STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

IN THE MATTER OF THE VERIFIED PETITION OF INDIANAPOLIS POWER & LIGHT FOR APPROVAL OF DEMAND SIDE MANAGEMENT (DSM) PLAN, INCLUDING ENERGY EFFICIENCY (EE) PROGRAMS, AND ASSOCIATED ACCOUNTING AND RATEMAKING TREATMENT, INCLUDING TIMELY RECOVERY, THROUGH IPL'S EXISTING STANDARD CONTRACT RIDER NO. 22, OF ASSOCIATED COSTS INCLUDING PROGRAM OPERATING COSTS, NET LOST REVENUE, AND FINANCIAL INCENTIVES.	)	**CAUSE NO. ________**

PETITIONER'S SUBMISSION OF DIRECT TESTIMONY OF
EDWARD J. SCHMIDT

Indianapolis Power & Light Company d/b/a AES Indiana ("Petitioner", "AES Indiana" or the "Company"), by counsel, hereby submits the direct testimony and attachments of Edward J. Schmidt.

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The undersigned hereby certifies that a copy of the foregoing was served this 28th day of April, 2023, by email transmission, hand delivery or United States Mail, first class, postage prepaid to:

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Petitioner’s Exhibit 3

PRE-FILED VERIFIED DIRECT TESTIMONY

OF

EDWARD J. SCHMIDT JR

ON BEHALF OF

INDIANAPOLIS POWER & LIGHT COMPANY D/B/A AES INDIANA

SPONSORING PETITIONER’S ATTACHMENTS EJS-1 – EJS-5

PRE-VERIFIED DIRECT TESTIMONY OF EDWARD J. SCHMIDT

I. Introduction

Q1. Please state your name, position, employer and business address.

A1. My name is Edward J. Schmidt, Jr. and I am a director in the energy efficiency practice for MCR Performance Solutions, LLC ("MCR"), 155 N. Pfingsten Road, Suite 155, Deerfield, IL 60015.

Q2. What are your academic and professional qualifications?

A2. I have bachelor and master's degrees in economics. I have worked in rates, resource planning, and energy efficiency for utilities in Connecticut, Massachusetts, and New York. In addition, I led the utility-facing business unit of a regional energy efficiency non-profit. For the last 12 years, I have been employed by MCR, a management consulting firm serving exclusively the utility and public power sectors. I began my career in and around utilities in 1989 and have over 30 years of experience, including prior work on energy efficiency database design, forecasting of electric vehicle and behind the meter solar photovoltaic system adoption and load impacts for Indianapolis Power & Light Company ("IPL") d/b/a AES Indiana ("AES Indiana" or "Company") as well as numerous other engagements modeling energy efficiency and demand response programs.

Q3. Have you testified before this Commission previously?

A3. I currently have testimony pending before the Indiana Utility Regulatory Commission in Cause No. 45843. I also currently have testimony pending before the Public Utilities Commission of Ohio in Case Numbers 22-0900-EL-SSO, 22-0901-EL-ATA, and 22-0902-EL-AAM. Otherwise, my experience as a witness has been before the Connecticut Public Utilities Regulatory Authority and the Massachusetts Department of Public Utilities.

Q4. What is the purpose of this testimony?

A4. The purpose of this testimony is to present the cost and benefit analysis of a one-year 2024 Demand Side Management ("DSM") Plan. My discussion will focus on the portions of the 2024 DSM Plan that are relevant to the modeling process. The testimony of AES Indiana witness Heard will provide additional details on each of the proposed programs.

Q5. Describe MCR's role in support of the AES Indiana DSM Plan.

A5. MCR performed cost effectiveness modeling and interpretation of the results to support the programs proposed in the AES Indiana 2024 DSM Plan. MCR's modeling effort in support of this filing utilized those portions of our Local Energy Efficiency Planning ("LEEP") model relevant to cost effectiveness testing. Consistent with past AES Indiana (IPL) DSM filings, MCR developed four of the five tests detailed by the industry standard guide to cost effectiveness testing, the 2001 edition of California Standard Practice Manual for Economic Analysis of Demand-Side Program and Projects ("CSPM"): the Program Administrator or Utility Cost Test, Total Resource Cost Test, Rate Impact Measure or non-participant test, and Participant Cost Test.[1] LEEP is a complex, proprietary spreadsheet tool that mathematically develops the CSPM tests based upon numerous inputs.

Q6. Have you prepared any attachments to accompany this testimony?

A6. Yes. Five attachments have been prepared and are labeled as <u>Petitioner's Attachments EJS-1</u> through <u>EJS-5</u>. The five attachments are as follows:

- <u>Petitioner's Attachment EJS-1</u> provides a table identifying the economic input data used by MCR in the cost effectiveness modeling.

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[1] The fifth test, the Societal Cost Test ("SCT") is not presented because it includes various non-energy impacts or benefits that are not considered in DSM cost effectiveness in Indiana.

- Petitioner's Attachment EJS-2 provides the AES Indiana avoided electricity supply costs used in the modeling. It includes avoided energy (kWh) costs for the summer, winter, and shoulder season during the on- and off-peak periods (the "costing periods") as well as the avoided demand (kW) costs associated with transmission and distribution along with generation capacity.
- Petitioner's Attachment EJS-3 provides mathematical equations for the specific cost effectiveness tests conducted in the modeling process.
- Petitioner's Attachment EJS-4 provides an illustrative example of the calculation of each test performed, as originally published in the 2008 National Action Plan for Energy Efficiency ("NAPEE") volume entitled, "Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers. The NAPEE volume references the CSPM extensively, and, likewise, the illustrative example is based upon the CSPM.
- Petitioner's Attachment EJS-5 summarizes the results of the work, showing the program costs, kW and kWh impacts, benefit-to-cost ratios ("BCRs"), and net benefits for each individual program, and then the portfolio as a whole.

Q7. Are you familiar with the goals and objectives of DSM?

A7. Yes, I am. In general, utility-offered DSM seeks to influence a customer's demand or consumption of energy supplied by AES Indiana in a manner such that the cost of doing so is more economic than satisfying customer needs through supply-side resources.

II. Cost and Benefit Analysis

Q8. Did AES Indiana conduct a cost and benefit analysis of the proposed DSM Plan Section 10(j)(2))?

A8. Yes. Referencing question 5 above, the modeling developed the Utility Cost Test ("UCT"), the Total Resource Cost Test ("TRC"), Rate Impact Measure ("RIM") test, and the Participant Cost Test ("PCT").[2] The benefit-to-cost ratios and associated net benefits (in dollars) for the 2024 program year are provided and described in my testimony. The types of costs included in the cost and benefit analysis are well-established and defined in the CSPM which is relied on throughout the country, including Indiana.

Q9. Please describe the Utility Cost Test.

A9. The Utility Cost Test, or UCT, quantifies the costs and benefits of a utility energy efficiency, demand response, or fuel substitution intervention (*i.e.*, program) from the perspective of the utility. The CSPM identifies the UCT as "(the test) measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator(including incentive costs) and excluding any net costs incurred by the participant."[3] It is similar to the Total Resource Cost test except it includes only the costs incurred by the utility so with respect to measure costs it only considers the rebate or other inducements provided by the utility. Petitioner's Attachment EJS-3 provides specific mathematical equations for calculating the UCT and Petitioner's Attachment EJS-4 illustrates the components of the benefit (numerator) and cost (denominator) terms of the UCT benefit-to-cost ratio, and calculation of the BCR.

[2] The Utility Cost Test is also referred to as the Program Administrator Cost Test and abbreviated PAC or PACT. In this testimony, I use Utility Cost Test or UCT to be consistent with standard nomenclature in Indiana.
[3] *Id.,* p. 23.

Q10. Please describe the Total Resource Cost Test.

A10. The Total Resource Cost Test, or TRC, quantifies the costs and benefits of utility energy efficiency, demand response, or fuel substitution interventions (*i.e.*, programs). The CSPM identifies the TRC as follows: "(the test) measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants and the utility's costs..."[4] Petitioner's Attachment EJS-3 provides specific mathematical equations for calculating the TRC and Petitioner's Attachment EJS-4 illustrates the components of the benefit (numerator) and cost (denominator) terms of the TRC benefit-to-cost ratio, and calculation of the BCR.

Q11. Please describe the Rate Impact Measure Test.

A11. The Rate Impact Measure, or RIM, test is also known as the "non-participants" test because it quantifies the costs and benefits of a utility energy efficiency, demand response, or fuel substitution intervention (*i.e.*, program) from the perspective of utility customers who do not participate in the program ("non-participants"). The CSPM identifies the RIM as a measure of "what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program."[5] Petitioner's Attachment EJS-3 provides specific mathematical equations for calculating the RIM and Petitioner's Attachment EJS-4 illustrates the components of the benefit (numerator) and cost (denominator) terms of the RIM benefit-to-cost ratio, and calculation of the BCR.

Q12. Please describe the Participant Cost Test.

A12. The Participant Cost Test, or PCT, quantifies the costs and benefits of a utility energy efficiency, demand response, or fuel substitution intervention (*i.e.*, program) from the

[4] *Id.,* p. 18.
[5] California Standard Practice Manual, October 2001, p. 13.

perspective of utility customers who participate in the program ("participants"). The CSPM identifies the PCT as "a measure of the quantifiable benefits and costs to the customer due to participation in a program"[6] while cautioning that it only addresses quantifiable factors, but consumers make decisions in large part on non-quantifiable ones. Petitioner's Attachment EJS-3 provides specific mathematical equations for calculating the PCT and Petitioner's Attachment EJS-4 illustrates the components of the benefit (numerator) and cost (denominator) terms of the PCT benefit-to-cost ratio, and calculation of the BCR.

Q13. For what period of time was the cost and benefit analysis performed?

A13. The analysis was performed on the lifetime measure impacts and costs for the DSM programs proposed to be delivered in the year 2024.

Q14. Briefly, how does the LEEP model work?

A14. The portions of the LEEP model used for cost effectiveness testing apply various mathematical operations to the input data described in Petitioner's Attachments EJS-1 and EJS-2 to generate the various terms of the equations shown in Petitioner's Attachment EJS-3, which represent the costs and benefits as illustrated in Petitioner's Attachment EJS-4. MCR conducted its cost effectiveness modeling at the measure level for the 2024 program year, and summed results to the program level for presentation here. The following provides in summary form the details as performed in the operation of the model:

1. Quantify the energy efficiency or demand response measures associated with each measure based on the planning assumptions provided by AES Indiana and its DSM implementation contrators, and summarize to the program level.

[6] *Id.,* p. 8.

2. Quantify the rebate, incentive, and administrative and other costs of the measures, and summarize to the program level, based on the planning assumptions provided by AES Indiana and its DSM implementation contractors.
3. Assign load profiles to the measures that identify the timing of when the savings can be expected to occur throughout an 8,760-hour year, summarized to the same costing periods by which the avoided costs are expressed.
4. Develop the life cycle avoided electric supply costs associated with the measures and summarize to the program level.
5. Calculate the cost effectiveness results, the BCRs and net benefits, under each of the CSPM tests performed.

Q15. What programs were modeled and run through MCR's cost effectiveness testing?

A15. As described in more detail in AES Indiana witness Heard's testimony, the following eleven (11) programs are being proposed in the AES Indiana DSM Plan:

- Residential Programs:
  - Appliance Recycling
  - Demand Response
  - Efficient Products
  - Multifamily
  - School Education
  - Home Energy Reports
  - Income Qualified Weatherization ("IQW")

- Commercial Programs:
    - Custom
    - Demand Response
    - Prescriptive
    - Small Business Direct Install ("SBDI")

Q16. Are the costs used in the cost and benefit analysis consistent with Section 10[7]?

A16. Yes. As previously discussed, AES Indiana evaluated the cost effectiveness of the DSM program portfolio using the standard UCT, TRC, RIM and Participant tests. The types of costs included in the cost and benefit analysis are well established and defined in the CSPM, which is relied on throughout the country including Indiana.

Q17. Did AES Indiana include lost electricity sales revenues in the cost and benefit analysis?

A17. Yes, when appropriate. In accordance with the CSPM, lost electricity sales revenue is included in the RIM test and not included in the other standard tests.

Q18. Is the proposed 2024 DSM Program portfolio cost effective?

A18. Yes. As presented in Table EJS-1, the 2024 DSM Plan is cost effective at the overall Portfolio level. The Residential Portfolio has a UCT of 1.34 when including the benefits and costs from the Income Qualified Weatherization ("IQW") program. It has been AES Indiana's policy to include offerings for the income-qualified segment of customers regardless of cost effectiveness. In the instant case, IQW is almost cost effective at a UCT of 0.99 and thus its inclusion slightly lowers overall BCRs. The program costs and load

[7] Section 10 refers to Ind. Code § 8-1-8.5-10, which outlines the DSM requirements for Indiana.

profile for IQW were included in the AES Indiana IRP model as "must run" and not included in a selectable resource bundle. As such, it is important to also evaluate the cost effectiveness of the Portfolio with this program removed. Table EJS-2 shows that the Residential Portfolio is cost effective with a UCT of 1.41 with the IQW program removed from the cost effectiveness calculation. Additionally, the Business Portfolio and overall Portfolio are cost effective.

Table EJS-1: AES Indiana's 2024 DSM Plan Cost Effectiveness Results – IQW Included

RESIDENTIAL	UCT	TRC	RIM	PCT
Appliance Recycling	0.71	0.81	0.21	N/A
Demand Response	1.49	2.12	1.40	N/A
Efficient Products	1.55	1.10	0.32	10.27
Multifamily	1.73	1.73	0.25	N/A
School Education	0.50	0.50	0.24	N/A
Home Energy Reports	2.58	2.58	0.53	N/A
Income Qualified Weatherization	0.99	0.99	0.23	N/A
Residential Portfolio	1.34	1.29	0.39	21.77
C&I				
Custom	2.72	1.38	0.30	8.62
Demand Response	3.72	N/A	3.72	N/A
Prescriptive	2.95	1.61	0.30	11.72
Small Business Direct Install	1.25	1.26	0.24	N/A
C&I Portfolio	2.65	1.50	0.30	11.21
Portfolio	**2.12**	**1.44**	**0.32**	**12.29**

***Portfolio and Sector totals include Indirect Costs; Residential = $740,000 /yr, C&I = $740,000 /yr**

Table EJS-2: AES Indiana's 2024 DSM Plan Cost Effectiveness Results – IQW Excluded

RESIDENTIAL	UCT	TRC	RIM	PCT
Appliance Recycling	0.71	0.81	0.21	N/A
Demand Response	1.49	2.12	1.40	N/A
Efficient Products	1.55	1.10	0.32	10.27
Multifamily	1.73	1.73	0.25	N/A
School Education	0.50	0.50	0.24	N/A
Home Energy Reports	2.58	2.58	0.53	N/A
Residential Portfolio	1.41	1.35	0.44	16.67
C&I				
Custom	2.72	1.38	0.30	8.62
Demand Response	3.72	N/A	3.72	N/A
Prescriptive	2.95	1.61	0.30	11.72
Small Business Direct Install	1.25	1.26	0.24	N/A
C&I Portfolio	2.65	1.50	0.30	11.21
Portfolio	**2.20**	**1.46**	**0.32**	**11.77**

***Portfolio and Sector totals include Indirect Costs; Residential = $740,000 /yr, C&I = $740,000 /yr**

Q19. Please describe how the cost effectiveness tests were considered in the DSM Plan development.

A19. Each test provides a unique perspective and evaluation criteria for program planning, and AES Indiana reviewed the results of all tests while preparing the 2024 DSM Plan.

AES Indiana uses the PCT to determine whether it is economically rational for customers to adopt the measures offered in a program. A PCT below 1.0 indicates that a customer will spend more money than they will ultimately save from program participation. Note that there is no incremental cost to the customer to participate in a program where a PCT result is indicated as not applicable ("N/A").

AES Indiana also identifies programs that pass the RIM Test. This test provides an indicator of both economic efficiency and fairness among customers. Any program passing this test benefits non-participating customers as well as participating customers in the form of lower rates in the long run and should be considered acceptable. AES Indiana understands that most energy efficiency programs do not pass the RIM test due to the loss in energy sales from savings which are recovered through higher utility rates. Rates will likely have to increase if a program fails the RIM test. However, the RIM test does not indicate whether rates will increase more if the programs are not implemented. Despite failing the RIM test, these programs may still be offered based on consideration of the other tests.

AES Indiana also identifies programs that pass both the TRC and the UCT tests. The TRC compares the total costs and benefits of a program for all customers. Program participants benefit through lower bills; whereas non-participants may be affected by the costs of the program being recovered through the ratemaking process. A TRC result of greater than 1.0 indicates that, on average, all customers benefit. Note that there is no incremental cost to the customer to participate in the C&I demand response program since all participants are pre-existing and incur no incremental costs to remain in the program, so its result is indicated as not applicable ("N/A").

The UCT assesses the benefits and costs from the utility's perspective by comparing the utility benefits to the utility costs (benefits of avoided energy and capacity costs compared to rebates, incentives and administrative costs).

Q20. Were there any programs that scored below 1.0 for the cost effectiveness tests?

A20. Yes, however, such programs may have other societal benefits, or the benefits are difficult to quantify and have been generally accepted as appropriate DSM programs subject to budget restrictions. In the instant case, the Appliance Recycling program has, like all such programs nationwide, experienced substantial increases in the (third-party, or vendor) cost of recycling but is retained since the program does add savings to the portfolio and is a valued service to customers. Likewise, absent the inclusion of general service LED lighting and given the high labor and administrative costs of in-school education, the School Education program bears UCT and TRC values less than one, but is retained given its continued contribution of savings to the portfolio and the high value AES Indiana and many stakeholders place on education. Note, again, that the residential and overall portfolios remain cost effective. As discussed above in question 18, the IQW program also bears UCT and TRC BCRs of slightly less than 1.0.

Q21. Did AES Indiana consider the effect, or potential effect, in both the long term and short term of the proposed DSM Plan on the electric rates and bills of customers that participate in EE programs compared to the electric rates and bills of customers that do not participate in EE programs (Section 10 (j)(7))?

A21. Yes. AES Indiana considered stakeholder perspectives when analyzing the cost effectiveness of the 2024 DSM Plan including those of participating customers and non-participating customers. This type of effect is directionally measured by the RIM test which is also called the "non-participant test." Lost retail electricity sales revenues, which are assumed to get spread across all customers (including non-participants), are included as a cost in this test. A score less than one indicates that rates will generally go up for all customers. While typically energy efficiency programs score less than one under the RIM test, this test is limited for measuring DSM because it fails to indicate whether rates (over the long term) will increase more than they otherwise would if programs were not implemented. The UCT provides a better indicator of the long run impact to customers by measuring the utility's revenue requirements from the DSM programs. The residential and C&I portfolios pass the UCT with a score of 1.34 and 2.65, respectively. These scores indicates that over the long term AES Indiana's revenue requirement will decrease due to the implementation of DSM programs compared to the alternative of building new generation and delivering the associated elctricity. With the revenue requirement serving as a proxy for rate impact, this means that implementing programs will ultimately result in lower rates for customers in the long term. Finally, the Participant Test measures the bill impact to program participants. A score greater than one indicates that a customer's bills will go down as a result of participating in a program. AES Indiana witness Aliff calculates the DSM Plan bill impact on the typical residential customer using 1,000 kWh per month.

Q22. Does this conclude your testimony?

A22. Yes, at this time it does.

VERIFICATION

I, Edward J. Schmidt, Jr., Director for MCR Performance Solutions, LLC, affirm under penalties of perjury that the foregoing representations are true and correct to the best of my knowledge, information and belief.

Edward J Schmidt Jr.

Edward J. Schmidt, Jr
Dated: May 25, 2023

Attachment EJS 1 Economic Inputs

Retail Electric Rates (2024)	Resi Blended $/kWh	$0.1249
	C&I BLended $/kWh	$0.1315
Line Losses - Energy		5.625%
Line Losses - Capacity		5.96%
Inflation		2.160%
Discount Rate (WACC)		6.652%
Direct Load Control Bill Credit/Mo		$20.00

Attachment EJS 2 - Annual Seasonal/Time of Use Avoided Energy Costs - Raw, Excl. Line Losses

		Summer ($/MWh)		Winter		Shoulder		T&D	Capacity
PY	Year	On-Peak	Off-Peak	On-Peak	Off-Peak	On-Peak	Off-Peak	$/kW-year	$/kW-year
1	2024	$52.14	$35.06	$66.04	$50.82	$46.68	$35.13	$24.91	$91.09
2	2025	$49.33	$34.98	$57.05	$44.29	$43.05	$34.21	$25.54	$93.00
3	2026	$48.01	$35.35	$51.00	$41.55	$41.43	$34.21	$26.18	$94.96
4	2027	$50.25	$36.04	$50.59	$42.23	$40.86	$34.37	$26.83	$97.04
5	2028	$53.41	$40.18	$52.50	$44.58	$43.30	$37.20	$27.50	$99.08
6	2029	$54.08	$41.57	$53.32	$46.30	$42.74	$37.48	$28.19	$101.06
7	2030	$53.47	$42.42	$52.53	$47.03	$41.36	$37.50	$28.89	$103.09
8	2031	$51.36	$42.35	$49.01	$44.83	$38.77	$36.19	$29.62	$105.04
9	2032	$52.19	$43.61	$50.69	$45.85	$39.89	$37.34	$30.36	$107.04
10	2033	$52.35	$44.25	$50.70	$46.59	$39.54	$37.41	$31.12	$109.18
11	2034	$53.11	$44.98	$50.92	$46.35	$39.56	$37.64	$31.89	$111.36
12	2035	$53.10	$45.26	$51.09	$46.73	$39.81	$37.77	$32.69	$113.59
13	2036	$54.28	$46.29	$49.99	$46.74	$40.20	$38.65	$33.51	$115.86
14	2037	$53.41	$47.05	$51.51	$48.24	$39.51	$38.89	$34.35	$118.30
15	2038	$54.80	$48.30	$52.31	$50.08	$39.90	$39.66	$35.20	$120.78
16	2039	$54.77	$48.65	$52.63	$49.56	$39.36	$39.73	$36.08	$123.44
17	2040	$54.71	$49.10	$51.73	$48.35	$39.77	$39.59	$36.99	$125.91
18	2041	$54.99	$49.56	$51.30	$48.64	$39.25	$39.53	$37.91	$128.42
19	2042	$56.61	$50.30	$51.68	$48.92	$39.57	$40.09	$38.86	$130.99
20	2043	$56.55	$50.76	$50.80	$47.74	$40.01	$39.96	$39.83	$133.61
21	2044	$56.51	$51.23	$49.99	$46.60	$40.50	$39.85	$40.83	$136.28
22	2045	$56.46	$51.70	$49.23	$45.51	$41.02	$39.76	$41.85	$139.01
23	2046	$56.42	$52.18	$48.52	$44.46	$41.59	$39.69	$42.89	$141.79
24	2047	$56.38	$52.66	$47.86	$43.45	$42.20	$39.64	$43.97	$144.63
25	2048	$56.34	$53.15	$47.25	$42.47	$42.87	$39.62	$45.06	$147.52

Attachment EJS 3 - 2001 CSPM Equatiions

Utility (Program Administrator) Cost Test

UCT Benefit-Cost Ratio = BPA/CPA

$$B_{pa} = \sum_{t=1}^{N} \frac{UAC_t}{(1+d)^{t-1}} + \sum_{t+1}^{N} \frac{UAC_{at}}{(1+d)^{t-1}}$$

$$C_{pa} = \sum_{t=1}^{N} \frac{PRC_t + INC_t + UIC_t}{(1+d)^{t-1}}$$

Total Resource Cost Test

TRC Benefit-Cost Ratio = BTRC/CTRC

$$BTRC = \sum_{t=1}^{N} \frac{UAC_t + TC_t}{(1+d)^{t-1}} + \sum_{t=1}^{N} \frac{UAC_{at} + PAC_{at}}{(1+d)^{t-1}}$$

$$CTRC = \sum_{t=1}^{N} \frac{PRC_t + PCN_t + UIC_t}{(1+d)^{t-1}}$$

Rate Impact Measure Test

RIM Benefit-Cost Ratio = BRIM/CRIM

$$B_{RIM} \sum_{t=1}^{N} \frac{UAC_t + RG_t}{(1+d)^{t-1}} + \sum_{t=1}^{N} \frac{UAC_{at}}{(1+d)^{t-1}}$$

$$C_{RIM} \sum_{t=1}^{N} \frac{UIC_t + RL_t + PRC_t + INC_t}{(1+d)^{t-1}} + \sum_{t=1}^{N} \frac{RL_{at}}{(1+d)^{t-1}}$$

Participant Cost Test

Participant Cost Test Benefit-Cost Ratio = BP/CP

$$BP = \sum_{t=1}^{N} \frac{BR_t + TC_t + INC_t}{(1+d)^{t-1}} + \sum_{t=1}^{N} \frac{AB_{at} + PA_{at}}{(1+d)^{t-1}}$$

$$C = \sum_{t=1}^{N} \frac{PC_t + BI_t}{(1+d)^{t-1}}$$

Terms

(1 + d)	(1 + d) terms reflect the fact that the tests all consider present values over the estimated useful life of the measures at a discount rate of d
Subscript t	References the time period
Subscript at	References the alternate fuel
BR	Bill reductions experienced by the participant
TC	Tax credits received by the participant
INC	Incentives paid to participants
AB	Avoided bills experienced by participants related to alternate fuels
PA	Participant avoided costs associated with measures not chosen
PAC	Participant avoided costs for the fuels not chosen
PC	Participant costs
BI	Bill increases experienced by the participant
UAC	Utility avoided supply costs
UIC	Utility incremental supply costs
RG	Revenue gain to the utility from increased sales
RL	Revenue loss to the utility from decreased sales
PRC	Program costs to the program administrator
PCN	Net participant cost

Attachment EJS 4 - NAPEE Example

National Action Plan for EE
Understanding Cost-Effectiveness of Energy Effi ciency Programs:
Best Practices, Technical Methods, and Emerging Issues for Policy-Makers
November 2008
Pages 3-3 to 3-8

Illustration of SCE Residential Program

		UCT		TRC		RIM		PCT	
	Pgm Budget	Ben	Cost	Ben	Cost	Ben	Cost	Ben	Cost
Marketing and Admin	$3,494,619		$3,494,619		$3,494,619		$3,494,619		
Incentive, DI, Upstream payments	$15,457,880		$15,457,880				$15,457,880	$15,457,880	
Installed Measure Cost (pre-program)	$41,102,993				$41,102,993				$41,102,993
Avoided Costs	$187,904,906	$187,904,906		$187,904,906		$187,904,906			
Bill Savings	$278,187,587						$278,187,587	$278,187,587	
		$187,904,906	$18,952,499	$187,904,906	$44,597,612	$187,904,906	$297,140,086	$293,645,467	$41,102,993
	BCR =>	9.91		4.21		0.63		7.14	

Attachment EJS 5 - Program Level Results

				UCT		TRC		RIM		PCT	
Program	AESI Budget	Net kWh	Net kW	BCR	Net Benefit	BCR	Net Benefit	BCR	Net Benefit	BCR	Net Benefit
Residential											
Appliance Recycling	$629,636.25	1,298,245	221.60	0.71	-$180,479.27	0.81	-$106,719.27	0.21	-$1,669,366.34	N/A	$1,632,087.07
Demand Response	$4,199,530.92	2,012,122	49,898.90	1.49	$2,051,207.15	2.12	$3,300,728.35	1.40	$1,799,893.16	N/A	$2,277,313.99
Efficient Products	$4,492,132.34	10,205,621	2,537.06	1.55	$2,470,416.42	1.10	$621,105.60	0.32	-$15,032,335.38	10.27	$17,145,595.98
Multifamily	$715,688.89	2,675,512	28.80	1.73	$520,696.18	1.73	$520,696.18	0.25	-$3,749,471.55	N/A	$4,546,394.01
School Education	$595,065.41	5,008,968	367.31	0.50	-$297,467.53	0.50	-$297,467.53	0.24	-$923,087.64	N/A	$647,446.28
Home Energy Reports	$710,337.60	21,924,000	6,090.00	2.58	$1,118,849.31	2.58	$1,118,849.31	0.53	-$1,619,458.29	N/A	$2,738,307.60
Income Qualified Weatherization	$2,303,898.02	5,073,246	126.77	0.99	-$20,836.64	0.99	-$20,836.64	0.23	-$7,643,766.45	N/A	$9,426,527.66
Residential Portfolio incl. IQW	$14,386,289.42	48,197,714	59,270.44	1.34	$4,922,385.63	1.29	$4,396,356.01	0.39	-$29,577,592.48	21.77	$38,413,672.59
Residential Portfolio excl. IQW	$12,082,391.40	43,124,468	59,143.67	1.41	$4,943,222.27	1.35	$4,417,192.65	0.44	-$21,933,826.03	16.67	$28,987,144.93
C&I											
Custom	$5,403,580.10	32,012,327	3,032.11	2.72	$9,282,471.69	1.38	$4,028,951.65	0.30	-$33,870,701.26	8.62	$40,027,132.66
Demand Response	$15,000.00		452.00	3.72	$40,757.34	N/A	$55,757.34	3.72	$40,757.34	N/A	$15,000.00
Prescriptive	$13,307,203.88	50,136,761	11,126.94	2.95	$25,922,927.78	1.61	$14,911,834.95	0.30	-$92,576,086.73	11.72	$118,064,799.73
Small Business Direct Install	$1,688,145.10	4,010,325	288.14	1.25	$435,881.07	1.26	$435,881.07	0.24	-$6,832,858.30	N/A	$8,004,906.41
C&I Portfolio	$21,153,929.08	86,159,413	14,899.20	2.65	$34,942,037.87	1.50	$18,692,425.00	0.30	-$133,978,888.94	11.21	$166,111,838.79
Total											
Portfolio incl. IQW	$35,540,218.51	134,357,128	74,169.64	2.12	$39,864,423.50	1.44	$23,088,781.01	0.32	-$163,556,481.43	12.29	$204,525,511.39
Portfolio excl. IQW	$33,236,320.48	129,283,881	74,042.87	2.20	$39,885,260.14	1.46	$23,109,617.66	0.32	-$155,912,714.97	11.77	$195,098,983.73