SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
D/B/A VECTREN ENERGY DELIVERY OF INDIANA, INC.
A CENTERPOINT ENERGY COMPANY
("VECTREN SOUTH")

I.U.R.C. CAUSE NO. 45387

DIRECT TESTIMONY
OF
PETER J. HUBBARD
MANAGER, PACE GLOBAL

ON

DEMAND SIDE MANAGEMENT MODELING IN VECTREN SOUTH'S 2019 IRP

SPONSORING PETITIONER'S EXHIBIT NO. 4
ATTACHMENT PJH-1

DIRECT TESTIMONY OF PETER J. HUBBARD

I. INTRODUCTION

Q. Please state your name, title and business address.

A. My name is Peter J. Hubbard. I am employed by Siemens Energy Business Advisory ("Siemens EBA") also doing business as Pace Global Energy Services, LLC ("Pace Global") as a Manager. My business address is 12700 Fair Lakes Circle, Suite 250, Fairfax, Virginia 22033.

Q. Please summarize your educational background.

A. I hold two Bachelor of Science degrees in Physics and Mathematics from the University of Memphis and one Bachelor of Arts degree in French, also from the University of Memphis. In addition, I hold one Master of Arts degree from the Johns Hopkins University School of Advanced Studies in International Affairs with two Concentrations in International Economics and Energy, Resources and Environment and one Specialization in Quantitative Methods and Economic Theory.

Q. Please briefly describe your professional background.

A. I am an energy consultant and Manager at Pace Global, focused primarily on natural gas and other fuel markets but also supporting power market focused work including integrated resource plans ("IRP"). In addition, I develop and manage Pace Global's proprietary natural gas market outlook using the Gas Pipeline Competition Model forecasting tool licensed by RBAC Inc. Finally, I fulfill a business development role at Pace Global.

Q. Please describe Pace Global's recent experience and expertise in structuring and leading integrated resource planning for utilities such as Vectren South.

A. Pace Global is a leading consultant for integrated resource planning, with extensive experience in structuring and facilitating IRPs for utilities throughout the United States and Caribbean. The following list represents a selection of recent clients who have engaged Pace Global to contribute to their IRP processes: Puerto Rico Electric Power Authority (PREPA), Orlando Utilities Commission, New York State Energy Research and

Development Authority (NYSERDA), Clean Power San Francisco, Minnesota Power (Minnesota), Madison Gas & Electric (Wisconsin), Dominion Energy, Glendale Water and Power (California), City of Farmington NM (New Mexico), Caribbean Utilities Corporation (Grand Cayman), and Pasadena Water and Power (California).

Q. Have you previously testified before the Indiana Utility Regulatory Commission ("Commission" or "IURC")?

A. Yes. I provided written testimony associated with Cause No. 45086 and I also provided written rebuttal testimony with Cause No. 45052.

Q. What is the purpose of your testimony?

A. My testimony is provided to give background and understanding to how demand side management ("DSM") programs were modeled and evaluated within the 2019 IRP through the use of the optimization and production cost modeling software program Aurora.

Q. Are you sponsoring any attachments?

A. Yes, Petitioner's Exhibit No. 4, Attachment PJH-1 provides a table with annual avoided cost values.

II. DSM MODELING IN VECTREN SOUTH'S 2019 IRP

Q. What DSM modeling assumptions did you use to model DSM in Vectren South's 2019 IRP?

A. At a high level, up to a maximum of 1.75% per year of eligible retail sales were considered for possible conservation through an incremental block of energy efficiency ("EE") which was divided into seven (7) blocks (roughly 0.25% per block). Two (2) demand response ("DR") blocks, one fixed and one selectable in addition to one (1) fixed low income ("LI") block were also included in the model. The savings associated with each block were initially based on the characteristics associated with the realistic achievable potential identified in the 2020-2025 Market Potential Study. DSM modeling assumptions were provided to Pace Global by Vectren South and Vectren South's other DSM-related consultants.

Q. Why is 2021 the first year that DSM can be selected in the model?

A. The 2019 IRP included Vectren South's approved 2018-2020 Electric DSM Plan (Cause 44927) as part of the base model assumptions. Therefore, 2021 was identified as the first year that new DSM programs could be selected.

Q. How were the DSM modeling assumptions put into the optimization software?

A. The DSM assumptions were entered into the Aurora software via the provided spreadsheets which contained year-by-year 8760 peak and energy sales impacts and costs for each of the seven (7) EE blocks, two (2) DR, and one (1) LI for each of the three (3) different time periods (2021-2023, 2024-2026, and 2027-2039).

Q. What is the model's primary objective?

A. Aurora is a model that can be used to perform a dynamic least-cost optimization routine. This routine uses reserve margin requirement logic, resource economics, market conditions and other parameters to identify optimized portfolios based on an identified objective function. For purposes of the 2019 IRP analysis, the objective function considered for the optimization routine was to minimize utility cost.

Q. What does the model evaluate?

A. Aurora evaluates the net present value of costs associated with a portfolio serving customer energy requirements with the capability to consider multiple supply side and demand side resource options. All fixed and variable costs and revenues associated with an identified portfolio are captured and compared on a net present value basis.

Q. How does DSM compete with supply side resources in the model?

A. DSM options are modeled as load-side alternatives that can be chosen as part of a portfolio to meet customer peak and energy sales requirements side-by-side with generation-side alternatives. This can be accomplished within the Long-Term Capacity Expansion (LTCE) module, which is the optimization module in Aurora.

Q. Can the model select varying levels of EE throughout the EE forecast?

A. As modeled, EE had seven (7) selectable EE bundles each representing 0.25% of annual

load excluding opt-out sales. The model also included one fixed low-income bundle, one fixed DR bundle (Air Conditioning Direct Load Control as well as Smart Thermostat) and one selectable DR BYOT (Bring Your Own Thermostat) bundle. While each bundle provides similar peak and energy reductions, each had an inclining cost associated with its inclusion in a portfolio. An increasing selection of EE blocks represents an increasing impact to peak and energy sales conservation and increasing cost to achieve those reductions.

Q. Is the model constrained by allowing it to select DSM in 2021 and holding constant throughout the applicable IRP planning period?

A. No. The model was allowed to make multiple selections over two three-year periods beginning in 2021 and 2024 and then evaluates the remaining years beginning in 2027 through 2039 as one collective group.

Q. Did Vectren South request that you conduct additional analyses whereby DSM prices were allowed to fluctuate?

A. Yes. In consideration of various regulatory constructs in the scenario-based portfolios, EE costs were decreased/increased by approximately 12% in the IRP model to capture the economic selection and optimization of EE.

Q. How does the model determine which load shapes are available for selection?

A. Each EE block has an 8760 load shape associated with it. The bundle specific load shapes were based on information provided by Vectren South's DSM consultant which relied upon the latest Market Potential Study ("MPS").

Q. Please describe the EE modeling result in the reference case, the preferred portfolio, and other candidate portfolios.

A. In addition to the fixed low-income EE block and fixed DR resource, the Aurora portfolio optimization module selected three (3) bundles of near-term EE representing approximately 0.75% of eligible sales adjusted for an opt-out rate of 77% of eligible load in the reference case, the preferred portfolio, and two of the candidate portfolios. Five candidate portfolios were optimized with two (2) bundles of near-term EE representing 0.50% of eligible sales, while one candidate portfolio was optimized with four (4) bundles

of near-term EE representing 1.00% of eligible sales. Ultimately, all 10 candidate portfolios were run with five (5) bundles representing approximately 1.25% of eligible sales based on a sensitivity that showed only a small difference in overall portfolio costs on a 20 year Net Present Value of Revenue Requirements ("NPVRR") basis between the 0.75% and 1.25% levels.

Q. Please describe the role of the EE high and low sensitivity costs and associated results.

A. The EE high and low sensitivity costs (with a range of approximately +/-12% compared to the Reference Case) were included within scenario-based modeling. The level of EE that was selected across these scenario-based portfolios ranged from 0.75% and 1.25% EE. As mentioned in the previous response, the candidate portfolios that were selected for further analysis, including the preferred portfolio, were all run with five (5) bundles of EE representing approximately 1.25% of eligible sales based on a sensitivity that showed only a small difference in overall portfolio costs on a 20 year NPVRR basis between the 0.75% and 1.25% levels.

Q. What improvements based on stakeholder feedback were made to the modeling of Energy Efficiency in the 2019 IRP?

A. Review of prior comments from stakeholders and robust stakeholder discussion led to several improvements to DSM modeling that have been made since the 2016 IRP. The model has been allowed to make multiple decisions over the 20-year period. The model selects DSM for two three-year periods beginning in 2021 and 2024 and then evaluates the remaining years beginning in 2027 as one collective group. This allows the model to select the appropriate level of DSM based on cost-effectiveness differences between the short and long run. Another improvement is the addition of bin specific load shapes which improved accuracy versus utilizing the same average load shape for each bin. Further, DR bundles have been added to the model. Lastly, the modeled savings were aligned to the latest MPS and price sensitivities were conducted. The addition of price sensitivities guided our understanding of energy savings potential as costs might vary.

III. DSM AVOIDED COSTS IN VECTREN SOUTH'S 2019 IRP

Q. Were Avoided Costs updated in Vectren South's 2019 IRP?

A. Yes. Consistent with IRP rules, Vectren South evaluated supply-side and demand-side resources on a consistent and comparable basis. As energy efficiency is selected through the IRP modeling process, it is avoiding the cost of investing in another supply-side resource.

Q. How were avoided costs derived in Vectren South's 2019 IRP?

A. The avoided costs utilized the same technology assumption as the 2019 IRP reference case. Avoided capacity costs were based upon a 216 MW 1x F Class Frame simple cycle gas turbine ("SCGT").

Q. Were avoided Transmission and Distribution costs included in avoided cost?

A. Yes. Consistent with Vectren South's 2018-2020 DSM Plan, avoided transmission & distribution ("T&D") costs were included in avoided costs for DSM Planning years 2021-2023. Vectren South's avoided T&D costs capture the reduction in line loss on the system by avoiding the next unit of energy in addition to SCGT transmission switchyard costs.

Q. Were any adjustments made to the 2019 IRP Avoided Costs in this filing?

A. Yes. Firm transmission service demand charge for gas commodity included in the IRP for a SCGT to be available all hours was removed from the avoided costs in this filing.

Q. Why was this adjustment included in this filing?

A. MISO is currently reviewing how resources will be accredited in the future, which could include a seasonal construct or other incentives to ensure resources are available when needed. For the 2019/2020 IRP, Vectren South decided to include firm transmission service charges for gas resources. As more clarity is needed from MISO regarding future changes in resource accreditation, for purposes of this filing, Vectren South determined it would reflect the ability to use less expensive pipeline capacity to supply the gas unit.

Q. What impact does this adjustment have on avoided costs over the 20-year period?

A. Removing the firm transmission service demand charge lowers the avoided costs by approximately $27 per kW in 2018$ over the 20-year period.

Q. What improvements to avoided costs have been included in the plan?

A. Avoided costs have been updated to include capital and operations and maintenance ("O&M") costs for the least cost resource identified in the 2019 IRP. In the 2016 IRP and 2018 – 2020 plan, avoided T&D costs were based on a standard rule-of-thumb to reflect 10% of capital cost. The avoided T&D costs calculation has been updated to capture the line loss reduction on Vectren South's T&D system using an average system line loss rate. Switchyard costs from the tech assessment have also been included in avoided T&D costs.

Q. Were any adjustments made to the avoided Transmission costs prior to applying line loss?

A. Yes. All costs applicable to Vectren South's Transmission, Distribution and Storage System Improvement Charge ("TDSIC") rider were removed from the calculation.

IV. CONCLUSION

Q. Does this conclude your direct testimony in this proceeding?

A. Yes, it does, at this time.

VERIFICATION

I, Peter J. Hubbard, Manager, Pace Global, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.

Peter J. Hubbard

Date: June 3, 2020

Avoided Costs in Nominal $

Year	Avoided Capital/ O&M Cost $/kW	Transmission & Distribution Avoided Capital Cost $/kW	Total Capacity Avoided Cost $/kW	Natural Gas Forecast $/MMBtu **	System Marginal Cost $/MWh* **
2020	$120.58	$6.36	**$126.94**	$2.98	$28.63
2021	$123.23	$6.43	**$129.66**	$3.16	$30.06
2022	$125.94	$6.55	**$132.49**	$3.37	$34.99
2023	$128.71	$6.73	**$135.44**	$3.63	$35.77
2024	$131.54	$6.71	**$138.25**	$3.83	$36.81
2025	$134.44	$6.83	**$141.27**	$4.00	$38.82
2026	$137.40	$6.99	**$144.38**	$4.19	$39.80
2027	$140.42	$7.15	**$147.56**	$4.35	$44.04
2028	$143.51	$7.32	**$150.83**	$4.52	$46.36
2029	$146.66	$7.50	**$154.16**	$4.68	$48.37
2030	$149.89	$7.63	**$157.53**	$4.87	$50.18
2031	$153.19	$7.81	**$161.00**	$5.06	$51.76
2032	$156.56	$7.98	**$164.54**	$5.27	$52.59
2033	$160.00	$8.16	**$168.16**	$5.51	$54.94
2034	$163.52	$8.34	**$171.86**	$5.73	$56.60
2035	$167.12	$8.52	**$175.64**	$6.02	$59.93
2036	$170.80	$8.71	**$179.51**	$6.23	$61.52
2037	$174.56	$8.90	**$183.46**	$6.48	$64.69
2038	$178.40	$9.10	**$187.49**	$6.70	$69.00
2039	$182.32	$9.30	**$191.62**	$6.90	$72.04