

Energy Efficiency as a Resource – Comparison of Energy Efficiency Resources vs. a new Power Plant

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Efficiency Long Island - Overview

- LIPA's Efficiency Long Island (ELI) is a 10-year, \$924 million comprehensive energy efficiency program focused on both peak and energy savings
- ELI is ramping up its 3rd year of operation
- Over the course of its 10-year mission, it is projected to:
 - reduce LIPA's peak demand by 520 MW in its 10th year (2018)
 - save 1,700 GWh of energy in the 10th year (2018)
 - reduce dependence on fossil fuel
 - reduce participants bills
 - substantially reduce CO₂ emissions
 - help strengthen Long Island's economy
 - Significantly contribute to LIPA's New York state mandated 15x15 targets

Supply-side alternatives

- LIPA compares the cost of potential demand-side resources to a benchmark cost of energy and capacity under a typical 20-year Power Purchase Agreement (PPA) with a combined cycle generator
- Supply-side alternative benchmark development:
 - ▶ Estimate the cost to construct
 - ▶ Calculate the carrying cost of financing, plus fixed operation and maintenance cost – assign to capacity payment
 - ▶ Estimate the cost of energy based on long-term fuel forecast plus variable O&M – assign to energy payment

Demand-side alternatives

- Energy Efficiency and Renewable programs are often evaluated based upon lifecycle levelized cost of energy and capacity
- Levelized costs can be computed from a Total Resource Perspective and from a Program Administrator Perspective
- Key factors for consideration:
 - ▶ Program costs
 - ▶ Measure costs
 - ▶ Measure life
 - ▶ Discount rate
 - ▶ Load shape and coincidence factor
 - ▶ Annual capacity factor (energy divided by peak x 8760)

Demand-side alternatives (cont'd)

- LIPA decided to use the Program Administrator test because it:
 - ▶ Reflects the cost to LIPA that are included in rates
 - ▶ Is consistent with supply-side alternative where only costs to LIPA are considered
- Total Resource Cost Test (TRC) is good for screening the measures which have the lowest overall cost, but does not differentiate who pays (rebates and incentives are omitted from calculation)
- Neither the TRC or Program Administrator Test accounts for lost net revenue

Cost-effectiveness Tests

- 2009 programs were evaluated based entirely on the Total Resource Cost Test (TRC)
- 2010 programs were evaluated based on both the Total Resource Cost Test (TRC) and the Program Administrator Test (PA).
- The PA test was used because it more accurately represents the costs of energy efficiency and renewable programs to LIPA, and can be directly compared to the cost of alternative supply-side options
- NYSERDA and the rest of NY State require energy efficiency programs to have TRC great than 1.0 (ELI programs are all greater than 1.0)
- B/C ratio for Renewable portfolio is 0.5 when viewed from TRC perspective which is consistent with the rest of the state.

Hypothetical Combined-Cycle Power Plant

Input assumptions

- Combined cycle plant was selected because it most closely resembles energy efficiency programs that provide both demand and energy reduction
- Assumptions:
 - 367 MW natural gas, combined cycle plant
 - \$750 million installed cost
 - 6,971 BTU/kWh heat rate
 - Natural gas with forecasted prices averaging \$5.98 per decatherm in 2012
 - Financing, property taxes, fixed labor cost, included
 - 5.643% LIPA discount rate

Hypothetical Combined-Cycle Power Plant

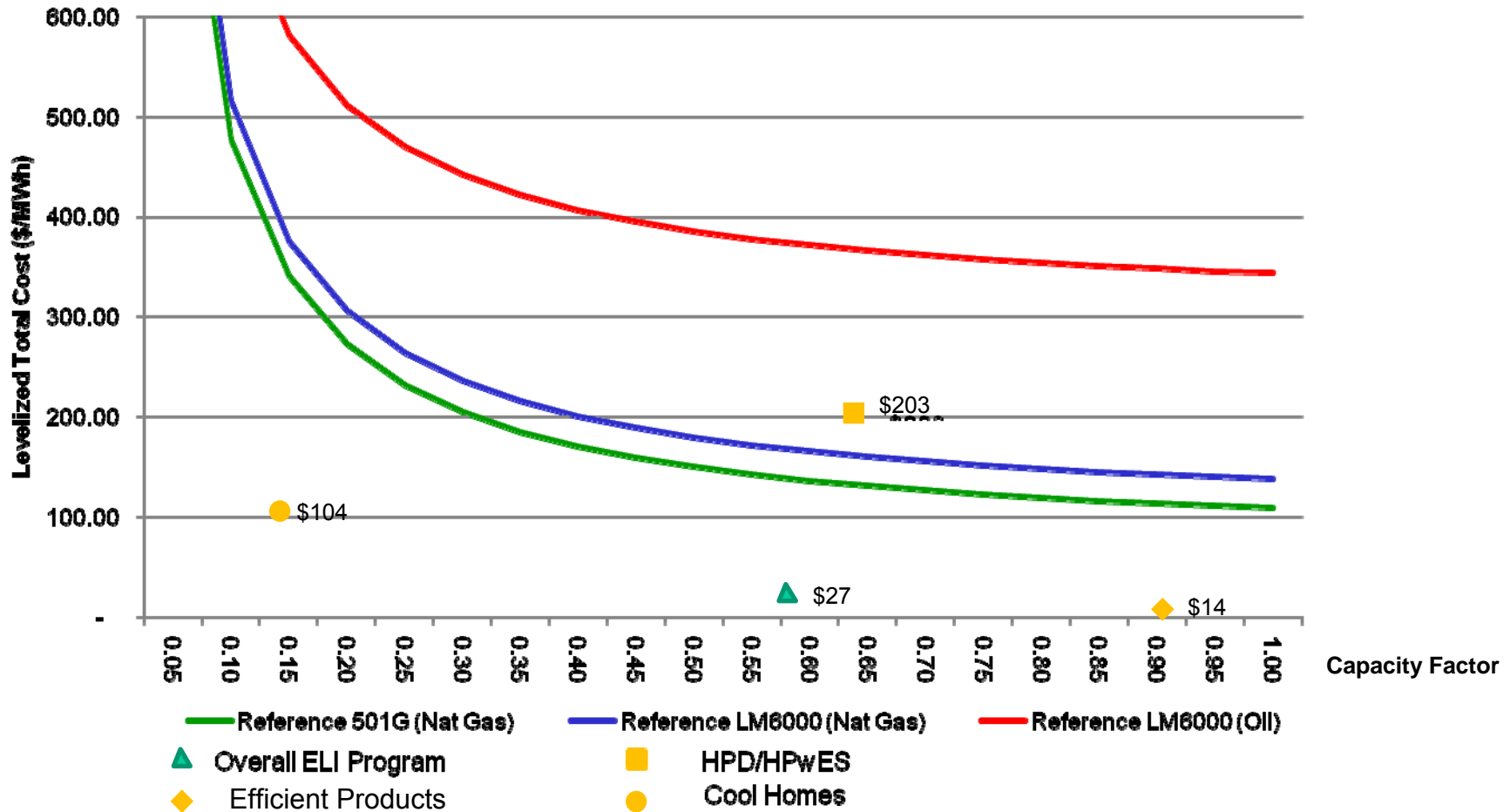
Levelized Cost

- Levelized Cost results for a PPA with payments for both capacity and energy over 20-yr term
- Lifetime levelized cost if split between capacity and energy
 - Capacity = \$372 per kW-yr
 - Energy = \$65 per MWh
- Lifetime levelized cost, if allocated 100% to capacity or 100% to energy
 - 100% Capacity = \$769 per kW-yr at 70% capacity factor
 - 100% Energy = \$126 per MWh at 70% capacity factor

For comparative purposes, the NYISO estimate for the all-in costs of a peaking unit on Long Island is \$235 per kW-yr

Levelized Cost vs. Capacity Factor

New Resources Located On Long Island



2010 Evaluated Program Level Results

<u>Program Name</u>	<u>Coincident Demand Savings (MW)</u>		<u>Energy Savings (MWh)</u>		<u>B/C</u>	<u>Program Administrator Levelized Costs</u>		<u>Capacity Factor</u>
	<u>Budget</u>	<u>Evaluated</u>	<u>Budget</u>	<u>Evaluated</u>		<u>PA</u>	<u>\$/kWh</u>	
Commercial Efficiency Program	10.13	10.60	45,023	47,580	10.0	0.018	78.78	51%
Subtotal Commercial	10.13	10.60	45,023	47,580	10.0	0.018	78.78	51%
Energy Efficient Products	8.72	9.97	92,959	80,474	8.7	0.014	110.42	92%
Cool Homes	5.13	3.90	2,969	3,697	4.8	0.104	98.54	11%
REAP	0.75	0.39	6,022	3,940	1.6	0.075	747.51	115%
Info Ed	1.15	1.49	3,250	2,746	2.4	0.110	203.12	21%
HPD/HPwES	2.72	0.49	5,710	2,851	1.1	0.203	1177.61	66%
<i>Residential Existing Homes</i>	9.75	6.26	17,951	13,234	2.4	0.104	216.07	24%
Residential New Homes	0.38	0.81	739	1,449	3.9	0.138	248.71	21%
Subtotal Residential	18.85	17.04	111,649	95,157	4.5	0.036	168.72	64%
Subtotal ELI	28.98	27.64	156,672	142,737	6.1	0.027	126.94	59%
Solar	2.72	4.57	5,869	12,297	1.1	0.214	575.75	31%
Small Wind	0.06	0.03	832	168	0.9	0.165	1112.92	77%
Subtotal Renewable	2.78	4.60	6,701	12,465	1.1	0.214	579.94	31%
TOTALS	31.76	32.23	163,373	155,203	3.4	0.052	219.62	55%

Evaluated results from Opinion Dynamics report dated April 1, 2011

2010 Evaluated Program Level Results

Program	NPV of Benefits	Total Resource Test		Program Administrator Test	
		Costs	Benefit Cost Ratio	Costs	Benefit Cost Ratio
Commercial Efficiency Program	\$86,073,056	\$12,669,992	6.8	\$8,648,061	10.0
EEP	\$57,057,362	\$16,793,596	3.4	\$6,535,303	8.7
Cool Homes	\$18,513,593	\$3,674,635	5.0	\$3,819,280	4.8
REAP	\$4,479,722	\$4,305,624	1.0	\$2,781,033	1.6
Information & Education	\$1,329,065	\$556,157	2.4	\$556,157	2.4
HPD/HPwES	\$6,355,266	\$5,450,159	1.2	\$5,660,650	1.1
<i>Existing Homes Subtotal</i>	<i>\$30,677,647</i>	<i>\$13,986,575</i>	<i>2.2</i>	<i>\$12,817,119</i>	<i>2.4</i>
ES New Homes	\$7,857,827	\$1,878,567	3.5	\$1,994,126	3.9
Subtotal Residential	\$95,592,835	\$32,658,737	2.9	\$21,346,547	4.5
Subtotal ELI	\$181,655,891	\$45,328,730	4.0	\$29,994,608	6.1
Solar	\$39,169,952	\$78,404,660	0.5	\$34,884,220	1.1
Backyard Wind	\$340,185	\$986,770	0.3	\$368,062	0.9
Subtotal Renewables	\$39,510,137	\$79,391,430	0.5	\$35,252,282	1.1
Total	\$221,176,028	\$124,720,159	1.8	\$65,246,890	3.4

Evaluated results from Opinion Dynamics report dated April 1, 2011

Energy Efficiency Cost Comparison

- Levelized cost of energy is \$104 per MWh (all-in) for Residential Existing Homes at 24% annual capacity factor (annual energy divided by peak x 8760 hours).
- Cost can be broken down into two components for comparison to supply-side alternatives:
 - ▶ Levelized cost of capacity = \$115 per kW-yr
 - ▶ Levelized cost of energy = \$48 per MWh
- Recall, the levelized cost of a combined cycle plant are estimated to be:
 - ▶ Levelized cost of capacity = \$372 per kW-yr
 - ▶ Levelized cost of energy = \$65 per kWh

Summary and Conclusions

- Efficiency Long Island (ELI) program overall is highly cost effective.
- Some energy efficiency programs target primarily demand reduction while others target primarily energy savings. These characteristics should be considered when reviewing levelized costs, much the same way as peaking plants are viewed differently from baseload power plants.
- No single test captures all aspects of energy efficiency cost effectiveness. LIPA considers the TRC and Program Administrator test, along with levelized cost of energy and capacity to judge the merits of implementing specific efficiency programs.

Questions & Discussion