally biased and non-leading.

6. Conduct surveys with participants and/or non-participants

In this task we conduct the process surveys with the participants and non-participants. These surveys are also coordinated with the impact evaluation team to make sure impact questions are included in the survey. This is particularly important for evaluations that use engineering analysis and modeling approaches that must be calibrated to the participant's use conditions.

During the weekly team meeting, we confirm the previously used (Duke Energy) participant contact standard in which the process or the impact evaluation can contact a participant. We employ 5 to 7 contact attempts (at different times of the week and days of the week) standard for reaching participants before dropping a participant and adding another contact to the sample.

The data collection approach for the participant is expected to be a random assignment approach across the programs based on downloads from the participant tracking records. For non-participants we have used several approaches in the past, including residential neighbor or neighborhood approaches, residential income certified approaches, commercial business size and type matching approaches, marketing contact approaches and other approaches. When non-participant surveys are indicated, we work with Duke Energy to identify the best approach for each program.

Surveys with participants focus on a wide range of issues including: their experiences with the program, their reasons for participation, their satisfaction with the program and the service components provided within the program. The survey will inquire about the most and least valuable parts of the program and inquire about their recommended changes. As noted above, surveys will also ask about actions taken and measure use conditions when energy impact estimates must be calibrated to participant use conditions.

Non-participant surveys focus attention on the reasons for non-participation and their perception of the needs for the services provided. These surveys also focus on marketing and outreach efforts and opportunities and ways that Duke Energy can use to motivate additional participation. When impact estimates need to be adjusted for non-participant considerations, these surveys also focus on actions they have taken on their own, and the measure use conditions associated with those actions.

During the survey development process, Duke Energy managers are given the opportunity to include additional questions in the participant and non-participant survey instruments. No surveys will be launched prior to the approval of the protocol and associated survey questions.

7. Analyze process evaluation data

This task covers a wide range of analytical efforts employing analysis strategies and systems that Duke Energy and the evaluation team have used successfully for over several years. It includes analysis of the following types of information consistent with the researchable issues identified for the assessment, and structuring the analysis in a way that allows a documentation of the program's structure and operation, an assessment of these conditions, and the development of recommendations to improve the program.

This assessment includes:

- ✓ Analysis of program materials, manager interviews, ally interviews and surveys, participant interviews and non-participant interviews to understand the organization and operations of the programs in order to identify strengths and weaknesses and make recommendations for program changes.
- ✓ Analysis of marketing materials (when requested) to determine their strengths and weaknesses and coverage to make recommendations on ways to improve the marketing efforts or materials.
- ✓ Analysis of ally interview and survey results to identify strengths and weaknesses in the relationships and operational conditions between the programs and the contractors and allies who help make the programs work well for their customers, the utility and themselves.
- ✓ Analysis of the participant information and survey results to identify drivers of satisfaction and their experiences with the programs from the view of the most important person in the chain of events, the customer who participates. This involves assessing a wide range of participant information and understanding their personal experiences and opinions about the programs, including ways that they think the program can be improved.
- ✓ Analysis of non-participant information to identify the barriers to participation and to assess the program's ability to satisfy customer needs. This analysis will result in the development of recommendations that can be expected to increase participation rates and strengthen program acceptance.

The primary purpose of the analysis efforts is to feed the development of actionable program change recommendations that can be expected to improve the performance and cost effectiveness

of the programs, but also serves as the development of baseline information to document the program's operations and performance.

Much of this analysis is basic statistical comparisons of data collected and the professional assessment of expressed opinions by managers, allies, participants and non-participants. For in-depth statistical analysis we use SPSS and can covert output files to SAS or Excel or in other requested formats.

8. Develop Process Evaluation Reports

The evaluation team will deliver both a draft and final process evaluation report for each program. The process report will be included with the impact report so that the deliverable is complete for each program (unless separate reports are requested). The draft report will be provided in time to be reviewed by Duke Energy and their consultant team, so that comments can be provided to the evaluation team. Following the receipt of comments, the report will be finalized into the draft final report. Once Duke accepts the report, it will be made into a final report. As always, the evaluation team is open to other comments from key Duke Energy or program/portfolio associated stakeholders.

9. Present Evaluation Results

In this task key members of the research team will travel to Duke Energy and present the results of the study to Duke Energy managers and other information consumers if requested. The presentations will consist of a PowerPoint slide show of the evaluation approach, key findings, and a review of the evaluation recommendations. Presentation locations and dates will be arranged by Duke Energy.

The Impact Evaluation Methodology

This section presents the impact evaluation efforts and discusses some of the key issues associated with the impact evaluation and the coordination of the impact evaluation with the process evaluation.

Overview of the Methodological Approaches

The overall impact evaluation approach consists of the following activies.

1. Hold an evaluation kick off meeting with Duke Energy to review all study objectives
2. Review programs materials and tracking data
3. Coordinate with process evaluation to design interview and survey instruments as needed
4. Develop samples for field M&V and impact analysis
5. Develop M&V plans for field M&V projects
6. Collect on-site survey and M&V data for sampled projects
7. Develop simple engineering algorithms for non weather-sensitive measures and programs with smaller impacts
8. Develop building energy simulation models for weather-sensitive measures within high impact programs
9. Develop statistically adjusted engineering (SAE) models that combine results of engineering analysis and statistical billing analysis

10. Perform billing analysis and/or SAE analysis as appropriate
    a. Process and Clean Billing and Program Tracking Data
    b. Estimate Statistical Models
11. Conduct Net to Gross Analysis
12. Present Impact Evaluation Study Findings
13. Develop Impact Evaluation Reports

These tasks are described below, but please note that the impact evaluation approach is customized to the needs of each program. . Information on the specific steps in the overall approach that are applied to each of program is presented in the program-specific discussions that follow this section.

1. Hold an evaluation kick off meeting with Duke to review all study objectives and begin evaluation planning for impact evaluations

The evaluation team holds a weekly off-site meeting with Duke Energy to review the evaluation efforts and finalize general evaluation plans. During these meeting we review the upcoming work in detail. We move through the programs and tasks and discuss their design, operation, and timing. Issues regarding the impact evaluation are covered in this meeting. The meeting is used to define key impact evaluation metrics, precision requirements, important measures by program and overall evaluation approaches. Data resources developed to support program planning, work papers, tracking data, prior impact studies and M&V work, and the respective roles of Duke Energy and TecMarket team personnel are discussed.

2. Review program materials and tracking data

Program planning materials, work papers, brochures and participant tracking data are reviewed to get a sense of the measure savings approaches used during program design, expected savings for each measure in the program, the quantity and type of measures installed by each program, and the type participant characteristics data available within the tracking data. From this assessment, the relative importance of each measure in terms of overall program savings is assessed to focus the overall impact evaluation plan on the important measures.

3. Coordinate with process evaluation to design interview and survey instruments as needed.

The impact evaluation effort requires participant and/or contractor surveys to gather additional data for the gross energy savings and net to gross analysis. The data collection efforts and survey development are coordinated with the process evaluation team.

4. Develop samples for field M&V and impact analysis

As appropriate, on-site surveys and field M&V work is done on a sample of participating sites. A sample plan is developed that meets the overall requirements of the evaluation. Samples are selected from the participant tracking data according to the sampling plan. The samples are submitted to Duke Energy for review and approval.

The development of the samples involves understanding the necessary accuracy, determining the sample frame, and developing the suitable sampling methodology. We employ the following statistical techniques as needed for each program evaluation:

- Stratified sampling
- Ratio sampling
- Nested sampling (time-of-use meters used within a smaller sample of interval meters), and
- Systematic sampling with random start

Duke Energy's existing load research or smart grid data are used as available as a component of the overall M&V metering plan. For a majority of the billing analysis, a sample design is not necessary, as the approach we use allows us to use all participants in the actual statistical analysis.

5. Develop M&V plans for field M&V projects

Measurement and Verification (M&V) plans are developed for each field measurement project. The M&V plans discuss the measurement approach, measurement points, instrumentation, data analysis and reporting. For prescriptive programs, a generic M&V plan is developed and applied to each sampled participant. For custom programs, a site-specific M&V plan is developed for each sampled participant addressing the unique attributes of each custom project.

M&V activities are conducted according to the International Performance Measurement and Verification Protocol (IPMVP). An important aspect of the M&V plan development is the presentation of the data analysis plan. The engineering and/or statistical regression equations used to project the measured data into the desired end results are presented in the M&V plan. This approach is designed to assure the project team that all the data needed to drive the analysis are identified prior to starting the data collection activities.

6. Collect on-site survey and M&V data for sampled projects

On-site survey and/or M&V data are collected for sampled projects according to the M&V and sampling plans created for each program. Field survey personnel used for on-site data collection include TecMarket team engineering staff, Duke personnel and/or local contractors as appropriate to meet the technical and logistical requirements of each project. All field staff have been trained by TecMarket in the data collection and instrumentation protocols employed by the project.

7. Develop simple engineering algorithms for non weather-sensitive measures and programs with smaller impacts

Many of the smaller, audit based programs, such as the Energy Assessments Program, Home Energy House Call and the Personalized Energy Report (PER) program rely on simple engineering equations to develop measure energy savings estimates. These engineering equations form basis of the impact estimate or are combined with a billing analysis in a Statistically Adjusted Engineering (SAE) approach. The engineering algorithms were developed according to guidelines presented by EPRI[3]. Non-weather sensitive measures in larger programs such as interior lighting are also analyzed using simple engineering equations. The equations are

[3] Engineering Methods for Estimating the Impacts of Demand-Side Management Programs, Vol 2: Fundamentals of Simple Engineering Algorithms for Residential and Commercial End-Uses. Electric Power Research INstitue, Palo Alto, CA.

developed to provide the impact evaluation metrics required by each study in accordance with the M&V plan.

8. **Develop building energy simulation models for weather-sensitive measures within high impact programs**

Weather sensitive measures, such as HVAC measures generally require more sophisticated analysis tools, especially in programs such as Smart Saver that provide a significant fraction of the overall Duke program portfolio savings. We use the DOE-2 building energy simulation program to develop impact estimates for these measures. For prescriptive programs, the DOE-2 simulations are run on prototypical building models to develop engineering estimates appropriate to specific types of buildings addressed by the program. The prototype models used in the evaluation are calibrated to available energy consumption statistics.

A site-specific DOE-2 modeling approach may be used for custom projects, as directed by the M&V plan. In these instances, an experienced DOE-2 engineer conducts an on-site survey of the building and develops a customized DOE-2 model. The model is then calibrated to billing data and/or site-installed end-use metering data as appropriate.

9. **Develop statistically adjusted engineering (SAE) models that combine results of engineering analysis and statistical billing analysis**

The engineering estimates developed for each participant are combined with a statistical billing analysis to true up the engineering estimates to customer utility bills. Note, the billing analysis provides the savings based on a comparison of the pre and post installation energy consumption. The "pre" condition in this case is the existing (pre retrofit) equipment, which is appropriate for "early replacement" measures. In instances where the program focuses on normal replacement (or replace on burnout), the appropriate baseline is a new standard-efficiency measure. In these instances, engineering estimates for an early replacement baseline and a normal replacement baseline are developed. The savings from the early replacement baseline (which is comparable to the pre/post condition in the billing analysis) is used in the SAE model. The SAE model provides an adjustment factor that is applied the engineering estimates resulting from a normal replacement baseline.

10. **Perform billing analysis and/or SAE analysis as appropriate**

Billing data for the participant population are obtained from Duke Energy and incorporated into the billing analysis model. Data are cleaned and formatted by the TecMarket team prior to running the analysis. Programs are analyzed using a weather adjusted billing analysis or an SAE analysis as appropriate. Billing analysis is generally not used when the expected energy impacts are small relative to the overall billed energy consumption. Impacts for these measures are analyzed using a calibrated engineering approach.

The Billing Analysis Methodology

Overview of the Methodological Approach

In general, the billing consists of an econometric analysis using billing data from participants (both pre- and post-participation, or "panel data"), program tracking data, and weather data. The statistical billing analysis will be conducted by Dr. Michael Ozog (Integral Analytics) and will

follow the general guidelines below. We advocate the use of panel data for program evaluation for several reasons:

- With panel data, participants essentially serve as their own control group, thus eliminating the need (and associated expense) of developing a non-participant group that is representative of the participant group. In addition, this eliminates the potential of self-selection bias.
- The use of panel data allows us to use statistical models that are very flexible in that it they can implicitly control for the level of a customer's energy use over time, thus eliminating the need to survey customers to develop variables for the model, so that all participants can be used in the model. and therefore allow the research several different specifications.
- Panel data allows us to develop monthly models rather than seasonal or annual models, thus we can use all the data, rather than aggregating and thus potentially hiding key effects.

However, we are very familiar with other alternatives billing analysis approaches, and where necessary, we augment the panel data models with other techniques to get most accurate and defensible impact estimates possible. In the rest of this section, we present the details of the specific panel data model approach we use.

In order to quantify the impacts of an energy efficiency program through a billing analysis, a statistical model is used that combines weather data with billing data. Since data are available both across premises (i.e., cross-sectional) and over time (i.e., time-series), it becomes possible to control at once for differences across premises as well as differences across periods in time through the use of a "fixed-effect" model. The fixed-effect refers to the assumption that differences across premises can be explained in large part by premise-specific intercept terms, as discussed below.

The fixed effects model can be viewed as a type of differencing model in which all characteristics of the premise, which (1) are independent of time and (2) determine the level of hourly electricity use, are captured within a premise-specific constant terms. In other words, differences in premise characteristics that cause variation in the level of energy consumption, such as building size and structure, are captured by constant terms representing each unique premise.

Algebraically, the fixed-effect panel data model is described as follows:

$$y_{it} = \alpha_i + \beta x_{it} + \varepsilon_{it},$$

where:

y_{it} = Energy consumption for premise i during month t
α_I = constant term for site i
β = vector of coefficients
x = vector of variables that represent factors causing changes in electricity for premise i during month t (i.e., weather and program participation)
ε = error term for premise i during month t.

The primary specification for the program participation variable is the Statistically Adjusted Engineering (SAE) model, where the variable is equal to the savings estimate developed through the engineering analysis. The coefficient on the engineering estimate represents the "realization rate," or the percentage of the engineering estimate which was achieved by program participants.

For some programs, such as the Power Share program, there may be such diversity across participants that it may not be appropriate to aggregate all customers into a single model. For such programs, it may be appropriate to estimate a single equation for each participant. For those programs, we use a pure time-series model, which uses data all consumption data before, during, and after an event.

Generally, the model uses hourly electricity consumption has the dependent variable, and includes weather terms, time of day, and the event term as independent variables. Algebraically, the model is described as follows:

$$y_t = \alpha + \beta x_t + \varepsilon_t ,$$

where:

- y_t = electricity consumption for the facility during hour *t*
- α = constant term for the facility
- β = vector of coefficients
- x_t = vector of variables that represent factors causing changes in energy consumption for facility during hour *t* (i.e., weather, time of day, and participation)
- ε_t = error term for during hour *t.*

To estimate the model parameters, we formulate the following least square problem:

$$\underset{\alpha_i, r, \beta}{Minimize} \sum_{i=1}^{N}\sum_{t=1}^{T}(y_{it} - \alpha_i - x_{it}\beta)^2 .$$

And the optimal solution is:

$$\left[\hat{\beta}\right] = \left[\sum_{i=1}^{N}\sum_{t=1}^{T}\left(X_{it} - \overline{X}_i\right)'\left(X_{it} - \overline{X}_i\right)\right]^{-1}\left[\sum_{i=1}^{N}\sum_{t=1}^{T}\left(X_{it} - \overline{X}_i\right)'\left(y_{it} - \overline{y}_i\right)\right]$$

$$\hat{\alpha}_i = \overline{y}_i - \overline{X}_i\beta$$

where

$$X_{it} = \text{ , a } 1\times(K+1) \text{ row vector} \quad \text{and} \quad \overline{y}_i = \frac{1}{T}\sum_{t=1}^{T} y_{it} \text{ , a scalar;}$$

$$\overline{X}_i = \frac{1}{T}\sum_{t=1}^{T} X_{it} \text{ and } X_i = \begin{bmatrix} x_{1i1} & \ldots & x_{Ki1} \\ x_{1i2} & \ldots & x_{Ki2} \\ \ldots & \ldots & \ldots \\ x_{1iT} & \ldots & x_{KiT} \end{bmatrix}$$

$\overline{X}_i$ is a $1\times(K+1)$ row vector and X_i is a $T\times(K+1)$ matrix.

The independent variables used in the model include:

- The current temperature as well as the temperature for the previous hours
- The current humidity as well as the humidity for the previous hours
- A variable incorporating the interaction between temperature and humidity
- An indicator variable for weekend days
- Indicator variables for all 24 hours of the day
- Indicator variables for the month
- An indicator variable for the event interacted with the temperature for that hour.

Since this is a pure time-series model, it is critical to account for the potential for autocorrelation, where the error term in one hour is correlated with the error term in the preceding hour(s).[4] In order to account for this potential, these models will be estimated using an AR(1) specification:

$$\varepsilon_t = \rho\varepsilon_{t-1} + \mu_t$$

Where:

ρ = is an estimated parameter (Phi)
μ_t = is white noise (i.e., zero mean with no autocorrelation).

The parameters ρ and β in the above equations are estimated for each participant via maximum likelihood techniques.

For Time-of-Use pricing program, as similar model specification can be used, with the inclusion of the price variable, as follows:

Let N be the number of cross-sectional units, e.g. households, or whatever the unit of analysis. Let T be the number of temporal points where the hourly electricity usage data for each cross-sectional units are collected. Let the dependent variable y_{it} be the hourly electricity usage for cross-sectional unit i at time point t. Let P_{it} be the electricity price of time point t for cross-sectional unit i:

$$\ln(y_{it}) = \alpha_i + r\ln(P_{it}) + x_{it}\beta + e_{it} \ ,$$

where

α_i is the fixed effect,
r is the overall price elasticity of demand for electricity, and
β is a vector of parameters.

[4] The intuition is that the factors that cannot be "explained" in one hour cannot be explained in other hours. In theory, autocorrelation does not result in bias results, but it does affect the standard error of the estimates, which may lead to erroneous conclusions.

In the next section, we describe the general tasks in a billing data analysis.

General Billing Analysis Tasks

Essentially, only two tasks are required to conduct a billing data analysis – process and clean all the necessary data, and use this data to estimate the statistical models. These tasks are discussed below.

10a: Process and Clean Billing and Program Tracking Data

A critical step in all the billing data analysis is the development of the data used in the analysis. This task includes the multiple account matching process (where more than one meter represents the usage of the facility – a common occurrence in the non-residential sector), as well as capturing tenant changes, multiple participation, and other "cleaning" tasks. For each participant, it is important to carefully investigate their monthly consumption history, both around the participation period, as well as during the same period in the prior year (to capture seasonally effects). This investigation commonly uses graphs as well as simple descriptive statistics. In order not to bias the analysis, customers with large changes in consumption, either increases or decreases will be noted but not be automatically eliminated from the analysis. While it may be attractive to somehow automate this procedure through color screening, for example, it is not recommended. Only through thoughtful manual inspection can one truly understand what the data are indicating.

Once the billing data are cleaned and verified, they are combined with the appropriate weather data (usually temperature, humidity, and dew points), information from the program tracking system (such as participation date, measures installed, and any other relevant data), and the engineering-based estimated savings.

A database containing all usage, participation, weather, and engineering estimates is developed. This database is the foundation of the billing analysis.

10b: Estimate Statistical Models

One the evaluation database is developed, the next step in the billing data analysis is the estimation of the statistical models presented above. The billing analyses generally consists of an econometric analysis using billing data (both pre- and post-participation), program tracking data, and weather data. We investigate both aggregate change models as well as monthly panel models. However, our preference remains the monthly model, since in this approach participants are essentially their own control (so there is no need to develop a matching non-participant group). In addition, since panel models are perhaps the most effective method for controlling for the large heterogeneity found in the non-residential programs, this approach is used for both residential and non-residential programs.

Where possible, the primary model specification is the Statistically Adjusted Engineering (SAE) model, as development of the realization rate from this method is quite transparent. We also investigate the use of other participation variables, but only use them if they clearly are superior to the SAE model, since transformation of the result into a realization rate is complicated, subject to misinterpretation, and unduly confusing.

11. Conduct Net to Gross Analysis

The net-to-gross (NTG) energy impact analysis efforts employ a series of questions within the participant surveys designed to collect information on what participants would have done if the program had not been offered. Additional questions are posed to key trade allies involved with program and customer purchase decisions to obtain ally perspectives on program impacts. The results from these efforts are used to adjust gross savings identified in the impact assessment by subtracting out the savings that would have occurred without the program. This approach is typically referred to as the self-report approach. In addition, the evaluation team considers Duke Energy's program enrollment freerider surveys to inform the NTG analysis.

To assess NTG, a battery of questions were developed using those approaches that worked best in both the previous Duke assessments and in other NTG evaluations around the country. This approach consists of a battery of questions about purchase intent and decision approaches. The questions are linked to a NTG assessment algorithm designed to assign a NTG ratio for each completed survey. The results from this survey are used to adjust gross impacts identified in the impact evaluation. .

12. Present Impact Evaluation Study Findings

The results of the study are presented to Duke Energy managers and other information consumers. The presentations cover the evaluation approach, key findings, and a review of the evaluation recommendations.

13. Develop Impact Evaluation Reports

Draft and final impact evaluation reports are developed for each program. The impact report is included with the process report so that the deliverable is complete for each program The draft report is provided for review and comment by Duke Energy and their consultant team Following the receipt of comments, the TecMarket team considers the merit of the comments and completes the final report.

Sampling Approaches

The sample size selection is consistent with the evaluation budget and the past evaluation efforts conducted by Duke. Sampling employs a 90% +/- 10% level of precision at the program level, but may be expanded or contracted depending on the level of reliability needed for each program, and the available budget for that effort.

Process Evaluation Sampling Approach

Program Managers

We interview all program managers for each process evaluation, along with program implementation staff, IT staff, and/or any other program-related staff at Duke Energy and/or the implementation firm.

Trade Allies

We work with Duke Energy's managers to identify the key allies for the interview sample. The key ally sample will be a targeted sample drawn with the advice of Duke Energy to get at allies that are most involved. This allows us to identify a set of "must interview" allies that have been or are significantly involved in the programs and who consequently should be high priority interview targets. If Duke Energy can identify a set of high-priority allies, we can identify these allies as interview targets. The remaining key allies not included in the interview sample will be put in the non-key ally sample and a random assignment of the non-key ally sample will be conducted to develop a priority list of sample targets for the ally survey. These approaches allow us to obtain a strong key ally sample and follow up with a strong ally sample of the remaining key and non-key allies.

Participant and Non-Participant Surveys

Participant and non-participant sampling follows standard evaluation sampling protocols and is guided by the Sampling and Uncertainty Protocol within the California Evaluation Protocols written by the TecMarket Works California Evaluation Team. Essentially these protocols assure that the sampling process is random, representative and reliable. The sampling objective will be to obtain a representative sample of participants (and non-participants, when needed) to reflect at least a 90% level of precision with a confidence interval of plus or minus 10%, or better, at the program level. This typically means that participants and non-participant samples will be set for a program-level parameter at 68 or more. However, TecMarket Works typically samples to a needs-based sample size that reflects the needs for reliable and robust findings. As a result, for process and impact support interview and survey sampling, samples sizes are typically set at 100 or more. Samples are also typically stratified to match the needs of the analysis effort. Stratification can be based on several characteristics depending on the attributes being measured or assessed, including demographic stratification, firmographic stratification, behavior stratification, population parameter stratification (energy savings, technology mix, etc.) or other approaches. In setting sampling approaches, valid points are established within a sampling database, typically within a stratified sub-group and a sample quota from each group. Then each valid population point is assigned a random number from a random number generator. The numbers are then assigned to the population and the sample is pulled by the random number sequence. Contacts are then made with the sequenced random population point, with each point contacted between 5 and 7 times at different times, on different dates to assure that the sample is not bias as a result of ease of contact success.

Impact Evaluation Sampling Approach

As appropriate, on-site surveys and field M&V work is done on a sample of participating sites. A sample plan is developed that meets the overall requirements of the evaluation. Sampling criteria are determined by program depending on the magnitude of the expected savings and available budget. Generally, the sampling plans are designed to meet ± 10%-20% relative precision at 90% confidence at the measure savings level.

The program tracking database is used as a sample frame. The measures within the tracking database are identified and sorted according to their relative contribution to program savings.

Measures with the largest contribution to overall program savings are identified. Samples are selected at random from within these measure groups according to the sampling plan. The samples are submitted to Duke Energy for review and approval prior to contacting the customers.

Depending on the program, the following sampling strategies may be employed:

- Simple random sampling. Large groups of participants with uniform savings per customer are generally sampled using simple random sampling.
- Stratified sampling. Programs with projects of varying size are generally divided into size strata, and random samples are drawn from each stratum. Efficient stratified sample designs generally employ a "certainty" stratum, where all of the largest projects are studied. This generally gives the best statistical precision while minimizing the overall sample size.
- Ratio sampling. In which a ratio is established to represent a desired frequency of measurements within a changing population of participants. In this approach as the population changes, sample points are added to reflect the desired ratio. In these cases multiple ratios can be established to apply at various levels of participation or measure adoption.
- Nested sampling. Nested samples are used to leverage high resolution data within a larger sample of customers. For example, end-use monitoring of a subsample of participants with whole-building interval meters is generally employed to develop samples for the direct load control projects.
- Systematic sampling with random start. Within individual sites, measures may be sampled for study. On site survey personnel may select equipment for metering based systematic selection (e.g. every 10^{th} measure) provided the first measure is selected at random.

The objective of the sampling plan is to develop efficient samples that meet the overall sampling objectives within the time and budget allocated to the evaluations. Note, for a majority of the billing analysis, a sample design is not necessary, as the approach we use allows us to use all participants in the actual statistical analysis.

Evaluation Activities

Smart Saver CFLs

The Smart Saver CFLs Program is an incentive program that offers in-store rebates to customers for the purchase and use of Energy Star CFLs.

The process evaluation will include program manager and retail site interviews to assess program operations, and online participant and nonparticipant surveys to assess program awareness, satisfaction, and use of CFLs. The impact evaluation includes data from the participant surveys as well as lighting logger data collection and analysis.

SmartSaver CFLs	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q3
Conduct Interviews – These interviews will be done over the phone.	2010 Q3
Participant and Non Participant Surveys (mailed n=1000)	
Instrument Development – Survey instruments were developed by TecMarket Works and Duke Energy Market Analytics staff, reviewed by TecMarket Works and Duke Energy Market Analytics staff, and mailed to participants and non participants.	2010 Q2
Mailed Surveys – These surveys were conducted through mail.	2010 Q2 – Q3
Analysis	2010 Q2 – Q3
Reporting	2010 Q3 – Q4
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q3 – Q4
Impact	
Lighting logger metering on random sample. – Lighting loggers installed on fixtures in homes of a sample of CFL program participants.	2010 Q3– Q4
Analysis of Data	2010 Q3– Q4
Reporting	2010 Q3– Q4
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q4

Power Manager

The Power Manager load control program is a residential direct load control program that focuses on central air conditioning systems. Load is controlled during system peak periods, generally 4 to 8 times per summer season.

The process evaluation will include program manager and implementer interviews to assess program operations, and participant and nonparticipant surveys to assess program awareness, satisfaction, and energy-related behaviors. The impact evaluation includes whole house metering, spot metering, and data logger analysis.

The impact evaluation will involve the panel model approach, with the timeframe of the analysis to be hourly since the program focuses on limiting usage at the hourly level. To accomplish this, the analysis must rely upon whole house metering data (monthly billing data does not provide the level of detail necessary).

Power Manager	Timing
Process	
Interview Program Managers and Implementers (n=5)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q2 – Q3
Conduct Interviews – These interviews will be done over the phone.	2010 Q2 – Q3
Analysis	2010 Q2 – Q3
Reporting	2010 Q3
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q3 – Q4
Impact	
Whole-house metering on random sample. – Whole premise interval meters installed on a sample of Power Manager participants.	2010 Q2 – Q3
Time-series framework – to estimate baseline energy usage. The interval data will be analyzed to estimate load reductions during control events.	2010 Q2 – Q3
Spot metering and data logger samples during peak season. – Data loggers installed at a sample of participant sites to estimate the fraction of units responding to the demand signal. Spot metering used to estimate the connected load of the controlled units.	2010 Q2 – Q3
Analysis of Data	2010 Q3
Reporting	2010 Q3

PowerShare

The Draft Report for this evaluation has been delivered and is currently being reviewed by Duke Energy staff. Another evaluation of this program will begin after the 2010 cooling season.

The process evaluation includes program manager interviews to assess program operations. The impact evaluation will include a regression analysis of interval demand data and analysis of system operations. A panel model may be developed, but the heterogeneity of the population may make separate time-series regressions specific to each customer a more appropriate approach.

PowerShare	Timing
Process	
Interview Program Managers and Implementers (n=5)	
Instrument Development – Interview instruments are developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q2 – Q3
Conduct Interviews – These interviews will be done over the phone.	2010 Q2 – Q3
Analysis	2010 Q2 – Q3
Reporting	2010 Q3
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q3 – Q4
Impact	
Data Cleaning. Data from interval meters installed at PowerShare sites prepared for analysis.	2010 Q2 – Q3
Time-series regression analysis. Interval data collected at PowerShare sites were entered into time series regression model to estimate the impacts resulting from load control events.	2010 Q2 – Q3
Observations of compliance (analysis of system operations data) Interval data were used to determine if customers are complying with terms of their load control agreements.	2010 Q2 – Q3
Reporting	2010 Q3 – Q4

Non-Residential Smart Saver Custom

This evaluation is currently being conducted on an ongoing basis as customers become participants.

The process evaluation includes program manager and implementer interviews to assess program operations, and participant surveys to assess program awareness, satisfaction, and equipment replacement, free-ridership, and end-use persistence. The impact evaluation will include an engineering walk through; short term monitoring, building simulation modeling as appropriate.

This program evaluation will include feedback on the Energy Smart Buildings offering within the Smart Saver Custom Program.

Non-residential Smart $aver (Custom Incentives)	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2009 Q2
Conduct Interviews – These interviews are done over the phone.	2009 Q2
Participant Surveys (n=25) – These interviews are done over the phone.	
Instrument Development – Survey instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2009 Q2
Conduct Interviews – this is ongoing as participants are added	2009 Q3-Q4 2010 Q1-Q4
Interview Program Vendors (Optional, n=5-10) – we have not determined if we are doing interviews with vendors.	
Instrument Development	
Conduct Interviews	
Analysis – this is ongoing as participants are added	2010 Q3-Q4
Reporting – this will be determined after more participation occurs	2010 Q3-Q4
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q4
Impact	
Selective monitoring. Pre/post monitoring at a sample of sites. Participants segmented into lighting, HVAC, and process projects, with stratified random samples selected within each group.	2009 Q2 – Q3 Q2 - Q3 2010
Site visits. Site visits were conducted at school districts installing out-of-session control systems to document and verify baseline conditions.	2009 Q2 – Q3 2010 Q2 - Q3
Data Cleaning. Data from pre-installation monitoring quality checked and archived for use in the final impact analysis.	2009 Q2 – Q3 2010 Q3
Engineering Estimates Engineering models developed using pre/post data to estimate savings after post-installation data collection is complete.	2010 Q4
Building Simulation Modeling. Calibrated DOE-2 simulation models will be run at selected sites to estimate savings for projects where pre/post monitoring is not appropriate. This process will be invoked as customer participation rates increase.	2010 Q4

Reporting – this will be determined after more participation occurs.	2010 Q4

Non-Residential Smart Saver Prescriptive

The Non-Residential Smart Saver Prescriptive Program offers rebates to customers to encourage them to install high efficiency lighting, HVAC, motors and pumps.

Non-Residential Smart $aver (Prescriptive Incentives)	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2009 Q4
Conduct Interviews – These interviews were conducted on-site and over the phone.	2009 Q4
Participant Surveys (n=25)	
Instrument Development – Survey instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2009 Q4
Conduct Interviews – These surveys were done over the phone.	2010 Q1
Interview Program Vendors (n=5-10) – These interviews were done over the phone.	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2010 Q1
Conduct Interviews – These interviews would be done over the phone.	2010 Q1
Analysis	2010 Q1
Reporting	2010 Q1 – Q2
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q2
Impact	
Selective monitoring Phase 1 – Monitoring and data analysis of lighting systems has been completed	2010 Q1-Q2
Selective monitoring Phase 2 – Monitoring of cooling related measures will be conducted over the 2010 cooling season.	2010 Q1-Q2
Site visits – Site visits to collect operations data for commercial building setback thermostat measures has been completed.	2010 Q1-Q2
Engineering Estimates – Engineering estimates of lighting savings using the lighting monitored data are complete	2010 Q1-Q2
Building Simulation Modeling – Building simulation modeling of setback thermostat measures will commence in April, 2010. Additional simulation modeling to support analysis of cooling measures will occur after cooling season data collection is complete.	2010 Q1-Q2
Reporting. Final report will be prepared after data collection and analysis of cooling-related measures is complete. Early feedback reporting has been provided to Duke Energy.	2010 Q2-Q3

Non-Residential Energy Assessment Program

The process evaluation will include program manager and implementer interviews to assess program operations, and participant surveys to assess program awareness, satisfaction, and compliance with recommendations. The impact evaluation will include engineering estimates and billing analysis.

Non-Res Energy Assessment	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q2
Conduct Interviews – These interviews will be done on-site and/or over the phone.	2010 Q2
Participant Surveys (n=30)	
Instrument Development – Survey instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2010 Q2
Conduct Interviews – These surveys will be done over the phone.	2010 Q2
Analysis	2010 Q2
Reporting	2010 Q2-Q3
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q3
Impact	
Engineering Estimates	2010 Q2
Billing Analysis – Engineering estimates of savings by participant incorporated into a statistically adjusted engineering (SAE) billing analysis to calculate the energy savings realized in customer bills.	2010 Q2
Analysis	2010 Q2-Q3
Reporting	2010 Q2-Q3

Residential Smart Saver

The Smart Saver Program provides incentives to customers to upgrade to an energy efficient heat pump or air conditioner or install a new, energy efficient heat pump or air conditioning system in new homes. The program saves energy by helping customers obtain efficient heating and air conditioning units that out-perform older furnaces and air conditioning units and many new systems currently on the market.

Residential Smart Saver	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q2
Conduct Interviews – These interviews will be done over the phone.	2010 Q2
Participant Surveys (n=50)	
Instrument Development – Survey instruments were be developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2010 Q2
Conduct Interviews – These surveys will be done over the phone.	2010 Q2
Interview Program Vendors (n=10-20)	
Instrument Development – Interview instruments are developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2010 Q2
Conduct Interviews – These interviews would be done over the phone.	2010 Q2
Analysis	2010 Q2
Reporting	2010 Q3
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q3
Impact	
Selective monitoring. Pre/post monitoring of AC and heat pump fans occurred last summer at sites in North Carolina and Indiana. These data are used to inform the DOE-2 simulation models	2010 Q2
Site visits. Duke staff conducted site visits at a sample of sites to verify AC or heat pump unit installation and gather building characteristics data.	2010 Q2
Data Cleaning. Monitored data from AC or heat pump unit fans have been analyzed and prepared for the simulation analysis.	2010 Q2
Engineering Estimates. Building characteristics data from the verification surveys, homeowner and contractor surveys, and the data from the monitoring sample are used to develop and calibrate a series of	2010 Q2

prototypical DOE-2 models representing a range of building ages and fan operating modes.	
Building Simulation Modeling. The calibrated DOE-2 simulation models are run using long term average weather data for Charlotte, NC and Asheville, NC; Savings are calculated for air conditioners, heat pumps, and dual fuel heat pumps from SEER 14 to SEER 18. Savings from the models are assigned to program participants according to their location, system type and system efficiency.	2010 Q2
Billing Analysis. Engineering estimates of savings by participant are incorporated into a statistically adjusted engineering (SAE) billing analysis to calculate the energy savings realized in customer bills.	2010 Q2
Reporting	2010 Q3

Personalized Energy Report

The process evaluation will include program manager and staff interviews to assess program operations, and participant surveys to assess program satisfaction. The impact evaluation will consist of a billing analysis and engineering estimates.

Personalized Energy Report	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments will be developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q2
Conduct Interviews – These interviews will likely be done over the phone, but may be held on-site at Duke Energy offices.	2010 Q2
Participant Surveys (n=100)	
Instrument Development – Survey instruments will be developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2010 Q2
Conduct Surveys – These surveys will be done over the phone.	2010 Q2-Q3
Analysis	2010 Q3-Q4
Reporting	2010 Q4
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q4
Impact	
Billing Analysis – A statistical billing analysis of program participants will be conducted and compared to the engineering estimates.	2010 Q3
Engineering Estimates – Engineering estimates of savings will be developed for efficiency actions identified through the participant surveys. Average savings per participant based on self-reported efficiency actions will be calculated.	2010 Q3-Q4
Reporting	2010 Q4

OLS EE Survey

The process evaluation will include program manager and implementer interviews to assess program operations, and participant surveys to assess program satisfaction and measure installation. The impact evaluation will consist of engineering estimates. This evaluation will coincide with the evaluation for the Personalized Energy Report in method and timing.

OLS EE Survey	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments will be developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q2
Conduct Interviews – These interviews will likely be done over the phone, but may be held on-site at Duke Energy offices.	2010 Q2
Participant Surveys (n=100)	
Instrument Development – Survey instruments will be developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	2010 Q2
Conduct Surveys – These surveys will be done over the phone.	2010 Q2-Q3
Analysis	2010 Q3-Q4
Reporting	2010 Q4
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q4
Impact	
Billing Analysis – A statistical billing analysis of program participants will be conducted and compared to the engineering estimates.	2010 Q3
Engineering Estimates – Engineering estimates of savings will be developed for efficiency actions identified through the participant surveys. Average savings per participant based on self-reported efficiency actions will be calculated.	2010 Q3-Q4
Reporting	2010 Q4

"Get Energy Smart" K12 Curriculum

The "Get Energy Smart" K12 Program is offered through North Carolina public schools. Teachers offer the energy curriculum that is developed by Scholastic. Duke Energy sends energy efficiency kits containing measures that the family can install at their homes. Mail surveys will be sent to participating student families to determine what measures were installed and their satisfaction with the program and the energy efficiency kit. The impact analysis will consist of applying engineering algorithms using the participant survey responses.

K12 Curriculum	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q1
Conduct Interviews – These interviews will be done on-site or over the phone.	2010 Q2
Interview Teachers (n=10)	
Instrument Development – Interview instruments were developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	2010 Q1
Conduct Interviews – These interviews will be conducted over the phone.	2010 Q2
Student Family Surveys (n=full population)	
Instrument Development – Survey instruments will be developed by TecMarket Works and Duke Energy.	2010 Q1
Conduct Surveys – These surveys will be mailed.	2010 Q2
Analysis	2010 Q2
Reporting	2010 Q2
Duke reviews and addresses report recommendations, enters them into database for resolution.	2010 Q3
Impact	
Billing Analysis – A statistical billing analysis of program participants will be conducted and compared to the engineering estimates.	2010 Q3
Engineering Estimates. Engineering algorithms are used to develop savings estimates for program actions	2010 Q2
Analysis	2010 Q2
Reporting	2010 Q2

Home Energy House Call

The Home Energy House Call Program provides recommendations to homeowners on the things that they can do to save energy in their homes. Once the occupant implements the recommendations, the home becomes more energy efficient and the customer saves money on their utility bills.

The billing analysis of the program will use program tracking data and billing data with the panel model to develop savings estimates by both individual that participated as well as those that reported that they undertook any of the recommendations.

Home Energy House Call	Timing
Process	
Interview Program Managers and Implementers (n=3)	
Instrument Development – Interview instruments will be developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff, and sent to the interviewees before the interview for their review.	Q2-Q3 2010
Conduct Interviews – These interviews will likely be done over the phone, but may be held on-site at Duke Energy offices.	Q2-Q3 2010
Participant Surveys (n=100)	
Instrument Development – Survey instruments will be developed by TecMarket Works, reviewed by Duke Energy Market Analytics staff and the program manager before being fielded.	Q2-Q3 2010
Conduct Surveys – These surveys will be done over the phone.	Q2-Q3 2010
Analysis	Q3 2010
Reporting	Q3 2010
Duke reviews and addresses report recommendations, enters them into database for resolution.	Q3-Q4 2010
Impact	
Engineering Estimates – Engineering estimates of savings will be developed for efficiency actions identified through the participant surveys. Average savings per participant based on self-reported efficiency actions will be calculated.	Q3 2010
Billing Analysis – A statistical billing analysis of program participants will be conducted and compared to the engineering estimates.	Q3 2010
Reporting	Q3 2010

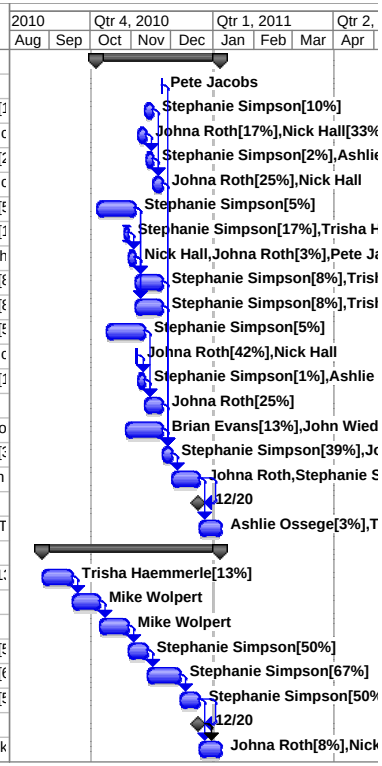
Evaluation Planning and Tracking

This section presents an overview of how the evaluation activities in North Carolina are tracked by the evaluation team.

TecMarket Works uses Microsoft Project to schedule and track evaluation tasks for each of the programs. Screen shots for each program are presented below.

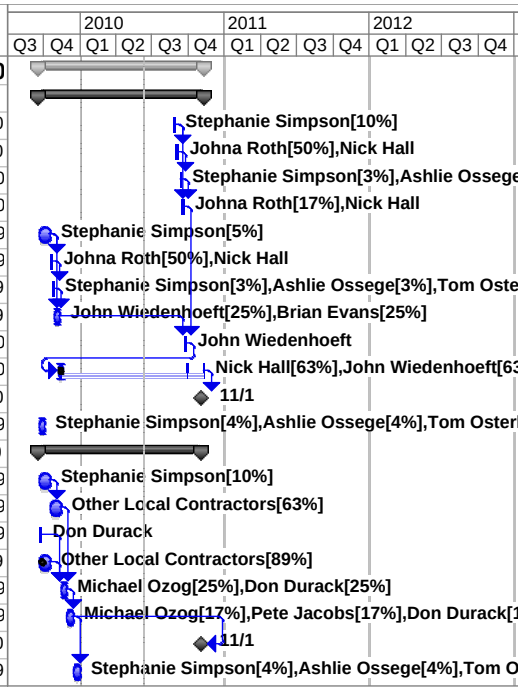
Smart Saver CFLs

ID	Task Name	Work	Duration	Start	Finish	Predecessors	Resource Names
1	**Carolinas: Smart Saver CFL - Process Evaluation**	**280 hrs**	**52.09 days**	**Tue 10/5/10**	**Wed 1/5/11**		
2	Database Analysis	8 hrs	1 day	Mon 11/22/10	Tue 11/23/10		Pete Jacobs
3	Collect Sample: Program Managers and Implementers	4 hrs	5 days	Tue 11/9/10	Tue 11/16/10		Stephanie Simpson[1
4	Instrument Development: Program Managers and Implementers	8 hrs	5 days	Thu 11/4/10	Thu 11/11/10		Johna Roth[17%],Nic
5	Instrument Review: Program Managers and Implementers	2 hrs	3 days	Thu 11/11/10	Tue 11/16/10	4	Stephanie Simpson[2
6	Conduct Interviews: Program Managers and Implementers (onsite or phone)	12 hrs	5 days	Tue 11/16/10	Tue 11/23/10	3,5	Johna Roth[25%],Nic
7	Collect Sample: Participant Survey	8 hrs	20 days	Tue 10/5/10	Tue 11/2/10		Stephanie Simpson[5
8	Instrument Development: Participant Survey	8 hrs	3 days	Mon 10/25/10	Thu 10/28/10		Stephanie Simpson[1
9	Instrument Review: Participant Survey	1 hr	3 days	Thu 10/28/10	Tue 11/2/10	8	Nick Hall,Johna Roth
10	Survey Deployment & Return (mail, sending 1000, Redeemers)	20 hrs	15 days	Tue 11/2/10	Tue 11/23/10	7,9	Stephanie Simpson[8
11	Survey Deployment & Return (mail, sending 1000 NON REDEEMERS)	20 hrs	15 days	Tue 11/2/10	Tue 11/23/10	7,9	Stephanie Simpson[8
12	Collect Sample: Local Retailers	8 hrs	20 days	Tue 10/12/10	Tue 11/9/10		Stephanie Simpson[5
13	Instrument Development: Local Retailers	8 hrs	2 days	Tue 11/2/10	Thu 11/4/10		Johna Roth[42%],Nic
14	Instrument Review: Local Retailers	1 hr	3 days	Thu 11/4/10	Tue 11/9/10	13	Stephanie Simpson[1
15	Conduct Interviews: Local Retailers (phone, n=10)	20 hrs	10 days	Tue 11/9/10	Tue 11/23/10	12,14	Johna Roth[25%]
16	Review of Results from Other States	40 hrs	20 days	Tue 10/26/10	Tue 11/23/10		Brian Evans[13%],Jo
17	Data Analysis	40 hrs	2.09 days	Tue 11/23/10	Mon 11/29/10	2,6,10,11,15,16	Stephanie Simpson[3
18	Write Draft Report	60 hrs	15 days	Tue 11/30/10	Mon 12/20/10	17	Johna Roth,Stephan
19	Write Draft Report	0 hrs	0 days	Mon 12/20/10	Mon 12/20/10	18FF	
20	Review Draft Report	12 hrs	10 days	Tue 12/21/10	Wed 1/5/11	18	Ashlie Ossege[3%],T
21	**Carolinas: Smart Saver CFL - Impact Evaluation**	**428 hrs**	**90 days**	**Thu 8/26/10**	**Wed 1/5/11**		
22	Data Logger Recruitment and Sample Design	16 hrs	15 days	Thu 8/26/10	Thu 9/16/10		Trisha Haemmerle[1
23	Data Loggers Installed in Homes (n=60 homes)	120 hrs	15 days	Fri 9/17/10	Thu 10/7/10	22	Mike Wolpert
24	Data Loggers Removed from Homes	120 hrs	15 days	Fri 10/8/10	Thu 10/28/10	23	Mike Wolpert
25	Data Cleaning	40 hrs	10 days	Fri 10/29/10	Thu 11/11/10	24	Stephanie Simpson[5
26	Analysis of Data/Savings Estimates	80 hrs	15 days	Fri 11/12/10	Mon 12/6/10	25	Stephanie Simpson[6
27	Write Draft Report	40 hrs	10 days	Tue 12/7/10	Mon 12/20/10	26	Stephanie Simpson[5
28	Write Draft Report	0 hrs	0 days	Mon 12/20/10	Mon 12/20/10	27FF	
29	Review Draft Report	12 hrs	10 days	Tue 12/21/10	Wed 1/5/11	27,28	Johna Roth[8%],Nick



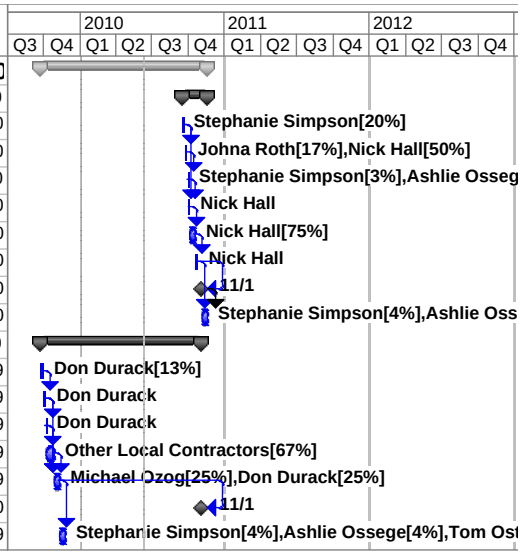
Power Manager

ID	Task Name	Duration	Start	Finish
5	**Carolina - Power Manager - Nov 1 2010**	**0.5 days**	**/ed 9/16/09**	**ue 11/9/10**
1	**Carolinas: Power Manager - Process**	**290.5 days**	**Wed 9/16/09**	**Tue 11/9/10**
2	Collect Sample: Program Managers and Implementers	5 days	Mon 8/23/10	Fri 8/27/10
3	Instrument Development: Program Managers and Implementers	5 days	Mon 8/30/10	Fri 9/3/10
4	Instrument Review: Program Managers and Implementers	3 days	Tue 9/7/10	Thu 9/9/10
5	Conduct Interviews: Program Managers and Implementers (onsite or phone)	5 days	Fri 9/10/10	Thu 9/16/10
6	Collect Sample: Participant Surveys	20 days	Wed 9/16/09	Tue 10/13/09
7	Instrument Development: Participant Surveys	5 days	Wed 10/14/09	Tue 10/20/09
8	Instrument Review: Participant Survey	3 days	Wed 10/21/09	Fri 10/23/09
9	Conduct Surveys: Participant Surveys (online)	10 days	Mon 10/26/09	Fri 11/6/09
10	Data Analysis	5 days	Fri 9/17/10	Thu 9/23/10
11	Write Draft Report	12.5 days	Wed 11/4/09	Tue 11/9/10
12	Write Draft Report	0 days	Mon 11/1/10	Mon 11/1/10
13	Review Draft Report	10 days	Wed 9/16/09	Tue 9/29/09
14	**Carolinas: Power Manager - Impact**	**285 days**	**Wed 9/16/09**	**Mon 11/1/10**
15	Collect Sample: Participant Data/Usage?	20 days	Wed 9/16/09	Tue 10/13/09
16	Whole-house metering on random sample	20 days	Wed 10/14/09	Tue 11/10/09
17	Time-series framework to estimate baseline energy usage	5 days	Wed 9/16/09	Tue 9/22/09
18	Spot metering and data logger samples during peak season	21 days	Wed 9/16/09	Wed 10/14/09
19	Data Analysis	10 days	Wed 11/11/09	Tue 11/24/09
20	Write Draft Report	10 days	Wed 11/25/09	Thu 12/10/09
21	Write Draft Report	0 days	Mon 11/1/10	Mon 11/1/10
22	Review Draft Report	10 days	Fri 12/11/09	Mon 12/28/09



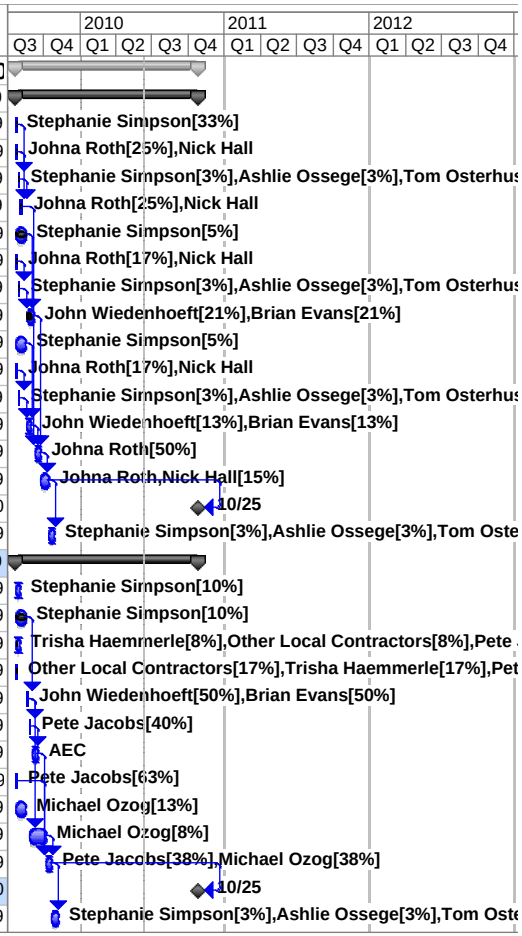
PowerShare

ID	Task Name	Duration	Start	Finish
3	**Carolina - PowerShare - Nov 1 2010**	**92 days**	**Mon 9/21/09**	**Mon 11/15/10**
1	**Carolinas: PowerShare – Process**	**46 days**	**Mon 9/13/10**	**Mon 11/15/10**
2	Collect Sample: Program Managers	5 days	Mon 9/13/10	Fri 9/17/10
3	Instrument Development: Program Managers	5 days	Mon 9/20/10	Fri 9/24/10
4	Instrument Review: Program Managers	3 days	Mon 9/27/10	Wed 9/29/10
5	Conduct Interviews: Program Managers (onsite or phone)	1.38 days	Thu 9/30/10	Fri 10/1/10
6	Data Analysis	10 days	Fri 10/1/10	Fri 10/15/10
7	Write Draft Report	5 days	Fri 10/15/10	Fri 10/22/10
8	Write Draft Report	0 days	Mon 11/1/10	Mon 11/1/10
9	Review Draft Report	10 days	Tue 11/2/10	Mon 11/15/10
10	**Carolinas: PowerShare – Impact**	**282 days**	**Mon 9/21/09**	**Mon 11/1/10**
11	Data Cleaning	5 days	Mon 9/21/09	Fri 9/25/09
12	Time-series regression analysis	5 days	Mon 9/28/09	Fri 10/2/09
13	Observations of compliance (analysis of system operations data)	0.5 days	Mon 10/5/09	Mon 10/5/09
14	Submetering of Controlled Loads, as necessary	15 days	Mon 10/5/09	Mon 10/26/09
15	Write Draft Report	10 days	Mon 10/26/09	Mon 11/9/09
16	Write Draft Report	0 days	Mon 11/1/10	Mon 11/1/10
17	Review Draft Report	10 days	Mon 11/9/09	Mon 11/23/09



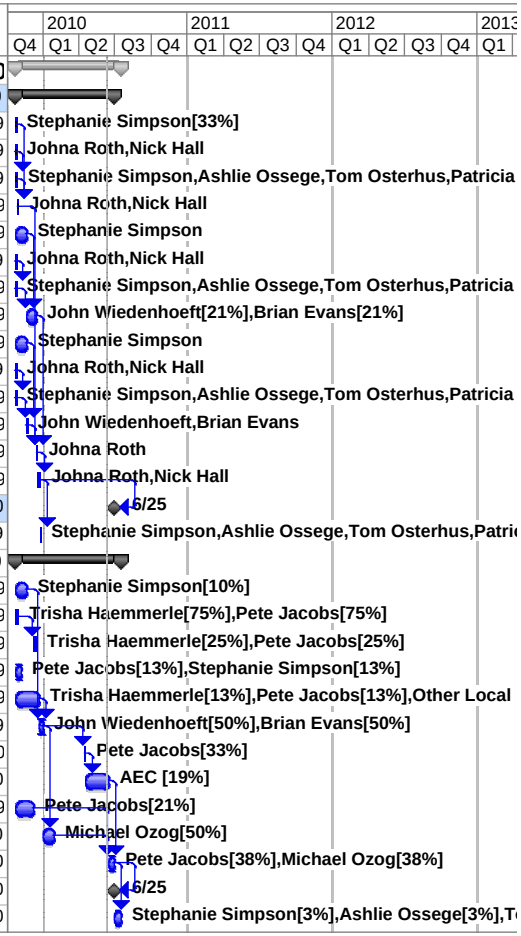
Non-Residential Smart Saver Custom

ID	Task Name	Duration	Start	Finish
12	**Carolina - Non-Res Smart Saver Custom - Oct 19 2009**	**321 days**	**Mon 7/20/09**	**Mon 10/25/10**
1	**Carolinas: Non-Res Smart Saver, Custom - Process**	**321 days**	**Mon 7/20/09**	**Mon 10/25/10**
2	Collect Sample: Program Managers and Implementers (WECC)	3 days	Mon 7/20/09	Wed 7/22/09
3	Instrument Development: Program Managers and Implementers (WECC)	5 days	Mon 7/20/09	Fri 7/24/09
4	Instrument Review: Program Managers and Implementers (WECC)	3 days	Mon 7/27/09	Wed 7/29/09
5	Conduct Interviews: Program Managers and Implementers (WECC) (onsite or phone	5 days	Thu 7/30/09	Wed 8/5/09
6	Collect Sample: Participant Survey	20 days	Mon 7/20/09	Fri 8/14/09
7	Instrument Development: Participant Survey	5 days	Mon 7/20/09	Fri 7/24/09
8	Instrument Review: Participant Survey	3 days	Mon 7/27/09	Wed 7/29/09
9	Conduct Interviews: Participant Survey (phone, n=25)	15 days	Mon 8/17/09	Fri 9/4/09
10	Collect Sample: Program Vendors	20 days	Mon 7/20/09	Fri 8/14/09
11	Instrument Development: Program Vendors	5 days	Mon 7/20/09	Fri 7/24/09
12	Instrument Review: Program Vendors	3 days	Mon 7/27/09	Wed 7/29/09
13	Conduct Interviews: Program Vendors (phone, n=5-10)	80 hrs	Mon 8/17/09	Fri 8/28/09
14	Data Analysis	10 days	Tue 9/8/09	Mon 9/21/09
15	Write Draft Report	10 days	Tue 9/22/09	Fri 10/9/09
16	Write Draft Report	0 days	Mon 10/25/10	Mon 10/25/10
17	Review Draft Report	10 days	Mon 10/12/09	Fri 10/23/09
18	**Carolinas: Non-Res Smart Saver, Custom - Impact**	**321 days**	**Mon 7/20/09**	**Mon 10/25/10**
19	Gather Energy Smart Building and Retrocommissioning Info	10 days	Mon 7/20/09	Fri 7/31/09
20	Collect Sample: Participant Data/Usage	20 days	Mon 7/20/09	Fri 8/14/09
21	Selective monitoring	10 days	Mon 7/20/09	Fri 7/31/09
22	Site visits	5 days	Mon 7/20/09	Fri 7/24/09
23	Data Cleaning	5 days	Mon 8/17/09	Fri 8/21/09
24	Develop Engineering Estimates	5 days	Mon 8/24/09	Fri 8/28/09
25	Apply Engineering Estimates	10 days	Mon 8/31/09	Mon 9/14/09
26	Building Simulation Modeling	4 days	Mon 7/20/09	Thu 7/23/09
27	Time Series Models	20 days	Mon 7/20/09	Fri 8/14/09
28	Billing Analysis	30 days	Mon 8/24/09	Mon 10/5/09
29	Write Draft Report	10 days	Tue 10/6/09	Mon 10/19/09
30	Write Draft Report	0 days	Mon 10/25/10	Mon 10/25/10
31	Review Draft Report	10 days	Tue 10/20/09	Mon 11/2/09



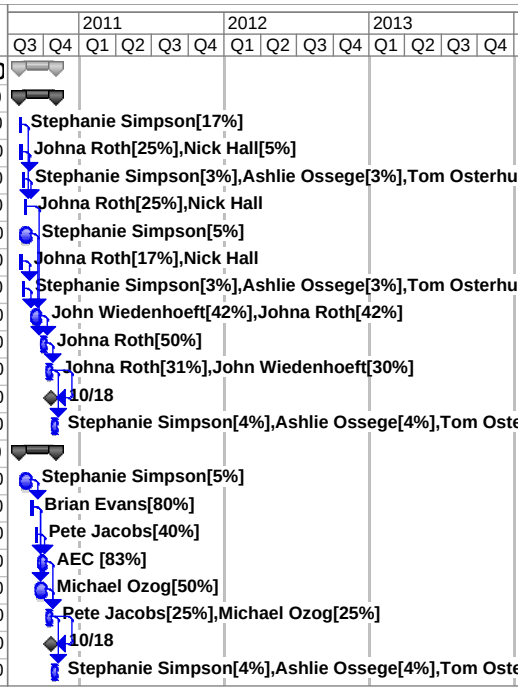
Non-Residential Smart Saver Prescriptive

ID	Task Name	Duration	Start	Finish
9	**Carolina - Non-Res Smart Saver Prescriptive - June 25 2010**	**81 days**	**ed 10/21/09**	**lon 7/12/10**
1	**Carolinas: Non-Res Smart Saver, Prescriptive - Process**	**171 days**	**Wed 10/21/09**	**Fri 6/25/10**
2	Collect Sample: Program Managers and Implementers (WECC)	3 days	Wed 10/21/09	Fri 10/23/09
3	Instrument Development: Program Managers and Implementers (WECC)	2.5 days	Wed 10/21/09	Fri 10/23/09
4	Instrument Review: Program Managers and Implementers (WECC)	0.3 days	Fri 10/23/09	Fri 10/23/09
5	Conduct Interviews: Program Managers and Implementers (WECC) (onsite or phone	1.5 days	Mon 10/26/09	Tue 10/27/09
6	Collect Sample: Participant Survey	20 days	Wed 10/21/09	Tue 11/17/09
7	Instrument Development: Participant Survey	1 day	Wed 10/21/09	Wed 10/21/09
8	Instrument Review: Participant Survey	0.1 days	Thu 10/22/09	Thu 10/22/09
9	Conduct Interviews: Participant Survey (phone, n=25)	120 hrs	Wed 11/18/09	Thu 12/10/09
10	Collect Sample: Program Vendors	20 days	Wed 10/21/09	Tue 11/17/09
11	Instrument Development: Program Vendors	1 day	Wed 10/21/09	Wed 10/21/09
12	Instrument Review: Program Vendors	0.1 days	Thu 10/22/09	Thu 10/22/09
13	Conduct Interviews: Program Vendors (phone, n=5-10)	9 hrs	Wed 11/18/09	Thu 11/19/09
14	Data Analysis	3 days	Fri 12/11/09	Tue 12/15/09
15	Write Draft Report	5 days	Wed 12/16/09	Tue 12/22/09
16	Write Draft Report	0 days	Fri 6/25/10	Fri 6/25/10
17	Review Draft Report	0.8 days	Wed 12/23/09	Wed 12/23/09
18	**Carolinas: Non-Res Smart Saver, Prescriptive - Impact**	**181 days**	**Wed 10/21/09**	**Mon 7/12/10**
19	Collect Sample: Participant Data/Usage	20 days	Wed 10/21/09	Tue 11/17/09
20	Selective monitoring phase 1	5 days	Wed 10/21/09	Tue 10/27/09
21	Selective monitoring phase 2	5 days	Fri 12/4/09	Thu 12/10/09
22	Develop lighting logger shapes	10 days	Wed 10/21/09	Tue 11/3/09
23	Site visits	40 days	Wed 10/21/09	Thu 12/17/09
24	Data Cleaning	5 days	Fri 12/18/09	Mon 12/28/09
25	Develop Engineering Estimates	3 days	Tue 4/13/10	Thu 4/15/10
26	Apply Engineering Estimates	40 days	Fri 4/16/10	Fri 6/11/10
27	Building Simulation Modeling	30 days	Wed 10/21/09	Thu 12/3/09
28	Billing Analysis	20 days	Tue 12/29/09	Wed 1/27/10
29	Write Draft Report	10 days	Mon 6/14/10	Fri 6/25/10
30	Write Draft Report	0 days	Fri 6/25/10	Fri 6/25/10
31	Review Draft Report	10 days	Mon 6/28/10	Mon 7/12/10



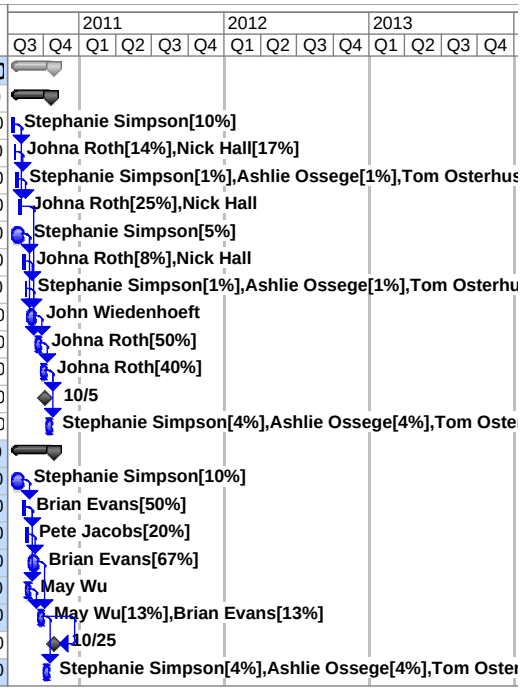
Non-Residential Energy Assessment Program

ID	Task Name	Duration	Start	Finish
13	**Carolina - Non-Res Energy Assessments - Oct 18 2010**	**65 days**	**Mon 8/2/10**	**Mon 11/1/10**
1	**Carolinas: Non-Res Energy Assessments - Process**	**64.94 days**	**Mon 8/2/10**	**Mon 11/1/10**
2	Collect Sample: Program Managers	3 days	Mon 8/2/10	Wed 8/4/10
3	Instrument Development: Program Managers	5 days	Mon 8/2/10	Fri 8/6/10
4	Instrument Review: Program Managers	3 days	Mon 8/9/10	Wed 8/11/10
5	Conduct Interviews: Program Managers (onsite or phone)	5 days	Thu 8/12/10	Wed 8/18/10
6	Collect Sample: Participant Survey	20 days	Mon 8/2/10	Fri 8/27/10
7	Instrument Development: Participant Survey	5 days	Mon 8/2/10	Fri 8/6/10
8	Instrument Review: Participant Survey	3 days	Mon 8/9/10	Wed 8/11/10
9	Conduct Interviews: Participant Survey (phone, n=50)	2.99 wks	Mon 8/30/10	Mon 9/20/10
10	Data Analysis	10 days	Mon 9/20/10	Mon 10/4/10
11	Write Draft Report	10 days	Mon 10/4/10	Mon 10/18/10
12	Write Draft Report	0 days	Mon 10/18/10	Mon 10/18/10
13	Review Draft Report	10 days	Mon 10/18/10	Mon 11/1/10
14	**Carolinas: Non-Res Energy Assessments - Impact**	**65 days**	**Mon 8/2/10**	**Mon 11/1/10**
15	Collect Sample: Engineering Estimates and/or Billing Analysis	20 days	Mon 8/2/10	Fri 8/27/10
16	Data Cleaning	5 days	Mon 8/30/10	Fri 9/3/10
17	Develop Engineering Algorithms	5 days	Tue 9/7/10	Mon 9/13/10
18	Apply Engineering Estimates	15 days	Tue 9/14/10	Mon 10/4/10
19	Billing Analysis	20 days	Tue 9/7/10	Mon 10/4/10
20	Write Draft Report	10 days	Tue 10/5/10	Mon 10/18/10
21	Write Draft Report	0 days	Mon 10/18/10	Mon 10/18/10
22	Review Draft Report	10 days	Tue 10/19/10	Mon 11/1/10



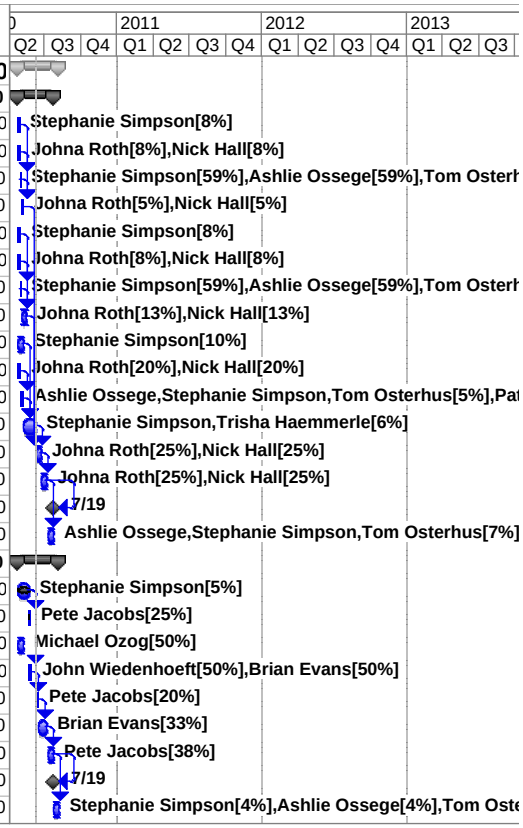
Personalized Energy Report

ID	Task Name	Duration	Start	Finish
7	**Carolina - PER - Oct 25 2010**	**75 days**	**lon 7/12/10**	**on 10/25/10**
1	**Carolinas: Personalized Energy Report - Process**	**70.5 days**	**Mon 7/12/10**	**Tue 10/19/10**
2	Collect Sample: Program Managers	5 days	Mon 7/12/10	Fri 7/16/10
3	Instrument Development: Program Managers	3 days	Mon 7/19/10	Wed 7/21/10
4	Instrument Review: Program Managers	3 days	Thu 7/22/10	Mon 7/26/10
5	Conduct Interviews: Program Managers (onsite or phone)	5 days	Tue 7/27/10	Mon 8/2/10
6	Collect Sample: Participant Surveys	20 days	Mon 7/12/10	Fri 8/6/10
7	Instrument Development: Participant Surveys	5 days	Mon 8/9/10	Fri 8/13/10
8	Instrument Review: Participant Surveys	3 days	Mon 8/16/10	Wed 8/18/10
9	Conduct Surveys: Participant Surveys (phone, n=100)	100 hrs	Thu 8/19/10	Tue 9/7/10
10	Data Analysis	10 days	Tue 9/7/10	Tue 9/21/10
11	Write Draft Report	10 days	Tue 9/21/10	Tue 10/5/10
12	Write Draft Report	0 days	Tue 10/5/10	Tue 10/5/10
13	Review Draft Report	10 days	Tue 10/5/10	Tue 10/19/10
14	**Carolinas: Personalized Energy Report - Impact**	**75 days**	**Mon 7/12/10**	**Mon 10/25/10**
15	Collect Sample: Participant Data	20 days	Mon 7/12/10	Fri 8/6/10
16	Data Cleaning	5 days	Mon 8/9/10	Fri 8/13/10
17	Develop Engineering Estimates	5 days	Mon 8/16/10	Fri 8/20/10
18	Apply Engineering Estimates	15 days	Mon 8/23/10	Mon 9/13/10
19	Billing Analysis	7.5 days	Mon 8/16/10	Wed 8/25/10
20	Write Draft Report	10 days	Tue 9/14/10	Mon 9/27/10
21	Write Draft Report	0 days	Mon 10/25/10	Mon 10/25/10
22	Review Draft Report	10 days	Tue 9/28/10	Mon 10/11/10



"Get Energy Smart" K12 Curriculum

ID	Task Name	Duration	Start	Finish
15	**Carolina - K12 Curriculum - July 19 2010**	**70 days**	**Fri 4/23/10**	**Mon 8/2/10**
1	**Carolinas: K12 Curriculum - Process**	**60 days**	**Fri 4/23/10**	**Mon 7/19/10**
2	Collect Sample: Program Managers and Implementers (Scholastic and Niagara)	3 days	Fri 4/23/10	Tue 4/27/10
3	Instrument Development: Program Managers and Implementers (Scholastic and Nia	3 days	Fri 4/23/10	Tue 4/27/10
4	Instrument Review: Program Managers and Implementers (Scholastic and Niagara)	3 days	Wed 4/28/10	Fri 4/30/10
5	Conduct Interviews: Program Managers and Implementers (Scholastic and Niagara)	5 days	Mon 5/3/10	Fri 5/7/10
6	Collect Sample: Teachers	5 days	Fri 4/23/10	Thu 4/29/10
7	Instrument Development: Teachers	3 days	Fri 4/23/10	Tue 4/27/10
8	Instrument Review: Teachers	3 days	Wed 4/28/10	Fri 4/30/10
9	Conduct Interviews: Teachers (phone, n=10)	10 days	Mon 5/3/10	Fri 5/14/10
10	Collect Sample: Student Families	10 days	Fri 4/23/10	Thu 5/6/10
11	Survey Development: Student Families	5 days	Fri 4/23/10	Thu 4/29/10
12	Survey Review: Student Families	5 days	Fri 4/30/10	Thu 5/6/10
13	Survey Implementation: Student Families (mail, n=all recent participants)	20 days	Fri 5/7/10	Fri 6/4/10
14	Data Analysis	10 days	Mon 6/7/10	Fri 6/18/10
15	Write Draft Report	10 days	Mon 6/21/10	Fri 7/2/10
16	Write Draft Report	0 days	Mon 7/19/10	Mon 7/19/10
17	Review Draft Report	10 days	Tue 7/6/10	Mon 7/19/10
18	**Carolinas: K12 Curriculum - Impact**	**70 days**	**Fri 4/23/10**	**Mon 8/2/10**
19	Collect Sample: Participant Data	20 days	Fri 4/23/10	Thu 5/20/10
20	Review available data	2 days	Fri 5/21/10	Mon 5/24/10
21	Billing Analysis	10 days	Fri 4/23/10	Thu 5/6/10
22	Data Cleaning	5 days	Fri 5/21/10	Thu 5/27/10
23	Develop engineering algorithms	5 days	Mon 6/7/10	Fri 6/11/10
24	Engineering Estimates	15 days	Mon 6/14/10	Fri 7/2/10
25	Write Draft Report	10 days	Tue 7/6/10	Mon 7/19/10
26	Write Draft Report	0 days	Mon 7/19/10	Mon 7/19/10
27	Review Draft Report	10 days	Tue 7/20/10	Mon 8/2/10



Home Energy House Call

ID	Task Name	Duration	Start	Finish
16	**Carolina - HEHC - Sept 13 2010**	**83 days**	**Tue 6/8/10**	**Mon 10/4/10**
1	**Carolinas: Home Energy House Call - Process**	**68 days**	**Tue 6/8/10**	**Mon 9/13/10**
2	Collect Sample: Program Managers and Implementers (WECC)	3 days	Tue 6/8/10	Thu 6/10/10
3	Instrument Development: Program Managers and Implementers (WECC)	3 days	Tue 6/8/10	Thu 6/10/10
4	Instrument Review: Program Managers and Implementers (WECC)	6 days	Fri 6/11/10	Fri 6/18/10
5	Conduct Interviews: Program Managers and Implementers (WECC) (onsite or phone	5 days	Wed 8/4/10	Tue 8/10/10
6	Collect Sample: Participant Surveys	20 days	Tue 6/8/10	Tue 7/6/10
7	Instrument Development: Participant Surveys	3 days	Tue 6/8/10	Thu 6/10/10
8	Instrument Review: Participant Surveys	2 days	Fri 6/11/10	Thu 6/17/10
9	Conduct Surveys: Participant Surveys (phone, n=100)	80 hrs	Wed 7/7/10	Tue 7/20/10
10	Data Analysis	10 days	Wed 7/21/10	Tue 8/3/10
11	Write Draft Report	10 days	Wed 8/4/10	Tue 8/17/10
12	Write Draft Report	0 days	Mon 9/13/10	Mon 9/13/10
13	Review Draft Report	10 days	Wed 8/18/10	Tue 8/31/10
14	**Carolinas: Home Energy House Call - Impact**	**83 days**	**Tue 6/8/10**	**Mon 10/4/10**
15	Collect Sample: Billing Analysis and Engineering Estimates	20 days	Tue 6/8/10	Tue 7/6/10
16	Data Cleaning	10 days	Wed 7/7/10	Tue 7/20/10
17	Develop Engineering Estimates	3 days	Wed 7/21/10	Fri 7/23/10
18	Apply Engineering Estimates	30 days	Mon 7/26/10	Fri 9/3/10
19	Billing Analysis	20 days	Wed 7/21/10	Tue 8/17/10
20	Write Draft Report	10 days	Tue 9/7/10	Mon 9/20/10
21	Write Draft Report	0 days	Mon 9/13/10	Mon 9/13/10
22	Review Draft Report	10 days	Tue 9/21/10	Mon 10/4/10