

P R E N T I S S

L • A • W • F • I • R • M

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September 16, 2014

Luly E. Massaro, Commission Clerk
Rhode Island Public Utility Commission
89 Jefferson Boulevard
Warwick, RI 02888

**Re: 2015-2017 Energy Efficiency and System Reliability Procurement
Plan Docket 4522**

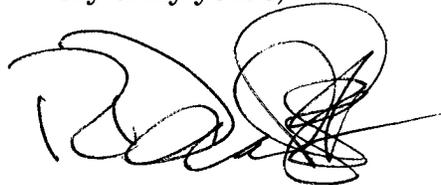
Dear Luly:

I enclose the original and nine copies of the EERMC's Cost Effectiveness Report on National Grid's 2015-2017 Energy Efficiency and System Reliability Procurement Plan.

The EERMC at its September monthly meeting formally approved the submission of the Cost-Effectiveness Memorandum entitled: "Cost-Effectiveness Report On National Grid's 2015-17 Energy Efficiency and System Reliability Procurement Plan" (Filed 9/2/2014).

In addition the EERMC formally voted to endorse and urge the Public Utilities Commission to approve the Energy Efficiency and System Reliability Procurement Plan as it was filed by National Grid.

Very truly yours,



R. Daniel Prentiss
EERMC Counsel

RDP/ka
Enclosures
Cc: Docket 4443 Serv

Cost-Effectiveness Report On National Grid's 2015-2017 Energy Efficiency and System Reliability Procurement Plan (filed 9/2/2014)

**An Assessment and Report by
The VEIC/Optimal Energy Consultant Team**



Working on Behalf of the



STATE OF RHODE ISLAND
**ENERGY EFFICIENCY &
RESOURCE MANAGEMENT COUNCIL**

**Submitted to the Rhode Island Public Utilities Commission
On September 15, 2014**

Energy Efficiency and Resource Management Council Consultant Team Findings

The EERMC Consultant Team finds that the *2015-2017 Energy Efficiency and System Reliability Procurement Plan* (“the Plan”), filed on September 2, 2014 by National Grid, is cost-effective according to the Total Resource Cost (TRC) test. We also find that the implementation strategies outlined in the Plan will support a reasonable and credible sustained implementation and moderate ramp-up of National Grid’s energy efficiency implementation efforts, and align with the savings targets proposed by the EERMC in its September 1, 2013 filing and approved by the PUC at its Open Meeting held on March 29, 2014.

These findings and the remainder of this report were presented to the Energy Efficiency and Resource Management Council (EERMC or “the Council”) by the EERMC Consultant Team at its September 11, 2014 meeting, and were approved and adopted in a vote of the EERMC.

Because the Plan has been approved by the EERMC and meets the cost-effectiveness requirements of R.I.G.L. § 39-1-27.7(c)(5) , the Consultant Team therefore recommends that the Plan also be approved by the Rhode Island Public Utilities Commission (“the Commission”). Through such approval the Plan can be used by National Grid to guide the development of more detailed annual implementation plans for 2015, 2016, and 2017, which would be submitted to the Commission by November 1st of the year prior to the plan’s implementation.

I: Introduction

Since 2010, the EERMC has met its requirement in R.I.G.L. § 39-1-27.7(c)(5) to review and approve the cost-effectiveness of National Grid's 3-year procurement plan and any related annual energy efficiency plans:

The Commission shall issue an order approving all energy efficiency measures that are cost effective and lower cost than acquisition of additional supply, with regard to the plan from the electrical and natural gas distribution company, and reviewed and approved by the energy efficiency and resources management council, and any related annual plans, and shall approve a fully reconciling funding mechanism to fund investments in all efficiency measures that are cost effective and lower cost than acquisition of additional supply, not greater than sixty (60) days after it is filed with the commission.

To comply with this requirement for National Grid's proposed *2015-2017 Energy Efficiency and System Reliability Procurement Plan* ("the Plan"), the EERMC directed its Consultant Team to produce this report. The Plan was presented to the Council at its August 18, 2014 meeting¹ where the Council voted to endorse the Plan and formalized the request for cost-effectiveness review.

This report describes that review, including the finding that the Plan is cost-effective, and submits it as evidence to the Commission. It also describes the nature and process of the review, and documents the professional experience and qualifications of the Consultant Team to fulfill this task.

The Consultant Team presented its preliminary findings to the EERMC Executive Committee for review and discussion on September 4, 2014. The final draft of the report was presented to the full Council at the September 11, 2014 meeting, and there was a vote to approve the report and submit it to the Commission within the prescribed timeline.²

II. The Rhode Island Legal and Regulatory Framework

Rhode Island's Comprehensive Energy Conservation, Efficiency, and Affordability Act of 2006 ("2006 Comprehensive Energy Act") established a comprehensive energy policy that explicitly and systematically requires maximization of ratepayers' economic savings through investments

¹ Although the Council is directed to approve the Plan by August 15 triennially, a slight delay in the Council meeting was required to assure a quorum.

² The updated Standards for Energy Efficiency and Conservation Procurement and System Reliability require that Cost-Effectiveness Reports be submitted within two weeks of the Plan being filed with the Commission.

in all cost-effective energy efficiency. By means of this requirement on the distribution utility to procure all cost-effective energy efficiency, Rhode Island ratepayers stand to save hundreds of millions of dollars in energy bills over the next decade.

The primary guidelines informing the planning process to achieve this objective are the “standards for energy efficiency and conservation procurement and system reliability” (“the Standards”), required in the 2006 legislation. The EERMC proposed the initial Standards in June, 2008, and a subsequent revision was approved by the Commission in July, 2008. Updates to the Standards were proposed by the EERMC in 2011 under Docket #4202, and again in 2014 under Docket #4443, which were both approved by the Commission. The purpose of these Standards is to provide sufficient direction to guide National Grid in its 3-year and annual Plans.

The Standards ordered by the PUC identify the Total Resource Cost (TRC) test as the methodology to use in determining whether the measures, programs, and the portfolio of energy efficiency (EE) services are cost-effective. The Standards for determining cost-effectiveness were modified in 2014 to include additional language, designated below by italics, from Section 1.2, A, 2, (a) and (b):

(a) The Utility shall assess measure, program and portfolio cost-effectiveness according to the Total Resource Cost test (“TRC”). The Utility shall, after consultation with the Council, propose the specific benefits and costs to be reported and factors to be included in the Rhode Island TRC test *and include them in the EE Procurement Plan. These benefits may include resource impacts and non-energy impacts. The accrual of non-energy impacts to only specific programs or technologies, such as income eligible programs or combined heat and power, may be considered.*

(b) That test shall include the costs of CO₂ mitigation as they are imposed and are projected to be imposed by the Regional Greenhouse Gas Initiative. The test shall *also* include any other *utility system* costs associated with *reasonably anticipated future* greenhouse gas reduction requirements at the state, regional or federal level for both electric and gas programs. *A comparable benefit for greenhouse gas reduction resulting from natural gas or delivered fuel energy efficiency or displacement may be considered.*

The same TRC methodology (adjusted appropriately for gas measures and programs) has been applied to the evaluation of cost-effectiveness for natural gas energy efficiency since natural gas was added to the Least Cost Procurement mandates in 2010.

On June 21, 2012, an amendment to Rhode Island’s Least Cost Procurement Statute, R.I.G.L. §39-1-27.7, to support the installation and investment in clean and efficient CHP was signed

into law.³ The new CHP provision required that National Grid document this support annually in its energy efficiency program plan by including a plan for identifying and recruiting qualified CHP projects, incentive levels, contract terms and guidelines, and achievable megawatt targets. In addition, the law requires that the following criteria be factored into the Company's CHP plan: (i) economic development benefits in Rhode Island; (ii) energy and cost savings for customers; (iii) energy supply costs; (iv) greenhouse gas emissions standards and air quality benefits; and (v) system reliability benefits.

In accordance with the requirement of this amendment, National Grid proposed a number of adjustments to the TRC as defined in the Standards approved by the PUC in Dockets No. 3931 and No. 4202. The Consultant Team, the EERMC Collaborative Sub-Committee, and the EERMC CHP sub-committee reviewed these proposed TRC modifications and agree that they are consistent with the requirements of Rhode Island law, and represent reasonable estimates of the benefits mandated for inclusion in the assessment of CHP projects in Rhode Island. These adjustments include:

- An Economic Benefit adder of \$2.51 of lifetime gross state product increase per dollar of program investment;
- A schedule of benefits from reduced Volatile Organic Compounds, SO₂, and Particulate Matter emissions;

National Grid has agreed to assess each CHP installation as a custom project, thereby ensuring that the specific costs and benefits of each project are appropriately evaluated. This will help assure that each installation is cost-effective.

III. Summary of EERMC Consultant Team's Qualifications

The EERMC Consultant Team is composed of Vermont Energy Investment Corporation ("VEIC") serving as the lead contractor, Optimal Energy Inc. ("OEI"), Energy Futures Group, and Prael Consultant. The Consultant Team is led by Scudder Parker and Mike Guerard. Key skills and expertise are provided by Sam Huntington on data and analytical issues; Sean Bleything, Richard Faesy and Glenn Reed on the Residential market sector; George Lawrence and Phil Mosenthal on the Commercial / Industrial sector; and Ralph Prael on evaluation, measurement, and verification (EM&V) activity. An additional layer of supporting staff is also in place, as well as a full range of industry experts available on an as-needed basis.

³ See R.I.G.L. § 39-1-27.7(c)(6)(ii) through (iv); For the legislative history, see P.L. 2012, Ch. 363, S2792 Sub A (Enacted June 21, 2012).

This team brings an impressive understanding of, and experience with, energy efficiency policy, regulatory practice, program design, cost-effectiveness analysis, measure characterization, assessment of potential savings, and evaluation, measurement and verification. Many of the individual consultants included on the Consultant Team have 15-25 years of direct experience in energy efficiency and broader regulatory policy. All participants also practice in jurisdictions outside of Rhode Island (many of those in New England) and their experience in those settings provides an important context and perspective to inform the EERMC in its oversight role.

A full listing of qualifications of the various team members and the resumes of the participating individual consultants is provided in **Attachment A**.

The Consultant Team has been involved in the Rhode Island oversight, program design, and implementation process since it was hired early in 2008. The Consultant Team:

- Helped draft the Standards for Least Cost Procurement proposed by the EERMC in 2008 and the revision to the Least Cost Procurement Standards and System Reliability Procurement Standards in 2011 and 2014, both of which were approved by the Commission;
- Oversaw the development of Phases I and II of *The Opportunity for Energy Efficiency that is Cheaper than Supply* (KEMA) report;
- Contributed to the development and review of EEPF filings by National Grid for 2009, 2010, 2011, 2012, 2013 and 2014.
- Analyzed the cost-effectiveness of the annual EEPF filings from 2009 – 2014, and documented the findings of the cost-effectiveness for the PUC on behalf of the EERMC.
- Contributed to the development and review of National Grid's 2012-2014 and 2015-2017 Energy Efficiency Procurement Plans;
- Analyzed the cost-effectiveness of the 2012-2014 Energy Efficiency Procurement Plan and documented those findings for the PUC on behalf of the EERMC;
- Developed and submitted proposed targets for the 2015-2017 Plan for the EERMC consistent with LCP, primarily through reviewing and updating assumptions in the initial KEMA Potential Study from 2010, and the 2012 Natural Gas Opportunity Report for the EERMC.

In 2013 and 2014, the Consultant Team has also worked closely with the Office of Energy Resources (OER). In this context it:

- Provided support as the OER worked with stakeholders to develop a new Rhode Island State Energy Plan;
- Advised the OER as it worked to secure legislative authorization for a new Property Assessed Clean Energy (PACE) Program and for a new approach to securing efficiency savings from street lighting;
- Provided input as the OER developed its proposals for allocation of Regional Greenhouse Gas Initiative (RGGI) funds;
- Worked closely with the OER staff in developing and delivering the Rhode Island Public Energy Partnership (RIPEP) program;
- Worked with OER, the EERMC and National Grid in developing working partnerships with the Alliance for Healthy Homes, Emerald Cities-Providence and the Rhode Island Housing Authority.
- Worked with OER and National Grid to design pilot program to locate solar installations in System Reliability Plan (SRP) target areas.

This strong familiarity with Rhode Island’s policy, planning, implementation, and evaluation experience provides a high level of assurance that practices in Rhode Island are consistent with regional and national best practices in Energy Efficiency Least Cost Procurement.⁴

IV. Consultant Findings

The EERMC Consultant Team finds that National Grid’s *2015-2017 Energy Efficiency and System Reliability Procurement Plan* is cost-effective according to the Total Resource Cost Test (TRC). That is, the present value of the Plan’s anticipated benefits is greater than the present value of the Plan’s costs, as defined by the TRC.⁵

The EERMC Consultant Team also finds that the proposed implementation strategies will improve Rhode Island’s energy efficiency services, both by serving more ratepayers and by achieving more savings per participant. These strategies represent an advancement in efforts to go both wider and deeper in the state’s energy efficiency markets to secure cost-effective savings for both electric and natural gas customers consistent with the least cost procurement

⁴ The EERMC and its Consultant Team also work closely with the Division and its Consultant through the Collaborative Subcommittee.

⁵ The specific costs and benefits in the TRC are described on page 11

and system reliability procurement requirements of R.I.G.L. § 39-1-27.7. The proposed Plan meets the Commission-approved savings targets for electric and gas efficiency.

The EERMC Consultant Team concludes that the Procurement Plan meets the cost-effective requirements of R.I.G.L. § 39-1-27.7(c)(5) and therefore should be approved by the Commission and used by National Grid to develop more detailed, specific annual implementation plans for 2015, 2016, and 2017 to be submitted to the Commission by November 1 annually.

The determination of cost-effectiveness for the Procurement Plan is by necessity and design at a higher level than the specific program analysis and modeling that is possible for Annual EE Program Plans. In effect, the Procurement Plan represents the second phase of a process that starts with three-year savings targets, and is finalized year by year in the Annual EE Program Plan review process. The Procurement Plan lays out a longer term approach to meeting a sequence of three annual EE goals. It sets direction for program strategy and exploration of new efficiency markets and implementation approaches to save consumers money. Much of the analysis is based on current program experience, and as a high-level planning document it does not spell out a full suite of detailed implementation strategies. These will be completely designed, characterized, and modeled for precise cost-effectiveness screening during the annual plan process.

The cost-effectiveness analysis of this 3-year EE Procurement Plan is based on substantial program implementation experience, professional judgment of what actual program costs and benefits will be, and reasonable estimates of savings opportunities that are available. The EERMC also recognizes that approval of the *2015-2017 Energy Efficiency and System Reliability Procurement Plan* will not, in itself, result in a specific change to the current fully reconciling funding mechanism. Adjustments to the fully reconciling funding mechanism will be made by the Commission upon review and approval of detailed Annual EE Program Plans that will be submitted to the Commission by the Company annually by November 1.

In order to assess the cost-effectiveness of the *2015-2017 Energy Efficiency and System Reliability Procurement Plan*, the EERMC Consultant Team engaged in the following plan development and review processes:

1. Consistent and on-going oversight of actual National Grid energy efficiency planning and implementation activities, both through direct interactions with National Grid staff and through participation in the Collaborative Subcommittee process (documented in Section V).
2. Direct review of National Grid's cost-effectiveness assessment practices and its screening process (documented in Sections VI and VII).

3. Review of National Grid's Evaluation Process (documented in Section VIII).

Finally, the Consultant Team's requisite skills, experience, and demonstrated expertise in the subject matter are documented in Attachment A.

V. Ongoing Oversight by the EERMC and its Consultant Team

The EERMC, consistent with its statutory obligations under the Rhode Island Comprehensive Energy Conservation, Efficiency and Affordability Act of 2006, continues to play an involved and active role with National Grid to guide, facilitate, and support public and independent expert participation in the review, oversight, and evolution of utility energy efficiency procurement and program implementation. The EERMC believes this input is critical to having the energy efficiency programs and new cost saving mechanisms evolve into resource acquisition tools that can effectively implement the Rhode Island law to procure all cost-effective natural gas and electric energy efficiency.

Dockets No. 3931 and 4202 and the Standards require a consistent and effective process to guide the development and submission of National Grid's *2015-2017 Energy Efficiency and System Reliability Procurement Plan* to the PUC. Section 1.4 (D) and (E) of the Standards state:

D. The Utility and Council shall report to the PUC a process for the Council input and review of its 2008 EE Procurement Plan and EE Program Plan by July 15, 2008 and triennially thereafter.

E. The Council shall vote whether to endorse the EE Procurement Plan by August 15, 2008 and triennially thereafter. If the Council does not endorse the Plan then the Council shall document the reasons and submit comments on the Plan to the PUC for their consideration in final review of the Plan.

In accordance with Section 1.4 (D) the EERMC and National Grid submitted a plan for a process for Council review and input of the EE Procurement Plan and subsequent EE Program Plans. The plan included the following steps for EERMC review and input into the EE Procurement Plan:

- Negotiation of a Performance Incentive design
- Three drafts of the Procurement Plan, with opportunity for EERMC and Collaborative Subcommittee review and response.
- Ongoing negotiations on specific issues, concepts and wording adjustments

The EERMC has met its review and input requirements both at its regularly scheduled monthly meeting and through the more frequently scheduled EERMC Collaborative Subcommittee meetings and phone calls. The EERMC Collaborative Subcommittee is comprised of EERMC members, the EERMC Consultant Team, the Division, the Attorney General’s Office, People’s Power and Light, Green and Healthy Homes and Environment Northeast all interacting with National Grid’s energy efficiency team. The EERMC Consultant Team has had repeated direct contact with National Grid staff before, during, and after the Collaborative Subcommittee meetings in order to provide consistent oversight and input.

Throughout this process, the objectives of the Standards are followed to ensure that program concepts and designs will result in implementation that secures cost-effective energy efficiency resources that are lower than the cost of supply, are prudent and reliable, and deliver hundreds of millions of dollars in bill savings to Rhode Island customers.

VI. Cost-Effectiveness Overview

Cost-effectiveness tests compare the net present value of a stream of benefits over the net present value of a corresponding stream of costs, whether they occur at the time of purchase or over several years. The Total Resource Cost (TRC) has been widely accepted and used by regulators and policy-makers to evaluate demand-side management programs. Most jurisdictions, including Rhode Island, use either the TRC or the Societal Test to assess efficiency program cost-effectiveness and the TRC test is widely accepted as one “best practice” option for evaluating energy efficiency programs.⁶ The TRC test indicates that an efficiency measure or program is cost-effective if the benefits outweigh the costs for Rhode Island consumers.

The TRC test compares the value of avoided energy costs and other resource costs to the full incremental cost of efficiency measures plus program administration costs. The TRC test was formally adopted as the best practice for evaluating the cost-effectiveness of energy efficiency measures and programs in 1983 when it was codified in the Standard Practice for Cost-Benefit Analysis of Conservation and Load Management Programs, published by the California Energy Commission. The “Standard Practice” manual has been revised several times since and has served as the *de facto* basis for determining efficiency cost-effectiveness by the majority of electric and gas utility efficiency programs. The manual is regarded as well-grounded in best-practices for cost-benefit analysis.

⁶ A significant difference between the Societal test and the TRC is that the Societal test attempts to account for the full value of environmental externalities that are not already embedded in the avoided costs of energy.

As noted above, the Rhode Island Public Utilities Commission ordered the TRC test for use in Rhode Island in its 2008 Docket No. 3931, and again in the 2011 EERMC proposed modifications under Docket 4202, on “Standards for Energy Efficiency Procurement.” Subsequently, National Grid proposed the specific costs and benefits to be included in the Rhode Island TRC test in its Least Cost Procurement Plan (September 2008) with support and input from the EERMC, which the Commission approved and ordered into effect. The Consultant Team reviewed National Grid’s application of the TRC test in the 2014 EEPP methodology and found it to be consistent with standard practice and the Standards. The Rhode Island TRC test includes the following benefits and costs:

- The benefits in the TRC include the discounted, monetized value of reduced energy (MWh), reduced capacity needs (MW, avoids the costs of providing both peak demand, and the transmission and distribution system), reduced fossil fuel use (or increased use as a negative benefit), reduced water and sewer use, non-energy impacts (generally due to decreased operation and maintenance costs), and Demand Reduction Induced Price Effect (DRIPE, as included in the avoided costs of electricity). In the 2014 version of the Procurement Plan new values are used for the projected costs of carbon reduction compliance. For the CHP program, an economic development and environmental adder are also included in the total benefits, and the assessment of distribution benefits is appropriately modified. The benefits for reduced electric energy (MWh and MW) and other resources are monetized based on avoided costs.⁷
- The costs in the TRC are all costs incurred by the utility and program participants as a whole to acquire the efficiency resources in the plan. They include the incremental cost of the efficiency measure(s),⁸ and the non-incentive costs required to deliver the program. Incremental cost is composed of incentives and customer contributions, while non-incentive costs are composed of program planning and administration, marketing, evaluation, shareholder incentive and related implementation costs.⁹ customer contribution, program

⁷ The EERMC notes that the current TRC methodology does not fully account for the economic costs (and benefits of avoiding) environmental externalities or other un-quantified economic costs and benefits. In contrast, the legislatively mandated inclusion of economic and environmental benefits in CHP analysis represents a more comprehensive treatment of externalities than is currently applied to other energy efficiency measures on either the gas or electric energy efficiency portfolios.

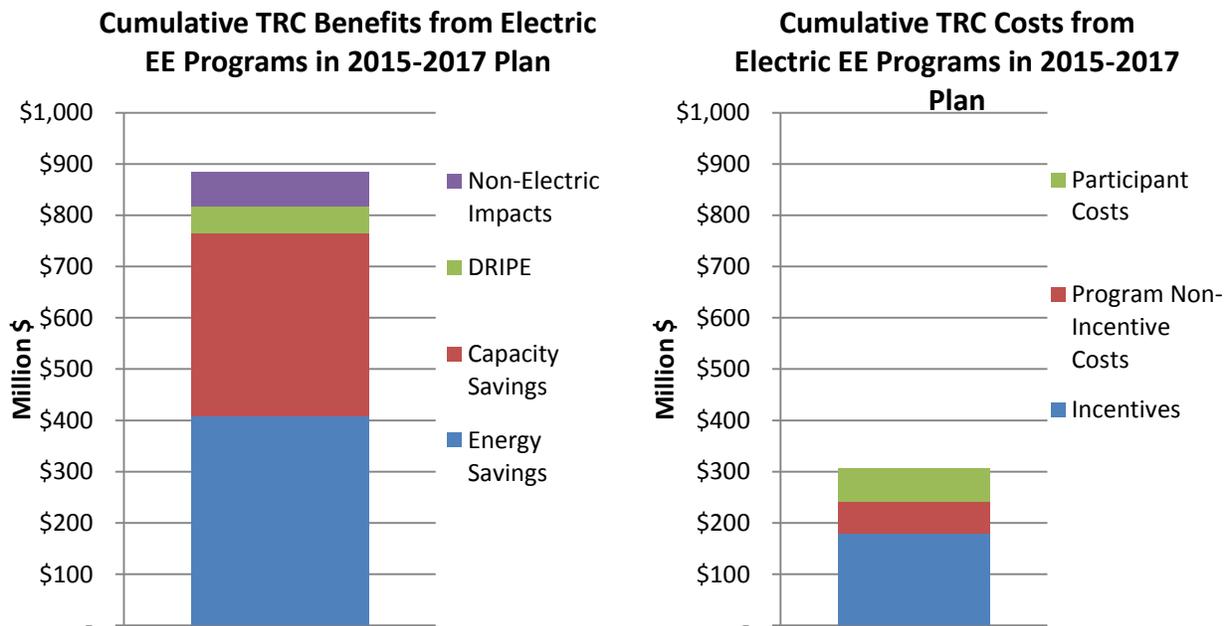
⁸ Incremental cost depends on the market opportunity. In a market-driven situation (when a customer is buying a new piece of equipment or replacing a broken one), it is the difference in cost between the baseline technology and the efficient technology. In a retrofit situation, the incremental cost is the full cost of the project, including equipment and installation (since the baseline condition would be continuing with the existing equipment).

⁹ Cross-program costs (e.g., comprehensive marketing not specific to a single program) are allocated at the sector or portfolio level.

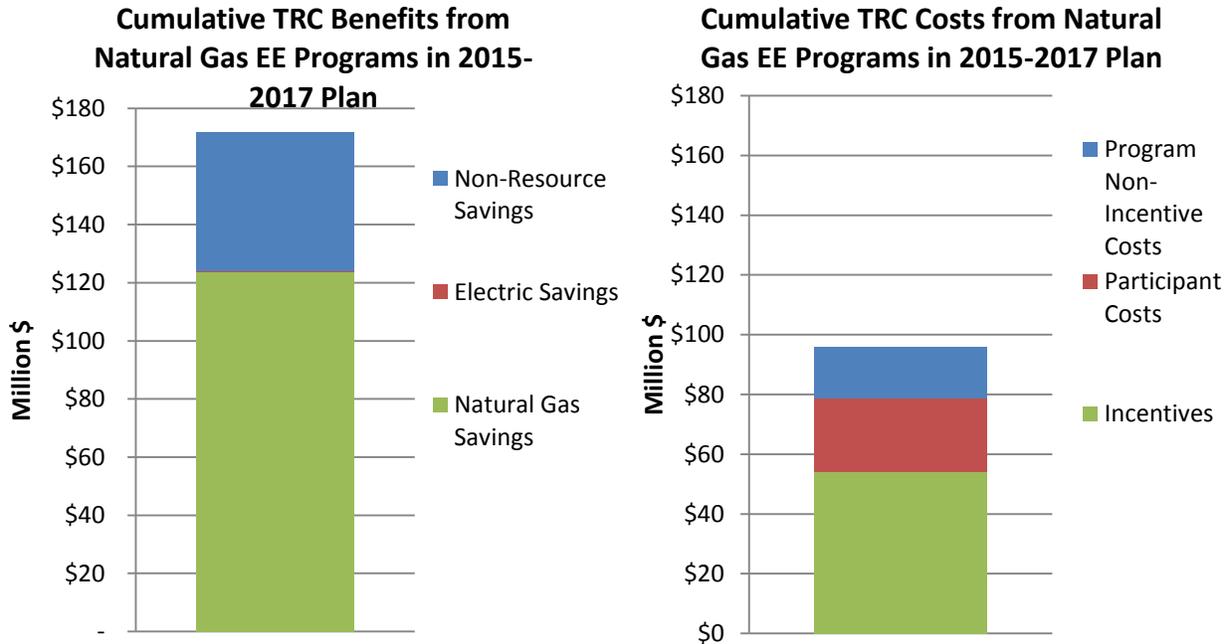
evaluation, and shareholder incentive costs, as shown in Tables E-2 and E-5, and G-2 and G-5, of the Company's 2014 EEPP.¹⁰

The costs and benefits of an efficiency program, which can occur over many years, are discounted to present-value using a real discount rate in order to discount the future value of money (i.e., money today is considered more valuable than the same amount of money in the future). A program is considered to be cost-effective if the present value of benefits exceeds the present value of costs, that is, when the TRC benefit-cost ratio (BCR) is greater than 1.0.

The charts below show how the total portfolio-wide costs and benefits in the Procurement Plan break out into the different components described above.



¹⁰ Benefit-cost ratio (BCR) at the sector level includes the shareholder incentive as a cost. As shareholder incentive is not calculated at a program level, it is not included in program level BCR



As the above charts show, the total resource benefits in both the gas and electric portfolios are mostly derived from primary fuel savings. Similarly, the total resource costs are largely participant incentives.

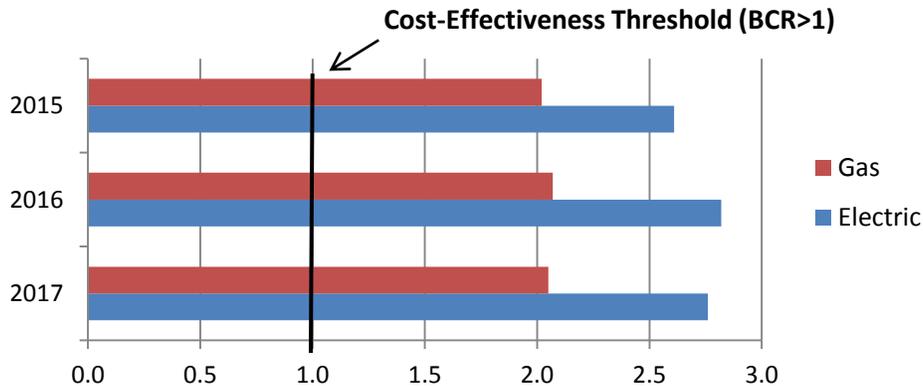
VII. Cost Effectiveness Review and Findings

The Standards require the Company to propose a portfolio of programs that are cost-effective as determined by having a TRC benefit-cost ratio greater than 1.0. The EERMC Consultant Team’s review of the 2015-2017 EE Procurement Plan has found it to be cost-effective, with benefit-cost ratios greater than 1.0 for each year of electric and gas programs. In this section we summarize the cost-effectiveness of the EE Procurement Plan, followed by a description of our review methodology and findings.

The overall portfolio cost-effectiveness of National Grid’s EE Procurement Plan for natural gas and electric efficiency programs for 2015-2017 is provided in Table 1 of the EE Procurement Plan, and summarized in the table below.

TRC BCR	2015	2016	2017
Electric	2.61	2.82	2.76
Gas	2.02	2.07	2.05

Each program year for electric and natural gas efficiency has a BCR greater than 1.0 as required by the PUC’s Standards for Energy Efficiency Procurement and R.I.G.L. § 39-1-27.7 (c)(5).



In addition to determining that the Procurement Plan is cost-effective using the current standard TRC test inputs, the Consultant Team conducted an illustrative analysis to assess the impact of the winter gas shortage. In recent years the shortage has occurred during periods of extended cold, driving up the price of natural gas for power generation, which in turn drives up the price of wholesale power. This phenomenon is not captured in the current avoided costs, which are a key input in the TRC test. As the analysis in **Attachment B** illustrates, taking the winter price spikes into account significantly increases overall benefits from the electric portfolio (by roughly 22% using our assumptions). To be clear, the Consultant Team is not arguing for a re-opening of the Avoided Cost studies that are used in the application of the TRC in Rhode Island, and we recognize that those avoided costs are now entering an update process for the next two-year forecast period. Rather, the analysis simply illustrates that in a time of high prices, the LCP benefits are even greater than the test currently being applied reflects.

Cost-effectiveness Review Process

Our review of the cost-effectiveness of the EE Procurement Plan addressed the methodology, mechanics, and assumptions used to estimate efficiency program costs and benefits for each year. The Consultant Team’s previous, detailed review of National Grid’s Annual Plan had confirmed their correct methodology for the TRC test, and provided detailed information on the mechanics of their cost-effectiveness model. Projections of costs and benefits for the 3-year plan are informed by detailed measure-level inputs and analysis, but are ultimately determined at a higher level than for an annual plan. This approach is appropriate given that there is less certainty in the inputs and assumptions for the 3-year period, and since a higher level of detail and associated effort is anticipated for the individual annual plans. With this in mind, the Consultant Team’s review consisted of the following primary activities:

- Confirm National Grid’s methodology for calculating the TRC test through review of their screening model;
- Review draft versions of the EE Procurement Plan and its cost-effectiveness projections;

- Review key changes in assumptions, including new avoided energy supply costs, carbon costs, and the results of new evaluation studies;
- Review the impacts of updated assumptions on estimated efficiency costs and savings;
- Discuss with National Grid specific issues regarding their methodology for projecting costs and savings, including anticipated cost and savings drivers, uncertainty, and contingency;
- Review the screening model with National Grid staff, including new and dropped measures, changes to measure baselines due to new codes and standards, and updates to other inputs such as realization rates, coincidence factors, and net to gross factors.

In addition, the Consultant Team has worked with National Grid over recent months on updating the latest version of the Rhode Island Technical Reference Manual (TRM), which documents the algorithms to calculate measure savings as well as additional inputs required for cost-effectiveness screening. This project has updated some of the savings assumptions that inform the projections of the Plan. The TRM will be especially useful for the more detailed development and review of the annual plans.

In general, the Consultant Team found National Grid’s processes for revising their cost-effectiveness inputs and assumptions to be thorough and comprehensive. National Grid appropriately adjusts baselines for new building codes and federal standards, and incorporates the latest findings from evaluation studies. In addition, the Company updates anticipated program costs based on recent experience and new market information. Finally, the proposed pilot programs are appropriate for determining the cost-effectiveness and viability of new measures (e.g., behavioral measures).¹¹

The Consultant Team’s review of the general model assumptions and inputs for the EE Plan’s projected costs and savings was performed via meetings with National Grid staff. The Consultant Team’s review focused on the general mechanics of the model, key screening inputs (such as avoided costs), and the allocation of resources between programs, markets, and sectors. . During the cost-effectiveness review of subsequent Annual EE Program Plans, the Consultant Team will examine inputs further and may suggest minor revisions while working

¹¹Pilot programs are important because while most measures can be found to be “cost-effective” or “non-cost-effective” in most standard applications, there may be highly cost-effective measures that are not cost-effective in certain applications, and some generally non-cost-effective measures that are cost-effective in certain situations. Pilot programs are crucial to overcoming key challenges of program design: refining the knowledge base of such situations; tailoring programs and services to avoid situations in which a measure is not cost-effective; and discovering the conditions and market segments in which a measure may prove to be cost-effective. The program and portfolio level analysis combined with increasing service delivery sophistication are positive characteristics of programs that help secure all cost-effective opportunities.

with National Grid, the EERMC, and the Collaborative Subcommittee to keep everything appropriately updated.

In conclusion we find based on this review that National Grid's 2015-2017 Energy Efficiency and System Reliability Procurement Plan is cost-effective based on the TRC test, and provides a solid platform for development of more detailed Annual Plans.

VIII. Review of Evaluation, Measurement and Verification (EM&V)

Process Evaluation, Measurement and Verification (EM&V) refers to the systematic collection and analysis of information to document the impacts of energy efficiency programs and improve the effectiveness of these programs. Impact evaluation, a specific type of EM&V activity, refers specifically to efforts to document program impacts. From the perspective of this review of the cost-effectiveness of National Grid's programs and 2014 EEPP, the relevance of National Grid's EM&V process is that this process is responsible for confirming and/or refining over time the values of many of the parameter assumptions that go into the Company's cost-effectiveness analyses, particularly those pertaining to program benefits.

EM&V activities in Rhode Island have generally been managed by the evaluation department of National Grid, with input from the Rhode Island Collaborative Subcommittee and (more recently) the EERMC, following high-level regulatory direction set by the PUC, Division, and the Office of Energy Resources. Recently, Northeast Energy Efficiency Partnerships (NEEP) has been playing a larger and more important role in establishing regionally harmonized EM&V standards. National Grid owns utilities in Massachusetts, Rhode Island, and New York, and National Grid's evaluation department has EM&V-related responsibilities in all of these states. National Grid's evaluation department is highly experienced, and has a strong national reputation in the evaluation industry. In New England, National Grid's EM&V planning, implementation, and reporting activities have historically been tightly integrated between Massachusetts, New Hampshire¹² and Rhode Island. Most new EM&V studies that bear on Rhode Island's energy efficiency programs are planned, budgeted, implemented, reported, and filed in Rhode Island and Massachusetts.

In Rhode Island, the Consultant Team's work with National Grid's evaluation department to date has focused on providing input into evaluation priorities, approaches, and spending levels. We have in-depth familiarity with these methods through our work with National Grid in Massachusetts, on behalf of the Massachusetts Energy Efficiency Advisory Council. On the basis

¹² Liberty Utilities has recently acquired National Grid's customer base in New Hampshire, but historically, EM&V was integrated between Rhode Island and New Hampshire.

of this familiarity, we believe that National Grid's impact evaluation methods in New England have generally been consistent with, if not superior to, prevailing industry standards. We therefore conclude that the strength of National Grid's EM&V process serves to buttress the finding that the Company's programs and plan are cost-effective. We have worked with National Grid on behalf of the EERMC on approaches to producing more Rhode Island-specific results within current EM&V budget limitations. We also recommended that National Grid's and the EERMC's EM&V budgets increase to support more Rhode Island-specific work.

IX. Conclusion

For the reasons stated herein, the EERMC and the EERMC's Consultant Team finds that National Grid's 2015-2017 Energy Efficiency and System Reliability Procurement Plan is cost-effective and lower cost than the acquisition of additional supply pursuant to R.I.G.L. § 39-1-27.7 (c)(5).

ATTACHMENT A
Resumes

Scudder Parker

Director,
Policy

Role on Project
Senior Advisor

Experience

- **Rhode Island Energy Efficiency Resource Management Council:** Led team in supporting implementation of energy efficiency least-cost procurement design and aggressive distributed resource acquisition
- **American Municipal Power:** Led team in creating new implementation strategy for energy efficiency service delivery in Ohio, created suite of programs for 120+ municipal utilities
- **Ontario Green Energy Coalition:** Provided regulatory testimony proposing and defending an aggressive suite of energy efficiency and distributed resource acquisition strategies as part of Ontario's energy resource planning
- **Iowa Consumer Advocate:** Provided and defended testimony stating that a proposed 640 MW coal plant could be avoided or deferred through more aggressive and comprehensive implementation energy efficiency programs
- **New Generation Partners:** Assisted with the creation of a new business venture designed to support development of community scale renewable energy and combined heat and power projects

Professional Profile



Scudder Parker is an expert in the development and implementation of energy policy, particularly regarding energy efficiency and renewable energy. As the Director of the Policy Division, he leads the policy development and communications for VEIC. Parker helps lead the organization toward a total energy approach to implementing its mission. He devises and supports legislation in Vermont that enables Efficiency Vermont to support cost-effective strategic electrification as part of its mandate.

Prior to his role as VEIC's Policy Director, Scudder was the Director of the Consulting Division. He provided overall direction to the analysis of energy efficiency and renewable energy markets, programs, and policies; national and international client base growth; staff training and mentoring; and business development for new projects. He made energy policy recommendations for many jurisdictions, analyzed the role efficiency can play in deferring the need for new power plants, improved efficiency operations, and led negotiations with utilities and other stakeholders regarding efficiency goals and program design.

Before coming to VEIC, Scudder was the Director of the Energy Efficiency Division for the State of Vermont's Department of Public Service. Scudder's work shaped the concept of the Vermont efficiency utility. He has led consulting projects focused on the creation of the necessary infrastructure for achieving aggressive efficiency savings and renewable energy targets.

Education

- **MS, *cum Laude*; Union Theological Seminary, Divinity, 1968**
- **BA, *magna cum Laude*, Williams College, English Literature, 1965**

Sean Bleything

**Consultant,
Consultant Division**

Role on Project

**Residential Retrofit
Low-Income Lead**

Experience

- **Rhode Island Energy Efficiency Resource Management Council Consultant Team:** Has led low-income team
- **DOE Consumer Behavior Study – Smart Grid Investment Grant:** Project lead for study
- **U.S. DOE Weatherization Training Center grant:** Managed grant and oversaw training activities
- **Charleston Energy Efficiency Partnership:** Provided guidance in design and program creation
- **ENERGY STAR[®], LEED for Homes, Building America Builders Challenge:** Certified homes through green building and energy efficiency programs
- **REM/Rate[™] energy modeling:** Conducted energy analyses to determine the cost effectiveness of energy upgrades
- **DOE Home Energy Professional Retrofit Certification:** Serves as subject matter expert

Professional Profile



Sean Bleything is a building analyst who provides residential technical assistance to energy efficiency programs nationwide. His area of specialty is low-income initiatives. He provides economic analyses of efficiency measures, programs, and policies. He creates and delivers energy efficiency trainings to residential construction industry professionals.

Prior to coming to VEIC, Sean held advisory and management positions at Southface Energy Institute, a clean energy solutions company offering market-based programming in sustainable energy. He oversaw the construction of the Southeast Weatherization and Energy Efficiency Training Center (5,000 square feet) and managed a Weatherization Training Center grant awarded by the U.S. Department of Energy (DOE). Sean was a program manager for the EarthCraft House Program, overseeing classroom and in-field training sessions for architects, contractors, and code officials.

Sean received a BA in History from the University of Kansas in 2003.

Leadership and Affiliations

- **Chair, BPI Residential Whole House Air Leakage Control Installer Certification Scheme Committee**
- **Weatherization Assistance Program National Trainers Consortium**

Education and Certifications

- **BA, University of Kansas, History, 2003**
- **BPI Building Analyst, Envelope Professional, Heating Professional, Air Leakage Control Installer, Test Proctor**
- **Level I Infrared Thermographer**
- **LEED Green Associate, AP HOMES**
- **EPA Certified Inspector**
- **NAHB Certified Green Professional**

Sam Dent

**Consultant,
Dent Energy Consulting, Ltd,
for VEIC**

Role on Project

Analyst

Experience

- **Rhode Island Technical Reference Manual (TRM):** Led annual review of residential measures and collaborated with National Grid to improve accuracy and transparency of prescriptive savings
- **Project Manager of Residential Energy Services Market Strategy and Technical Support:** Researched and created new efficient technology characterizations
- **Mid-Atlantic Technical Reference Manual:** Residential lead in the classification of electric measures for the creation of the TRM for Mid-Atlantic States
- **Ohio TRM:** Reviewed and developed residential electric measure characterizations
- **Iowa Office of Consumer Advocate:** Wrote testimony and rebuttal from review of five-year efficiency plans of three investor-owned utilities
- **Groton School, Massachusetts:** Developed comprehensive utility data tracking tool allowing the school to track changes in energy use from efficiency improvements

Professional Profile



Sam Dent is a professional energy efficiency evaluation and analysis specialist. He performs analytical research and consulting that supports regulatory compliance for efficiency and renewable energy programs.

He has led the characterization of residential measures for Technical Reference Manuals for Rhode Island, Vermont, Illinois, Ohio, and the Mid-Atlantic region. He provides supporting analytical documentation for legislative and regulatory testimony.

Sam has created and maintained multiple comprehensive Excel tools for internal staff to analyze energy usage and calculate potential savings for Lighting Power Density, Demand Control Ventilation, Heat and Energy Recovery Ventilation, Compressed Air Systems, and Residential Home Performance. He has researched and created technical resource policies and analysis methodologies for new energy efficient technologies. Sam has provided technical training and analytical and procedural support to staff and external energy professionals.

He has experience in both the residential and commercial efficiency markets, and a background in working effectively with large utilities.

A certified Home Energy Rater, Sam also holds a Bachelor of Science degree from the University of East Anglia, UK.

Education and Certifications

- **BS, University of East Anglia, Environmental Sciences, 2002**
- **Home Energy Rating System Training, October, 2008**
- **Fundamentals of Heating Ventilation and Air Conditioning Systems, February, 2008**
- **Building Analyst (Auditor) Course, September, 2004**

Kate Desrochers

Analyst
Consulting Division

Role on Project

Analyst

Experience

- **Air Force Encroachment Management Program:** Provided spatial and qualitative analysis that supported projects in Japan, United Kingdom, and Colorado's Front Range
- **Energy and land use conservation:** Researched and analyzed best practices for Marstel-Day
- **Chaired Marstel-Day's Green Vision Council:** Directed efforts to measure and improve internal conservation and sustainability efforts
- **ArcGIS 9.3 and 10.1:** High proficiency
- **Northern Forest Canoe Trail:** Implemented web forum and interactive map and maintained volunteer and donor databases
- **Dartmouth Sustainable Living Center:** Managed energy efficiency programming

Professional Profile



Kate Desrochers joined VEIC in Summer 2014 as an Analyst in the Consulting Division.

A recent graduate of Dartmouth College, Kate began her career at the environmental consultancy Marstel-Day. Her areas of specialty involve GIS modeling, advanced qualitative analysis, and communications engagement support. She has completed projects for the US government in Japan, the United Kingdom, and Colorado.

As an undergraduate at Dartmouth, Kate's research was in sustainability, land use management, and statistical analysis. Her research work has involved three substantive reports: "The Value of Vouchers: A Study of the Capitalization of the Vermont Voucher Program in Housing Values," "The Problems of Eco-System Management in the West Mountain Wildlife Management Area," and "The Statistical Importance of Anti-Truancy Programs."

While she was in college, Kate organized community conservation activities. She was also an intern for the Northern Forest Canoe Trail, where she created a map tool that helped limit the spread of aquatic invasive species.

Her other community activities have involved creating and carrying out curricula for sustainable living, community involvement, and green technologies.

Leadership and Affiliations

- **New England College Women's Regional Coordinator, 2011**

Education

- **BA, Dartmouth College, Geography, *magna cum Laude*, 2012**
- **University of Hyderabad, Hyderabad, India, 2011**

Rebecca Foster

Director, Consulting

Role on Project

Senior Project Advisor

Experience

- **New Jersey Clean Energy Program:** Program Design and Technical Project Advisor to the Honeywell Team that provides Market Manager services for Home Performance with ENERGY STAR, HVAC, lighting, consumer electronics, and appliances.
- **Super Efficient Dryers Initiative:** Project advisor spearheading a binational initiative working to bring new heat pump dryers to the US market. Liaison to the ENERGY STAR Program and to energy efficiency program sponsors.
- **U.S. Department of Energy, Better Buildings Neighborhood Program:** Technical expert and author of guidebooks and website content intended to improve improving the viability and effectiveness of residential retrofit programs.
- **Iowa Office of Consumers' Advocate:** Provided expert testimony and recommended improvements on the Iowa investor owned utilities' five year plans for their energy efficiency portfolios. This included recommendations on both policy issues, such as utility goals and cost effectiveness targets, and program design considerations, such as how best to reach underserved customers.

Professional Profile



Rebecca Foster is the Director of VEIC's Consulting Department. She has broad expertise in electric and gas energy efficiency program design and policy, with a deep emphasis on identifying and developing new energy savings opportunities in the residential sector. She oversees a staff of 30 consulting professionals, manages the department's operations, and undertakes special projects related to program design and research involving utility efficiency programs.

During her tenure at VEIC, which has included roles as a Managing Consultant and a Senior Consultant, Rebecca has led VEIC's work designing the residential efficiency programs for the New Jersey Clean Energy Program. She has also worked extensively with Consolidated Edison, recently named the "greenest utility in America" by Newsweek Magazine. Her work for Consolidated Edison has included leading a third-party review of their residential program portfolio and conducting a comprehensive research project to inform the utility's cost effectiveness screening. She has also provided expert testimony critiquing the 5-year energy efficiency programs proposed by the Iowa investor owned utilities, on behalf of the Iowa Office of Consumer's Advocate.

Rebecca's career began in 2000 at the Consortium for Energy Efficiency (CEE), where she directed the residential sector initiatives. This included developing program strategies to increase efficiency in lighting, appliances, air conditioners, consumer electronics, windows, new homes, and existing homes. She also authored and oversaw the publication of CEE's *Existing Homes Program Guide*.

Leadership and Affiliations

- **Program Planning Committee, ACI National Conference Program, 2012**

Education

- **MBA, high honors, Beta Gamma Sigma, Simmons College, 2010**
- **BA, summa cum Laude, Phi Beta Kappa, Boston University, Psychology, 1999**

George Lawrence

**Consultant,
Consulting Division**

Role on Project

**Commercial and Industrial
Expert**

Experience

- **Rhode Island Office of Energy Resources:** Provides ongoing support to the Rhode Island Public Energy Partnership focusing on promoting energy efficiency at municipal buildings, water treatment plants, and public schools
- **Commonwealth Edison:** Identified the potential for technical and behavioral energy efficiency in Chicago and assessed saturation and penetration levels of standard and efficient equipment in markets
- **Consolidated Edison:** Researched the availability and incremental costs for baseline and efficient equipment
- **NYSERDA:** Oversaw a section of the 2012 potential study regarding the renewable energy potential for the New York State Energy Plan.
- **New York Power Authority:** Managed the section on renewable energy for the 2011 NYPA study of efficiency and renewable energy potential.
- **U.S. Department of Energy, Oak Ridge National Laboratory:** Helped design programming to support technical assistance to municipal governments receiving Energy Efficiency and Conservation

Professional Profile



George Lawrence manages Commercial and Industrial energy efficiency projects for medium-sized and large enterprises. He designs, reviews, and critiques energy efficiency and renewable energy programs and policies for the commercial, industrial, and institutional markets. His work ranges from conducting research and economic analysis of efficiency measures, programs, and policies to assisting organizational business development.

He has worked closely with National Grid's C&I strategy and planning team, advising on initiatives, market segmentation. He has also negotiated incentive agreements. George has led the research effort in identifying new program opportunities for natural gas savings in the EERMC-funded Gas Opportunity report.

He has completed program design for a technical assistance project with Oak Ridge National Laboratory (ORNL), market initiative analysis for the DC Sustainable Energy Utility, and evaluations in cost-effectiveness and comprehensiveness for New Hampshire's Commercial and Industrial energy efficiency programs. Prior to working for the Consulting Division, he was a Planning and Development Manager for Efficiency Vermont. He has also been an Energy Consultant for that contract.

Education

- **BS, Middlebury College, Physics, 1989**

Certifications

- **Certified Practitioner in Industrial Energy Management Systems (Institute for Energy Management Professionals)**
- **Certified Energy Manager (Association of Energy Engineers)**
- **Certified Energy Auditor (Association of Energy Engineers)**
- **AirMaster+ Specialist (US DOE)**
- **Building Performance Institute: Building Analyst, Envelope, and Heating Certifications**

MIKE GUERARD
MANAGING CONSULTANT

Mike Guerard, an Optimal Energy, Inc. Managing Consultant, has over 20 years of experience in the energy efficiency, green building and the renewable energy industry. He has developed and managed a wide-range of energy efficiency programs throughout New England and the Pacific Northwest. These have included large-scale residential retrofit and new construction programs, green building initiatives, and projects funded by federal and state entities. His role in delivering these efforts included overseeing dozens of internal staff covering field delivery, technical specifications and enhancements, marketing and administration, while also working collaboratively to achieve positive program results and significant energy savings with a wide range of stakeholders including utility staff, government officials, state building code and energy office staff, and leading building scientists. In his current role as Managing Consultant, he brings the experience gained in implementation to support design, planning and oversight of residential and C&I programs in multiple jurisdictions for a wide variety of clients.

PROFESSIONAL EXPERIENCE

Optimal Energy, Inc.

Providence, RI

Managing Consultant, July 2008 to present

Primary role is to provide project management, research, stakeholder coordination and technical analysis to support clients' development of strategies for achieving energy efficiency and attainment of least-cost resources. Main clients have included:

- Rhode Island Energy Efficiency and Resources Management Council.
- Massachusetts Energy Efficiency Advisory Council.
- Tennessee Valley Authority
- Long Island Power Authority for the Clean Energy Initiative.

Conservation Services Group, Inc. (1991 – 2008)

Westborough, MA

Senior Project Manager, 2006-June 2008

- Primary responsibility to direct CSG's research, development and delivery of LEED for Homes provider services; the launch of a Northeast regional green building program, Earth Advantage; and multi-family new construction initiatives.
- Provided coordinated development of the technical, program, staff and business strategies to address serving these new initiatives for the company.

Program Manager, Pacific Northwest New Construction Programs, 2004-2006

- Developed, launched and managed the ENERGY STAR-labeled Home™ Program in the Pacific Northwest for the Energy Trust of Oregon and the Northwest Energy Efficiency Alliance, covering Oregon, Washington, Idaho, and Montana
- Hired and managed staff; coordinated operations with primary partner and minor partners; served as primary liaison with multiple stakeholders including state energy offices and universities
- Served on board of PNW Technical Review Committee, to establish and advance program technical standards and protocols

Director, New England Residential Energy Services, 2000-2003:

- Overall management of over 50 staff delivering thousands of energy audits and new home certifications annually throughout New England, along with the associated building science training and contractor infrastructure development required to successfully complete production levels.
- Provided primary interface with multiple utility clients and other funding sources, and oversight of all required tracking, reporting and analysis

Program Management Roles, 1991-2000

- 1998-2000, Program Manager, ENERGY STAR Homes
- 1996-1997, Developed successful grant request, and subsequently managed and delivered *HERS: Infrastructure Development for the Northeast HERS Alliance* funded by the U.S. Department of Energy
- 1995-1997, Developed successful grant request, and subsequently managed and delivered *Promotion and Evaluation of Energy Efficient New Construction in the Northeast* funded by the U.S. EPA
- 1994-1998, Program Manager, EUA Lighting Program
- 1994-1995, Program Manager, Advanced Retrofit pilot program
- 1991-1997, Program Manager, Energy Crafted Homes Program

EDUCATION

University of Kansas and Goethe Institute, graduate studies

University of Rhode Island and Rhode Island College, Bachelor's degrees

SAMUEL C. HUNTINGTON
CONSULTANT

Mr. Huntington joined Optimal Energy in 2009 where he provides analytical support on a variety of projects, including development of technical reference manuals, efficiency measure characterization, potential studies, and critical review of efficiency program plans. In addition, he manages the development and maintenance of Optimal Energy's various cost-effectiveness screening and DSM-forecasting tools. Recently, Sam has been involved with technical analysis, program assessment, and forecasting efforts in support of Efficiency Vermont, the Massachusetts Energy Efficiency Advisory Council, and the New York State Energy Research and Development Authority. Sam also assists the Connecticut Municipal Electrical Energy Cooperative with submissions and compliance reviews for their participation in the ISO NE Forward Capacity Market. Mr. Huntington holds a B.S. in Mathematical Sciences from Colby College.

PROFESSIONAL EXPERIENCE

Optimal Energy, Inc.

Providence, RI

Consultant, 2014

Analyst, 2009-2013

- Lead Analyst on a statewide energy efficiency and renewable energy potential study for the New York State Energy Research and Development Authority
- Lead Analyst on a statewide energy efficiency potential study for the Delaware Department of Natural Resources and Environmental Control
- Contributing Analyst to a study of the statewide energy efficiency in Vermont, as well as a study of the energy efficiency potential in New York's government-owned facilities
- Contributing Analyst to the development of commercial and industrial measure characterizations for a Technical Reference Manual for use by various Ohio municipal utilities
- Ongoing support Analyst to the Massachusetts Energy Efficiency Advisory Council with regards to the annual update and release process of their technical reference manuals.
- Ongoing support Analyst to the Rhode Island Energy Efficiency and Resource Management Council. Responsibilities include: goals tracking,

- Ongoing support Analyst to the Connecticut Municipal Electrical Energy Cooperative with regards to their ISO-NE Forward Capacity Market submissions and DSM program implementation
- Contributing Analyst to market and measure characterizations of emerging technologies for Duke Energy in Ohio, North Carolina, and South Carolina
- Contributing Analyst to the modeling analyses and reports on the economic impacts of ratepayer funded energy efficiency investments in Vermont and Michigan
- Contributing Analyst to the critical review and development of residential program strategies in the Five-Year Energy Efficiency Plan for the Tennessee Valley Authority
- Contributing Analyst to market research and analysis, and program strategy recommendations in support of commercial efficiency programs in Ohio
- Primary contributor to a market research report on commercial refrigeration for Efficiency Vermont
- Primary contributor to a market research report on the hospitality and commercial kitchen market sectors for Efficiency Vermont
- Lead developer of Optimal's Project Tracking Database
- Contributing developer and maintenance lead for Optimal's Portfolio Screening Tool and Project Screening Tool

New England Housewrights

Charlotte, VT

Assistant Homebuilder, 2007-2009

- Assisted with design and construction of LEED certified homes
- Worked with various tradespeople to install critical building systems such as the electric, plumbing, and HVAC

EDUCATION

B.S. Mathematical Sciences, Colby College, Waterville, ME, 2008

Summer Study in Urban Design, Harvard Graduate School of Design, Cambridge, MA, 2009

PUBLICATIONS

"Economic Impacts of Energy Efficiency Investments in Vermont," 2012 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA, August 2012.

CLIFFORD S. MCDONALD
CONSULTANT

Mr. McDonald has over 6 years of experience with various policy and technical issues relating to energy efficiency, renewable energy, and LEED. In addition to his professional experience, Mr. McDonald has performed long-term volunteer work in South America promoting environmental causes and sustainable development.

PROFESSIONAL EXPERIENCE

Optimal Energy, Inc.

Hinesburg, VT

Analyst 2006-2007/Senior Analyst August 2009-2011/Consultant January 2012-present

- Perform financial and cost-effectiveness analyses of efficiency programs and measures
- Develop measure characterizations for TRMs and cost-effectiveness screenings
- Develop memos and white papers on energy efficiency best practices
- Perform program reviews, including savings and incentive analyses
- Provide energy efficiency project technical support to utilities and program implementers

Viridian Energy and Environmental

New York, NY

Energy Analyst, 2008- 2009

- Used DOE2 to create energy models to analyze the energy use in existing and new construction buildings
- Developed specific recommendations on the implementation of energy efficiency measures
- Worked with architects and developers to get LEED certification on new construction projects and building renovations

University of Pennsylvania Medical Center

Philadelphia, PA

Medical Physics Researcher, Summers 2004 and 2005, April – August 2008

- Used computer simulations and Monte Carlo algorithms to support development of new, state-of-the-art proton therapy center for cancer treatment
- Developed recommendations on materials and dimensions to be used in multi-leaf collimator

- Created micro-dosimetry simulations to investigate neutron doses at a molecular level

Volunteer Experience

- Taught environmental issues and alternative income methods in the Peruvian Amazon
- Taught English and environmental issues in Quilotoa, Ecuador, a small indigenous village
- Developed bio-diesel capability at an organic permaculture farm in Bahía, Ecuador

EDUCATION

B.S., Physics, Middlebury College, Middlebury, VT, 2006

HIGHLIGHTS OF PROJECT EXPERIENCE

- Created an analysis of electric-sector emission reductions for the New York State Climate Action Plan
- Provided implementation support for Orange & Rockland Utilities, including verifying savings estimations, screening custom projects for cost-effectiveness, and reviewing the incentives offered
- Used building modeling to develop prescriptive savings recommendations for VFDs.
- Wrote paper on the potential of continuing Pennsylvania's efficiency programs, and their economic and environmental benefits.
- Performed review of NYPA's efficiency projects, and developed recommendations concerning NYPA's Evaluation, Measurement, and Verification protocols
- Developed recommendations for an industrial sector energy efficiency program for NYPA, and provided an analysis of its potential costs and benefits
- Developed an operations manual for LIPA's commercial efficiency programs
- Researched efficiency program best practices in data centers and commercial leased spaces
- Developed measure characterizations for Technical Resource Manuals in New Brunswick, Vermont, and Long Island
- Completed market analysis of energy efficiency opportunities for commercial kitchen equipment
- Wrote white papers on the costs and benefits of commissioning and power factor correction
- Co-authored US Environmental Protection Agency guides to action on potential studies and clean energy funds

- Provided retro-screening information to Connecticut Municipal Utilities

PHILIP H. MOSENTHAL
PARTNER

Mr. Mosenthal has over 25 years' experience in energy efficiency consulting, including facility energy management, utility and state planning, program design, implementation, evaluation and research. He has particular expertise in the commercial, industrial and institutional sectors. Mr. Mosenthal has developed numerous utility, state and region integrated resource and DSM plans, and designed and evaluated residential, commercial and industrial energy efficiency programs throughout North America and in Europe and China. Mr. Mosenthal has played key roles in utility collaboratives and has successfully worked to build consensus among diverse parties in various assignments.

PROFESSIONAL EXPERIENCE

Optimal Energy, Inc.

Hinesburg, VT

Founding Partner, 1996-present

Consult with electric and gas utilities, governments and other non-utility parties on energy efficiency, resource planning and regulatory issues. Develop strategies for achieving energy efficiency and least-cost resources, including administrator funding and incentive mechanisms, and program and market design and analysis. Current or recent projects relevant to this procurement include:

- Advisor for the commercial and industrial programs for the Massachusetts Energy Efficiency Advisory Council, led by the Massachusetts Department of Energy Resources. Responsible for representing non-utility parties interests on the design, development, implementation and evaluation of all Massachusetts Program Administrator's portfolios of C&I programs. This project involves supporting the PAs in developing and implementing a set of SBC-funded C&I programs. (2000-present)
- Chief architect of Efficiency Vermont, the nation's first and only state efficiency utility, as well as advisor on C&I planning and program design to Efficiency Vermont. Managed program design, development and planning. Includes design, development and start-up of programs to serve the commercial, industrial, institutional and agricultural sectors in Vermont. (2000 – present)
- Advisor to the Illinois Attorney General on policy, planning, program design and evaluation and utility oversight regarding Commonwealth Edison's and Ameren Illinois' efficiency programs. This project included expert testimony on development of initial

plans, funding mechanisms, policy and evaluation and verification issues. Currently, Mr. Mosenthal represents the AG in a collaborative addressing all issues surrounding planning, development, implementation and evaluation. For ILL AG (2007 – present).

- Lead researcher on energy efficiency issues for EPA's Clean Energy Partnerships with State and Local Government to advance State Clean Energy Action Plans. (2006 – present)
- Manager of electric and natural gas efficiency and renewable potential assessments for New York State Energy Research and Development Authority. (2005 – present)

Resource Insight, Inc.

Middlebury, VT

Senior Research Associate, 1995-1996

Consulted on DSM planning, program design, monitoring and evaluation, and resource characterization, specializing in the commercial and industrial sectors. Projects performed on behalf of utility and non-utility parties, in both cooperative settings and in contested regulatory proceedings.

Xenergy, Inc. (now Kema)

Allendale, NJ

Chief Consultant, 1990-1995

Managed the consulting division for Xenergy's (now Kema's) Research, Planning and Evaluation Group (RP&E) in its Mid-Atlantic Region. Responsibilities included direct utility consulting, as well as marketing, administration and staff management for RP&E. Consulting activities focused on assessment of DSM technology potential, DSM planning, program design and development, and process and impact evaluation for electric and gas utilities.

EDUCATION

M.S., Energy Management and Policy, University of Pennsylvania, Philadelphia, PA, 1990, 4.0 GPA.

B.A., Design of the Environment, University of Pennsylvania, Philadelphia, PA, 1982.

Certificate in Electrical Engineering, Pennsylvania State University, Ambler, PA, 1984.



RICHARD FAESY, PRINCIPAL

EDUCATION

M.S. Coursework in Energy Management & Policy, University of Pennsylvania, 1986
B.S., Resource Economics and Environmental Studies, University of Vermont, 1983

EXPERIENCE

2010-present: Principal, Energy Futures Group, Hinesburg, VT
2000-2010: Energy Efficiency Division Manager, Vermont Energy Investment Corporation (VEIC), Burlington, VT
1986-2000: Director, Energy Rated Homes of Vermont (ERH-VT), Burlington, VT
1989-2000: Development Director, Single Family Services, VEIC, Burlington, VT

PROFESSIONAL SUMMARY

As a Certified Energy Rater and LEED Accredited Professional, Richard Faesy is an expert in residential and multifamily energy efficiency programs, technologies and markets, including retrofits, labeling, new construction, home energy rating systems (HERS), energy codes, green building, financing and effective market characterization, program design, policy and implementation. He has been active locally, regionally, and nationally in all of these areas for more than 25 years. Richard helped create and was the founding president of the board of the Northeast HERS Alliance and was a founding board member of the Residential Energy Services Network (RESNET), including a term as president. Richard was featured in a national Dateline/NBC story on energy efficiency and was awarded RESNET's Lifetime Achievement Award. As a leader and technical expert, he has a reputation for delivering fresh thinking grounded in reality.

PROJECTS

- ***Connecticut Energy Efficiency Board.*** Residential programs advisor assisting the Board with goal setting, utility oversight and planning and technical assistance. 2007-present.
- ***Efficiency Maine.*** Team lead for development of Maine Residential New Construction Technical Baseline Study, resulting in influencing adoption of Maine's energy code. 2007- 2008. Low Income Multifamily Program evaluation with NMR Group, 2014.
- ***Efficiency Vermont.*** Senior Advisor for residential program design, implementation support and policy guidance for Vermont's statewide, award-winning energy efficiency utility. Focus on residential retrofit programs, fuel dealer partnerships, cold climate heat pump program, home energy labeling. 2000-present.
- ***Energy Foundation.*** Interviewed national experts and developed report to a consortium of philanthropic foundations on ramping up the residential retrofit market in the U.S. 2012.
- ***Green Mountain Power.*** Led the development of a new cold climate heat pump program to introduce this emerging technology to Vermont. Supported partnership between Efficiency Vermont and Vermont Fuel Dealers Association in promoting heat pump installations. 2013-2014.
- ***High Meadows Fund (Vermont Community Foundation).*** Interviews and research of Vermont Home Performance contractors and fuel dealers, report, presentations and follow-on



RICHARD FAESY, PRINCIPAL

market support, including development of partnership with Vermont Fuel Dealers Association, business support and development of Efficiency Excellence Network. 2012-present.

- ***Iowa Office of Consumer Advocate.*** Team lead and senior advisor for utility program portfolio review, testimony development, and on-going program modifications and enhancements. 2008-present.
- ***Joint Management Committee (Massachusetts, Connecticut, Rhode Island and New Hampshire utilities).*** Oversight of the regional ENERGY STAR Homes Programs as a representative for the non-utility parties. 2003-2007.
- ***Long Island Power Authority.*** Team lead on program design, planning, policy guidance and technical assistance on residential and multifamily sectors and development of Long Island Residential New Construction Technical Baseline Study. 2003-2010.
- ***Massachusetts Energy Efficiency Advisory Council.*** Consultant overseeing the residential new construction and existing homes programs in Massachusetts. 2007-present.
- ***New Jersey Office of Clean Energy, Board of Public Utilities.*** Senior Advisor for program design and oversight of New Jersey ENERGY STAR Homes Program assisting the Honeywell Team and the Office of Clean Energy design and develop program modifications and enhancements, set goals, and provide budgeting and implementation assistance. 2004-2010.
- ***Rhode Island Energy Efficiency and Resource Management Council.*** Consultant leading the residential team and overseeing the residential new construction and existing homes programs in Rhode Island. 2008-present.
- ***U.S. Department of Energy/Oak Ridge National Laboratory.*** Senior Advisor and Aggregated Products lead for Program Design Team of DOE's Technical Assistance Project for American Recovery and Reinvestment Act (ARRA) communities and states. 2010-2011.
- ***Vermont Public Service Department.*** Multiple projects including development of the Vermont Energy Code Compliance Plan (2011 – 2012), development of report to the Vermont Legislature on Vermont Home Energy Score and Label. (2012 – 2014), and energy code update support (2014).

SELECTED PUBLICATIONS

- Residential Building Energy Scoring and Labeling – An Update from the Leading States, (with L. Badger, D. Ferington, I. Finlayson, J. Jane and E. Levin), Proceedings of ACEEE 2014 Summer Study on Energy Efficiency in Buildings, (to be published) August 2014.
- How Energy Code Compliance Programs Can Generate More Savings Opportunities, with N. Corsetti, April 2014.
- Attributing Building Energy Code Savings to Energy Efficiency Programs, with the Cadmus Group, Inc. for Northeast Energy Efficiency Partnerships (NEEP), The Edison Foundation and Institute for Market Transformation, February 2013.
- Accelerating Energy Efficiency in the New Construction Market with Stretch Codes, Proceedings of ACEEE 2012 Summer Study on Energy Efficiency in Buildings, August 2012.



JIM GREVATT, MANAGING CONSULTANT

EDUCATION

B.F.A., University Honors, University of Illinois, 1982

EXPERIENCE

2013-present: Managing Consultant, Energy Futures Group, Hinesburg, VT
2012-2013: Director, Targeted Implementation, Vermont Energy Investment Corp., Burlington, VT
2011-2012: Director, Residential Energy Services, District of Columbia Sustainable Energy Utility
for Vermont Energy Investment Corp., Washington, D.C. and Burlington, VT
2010-2012: Managing Consultant, Vermont Energy Investment Corporation, Burlington, VT
2005-2010: Director, Residential Services, Vermont Energy Investment Corp., Burlington, VT
2001-2005: Manager, Energy Services, Vermont Gas Systems, S. Burlington, VT
1998-2001: Manager, Residential Energy Services, Vermont Gas Systems, S. Burlington, VT
1996-1998: Manager, HomeBase Retrofit Program, Vermont Gas Systems, S. Burlington, VT
1994-1996: Technical Specialist, Vermont Gas Systems, S. Burlington, VT
1991-1994: Associate Director and Technical Specialist, Champlain Valley Weatherization Program,
Burlington, VT

PROFESSIONAL SUMMARY

Jim Grevatt brings over 20 years' experience as a leadership professional in energy efficiency program operations to his consulting practice. Jim uses an in-depth knowledge of the nuts and bolts of running programs and a clear understanding of strategic thinking and planning to ensure that programs achieve their desired market impacts. Throughout his career, Jim has focused on building strong relationships with staff, peers, trade allies, and clients as the best way to understand the needs and challenges that each sector faces. As Director of Residential Services for Efficiency Vermont for over five years, and then in the same role for the District of Columbia Sustainable Energy Utility for its startup operation, Jim has hands-on experience with industry-leading markets-based approaches to managing energy efficiency programs, including multi-family, low income, residential retrofit, new construction, HVAC, and efficient products programs. In his leadership role he was responsible for policy interactions with regulators, and for assuring that program processes were efficient and effective. Prior to his roles with Vermont Energy Investment Corporation, Jim managed Vermont Gas' residential and commercial energy efficiency programs. In each of these roles Jim had overall responsibility both for program design and delivering results.

SELECTED PROJECTS

- ***Evaluation of Efficiency Maine Low-Income Multi-Family Weatherization Program-*** Responsible for program staff and building owner interviews and process evaluation under contract to NMR and Efficiency Maine (2014)
- ***Regulatory Assistance Project-*** Provide technical support to energy efficiency advocates in proceedings in Maryland and Mississippi (2013-2014)
- ***Better Buildings Solutions Center, U. S. Department of Energy-*** Energy Futures Group's lead author in drafting and reviewing web content for ten how-to "handbooks" detailing proven approaches to designing and implementing residential retrofit efficiency programs (2013-2014)



JIM GREVATT, MANAGING CONSULTANT

- ***Natural Resources Defense Council-*** Provided expert witness testimony in support of NRDC's intervention in Ameren Illinois' 2014-2016 energy efficiency plan. Testimony demonstrated that Ameren would be capable of capturing significantly greater efficiency savings than it had proposed (2013)
- ***Energy Savings Potential Study, Delaware Department of Natural Resources-*** led narrative development for the residential programs for a study of the energy efficiency savings potential in Delaware (2013-2014)
- ***Utility Program Benchmarking-*** led research on behalf of a California IOU to compare the cost of saved energy across ~10 leading utility portfolios. The research sought to determine if there are discernable differences in the cost of saved energy related to utility spending in specific non-incentive categories, including administration, marketing, and EM&V (2013)
- ***Research on trends in multi-family, HVAC, and new construction programs-*** developed an analysis of emerging program trends on behalf of a leading energy efficiency industry firm (2013-2014)
- ***Efficiency Power Plant, Regulatory Assistance Project-*** Partnered with RAP to develop a demonstration tool to show how energy efficiency measures can be used to mitigate air quality impacts related to power production (2013)
- ***Natural Gas Energy Efficiency Analysis, the Green Energy Coalition-*** Provided analytical support to demonstrate in testimony that Enbridge Gas could reduce the scale of its proposed pipeline expansion by implementing aggressive energy efficiency programs (2013)
- ***Targeted Implementation, VEIC-*** Responsible for market analysis and strategic planning for a new division expanding VEIC's energy efficiency program implementation projects (2012-2013)
- ***DC Sustainable Energy Utility-*** Led the planning and startup implementation of Residential programs for the DC SEU, including single and multi-family and retail market programs. Led the development of the initial portfolio-level Annual Plan. Led client and partner interactions around planning and policy development. Member of DC SEU Senior Management Team (2011-2012)
- ***EmPOWER Maryland Critical Program Review-*** Expert consultant to the Maryland Office of Peoples' Counsel in EmPOWER Maryland hearings regarding utility energy efficiency planning and reporting. Represented the OPC in stakeholder meetings that informed the current 2012-2014 EmPOWER plans. Multiple appearances before the Maryland Public Service Commission. (2010-2012)
- ***Efficiency Vermont 20 year Forecast of Efficiency Potential-*** Senior Advisor in developing the forecast scenarios that led to significantly increased efficiency investment in Vermont (2010-2011)
- ***Efficiency Vermont Residential Programs-*** Directed 100% growth in program budgets to nearly \$10M annually. Responsible for strategic direction, leadership, and results for Efficiency



JIM GREVATT, MANAGING CONSULTANT

Vermont's award-winning residential retrofit, new construction, retail, and low income programs. Supported excellence in a staff of 30 (2005-2010).

- ***Vermont Gas Systems Efficiency Program Leader-*** Directed strategic planning and program operations that led to six programs and portfolio as a whole being recognized as exemplary in Responding to the Natural Gas Crisis: America's Best Natural Gas Energy Efficiency Programs (ACEEE, 2003). Built contractor infrastructure and internal support to consistently meet program objectives. Led development of Annual Reports, planning and budgeting. Collaborated with Efficiency Vermont staff to develop a fuel-blind, state-wide, jointly offered residential new construction program (2001-2005)
- ***Residential Retrofit Program Development-*** Enhanced design and performance of VGS' residential retrofit offerings by streamlining delivery and building strong relationships with contractors, homeowners, and property managers (1994-2005)
- ***Demonstrated Technical Excellence in Approaches to Residential Retrofits*** Conducted hundreds of residential energy audits and quality assurance inspections for natural gas and alternative-fueled homes. Trained and coached installers to obtain desired quality. Worked to satisfy homeowners through explanation, education, sound listening to concerns, and ultimately assuring that concerns were addressed. Trained new staff in auditing techniques. (1991-1998)

SELECTED PUBLICATIONS AND PRESENTATIONS

Residential Retrofit Programs: What's Working? Perspectives from National Program Leaders- Panelist at AESP National Conference 2012

Elements of Retrofit Program Incentive Design- DOE Technical Assistance Program Publication, April, 2011

Designing Effective Incentives to Drive Residential Retrofit Participation- DOE Technical Assistance Program Webinar, October, 2010

Quality Assurance for Residential Retrofit Programs- DOE Technical Assistance Program Webinar, October, 2010

Home Performance with ENERGY STAR, Quality Assurance in Vermont- Panelist at the ACI Home Energy Retrofit Summit, April 2010

Delivering on the Promise-Engaging Communities and the Public- Panelist at 2010 NEEP Summit, March, 2010

Home Performance with Energy Star in Vermont - Presentation at CEE Member meeting, June 2009

Leading by Example: Exemplary Low Income Energy Efficiency Programs –Presented on Efficiency Vermont's Residential low income services at California's Low Income Energy Efficiency Symposium, June 2006

"Natural Gas Efficiency Policies, Responding to the Natural Gas Crisis One Therm at a Time" - Co-presented with Dan York and Anna Monis Shipley of American Council for an Energy-Efficient Economy (ACEEE) -ACEEE/CEE Market Transformation Symposium, 2004



GLENN REED, PRINCIPAL

EDUCATION

M.S., Energy Management and Policy, University of Pennsylvania, 1982

B.A., Biology, Wesleyan University, 1979

EXPERIENCE

2010-present: Principal, Energy Futures Group, Hinesburg, VT

2005-2010: Managing Consultant, Vermont Energy Investment Corporation, Burlington, VT

2001-2005: Dir. of Regional Initiatives, Northeast Energy Efficiency Partnerships, Lexington, MA

1987-2000: Deputy Dir. of East Coast Consulting, XENERGY, Inc. (now DNV GL), Burlington, MA

1983-1987: Principal Planner, Massachusetts Executive Office of Energy Resources, Boston, MA

PROFESSIONAL SUMMARY

Glenn Reed has more than 25 years experience in demand-side management (DSM) program planning and evaluation; energy-efficiency policy development and implementation; building codes and appliance standards development; and group facilitation and consensus building. Mr. Reed currently is a lead residential advisor to both the Rhode Island Energy Efficiency Resource Management Council (EERMC) and to the Massachusetts Energy Efficiency Advisory Council (EEAC) assisting and overseeing program design and implementation of residential lighting, appliance, HVAC, and consumer electronics programs. As the lead residential Technical Consultant to the Connecticut Energy Efficiency Board (EEB), he plays a similar, though somewhat broader, technical assistance and oversight role in that state. In addition to his on-going work in Massachusetts, Connecticut, and Rhode Island, Mr. Reed is currently supporting stakeholder engagements in Oklahoma, Delaware and Pennsylvania.

SELECTED PROJECTS

- ***Rhode Island Energy Efficiency Resource Management Council.*** Senior Advisor providing on-going technical and programmatic advice to, and oversight of, Rhode Island's residential efficient products (lighting, appliances and consumer electronics) and HVAC programs. Works closely with National Grid staff to develop cost-effective program designs and goals for their energy efficiency plans.
- ***Massachusetts Energy Efficiency Advisory Council.*** Provides on-going technical and programmatic advice to, and oversight of, the Massachusetts gas and electric program administrators' residential efficient products (lighting, appliances and consumer electronics) and HVAC programs. This includes review of key screening tool inputs and development of three-year program savings goals. Also assists Council evaluation consultants in review of key residential evaluation and market research studies.
- ***Connecticut Energy Efficiency Board (EEB).*** Leads residential team to provide oversight of the state's electric and gas residential efficiency programs. Works closely with the state's utilities to develop, implement, and evaluate cost-effective program designs and goals for the annual Conservation and Load Management Plan.
- ***New York State Energy and Research Development Authority (NYSERDA).*** Part of evaluation oversight team currently assisting NYERDA with planning, coordinating, implementing



GLENN REED, PRINCIPAL

and reviewing a wide range of program evaluation efforts. Principal engagement has been on evaluation of NYSERDA's residential lighting program and transportation RD&D activities.

- ***Delaware Potential Study and Preliminary Program Designs, Delaware Department of Natural Resources and Environmental Control (DNREC).*** Led EFG's support of the residential components of this two phase study. Reviewed all measure characterizations and program and sector savings estimates. Developed draft and final program descriptions and assisted in program budget development.
- ***Oklahoma Sustainability Network (OSN).*** Providing ongoing support to this key stakeholder group. Have assisted with re-writing the state's DSM rules and provided critical review of the utilities' 2013 annual reports. Currently providing review and comment on an ongoing statewide technical, economic and achievable potential study.
- ***PennFUTURE and Keystone Energy Efficiency Alliance.*** Providing technical support for those two efficiency stakeholder groups in Pennsylvania. Assisting with review of ongoing energy efficiency potential study that will inform proposed goals for the utilities' next multi-year plan.
- ***Regulatory Assistance Project (RAP).*** Co-authored report on the ten most common pitfalls encountered when performing potential studies: *Ten Pitfalls of Potential Studies*. Co-presented webinar on report findings.
- ***Alliance for Affordable Energy.*** Provided technical support for this New Orleans-based stakeholder organization. As part of Entergy's IRP proceeding completed detailed review of comprehensive energy efficiency potential study.
- ***Management of Regional Market Transformation Initiatives.*** Responsible for NEEP's six residential and C&I regional market transformation Initiatives - ENERGY STAR[®] Products, Residential HVAC, ENERGY STAR Windows, Premium Efficiency Motors, Unitary HVAC and C&I Information Exchange - and for Initiative-related research and evaluation activities.

SELECTED PUBLICATIONS

- *Northeast Residential Lighting Strategy.* (With Optimal Energy, D&R International, and Ecova). Northeast Energy Efficiency Partnerships. Lexington, MA. March 2012
- *The Costs and Benefits of Measuring if States Meet 90% Compliance with Building Codes.* R. Wirtshafter, Glenn Reed, et. al.), Proceedings of the International Energy Program Evaluation Conference (IEPEC), August 2011.
- *Do CFLs Still Pass the Test.* Chris Granda and Glenn Reed. Home Energy. May/June 2010.
- *Comparative Performance of Electrical Energy Efficiency Portfolios in Seven Northeast States.* Stuart Slote, Glenn Reed, and John Plunkett. 2006 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, California, August 2006.

Ralph PrahL, Independent Consultant

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EXPERIENCE

1990-Present: Independent Consultant

Advised public agencies and collaboratives on the planning, review and oversight of energy efficiency program evaluation and market assessment activities. Clients included the Wisconsin, California, Massachusetts, New York, Connecticut and Vermont PUCs; the National Association of Regulatory Utility Commissions; the Wisconsin Department of Administration; the Massachusetts Department of Energy Resources; the Long Island Power Authority; the Massachusetts Energy Efficiency Advisory Council and Non-Utility Parties; and the Northwest Energy Efficiency Alliance. Selected recent assignments include:

- Evaluation planning, review and oversight consultant to the Massachusetts Energy Efficiency Advisory Council, Department of Energy Resources, and Non-Utility Parties, 1998-present.
- Evaluation advisor to the California PUC, 2010-present
- Evaluation advisor to the New York Department of Public Service, 2008-present
- Lead evaluation planner and reviewer for the Wisconsin statewide public benefits evaluation team, 1999-2011.
- Evaluation advisor to the New York Power Authority, 2009-2010
- Assisting the California PUC in overseeing a series of market effects studies, 2007-2010 (subcontractor to the California Institute for Energy Efficiency)
- Evaluation planning and review consultant to Efficiency Vermont, 1999-2010.
- Evaluation planning and review advisor for the Long Island Power Authority, 1999-2010 (subcontractor to Optimal Energy).
- Assisting the New England states and ISO in developing regional Measurement and Verification protocols for use in the Forward Capacity Market, 2006-2007
- Primary overseer of energy efficiency evaluation efforts in California on behalf of the California Board for Energy Efficiency and the California PUC, 1997-2000.
- Independent reviewer of the evaluation activities of the California utilities on behalf of the California PUC, 1995-2000.

1985-1997: Coordinator of Energy Efficiency Evaluation and Research, Public Service Commission of Wisconsin

Provided regulatory oversight for the program evaluation, market assessment and R&D efforts of the Wisconsin utilities in support of their energy efficiency programs. Played a leading role in conceiving, developing, and overseeing the Energy Center of Wisconsin, a unique state-level research consortium. Served as an in-house consultant on a wide range of regulatory issues involving statistical analysis and applied social research.

EDUCATION

1985. M.A., Sociology, University of Wisconsin-Madison.
1982. B.S., History, University of Wisconsin-Madison.
1982. B.A., Journalism, University of Wisconsin - Madison.

PUBLICATIONS

1. Conference Papers

Provencher, Bill, Bethany Vittetoe-Glinsmann, Anne Dougherty, Katherine Randazzo, Phil Moffitt, and Ralph Prah, 2013. "Some Insights on Matching Methods in Estimating Energy Savings for an Opt-In, Behavioral-Based Energy Efficiency Program." In *Proceedings of the 2013 International Energy Program Evaluation Conference*. Chicago, IL.

Hoefgen, Lynn, Lisa Wilson-Wright, Chris Russell, Matt Nelson, Wendy Todd, Ralph Prah, Glenn Reed, and Scott Dimetrosky, 2013. "Study It 'til You're Sick of It: CFL Research as an Example for Other Efficiency Markets." In *Proceedings of the 2013 International Energy Program Evaluation Conference*. Chicago, IL.

Ridge, Richard, Michael Baker, Nick Hall, Ralph Prah and William Saxonis, 2013. "Gross is Gross and Net is Net: Simple, Right?" In *Proceedings of the 2013 International Energy Program Evaluation Conference*. Chicago, IL.

The Estimation of Spillover: EM&V's Orphan Gets a Home
Prah, Ralph, Richard Ridge, Nick Hall and William Saxonis, 2013. "The Estimation of Spillover: EM&V's Orphan Gets a Home." In *Proceedings of the 2013 International Energy Program Evaluation Conference*. Chicago, IL.

Rathbun, Pam, Miriam L. Goldberg, Ralph Prah and Monica Cohen, 2012. "And Now Over to Massachusetts: Developing Standardized NTG Approaches." In *Proceedings of the 2012 AESP Annual Conference*.

Clendenning, Greg, Gail Azulay, Cheryl Browne, Monica Cohen, Lindsay Perry and Ralph Prah, 2012. "Measuring Participant Perspective Non-Energy Impacts (NEIs)." In *Proceedings of the 2012 ACEEE Summer Study on Energy Efficiency in Buildings*.

Vine, Edward, Nick Hall, Kenneth M. Keating, Martin Kushler, and Ralph Prah, 2011. "Emerging Evaluation Issues Revisited." In *Proceedings of the 2011 International Energy Program Evaluation Conference*. Boston, MA.

Russell, Chris, Lisa Wilson-Wright, Ralph Prah and Lynn Hoefgen, 2011. "Net Impacts from Upstream Lighting Programs: A Multi-State Model." In *Proceedings of the 2011 International Energy Program Evaluation Conference*. Boston, MA.

Tannenbaum, Bobbi, Carol Stemrich, Laura Schauer and Ralph Prah, 2011. “Lessons Learned: 10 Years of Focus on Energy Evaluation.” In *Proceedings of the 2011 International Energy Program Evaluation Conference*. Boston, MA.

Sabo, Carol, Birud Jhaveri and Ralph Prah, 2011. “Comparing Energy Efficiency Program Rebates and Incentive Levels.” In *Proceedings of the 2011 International Energy Program Evaluation Conference*. Boston, MA.

Vine, Edward, Nick Hall, Kenneth M. Keating, Martin Kushler, and Ralph Prah, 2010. “Emerging Evaluation Issues: The U.S. Experience.” In *Proceedings of the International Energy Program Evaluation Conference*. Paris, France.

Vine, Edward, Ralph Prah, Steve Meyers and Isaac Turiel, 2009. “A Framework for Evaluating Market Effects of Energy Efficiency Programs: Guidance for Evaluators.” In *Proceedings of the 2009 International Energy Program Evaluation Conference*.

Ledyard, Thomas, Dimple Gandhi and Ralph Prah, 2009. “In it for the Long Haul: The Challenges of a Seven-Year Effort to Assess the Market Effects of a Non-Residential New Construction Program.” In *Proceedings of the 2009 International Energy Program Evaluation Conference*.

Tolkin, Betty M., William Blake, Elizabeth Titus, Ralph Prah, Dorothy Conant, and Lynn Hoefgen, 2009. “What Else Does an ENERGY STAR Home provide? Quantifying Non-Energy Impacts in Residential New Construction. In *Proceedings of the 2009 International Energy Program Evaluation Conference*.

Wilson-Wright, Lisa, Tom Ledyard, Ralph Prah, Kim Oswald and Angela Li, 2009. “They’re Out There – Somewhere: Locating and Evaluating CFLs Distributed Through Markdown Programs.” In *Proceedings of the 2009 International Energy Program Evaluation Conference*.

Barry, J. Ryan, Oscar Bloch, Miriam Goldberg, Ralph Prah and Mitch Rosenberg, 2009. “State-to-State Baseline Comparison to Establish Existence of Market Effects in the Non-Residential Sector.” Forthcoming in *Proceedings of the 2009 International Energy Program Evaluation Conference*.

Lynn Hoefgen, Angela Li, Gail Azulay, Ralph Prah, and Susan Oman, 2008. “Market Effects: Claim Them Now or Forever Hold Your Peace.” In *Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings*.

Glenn C. Haynes, Thomas Ledyard, Gail Azulay, and Ralph Prah, 2007. “Building a Better Mousetrap: A Unique Approach to Determining Reliable Savings Potential.” In *Proceedings of the 2007 International Energy Program Evaluation Conference*.

Susan Oman, Lynn Hoefgen, Angela Li, and Ralph Prah, 2007. “Blinded by the Light: Why Are We in the Dark about How Many CFLs are Out There?” In *Proceedings of the 2007 International Energy Program Evaluation Conference*.

Robert M Wirtshafter, Greg Thomas, Gail Azulay, William Blake, and Ralph Prah, 2007. “Do Quality Installation Verification Programs for Residential Air Conditioners Make Sense

in New England?” In *Proceedings of the 2007 International Energy Program Evaluation Conference*.

Ann Clarke, Robb Aldrich, Robert Allgor, David Hill and Ralph Prah, 2007. “A Performance Evaluation Study of Photovoltaic Systems Installed through the Long Island Power Authority’s Clean Energy Initiative Solar Pioneer Program.” In *Proceedings of the 2007 International Energy Program Evaluation Conference*.

Ann Clarke, Timothy Pettit, Robert Allgor, David Hill and Ralph Prah, 2005. “A Theory-Based Evaluation of LIPA’s Solar Pioneer Program: Measuring Early Progress in the Transformation of the PV Market on Long Island.” In *Proceedings of the 2005 International Energy Program Evaluation Conference*.

Thomas A. Ledyard, Ann Clarke, Ralph Prah, Todd Romano, and Eric Belliveau, 2005. “LIPA’s Commercial Construction Program: Demonstrating Initiative Influence along the Road to Transformation.” In *Proceedings of the 2005 International Energy Program Evaluation Conference*.

Timothy Pettit, Ann Clarke, David Hill, Ralph Prah, and Marjorie McCrae, 2004. “Using Theory-Based Evaluation To Help Plan Improvements for LIPA’s Solar Pioneer Program.” In *Proceedings of the 2004 American Solar Energy Society Conference*.

Michael W. Rufo, Ralph Prah and David Sumi, 2002. “Nonresidential Performance Contracting Programs: Assessing the Market Transformation Dimension.” In *Proceedings of the 2002 ACEEE Summer Study on Energy Efficiency in Buildings*, pp. 6.267-6.282.

Sumi, David, and Ralph Prah, 2001. “A Comprehensive Examination of the Market Effects of a Public Benefits-Sponsored Pilot Program: Lessons Learned from Wisconsin’s Focus on Energy.” In *Proceedings of the 2001 International Energy Program Evaluation Conference*, pp. 237-248.

Sumi, David, and Ralph Prah, 2000. “Market Transformation Assessment: Early Results to Inform Program, Policy And Administrative Decisions in Wisconsin.” Presented at the 11th National Energy Services Conference and Exposition, December 4-6, 2000.

Mosenthal, Philip, Ralph Prah, Chris Neme and Robert Cuomo, 2000. “A Modified Delphi Approach to Predict Market Transformation Program Effects.” In *Proceedings of the 2000 ACEEE Summer Study on Energy Efficiency in Buildings*.

Hastie, Steve, Ralph Prah, Phil Mosenthal, Dimple Gandhi and Barbara Klein, 2000. “A Systematic Application of Theory-Based Implementation and Evaluation of Market Transformation Programs.” In *Proceedings of the 2000 ACEEE Summer Study on Energy Efficiency in Buildings*.

Rufo, Michael, Ralph Prah and Pierre Landry, 1999. “A Comprehensive Baseline Assessment of the Non-Residential Energy-Efficiency Services Market.” In *Proceedings of the 1999 Energy Services Conference*.

Rufo, Michael, Ralph Prah and Pierre Landry, 1999. “Evaluation of the 1998 California Non-Residential Standard Performance Contracting Program: A Theory-Driven Approach.” In *Proceedings of the 1999 International Energy Program Evaluation Conference*, pp. 867-880.

Goldman, Charles, Joseph Eto, Ralph Prael and Jeff Schlegel, 1998. "California's Non-Residential Standard Performance Contract Program." In *Proceedings of the 1998 ACEEE Summer Study on Energy Efficiency in Buildings*.

Prael, Ralph, Jeff Schlegel and Charles Goldman, 1998. "Organizing for Market Transformation: Institutional Issues in the Creation of a New Energy Efficiency Policy Environment in California." In *Proceedings of the 1998 ACEEE Summer Study on Energy Efficiency in Buildings*.

Prael, Ralph, and Scott Pigg, 1997. "Do the Market Effects of Utility Energy Efficiency Programs Last? Evidence From Wisconsin." In *Proceedings of the 1997 International Energy Program Evaluation Conference*, August.

Pigg, Scott, Ralph Prael and Mark Wegener, 1997. "Motors Market Transformation in a Time of Utility Restructuring -- The Wisconsin Story." In *Proceedings of the 1997 International Energy Program Evaluation Conference*, August.

Kushler, Martin, Jeff Schlegel and Ralph Prael, 1996. "A Tale of Two States: A Case Study Analysis of the Effects of Market Transformation." In *Proceedings of the 1996 ACEEE Summer Study on Energy Efficiency in Buildings*, Volume 3, pp. 59-68. American Conference for an Energy Efficient Economy, Washington, D.C., August.

Prael, Ralph and Jeff Schlegel, 1994. "DSM Resource Acquisition and Market Transformation: Two Inconsistent Policy Objectives?" In *Proceedings of the 1994 ACEEE Summer Study on Energy Efficiency in Buildings*. American Council for an Energy Efficient Economy, Washington, D.C.

Prael, Ralph, 1994. "When Worlds Collide: The Role of Verification in DSM Bidding." In *Proceedings of NARUC's Fifth National Conference on Integrated Resource Planning*. National Association of Regulatory Utility Commissioners, Washington D.C., May.

Schlegel, Jeff, and Ralph Prael, 1994. "Market Transformation: Getting More Conservation and Energy Efficiency for Less Money." In *Proceedings of the 1994 Affordable Comfort Conference*.

Schlegel, Jeff, George Edgar, Martin Kushler, Ralph Prael and Angie Minkin, 1993. "Do Shareholder Incentives Work? Results of an Evaluation of DSM Shareholder Incentives in California." In *Proceedings of the 1993 International Energy Program Evaluation Conference*. Argonne National Laboratory, Argonne, IL, August.

Prael, Ralph, and Jeff Schlegel, 1993. "Evaluating Market Transformation." In *Proceedings of the 1993 International Energy Program Evaluation Conference*. Argonne National Laboratory, Argonne, IL, August.

Peach, Gil, Ralph Prael, Jeff Schlegel and Rick Fleming, 1993. "Moving Towards Market Transformation." In *Proceedings of The ECEEE 1993 Summer Study: The Energy Efficiency Challenge for Europe*. European Council for An Energy Efficient Economy, Oslo, Norway, August.

Schlegel, Jeff, and Ralph Prah, 1993. "Money Talks: The Changing Role of Measurement and Evaluation in the Age of DSM Regulatory Incentives." In *Proceedings of the Sixth National Conference on Utility Demand-Side Management Programs*. Electric Power Research Institute, Palo Alto, CA, March.

Schlegel, Jeff, Ralph Prah, Wayne DeForest and Martin Kushler, 1992. "Are Markets Being Transformed by DSM Programs?" Presented at NARUC's Fourth National Conference on Integrated Resource Planning, September 16, 1992.

Prah, Ralph, Jeff Schlegel and Scott Pigg, 1992. "Evaluation and Utility Performance Incentives: Not (Just) A Scorecard." In *Proceedings of NARUC's Fourth National Conference on Integrated Resource Planning*. National Association of Regulatory Utility Commissions, Washington D.C., September.

Vine, Edward, Odon de Buen, Charles Goldman, and Ralph Prah, 1991. "Stimulating Utilities to Promote Energy Efficiency: Process Evaluation of the Madison Gas and Electric Competition." In *Proceedings of the 1991 International Energy Program Evaluation Conference*. Argonne National Laboratory, Argonne, IL, August. Pp. 234-248.

Schlegel, Jeff, Ralph Prah and Martin J. Kushler, 1991. "Measurement in the Age of Incentives." In *Proceedings of the 1991 International Energy Program Evaluation Conference*. Argonne National Laboratory, Argonne, IL, August. Pp. 182-190.

Prah, Ralph, 1991. "Evaluation of Utility Performance Incentives in Wisconsin." In *Proceedings of the 1991 International Energy Program Evaluation Conference*. Argonne National Laboratory, Argonne, IL, August. Pp. 244-250.

Vine, Edward, Odon de Buen, Charles Goldman and Ralph Prah, 1991. "Stimulating Utilities to Promote Energy Efficiency: The Madison Gas and Electric Competition." In *Proceedings of the Fifth National Conference on Utility Demand-Side Management Programs*. Electric Power Research Institute, Palo Alto, CA, July. Pp. 346-351.

Prah, Ralph, 1990. "Development of a State-Level Collaborative DSM Research Center." In *Proceedings of the 1990 ACEEE Summer Study on Energy Efficiency in Buildings, Volume 5*. American Council for an Energy Efficient Economy, Washington, D.C., August. Pp. 149-156.

Prah, Ralph, Virginia L. Kreitler and Julie Worel, 1989. "Market Research in a Regulatory Setting: the Wisconsin Commercial Market Segmentation Study." In *Proceedings of the Fourth National Conference on Utility Demand-Side Management Programs*. Electric Power Research Institute, Palo Alto, CA, May. Pp. 63.1-63.10.

Kreitler, Virginia L., and Ralph Prah, 1989. "Variability in Commercial Markets and Implications for Program Transferability." In *Proceedings of the Fourth International Conference on Energy Program Evaluation*. Argonne National Laboratory, Argonne, IL, August. Pp. 349-354.

Prah, Ralph, 1988. "Evaluation for PUCs." In *Proceedings of the 1988 ACEEE Summer Study on Energy Efficiency in Buildings, Volume 9*. American Council for an Energy Efficient Economy, Washington, D.C., August. Pp. 126-138.

Oliver, Pamela E., Gerald Marwell and Ralph Prael, 1985. "Organizer and Network Characteristics as Predictors of Collective Action Through All-or-None Agreements." Presented at the annual meetings of the American Sociological Association, Washington, D.C.

2. Journal Articles

Ridge, Richard, Michael Baker, Nick Hall, Ralph Prael and William Saxonis. "Gross is Gross and Net is Net: Simple, Right?" Forthcoming in *Journal of Progress in Industrial Ecology*.

Vine, Edward, Nick Hall, Kenneth M. Keating, Martin Kushler and Ralph Prael, 2012. "Emerging Evaluation Issues: Persistence, Behavior, Rebound and Policy." *Energy Efficiency*.

Vine, Edward, Nick Hall, Kenneth M. Keating, Martin Kushler and Ralph Prael, 2012. "Emerging Issues in the Evaluation of Energy Efficiency Programs: The US Experience." *Energy Efficiency*, 2012:5-17.

Vine, Edward, Odon De Buen, Charles Goldman and Ralph Prael, 1992. "Mandating Utility Competition: One Option for Promoting Energy Efficiency." *Utilities Policy*, January, 1992:51-61.

Prael, Ralph, Gerald Marwell and Pamela E. Oliver, 1991. "Reach and Selectivity as Strategies of Recruitment for Collective Action: A Theory of the Critical Mass, V." *Journal of Mathematical Sociology* 16(2):137-164.

Oliver, Pamela E., Gerald Marwell and Ralph Prael, 1988. "Social Networks and Collective Action: A Theory of the Critical Mass, III." *American Journal of Sociology* 94:502-534.

3. Journal Issues

Prael, Ralph, and Jeff Schlegel, 1995, Guest Editors. *Energy Services Journal: Special Issue on Market Transformation*, Volume 1, No. 2. Lawrence Erlbaum Associates, Mahwah, New Jersey.

4. Book Chapters

Prael, Ralph, and Jeff Schlegel, 1994. "Evaluating Market Transformation." In *Energizing the Energy Policy Process: The Impact of Evaluation*, Roberta W. Walsh and John G. Heilman, editors, pp. 181-197. Quorum Books, Westport, Connecticut.

5. Miscellaneous

Eto, Joseph, Ralph Prael and Jeff Schlegel, 1996. *A Scoping Study on Energy-Efficiency Market Transformation by California Utility DSM Programs*. Ernest Orlando Lawrence Berkeley National Laboratory, Berkeley, CA.

Schlegel, Jeff, Miriam Goldberg, Jonathan Raab, Ralph Prael, Marshall Kneipp, and Dan Violette, 1997. *Evaluating Energy Efficiency Programs in a Re-Structured Industry*

Environment: A Handbook for PUC Staff. Washington, D.C.: National Association of Regulatory Utility Commissioners.

MISCELLANEOUS PROFESSIONAL ACTIVITIES

Member of the planning committee for the International Energy Program Evaluation Conference (IEPEC), 1999-present.

Independent Peer Review Panel for evaluation of US DOE Better Buildings Neighborhood Program, 2012-2013. Invited member of five-person panel.

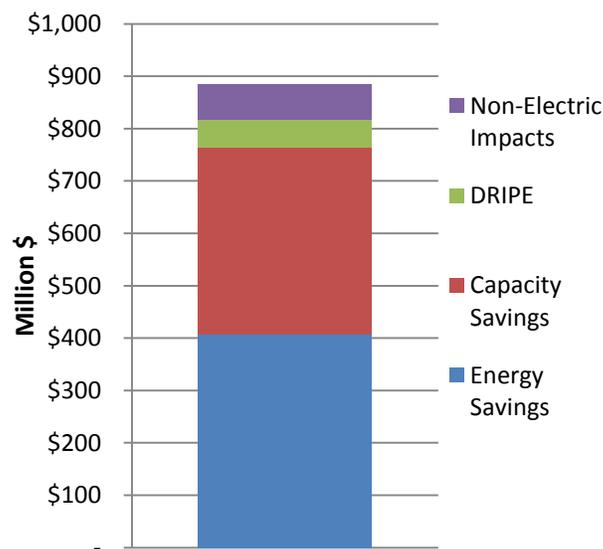
Independent Peer Review Panel for review of savings estimation methods for the US EPA Energy Star Program, 2009-2010. Invited member of five-person panel.

ATTACHMENT B
Implications of
Winter Gas Constraint

Attachment B: Implications of Winter Gas constraint on Energy Efficiency Cost-Benefit Analysis

The figure below, reproduced from the report, shows how the benefits in the 2015-2017 Procurement Plan are built up from the individual components as defined by the Total Resource Cost test.

Cumulative TRC Benefits from Electric Energy Efficiency Programs in 2015-2017 Plan



Benefits from energy savings account for the greatest share of the total benefits at 46%. They are calculated by multiplying the cumulative savings from the entire portfolio – which occur over a number of years in the future – against a forecast of avoided costs that roughly correspond to the wholesale price of power. The avoided costs used in the above calculation come from the 2013 Avoided Energy Supply Cost (AESC) study developed by Synapse.¹ Since the 2013 AESC study was published, the well-publicized winter gas constraint has driven wholesale prices up dramatically.² The table below shows the forecasted cost of energy for 2014 from the AESC report compared to an average of actual monthly wholesale prices reported by ISO-NE for the winter months.^{3,4}

¹ <http://www.synapse-energy.com/Downloads/SynapseReport.2013-07.AESC.AESC-2013.13-029-Report.pdf>

² <http://isonewswire.com/updates/2014/5/13/first-quarter-markets-report-reviews-outcomes-during-january.html>

³ <http://iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/monthly-wholesale-load-cost-report?loadZone=4005&periodicity=Monthly&detailLevel=ON&loadCostConcept=TC&startYear=2014&startMonth=01&endYear=2014&endMonth=12&type=>

⁴ Winter months are defined as December-March.

	Winter On-Peak	Winter Off-Peak
2013 AESC (\$/kWh)	0.053	0.046
2014 ISO (\$/kWh)	0.109	0.084
% Increase	206%	181%

Intuitively, higher avoided costs should lead to higher benefits since the state is avoiding a more expensive cost than initially anticipated. To test this idea we assumed the high costs would persist through 2019 before subsiding, and substituted the new forecast into the screening model. The resulting benefits are summarized in the table below.

	Total Electric Benefits (\$M)
Original 2015-2017 Plan	\$884
Plan with adjusted costs	\$1,083
Difference	\$199
% Difference	22%

Overall electric benefits increase by 22%, corresponding to roughly \$200 million, when we substituted in revised avoided costs. This is significant. While the analysis is high-level, the results suggest Rhode Island is realizing even greater benefits than expected from its energy efficiency programs.