SOUTHERN INDIANA GAS AND ELECTRIC COMPANY
d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC.

("VECTREN SOUTH")

I.U.R.C. CAUSE NO. 44645

DIRECT TESTIMONY

OF

RICHARD G. STEVIE

VICE PRESIDENT, INTEGRAL ANALYTICS,

ON

OFFICIAL
EXHIBITS

COST EFFECTIVENESS OF VECTREN SOUTH'S
2016-2017 DEMAND SIDE MANAGEMENT PLAN

SPONSORING PETITIONER'S EXHIBIT NO. 3 &
ATTACHMENT RGS-1

VERIFIED DIRECT TESTIMONY OF RICHARD G. STEVIE

INTRODUCTION

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

A. My name is Richard G. Stevie. I am employed as Vice President, Forecasting, by Integral Analytics, Inc. ("IA"). My business address is 123 East Fourth Street, Suite 300, Cincinnati, Ohio 45202. I am submitting this testimony on behalf of Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren South" or the "Company").

Q. Please describe Integral Analytics.

A. IA is an analytical software and consulting firm focused on operational, planning, and market research solutions for the energy industry. IA excels at sophisticated and accurate analytical approaches to valuation. Its analytical, programming, and statistical methods offer clients more precise valuation, faster and more affordably. As part of its set of software tools, IA developed the DSMore model which is used for valuing the cost-effectiveness of energy efficiency and demand response programs across 30 States. IA excels at insuring more accurate valuations by capturing all avoided costs and the covariance between prices and loads, and values these impacts across 40 years of actual hourly weather patterns, which ensures accuracy in quantifying avoided costs.

Q. Please briefly describe your educational background and business experience.

A. I received a Bachelor's degree in Economics from Thomas More College in May 1971. In June 1973, I was awarded a Master of Arts degree in Economics from the University of Cincinnati. In August 1977, I received a Ph.D. in Economics from the University of Cincinnati. In 2012, I was named a Research Fellow for the Economics Center at the University of Cincinnati.

Since joining IA in 2012, I have been involved in projects on cost-effectiveness analysis of energy efficiency and demand response programs, system load forecasting, spatial load forecasting for distribution planning, rate negotiation, big data/smart grid analytics, and utility planning analytics. In addition, I have presented/written papers on estimating the value of electric service, regulatory stakeholder objectives, cost of energy efficiency, and energy efficiency cost recovery mechanisms.

Prior to joining IA, I was Chief Economist for Duke Energy. During my tenure with Duke Energy, I managed several key analytical functions including economic forecasts, projections of energy sales and peak load demands, customer research on energy usage, market research, product development analytics, evaluation of energy efficiency and demand response program cost-effectiveness, and measurement and verification of energy efficiency and demand response impacts. I have been involved in many regulatory proceedings and provided expert witness testimony on numerous utility economic issues in Ohio, Kentucky, Indiana, North Carolina, and South Carolina. The principle areas of testimony involved

load forecasting, cost-effectiveness analysis of energy efficiency and demand response programs, measurement and verification plans for energy efficiency and demand response programs, market pricing for energy, regulatory recovery mechanisms for energy efficiency, weather normalization of energy sales, and assessment of economic conditions.

Before the merger with Duke Energy, I was General Manager of Market Analytics for Cinergy Corp. and prior to that Senior Economist with the Cincinnati Gas & Electric Company. In addition, I was a past Director of Economic Research for the Public Staff of the North Carolina Utilities Commission. While working at the Public Staff, I provided expert testimony on numerous issues including cost of capital, capital structure, operating ratio, and rate design.

For over twenty years, I chaired the Regional Economic Advisory Committee for the Greater Cincinnati Chamber of Commerce. As chair of the committee, I led the development and presentation of the Chamber's Annual Economic Outlook. In addition, I have appeared in numerous local forums to provide views on the economy.

Q. Are you a member of any professional organizations?

A. Yes, I am a member of the American Economic Association, the National Association of Business Economists, the International Association for Energy Economics, and the Association of Energy Services Professionals.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to present the results of the cost-effectiveness analysis of the Vectren South 2016 - 2017 Electric DSM

Action Plan ("2016 - 2017 Plan") which was developed under the direction of Vectren South. I also discuss the process to evaluate the cost-effectiveness of the Vectren South proposed conservation voltage reduction program.

Q. Are you sponsoring any attachments?

A. Yes. I am sponsoring Petitioner's Exhibit No. 3, Attachment RGS-1, which is a Benefit/Cost Test Matrix.

COST-EFFECTIVENESS MODELLING

Q. What are the cost effectiveness tests you performed?

A. As required by the Indiana Utility Regulatory Commission ("IURC" or "Commission"), the 2016 - 2017 Plan considers the Utility Cost Test ("UCT" also known as the Program Administrator Cost Test), the Total Resource Cost Test ("TRC Test"), the Ratepayer Impact Measure Test ("RIM"), and the Participant Test.

Q. How were these tests evaluated?

A. The tests were evaluated using the DSMore model.

Q. What is the DSMore model?

A. DSMore is a financial analysis tool designed to evaluate the costs, benefits, and risks of energy efficiency programs and measures. DSMore estimates the value of an energy efficiency measure at an hourly level across distributions of weather and/or energy costs or prices. By examining energy efficiency performance and cost effectiveness over a wide variety of weather and cost conditions, the Company is in a better position to measure the risks and benefits of employing energy efficiency

measures versus traditional generation capacity additions, and further, to ensure that demand side resources are compared to supply side resources on a level playing field.

The analysis of energy efficiency cost-effectiveness has traditionally focused primarily on the calculation of specific metrics, often referred to as the California Standard tests: UCT, RIM Test, TRC Test, Participant Test, and Societal Test. For this proceeding, test results will be reported for the previously mentioned set of tests required by the IURC. DSMore can be utilized to provide the results of those tests for any type of energy efficiency program (demand response and/or energy saving).

Test results are also developed for a range of weather conditions, including normal weather, and under various cost and market price conditions. Because DSMore is designed to be able to analyze extreme conditions, one can obtain a distribution of cost-effectiveness outcomes or expectations. Avoided costs for energy efficiency tend to increase with increasing market prices and/or more extreme weather conditions due to the covariance between load and costs/prices. Understanding the manner in which energy efficiency cost effectiveness varies under these conditions allows a more precise valuation of energy efficiency programs and demand response programs.

Generally, the DSMore model requires the user to input specific information regarding the energy efficiency measure or program to be analyzed as well as the cost and rate information of the utility. These inputs enable one to then analyze the cost-effectiveness of the measure

or program.

Q. What energy efficiency program or measure information is input into the model?

A. The information required on an energy efficiency program or measure includes, but is not limited to:

- Number of program participants, including free ridership or free drivers;
- Projected program costs, contractor costs and/or administration costs;
- Customer incentives, demand response credits or other incentives;
- Measure life, incremental customer costs and/or annual maintenance costs;
- Load impacts (kWh, kW and the hourly timing of reductions); and
- Hours of interruption, magnitude of load reductions or load floors.

Q. What utility information is input into the model?

A. The utility information required for the model includes, but is not limited to:

- Discount rate;
- Loss ratio, either for annual average losses or peak losses;
- Rate structure, or tariff appropriate for a given customer class;

- Avoided costs of energy, capacity, transmission & distribution; and
- Cost escalators.

Q. How are programs or measures modeled?

A. An analyst or program manager at Vectren South develops the inputs for the program or measure using information on expected program costs, load impacts, customer incentives necessary to drive customers' participation, free rider expectations, and expected number of participants. This information was used in runs of the DSMore model to determine cost-effectiveness.

In DSMore, the load impacts of the program or measure may be analyzed as a percent of savings reduction from the current level of use, as proportional to the load shape for the customer, or as an hourly reduction in kWh and/or kW. These approaches apply to energy saving programs and measures. For demand response programs, the analyst must provide information on the amount of the expected load reduction and the possible timing of the reduction.

Q. What is the source of the data for the program or measure?

A. Program managers and analysts at Vectren South develop the inputs for each program or measure for the DSMore runs.

Q. What is the source for the utility inputs to the model?

A. Vectren South staff provided information on the required utility inputs with guidance from IA.

COST-EFFECTIVENESS TESTS

Q. Please describe how energy efficiency programs and measures are analyzed.

A. Evaluating cost-effectiveness of energy-efficiency programs involves following the procedures specified in the California Standard Practice Manual ("SPM")[1]. Evaluation of Vectren South's proposed energy efficiency and demand response programs followed the tests as defined by the SPM which have been used since their development in 1983. At a high level, the tests utilize estimates of the net present value of the financial stream of costs versus benefits, *e.g.*, the cost to implement the measures is valued against the savings or avoided costs. The resultant benefit/cost ratios, or tests, provide a summary of each program's cost-effectiveness relative to the benefits of the projected load impacts. The principal tests for screening energy efficiency measures are the Participant Test, the UCT, the RIM Test, and the TRC Test. The following paragraphs provide a summary of the applicable tests.

- The Participant Test compares the benefits to the participant through bill savings plus incentives from the utility relative to the incremental costs to the participant for implementing the energy efficiency measure. The costs can include capital cost as well as increased annual operating cost, if applicable.

1 Evaluation of the Energizing Indiana programs relied upon the Indiana Evaluation Framework which based its cost-effectiveness approaches primarily on the California Standard Practice Manual. The only difference was that the results reported for the Energizing Indiana programs did not include utility administrative costs in the computation of the test results.

- The UCT compares utility benefits (avoided costs) to incurred utility costs to implement the program, and does not consider other benefits such as participant savings or societal impacts. This test compares the cost (to the utility) to implement the measures with the savings or avoided costs (to the utility) resulting from the change in magnitude and/or the pattern of electricity consumption caused by implementation of the program. Avoided costs are considered in the evaluation of cost-effectiveness based on the projected cost of power, including the projected cost of the utility's environmental compliance for known regulatory requirements. The cost-effectiveness analyses also incorporate avoided transmission and distribution costs, and load (line) losses.

- The RIM Test, or non-participants test, indicates if rates increase or decrease over the long-run as a result of implementing the program. The RIM Test compares the same benefits as the UCT (utility avoided costs) to the total costs to the utility including the utility costs to implement the programs and lost revenues.

- The TRC test compares the total benefits to the utility and to participants relative to the costs to the utility to implement the program along with the costs to the participant. The benefits to the utility are the same as those computed under the UCT. The benefits to the participant are the same as those computed under the Participant Test, however, customer incentives are considered

to be a pass-through benefit to customers. As such, customer incentives or rebates are not included in the TRC. The TRC Test represents a combination of the Participant Test and the RIM or non-participants test.

Petitioner's Exhibit No. 3, Attachment RGS-1 provides a more detailed summary of the items included in the respective tests.

Q. Would you discuss information provided by each of the tests?

A. Yes. Each one of the tests provides an insight into the cost-effectiveness of the programs from the perspective of different stakeholders: participant (Participant Test), non-participants (RIM), the utility and ratepayers (UCT, and society as a whole (TRC). The use of multiple tests can ensure the development of a reasonable set of energy efficiency programs, indicate the likelihood that customers will participate, and also protect against cross-subsidization.

In general, programs must pass the Participant Test or the programs will not be successful in the market place, i.e., will not be adopted by potential participants. The bill savings (see line 1 on Petitioner's Exhibit No. 3, Attachment RGS-1) that provide a benefit to the program participants represent lost revenues to the utility (see line 21 on Petitioner's Exhibit No. 2, Attachment RGS-1).

The UCT, in essence, provides the same type of information as the benefit cost analysis conducted by Integrated Resource Planning (IRP) models. The UCT evaluates the long-run implications for utility revenue

requirements, just like in an IRP. For example, if a program passes the UCT, it means that long-run requirements for ratepayers will be lower than not implementing the program.

The RIM Test is similar to the UCT except that the lost revenues, the bill savings from the Participant Test, now show up as a cost. These lost revenues have to be spread for recovery across all the utility's customer sales to enable the utility to cover its costs. That is why the RIM Test is called the non-participants test. If a program fails the RIM Test, it indicates that rates would likely have to increase. What the RIM Test does not tell us is whether rates would increase more if the program were not implemented. That is why this test is viewed with a significant level of skepticism. Having a program pass the RIM Test is definitely a more positive outcome than not passing the test. However, the value of the test is limited. Generally, programs that target energy efficiency tend to fail the RIM Test.

Finally, there is the TRC Test. The TRC Test actually represents the sum of the components of the Participant Test and the non-participants or RIM Test. This is why it is viewed as a comprehensive test since impacts on participants and non-participants are considered. One point to note is that while the TRC Test does not explicitly include lost revenues, in combining the components of the two tests, the utility bill savings and the incentives paid to customers by the utility which are benefits in the Participant Test are offset by the lost revenues and customer incentives (costs in the RIM

Test). These components cancel each other out and are not included in the calculation of the TRC Test. Typically, if a program passes the UCT, it will pass the TRC Test unless the participant's cost to implement the energy efficiency measure is large relative to the program benefits.

Again, each test provides insights into a very complex issue. Understanding the implications when a program passes or fails a test helps in deciding whether or not to implement the program or judge its success.

Q. What were the results of the cost-effectiveness analysis?

A. The Company seeks, in part, approval to implement the following set of programs.

RESIDENTIAL CUSTOMER PROGRAMS

- Residential Lighting;
- Home Energy Assessment;
- Income Qualified Weatherization;
- Energy Efficient Schools;
- Appliance Recycling;
- Residential Efficient Products;
- Residential New Construction;
- Multi-Family Direct Install;
- Residential Behavior.

COMMERCIAL & INDUSTRIAL PROGRAMS

- Commercial & Industrial Prescriptive Rebate;

- Commercial & Industrial New Construction;
- Small Business Direct Install;
- Commercial & Industrial Custom.

NEW PROGRAM INITIATIVES

- Residential Smart Thermostat Demand Response;
- Conservation Voltage Reduction (CVR);
- Multi-Family Energy Efficiency Retrofit;

The table provided below provides the cost-effectiveness test results for each program as well as the portfolio in total. For several programs, the Participant Test could not be calculated since there were no costs to participants for adopting the program. These are represented by "NA" on the table. All of the programs pass the TRC and UCT cost effectiveness Tests, but not the RIM Test. While the programs do not pass the RIM Test, this should not be interpreted to mean the programs are not cost-effective. In these cases, one should look to the UCT test as passage of that test reveals whether or not one can expect the long-run revenue requirements for ratepayers would increase or decrease.

Vectren South 2016-2017 Electric DSM Action Plan				
Program Name	Cost-Effectiveness Results			
Residential Programs	TRC	UCT	RIM	PT
Residential Lighting	2.30	2.95	0.56	4.23
Home Energy Assessments & Weatherization	1.53	1.80	0.46	8.49
Income Qualified Weatherization	1.06	1.06	0.40	NA
Appliance Recycling	1.40	1.40	0.39	9.77
Energy Efficient Schools	3.39	3.39	0.53	NA
Residential Efficient Products	1.31	2.07	0.69	1.54
Residential New Construction	1.36	2.65	0.71	1.37
Multi-Family Direct Install	3.69	3.69	0.44	NA
Residential Behavior Savings	1.45	1.45	0.44	NA
Residential Smart Thermostat Demand Response	1.56	1.30	0.78	NA
Conservation Voltage Reduction (Residential)	1.38	1.38	0.52	NA
Residential Sector Portfolio (No Utility Performance Incentive)	1.57	1.71	0.56	5.00
Residential Sector Portfolio (With Utility Performance Incentive)	1.48	1.61	0.55	5.00
Commercial & Industrial (C&I) Programs				
Small Business Direct Install	1.28	2.33	0.74	1.56
C&I Prescriptive	3.00	4.07	0.87	3.25
C&I New Construction	1.99	2.49	0.79	3.03
C&I Custom	1.07	2.74	0.77	1.18
Multi-Family Energy Efficient Retrofit	1.35	2.12	0.75	1.53
Conservation Voltage Reduction (C&I)	1.06	1.06	0.51	NA
C&I Sector Portfolio (No Utility Performance Incentive)	1.54	2.62	0.77	1.93
C&I Sector Portfolio (With Utility Performance Incentive)	1.46	2.40	0.75	1.93
Conservation Voltage Reduction (Residential & C&I)	1.26	1.26	0.52	NA
Total Portfolio (No Utility Performance Incentive)	1.55	2.10	0.65	2.92
Total Portfolio (With Utility Performance Incentive)	1.47	1.95	0.64	2.92

Q. What does your analysis show concerning the long-term effect, or potential effect, of the 2016-2017 Plan on the electric rates and bills of customers that participate in Vectren South's energy efficiency programs compared to the electric rates and bills of customers that do not participate in the Company's energy efficiency programs?

A. The long-term effect on rates and bills of participants are demonstrated through the Participant Test, which compares the benefits to the participant through bill savings plus incentives from the utility relative to

the incremental costs to the participant for implementing the energy efficiency measure. A score greater than 1 indicates the customer is saving more money than expended, thus reducing the participant's energy bill over the life of the measure. All of the programs included in Vectren South's 2016-2017 Plan have a Participant Test score greater than 1, except for those programs where the Participant Test score could not be calculated because there were no costs to participants for participating in the program. As a result, all participants would benefit from the programs. The long-term effect on rates and bills of non-participants are demonstrated through the RIM Test, which is also called the non-participant test. It spreads lost revenues across all the utility's customer sales to enable the utility to cover its costs. If a program's RIM Test has a score lower than 1, it indicates that rates would likely have to increase over time. A rate increase in and of itself should not be viewed negatively given that DSM programs create a demand side resource that allows utilities to avoid the cost of a supply side resource, which has its own costs that would increase rates. As I stated earlier, the RIM Test does not tell us whether rates would increase more if the programs were not implemented, which is one reason the value of the RIM Test is limited. None of the programs in Vectren South's 2016-2017 Plan pass the RIM Test, but generally, programs that target energy efficiency tend to fail the RIM Test.

Q. Given your review of Vectren South's 2016-2017 Plan, the analysis of the goals and cost benefit modeling results, do you believe that the Company's 2016-2017 Plan is cost effective?

A. Yes.

CONSERVATION VOLTAGE REDUCTION

Q. Please describe the conservation voltage reduction (CVR) program.

A. The CVR program is described in the testimony of Company witness Huber. In general, the program involves the installation of technology to reduce customer electricity consumption by 2.5% through the application of lower circuit voltages.

Q. How was the CVR program evaluated for cost-effectiveness?

A. The Vectren South CVR program cost-effectiveness evaluation involved analysis of a two-year implementation for one substation and a three-year implementation including two substations.

The cost-effectiveness evaluation was set up in a two-fold manner. For the two-year implementation, the selected substation load was broken into a residential portion and a business portion based upon the respective number of residential and business customers served via the substation. It was assumed that the CVR program could achieve a 2.5 percent reduction in electricity consumption for each customer class. The results for both customer segments were combined together for the full cost-effectiveness results.

The full cost of the required infrastructure for the program was included in the two-year implementation, even though this infrastructure could be

used for future substation programs. The two-year implementation was found to be cost-effective with TRC and UCT results of 1.26.

The cost-effectiveness analysis was expanded to include a second substation in a three-year implementation analysis. In this situation, the program continues to be cost-effective with TRC and UCT results of 1.22.

Q. Does this conclude your testimony?

A. Yes.

BENEFIT/COST TEST MATRIX

BENEFIT/COST TEST MATRIX				
Benefits:	Participant Test	Utility Test	Ratepayer Impact Test	Total Resource Cost Test
1. Customer Electric Bill Decrease	X			
2. Customer Non-electric Bill Decrease	X			
3. Customer O&M and Other Cost Decrease	X			X
4. Customer Income Tax Decrease	X			X
5. Customer Investment Decrease	X			X
6. Customer Rebates Received	X			
7. Utility Revenue Increase			X	
8. Utility Electric Production Cost Decrease		X	X	X
9. Utility Generation Capacity Credit		X	X	X
10. Utility Transmission Capacity Credit		X	X	X
11. Utility Distribution Capacity Credit		X	X	X
12. Utility Administrative Cost Decrease		X	X	X
13. Utility Cap. Administrative Cost Decrease		X	X	X
14. Non-electric Acquisition Cost Decrease				X
15. Utility Sales Tax Cost Decrease		X	X	X
Costs:				
16. Customer Electric Bill Increase	X			
17. Customer Non-electric Bill Increase	X			X
18. Customer O&M and Other Cost Increase	X			X
19. Customer Income Tax Increase	X			X
20. Customer Capital Investment Increase	X			X
21. Utility Revenue Decrease			X	
22. Utility Electric Production Cost Increase		X	X	X
23. Utility Generation Capacity Debit		X	X	X
24. Utility Transmission Capacity Debit		X	X	X
25. Utility Distribution Capacity Debit		X	X	X
26. Utility Rebates Paid		X	X	
27. Utility Administrative Cost Increase		X	X	X
28. Utility Cap. Administrative Cost Increase		X	X	X
29. Non-electric Acquisition Cost Increase				X
30. Utility Sales Tax Cost Increase		X	X	X

VERIFICATION

I, Richard G. Stevie, Vice President, Integral Analytics, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.

Richard G. Stevie

Date: May 22, 2015