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MEMORANDUM

November 16, 2006

To: Steering Committee, ISO New England Scenario Analysis Initiative
From: Derek Murrow, Director, Policy Analysis; Roger E. Koontz, Senior Attorney
RE: Comments on Proposed Goals, Methods, and Presentation of Results

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Environment Northeast (ENE) is a nonprofit research and advocacy organization focusing on the Northeastern United States and Eastern Canada. Our mission is to address large-scale environmental challenges that threaten regional ecosystems, human health, or the management of significant natural resources. We use policy analysis, collaborative problem solving, and advocacy to advance the environmental and economic sustainability of the region. We are actively engaged with policy makers in the New England states on issues related to energy policy, air emissions, and climate change.

ENE appreciates the opportunity to comment on the process the Steering Committee has laid out for ISO New England's Scenario Analysis Initiative. We are hopeful that this assessment can help inform policy makers about the kinds of energy resources the region should be investing in over the coming decades. However, we are concerned that the initial proposal and process may come up short if a full range of scenarios are not examined and presented to policy makers in a complete and responsive way. The following comments and suggestions to the Steering Committee are designed to improve the process and analysis so that it provides the most useful information to policy makers.

Process Goals and Policy Maker Needs

The goal of this planning exercise is a good one: to "Provide study results that will help inform energy policy makers." ENE agrees that this should be the goal and we encourage the Steering Committee to think carefully about the information policy makers need in order to act based on the results of this study. Forecasting the future with certainty is essentially impossible and scenario assessments and planning exercises are the best way to assess a range of future outcomes that take into account major drivers: from energy prices, to economic drivers, to environmental impacts, to policy choices.

The following are some recommendations related to the goals and elements policy makers will likely be looking for from this study.

- Consider the key information that policy makers will likely be looking for. These include total costs to the region's ratepayers in the form of their total delivered energy bill, economic impacts (jobs and gross state product), environmental and health impacts, and the impact on energy independence (how does reliance on energy sources form outside the region change over time). An analysis that does not address these issues using at least estimates will not have as significant an impact or at worst could be misleading.

- On the cost front, the ISO described an analysis that may not adequately address the total costs policy makers will care about. The analysis should estimate the total cost or a range of cost estimates and report that on a net present value basis for the region and as representative costs for an average ratepayer (residential, commercial, and industrial). The total cost to consumers requires estimates of the following:

- Peak demand (MW)
- Total and average energy consumption (net energy for load, MWh)
- Distribution costs ($/MWh)
- Transmission costs ($/MWh)
- Energy price ($/MWh)
- Capacity cost/price (convert to $/MWh)
- Any additional cost that would have to be paid to achieve the scenario's outcome:
  - The capacity and energy costs would likely not be enough to generate new construction of expensive power plants such as coal IGCC or nuclear, policy makers will want to know how much more they will have to pay to achieve that outcome;
  - Some resources like energy efficiency might have a first cost similar to a new power plant but deliver energy savings at no cost (essentially no marginal or fuel costs)while not being able to participate in the energy market; any costs above the capacity payments they would receive should be represented as additional capacity costs or a stand alone cost;
  - Policy makers know that building the energy future they want will cost something and the total cost of any scenario needs to be adequately represented;
  - Some of these data may not be an output of the ISO's model, but estimates of costs (ranges are fine) should be developed using spreadsheet analysis and compared to revenue streams from the model with any shortfalls identified (including profit requirements).

- Keep the scenarios simple and avoid mixing and matching technologies and resources. This means developing a model run for each similar bundle of supply resources (coal, natural gas, combined heat and power, renewables, etc) and a separate model run for energy efficiency. In working closely with policy makers across the region, few policy proposals bundle efficiency with renewables, much less with large new imports of energy from outside the region.

- It will be important to fully assess those options policy makers are actively discussing, as well as ones that may not be on the table. We would list those policy options and investments as the following, in order from most discussed to least discussed: energy efficiency, renewable energy, demand response, distributed generation and combined heat and power, imports of hydro power from Canada, new natural gas plants and LNG terminals, new IGCC coal facilities (possibly with carbon capture), and new nuclear.

- Use the techniques of scenario analysis and describe each scenario using a ***storyline*** that describes the future in layman's terms and the kinds of actions or policies that might deliver that future. There are many good examples of this technique and language, from Shell to the IIASA/WEC emissions scenarios[1], and we encourage the group to look to these examples. Storylines provide a vivid and understandable picture for policy makers and allow the reader to assess how reasonable they think a certain outcome is.

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[1] Peter Schwartz, *The Art of the Long View*, Doubleday, 1991; Shell's book, *Scenarios: An Explorer's Guide*, available at: http://www.shell.com/static/royal-en/downloads/scenarios/scenario_explorersguide.pdf; or Nakicenovic et all, 1998, *Global Energy Perspectives*, Cambridge University Press, web site: http://www.iiasa.ac.at/Research/ECS/docs/wec_orderbook.html

Assumptions for All Scenarios

The following are recommendations associated with the common assumptions for all scenarios.

- Existing Generators: a portion of the existing generating assets should be retired over the study period and replaced with the technology(s) being modeled; the old units will not run for another 20 years and will be upgraded or replaced by more efficient and cleaner units over time; this will be driven by both economics and environmental concerns; the level of retirement should be discussed with stakeholders, but something in the 20-30% range seems reasonable to us.

- Transmission: transmission requirements will not be the same for all scenarios; that being said we understand the ISO's reluctance to do detailed analysis of this issue; we would suggest two or three transmission cost estimates that would be bounded by distributed generation on one end and large imports from Canada on the other and assigning a per MW cost to each scenario based on where it fits within this range.

- Capacity or First Costs: for all scenarios (supply or demand side), an estimate or range of the capacity cost will be required; this will be variable based on location and project type, but a cost range should be developed based on EIA data and other sources (the RGGI modeling assumptions are a good place to start with this). Current experience within the region for energy efficiency costs should be based on existing program costs and achievable potential studies (see efficiency discussion below).

- Fuel Prices: Fuel price forecasts should be developed based on a merging of current futures prices and EIA forecasts (see sensitivity discussion below).

Scenarios & Sensitivities

Balancing the needs of policy makers and the wish to assess a number of different policy options, we suggest that the following 7 scenarios be developed. We know this represents an addition, but believe that it's the most responsive representation of the technology and policy options facing decisionmakers in the region. If one scenario is to be dropped, it should be the least likely one which is the nuclear scenario (based on political reality and the fact that nuclear developers are not proposing building new plants in this region).

> Scenario 1 – NGCC/Queue Fuel Mix: the queue fuel mix as identified by the ISO is an unlikely outcome due to its reliance on natural gas combustion turbines; a scenario that mostly relied on natural gas combined cycle would be more reasonable and essentially represent the natural gas scenario proposed by the ISO and the trajectory we are currently on.
>
> Scenario 2 – Energy Efficiency: existing studies of the achievable potential for energy efficiency gains indicate we can achieve and even go beyond zero load growth (see discussion below) and an aggressive efficiency scenario should be modeled that stabilizes load growth in the next few years and has it decline from 2010 on, using the NEEP trajectory.[2]

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[2] Optimal Energy Inc., 2004, *Economically Achievable Energy Efficiency Potential in New England*, for Northeast Energy Efficiency Partnerships, available at: http://www.neep.org/policy_and_outreach/policy/Executive_Summary.pdf and http://www.neep.org/policy_and_outreach/policy/Narrativeresults.pdf

Scenario 3 – Renewables: this scenario should assume that all new capacity comes from renewables and the technology and fuel split should be based on the resource potential identified for the RGGI states by Sustainable Energy Advantage and LaCapra Associates.[3]

Scenario 4 – Combined Heat & Power: this scenario should examine distributed generation technologies and focus on efficient combined heat and power systems (note that in just the commercial sector there are about 4,000 MW of CHP potential in New England[4] and significant additional potential for industrial CHP[5])

Scenario 5 – Canadian Hydro: this scenario, representing large new imports of hydro power from Canada, should be stand alone due to its unique transmission cost and seasonal capacity issues.

Scenario 6 – New Coal: this scenario should assume new coal using integrated gasification and combined cycle technology; there is currently no known repository for carbon in the northeast and it should not include carbon capture and sequestration (CCS); CCS should only be looked at as a sensitivity and carbon capture equipment, infrastructure costs, and O&M should be included to ship the carbon by pipeline to the Midwest or Canada.[6]

Scenario 7 – New Nuclear: this scenario could be run, but it is the most unlikely from a political perspective; costs should be represented using a range based on current projections and past experience in the region.

Sensitivity analysis is an important way to test assumptions and develop a range of potential costs and benefits for each scenario. We would suggest the following sensitivity runs for each of the scenarios:

1. Low Load and Demand Growth: achieve zero load growth through energy efficiency investments with costs calculated based on existing program experience and achievable potential studies (see discussion below).

2. High Load and Demand Growth: grow load and demand at the 2004 to 2005 rate of 6% per year for peak demand and 2.9% per year for net energy for load.[7]

3. Low Energy Prices: use EIA's long-term forecast contained in the Annual Energy Outlook 2006 and the Low Cost Case.[8]

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[3] This report should be available by contacting the staff at NYSERDA who managed this modeling assessment (Karl Michael, ksm@nyserda.org)

[4] ONSITE SYSCOM Energy Corporation, 2000, *The Market and Technical Potential for Combined Heat and Power in the Commercial/Institutional Sector*, for US DOE EIA, Table B1, available at: www.eere.energy.gov/de/pdfs/chp_comm_market_potential.pdf

[5] Energy and Environmental Analysis, Inc., 2004, *Project Summary Report: Assessment of Large Combined Heat and Power Market*, for Oak Ridge National Laboratory, available at: http://www.eere.energy.gov/de/pdfs/chp_large.pdf

[6] For cost estimates see: IPCC, 2005, *IPCC, Special Report on Carbon Dioxide Capture and Storage*, Prepared by Working Group III of the Intergovernmental Panel on Climate Change [Metz, B., O. Davidson, H. C. de Coninck, M. Loos, and L. A. Meyer (eds.)], Cambridge University Press, available at: http://www.ipcc.ch/activity/srccs/; and International Energy Agency Greenhouse Gas R&D Program, 2005, *Building the Cost Curves for CO_2 Storage: North America*, Report Number 2005/3

[7] ISO New England, 2006, *2005 Annual Markets Report*, available at: http://www.iso-ne.com/markets/mkt_anlys_rpts/annl_mkt_rpts/2005/2005_annual_markets_report.pdf

[8] EIA, Annual Energy Outlook 2006, Available at: http://www.eia.doe.gov/oiaf/aeo/index.html

4. High Energy Prices: use the futures market for natural gas, oil, and coal and merge these forward prices with EIA's long-term forecast contained in the Annual Energy Outlook 2006 and the High Cost Case.

5. Low-cost Emissions Allowances: use the low end of EPA CAIR modeling for SO_2, NO_x, and mercury allowances[9] and the low end of RGGI CO_2 allowance cost projections.[10]

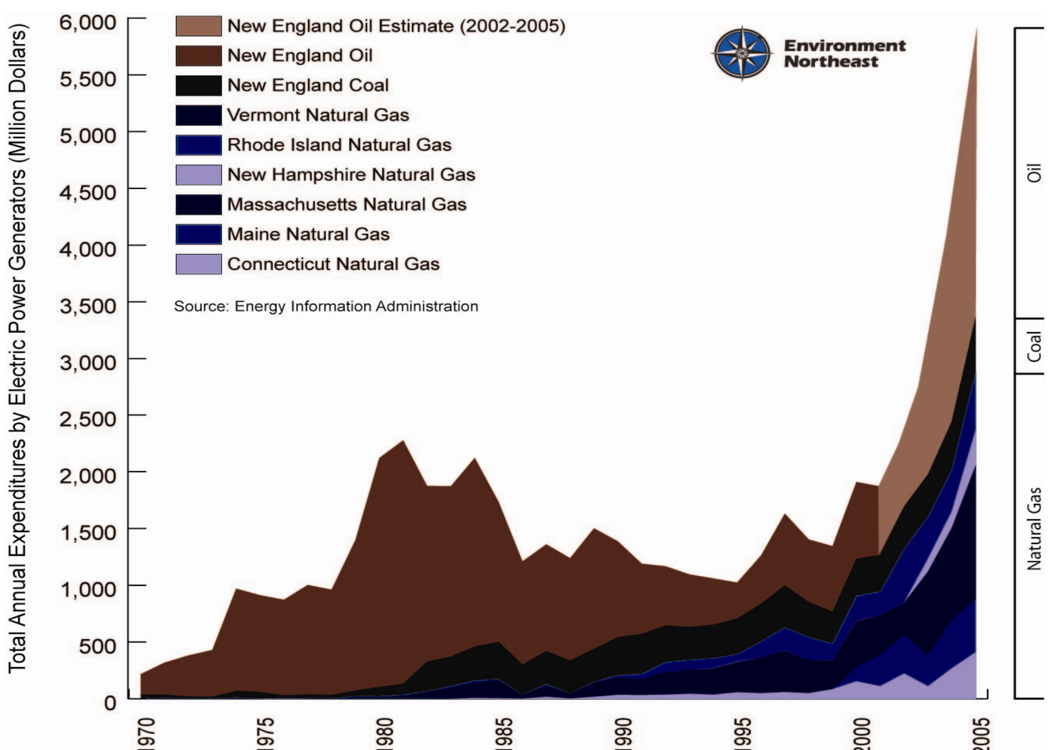
6. High-cost Emissions Allowances: use the high end of EPA CAIR modeling for SO_2, NO_x, and mercury allowances and the high end of RGGI CO_2 allowance cost projections.

Energy Efficiency Background

Energy efficiency represents a large and significantly underutilized resource in the region that can assist us in meeting our energy needs while improving the region's economy. The existing programs are limited in their size – the region invests about $250 million per year on ratepayer supported energy efficiency programs while spending about $10 billion on the supply of electric generation.

On the supply side this is leading to a drain of energy dollars out of the region to pay for fossil fuels on the order of $5 to 6 billion dollars per year, as seen in the figure below. This money is no longer available to invest in other portions of state economies.

Figure 1: Fossil Fuel Expenditures by New England Electric Power Generators



[9] US EPA, 2005, Technical Support Document for the Final Clean Air Interstate Rule: Modeling of Control Costs, Emissions, and Control Retrofits for Cost Effectiveness and Feasibility Analyses, available at: http://www.epa.gov/cair/pdfs/finaltech07.pdf with other documents at: http://www.epa.gov/cair/

[10] See RGGI modeling documents available at: http://www.rggi.org/documents.htm

The trend in terms of markets and more importantly policy is to significantly increase investments in energy efficiency:

- The Forward Capacity Market will provide additional funding to existing programs and may spur significant new investments in energy efficiency projects and programs;

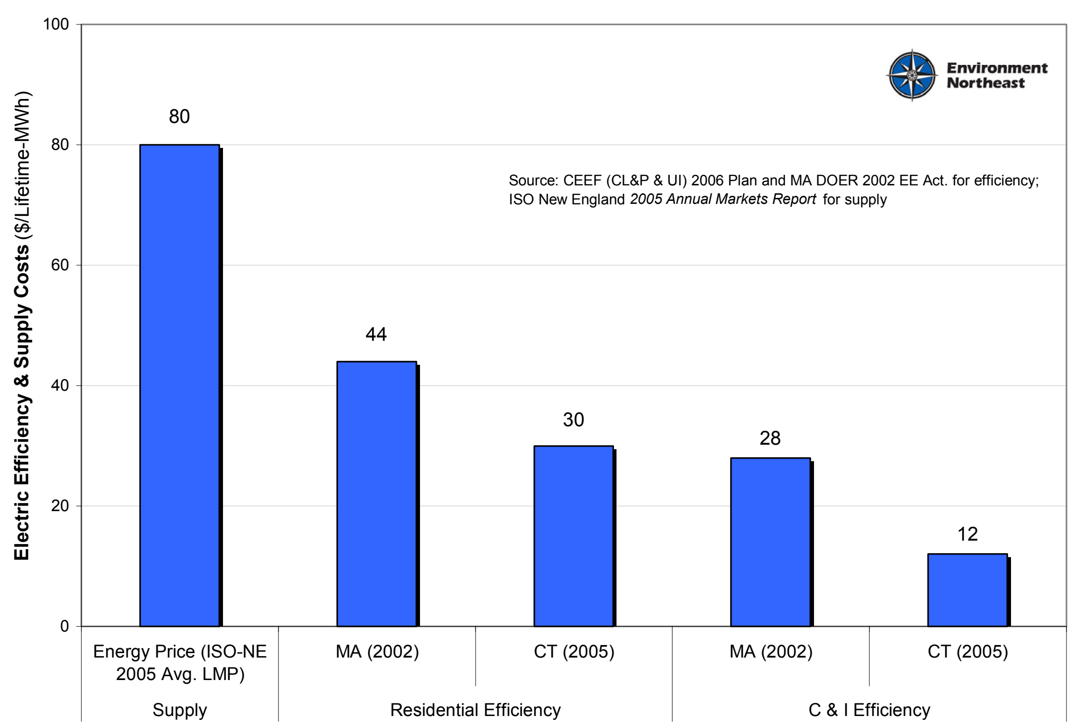
- State mandated investments are increasing in Connecticut, Rhode Island, Vermont, and likely Maine;

- Programs like RGGI and the CAIR program will likely provide more funding for efficiency programs through the auction of emissions allowances;

- There is an interest and move to allow efficiency to compete in energy markets as well as capacity markets; Rhode Island and Maine legislation in 2006 allows efficiency to compete in standard offer energy procurement (other states are also interested in this model); the Connecticut CHP and efficiency portfolio standard will increase demand for efficiency investments; and the Connecticut capacity RFP factors in energy savings from efficiency and allows efficiency investments to compete with supply;

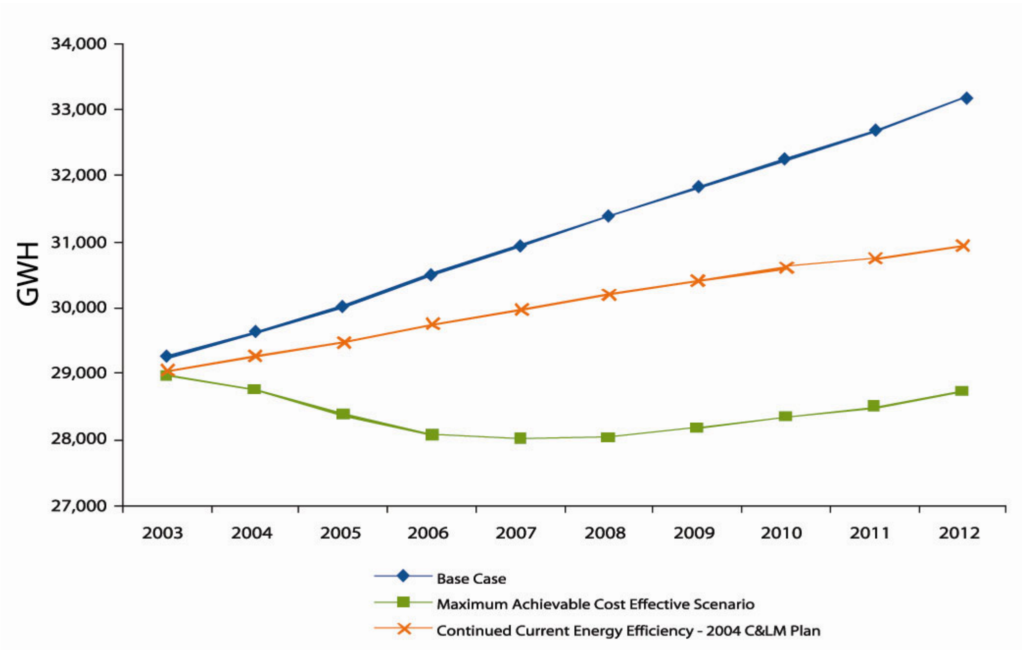
There is a significant untapped efficiency resource in the region. It costs less to assist customers to save a unit of energy than to provide them a unit of energy from the regional electric market. The following figure illustrates the cost differential between efficiency programs and energy supply on a MWh basis.

Figure 2: Comparison of Electric Supply vs. Efficiency Costs on a Unit of Energy Basis



State and regional studies indicate that we are only capturing a portion of the achievable energy efficiency potential. We know that there are products like lights and appliances that consume a fraction of the energy average units consume. We also know that we can build and retrofit buildings that use ½ or even 1/3 the energy of a building built to code. Based on the achievable potential studies developed for the states we know we can achieve zero load growth in the electric sector. The following figure from the Connecticut Maximum Achievable Potential Study indicates the untapped resource available in 2004.

Figure 3: Connecticut Energy Forecast (GWh) – Base Case, Continued Current Energy Efficiency, and Maximum Achievable Cost Effective Potential [11]



It is important to note that higher energy prices lead to larger achievable potential numbers and the average load-weighted real-time system energy price has grown from $53.57/MWh in 2004 to $79.96/MWh in 2005[12], so the achievable potential is only growing as the supply price they are compared to rises.

Analyses for other states indicate similar trends. Northeast Energy Efficiency Partnerships (NEEP) contracted for a study in 2004 that looked at a range of policy options and they concluded that load growth could decline over time through investments in cost effective energy efficiency programs and policies. The figure on the following page summarizes the potential identified in that study.

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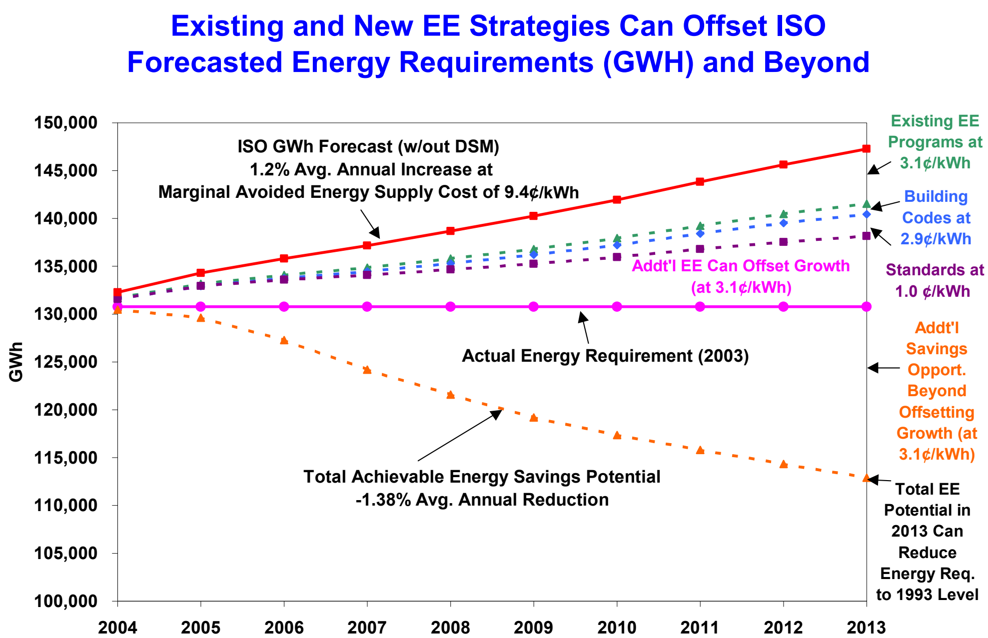
[11] GDS Associates Inc. and Quantum Consulting, 2004, *Independent Assessment of Conservation and Energy Efficiency Potential for Connecticut and the Southwest Connecticut Region*, for the Connecticut Energy Conservation Management Board, Figure 1-2, available at:
http://www.dpuc.state.ct.us/Electric.nsf/By%20ECMB/12.%20Maximum%20Achievable%20Potential%20Study?OpenView&Start=1&Count=30&Expand=1.1#1.1

[12] ISO New England, 2004 and 2005 Annual Markets Reports, available at: http://www.iso-ne.com/markets/mkt_anlys_rpts/annl_mkt_rpts/index.html

Figure 4: Results from NEEP Economically Achievable Energy Efficiency Potential Study [13]



The costs to administer and implement these kinds of programs are known or estimates have been developed in the achievable potential studies. Actual costs from existing programs can also be used. The following is a summary of the program costs and benefits for the 2006 Connecticut Energy Efficiency Fund which is administered by Connecticut Light and Power (CL&P) and United Illuminating (UI).

Table 1: 2006 Connecticut Energy Efficiency Fund Costs and Benefits[14]

Company	Sector	Utility Costs ($)	Electric System Benefit (Disounted $)	Electric System B/C Ratio	Annual Savings (MWh)	Lifetime Savings (MWh)	Avg. Measure Life (Years)	Demand Reduction (MW)	Demand Cost ($/MW)	Demand Cost ($/MW-yr)	Cost Rate ($/First Year-MWh)	Utility Cost Ratio ($/Lifetime-MWh)
CL&P	Residential	$14,798,700	$39,711,967	2.7	63,206	509,531	8	8.4	$1,771,953	$219,807	$234	$29.0
	Commercial & Industrial	$25,182,705	$150,819,727	6.0	133,568	2,216,353	17	20.3	$1,238,685	$74,649	$189	$11.4
	RC&I	$39,981,405	$190,531,694	4.8	196,774	2,725,884		28.7	$1,393,963		$203	$14.7
UI	Residential	$3,396,411	$8,007,288	2.4	14,221	107,669	8	2.0	$1,728,673	$228,324	$239	$31.5
	Commercial & Industrial	$6,466,456	$33,042,163	5.1	35,639	559,640	16	7.0	$919,147	$58,533	$181	$11.6
	RC&I	$9,862,867	$41,049,451	4.2	49,860	667,309		9.0	$1,095,871		$198	$14.8
Average	Residential			2.5			8		$1,750,313	$224,066	$236	$30.3
	Commercial & Industrial			5.5			16		$1,078,916	$66,591	$185	$11.5

Source: CL&P and UI 2006 Plan, Table B

[13] Optimal Energy Inc., 2004, *Economically Achievable Energy Efficiency Potential in New England*, for Northeast Energy Efficiency Partnerships, Slide 12, available at: http://www.neep.org/policy_and_outreach/policy/NEEPAPP.ppt

[14] Summarized by ENE from the CL&P & UI, 2006, Conservation and Load Management Plan, Table B for both companies.

In Connecticut, where the utilities run some of the best and largest efficiency programs, Energy Conservation Management Board (ECMB) sponsored studies show we can achieve zero load growth, the state energy plan strives to achieve this or more, and the programs are currently developing a program plan and budget to achieve zero load growth. ENE and the ECMB should be able to share this zero load growth scenario with the Steering Committee once it is finalized, which should be before the end of the year.

There is clearly an untapped efficiency potential available at low cost. These programs avoid sending our energy dollars out of the region to pay for fossil fuels and instead invest these dollars in-region expanding the workforce of energy service companies and leaving money in consumer's wallets that they can then spend in other parts of the economy. The following table summarizes the benefits of the current programs in Connecticut and gives a sense of why policy makers are interested in increasing these investments and allowing efficiency to compete in energy and capacity markets and procurement processes.

Table 2: 2005 Program Results - Connecticut Energy Efficiency Fund[15]

<table>
<tr><td>Annual Investment:</td><td colspan="3">$82,000,000</td></tr>
<tr><td>Energy Savings:</td><td colspan="3">4,398,000 MWh (Lifetime) ; 318,000 MWh (Year 1)</td></tr>
<tr><td>Demand Reduction:</td><td colspan="3">135,000 kW</td></tr>
<tr><td>Economic Benefits:</td><td colspan="3">$550 million in avoided energy bills (Lifetime);
$40 million in avoided energy bills (Year 1)
Generated $4 in lifetime savings (today's dollars) for every $1 spent
Created approximately 1,000 non-utility jobs</td></tr>
<tr><td>Customer Assistance to:</td><td colspan="3">18,000 low income customers
890 small business customers
3,270 commercial and industrial customers</td></tr>
<tr><td rowspan="3">Emissions Benefits (Tons):</td><td>Pollutant</td><td>2005</td><td>Lifetime</td></tr>
<tr><td>CO2</td><td>198,586</td><td>2,748,461</td></tr>
<tr><td>NOx & SOx</td><td colspan="2">The program assists the region meet its goals under the cap and trade programs by reducing demand for electric power</td></tr>
<tr><td>Awards:</td><td colspan="3">Ranked #1 among U.S. states for cumulative annual energy savings (7.8%) as a percentage of annual total retail sales by American Council for Energy Efficient Economy (ACEEE) National Scorecard on Utility and Public Benefits of Energy-Efficiency Programs. (October, 2005). The U.S. national average is only 1.9%.</td></tr>
</table>

For additional information on this memo or should the Steering Committee or other stakeholders have questions, please contact Derek Murrow at (203) 495-8224 or dmurrow@env-ne.org.

[15] Connecticut Energy Conservation and Load Management Board, 2006, *Energy Efficiency: Investing in Connecticut's Future – Report of the Energy Conservation Management Board, Year 2005 Programs and Operations*, available at: http://www.dpuc.state.ct.us/Electric.nsf/cafda428495eb61485256e97005e054b/5abe828f8be75356852571390052027 0/$FILE/FINAL%20ECMB%202005%20Report.pdf