DIRECT TESTIMONY OF JIM GREVATT

ON BEHALF OF THE

SOUTH CAROLINA COASTAL CONSERVATION LEAGUE, SOUTHERN ALLIANCE FOR CLEAN ENERGY, UPSTATE FOREVER, SIERRA CLUB, AND NATURAL RESOURCES DEFENSE COUNCIL[1]

DOCKET NOS. 2019-224-E AND 2019-225-E

Q: PLEASE STATE YOUR NAME, POSITION, AND BUSINESS ADDRESS.

A: My name is Jim Grevatt. I am a Managing Consultant at Energy Futures Group, located at 10298 Route 116, Hinesburg, VT 05461.

Q: PLEASE SUMMARIZE YOUR PROFESSIONAL AND EDUCATIONAL QUALIFICATIONS.

A: I have worked in the energy efficiency industry since 1991 in a wide variety of roles. Prior to joining EFG in 2013, I served as the Director of Residential Energy Services at Efficiency Vermont and the District of Columbia Sustainable Energy Utility. I also helped develop and launch the award-winning natural gas energy efficiency programs at Vermont Gas Systems. I have extensive hands-on experience conducting hundreds of energy audits for Vermont's Low-Income Weatherization Assistance Program and Vermont Gas Systems' DSM programs. In my current role as Managing Consultant at EFG, I have advised regulators, utilities, and other energy efficiency program administrators, environmental

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[1] Sierra Club and Natural Resources Defense Council filed a petition to intervene out of time on February 3, 2021; as of the date of this filing, February 5, 2021, these petitions are still pending before the Commission.

organizations, and low income and affordable housing advocates in numerous states, including California, Colorado, Delaware, Florida, Illinois, Indiana, Iowa, Kentucky, Maine, Maryland, Mississippi, Missouri, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Pennsylvania, Vermont, Virginia, and West Virginia, as well as the Canadian provinces of British Columbia and Manitoba. I focus on using my in-depth knowledge of energy efficiency program management and operations as well as experience in strategic planning to ensure that programs achieve their desired market impacts. I received a B.F.A. from the University of Illinois.

Q: HAVE YOU PREVIOUSLY FILED TESTIMONY AS AN EXPERT WITNESS IN A REGULATORY PROCEEDING?

A: Yes, I have provided expert witness testimony in energy efficiency proceedings in fourteen of the jurisdictions I mention above, including Colorado, Florida, Illinois, Indiana, Iowa, Kentucky, Nevada, North Carolina, Pennsylvania, Vermont, Virginia, and West Virginia, as well as the Canadian provinces of British Columbia and Manitoba.

Q: ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A: The South Carolina Coastal Conservation League, Southern Alliance for Clean Energy, Upstate Forever, Sierra Club, and Natural Resources Defense Council (collectively, “Clean Energy Intervenors”).

Q: ARE YOU SPONSORING ANY EXHIBITS?

A: Yes, I am sponsoring two exhibits. Exhibit A is a report, “Review of DEC and DEP Market Potential Studies,” authored by myself and Dan Mellinger. Exhibit B is my curriculum vitae.

Q: WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY IN THIS PROCEEDING?

A**:** The purpose of my testimony is to provide recommendations to the Commission related to the energy efficiency (“EE”) and demand side management (“DSM”) assumptions underlying the Duke Energy Carolinas (“DEC”) and Duke Energy Progress (“DEP”) (collectively, “Duke” or “Company”) 2020 Integrated Resource Plan (“2020 IRP”).

Q: PLEASE DESCRIBE HOW YOU ASSESSED THE EE AND DSM ASSUMPTIONS IN THE DUKE ENERGY 2020 IRP.

A: With my colleague Dan Mellinger, I conducted a review of the key assumptions employed by Duke and its consultant, Nexant, in developing the Duke Energy South Carolina EE and DSM Market Potential Study and Duke Energy North Carolina EE and DSM Market Potential Study (“MPS”) dated June 2020. We also compared the potential winter peak capacity savings identified in the MPS to the results of the December 2020 Duke Energy Winter Peak Analysis (“WPA”), prepared by Tierra Resource Consultants in partnership with Dunsky Energy Consulting and Proctor Engineering Group. The report, “Review of DEC and DEP Market Potential Studies,” includes the full findings of our assessment and is attached as Exhibit A to my direct testimony.

Q: HOW DID DUKE ENERGY USE THE MPS AND THE WPA IN THE 2020 IRP?

A: My understanding is that the 2020 Duke IRP used the EE/DSM potential estimates developed in the MPS as the basis for its projections of EE/DSM savings over the IRP review period. EFG thus focused our review on the MPS rather than the IRP itself. The EE savings were used as a reduction to the load forecast, while the DSM savings were treated as resource options.

Q: PLEASE SUMMARIZE THE KEY FINDINGS OF YOUR REVIEW AND YOUR RECOMMENDATIONS TO THE COMMISSION.

A: Based on our review, the Duke MPS appears to significantly underestimate the potential EE and DSM savings in Duke's territory due to a variety of omissions, unreasonable assumptions, and arbitrary limitations in the scope of the study design. The MPS failed to account for emerging technologies, omitted many known measures offered by numerous EE programs in other jurisdictions, and did not consider new or enhanced customer engagement strategies or program designs that could increase customer participation rates. The MPS also used the Total Resource Cost ("TRC") instead of the Utility Cost Test ("UCT") to screen for cost-effectiveness, even though the UCT is a more relevant measure of cost-effectiveness for use in utility planning and, indeed, has been approved by the Commission as the primary cost-effectiveness test for Duke in South Carolina.

Our review also showed that, due to many of the issues noted above, the Duke MPS significantly underestimated DSM potential, particularly in winter where the need is growing. Indeed, Duke's WPA, which included an assessment of several innovative approaches that the MPS excluded, identified significantly more winter peak potential than the MPS.

Because Duke relied on the MPS as the basis for its EE and DSM scenarios in the IRP, those scenarios should be revised to account for higher, more realistic estimates of potential.

ASSESSMENT OF THE MARKET POTENTIAL STUDY

Q: PLEASE DESCRIBE HOW YOU CONDUCTED YOUR ASSESSMENT OF THE MARKET POTENTIAL STUDY.

A: EFG reviewed the methodology and assumptions that Nexant used to prepare the MPS, as provided in the MPS document, and compared them with other potential studies and known best practices from around the country. In conducting this analysis, EFG relied on data that were available in the public reports and did not conduct a detailed analysis of the underlying data.

Q: WHAT OMISSIONS DID YOU IDENTIFY IN THE MPS?

A: Our report identifies three major categories of omissions in the MPS:

1. The MPS failed to account for potential savings that could result from promotion of emerging technologies, instead only considering "existing technology and market trends as observed with currently available data."

2. The MPS failed to evaluate a variety of measures that are known today and used to achieve savings by numerous EE programs in other jurisdictions.

3. Finally, the MPS failed to consider new or enhanced customer engagement strategies or program designs that Duke could employ to increase customer participation rates.

Q: DID YOU IDENTIFY ANY ISSUES WITH THE STUDY DESIGN OF THE MPS?

A: Yes. We identified four major issues with the MPS' study design:

1. The MPS made unreasonable assumptions regarding commercial and residential end-uses that result in an underestimation of savings;
2. The MPS failed to account for increasing measure savings due to technology improvement and decreasing measure and program costs driven by economies of scale;
3. The MPS unreasonably constrained its calculation of achievable potential by limiting it to measures already included in Duke's EE portfolio and historic participation rates; and
4. The MPS used the Total Resource Cost ("TRC") instead of the Utility Cost Test ("UCT") to screen for cost-effectiveness, even though the UCT has been approved by the Commission as the primary cost-effectiveness test for Duke in South Carolina and is a more relevant measure of the value EE and DSM provide to the utility system.

Q: WHAT ISSUES DID YOU IDENTIFY WITH RESPECT TO END-USE DISAGGREGATION IN THE MPS?

A: A crucial step in developing an MPS is ensuring that load is disaggregated properly into relevant end-uses. The percentages of sector loads that fall into different end uses is used as a basis for calculating energy savings. For example, the percentage savings from efficient chillers is applied to the portion of the sector load that has been allocated to air conditioning to estimate the potential savings that could be achieved from that measure. In the MPS, Nexant relied on data sources from Duke to perform its disaggregation, with secondary data from the Energy Information Administration (EIA) Residential End Use Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS), and Manufacturers' Energy Consumption Survey. However, we identified some disparities between the MPS and EIA data with respect to the amount of residential and commercial load allocated to "miscellaneous" end-uses.

Q. WHAT DISPARITIES DID YOU IDENTIFY?

A: First, the MPS assumed that 27% of commercial load fell into the "Miscellaneous" end-use for both DEC and DEP. In contrast, the EIA CBECS shows only 17% of the load in an "Other" category for the South Atlantic census division[2]. This is significant because few measures in the MPS are associated with the miscellaneous end-use, which means that very little energy savings potential will be derived from 27% of the DEC/DEP commercial load using Nexant's assumption. Likewise, for the residential sector, the miscellaneous category in the MPS is notably higher than what the EIA data suggest. Nexant assumes 21% and 14% miscellaneous for DEC and DEP, [3] respectively, compared to 11% estimated by RECS.[4] Taken together, this means that other end-uses will be underrepresented, and savings from those measures will be conservatively low.

[2] EIA CBECS 2012. Table E5, South Atlantic census division, indicates an "Other" end-use electricity consumption of 48 billion kWh out of the total electricity consumption of 287 billion kWh.
[3] Nexant South Carolina Market Potential Study, pp. 23-25.
[4] EIA RECS 2015. Table CE5.1b, South Atlantic census division, indicates an "Other" end-use electricity consumption of 34.7 billion kWh. Table CE4.4, South Atlantic division, indicates the total electricity consumption of 316 billion kWh.

Q: DID THE MPS ACCOUNT FOR FUTURE IMPROVEMENTS IN THE EFFICIENCY OR COST OF EE/DSM MEASURES?

A: No. The MPS fails to account for increasing measure savings due to technology improvement and decreasing measure and program costs driven by economies of scale. Many technologies have well established track records of energy improvement over time, such as LED lighting and heat pumps, and it is well understood that new technologies will decrease in cost as they continue to develop market acceptance. However, in the MPS, Nexant unrealistically assumes measures would have a static efficiency level and cost over time.

Q. CAN YOU PROVIDE AN EXAMPLE OF THE STATIC MODELING YOU DESCRIBE IN THE MPS?

A: For example, while Nexant modeled various SEER levels for air conditioning in the MPS, the saturation shares of the different efficiency levels remain fixed throughout the study. It would be more realistic to model decreasing incremental costs for higher SEER models with the result that their adoption share would increase accordingly. The implications of the overly simplistic approach used in the MPS are: (1) for these measures, the MPS underrepresents their savings potential; (2) some measures will fail the economic screen due to erroneous calculations of lower savings and higher cost; and (3) the levelized cost of a measure will be unreasonably high and will lead to inaccurate modeling in the IRP.

Q: WHAT ISSUES DID YOU IDENTIFY WITH HOW ACHIEVABLE POTENTIAL WAS CALCULATED IN THE MPS?

A: The MPS includes two levels of achievable potential. The "Base" scenario aligns with Duke's existing program portfolio and includes existing EE programs and measures currently offered by DEC or DEP, while the "Enhanced" scenario builds on the base scenario with increased program incentives designed to attract new customers into the market for EE technology and program participation.

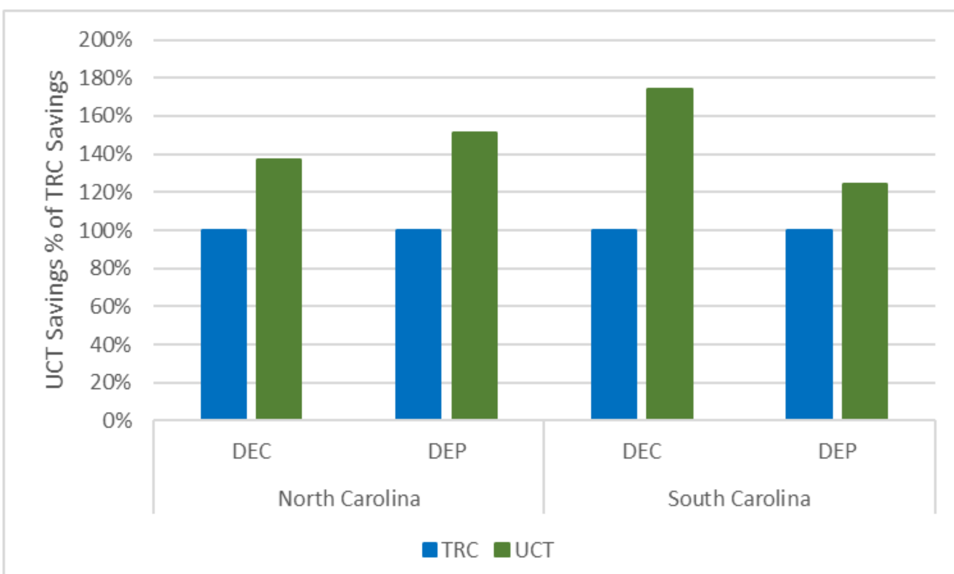
Q. DO THESE TWO LEVELS OF ACHIEVABLE POTENTIAL PRESENT AN APPROPRIATE AND REASONABLE ESTIMATE OF THE EE AND DSM SAVINGS DUKE COULD EXPECT TO ACHIEVE?

A: Unfortunately, no. The approach that Nexant uses in the MPS fails to reasonably account for known EE technologies that could be offered using typical incentive rates. The "base scenario" is constrained to measures currently offered in the existing program portfolio, and therefore energy efficiency measures that are known today but not offered by Duke are excluded. Further, the MPS calculates the achievable potential based on historic participation rates. Participation rates can be influenced by a variety of factors, including incentives and marketing, which can be adjusted to drive different participation rates through program designs and strategies. The participation rates currently experienced by the programs should not be assumed to be an upper bound, as this constrains potential by assuming that program delivery improvements would have no effect on participation and savings.

Q: WHAT COST-EFFECTIVENESS SCREENING TEST DID DUKE USE IN THE MPS?

A: The market potential studies use the TRC test. However, the TRC as used in the MPS is a flawed measure of cost-effectiveness. This is because, as discussed by the American Council for an Energy Efficient Economy ("ACEEE"), it is asymmetrical in that it "counts a number of categories of costs (e.g., the full incremental measure cost to customers) without their attendant benefits (e.g., other fuel or water savings, or health benefits)." The MPS uses this asymmetric TRC even though use of the UCT as the primary cost-effectiveness test in North and South Carolina was pending in mechanism review proceedings with regulators at the time the MPS was developed, and has since been approved. Nexant performed a sensitivity analysis for economic potential using the UCT and found significantly higher economic savings potential, summarized for the residential sector in Table 1 below:

Table 1: Residential UCT Economic Savings vs. TRC[5]

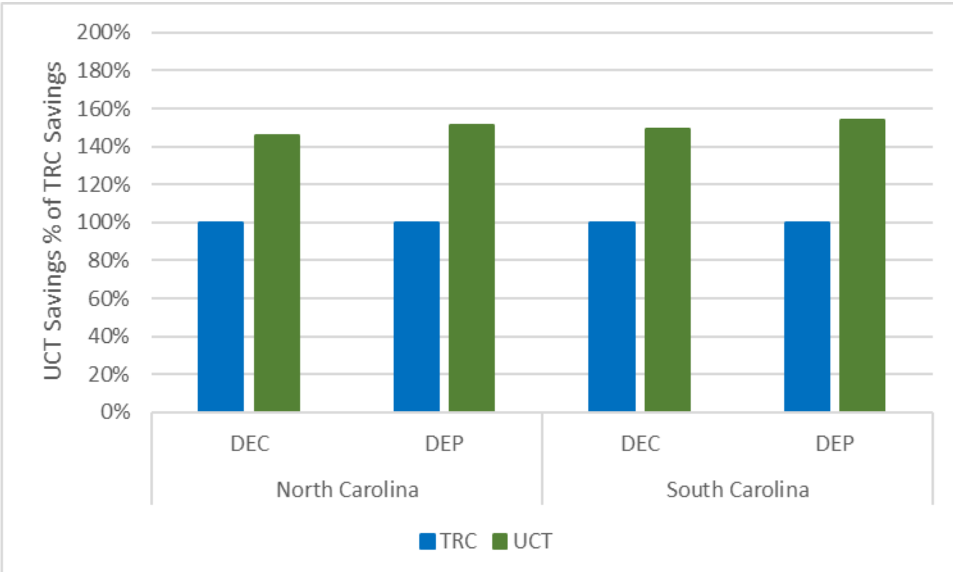


[5] Nexant North Carolina Market Potential Study, p.72; Nexant South Carolina Market Potential Study, p.72.

Q: DOES THE UCT YIELD HIGHER SAVINGS FOR THE COMMERCIAL SECTOR AS WELL?

A: Yes, it does. The difference between the amount of savings that was found to be cost-effective for the commercial sector is similarly greater using the UCT instead of the TRC, as illustrated below in Table 2:

Table 2: Commercial UCT Economic Savings vs. TRC[6]



Based on these findings, and the Commission's decision to adopt UCT as a primary cost-effectiveness test, the results of the MPS based on the TRC must be viewed as overly conservative and not reflective of the true economic potential.

Q: HOW DO THE ISSUES YOU IDENTIFIED ABOVE AFFECT THE RESULTS OF THE MPS?

A: The MPS estimates that Duke can expect only a relatively low level of achievable savings, as illustrated below in Table 3:

6 Nexant North Carolina Market Potential Study, p.72; Nexant South Carolina Market Potential Study, p.72.

Table 3: Average Incremental Annual Savings as a % of Sales, 5-yr Sum of Annuals[7]

North Carolina		South Carolina	
DEC	DEP	DEC	DEP
0.88%	0.94%	0.91%	0.89%

Because of the omissions and study design issues noted above, it is my view that the MPS likely significantly underestimates the EE and DSM potential in DEC and DEP territories. This finding is consistent with observations made by ACEEE, which reports that its "meta-analysis of potential studies from around the country in states or utilities similar to Dominion, Duke Energy Progress and Duke Energy Carolinas in their retail prices…found achievable average annual savings as a percentage of baseline of 1.2% (with achievable maximum annual savings of 1.6%)."[8]

Q: ARE THERE OTHER SPECIFIC AREAS THAT CONCERN YOU REGARDING THE MPS?

A: Yes. I am also deeply troubled by the fact that the MPS residential savings are heavily skewed toward savings from residential behavioral programs. These programs typically have very short persistence—meaning their savings do not accumulate or persist over time—and tend to be more expensive than other longer-lived measures. As the savings from residential lighting diminish due to market maturation and the effect of federal standards, programs have an opportunity to backfill the void with non-lighting equipment-based measures such

[7] Nexant North Carolina Market Potential Study, pp.3-4; Nexant South Carolina Market Potential Study, pp.3-4.

[8] Gold, R., C. Cohn, A. Hoffmeister, and M. Molina. 2020. How Energy Efficiency Can Help Rebuild North Carolina's Economy: Analysis of Energy, Cost, and Greenhouse Gas Impacts. Washington, DC: American Council for an Energy-Efficient Economy, p. 26. https://www.aceee.org/research-report/u2007

as HVAC and heat pump water heaters. Unfortunately, the MPS does not evaluate these opportunities, depriving customers of substantive opportunities to manage their energy costs.

Q: HOW DO THE RESULTS OF THE MPS AFFECT DUKE'S 2020 IRP?

A: The MPS calculated and presented levelized costs by sector for DEC and DEP, presented from the TRC perspective. However, as discussed above, the TRC test includes participant costs but does not include a variety of participant benefits; as a result, the test tends to understate cost-effectiveness and overstate levelized costs, making EE and DSM resources seem misleadingly expensive when compared with other resource options. What is more, the TRC is not the most relevant measure of how EE and DSM can reduce utility system costs – that is more appropriately measured by the UCT. Since minimizing utility costs while maintaining safe, reliable service is the core issue of an IRP, it makes no sense that Duke uses asymmetrically calculated TRC results to determine the optimal level of EE and DSM in its IRP.

Q: HOW DO YOU SUGGEST THE COMMISSION SHOULD RESPOND ON THE ISSUE OF THE LEVELIZED COSTS USED IN THE IRP?

A: The levelized costs as presented in the Nexant studies should not be used as an input to the IRP. Instead, I recommend that the Commission require Duke to recalculate levelized costs from the UCT perspective, as the sum of program incentives and administrative costs divided by the discounted sum of lifetime energy savings, and revise its IRP using these updated cost assumptions. Of course, based on my previous observations, this should only be done after the MPS is revised to address potential savings more fully.

EVALUATION OF THE WINTER PEAK ANALYSIS

Q: PLEASE DESCRIBE HOW YOU CONDUCTED YOUR REVIEW OF THE WPA.

A: EFG compared the results of the comprehensive approach used to estimate winter peak potential savings in the WPA with the winter peak savings results identified in the MPS. As with our review of the MPS, EFG relied on the data available in the public reports and did not conduct a detailed analysis of the underlying data.

Q: WHAT WERE YOUR KEY FINDINGS IN CONDUCTING THIS COMPARISON OF THE WPA AND THE MPS?

A: Our review showed that, due to many of the same issues identified above with respect to EE savings in the MPS, Nexant significantly underestimated DSM potential in winter where the need is growing. Indeed, Duke's WPA, which included an assessment of several innovative approaches that the MPS excluded, identified significantly more winter peak potential than the MPS: the WPA's "Max" scenario identified nearly twice the winter peak potential identified in the MPS's "Base" scenarios, and roughly 70 and 77% more winter peak potential compared to the MPS "Enhanced" scenarios for DEC and DEP, respectively.[9] This is particularly important because, as was discussed in both the WPA and the 2020 IRP, Duke's winter peak capacity requirements are growing faster than its summer peak requirements.

[9] Duke Energy Winter Peak Demand Reduction Potential Assessment Final Report 2020.12.23, p. 22. Note that in both cases the projected savings are incremental to DSM savings already achieved by Duke.

RECOMMENDATIONS

Q: WHAT RECOMMENDATIONS DO YOU HAVE FOR THE COMMISSION?

A: I recommend that the Commission require Duke to revise its 2020 IRP using updated EE and DSM assumptions. In particular, I recommend that Duke be required to revise its EE and DSM assumptions and calculations in the following ways:

1. Recalculate levelized costs using the Commission-approved UCT rather than the TRC.

2. Revise its assessment of EE/DSM potential to account for emerging technologies, measures not currently included in its program portfolio, and modifications and improvements Duke could make to its current marketing efforts and program designs that could increase program participation. In this assessment, Duke should give particular attention to programs to address winter peak, consistent with the findings of the WPA.

3. Re-evaluate its calculations of EE/DSM potential to align its allocation of residential and commercial load to the “miscellaneous” end-use category with EIA data.

Duke should be required to file a Modified 2020 IRP incorporating these revisions to its EE/DSM assumptions and analysis.

Q: DOES THIS CONCLUDE YOUR TESTIMONY?

A: Yes

STATE OF SOUTH CAROLINA

BEFORE THE PUBLIC SERVICE COMMISSION

DOCKET NO. 2019-224-E
DOCKET NO. 2019-225-E

In the Matter of: South Carolina Energy Freedom Act (House Bill 3659) Proceeding Related to S.C. Code Ann. Section 58-37-40 and Integrated Resource Plans for Duke Energy Carolinas, LLC and Duke Energy Progress, LLC	))))))))	CERTIFICATE OF SERVICE

I certify that the following persons have been served with one (1) copy of Testimony of Jim Grevatt on behalf of South Carolina Coastal Conservation League, Southern Alliance for Clean Energy, Upstate Forever, Natural Resources Defense Council, and Sierra Club by electronic mail and/or U.S. First Class Mail at the addresses set forth below:

Heather S. Smith
Duke Energy Progress, LLC
Duke Energy Carolinas, LLC
Heather.smith@duke-energy.com

Nanette S. Edwards
Jeffrey M. Nelson
Andrew M. Bateman
Office of Regulatory Staff
nedwards@ors.sc.gov
abateman@ors.sc.gov
jnelson@ors.sc.gov

Rebecca J. Dulin
Duke Energy Progress, LLC
Duke Energy Carolinas, LLC
Rebecca.Dulin@duke-energy.com

Becky Dover
Carri Grube Lybarker
SC Department of Consumer Affairs
bdover@scconsumer.gov
clybarker@scconsumer.gov

Richard L. Whitt
Whitt Law Firm, LLC
richard@rlwhitt.law

Samuel J. Wellborn
Frank R. Ellerbee, III
Robinson Gray Stepp & Lafitte, LLC
swellborn@sowellgray.com
fellerbe@sowellgray.com

James Goldin
Weston Adams III
Courtney E. Walsh
Nelson Mullins Riley & Scarborough LLP
Jamey.goldin@nelsonmullins.com
Weston.adams@nelsonmullins.com
court.walsh@nelsonmullins.com

Roger P. Hall*, Assistant Consumer Advocate
South Carolina Department of Consumer Affairs
rhall@scconsumer.gov

Thadeus B Culley, Regional Director
Vote Solar
thad@votesolar.org

John J. Pringle, Jr.
Adams and Reese LLP
jack.pringle@arlaw.com

Michael K. Lavanga
Stone Mattheis Xenopoulos & Brew, PC
mkl@smxblaw.com

Robert R. Smith, II
Moore & Van Allen, PLLC
robsmith@mvalaw.com

This the 5th day of February, 2021.

s/ Rachel Pruzin

EXHIBIT A

ENERGY FUTURES GROUP

energyfuturesgroup.com

Review of DEC and DEP Market Potential Studies

Underestimation of Energy Efficiency

and

Demand Side Management

Prepared by:

Dan Mellinger and Jim Grevatt

February 5, 2021

Energy Futures Group, Inc

PO Box 587, Hinesburg, VT 05461 – USA | 802-482-5001 | 802-329-2143 | info@energyfuturesgroup.com

Contents

About the Authors

Energy Futures Group (EFG) is a clean energy consulting firm based in Hinesburg, Vermont and with offices in Boston and New York. EFG specializes in the design, implementation and evaluation of programs and policies to promote investments in energy efficiency, renewable energy, other distributed resources and strategic electrification. EFG staff have worked on these issues on behalf of energy regulators, other government agencies, utilities and advocacy organizations across the United States, Canada, Europe, and China.

Dan Mellinger is a Principal with Energy Futures Group. He specializes in the design, planning and administration of commercial and industrial energy efficiency programs and is a lighting technologies expert. He provides technical consultative services on efficient technology capabilities, market analysis, technology adoption, energy savings potential, industry standards, and training programs. Dan has consulted on hundreds of commercial efficiency projects across many jurisdictions nationwide and has designed and administered industry-leading commercial lighting programs. He received his degree in Electrical Engineering from Michigan State University, is a licensed Professional Engineer, is a Certified Energy Manager, and is Lighting Certified.

Jim Grevatt has 30 years of experience in energy efficiency program planning and operations. At Energy Futures Group Jim has advised regulators, program implementers, and advocates in Florida, Louisiana, West Virginia, Colorado, Nevada, British Columbia, Manitoba, Maryland, Pennsylvania, Delaware, Virginia, New Jersey, Illinois, Iowa, Indiana, Mississippi, North Carolina, South Carolina, California, Vermont, Maine, Kentucky, and New Hampshire, and has provided expert witness testimony in fourteen of those jurisdictions. Jim has hands-on experience with industry-leading approaches to designing and managing energy efficiency programs, including multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs. His in-depth knowledge of program operations and clear understanding of strategic thinking and planning ensure that programs achieve their desired market impacts. In past leadership roles at Efficiency Vermont, the DCSEU, and Vermont Gas, Jim had overall responsibility both for program design and operations, assuring that program processes were efficient and effective.

Introduction

At the request of the Southern Environmental Law Center, EFG conducted a review of key assumptions employed by Duke Energy ("Duke" or "Company") and Nexant in developing the Duke Energy North Carolina and South Carolina EE and DSM Market Potential Studies ("MPS") dated June 2020. EFG also compared the potential winter peak capacity savings identified in the MPS to the results of the December 2020 Duke Energy Winter Peak Analysis ("WPA") that was prepared for Duke by Tierra Resource Consultants in partnership with Dunsky Energy Consulting and Proctor Engineering Group.

Accurate estimates of the full scope of potential energy efficiency ("EE") and demand-side management ("DSM") savings are critical for the development of the Company's Integrated Resource Plans ("IRP") to ensure that costly infrastructure and capacity investments are not made unnecessarily when lower-cost EE and DSM alternatives are available. In Duke's IRP, "EE-based demand and energy savings are treated as a reduction to the load forecast, which also serves to reduce the associated need to build new supply-side generation, transmission and distribution facilities."[1] The IRP views DSM programs "as resource options that can be dispatched to meet system capacity needs during periods of peak demand."[2]

In reviewing both the MPS and WPA, EFG relied on data that were available in the public reports and did not conduct a detailed analysis of the underlying data. Nevertheless, this review revealed numerous instances where arbitrary limitations were made in the scope of the MPS that result in significant underestimations of potential EE and DSM savings. The Company itself says as much regarding potential winter peak savings, when it states, "preliminary results from [the WPA] show promise for additional winter peak demand savings that could move the Company closer to the high energy efficiency and demand response sensitivity identified in the IRP." [3]

[1] Duke Energy Carolinas 2020 Integrated Resource Plan, p.35.

[2] Duke Energy Carolinas 2020 Integrated Resource Plan, p.35.

[3] Duke Energy Carolinas 2020 Integrated Resource Plan, p.36.

Principal Observations – EE Potential

Omissions

1. **Emerging Technologies**
   The Nexant studies for DEC and DEP indicate that the MPS only considers "existing technology and market trends as observed with currently available data and does not speculate on the potential impact of unknown, emerging technologies that are not yet market ready." [4] This failure to account for emerging technology results in a conservative long-term forecast of EE potential. The seriousness of this omission increases the further out in time the estimates of savings potential go insofar as new technologies or systems are constantly being developed. For example, nearly half of the efficiency savings in the Northwest Power and Conservation Council's Draft Seventh Power Plan were from efficiency measures not included in the Council's sixth plan published just five years prior.[5] The portfolios offered today by DEC, DEP, and other utilities include numerous high-impact measures that would have been considered emerging technologies or non-existing 10-15 years ago, such as LED lighting, heat pump water heaters, smart thermostats, and networked lighting controls. Over the next 10-15 years, the marketplace will continue to evolve, and new products and technologies will inevitably be introduced. Speaking to the importance of emerging technology, the American Council for an Energy Efficient Economy ("ACEEE") states the following:

   > Assumptions about emerging technologies (ETs) can have a noticeable impact on potential results, particularly for those studies that consider long-term savings potential (i.e., ten years out or more). Many studies we reviewed include savings from ETs, but only a half-dozen or so are transparent about the measures they assume to be emerging. Where savings potential from ETs is provided, however, the impacts are considerable. Cadmus' 2012 study for the Iowa Utility Association, for example, finds that ETs could increase electric

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[4] Nexant North Carolina Market Potential Study, p.10; Nexant South Carolina Market Potential Study, p.10.

[5] *The Next Quantum Leap in Efficiency: 30 Percent Electric Savings in Ten Years*, The Regulatory Assistance Project, February 2016 (http://www.raponline.org/wp-content/uploads/2016/05/rap-efg-neme-grevatt-30percentefficiency-2016-feb-1.pdf).

market potential (i.e., maximum achievable potential) by up to 3%, or 0.3% additional achievable savings annually over the ten-year study period (Cadmus 2012). KEMA's 2010 study for Xcel Energy Colorado finds that economic potential increases by 24% when ETs are included. Of these, 13% could be achieved through programs over an 11-year period (KEMA 2010). Clearly the savings potential for ETs is substantial enough that it should not be ignored.[6]

2. Omitted Measures

Even within the realm of known technology, the Nexant potential studies omitted measures that would have contributed to higher energy savings potential. Figure 1 below lists nearly two dozen technologies that are known today and offered by numerous energy efficiency programs in other jurisdictions.

[6] *Cracking the TEAPOT: Technical, Economic, and Achievable Potential Studies*, August 2014 (https://www.aceee.org/research-report/u1407)

Figure 1: Omitted Measures

Residential
- LED decorative and directional lamps
- Pool covers
- CEE tier 2 refrigerators

Commercial
- Networked lighting controls
- LED parking lot lighting
- LED directional lamps
- Evaporator fan motor controls
- Variable refrigerant flow (VRF)
- Dedicated outdoor air system (DOAS)
- Air-source heat pumps
- Variable speed air compressor
- Dual enthalpy economizer for existing buildings
- Data center hot/cold aisle configuration

Industrial
- Strategic energy management
- Process improvement
- Compressed air leak survey & repair
- Compressed air no-loss drains
- Chiller plant optimization
- Advanced rooftop control

The impact that these measures would have had on the MPS is difficult to quantify, but undeniably their omission results in an underestimation. Several of the measures listed in the table have proven to offer significant energy savings potential due to large load reductions, widespread applicability, or both. For example, the U.S. Department of Energy's High Impact Technology program identified significant savings potential from advanced rooftop unit controls (56%) and variable refrigerant flow (34%).[7] Other potential studies have identified networked/integrated lighting controls, strategic energy management, and evaporator fan motor controls among the top contributing

[7] https://www.energy.gov/eere/buildings/high-impact-technology-deployment-pathways

measures to achievable potential.[8]

3. **New Customer Engagement Strategies and Program Designs**
   The Nexant MPS relies on customer engagement strategies and program designs that are currently employed by DEC and DEP and makes no effort to estimate the potential from new or enhanced strategies. An attempt was made to model an "enhanced" level of savings, but this was only done by introducing higher incentives (75% of incremental cost) and assumed higher adoption based on a customer's willingness to participate. Nexant states that "[w]hile program design and optimization is outside the scope of this MPS, Nexant's enhanced scenario describes the expected market response to higher incentives that reduce participant costs for EE and DSM." [9] Yet new customer engagement strategies and program designs can reach new customers and change their willingness to participate for a variety of reasons. For example, a customer may be more willing to participate if on-bill financing were offered for investments in energy efficiency projects. In another example, midstream programs that focus on technologies beyond commercial lighting, such as residential/commercial HVAC and commercial kitchen equipment, can reach far more customers than downstream programs, often with lower administration costs. Financing and midstream programs both overcome a key obstacle to customer participation: the upfront capital investment. Additional examples of strategies and designs omitted by the MPS include energy efficiency as a service (EEaS) and strategic energy management (SEM). Had Nexant accounted for any of these or other engagement strategies and program designs, it is likely that more aggressive adoption curves would be possible resulting in higher levels of savings.

Study Design

1. **End-use Disaggregation**
   The disaggregation of the DEC and DEP loads into end-uses is an important step in the development of a market potential study. The end-use shares of the sector loads are

[8] Minnesota Energy Efficiency Potential Study, 2020 (https://mn.gov/commerce-stat/pdfs/mn-energy-efficiency-potential-study.pdf); Michigan Lower Peninsula Electric Energy Efficiency Potential Study, 2017 (https://www.michigan.gov/documents/mpsc/MI_Lower_Peninsula_EE_Potential_Study_Final_Report_08.11.17_598053_7.pdf); Commonwealth Edison Energy Efficiency Potential Study, 2020 (https://ilsag.s3.amazonaws.com/ComEd-2021-2030-Potential-Study-Final-Report-rev1_Aug-2020.pdf)

[9] Nexant North Carolina Market Potential Study, p.74; Nexant South Carolina Market Potential Study, p.74.

used as a basis for calculating energy savings. For example, the percentage savings from efficient chillers is applied to the portion of the sector load that has been allocated to air conditioning to estimate the potential savings that could be achieved from that measure. Therefore, ensuring that the load has been disaggregated properly into relevant end-uses is a critical step. Nexant relied on data sources from Duke to perform this disaggregation, with secondary data from the Energy Information Administration (EIA) Residential End Use Consumption Survey (RECS), Commercial Building Energy Consumption Survey (CBECS), and Manufacturers' Energy Consumption Survey (MECS). However, two areas of concern stand out in Nexant's analysis:

a. Nexant assumes approximately 27% of the commercial load falls into the "miscellaneous" end-use for both DEC and DEP.[10] The EIA CBECS, meanwhile, shows only 17% of the load in an "Other" category for the South Atlantic census division.[11] This is an important consideration since few measures in the MPS are associated with the miscellaneous end-use, which means that very little energy savings potential will be derived from 27% of the DEC/DEP commercial load using Nexant's assumption. Furthermore, with the miscellaneous end-use representing an outsized portion of the load, other end-uses will be underrepresented, and savings from those measures will be conservatively low.
b. In the residential sector, the miscellaneous category is again notably higher than what the EIA data suggest. Nexant assumes 21% and 14% miscellaneous for DEC and DEP, [12] respectively, compared to 11% estimated by RECS.[13] Furthermore, Nexant's estimate for water heating and clothes drying end uses are approximately half as much as estimated by EIA, meaning high-growth potential measures such as heat pump water heaters and heat pump

[10] Nexant North Carolina Market Potential Study, pp. 24-25; Nexant South Carolina Market Potential Study, pp. 24-25.

[11] EIA CBECS 2012. Table E5, South Atlantic census division, indicates an "Other" end-use electricity consumption of 48 billion kWh out of the total electricity consumption of 287 billion kWh.

[12] Nexant North Carolina Market Potential Study, pp. 23-25; Nexant South Carolina Market Potential Study, pp. 23-25.

[13] EIA RECS 2015. Table CE5.1b, South Atlantic census division, indicates an "Other" end-use electricity consumption of 34.7 billion kWh. Table CE4.4, South Atlantic division, indicates the total electricity consumption of 316 billion kWh.

dryers will have significantly understated savings.

2. **Future Improvements in Efficiency and Cost**
   The MPS also fails to account for increasing measure savings due to technology improvement and decreasing measure and program costs driven by economies of scale. Many technologies have well established track records of energy improvement over time, such as LED lighting and heat pumps, and it is well understood that new technologies will decrease in cost as they continue to develop market acceptance. The Nexant modeling of measures assumes a static efficiency level and cost. Some measures are modeled with multiple levels of efficiency, such as various SEER levels for air conditioning, but these measures compete against each other and their saturation shares remain fixed throughout the study. For other measures such as LED lighting and heat pump water heaters, the study has no mechanism to account for higher levels of efficiency and lower anticipated costs. The multiple implications of these shortcomings are: (1) these measures will underrepresent the savings potential; (2) some measures will fail the economic screen due to lower savings and higher cost; and (3) the levelized cost of a measure will be unreasonably high and will lead to inaccurate modeling in the IRP.

3. **Achievable Potential**
   The Nexant MPS includes two levels of achievable potential, described as follows:
   - Base scenario – aligns with existing program portfolio, and includes existing EE programs and measures currently offered by DEC or DEP.
   - Enhanced scenario – includes the base scenario, but with increased program incentives designed to attract new customers into the market for EE technology and program participation.

   Unfortunately, this approach fails to reasonably account for known EE technologies that could be offered using typical incentive rates. The “base scenario” is constrained to measures currently offered in the existing program portfolio, and therefore energy efficiency measures that are known today but not offered by Duke, such as those listed above in Figure 1, are excluded. As a result, the long-term potential will be significantly underestimated since there is no mechanism to allow the portfolio to evolve over time. While some of these measures are included in the “enhanced scenario” they are associated with an incentive that is doubled (subject to a maximum of 75% of incremental cost), which likely artificially inflates the cost required to induce customers to install them.

Nexant also calculates the achievable potential based on historic participation rates. As previously discussed, participation rates can be influenced by a variety of factors, including incentives and marketing, which can be adjusted to drive different participation rates through program designs and strategies. The participation rates currently experienced by the programs should not be assumed to be an upper bound, as this constrains potential by assuming that program delivery improvements would have no effect on participation and savings.

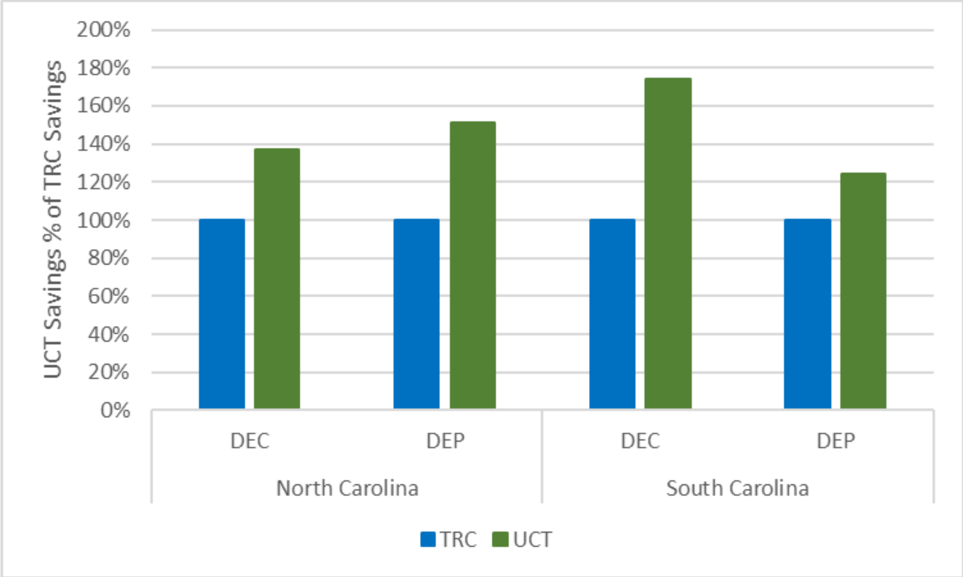
4. **Economic Screening**

The market potential studies use the Total Resource Cost ("TRC") test as currently approved by regulators for economic screening, which, as discussed by ACEEE, is asymmetrical because it "counts a number of categories of costs (e.g., the full incremental measure cost to customers) without their attendant benefits (e.g., other fuel or water savings, or health benefits)."[14] The MPS uses this asymmetric TRC even though use of the Utility Cost Test ("UCT") as the primary cost-effectiveness test in North and South Carolina was pending in mechanism review proceedings with regulators at the time the MPS was developed, and has since been approved.[15] Nexant performed a sensitivity analysis for economic potential using the UCT and found significantly higher economic savings potential, summarized for the residential sector in Figure 2 below:

[14] Gold, R., C. Cohn, A. Hoffmeister, and M. Molina. 2020. How Energy Efficiency Can Help Rebuild North Carolina's Economy: Analysis of Energy, Cost, and Greenhouse Gas Impacts. Washington, DC: American Council for an Energy-Efficient Economy, p. 25. https://www.aceee.org/research-report/u2007

[15] The UCT has since been approved as the primary cost-effectiveness test in both states. See Docket No. 2013-298 –E, Order No. 2021-32, https://dms.psc.sc.gov/Attachments/Order/9f6b5eea-227f-42f7-9326-622c28be349c (DEC); Docket No. 2015-163-E, Order No. 2021-33, https://dms.psc.sc.gov/Attachments/Order/fd6a5654-593f-4ebd-a2a7-8419bab8ee51 (DEP).

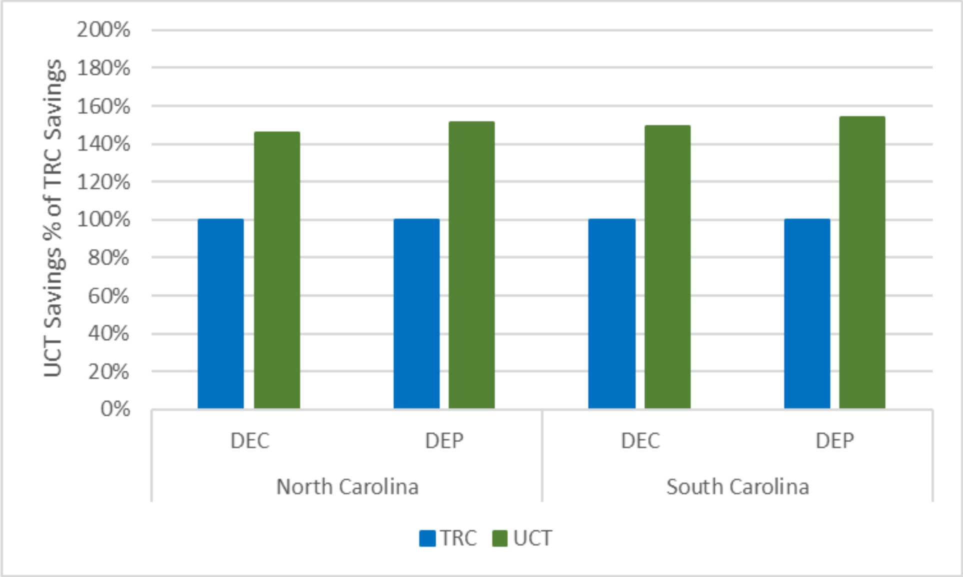
Figure 2: Residential UCT Economic Savings vs. TRC[16]



Commercial cost-effective savings were also considerably greater under the UCT, illustrated in Figure 3 below:

[16] Nexant North Carolina Market Potential Study, p.72; Nexant South Carolina Market Potential Study, p.72.

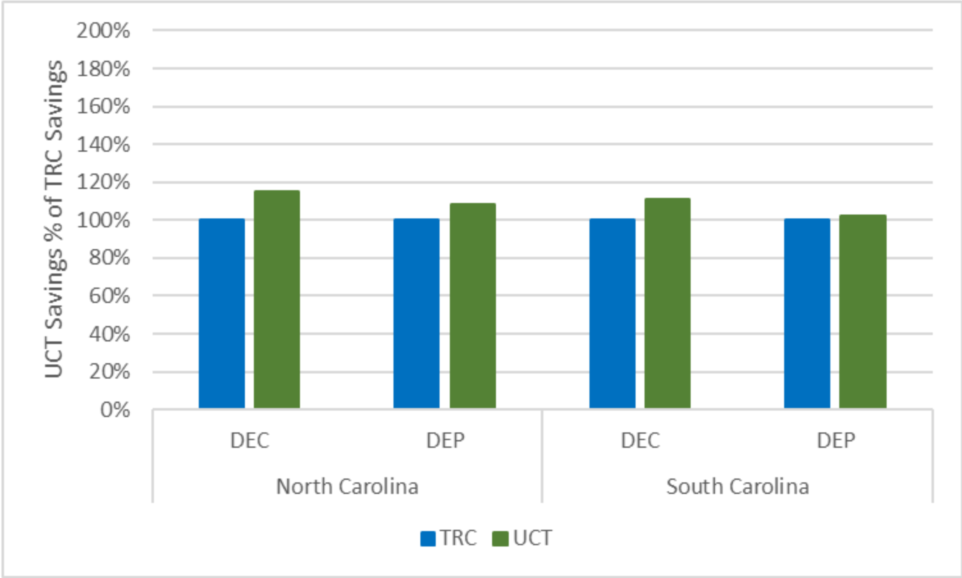
Figure 3: Commercial UCT Economic Savings vs. TRC[17]



And, while the gap between UCT savings and TRC savings was not as great for industrial measures, UCT savings were nevertheless still greater, as shown in Figure 4:

[17] Nexant North Carolina Market Potential Study, p.72; Nexant South Carolina Market Potential Study, p.72.

Figure 4: Industrial UCT Economic Savings vs. TRC[18]



Based on these findings, and the adoption of the UCT as a primary cost-effectiveness test, the results of the market potential study based on the TRC must be viewed as overly conservative and not reflective of the true economic potential. Refreshing the MPS analysis using UCT savings rather than TRC would be one step that Duke could take to more realistically assess EE savings potential in the Carolinas.

Study Results

1. **Low Achievable Potential Relative to Other Jurisdictions**
   The MPS estimates that Duke can expect only a relatively low level of achievable savings, as illustrated below in Table 1:

[18] Nexant North Carolina Market Potential Study, p.72; Nexant South Carolina Market Potential Study, p.72.

***Table 1: Average Incremental Annual Savings as a % of Sales, 5-yr Sum of Annuals*[19]**

North Carolina		South Carolina	
DEC	DEP	DEC	DEP
0.88%	0.94%	0.91%	0.89%

For all of the reasons described above, EFG concludes that the MPS is highly likely to significantly understate Duke's EE savings potential in the coming years. This finding is consistent with observations made by ACEEE, which reports that its "meta-analysis of potential studies from around the country in states or utilities similar to Dominion, Duke Energy Progress and Duke Energy Carolinas in their retail prices…found achievable average annual savings as a percentage of baseline of 1.2% (with achievable maximum annual savings of 1.6%). A number are also vertically integrated utilities, such as Entergy New Orleans, Puget Sound Energy, NV Energy, and Minnesota utilities, and the sample includes large utilities like Duke, such as ComEd, Ameren Illinois, and Entergy Louisiana, and some smaller utilities like Dominion in North Carolina, such as Idaho Power and some of the Minnesota utilities included in their statewide potential study." [20]

2. **Unreasonable Reliance on Residential Behavioral Programs**
   The residential energy efficiency potential is heavily reliant on savings from behavioral programs, as outlined in the following table:

***Table 2: Behavior Savings % of Residential 5-Year Cumulative Potential, Base Scenario*[21]**

North Carolina		South Carolina	
DEC	DEP	DEC	DEP
75%	78%	75%	73%

Behavior savings have very short persistence – a measure life of just one year – and must be "renewed" each year through repeated customer treatment. As a result,

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[19] Nexant North Carolina Market Potential Study, pp.3-4; Nexant South Carolina Market Potential Study, pp.3-4.

[20] Gold, R., C. Cohn, A. Hoffmeister, and M. Molina. 2020. How Energy Efficiency Can Help Rebuild North Carolina's Economy: Analysis of Energy, Cost, and Greenhouse Gas Impacts. Washington, DC: American Council for an Energy-Efficient Economy, p. 26. https://www.aceee.org/research-report/u2007

[21] Nexant North Carolina Market Potential Study, Figure 7-5 and Figure 7-14; Nexant South Carolina Market Potential Study, Figure 7-5 and Figure 7-14.

behavior savings do not accumulate/persist. Due to the short measure life, the levelized cost of behavior savings will tend to be more expensive than other long-lived measures. Accordingly, with such a heavy reliance on behavior the levelized cost of the residential sector as calculated by Nexant is twice as expensive as the non-residential sector. There are many factors that can lead to a more expensive levelized cost for the residential sector, but an excessive reliance on behavior exacerbates the issue. As the savings from residential lighting diminish due to market maturation and the effect of federal standards, programs have an opportunity to backfill the void with non-lighting equipment-based measures such as HVAC and heat pump water heaters. Unfortunately, the MPS takes the easy, but short-sighted approach, by relying too heavily on behavioral programs, thus depriving customers of substantive opportunities to manage their energy costs.

The long-term effect of this strategy is plainly obvious when comparing the cumulative (persisting) energy savings to the sum of annual savings. When not counting the savings from expired measures, the 25-year cumulative energy savings potential is a mere 1.26-1.35% of sales while the sum of annual energy savings appears much more significant, as shown in Table 3. Unfortunately, the sum of annual MWh figure is a mirage since a large portion of the savings persist for only one year. As a point of comparison, the 2019 Electric DSM Market Potential Study for Vectren Energy of Indiana identified behavior savings potential at 20% of the residential sector[22], and the 25-year cumulative energy savings potential is accordingly much more significant at 21.9% of sales[23].

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[22] GDS Associates 2020-2025 Integrated Electric DSM Market Potential Study & Action Plan, Table 4-6 on p. 29. https://www.vectren.com/assets/downloads/rates/in-south-action-plan.pdf

[23] GDS Associates 2020-2025 Integrated Electric DSM Market Potential Study & Action Plan, Figure 4-1 on p. 25, realistic achievable potential (RAP). https://www.vectren.com/assets/downloads/rates/in-south-action-plan.pdf

Table 3: 25-year Potential, Base Scenario[24]

	North Carolina		South Carolina	
	DEC	**DEP**	**DEC**	**DEP**
Cumulative MWh (% of Load)	1.31%	1.26%	1.35%	1.26%
Sum of Annual MWh (% of Load)	17.34%	19.13%	18.01%	17.87%

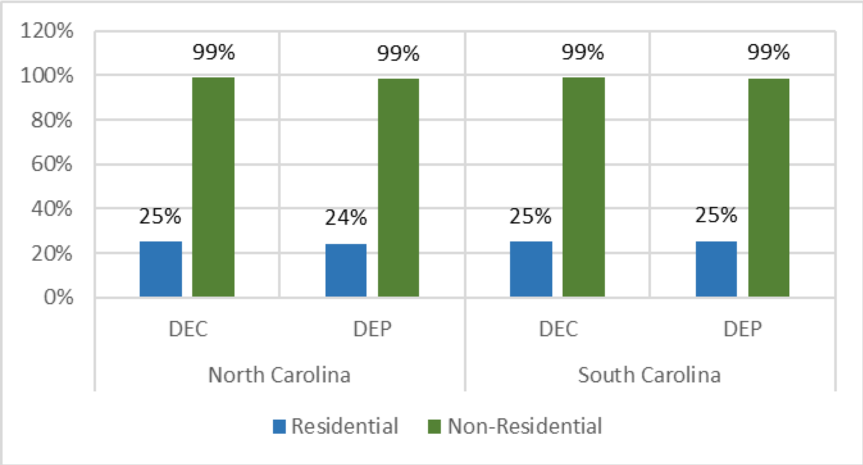
Another way to highlight this issue is to consider the percentage of savings that persist after just 5 years.[25] According to Nexant's analysis, the behavior-heavy residential sector would have only 24-25% persisting savings after 5 years, while the non-residential sector would have 99% persisting savings as shown below in Figure 5. Using Vectren Indiana as a point of comparison again, a much more significant 72% of the residential sector energy savings persist after 5 years.[26]

[24] Nexant North Carolina Market Potential Study, Table 7-6 and Table 7-14; Nexant South Carolina Market Potential Study, Table 7-7 and Table 7-14.

[25] Calculated as the 5-year cumulative energy savings divided by the 5-year sum of annual energy savings.

[26] GDS Associates 2020-2025 Integrated Electric DSM Market Potential Study & Action Plan. The 5-year sum of annual savings is 221,243 MWh based on Table 4-6 on p. 29. The 5-year cumulative savings is 159,025 based on Table 4-7 on p. 30. https://www.vectren.com/assets/downloads/rates/in-south-action-plan.pdf

Figure 5: % of Annual Savings that Persist after 5 Years [27]



3. **Levelized Cost**

   The market potential studies calculate and present levelized costs by sector for DEC and DEP. These costs, according to Nexant, are "presented from the TRC perspective as the sum of incremental measure costs and program admin costs divided by the discounted sum of lifetime energy savings. Program potential costs include both incremental measure costs and program delivery and administrative costs."[28] Since the levelized costs include the participant cost, these values will be misleading (and overly expensive) in comparison to other resource options being modeled and considered in the IRP. For this reason, the levelized costs as presented in the Nexant studies should not be used as an input to the Integrated Resource Plan. Instead, EFG recommends that the levelized costs for energy efficiency be recalculated from the UCT perspective as the sum of program incentives and admin costs divided by the discounted sum of lifetime energy savings. And importantly, when accounting for lifetime energy savings, the calculation must include the benefit of persisting savings that extend beyond the horizon of the

[27] Nexant North Carolina Market Potential Study, Table 7-8 (DEC), Table 7-11 (DEC), Table 7-16 (DEP), Table 7-19 (DEP); Nexant South Carolina Market Potential Study, Table 7-8 (DEC), Table 7-11 (DEC), Table 7-16 (DEP), Table 7-19 (DEP)

[28] Nexant North Carolina Market Potential Study, footnote 4, p.88; Nexant South Carolina Market Potential Study, footnote 4, p.88.

market potential study. For example, the savings from a measure with a 10-year life installed in 2044 (the last year of the MPS) should include the persisting savings from years 2045-2053. Without access to the underlying data, EFG cannot determine if Nexant performed the levelized cost calculation in this manner.

Capacity Savings in the MPS and Winter Peak Analysis

In the MPS, Nexant states that "DSM opportunities were analyzed…to determine the amount of summer and winter peak capacity that could be reduced through DSM initiatives."[29] In its analysis "Nexant and Duke Energy worked together to determine which DSM products and services were included in the MPS"[30] but only chose to include direct load control ("DLC"), emergency load response, economic load response, and base interruptible DSM in its analysis.[31] Importantly, the MPS "excluded DSM programs that explicitly target behavior (i.e., they are not automated or dispatchable)."[32] Non-dispatchable measures can be equally effective at minimizing peak load constraints, and some of them are indeed automated, but they take the form of preventative measures rather than the actively managed dispatchable measures included in the MPS. Examples of non-dispatchable DSM measures omitted from the MPS include time-of-use rates, real time pricing, critical peak pricing, peak time rebates, permanent load shifting, thermal storage, and battery storage. Nexant says further that its analysis of residential and small commercial and industrial ("C&I") DSM opportunities was "limited by the loads that can be controlled remotely at scale"[33] and that "all end uses are considered for large C&I." [34] Further, in the MPS "Nexant incorporated th[e] opt-out rate into the model by reducing the non-residential sales estimates by the appropriate percentage for each service territory and applying the applicable energy efficiency technologies and market adoption rates to the remaining sales forecast."[35] In other words, the MPS assumed that there were no options to

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[29] Nexant North Carolina Market Potential Study, p.4; Nexant South Carolina Market Potential Study, p.5.

[30] Nexant North Carolina Market Potential Study, p.36; Nexant South Carolina Market Potential Study, p.36.

[31] Nexant North Carolina Market Potential Study, p.36; Nexant South Carolina Market Potential Study, p.36.

[32] Nexant North Carolina Market Potential Study, p.48; Nexant South Carolina Market Potential Study, p.48.

[33] Nexant North Carolina Market Potential Study, p.40; Nexant South Carolina Market Potential Study, p.40.

[34] Nexant North Carolina Market Potential Study, p.40; Nexant South Carolina Market Potential Study, p.40.

[35] Nexant North Carolina Market Potential Study, p.34; Nexant South Carolina Market Potential Study, p.34.

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achieve DSM reductions for the many C&I customers that have opted out of the EE/DSM programs.

Unfortunately, the limitations that were imposed in the MPS DSM analysis result in a significant underestimation of DSM potential, particularly in winter, where the need is growing. This is made starkly clear in the more thorough Winter Peak Analysis ("WPA"), which reflects Duke's recognition that "meeting its clean energy commitments requires finding innovative approaches for addressing winter peak capacity needs with clean energy resources" which is "becoming a greater need than summer peak as net loads after solar are growing faster for winter needs than summer."[36] That winter peak capacity requirements are expected to continue to be larger than summer peak requirements is discussed in the WPA[37] and illustrated in the IRP.[38]

Because the focus of the Company's current DSM programs has been on reducing summer peaks, the underlying reliance on current programs in the MPS results in very low estimates for winter peak savings potential. The WPA illustrates the gap in the Company's current DSM portfolio used in the MPS when it states that "[b]ased on HP [heat pump] saturation data available from the 2019 RASS, we estimate that approximately 15% of all HP units are currently enrolled in a residential DSM program, the vast majority of which control only cooling (AC) operations…. This analysis estimates that approximately 1.4M customers with HPs are not participating in a DSM program."[39] Yet the WPA also found that "Residential sector programs are key to achieve significant winter demand reduction potentials." [40]

The WPA included analysis of the opportunity for Duke to use both the mechanical, dispatchable solutions such as those addressed in the MPS, but also included an assessment of how different rate structures could be used to manage winter peaks, including how rate structures could be used to mitigate winter peak even for those C&I customers who have opted

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[36] Duke Energy Winter Peak Targeted DSM Plan Final Report 2020.12.23, p. 8 of 101.

[37] See, e.g., Duke Energy Winter Peak Analysis and Solution Set Final Report 2020.12.23, p. 11 of 107.

[38] Duke Energy Carolinas 2020 Integrated Resource Plan. TABLE 12-G, DEC – Assumptions of Load, Capacity, and Reserves Tables

[39] Duke Energy Winter Peak Analysis and Solution Set Final Report 2020.12.23, p. 36 of 107.

[40] Duke Energy Winter Peak Targeted DSM Plan Final Report 2020.12.23, p. 95 of 101.

out of the EE/DSM programs. The critical role that rate solutions could play in mitigating winter peak is made crystal clear in the WPA findings, where, for example, in the “Mid Scenario” for DEC and DEP “rate solutions (residential and C&I) and BYOT now collectively account for over 85% of the DSM potential.”[41] Overall, the WPA “Max” scenario identifies nearly twice the winter peak potential that is identified in the MPS for DEC and DEP “Base” scenarios and roughly 70% more winter peak potential than the MPS “Enhanced” scenario for DEC and 77% more than for DEP. Importantly, the WPA states “[f]or the C&I market, this study estimates rate and mechanical potential separately and shows the impact mechanical solutions and rates not considered in the MPS and are therefore incremental to that study. For the residential sector, the potential in this study is also incremental to the MPS.”[42] The comparisons provided in the WPA are reproduced here as Table 4 and Table 5.

Table 4: Reproduced WPA Comparison with MPS Winter Peak Savings[43]

	DEC - 2041 Max Scenario	MPS - DEC (Base - 2041)	MPS - DEC (Enhanced - 2041)
Potential Total (MW)	834	403	488
C&I	Rates: 120 Mechanical: 51	38	69
Residential	Rates: 481 Mechanical: 182	365	419

[41] Duke Energy Winter Peak Demand Reduction Potential Assessment Final Report 2020.12.23, p. 17.

[42] Duke Energy Winter Peak Demand Reduction Potential Assessment Final Report 2020.12.23, p. 22.

[43] Duke Energy Winter Peak Demand Reduction Potential Assessment Final Report 2020.12.23, Table 10: Achievable Potential Comparison - Max Scenario and MPS Enhanced scenario (DEC), p. 22. Note that in both cases the projected savings are incremental to DSM savings already achieved by Duke.

Table 5: Reproduced WPA Comparison with MPS Winter Peak Savings[44]

	DEP - 2041 Max Scenario	MPS - DEP (Base - 2041)	MPS - DEP (Enhanced - 2041)
Potential Total (MW)	544	273	307
C&I	Rates: 53 Mechanical: 36	3	5
Residential	Rates: 306 Mechanical: 149	270	302

The WPA concludes that its "mid scenario forecast potential of 1,185 MW is mostly incremental to the MPS and 67% of the winter peak study potential is associated with rates" and notes that:

> …the MPS looked at only mechanical technology solutions, while the winter peak study looked at opportunities to combine both rate design and EE/DSM technologies to manage winter peak. In addition, the Winter Peak Study did not set out to be a comprehensive look at all potential but specifically focused on targeted opportunities and savings load shapes to best address winter peak needs. In total we found lower savings from mechanical solutions than the market potential study but found mostly incremental potential from the combination of rates and technologies. In the context of the IRP, note that the potential savings from new rate options would be captured in Duke's load forecast, not in EE/DSM potential, since it would be a change to load in response to these rates. Although our study was not timely to be directly included in Duke's current IRP, in total our findings align within the 'high EE/DSM' scenario in the IRP and help bolster this high scenario and provide higher confidence that this level of savings could be achievable.[45]

[44] Duke Energy Winter Peak Demand Reduction Potential Assessment Final Report 2020.12.23, Table 11: Achievable Potential Comparison - Max Scenario and MPS Enhanced scenario (DEP), p. 22. Note that in both cases the projected savings are incremental to DSM savings already achieved by Duke.

[45] Duke Energy Winter Peak Targeted DSM Plan Final Report 2020.12.23, p.96, underline added.

Conclusions

It is clear to the EFG reviewers that applying the kinds of "innovative approaches" that led to a vastly greater estimate of winter peak savings potential in the WPA compared with the MPS would similarly benefit the underwhelming estimate of EE savings potential that was identified by Nexant. The constraints that were applied in the MPS artificially limit a true estimate of EE savings potential for Duke, which will distort the results of the IRP and may lead to unnecessary investments in costly infrastructure when less expensive EE and DSM/rates alternatives are available that could benefit customers by reducing system costs while simultaneously providing significant energy bill reductions through reduced usage.

EXHIBIT B

Jim Grevatt
Managing Consultant

Professional Summary

Jim Grevatt has 30 years of experience in energy efficiency program planning and operations. At Energy Futures Group Jim has advised regulators, program implementers, and advocates in Florida, Louisiana, West Virginia, Colorado, Nevada, British Columbia, Manitoba, Maryland, Pennsylvania, Delaware, Virginia, New Jersey, Illinois, Iowa, Indiana, Mississippi, North Carolina, South Carolina, California, Vermont, Maine, Kentucky, and New Hampshire, and has provided expert witness testimony in fourteen of those jurisdictions. Jim has hands-on experience with industry-leading approaches to designing and managing energy efficiency programs, including multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs. His in-depth knowledge of program operations and clear understanding of strategic thinking and planning ensure that programs achieve their desired market impacts. Throughout his career, Jim has focused on building strong relationships with staff, peers, trade allies, regulators, and clients as the best way to understand the needs and challenges that each sector faces. In past leadership roles at Efficiency Vermont, the DCSEU, and Vermont Gas, Jim had overall responsibility both for program design and operations. He was responsible for finding successful consensus approaches among diverse groups of partners and stakeholders, and for policy interactions with regulators, assuring that program processes were efficient and effective.

Experience

2013-present: Managing Consultant, Energy Futures Group, Hinesburg, VT

2012-2013: Director, Targeted Implementation, Vermont Energy Investment Corp., Burlington, VT

2011-2012: Director, Residential Energy Services, District of Columbia Sustainable Energy Utility

for Vermont Energy Investment Corp., Washington, D.C. and Burlington, VT

2010-2012: Managing Consultant, Vermont Energy Investment Corporation, Burlington, VT

2005-2010: Director, Residential Services, Vermont Energy Investment Corp., Burlington, VT

2001-2005: Manager, Energy Services, Vermont Gas Systems, S. Burlington, VT

1998-2001: Manager, Residential Energy Services, Vermont Gas Systems, S. Burlington, VT

1996-1998: Manager, HomeBase Retrofit Program, Vermont Gas Systems, S. Burlington, VT

1994-1996: Technical Specialist, Vermont Gas Systems, S. Burlington, VT

1991-1994: Associate Director and Technical Specialist, Champlain Valley Weatherization Program, Burlington, VT

Education

B.F.A., University Honors, University of Illinois, 1982

Energy Futures Group, Inc

PO Box 587, Hinesburg, VT 05461 – USA | 802-482-4086 | jgrevatt@energyfuturesgroup.com

Selected Projects

- The Coalition for Affordable Utility Services and Energy Efficiency in Pennsylvania ("CAUSE-PA"). Provided expert witness testimony in support of robust low income efficiency programs in Philadelphia Gas Works Petition for Approval of Demand-Side Management Plan and PECO, Duquesne, and First Energy Act 129 Phase IV Plan proceedings. (2020-2021)
- Appalachian Voices and Natural Resources Defense Council. Provided expert witness testimony in Virginia Electric and Power Co. Phase VIII DSM Program Application. (2020)
- Citizens Action Coalition of Indiana. Provided expert witness testimony in Duke Energy Indiana 2020-2023 DSM Plan. (2020)
- The Consumers' Association of Canada (Manitoba) and Winnipeg Harvest. Provided expert witness testimony in the Efficiency Manitoba 2020/23 Efficiency Plan proceeding. (2019-2020)
- British Columbia Sustainable Energy Association. Provided expert review, discovery, and evidence in DSM-related aspects of multiple proceedings with Fortis BC, BC Hydro, and FEI. (2017-2020)
- Southern Environmental Law Center. Provided technical support to environmental and social justice advocates in the Carolinas, and ongoing participation in the Duke Energy EE Collaborative (2019-2020) and Dominion South Carolina EE Advisory Group (2020-2021).
- Coalition of Maryland Energy Efficiency Advocates. Prepared written comments and multiple appearances before the Commission to present evidence regarding Maryland utilities' 2015-2017, 2018-2020, and 2021-2023 EmPOWER Maryland energy efficiency plans, and in additional proceedings related to utility goal setting, cost-effectiveness testing, best-practices in low-income programs, and energy efficiency financing. (2014-2021)
- Southern Alliance for Clean Energy and Earthjustice. Provided expert witness testimony in the Florida Energy Efficiency and Conservation Act goal setting proceeding. (2019)
- Energy Efficient West Virginia, West Virginia Citizen Action Group, and Earthjustice. Provided expert witness testimony in Appalachian Power Company and Wheeling Power Company's Petition regarding EE/DR program approvals. (2019)
- Alliance for Affordable Energy and Natural Resources Defense Council. Provided expert technical support for Louisiana Public Service Commission EE Rulemaking and Entergy New Orleans DSM Plan. (2019-2021)
- New Jersey Clean Energy Program. Planning support for NJCEP implementation team. Facilitated focus groups, worked with Board of Public Utilities Staff, program administrators, utility companies, and other stakeholders to identify opportunities to improve NJCEP strategic direction and increase benefits for ratepayers. Lead author drafting strategic plan. (2015-2020)
- Natural Resources Defense Council and Sierra Club. Provided expert witness testimony in Public Service Company of Colorado's Strategic Issues, 2019-2020 DSM Plan, and 2021-2022 DSM Plan proceedings. (2017-2020)
- Natural Resources Defense Council and Sierra Club. Provided expert witness testimony in Nevada Energy Company's 2019-2038 Triennial Integrated Resource Plan and 2019-2021 Energy

Supply Plan, and 2019 and 2020 DSM Update proceedings and participated in stakeholder collaboratives. (2018-2020)

- Environmental Law & Policy Center and Iowa Environmental Council. Provided expert witness testimony in DSM proceedings regarding MidAmerican Energy Company's and Interstate Power and Light's 2019-2023 Energy Efficiency Plans. (2018)
- Pueblo County Colorado. Provided expert witness testimony in DSM proceedings regarding Black Hills Energy Company's 2019-2021 DSM Plan. (2018)
- Sierra Club. Provided expert witness testimony in proceedings regarding Kentucky Power Company's DSM programs and cost-effectiveness. (2017-2018)
- California Alternative Energy and Advance Transportation Financing Authority. Provide technical assistance on development of commercial energy efficiency financing pilot. (2017-2019)
- Energy Efficiency for All. Expert technical support for affordable multifamily energy efficiency advocacy in Pennsylvania and Virginia. Worked with a coalition of energy efficiency and affordable housing advocates to shape advocacy efforts with utilities and regulators. (2015-2020)
- Southern Environmental Law Center. Provided expert witness testimony in DSM proceedings with Duke Energy Progress and Dominion Virginia, as well as technical support for SELC staff regarding pre-pay programs and other policy issues. (2015-2019)
- Regulatory Assistance Project. Researched and co-authored with Chris Neme: The Next Quantum Leap in Efficiency: 30 Percent Electric Savings in Ten Years, addressing program and policy questions related to doubling the best efficiency program results. (2016)
- Natural Resources Defense Council. Provided expert witness testimony in support of NRDC's intervention in Ameren Illinois' 2014-2016 energy efficiency plan. Testimony demonstrated that Ameren would be capable of capturing significantly greater efficiency savings than it had proposed. (2013)
- Regulatory Assistance Project. Expert technical support for DSM in China. Worked with various government agencies and grid companies, as well as advocacy organizations to provide technical support related to advancing DSM and energy efficiency in China. (2015)
- Vermont Public Service Department. Evaluation of Clean Energy Development Fund. Conducted interviews of staff and key stakeholders under contract to NMR and prepared memo outlining process findings and recommendations. (2014-2015)
- Evaluation of Efficiency Maine Low-Income Multi-Family Weatherization Program. Responsible for program staff and building owner interviews and process evaluation under contract to NMR and Efficiency Maine. (2014-2015)
- Northeast Energy Efficiency Partnerships. Researched and co-authored meta-study of the use of energy efficiency to defer T&D investments. (2014)
- Northeast Energy Efficiency Partnerships- Researched and co-authored meta-study of ductless heat pump performance and market acceptance. (2014)
- New Hampshire Electric Co-op. Conducted assessment of the co-op's environmental and social responsibility programs' promotion of whole building efficiency retrofits, cold climate heat pumps and renewable energy systems. Presented recommendations to the co-op Board. (2014)

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- High Meadows Fund. Co-authored a study assessing the market viability of "High Performance Homes" in Vermont. (2014)
- Energy Savings Potential Study, Delaware Department of Natural Resources. Led narrative development for the residential programs for a study of the energy efficiency savings potential in Delaware. (2013-2014)
- Regulatory Assistance Project. Provide technical support to energy efficiency advocates in proceedings in Maryland, Mississippi, and Missouri. (2013-2017)
- Better Buildings Solutions Center, U. S. Department of Energy. Energy Futures Group's lead author in drafting and reviewing web content for ten how-to "handbooks" detailing proven approaches to designing and implementing residential retrofit efficiency programs. (2013-2014)
- Utility Program Benchmarking. Led research on behalf of a large IOU to compare the cost of saved energy across ~10 leading utility portfolios. The research sought to determine if there are discernable differences in the cost of saved energy related to utility spending in specific non-incentive categories, including administration, marketing, and EM&V. (2013)
- Research on trends in multi-family, HVAC, and new construction programs. Developed an analysis of emerging program trends on behalf of a leading energy efficiency industry firm. (2013-2014)
- Efficiency Power Plant, Regulatory Assistance Project. Partnered with RAP to develop a demonstration tool to show how energy efficiency measures can be used to mitigate air quality impacts related to power production. (2013)
- Natural Gas Energy Efficiency Analysis, the Green Energy Coalition. Provided analytical support to demonstrate in testimony that Enbridge Gas could reduce the scale of its proposed pipeline expansion by implementing aggressive energy efficiency programs. (2013)
- Targeted Implementation, VEIC. Responsible for market analysis and strategic planning for a new division expanding VEIC's energy efficiency program implementation projects. (2012-2013)
- DC Sustainable Energy Utility. Led the planning and startup implementation of Residential programs for the DC SEU, including single and multi-family and retail market programs. Led the development of the initial portfolio-level Annual Plan. Led client and partner interactions around planning and policy development. Member of DC SEU Senior Management Team. (2011-2012)
- EmPOWER Maryland Critical Program Review. Expert consultant to the Maryland Office of Peoples' Counsel in EmPOWER Maryland hearings regarding utility energy efficiency planning and reporting. Represented the OPC in stakeholder meetings that informed the current 2012-2014 EmPOWER plans. Multiple appearances before the Maryland Public Service Commission. (2010-2012)
- Efficiency Vermont 20 year Forecast of Efficiency Potential. Senior Advisor in developing the forecast scenarios that led to significantly increased efficiency investment in Vermont. (2010-2011)
- Efficiency Vermont Residential Programs. Directed 100% growth in program budgets to nearly $10M annually. Responsible for strategic direction, leadership, and results for Efficiency Vermont's award-winning residential retrofit, new construction, retail, and low-income programs. Supported excellence in a staff of 30. (2005-2010)

- Vermont Gas Systems Efficiency Program Leader. Directed strategic planning and program operations that led to six programs and portfolio as a whole being recognized as exemplary in Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs (ACEEE, 2003). Built contractor infrastructure and internal support to consistently meet program objectives. Led development of Annual Reports, planning and budgeting. Collaborated with Efficiency Vermont staff to develop a fuel-blind, state-wide, jointly offered residential new construction program. (2001-2005)
- Residential Retrofit Program Development. Enhanced design and performance of VGS' residential retrofit offerings by streamlining delivery and building strong relationships with contractors, homeowners, and property managers. (1994-2005)
- Demonstrated Technical Excellence in Approaches to Residential Retrofits. Conducted hundreds of residential energy audits and quality assurance inspections for natural gas and alternative-fueled homes. Trained and coached installers to obtain desired quality. Worked to satisfy homeowners through explanation, education, sound listening to concerns, and ultimately assuring that concerns were addressed. Trained new staff in auditing techniques. (1991-1998)

Selected Presentations

Keys to the House: Unlocking Residential Savings with Program Models for Home Energy Upgrades- ACEEE 2016 Summer Study on Energy Efficiency in Buildings, August, 2016

Home Upgrade Program Design & Implementation Models for Acquiring Savings in Multiple Climate Zones- 2016 National Home Performance Conference, April, 2016

EERS Advancements in Maryland: EmPOWER After 2015- Presentation at ACEEE Energy Efficiency as a Resource Conference, September, 2015

Leveling the Playing Field for Distributed Energy Resources- Panelist discussing the use of energy efficiency to defer T&D investments, Acadia Center forum on Envisioning Our Energy Future, February, 2015

Residential Retrofit Programs: What's Working? Perspectives from National Program Leaders- Panelist at AESP National Conference 2012

Elements of Retrofit Program Incentive Design- DOE Technical Assistance Program Publication, April, 2011

Designing Effective Incentives to Drive Residential Retrofit Participation- DOE Technical Assistance Program Webinar, October, 2010

Quality Assurance for Residential Retrofit Programs- DOE Technical Assistance Program Webinar, October, 2010

Home Performance with ENERGY STAR, Quality Assurance in Vermont- Panelist at the ACI Home Energy Retrofit Summit, April 2010

Delivering on the Promise-Engaging Communities and the Public- Panelist at 2010 NEEP Summit, March, 2010

Home Performance with Energy Star in Vermont - Presentation at CEE Member meeting, June 2009

Leading by Example: Exemplary Low Income Energy Efficiency Programs –Presented on Efficiency Vermont's Residential low income services at California's Low Income Energy Efficiency Symposium, June 2006

"Natural Gas Efficiency Policies, Responding to the Natural Gas Crisis One Therm at a Time" - Co-presented with Dan York and Anna Monis Shipley of American Council for an Energy-Efficient Economy (ACEEE) -ACEEE/CEE Market Transformation Symposium, 2004

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