IL COST-EFFECTIVENESS SCREENING ISSUES

SAG WORKSHOP
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Presentation Overview

1. Non-Energy Benefits (NEBs)
2. Line Losses: Marginal or Average?
3. Utility Administrative Costs for IPA Programs

IL Leg. Language on Cost-Effectiveness

- "'cost-effective' means that the measures pass the total resource cost test"
- TRC test "*compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, as well as other quantifiable societal benefits, including avoided natural gas utility costs, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases.*"

Implications of 5 Principal Cost-Eff. Tests

Test	Key Question Answered	Summary Approach	Implications
Societal Cost	Will total costs to society decrease?	Includes the costs and benefits experienced by all members of society	Most comprehensive comparison
Total Resource Cost	Will utility costs and program participants' costs decrease?	Includes the costs and benefits experienced by all utility customers, including energy efficiency program participants and non-participants	Includes the full incremental costs and benefits of the efficiency measure, including participant and utility costs and benefits
Program Administrator Cost	Will utility costs decrease?	Includes the costs and benefits experienced by the energy efficiency program administrator	Limited to impacts on utility revenue requirements; indicates net impact on utility costs and utility bills
Participant	Will program participants' costs decrease?	Includes the costs and benefits experienced by the customer who participates in the efficiency program	Provides distributional information; useful in program design to improve participation; of limited use for cost-effectiveness screening
Rate Impact Measure	Will utility rates decrease?	Includes the costs and benefits that will affect utility rates, including program administrator costs and benefits as well as lost revenues	Provides distributional information; useful in program design to find opportunities for broadening programs; should not be used for cost-effectiveness screening

Woolf, Tim et al., *Energy Efficiency Cost-Effectiveness Screening: How to Properly Account for "Other Program Impacts" and Environmental Compliance Costs*, published by the Regulatory Assistance Project, November 2012.

Non-Energy Benefits (NEBs)

Rationale for Including NEBs in IL

- NEBs should be an essential component of the TRC
  - TRC perspective is utility + participants
  - Inclusion of participant portion of costs requires inclusion of participant benefits

Total Resource Cost	Will utility costs and program participants' costs decrease?	Includes the costs and benefits experienced by all utility customers, including energy efficiency program participants and non-participants	Includes the full incremental costs and benefits of the efficiency measure, including participant and utility costs and benefits

  - Participant benefits not limited to energy benefits
  - Indeed, NEBs often part of efficiency program marketing:

    "weatherization is designed to save you money on heating and cooling costs, and keep your home comfortable" (ComEd website)

- In addition, IL legislation explicitly calls for inclusion of "other quantifiable benefits"

National Resource Value Framework

If you are going to include these costs…

Resource Value Framework - Template			
Program Name:		Date:	
1. Key Assumptions, Parameters and Summary of Results			
Analysis Level	☐ Program ☐ Portfolio		
Measure Life		Discount Rate	
Projected Annual Savings		Projected Lifetime Utility Savings	
2. Monetized Utility Costs[13]		**Monetized Utility Benefits**	
Program Administration		Avoided Energy Costs	
Incentives Paid to Participants		Avoided Capacity Costs	
Shareholder Incentive		Avoided T&D Costs	
Evaluation		Wholesale Market Price Suppression	
Other Utility Costs		Avoided Environmental Compliance Costs	
		Other Utility System Benefits	
NPV Total Utility Cost		NPV Total Utility Benefits	
3. Monetized Participant Costs		**Monetized Participant Benefits**	
Participant Contribution		Participants' Savings of Other Fuels	
Participant's Increased O&M Costs		Participant Non-Energy Benefits:	
Other Participant Costs		Participants' Water and Sewer Savings	
		Participants' Reduced O&M Costs	
		Participants' Health Impacts	
		Participant Employee Productivity	
		Participant Comfort	
		Additional Low-Income Participant Benefits	
		Other Participant Non-Energy Benefits	
NPV Total Participant Cost		NPV Total Participant Benefits	
4. Monetized Public Costs		**Monetized Public Benefits**	
Public Costs		Public Benefits of Low Income Programs	
		Reduced Environmental Impacts (if monetized)	
		Public Fuel and Water Savings	
		Reduced Public Health Care Costs	
		Other Public Benefits	
NPV Total Public Costs		NPV Total Public Benefits	
Total Monetized Costs and Benefits			
Total Costs		**Total Benefits**	
Benefit- Cost Ratio		**Net Benefits**	

…then you must also include these benefits

Woolf, Tim et al., *The Resource Value Framework: Reforming Energy Efficiency Cost-Effectiveness Screening*, The National Efficiency Screening Project, Updated August 16, 2014

NRDC NEBs Proposal

1. 15% Default Non-Low Income Benefits Adder
2. 30% Default Low Income Benefits Adder
3. 50% Whole House Retrofit Program Benefits Adder
4. Other program specific adders can be developed to replace default values
5. Begin conducting some IL NEBs studies
   - Could be added to existing evaluations at modest cost

Switch to Lisa Skumatz Slides

Line Losses

Problem Statement

- Ameren uses average line loss rates
- Efficiency affects loads on the margin
- Marginal line loss rates higher than average loss rates
  - Higher for annual energy savings
  - Higher still for peak savings
- Thus, Ameren under-stating reduction in losses due to EE
- This is an irrefutable technical conclusion

Two Key Components to Line Losses

- "no-load" losses:
  - losses incurred "to create a voltage available to serve a load. Nearly all of these occur in step-up and step down" transformers."
  - Typically ~25% of average annual losses
- "resistive" losses:
  - "caused by friction released as heat as electrons move on increasingly crowded lines and transformers."
  - Mathematically a function of the square of the load…
  - …so losses increase as load increases, decrease as load decreases
  - Thus, marginal losses are greater than average losses
  - ~75% of average annual losses

Lazar, Jim and Xavier Baldwin, *Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements*, published by the Regulatory Assistance Project, August 2011.

Illustrative Example

MW of load a example assumptn	% of Hours b example assumptn	MWh/yr c a*b*8760	% of MWh d c/total	Core losses (MW) e example assumptn	Square of Load f a^2	Resistive Losses (MW) g	Total Loss (MW) h e+h	Avg Loss i h/a	Incr Load j from "a" rows	Incr Loss k from "h" rows	Marginal Loss % l l/k
75.0	5.0%	32,850	2.5%	2.6	5,625	2.0	4.6	6.10%			
100.0	10.0%	87,600	6.7%	2.6	10,000	3.5	6.1	6.11%	25.00	1.54	6.1%
125.0	20.0%	219,000	16.7%	2.6	15,625	5.5	8.1	6.47%	25.00	1.98	7.9%
150.0	33.0%	433,620	33.0%	2.6	22,500	7.9	10.5	7.00%	25.00	2.41	9.7%
175.0	18.0%	275,940	21.0%	2.6	30,625	10.8	13.4	7.63%	25.00	2.85	11.4%
200.0	8.0%	140,160	10.7%	2.6	40,000	14.0	16.6	8.32%	25.00	3.29	13.2%
225.0	3.5%	68,985	5.2%	2.6	50,625	17.8	20.4	9.06%	25.00	3.73	14.9%
250.0	2.0%	43,800	3.3%	2.6	62,500	21.9	24.5	9.82%	25.00	4.17	16.7%
275.0	0.4%	9,636	0.7%	2.6	75,625	26.6	29.2	10.60%	25.00	4.61	18.4%
300.0	0.1%	2,628	0.2%	2.6	90,000	31.6	34.2	11.40%	25.00	5.05	20.2%
150.0	100.0%	1,314,219	100.0%	2.6	27,006	9.5	12.1	7.3%	25.00	2.81	11.26%

annual marginal as % of annual average **153%**

marginal peak as % of annual average **275%**

Change Needed

- Ameren needs to begin using marginal line losses
- These can be estimated from system studies…
- …but proxies can be used until studies are available
  - Marginal energy losses = 150% of average annual losses
  - Marginal peak losses = 275% of average annual losses
- Proposed proxies are consistent w/RAP paper
- Also consistent w/ComEd study
  - Marginal/Average ratio = 1.65 (D only); 1.49 (T&D)
  - Marginal Peak/Average ratio = 2.93 (T&D)

Change Matters

ComEd Line Loss Factors

	Average Energy	Marginal Energy	Marginal Peak
Distribution	5.60%	9.24%	18.11%
Transmission	1.78%	1.78%	3.49%
Total	7.38%	11.02%	21.60%

These are the resulting values currently being used by ComEd.

In contrast Ameren loss rate assumption is ~7%

The difference is equal to roughly 0.4 cents/kWh (levelized) for measure w/10 year life and average load shape (based on ComEd avoided costs)

Utility Administrative Cost Adders

Problem Statement

- Ameren applied ~14% admin. cost adder to IPA programs
- From Plan 3 ratio of total overhead to total program costs (excluding emerging technologies costs)

	PY7	PY8	PY9	Total
Program Costs	**$48.16**	**$48.81**	**$49.04**	**$146.01**
Portfolio Costs (excluding Emerging Tech)				
Admin	$2.42	$2.46	$2.47	$7.35
EM&V	$1.69	$1.71	$1.72	$5.12
Education	$1.21	$1.23	$1.23	$3.67
Marketing	$1.21	$1.23	$1.23	$3.67
Total	**$6.53**	**$6.63**	**$6.65**	**$19.81**
Portfolio Costs as % of Program Costs	**14%**	**14%**	**14%**	**14%**

- Result was significant over-estimation of incremental admin costs that Ameren would incur
- Likely led to screening out some cost-effective programs

Why Ameren Adder Over-Estimated Costs

- Many Plan 3 portfolio costs don't apply to IPA programs
  - Education/marketing are bidders' responsibility, not Ameren's
- Marginal admin should be lower than average admin
  - Some portfolio admin costs are fixed (e.g. DSM Manager)
  - Marginal admin is not a linear function of program budget
    - Program w/2x budget due to big rebate will not cost 2x to oversee or evaluate
  - Particularly problematic for bigger programs
- 14% of 2014 IPA Ameren programs = ~$5.6 million/yr
- If 3% for evaluation, then ~$4.4 million/yr for Ameren staff
  - ***Just for approved programs!***
  - Equivalent to ~20-25 FTEs (assuming ~200k each)
  - Not even close to realistic

NRDC Proposed Solution Options

- Option 1: Develop custom admin cost estimates
  - Different estimates for each program
  - Based on expected evaluation costs, expected Ameren FTEs to manage contracts
  - Not difficult to do in reasonable ballpark terms
- Option 2: More accurate adders
  - 3% for evaluation
  - Fixed Ameren staffing levels for contract management
    - $50k (~0.25 FTEs) for <$3 million budget
    - $100k (~0.50 FTEs) for >$3 million budget

Q&A

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