New Jersey Energy Master Plan 2010

"Useful Suggestions"

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Submitted By:

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Introduction

Gerdau Ameristeel is delighted that the State of New Jersey is taking steps to revisit the Energy Master Plan. Gerdau supports the concept that a secure energy future must be reliable, safe, and affordable. Gerdau remains very concerned about the affordability of electricity to power its steelmaking operations in Sayreville and is pleased to have the opportunity to offer some useful suggestions for improving the State's energy strategy. Several aspects of the State's current energy strategy jeopardize the ability of large industrial users of electric power and natural gas to compete effectively in today's challenging marketplace. Companies like Gerdau Ameristeel are highly motivated to operate as energy-efficiently as possible due to both global competition and the major role energy costs play in their operations. The State's energy strategy should support and facilitate these objectives, not hinder manufacturers' ability to compete, employ and contribute to the economy.

Gerdau Ameristeel operates a steel minimill in Sayreville, employing more than 200 people. However, Gerdau has shut down steelmaking operations in neighboring Perth Amboy, in part due to the high cost of electricity and natural gas in New Jersey. Unfortunately, that shut-down resulted in hundreds of employees losing well-paying jobs. The continued operations of the Sayreville Facility, which still pays high per-ton energy costs despite being energy-efficient remains challenged.

Gerdau Ameristeel encourages New Jersey to engage proactively and immediately in the development of both short-term and long-term strategies to hedge the risks associated with volatile and unforgiving wholesale market design experiments. New Jersey's approach should be multi-faceted, encompassing all aspects of energy supply, energy delivery, and energy consumption. New Jersey's approach should learn from, and build on, the efforts of other states in "organized" markets.

Gerdau Ameristeel provides the following strategy recommendations for the singular purpose of reducing the costs of electricity and natural gas for its Sayreville operations, for other

manufacturers, and for all New Jersey customers. A more rational approach to energy pricing is critically necessary and critically urgent.

To that end, Gerdau Ameristeel offers below 5 recommendations for adoption as part of the State's next iteration of an Energy Master Plan. Gerdau emphasizes, however, that inclusion in an Energy Master Plan is only the first step in the process. If the Energy Master Plan is to succeed, the State must fully commit its attention and the necessary resources.

Recommendation No. 1

The BPU, in conjunction with other New Jersey state agencies, the PJM Independent Market Monitor ("IMM"), and PJM Staff, should engage in regular analyses of New Jersey's generation and transmission infrastructure relative to projections of load growth and areas of congestion. The BPU process should seek input from New Jersey stakeholders. Through these analyses, the BPU should identify in-state needs for generation and transmission, and the impediments to timely capital deployment for new generation and transmission projects in New Jersey. The BPU should publish its analysis and findings. If the BPU determines that barriers to entry exist and cannot be overcome, or that other fundamental indicia of competitive markets are not present in New Jersey, then the BPU should actively engage in efforts to cease the "price-signal aspects" of existing market designs.

Strategy

PJM's Reliability Pricing Model ("RPM") has now been in place for more than 3 years, and has tagged New Jersey customers with more than $10 **b**illion in capacity-related costs. Notwithstanding this extreme resource commitment, New Jersey customers can credibly argue that their collective investment has not resulted in meaningful amounts of newer or more efficient in-state generation. Like the failed promise of LMP, these new and even higher price signals are not delivering on their promise to incent investment.

The State and the BPU are no longer in a position where they can "wait and see" whether RPM will work. The evidence overwhelmingly demonstrates that RPM has fallen short. Accordingly, the BPU should now undertake regular analyses of generation and transmission needs relative to New Jersey's projected peak loads. Part of these analyses must be a New Jersey-specific investigation and "root cause analysis" of the under-investment in electricity industry infrastructure in New Jersey. The investigation and analysis should include proper notice and an adequate opportunity for all industry stakeholders to be heard on the issue. All generation technologies should be evaluated.
These evaluations should occur frequently and should lead to selection of one or more of the outcomes included in Recommendation No. 2, below.

Responsible Party

The BPU should initiate these periodic proceedings and issue orders with its findings and recommendations.

Timeline of Action

The BPU should undertake the first investigation and root cause analysis as soon as possible, and issue its findings and conclusions no later than 120 days after commencement of each proceeding. Also, BPU coordination with PJM Staff and the PJM IMM must occur on a regular basis, beginning immediately

Strategy outcome

The investigation and root cause analysis should isolate the reasons for under-investment in New Jersey, and identify approaches to overcome these barriers.

Implementation cost

Because the investigation and root-cause analysis would occur in the form of an open, contested, on-the-record proceeding, existing staff and resources should suffice. At most, the BPU may need to retain qualified outside consultants to assist in the analyses.

Source of Funding

Any procurement of outside consultants would be funded in the same manner as outside consultants are funded for other BPU proceedings.

Indicators

Identifying the various contributors to transmission and generation under-investments in New Jersey would be the appropriate measures of success for this first step

Recommendation No. 2

Supplement energy efficiency and renewable generation objectives with larger-scale, viable, and environmentally compatible generation technologies to meet New Jersey's present and growing need for long-term generation supply.

Strategy

Practical reality suggests that the State's renewable energy initiatives will be inadequate to cost-effectively meet the gap between total demand for electric energy and the sum of in-state and imported electric energy. Updates to the Energy Master Plan must reflect a long-term commitment to substantially reduce or, if cost-effective, completely eliminate New Jersey's dependence on energy imports. Accomplishing this objective will require New Jersey to facilitate the siting and permitting of new generation resources, such as gas-fired combined cycle, nuclear, combined heat and power and waste heat recovery that will be needed to satisfy long-term demand projections and complement the state's renewable energy objectives. These initiatives are also necessary in light of recent generator retirements, such as PSEG Power's retirement of its Sewaren and Hudson 2 units, and threatened retirements. Accomplishing this

objective may also require additional in-state transmission, to enable the free-flow of energy within the State.

Given that the siting and permitting approval process associated with new generation is a significant hurdle to the deployment of capital in fuel-diverse and size-diverse generation, New Jersey should procure and approve new generation sites and then auction those pre-approved and pre-permitted sites to prospective generation developers. The bids in that auction would include not only return of and on the state's investment in those sites, but would include return of and on the capital investment necessary for the generation project, in exchange for a guaranteed hourly capacity factor and actual energy output at cost up to that limit. Energy produced up to the bid capacity factor would be provided to New Jersey customers at actual cost. To ensure robust operation and strong output, any energy produced in excess of the bid capacity factor in any given hour could be sold into the wholesale market, and the developer could receive the benefit of those sales. Financial penalties would be assessed for under-performance in any hour. The arrangement should take into account the need for scheduled maintenance outages, emissions limits, and other non-negotiable factors that are beyond the operator's control.

Implementation Cost

The facilitation of the siting and permitting of new generation should not require significant expenditures by the state. Those New Jersey agencies with that responsibility now would continue in their functions. The acquisition of generation sites would require state funds on a short-term basis, to be recovered upon the auctioning of the site in conjunction with the awarding of the long-term, tariff-backed arrangement. Because cost recovery would occur through tariff-backed, regulatory arrangements, the state would not need to be a counter-party to any transaction except the sale of the pre-approved, pre-permitted site.

Responsible Party

All state and local government bodies that must be involved in the siting and permitting of new generation should collaborate in the identification of feasible generation plant sites and commence the process of streamlining the approvals necessary to obtain and permit those new generation sites. For the actual procurement and subsequent auctioning of the generation sites, the necessary government procurement agencies and specialized generation consultants will need to be involved.

Timeline of action

New Jersey should engage in this process immediately, preferably even prior to adoption of new changes to the Energy Master Plan.

Strategy outcome

The outcome of this process should be the construction of highly efficient and environmentally compatible baseload and intermediate generation that provides energy at actual production costs, while providing the developer with a tariff-backed opportunity to recover a reasonable return of and on its investment.

Source of Funding

Any incremental funding for New Jersey state agency involvement would come from taxpayer funds. The ultimate investment in the generation site and the generator itself would come from private sector funds. Revenue to the generation owner for cost-based sales of power would be recovered from ratepayers, depending on the classes of ratepayers that are eligible for the output. For example, if access to "at-cost" generation is limited to Basic Generation Service – Fixed Price ("BGS-FP") customers, then only BGS-FP customers should be allocated the costs. Moreover, because the focus of these efforts would be to add new capacity to the system, new generation costs must be allocated on a capacity/demand basis, consistent with the cost-drivers for the new resources.

Indicators

- Number of permitted and approved sites made available for auction
- Number of available sites that were successfully auctioned
- Number of new generators that were actually developed through this process

Recommendation No. 3

Eliminate certain, and substantially reduce other, state-imposed elements of electricity and natural gas prices.

Strategy

Gerdau Ameristeel currently pays millions of dollars each year at its Sayreville Facility for the Societal Benefits Charge ("SBC") and is perennially exposed to new kilowatt-hour based charges that are implemented to collect the costs of public policy pursuits (e.g., the RGGI Recovery Rider). These charges are not connected to the underlying costs of energy supply or delivery, and impede Gerdau Ameristeel's global competitiveness. Also, these charges are levied on a kilowatt-hour basis, which disproportionately impacts high-volume electricity and natural gas users like Gerdau Ameristeel.

New Jersey's SBCs grossly exceed comparable charges in nearby states, contributing to New Jersey's competitive disadvantage among states in the Mid-Atlantic and Northeast and contributing to the flight of industry from New Jersey. Because the SBC is assessed on a **usage** basis, large end-users pay disproportionate and steadily increasing contributions to the SBC as it has expanded each year to support various programs. Gerdau and other manufacturers understandably react with considerable frustration and apprehension to suggestions that multiples of present-day amounts should be expended to achieve EMP goals. All New Jersey customers have contended that the SBC should not be viewed as a bottomless pit.

Not only are increasing SBC levels counter-productive to the State's economic development objectives, but the recovery mechanisms for the SBC are also counter-productive. For example, current recovery of costs through the SBC entirely on a usage/volumetric basis is

counterproductive to the EMP goals of Peak Load Reduction. Charging the SBC on all kWhs no matter when they are consumed mutes the signal to shift load to low demand periods.

New Jersey could make large strides in its economic development initiatives by eliminating certain, and substantially reducing other, state-imposed charges for large-volume, energy-intensive employers in the state. Gerdau addresses a few below.

- **SBC**: The SBC is actually comprised of several individual charges, some addressing low-income needs and others addressing renewable energy and demand-side management ("DSM") initiatives. Gerdau presented in a pending BPU docket on the subject, and presents here, several alternatives for equitably reducing the SBC impact on manufacturers. These are listed in no particular order. As a threshold matter and as an exception to the recommendations below, Gerdau recognizes and does not intend to shirk its corporate citizen responsibilities with respect to the low-income assistance components of the SBC.

    - *Option 1 - Full Exemption*: Obviously, Gerdau would prefer to be fully exempt from paying for any surcharge or surcharge element that it does not cause or from which it does not benefit, with the exception of the low-income assistance element mentioned above. All other SBC elements should be assessed on a cost-causation or "beneficiary pays" basis. Accordingly, Gerdau should not pay for the demand response, customer education, or energy efficiency components of the SBC (or other kWh-based charges). Gerdau acknowledges that payment for nuclear decommissioning expense, as part of the SBC, may be appropriate, although allocating that expense across all customers classes on a kWh basis should be revisited.

    - *Option 2 – Full Opt-Out Based on Self-Investment*: This alternative could lead to the same outcome as the Full Exemption alternative discussed above, but should only be pursued if a customer's past investments are taken into account. In the case of a steelmaking facility like Sayreville, the investments necessary to enhance energy efficiency and demand response capabilities are typically very large and years apart. Mandating that a customer spend a certain amount every year would impose a substantial and unjustified hardship in years when no large capital program is in place or, worse yet, in an economic downturn when the plant can hardly afford to spend. The Sayreville Plant has been investing in energy efficient solutions for many years, totaling more than $65 million since 1994 on upgrades to the plant that made the plant more energy efficient. In essence, the Sayreville Plant already has its own energy efficiency program in place; it does not need additional programs and costs. Although this Full Opt-Out alternative could lead to the same outcome as the Full Exemption alternative, steps would have to be taken to make sure that the administrative processes for manufacturers are not unduly burdensome.

    - *Option 3 – Revised Cost Allocation*: The costs of the SBC programs are currently allocated to all customer classes on an energy basis. This is inappropriate because many of the programs are designed to address demand-related issues. For example, certain demand-side response measures are

intended to reduce peak demand. Certain energy efficiency projects may even qualify to receive payments under PJM's Reliability Pricing Model ("RPM"), which focuses exclusively on capacity/demand measures. As a potential alternative to burdening manufacturers with high SBC, Gerdau urges the State to undertake a detailed analysis of the costs underlying the SBC and allocate those costs to and recover those costs from customer classes on a demand or energy basis, consistent with the demand or energy motivation for or benefit of the program. Doing so would better align cost allocation for the RRC and SBC with fundamental ratemaking principles, promote efficient use of the system, encourage demand response, and contribute to the State's objective of reducing greenhouse gas and other emissions.

- *Option 4 - Hard Caps on Individual Customer Contributions*: This alternative would involve establishing a maximum RRC and SBC contribution for individual customers in each customer class. For example, the Board could establish a hard SBC contribution cap of $100,000 per year for each customer in the Rate GT class. A hard cap approach would go far in mitigating the surcharge burden. Setting the hard caps would involve an administrative process and the Board may be challenged to justify setting the cap at a particular level for a particular customer class.

- *Option 5 – Surcharge Phase-Out Mechanism*: If it is implemented properly and carried through to complete, this alternative would clearly be preferred. Gerdau's concern, though, is that a phase-out would require a reversal of the current trend-line of increasing SBCs and would require fidelity to the ultimate objective of complete phase-out. Experience has shown that surcharges, once implemented, are extremely difficult to eradicate and often become safe haven recovery mechanisms for programs that were not contemplated when the surcharges were established. Gerdau also has concerns that, even if a phase-out timeline were set, the timeline would be extended on multiple occasions and would not provide rate relief.

- **Solar Alternative Compliance Payments (SACP)**: SACPs should be structured to reflect a fair return to investors that takes into account the impact on rate-payers. According to testimony from Mr. Hunter from the New Jersey Large Energy Users Coalition at the EMP Stakeholder meeting on September 24, Solar System costs can be fully recovered within five to eight years under the current payment structure. Several others indicated that Solar RECs in neighboring jurisdictions were trading well below New Jersey's. When assessing the SACPs for future years, this should be taken into consideration, as should the impact on rate-payers of the accelerating obligations to purchase Solar RECs and the lofty SACPs that currently exist.

Responsible Party

Fundamental changes to the way in which the SBC and SACP are designed and recovered from customers would benefit from statutory changes. In the interim, the BPU should exercise whatever authority it has now to ameliorate SBC, SACP, RRC, and other charges' impacts on

customers that do not cause them or benefit from them. Gerdau notes that the BPU has a proceeding underway to examine such relief. Gerdau strongly encourages the BPU to undertake meaningful reform through that proceeding.

Strategy outcome

Elimination or substantial reduction of kWh-based charges on manufacturers would immediately establish greater parity among the regulated and state-imposed charges paid by manufacturers in New Jersey and those paid by their competitors in other U.S. states.

Source of Funding

Reductions in kWh-based charges across the board and, in particular, reductions in the level of charges collected from manufacturers, should not have a funding implication.

Indicators of Success

A substantial reduction in energy costs to large customers, and the accompanying retention of existing manufacturers and attraction of new manufacturers, are potential benchmarks against which the relative success of this initiative can be measured.

Recommendation No. 4

New Jersey BPU staff and other New Jersey government representatives should continue to engage regularly and consistently in the PJM stakeholder process and in proceedings before the Federal Energy Regulatory Commission ("FERC") that impact the price and availability of electricity to New Jersey customers.

Strategy

PJM, the regional grid operator, regularly holds stakeholder meetings to address PJM market rules, transmission planning, and related issues. New Jersey BPU Staff has participated occasionally in PJM stakeholder meetings. Proposals developed through the PJM stakeholder process typically involve changes to the PJM Operating Agreement, PJM Open Access Transmission Tariff, and/or the PJM Reliability Assurance Agreement and, thus, require FERC approval. Shortly after PJM files any such proposal with FERC, all parties have an opportunity to file comments or a protest on the filing, and to participate fully in any evidentiary hearing, settlement judge process, or other forum that results from that filing. The New Jersey BPU occasionally files comments or a protest of a PJM filing.

The strategy would involve dedicating at least one BPU full-time employee ("FTE") permanently and visibly to the PJM stakeholder process, to serve as a liaison between the Board and PJM stakeholders and to argue the Board's position as issues arise. The strategy would also involve the dedication of at least one Deputy Attorney General to ensure that the BPU proactively engages in all FERC proceedings that implicate New Jersey's and New Jersey customers' interests. BPU commissioners should meet directly and regularly with each FERC commissioner to pursue alignment of state and federal objectives. The BPU FTE should also

ensure a process exists to receive regular, transparent feedback from New Jersey customers on specific PJM and FERC-related issues.

Responsible Party

The BPU would have primary responsibility for establishing and filling the PJM stakeholder representative position and for making the necessary arrangements to ensure that state attorneys regularly engage in FERC proceedings that affect New Jersey rates.

Timeline of Action

Because the BPU has been at least partially engaged in both PJM and FERC processes, implementation of these additional steps could be completed quickly.

Strategy outcome

New Jersey has been lagging behind other PJM states' presence in the PJM stakeholder process and in FERC proceedings. If the recommendation is implemented successfully, PJM and FERC will regularly look to New Jersey for direction on "wholesale" market issues that directly affect New Jersey customers. The BPU would also be in position to more effectively and proactively address the wholesale-related risks and costs that have been and are currently adversely affecting New Jersey's electricity consumers.

Implementation Cost

This recommendation could be accomplished through redeployment and refocusing of existing personnel. Alternatively, the BPU may need to hire one or two mid-level FTEs to fulfill these responsibilities.

Source of Funding

Any additional costs should be included as part of the BPU budget.

Indicators

Quantifying the effectiveness of the BPU's engagement may be challenging. Success will need to be measured qualitatively via regular comparisons between the positions advocated by the BPU in PJM stakeholder processes and the substantive outcome of those processes, and between the positions advocated by the BPU in FERC proceedings and the substantive outcome of those proceedings.

Recommendation No. 5

Eliminate and reverse cross-class subsidization that is artificially inflating industrial customer rates and placing them at a significant disadvantage relative to intra-company and inter-company competitors in other U.S. states and abroad.

Strategy

Many of the rates that industrial customers pay for electricity and natural gas heavily subsidize residential customer classes. The cross-subsidization that pervades New Jersey's electricity and natural gas charges places industrial customers at a significant disadvantage relative to industrial customers in other U.S. states. For Gerdau specifically, its Sayreville Facility is paying more than $1 million/year in distribution costs even though the only "distribution" facility used by Sayreville is the Jersey Central Power & Light ("JCPL") meter, which Sayreville is willing to pay for outright. The gross mismatch between Sayreville's cost-causation and its cost responsibility stems from cost allocation methodologies that institutionalize gross subsidies among customer classes. These inequities must be addressed and eliminated.

Competition among manufacturers is global. If New Jersey is to have any chance of remaining globally competitive in its quest for high-paying and intellectually challenging employment for its citizens, it must abandon quickly its longstanding policy of requiring industrial customers to subsidize other customer classes. Its important to note that the Steel Manufacturing Association has calculated that for every dollar spent directly in a steel mill, an average of 5 dollars of indirect economic activity is generated in the local economy through tax contributions, wages, procurement of local goods, employment of upstream and downstream workers, and expenditures for product inputs and transportation.

If and as new cost-based generation becomes eligible for tariff-based recovery, these anti-subsidization approaches apply to generation as well. Specifically, generation capacity/fixed costs should be allocated to customers based on their capacity obligations, as those capacity obligations are determined now for PJM purposes. Generation fuel and O&M costs for each hour should be charged to the customers that are relying on that energy during that hour.

This fundamental change in New Jersey's ratemaking philosophy could be implemented, in part, by the BPU in the way it currently approaches the allocation of distribution and certain transmission costs. Ideally, statutory changes would be implemented to safeguard against the potential for deviations from this approach occasioned by changes in Board composition. Statutory changes are also necessary to ensure that any state-imposed charges on manufacturers are consistently assessed on a customer or demand basis, not on a volumetric basis. Statutory changes should be accompanied by language that states clearly an overall objective of enhancing New Jersey manufacturers' global competitiveness, to stifle any attempts to circumvent the overarching intent.

Responsible Parties

The BPU and the New Jersey legislature.

Timeline of Action

We expect that statutory changes of this ilk would follow the timeline associated with other statutory changes. We would also expect that statutory changes would require prompt implementation by the BPU.

Strategy outcome

Existing natural gas and electricity rates for industrial customers include substantial amounts of cross-subsidization. Consequently, the changes proposed above would have a meaningful impact on enhancing industrial customers' global competitiveness.

Implementation cost

These initiatives involve changes in Board policy and statutory changes. There should be no implementation costs outside typical state budgets.

Source of Funding

None required.

Indicators

- New Jersey should routinely benchmark its industrial electricity and natural gas prices against those in all U.S. states, the European Union member countries, and other industrialized countries. This benchmarking will reveal the relative success or failure of initiatives to eliminate cross-subsidization.
- New Jersey should also solicit from manufacturers within the state, on a confidential basis, any information they have on the comparison of their New Jersey energy costs to energy costs at their other facilities, both here and abroad.

To: NJEMP 9/24/10

FYI: Submitted by Grandmothers, Mothers and More for Energy Safety (GRAMMES)

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In previous testimony to the EMP in 2006, GRAMMES forwarded documentation that projected that energy efficiency and renewable energy development would be the safest and most economical future energy path for New Jersey. As an update we offer further reporting that adds current realities to those predictions.

Please find enclosed:

Press Advisory from the **Hastings Group, LLC.**
A look at nuclear manufacturing issues from ***IndustryWeek***
Other "Sobering Nuclear Realities" excerpted from Huffington Post. 9/21/10

Press advisory: the **Hastings Group, LLC. September 22, 2010.**

If you are covering the U.S. Senate Energy & Natural Resources hearing Thursday on the "U.S. Department of Energy's Loan Guarantee Program and its effectiveness in spurring the near-term deployment of clean energy technology," make sure that you get the facts that you won't be hearing there about nuclear energy.

Ironically, the Senate hearings are coming at a moment when there is a rush of new evidence that the so-called "nuclear renaissance" in the U.S. is in ruins and that the risk to Americans of taxpayer-backed loan guarantees has never been higher.

Consider the following:

Even the Nuclear Energy Institute (NEI) now concedes that the nuclear build is now on hold in the United States. "Plans for new nuclear build in the USA have been delayed due to a lack of demand for electricity, according to the head of the Nuclear Energy Institute (NEI) . Speaking in London at the Annual Symposium of the World Nuclear Association, NEI President and CEO Marvin Fertel told the meeting that the economic downturn, along with a decline in the price of natural gas, has caused forward power prices to fall to levels well below those previously predicted. The country now faces a similar situation to the past 15 years, during which time 320 GWe of gas-fired plant capacity was built, compared with a total of only 20 GWe of

capacity from all other forms of generation. 'Gas is going to be the dominant part of the new supply source,' Fertel said." (World Nuclear News, September 17, 2010, http://www.world-nuclear-news.org/NN-US_new_build_plans_delayed-1709108.html .)

A major new report from Mark Cooper, the Vermont Law School's Institute for Energy and the Environment senior research fellow for economic analysis, finds that the so-called "French nuclear miracle" embraced by some U.S. policymakers as a model for this nation is a misconception masking a pattern of fast-rising nuclear reactor construction costs and a "crowding out" of investments in renewable energy. As Mark Cooper explains: "The problems in the French nuclear industry are similar to the problems that have long afflicted the U.S. industry, so there it no reason to believe that things will change if the U.S. follows the French path. If the U.S. nuclear industry is relaunched with massive subsidies, this analysis shows the greatest danger is not that the U.S. will import French technology, but that it will replicate the French model of nuclear socialism. Nuclear power will remain a ward of the state, as has been true throughout its history in France; a great burden on ratepayers, as has been the case throughout its history in both France and the U.S.; and it will retard the development of lower-cost renewables alternatives, as it has done in France and portions of the U.S." ("Policy Challenges of Nuclear Reactor Construction: Cost Escalation and Crowding Out Alternatives. Lessons from the U.S. and France for the Effort to Revive the U.S. Industry with Loan Guarantees and Tax Subsidies," Vermont Law School, Institute for Energy and the Environment, September 9, 2010, http://www.vermontlaw.edu/energy/news.)

. According to the American Nuclear Society -- since new nuclear loan guarantee funds over and above what Congress already has authorized are unlikely to be available before the end of 2010 -- either the STP reactor project in Texas or the Calvert Cliffs project in Maryland will fail. "With DOE loan guarantees not forthcoming, the organizations pursuing Calvert Cliffs-3 and South Texas-3 and -4 are conserving funds--and they may eventually have to cancel the projects. During their disclosures of financial results for the second quarter of 2010, Constellation Energy and NRG Energy had roughly the same message regarding their new power reactor projects and loan guarantees from the Department of Energy. Both companies announced that they would reduce spending on the projects because the DOE has not yet offered them guarantees, and they suggested that if offers are not made by the end of the year, the projects may have to be abandoned. The amount of DOE loan guarantee authority still available for new power reactors is only $10.2 billion, which is not enough to stake both projects--Calvert Cliffs-3, being pursued by Constellation through UniStar Nuclear Energy, and South Texas-3 and -4, to be built by NRG through STP Nuclear Operating Company--to the level of the $8.3 billion in backing that

the DOE awarded this year to Southern Nuclear Operating Company for Vogtle-3 and -4." (Nuclear News, September 2010, http://www.new.ans.org/pubs/magazines/download/a_711, with full text available via Nexis and by subscription.)

The respected business magazine Japan Inc. says that the STP project - a leading loan guarantee candidate -- is "stalled and may be destined for failure." According to Japan Inc.: "Japan is a world leader in nuclear reactor technology. That lead, however, is threatened by China, France, Korea and Russia. Moreover, failure in the American State of Texas might be the end for Japanese vendors of commercial nuclear reactors ... NINA lacks both the balance sheet and source of income to repay a federally guaranteed loan. NINA's share of the South Texas Project expansion is in the competitive Electric Reliability Council of Texas (ERCOT) market. NINA is a merchant nuclear development company without material assets beyond its interest in the South Texas Project expansion with which to secure financing for a multi-billion dollar nuclear development project. NRG's CEO David Crane has made clear that this project is not going forward with parent-company guarantees from NRG. In its earnings call on August 2, 2010, Mr. Crane announced that his company is rolling back spending on the South Texas Project to $1.5 million per month while uncertainties about NINA's ability to obtain loan guarantees remain . The projects the Japanese sold in Texas currently appear to have stalled and may be destined for failure ..." (Japan Inc., August 4, 2010, http://www.japaninc.com/node/4459.)

A former CEO of the French-run EdF has publicly admitted that the EPR design destined for Calvert Cliffs is flawed and may not be the way for EdF to proceed. In a recently issued report, former EdF chief Francois Roussely urged an overhaul of EdF and Areva to deal with a variety of problems. The report states: "The credibility of both the EPR model and the ability of the French nuclear industry for success in new construction have been seriously undermined by the difficulties encountered on the Olkiluoto site in Finland and at Flamanville [in France]." The complexity of the EPR model "including the level of power, the core catcher and the redundancy of safety systems is certainly a handicap for its implementation and therefore its cost. These factors explain in part the difficulties encountered in Finland and at Flamanville." Roussely went even further in the report by indicating that reactors will need to be smaller than the EPR for EdF to succeed in the long run. (World Nuclear News, July 28, 2010, http://www.world-nuclear-news.org/C_France_considers_its_position_2807101.html.)

For more information, contact Leslie Anderson, (703) 276-3256 or landerson@hastingsgroup.com.

Nuclear Revival Falls into a Lull

"Because you have to understand, you can go through all of that -- getting those accreditations, spending all those thousands of dollars -- and there's no business guarantee of what's going to happen. We just don't know." (Below)

A wave of proposed new nuclear power plants has stalled. Will America's nuclear renaissance ever take off -- and what does it mean for manufacturers? *Wednesday, September 22, 2010*
By *Peter Alpern* The U.S might be on the verge of a second nuclear renaissance, but it still feels an awful ways away in Bremen, Ohio. In this rural town of 1,200 people, 50 miles southeast of Columbus, sits a bare, uncultivated 17-acre tract of land where Westerman Nuclear was supposed to build a new state-of-the art facility to produce a range of customized vessels and heat exchangers for the nuclear power industry.

The building should have been completed in April. But there are no signs of bulldozers or cement trucks anywhere -- nor will there be until the spring of 2011, at the earliest.

Like many manufacturers that have realigned their businesses to cash in on America's return to building new nuclear power plants, Westerman Nuclear is already signing contracts for new projects. But it's hardly at the rate that was envisioned when its parent company, Westerman Cos., created a subsidiary devoted entirely to the industry.

"We just don't have a large enough backlog [of projects] to justify spending $6 million for a new facility," says Matt Dodds, vice president and general manager at Westerman Nuclear.

For all the enthusiasm generated by the Nuclear Regulatory Commission having 22 applications in hand from companies that want to build 31 reactors, the gun hasn't gone off on a 21st century nuclear boom in the United States.

Only last January, President Obama gave the nuclear industry a powerful boost by citing its potential in his State of the Union speech. Weeks later, the Energy Department announced $8.3 billion in government-backed loan guarantees to help Southern Co. build a new nuclear power plant in Georgia, the country's first new build in more than three decades.

But in the months since, that momentum has withered, as energy prices have fallen, making it harder to justify the expensive, lengthy process of securing financing and waiting on regulatory approval for a new plant -- even before actually building the reactor itself.

Meanwhile, the Obama administration, which had hoped to triple the total amount of available loan guarantees for new reactors to $54 billion, has been unable to secure passage of the required funding measure. So while the Department of Energy is still sitting on $10 billion in available loan guarantees, none have been awarded yet as of press time.

This in many ways helps to define the unique nature of nuclear power. Without loan guarantees from the federal government, it's virtually impossible to finance a new plant. And without climate-change legislation that puts a price on carbon, nuclear power will have a harder time competing with cheaper, fossil-fuel forms of energy.

"Because of those loan guarantees, it really seems to have quenched a little bit of the fire that would get this thing off and running," says Lee Presley, vice president of nuclear operations for Chicago Bridge & Iron (CB&I), which is manufacturing containment vessels for the nuclear industry. "We know there's going to be new plants built and we know there's going to be work. But until Congress moves more money to the Department of Energy, it's probably going to be slow for a while."

This means that companies, such as Westerman Nuclear and CB&I, which have been mobilizing for the last several years for a potential boom in the industry, might be waiting a while longer.

"We've got all our ducks in a row -- between accreditations and equipment," says Terry McGhee, president and CEO of Westerman Cos. "Everyone knows there's going to be a nuclear renaissance at some point in time. It's just been delayed."

An Issue of Supply

Those delays are not expected to be indefinite. Far from it. Unlike competing carbon-less forms of energy, nuclear power has a broad range of support from both Democrats and Republicans, and already accounts for about a 20% share of electricity generation in the U.S. with 104 commercial reactors still in operation.

All of which is good news for U.S. manufacturers. But when many of these plants are ultimately approved and receive federal resources, it will undoubtedly create an entirely new and deeper question in need of answering: Who is going to build the thousands of components and subcomponents, ranging from valves to piping to pumps, heat exchangers, cables, electronic controls and steel structures?

Some of that equipment is easily accessible and some of the necessary commodities, such as concrete and steel, can be produced as necessary. But many more of the custom parts, such as reactor pressure vessels, steam generators, moisture separator reheaters, turbine generators, pumps, valves and piping, all need to be manufactured to extremely precise industry standards. And the U.S. hasn't had to mass-produce these types of pieces in over 30 years.

That's not to say there isn't a domestic nuclear supply chain already in existence. There is, only it is fairly small in size and largely focused on producing components for existing plants, not new ones.

"That's a big misconception today," says Mike Rencheck, chief operating officer at Areva. "People think we're starting from scratch in establishing a supply chain. There already is one. We just need to adjust it for having multiple plants being built over the next few years."

Rencheck has hanging in his office a graph that details the number of plants built year by year over the last half century. In 1980, for instance, there were 180 nuclear plants under construction globally -- and almost all those components were being produced in the U.S. But following the accident at Three Mile Island in 1979, the domestic market shrank dramatically.

According to Dale Klein, since 1977, three-quarters of the world's reactors still operating are of U.S. origin, either in construction or design. Klein served as chairman of the Nuclear Regulatory Commission during the administration of President George W. Bush.

That monopoly on power plant expertise no longer exists, he warns.

"When reactor orders in the U.S. ground to a halt about 30 years ago, technological progress and manufacturing innovation moved abroad -- and along with them, most of the links in the global supply chain," says Klein.

Thus, with half a dozen new plants ready to start building in the next several years, some within the industry worry if there's enough time to prepare a new domestic supply base.

"The struggle is going to be whether [the suppliers] can do it fast enough," says Rich Reimels, president of Babcock & Wilcox's Nuclear Power Generation Group. "The talk is [the nuclear plants] will be in operation by 2018 or 2019. Well, if you only had one plant, that wouldn't be a problem. But trying to gear up for that many plants in a very short period of time, it's going to be a huge problem, in my opinion."

Super-Sized Forgings

While most of the components and subcomponents that go into a nuclear power plant can be readily manufactured within the United States, three of the most vital pieces in a nuclear power plant -- the reactor vessel components, the turbine rotors and steam generators -- will have to be imported from elsewhere.

All of these pieces in question come from ultra-large forgings. While there are dozens of suppliers capable of providing small- to medium-sized forgings, there are few capable of delivering those that weigh greater than 400,000 pounds.

Today, Babcock & Wilcox estimates its demand at 100 heavy forgings per year. But that demand could more than triple in the next 15 years if the market in the United States takes off.

The U.S. steel industry produces over 100 million tons of steel per year, so in theory there should be enough domestic steelmaking capacity to fulfill the demand for forging nuclear components. The problem lies in how those forgings have changed over the last 40 years and the scale of the investment that would be required for U.S. forgers to participate.

In the late 1960s, designers discovered that larger forgings had better mechanical properties, requiring less welding and therefore less inspection requirements over the life of a plant. These larger forgings became a signature of Generation II plants and all others that have followed.

But by choosing larger forgings, even the most powerful domestic steel producers, such as U.S. Steel and the now-defunct Bethlehem Steel, were shut out of the supply chain.

Today's newest nuclear power plants, Generation III, follow designs that require steel ingots weighing between 500 to 600 tons each. And no steel producers in the U.S. can handle that kind of size or weight.

The largest and best-known supplier of heavy forgings is Japan Steel Works (JSW), which claims 80% of the world market for large forged components for nuclear power plants, including the steam generator, reactor pressure vessels and turbine shafts. JSW is contracted to supply Areva with large forged parts until at least 2016 -- enough to build six nuclear plants per year.

"The ability to make large forgings is gone in the U.S.," says Danny Roderick, senior vice president of new plant projects for GE Hitachi. "We've been trying to work with some companies that are interested in regaining that forging technology for large components, but it's very expensive and there are a lot of competitors out there now. It becomes a question of investment versus demand."

High Price of Admission

Four years ago, when Terry McGhee, president and CEO of Westerman Cos., set a course to enter the nuclear market, he was working from a position of strength. Though Westerman didn't have any prior nuclear experience, it had been a longtime producer of well-head equipment for the oil and gas industry.

Though the parts, materials and manufacturing techniques might differ between the two industries, they do hold one very important similarity: both maintain meticulous standards in quality. According to Mike Lees, vice president of nuclear equipment and manufacturing at Babcock & Wilcox, suppliers that have a history of producing parts for the petrochemical industries and military applications often have an easier time transitioning into nuclear.

Westerman first had to apply for nuclear stamp accreditations. It received five N-stamps, as they're called, which cost $300,000 upfront, plus an additional $75,000 to renew every three years.

"The price for admission is high to get into nuclear," says McGhee. "But it's a multibillion dollar market and it's an international market."

CB&I paid their entry fee 30 years ago. Nearly three-quarters of the 104 operating nuclear power plants in America use CB&I containment vessels.

"There's plenty of quality built into our normal products, but it's just at another level when you go into nuclear," says Presley. "All the workers have to be retrained and show proficiency. And there are very precise procedures you have to follow."

As an example, he cites the manufacturing process of a containment vessel. The industry stipulates that every process needs to be documented down to the finest detail, then instructed throughout the workforce and rigorously tested.

"The beauty of nuclear -- and I hate to say this -- is you don't have to do a lot of thinking, because it's all written down for you," says Presley. "None of these procedures are all that complex or harder to do than anything else we manufacture."

The difference, he says, is the paperwork. Presley boasts that CB&I can trace the material used in its containment vessels all the way back to the original iron ore. And he's only half-joking.

"The paperwork is every bit as important as the finished product," he adds. "If the documentation and paperwork is not right, it doesn't matter what you've built, you're not going to install it in a nuclear power plant. It's fundamental that everybody understands that. It's a mindset."

Forecast Cloudy

One of the newer trends among OEMs reestablishing the U.S. nuclear supply chain is localizing it to new projects. Companies like GE Hitachi, which formed a nuclear joint venture three years ago, and Areva have begun holding seminars in targeted regions to educate the manufacturing base on what it takes to break into the nuclear industry.

In Michigan, for instance, GE Hitachi held a two-day seminar in September which targeted former automotive suppliers to help provide components for the company's proposed Detroit Edison Fermi-3 plant 30 miles southwest of Detroit.

"We're trying to teach [Michigan manufacturers] what it means to be a nuclear supplier, how to get qualified and what local, state and federal aid is available to help in the process," says GE Hitachi's Roderick. "We try to provide an idea for what kind of market is on the horizon, so these companies can make informed decisions and investments."

That investment requires time and patience -- and lots of it, says Westerman Cos.' CEO McGhee.

"It's just such a long-term selling cycle," says McGhee. "We're quoting things now we won't build or ship until 2016. It takes a very strategic-minded, planning-oriented management team. You have to have a stomach for that."

And even then, there's little to no certainty of just how much business a company can expect. Juan Molina, vice president of supply chain management and the chief procurement officer at Westinghouse, visits with curious manufacturers regularly, many of whom are tantalized by the opportunity, yet ask for some sense of assurance.

There is none, he says. It's very expensive to get into nuclear, it might take years for the industry to take off, and even then, no one knows just how much business there will be in the end.

"To become a nuclear-grade supplier, it's not as simple as adding nuclear onto your business card," says Molina. "A lot of people prefer to wait to see what happens. They're hesitating. And that is the struggle. Because you have to understand, you can go through all of that -- getting those accreditations, spending all those thousands of dollars -- and there's no business guarantee of what's going to happen. We just don't know."

The Demise of the Pebble Bed in South Africa.

Though Pebble Bed technology originated in Germany, it was adopted and developed by the government of South Africa. For some it was a source of pride that a "developing" nation had become a significant player in the so-called nuclear renaissance.

But the South African government has now cut off funding for the project. Public Enterprises Minister Barbara Hogan has told the National Assembly that "**sobering realities**" included the lack of working demonstration model, the **lack of customers**, the lack of a major investment partner and the impending demand for $4.2 billion in new investment capital. As deadlines consistently slipped, Westinghouse withdrew from the project in May.

South African officials say the US and China are still working on the technology. But with no one seriously committed to building a prototype, any tangible future Pebble Bed might have as a major source of new energy seems highly imaginary. Critics also worry that without a containment dome, the technology would be vulnerable to small groups of terrorists with simple shell-lobbing mortars and that critical metal components would not perform as needed under the intense stresses of heat and radiation.

The death of the Pebble Bed has considerable significance. For nearly two decades reactor backers have counted it among a seemingly imaginary fleet of future “new generation” reactors which backers alleged would render solar and wind energy unnecessary.....

Meanwhile, Canada has been unable to find buyers for its CanDu design, and has put its own Atomic Energy of Canada, Ltd., up for sale. Thorium reactors are unproven, with no prototypes. Fusion reactors are still hoped to be "twenty years away." The AP1000 and EPR face major regulatory, safety and financial hurdles. Fourth Generation reactors are theoretical; by the time working prototypes might be built, it is evident to all but the most avid supporters of nuclear energy, that efficiency and renewables would be far down the path of energy independence and at much less cost.

Sensing an unending march of .....new design failures, the US industry is now pushing hard to get its aging fleet -- originally designed to operate 30 to 40 years -- licensed to run for 60 to 80 years.

But not one of 104 US reactors has a containment dome designed to withstand a serious jet crash. (Excerpted from Huffington Post, H. Wasserman 9/21/10)

Below program is offered to residents of Massachusetts; it would be wonderful to replicate this program in New Jersey. EMP Goals 1 and 5 apply.

> The University of Massachusetts Dartmouth Sustainability Studies is offering a free, non-credit, online professional graduate certificate in Sustainable Development through a Department of Labor workforce development grant. The certificate is a 2-semester program, beginning in Fall 2010 and running through Spring 2012.
>
> The certificate is for individuals who hold an undergraduate degree and meet one of these categories:
>
> > Unemployed and seeking job training for the clean energy job market
> > Underemployed and seeking to transition to a better position
> > Interested in entrepreneurial opportunities in the clean energy market
> > Employed and are seeking sustainability training to receive a promotion/salary increase*
>
> *This program is funded through the Massachusetts State Energy Sector Partnership in partnership with the Brockton Area Workforce Investment Board and is funded in whole by a $5.973M grant awarded by the U.S. Department of Labor's Employment & Training Administration.*
>
> *Ref:*
> *http://www1.umassd.edu/sustainability/studies/academics_certificate_graduate.cfm*

Joseph Scarpa, LEED AP, GREEN, EcoBroker, e-PRO
Green Paradigm Institute® – Tomorrow's Real Estate Education℠
Green Paradigm Realty LLC® – Tomorrow's Real Estate Experience℠
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Green Paradigm Realty LLC is a real estate brokerage and advisory firm specializing in green building, renewable energies, and sustainable development.
Be Smart. Build Green. Bring Profit.™

Renewable energy is still not possible for everyday customers of gas or
electric companies.
My family is looking at installing solar energy on our roof.
It will cost $35,000. We will get a tax credit next year of $10,000. We will also receive approximately $2500 per year in negotiable certificates. It all looks good on paper.
But the first question is, where are we to get the initial $35,000? So far, we have found no one who will give a loan. This means anyone who would like to install solar, needs to have a large
amount of disposable income.
It is still not feasible.
Thank you.
Janice

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Thank you for the very transparent and productive discussion yesterday regarding the New Jersey Energy Master Plan (EMP). As discussed, CPV believes gas-fired generation has an important role to play as New Jersey moves towards a carbon-constrained future and adopts a heavier mix of renewables in its supply mix. CPV is providing its comments below in response to the request yesterday that stakeholders follow up their verbal comments by email.

CPV believes that in adopting a Renewable Portfolio Standard, it is essential that the state consider the effects of renewable generation on the stability and operation of the grid. As New Jersey increases its use of renewables, there is an ever greater need for generation capacity that can provide "firm" energy on demand when the wind does not blow or the sun does not shine. Further to being intermittent, renewable resources can also increase or decrease at a very fast rate. In both of these respects, the large supply of energy from renewables will place a great strain on existing generation. Existing generation will have to ramp up or down quickly and will require many more starts and stops to accommodate these unpredictable and rapid changes. By running more sporadically, the existing generation sources will emit more pollutants than they otherwise would – clearly the opposite effect of what is intended by the adoption of the RPS. If the increasing demand for power over the next decade is considered, CPV believes the best way to complement the growth in renewables is through the development of new firm, efficient, and clean generation that is specifically designed to start and stop frequently, reliably and cleanly. This type of new facility can both support renewables and replace older generation facilities that were not designed to run under this paradigm. The cleanest and most dependable technologies to achieve this firming are gas-fired simple and combined cycle type projects.

Consistent, and in tandem with this concept, we believe that new gas-fired generation should be developed in transmission constrained areas that currently pay higher prices for wholesale power than the rest of PJM due to congestion. If the state provides economic incentives for the development of a few hundred megawatts of generation in strategic locations, the state will quickly recoup its investment through the savings that will be realized by ratepayers in the affected areas. Those ratepayers will thereafter pay a lower price for wholesale energy across several thousands of megawatts. As we know, the wholesale cost of power comprises about half of New Jersey ratepayer's electric bills, so that is the cost area that can yield the greatest reduction in costs to New Jersey's ratepayers.

Yesterday there was a request for specific solutions. While perhaps imperfect, the following approach has been crafted with the intention of accomplishing the goals of the state in a balanced and effective way – namely clean, safe, affordable and reliable energy. The numbers are approximate and can be refined through studies but are intended to provide some idea of the relative magnitudes involved in the analysis.

If the state increases the RPS in New Jersey to 30% of the BGS provided energy by 2020, that requirement translates to about 20,000 GWh per year based on the Preliminary Data Update of the 2008 EMP. If we assume 50% of this supply from renewables is "firm" and the remainder is intermittent, New Jersey would need about 10,000 GWh of new firm energy per year. This is the amount of energy that roughly 1,500 to 3,000 MW of simple and combined cycle projects would produce.

In principle, we therefore recommend that the state adopt appropriate policies to incentivize the development of up to 3,000 MW of new gas-fired power generation in the state along the following guidelines:

- The 3,000 MW should be procured for power deliveries beginning in 2015.
- The plants should be developed on brownfield sites that have been designated Brownfield Development Areas by the NJDEP and as such should receive expedited permitting treatment by the state.
- The minimum project size should be 200 MW and the maximum size should be 750 MW.
- The projects should be dispersed throughout the state.
- The projects should be located in transmission congested areas where the congestion relief benefits (net of any state incentives) would reduce overall costs to NJ ratepayers.

With the adoption of these additional provisions in the EMP, the state will:

- Create a more reliable grid before 2020 given the unpredictable nature of renewable generation;
- Clean up and redeploy some of the state's dirtiest and under-utilized brownfield sites;
- Minimize state administration by adopting a minimum project size;
- Ensure benefits are allocated fairly to communities across the state by adopting a maximum size;
- Reduce electric costs to ratepayers;
- Increase employment in New Jersey, and
- Increase state and local tax revenues.

CPV is grateful for the opportunity to provide these comments and thanks the state for conducting such a transparent and interactive process.

Respectfully submitted,

John Seker

John Seker
Competitive Power Ventures, Inc.

To: Lee Soloman, President, New Jersey Board of Public Utilities,
Evelyn Dowling, Evelyn.Dowling@bpu.state.nj.us

From: Lawrence J. Furman, lfurman97@gmail.com

Re: The Energy Master Plan; Energy, Environment & Economic Development
Part 1: An RPS of 100% by 2050

Date: September 24, 2010.

Thank you for extending this opportunity to comment on the Energy Master Plan. It is a privilege to live in a state where ideas and opinions, whether visionary or conventional are sought by the agents of this government "of the people, by the people and for the people."

If "Energy, Environment & Economic Development" is a prioritized list it is good to see "Environment" placed before "Economic Development." As Bill McKibben notes in "*EAARTH*"[1], the world is a different place than the one on which we were born, and the one on which we evolved. Regarding the causes, I would point to the fact that for most of the holocene period the concentration of carbon dioxide and other greenhouse gases was about 270 parts per million in the atmosphere, equivalent to 2.53 trillion metric tons. Today, at the beginning of the autumn of 2010, the hottest year on record, the concentration is 390 parts per million, equivalent to about 3.669 metric tons.[2] To reverse this trend we must first stop pushing carbon dioxide into the atmosphere and then figure out how to pull a lot of it out.

The Renewable Portfolio Standards in New Jersey, 23 other states, and Washington, DC, and the non-binding goals in five other states are a good start. Here in New Jersey the current Renewable Portfolio Standard calls for 22.5% generating capacity by 2021. We have 11 years to implement a renewable generating capacity capable of generating 18,672 gwh[3] of electricity per year. We need to define the Master Plan with consideration of the true costs and

1 Bill McKibben, "EAARTH", Times Books, 2010, ISBN: 978-0805-090567.
2 Deutsche Bank Climate Change Advisors, on the Internet at http://www.dbcca.com, viewed 9/22/10.
3 In their comments to the 2008 NJ Energy Master Plan, David Byer, Cindy Zipf, and Jennifer Samson of Clean Ocean Action noted "In 2005, New Jersey consumed roughly 83,000 gwh of electricity." Memorandum RE: "New Jersey Energy Master Plan Comments" to NJ BPU, dated 7/25/08, on the Internet at http://www.state.nj.us/emp/home/docs/pdf/080608_CleanOceanAction_ByerD.pdf Downloaded Sept. 1, 2010.

the risks, security concerns, economic externalities and reasonable long range projections. We should also look 100 years into the future, to define the RPS in the next century. Will our grand-children and great-grandchildren buy oil from the House of Saud or the Mullahs of Iran? Will they blow up the last mountains of West Virginia? Will they drill for oil in the Gulf of Mexico or off the coasts of New Jersey? Will they build more nuclear power plants? Or will they be living in a human economy in harmony with the biosphere – in a world with a Renewable Energy Portfolio of 100%?

Some citizens and the Commerce and Industry Association of New Jersey have commented that "we should build more nuclear power."[4] Some are pushing for development of the Purgen plant, a $5 Billion experimental coal with carbon sequestration plant to be sited in Rahway. Others favor solar, wind, biofuels, and conservation. In the interest of time I will limit my discussion to the sustainable technologies and present my observations on coal and nuclear power in a second document.

Sustainability

The Brundtland Commission defined as sustainable "[development which] meets the needs of the present without compromising the ability of future generations to meet their own needs."[5] John Eherenfeld defines "Sustainability" as "Flourishing forever."[6] Using what John McCain might consider straight talk, we could say "Consuming resources that can never be replenished and creating tremendous quantities of toxic wastes is not sustainable. In addition to energy conservation the only sustainable energy systems are built using renewable systems: solar, wind, tidal, bio-fuel." Clean Ocean Action is absolutely correct that we must build solar energy systems and conserve.[7] They were, however, wrong in their 2008 conclusions regarding wind power. Wind power at about $6 billion per gigawatt of nameplate capacity seems to me to be about the same price as solar at about $6 billion per gigawatt of nameplate capacity.

Sustainable Energy

When we put a solar module in the path of a stream of photons, or a wind turbine in the path of a stream of larger particles of air, we use some resources to make the widget; but we

4 Paul Tyahla, Memo re: "CIANJ Comments on the Draft Energy Master Plan: dated July 25, 2008, on the Internet at http://www.state.nj.us/emp/home/docs/pdf/080408_CommerceIndustryAssocNJ_TyahlaP.pdf

5 Our Common Future, Chapter 2, Towards Sustainable Development, on the Internet at http://www.un-documents.net/ocf-02.htm, viewed on Sept. 1, 2010.

6 John Eherenfeld, *Sustainability by Design*, Yale University Press, 2009. ISBN: 978-0300-158434.

7 David Byer, Cindy Zipf, Jennifer Samson, comments to BPU noted above.

don't *CONSUME* any fuel in the ongoing process by which we transform the energy in those moving particles of light and air into electricity. And we don't create any waste. No arsenic, no mercury, no radio-nucleotides, no carbon dioxide. The U. S. Department of Energy says, "Wind energy could provide 20 to 30 percent of the eastern half of the country's energy needs by 2024."[8]

When people, say "Wind turbines spoil the view" they don't consider the haze of smog on the horizon "spoiling the view." Perhaps worse, they force the status quo of nuclear and coal over offshore wind. This "spoil the view jazz" is a trivial subjective complaint that is neither provable nor disprovable. Wind turbines allegedly kill birds. Cell phone towers, buildings like the Borgata, and domestic cats kill birds. Like most Americans, I am not a vegetarian; I eat chicken, duck, goose – I cause birds to be killed, and I eat them. I won't eat tuna, swordfish, or lobster – there is too much mercury – mostly from coal – in tuna, swordfish, and lobster. Offshore wind turbines form artificial reefs which nurture fish stocks, which feed birds. Wind turbines produce power without producing mercury and other toxic wastes and without consuming resources that once used are gone forever. That is what is important.

What the "Spoil the View Environmentalists" must understand is that offshore wind farms, solar energy systems and even measures of conservation have an environmental impact. So does breathing – we exhale carbon dioxide. We need to look at our economy as a subset of human ecology and integrate the economy into the biosphere in a sustainable manner. As Wendell Berry says;

> "The defenders of nature and wilderness sometimes seem to feel that they must oppose any human encroachment whatsoever, just as the industrialists often apparently feel that they must make the human encroachment absolute or, as they say 'complete the conquest of nature.' ... People cannot live apart from nature … yet, people cannot live in nature without changing it. But this is true of all creatures; they depend upon nature, and they change it."[9]

Sustainable energy is not natural energy. Sunlight is natural. When it shines on a leaf

8 National Renewable Energy Laboratory, "Eastern Wind Integration and Transmission Study: Executive Summary and Project Overview", January, 2010, on the Internet at http://www.nrel.gov/wind/systemsintegration/pdfs/2010/ewits_executive_summary.pdf, downloaded Sept. 4, 2010.

9 Wendell Berry, *Home Economics*, Copyright © 1987, Northpoint Press, New York, pages 7-8.

that leaf photosynthesizes sugars out of carbon dioxide and water. But when that leaf is on a farm, it may be natural, but it is no longer wild. PV Solar modules are not made from leaves. The best insulation today is boric acid treated cellulose – this is not 100% natural. Like nuclear power plants and coal fired turbines; like houses and tents, wind turbines, photovoltaic solar modules, and insulation are man-made. Nuclear and coal based power systems are tremendously expensive and generate toxic by-products that must be isolated from the biosphere. Ground mounted PV Solar systems shade the ground. Offshore wind turbines create artificial reefs. These will influence local flora and fauna. But shade and artificial reefs are not toxic. Wind and solar are sustainable. They support the biosphere. An economist could say "The economic externalities of unsustainable technologies are liabilities. The economic externalities of sustainable technologies are assets which produce income or dividends."

We know this. That's why we have the RPS of 22.5% by 2021. Maybe we should be acting faster and we should not be throwing roadblocks in the path of sustainable development, but we are acting. Rush Holt, who represents New Jersey's 12th District in Congress, understands this and has discussed the DOE's "Eastern Wind Integration Study" with his constituents. Looking beyond the short term, the ultimate goal of the Energy Master Plan must be an energy portfolio in harmony with the biosphere; one that is 100% renewable and meets the Brundtland or Eherenfeld definitions of sustainability.

The real problem with wind power is similar to the real problem with solar power – these are intermittent sources of energy. The sun shines 24 hours per day in space, but does not shine 24 hours per day over New Jersey. We need to integrate solar power, wind power, hydro and biofuel in such a way as to provide supply in accordance with demand.

Professor Jurgen Schmid and his colleagues at the University of Kassel, in Germany, have done just that. Schmid and his colleagues have developed the "Kombikraftwerk" or Combined Cycle Power Plant, and proven that they can use wind, solar, biomass and hydro to meet ***ALL*** Germany's electricity needs around the clock regardless of weather conditions. Schmid says."If renewables continue to grow as they have done in the past, they'll provide around 40% of Germany's electricity needs by 2020. We could therefore achieve 100% by the middle of the century."[10]

10 Renewable Energy Campaign Germany, Ulf Gerder, "The Combined Power Plant – the first stage in providing 100% power from renewable energy, 9 October, 2007, on the Internet at http://www.kombikraftwerk.de/

What if -

- We deploy Solar on homes, commercial buildings, and parking lots, like at the Atlantic County Utilities Authority, and on museums like at the Liberty Science Center and schools, like Rutgers and Toms River? And malls, schools, factories, like in Spain and Germany?
- We put land-based wind turbines on high school football fields, parking lots?
- We put wind turbines off the shore from Cape May to Sandy Hook?
- And using the German “Kombikraftwerk” model, we integrate solar, wind, and biofuel with insulation and a computerized grid for an RPS of 100% by 2050.

That would be a Master Plan!

To: Lee Soloman, President, Board of Public Utilities,
Evelyn Dowling, Evelyn.Dowling@bpu.state.nj.us

From: Lawrence J. Furman, lfurman97@gmail.com

Re: The Energy Master Plan; Energy, Environment & Economic Development
Part 2: On Nuclear and Coal.

Date: September 24, 2010.

Thank you for extending this opportunity to comment on the Energy Master Plan. It is a privilege to live in a state where ideas and opinions, whether visionary pr conventional, are sought by the agents of this government "of the people, by the people and for the people."

Regarding Coal and Nuclear Power

Nuclear Power

Nuclear power provides about half of New Jersey's electric power. The NRC represents that the chances of catastrophe are small. Yet our fleet is aging. While it has been a known problem since the 1960's, management of radioactive wastes is a problem that has not yet been resolved. The Price-Anderson Act, signed by President Eisenhower in 1957[1] limits liability to $10 Billion[2] from a government fund, i.e. from the taxpayers. There are frequent, perhaps constant, leaks of tritium into Barnegat Bay from Oyster Creek, the Connecticut River from Vermont Yankee, the Hudson River from Indian Point, and from other nuclear power plants, and there are economic and security concerns. Because of these facts many stakeholders oppose the development of new nuclear facilities and call for the decommissioning of existing facilities.

Should we? Does General Electric, which built Oyster Creek, forecast new nuclear reactors? As I suggested to the Wind Power Commission in '05, and as has been stated by Jane Hoffman and Michael Hoffman in 2008[3], Al Gore in 1992[4], and various articles in the Wall

1 American Nuclear Society, "The Price Anderson Act", Nov., 2005, on the Internet at http://www.ans.org/pi/ps/docs/ps54-bi.pdf. See also U. S. Dept of Energy, "Price Anderson Act", http://www.gc.doe.gov/price-anderson_act.htm.
2 Ibid.
3 Jane Hoffman, Michael Hoffman, *Green, Your Place in the New Energy Revolution*, Copyright 2008, Palgrave Macmillan ISBN 978-023-060544-2
4 Al Gore, *Earth In The Balance,* 1992, Houghton Mifflin, Boston, 978-039-557821-6

St. Journal, new nuclear power is not viable. This has everything to do with economics, logistics, and national security and very little to do with politics.

Logistics of New Nuclear Reactors

Who would we hire to build new nuclear reactors? According to Medill Reports and the Oak Ridge Institute for Science and Education, out of close to 226,000 students graduating with degrees in science, technology, engineering, and mathematics in 2006, a total of 346 graduated with Bachelor's of Science in Nuclear Engineering. That's approximately 0.15 %, about three out of 2,000 or one out of 653.[5]

Security and Nuclear Power

If a terrorist destroys one wind turbine in a wind farm of ten or 100 or 1,000, then he or she destroys a $7 million or $10 Million investment that accounts for 10% or 1% or 0.1% of the facility's generating capability. Nuclear plants cost Billions of dollars. If a terrorist "takes out" a nuclear plant, the least of our worries will be the money spent on the facility. Our concern will be the crater and the "no live zone." Our nuclear plants are very, very dirty bombs we have placed in the hands of our enemies.

Sharif Mobley, an American of Somali ancestry, was arrested in March in Yemen in connection with Al Queda and the "Underwear Bomb Plot" of December, 2009. In an escape attempt, he allegedly shoot two police officers, one fatally. From 2002 to 2008 Mr. Mobley worked as a day laborer at six nuclear plants, including Salem and Hope Creek in New Jersey, Peach Bottom, Limerick and Three Mile Island in Pennsylvania, and Calvert Cliffs in Maryland.[6]

Coal with Carbon Capture & Sequestration, CCS

According to the Electric Power Research Institute, we don't have the technology for

5 Michael Baigorri, "College Graduates in Science, Technology, Engineering and Math", Medill Reports, Northwestern University on the Internet at http://news.medill.northwestern.edu/washington/news.aspx?id=94961 downloaded 8/13/10, and "Nuclear Engineering Enrollments and Degrees Survey, 2009 Data," Oak Ridge Institute for Science and Education, on the Internet at http://orise.orau.gov/files/sep/NE-Brief-66-2010-data.pdf, downloaded 8/13/10.

6 CBS 3 News, "Al-Qaeda Suspect from NJ Worked at 6 Nuke Plants", published on the Internet on March 13, 2010, Downloaded http://cbs3.com/local/sharif.mobley.yemen.2.1556982.html Sept 2, 2010. Also Brian Kates, "Al Qaeda-linked New Jersey man Sharif Mobley, arrested in Yemen, worked in nuclear power plants." NY Daily News, March 12, 2010, on the Internet at http://www.nydailynews.com/news/world/2010/03/12/2010-03-12_al_qaedalinked_new_jersey_man_sharif_mobley_arrested_in_yemen_worked_in_nuclear_.html, downloaded Sept. 2, 2010.

carbon capture and sequestration.[7] The Purgen carbon sequestration experiment at Rahway is presented as 750 MW power plant which will cost $5 Billion, if built on schedule and within budget. However, it will also require $100 million per year in tax incentives[8], or, to use what John McCain might consider straight talk, “taxpayer-funded handouts.” Thus, it's $9 Billion over 40 years. The capital costs are $8.89 Billion per gigawatt up front and $16 Billion per gigawatt over the the life of the plant, plus fuel, maintenance, management of wastes.

It will, theoretically, capture 90% of the carbon dioxide, compress it and pipe it about 70 miles on the floor of the Atlantic, from Rahway past Middlesex, Monmouth, and Ocean to Atlantic, to a point south east of Atlantic City, and then bury it in a well about a mile beneath the ocean floor. This sounds like the Deepwater Horizon. What happens to ocean temperature in a release of liquid carbon dioxide? What happens to the fish, the fishing industry, the tourism industry? How much energy will be required to capture, compress and transport the Liquid CO_2? According to the Electric Power Research Institute, EPRI, carbon capture and sequestration has “parasitic plant loads and costs[9]” According to Roger Saillant, PhD, Director of the Weatherhead School for Sustainable Value at Case Western, it's 25%.[10] If so then the plant is just went from a 750 MW plant to a 562.50 MW plant. And the costs per kwh just went up. Who pays the tax incentives? Taxpayers.

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7 Electric Power Research Institute, EPRI.Com, report “CO_2 Capture and Storage- Program 165” On the Internet at http://mydocs.epri.com/docs/Portfolio/PDF/2010_P165.pdf, viewed on Sept. 1, 2010, states “According to EPRI's PRISM/MERGE analysis, carbon capture and storage (CCS) from electricity generation will be one of the largest contributors to the nation's goal of decreasing greenhouse gas (GHG) emissions in the near-to mid-term. For pulverized coal (PC) plants to provide competitively priced electricity while addressing climate change concerns, they must have access to CO_2 capture systems with acceptable costs as well as secure geologic storage. To achieve that goal, the industry needs capture processes with much lower parasitic plant loads than systems available today; confidence in the ability to safely and permanently store large quantities of CO_2 in underground formations; and a legal and regulatory framework that is workable and technically sound.... EPRI's CO_2 Capture and Storage program (Program 165) provides information about the expected cost, availability, performance, and potential risks of a range of flue gas CO_2 capture processes. The program seeks and encourages the development of breakthrough post-combustion CO_2 capture technologies with substantially lower energy and cost penalties.”

8 Kate Galbraith, "A Plan for U.S. Emissions to Be Buried Under Sea", The New York Times, published 4/17/09. On the Internet at http://www.nytimes.com/2009/04/18/business/energy-environment/18clean.htm downloaded 9/4/10,
Davis, Leigh, "Oceanic carbon interment plan draws local objections," Highland Park Mirror, Oct. 15, 2009, http://www.highlandparkmirror.com/pp/story/oceanic-carbon-interment-plan-draws-local-objections, viewed 9/4/10.
L. J. Furman, "Sustainability and Carbon Sequestration," 2/20/10, on the Internet at http://popularlogistics.com/2010/02/sustainability-carbon-sequestration/ viewed 9/4/10.
L. J. Furman, Coal Plant With Carbon Sequestration, 4/30/10, on the Internet at http://popularlogistics.com/2009/04/coal-plant-with-carbon-sequestratio/, viewed 9/4/10.

9 Electric Power Research Institute, EPRI.Com, report “CO_2 Capture and Storage- Program 165” On the Internet at http://mydocs.epri.com/docs/Portfolio/PDF/2010_P165.pdf, viewed on Sept. 1, 2010.

10 Roger Saillant, conversation with the author, September, 2009.

The coal and utility industries use the term "Clean Coal," but consider the whole process. We blow up mountains to get to the coal - and we blow up a few mountains each day. In place of the mountains we create heaps of toxic waste. We ship the coal hundreds or thousands of miles, which costs time, money, and energy. When we burn the coal we release heat, some of which can be used to generate electricity, some of which is wasted. We also produce carbon dioxide, arsenic, mercury, lead, radio-nucleotides. Some miners die each year. On April 5, 2010 29 miners were killed in an accident at the Upper Big Branch mine in West Virginia. On Dec. 22, 2008, 1.2 Billion Gallons of toxic sludge flooded 3000 acres and the Clinch and Emory Rivers at the Kingston Steam Plant in Kingston, Tennessee. So even if we capture most of the CO_2, we still have arsenic, lead, mercury, and literally tons of toxic wastes. The stuff doesn't disappear. Mercury, a neurotoxin, finds its ways into the fish we eat – into our food. After we're done burning it we want to isolate all that stuff from the biosphere. Wouldn't it be easier to use a technology that doesn't create waste?

As a tax-payer, I don't mind paying for schools. When I need doctors, lawyers, or auto mechanics, I want people who know what they are doing. Airlines need educated and competant pilots and mechanics. Airports need educated security staff. We need schools for our future. But I don't want to subsidize destruction of mountains of trees, streams, and wildlife or their conversion into mountains of toxic waste. We don't need mountains of toxic waste. We need mountains of natural beauty.

The League of Women Voters' positions in 1995 and 1997 against the un-scientific designation of Yucca Mountain as a permanent repository for nuclear waste was a prophetic one! After over $11 Billion dollars spent and years of delay, Yucca is now off the table as the promised final resting place for nuclear waste!

According to the New Jersey Department of Environmental Protection , we currently have over 1100 metric tons of highly radioactive nuclear waste stored at the Oyster Creek Nuclear Generating Facility. Will Ocean County become a defacto highly radioactive nuclear waste storage dump? What are the options available to address this serious issue?

Many residents of Ocean County may not be aware that our county is poised to become a permanent repository for hundreds of tons of highly radioactive waste produced by Oyster Creek Generating Station in Lacey Township. The Yucca Mountain Repository proved to be fatally flawed as many in the scientific community predicted. This promise of a "final resting place" for the dangerously irradiated spent nuclear fuel from the Oyster Creek facility and other nuclear facilities was an illusion of massive proportions.

This waste, and its continued generation, poses an on-going threat to our health and safety. In official recognition of the criticality of radioactive waste accumulation, a US Department of Energy commissioned study on the problem is currently underway with much expert testimony but with no effective solution in sight.

On Monday, Exelon, the owners of Oyster Creek, gained permission from the Lacey Township Planning Board to increase its on-site capability to store even more hundreds of metric tons of highly radioactive waste produced during the license renewal 20 year timeframe. The waste on site will remain radioactive for hundreds of thousands of years essentially making Ocean County a permanent nuclear waste dumping ground.

We call on our elected officials to study up and weigh in on this public safety issue. In light of a Nuclear Regulatory Commission recent call for comment - in recognition of the problems inherent with on-site nuclear waste storage, washing the hands and passing the buck to an apparently perplexed NRC won't work as an excuse for lack of involvement.

We call on our elected officials to step up to the plate in two specific areas:

1) Calling for a storage plan for Ocean County's growing accumulation of radioactive waste that sees that the most effective safety precaution is taken to ensure the well-being of the 3.5 million people living within a 50-mile radius of the plant.

In light of a post 9/11 era , The proposed and current casks at Oyster Creek should be placed in hardened thick walled buildings with berms shielding them from view, as is already mandated in Germany, Japan and Switzerland. The fuel pool, which has been repeatedly reconfigured to squeeze in four decades of waste, exceeds its original design and for safety sake, should be reconfigured back to its original design specifications.

2) An NRC contracted study by the National Academy of Sciences to evaluate elevated cancer rates in communities surrounding nuclear plants is in its start up phase. Our local, county, and state legislators as well as our congressional delegation, must ensure that Oyster Creek, the country's oldest operating plant, be a focus of the study. Housing the oldest operating facility means that Ocean County residents have been subjected to the longest period of radiation exposure from daily low level emissions, and accidental releases into the air.

Exelon's application for more cask storage space coincides with this month's International Nuclear Waste Awareness Day on Sept. 29. There will be local events planned worldwide.

The Ocean County League of Women Votes will recognize the day by hosting a forum, "Ocean County's Tons of Nuclear Waste – Are we stuck with it?, at the Berkeley Branch –of the Ocean County Library,30 Station Street, Bayville, NJ, on Sept. 25, 10:30 AM. Internationally recognized nuclear waste expert, Kevin Kamps, of Beyond Nuclear, will be the featured speaker.

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MSEIA Comments regarding the New Jersey Energy Master Plan

MSEIA is the trade organization representing solar energy businesses in New Jersey, Pennsylvania, and Delaware. Its member companies respectfully submit the following comments to the Energy Master Plan Committee.

1. The transition from SBC-based rebate incentives for solar energy to SREC-based performance incentives can be accomplished gradually, and without reversing the small business growth and job creation successes that have characterized the solar program to date. However, this will require deliberate policy choices.

In 2002 New Jersey began in earnest to undertake an ambitious program of growing an entirely new economic sector in the state – solar energy. Today it is evident that this program has had successes that can be seen as a model of public policy-based economic growth. There are approximately 300 solar installers in New Jersey – hundreds of small businesses based in this state, who have created thousands of new, permanent jobs, in just a few years. But in addition to the many solar installer businesses and solar equipment manufacturers, many other business categories have been integrated into this fast-growing sector. New Jersey is known for its excellence in the professional trades. Many prominent architectural firms and engineering firms in New Jersey have begun to specialize in solar energy. During the current economic downturn (especially in construction), the solar energy business is playing a key role in keeping them alive. A similar story can be told about large electrical contractors. Prominent law firms and accounting firms, investment banking entities, traditional banks, real estate developers, and other types of businesses are involved. Solar energy is fast becoming deeply embedded throughout the fabric of our economy, and is one of the few parts of the economy showing fast growth.

Small business growth is always the cornerstone of economic growth, and New Jersey has succeeded – so far - in making it the cornerstone of growth in solar energy. In the early years of the Clean Energy program, incentives were based on rebates supported by SBC funds collected through utility bills. The rebate program was carefully designed and managed to ensure that these incentives were deployed in a balanced fashion, so that small and large businesses could participate, and so that small and large *ratepayer segments* could participate. This deliberate portfolio approach recognized that small solar projects might not be able to compete head-to-head with larger ones on price alone, but that they would provide other benefits that made them worthwhile. Besides local, small business growth and job creation, these benefits included fairness to all ratepayer segments. For instance, residential ratepayers pay nearly 40% of the costs of the Clean Energy Program. Without the deliberate portfolio approach that was taken,

they would not be able to participate directly in the benefits of the program. Benefits of the small system segments also include the benefits of distributed generation – taking pressure off of the transmission and distribution system, postponing or reducing upgrade costs and making the system more reliable.

The Clean Energy Program has already begun to transition away from SBC-based rebates and toward SREC-based performance incentives. MSEIA understands why this transformation is desired by policy makers. The motivation for this transformation is illustrated by the figures published by the Energy Master Plan Committee. The figures show that SRECs currently contribute only about 0.5% of a typical residential bill, while the renewable energy portion of the SBC is considerably higher. This is because performance-based incentives spread out payments for solar capacity over many years. While MSEIA understands the need for this transformation, our members are concerned that the portfolio approach, and the deliberate policy of support for small and medium-sized, New Jersey-based business might not continue. Our members are, of course, concerned chiefly with their own continued existence and continued growth. From a public policy point of view, though, we believe it would be a great shame if New Jersey were to build up this vibrant business ecosystem in the state only to let it disappear, even while the pace of solar construction accelerates strongly.

In the primarily SREC-supported environment that we are now entering, continued support for this portfolio approach will mean deliberate policies that are embraced and understood by all state agencies. **In practice, MSEIA believes that continued support for small business, small projects, and small ratepayers will require market segmentation.** This means that projects in different size classes will compete within their class, and the portfolio approach will be used to adjust market size for these segments according to a range of public policy considerations.

2. The cost of solar power as delivered through SRECs is far too high, and must be reduced dramatically. Bold new policies are required to accomplish this.

The market average price for SRECs, including the current mix of spot prices, short-term multi-year contracts, and the few long-term contracts created through BPU policy, is about $0.57 per KWH. The real cost of solar power has dropped precipitously over the last two years, yet the cost of SRECs has risen sharply during the same period. If secure, long term contracts were available throughout the SREC market, the average cost of about $0.27 per KWH would be sufficient to support projects with a reasonable rate of return. Therefore, ratepayers are currently paying more than twice the price they should pay for solar power. The Summit Blue report, commissioned by the BPU, made it very clear that the economic factors driving solar projects would inevitably drive the price of solar higher in the absence of secure, long-term contracts. Now actual experience in New Jersey has borne out this prediction. ***Quite simply, risk costs money.*** Even if the supply of solar and the RPS demand are in balance (as was assumed in the Summit Blue report), these economic drivers still exist, and the result must be either prices that are too high or failure to achieve the RPS mandates.

The answer, MSEIA believes, is to create policies ensuring that the SREC market is composed entirely of secure, long term contracts. The BPU has created programs and policies that comprise a good start. Now it is time to refine, and most of all, expand these initiatives. As stated before, in doing so it is essential that we do not lose the diversity of business or the diversity of rate classes that have characterized the growth of solar so far.

3. New Jersey currently accepts unlimited amounts of planned solar capacity for SREC registration. Serious consequences could occur in the near future. The state must control solar development, playing a gatekeeper function.

As long as sufficient incentives exist to make projects economical, the appetite in New Jersey to build solar seems almost to be infinite. However, the state's RPS mandates for solar are not infinite. The current rate of construction is substantially higher than is called for in the RPS law, and with the current rate of acceleration the total solar generation installed will blow past the RPS requirements in less than 10 months.
The SREC market is not a natural market. It is an immature, volatile creation of government. Thus far, with solar generation short of the mandates, we have had a choice between either failing to build at the rates required by the mandates (which is what happened first), or paying prices that were far too high (which is what happened next). If the pace of solar construction rockets past the goals, the SREC market may well destabilize and crash. In that case, equally bad choices face us. In the case of a price crash, existing solar generation owners will not be able to meet their debt obligations. This includes hundreds of schools who issued bonds, trusting in the design of this program - just like many other types of local, state, and federal agencies, thousands of homeowners, and hundreds of private businesses. Confidence on the part of finance entities and investors bringing money into the state to fuel the growth of solar will fail, and may take many years to restore. If the SREC market miraculously settles quickly into balance (which would require an unlikely market discipline given the desperate fervor fueled by the current economic downturn), the economic realities detailed in the Summit Blue report still apply. We will still face the same old choice between higher-than-necessary prices or failure to achieve the mandates.
MSEIA believes that the only rational choice for policy makers is to perform a gatekeeper function, metering the amount of solar power approved to enter the market. This can include creating stricter barriers for SREC registration, approving projects for construction in a future year, temporarily halting SREC registrations if certain criteria are met, and policing current approved projects that are not moving forward.

4. The New Jersey Net Metered solar electric industry, developed during the past eight years and now comprised of several thousand employees, faces an uncertain future because the state lacks clear policy to define how much of the state's solar RPS commitment will be supplied by MWs of Net Metered solar systems, and how much will be supplied by MWs of merchant generator, or grid supply solar systems.

The danger to the net-metered solar industry is exemplified by the more than 1400 MW of merchant generator projects that have applied to the Pennsylvania-Jersey-Maryland

(PJM) grid manager for permission to connect to the electric grid in New Jersey. This amount of planned capacity can be contrast to the annual need for only 70 to 150 MW of new solar electric capacity for each of the next several years. It can also be contrasted to the cumulative total built to date, 180 MW of residential and commercial net-metered systems, comprised of over 6500 systems.

These mega-projects, as explained below, could crash the SREC market, overwhelm the capacity of the transmission and distribution system in certain parts of the state, cost ratepayers tens of millions of dollars of hidden costs for T&D upgrades, and destroy the vibrant solar small business ecosystem.

The issue is particularly acute because the scale of the largest individual Grid Supply system under development of 100 MW, is fifty times the size of the largest commercial systems installed (2 MW), and equal to nearly 15,000 residential systems. With Solar Renewable Energy Certificates the principal state incentive that financially supports the development of all solar electric capacity, the development of any significant amount of Grid Supply Capacity that is eligible to earn SRECs will fulfill most or all the annual need for SRECs for years to come, and devastate the New Jersey Net Metered Solar Industry. Residential and commercial net metered customers will lose confidence in the SREC market as a financial incentive to encourage solar system development when they are unable to sell SRECs because the RPS requirement has been met from one or more large grid supply projects. Some customers who invested in solar generation in prior years will not be able to sell their SRECs, and will have difficulty in paying off debt incurred to finance their solar investment.

It is for these reasons and the explanations that follow that MSEIA believe all Grid Supply solar generation should compete in competitive solicitations to earn SRECs, and only for annual amounts of capacity that will not curtail the continued growth of the solar Net-Metered market in New Jersey.

NJ Solar Industry

To date, nearly all the 180 MW of solar electric generation capacity installed in New Jersey has been Net Metered, with the solar electric production consumed on the site where the solar system is located. This market has created over two hundred individual solar businesses and several thousand jobs. The financial support for solar electric generation in New Jersey was initially through rebate payments, from monies collected by New Jersey's System Benefits Charge (SBC), and were available for residential and commercial solar systems. Commercial rebates were available, at a declining rate as the size increased, for systems up to 700 KW in capacity. As the NJ solar industry grew, and more customers proceeded to install solar generation, the response outgrew the funding available from SBC monies, leading to lengthy waiting periods and the curtailment of commercial solar rebates.

To continue financial support for the solar system growth needed to meet New Jersey's annual solar RPS requirement, expressed in the amount of SRECs that needed to be secured by the state's Load Serving Entities each year, the Solar Alternative Compliance Payment (SACP) was increased to $711.00 in 2008. Subsequent SACP levels declined on a schedule that drops about 3% each year. Soon after the new

schedule went into effect, spot SREC prices started to increase, and have settled at over 90% of the SACP since mid 2008.
The hope expressed by some proponents of the higher SACP was that setting the SACP at a high level, equal to $0.71/kWh for each solar kilowatt-hour, would induce the LSEs to enter into long term (10-15 year) SREC contracts at much lower prices. This hope has not been realized and multi-year SREC contracts with LSEs have generally been available for only three to five year terms. LSEs, which sell much of the electricity consumed in NJ through the Basic Generation Service (BGS) Auction, only contract for supply for three year term agreements, and are thus reluctant to enter into long term contracts for SRECs. As a result, most SRECs are being sold in monthly spot transactions as they are produced, or under short multi-year term agreements at high prices. These short term contracts implicitly discount the value of the remaining years of SREC production.

Short Term SREC Contracts and their effect on SREC prices.
Since SRECs were established as a tradable commodity in New Jersey, all solar electric systems have had the right to generate and sell the SRECs produced from eligible solar systems for fifteen years from the date of operation. The lack of long term (10-15 Year) SREC contracts and predictable prices for the SRECs to be produced over the long term, has led to solar project financing and investment decisions confined to a short multi-year return on investment horizon, which heavily discounts the value of SRECs for the years beyond those with firm SREC prices. By heavily discounting the value of SRECs for most of the years that SRECs will be produced, it forces the solar investor to concentrate their return on investment to only the early years of the solar system's productive life. This approach results in higher average SREC prices, and costs the ratepayers more as the LSEs who are paying a high price for the SRECs include those costs in the price of electricity supplied to the state.

Net Metered Solar vs. Grid Supply Solar – The fallacy of lower cost
It has been said by some that large grid supply solar systems should be encouraged over net-metered solar electric systems because the former cost less per KW to build, and can thus deliver kWh at a lower cost as a result of better economies of scale in the cost of construction. While it may be true that large multi-MW ground mount systems may cost 10% to 15% less to build than a 500KW or 1000KW roof mounted system, the cost of construction is only one factor in determining the actual cost of the solar electricity delivered to the state. In 2010 many NJ commercial roof mount solar systems of 500KW or greater are being installed at a cost of about $4.50 or less. We believe that large ground mount solar systems are being installed at a cost only about 15% lower. Thus the cost difference per KW is not very great.
But the cost of construction does not alone determine the cost to the ratepayers of the kWh delivered from a solar system. Rather, it is the cost of the SRECs purchased by the LSEs from any solar system that determines the cost that flows through the LSEs purchase of SRECs to all ratepayers. Just because a solar system costs slightly less to build, that does not mean that the developer/owner of that large system will sell the SRECs produced at a lower price than a smaller system. Instead, the owner of a large Grid Supply solar system, because it can be assumed the owner is interested in

maximizing its profits, will attempt to sell the SRECs produced from its large system at the highest price the market will bear.
Thus it is not the cost of construction that determines the cost of the solar kWh produced, but rather it is the cost that is paid to induce the construction of the system, in the form of the payment for the SRECs produced for the 15 years of SREC production, that determines the true cost to the ratepayers for the kWh of solar electricity delivered. Under the current market conditions for the development of Grid Supply solar projects, there is no competition between these large projects to deliver SRECs at the lowest cost to ratepayers. Instead the only competition is of speed to develop their project – primarily comprised of who can quickly lock up control over farmland, who can get through the PJM interconnection approval process first, and who can attract the high risk capital to be able to build the project while SREC prices are high. We believe that these large Grid Supply projects are being developed in the hope by their developers that their project will be one of the early projects that are developed, in an effort to achieve an above market return on equity by achieving higher SREC sale prices than would be achieved in a competitively priced procurement process
.

Grid Supply Solar Development Process

At present, there is no legal or regulatory process in place to determine which Grid Supply solar project should be developed, or how much MW of Grid Supply solar capacity is appropriate to develop over any particular time frame. Current laws and regulations allow any solar electric system connected to the electric distribution system to earn SRECs. The size limitation of 2 MW, that existed for many years, has been removed. Technically, that removal allows for the development of a solar system of any size to be developed and earn SRECs upon commercial operation as long as it can connect to the distribution grid. It is this void in state solar policy that has led to many solar project developers, from around the world, to seek control over large farm parcels in the hope that they can develop a large solar farm and squeeze through this policy gap while it still exists, and earn above market returns.
A good example of the process is the 100 MW project under development that is commonly known as the “Pittsgrove” project. The application for this project of 100 MW was submitted to PJM, the first step in the technical feasibility process, in ____ of 2009. In ___ of 2010 PJM gave preliminary approval for the project’s proposal to connect its electric output to eight separate surrounding substations in the service territory of Atlantic Electric. This is an unconventional approach, and involves installing new wiring from the solar farm to eight substations up to 20 miles away. Subsequent to that PJM approval, Atlantic Electric reserved electric capacity in those substations for the proposed project. When other net metered solar projects in that geographic area subsequently sought interconnection permission, granted in nearly all other net metered cases, interconnection permission was denied by Atlantic Electric because there was no capacity available due to the reservation of capacity for the 100 MW project. Thus the potential development of one large Grid Supply solar project has already shut down the Net Metered solar market in at least one geographic area of the state.
This evaluation of current laws and regulations governing the SREC market, and more particularly the Grid Supply market, leads us to the conclusion that all Grid Supply

capacity (or all Grid Supply capacity over 5 MW in size) should be procured through a competitive process for the purchase of the SRECs to be produced. Without a competitive procurement process there will be little downward pressure on SREC prices for this class of solar generation. And it is the price paid by LSEs for the SRECs produced that is the mechanism to flow the cost of solar generation to the ratepayers, not the actual cost of constructing the solar capacity.

Net-Metered Solar Capacity Benefits

Net Metered solar systems provide the most benefits to New Jersey ratepayers because:

(1) they create local continuing local employment for all the individuals involved in the sale, design, procurement, permitting, installation and service of the residential and commercial solar systems comprising the Net Metered Solar Industry
(2) they deliver electricity, primarily during peak electric demand hours, at the point of consumption, and do not require investment in new electric infrastructure to utilize the electricity produced
(3) they benefit New Jersey based homeowners and businesses that purchase solar electric systems, by reducing and stabilizing their electric costs for decades to come
(4) They reduce the load on the electric distribution system during peak demand hours, and with sufficient penetration, should reduce the stress on the electric distribution system, and thus avoid some of the future investment by EDCs to expand the capacity of the distribution system.
(5) They utilize some of the hundreds of millions of sq.ft. of unused roof space in NJ or are mounted above parking areas, rather than on productive farmland

Grid Supply Solar Projects

(1) Need large tracts of inexpensive land to achieve cost effectiveness
(2) Are usually located a significant distance from where the electricity will be utilized, incurring losses in moving the electricity to the point of use
(3) Are planned for land that has alternative productive use, such as farming
(4) Primarily benefit the solar project developer and system owner, rather than New Jersey electric consumers
(5) Often require additional distribution system investment to connect to the grid
(6) Only generate installation work for a short intensive period
(7) Are often funded by capital from outside New Jersey or outside the US, benefiting non-NJ residents more than New Jersey homeowners and businesses

MSEIA thanks the Energy Master Plan Committee for the opportunity to submit these comments.

Sincerely,

Lyle K. Rawlings, P.E.
President

Dennis Wilson
Vice-President, New Jersey

Northeast Energy Efficiency Partnerships, Inc.

An Energy Efficiency Strategy for New Jersey

Achieving the 2020 Master Plan Goals

March 2009

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Any errors or omissions are the sole responsibility of NEEP.

NEEP is regional non-profit organization that promotes the efficient use of energy in homes, buildings and industry in the Northeast U.S. through regionally coordinated programs and policies. See www.neep.org for detailed information.

CONTENTS

EXECUTIVE SUMMARY

The Energy Master Plan goals are achievable, but only with visionary leadership and a truly all-hands-on-deck approach.

In October 2008, Governor Corzine finalized an Energy Master Plan for New Jersey "to place New Jersey at the forefront of a growing clean energy economy with aggressive energy efficiency and renewable energy goals and action items, and the development of a 21st century energy infrastructure." Designed to achieve New Jersey's 2020 and 2050 greenhouse gas targets while maintaining affordable, adequate and reliable energy supplies, the Energy Master Plan proposes to reduce projected energy demand by 20% by 2020.

The 20% goal equates to offsetting projected growth in the demand for energy needed to power New Jersey homes and buildings by the year 2020 – approximately 19,000 GWh per year, 5,700 MW peak electric system demand and 101,000 BBTUs of heating energy savings annually.* These are aggressive, but achievable, goals. One other state, Vermont, has offset statewide growth in electric system demand in 2007 and 2008 through a steadily increasing, multi-year program implemented by Efficiency Vermont. New Jersey can do the same, but through its own unique approach to address the specific needs, opportunities and circumstances of the Garden State.

The Energy Master Plan Efficiency Goals Are Achievable

This report, developed by Northeast Energy Efficiency Partnerships (NEEP) with input from leading consultants – many of them deeply knowledgeable of the New Jersey Clean Energy Program, as well as from New Jersey stakeholders, confirms that New Jersey can achieve the Energy Master Plan goal to offset energy and load growth with cost-effective energy efficiency. It also offers a way forward to a sustainable, energy efficient future. In implementing the recommendations described herein, New Jersey residents, businesses and institutions can collectively realize $16.8 billion in net savings (present value 2008 dollars). Achieving this will take a concerted, multi-year effort involving significant resources – a *total of $6.8 billion* – to fund a wide range of well coordinated policy and program strategies. Through these strategies, we expect consumers to spend an additional $4.4 billion of their own money on energy efficiency investments that indeed are cost-effective for them.

New Jersey can meet the Energy Master Plan projected electric system energy and capacity consumption reduction goals by using current, cost-effective technology and best practices for program and policy implementation.

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* The Energy Master Plan sets 20,000 GWh per year as the 2020 energy consumption reduction goal. However, adding the effect of the federal general service lamp efficiency standard, which takes full effect in 2015, will reduce overall consumption by 1,000 GWh. Note that the EMP expects energy efficiency programs alone to achieve the majority of savings: 14,000 GWh/yr (after the aforementioned adjustment), 3,300 MW and 75,000 BBtu.

NEEP's Energy Efficiency Strategies Can Meet the Energy Master Plan Goals

	Energy Master Plan Efficiency Programs 2020 Savings Goals ‡	Strategy Portfolio Energy Efficiency Initiative: Estimated Impact*	% of EMP Efficiency Program Goal
ELECTRICAL ENERGY	14,000 GWh✦	**17,800 GWh**	**127%**
ELECTRICAL CAPACITY	3,300 MW	**6,400 MW**	**194%**
OTHER ENERGY	75,000 BBTUs	**74,000 BBTUs**	**99%**

‡ *Considers only EMP energy efficiency program goals. Excludes EMP goals related to State lighting and appliance standards, new building codes, on-site power, demand response, biofuels and others*

✦ *EMP goals for efficiency programs; adjusted for the impact of new federal incandescent lamp standards*

* *Considers only efficiency programs (and time of sale building energy rating policies). Excludes on-site power*

These cost-effective savings primarily reflect the impacts of the market sector programs as well as, for both energy and capacity goals, the impacts of implementing building energy rating and performance requirements described herein. They do not reflect the impact of new state or federal appliance standards, nor the strategies aimed at increasing penetration of clean, on-site power (though these are partially addressed in this report). While the impacts of increasing appliance efficiency standards can be large, they are complex to estimate and required data we did not have. Indeed to meet the Energy Master Plan goal of offsetting all growth in energy by 2020, the increased use of cost-effective combined heat and power as well as public policies such as increasing state and federal appliance standards and building energy code requirements will be necessary.

What will it take?

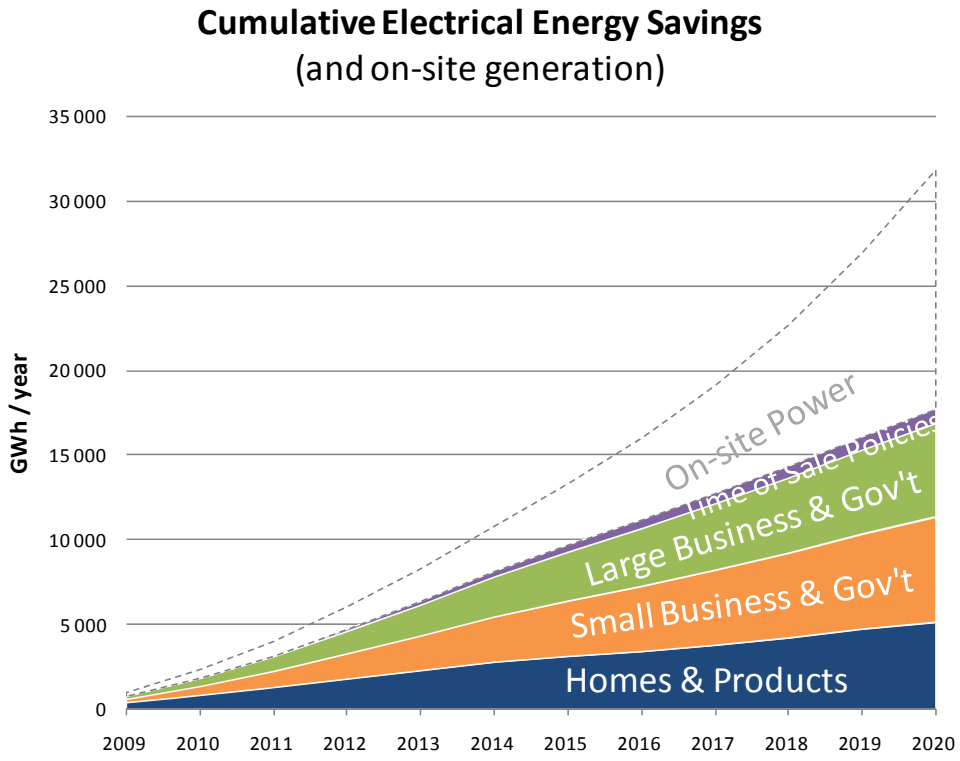
To achieve the Energy Master Plan savings goals, New Jersey must improve the energy performance of 60% of all New Jersey homes and buildings by 30% relative to projected energy use in 2020. It must also increase the efficiency of the majority of homes and buildings built, remodelled or renovated by at least 35% above today's building energy code requirements.

New Jersey's current energy efficiency programs can achieve 30% energy savings in individual residences and businesses. However, scaling up to reach over 1.7 million homes and between 180,000 and 240,000 business and government facilities by 2020 requires an unprecedented effort. Achieving this will take a strategic combination of programs to overcome pervasive institutional, market and financial barriers that result in wasteful energy consumption, and public policies that set new mandatory efficiency standards for appliances and equipment purchased and installed, for home and building construction, and for the energy performance of existing homes and buildings. It will also take dedicated and sustained

State leadership that makes energy efficiency a top priority, and fosters a positive policy and regulatory environment to facilitate necessary investments and raise baselines for energy performance across the state for the next ten years.

A Portfolio of Strategies

To achieve the Energy Master Plan efficiency goals, this report recommends a portfolio of interrelated programs and public policies to set new standards, build market place capacities, and provide assistance to the large majority of New Jersey residents, businesses and institutions to significantly improve the energy performance of homes and buildings.



The portfolio of strategies addresses all market sectors to achieve the Energy Master Plan Goals.

Building on New Jersey's current programs and policies, the strategies draw from best practices and experiences from across the country tailored to address New Jersey needs, issues and opportunities (e.g., its aging building stock built prior to minimum building energy codes; the large percentage of tenant occupied space in multifamily dwellings and small to medium-sized commercial spaces; the high percentage of homes served by heating oil; and the interest of many communities to be part of New Jersey's energy efficiency "makeover").

As a portfolio, it is intended to be implemented in a flexible and strategic manner responsive to evolving circumstances, opportunities and feedback.

This portfolio of strategies is presented in five sections:

A Foundation for Success describes the overall structure needed to implement an aggressive statewide energy efficiency effort to achieve the Energy Master Plan goals.

Saving Energy in Homes describes the nature and size of the cost-effective energy efficiency resource in the residential sector and recommends program strategies and public policies to achieve the 2020 energy consumption savings goals in new and existing housing, appliances and equipment.

Saving Energy in Business and Government describes the opportutnity and strategies to capture comprehensive cost-effective energy efficiency in commercial buildings – small and large, government and institutional facilities and industry.

Cross Cutting Strategies provides recommendations that cut across sectors including the use of community leadership to scale-up programs, on-site power to further improve energy performance and reduce system energy requirements for homes and buildings, the role of innovation to tap new and emerging program strategies, technologies and best practices to increase cost-effective savings, and the important role of evaluation, measurement and verification to "prove the resource" and document progress towards goals.

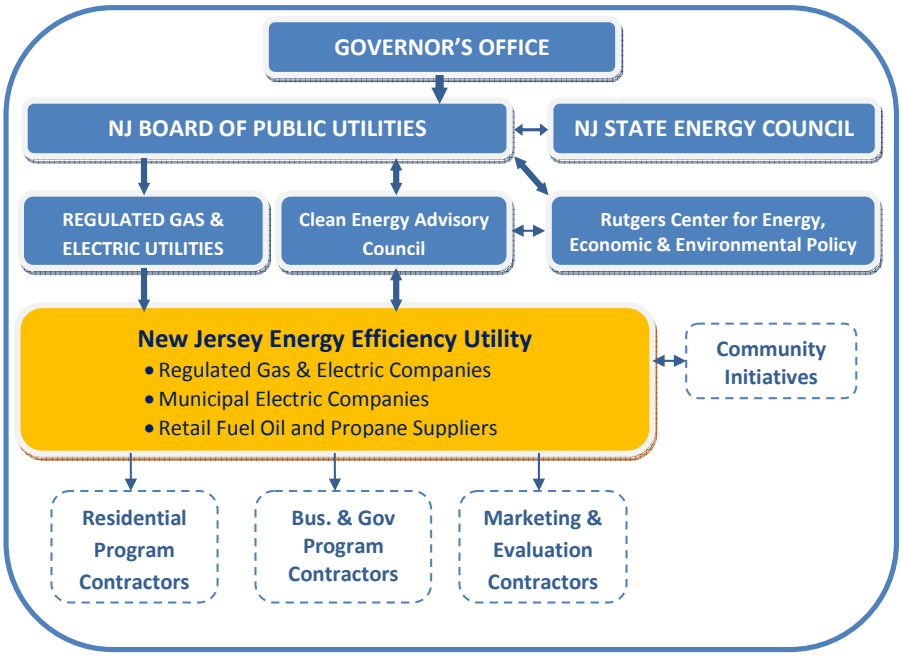
Savings, Costs and Benefits provides the results and explains the high level, though detailed analysis conducted to assess thecosts and potential impacts of effective implementation of the recommended program strategies and policies to achieve the Energy Master Plan goals.

Ten Key Recommendations

This report contains a vast array of recommendations to achieve the EMP goals. While each is important, we can reasonably group these into ten distinct pieces:

#1: Create a New Jersey Energy Efficiency Utility

A centerpiece of the strategy portfolio is a **New Jersey Energy Efficiency Utility** to serve the entire State with consistent initiatives coordinated with policies at the state and local levels. The urgency and importance of achieving the EMP efficiency goals, as well as the challenge of systematically overcoming the many barriers to cost-effective savings, requires such an approach. **It is highly unlikely that a patchwork of programs implemented by individual agencies and utilities can scale up to achieve the EMP's goals** – even with a well intentioned effort at coordination. A statewide structure will focus efforts on overall, not piecemeal, success, and will leverage resources and avoid wasteful and possibly confounding duplication.



NJ Energy Master Plan Energy Efficiency Initiative – Organizational Structure

Consistent with the Energy Master Plan finding that New Jersey's regulated utilities are uniquely situated and equipped to meet the State's energy efficiency targets, the New Jersey Energy Efficiency Utility should be implemented as an instrument of the utilities at the direction of the New Jersey Board of Public Utilities ("BPU"). This structure should welcome municipal utilities and unregulated fuel service providers that participate and fund the programs to serve their customers. In addition, state agencies that fund or implement energy efficiency programs or projects should coordinate, if not integrate, their programs with the New Jersey Energy Efficiency Utility to provide consistent messages, leverage resources and provide seamless whole solutions to residents, businesses and institutions.

To scale-up and serve the majority of homes, businesses and institutions across the state, the utilities - through the New Jersey Energy Efficiency Utility - should engage a broad range of market channels and market-based service providers to provide comprehensive solutions to improve the energy performance of homes and buildings across the Garden State.

#2: Supportive Regulatory Oversight

Critical to the success of the overall effort is the BPU's direction and oversight of the energy efficiency program plans, goals, budgets, reporting and evaluation implemented by the utilities through the New Jersey Energy Efficiency Utility. A positive and stable regulatory environment – which provides a long-term view in setting goals, is results-oriented, offers incentives and removes regulatory barriers to aggressive program implementation, requires accountability to protect ratepayers, and engages real-time input and feedback from stakeholders – is vital to achieve the energy and economic savings that offer such

extraordinary value to ratepayers collectively and individually ($16.8 billion in net savings). Supported by the Governor's office, the BPU should also facilitate state agency coordination with the ratepayer-funded efficiency programs to provide integrated, comprehensive and seamless efficiency programs statewide.

#3: Flexible Energy Efficiency Program Strategies

The portfolio presented in this report describes program strategies to serve specific market segments across New Jersey. Core concepts include flexibility to package services and financial assistance to make efficiency investments attractive, affordable and accessible to motivate residents and businesses to take action – offering them the cost-effective "deal they can't refuse". This customer-oriented approach focuses on understanding customer needs – including their vast array of decision criteria –, offering appropriate incentives and selling the full value of energy efficiency. It requires understanding and addressing the efficiency opportunities and barriers to efficiency investments in each market segment – whether retrofitting existing buildings or capturing efficiency in market driven transactions such as new construction, remodelling, tenant build outs, or equipment purchases. Central to the customer-oriented approach is integrated program offerings that offer whole solutions – "one-stop" shopping – that address all fuels using the broad range of cost-effective demand-side resource options, including efficiency, demand-response, combined heat and power and building integrated renewable, to close the deal and maximize net savings.

Another key to program success is a statewide marketing campaign using targeted and cross-sector marketing to build a high level of awareness of energy efficiency. This includes the use of social, business and professional networks, community-based initiatives, and relationship marketing to enlighten, inspire, and connect individuals and businesses to programs and services to take action. The strategies also recommend extensive use of existing market channels – manufacturers, retailers, distributors, builders, designers, energy service companies and other service providers – to educate consumers and "sell" high efficiency solutions.

#4: Aggressive State and Local Policies

The voluntary program strategies described in this portfolio are necessary to build market capacities to deliver energy efficient products and services, and engage a significant number of homes and buildings. However, they will be not be sufficient to reach the majority of households, businesses and institutions with average savings of 30% to achieve the Energy Master Plan energy savings goals by 2020. Regulation in the form of building energy codes, appliance standards, and building energy ratings and performance requirements will also be necessary.

Complementing the positive market effects of the programs to increase the availability of high efficiency products, homes and buildings, this portfolio recommends that New Jersey continue to adopt state level appliance efficiency standards in coordination with other states,

support new and updated federal appliance efficiency standards, and continue to update the state building energy code to at least 35% above the current code. To pave the way for future state code updates, New Jersey should adopt an optional advanced or stretch energy code to set a common technical reference for "above code" programs and policies for new construction – with a long-term goal of building the market capacity to design and build micro-load or net zero energy homes and buildings as a standard practice.

We recommend further that state government establish advanced energy performance requirements for the design and construction of local and state-funded homes and buildings (e.g., require for all school construction use of the 21st Century Schools Guidelines developed by New Jersey Schools Development Authority with the New Jersey Institute of Technology). We also recommend that state and local procurement authorities adopt ENERGY STAR or other high efficiency standards for all energy-using appliances and equipment.

In addition, New Jersey should establish a market value for energy efficient homes and buildings by requiring building energy rating at the time of sale or lease. Building energy rating requirements, recently adopted by several states, are common in Europe. In addition, given the age and relative inefficiency of much of New Jersey's built environment, the State should use the voluntary programs to build the market capacity to support building energy performance requirements for existing homes and buildings at the time of sale or lease beginning in 2015. This is necessary as only a portion of the homes and buildings will likely respond to voluntary programs in time to meet the 2020 Energy Master Plan Goals.

#5: Appropriate Energy Rates, Prices and Usage Information

A major barrier to improving the energy performance of homes and buildings is the lack of real-time information for home and building occupants and energy system managers about actual energy consumption and the value of improved efficiency. This strategy recommends that the BPU explore rate designs that encourage reduced energy consumption (e.g., inverted block rates, time of use pricing for customers with flexible energy loads) as well as the use of "dashboard" technologies, building energy controls, "smart" appliances as well as bill comparisons that help users and managers understand actual energy usage and opportunities to improve performance.

#6: Community Initiatives

Many New Jersey communities are interested in local action to address climate change, sustainability and energy costs, and have made public commitments that reflect their intent to act (e.g., by signing the U.S. Conference of Mayor's Climate Protection Agreement). Motivated communities, such as these, can play an important role to help achieve the Energy Master Plan goals by participating in programs and contracting services to improve municipal facility energy performance; leading community-based social marketing campaigns to encourage residents and businesses to be part of the energy efficiency solution; sponsoring door-to-door direct installation initiatives for residents and small businesses with the New

Jersey Energy Efficiency Utility; and/or undertaking community-wide energy efficiency initiatives to achieve specific energy reduction goals. Muncipal financing that allows property-owners to repay loans for major efficiency improvements on their property tax bill is a new financing tool that requires local leadership and action. Community initiatives to increase energy efficiency can also assist workforce development efforts.

#7: Evaluation, Measurement and Verification

The New Jersey Energy Master Plan, containing some of the nation's most ambitious energy efficiency goals, deserves a significant commitment and dedication of resources to provide transparent, accurate, and timely evaluation, measurement and verification (EM&V) to support regulatory oversight of and accountability for ratepayer-funded energy efficiency programs; inform planning, goal setting and budgeting; track and report progress towards goals; support program implementation and resource allocation; and inform the award of performance incentives. To support this effort to "prove the energy efficiency resource", the BPU should maintain and adequately fund an integrated and comprehensive EM&V plan and process using consistent statewide protocols – coordinated with regional and national protocols - to estimate, track and report the impacts of energy efficiency programs and policies. In addition, the BPU should maintain protocols, data and tools to assess the cost-effectiveness of efficiency investments at the measure, project and program level.

#8: Workforce Development

Achieving the Energy Master Plan goals will require workforce development to train and credential a wide range of green jobs – engineers and designers, tradesmen and women, installers, auditors and inspectors, program managers, financial product managers, trainers, etc. - to provide quality and comprehensive energy efficiency solutions. New Jersey will also need to use the reach of universities, technical and vocational schools, community colleges, community and professional development associations, labor unions and employer training programs to build the capacities to deliver the energy efficiency solution across the Garden State. The New Jersey Department of Labor is leading this effort through an Industry Workforce Advisory Council to build a green collar work force to implement the Energy Master Plan recommendations - including a recent grant to establish the New Jersey Center for Energy and Environmental Training.

#9: Ongoing Learning and Innovation

Opportunities to increase energy savings continue to evolve as new products and innovative services are introduced. For example, rapidly developing breakthroughs to provide market-ready solid state lighting products can radically change energy usage and reduce consumption over the next twelve years. In addition, scaling up program implementation to reach 1.7 million homes and 180,000 to 240,000 business and government facilities will likely

result in creative delivery mechanisms, partnerships and channels that accelerate adoption, reduce costs and increase savings.

To drive such learning and innovation in energy efficiency, New Jersey's program administrators need a clear charter and adequate resources to attract creative ideas; vet and fund promising delivery organizations and projects quickly; assess new technologies and program designs via controlled studies and field trials; and improve or discontinue technologies or program components that do not meet expectations.

In addition to goals and budget set asides for such efforts, we recommend that the New Jersey Energy Efficiency Utility convene and manage a New Jersey Efficiency Technical Committee that includes participation from the utilities, academia, relevant state agencies and other key stakeholders to review and vet new opportunities to increase cost-effective energy savings. This should complement the Energy Master Plan recommendations to expand the Edison Innovation Fund to include an *Edison Innovation Clean Energy Technology Commercialization Fund* and an *Edison Innovation Clean Energy Manufacturing Fund* administered by the New Jersey Economic Development Authority (EDA) in partnership with the New Jersey Commission on Science and Technology (CST), and to form an Energy Institute of New Jersey as a strategic collaboration of New Jersey's colleges and universities to advance new clean energy technologies.

#10: Regional and National Coordination

New Jersey is not alone in committing to an aggressive ramp-up of energy efficiency. States across the Northeast and Mid-Atlantic region – New England and the neighboring states of New York Pennsylvania, Delaware and Maryland – are all in various stages of implementing programs to more than double current rates of energy savings from efficiency programs. National policies are also calling for a ramp-up of energy efficiency. This simultaneous ramp-up offers opportunities to quickly engage market momentum and facilitate a culture that values increased energy efficiency. It also offers challenges as the demand for high efficiency products and services spikes. To manage and leverage this policy convergence, New Jersey should continue to coordinate its programs and policies with relevant regional and national efforts to provide consistent messages, engage the muscle and creativity of the market place through coordinated efforts, adopt common standards, specifications, definitions and protocols that minimize market barriers to broad participation, as well as share learning and the costs of research and development.

The Bottom Line: Funding the Initiatives

To reach the 2020 energy consumption reduction goals will require approximately $6.8 billion to implement programs and policies through 2020, in addition to $4.4 billion in private investment (i.e., participant costs). To achieve this, the State should tap and focus the use of multiple revenue sources with an overall intent to use government resources and ratepayer funding to leverage private investment and financing.

Funding recommendations include increasing New Jersey's ratepayer-funding for energy efficiency as a least cost resource (i.e., cheaper than the cost of supply resources). In addition, to fund efficiency for all heating fuel types, New Jersey should institute an energy efficiency surcharge on non-regulated heating fuels (e.g., heating oil). New Jersey should also tap to the fullest extent possible market-based revenues (e.g., from the sale of carbon emission allowances and the successful inclusion of ratepayer-funded energy efficiency programs in the PJM future capacity market). The State should also maximize the use of federal funding provided through traditional sources (i.e., state funding from US Department of Energy's Weatherization Assistance and State Energy programs), as well as the $276.6 million allocated to New Jersey through the recently approved American Recovery and Reinvestment Act of 2009 ("ARRA") to increase energy efficiency over the next two years.

To supplement these revenues, New Jersey should tap private investment and financing through a range of strategies including ESCo financing, municipal financing, utility financing and other innovative uses of State revenues to make private sector financing more broadly available at attractive rates – a strategy particularly important in this time of constrained commercial and consumer credit. In addition, New Jersey should complement federal tax incentives with best practices for state tax incentives such as the model Business Energy Tax Credit program offered by the State of Oregon since 1980.

Conclusion

With the sustained and committed leadership of the Governor's Office, supported by the BPU, New Jersey can achieve the Energy Master Plan goals to offset growth in energy consumption in homes and buildings through 2020. In doing so, New Jersey can net cost savings of $16.8 billion and establish itself as a national leader in building energy efficiency – a model sorely needed in these times of climate change, economic crisis and uncontrollable energy costs. **Achieving these goals will require an all-hands-on-deck approach, combining visionary and inspiring leadership with commitment to state-of-the-art programs and policies.**

As the Energy Master Plan makes plain, continuing down a path of "business as usual" in energy policy and use exposes New Jersey to unacceptable economic, reliability and environmental consequences, some of which may be irreversible. This portfolio of strategies illustrates the path New Jersey can take toward a new, more sustainable energy future.

A FOUNDATION FOR SUCCESS

Achieving the Energy Master Plan 2020 energy efficiency goals will require leadership, trust and a long-term commitment.

BUILDING NEW (AND IMPROVED) RULES OF THE GAME

INTRODUCTION

Achieving the ambitious New Jersey EMP 2020 Energy Efficiency Goals requires a major investment in all sectors of the New Jersey economy – approximately $11 billion in inflation-adjusted dollars over the next 12 years to improve the overall energy performance of New Jersey homes and businesses by 20% relative to current and projected energy use. This investment offers the potential to provide considerable energy, economic and environmental benefits – savings are more than double the costs. But it will take a concerted, well managed and coordinated program and policy effort that leverages resources, builds momentum and instils confidence and good will at all levels – state, local, public and private. To overcome multiple market, institutional and financial barriers to energy efficiency, the New Jersey EMP Energy Efficiency Initiative will take:

- ***Bold, inspiring leadership with the political will to encourage statewide policy and program collaboration;***
- ***A long-term view to build and sustain market capacities to achieve the 2020 Energy Master Plan Goals.***
- ***A well designed, integrated program strategy that can serve sixty percent of New Jersey's homes and businesses by 2020 with comprehensive, cost-effective efficiency solutions that address all fuels to reduce energy consumption by thirty percent to meet energy, economic and environmental goals.***
- ***A durable, flexible integrated statewide program administrative structure focused on performance and results;***
- ***A positive and stable regulatory environment; and***
- ***A major financial commitment – approximately $11 billion over the next 12 years.***

The Governor's Energy Master Plan released in October provides an overall plan to address most of these. It is bold, comprehensive and inspiring. Going forward, however, two key issues offer potential challenges that can impede the success of New Jersey's energy efficiency effort – lack of integration of programs and policies intended to advance energy efficiency in New Jersey, and the need for a stable, supportive regulatory environment with

the primary goal to successfully implement an aggressive statewide multi-year effort to meet the Energy Master Plan goals.

A PATCHWORK OF ENERGY EFFICIENCY PROGRAMS AND POLICIES

Currently, New Jersey's policy and program environment for energy efficiency includes multiple and potentially competing elements:

- The BPU's Office of Clean Energy offers residential, commercial and industrial gas and electric energy efficiency programs via contracted services from market managers.

- Three utilities - PSE&G, New Jersey Natural Gas and South Jersey Gas - offer gas efficiency programs directly to their customers, and others have proposed additional new programs allowed under the New Jersey Global Warming Response Act of 2007.

- All of the regulated utilities are each now developing program plans to implement the New Jersey Energy Master Plan goals while introducing programs to meet more near-term economic stimulus goals.

- Using sixty percent of the revenues from the RGGI Carbon allowance auction, the New Jersey Economic Development Authority will offer grants and financial assistance to commercial, institutional and industrial entities to support energy efficiency, renewable energy and combined heat and power projects that reduce carbon emissions.

- Currently, the New Jersey Department of Community Affairs (DCA) through its Home Energy Assistance Program assists the elderly, handicapped and low-income persons in weatherize their homes, improve their heating system efficiency and conserve energy.

- The Green Homes Office of New Jersey Housing & Mortgage Finance Agency offers financial and technical assistance for energy efficiency and other sustainability practices for the rehabilitation and new construction of affordable, market rate and special needs housing.

To be effective, these various efforts must be strategically coordinated and integrated to provide comprehensive, integrated, fuel-blind energy efficiency solutions across the state – including to towns and cities served by municipal utilities. The alternative - a patchwork of competing efforts and services - will undermine the ability to build the needed market capacities and momentum necessary to achieve the Energy Master Plan goals.

AN EVER-CHANGING, COMPLEX REGULATORY ENVIRONMENT

Over the past six years – with the best of intentions–the State moved program administration from the regulated gas and electric utilities to the BPU's Office of Clean Energy. This process dismantled and then rebuilt New Jersey's energy efficiency program planning, management and evaluation infrastructure to provide a state delivered initiative. While the current Clean Energy Program offers many excellent features and has several important successes, this transition interrupted building market momentum to provide cost-effective efficiency solutions. It has also encountered structural and process issues that have made it difficult to modify programs to rapidly respond to changing market conditions and evolving opportunities. This structure is not well suited to ramp up aggressive efficiency program implementation that requires ongoing innovation and rapid response.

> *"The gas and electric utilities will be responsible for developing an energy efficiency program to be submitted to the BPU staff for consideration that would put the State on the track to meet its 2020 energy consumption goals."*
>
> ***Final NJ Energy Master Plan October 2008***

Last winter, to expand energy efficiency programs, the Governor approved legislation which empowers utilities to propose for BPU approval new energy efficiency programs. It took much of the year with several re-filings of utility program plans to meet complex filing requirements before program plans were approved for implementation and cost recovery. Key issues were the complexity of the filing requirements, the lack of an efficient process to engage major stakeholders to reach agreement on key issues, and limited staff resources to review the filings.

In October 2008, the Energy Master Plan, recognizing the important role of electric and gas utilities' relationships with their customers to improve the energy efficiency of homes and buildings, directs the utilities to develop and implement energy efficiency programs to help meet the Energy Master Plan goals. In addition, the Governor directed the utilities to develop and begin implementation of additional energy efficiency programs in 2009 as an economic stimulus to create jobs and make consumer energy bills more affordable.

While the utilities have expressed their interest to meet these directives to expand energy efficiency programs, they have indicated the need for a shift in the regulatory paradigm to enable effective planning and implementation to address these urgent policy directives. In a letter last summer responding to NEEP's initial proposals for utility implementation of statewide programs to meet the Energy Master Plan goals, they called for a change in the state's regulatory paradigm to - **build trust, provide certainty, minimize barriers and disincentives, and provide expeditious decisions** – noting that they should face no greater risk and no lesser reward for their energy efficiency investments than they face for their investments in pipes and wires.

> *"... the process for obtaining [BPU] approval of utility programs and proposals must be streamlined and expedited and regulators must be supportive of the ultimate goals of achieving energy efficiency without financially impairing utilities."*
>
> ***NJ Utilities Association, Letter to NEEP - July 29, 2008***

Clearly, ratepayer interests must be a top concern in ramping up the Energy Master Plan energy efficiency initiative. However, the greatest ratepayer value in ramping up the programs is the potential for a **net cost saving of some $16.8 billion** to society as a whole. To delay the overall effort will commit the state's utilities to the purchase more costly power supplies – not a cost effective result. In other words, in the absence of the $11.2 billion total investment needed to achieve the Energy Master Plan savings goals, ratepayers would have to pay an additional $28 billion to supply the energy that could otherwise be saved. While utility investments to implement programs require oversight, the focus should be on achieving ratepayer value through results – energy, capacity, carbon and economic savings.

To develop a stable, supportive regulatory environment for aggressive, cost-effective utility energy efficiency programs and investments, the State can learn from the experience of others states that have likewise committed major ratepayer resources to meet aggressive energy efficiency goals (e.g., Massachusetts, Connecticut, Vermont, California, Wisconsin, and Oregon). We offer several specific recommendations below in the following section.

A STATEWIDE, LONG-TERM ENERGY EFFICIENCY RESOURCE PROCUREMENT STRUCTURE

To achieve the New Jersey EMP 2020 energy efficiency goals, we recommend that the BPU and the Governor's Office establish a durable, flexible, and integrated statewide structure that can:

- **Build statewide capacities** to procure cost-effective energy efficiency
- **Address long-term goals** while delivering near-term savings
- **Provide comprehensive customer services statewide** to all market segments addressing all end-uses, all fuel types and the full range of demand-side solutions (efficiency, demand response, combined heat and power and building-sited renewable resources)
- **Leverage financial and market resources** to provide comprehensive solutions to reduce energy usage,
- **Quickly and** f**lexibly respond** to policy, market and technical developments
- **Encourage learning and innovation**
- **Provide for efficient, accountable administration** that minimizes duplication of effort.
- **Coordinate with national and regional efforts** that help overcome barriers or reduce costs

To do this, New Jersey would be well-served by establishing, a **New Jersey Energy Efficiency Utility** implemented as a formal, strategic collaboration of New Jersey's gas and electric utilities working together with municipal utilities and unregulated fuel dealers that opt to participate in and fund all-fuels programs across the state. The New Jersey Energy Efficiency Utility should serve the entire state including strategic coordination (if not integration) with relevant state agency programs (e.g., Green Homes, Weatherization, efficiency or CHP grants to businesses) to provide consistent messages and leverage resources to provide seamless whole solutions to residents, businesses and institutions. The New Jersey Energy Efficiency Utility should work with New Jersey communities to engage their full participation to improve energy performance in their facilities, and to motivate, educate and assist their residents and businesses to likewise contribute to the Energy Master Plan goals. Experience in Vermont, Oregon and Wisconsin demonstrate that an integrated statewide effort is an effective path to meet aggressive long-term energy efficiency goals.

The utilities in turn, through the New Jersey Energy Efficiency Utility, should engage a broad range of market-based service providers to work with their customer account staff to provide comprehensive, cost-effective solutions to improve the energy performance of homes and buildings throughout the state. This arrangement respects the confidentiality of utility customer information essential to successful program marketing, implementation

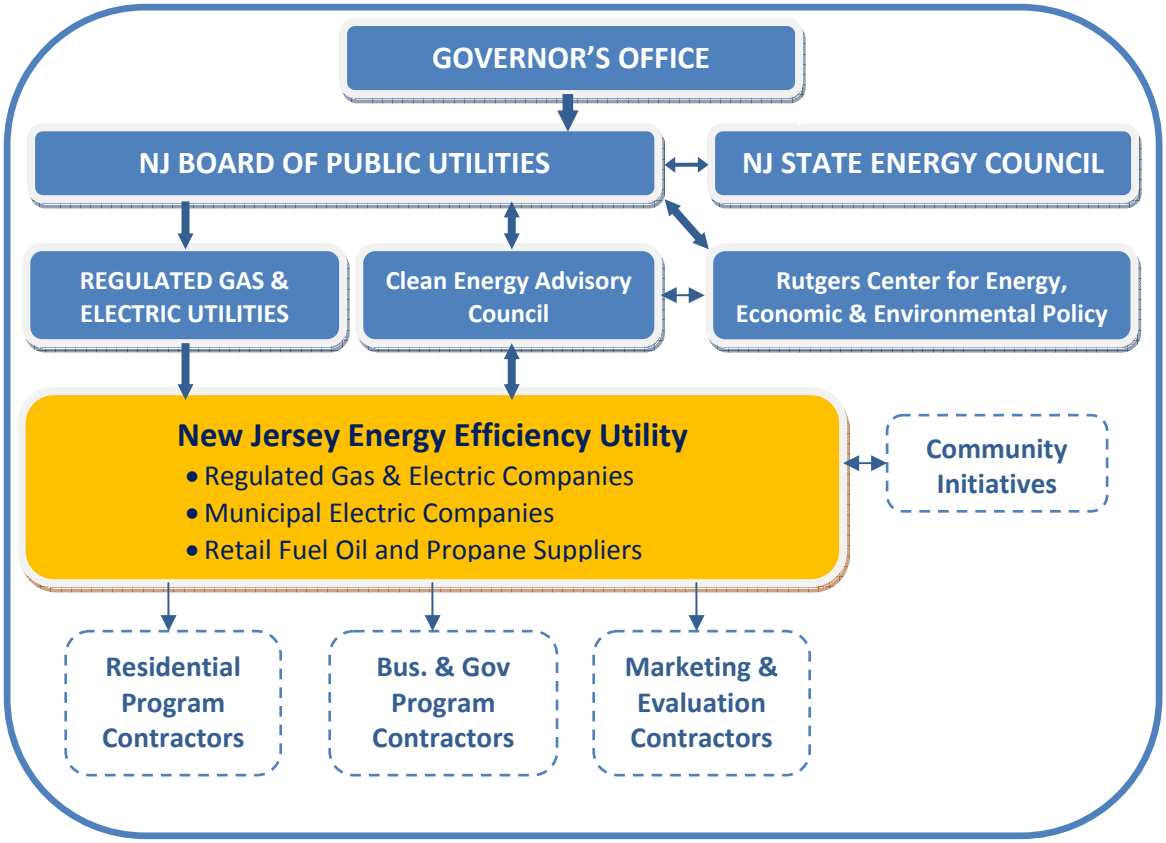
and evaluation, while overcoming the barriers of state procurement processes that have hampered implementation of the New Jersey Clean Energy Programs by the BPU Office of Clean Energy.

The alternative – a fragmented program effort with many masters – adds inefficiencies and cost, making it difficult, if not impossible, to achieve the desired rapid results.

STRUCTURAL ELEMENTS

Building on the Governor's Energy Master Plan recommendation that the New Jersey gas and electric utilities implement coordinated statewide programs to help achieve the plan's 2020 energy efficiency goals, we recommend an administrative structure to achieve the EMP energy efficiency goals that links and integrates the range of program and policy efforts through a clear organizational structure to deliver comprehensive energy efficiency solutions to all New Jersey businesses, institutions and residents, as illustrated below.

New Jersey Energy Master Plan Energy Efficiency Initiative – Organizational Structure



Below we elaborate on the recommended roles and responsibilities for each of these participants:

STATE ENERGY COUNCIL for Leadership and Strategic Coordination – Maintain the recently established State Energy Council as announced in the Energy Master Plan – chaired by the Governor (or his designee) - to provide leadership to strategically coordinate the various state agency efforts to meet the Energy Master Goals energy efficiency goals through integrated efficiency program and policies across the state. Responsibilities include:

- Interagency coordination to coordinate policy initiatives (e.g., building energy codes, affordable housing initiatives, building and home energy rating, workforce development initiatives, etc.)
- Track and assess overall progress to achieve the Energy Master Plan Goals
- Recommend changes to or new strategies to achieve the 2020 goals.

BPU for Regulatory Oversight – Establish goals for and oversee regulated results-oriented utility implementation of statewide energy efficiency programs. Responsibilities include:

- Establishing statewide and utility-specific long-term, intermediate (e.g., four-year) and annual program goals (i.e., efficiency savings targets, participation rates, etc.)
- Setting filing requirements for program plans
- Setting standards for the filing of program plans, budgets and cost recovery requests
- Reviewing and approving statewide program plans submitted by the utilities for implementation through the New Jersey Energy Efficiency Utility
- Overseeing cost recovery including the award of performance incentives for goal achievement
- Reviewing, approving utility-specific budgets and goals to implement the statewide plan
- Setting requirements, protocols and priorities for program evaluation, measurement, verification and reporting including cost-effectiveness assessment and related research
- Preparing and publishing annual reports of overall progress towards Energy Master Plan energy efficiency goals
- Establishing and administering sales/profit decoupling mechanisms
- Supporting utility program coordination with state agency program and policies

REGULATED GAS AND ELECTRIC UTILITIES to Meet Energy Efficiency Goals - Ultimately responsible to meet the program goals approved by the BPU, establish and direct the New Jersey Energy Efficiency Utility as a primary mechanism to design, implement, evaluate and track consistent statewide programs. Maintaining a professional staff to direct the New Jersey Energy Efficiency Utility, responsibilities include:

- Proposing statewide energy efficiency programs, goals and budgets with specific allocations to each company
- Directing and supporting the preparation of plans and reports

- Supporting program implementation through trained utility customer account representatives that link customers to Efficiency Utility Services
- Providing customer data necessary to support contracted marketing and service delivery
- Supporting the development and implementation of related public policies (e.g., building energy codes, appliance standards, building energy rating)
- Facilitating productive relationships with market actors (retailers, manufacturers, distributors, trade associations)
- Participating in and assisting State workforce development efforts
- Sponsoring or conducting research and development (e.g., pilot projects, field tests of new products)

These functions should be carried through or in strategic coordination with the Energy Efficiency Utility.

NEW JERSEY ENERGY EFFICIENCY UTILITY to Plan, Implement and Evaluate Statewide Programs – Establish a formalized joint effort of the New Jersey's gas and electric to design, deliver, and evaluate comprehensive, statewide energy efficiency programs that leverage state agency programs to provide seamless program services based on plans and budgets approved by the BPU. This structure should be designed and operated to allow municipal utilities and non-regulated fuel suppliers (e.g., through the New Jersey Fuel Merchants Association) the opportunity to "opt in" to the statewide programs to fund and deliver efficiency solutions to their customers through integrated, comprehensive customer energy efficiency services. Served by a professional and administrative staff directed jointly by the utilities who hold responsibility for the Energy Efficiency Utility, roles include:

- Develop, propose and implement statewide energy efficiency program plans as approved by the BPU
- Meet regularly with the Stakeholder Advisory Committee to inform program planning, development, implementation and evaluation
- Coordinate funding and administration of joint or statewide programs
- Engage service providers and contractors for joint or statewide efforts
- Coordinate New Jersey energy efficiency programs with relevant regional and national efforts
- Conduct statewide research and evaluation as approved by the BPU
- Track and report program impacts and results relative to overall and individual utility goals

In addition, The New Jersey Energy Efficiency Utility should maintain a technical review committee of experts from the New Jersey Efficiency utility, state agencies and academic institutions to review new technologies and efficiency opportunities to assess their readiness and cost-effectiveness for inclusion in the New Jersey energy efficiency programs.

Market Based Service Providers to Deliver Program Services – A broad and expanding base of skilled service providers engaged by the utilities and the Energy Efficiency Utility to ramp-up and deliver the full range of services needed to design, implement and evaluate the Energy Efficiency Initiative programs statewide.

Clean Energy Advisory Council to Provide Support and Perspective for Program Success – Based on the current Clean Energy Council, includes representatives from key stakeholders – (i.e. customer groups - business/industry, low-Income, Ratepayer Counsel, environmental groups, community groups, state agencies with related programs, etc.), to provide information and perspective to guide the New Jersey Energy Efficiency Utility program planning, implementation and evaluation to meet program goals. The Council should not include individuals or entities that stand to profit from implementation of the New Jersey energy efficiency or clean energy programs. However, the meetings should be open and public, and invite comment from interested parties.

Community Initiatives to Ramp-Up Participation – Municipal leaders to connect civic leaders and community initiatives to the Energy Efficiency Utility program outreach – using social marketing to motivate and engage residents and business to participate in large numbers to help achieve the Energy Master Plan goals while addressing community needs and issues.

Rutgers Center for Energy, Economics and Environmental Policy (CEEEP) to Provide Technical Support to the BPU – Building on CEEEP's current role to review and update protocols to measure and evaluate program impacts, maintain tools and data for cost-effectiveness evaluation, and develop an on-line tracking and reporting system for the current Clean Energy Programs - continue this role and expand to assist the BPU to maintain a multi-year EM&V and research plan, prepare and post reports of overall impacts, and monitor third-party program evaluators contracted by the New Jersey Energy Efficiency Utility.

Strategic use of this structure can reduce overall administrative costs and streamline the time and resources needed for regulatory review and approval. More specifically it can minimize duplication of effort to plan, implement, track and evaluate programs; provide for timely and efficient stakeholder input to guide planning and implementation; minimize barriers to the participation of market-based interests (e.g., Energy Service Companies, manufacturers, retailers, etc.); facilitate strategic coordination of state policy and program with ratepayer funded programs, and build momentum to engage existing market channels and the public to realize the Energy Master Plan goals.

This model builds on current capacities in New Jersey and draws from many experiences in the U.S. from state leaders in energy efficiency including processes in New England, Wisconsin and the Pacific Northwest. For example:

- The Wisconsin State Energy Efficiency and Renewable Energy Administration ("SEERA"), a project of Wisconsin gas and electric utilities - supervised by the Public Service Commission - creates and funds statewide energy efficiency and renewable energy programs, and contracts through competitive bids one or more entities to implement the programs. See http://www.focusonenergy.com/About-Us/Organizational-Structure.aspx

- Efficiency Vermont, a statewide efficiency utility that plans and delivers ratepayer funded energy efficiency programs under a competitively bid contract to the Vermont Public Service Board. See http://www.efficiencyvermont.com.

- The Connecticut Energy Efficiency Fund which provides statewide efficiency programs jointly implemented by regulated utilities with input and guidance from the Connecticut Energy Conservation Management Board ("ECMB") and approval by the Department of Public Utility Control. See http://www.ctsavesenergy.org

- The Energy Trust of Oregon which plans delivers and evaluates statewide energy efficiency and renewable energy programs with oversight from the Public Utility Commission and input and guidance from statewide advisory councils. See http://www.energytrust.org

A NEW REGULATORY ENVIRONMENT

To pave the way to the extraordinary and sustained effort needed to achieve the Energy Master Plan goals, New Jersey should establish a regulatory environment that provides strategic vision as well as accountability. Key attributes of such a regulatory approach include:

- **Visionary** – maintains a keen focus on longer-term goals
- **Trust** and understanding that come from common goals, clear roles and good will
- **Certainty** about expectations and requirements
- **Commitment** to minimize barriers and disincentives to undertaking an aggressive effort
- **Expeditious decision-making** to keep efforts timely and responsive
- **Results oriented** – focused on performance that maximizes value to ratepayers
- **Motivational** – rewards performance in a manner that aligns ratepayer benefits with utility profitability.
- **Accountability** based on timely, transparent reporting and independent, expert evaluation

It is beyond the scope of this project to specifically evaluate current regulation or to offer specific recommendations. However, based on what we have learned through our meetings and research in New Jersey, and the experience of other states, we suggest the following elements:

- **Streamlined Regulations**
  - Essential filing requirements – requiring only essential information to review program plans and budgets to ensure cost-effectiveness, prudency, clarity and

reasonableness of goals, and appropriateness to meet long-term goals – such as high level program plans with budgets, savings and participation goals, key milestone or performance indicators for new efforts; projected savings and cost-effectiveness analysis that project net benefits.
  - Cost-effectiveness standards – approved methods, tools and inputs (e.g., avoided costs) to assess the value of energy efficiency investments.
  - EM&V and Reporting standards – approved protocols and tools for estimating, evaluating, verifying, tracking and reporting results and impacts
  - Cost recovery – pre-established requirements and schedules for requesting cost recovery including the award of performance based incentives and/or rate of return on investments

- **Regular Schedule for Efficiency Plan Review and Decisions**
  - Four-year plans with annual updates
  - Informal pre-filing meetings (Stakeholder Input) through the Clean Energy Advisory Committee to review and comment on draft goals, plans and budgets
  - Encourage stakeholder settlements to minimize the time and cost of formal proceedings

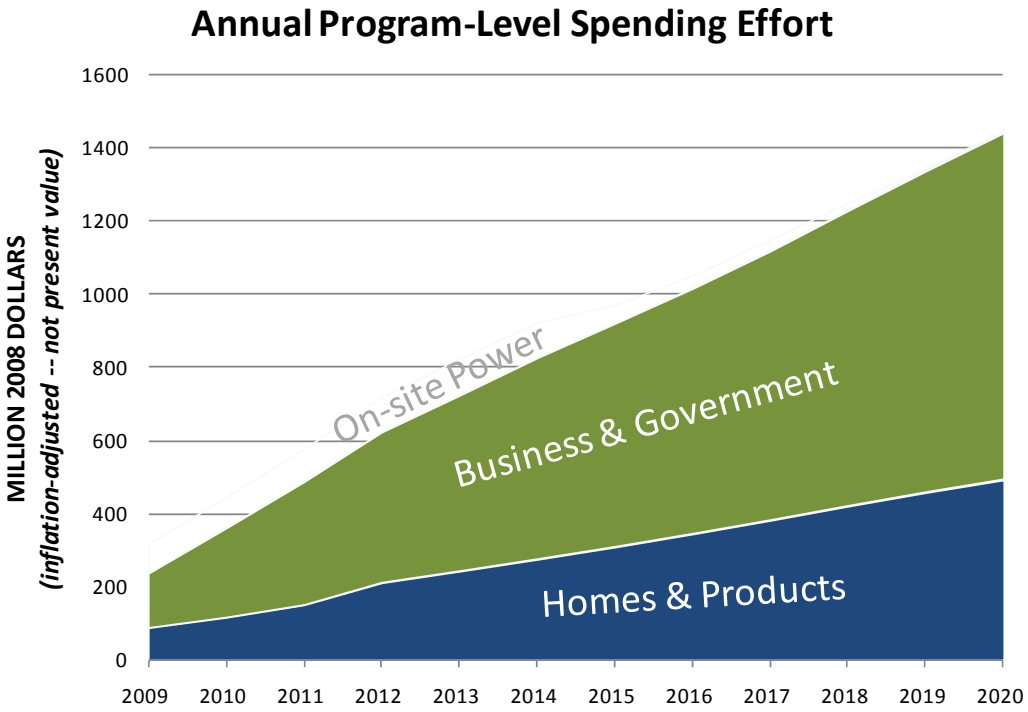
- **Approval Focus on Broad Parameters with Results Oriented Goals**
  - Program and Budget flexibility –Establish aggressive goals and give the utilities the autonomy, responsibility and ultimately the accountability to reach these targets (e.g., adopt high level program designs with budget and implementation flexibility to address evolving needs, opportunities and market developments)

- **Incentives and Cost Recovery - allow flexibility for different approaches**
  - Establish up-front requirements and processes for utilities to recover costs associated with program research, planning, implementation and evaluation.
  - Remove financial disincentives to utilities related to the ramp-up of energy efficiency programs and policies through the adoption of mechanisms that decouple utility profits from growth in energy and capacity retail sales.
  - Make energy efficiency as attractive as any other regulated investment through financial incentives including rate of return policies that reward utilities for achieving cost-effective energy savings and related goals and milestones tied to the long-term Energy Master Plan goals.

MULTIPLE RESOURCES TO FUND NEW JERSEY'S EFFICIENCY INVESTMENT

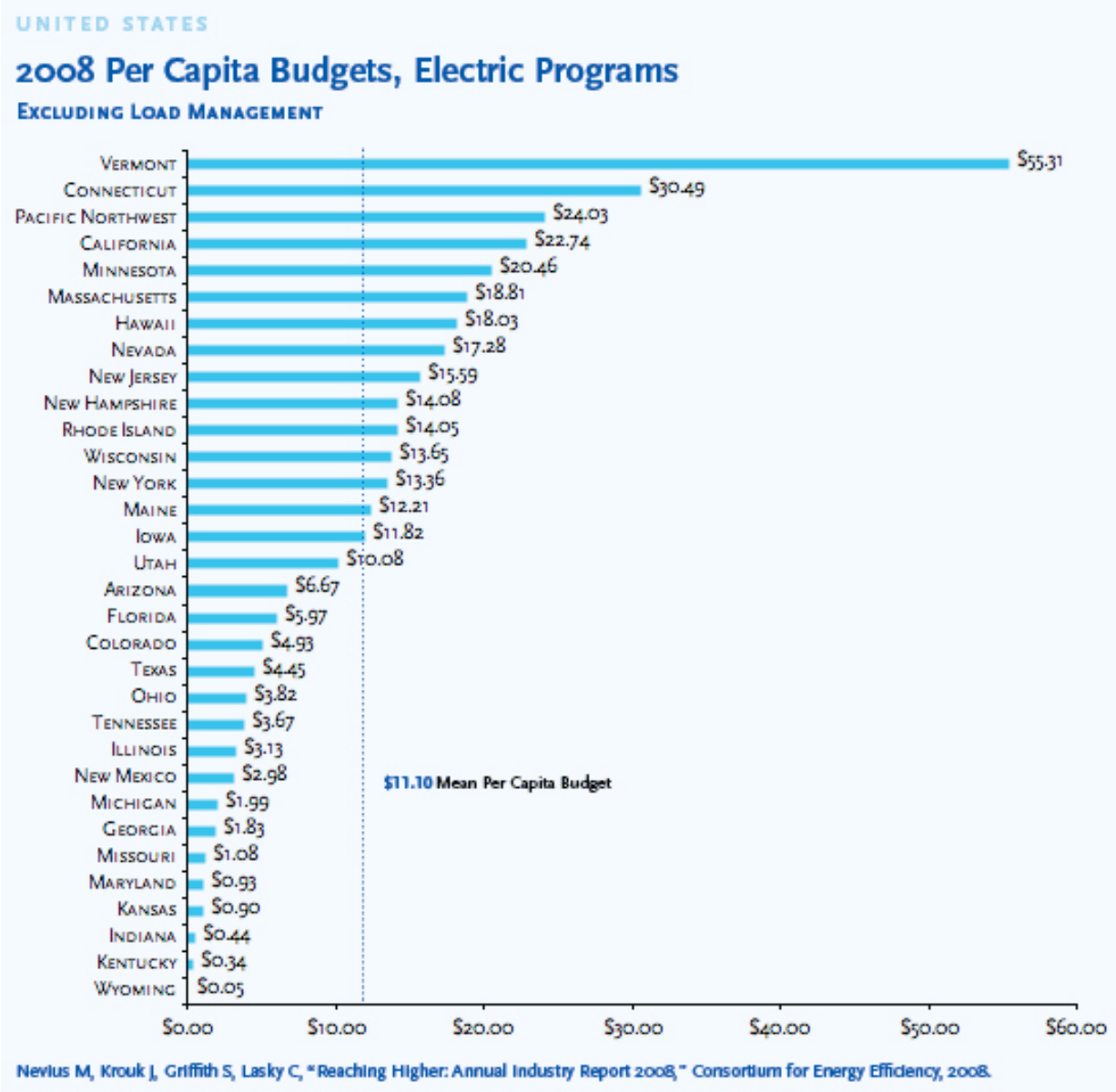
The programs and policies described herein to achieve the Energy Master Plan goals will cost, over the 12-year period, approximately $6.8 billion (net present value 2008 dollars). This covers the full cost of implementation the efficiency program strategies and policies, though it does not include CHP). In addition, we expect consumers – the first beneficiaries of these efforts – to spend $4.4 billion of their own money for what will become extremely attractive, cost-effective investment opportunities.

The graph below presents the annual costs in inflation-adjusted – not present value – dollars.



To provide the $6.8 billion program and policy funding needed to reach the 2020 goal, we suggest that the State tap and focus the ***use of multiple resources with an overall strategy to use government resources and ratepayer funding to leverage private investment.*** Elements of this strategy are described below.

Ratepayer Funding for Efficiency as a Least Cost Resource: In states with aggressive energy efficiency goals, the primary vehicle to fund energy efficiency programs is ratepayer funding of energy efficiency as a least cost resource (i.e., a resource less costly than supply options). States with the most aggressive programs (i.e., Vermont, Connecticut and



California) spend between $23 and $55 per capita on energy efficiency programs compared to New Jersey at $16 per capita.

To achieve the Energy Master Plan goals, an increase in New Jersey ratepayer funding for efficiency as a least cost resource will be necessary. The current Comprehensive Resource Assessment four-year budget of $969.5 million established by the BPU for the period 2009-2012, provides for increasing annual budgets beginning with $250,378,000 in 2009 and ending with $325 million in 2012[*] (NJ BPU Docket No. EO07030203, Order September 30,

[*] See NJ BPU Docket No. EO07030203, Order September 30, 2008, p. 57

2008). Some or all the additional ratepayer funding may be provided through BPU approval of utility program budgets as authorized by the Regional Greenhouse Gas Initiative bill of 2008 (Assembly Bill 4559).

> *"It is imperative that priority be given to developing a viable means for inclusion of delivered fuels in the [Energy Master Plan] energy efficiency initiative."*
>
> *Fuel Merchants Association of NJ Comments on draft NEEP report, December 8, 2008*

Non-Regulated Heating Fuels Efficiency Charge: Heating oill heat serves approximately 400,000 or 13 percent of all housing units in New Jersey. Oil heat also serves a significant number of small businesses and institutions (schools, municipal buildings, etc.) Electric and gas ratepayer-funded programs do not address the heating efficiency opportunities in such dwellings. To provide whole solutions that increase the energy efficiency of all end uses of energy in homes and – heating, cooling Lighting, appliances, etc. – New Jersey must provide a revenue stream to deliver efficiency program services to homes and buildings served by non-regulated heating fuels (i.e., heating oil, propane)..

Options to fund non-regulated heating fuel efficiency measures include establishing an energy efficiency surcharge on non-regulated fossil-based heating fuels. Merchants of these fuels could agree to offer this voluntarily and use these funds to "opt-in" to participate in the New Jersey Energy Efficiency Utility. A voluntary effort, however, is unlikely to include all such fuel sales leaving some customer unserved. Alternatively, the State could legislatively mandate that non-regulated fossil-fuel merchants collect a minimum charge from fuel sales to fund energy efficiency through programs approved by the BPU and implemented on a fuel-blind basis through the New Jersey Energy Efficiency Utility. To supplement or leverage these revenues, New Jersey could dedicate a portion of market-based revenues from the sale of carbon emission allowances to fund non-regulated heating fuel efficiency. In addition, New Jersey should examine near-term opportunities to use energy efficiency program funding from the federal Economic Stimulus Bill to fund non-regulated heating fuel efficiency measures.

Federal Funding: Part of New Jersey's energy efficiency solution is currently provided via the federally funded Weatherization Assistance Program (WAP), administered by the Department of Community Affairs (DCA) to provide income-qualified residents with energy efficiency services via a network of local, community-based agencies that deliver weatherization services throughout the state. DCA received federal funds of $5,078,993 for FY2008 to serve approximately 3,500 households[*].

[*] See http://www.waptac.org/sp.asp?id=1948

In addition, US DOE's State Energy Program (SEP), helps to fund the BPU's role as a state energy office with a focus on "conservation of energy".[*]

The American Recovery and Reinvestment Act of 2009 (ARRA) offers New Jersey a special opportunity to use federal funding to increase energy efficiency over the next two years. ARRA offers New Jersey $121,853,000 for the low-income weatherization program, $74,832,000 for energy efficiency programs through US DOE's State Energy Program, and $79,956,000 for community efficiency block grants[†]. This $276.6 million can provide important assistance to quickly ramp-up programs to work towards New Jersey's Energy Master Plan goals by expanding currently committed weatherization and energy efficiency programs as suggested herein, and assisting the local and state government to save taxpayers money by improving the energy performance of state and municipal facilities. ARRA offers many other opportunities to leverage federal funding to increase building and electric energy efficiency – the rules for which are still being written. The State should follow these closely to maximize New Jersey funding opportunities.

Market-based Revenues: Revenues from market-based programs can help offset the ratepayer funding otherwise needed to implement the portfolio of strategies.

One such revenue source is proceeds from the RRGI auction of carbon allowances. The New Jersey RGGI legislation of 2008 allocates 70% of these revenues to clean energy programs and 20% to low income assistance. The first auction resulted in total carbon allowance revenues to New Jersey of $15,321,000. With quarterly auctions, this could provide $60 million per year (more or less) of which 73% could be allocated to energy efficiency programs. Using the RGGI carbon allowance auction revenues to fund energy efficiency is the most cost-effective low-carbon-intensity solutions and is a top priority of the RGGI greenhouse agreement.

Another market-based source of revenues to fund efficiency could be provided from the successful bid of ratepayer-funded energy efficiency programs into PJM's Reliability Pricing Model (RPM) auction to meet future electric power capacity needs. Subject to pending approval by the Federal Energy Commission (FERC), PJM plans to allow efficiency to compete as a comparable resource in the RPM auction beginning this spring. In a similar capacity market auction at ISO New England- the Forward Capacity Market (FCM) - energy efficiency (mostly ratepayer funded programs) constituted one-third of the resources that cleared the first FCM auction in February 2008 - providing future revenues for the delivery of capacity reductions through energy efficiency resources. Most states are using those revenues to help fund energy efficiency programs going forward.

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[*] See http://apps1.eere.energy.gov/state_energy_program/pdfs/sepopman_b.pdf

[†] See http://www.edisonfoundation.net/iee/newsEvents/news/ARRA_stimulus_data.pdf

Utility Financing: Another form of ratepayer funding could be provided by utilities to finance the installation of energy efficiency measures. An avenue of potential interest is "on-bill financing" with the potential to match customer loan repayment with monthly energy savings. While this has been implemented by some utilities for some customers (e.g., National Grid's small commercial retrofit program), others have raised concerns that the complexity and cost to implement this are significant. Concerned that on-bill financing for efficiency measures could increase the risk that payment-troubled customers may be terminated from service, some utilities (e.g., NSTAR Gas and Electric) offer a separate billing for energy efficiency loans – but for customers qualified for loans. Another concern is that the cost to service loans and absorb "bad debt" from unpaid loans places a burden on other ratepayers – particularly where loan products and services otherwise exist from market-based resources.

Muncipal Financing: Another innovative financing strategy described in the Sections on ***Saving Energy in Homes*** and in ***Leveraging the Power of Communities*** allows property owners to finance major energy efficiency improvements and renewable energy installations with repayment over terms up to 20 years through their property tax bills. With loan funds provided by municipal bonds, all costs are borne by program participants. Importantly, municipal financing transfers loan repayment obligations to subsequent property owners who benefit from lower energy bills from efficiency improvements installed by a previous property owner. While very new, this innovative tool can play important role to overcome institutional and financial barriers to energy efficiency improvements – including helping to pay for structural repairs necessary to install efficiency measures (e.g., roof or wall repair to install insulation). Recently piloted in Berkeley, California as the "Financing Initiative for Renewable and Solar Technology" (FIRST) program, this financing strategy – sometimes called a "Clean Energy Tax District". was extended to all California cities when Assembly Bill 811 was signed into law last July. Since then, Arizona, Texas and Virginia, have introduced bills to allow such municipal financing. Colorado has already passed a version of the law, with the City of Boulder ready to begin a program.[*] In Canada, this strategy is referred to as *Local Improvement Charge.*[†]

Leveraging Private Investment: The portfolio of strategies recommends several mechanisms to leverage private capital to fund energy efficiency improvements in homes, businesses and institutions. The most straight-forward approach is to include a participant co-payment for energy efficiency measures and improvements. In many cases – particularly for larger capitol projects - participants require financing to share in the upfront cost of energy efficiency projects. Adding to conventional financing (e.g., bank loans), we

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[*] *Harnessing the Sun, With Help From Cities b*y Leslie Kaufman, The New York Times, March 14, 2009

[†] "Using Local Improvement Charges to Finance Energy Efficiency Improvements: Applicability Across Canada" prepared for Natural Resources Canada's Office of Energy Efficiency, by Roger Peters, Matt Horne, Johanne Whitmore of The Pembina Institute, Alberta Canada, June 20, 2005.

recommend several financing strategies to broaden the range of options to meet the needs of different customers and energy efficiency projects.

- **Energy Service Companies** (ESCO's) provide performance-based investments to improve the energy efficiency of commercial, municipal, state and other institutional facilities (see Section on ***Saving Energy in Business and Government***). ESCo can provide design services to estimate bond amounts, arrange cash flow based financing – including municipal bonding and leasing as well as provide turnkey implementation of efficiency measures. By providing cost and savings estimates, ESCOs are able to maximize investment with a given cash flow (from energy savings) which enables capital expenditures to be financed through operating budgets. ESCo's that specialize in demand response programs (e.g., to participate in PJM's Demand Response Programs) likewise provide the upfront capital to install equipment and control that enable load curtailment during high- cost peak power system periods. Legislation signed into law by Governor Jon Corzine in January 2009, A1185/S1537, removes barriers to and encourages local and state entities to enter into long-term contracts with ESCos to finance, install and monitor energy efficiency improvements in public facilities

- The Section on ***Saving Energy in Homes*** describes how State government can facilitate the market-based financial resources by establishing **a secured, wholesale energy efficiency loan fund** sourced by private capital and secured by the State to offer attractive wholesale interest rates to retail lenders. State government can also establish **a dedicated energy efficiency deposit fund** by state agencies can choose to direct their financial accounts to a local bank that in turn uses the deposits exclusively to fund energy improvements.

- The section on **New Homes** recommends that New Jersey partner with local lenders to develop **Energy Efficient Mortgage** (EEM) products. EEM products account for and reward the cash flow benefits of higher levels of energy efficiency, and take advantage of the long-term financing opportunities to finance measures, such as solar hot water systems, that provide positive cash-flow when added to the mortgage.

Tax Incentives: Both state and federal tax incentives can play a role to finance energy efficiency projects. Currently, federal tax incentives are extended through 2009 to cover up to a third of the cost of energy efficiency projects (after program incentives or rebates have been applied). For now, there is no ceiling on the amount of this federal tax incentive. Detailed information is available on line from the Tax Incentives Assistance Project (a national non-profit organization).

In addition, in the **Business and Government** chapter of this report (see "Policies: Cementing Gains through Codes, Standards and Taxes" on on page 118) recommends that New Jersey offer a business tax credit modeled after Oregon's Business Energy Tax Credit highly successful program which provides 35 percent of eligible project costs taken over five years.

A 2009 TRANSITION PLAN

A smooth, seamless transition from the current BPU administration of energy efficiency programs to the utility-directed New Jersey Energy Efficiency Utility is important to the successful attainment of the Energy Master Plan energy efficiency goals. With a goal to implement statewide programs through the New Jersey Energy Efficiency Utility beginning in 2010, high level steps to accomplish this include:

- **Establish the New Jersey Energy Efficiency Utility** through formation of the board; scoping of efficiency utility's responsibilities; development of an organizational plan, budget revenue and cost sharing plan; hiring (or appointment) of key staff to manage activities; agreement of a process to procure and share the costs of contracted services; preparation of a system for financial management and reporting necessary for accountable and efficient operation; and development of a data sharing and management system to support and track customer outreach and participation, track progress towards goals, and support program management, planning, regulatory reporting and program evaluation.

- **Review and revise BPU program plan and budget filing requirements and schedules to** support the filing, approval and implementation of a statewide energy efficiency plan jointly implemented by the utilities through the New Jersey Energy Efficiency Utility beginning in 2010.

- **Make Financial Resources available to** implement the plan including the assignment of the ratepayer funding, market based revenues and an efficiency surcharge on non-regulated heating fuels; the application of federal funding, and implementation of financing strategies to make capital broadly available at affordable rates to increase participation in comprehensive energy efficiency investments.

- **Develop a 2010 Program Plan, Goals and Budget for BPU Approval** based on the current programs implemented the Office of Clean Energy through its contractors but modified to address the program recommendations detailed herein. This plan, developed with input of the Clean Energy Advisory should incorporate current utility programs approved by the BPU.

- **Transfer the Programs of the Office of Clean Energy to the New Jersey Energy Efficiency Utility** to begin in 2010 as the basic platform to implement joint statewide programs. To support this, establish an appropriate mechanism to transfer back to the utilities the CRA ratepayer funding which they currently collect and turn over to the state to implement the OCE programs. The issue of whether to rebid current program implementation contractors or not should be decided early on in the transition planning process. The intent should be for a smooth transition with no interruptions to customers currently served by the OCE market managers and their subcontractors.

- **Expand CEEEP Responsibilities and Funding to Provide Technical Support to the BPU** including its role to support evaluation, cost-effectiveness, reporting, and tracking.

- **Establish a Public Policy Agenda** to implement the state and local policy recommendations including new appliance standards, building energy rating and updates to the building energy code.

The transition process may involve additional steps including consideration of any potential legal and regulatory requirements – the assessment of which are beyond the scope of this assessment. We recommend that the BPU form a transition team involving participation from key stakeholders to prepare a detailed plan for a smooth and successful transition to statewide programs implemented by the utilities in 2010.

SAVING ENERGY IN HOMES

Homes offer a tremendous opportunity for energy savings. Achieving success will require a host of strategies, and the flexibility to adapt to dynamic market conditions.

EXISTING HOMES: TAPPING THE RETROFIT OPPORTUNITY

VISION AND GOALS

For the existing homes market, the vision for New Jersey is to **"build a trained and certified energy workforce infrastructure, provide meaningful incentives (including workable financing and time-of-sale rating policies), and promote a robust marketing campaign to drive consumer demand to whole-house retrofits in existing homes."**

With that vision in mind, achieving the Energy Master Plan target will require from this market the **"retrofit of a total of 350,000 single family homes and multifamily units by the end of 2013, over 1,000,000 by the end of 2017, and over 1.7 million by the end of 2020, while achieving an average 20% reduction in overall household energy use."**

MARKET: AN ENORMOUS OPPORTUNITY IN OLDER HOMES

Of the three million housing units[*] in New Jersey, a little over half are single family homes, the vast majority of which are owner-occupied. The remaining housing stock is multi-family units, of which two-thirds are rented. The average home size is just less than 2,300 square feet, with an average 2.7 occupants.

There are a large number of older homes throughout New Jersey. More than three-quarters of Mid-Atlantic homes were built before 1980, when energy efficiency began to be considered in more earnest in construction practices. For rental units in New Jersey, the median year built is about 1951.[†] An older housing stock provides significant opportunities for repairs, renovations and energy improvements. In 2007 alone, ten percent of New Jersey existing housing units received building permits for improvements ranging from new decks to extensive reconstruction or gut rehabilitation.

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[*] Source: US Census Bureau - 2007 American Community Survey.

[†] Source: Fast Facts, New Jersey Apartment Association, September 2007.

Approximately 90,000 existing homes are bought and sold each year, which is about 4 percent of the owner-occupied market. As homes turn over, there are opportunities for improving their energy efficiency.

A third of New Jersey households have an income of 60 percent or less of the median state income. Falling within this income threshold qualifies households to receive free comprehensive efficiency services either from the federally-sponsored Low-Income Weatherization Assistance Program (WAP), or from the current, utility-delivered Comfort Partners program. Another 7% qualify through Assisted Home Performance with ENERGY STAR for special incentives based on a sliding income scale.

The existing homes sector annually consumes approximately 30 million MWh of electricity, 192 trillion BTUs of natural gas and 39 billion BTUs of fuel oil.

GAPS: A MUCH MORE AGGRESSIVE EFFORT IS NEEDED

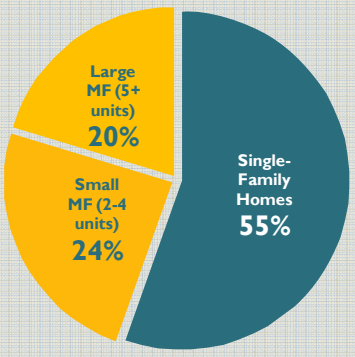
New Jersey currently offers energy efficiency incentives and services to the existing residential building market through a variety of programs. These include:

WAP – Weatherization Assistance Program: New Jersey receives funding from the national Department of Energy through the Low-Income Weatherization Assistance Program (WAP) to provide free home weatherization services. This fund is used to serve low-income oil heat customers (estimated at 16% saturation overall) who meet the low income threshold (where household earnings are 60 percent or less of the median income as adjusted for number of household occupants).

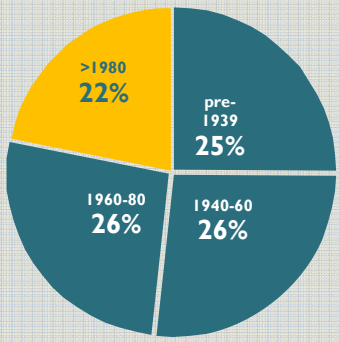
CP – Comfort Partners: The New Jersey gas and electric utilities provide a similar service to low income homes with gas or electric heat and/or central electric cooling through the Comfort Partners (CP) program, using the same income eligibility thresholds as WAP.

AHPwES – Assisted Home Performance with ENERGY STAR: This program is intended for customers who do not meet the income guidelines for WAP or CP, or who are eligible for WAP or CP but whose needs cannot be met by these programs. The program is essentially identical to Home Performance with ENERGY STAR (HPwES, see below) but offers additional *financial incentives up to 50% of the cost of qualifying measures*, based on a sliding household

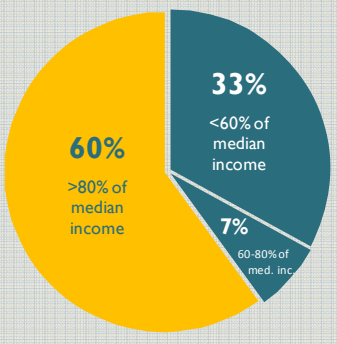
A GLIMPSE INTO NEW JERSEY'S HOUSING STOCK



Not All Homes Look Alike
The housing stock in New Jersey is pretty much split between single family homes and multifamily units.



Most Homes are Old Homes
More than three quarters of homes in the Mid-Atlantic were built before 1980.



Many Live on Little Means
Four in ten N.J. households are eligible for income-tested efficiency programs, most notably the federally-funded Weatherization Assistance Program.

income scale which cannot exceed 80 percent of the median state income.

HPwES – Home Performance with ENERGY STAR: For the remainder of the population (with a household income of 80 percent or greater of the median), the HPwES program provides subsidized loans or cash incentives from 10% to 50% of the cost of qualifying measures, dependent on the comprehensiveness of the recommended measures that have been installed and their cost-effectiveness. *This program has had a relatively slow start and is being reconfigured in 2009* in an effort to boost participation, though even its new goal of 3,000 participating homes barely scratches the surface of the energy savings potential.

HVAC – Heating, Ventilation and Air Conditioning Program: This program provides discrete incentives for high efficiency domestic hot water, gas heating and electric cooling measures.

CORE – Customer On-Site Renewable Energy: In addition to the above efficiency programs, residential customers are also eligible for incentives for installing home-scale solar-photovoltaic systems, although the current budget is already oversubscribed and there is a queue for the next funding cycle.

There are a number of key areas where New Jersey should do more to serve the residential existing building sector:

To begin with, the efforts to serve low-income customers have not adequately addressed the breadth or depth of the need. ***At least 75 percent of the low-income market has not been treated through an efficiency program.*** This is a market with substantial potential for deep savings in each home and multifamily building since important upgrades and other investments in efficiency cannot be expected to have occurred to the same degree as with non-low-income housing.

In the absence of a wide-ranging marketing effort, consumers are woefully unaware of the benefits of energy efficient renovations, or of the financing available to them. It's no wonder participation is so low.

The Home Performance with ENERGY STAR program also suffers from inadequacies in program reach, although for different reasons. The proposed rate for 2009 of 2,000 to 3,000 participants represents only 0.1% of the potential market. There has been limited growth in the demand for the comprehensive services offered through this program, due in large part to insufficient marketing campaigns resulting in limited consumer awareness, the delays in obtaining contract modifications and to insufficient experience within the contracting community which must learn to treat each and every home improvement project as an opportunity to sell a whole house energy retrofit.. Limited by scope of effort and resources, neither the program administrator nor the participating contractors have carried out ongoing, effective marketing campaigns. *Today, consumer awareness of the benefits of comprehensive energy efficiency improvements remains relatively low*.

Many consumers are not aware that their inability to finance the work required through their own resources does not prevent them from proceeding and that there are financing options available where the energy cost savings associated with improvements can be greater than the payments on their loan. Consumers also tend not to be aware of the root cause of excessive energy consumption and, when making building improvements, often focus on tangential measures or on limited strategies. **Reaching the aggressive goals of the Energy Master Plan will require *an extensive, sustained marketing strategy to inform home owners of the benefits of comprehensive energy improvements and of the assistance available to them toward this end*.**

Further, there has been insufficient market support to strengthen the infrastructure necessary to build a skilled, "comprehensive building performance" contractor market, and consequently there is nowhere near a large enough workforce to appropriately serve the potential demand. ***Meeting the challenge of 20% savings by 2020 will require an unprecedented effort to develop the necessary infrastructure of trained, skilled and certified contractors*** *capable of identifying and treating the root causes of building energy inefficiency.*

There are currently numerous barriers to contractor participation in the Home Performance with ENERGY STAR program, including the length of time required for processing of invoices and payment of incentives, burdensome paperwork, complex modeling requirements and cumbersome incentive structures. For example, the program imposes some steep standards for contractor participation by requiring company accreditation by the Building Performance Institute (BPI). With a longer-term market transformation effort in mind, there are some justifiable reasons for requiring these high standards. However, to ramp up quickly to achieve the Master Plan goals, ***New Jersey will need to revamp its program requirements to reduce some of these barriers to contractor participation***. Reaching large number of homes in short order will require a massive contractor ramp-up, which means striking a better balance between sound standards and requirements, and encouraging contractor participation. Additionally, contractors will need to be convinced that the market potential for comprehensive energy performance improvements is big enough to warrant their investment of time and effort into it. A robust marketing campaign and healthy incentives to homebuyers to spark that demand is essential to attract the contractor workforce needed to be trained, certified and readied to serve this vast market. This may also require contractor incentives to engage sufficient numbers of qualified contractors.

The presence of health and safety concerns on site, such as moisture and mold issues, the presence of asbestos and combustion safety, have occasionally meant that energy efficiency retrofits must be delayed until the health and safety concerns were addressed. An estimated 10% of the housing stock contains one or more of these problems so it is vital that this issue be addressed to ensure that health and safety problems are fixed and energy savings opportunities are not lost by walking away.

Another concern is the level of incentives available to those residents who do not qualify for the enhanced financial incentives available through Assisted Home Performance with ENERGY STAR Homes Program. Experience has clearly shown that strong incentives are required to convince large numbers of moderate and mid-income homeowners to devote

their limited available financial resources to what is often considered unimportant (if considered at all). Financing alone – even if tied to monthly bill savings - will not engage sufficient participation to achieve the Energy Master Plan goals. The need for significant incentives is all the more critical as many moderate income homeowners struggle with the current mortgage and credit crisis.

A major gap in the existing program portfolio is ***adequate service to the multifamily sector***, a consistently underserved market due to a multitude of factors. These include disincentives to invest due to rent control regulations; inadequate investments by owners whose business model is focused on short-term ownership ("flipping"); and "split incentives" between the building owners who are responsible for the physical structure and the occupants who are the actual utility bill payers where sub-metering is in place (we discuss this issue in more detail in the Business and Government chapter). The multi-family sector accounts for just under half of all housing units. To date it has been unclear which New Jersey program is designated to serve this market (Residential, Business or Low Income) and therefore a significant proportion of these buildings are either addressed inappropriately or not at all***. Without a dedicated program, issues and barriers that are unique to the multi-family market will not be overcome.***

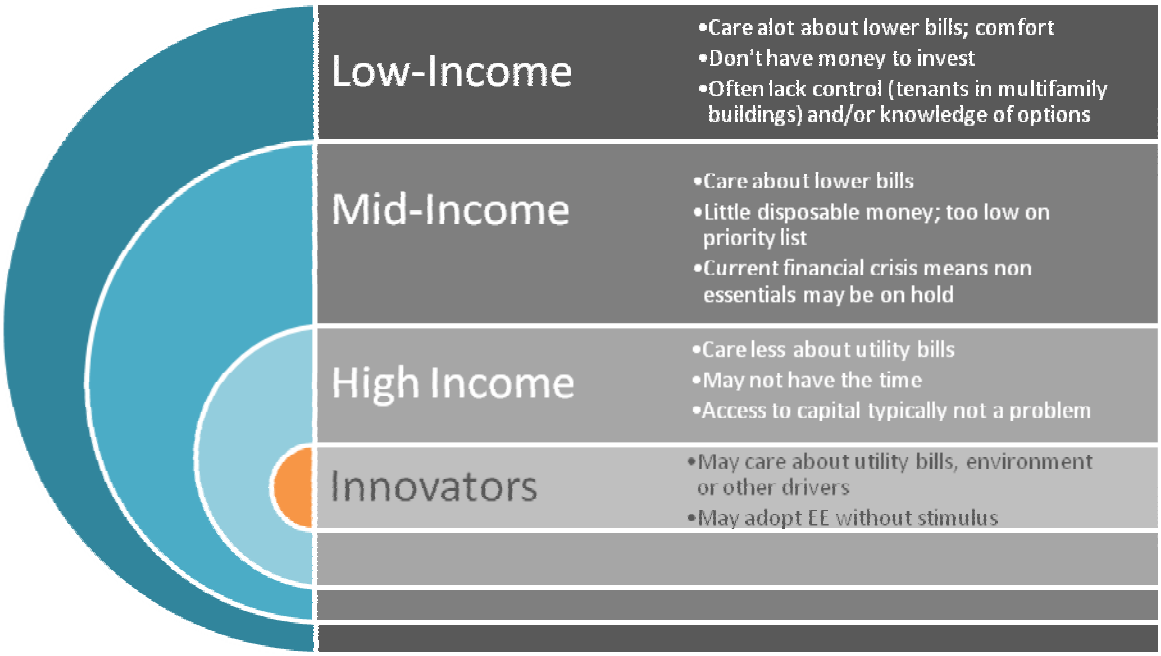
There also has been ***inadequate promotion of solar hot water heating*** measures throughout the existing home sector. As noted, the CORE program does promote solar photovoltaics, but it has been unable to keep up with the pace of rising interest.

PROGRAMS: A VARIETY OF STRATEGIES FOR DIFFERENT SEGMENTS

Ramping up from retrofitting a few thousand homes a year to improving the energy efficiency of tens of thousands of homes annually – a necessity if New Jersey is to meet its Energy Master Plan goals – will entail an effort unprecedented in scale and scope. Broadly speaking, a successful strategy will need to rely upon a variety of tools, including:

- Attractive incentives and financing;
- An effective management structure;
- A large-scale trained, equipped and certified work force, able to both conduct audits and perform quality renovations;
- A robust quality assurance mechanism;
- A thorough understanding of the markets, players and motivations;
- Extensive social marketing;
- Performance guarantees;
- Effective community initiatives;
- Time-of-sale policy initiatives that drive customers into programs; and
- An involved, engaged and profitable private sector.

These tools will need to be packaged in a variety of programs aimed at different opportunities (improved building envelope, HVAC, lighting, etc.) and market segments



Different households face different barriers, drivers.

(mainstream, low-income, multifamily…). To be effective and cost-efficient, program administrators need sufficient flexibility and autonomy to deploy this set of program tools in a manner that responds quickly to changing market conditions and evolving opportunities. This flexibility is essential to achieving program goals and objectives, including targeted participation rates, savings, geographic distribution and overall energy affordability.

A MULTI-PRONGED MARKET APPROACH

New Jersey should ***focus on differing campaigns targeting divergent segments*** within the existing home market using a multi-faceted effort with strategies designed to overcome the inherent barriers to participation and policies to motivate people to action. Those with the means to make efficiency improvements must be convinced to do so. Those with the desire to make necessary improvements must be provided the means. And time-of-sale policies are needed to give market value to energy efficiency. In all cases, New Jersey's programs must provide expertise for comprehensive home efficiency improvements along with incentives and financing, and construction management and quality assurance services that together provide a compelling package that stimulates high levels of customer participation (i.e, the deal that customers can't afford to refuse). To motivate action throughout New Jersey's large residential population, targeted social marketing strategies are essential to initiate interest and passion. It is also important to be able to segment the market using utility billing data so that the highest use homes can be targeted first.

These fundamental needs ***require development of an infrastructure that sustains workforce development and continuing quality assurance and control***. Contractors must have confidence that adopting the desired business model will yield profitable work over a period of time. Consumers must have confidence that their investments will yield positive results. Each is yoked to the other and ***meeting the 2020 goal cannot occur without massive participation increases by all sides***.

SINGLE-FAMILY HOMES: BUILDING ON THE CURRENT HPWES PROGRAM

The Home Performance with ENERGY STAR (HPwES) program will need to be enhanced and grown significantly to treat over 930,000 non-low-income homes by 2020 – a target we believe must be achieved to meet the Master Plan goals. Beyond the program's current infrastructure, a number of **key program enhancements** will be necessary to pull this off. From the customer's perspective, these include:

Incentives: Program implementers must offer attractive, flexible incentive packages to help drive residents to make comprehensive energy improvements. These incentives must be available to all customers, regardless of heating fuel type, and should be funded jointly through the electric and gas utilities along with dedicated revenues to fund oil heat efficiency improvements (e.g., an efficiency surcharge on non-regulated fossil fuels).

Free direct installation: Customers should be encouraged to participate with free direct-install services, such as compact fluorescent lighting, air-sealing, duct-sealing and old appliance removal. Contactors may require financial incentives to encourage them to perform direct installations. Free direct installation of simple, cost-effective measures is a central strategy to open doors to comprehensive retrofit treatments across the state. .

Whole-house services: Approved contractors should then be able to "sell" additional measures to provide a comprehensive "whole-house" package of improvements, by offering major incentives to significantly reduce the cost of additional measures that result in deeper savings. These incentives in the form of grants based on the cost of the work should be packaged with low-interest and readily available financing options.

Innovative financing: Financing options should include, in addition to the direct short and medium term loans already available through Home Performance, more innovative repayment options such as utility sponsored financing that matches the schedule of payments to projected monthly energy bill savings (simplifying the process for participants) and, through the collaboration of municipalities, surcharges on property tax bills. Accessible financing can also be made more readily available through contractors and equipment vendors. We elaborate further on financing options on page 50 below (see "Financing").

Social marketing campaign: Beyond the nature of the services and incentives offered, promotion and marketing of the Home Performance with ENERGY STAR program needs to increase dramatically to build consumer awareness and increase demand for the service. This should include a "cause-driven" targeted social marketing campaign to enlighten customers

to the societal drivers behind energy efficiency (environment, national security, economy), to inspire action and to inform customers of their options for proceeding.

Workforce Development: To service increased demand, it is equally important that New Jersey grow and sustain a large skilled work force. Presently there are simply not enough qualified people to do the work that is required, nor enough hands-on training programs to build capacity. This applies both to the capacity to conduct audits and the capacity to complete projects. The numerous barriers to contractor participation in the program must all be quickly and effectively addressed – it must be made both attractive and relatively painless to participate in this effort and any unnecessary burdens should be removed. Specifically:

- ***Relax technical requirements:*** *The BPI accreditation requirement needs to be quickly addressed to make participation more streamlined and less burdensome, to build supply while upholding the quality of service. New Jersey should consider developing a new credentialing scheme that maintains quality assurance without beholding contractors to impractical restrictions. For example, by requiring BPI certification of field technicians and their immediate supervisors, but forgoing BPI Accreditation of the company itself, the focus on technical competence and installation standards is placed where it belongs.*

Improving energy efficiency in existing homes will be key to achieving the Master Plan goals. New Jersey can provide national leadership by adopting a new, more aggressive approach to the current Home Performance model.

- ***Ongoing Training:*** *After credentialing, the program should support field technician skill development through continuous training and quality control visits. This training should go beyond the building science aspects of certification and emphasize the "hands-on" skills necessary for effective installations, as well as the sales skills needed for customers to understand the benefits of a comprehensive approach to home performance improvements.*

The recently established Center for Energy and Environmental Training (CEET) offers the potential to provide one such path to ramp up workforce development and training to expand capacities to provide audits and install energy efficiency measures. Efforts such as this lead by the New Jersey Department of Labor with its Industry Workforce Advisory Council are critical to meet the Energy Master Plan goals.

Health and safety: An incentive structure that pays contractors to resolve health and safety issues where possible, in addition to energy improvements, is needed to prevent opportunities being lost by contractors walking away (see earlier discussion).

In addition to contractor incentives, the State should identify services and funds (e.g., loans) available to address health and safety issues (e.g., preventing lead paint contamination in replacing old windows and doors; and mold removal and structural repairs to install or repair wall or attic insulation). The State should also link efficiency program services with the appropriate state agencies and programs that can provide funds and assistance. Given the age of New Jersey's housing stock – particularly that occupied by low income households – addressing this issue is critical to reaching the majority of New Jersey residences with an average of thirty percent energy savings.

Promoting leadership: Approved contractors can and must be highly promoted in the marketplace to stimulate demand for their services, to build trust and to assure the marketplace of their skills. Such promotional efforts will also serve as an additional incentive to attract new contractors into the program, and to reinforce consumer awareness of – and confidence in – the program. This might also include sales-based contests within the contractor community to encourage active participation. This relatively low-cost approach has proven time and again to build a sense of excitement within the contractor community when it is pursued by product manufacturers and distributors.

Permits as leads: Permit applications for additions and renovations should serve as leads for Home Performance projects. While ensuring that the new addition or renovation is efficient, once a crew is at a house it is a great opportunity to present information, services and incentives to go beyond the initial project scope and treat the whole house, especially when incentives and reduced energy bills can help offset some of the incremental cost.

Billing Data for Target Marketing: Customer consumption histories should be made available electronically to program implementation contractors who agree to protect the confidentiality of such customer data. This allows the program to target the highest users, to identify and act on consumption pattern anomalies, and to aggressively market and target program services to homes where the greatest bang-for-the-buck may be found.[*]

These are all pieces of a broad strategy aimed at the most significant energy savings opportunity in the residential market. We believe that adopting this strategy – and the pieces prescribed above – offers New Jersey a key to achieving the Master Plan goals, and the opportunity to become a true North American leader in transforming the energy efficiency of the existing stock of homes.

[*] Note that high usage does not *necessarily* mean large homes. Program managers can differentiate between large homes and high usage based on cross-referencing with other data, including home size.

MULTIFAMILY BUILDINGS

The multifamily sector is a consistently under-served market. Yet to meet the Master Plan goals, ***New Jersey's energy efficiency campaign should make energy efficiency retrofits of multifamily*** buildings comprising over 300,000 residential units a primary target from now through 2020.

Recognizing this challenge, the New Jersey Apartment Association (NJAA) recently signaled its interest in finding ways to improve the energy efficiency of member buildings. To address this, program implementers should engage building owners, condo associations and retirement community boards with incentive offers that are simply too good to pass up. For mid-rise and larger buildings, they should offer landlords and building owners long-term strategies, plans, incentives and financing options to systematically improve their buildings – lowering tenant energy costs and increasing occupant comfort. Tenants, likewise, need on-going awareness and education to manage and reduce energy consumption including a focus on the societal drivers for energy conservation. This is particularly important in master-metered buildings where tenants do not receive utility bills that provide direct feedback regarding their energy use. New Jersey's policymakers should address the disincentives to building owners to make efficiency improvements to rent-controlled buildings as well as prohibitions to move from master-metered to sub-metered arrangements.

The first step to address this priority market to increase energy efficiency is to engage the multifamily community and listen to and understand their needs and suggestions.

New Jersey's program administrators should give priority to developing a targeted multifamily program including substantial incentives and direct installation immediately to serve this unique market. This might involve redefining the border between single family and multifamily programs, to allow low-rise buildings with individual heating and cooling systems to be served under the Home Performance with ENERGY STAR program, without any additional requirements of extensive energy modeling. A comprehensive direct install component should provide compact fluorescents and low

MASTER- OR SUB-METERING IN MULTIFAMILY BUILDINGS? A Classic Split Incentives Conundrum

The New York State Energy Research and Development Authority (NYSERDA) recommends that making tenants responsible for their own utility bills through the use of sub-meters, ***can result in 10 to 20 percent energy savings*** *through changes in occupant behavior regarding energy use. Indeed, paying for a resource is essential to encouraging its responsible use.*

Yet the reverse can also be true. *If sub-metering is applied to buildings that are inefficient to begin with, the building's owner would no longer see a clear benefit stream (i.e., bill savings) from the installation of measures such as improved energy maintenance, purchase of higher-efficiency HVAC systems, or installation of ENERGY STAR® windows and doors. As a result, the occupant-driven energy savings resulting from sub-metering could be dwarfed by lingering structural inefficiencies which the building owner has little direct financial incentive to address.*

Clearly, the issue of sub-metering must be considered comprehensively. The New Jersey Apartment Association's clear interest in energy efficiency offers the State an opportunity it must seize: working with the NJAA toward an optimal solution, in which sub-metering is encouraged on the condition that buildings achieve high levels of energy performance through comprehensive energy efficiency upgrades.

flow water saving devices for tenants of *all* multifamily buildings. During this effort, inefficient refrigerators and room air conditioners should be tagged for replacement. The very first step in this priority effort, however, should to be to engage the multifamily community and to listen to and understand their particular needs and suggestions.

LOW-INCOME HOUSEHOLDS

The "low income" segment of the market is, by definition, the least able to afford investments in energy efficiency. The ability to self-finance efficiency improvements is not, however, a binary, either/or, matter. Some low-income households may have resources available that higher income households do not. For example, a low-income household may have a mortgage that has been paid and little or no other debt, whereas a moderate-income household may be at the limits of credit-worthiness and without the ability to add to their debt burden. Similarly, a lower-income household may have more time available to engage with contractors. Money is a critical factor in enabling investments in energy efficiency, but it is by no means the only factor.

We believe a more useful way of thinking of this particular market segment is not in terms of special rules limiting participation, but rather as simply one end of an incentive spectrum. To dramatically increase the number of low income households served, in addition to the Comfort Partners Program, low-income households should be eligible for the general Home Performance with ENERGY STAR program (see page 40). This should include direct installation of some low-cost products and services (CFLs, air/duct sealing where applicable), and incentives, including grants and preferential financing, to cover the remainder of the cost of comprehensive measures. In the case of income-eligible households, however, incentives should simply be higher than for non-qualifying households, thereby addressing the income barrier without requiring a separate – and arguably stigmatizing – program.

Ultimately, a successful incentive package must be tied not only to the measure being promoted, but also to overcoming some of the additional barriers to reaching low-income households (education, unconventional work hours, etc.) in the goal of treating more than 450,000 low-income units by 2020.

HEATING, COOLING AND WINDOWS

Much of the heating, cooling and water heating equipment and windows in New Jersey homes are old, outdated and inefficient. While program implementers currently focus on up-selling higher-efficiency equipment, experience suggests that a significant opportunity lies in ensuring quality equipment sizing and installation practices, including duct design and tightness of the heating systems and the charge and airflow of the cooling units - all of which are addressed in the new ENERGY STAR HVAC quality installation program. Trained and certified skilled technicians will, therefore, need to play a key role in helping New Jersey achieve its Energy Master Plan goals.

To effectively capture savings through quality installation and verification (QIV), New Jersey should increase training of equipment technicians through partnerships with trade associations, manufacturers and distributors, some of whom have now focus on best practices for quality installation to improve customer satisfaction and minimize call-backs.

New Jersey's current residential HVAC program already tries to encourage proper sizing and installation. Yet success has been mitigated, since even for properly trained personnel, proper HVAC sizing and installation requires more time, making it less profitable in a competitive market focused almost exclusively on upfront costs. To overcome this barrier, New Jersey's energy efficiency programs must go a step further and tie equipment incentives to third-party quality installation verification (QIV) with the long run goal to transform industry practices such that QIV becomes a standard requirement of manufacturers themselves.

In encouraging window replacements, New Jersey's programs should move to high-performance R-5 windows now cost-effective for many applications in New Jersey. Such windows have existed for decades, but generally are installed in colder climates. New Jersey should work upstream with window manufactures, distributors and retailers to move the large window replacement and new construction market to one that commonly stocks, sells and installs these high-performance window options as a preferred choice.

Of course - as with air conditioners - proper installation of windows is also essential to translate energy *ratings* into *actual* energy performance. New Jersey program administrators must be diligent in providing or requiring proper training for window installation staff so that actual window performance meets expectations.

Proper HVAC installation practices – an enormous energy savings opportunity – will remain a losing proposition until incentives are tied to third-party, quality installation verification.

LINKAGE TO OTHER SERVICES

New Jersey must endeavor to limit the "silo" effect of providing distinct stand-alone programs rather than a comprehensive and streamlined package of services. Customers should not be excluded from participation if they do not fit exactly within the program criteria nor be discouraged to participate for not knowing in which program they fit. For all customers across the income spectrum, ***programs and incentives must be designed to make participation the easiest choice***.

Customers in the Home Performance with ENERGY STAR program – whether low-income or otherwise – should be made aware of and turned to other efficiency initiatives they may benefit from (e.g., incentives for efficient consumer electronics, appliances or renewable energy). Likewise, equipment incentives should be available to customers beyond those

participating in the Home Performance with ENERGY STAR or low-income programs. Incentives for efficient hot water heating (including solar hot water systems), for space heating and cooling replacements, and for triple-glazed windows, should be made available to all customers to drive the market towards the more efficient product choices and to ensure that every opportunity to "sell" efficiency is taken advantage of.

REGULATORY FLEXIBILITY

To allow program managers to respond to changing market conditions, to go after new opportunities and to help stimulate new and innovative strategies, they should be given a high degree of flexibility in the details of program design, resource allocation and implementation***. Aggressive goals should be established and the program managers should be provided the autonomy, responsibility and ultimately the accountability to reach these targets.***

If savings targets are to be met, the strategies and tactics used to achieve them cannot be micro-managed from the top of the regulatory and administrative structure. Goals and targets, once clearly defined, and realistic budgets allocated, should be left to the implementation contractor to meet. Performance metrics and incentives are also prudent, but they should be directly relevant to meeting the goals and targets.

Aggressive policies are essential, but alone can't guarantee results. To be effective, they need to be coupled with implementation support, training, enforcement, periodic updates and education.

POLICIES: PUBLIC BUILDINGS

While effective programs can go a long ways towards the 2020 goals, they won't be enough. Effective policies, codes and regulations can provide the most cost-effective means to achieve goals. However, it is important to realize that a particular policy being enacted does not necessarily guarantee results. New Jersey's policymakers and administrators should couple smart, effective policies with implementation support, training, enforcement, periodic updates and education to achieve expected energy savings.

The key policy approach New Jersey should consider implementing as soon as possible is a set of ***time-of-sale requirements***. As homes change hands, opportunities arise to factor energy efficiency into market transactions, and require homes to attain minimum standards. Efforts to upgrade efficiency at the time of sale/purchase can more easily take advantage of long-term mortgage financing. We address this in the section below.

Other policies worth examining include allowing recovery of investments in energy efficiency for rent-controlled properties, allowing the switch from master-metering to tenant sub-metering in multifamily buildings that meet certain energy efficiency standards, and creating a "systems benefit charge" for oil customers to enable funding of energy programs

for homes that heat with oil. Additionally, instituting a time-of-use electric rate, coupled with customer feed-back devices in homes, can send strong price signals that will influence customer behavior.

TIME OF SALE ENERGY RATING DISCLOSURE

In theory, the energy efficiency of homes – and the resulting energy bills – should be a significant factor in consumer home purchase decisions. In practice however, housing markets grossly undervalue energy efficiency, if at all.

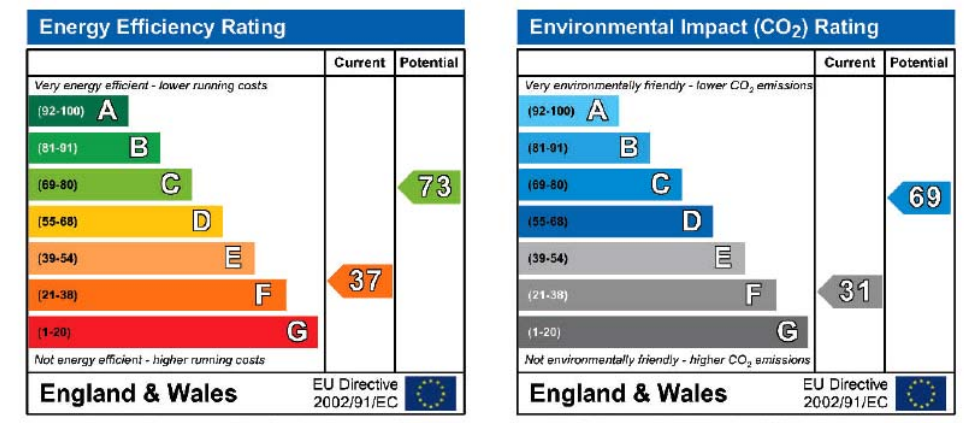
To address this, an increasing number of regions in the U.S. and elsewhere are implementing or planning to implement mandatory, time of sale energy rating disclosure policies. Such policies allow home buyers to at least be aware of the relative efficiency and operating cost of the homes they are considering, the first step to a properly functioning market that values investments in energy efficiency.

A time-of-sale disclosure requirement brings energy efficiency to the surface in transactions. Energy ratings increase awareness and, if coupled with energy audits, technical assistance and financial incentives, they can result in investments that significantly improve energy efficiency. **Indeed, experience elsewhere strongly suggests that mandatory energy rating disclosure can significantly increase the market value of homes with improved energy efficiency.** This market valuation, in turn, can convince homeowners to invest in energy savings measures, knowing that their investment will increase the value of their home.

To help home sellers or buyers take the next step to make efficiency improvements before or after the sale of a home, the New Jersey energy efficiency programs should work with realtors and lending institutions to provide efficiency program services, incentives and financing to drive comprehensive home efficiency improvements. Engaging the real estate industry in this concept will be key to the success of time-of-sale energy ratings. In addition to linking prospective buyers and sellers to energy rating and program services, realtors can post energy ratings in the Multiple Listing Service (MLS) (and other) databases. This will allow the energy performance of listed properties to become an integral part of home pricing negotiations and purchase decisions. Home inspectors, too, could play a key role, expanding their businesses to offer a certified service to complete energy ratings in the homes they inspect as well as offer related audit services. [*]

[*] As some New Jersey energy audit providers have noted (e.g., CMC), energy ratings alone will not provide the information needed to make home energy efficiency improvements. But establishing a common measure to understand the relative energy performance of a home provides homeowners and prospective buyers reason to consider efficiency improvements. Indeed partnerships between

MANDATORY HOME ENERGY LABELLING: THE U.K. EXAMPLE



***In the United Kingdom**, as elsewhere in Europe, homes must have their energy efficiency and carbon footprints rated and published prior to sale. This allows prospective buyers to compare the economic and environmental costs of the homes they are considering, providing market value to energy efficiency improvements.*

Similarly, a time-of-lease energy rating disclosure of a rental property (house or apartment) will help prospective tenants assess the relative value of a lease (e.g., with more efficient properties commanding a higher rental fee than less efficient properties). In addition to providing important information to potential tenants, this policy rewards landlords that invest in energy efficiency and supports a market value for energy efficiency in rental properties. To implement this policy, the New Jersey's energy efficiency programs should target landlords for energy efficiency program services using energy performance rating requirements as an "entry point" towards energy efficiency improvements including comprehensive efficiency "makeover" projects (see the recommendations in the preceding section regarding multifamily housing efficiency).

Given this, we strongly recommend that New Jersey begin by developing a consistent and streamlined energy rating system for existing homes, based on actual consumption history normalized for weather, and readily identified building characteristics. Such systems exist in many regions, including Canada (where homes are rated on a scale of 0-100) and Europe, where a similar scale is translated into A-to-G grades (see inset for the British example). Rating systems can be based on simple or more complex home audits, and needn't be cost prohibitive.* Once developed, the rating – which should provide information on at least energy usage and cost – should be made mandatory for any home that undergoes a change of ownership or for properties offered for lease.

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realtors, home inspectors and New Jersey's energy efficiency programs can link auditors and energy service providers to make efficiency upgrades an attractive element of closing home sales.

* Rating schemes should choose an optimal combination of precision and cost. If a simplified system is chosen, more complex audits could nonetheless be encouraged and incentivized.

TIME OF SALE EFFICIENCY UPGRADES

Once the mandatory energy rating system is fully operational, to achieve the Energy Master Plan goals with cost-effective efficiency improvements in sixty percent of homes and apartments, New Jersey should take the additional step to require that homes changing ownership meet a minimum building efficiency performance standard (e.g., achieve a minimum energy performance rating) much like homes must meet minimum fire safety standards when listed for sale. In this way, the 90,000 homes that change hands each year will be upgraded with cost-effective efficiency (if they haven't been already) making New Jersey's standing stock of homes more affordable to own and contributing to the State's energy and carbon emission reduction goals..

This will be politically challenging, but the significant benefits of such a policy should prevail. Energy improvements could be negotiated by buyer and seller in a transaction, with the buyer possibly financing the improvements in an Energy Improvement Mortgage designed to ensure positive cash flow (i.e. energy savings outstrip the monthly mortgage increase). The substantial growth in retrofit jobs that would arise from this policy would stimulate job creation, paid for through energy savings.

NON-REGULATED FOSSIL FUEL EFFICIENCY FUNDING

Approximately 400,000 homes - roughly thirteen percent of all New Jersey homes - are heated with fuel oil or other non-regulated fossil fuels (e.g., propane). To provide comprehensive, whole house efficiency solutions that maximize energy savings and consumer value and meet the Energy Master Plan Goals, New Jersey policymakers should establish a fund to support energy efficiency improvements in homes heated by non-regulated fossil fuels. This funding should support implementation of the New Jersey Energy Efficiency Utility program strategies to provide comprehensive set of energy efficiency solutions – regardless of heating fuel type. With this, providers of non-regulated heating fuels should be included (e.g., through their statewide association) in the New Jersey Energy Efficiency Utility – a role supported by the Fuel Merchants Association of New Jersey.

Options to fund non-regulated heating fuel efficiency measures are discussed in the Foundations section of this report.

RATE DESIGN, SMART GRIDS AND CONSUMER BEHAVIOUR

A valuable tool to encourage efficiency efforts and change residents' behavior is the design of ***time of use rate structures***. For example, many washers, driers and dishwashers now come with "Start delay" options, allowing consumers to shift power demands to off-peak periods that incur lower costs for society as a whole. Yet customers have no incentive to use these options as long as rates remain the same at 6pm or 2am.

Time-of-use pricing, which reflects the true costs of electricity consumption at different times (with notably higher rates during system peak periods), while remaining revenue neutral on the whole, is thus an important tool to encourage consumers who have flexibility in the timing of their appliance use to shift some of their demand to off-peak time periods. It is also a powerful tool to help consumers *reduce their utility bills*, since higher peak rates would be offset by lower off-peak ones. Ultimately, such smart rate design, combined with smart appliances and other equipment (including programmable thermostats), empowers consumers to consume responsibly, reduce their own utility bills and reduce the cost and environmental burden of energy consumption on New Jersey as a whole.

New Jersey could also go a step further and embrace the concept of ***smart grids (i.e., two way power flow to support on-site generation and demand response with two-way communication) and in-home feedback devices***, which empower consumers further with the real time information required to allow informed decisions of their behavioral energy usage patterns.

Inverted block rates with increased costs per KWH or therm of gas for increasing volumes of energy use is another rate design strategy that New Jersey can employ to encourage the efficient use of energy. An advantage of this strategy is that it can be implemented using existing metering technology. It does not, however, provide consumer price signals regarding the cost of energy or capacity during peak versus off-peak time periods.

And as discussed above, the issue of sub-metering in currently master-metered apartment buildings should be addressed as an element of an overall strategy to achieve comprehensive efficiency improvements in multifamily buildings.

FINANCING

As previously indicated, financing can be a powerful tool to enable consumer investment in home energy efficiency improvements. Government can encourage the availability of smart financing through several vehicles:

Financing on utility bills: Utility sponsored **f**inancing that structures repayment schedules to match projected bill savings simplifies the repayment process and, more importantly, ties payments to the savings they generate. Indeed, if payment is spread over a long enough period (a critical success factor), consumers could see positive cash flow when viewing the net impact of both financing payments and reduced consumption on their utility bills. This is an ideal way to "make the case" for the positive economics of energy improvements. Financing tied to utility bills can be incorporated into a customer's monthly bill or be handled as a separate but related transaction (e.g., a separate bill for financed efficiency improvements that references billed energy usage and calculated savings). This latter approach can reduce the cost and challenges of revising utility billing systems and offers consumer protection against service disruptions by separating energy bill payments from loan repayments.

Financing on municipal tax bills: Financing energy efficiency improvements on the property tax bill – often referred to as *Local Improvement Charges* – allows for long repayment periods (in line with the useful lives of the efficiency measures) – thus improving cash-flows – *and* for the transfer of payment obligations to subsequent home buyers. This is particularly valuable in that it allows repayment to remain tied to those who would continue to benefit from lower energy bills long after the original homeowner is gone. The value of this last benefit cannot be understated: home turnover tends to average seven years, while the payback on many energy improvement opportunities, setting aside intangibles like comfort and health, may be a fair bit longer.

Energy Improvement Mortgages: EIMs were developed by the lending industry to give the buyer of an existing home the opportunity to borrow more money at the time of purchase or refinancing to make home energy efficiency improvements. The money borrowed to add insulation, replace the old heating/cooling system, or tighten the home's building envelope is rolled into the new mortgage and spread over the mortgage term (usually 30 years). State government can encourage – though not require – the development and active marketing of EIMs by financial institutions.

State Roles to Encourage Efficiency Financing: State government can facilitate the provision of financing strategies by:

- **Establishing a secured, wholesale energy efficiency loan fund:** The fund, sourced by private capital, could lend to utilities, municipalities and, possibly, contractors and equipment vendors. Secured by the state, the fund could offer attractive wholesale interest rates, which retail lenders (utilities, towns and others) could then buy down further as part of their own efforts to encourage energy efficiency. Funds could be allocated competitively by asking these "retailers" to bid for shares of the capital, based on the extent to which they intend on providing additional value-added (interest buy-downs, aggressive marketing, etc.) and on their leverage to minimize defaults.

- **Establishing a dedicated energy efficiency deposit fund:** New Jersey's state agencies can choose to direct their financial accounts to a local bank that in turn uses the deposits exclusively to fund energy improvements. The state agency gets a guaranteed return on its deposits (similar to investing in a CD or bond elsewhere), but is able to use its funds to leverage energy investments, while keeping their money in the local economy.

IMPLEMENTATION: AN OVERVIEW

The table below provides an overview of the various strategies proposed and the timetable for their implementation.

Legend for "Key Segments": *G = General market. LI = Low-income. MF = Multi family.*

MARKET: EXISTING HOMES Goals: Upgrade 1.7 million homes while saving an average of 20% of energy consumption by 2020								
	Strategies	Key Segments			Ownership	Partners	Implementation		
		G	LI	MF			2009-2010	2011-2015	2016-2020
PROGRAMS	**Comprehensive home retrofit incentive program for all building types**				EE Utility	Electric and gas utilities, oil suppliers	Develop, roll out comprehensive marketing and awareness campaign. Develop oil 'system benefit charge', improve financing options and increase social marketing campaigns. Widen breadth - include major renovation and depth of efficiency efforts in each home.	Continue building market demand	Continue
	Enhanced low-income retrofit strategy				EE Utility	WAP agencies, electric and gas utilities, housing service agencies, social services	Provide free CFLs, air and duct sealing, and an array of enhanced incentives. Enhance marketing and customer relations to drive demand.	Continue	Continue
	Targeted Multi-Family initiative				EE Utility	NJ Apartment Assoc., condo and retirement community assoc., municipalities landlords and building owners	Enhanced cooperative advertising, attractive incentives and long-term technical support. Improved billing and metering arrangements.	Build a targeted Multi-Family Home Performance program	Continue
	HVAC, hot water and windows				EE Utility	Electric and gas utilities	Increase equipment incentives for high efficiency (and solar) domestic hot water, space heating and cooling	Adapt to changing market demands by adding new	Continue

MARKET: EXISTING HOMES Goals: Upgrade 1.7 million homes while saving an average of 20% of energy consumption by 2020								
	Strategies	Key Segments			Ownership	Partners	Implementation		
		G	LI	MF			2009-2010	2011-2015	2016-2020
							equipment, triple-glazed windows.	equipment and/or higher efficiency tier incentives	
	Contractor technical assistance and certification				EE Utility	NJ Institute of Technology, community colleges and trade schools, NATE, NJBA	Develop streamlined credentialing scheme, schedule on-going comprehensive trainings and tie incentives to third-party quality installation verification.	Continue	Continue
	Cross-strategy promotion via real estate agents				EE Utility	Real estate agents	Develop consistent Home Energy Rating System. Train home inspectors to complete ratings.	Post ratings on MLS to promote energy efficiency considerations in purchase decisions.	Continue
POLICIES	**Time of sale disclosure and upgrade legislation**				Governor's Office	DCA, Municipalities, EE Utility, OCA	Develop and implement time-of-sale energy rating legislation	Implement minimum efficiency improvement requirement at time-of-sale	Continue
	Rate design and smart grid				BPU and Regulated utilities	EE Utility, BPU, OCA	Develop new rate designs, assess and promote cost effective smart metering installations	Implement new electricity rate design.	Continue
	Innovative financing (including by municipalities, utilities and/or mortgage lenders)				Governor's Office, EE Utility, Municipalities	DCA, Mortgage lenders	Provide low interest financing of energy improvements tied to utility, property tax and/or mortgage bills; consider secured wholesale loan fund or dedicated deposit fund to facilitate value-added financing.	Continue	Continue

NEW HOMES: MOVING CLOSER TO ZERO NET ENERGY NEEDS

VISION AND GOALS

For the new homes market, the vision for New Jersey is to "**transition the new construction market to one in which a majority of homes and buildings are built to be very energy efficient and powered primarily by renewable energy, through a combination of incentives, more aggressive codes and standards, comprehensive builder training and widespread consumer marketing."**

With that vision in mind, achieving the Energy Master Plan target will require that **"by 2020, the majority of new homes being built are considered "micro-load homes", with negligible net energy consumption from the home itself."**

MARKET: THOUSANDS OF NEW OPPORTUNITIES EVERY YEAR

Historically in New Jersey, between 20,000 and 30,000 new homes are built each year. With the current economic downturn, we expect to see half of these historical numbers for at least 2009 and the next number of years. Over half of these new homes are single family homes with the remainder being multi-family developments, both large scale and townhouse. The vast majority are site-built (98%) and speculative construction, the average size being approximately 2,450 square feet and containing three bedrooms. Almost all new homes now include central air conditioning.

In the 1980s, home building practices improved significantly, leading to increased energy efficiency. Yet since 1990, the average total energy consumption in new homes has actually risen, even as product efficiency and building practices have continued to improve. Higher energy use has been driven largely by an increase in size of the average new home. Although the total energy consumption per square foot has continued a steady decline since the 1940s, the average new home built in the 2000s was 40% bigger than the average new home built in the 1980s.

The single-family sector accounts for electric consumption of around 95 million kWh per year, or 9,750 kWh per year per home, and a total of one billion BTUs per year in natural gas consumption. Multi-family developments account for total consumption of 58 million kWh and 65 billion Btus per year of natural gas. Nearly all homes – 98 percent – are heated with natural gas, the remainder opting for electric space heating.

Green building programs in New Jersey are gaining in popularity and use. LEED for Homes is promoted and supported and the National Association of Home Builders' (NAHB) "National

Green Building Standard" is also gaining interest from builders. Energy efficiency is an important component of both programs.

The largest impact on the new homes market is the current down-turn in the economy. The decreasing number of permits for new homes (down from about 4,500 per month at its high in 2005 to about 1,100 in the summer of 2008) will have real impacts on any energy efficient new homes program. That said, as the market tightens, the builders that are left building homes will seek out new ways to differentiate their homes, and labeling their homes as ENERGY STAR or higher may become more desirable. This may be reinforced by the recent spike in oil prices, as consumers become have become more concerned with the costs of energy.

GAPS

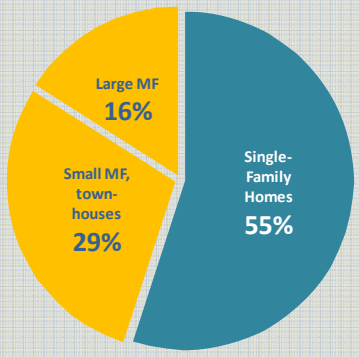
The New Jersey ENERGY STAR Homes Program services about a quarter of the total new home construction market. Currently, one company implements the program statewide as part of the Honeywell market manager team, providing an average of $1,850 in incentives per participating home that meets the ENERGY STAR efficiency tier. Each ENERGY STAR labeled home saves on average around 23 percent of energy consumption compared to a baseline non-participating home. The multi-family market, including both low and mid-rise buildings, is also served through this program.

Currently the program prohibits offering incentives to homes built outside of the Smart Growth area. This means that approximately one thousand new homes each year are ineligible to participate.

Another missed opportunity is that the program offers no incentive for participants to build any better than the single ENERGY STAR efficiency tier. Enhanced tiers are planned for 2009 to encourage participants to go deeper to save more energy, including a very high level of micro load homes. This is a welcome move in the right direction.

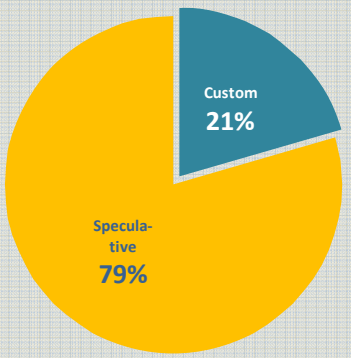
Another gap in the current program is the very limited program marketing effort which is inadequate to stimulate consumer demand for ENERGY STAR homes. Nor does the program tap potential beneficial roles for subcontractors to build demand for ENERGY STAR Homes and provide high efficiency products and apply best practices (e.g., for HVAC system and window installation) in home construction.

NEW JERSEY'S NEW HOMES



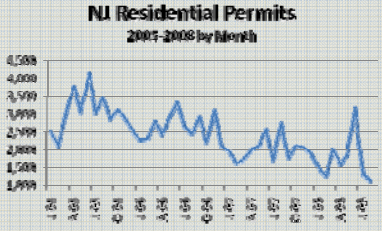
A Diversity of New Homes

As with the existing stock, a little less than half of new homes are part of multi-family buildings, though only one in six are part of large buildings.



Most are Built on Speculation

Barely one in five homes are custom-built; the remainder are built on a speculative basis, to be purchased "as is". Only 2% of new homes are manufactured (not shown on this graph).



Construction is on the Decline

Even before the mortgage crisis hit its peak in September 2008, new housing permits had been on a three-year decline. Permit requests have dropped even more substantially since.

Throughout North America, the concept of "zero net energy" homes has become a focus of long-term program objectives, with "micro load" homes becoming the more realistic, mid-term goal. Historically, New Jersey has not adapted its efforts to align with the level of endeavor required to meet these lofty targets. Here again, current plans for 2009 include a move in this direction, with a pilot "micro load" homes effort.

New Jersey is one of the few states left that still centrally delivers its new homes program through a single statewide vendor *with all home energy raters set up as employees on staff*. However, the 2009 plans currently call for opening up New Jersey's Home Energy Rating System (HERS) to qualifying energy rating organizations and market-based energy raters that meet certain qualifications. This will entail significant program changes, including setting up selection criteria, establishing a robust quality assurance program and planning for transition to and implementation of a new market-based system.

There is currently no research and development (R&D) effort as part of the residential new construction efforts in New Jersey to actively identify, test and deploy new and promising technologies. Again, plans are in place to begin a limited effort in 2009.

Finally, the state's energy code has generally kept up with current national model energy codes. Efforts to push beyond the NMEC have been introduced in the legislature, but have not been passed.

PROGRAMS: A BASIC BUILDING BLOCK OF STRATEGIES

New Jersey must ramp up savings per home and participation levels to achieve the aggressive program targets required to meet the Master Plan goals. This will require encouraging builders to go deeper through the introduction of new technologies and building designs, increased incentives for doing more, new financing options, extensive marketing and market support, and a significant growth in builder and subcontractor building performance knowledge and skills.

THE PRIMARY NEW CONSTRUCTION STRATEGY

The primary strategy to significantly increase the efficiency of New Jersey's new homes should include the following components:

Broaden eligibility: Participation in the New Jersey ENERGY STAR homes program should immediately be extended to include all new homes, without restriction based on Smart Growth areas. While well-intentioned, this restriction has invariably led to more inefficient homes located outside of Smart Growth areas. Similarly, eligibility should not be restricted by fuel type; funding by both electric and gas utilities should be supplemented by funding for non-regulated fuel energy efficiency discussed previously. See inset.

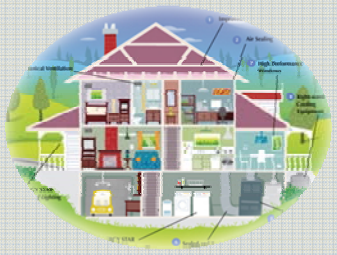
Upstream Targeting: Targeted strategies should be customized to reflect the differing needs of individual market segments, including speculative versus custom builders, single versus multi-family homes, and site built versus manufactured homes. Each of these builders can be sold on energy efficiency with a different set of arguments and, possibly, a different set of upstream incentives (e.g., integrated and expedited construction permitting for residential projects and developments that meet or exceed ENERGY STAR Home standards). Upstream marketing strategies should also target subcontractors and building supply channels to provide high efficiency technologies and best practices in home construction and remodeling (e.g., HVAC system and window installation).

Higher Tiers: To move builders up the ladder of efficiency towards "micro load" homes, a sliding scale of tiered incentives for higher performing homes needs to be established. Incentives need to cover not only the higher costs of technology and labor associated with more attention to building details, but also the time it takes to learn and integrate new techniques into the building process. These tiers need to be supported with marketing to make home buyers aware of the benefits of purchasing homes at these higher levels. Tiers should lead and drive builders towards micro load homes.

Marketing Campaigns: Builders will increase program participation when they see growing interest and demand from home buyers. New Jersey needs to increase general consumer advertising and builder cooperative advertising to drive this demand. This program would also benefit tremendously from a more extensive social marketing campaign to stimulate consumer interest in energy efficiency, coupled with efforts to engage builders, subcontractors and architects. Awards and the active promotion of builders who achieve high levels of building performance will reinforce their success and serve as incentives to others to strive for these high levels as well.

Builder Training: To impart to architects, designers, builders and subcontractors the knowledge and skills to construct highly performing homes, a sustained training effort needs to be developed and carried out. This should not only include on-site technical assistance with each building project, as is currently done, but also needs to integrate more structured trainings to enable greater increments of building performance from the design community, participating builders and their subcontractors.

New Measures: Incorporating new technology and practices into the new homes program will be important in helping builders achieve the higher tiers and micro load homes levels. Technologies



ENERGY STAR HOMES Building Participation and Driving to Deeper Savings

Construction of new homes in New Jersey will need to change significantly from current practice to achieve the goal of a majority of new homes built to "micro load" standards by 2020. This will entail a multi-pronged effort, including:

- *Expanding the current ENERGY STAR Homes program by offering higher tiers and more marketing while supporting builders and subcontractors through expanded training and technical assistance;*

- *Enticing the best builders to construct aspirational homes at the "micro load" level while publically recognizing and rewarding them for their efforts; and*

- *Ramping up the state-wide energy code to ENERGY STAR Homes levels and allowing market-based energy raters to verify compliance, while selling builders to participate at higher program tiers.*

ALIGNING "SMART GROWTH" WITH EFFICIENT NEW HOMES

"Smart Growth" Executive Order #4 of January 2002 directs the NJ Smart Growth Policy Council to ensure that state incentives and funding are consistent with smart growth principles. As a result, ENERGY STAR Home incentives are available only in Smart Growth areas.

Restricting incentives in non-Smart Growth areas is unlikely to reduce the level of new construction. Yet it does result in lost opportunities for cost-effective, residential energy efficiency. Limiting ENERGY STAR home incentives to Smart Growth areas also undermines the development of a statewide best practices infrastructure to maximize energy efficiency to build micro load or net zero energy homes. These outcomes are at cross-purposes with the Energy Master Plan's efficiency goals to offset energy and load growth.

We encourage legislators to consider the following options to resolve this conflict:

- *Requiring that all homes built in non-Smart Growth areas meet more stringent energy code requirements (e.g., meet the ENERGY STAR Home requirements);*
- *Allowing ENERGY STAR Home incentives to apply regardless of location; and*
- *Passage of pending legislation (S702) that would establish a more stringent building energy code across the state.*

and techniques that are proven should be incentivized and adopted immediately, including:

- Quality HVAC design and installation techniques;
- R-5 windows;
- Solar domestic hot water systems;
- High-efficiency instantaneous gas water heaters;
- Drain-water waste heat recovery systems; and
- Combination space-heat/hot-water systems.

Other emerging technologies that are promising but not yet proven should go through a research, development, demonstration and deployment effort to determine their worthiness and, where relevant, push them to market sooner than would have been the case otherwise.

MULTIFAMILY BUILDINGS

The strategy for multifamily buildings falls somewhere between the primary new homes construction strategy, described above, and the custom, relationship-based strategy discussed in the Business and Government chapter of this report.

For this market segment, relationships are indeed key. Developers and their projects must be identified early on, and targeted for inclusion in the ENERGY STAR program. For this to happen, relationships must be forged with owners, architects and developers, a task facilitated by providing value-added support throughout the building process.

It will also be important to lock in participation in the EPA's Multifamily High Rise ENERGY STAR program. This program aims to enable the labeling of high-rise buildings – considered those over three stories tall – that are built at least 20% more efficient than ASHRAE 90.1 standards.

LOW INCOME

Low income families are least able to afford rising energy costs. To provide them with the greatest assurance that unaffordable energy bills won't be the cause of eviction in the future, the New Jersey ENERGY STAR Homes Program should establish higher

incentives and secure other funds to help move new affordable housing projects toward the micro load homes level.

To this end, new low income housing should receive enhanced support via higher incentives to cover most if not all of the incremental costs associated with building to ENERGY STAR and higher standards. Since it is this segment of the market that can least afford rising energy costs, providing them with micro load homes would make the most sense. Partnering with non-profit developers and securing resources to cover all of the incremental costs of highly-efficient homes should be a program priority.

MANUFACTURED HOUSING

Contrary to activity in many other states, New Jersey homebuyers purchase a surprisingly low number of factory-manufactured homes. Nonetheless, the state's proximity to Pennsylvania, where there are numerous such factories, means that a near-term shift could happen at any time. The ENERGY STAR Homes program should immediately identify which of these manufacturers ship to New Jersey, and work with them to move their entire product lines to at least ENERGY STAR levels. The 30% Federal tax credit available to manufacturers that build to the EPA levels should help convince them. However, a targeted outreach effort is needed to move this effort forward.

CUSTOM AND OTHER SMALL BUILDERS

The current New Jersey ENERGY STAR Homes Program is designed primarily for those speculative builders who construct the majority of new homes in New Jersey. These efforts should continue and be enhanced, as suggested above. In addition to the speculative builder market, the program should also focus outreach to architects, designers and smaller custom builders who are not responsible for the majority of new homes built each year but who, nonetheless, are a market segment that has the resources and desire to construct exemplary homes.

Indeed, custom builders, who by definition are open to new designs and concepts – and often work with clients who expect customization and innovation, represent an ideal target market for moving beyond current ENERGY STAR standards toward building micro load homes. Custom builders can be a conduit for innovators – clients who are generally interested in positioning themselves as technology and "green" leaders. The results could form the educational and competitive bases for convincing standard, speculative home builders to modify their own designs to move toward micro-load homes in the future.

POLICIES

Beyond voluntary programs, the state of New Jersey should adopt a series of policies that, together, can play a significant role in achieving both short- and long-term improvements in the energy efficiency of new homes.

CODE UPGRADE AND ENFORCEMENT

New Jersey should implement a series of code upgrades, increasing efficiency levels by thirty percent by 2011 and fifty percent by 2016. This requires fostering strong partnerships and stakeholder participation, sound analysis and resilient political support. While legislation may be required to this effect, town councils could be encouraged and supported in advocating locally-applicable, higher-code tiers based on a model advanced energy code included as an "informative appendix" to the minimum state energy code.

Furthermore, New Jersey should institute a market-based code enforcement infrastructure that is trained, certified and equipped (e.g., with blower doors, duct blasters, etc.) to verify the most important aspects of building performance: air- and duct-tightness. Certified HERS energy raters could play this role.

SOLAR READY

All too often, urban planning and construction practices ignore the value that solar energy – whether passive or active – can play in the future. Homes are oriented away from the sun; higher buildings block the sun from smaller homes; and homes themselves are not built with solar equipment – expensive today, but dropping in price – in mind. Solar-ready homes could reverse this problem with developments laid out for maximum solar orientation; roofs positioned to enable the installation of solar panels; and builder-provided dedicated circuit and wiring to the attic space as well as capped-off water pipes to enable later installation of PV and solar hot water panels.

The State should immediately consider requiring such "solar ready" construction. The negligible cost today could remove significant future barriers to the widespread adoption of

THE ENERGY EFFICIENT MORTGAGE (EEM)

The EEM was developed by the lending industry to give the builder/buyer of an energy efficient home credit for the fact that the home will have lower energy bills than a typical home. The program is typically used for new energy efficient homes, but can also be used for existing homes that are already energy efficient.

An EEM allows a lender to stretch the housing debt-to-income ratio and the total debt-to-income ratio by two percentage points (these ratios are typically 28% and 36%, respectively, prior to the EEM stretch). The lender allows the buyer to borrow more capital to finance the somewhat higher cost of an energy efficient home, knowing that the higher payments will be more than offset by lower utility bills.

Private national primary mortgage lenders like Norwest Mortgage, GMAC Mortgage and PHH Mortgage are now offering mortgage incentives such as reduced closing costs, interest rates and free appraisals for the purchase of high energy efficient rated homes. This trend is expected to continue as consumer demand for energy efficient homes continues to grow.

Source: Residential Energy Services Network (RESNet)

renewable energy sources. Without such policies, retrofitting homes in the future will be needlessly prohibitive and costly.

FINANCING

New Jersey should partner with local lenders to develop Energy Efficient Mortgage ("EEM") products (see inset). These products account for and reward the cash flow benefits of higher levels of energy efficiency, and take advantage of the long-term financing opportunities to finance measures, such as solar hot water systems, that provide positive cash-flow when added to the mortgage.

As discussed previously, the state should also consider financing options – including a dedicated deposit agreement (see "Financing" on page 50).

HOUSE SIZE

New construction programs are focused on energy *efficiency,* but not on energy consumption. There is good reason for this, but the other side of the consumption coin – house size – need not be neglected.

The State as well as municipalities can play an important role to mitigate the move toward ever-larger homes. First, the social marketing campaign discussed elsewhere in this report should be used to spread awareness of the sustainability issues around large homes. Second, the state and/or municipalities can consider implementing a utility hook-up fee system that places a surcharge on larger homes that are not built to perform as net zero energy homes.

PERMITTING

Another potentially very effective, vehicle for strongly encouraging ultra-efficient new construction involves state and municipal development of a scaled building permit fee structure that provides price signals in the form of higher costs for less efficient designs.

OTHERS

Many of the policy-level strategies discussed in the Existing Homes section apply to new homes as well. Indeed, rate designs that unlock the value of start-delay options on new appliances can influence the pre-installed equipment in new homes. Similarly, mandatory energy ratings could play a significant role in encouraging customers to consider high-efficiency new homes. Finally, ENERGY STAR Home implementers must have the same flexibility to readily adapt the program to achieve the desired results.

IMPLEMENTATION: AN OVERVIEW

The table below provides an overview of the various strategies proposed and the timetable for their implementation.

Legend for "Key Segments": *G = General market. LI = Low-income. MF = Multi family. MH = Manufactured housing.*

MARKET: NEW HOMES

Goals: ***By 2020, the majority of new homes being built are considered "micro-load homes", with negligible net energy consumption from the home itself.***

	Strategies	Key Segments				Ownership	Partners	Implementation		
		G	LI	MF	MH			2009-2010	2011-2015	2016-2020
PROGRAMS	**Overall incentive program**					NJEE Utility	Electric and gas utilities, lenders, oil companies if systems benefit charge passed	Promote higher efficiency tiers and micro load homes; Develop and promote Energy Efficient Mortgages and new technologies.	Continue with increased support of higher efficiency tiers and promotion of exemplary construction.	Continue
	Enhanced low-income incentives					NJEE Utility	DCA, Affordable housing developers and agencies, Municipalities	Focus increased incentive levels on higher tiers and micro load target. Engage non-profit developers.	Continue	Continue
	Specialized manufactured housing approach					NJEE Utility	NJ Manufactured Housing Assoc., EPA, Manufacturers who deliver to NJ	Develop inspection procedure for manufactured housing plants. Create ENERGY STAR plant certifications.	Push plants to higher efficiency tiers. Promote and award manufacturers to drive demand	Continue
	Builder and subcontractor training					NJEE Utility	NJIT, community colleges, trade schools, NATE, NJBA, DCA	Develop and schedule on-going comprehensive trainings.	Continue	Continue
	General marketing, coop marketing					NJEE Utility	Builders, NJ Builders Association	Carryout statewide marketing campaign; include coop advertising	Adjust and enhance based on review and feedback. Continue	Continue

MARKET: NEW HOMES

Goals: ***By 2020, the majority of new homes being built are considered "micro-load homes", with negligible net energy consumption from the home itself.***

	Strategies	Key Segments				Ownership	Partners	Implementation		
		G	LI	MF	MH			2009-2010	2011-2015	2016-2020
								with builders		
POLICIES	**Expand ENERGY STAR Home beyond smart growth areas**					Governor's Office	DCA, BPU, NJEE Utility, Municipalities	In non-Smart Growth areas allow ENERGY STAR Home program incentives ***or*** require the ENERGY STAR standard regardless of heating fuel type.	Coordinate minimum efficiency requirements for non-Smart Growth areas with changes in ENERGY STAR Homes program requirements. .	Evolve minimum new home efficiency requirements in non-Smart Growth areas to micro load or net zero by 2016
	Code upgrades					DCA, Governor's Office	NJEE Utility, NJ Builders Association	Increase code efficiency levels by 30% by 2011.	Increase energy code efficiency levels by 50% by 2016.	Evolve minimum requirements for all new construction to micro load or net zero by 2020.
	Market-based code enforcement					DCA	HERS raters, home inspectors, EE Utility	Develop enforcement infrastructure and trained, certified workforce to performance test new homes	Support raters and provide on-going QA.	Continue
	Feebates for hook-up					Governor's Office, legislature	DCA, BPU, NJEE Utility, Municipalities	Instigate surcharge on larger homes to encourage smaller more efficient or net zero homes.	Work with legislature or BPU to pass law	Continue
	EE Mortgages					Governor's Office,	NJEE Utility, lenders, real-estate agents	Develop new mortgage products to utilize long-term financing to reward energy efficiency. Make available a State deposit fund to allow lenders to offer low interest financing.	Actively promote new available financial products to explain concept and drive demand.	Continue

MARKET: NEW HOMES

Goals: ***By 2020, the majority of new homes being built are considered "micro-load homes", with negligible net energy consumption from the home itself.***

Strategies	Key Segments				Ownership	Partners	Implementation		
	G	LI	MF	MH			2009-2010	2011-2015	2016-2020
Rate design					BPU, Electric and gas utilities	DCA, Governor's Office, OCA	Develop new time-of-sale rate designs, and promote smart metering installations.	Implement new electricity rate design.	Continue
Required time of sale rating					Governor's Office	DCA, Municipalities, NJEE Utility, OCA	Develop time-of-sale rating legislation.	Implement time-of-sale rating legislation.	Continue

THINGS IN HOMES: LIGHTING, ELECTRONICS, APPLIANCES AND POOLS

VISION AND GOALS

For the residential market, the vision for New Jersey is to "**to leverage the market and increase consumer demand by engaging product manufacturers, distributors, retailers, builders and installers to make, sell, specify, install and service the most energy efficient products available in New Jersey (i.e., lighting, appliances, electronics, pool pumps, controls, etc.).**"

With that vision in mind, achieving the Energy Master Plan target will require that **"the New Jersey market is transformed into one in which targeted energy efficient products are readily available and sought after by consumers, resulting in a 20% reduction in lighting, appliance, pool and consumer electronic electricity consumption in the state by 2020."**

MARKET: THOUSANDS OF NEW OPPORTUNITIES EVERY YEAR

Following the same pattern as most homes across North America, ***the number of energy using devices, and the energy they consume, has steadily increased in New Jersey homes since the mid-1940s***.

WHITE GOODS

Some devices, such as refrigerators and clothes washers, have become significantly more energy efficient over time. However, while efficiency has increased, usage too has gone up, both in terms of the number of different devices in each home (see inset), and the extent of services provided (more loads of laundry, greater use of the clothes drier, larger fridges with added features like ice-making).

White goods (refrigerators, freezers, dishwashers, laundry and cooking appliances) in existing New Jersey homes consume on average an estimated 3,265 kWh/year per home. The installed base of older, inefficient products presents a potentially large untapped source of savings, as old refrigerators consume several times more power for the same service than standard newer models.

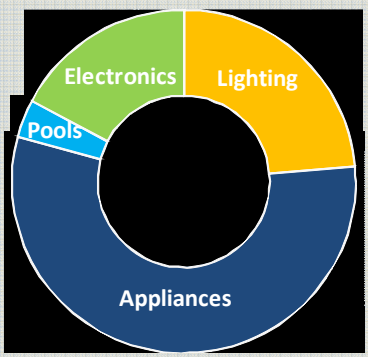
CONSUMER ELECTRONICS

The explosive growth of consumer electronics technologies has recently driven an increase in electricity consumption. Consumer electronics continue to evolve rapidly; moreover, they tend to rapidly diffuse into homes. Like refrigerators, consumer electronics have become more efficient over time. However, also like refrigerators, newer consumer electronics products offer broadly expanded (and energy consuming) features, and the sheer proliferation of products, combined with the tendency towards increasing size, means that total electricity consumption continues to grow at a significant pace.

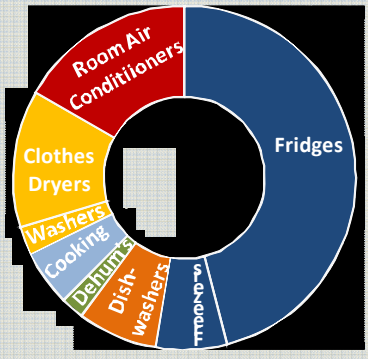
By 2005, the Mid-Atlantic region had nearly six times as many computers per home as it did barely a dozen years earlier. With the increase in computer stock, also comes an increase in the stock of peripherals such as internet devices, printers and scanners. Televisions, too, are on the rise, with homes reporting on average two and a half TVs each, up from 14% in barely four years. The significant, but more modest growth in the number of televisions per household hides two additional trends: New TV technologies such as LCDs are sometimes more efficient than older cathode ray technology on a watts per square inch of screen basis, but screen size has so tremendously that newer, more efficient TVs actually consume more today than the average older one.

In the Mid-Atlantic region, there are nearly 6 times as many home computers today as a there were a dozen years ago. These PCs open the door to the proliferation of peripheral devices, all of which consume more and more electric power.

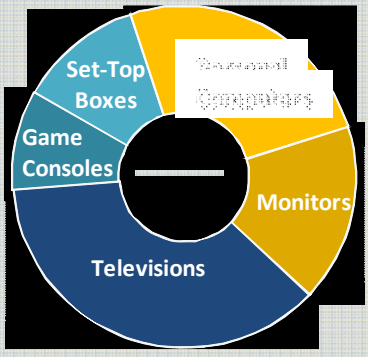
POWER FOR "THINGS" IN NEW JERSEY HOMES



Appliances Still Reign…
Appliances (including room air conditioner units) still consume the bulk of power from things in homes.



… And Fridges More than All
Despite improvements in efficiency, fridges still consume nearly half of all the power used by home appliances in the Garden State.



With PCs and TVs on the Rise
There are nearly 6 times more PCs and 25% more TVs per home today than a decade ago. With them come a host of other energy-consuming peripherals.

AIR CONDITIONING

In addition to growing numbers, size, and features of consumer electronics, the other factor influencing the growth in residential electricity consumption in the Mid-Atlantic region is the increased penetration of central air conditioning – again, increased efficiencies are being offset by increasing demand for the cooling service.

NEW HOMES

New homes tend to have new and more efficient appliances: average power consumption from white goods in new homes is 40% below that in existing homes. However, new homes are also forty percent bigger than homes built barely 20 years earlier. As such, they require more heating, cooling and lighting, and are built to accommodate more televisions and other consumer electronics. Additionally, there is a growing market for home networking systems that will also influence energy consumption. **The net effect of the increased size of homes has been to increase energy consumption. In fact, despite efficiency improvements, the average home built since 2000 actually uses more energy annually than the average home built before then.**

BIG OPPORTUNITIES

While there have been large improvements in the energy efficiency of white good appliances , modest cost-effective savings potential remains; meanwhile, ***lighting and consumer electronics continue to offer immediate opportunities for savings***. Lighting accounts for about 1,400 kWh/year of typical residential electricity consumption in New Jersey and remains ***dominated by incandescent technology***. In 2012, federal standards will increase required efficiency levels for incandescent lighting. These standards will both decrease the allowable consumption of electricity by incandescent lamps, and help to accelerate the penetration of more efficient fluorescent and solid state (LED) lighting.

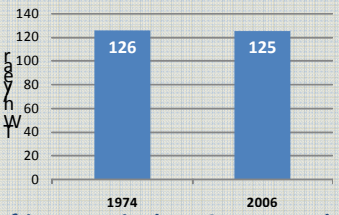
The category of residential end-use with the ***largest recent growth in electricity consumption, and probably the largest potential for future growth in the short term, is consumer electronics***. Consumer electronics currently consume up to 15 percent of household electricity and 7 percent of total US electricity. These figures may continue to grow quickly because the penetration of electronic

REFRIGERATORS: AN EFFICIENCY PARADOX

From 1974 through 2006, refrigerator efficiency has increased substantially, offering the efficiency industry one of its greatest success stories. Yet that story is only one side of a complex coin.

During the same period, the average number of refrigerators in each home has increased by 20% (to 1.2 per home), while the number of homes has increased by more than 50%. Furthermore, these refrigerators have become bigger, thereby cooling larger volumes of air and products. And they have more added features, such as ice-making, than ever before (recent models have begun to integrate LCD screens with internet connections as well, further adding to the overall power requirement).

As a result, despite tremendous improvements in energy efficiency over more than three decades of technological progress, total US residential power consumption for refrigeration has remained surprisingly flat.



Refrigerators in the U.S. consumed as much in 2006 as they did more than three decades earlier.

devices into homes, unlike other residential appliances, is not near saturation, and because as digital technology continues to evolve, new products will enter the marketplace.

Swimming pools and electric clothes dryers are other major residential electricity end uses. While relatively few New Jersey households have a pool, a typical pool requires an estimated 2,700 kWh per year to run filter pumps and another 26 MMBtu per year for heating. A far higher percentage of New Jersey households use electric clothes dryers, and typical energy consumption is about 800 kWh per year.

Old refrigerators (many of which are secondary units) represent another significant energy savings potential. Over the past several years, numerous programs throughout the U.S. and Canada have successfully encouraged and arranged for the removal of old, inefficient units, in the process generating rapid, large and cost-effective energy savings.

In 2005, more than 60 percent of households in New Jersey had a computer and 20 percent had more than one. Like refrigerators, old computers often are not thrown away, but accumulate in homes. Unlike refrigerators however, new computer energy consumption has steadily risen as computing power and the number of peripherals have increased and most computer users now have internet access and broadband connections.

GAP ANALYSIS: MORE CAN BE DONE, AND SOME IS ALREADY PLANNED

The New Jersey Clean Energy Program (NJCEP) currently promotes a range of energy efficient consumer products. In 2009, incentives will be available for ENERGY STAR qualified compact fluorescents (CFLs) and light fixtures, room air conditioners and dehumidifiers. Revisions to the ENERGY STAR specification for clothes washers have not been able to keep up with the transformation of the market. The result is that a high percentage of clothes washers on the market are now ENERGY STAR qualified. For this reason, the NJCEP program plans on limiting incentives to a more efficient sub-set of ENERGY STAR qualified washers.

Incentives on CFLs are currently delivered primarily through upstream markdowns and buy-downs that reduce the retail price customers see in the store. Light fixtures and appliances receive incentives through mail-in rebates available to the customer at time of sale. The program started experimenting with community-based CFL distribution and/or sales in 2008 and also opened an on-line store for efficient lighting products. For 2009, a major new program component is planned to target ***old and inefficient refrigerators and freezers for early retirement***. Community-based approaches will be used to locate, remove and recycle redundant appliances.

New Jersey must broaden efforts to reverse the trend of increasing energy consumption from key end-uses such as electronics, swimming pools and old appliances. ***Some major end uses have not been adequately addressed***. For example, programs targeting consumer electronics, televisions, computers, set top boxes, game consoles and other devices are only in the planning stages. Energy saving measures for swimming pools should be promoted. The planned refrigerator/freezer early retirement initiative should be expanded to include other

inefficient appliances. Whole building controls, occupancy sensors and smart switching should be addressed, especially in new construction.

Beyond incentives, beyond even codes and standards, society at large must be convinced to want to save energy. A broad social marketing campaign is indispensable to achieving this goal.

The market transformation of lighting and major appliances should be supported with concurrent research and promotion of new products. The market for basic CFLs is maturing rapidly, but the ***percentage of sockets in the typical house that are filled by CFLs remains low***. There are some residential applications that CFLs have had a harder time filling, including dimmable sockets and decorative or other specialized uses. Appropriate efficient lighting products should receive enhanced support and be heavily promoted, and new techniques should be used to convince consumers to "go 100% energy efficient" with their lighting.

While the ENERGY STAR label is widely recognized, positively regarded and easy for consumers to understand, the NJCEP has faced challenges in working with ENERGY STAR over the past several years. This is largely due to the federal program having insufficient resources to keep up with transforming markets, and because of what amount to "turf wars" between the two agencies responsible for it.

New Jersey could do more to engage and stimulate retailers and sales personnel to educate consumers on efficiency choices, and to convince professional trades-people to employ best practices to optimize efficiency and install controls for the appliances they install.

PROGRAMS: FOCUSING ON THE KEY END-USE OPPORTUNITIES

Current New Jersey energy efficiency efforts for things in buildings are a good start, but must be ***broadened, strengthened and linked with appropriate policy initiatives*** to achieve the aggressive goals of the Energy Master Plan. This should include new incentives and improved upstream and buy-down coordination, as well as state minimum efficiency standards, workforce training and marketing campaigns to increase consumer education. Strategies will have to be modulated to address the divergent needs and issues in individual market segments.

SOCIAL MARKETING AND EDUCATION

To heighten consumer awareness and place increased value on efficiency considerations in purchasing decisions, New Jersey should launch an ***extensive social marketing campaign***, educating consumers, driving demand for the most efficient products and thereby stimulating manufacturers to improve standards. This campaign must increase awareness of the root problems that lead to overconsumption, rather than merely high-efficiency technologies. For example, installing window shades can reduce the need for air conditioning, while resolving basement moisture issues can eliminate the need for a new dehumidifier.

Similarly, buyers should be warned against the hidden costs of major energy "hogs" such as hot tubs and plasma televisions, and directed where possible to more efficient alternatives. New Jersey should also diversify the sources of product energy efficiency and benchmarking information available to consumers through efforts like the "Top**ten**" initiative, which identifies the ten most energy efficient products available. Currently run in Europe, a national effort with strong support from California, Northeast States and the Pacific Northwest is in the process of adapting "Top**ten**" to North America – see sidebar). In addition to helping New Jersey residents find the most energy efficient products, TopTen USA can serve as a program tool for bulk purchases by the home-building community and state procurement processes, as well as upstream cooperative promotions within the retail sales channels.

The development of a trained and motivated workforce to provide education to consumers and promote best practices is vital to the success of this campaign. Swimming pool companies should be trained and incentivized to replace old pool pumps and heaters, to promote efficient installations, designs and pool covers. Retailers and sales personnel should be trained to promote efficient products and make purchase decision recommendations. Electricians and installation professionals who set up home computer or audio systems could be offered incentives to up-sell customers on "green" systems and to follow energy efficient installation protocols. The energy consumption of consumer electronics can be significantly reduced by educating customers on good habits, through the installation or enabling of appropriate software (on computer systems), and by the inclusion of "smart" switching devices that turn devices off when they are not in use.

Beyond awareness, and in particular with respect to the relatively low cost purchase of appliances, lighting and computers, the aim of social marketing must be to create a clear sense among

PROMOTING THE "TOPTEN"

***Topten USA** is a new national non-profit, dedicated to speeding the introduction and adoption of dramatically more efficient products into the US market.*

Topten USA will develop a user-friendly Web guide that links consumers to local distributors, as well as to energy efficiency program incentives or promotions for Topten USA listed products –. Its goal is to stimulate market demand and accelerate product competition to make tomorrow's "business as usual" products radically more energy efficient.

An extension of the Topten program offered in Europe (see www.topten.info), Topten USA will identify and list the 10 most efficient options available for a broad range of key products – including televisions, computers, monitors, screw-based lamps, major home appliances and passenger vehicles – and product classes. Many TopTen USA listed products will represent the most efficient ENERGY STAR qualified products available and encourage more frequent ENERGY STAR updates.

In addition to serving as a source of information for consumers, Topten can also be expected to provide a platform for efficiency programs in identifying and promoting top energy savings products.

New Jersey's residents that "*Everyone is doing it, so why shouldn't I?*". This "positive peer pressure" will accelerate adoption of energy efficient products.

The Social Marketing Campaign should be an integral element of the overall New Jersey efficiency strategies including cross- marketing with programs designed to reach the business and government sectors (e.g., coordination with programs such as Teaching Energy Awareness with Children's Help, "TEACH", which engages faculty members to teach their students about energy efficiency while improving the energy performance of schools).

LIGHTING

Energy efficient lighting is a major and broad-based opportunity to achieve cost-effective energy savings with applications available in virtually every New Jersey household. New Jersey's strategy to capture these cost effective savings should help prepare consumers and the market for implementation of the federal lighting standard that by 2015 will essentially eliminate incandescent lighting as we know it today, setting the baseline for lighting at or near the efficiency of CFLs as of 2015.

With the new federal lamp efficiency standard in mind, program efforts to transform the residential lighting market must continue to focus on both the quality and price of compact fluorescent (CFL) as well as introduce rapidly developing solid state (LED) lighting products. CFL mark downs and buy-downs tend to reach consumers who shop at participating retailers. To reach the estimated minimum 25 percent of New Jersey residents who do not yet own a single CFL, and reach the many sockets that still hold incandescent light bulbs, it will be necessary to develop different marketing and retail distribution approaches including strategic partnerships with retailers and manufacturers to stock and promote a broad range of high-quality CFL product options (e.g., ENERGY STAR products). Overcoming consumer perceptions that CFL lamps provide inferior light and that many applications are not compatible with CFLs will be key to the success of this market transformation. To do so, New Jersey's cooperative promotions with lighting manufacturers and retailers must educate consumers to select high efficiency lighting product options appropriate to replace more familiar incandescent lighting products. Consumer education should also address proper handling and disposal of fluorescent lighting products which contain some level of mercury. In addition, New Jersey should support and participate in product testing programs designed to ensure that CFL products perform as indicated by manufacturer product labeling (e.g., Program for the Evaluation and Analysis of Residential Lighting "PEARL" and its U.S. DOE successor).

Energy efficient lighting can continue to provide savings for some time to come, but probably not at the levels currently being achieved through the New Jersey Clean Energy Program. New Jersey only started running broad-based, large-scale compact fluorescent (CFL) promotions in 2007. The program goals for 2008 and 2009 are to provide incentives, respectively, on 4 and 5 million CFLs. Given the rate that consumers are buying CFLs, and their broad availability, it will probably not make sense to continue these incentives for many years. ***Focus should move to specialty bulbs – for example dimmable CFLs – and for new lighting technologies,*** including solid state lighting, low-mercury CFLs and high performance CFLs (identified through vehicles such as TopTen USA) that perform better than the norm**.**

Solid state (often referred to as LED) lighting is developing rapidly and certain categories of product are beginning to perform adequately on a consistent basis, but the technology is still some time away from providing a full range of products, especially replacement screw-in lamps, that perform effectively at reasonable prices. Currently available solid state lighting products are whole fixture – rather than lamp – replacements, and many have efficiency levels that are at best comparable to fluorescent products.

Solid state technology will continue to improve, but on a broad scale the incremental savings from this innovation over fluorescent technologies may be smaller, and in many cases longer in coming, than the savings from changing from incandescent to fluorescent. Examples of products that are potentially viable for consideration by efficiency programs in the term include many types of outdoor lighting, task lights such as desk lamps, under-cabinet lighting and downlights such as recessed cans. In all cases, due diligence is required to determine whether the performance of any solid state lighting project under consideration for support by efficiency programs is adequate.

For these reasons New Jersey should aggressively participate in market-leading activities such as US DOE's ***L Prize*** contest to develop highly performing products to replace the most common incandescent and products, and ***Quality Advocates and Lighting Facts***, a national initiative to promote quality SSL lighting through effective product SSL product labeling for consumers.

PEARL

PROMOTING LIGHTING PRODUCT QUALITY AND PROTECTING CONSUMERS

The Program for the Evaluation and Analysis of Residential Lighting (PEARL) is a watchdog program directed and funded by energy efficiency program administrators from New England, New York, California, the Pacific Northwest and Wisconsin to ensure that ENERGY STAR® lighting products perform to meet ENERGY STAR product quality specifications (e.g., reliability, product life, color, etc.).

Administered by The Lighting Research Center (LRC) at Rensselaer Polytechnic Institute, PEARL purchases and conducts ongoing performance testing of consumer CFL products in LRC's controlled and monitored lighting laboratory. LRC provides the test results to the PEARL sponsors, who provide them to the U.S. Environmental Protection Agency and the U.S. Department of Energy with copies to individual manufacturers whose products are tested.

To date, PEARL has tested 156 models of compact fluorescent lamps and 52 models of luminaires (light fixtures). In some cases, at the request of PERAL sponsors, these test results have resulted in ENERGY STAR delisting of products that failed the PEARL product testing.

For test results, see: www.lrc.rpi.edu/programs/pearl/index.asp.

APPLIANCE EARLY RETIREMENT

If successful, the ***appliance early retirement effort planned for 2009 should evolve*** to a systematic engagement with the regional markets, expanding to include old room air conditions, televisions and possibly other measures like old clothes washers. The objective should be to remove inefficient appliances from the market as soon as possible, regardless of whether they are going to be replaced or not.

Retiring old and inefficient appliances has proven time and again to offer a fast, reliable and cost-effective source of energy savings. Approaches to appliance retirement and recycling can vary from in-home pick-up by a dedicated program vendor to drop-off of eligible small appliances such as room air conditioners at designated program collection sites to partnering with existing retail appliance delivery and removal infrastructure. The optimal approach for New Jersey is to engage greater coordination with appliance retailers to offer hassle-free pick up of inefficient appliances at the time of a new appliance purchase and program oversight to ensure proper disposal of the used units. Where retired appliances are replaced, incentives for the highest efficiency replacements such as those identified via tools such as Topten should be utilized.

The early retirement effort should be coordinated with public housing authorities to likewise permanently remove and replace inefficient appliances with high efficiency models.

CONSUMER ELECTRONICS

The technical characteristics of consumer electronics and the structure of the markets for these products pose ***new challenges to efforts to improve energy efficiency***. One positive dynamic is that digital electronics give manufacturers a built-in incentive to make products efficient to avoid waste heat that accelerates degradation of the internal electronic components of the products. Also, battery technology has been struggling to keep up with the power demands of portable consumer electronic devices, again providing manufacturers with a reason to improve product efficiency to maximize run-time before recharging. It is also the case that, in general, profit margins on the most efficient electronics products are often higher than the norm, providing another built-in incentive for manufacturers and retailers alike to encourage their sale.

Set-top boxes: As television and the internet become more and more intertwined, cable set-top boxes will take on more of the characteristics, and typical energy consumption, of a desktop computer. Unfortunately, to work correctly, current cable set-top boxes must be left switched on and operating constantly. In the rapidly expanding sale of fiber-optic based home network systems that provide multiple services[*] (television, telephone and internet) a

[*] Examples of such systems include AT&T's U-Verse and Verizon's Vios.

single server acts as a hub for all services including the data processing tasks of set top boxes so that the boxes themselves are able to run on the same type of low-level power as many battery charging devices.

While set top boxes may pose a new challenge to energy savings, they may also present unique opportunities. If service providers were motivated by incentives laid out in voluntary specifications or through procurement specifications, they could provide a simple path for efficient products to enter the market place. When coupled with minimum state or federal efficiency standards, voluntary and procurement specifications could provide even greater energy savings.

The proliferation of cheap consumer electronics challenges us address this market head-on. From computers to set-top boxes, a coordinated effort is urgently needed.

Cable companies enjoy franchises regulated by the BPU and efforts have already begun to work through the BPU to open a dialog with the cable companies on set-top box efficiency. Similarly, smart plug strips should be promoted within system (entertainment or computer) bundles together with sophisticated switching controls that automatically shut-off equipment when not in active use.

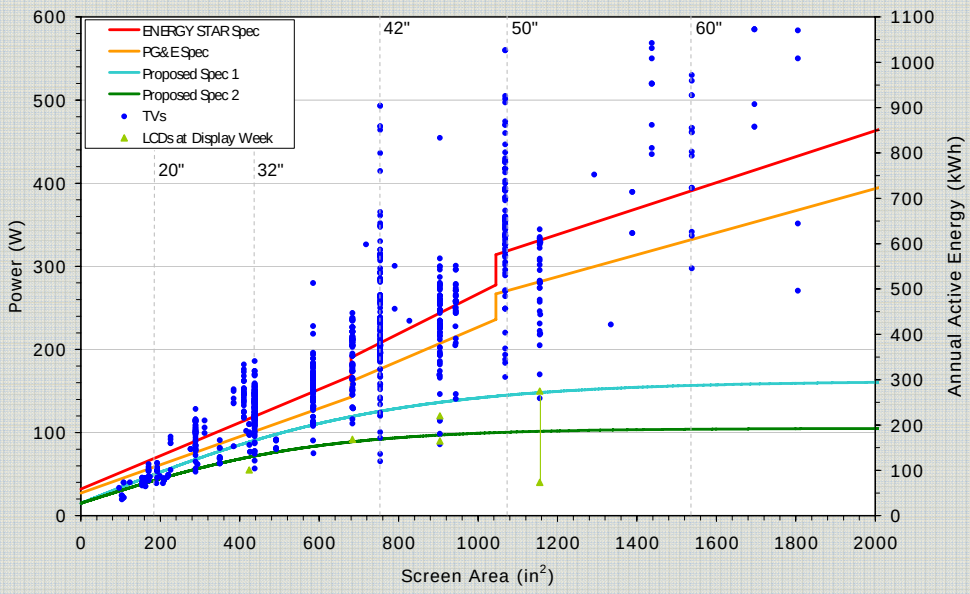
Portable Consumer Electronics: Portable consumer electronics, and their charging devices, are a significant challenge for energy efficiency. Their proliferation through conventional retail and online vendors, combined with constantly falling prices and shifting products, makes this a very difficult market to engage to promote high efficiency options. Yet these same factors drive rapid product innovation with its inherently shorter manufacturing cycles. In this competitive and innovation-driven market, product designs are easier and cheaper to change, making manufacturers more willing to embrace energy efficient designs.

The New Jersey energy efficiency programs should focus on products with efficient charging devices and controls that avoid or minimize power consumption when a device is not in use. Smart strips, education and utilization of highly efficient universal chargers with device-specific adapters or "tips" are also important technical solutions. These should all be a focus of program efforts to pull into the New Jersey market high efficiency consumer electronics. As with televisions, upstream promotions with retailers and manufacturers are key to cost-effectively leverage large savings and effect wide-scale market transformation. This, too, will benefit from strategic regional and national collaboration with other energy efficiency programs.

New Jersey should also consider state and federal minimum appliance efficiency standards for portable electronics and their power supply adapters to minimize the energy and capacity impacts of the proliferation of electronic devices.

REIGNING IN THE GROWTH IN T.V. POWER CONSUMPTION

The chart to the right outlines two possible specifications for voluntary programs. Proposed specs 1 and 2 – the bottom lines – provide greater savings by leveling out at higher screen sizes. As the graph demonstrates, there are a number of televisions in various screen sizes that currently meet these levels. With the average size of TVs growing, lowering TV energy use at higher screen sizes should be a priority.



Explanatory Notes: The **blue dots** are TV data measured by Ecos and CNET in 2006-08. The **green dots** are nominal performance of high efficiency TVs exhibited at the May 2008 DisplayWeek conference. The **red line** is the ENERGY STAR 3.0 TV specification (effective Nov. 2008). The **orange line** is California utilities' TV efficiency pilot (15% more efficient), which launched in Q4 of 2008. The **blue** and **green** curves are "next generation" efficiency specifications already being met by some of the best-performing new TVs available in New Jersey.

Computers: Computers, including laptops, desktops, home network systems (see "Set-top boxes" above) and video game consoles warrant significant attention given their proliferation and hours of use. Again, power supplies should be a program focus. For example, the 80 PLUS program exists to promote the sale of desktop computers that include efficient power supplies and meet the most recent revision to the ENERGY STAR for PCs specification.* A similar new effort to promote the most efficient televisions is also under way and should be considered for video game consoles. With respect to desktop computing, promotion of laptops and/or LCD display monitors as more efficient options. In all categories of computers, incentives for models that are configured with efficient default settings and minimizing "off-state" consumption should be pursued. To significantly impact the market to provide high efficiency product options with appropriate default settings, New Jersey should participate in national and regional efforts that engage retailers and manufacturers to stock and promote such product options in the Garden State and surrounding states. Working with upstream markets offers the most cost-effective option to achieve this.

Televisions and Displays: Energy consumption for display devices, whether televisions with a built-in tuner or displays that are utilized with a cable box or a computer, is growing rapidly with the advent of new digital technologies (e.g., plasma, LCD) coupled with new, much larger screen displays. In addition to consumer excitement about bigger, clearer images, TV turnover is also driven by the pending federal digital-only standard for broadcast television

* Disclosure: Ecos Consulting, a contributor to this report, runs the 80 PLUS program.

which requires viewers to have either a digital TV or a digital converter for analog TVs by June 12, 2009. As a result TV sales are very strong.

As is illustrated in the inset about TV energy use, the energy required for TVs varies significantly – even for ENERGY STAR qualified TVs. The good news is that high efficiency product options exist for even very large TV screens.

To draw consumer attention to very high efficiency models, New Jersey should work with upstream market channels (e.g., manufacturers and retailers) to offer "rewards" for increasing the market share of the sales of high efficiency TVs and for promoting best practices for TV set-up and default settings – including encouraging consumers to select "right size" equipment and discouraging massive screen sizes that are often larger than optimal for viewing given the size of the room in which they are installed. Using past state as well as concurrent national sales data to set baselines, such a strategy can reduce the program cost of potential consumer incentives, and minimize the issue of free riders. Given the wide spread of efficiency ratings for ENERGY STAR -labeled TVs, the program should reward a subset of products that meet a more efficient specification. Such a strategy is likely to work best through strategic coordination with other efficiency programs regionally and nationally.

In addition, the State of New Jersey should set minimum efficiency and right sizing procurement standards for TVs and displays purchased by the State, and consider adopting a minimum efficiency standard for TVs such as that being proposed by the California State Energy Commission.

In Home Services: In home services such as installation and technical support provided by consumer electronics retailers present a unique opportunity to provide education and "tuning" of consumer electronics devices. Education regarding smart strips and cutting power to devices when not in use is perhaps easiest and most effectively delivered in the home and where the power is actually connected – at the electrical outlet. "Tuning" involves the opportunity to configure many types of devices to utilize the most efficient setting with respect to "sleep" or "auto-off", brightness and so on. New Jersey has the opportunity to be a pioneer in development and execution of programs to train and incentivize such service providers.

SWIMMING POOLS

Some west coast electric utilities have developed effective program models for improving residential swimming pool efficiency, working with ***pool contractors to retrofit oversized and single-speed filter pumps and improve heaters*** on existing pools. The use of ***solar pool heating*** should be actively encouraged. As with new home construction, it is far easier to optimize pool energy use during the design phase. The program should try to identify new pools before ground is broken and provide information and incentives to both customers and installers. Similarly, education and incentives at the point of sale for the "do it yourself" and replacement markets should be pursued. Utilization of timers and other controls along with education on the required amount of run-time for pool and spa pumps and related incentives

represent another strong opportunity for savings. Setting state minimum appliance efficiency standards for pool pumps are another strategy that New Jersey should seriously consider.

RESEARCH, DEVELOPMENT, DEMONSTRATION AND DEPLOYMENT

Growth in residential electricity consumption indicates a need for new tools in the energy efficiency tool box. Starting in 2009, the NJCEP residential programs will for the first time benefit from small budgets for research, development, demonstration and deployment (RDD&D) efforts.

RDD&D should be centrally coordinated across all sectors with rigorous standards. It is also important to share both costs and results with other energy efficiency programs through organizations such as the Northeast Energy Efficiency Partnerships, the Consortium for Energy Efficiency, the Electric Power Research Institute and others.

Successful incentive strategies, marketing and training campaigns could benefit considerably from careful market research and insight through and RDD&D initiative.

POLICIES: NEW STANDARDS AND PRODUREMENT SPECIFICATIONS

The state of New Jersey can play an important role, both stateside and nationally, in reigning in the growing power consumption from a variety of electronic and other devices.

Mandatory standards: While minimum efficiency standards will be most effective when developed on the national level, policy initiatives for lighting, appliances and consumer electronics also make sense at the state level. Indeed, New Jersey is already among the states that have adopted state appliance standards that ultimately set the stage for new federal standards adopted by Congress in the 2007 Energy Independence and Security Act. New Jersey could continue to explore standards in areas that are not currently regulated by the federal government, influencing and transforming national policy in the process (e.g., televisions, pool pumps). Such initiatives should complement voluntary initiatives, especially in situations where third-party decision makers (i.e. cable service providers) purchase products (e.g., set top boxes) but don't

AN RDD&D OPPORTUNITY: Heat Pump Clothes Dryers

After fridges and room air conditioners, clothes dryers are the third most energy-consuming appliance in New Jersey homes. Yet significant savings are still possible.

In Europe, appliance manufacturers currently offer heat pump clothes dryers, with documented savings on the order of 50%. Better still, heat pump clothes dryers do not require venting, and therefore do not blow heated or cooled air out of the house, yielding secondary energy savings.

Heat pump dryers are currently only available in sizes more suited for the European market. A coordinated RDD&D effort, jointly with other energy efficiency programs as well as manufacturers and, perhaps, retailers, could help bring this proven, energy saving technology to North America.

The Panasonic NA-VR1000 heat pump dryer completes a cycle of washing and drying using half the energy, water and time of standard models.

purchase the electricity to power them. Of course, New Jersey should also actively participate in federal standard setting proceedings to make those as stringent and timely as possible to address New Jersey's energy needs.

Voluntary specifications: Working with industry to develop voluntary efficiency specifications, specifically for some consumer electronics products such as game consoles, could lead the way to eventual national adoption. Further, given the limitations of ENERGY STAR, New Jersey should not be afraid to set program eligibility standards for ratepayer funded program incentives that exceed ENERGY STAR minimum standards when market conditions warrant. The ENERGY STAR Program Requirements for Television (version 3.0) provides a good example of the opportunity for New Jersey leadership (see inset).

Procurement specifications: The State of New Jersey can prepare and adopt procurement specifications to require or give preference to high efficiency products and best practices for installation for volume purchase applications. Such specifications can be mandated for state agencies, and can be offered to and/or tailored for other bulk purchases, including large businesses and universities (e.g. computers and peripherals), and multi-family buildings (e.g. washing machines and refrigerators).

It is worth noting that many of the policy-level strategies discussed in the Existing Homes section apply to the products discussed above. Indeed, rate designs that unlock the value of start-delay options on new appliances can influence appliance purchase decisions.

Finally, the same flexibility essential to ensuring that existing home program implementers achieve the desired results applies to program efforts aimed at appliances, electronics and other power-consuming devices.

IMLEMENTATION: AN OVERVIEW

The table below provides an overview of the various strategies proposed and the timetable for their implementation.

Legend for "Key Segments": *W = White goods. L = Lighting. SP = Swimming pools. CE = Consumer electronics.*

MARKET: THINGS IN HOMES

GOAL: ***To transform the New Jersey market into one in which targeted energy efficient products are readily available, sought after by consumers, and enjoy large market shares resulting in a 20% reduction in lighting, appliance, and plug-load electricity consumption by 2020.***

Strategies	Key Segments				Ownership	Partners	Implementation		
	W	L	SP	CE			2009-2010	2011-2015	2016-2020
Equipment Replacement					EE Utility	Retailers, contractors, Public Housing Authorities	Offer rewards and assistance for replacement and disposal of inefficient equipment. Train contractors to recognize cost-effective opportunities.	Adapt to changing market demands by adding new equipment and/or higher efficiency tier incentives	Continue
Upstream retail incentives					EE Utility	Manufacturers and retailers	Develop upstream incentive programs for key products. Engage manufacturers, retailers to drive down retail prices.	Adapt to changing market demands by adding new products.	Continue
Installer incentives and training					EE Utility	Professional trades, retailers, distributors, manufacturers	Develop a "Green Services" sector for swimming pool companies, electricians, home theatre and computer installers	Continue	Continue
Consumer education					EE Utility	Retailers, universities	Research consumer behavior and marketing options. Promote ENERGY STAR, "Top Ten" and other high efficiency products and encourage behavioral changes.	Roll out broad-based consumer campaign based on market research.	Continue

MARKET: THINGS IN HOMES

GOAL: ***To transform the New Jersey market into one in which targeted energy efficient products are readily available, sought after by consumers, and enjoy large market shares resulting in a 20% reduction in lighting, appliance, and plug-load electricity consumption by 2020.***

	Strategies	Key Segments				Ownership	Partners	Implementation		
		W	L	SP	CE			2009-2010	2011-2015	2016-2020
	Research and Development					NJEE Utility	NEEP, CEE, NJIT	Research new technologies and more effective program delivery mechanisms.	Continue	Continue
	Voluntary NJ product standards					NJEE Utility	Manufacturers and retailers, NJ Director of Energy Savings	Provide support for manufacturers and retailers adopting higher voluntary efficiency standards.	Continue	Continue
	"Top Ten USA" initiative					NJEE Utility	Manufacturers, retailers, NJ Director of Energy Savings	Identify and promote most efficient products. Use for state procurement	Update and continue	Update and continue
	Controls and feedback device incentives					NJEE Utility	Manufacturers and retailers	Research and offer limited incentives for control and feedback devices with established track records.	Provide broader incentives for on-site services delivered through local service providers.	Provide incentives for "smart home" equipment proven to integrate home energy monitoring and control
POLICIES	**State regulations/ appliance standards**					Governor's Office, BPU	DCA, NJEE Utility	Research opportunities for state-level efficiency standards, e.g. for pool equipment or TV set-top boxes.	Continue	Continue
	Government procurement specifications					NJ Director of Energy Savings, cites and towns	NJEE Utility , Multi-Family associations, Public Housing Authorities	Create procurement specifications, for volume purchase applications (e.g. clothes washers, refrigerators in multi-family buildings)	Continue	Continue

SAVING ENERGY IN BUSINESS & GOVERNMENT

Adapting strategies to the needs of businesses requires a significant change in approach. But the payoff in energy savings can be tremendous.

OVERVIEW: AN INTEGRATED APPROACH

INTRODUCTION: THE NEED FOR AN INTEGRATED APPROACH

In the chapter of this report on energy efficiency for homes, we present a series of strategies by major market: new construction, existing homes and "things in homes", meaning lights, appliances, electronics and the like. One might then naturally expect a similar division in this, the Business and Government chapter.

In fact, businesses and governments do not operate the same way households do, and replicating the same silos, while common, is not the best approach. Rather, most businesses require a more customized approach, building relationships and trust such that programs can be "invited" into the decision-making process, when opportunities are greatest. This applies as much to existing buildings, including the lights and other devices in them, as it does to new construction; as much to government agencies as it does to the manufacturing industry.

Of course, things are never quite as simple as that. Some market segments present unique characteristics that require nuances to the overall strategy: public buildings may operate under distinct rules designed to have government lead the way on efficiency; chains, office buildings and data centers all require slightly different approaches and competencies as well. Furthermore, it is not practical to provide custom services to smaller businesses – for these customers, a more direct, admittedly expensive but nonetheless effective "direct install" approach is needed. Finally, developing relationships with industry requires more technical specialization than for typical businesses. **Still, the basic strategy remains: build relationships when feasible, offer turnkey services directly when it's not.**

For these reasons, we approach the Business and Government chapter differently from the chapter addressing Homes: First, by introducing the market as a whole, and then by provide distinct discussions for large customers, small customers and industry.

Of course, beyond program strategies lie government policies: building codes, time-of-sale disclosure and upgrade requirements, equipment standards and others. These apply to all our markets to varying degrees, and are addressed separately as the final section – though certainly not the least – within this chapter.

MARKET DATA: A DIVERSITY OF OPPORTUNITIES

New Jersey has between 300,000 and 400,000 existing commercial and industrial facilities. Of these facilities, office buildings consume roughly one-quarter of this sector's power requirements. Another 30% is consumed in buildings occupied by retail stores, health facilities, schools, warehouses, grocery stores and hotels. The picture is similar for natural gas.*

However, the largest consumers of energy are buildings simply categorized as "Other". Buildings included here are occupied by businesses and other users who are engaged in a wide assortment of economic activities from agriculture (greenhouses), to public assembly (municipal halls), religious (churches), fraternal organizations (the VFW, Knights of Columbus, Elks, etc.), to pharmaceutical (science laboratories), funeral homes (crematoriums), air transportation (hangars and terminals), recreational/tourism (rest stops), telecommunications (telephone exchanges), manufacturing with retail sales. Due to the diversity of the economic activity that is taking place in these building types, the task of aggregating customers into groups for analysis – let alone efficiency treatments – is extremely difficult. **The energy consumption habits and load profiles of these occupants are simply too diverse to provide any meaningful comparisons.**

As a consequence, any effort to develop a cohesive savings strategy, the focus must be placed on the largest end-uses.

Studies consistently show that lighting consumes a majority share of the electricity in most building types; roughly 42 percent. Meanwhile, the largest end-use for natural gas is space heating; at 81 percent of the natural gas consumed in the building sector. Because these two end-uses represent the bulk of the energy consumed in the building sector, New Jersey's energy efficiency programs need to focus strategies aimed at acquiring the most savings from them.

There are also significant opportunities for combined heat and power applications that benefit both electricity and fossil end use

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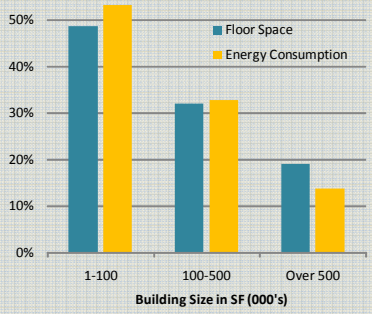
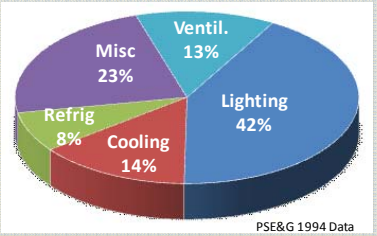
* Accurate data on New Jersey's commercial new construction market is not readily available. Data for existing buildings, derived from a 1994 study, should be viewed with caution.

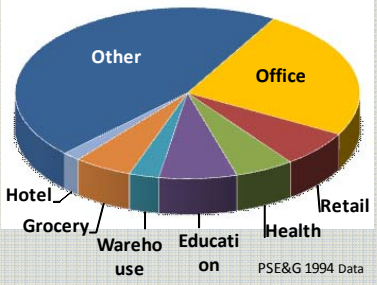
HOW BUSINESS AND GOVERNMENT CONSUME ENERGY IN NEW JERSEY



Small Buildings, Big Consumption
Over half of all energy consumption in the Mid-Atlantic commercial sector takes place in buildings less than 100,000 ft².



A Mix of End-Uses
Available data suggests that lighting is the biggest power draw in commercial buildings, followed by HVAC demands.



Offices Consume Power
Offices seem to consume far more electricity than any other type of building in the commercial sector.

efficiency. Renewable technologies, although they have not achieved much penetration in the commercial sector to date, also offer significant mid- to long-term potential savings.

Programs aimed at business and government sectors must also take into account building sizes, building vintages and equipment replacement opportunities. For example, less than 20% of the commercial square footage is comprised of buildings over 500,000 sq ft, whereas more than half of the sectors' energy is consumed by smaller buildings.

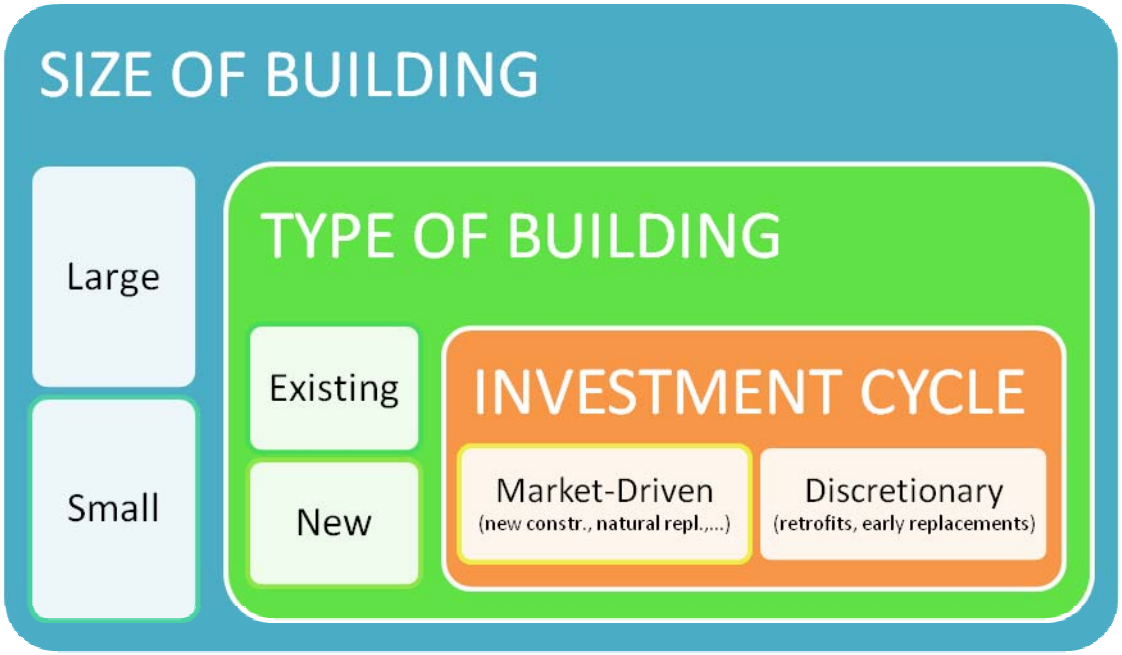
Building sector data (i.e. Commercial Buildings Energy Consumption Survey ("CBECS") also shows that roughly 75 percent of the commercial buildings existing in New Jersey were built before 1990 and 40 percent before 1960. Buildings built during the era of cheap energy were typically designed to suit the needs of owners who were more concerned about initial capital costs than total life-cycle costs. For these real estate investors and business owners, energy costs were a secondary, or sometimes, a tertiary consideration. **There is great potential in New Jersey's existing older building stock.**

SIZE MATTERS: LARGE AND SMALL CUSTOMERS OPERATE DIFFERENTLY

The business and government sectors can be fairly cleanly divided into two major segments - large and small customers. Each building segment and each transaction has a unique set of characteristics and motivations. Efficiency program managers must understand each and tailor their marketing and outreach approaches in an appropriate manner. One size fits all programs usually end up "fitting" the few projects for which the standardized incentives make the most sense. Renewable and combined heat and power (CHP) applications should be integrated into custom building systems, and their incentives based on overall energy and demand reductions.

As noted above, **small customers** represent the bulk of energy consumption and of energy savings opportunities. They are, however, more challenging to reach and address adequately. Indeed, while small customers make up the majority of the total population, they are geographically dispersed throughout the service territory and are therefore difficult and expensive to contact directly. The transaction costs are similar to large customers but the savings potential per unit are usually far less. Typically, most small customers do not have a dedicated facility manager responsible for assessing the viability of efficiency projects. Because many small businesses and government departments are renters, it is often unclear to whom an efficiency proposal should be presented. Furthermore, small businesses tend to be more volatile than larger ones; as such, they often view the long-term (including promises of long-term returns on investment) with greater scepticism than their larger counterparts.

Although **large customers** represent a small share of total consumption, they nonetheless offer significant – and in some respects easier – potential for energy savings. Tapping into this reservoir requires a concerted face-to-face effort by teams of account managers and technical energy experts. Account managers, or energy efficiency "solutions providers", need to identify, approach, and gain the trust and confidence of large customers as competent expert resource managers who can reliably provide access to solutions across a wide spectrum of energy-related matters.



KNOW THINE MARKET: *Achieving success in the business and government sectors requires a multi-layered understanding of where the energy efficiency opportunities lie… and how the market itself makes investment decisions.*

OPPORTUNITIES: MARKET-DRIVEN AND DISCRETIONARY INVESTMENTS

The efficiency market also has two tracks: market-driven (aka "lost opportunities") and discretionary (aka "early retirement/retrofit"). Market-driven opportunities include replacement of failed or failing equipment, new construction and substantial renovation, tenant improvements, and additions. Discretionary opportunities involve convincing existing customers to replace or retire inefficient equipment *before* the end of their useful lives. Renewables and combined heat and power opportunities, depending on the application, can be categorized as either.

Discretionary opportunities, as the name suggests, are efficiency projects and purchases that are not necessarily critical to the operations of the business. Convincing *existing customers* to change out inefficient but functional equipment represents a significant challenge, but also offers the biggest potential for savings in the B&G sector. Most customers are usually not even aware of the potential for energy and cost savings unless a vendor with an efficiency product or service to sell, or a neutral program account manager, is able to make them aware. Even though these projects represent significant savings to customers, experience continues to demonstrate that they are difficult to initiate. Renewable technologies and combined heat and power applications can be seen as discretionary opportunities when the system is added to an existing system. For instance, a CHP waste heat

recovery system is not a necessity for a functioning refrigeration system, but may offer highly cost effective savings if added to one.

Market-driven opportunities can be divided into two categories: natural replacement for *existing customers*, and *new construction* (including expansions). Natural replacement opportunities come about when a customer is faced with an immediate purchasing decision – either because they are building a new facility or the existing equipment has failed or is failing. These purchases can be, and usually are, time-critical; this is particularly so in existing businesses where business operations are negatively impacted until the equipment is replaced, or in small businesses, who have little time or resources to shop around, preferring to replace "like with like". New construction opportunities, meanwhile, benefit from longer decision-making timeframes, not to mention the potential for more comprehensive savings from integrated design. As such, design professionals (architects, engineers, lighting designers, equipment specifiers) can play a greater role in influencing customer decisions.

Convincing customers to change out functioning equipment is a significant challenge. It also offers by far the biggest potential for energy savings.

From a strictly cost perspective, the key difference in the transaction from the program perspective is that market-driven incentives provide lower cost savings as they need only account for the difference between the costs of the baseline, or "typical" equipment replacement option and the more efficient option. Because the business must replace the equipment anyway, there is typically no incremental labor cost. A discretionary incentive (for the replacement of functioning, but inefficient equipment), on the other hand, must cover a significant share of *all labor and equipment* costs. While cost is not the only issue, it can be a daunting one.

STRATEGIES: PROGRAMS TAILORED TO CUSTOMER NEEDS AND CONTINUOUS-IMPROVEMENT POLICIES

The needs of customers cut across market segments. Nonetheless, we recognize that the needs of large customers may be very different from those of their smaller counterparts. As such, we divide our proposals for addressing this market into large and small customers, recognizing that the line to be drawn between them will never be perfectly opaque.

The overriding strategies we propose will serve a majority of the customers most of the time. Nonetheless, program managers must recognize that there are specific customer segments that benefit from customized approaches. These include, for example, public (including institutional) buildings and schools, chains and franchises, and tenant occupied buildings. Strategies tailored to these actors can increase their participation and savings, and we further provide examples of these in the pages that follow.

LARGE CUSTOMERS: BUILDING RELATIONSHIPS FOR DEEP SAVINGS

VISION AND GOALS

For the large customer segment, the vision for New Jersey is to "**to transform energy efficiency opportunities into an irrefutable value proposition through customized outreach, sales, technical, and financial assistance, and to lock in and further advance those savings through continuous improvements in codes and standards.**

With that vision in mind, achieving the Energy Master Plan target will require achieving unparalleled objectives. Specifically, the EMP will have to **"achieve, by 2020: 18% energy savings in large private sector buildings (and 30% in public buildings); 35% savings in existing large commercial tenant space; 25% in projected energy use (from code) in all new/renovated office space; 20% average savings from existing chains and franchises and 40% from new ones; and 26% savings in existing data centers."**

INTRODUCTION

Electric demand requirements and energy consumption patterns differ slightly among the variety of large customer building types. However, the range of efficiency measures and services that apply are relatively consistent. Ventilation is but one example of an efficiency measure that applies equally to all types of large buildings, even though the occupants of the building may have varying standards as to what constitutes adequate fresh air and, as such, may have different drivers for changes to their HVAC system.

For hospitals, the standards defining fresh air and comfort are more rigorous than those that apply to an office building. Preventing the transmission of potentially life threatening infections through a hospital's ventilation system is obviously a concern of paramount importance. This concern has motivated hospitals across New Jersey and elsewhere to upgrade their buildings with high-performance ventilation systems to supply hepa-filtered air to rooms. It is the non-energy benefits that drive the hospital's decision to invest in energy savings measures. The fact that more exacting requirements for fresh air in hospitals is driving them to upgrade ventilation should not be seen as a single application but rather a chance for program staff to talk about other efficiency opportunities, such as lighting systems and controls, air conditioning, hot water, and space heating.

The restaurant industry also provides an interesting case study for efficiency program managers. Within the industry there is a wide variety of restaurants, from high-end, dinner only establishments to fast-food franchises. Despite the disparities in clientele, each type of restaurant requires a similar need for fast, effective air conditioning and space heating. In this case, however, the systems that deliver heating and cooling may be completely different depending on the type of building the restaurant occupies. For restaurants located in stand-alone buildings, heating and cooling is provided by simple roof-top units. For restaurants that occupy space in a large, multi-use commercial building heating and cooling most likely comes from complex chiller systems. Regardless of the particular scenario, the need for cooling and heating from the restaurant's perspective is the same.

Customer needs and drivers vary significantly. So too, then, should the solutions we are able to provide. Large clients need custom solutions.

These examples underscore an important point: customers – hospitals and restaurants, in these examples – have fairly similar energy service needs. Each has a lighting requirement, each needs to ventilate occupied space for the comfort and health of their customers and staff, and each needs heating and cooling. But those broad needs begin to disentangle when we look more carefully. The *level* of lighting, the *quality* of airflows, and the *extent* of heating and cooling will differ by client. Similarly, the solutions for optimal, energy efficient lighting, air flows and heating and cooling will vary by building type. These differences translate into a critical conclusion: since customer needs and drivers may vary significantly, so too should the solutions we are able to provide. In other words, large clients need custom solutions.

GAPS: RELATIONSHIP ARE KEY TO SUCCESS

New Jersey's efforts toward customers in this market are not sufficiently aggressive to meet the Energy Master Plan efficiency goals. This is not necessarily a failure of the program design but a reflection of the savings goals. Current offerings provide the standard list of tools: audits, prescriptive incentives, benchmarking and pay for performance incentives. Because these are all standardized offerings, they are inherently unable to provide large customers what they need: custom solutions. And because they are publishable lists, they come with little active *sales* effort. As a result, only the most interested customers, and the customers with the most to gain at the outset, will find and pursue them.

For outreach, New Jersey's programs rely largely on existing market actors, including architects and engineers, business and municipal associations, and contractors. The strategy underlying this approach assumes that these actors will find and vet energy efficiency opportunities on their own, and proceed to convince their clients of their added value. Yet trade allies tend to sell only what they sell. A lighting designer does not try to encourage customers to upgrade their motors, even if he or she could recognize the opportunities.

Similarly, an engineering firm has little reason to push its clients to higher levels of efficiency if that is not what the client is already asking for; they are there to provide what the client wants, period. Beyond a handful of innovators, trade allies cannot be expected to play a front-line role in "upselling" efficiency.

*Much the same way telecommunications equipment and services or process equipment is sold, so too must energy efficiency be **sold**.*

To be effective, energy efficiency staff must leverage relationships – their own or those of other actors in the market channel to get themselves in front of the customer. Much the same way telecommunication equipment and services or process equipment is sold, so too must energy efficiency be *sold*. It is not hard to imagine the level of sales resulting from a HVAC equipment vendor who required all their customers to submit a plan to them, which they then review, make a conditional price quote, but provide final pricing only when the job was complete.

What is missing in this market are the resources to conduct direct and deliberate customer outreach, and to provide comprehensive and customized solutions. Indeed, current utility account managers have multiple responsibilities that necessarily leave little time for comprehensively addressing energy efficiency. An effective outreach strategy will establish sustained, long-term relationships with customers beyond the normal utility account representative scope of work.

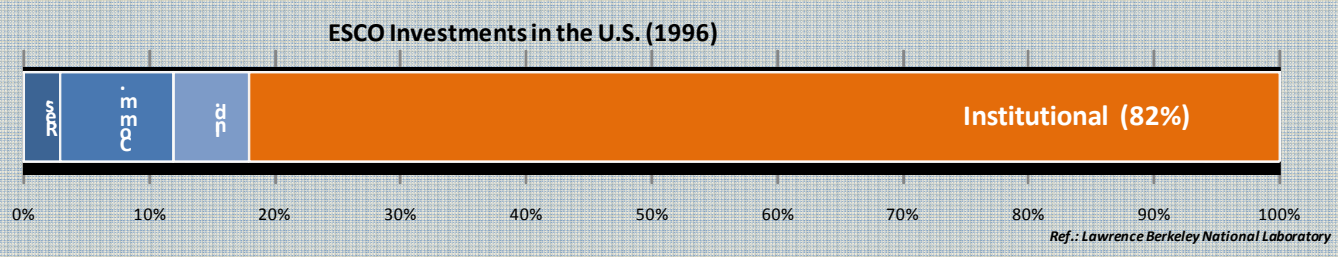
PROGRAM STRATEGY: ACCOUNT MANAGEMENT AND THE "ENERGY EFFICIENCY SOLUTIONS PROVIDER" (EESP)

To complement account managers, we urge New Jersey to hire a series of Energy Efficiency Solution Providers (EESP). EESPs can be in-house staff or third-party firms. They act in part as a resource for account managers, who can introduce the EESP to clients when they spot – or are queried about – potential energy savings opportunities. They also take on a proactive outreach and "sales" role, to seek out businesses with energy savings opportunities, develop relationships with large customers and facilitate successful energy efficiency project implementation.

Long-Term Plans and Relationships: To persuade clients of the business value of energy efficiency, the EESP will need to develop deep and sustained customer relationships. The EESP will notably need to make a successful business case, using a range of solutions based on the unique building that customer occupies, and the unique financial perspectives that operate within the company (the EESP will need to be able to discuss technical characteristics with the energy manager, while addressing the CFO in terms of his financial criteria). Ultimately, the EESP's goal is to integrate implementation staff into capital planning activities with the aim of creating a long-term energy plan. The long term energy plan lays out a multi-year cost effective investment focusing on achieving at least a 15 to 20 percent reduction of current energy consumption.

THE "EESP" AND THE ROLE OF ENERGY SERVICE COMPANIES (ESCOs)

Throughout the U.S. and elsewhere, Energy Service Companies, commonly known as ESCOs, provide turnkey energy efficiency projects to mid- and large-sized customers. ESCOs tend to service primarily the government sector – where longer payback periods are more commonly accepted – and larger businesses where quick turnaround and short payback projects (often lighting) are readily available. ESCOs can operate under any number of contract types, and often provide a third-party guarantee that identified savings will offset the amortized cost of the project.



ESCOs are a valuable, first-line partner in the push for increased energy efficiency, yet they alone cannot meet the aggressive N.J. Master Plan targets. *When working with private sector customers, ESCOs are often obliged to deliver projects with very short paybacks, leaving behind significant savings opportunities. Furthermore, because of the upfront investment required to identify valid opportunities (marketing, audits), most ESCOs are understandably driven to only the biggest, most cost-effective projects (and will typically focus their limited marketing dollars on "warm sales" - on winning an already-planned project - rather than on convincing potential customers to contemplate projects they never even considered). In other words,* ***ESCOs achieve their business objectives more from winning, financing and completing individual projects than from deliberate efforts to lift the market as a whole. Energy efficiency programs have both goals.***

THE EESP

The Energy Efficiency Service Provider, or EESP, is tasked with lifting the market as a whole as well as providing a catalyst for individual projects. The EESP does so first by investing significantly in "cold sales" - in convincing customers to consider energy savings opportunities in the first place. Because it does not implement projects itself, the EESP acts in effect as the customer's agent, helping to identify savings opportunities, to communicate their value to company decision-makers and, if needed, to enlist private firms to do the work. The EESP also aims to encourage deep savings through comprehensive projects, and does so by listening to the customer, understanding their investment barriers and negotiating appropriate, customized incentives to overcome them. Finally, the EESP can support the customer in a variety of areas from writing an RFP to selecting qualified contractors, to ensuring quality control.

The EESP also has the additional task of working upstream – with architecture and engineering firms, equipment vendors and others – to ensure that all are aware of efficiency opportunities (and incentives), stock the right equipment and are generally able to bring savings opportunities to their customers.

So where does this leave ESCOs? Since the EESP's role is complementary to – not duplicative of – ESCOs, the latter can elect to benefit in several ways, as illustrated on the following page.

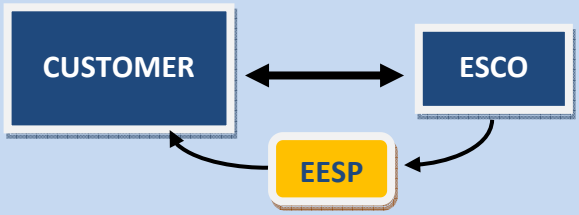
INTERACTIONS BETWEEN THE "EESP" AND ESCOs: THREE SCENARIOS

Scenario A

OBTAIN NEW PROJECTS. In this scenario, the EESP works hand in hand with a customer to identify energy savings opportunities and ensure their financial viability. The customer, with or without the EESP's help, then hires an implementer – often an ESCO – to do the work. The EESP may additionally help the customer with project management and quality control.

Note that the EESP is trained to know what to expect and can "package" projects that take full advantage of the capabilities of potential implementers. By understanding the capabilities of the various market players, the EESP will act as a project catalyst for all implementers in the marketplace. The "free marketing" offered by the EESP should further enable ESCOs to optimize their in-project margins, to the benefit of customers and, ultimately, energy efficiency.

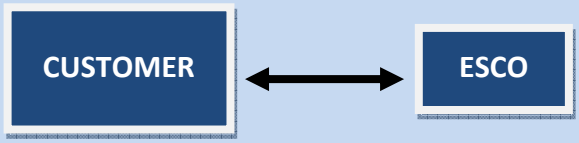
Scenario B



INCREASE PROJECT SCOPES. In this scenario, the ESCO has already developed a relationship with the customer, but elects to bring in the EESP to help the customer overcome any concerns and/or provide customized incentives and expertise to facilitate a more comprehensive work scope.

Note that the collaboration should result in a larger project for the ESCO, and increased energy savings for both the customer and New Jersey as a whole.

Scenario C



STATUS QUO. Finally, in this scenario, the ESCO has already developed a relationship with the customer, either proactively or after having won an RFP, and chooses not to involve the EESP. The project proceeds as usual.

Note that in this case, the ESCO can still use the program's prescriptive energy efficiency incentives to help overcome customer barriers to investment.

One-Stop Services to "Close" Projects: To be invited into the customer's capital planning process, the EESP must demonstrate additional value beyond energy savings (e.g., finding resources to assist with power factor correction, productivity, water savings, demand management, and other resource impacts). To attain this level of trust, the large customer must have the assurance that he or she will be able to interact with a trained sales staff that can *facilitate* (not just offer) comprehensive, one-stop services, including:

Many specialists may be needed to help large customers buy into efficiency. Whoever provides the service, the customer's point of contact is always his or her "Energy Efficiency Solution Provider".

- Design incentives to develop project specifications for retrofit projects, including CHP and renewable applications;
- Retro-commissioning services (i.e., facility building and process system "tune-ups");
- Other technical and design assistance on "market-driven" projects;
- Financial incentives based on labor and equipment; and
- Implementation coordination services to assist consumers, design professionals, vendors and contractors to overcome various transaction barriers

Where appropriate, technical and design review services can be provided either by program staff, outside contractors hired by the program, the consumer's own design team, or some combination of the three, depending on customer needs and expertise. The point is this: however the service is to be provided, the customer's point of contact is his or her "solution provider"; all else takes place behind the screen – only the results are apparent to the customer.

EESP Assembles Service Teams: The EESP facilitates a number of different services, including:

- Determination of efficiency opportunities;
- Determination of renewable and CHP opportunities;
- Preliminary analysis and ranking of efficiency opportunities in terms of costs and savings;
- Identification of available products and vendors;
- Determination of incentives based on customer requirements;
- Review of design and specification documents;
- Procurement of commissioning or retro-commissioning services;
- Drafting scopes of work;
- Locating and vetting turnkey vendors to complete the scope; and
- Quality control: verifying that work has been properly completed.

Program management will establish teams of outreach, technical, and administrative personnel for key market segments' dominant end use categories. The EESP's addressing the concerns of hospitals will assemble a team of in-house or external resources to bring first-hand knowledge and experience in this business type and building type. For example,

hospitals have office buildings, operating rooms, and laboratories with the end uses typically found there. The core organizing principle is this: EESP's do not necessarily need to have specialized knowledge for every business, but they need to know which resources to assemble into a project team to meet the customer's needs and gain their trust.

In addition to account management for individual large customers, EESP's, along with other program staff, must cultivate and engage the interest, commitment, and capability of the other market actors who interact with large customers. Industry associations, design professional firms, distributors of equipment and products sold into the customer supply chain, and businesses that service the facilities, equipment, and grounds all offer viable opportunities for engagements with energy efficiency staff.

Existing Building Measures: The following measures are needed to comprehensively address efficiency opportunities in existing facilities, including retrofit, renovation and remodel/replacement situations:

- Improved interior and exterior lighting equipment, controls and system design;
- Heating, ventilating and air conditioning (HVAC) system design, equipment, controls and fuel choice;
- Premium motors and variable frequency motor drive controls;
- Service hot water system design, equipment efficiency upgrades, end-use efficiency (e.g., high efficiency clothes washers, pre-rinse spray valves, showerheads, etc), and fuel choice;
- High performance envelope systems, including high efficiency window glazing, insulation upgrades, etc.;
- High efficiency refrigeration system design, equipment and controls;
- High efficiency cooking equipment;
- Improved industrial process systems and equipment;
- Combined heat and power and renewable applications and
- Retro-commissioning services to improve operation and maintenance practices.

These measures are not significantly different from current program offerings in New Jersey, but their presentation, bundling, and delivery reconfiguration will be a cornerstone of a solution provider energy plan.

Flexible Packaged Financial Incentives: As a general principle, financial incentives should be designed and packaged to capture comprehensive energy efficiency and minimize lost opportunities. This requires that, financial incentives be designed to cover as much of the full incremental installed cost of cost-effective efficiency measures and projects as necessary to engage full customer participation. For discretionary retrofit, the effective incentives start at, on average, 60 percent of retrofit project costs and 80% of incremental cost (i.e., the full labor and equipment installation costs for retrofit measures, and the incremental labor and equipment costs associated with replacement). Incentive offers, including ESCo financing when available, should be packaged and presented in the form of cash flow analyses that provide energy efficiency investments in the terms of the financial decision making criteria required by the customer (e.g., internal rate of return, positive cash flow, and return on

investment). At no point should incentives violate the utility cost test as defined by the California Standard Practice Manual.

The initiative should also cover most of the full incremental design costs for projects requiring redesign of existing facilities and systems. At the customer's option, the initiative should reimburse costs related to:

- Extra efforts undertaken by the customer's designers/vendors, including modelling of base case scenarios, CHP and renewable assets;
- Added project facilitation and/or design management costs; and/or
- The procurement of additional outside technical assistance, or engaging retro-commissioning and commissioning services. Initiative staff or subcontractors should provide services as appropriate if competitive solicitations are impractical, due to project size or timetables.

For market-driven opportunities (i.e., efficiency upgrades added at the time of planned investment by customers) the program should start by paying, on average, 80 percent of the full incremental cost of high-efficiency equipment choices or planned purchase of new equipment and systems. New construction opportunities are discussed separately below.

In some cases the initiatives can substitute and/or supplement end-user financial incentives with specially tailored payments to upstream market actors (e.g., equipment manufacturers, distributors and vendors) to motivate the production, stocking and placement of the highest-efficiency choices.

The EESP model is being implemented, to varying degrees, in places such as Vermont, Massachusetts and Long Island, New York. It is also common practice in many if not most non-energy efficiency, business-to-business models.

The following sections illustrate how this strategy applies to market segments that constitute a significant portion of the cost-effective savings opportunities in the large customer sector including:

- Public Buildings
- Chains and Franchises
- Leased Office Space
- Data Centers
- New Construction

SEGMENTS: PUBLIC BUILDINGS

Public entities investing in energy efficiency do not necessarily face more barriers than other commercial and institutional customers. However, some barriers may be more pronounced or apply in different ways.

Public Building Efficiency Barriers: Examples of barriers abound. For example, for capital projects, the public sector relies heavily on bond and lease funding. Bond commitments are

usually put in place at the beginning of the project cycle and are usually not expandable, meaning the building has to be designed before the bond money is available – a chicken and egg problem.

City officials are not always aware of the benefits of energy efficiency, and often lack the expertise to identify, hire and supervise quality technical design professionals trained in high performance energy efficient design. As a result, bid documents and RFPs fail to specify energy efficiency, and given the competitive process, bidders don't insist. The winning bid, invariably a lowest-cost / lower-efficiency solution, will determine the amount of the bond.

Once the bond is approved and contractors chosen, elected officials often watch as final design and construction costs trend higher. After the bond is placed, the design team is hired to do the final design. At this point, any difference between the bonded amount and final design may be "value engineered" to fit the now out-of-date budget. When energy efficiency is not at the top of the list of the targeted facility improvements or the construction of a new facility, it is often removed for first-cost reasons. And omitting energy efficiency as a design objective upfront can miss opportunities to offset higher first costs of efficiency measures with cost savings in other areas (e.g.., right-sized HVAC and lighting systems).

Another example arises from the unique capital budgeting process. For example, maintenance is often deferred as budgets are inadequate to take care of both unbudgeted expenses – excess snow removal or new mandates for handicap accessibility – and budgeted repairs. As maintenance is deferred, the costs of repair rise to the point where they can no longer be covered with operations budgets – necessitating that capital improvement funds be allocated. It is at this point that many municipalities, school districts and even state buildings begin looking for a way to fund these upgrades.

Efficiency programs that intervene in this market must have staying power and incentive commitments that extend far into the future. Properly interacting with this market segment means keeping abreast of project developments and fighting for efficiency as the "hurry up and wait" process meanders its way toward the start of construction. Fortunately, several recent policy developments coupled with the expansion of program services can help overcome these barriers to comprehensive efficiency improvements in New Jersey's public buildings.

CURRENT PROGRAMS AND POLICIES

Smart Start Offers Incentives and Technical Assistance: New Jersey offers Smart Start incentives and technical assistance, and financing in some cases through the New Jersey Economic Development Authority. The Energy Master Plan proposes a new energy code by 2009 that will increase new building efficiency by 30% and equipment standards for the same year.

Municipal Audit Program Provides Stepped Assistance: The Municipal Audit program is a multi-step process for providing municipal entities with the information required to understand what efficiency upgrades could be made to their new construction plans or

existing buildings. When the audit is complete the applicant is directed to the existing programs for incentive offers. This approach has been tried in many jurisdictions and has consistently resulted in a significant drop off between the number of customers audited and those that implement projects. Universal experience in the efficiency industry long ago established that audits that are not nested within a comprehensive solutions package simply fill client shelves.

Legislation Opens Door to ESCo Financing: Legislation signed into law by Governor Jon Corzine in January 2009, A1185/S1537, removes barriers to and encourages local and state entities to enter into long-term contracts with ESCos to finance, install and monitor energy efficiency improvements in public facilities. This important legislation opens to New Jersey public facility managers an important source of capital and technical assistance to increase the overall energy performance of public buildings. The New Jersey energy efficiency programs can further the impact of this new policy by assisting public facility managers to solicit and enter into energy performance contracts that maximize energy savings (see below).

Public School Construction and Renovation: In July 2002, Governor James McGreevey signed Executive Order #24, requiring all new school designs to incorporate LEED 2.0 guidelines to achieve maximum energy efficiency and environmental sustainability. In May 2007, the New Jersey Schools Development Authority (SDA) published the *New Jersey 21st Century Schools Design Manual*, which uses LEED as a baseline and combines national best practices in high performance design from other frameworks such as CHPS. Intended to guide the design and construction of schools across the state, thus far three schools have been completed based on these guidelines. Several other communities have constructed LEED certified schools.

TEACH Complements Efficiency Program Investments: The newly adopted K-12 Schools Energy Education Pilot Program (TEACH) offered by the New Jersey Clean Energy Program can complement comprehensive efficiency improvements to achieve significant and lasting energy savings. In addition to ongoing benchmarking, student education and ongoing monitoring of energy use by a range of stakeholders (e.g., facility managers, teachers, students, and administrators) TEACH can help sustain a high level of energy performance by facilitating ongoing organizational support for best practices in facility energy management while educating the next generation in the wise energy management.

Gaps in the current policy and programs include:

- Lack of implementation of High Performance Building Standards in schools and other state-funded new construction,
- Public procurement requirements that require low cost bids and thwart the best-intended executive and legislative efficiency policies,
- Absence of efficiency requirements in state leasing procedures that miss opportunities to increase efficiency in leased properties,
- Limited efficient equipment procurement standards at the state level that result in lost opportunities, and

- Limited technical assistance and lack of creative capital approaches for all public sector actors which leave gaps in cost-effective efficiency improvements.

To meet the aggressive efficiency goals of the Energy Master Plan, the strategy below outlines steps to build on existing programs and policies to address these gaps and greatly increase public sector program participation and energy savings.

AN ENHANCED PUBLIC BUILDINGS STRATEGY

The public sector responds well to several key strategies – up front design incentives, procurement guidelines, model contracts, on-site energy managers, turnkey project implementation, and cash flow based financing. These translate into two broad categories, knowledge and money. As noted above, dedicated account management via an EESP that builds relationships with customers and service providers is critical for success with municipal, state, and federal entities.

An efficiency program is most effective when it helps public entities acquire and manage all of the necessary pieces for their project, including:

- Design assistance, including savings estimates;
- Expert advice on the costs and benefits;
- Structuring the means of servicing bonds or lease costs;
- Implementation support and advocacy during the construction and commissioning process.

With a comprehensive understanding of these customers needs and constraints and a trusting relationship built over time, the EESP's can maximize the savings for these customers and reduce barriers to ESCo financing and installation of comprehensive efficiency improvements.

Early Intervention Is Key: To be truly effective, technical assistance must be made available when projects are first conceived, before a commitment to undertake improvements or to build has even been made. **Such early intervention is the least-cost way to achieve energy efficient buildings, and the only way to achieve comprehensive treatments.** Qualified technical assistance, provided early on, can guide lay decision-makers towards making informed decisions about the inclusion of energy efficient measures or design elements in their project.

A VARIETY OF PUBLIC BUILDINGS REQUIRES A VARIETY OF APPROACHES

Federally-owned buildings: *Conscious of energy costs and mandated to achieve a 30% energy reduction by 2015 by Executive Order 13423.*

State-owned buildings: *Tend to take a long term view and lead by example. Can be sensitive to human resource concerns and concerned about rising energy costs.*

Municipal facilities: *Water and sewer plants as well as transportation buildings are very conscious of energy costs. Motor/drive/pumping options provide large potential savings.*

Private buildings with long-term government leases: *Owner's relationship w/ their tenant may provide many of the above motivations; government has the market clout to require "energy efficient leases".*

Large Non-Profits: *Tend to take a long term view and seek to lead by example. Can be sensitive to human resource concerns and concerned about rising energy costs.*

A good energy efficiency program strategy will take a custom approach to each of these customer segments, recognizing their own unique situations, needs and drivers.

Facilitate ESCo Investments: Municipalities and other public entities suffer from a common problem - access to capital. Without explicit implementation strategies aimed at this barrier all other forms of assistance combined will not move an energy efficient design forward if it increases unfunded project cost. Public entities have limited ways to raise money; **it is always easier for public entities to approve expenditures that are paid for through cash flow amortization** than it is for them to raise supplemental capital. If cash flow can be created by energy savings, most municipal and state entities have become familiar enough with this mechanism to take advantage of it.

In large organizations, city governments for instance, public works staff may have the requisite expertise to properly vet and shepherd a project with cutting edge energy efficiency options through the process from design to construction. But in most cases, this expertise does not exist. **ESCos** usually provide well developed services in this market segment. .

Many ESCOs do the bulk of their business in the public sector, and have developed services designed to overcome unique public sector barriers. They can provide design services to estimate bond amounts, arrange cash flow based financing – including municipal bonding and leasing, and provide turnkey implementation. By providing cost and savings estimates, ESCOs are able to maximize investment with a given cash flow. The cash flow stream is used in lieu of increased expenditure that must either be raised through taxes or reductions in other departments. **This creation of cash flow enables capital expenditures to be financed through operating budgets.**

On the other hand, many ESCOs are by their very nature limited to certain project types. Indeed, ESCOs have high customer acquisition costs. Comprehensive development of energy saving projects can reasonably cost tens of thousands of dollars. ESCos are usually asked to provide prospective customers with a good faith estimate of project costs and energy savings, meaning that ESCOs themselves need to be extremely confident in the project's profitability – a confidence that requires facility walkthroughs and detailed energy and cost estimates. At the point where a prospective customer makes a decision to pursue a project, a more detailed audit contract is drawn up. Finally an audit is performed. Payment for the audit can be a part of the project cost or in the case of a terminated project, a fee for service. All of this effort predates a payment stream. The result is upfront costs for the ESCO. **In response to these pressures, ESCOs seek out projects that will have a rate of return that justifies the upfront costs. These same acquisition costs mean that ESCOs also usually exclude smaller customers and smaller projects.**

The role of the program administrator staff is to help align the interests and profit motives of all parties, and help reduce project overhead costs. In the case of smaller projects, the program administrator staff can play a significant role in finding, assessing, aggregating, and delivering good opportunities to the ESCOs. Vetting opportunities reduces the customer acquisition cost and allows more ESCO participation resulting in better turnkey services for more projects.

In the case of the large retrofit projects in Vermont State buildings, the Buildings and General Services staff confers with Efficiency Vermont's in-house Solutions Providers and then establishes an RFP for a scope of work. The RFP is then released and, in several cases,

the State turned to an ESCo to deliver comprehensive retrofit energy solutions to its inefficient buildings.

This resulted in a perfect partnership – the EEPS assigned to the State helped quantify the opportunity and turned to the market, in this case and ESCo, to deliver the solution.

High Performance Design for Public Schools: It is critical to design a comprehensive, consistent approach to this market sector that acknowledges the multiplicity of stakeholders, the complexity of drivers, the constraints of public funding, and the unique role of schools in our communities. The *21st Century Schools Design Manual* is an excellent resource intended for use in the design of all New Jersey pre-K through 12 public School Facilities Projects within the New Jersey Schools Construction Corporation (NJSCC) Program (see the inset). New Jersey plans to invest $8.6 billion over the next ten years into the renovation and construction of its school buildings – including thirty special needs districts, known as the Abbott School Districts. New Jersey can achieve significant savings by requiring that all of these state-funded projects be designed according to the 21st Century Design Manual, and coordinating implementation and updating of these materials with the regional and national Collaborative for High Performance Schools which provides training and technical support materials, case studies and other resources to support New Jersey implementation of the *21st Century Schools Design Manual*. Energy Efficiency Solution Providers can help establish the *21st Century Schools Design Manual* as the standard practice in the State by providing guidance and resources throughout the project including referrals, training, technical assistance and financial incentives for cost-effective efficiency upgrades.

Energy Efficient Equipment Procurement: The Department of Treasury, through its Director of Energy Savings, should implement Executive #11 with an expanded list of products (e.g., add lighting products and fixtures, HVAC, appliances, office equipment and electronic devices) and work with the New Jersey energy efficiency programs to coordinate procurement specifications and leverage the involvement of retailers and manufacturers to provide high efficiency products options at attractive prices. The ENERGY STAR program provides resources to assist procurement officials in smart purchasing decisions, as does the Responsible Purchasing Network (http://www.responsiblepurchasing.org/) and The Consortium for Energy Efficiency at: http://www.cee1.org/gov/purch/purch-main.php3

In Vermont, Efficiency Vermont has helped to increase energy efficiency in public buildings by providing expert advice and recommending procurement guidelines to the Vermont Department of Building and General Services for high efficiency equipment purchases. By proscribing energy efficient replacement technologies, the state is assured that it is buying only efficient products as a matter of course. A similar service would be beneficial for New Jersey.

New Jersey 21st Century Schools and the Collaborative for High Performance Schools

New Jersey 21st Century Schools: *The NJ Schools Development Authority (SDA) collaborated with the New Jersey Institute of Technology (NJIT) to develop The 21st Century Schools Design Manual to plan and construct public schools across the Garden State to be healthy and productive; cost effective; educationally effective; sustainable; and community centered. It combines national best practices in education design with LEED, the Collaborative for High Performance Schools (CHPS), and other regional design frameworks. The core elements include* ***twenty-five design criteria:***

Acoustic Comfort	*Thermal Comfort*	*Environmentally Preferable Materials and Products*
Visual Comfort	*Daylighting*	*Environmentally Responsive Site Planning*
High Performance HVAC	*High Performance Lighting*	*High Performance Building Envelope*
Energy Performance	*Life Cycle Cost*	*Catalyst for Economic Development*
Indoor Air Quality	*Safety and Security*	*Stimulating Architecture*
Commissioning	*Water Efficient*	*Learning Centered Design*
Accessibility	*Service Life Planning*	*Flexibility and Adaptability*
Information Technology	*Renewable Energy*	*Community Involvement and Community Use*

The 21st Century Schools Design Manual provides, for each of these design criteria:

- ***What and Why****: A brief explanation of the Criterion intent and significance*
- ***Integrated Design Considerations****: A discussion of how each Criterion may interact with other Design Criteria and systems*
- ***Requirements:*** *Performance requirements which must be met in the school design*
- ***Recommendations:*** *A brief list of best practice recommendations to guide or incorporate into the school design*
- ***Associated LEED Credits****: A summary of the associated LEED credits and/or prerequisites*
- ***Reference Standards and Guidelines****: A list of applicable technical reference standards and/or guidelines*
- ***Industry and Governmental Resources****: Targeted references and resources to assist design and construction*

To date, three New Jersey schools have been completed based on 21st Century Schools Design Manual.

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The Collaborative for High Performance Schools (CHPS) *is a mature, strong and proven national program supporting the design, construction and operation of schools that are energy and resource efficient, cost effective, as well as healthy, comfortable, and conducive to learning. The CHPS program offers a variety of services including:*

- ***High Performance School Rating and Recognition –*** *The CHPS Criteria is a comprehensive benchmark system to guide schools to environmental and operational excellence. Designed by technical experts from every discipline and stakeholder group, the Program offers two paths to recognition. The "CHPS Designed" program allows for self-certification through a free software program. The "CHPS Verified" program uses third-party verification may be required for incentives. CHPS recognition activities include award ceremonies, case studies, and media outreach.*
- ***High Performance School Trainings –*** *CHPS offers American Institute of Architects accredited technical seminars for design professionals, workshops for school district stakeholders, and assistance to systems crafting district-wide green schools resolutions. Its annual conference "Greentools for Healthy Schools" is the premier training event for professionals in the development of healthy, environmentally sustainable schools.*
- ***CHPS Best Practice Manual –*** *The six-volume technical manual covers planning, design, high performance benchmarks, maintenance, operations, commissioning, and relocatable classrooms. See: http://www.chps.net/manual/index.htm#BPM*
- ***CHPS High Performance Resources –*** *CHPS maintains a directory of high performance building services and products and a list of low-emitting materials for use in schools. It also offers a variety of online resources.*

School jurisdictions across the nation participate in the CHPS program. Over thirty-five schools have completed construction and another three hundred are in the works. Twenty-seven school districts had adopted the CHPS Criteria for all new construction.

In the northeast, the ***Northeast Collaborative for High Performance Schools*** *provides building and design standards for pre-K schools through community colleges. Based on California's pioneering CHPS guide Northeast CHPS is tailored to state code requirements, the Northeast climate, and the environmental priorities of the region. In addition to technical guides for new school construction, Northeast CHPS offers a guide to retrofit existing schools to high performance design principles, design guides to construct high performance public buildings, case studies of twenty schools built to MA and NE CHPS NE references, a regional exchange forum, and facilitates statewide high performance school conferences. See http://www.neep.org/HPSE/index.php.*

SEGMENTS: CHAINS & FRANCHISES

Chains and franchises, referred to hereafter as simply "chains", exhibit barriers to investment that can be particularly vexing for efficiency program administrators. Chains are characterized by small food service, small and large retail, specialty stores such as Sports Authority or Pep Boys, and grocery and convenience stores including gas stations, and a multitude of other building types such as automobile dealers.

The primary barrier to efficiency investment is organizational practice. This takes many forms. The most pervasive is the fact that store design and presentation is often integral to the brand. Color rendering for the Gap or Moe's Southwestern Grill can trump more efficient lighting especially as the upgrade may require, for example, cooler florescent replacements for warmer incandescent lighting. The characteristic "yellow" of Moe's may not come across with florescent lighting. Newer styles of metal halide track lighting and LED technologies are available but their track record is such that many franchisors have only tried them out in limited sites and applications.

Other equipment such as rooftop HVAC, refrigeration, cooking and hood systems are part of the building package and are not always changeable without considerable effort. The objection to these changes can be overcome but it may not be in the current building cycle for the particular store model being assessed. For food establishments, product must be reproduced the same way at every location; consequently, the equipment used to create it must be consistent from place to place. Very often, the equipment and designs must also be approved and, in fact, provided to the local outlet by corporate staff.

Another reason that chains build multiple stores of the same model is to control costs. Often times, all aspects of the build out are prescribed long before the building permit is requested and construction begins. Influencing the design takes a presence at the company headquarters or interaction with the design firm developing the plans at a time when design decisions are being made. To the extent that a chain runs a pilot program in New Jersey, some headway could be made, but in cases where testing is not done in the local market, administrator staff are typically out of luck. In addition, franchisees may face the barrier of not being able to change anything about the store design or layout without express permission from the franchisor. A final barrier to investment by chains is that they are not usually the owner of the building they inhabit. Similarly, large developers subdivide sites, build the buildings, and then turn them over to the eventual landlord.

The loads for chains are dominated by lighting and HVAC with significant refrigeration depending on the market sector. Obviously grocery stores and food service will show more energy consumption in refrigeration, hot water, and cooking end uses. They are characterized by long operating hours and may make up as much as 15% of the New Jersey C&I sector. Chains account for a significant percent of newly constructed buildings.

The account management approach described previously is particularly important for chain accounts. The sheer diversity of the needs represented in each segment requires a jack-of-all-trades front line staff. At the same time, the requirement for the supporting technical assistance staff is both broad and deep. When McDonalds designs a restaurant or Hess designs a Hess Express they use some of the most sophisticated design teams around.

They may be designing stores with product and customer flow as a primary determinant and their ideas on lighting may lean to the harsh as a way to decrease customer dwell time. Approaching them with a change requires detailed knowledge of their specific circumstances, advanced technical assistance, and hard data.

Split incentives are pervasive in blocking energy efficiency in office buildings. A tenant whose rent includes utilities won't care much about leaving lights or computers running all night, and a landlord won't invest in improving HVAC efficiency if utility costs are passed on through rent adjustments.

The specific characteristics of chains and franchises calls for program outreach engage as many market channels as possible. In the case of chains, outreach to A&E firms, distributors, contractors, ESCOs and industry specific equipment vendors are an important part of the effort. Dealing with chains may take program staff out of New Jersey to work with the primary decision makers. Each type of chain account – grocery, convenience, restaurant or car parts –has an applicable set of energy efficiency measures and services. These measures include display lighting, refrigeration – packaged and central plants –, and control strategies. The chains need program partners who take the time to figure out what they need and how to make the business case to get them implemented. In some cases, strategic regional or national coordination with other efficiency program administrators will help to effectively engage regional or national corporate offices of retail chains in energy efficiency improvements in local outlets.

In short, dealing with chains requires the full palette of energy efficiency program initiatives. They should be managed with a focused team, as should the actors in their market channels and industry associations.

SEGMENTS: LEASED OFFICE SPACE

Large office buildings dominate the non-residential, non-industrial load, and the approaches to achieving energy savings within such buildings can be as varied as the types of businesses that occupy them. In leased office space, the two events that most commonly result in tenant energy efficiency improvement opportunities include – tenant changeover or re-lease, and original fit up of unimproved space.

Barriers to Efficiency Upgrades in Leased Office Space: Tenant changeover comes from either a change in business focus of an existing tenant or reconfiguring space for a new tenant. All too often, however, the omnipresent 2 x 4 ceiling grid dictates fixture locations for

lighting and central HVAC systems, removing the individual tenant's ability to influence overall system efficiency. Even when there are opportunities to upgrade efficiency through design changes, the landlord's appetite for investment is directly linked to the amount of net cash flow the space returns. A landlord limited by market rents and hobbled with fixed debt may not have the cash flow to invest in all of the tenant needs and desires.

When presented with the inevitable choice, tenants will usually choose options that meet core business needs – paint, floor coverings, and location – before they push for more efficient – and initially expensive – lights or HVAC equipment. Tenants may not be aware of the occupancy costs of a particular space and even when they are, they may discount the costs believing they can do better than the previous tenant.

Beyond limited awareness or interest, the most pervasive barrier to investment in office buildings (other than buildings occupied by the owner) is the split incentive: a tenant whose rent includes utilities won't care much about leaving lights or computers running all night, and a landlord won't invest in improving HVAC efficiency if utility costs are passed on through rent adjustments, or assumed directly by tenants.

Despite this seemingly daunting challenge, there are solutions.

The first and easiest way to increase the level of efficiency in tenant fit up is to work with upstream markets. By influencing the stocking patterns of distributors and by providing incentives to inventory the more efficient option, whether in HVAC, motors or lighting, the purchaser ends up buying more of the higher efficiency equipment without making a direct choice to do so.

Landlords and tenants can agree to share the costs of the efficiency upgrades through a lease addendum. This addendum, already allowed for in standard BOMA lease contracts, can be drafted to either increase the term or increase the rent to allow the landlord to recover the cost of investment over the term. The landlord can thus recover his costs, and the tenant can achieve a positive cash flow (from reductions in utility charges).

While this sounds simple enough, both customers and building owners need to be sold on the value of a lease addendum. While data suggests that "green" buildings can reduce the time-lag between tenant rollover in half, leading to a significant increase in landlord revenue – only a solid relationship with dedicated sales staff can convince an otherwise reluctant building owner to listen to

NOI BUILDER®: Increasing Office Buildings' Net Operating Income

The NOI Builder® is a tool developed by Pennsylvania-based WinWinWin, Inc.

The tool can be used as part of an energy efficiency effort directed specifically at owners of office buildings. It assesses efficiency options and reports on such issues as:

- *How a lease would allocate the costs and benefits of the proposed upgrade between the owner and the tenant(s).*
- *How other building expenses, vacancy rates, and other factors would affect this allocation.*
- *How the owner's share of savings affects net operating income, and what effect that would have on the building's appraised value.*
- *The project's total return, simple payback period, net present value and internal rate of return, calculated from the owner's perspective.*
- *How changes to vacancy, holding period, capitalization rates, inflation rates, and other factors would influence the owner's financial return.*

The results of this analysis can be a key tool in efforts to convince building owners – and in turn, to have them convince their tenants – to spend the time and effort on a shared-savings lease amendment to enable energy efficiency investments.

the evidence and, ultimately, invest the necessary time and effort to convince their tenants to go along (see insets).

Finally, large office building can also be seen as an aggregation of small businesses, at least from a utility bill standpoint. As such, **direct install options** – the same as those noted elsewhere in this report for small customers – can be applied here as well, though typically at a higher cost than the two previous approaches.

SEGMENTS: DATA CENTERS

Data centers accounted for approximately 1.5% of US electric energy consumption in 2006, with total consumption expected to double by 2011. Technologies and management strategies exist, and are rapidly being developed, to significantly reduce data center energy use.

One of the primary challenges facing efficiency programs is the lack of precise information on the actual number and specific characteristics of this sector. Data centers can range from a server closet conditioned with the building's existing HVAC system to enterprise class server "farmers" covering thousands of square feet with dedicated conditioning and power quality management equipment.* Some customers, like Google or Yahoo, consider their energy use profile competitively sensitive information, electing to keep it private. Some customers may not consider their "server rooms" as data centers, and so do not report, or seek efficiency services for, their energy use. Nonetheless, despite the paucity of data, this sector offers a large opportunity for energy savings, especially as the information economy expands.

New Jersey currently does not have any special initiative targeted at data centers. While utilities have expressed interest in this sector, customers in the market sector are largely unaware that significant cost savings could be achieved through energy efficiency. Our suggested goal for this sector – 35% reduction in overall data center energy usage in three quarters of all data

THE OFFICE OF THE FUTURE

The Office of the Future Consortium brings some of the nation's largest utilities and private companies together in a commitment to finding new ways to address energy efficiency in office spaces.

Energy use under the control of tenants has proven difficult to address, as lease terms and relatively short-term occupancy have created financial and responsibility barriers. In response, Southern California Edison initiated the Office of the Future project in early 2007. Seven other utilities and a number of other companies, governmental agencies and research organizations have since joined the effort.

The "25% Solution" is the initial offering developed by OTF. It is based on improved integration of readily available technologies and best-practice design and operations. A "50% Solution" package is due in 2010.

* For simplicity, we address data centers within the "Large Customers" section. However, some of the strategies indicated are aimed at smaller customers.

centers in the state by 2020 – will require a three-pronged strategy, as outlined below.

- Outreach and Technical Assistance – As with all other large customers, outreach through dedicated account managers ***with knowledge of data center savings opportunities*** is critical to serving this market segment. Outreach can focus on awareness and action by owners, operators, and users of all data center segments to benchmark their facilities, invest in efficient data center equipment, and utilize best practices for energy efficiency. The same team can also provide technical assistance and help clients identify opportunities and access incentives.

- Incentives – Provided to customers for optimization of energy use in new and existing data centers, and to market channel actors for stocking, installing, or manufacturing efficient equipment – financial incentives should be flexible and packaged to maximize cost-effective efficiency improvements while meeting customer financial investment criteria.

- Training – Training on all aspects of data center efficiency will be necessary both for program deliverers (including account managers), as well as third party vendors and design professionals.

Strategies for this sector are best differentiated based on the type and size of data installation. Below are five general categories with specific approaches to each.

- *Server Closets (measure):* Best practices marketing/education/rebates to invest in energy efficient products (power supplies, servers, etc.)

- *Server Rooms (measure bundle):* Use the above strategy plus additional information for HVAC optimization, training of facility personnel on proper cooling methods. Encourage participation in energy benchmarking efforts.

- *Localized Data Centers (measure bundle):* Above strategy plus data center infrastructure audit efforts, accelerate adoption of virtualization upgrade software, decommissioning of comatose servers, provide advanced best practices training for data center owners/operators

- *Mid-tier Data Centers (small to medium building)*: Above strategy plus incentives for CRAC (computer room air conditioners) control system upgrades. Free or cost shared audit of existing facilities. Requirement of energy benchmarking efforts.

- *Enterprise Class Data Centers (large building*): Above strategy plus incentives for high level/detailed design reviews of new data centers.

Institutional barriers, e.g. the split between information technology responsibilities and facility management and operation responsibilities, require that the program address the concerns of a variety of stakeholders. Project enrollment may hinge on the biases and history of non-traditional decision-makers. For this reason, the strategies must be tailored for each specific project and may rely heavily on the relationship marketing and account management.

SEGMENTS: NEW CONSTRUCTION

New construction projects present major opportunities to improve building energy performance at significant cost savings. Tapping these long-term, cost-effective savings and achieving a high level of market participation should be a top priority in meeting the Energy Master Plan Goals. Doing so captures savings *and* builds market readiness for updating the state building energy code to raise energy efficiency requirements for all new construction.

The commercial development process has a number of unique barriers that make it particularly difficult for an efficiency program to capture attention and garner respect in the market. First and foremost, most of the process occurs in an environment that is outside of public view. Decisions to develop particular buildings on particular sites, and subsequent agreements for financing, real estate purchase, design and construction services, and, ultimately, sale or rental are - after all - *private* business. The participants are usually reluctant to reveal that a development is even contemplated; for example, they may not wish to alert potential competitors to their intentions or give local siting opposition time to develop.

Also, the process itself does not proceed along a seamless continuum. Rather, development tends to be a spasmodic process, with flurries of activity followed by periods of dormancy, and more false starts than completions. From all the projects that are proposed, it is often difficult to determine which proposed projects are real, particularly at the earliest conceptual phase, and which are unlikely to materialize.

Yet it is at the conceptual phase - when all plans are fluid - that the greatest potential exists to influence the project in the direction of a comprehensive, integrated energy efficient design. When earth gets moved, the plans have long since been functionally complete, and all attention is on the projected completion and occupancy date. Millions have been borrowed and no revenue is generated to repay these loans until the tenants or owners move in. A change to incorporate efficiency - or any change, for that matter - means delay. And delay costs money.

Within design firms, top barriers to improved energy efficiency in new construction projects include a strong bias towards use of standard, tested designs, meaning designs that are unlikely to incorporate the latest technologies or high performance design practices. The additional time and cost to prepare a new or different design can be formidable relative to reuse of past ones. (Design firm fees are generally fixed at a percentage of total project costs, which discourages the design team from adding unnecessary – and uncompensated – hours of research and design work.) New designs and technologies also add an element of risk in construction management – for example, will increased use of natural daylighting delay or complicate roof construction or limit interior space use options? Unless high performance is incorporated into the earliest design concepts, cost reductions from technology tradeoffs can be difficult to capture (e.g., reduced HVAC equipment due to improved building design). The presence of many perceived competing advanced building standards – LEED, ENERGY STAR,

Green Globe, ASHRAE Advanced Energy Design Guides, and Core Performance – adds further confusion and provides justification for inaction.

Finally, the issue of split incentives is a particular challenge in integrating high energy performance into commercial buildings built in anticipation of future tenants. A builder of a spec building is interested primarily in (a) speed and (b) first cost, as revenue is not generated until tenants occupy the space. Since tenants generally take on responsibility for utility bills – and are unlikely to factor energy efficiency into their own leasing decisions – the builder may see little or no benefit to energy efficient construction.

With these barriers in mind, key elements of the commercial new construction strategy must include:

Add more Feet on the Ground: The current Smart Start program includes key elements (incentives and technical assistance) to drive high performance new construction. However the budget and staff resources are inadequate to reach the large number of program participants necessary to meet Master Plan Goals. A sufficient number of reputable Solution Providers is necessary to identify and then induce into the program a large percentage of the market-driven new construction/renovation projects in the state.

Provide Top-Level Technical Assistance: Organizing a strong resource pool of technical assistance providers – including the best design professionals from the private sector – who can be deployed quickly through their dedicated Smart Start Solutions Provider to address discrete technical assistance needs identified by design teams. It is vital that this "bench" have a reputation for technical expertise that can gain the trust of building owners, developers, and their design professionals, as well as other market actors.

Link Advanced Energy Design to Building Energy Codes: New Jersey can build market readiness for energy code updates by adding to the New Jersey state building energy code a technical appendix providing an optional "advanced commercial building energy code" that sets a common technical standard for above-code programs across the state (e.g., the Smart Start program, minimum requirements for state-funded construction). As is described in the Policy section below (see page 120), this optional advanced code could also serve as a common and technically supported basis for municipalities that choose to adopt tighter minimum energy requirements for new construction permits (though the ability for municipalities to do so may require legislation). Setting a common statewide technical guideline with technical support and training for best practices in high efficiency commercial new construction will help build the design and construction community capacities to make high energy performance a standard practice.

Establish Smart Start as Reputable Resource for High Performance New Construction: Success in achieving a high level of market participation in high performance building design depends on the degree to which dedicated program staff build a credible reputation for technical expertise and trust with the client and other market actors.

By and large, the approach to large new construction is identical to that in the existing building large project segment. **Efficiency is sold by relationships.** The primary difference between the two segments is the opportunity presented by the project. New construction projects offer an opportunity for more thorough efficiency application – the sooner the

engagement with the project owner or the owner's design team, the greater the opportunity. A new building in the concept stage retains 100% of its potential to maximize efficiency. Through comprehensive design and technical assistance, assistance with financing strategies, and focus on the performance requirements of the client, energy savings can be maximized through linkage with other customer needs. For example, a high performance lighting scheme may save kWh, but from the customer's perspective the fact that their product looks better, and sells faster, or that the building occupants are happier and more productive, can be the determining factor. The new construction program approach uses a more comprehensive Energy Efficiency Solution Provider approach described in the section dealing with existing buildings.

SMALL CUSTOMERS: A DIRECT APPROACH FOR GUARANTEED RESULTS

VISION AND GOALS

For the small customer segment, the vision for New Jersey is to "**to provide turnkey energy efficiency retrofit services that are 'too good to pass up' for a majority of small businesses and government departments in the Garden State, and to simultaneously transform new construction practices in this market."**

With that vision in mind, achieving the Energy Master Plan target will require that efforts **"achieve, by 2020, 30% energy savings on average in two out of three existing small business and government buildings, and 35% energy savings above code in half of all small new construction."**

INTRODUCTION

Programs focused on market-driven opportunities have the potential to permanently transform markets, thereby ensuring the capture of durable and widespread savings at relatively low cost. However, **the vast majority of current and near-future electric consumption and savings potential is to be found in existing buildings and equipment.** While some small commercial facilities are regularly renovated or remodelled, most are not. Most remodels are performed for cosmetic or functional reasons, and often leave much of the worst energy consuming equipment in place. The efficiency of in-place mechanical and electrical equipment is often substantially below not only new high efficiency equipment, but also new standard equipment, increasing the opportunity for savings in these situations. In these facilities, lighting opportunities offer the vast majority of savings potential, followed at a distant second by refrigeration measures.

Numerous intractable barriers prevent most small business customers from pursuing energy efficiency on their own. These barriers — including limited access to capital and an inability to devote the necessary time and expertise to identify opportunities and manage installations — often prevent participation in utility programs geared toward larger or more generalized B&G markets. Because smaller customers generally face high transaction costs for efficiency projects and limited savings potential, they are not targeted by most energy service companies either. Small commercial establishments individually have small loads, but in aggregate they represent a significant untapped savings opportunity. Although efficiency services will almost invariably improve a small business's bottom-line, they are often neglected due to the myriad barriers customers face.

GAPS: FROM A LIMITED PILOT TO AN AGGRESSIVE STRATEGY

New Jersey does not provide energy efficiency services customized to meet the needs of the small business sector. Thankfully, utilities plan on launching a pilot project to test the value of a direct install approach. As we will see below, this approach is critical to achieving cost effective savings, although the size threshold proposed for the pilot – 100 kW – will limit the extent of savings (many programs consider businesses with double that demand as "small").

DIRECT INSTALL FOR EXISTING SMALL BUSINESSES

Below we focus on small customers other than chains, such as single store retail, restaurant, and office. (We discuss franchise chains, and the landlord side of the tenant-landlord relationship, elsewhere in this report). In many ways the tenant-occupied small commercial market is the flip side of parts of the large customer market: for each developer or multi-tenant building in the large building market, there are the tenants who are typically small customers.

A Small Business Program typically targets discretionary retrofit opportunities among small business customers under 200 kW, across the entire state – including existing small commercial and industrial facilities. It should identify cost-effective retrofit efficiency opportunities and provide direct installation, financial incentives, and other strategies to encourage the early replacement of inefficient equipment with high efficiency alternatives. Targeted end-uses include lighting, refrigeration and HVAC. Where appropriate, retrofitting multiple and interacting end-uses should be coordinated to ensure optimal system design (e.g., resizing and replacement of cooling equipment at the time of a comprehensive lighting replacement). The program should offer customers a simple, turnkey service for key measures including lighting, HVAC and refrigeration.

The most commonly applicable measures include:

- High efficiency lighting (e.g., linear and compact fluorescent, metal halide track, and solid-state lighting)
- Lighting controls (e.g., photocells, timers, occupancy sensors)
- HVAC and refrigeration controls (e.g. timers, temperature setbacks, anti-condensate humidistats)
- HVAC system efficiency improvements (e.g. improved refrigerant charge, optimized airflow, cleaning, and distribution system repair).
- Early replacement of old, inefficient air conditioners with new, high efficiency, optimally sized units.
- Low cost service water heating measures (e.g., tank and pipe insulation).

Many non-lighting measures are site-specific, and require more detailed analysis and/or more customized installation services.

The program should offer a comprehensive menu of service to achieve savings in these end-uses, including:

- **Design and Analysis Service.** The program should provide on-site customized design and analysis of cost-effective retrofit opportunities. Services include: identifying possible energy efficiency opportunities; estimating associated costs and savings; analyzing the economics of measures from both the customer's and society's perspectives; and presenting a proposed package of measures and related economics to the customer in a clear and concise way to facilitate decision-making.

- **Direct Installation.** For those savings opportunities that are commonly applicable, and do not require extensive customized analysis, equipment inventory, or unique skills, the program contractor(s) should directly install the measures. These measures will generally include lighting, as well as some HVAC (e.g., replacements, system tune-ups), and refrigeration control measures.

- **Contractor Arranging.** If comprehensive opportunities in addition to those directly installed appear likely to be cost effective, the program contractor should arrange for more detailed analysis, and both coordinate and manage the installation work. Services include: developing bid specifications, soliciting bids, procuring contractors, managing the contractor installation, and ensuring all equipment is operating as intended. The program administrator should rely on a stable of pre-approved contractors selected under competitive bid for equipment purchase and installation of custom measures.

- **Financial Services.** The program should provide a package of financial incentives to encourage customer participation including an up-front cash incentive of 100% of the total cost of the direct install portion of the project. For follow-up measures the program should provide the customer with both incentives and low or no interest financing on the balance of project costs. To the extent possible, the combination of incentives and low-cost financing should allow for immediate positive cash flow. Financing approvals should be streamlined, with payments provided on-the-bill where practicable.

This strategy has a long history of success throughout the United States, and can be ramped up or down more easily than many other programs.

A contractor installs efficient, electronic T5 lights.

"LIGHTING PLUS" Vermont's Direct Install Program

Efficiency Vermont's direct install program, Lighting Plus, completed more than 1,000 lighting retrofit projects for medium-sized commercial customers in its first year.

The program is completely outsourced to a single vendor, who provides efficiency assessments, garners customer sign off, and then reaches out to local electricians and HVAC contractors for installation of measures based on their unit pricing. Some 95% of customers accept the program's offers.

Energy savings generated from the first round of completed projects were almost exactly equal to the pre-launch estimates.

SMALL BUSINESS NEW CONSTRUCTION

One of the greatest challenges for energy efficiency programs is to achieve comprehensive energy savings in the small-to-medium commercial new construction market. This market represents a significant "lost opportunity," accounting for substantial portions of both new floorspace and new construction projects.

There are two ways to think about small to medium new construction projects: that they are designed and built by small customers or that they are built by large companies for small customers. New buildings built for small customers present a classic conundrum: they do not warrant account management at the level of large customers, but the aggregated number of their projects represents a significant opportunity. To the extent they come to the existing efficiency programs for design and technical assistance, they can be handled by program staff. However, unless the account manager has developed a strong relationship with the design firms that cater to buildings in this size range, their planning and development may be invisible to the marketplace. The intent to build may first appear through a load letter or through a municipal building office or planning board application, and the design process may be all but complete at that point. Because these buildings may be simple or even pre-manufactured, they can pop up quickly and unnoticed.

New Jersey's current new construction program provides a limited approach to the market. The level of outreach should be increased. Smaller contractors in a variety of trades are given cursory attention, but to transform the market, program outreach must intensify to include other influential market actors, such as local planning officials, design firms operating in the small buildings market, design/build firms, local economic development associations and others.

WORK UPSTREAM TO TRANSFORM PRODUCT AVAILABILITY

The first and easiest way to influence smaller customers is to work in upstream markets so that energy efficient products are stocked and sold. New Jersey's current new construction program provides a comprehensive list of prescriptive technologies and technical assistance that should be continued under any program scenario. These technologies and services are applicable to new construction, and provide some limited (seldom comprehensive) savings where the opportunity to more directly address design does not exist or has been missed. That said, however, this service *does not address* the need to deepen penetration rates for smaller customers. One relatively simple fix is to move some incentives – such as those for high performance T8 lighting products (so-called "super T8" technology) upstream to the distributor level, and cover essentially the full incremental cost between conventional T8s and super T8s. By removing the price barrier at the distributor level (and working with the distributor to this end), the program could ensure that distributors cease to stock "old" T8s. The end-use customer doesn't have to deliberately choose high performance T-8 systems for the savings to accrue.

For this class of customers a simple, easy to follow list of efficient design criteria can be the best approach. If program outreach and marketing is done correctly, interaction provided by any of the multiple market actors the builder may encounter can influence efficiency levels. Individual trades-people, vendors and distributors do not always have the whole picture. This is where a design guide or criteria applicable to many building comes into play.

WORK DOWNSTREAM WITH NBI'S "CORE PERFORMANCE" SPECIFICATIONS

Prescriptive incentives apply to a limited range of technologies, at most achieving effective lighting design or improved HVAC equipment efficiency but overlooking controls or system interactions. One reason is that energy modeling is cost-prohibitive for smaller projects. Another is that designers lack the time or incentive to determine and hit "high performance" targets on each project and satisfy administrative requirements for unpredictable incentive offers.

New Buildings Institute's (NBI) Core Performance program provides an opportunity for New Jersey to establish a prescriptive approach to comprehensive savings in this market. Core Performance sets national prescriptive design targets for building envelope, lighting, HVAC, power systems, and controls which have been shown to achieve, through extensive energy modeling, energy savings of 20 to 30 percent over ASHRAE 90.1-2004 - the current basis for New Jersey's commercial energy code.

Nationally, the small commercial construction market accounts for a significant amount of floor space and energy consumption, but relatively limited energy savings opportunity per project. For the Mid-Atlantic census region, Energy Information Administration (EIA) data suggests that buildings less than 50,000 ft^2 account for nearly 40% of all commercial building floor space, but over 90% of the number of commercial buildings. Any aggressive commercial new construction program must obtain comprehensive energy savings in the small buildings submarket.

Because small commercial projects yield a much lower level of savings than that of larger facilities, low-cost, high volume programmatic strategies (such as prescriptive incentives), possibly combined with limited outreach, are typically employed to reach this submarket. Unfortunately, prescriptive incentives often fail to address the full breadth of opportunities and lack the integrated

new buildings INSTITUTE

"CORE PERFORMANCE" A Simplified Approach for Small to Medium New Buildings

The Core Performance program was developed by the New Buildings Institute (NBI) as a streamlined approach to achieve predictable energy savings in small-to-medium commercial new construction buildings.

A successor to Advanced Buildings Benchmark, the Core Performance Guide presents a concise set of energy efficiency measures that have been proven cost-effective through extensive energy modeling.

Using DOE-2 based modeling software, NBI identified a core set of 20 criteria that, when properly implemented, yield an estimated savings of 20 to 30 percent over ASHRAE 90.1-2004. These criteria are subdivided into "Design Process Strategies" and "Core Performance Requirements". The Design Process Strategies section describes the required steps for ensuring an integrated design process, while the Core Performance Requirements section outlines the specific efficiency measures required to reach the savings targets of the program.

approach necessary to attain a high level of savings in small facilities.

The benefit of using a streamlined, prescriptive program such as Core Performance is that the framework for achieving efficiency improvements is well-established. NBI developed Core Performance as a "state-of-the-shelf" program, meaning that all the promoted efficiency measures are readily available in the marketplace or represent established "best-practices". The program presents efficiency requirements in a format similar to New Jersey's current energy code, facilitating improvements with minimal necessary design work. This greatly reduces the burden on architects and engineers to research and evaluate alternatives – a major benefit considering the shorter design and construction timeframes on smaller projects.

Because the program specifications lead to predictable energy savings, financial incentives can be offered on a prescriptive basis. From a program management standpoint, this ensures that cost of saved energy will remain predictable. From the perspective of design professionals, prescriptive incentives represent a clear selling-point that can be proposed to new building owners at the outset of a new construction project.

Implementing the Core Performance program in New Jersey will require the development of a competent staff capable of working with design professionals to assist them through each step of the program. Staff will need to share and review the requirements of the Core Performance program with members of the design team, review the proposed designs for adherence to the Core Performance requirements, and answer any questions about "gray areas" in interpretations. Program staff should also verify installation according to the Core Performance requirements at the completion of each project.

Additionally, a comprehensive outreach effort will be required to ensure that New Jersey's design professionals are both aware of the program's existence and able to convey the program benefits to building owners.

Ultimately, the ideal approach to small commercial new construction is through an aggressive, enhanced building code. As such, initiating the Core Performance program in New Jersey should be considered only to the extent that code could not be expected to match the program's requirements. If that were to be the case, the Core Performance would be an ideal way to address the needs of the relatively untapped commercial new construction market. By eliminating the need for costly and time-consuming energy modeling, reducing the dependence of program performance on technical assistance contractors, and offering a clear incentive package from the outset of a project, the Core Performance program has the potential to make a significant contribution toward realizing New Jersey's overall energy savings goals.

INDUSTRY: ADDING TECHNICAL EXPERTISE TO THE VALUE PROPOSITION

VISION AND GOALS

Our vision for industry resembles that of other large business customers – we envision "**transforming energy efficiency opportunities into an irrefutable value proposition through customized outreach, sales, technical, and financial assistance, and to lock in and further advance those savings through continuous improvements in codes and standards."**

With that vision in mind, achieving the Energy Master Plan target will require that efforts **"achieve a 10% reduction in overall industrial energy usage in 50% of New Jersey facilities by 2020."**

MARKET

Industry shares many of the same end uses as the commercial sector – lighting, HVAC, computer and plug loads --but these typical uses constitute only a fraction of the industrial savings potential. The dominant load in industry is process.

Process loads are as varied as New Jersey's industries, and take the form of a variety of energy intensive end uses from the heating and cooling needs of hydraulic metal stamping processes to melting and releasing processes in injection moulding. The opportunities are very individualized – or "custom". In most cases production needs can be met more efficiently, but the customer must be convinced that the advisor knows not just energy, but their business and their unique drivers as well. Any presentation must be well informed and data driven. A company producing jet engine rotors for a Department of Defense contractor will not entertain process changes without intense review and vetting of suggested changes. And the party that must be convinced is not the energy manager, but rather the production manager. Industry specific engineering expertise is not typically part of a utility program skill set, but must be acquired to achieve the significant savings from the industrial sector.

Industrial energy efficiency is driven by technical expertise, but as in the commercial and government sector, relationships are critical. The trust established by providing value over an extended period of time is the "means" to the efficiency "end". Each industry tends to turn to turn a small circle of technical experts who have found a market niche specializing in that industry. Experience in other jurisdictions indicates that it may take years to prove to industrial customers that efficiency outreach staff are capable of providing trustworthy advice on process improvements. It usually takes several non-process related efficiency

projects at an industrial facility before the customer is willing to take the next, and riskier, step and discuss process changes.

GAPS: RELATIONSHIPS ARE (STILL) KEY

The same gap we have described in other sectors applies directly to the industrial market – account management. The current program offerings are not designed to gain deep participation from New Jersey's industrial customers.

New Jersey's program promotes prescriptive and custom incentives for efficient drives and motors and the same lighting and HVAC measures as for commercial buildings. There is a wide range of process and other opportunities overlooked, dedicated process cooling and heating, process heat recovery, commissioning and retro-commissioning, and industry specific measure such as efficiency paper pulping blades, ultraviolet food processing, and others too numerous to list. While the customer may be able to characterize a custom measure, the burden is on them to contact the program to understand how their measure could receive an incentive. The entire burden of project development and application preparation falls on them. This process runs aground against the customer's barriers of lack of time, lack of information, and first cost bias.

And again, the gap here is a program design aimed at the lost opportunity market. We repeat our earlier observation: this is an appropriate strategy for limited program budgets, but it reduces the industrial market participation in the program. ***Proactive customer recruitment, project development and management on the customer's behalf are an essential component of a successful program plan.***

A final gap for the large industrials has been program budget caps and the limits of program staff expertise. Industrial customers have the potential for very large projects. The existing program's incentives, technical expertise, and project spending caps are all directed to managing a commercial sector based program, and offer little benefit to large projects. Furthermore, an integrated offering of technical process reviews, investment grade audits, and potential financing schemes are currently beyond the scope of the existing program.

INDUSTRY
A Wealth of Efficiency Opportunities

Some 27% of New Jersey's non-transportation energy is consumed by in industry. Key industrial market segments, ranked by size, include:

- *Chemical*
- *Plastics & Rubber*
- *Food & Beverage Products*
- *Computers & Electronics*
- *Metal Fabrication*
- *Printing*
- *Machinery Manufacturing*
- *Papermaking*
- *Mineral Products*

Meanwhile, key growth areas in the state include computers and electronics, biotech, pharmaceuticals and data processing.

INDUSTRIAL STRATEGY

We previously described the account management strategy (see page 89 and beyond) that is designed to transform the energy efficiency effort from a reactive to a proactive, relationship-driven approach. Broadly speaking, that strategy applies equally well to industrial customers.

That said, industrial companies may have a more intense (and often more skeptical) decision making process than other large customers. Since process improvements are the major opportunity to save energy in the sector, process expertise (on call from the best available in the private sector) must be the indispensable cornerstone of industrial efficiency program delivery. Successful outreach to this sector requires industry savvy account managers supported by process and industry experts.

The key to the successful efficiency team for industrial customers is the combination of experts who, for example, can address the process concerns of the biotech industry as well as cutting edge lighting measures for the individual biotech plant. The team's collective knowledge of best practices and previous successes is the foundation upon which the customer will base their trust to undertaking efficiency improvements in the critical process related equipment that are at the heart of what they do as a business. Once the trust barrier is surmounted, the program must have the wherewithal to provide incentives that truly overcome the barriers to investment – program budgets that do not discriminate against large projects.

A successful industrial sector program should supplement its relationship marketing through the development of industry specific upgrade packages with flexible ROI- or cash flow-based incentives, partnering with productivity consultants, and facility manager training and certification in process productivity and energy throughput.

Ultimately, the industry approach is no different than that for large business and government customers: it requires deep relationship building (and maintaining), value-added expertise and technical knowledge of specific industry needs, and an ability to customize incentives, within cost-effectiveness bounds, to make the economic case based on each customer's needs and context.

focus on energy

WISCONSIN INDUSTRIAL ENERGY BEST PRACTICE GUIDEBOOKS

*To engage industry to undertake energy efficiency improvements, the **Wisconsin Focus on Energy** uses energy advisors to guide the development of projects – many of them on a customized basis. To assist, **Focus on Energy** offers "Energy Best Practice Guidebooks" for various industries throughout Wisconsin.*

The guidebooks provide industry-specific information on topics such as energy use and baselines, energy benchmarks relative to similar industries in Wisconsin, examples of best practices to increase energy performance, and relevant technical information and resource links.

Topics include:

- ***Dairy Processing Industry***
- ***Metalcasting Industry***
- ***Plastics Industry***
- ***Water & Wastewater Industry***
- ***Pulp & Paper Industry***

For more information, see http://www.focusonenergy.com/Business/Industrial-Business/Guidebooks/default.aspx.

POLICIES: CEMENTING GAINS THROUGH CODES, STANDARDS AND TAXES

INTRODUCTION

The State of New Jersey can and must play a key role in helping to achieve the Energy Master Plan goals. Through mandatory energy performance disclosure and upgrades, through tax policies, through smart building energy codes and appliance standards, and by facilitating innovative financing, the state has all the tools at its disposal to contribute significantly to EMP's success.

MANDATORY ENERGY PERFORMANCE DISCLOSURE AND UPGRADES

With the idea that you "can manage only what you can measure", the ENERGY STAR program established in 1999 a benchmarking tool to rate the overall energy performance of commercial buildings and selected industrial applications compared to similar facility types and uses. Ratings are informed by facility energy use (i.e., 12-months of actual energy bills with information about occupancy, energy uses, etc.). Buildings with energy performance ratings in the top 25% earn the ENERGY STAR label.

The ENERGY STAR building rating establishes a benchmark that building managers can track over time to help attain or maintain building energy performance levels. For those with multiple facilities, building energy ratings can help set priorities for investments to increase energy efficiency. Energy ratings offer a particular value to prospective investors in commercial properties concerned to know a facility's overall energy performance and likely cost to operate.

Currently, sixty-nine buildings in New Jersey have the ENERGY STAR label – the majority of them offices followed by hotels and supermarkets. Nationally nearly 5,900 buildings have earned the ENERGY STAR label. Many more have been rated but not earned the label.

TIME OF SALE BUILDING ENERGY RATINGS

With the ENERGY STAR Building rating program well established, policymakers in California and the District of Columbia each passed 2008 legislation requiring that all commercial buildings receive an ENERGY STAR building energy rating. The District's law requires that federal buildings be rated first – then private sector. The California law requires building energy rating at the time of a transaction (lease or sale) beginning in 2010. To build market

capacities, the law requires that in 2009 California's utilities make billing and energy consumption data available to building owners in a format easily downloaded into the EPA's ENERGY STAR tool. **To meet the Energy Master Plan goals, we recommend that New Jersey follow suit.** While building energy ratings can be provided at the time of energy efficiency program services (some ESCos routinely provide this), requiring a building energy rating at the time of sale or lease helps to create a market value for building energy performance.

The State's proposal to include ENERGY STAR Building Ratings for state building in the On-Line Energy Tracking System (ETS) proposed in the Energy Master Plan will contribute to the development of the state's building energy rating infrastructure, enabling it to support an energy rating disclosure requirement for all buildings. Under the economy-wide disclosure system, ratings could be required during the building audit process or at other key moments prior to sale.

"Bills that require benchmarking and disclosure of energy efficiency are market transformative for the real estate industry. They lay the groundwork for the industry to place higher values on high performance buildings.

…It's like walking into an auto dealership and seeing a car's miles per gallon rating."

- Stuart Brodsky
Sustainability Leader for GE Real Estate's Americas' Equity unit.

Global Real Estate Monitor, November 2008.

TIME OF SALE BUILDING ENERGY PERFORMANCE REQUIREMENTS

To engage 60% of New Jersey's standing stock of business and government buildings to achieve at least a 30% improvement in energy performance, eventual mandatory minimum building energy performance requirements for existing buildings may be necessary. Once the practice of Building Energy Rating has been well established and the market infrastructure has been well developed to deliver cost-effective building energy upgrades, we recommend that New Jersey policymakers require that commercial buildings sold or leased meet minimum building energy performance requirements (i.e., a building energy code for existing buildings). The State could begin by first requiring all State business and institutional facilities meet a minimum building energy performance level by a date certain (e.g., 2015).

SMART BUILDING ENERGY CODES

Adopting and effectively implementing state building energy codes and beyond-code building standards represents one of the most cost-effective ways of reducing building energy consumption in new construction and substantial building renovation, including building additions. Progressively stronger building energy codes will lead to continual improvements in building practices such that by 2030, "micro-load" or "net-zero" energy buildings should comprise the majority of new construction.

Regular Code Updates: The State should regularly update the building energy code to reflect the most recent editions of the national model codes or better to increase efficiency levels by thirty percent by 2011 and fifty percent by 2016. It should also adopt an Informative Appendix as part of the state code to provide "above" code guidance to inform incentives policies, municipal desires for advanced, above-code building regulations and government "leading by example" policies. These code developments should specifically address the roles of building-sited renewable energy and combined heat and power to work towards and help build the market infrastructure to provide net zero energy as the building energy performance standard by 2030.

Special Inspectors: As the state's commercial energy code becomes more complex (more systems vs. technology based), the state should establish special inspector certification for building energy inspections to address the energy features of permitted projects.

Efficiency Program Support: As in other regions of the United States, New Jersey's gas and electric utilities, as the energy efficiency program administrators, can play an important role in support of building energy code development and implementation by:

- **Conducting or funding research and analyses** that contributes to the ongoing development of advanced energy code requirements applicable to the State and which can be used as the technical basis for the commercial new construction program. For example, the technical requirements of the commercial new construction program offered by the New Jersey Energy Efficiency Utility that includes cost-effective efficiency beyond minimum code requirements (e.g., Core Performance) can serve as the basis for or inform the development of Informative Appendix – as was recently adopted by Massachusetts.
- **Sponsoring technical training and support** for the design and construction community to meet and exceed the building energy code to build high performance buildings
- **Serving as technical advisors** to the States energy code update and adoption process to provide expertise and analyses

Ultimately, state codes could be one of the most significant factors in the success of the Energy Master Plan's goals.

APPLIANCE STANDARDS

Continuing the States' leadership to set state appliance standards, many of which supported several new federal standards adopted in the National Energy Independence and Security Act of 2007, New Jersey's policymakers should continue to look for new opportunities to set state appliance standards. As in recent years, coordination with other states to create consistent requirements helps to ease implementation (as well as build support for federal standards).

In addition, as the US Department of Energy continues to ramp up its program and schedule to set or update a wide range of appliance standards, New Jersey should take a active role by providing comments in standard-setting proceedings and otherwise working to encourage adoption of the most efficient, cost-effective federal standards that meet the State's need for increased energy efficiency. Several of the scheduled standard setting proceedings can significantly assist New Jersey to meet the Energy Master Plan Goals and increase business and government building efficiency (e.g., lighting, commercial refrigeration, vending machines, battery charges, external power supplies). See http://www1.eere.energy.gov/buildings/appliance_standards/schedule_setting.html for more information.

TAX POLICY: TARGETED DEDUCTIONS AND CREDITS

Tax deductions or tax credits have been used to promote investment in renewable energy and energy efficiency. While they can play a role to help engage business investment in energy efficiency, ***tax deductions and credits by themselves will not overcome barriers to comprehensive building energy efficiency***. Rather they can serve as a tool in a package with other essential services and incentives designed to overcome the range of barriers to energy efficiency investments. Such deductions and credits should be adopted with caution, however, as it may be difficult to gauge budgetary impacts or secure data to assess the associated energy savings.

State Tax Credits: Several states provide tax credits for energy efficiency investments in commercial buildings or multi-family properties - including Oregon, Maryland, Montana, and Kentucky. Of these, Oregon's is the oldest and most successful (see sidebar).

OREGON'S BUSINESS ENERGY TAX CREDIT 15,000 credits since 1980

Oregon's Business Energy Tax credit is 35 percent of eligible project costs (the incremental cost of the system or equipment that is beyond standard practice), taken over five years: 10 percent in the first and second years and 5 percent each year thereafter. If a recipient can't take the full tax credit each year, it can be carried forward up to eight years. Those with eligible project costs of $20,000 or less may take the tax credit in one year. Credits are also transferable.

The success of the Oregon program is grounded in two elements: the Oregon Department of Energy (not the taxing authority) administers the program, and all credit applications must be preapproved based on Oregon DOE's thorough technical review prior to approval.

For more information, visit http://www.oregon.gov/ENERGY/CONS/BUS/BETC.shtml.

Sales Tax Exemptions: Several states, Florida, Georgia, and Texas are among them, have provided limited "sales tax holidays" for purchase of energy efficient (usually defined as ENERGY STAR labeled) products. Time limits are important as tax exemptions are the least controllable in terms of budget impact. And analyses typically show that point-of-sale product incentives are far more cost-effective and offer more stability to build market demand.

Property Tax Exemptions: State property tax incentives are more frequently available than any other type of tax incentives for renewable energy, and they are sometimes applied to efficiency investments as well. Tax incentives range from straightforward local property exemptions for renewable energy systems, to special assessment for property with value-added by a renewable energy source or efficiency upgrades.

FACILITATING INNOVATIVE FINANCING

At the state level, government can facilitate the provision of financing. While not a panacea, financing can complement the host of other market strategies to provide a package that encourages business and government investments in energy efficiency.

Strategies to facilitate appropriate energy efficiency financing for business and government resemble those discussed previously for homeowners, and include:

Establishing a secured, wholesale energy efficiency loan fund: Using private capital guaranteed by the state government, the fund could lend to utilities, municipalities and, possibly, contractors and equipment vendors. Being secured, the fund could offer attractive wholesale interest rates, which retail lenders (utilities, towns and others) could then buy down further as part of their own efforts to encourage energy efficiency. Funds could be allocated competitively by asking these "retailers" to bid for shares of the capital, based on the extent to which they intend on providing additional value-added (interest buy-downs, aggressive marketing, etc.) and on their leverage to minimize defaults. This approach extends the opportunities associated with utility financing (on-bill or otherwise) to a broader array of market players and, as such, to a broader array of energy efficiency opportunities.

Establish a dedicated energy efficiency deposit fund. New Jersey's state agencies can choose to direct their financial transactions to a local bank that in turn uses the deposits exclusively to fund energy improvements. The state agency gets a guaranteed return on its deposits (similar to investing in a CD or bond elsewhere), but is able to use its funds to leverage energy investments, while keeping their money in the local economy.

We encourage the state to begin immediately investigating these options with a view to launching a relevant strategy by early 2010.

IMPLEMENTATION: AN OVERVIEW

The table below provides an overview of the various strategies proposed and the timetable for their implementation.

Legend for "Key Segments": *SC = Small commercial. TI = Tenant improvement. PB = Public buildings. LC = Large commercial. C/F = Chains and franchises. Ind = Industrials.*

MARKET: BUSINESS AND GOVERNMENT Goals:											
Strategies	Key Segments						Ownership	Partners	Implementation		
	SC	TI	PB	LC	C/F	Ind			2009-2010	2011-2015	2016-2020
Small commercial direct install							NJEE utility , implemented through competitively selected contractors	Landlord Associations, chambers of commerce, local gov'ts. neighborhood associations, SBA, distributors, etc.	As soon as possible; can generally be implemented in phases, starting in 6 months	Continued	Continued
Large commercial tenant improvement program							NJEE Utility Through in-house or contracted outreach staff	Tenant fit up contractor community, property owners and managers, realtors, chambers of commerce, property owners associations, BOMA, space design firms and architects	Implement as part of account management outreach strategy, train and develop technical resources, pilots	Full implementation as program initiative	Continue
Public buildings support program							NJEE Utility Through in-house or contracted outreach staff	State and local government agencies, Gov's Office, New Jersey Municipal Management Assoc.,	Finalize more aggressive program design, assign outreach staff, train and develop technical resources	Increase penetration	Continue

MARKET: BUSINESS AND GOVERNMENT Goals:												
	Strategies	Key Segments						Ownership	Partners	Implementation		
		SC	TI	PB	LC	C/F	Ind			2009-2010	2011-2015	2016-2020
	Public buildings turnkey direct install							NJEE utility implemented through solicitation (can be part of SBDI), ESCos	ESCOs, State and local government agencies, Gov's Office, New Jersey Municipal Management Assoc.,	As soon as possible; can generally be implemented in phases, starting in 6 months	Continued	Continued
	Large commercial custom incentives							ENJE Utility Through in-house or contracted outreach staff	Associations represented in top ten customer classes, A&E, and designer community, ESCos	Redesign current outreach strategy, implement as soon as possible	Continue ramp up	Continue
	Chains/franchises custom							NJEE Utility Through in-house or contracted outreach staff	Franchisors, Franchisee associations, equipment vender, contractors, and, in partnership with other programs, nat'l chain HQs	Redesign current outreach strategy, implement as soon as possible	Continue ramp up	Continue
POLICIES	**Time of lease consumption disclosure and upgrade legislation**							Governor's Office,	DCA, NJEE Utility,	Develop and implement time of sale energy rating legislation	Implement	Increase to time of sale minimum energy improvement requirement
	Tax increment financing							Governor's Office	Chambers of commerce, Municipal Management Assoc.,	Select potential pilot sites Conduct pilot	Use pilot results to refine design. Implement in applicable areas	Continue
	Building code							DCA, Governor's Office	Utilities, municipalities, NEEP, CEE, ASHRAE, AIA, NBI	Set baseline, Introduce legislation	Reflect new code in incentive designs	Continue

MARKET: BUSINESS AND GOVERNMENT

Goals:

Strategies	Key Segments						Ownership	Partners	Implementation		
	SC	TI	PB	LC	C/F	Ind			2009-2010	2011-2015	2016-2020
Equipment standards							Governor's Office	Utilities, municipalities, NEEP, CEE, ASHRAE, AIA, NBI	Continue and augment present efforts	Continue and augment present efforts	Continue and augment present efforts
Metering systems							Electric and gas utilities, BPU	NJEE Utility, other utilities, NARUC, APPA, EPRI	Develop TOU rates	Implement rates as meters are installed	Continue
Tax deductions							DCA, Governor's Office, Federal Gov.	EE Utility, EPA, USGBC, AWEA, Municipal Management Assoc.	Build tax deduction calculator, Implement calculation as part of project financial analysis	Continue	Continue
State procurement							DCA, Gov. Office, NJ Director of Energy Savings	NJEE Utility, Utilities, CEE, NEEP	Continue current NJ Office of Energy Savings approach	Continue	Continue
Facility manager training and certification							EE Utility	BOMA, technical centers, colleges and universities –Rutgers, NJIT	Continue and expand current effort	Continue	Continue
External lighting regulations (standards)							Governor's Office	Utilities, APPA, EPRI, NEEP, CEE	Implement exterior lighting initiative reflecting regulation	Continue	Continue

CROSS-CUTTING STRATEGIES

Clean, distributed generation is poised to play a significant role in achieving the EMP goals. Other strategies will also support the overall effort.

POWER FROM BUILDINGS: CLEAN, DISTRIBUTED GENERATION

VISION AND GOALS

By 2020, we envision that ***New Jersey's building infrastructure, including homes, businesses, institutions and industries, will become a significant source of power, while helping the state reduce emissions and reach greenhouse gas targets***.

With that vision in mind, we believe a realistic goal to **"*generate more than 14,000 GWh and 1,500 MW of distributed, clean power generation by 2020*."**

INTRODUCTION: THE EMERGENCE OF ON-SITE CLEAN POWER

A rapidly growing confluence of economic, technical and financial factors is contributing to the emergence of on-site distributed generation (solar photovoltaics, or "PV", wind, biomass and cogeneration) as a significant strategic resource for energy planning. This section provides an overview of how renewable distributed generation, combined heat and power, and smart grid technologies can make large contributions towards New Jersey's Energy Master Plan and Renewable Portfolio Standard goals and targets. The overarching strategy is to ***enable customers to use on-site resources – in many cases renewable resources – to generate power and thermal energy***. This development is essential to achieve the recommended goal of working towards net zero and micro-load homes as the majority of new construction by 2020 and for buildings by 2030.

In the coming decade, buildings, through on-site distributed generation and combined heat and power can provide more than 10,000 GWh or more than 12% of total power requirements. This will be possible through the use of on-site renewable generation, efficient combined heat and power systems, and a smart grid infrastructure that enables distributed resources to be optimally integrated with the distribution and transmission system

With well designed policy and market support, on-site generation, using solar, wind and biomass resources can provide ***favourable customer financial returns while providing significant system benefits***. Combined heat and power systems, using renewable or non-renewable fuels typically operate at 1.5 to 2 times the overall efficiency of conventional boilers and power delivery systems. Smart grid infrastructure can help reduce peak loads and allow distributed resources to be safely, economically, and reliably integrated into broader electric networks.

New Jersey has an established track record, and has been a leader in renewable distributed generation, and particularly in the photovoltaic market, over 8 years now. This progress has been based on a strong policy foundation – state-wide net metering and interconnection rules, an aggressive renewable portfolio standard with solar set aside – combined with support through the New Jersey's Clean Energy Programs. These policies and program assets have leveraged industry and customer participation and investments making New Jersey the second largest market for photovoltaic systems in the United States.

In the coming decade, New Jersey's early achievements provide a spring-board for deeper accomplishments based on continued growth in PV and rapid expansion in other distributed generation and combined heat and power market segments.

OPPORTUNITIES

The exact mix of electric power New Jersey attains from buildings through on-site generation will evolve as rapidly growing and dynamic markets and technical advances occur across a broad spectrum of industries.

Combined heat and power technologies utilize heat produced during on-site electric generation, taking advantage of a resource that is often "wasted" when power is produced at a central station. By locating power generation equipment on-site, where there is a well matched thermal load the overall efficiency of delivered energy services can be significantly increased. CHP applications range from large industrial applications, health care, education, multi-family housing, institutional, to smaller scale commercial applications (such as food processing and restaurants). Micro CHP systems are being developed that may also make residential applications feasible and cost effective.

On-site bio power generation uses sustainable biomass feed-stocks and a variety of conversion technologies, including direct combustion, gasification, anaerobic digestion, and CHP to produce on-site power. In New Jersey, high potential markets include waste water treatment facilities, food processing, institutions, and other industries with high levels of organic feedstock flows (including wood or paper processing industries). Central plants, that draw biomass feed-stocks from a wider territory, can also be economically developed and will contribute to the overall Energy Master Plan objectives of 900 MW of bio fuels and biomass based generation by 2020.

Photovoltaic systems convert sunlight to electricity. New Jersey has been the second largest market in the United States market growth as the industry has grown rapidly with compound annual growth of 30% to 50+% over the last decade. This rapid growth is expected to be maintained and even accelerate during the next decade, as production capacity and economies of scale continue to produce cost reductions throughout the value chain.

On-site solar-PV generation is modular, can be rapidly deployed, and is well matched to applications ranging from small residential systems on the scale of a couple kW to large rooftop or ground mounted systems of 1+ MW. Combined with deep efficiency savings on-

site PV is a critical strategy for enabling efforts to reach carbon neutrality in new and existing buildings.

New Jersey's strong policy foundation and PV industry infrastructure are valuable strategic assets that will enable continued rapid growth – in an increasingly competitive global market. The solar set aside in the RPS, the solar market transition with Solar Renewable Energy Credit trading, the revised Energy Master Plan target and the interconnection and net metering standards are all solid platforms on which to build. Newer initiatives, such as the solar loan program developed by Public Service Electric and Gas, and initial stakeholder discussions on how to catalyze community scale solar provide additional impetus for meeting, or possibly exceeding, New Jersey's solar targets.

On-site – on shore – wind generation is expected to play a more limited role, meeting roughly 2% to 5%, of the power from buildings targets. Wind resources in the highlands and shore regions are moderate to good and can support the economic development of systems ranging in scale from a couple of kW for residential to 1+MW for community or industrial scale developments. Prospective market and project development has increased dramatically during 2008, and promises to lead to a rapid expansion of installed wind capacity during the next few years. Siting and permitting continues to be a potential challenge and barrier to wind project development, although work on model ordinances for local permitting and the growing experience base from progressive communities will help to reduce these going forward.

The potential development of on-shore "cluster scale" wind projects with capacities in the 3- 10 MW range are a promising market niche. These are less likely to be matched to on-site customer loads, but may take advantage of initiatives to further encourage and support "community scale" wind.

GAP ANALYSIS

The Energy Master Plan targets that relate to power from buildings are aggressive but clearly attainable. Reaching goals for this sector will require a significant paradigm shift - so that the owners and operators of each new and existing building site begin to actively consider how they can best utilize distributed generation and on-site renewable resources. New Jersey has a strong foundation and good early track record to build upon, but accelerated growth and consistent policy and program support is required across all segments.

The potential for the power from buildings sector is not limited by current technologies, or renewable resource availability. Broadly speaking, the growth and development of the market delivery infrastructure, and the requirement for continuing direct incentives during the time when the technologies are becoming more cost competitive are the primary gap analysis issues.

Combined heat and power (CHP): As noted in the Energy Master Plan: "Currently, New Jersey has more than 3,000 MW of installed cogeneration capacity. However, no significant

new cogeneration plants have been built in New Jersey since 1999. The barriers have included the sizable initial investment, rising and unstable fuel costs, unfavorable changes in the tax structure and various legal and regulatory concerns."[*] Re-invigorating investment in the CHP market with an objective of increasing the total capacity by 50% will require a coordinated set of regulatory, tax code, and permitting actions combined with targeted direct incentives and financing strategies to help restart development activity. In good applications, CHP provides favourable financial returns and promises to provide significant benefits while providing the majority of the anticipated new power from the buildings sector.

The growth required to meet the objective of a total of 1,500 MW of new CHP capacity installed by 2020, is roughly equivalent to starting with 20 MW of new capacity in 2009 and maintaining a 30% compound annual growth for a decade. This level of activity is ambitious, but consistent with the general levels of growth required across all segments that will contribute to meeting the Energy Master Plan goals. Providing targeted direct incentives (declining steadily as the market increases) for roughly 5 years will help re-invigorate this important segment. The residential market, through micro CHP, may also contribute a small portion (e.g. <5%) towards the overall CHP targets.

On-site bio power: The on-site bio power market has begun to see more market development in 2008, particularly with prospects for projects using anaerobic digestion at waste water treatment facilities. For the scenario analysis in this study it is assumed that roughly ½ of the bio power development will include CHP technologies (these are counted under CHP segment of our estimates). The remaining half will require approximately 450 MW of new capacity installed by 2020, providing more than 3,000 GWh annually. For the purposes of this study we are combining the share of this new capacity that will serve on-site loads and the grid supply market. While the project level economics at favourable sites can be attractive, this market is still relatively under-developed and will require significant catalysts to prompt the required growth. For example starting with 5 MW of new capacity in 2009 (which exceeds current estimates of "pipeline" potential), compound annual growth rates in excess of 30% are required to meet sector targets.

Solar power: Solar markets in New Jersey are currently more active than CHP, and more mature and active than the bio power market. Although rebate budget constraints have hindered growth rates in the last two years, several major factors point towards resumption of rapid growth rates that will be required to meet the solar set aside targets. First is the solar market transition, which targets rebates to the <50kW market, and establishes a long term commitment through the Solar Alternative Compliance Payment Schedule to enable a robust market for Solar Renewable Energy Certificates (SRECs). Four years of rebate funding have been identified in the new Comprehensive Resource Assessment Board Order. The recent 8 year extension of the Federal Investment Tax Credit includes a number of important provisions, such as eliminating the $2,000 residential cap, removing barriers for Alternative

[*] New Jersey Energy Master Plan, October, 2008, page 78.

Minimum Tax Filers, and making utility investments in PV eligible for the investment tax credits.

In addition to revenues from the SREC compliance market, PV projects in the <50kW market are expected to continue requiring direct incentives for at least several more years, with total rebate budgets likely to exceed $100 million. Projects that are eligible for rebates are expected to meet up to one half of the incremental solar market SREC requirements for 2009, with the remainder coming from larger scale installations. Steady growth exceeding 30% per year is required to meet the goal of roughly 1,800 MW of total installed capacity by 2020.

On-site wind: There is also potential for accelerated development of on-site wind projects, but compared to the other distributed and renewable technologies this segment is expected to make smaller total contributions. Reaching a total of 200 MW of installed capacity by 2020 requires growth profiles equivalent to starting with 6 MW of new capacity in 2009 and continuing with a 15%- 20% annual growth rate. In comparison to other renewable and distributed generation technologies, siting issues may limit growth to this lower, although still robust, level.

MARKET STRATEGIES

Work recently conducted in a multi-client study by Navigant Consulting identifies four primary functional components of a Smart Grid system. These are Advanced Metering Infrastructure, Distribution Automation, Energy Storage, and Demand Response. The same study estimates that by 2020, integration of smart grid technologies with photovoltaics could increase the total market penetration for PV systems by as much as 60%[*] the city of Boulder, Colorado, in partnership with Xcel Energy and other partners is an early pilot of smart grid infrastructure development and deployment.[†] Identifying and coordinating smart grid investments and efforts in New Jersey will be critical factors further enabling renewable distributed generation, storage, and electrification of transportation.

Reaching the goals for the buildings as a power source segment will require a coordinated set of implementation activities and strategies. Consistent across all of the market segments outlined above is the need to support sustained market growth rates – typically in the 30% per year range. The key strategies required to achieve these ambitious targets include:

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[*] The concepts inherent in a "Smart Grid" reduce some technical barriers to intermittent, customer-sited energy sources achieving greater market penetration. From *The Convergence of the Smart Grid with Photovoltaics: Identifying Value and Opportunities*, Navigant Consulting, Executive Summary, Public Release Document, October 28th, 2008.

[†] The pilot design plan for Boulder is available at: http://birdcam.xcelenergy.com/sgc/media/pdf/SmartGridCityDesignPlan.pdf

- Multi-year direct incentive budgets;
- Steadily declining incentive levels as market activity increases and costs decline;
- Excellent commitment to workforce development and training;
- Close attention to quality assurance and qualification of contractors and equipment as the market expands;
- Clear, consistent, and regular communications on progress towards goals – particularly as in the SREC market – where market dynamics have a large impact on project financing and decision making;
- Integration and active cooperation with other state, regional and national, initiatives that are supporting distributed generation and renewable development; and
- Coordinate studies, pilots and investment in smart grid technologies that will enable distributed power generation from buildings. These investments will also provide benefits such as load management and real time pricing.

Investments in smart grid technologies and infrastructure will help to integrate and connect these distributed, and in some cases intermittent, generation resources to the grid in an economic, reliable and safe manner. In addition to supporting distributed generation, smart grid investments also enable demand reduction, reduced transmission and distribution line losses, load levelling, and time of use pricing. All of these strategies contribute to the overall objectives of the Energy Master Plan by ***increasing system reliability, efficiency and consumer price response***.

POLICIES

New Jersey's experience with the photovoltaic industry illustrates how the state, through a set of coordinated and well implemented policy strategies can take a leadership role in emerging distributed generation markets. To maintain leadership, and meet the Energy Master Plan goals, it will be necessary to maintain and revisit policy support mechanisms. Looking forward, critical issues relating to financing and infrastructure development are likely to require more policy attention than in the past, as the scale of effort is significantly increased. Governance and implementation structures are also likely to require attention, at

POWER FROM BUILDINGS Tapping Distributed and Renewable Resources

In the past, energy and utility planners have typically viewed new and existing buildings as load centers, to be supplied with power generated at a central station and transmitted by a transmission and distribution network to the end user.

Today, the combination of a number of technical, information, and market advances has created exciting new potential for buildings to provide a significant share of their power requirements

Reaching goals for this sector will require a significant paradigm shift - so that the owners and operators of each new and existing building begin to actively consider how they can best utilize distributed generation and on-site renewable resources. Investments in smart grid technologies will also be required to capture the full market potential.

least initially during the early phases of rapid program and market expansion.

Examples of the new policy initiatives that can help to promote the power from buildings market segment include:

- Standards for building renovation and new construction that promote and/or require progress towards zero net energy targets;
- Clean Energy Tax Financing Districts;
- Planning & zoning to promote clean energy permitting and siting;
- Requirements for the utilities to coordinate and standardize approaches to investment and technical requirements for smart grid functionality; and
- Policy support for green workforce development and training.

LINKS TO OTHER STRATEGIES

A number of clear opportunities exist for coordinating the power from buildings segment with efficiency initiatives for new and existing buildings in both the residential and commercial markets. In addition, there are linkages to other economic development planning and zoning activities that should also be considered. An example of the types of new activities that may also provide opportunities for links include:

- Community based efforts for distributed renewable generation;
- Transportation planning and investment with special emphasis on transportation electrification; and
- Economic development and incentives for green technology manufacturing and infrastructure.

The list of potential partners in these strategies can include:

- Rutgers Center for Green Building
- Green Faith – Interfaith Partners in Action for the Earth
- New Jersey Higher Education Partnership for Sustainability
- Association of New Jersey Environmental Commissioners
- Clean Energy States Alliance
- Solar Electric Power Association

It is through the combined work of all of these partners, and through the combination of a multitude of strategies, that New Jersey will be positioned to achieve its ambitious Energy Master Plan goals for clean energy generation.

LEVERAGING THE POWER OF COMMUNITIES

MARKET CHARACTERIZATION

The concentration of New Jersey's population varies widely, from large and dense urban areas to largely rural areas with small villages. That said, it is notable that approximately half of New Jersey's 8.7 million residents live in:

- The state is comprised of 5 cities of over 100,000 people, 25 with populations between 50,000 and 100,000, 210 cities and towns of 10,000 to 50,000, and 327 towns of less than 10,000 people
- Half the population lives in 13% of the State's municipalities
- 90% of the population lives in the most populous 50% of municipalities
- Nearly half the State's municipalities are boroughs, with an average population of less than 7,000

Sustainable Community Initiatives

In many of these communities there is a high level of interest and motivation in taking local actions to address climate change, sustainability and energy costs. Indeed, many of these communities have already made public commitments and initiated actions that reflect their interest and motivation. The extent of this commitment is reflected in the fact that over 80 of New Jersey's Mayors have signed the U.S. Conference of Mayor's Climate Protection Agreement.

Many of New Jersey's communities have sustainability plans, working groups and/or projects underway, with early notable initiatives including those in Maplewood, Belmar, Trenton, Bernards, Highland Park, Lawrence, West Windsor, Princeton and Hillsborough.

Over 150 members from 88 communities have joined the **Mayors' Committee for a Green Future,** a standing committee of the New Jersey State League of Municipalities with a mission to "*Make New Jersey green, one municipality at a time.*" The Committee intends to develop a *Green Future Roadmap* that will:

- "Identify measurable actions that define what communities must achieve to be considered green and sustainable;

- Provide guidance and tools to enable communities to make progress on those actions and issues; and

- Identify and create incentives for municipalities that are making progress toward the actions, including a sustainable community certification and awards program."

As part of the New Jersey Sustainable State Institute (NJSSI), the Bloustein School at Rutgers is providing support to both the Mayor's Committee for a Green Future and a Sustainable Communities Working Group. Other support for community sustainability initiatives is coming from the New Jersey Department of Environmental Protection – Office of Planning and Sustainable Communities, the Municipal Land Use Center at the College of New Jersey, The Rutgers Center for Green Building, GreenFaith – Interfaith Partners in Action for the Earth, the New Jersey Higher Education Partnership for Sustainability and the Association of New Jersey Environmental Commissions.

This groundswell of interest and activity suggests an enormous potential to partner with communities and multi-community efforts to leverage the considerable resources of communities to partner in achieving Energy Master Plan goals.

PRIMARY STRATEGIES

Effective partnerships with municipalities and community organizations can support individual community sustainability and energy-savings objectives, and at the same time accelerate the achievement of Energy Master Plan goals by contributing to energy savings goals in all sectors. In some areas, communities may also be able to act sooner and more aggressively than the State as a whole.

There are two primary strategies to achieve these goals:

- **Policy** intiatives that can be enacted at the municipal level

- **Implementation** of efficiency and renewable energy awareness, education and measure-installation initiatives that can be carried out by municipalities or community organizations

LOCAL ACTION
Harnessing the Power of Communities to Achieve Clean Energy Goals

Many New Jersey communities are already taking action at the community level to achieve local sustainability and energy-savings objectives. Energy Master Plan efforts should build on this interest, leveraging community commitment and resources.

Working both with individual communities and through a range of State-wide community sustainability coordination initiatives, existing local efforts can be supported and expanded.

These community-based efforts will support awareness and accelerated early participation in State-wide Energy Master Plan initiatives. They can bundle State-wide strategies in a single community initiative and can also serve as pilot projects for potential State-wide adoption.

SPECIFIC SEGMENTS

There are already many relevant activities underway in a number of communities that serve as the foundation for further community initiatives. These existing community-based efforts include:

- Adoption of local government climate goals,
- Development and adoption of local sustainability plans,
- Local events to promote energy efficiency and renewable energy,
- Energy or sustainability requirements for construction of new public buildings,
- Participation in existing New Jersey energy efficiency program offerings and other energy and sustainability programs,
- Development and implementation of demonstration projects, and
- Adoption of sustainability or energy-related land use planning provisions.

But the potential of community-based strategies has barely begun to be realized. To achieve this potential, communities will need more resources and support so that they can move forward more quickly and have more impact. As part of a stepped-up effort to meet Energy Master Plan goals, existing community initiatives and plans can be expanded and/or moved forward to implementation. Moreover, there are other, bold new initiatives that could be considered for implementation at the community level that could have major energy savings impacts.

POLICY INITIATIVES

Existing community-based policy strategies should be supported and expanded, including those that involve setting community sustainability and/or energy goals and developing plans to meet them, efficiency requirements for new construction of public buildings and adoption of local land-use policies that will result in energy savings.

Among the new policy initiatives that should be pursued as partnership opportunities with communities are:

CLEAN ENERGY TAX DISTRICT FINANCING
An New Community-Based Energy Savings Strategy

The Clean Energy Tax District (CETD) is a innovative financing mechanism that has the potential to overcome some of the key barriers to greater use of financing for broad implementation of deep efficiency retrofits and customer-sited renewable energy.

Terms of up to 20 years are possible by having the repayment for clean energy investments tied to the property rather than the customer. Use of the property tax mechanism for repayment can also overcome the credit limitations of typical energy loan programs.

The City of Berkeley, where this concept was initiated, is currently implementing a pilot program. A number of other communities in both California and Vermont are also pursuing this mechanism.

Local building construction and/or equipment standards that are higher than State-wide requirements - In many States, local communities have provided leadership by adopting energy efficiency and/or sustainability standards that exceed more widely-required requirements. These could range from modest increments above State and Federal standards to adoption of standards consistent with achieving net-zero energy for new construction by a certain date. While New Jersey's municipalities are not currently allowed to set local codes, legislation could change that, enabling State adoption of optional advanced building energy codes (as a formal appendix to the state building code) and offering communities a common, technically supported basis for a more stringent local energy code. This strategy should strategically build market capacities to design and construct highly energy efficient homes and buildings.

Clean Energy Tax District financing – The CETD is a novel mechanism that creates a special municipal tax district where homeowners or businesses can opt to finance deep energy-savings retrofits or renewable energy installations with repayment over terms up to 20 years through their property tax bills. Loan funds should be provided by municipal bonds with all costs born only by program participants.

Planning & zoning to promote clean energy – Planning and zoning are highly effective local tools that can be used to accelerate achievement of energy savings goals. Increased building energy efficiency, use of renewable energy and/or low net energy requirements could all be incorporated into municipal planning and zoning, assuming that New Jersey enacts appropriate enabling legislation. Consideration of the locational energy impact of development (transportation energy associated with location) can also be incorporated into planning and zoning.

Local ordinance for time-of-sale minimum building efficiency requirements – Once time-of-sale disclosure is established, communities should be in the position to adopt time-of-sale minimum efficiency requirements. Like disclosure, such requirements have greater impact if adopted State-wide, but may be adopted sooner by individual communities, potentially providing a pilot for State-wide expansion. It is worth noting that a number of communities in other states have had municipal ordinances of this type for over a decade.

Adoption of low-energy street illumination standards – New technology, including the emergence of solid-state (LED) lighting, offers the potential for substantially reducing street lighting energy

Energy Smackdown™
A Community Outreach Program to Reduce Carbon Emissions

THE MASSACHUSETTS "ENERGY SMACKDOWN"

The Brain Shift Foundation launched the Energy Smackdown in 2007 as a pilot community outreach program to educate and empower individuals, families and whole communities to address climate change by reducing their individual and collective carbon emissions.

The Smackdown is a year-long contest between groups of families in multiple communities to demonstrate the greatest reduction in their individual and collective carbon footprints.

Comprehensive in nature, covering everything from recycling and travel to energy, the process starts with a home energy audit and recommendations aided by a Power Cost Monitor to enable behavior change and good energy-related decision-making.

When connected to energy efficiency programs, with their related measurement, verification and evaluation of program impacts, the concept shows promise as a vehicle accelerate the reach of efficiency programs.

Currently three communities – Arlington, Medford and Cambridge – are competing to reduce their carbon emissions.

use. New standards being adopted by national illumination organizations offer additional savings potential by recognizing options for greater variability in illumination requirements depending on local situations. These developments create an opportunity for municipalities to set both new illumination level standards and efficacy requirements for street lighting.

IMPLEMENTATION INITIATIVES

Existing community-based implementation strategies should be supported and expanded, including those that involve local events to promote energy efficiency and renewable energy, participation in New Jersey energy efficiency program offerings and other energy and sustainability programs and the development and implementation of demonstration projects.

Among the new implementation initiatives that should be pursued as partnership opportunities with communities are:

Comprehensive, community-based clean energy implementation initiatives that are tied to goals – Just as the State has adopted quantitative Energy Master Plan goals, individual communities should be encouraged and supported to develop and adopt quantitative goals to be achieved at the community level, together with detailed implementation plans.

Community-based social marketing campaigns – The rationale for approaching energy and sustainability at a community level builds on the identification of individuals with their community, as well as shared community values and interests. Social marketing at the community level should thus be particularly effective in motivating individuals to participate in energy-saving initiatives.

Municipal facilities energy-savings programs – Communities have a high level of interest in reducing the energy cost of their taxpayer-supported community facilities, including municipal buildings, schools and, in many cases, streetlights. Mechanisms and programs to support and partner with communities in pursuing these energy savings opportunities should be particularly effective. For example, recent passage of Assembly Bill 844 opened doors for long-term contracts for energy conservation upgrades and renewable energy systems in municipal buildings. In addition to buildings, municipal water and waste water facilities are key opportunities for cost and energy savings from efficiency upgrades assisted by private sector financing via performance based contracts.

Door-to-door direct installation programs – Such programs are by their very nature best implemented at the neighbourhood and community level. The most successful of these programs have been partnerships with local communities, typically involving participation of municipal government, other civic leaders, community organizations, and local media. There are numerous examples of community-based initiatives focused on door-to-door direct installation of low-cost energy-savings measures. While there is less experience, there is also considerable potential in using a similar approach to implement major savings measures such as attic insulation and building envelope air sealing.

New special-purpose ESCO to address municipal buildings – While energy service companies (ESCOs) have been effective mechanisms to acquire substantial amounts of energy savings from large energy users, using performance contracts, smaller facilities are not particularly attractive to them. Yet energy-saving projects in smaller facilities, specifically municipal buildings, are viable candidates for implementation through performance contracting. A new, non-profit ESCO that was created expressly to address this market could comprehensively address municipal buildings in an individual community or group of communities, or all communities in the State.

High performance building standards for new schools and municipal facilities – Many communities, indeed several in New Jersey, require new and renovated schools and municipal facilities to meet advanced building energy standards as visible public models for efficiency and sustainability. Development of high performance buildings requires an integrated collaborative design process that engages stakeholders (e.g., school board construction committees, superintendents, facility managers, teachers, project engineers, construction contractors, etc.) to work with a qualified design from the earliest stages. In addition to participating in New Jersey's energy efficiency and clean energy programs, these communities can access tools and information such as those offered by the Collaborative for High Performance Schools (CHPS).

Energy efficiency procurement standards – Communities can save money and help meet the Energy Master Plan goals by adopting procurement policies that require equipment and vehicle purchases and leases to meet minimum energy efficiency standards (e.g., ENERGY STAR). State adoption of energy efficient procurement guidelines and programs can help communities take action fast and stay current with the latest high efficiency equipment options. Resources for this include the Responsible Purchasing Network (http://www.responsiblepurchasing.org/) and the Consortium for Energy Efficiency (http://www.cee1.org/gov/purch/purch-main.php3).

Other new implementation strategies to consider supporting as part of a community-based strategy include:

- Inter-community competitions in making measurable progress toward clean energy goals (e.g., the Energy Smackdown pilot in Massachusetts)
- Making schools the center and beacon (demonstration and education) for broad community energy initiatives

HIGH-PARTICIPATION COMMUNITY-BASED ENERGY SAVINGS STRATEGIES

Door-to-door direct installation programs have been implemented sporadically over the past twenty years, by municipalities and utilities. They have ranged from urban apartment-building focused programs (United Illuminating and PEPCO in the early 1990s) to intensive rural customer saturation efforts (Washington Electric Cooperative in the latter 1990s).

More recently, community-based campaigns have demonstrated the ability to achieve very high participation and measure penetration rates with compact fluorescent bulbs (e.g., 40,000 bulbs in the 2,500 population town of Manchester, Vermont).

Social marketing-based campaign using community volunteers to go door-to-door, such "Project Porchlight," have also demonstrated effectiveness in reaching high numbers of community residents.

More recently, several community and utility programs have expanded the scope of door-to-door efforts to include major measures like insulation and building envelope air sealing.

- Moving to community-wide net-zero new construction
- District energy systems
- Community scale / community-owned renewable generation

LINKS TO OTHER STRATEGIES

With respect to other state-wide strategies (commercial, residential, etc.) community-based strategies can:

- Support awareness and implementation of statewide efforts,
- Serve as pilot projects for potential State-wide strategies and accelerate early participation,
- Bundle State-wide strategies in a single community initiative

Costs and savings from community-based strategies are accounted for under other State-wide strategies.

INNOVATION: REPLENISHING THE POOL OF SAVINGS OPPORTUNITIES

INTRODUCTION

Throughout this portfolio development process, a consistent theme has emerged: "The future of energy efficiency programming in New Jersey will little resemble the past. Achieving New Jersey's goals will require a paradigm shift." The work will require a larger and highly-skilled workforce at every level – from program administration to on-the-street delivery – deploying new technologies, using innovative strategies, partnerships and channels to accelerate adoption of energy efficiency in new and difficult-to-reach markets. It is also clear that what is today's best practices will evolve and change through experience and learning.

Energy efficiency innovation as an integral element of New Jersey's strategy portfolio to achieve the Energy Master Plan goals includes four elements:

- Targeted Research / Emerging Technology Assessments
- Continuous Improvement of Program Designs
- Energy Efficiency Training and Education
- Public Policies to Drive and Disseminate Innovations

To drive innovation in energy efficiency, New Jersey's program administrators must receive a clear charter and adequate resources to identify, assess, and accelerate the introduction of new technologies and new program strategies; and engage new channels and approaches to move market interest and acceptance. They must be able to attract creative ideas; vet and fund promising delivery organizations and projects quickly; assess new technologies and program designs via controlled studies and field trials; and improve or discontinue technologies or program components that do not meet expectations. The BPU can encourage this by approving program portfolios that support innovation and experimentation (e.g., budget set asides for specific efforts with initial goals focused on learning and incorporating those lessons into programs).

TARGETED RESEARCH / EMERGING TECHNOLOGY ASSESSMENTS

The market has responded to rising energy costs with an increasing volume of promising new technologies – in lighting, household appliances and office "plug

loads"; advanced domestic and commercial HVAC systems - plus "smart" technologies to monitor and control all of these.

To tap this stream of innovation to meet long-term goals, New Jersey's efficiency program administrators must be in a position to verify the quality and performance of new products and services independently of the product developers prior to offering implicit endorsement by including them in programs and offering financial incentives. This requires that New Jersey's program administrators, solo or in collaboration with their peers in other states, have the resources to test new products and deploy them in controlled pilots or field trials. Such unbiased assessments provide manufacturers with valuable feedback on the success - or potential shortfalls - of their innovative products as a key step in scaling up production and establishing market pricing. It also helps to protect consumers from products that don't perform as claimed.

The California Emerging Technologies program encourages stakeholders to explore breakthrough as well as incremental advances in energy efficient products and services. Similarly, the New York State Energy Research and Development Authority (NYSERDA) frequently solicits installations and seeks venture capital funding for new technologies. The Massachusetts Joint Utility Technical Committee also vets and tests in field applications technologies that seek inclusion in the Commonwealth's efficiency programs. These sates are good examples of jurisdictions where policymakers recognize the need to dedicate staff resources and funding to seek out, assess and deploy new and emerging technologies which have the potential to be cost-effective in full program application.

We recommend that New Jersey Energy Efficiency Utility follow this model by maintaining an Efficiency Technical Committee that includes participation from the utilities, NJIT, EDA and other key stakeholders to recommend new technologies and best practices to incorporate into the energy efficiency programs, and to recommend research and development priorities including pilot programs to field test new products and practices as well as participation in national and regional research, development and deployment efforts. The Technical Committee should complement the Energy Master Plan recommendations to expand the Edison Innovation Fund to include an *Edison Innovation Clean Energy Technology Commercialization Fund* and an *Edison Innovation Clean Energy Manufacturing Fund* administered by the EDA in partnership with the New Jersey Commission on Science and Technology, and to form an Energy Institute of New Jersey as a

CALIFORNIA'S EMERGING TECHNOLOGIES PROGRAM

California funds a statewide Emerging Technologies Program exempt from cost-effectiveness testing to accelerate the introduction of innovative energy efficient technologies, applications and analytical tools.

Recognizing that numerous market barriers prevent such new energy efficient products from moving beyond interest among "early adopters" to more mainstream markets, the Emerging Technologies program bridges the "chasm" between introduction and self-sustaining market demand.

A key focus is overcoming uncertainties regarding product performance – one of most significant market barriers for new products.

The program works in conjunction with targeted research, development and demonstrations funded under California's Public Interest Energy Research (PIER) program.

strategic collaboration of New Jersey's colleges and universities to advance new clean energy technologies.

CONTINUOUS IMPROVEMENT OF PROGRAM DESIGNS

Just as today's technologies will not be sufficient to meet New Jersey's lofty long-term goals, neither will today's programs. Program administrators, therefore, need the charge and the latitude to experiment to push program strategies to respond to evolving needs and opportunities.

For example, current programs tend to focus on the energy consumption of different technologies out of the context of their specific application and use. To reach deeper savings, this technology-based approach must evolve to a systems approach. A case in point - the current New Jersey residential HVAC program provides incentives for high SEER air conditioners, and tries to get installers to properly size and install them. Under a systems approach, whenever a residential central air conditioner were installed, everything possible should first be done to reduce the cooling load of the home – from improving the thermal envelope to teaching the occupants how to avoid solar gain in the summer time.

In the commercial sector, significant efficiency potential available can be unlocked only by driving best practices in building system designs. This requires flexible and innovative program strategies. For example, in Connecticut and Massachusetts, efficiency programs provide both in-house technical and engineering expertise and contracted design assistance services to enable customers to pursue aggressive efficiency well beyond what can be achieved with legacy technologies and standard designs.

To meet aggressive goals, programs, too, need more of a systems approach. Technology incentives need to be moved upstream to evolve from a model that captures savings one building at a time – via a series of bilateral negotiations with individual building owners – to a model that captures the full savings potential of a technology by capturing the full market for it.

Moving to a systems approach to program design and delivery requires considerable investment in market infrastructure enhancement (e.g., training the trades, developing better diagnostic and measurement tools) taking several years to impact market uptake and generate program level savings.

With continuous improvement comes the need to document changes and the results of new approaches. Even the best energy efficiency programs nationally have become Balkanized at the state (and sometimes down to the utility service territory) level. As a result, the efficiency community as a whole has not developed and institutionalized pathways to quickly identify and migrate good program experiences around North America. In New Jersey, with amongst the most ambitious savings goals in the nation, and with the need to strongly encourage innovation, the BPU has an opportunity to model transparent processes and the sharing of results, and promote a more open culture for the community as a whole.

ENERGY EFFICIENCY TRAINING AND EDUCATION

New technologies and practices cannot succeed without capable and fully trained practitioners to deliver them. Even the best program will flounder without expertise and support from the design community, vendors, the building trades, and other trade and professional allies.

Additionally, the sheer scope, magnitude and growing complexity of efficiency goals in not only New Jersey, but throughout North America, will require a massive investment in workforce development and recruitment – including attracting a new generation of engineers and architects into the energy efficiency domain, and training and retraining trades people to specify and install high performance equipment safely and properly. The very nature of the workforce development cycle, and the lag between entering a training program and emerging as a skilled worker, signals a profound short term gap between workforce needs and program requirements. State programs have begun to address this need.

NYSERDA, for example, undertook a multi-year effort to build a trained and certified workforce to deliver New York's Home Performance with ENERGY STAR program at full scale. A similar investment in 21st Century energy engineering and architectural practice will be needed in New Jersey to achieve the State's energy and environmental goals.

It is equally critical to reach out to currently practicing architects, engineers, lighting designers, facilities managers and building officials with continuing education opportunities. New Jersey already has a nationally recognized resource in the New Jersey Institute of Technology, which has developed and customized high quality online and direct training and college-level curricula in building technologies and practices.

PUBLIC POLICY DEVELOPMENT AND IMPLEMENTATION

State and local policy initiatives can also support innovation by helping to create stable markets for the innovative products, services and programs that will propel New Jersey to achieve its goals. These include:

NEW YORK HOME PERFORMANCE WORK-FORCE DEVELOPMENT

The New York State Research and Development Authority (NYSERDA) recognized quickly that as they began investing heavily to develop the market capacities to deliver their Home Performance with ENERGY STAR they would need more than just incentives for tools and training – they needed a whole technical education infrastructure.

Today, that recognition is visible in the existence of the Building Performance Institute (BPI) to provide appropriate accreditation, the Center for Energy Efficiency and Building Science (a partnership with Hudson Valley Community College) to train for that accreditation and other related skills, and in the related trades unions throughout the state as their training and apprenticeship programs connect directly to the BPI testing required for accreditation as a home performance trades-person.

As a result, New York has a robust and growing population of contractors and trades people to perform the work of the Home Performance Program.

- Advanced Building Energy Codes
- State Efficiency Procurement Policies that create a market pull for high efficiency technologies and best practices.
- Tax credits or development incentives structured to build markets for new products with dramatically improved energy performance and encourage deep "beyond code" investment in new and renovated homes and buildings.
- Home and building energy rating disclosure and requirements (e.g., at the time of lease or sale) that encourage new tools and services to improve building energy performance.
- Appliance Standards that regularly update minimum efficiency requirements for products sold in New Jersey remove the least efficient devices from the market place and help create a market pull for innovative, highly efficient products.

Energy efficiency program administrators can play an important role to develop and implement public policies that drive innovation. Their research and analysis can identify new products, practices and tools for use in policy initiatives. They can provide expertise and technical support for policy development and adoption. They can implement programs to build New Jersey's market capacities to deliver high efficiency solutions and set the stage for new minimum codes and standards that continue the state's progress to offset energy and load growth. California's Energy Efficiency Codes and Standards Program, for example, funds regulated utilities to contribute to the development and adoption of new state building energy codes and appliance standards. This strategy has been a resounding success - benefiting even New Jersey which has adopted state appliance standards based on the research and analysis from the California program.

This strategic linking of program and policies to drive innovation should be a cornerstone of New Jersey's strategy to meet the Energy Master Plan goals.

STRATEGIES

To continue to replenish the pool of energy efficiency opportunities, New Jersey should adopt a series of strategies aimed at identifying new technology opportunities, continuous program improvement, training and education and public policy development. Specifically:

TARGETED RESEARCH / EMERGING TECHNOLOGY ASSESSMENTS

The State of New Jersey has already established, through the Commission on Science and Technology, a statewide research and development program aimed at funding developers of targeted technologies and services, third-party product performance validation entities and academic institutions. This is a good start, on which the State can build by:

- Providing development grants, support independent testing and analyses of emerging products and services, and provide efficiency program financial incentives for pilots and demonstrations of viable, emerging products that are entering the market;
- Enabling efficiency programs to assess and evaluate new products and services by exempting approved research, demonstration, and emerging technology projects from measure and program level cost-effectiveness testing; and
- Linking efficiency programs and incentives to national programs and organizations that provide consumer access to the best of the best products (e.g., US EPA Climate Choice, TopTen USA).

CONTINUOUS IMPROVEMENT OF PROGRAM DESIGNS

The State of New Jersey can:

- Provide a charter and mandate to program administrators to engage in continuously improving programs in response to emerging best practices
- Encourage and set aside funding for development of better building and system diagnostic and measurement tools
- Fund dedicated resources in support of innovation and continuous improvement (e.g., budget set asides for specific efforts with initial goals focused on learning and incorporating promising new approaches into programs)
- Require transparent processes and rapid dissemination of results from innovation and continuous improvement efforts
- Fund organizations that develop new program designs and open new market channels.

ENERGY EFFICIENCY TRAINING AND EDUCATION

The State of New Jersey can:

CALIFORNIA STATEWIDE ENERGY EFFICIENCY CODES & STANDARDS PROGRAM

The California CPUC funds a statewide Codes & Standards (C&S) program through which the regulated utilities advocate improvements to building energy codes and appliance standards. The essential elements of this program are studies documenting promising energy efficient design practices and technologies presented to standards and code-setting bodies.

In rulemaking proceedings Pacific Gas and Electric provides affirmative expert testimony and conducts supporting research and analysis throughout the process. Following adoption, the program supports training for strategic interventions that improve compliance with new codes and standards. The C&S program also monitors and intervenes, as appropriate, in US DOE's appliance standards proceedings that preempt California's state standards.

The C&S program also conducts information surveys to support future code upgrade cycles. Part of the budget is set aside for future innovative initiatives.

- Create specific and significant funding for training and education programs that build marketplace capacities needed to implement clean energy program including vocational training for the trades ,and professional training for the architect, engineering and design communities, and efforts such as the New Jersey Center for Energy and Environmental Training.
- Fund New Jersey's higher education community to support professional training and academic exploration and technical review of emerging technologies and practices.

PUBLIC POLICY DEVELOPMENT AND IMPLEMENTATION

The State of New Jersey can:

- Develop a state tax policy that includes credits and other incentives for research, development, deployment and installation of technologies and practices consistent with the overall Energy Master Plan

- Adopt a building energy codes policy that requires automatic adoption of the latest IECC model code and that specifically defines elements of above-code practice for use in establishing other code-related policy, tax credits and which informs the direction and technical requirements for new construction advanced efficiency programs.

MAKING IT REAL: EVALUATION, MEASUREMENT AND VERIFICATION

INTRODUCTION

The New Jersey Energy Master Plan, containing some of the nation's most ambitious energy efficiency goals, requires a significant commitment and dedication of resources to provide transparent, accurate, and timely evaluation, measurement and verification (EM&V) to:

1. Support regulatory oversight of and accountability for ratepayer-funded energy efficiency programs and investments.
2. Inform planning, goal setting and budgeting to meet the State's energy, environmental and economic goals.
3. Track progress towards Energy Master Plan and program goals (e.g., costs, energy savings, capacity, emission savings, etc.).
4. Support program implementation and resource allocation.
5. Inform the award of performance incentives for meeting energy efficiency goals.
6. Inform related energy system goals (e.g., the role of energy efficiency to defer generation, transmission and distribution infrastructure upgrades).

EM&V is particularly important to support a performance-oriented strategy for regulatory oversight – one that tracks and rewards results – whether defined as energy savings, market participation, milestone achievement, or net benefits.

To support EM&V, the BPU should maintain and adequately fund an integrated and comprehensive EM&V plan and process that continues to use consistent statewide protocols to estimate, track and report the impacts of energy efficiency and other demand side resources. This should include a centralized data aggregation function, such as the New Jersey Energy Data Center now in development, as well as an expanded reporting function that regularly assesses the combined impact of policies and programs implemented across the state relative to the Energy Master Plan and other clean energy policy goals.

For cost-efficiency and strategic policy management, New Jersey's EM&V process and plan should be designed to provide information needed to inform the range of public policy goals (energy, economic and environmental) and support the participation of demand-side resources in evolving regional markets (e.g., PJM's RPM). The alternative – multiple or competing protocols, analysis and reporting mechanisms within the State for the range of

energy efficiency programs and policies – creates confusion and undermines the credibility and value of demand-side resource investments.

Whereas the majority of EM&V and related studies should be managed and undertaken by program administrators, the BPU should maintain staff expertise assisted by independent EM&V experts, including the Center for Energy, Economic and Environmental Policy (CEEEP), to provide informed oversight to EM&V planning, resource allocation, protocol development and updating; informed review of EM&V studies and reports; and to prepare regular statewide tracking reports. If experience from other states is a guide, program administrators should allocate between three and five percent of program overall program costs for EM&V studies and processes. The specific cost of EM&V to support program and policy implementation to meet New Jersey's Energy Master Plan goals should be informed by a multi-year EM&V plan described below.

EM&V –AN ONGOING PROCESS

EM&V is an integral part of a continual, usually cyclic, and flexible process of program planning, implementation, tracking, reporting, and evaluation. It is complemented by market and load research that provide information that document baseline conditions from which to assess impacts and measure progress of program and policies. With regular and frequent feedback, program implementers can alter program strategies in real time and support mid-course corrections that keep the effort on track to meet goals efficiently and effectively. Results can be used to plan future programs and assess the potential impact, effectiveness and value of a portfolio of energy efficiency programs and policies to meet the New Jersey Energy Master Plan goals. They can also be used retrospectively to assess the performance of contractors and administrators responsible for implementing efficiency programs.

To guide and quantify the impacts, costs and benefits of New Jersey's investment to meet Energy Master Plan goals, EM&V should include several interrelated components:

EM&V Protocols establish the methods and standards to be used in EM&V. New Jersey's existing protocols use measured and customer data as input values in industry-accepted algorithms. The data and input values for the protocol algorithms come from the program application forms and tracking systems, or from standard values. These Protocols are updated and approved by the Board on an annual basis.

Cost Benefit Analysis assesses the societal costs and benefits of individual programs and measures as well as the overall portfolio of programs. Costs include program implementation costs including contributions by participants or others. Benefits include resource savings (i.e., time differentiated avoided energy, capacity, transmission and distribution costs; the quantified value of avoided air pollutants; and other quantifiable benefits or avoided resource costs). Costs and benefits are assessed over the life of specific measures individually and in aggregate for projects and programs. It is used to design and justify program designs as well as to guide program implementation to project design to maximize net benefits. CEEEP has developed and uses a model to assess cost-effectiveness. The BPU, however, has

not established a standard test to determine cost effectiveness or approved standard input assumptions (e.g., avoided energy and capacity costs, avoided T&D costs, discount rate, etc.).

Market potential studies assess the technical, economic and market potential for energy efficiency and renewable energy measures. Technical potential is an estimate of the total level of energy efficiency or renewable energy resources available unrestrained by economics. Economic potential screens for available energy efficiency and renewable energy resources that are economically viable compared to other available alternatives. Market potential is an estimate of the realistic level of economic resources that can be developed taking into consideration other market factors. Energy efficiency market potential studies were last performed in New Jersey in 2004 by KEMA. CEEEP and Applied Energy Group (AEG) updated the KEMA market potential study in April 2008 and recommended that a further market potential study be performed prior to the next BPU proceeding to determine future funding levels.

Market assessments address specified market attributes such as customer or market actor awareness and attitudes, program activity, product and service availability, common practice, prices, new products, codes and standards, amount and distribution of energy savings, and market share of energy efficient products and services. They also inform savings estimates from programs that seek to increase the market penetration of high efficiency products (e.g., the ENERGY STAR Products program). Market assessments should be performed every few years to help gauge program success and provide updated market information to inform changes to programs. Summit Blue submitted an energy efficiency market assessment in July 2006. Honeywell and TRC have incorporated some of the recommendations in their respective 2008 programs.

Baseline studies document current practices relative to energy efficiency (e.g., actual construction practices, product and equipment sales, lighting design practices, HVAC installation practices) to set the basis against which to measure the impacts of high efficiency options. These studies define the baseline period, and provide numerical results used to calculate measure energy savings. The last baseline studies were performed in New Jersey by the utilities in 2000. Summit Blue updated baseline studies as part of the energy efficiency market assessment in July 2006.

End-Use Load Research assesses how and when energy is used in specific customer sectors and building types for selected end-uses of energy (e.g., residential lighting and HVAC, home electronics, commercial lighting and HVAC, office equipment). Using field-based hourly metered data, it documents the timing of when energy is used and at what level to provide a daily, weekly, monthly or seasonal curve of energy use. This informs the number of hours that demand-side measures provide savings (e.g., load factor) as well as their contribution to reducing peak period demand for energy (e.g., coincident peak factor) – information needed to estimate measure and program savings and their time-differentiated value. Load research also supports forecasting future system energy needs.

Impact Evaluations measure energy savings, the amount and distribution of savings, and the appropriateness and comprehensiveness of measure installations. Impact evaluations test the assumptions used to estimate the level of energy savings or renewable energy delivered by the installation of various technologies. Impact analyses should follow methods

and standards set by the BPU's EM&V protocols to employ industry-accepted methods of analysis that rely on well-developed engineering and statistical analysis techniques including energy-use simulation models, multivariate regression models, and/or other analytic tools. Consistent with BPU requirements, impact evaluations should incorporate net-to-gross ratios that factor free riders, free drivers and snapback effects for assessing program impacts and informing cost-effectiveness analyses. KEMA is in the process of performing an impact evaluation, with results expected in late 2008.

Process evaluations address implementation effectiveness, operational efficiency, and customer and market actor satisfaction, attitudes, and awareness related to specified programs. Process evaluations also seek to find ways to improve the effectiveness and efficiency of program delivery. They provide an understanding of program delivery approaches that are the most and least effective, and how to improve future programs to achieve greater savings. Last process evaluations completed were by Aspen in 2005 for the Renewable Energy program and by Apprise in 2006 for the Low Income Program.

Performance indicators include quantitative and qualitative measures to monitor progress towards market transformation goals – typically evolving over time to reflect market progression, starting with indicators of product availability and customer awareness, moving to product competitiveness and market share as well as changes in customer knowledge and behavior. The Annual Compliance Filings provided by OCE's market managers include performance indicators as well as progress relative to annual energy savings goals.

Tracking system assessments review the tracking systems to ensure consistent tracking and reporting, and collection of all necessary data. This step is critical in determining what level of detail is available for all other analyses related to the established programs. Stakeholders should have an opportunity to provide feedback on what data is necessary and all data should be available for the public to evaluate and use. Such an assessment has not yet been conducted for the current OCE tracking system.

GAPS: CURRENT EM&V PRACTICE IN NEW JERSEY

New Jersey is well on its way to having many of these components in place. Indeed:

- CEEEP coordinates an annual review and update of the "New Jersey Clean Energy Program Protocols to Measure Resource Savings", which includes the algorithms and inputs for estimating electric, natural gas, water and oil savings for the various programs in the State . As part its process, CEEEP reviews protocol manuals from other states.
- CEEEP has managed several market assessments, process and impact evaluation projects performed by outside contractors.
- All reports are currently available through the New Jersey Clean Energy Program website. In addition, CEEEP reports are published on its website.

- Program reports and results are available on a quarterly basis with program data collected down to the measure level beginning in 2008.
- CEEEP has developed a cost-benefit model for estimating the costs and benefits of New Jersey's Clean Energy Programs. This tool is used to calculate the costs and benefits of historic programs and can be used to evaluate programs into the future.

The following table shows a list of the various evaluation studies, when they were last performed and who should perform them in the future.

NEW JERSEY EVALUATION STUDY STATUS

STUDY	LAST PERFORMED	WHO PERFORMS?
Baseline	2000/2001	Program Administrator
Load research	2008	PJM
Process Evaluation	2004 for Renewables 2006 for Low Income	CEEEP Coordinating Planning
Market Potential	2004 (updated 2008)	Program Administrator
Market Assessment	2006	Program Administrator
Impact Evaluation	2008 (in progress)	CEEEP Coordinating
Tracking/Reporting	2008	BPU/AEG
Cost-benefit Analysis	2007 (2008 in progress)	CEEEP
Protocols	2007 (2008 in progress)	CEEEP Coordinating

STRATEGY: DEVELOPING A CONSISTENT STATEWIDE FRAMEWORK

As New Jersey implements the newly released Energy Master Plan, the State should develop, implement and track programs within a consistent EM&V framework to monitor progress towards goals, assess impacts, and evaluate cost effectiveness. This statewide framework should continue to include:

- Consistent statewide protocols, inputs and assumptions for estimating resource savings and costs relative to the full range of public policy goals (energy, environmental and economic)
- A multi-year EM&V plan with priorities for research, evaluation and reporting schedule
- Regular, publicly available reports and EM&V results with supporting data to assess progress towards goals
- Sufficient budget and staff resources to implement the EM&V plan

- Coordination with regional and national protocols to leverage resources and encourage consistency to minimize barriers to the aggressive ramp-up of efficiency across the region

Structurally, the BPU should continue to serve as the state authority on demand-side resource EM&V efforts in New Jersey.

THE BPU'S ROLE IN EM&V

For consistency, transparency, and cost-efficiency, the BPU should continue to set statewide standards for, supervise and make publically accessible EM&V results and reports to track progress towards goals. Necessarily, this process should continue to be informed by input from affected state agencies, utilities, and other stakeholders. Critical EM&V functions include:

Maintain Multi-Year EM&V Plan: The BPU should lead development of a statewide EM&V plan that annunciates the multiple purposes of EM&V, and sets annual and multi-year priorities and schedules for research, studies and analyses. The EM&V plan should be designed to address the range of state public policy goals for efficiency and demand-side resources. To avoid duplication of effort, encourage consistency and maximize the usefulness of reported results, the plan should be developed in strategic coordination with other state agencies that implement, contribute to or depend on the results of demand-side resource programs and policies (e.g., Department of Community Affairs, the Economic Development Authority, the Housing Finance Authority, the Department of Environmental Protections, etc.).

Maintain Statewide Protocols: The BPU should continue to maintain statewide EM&V protocols (i.e., methods and standards) with approved algorithms, input data and assumptions (e.g., measure savings, measure life, avoided costs, etc.) including a standard reporting format so that data from various efforts are comparable. With this the BPU should establish a statewide methodology for assessing demand-side resource cost-effectiveness (measures and programs), and maintain a standard tool with current input assumptions (i.e., avoided energy and capacity costs, avoided T&D costs, factors to calculate avoided emissions by fuel type) for use by program administrators, contractors as well as other state agencies.

Review and Approve EM&V Results: The BPU should receive and expertly review EM&V study results for consistency with the methods and standards approved by the BPU. This is particularly important for studies and reports used to justify cost-recovery or award performance incentives. For transparency and accountability, such studies should be available as public information with appropriate care to protect the confidentiality of customer specific information.

Prepare and Publish State Level Tracking Reports: The BPU should set standards, requirements and formats for program tracking and reporting. Using those, the BPU, assisted by CEEEP, should collect and review data from utility program implementation, evaluations and related efforts, to prepare and publish quarterly and annual statewide reports that track

progress towards annual as well as long-term goals. For transparency, these reports should be documented (e.g., data sources) and readily acceptable (e.g., web posting).

Establish On-Line Tracking and Reporting System: The BPU should establish an electronic reporting function integrated with the New Jersey Energy Data Center at CEEEP to facilitate consistent use of methods, data and information statewide as well as support data aggregation to provide integrated and timely reports. An example of such a web-based service is offered by the Regional Technical Forum of the Northwest Power and Conservation Planning Council.

Allocate Sufficient Resources: A lack of consistent, sustained BPU staff, contractor and allocated budget resources, present an ongoing constraint to implementing forward-looking, comprehensive EM&V and reporting functions. To serve these roles in a timely and effective manner, the BPU should increase staff EM&V expertise (e.g., at the OCE) supported by CEEEP and contracted experts to develop and review EM&V plans, reports and results, update EM&V protocols and related inputs, and prepare and post reports and studies. BPU should allocate or approve adequate resources (estimated to be between three and five percent of demand-side program costs) to maintain and continuously implement the statewide EM&V plan – including utility, contractor and regulatory oversight costs. The Multi-year EM&V Plan should inform the necessary level of BPU staff, CEEP and contractor resources.

Leverage Regional and National Efforts: New Jersey is one of several states aggressively ramping-up energy efficiency. Adjoining states (i.e., New York, Maryland, Delaware and, most recently, Pennsylvania) in addition to New England and the District of Columbia have plans to increase, and in many cases, double energy efficiency funding to acquire cost-effective energy efficiency as a priority resource. As New Jersey's state agencies and utilities increase their demand-side resource activities, they are competing for personnel and contractors across the region (as well as nationally). To ease the impact of the likely staff and contractor capacity crunch, adopting consistent protocols and conducting studies jointly with other states will reduce the burden on EM&V expertise. Consistent EM&V protocols may also ease the participation of market-based service providers operating in multiple states. And New Jersey can achieve major costs savings by jointly undertaking with other states selected studies – especially big-ticket studies such as load research, baseline studies, and metered impact analyses. NEEP's recently established Regional

NEEP'S REGIONAL EM&V FORUM

Convened by NEEP in July 2008, the Forum engages policymakers and efficiency program administrators to develop common EM&V protocols that New England and Mid-Atlantic states may elect to use to in ramping up their energy efficiency and demand-side resource programs and policies.

With start-up funding from US DOE, US EPA and the Energy Foundation, the Forum is guided by a Steering Committee of public utility commissioners from eleven states (including the BPU) and NESCAUM.

Forum projects, including joint research by third-party contractors, are developed and managed with input from Project Committees of staff from state energy offices, public utility commissions, and efficiency program administrators.

For more information about EM&V projects see: http://www.neep.org/policy_and_outreach/EMV.html

EM&V Forum presents an opportunity for such strategic coordination (see sidebar). In addition, the BPU should continue its strategic coordination with other states through processes to guide the development of M&V protocols required by PJM to include efficiency and demand-side resources in its future capacity markets (RPM). As efforts to develop national EM&V protocols for energy efficiency move forward (e.g., potentially through the North American Energy Standards Board, or national carbon legislation), New Jersey should consider whether to monitor and contribute to address issues of concern to the State.

The Northwest Regional Technical Forum (RTF), administered by the Northwest Power and Conservation Council, provides an on-line database with downloadable default deemed savings values, inputs and formulas; M&V protocols to measure energy efficiency program savings (including guidelines for addressing custom projects); standardized calculation procedures; and reporting formats and module to allow users to upload savings data used for regionally resource planning purposes.

www.nwcouncil.org/energy/rtf/charter.htm

THE UTILITIES' ROLE IN EM&V

As program administrators with access to customer and other data needed for EM&V, the gas and electric utilities should serve as the primary vehicle to conduct EM&V studies and analyses, and track and report results – working cooperatively with the BPU, CEEEP and others to develop annual EM&V plans for BPU approval (i.e., based on the BPU's statewide plan).

To undertake EM&V research, studies and analyses, the utilities should work collaboratively (through the Energy Efficiency Utility) to retain qualified, independent third-party contractors to produce timely, credible and useful results. They should take appropriate action to apply the results from the resulting reports to optimize program performance to achieve BPU approved goals. They should use an integrated tracking and reporting database, such as that being developed by the New Jersey Energy Data Center at CEEEP, to aggregate and report the results of programs statewide quarterly and annually as required by the BPU, and identify EM&V and research needs.

To keep the EM&V process transparent, the utilities should make all EM&V results and reports public, taking appropriate steps to protect confidential customer information.

IMMEDIATE STUDY NEEDS

Finally, we take the opportunity to note the immediate need for several studies to support implementation of the Energy Master Plan:

Update Baseline Studies: Baseline studies have not been performed in several years. Program administrators should collectively undertake statewide studies to update assumptions regarding current practices relative to equipment and appliances purchased and installed in New Jersey and practices relative to building design and construction, as well as lighting and HVAC system installation practices as new or ramped-up programs are developed.

New Market Potential Study: The latest market potential study for New Jersey was updated in 2008. A new one should be conducted by program administrators prior to the next proceeding to determine future funding levels.

Additional Impact Evaluations: An impact evaluation of current OCE programs is currently underway, but a third-party contractor should undertake new studies as new programs are rolled out.

Program Process Evaluations: The utilities should undertake process evaluations as soon as they begin program implementation to identify and implement actionable improvement procedures to cost-effectively administer programs in a manner that produces significant and cost-effective savings for ratepayers (i.e., to maximize overall net present value of benefits). These evaluations should include, but not be limited to, the following: energy efficiency measures offered, accounting procedures, rebate funding processes, general work flow, rebate processing and approval procedures, rebate processing time-frame and safeguards (such as fraud prevention and auditing procedures), scheduling and customer interface (e.g., account management and customer satisfaction). The process evaluation should also look at data gathering needs, as well as processes and organization structures, including but not limited to tracking participation at the program and measure levels, including associated costs and electric and natural gas savings. Through the process evaluation, other data fields may be identified and procedures recommended for reasonable and pertinent tracking, gathering and reporting.

Cost-Benefit Analyses: To support the development and implementation of expanded energy efficiency programs and services, it is essential that the BPU establish standard tests to assess and determine cost effectiveness with approved input assumptions (e.g. discount rate, externality costs, measure costs, capacity benefits, electricity/natural gas price forecasts, avoided energy, capacity and T&D costs, etc.). The results of this policy should be incorporated into the cost-effectiveness model developed by CEEEP, which can be used either prospectively or retrospectively. Likewise, the BPU should approve a standard tool to assess cost-effectiveness to support program implementation.

SAVINGS, COSTS & BENEFITS

Achieving the Master Plan goals is not only possible, it is very cost-effective. Still, it will require a substantial investment.

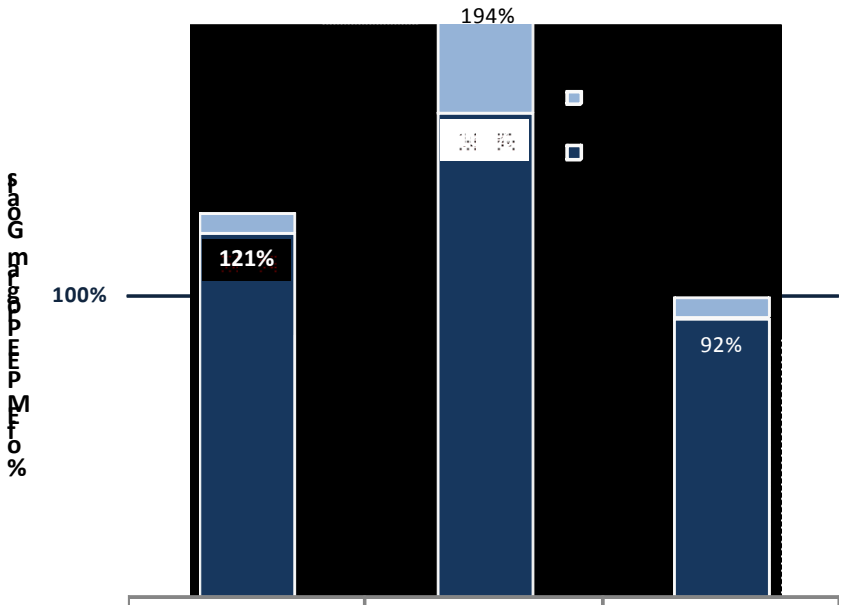
PROJECTED SAVINGS, COSTS AND BENEFITS

INTRODUCTION

Though not explicitly part of the scope of this mandate, our team conducted what should be considered a high-level assessment of the costs, benefits and energy savings that could arise from the aggressive strategies outlines in previous chapters.

The most important finding from the analysis is this: The Energy Master Plan goals are, by and large, achievable. In fact, relative to the EMP's 2020 goals for energy efficiency programs, we find it possible to exceed, by 27% and 94% respectively, the electrical energy and peak capacity goals. Our analysis also suggests that non-electric heating savings would fall just one percent shy of the EMP's goals. These values do not account for opportunities from new construction building codes and lighting and appliance standards, neither of which were assessed as part of this report.

Impact of NEEP Efficiency Strategies vs. EMP EE Program Goals



	GWh Savings	MW Savings	MMBtu Savings
Time of Sale Policy	6%	33%	7%
EE Programs Only	121%	161%	92%

	Energy Master Plan Efficiency Programs 2020 Savings Goals ‡	Strategy Portfolio Energy Efficiency Initiative Estimated Impact*	% of EMP Efficiency Program Goal
ELECTRICAL ENERGY	14,000 GWh✦	**17,800 GWh**	**127%**
ELECTRICAL CAPACITY	3,300 MW	**6,400 MW**	**194%**
OTHER ENERGY	75,000 BBTUs	**74,000 BBTUs**	**99%**

‡ *Considers only EMP energy efficiency program goals. Excludes EMP goals related to State lighting and appliance standards, new building codes, on-site power, demand response, biofuels and others*

✦ *EMP goals for efficiency programs; adjusted for the impact of new federal incandescent lamp standards*

***** *Considers only efficiency programs (and time of sale building energy rating policies). Excludes on-site power*

In addition to these, our cursory analysis of our on-site power strategies produces very similar results. Indeed, relative to EMP goals, our analysis finds electrical energy and peak capacity savings from on-site power to exceed goals by 41% and 112%, respectively, while falling less than one percent shy of the EMP's goals for non-electrical heating savings (exclusively from CHP).

RESULTS

To project the savings, costs and benefits of the program strategies we outlined previously, we developed a methodology described in some detail in the following section (see page 166 – A Note on Methodology). Key findings are presented below.

Note to the reader: *Unless stated otherwise, all savings, costs and benefits indicated below are for energy efficiency only, to the exclusion of clean, on-site power generation.*

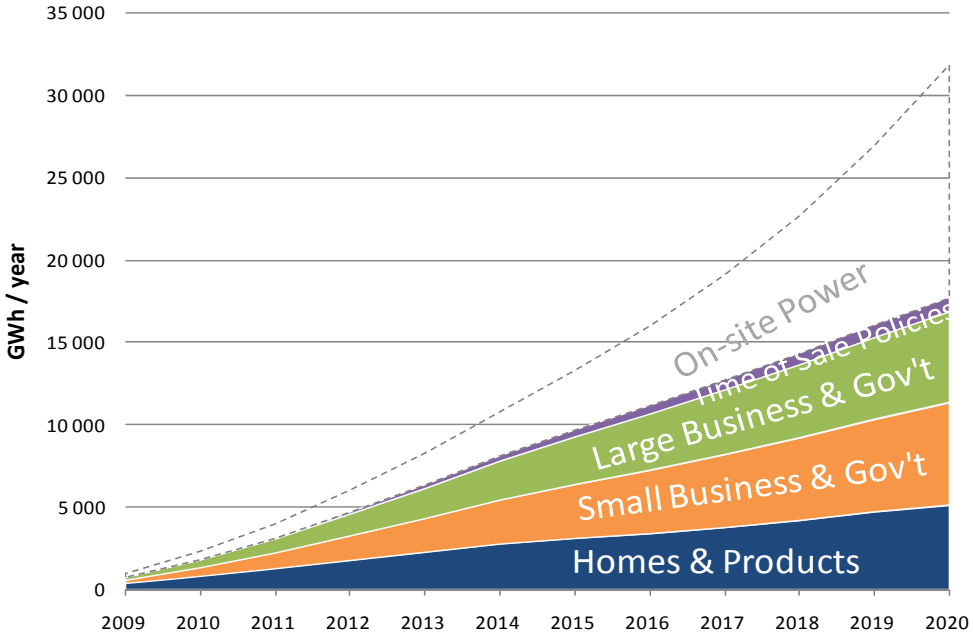
OVERALL SAVINGS

- Energy efficiency programs alone are able to deliver savings of nearly 18,000 GWh per year by 2020. These same efficiency strategies will free up nearly 6,400 MW of capacity, and save an additional 74,000 BBtus of non-electric energy.

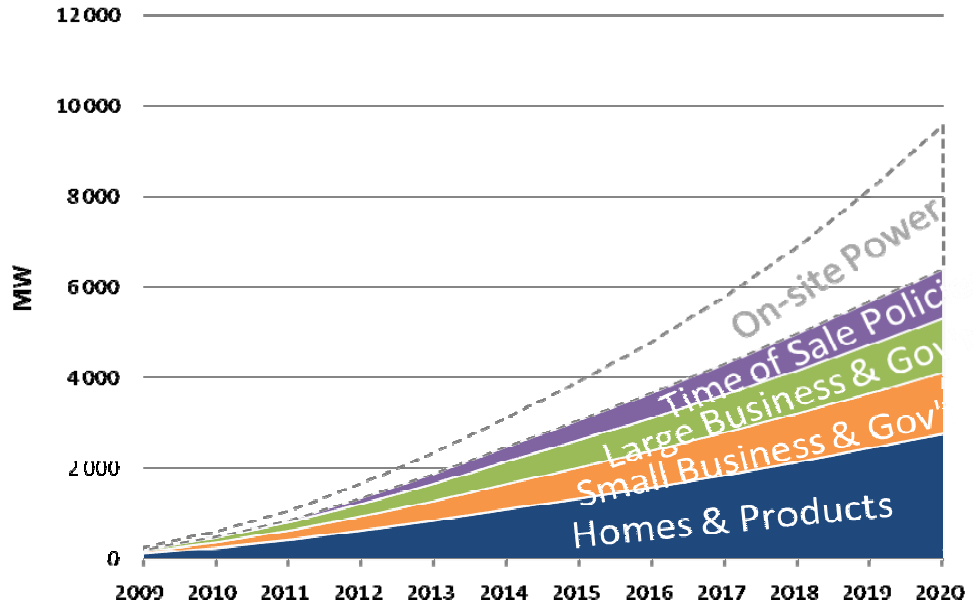
- Strategies aimed at encouraging clean, on-site generation of power and/or heat can generate an additional 14,000 GWh/year of power by 2020, as well as nearly 3,200 MW of capacity and nearly 33,000 BBtu of non-electric energy.

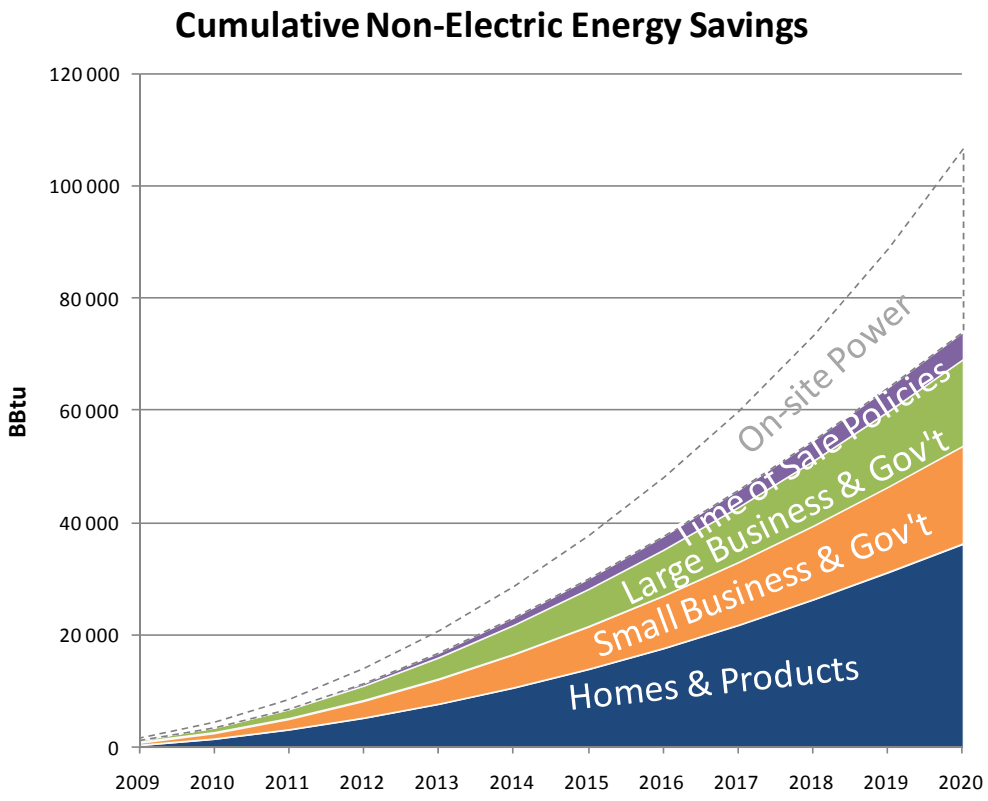
- **Combined, the electrical grid could be relieved of more than 30,000 GWh/year through these strategies. They could also generate a total of nearly 10,000 MW and more than 100,000 BBtus/year of grid savings by 2020.**

Cumulative Electrical Energy Savings
(and on-site generation)



Cumulative Electrical Capacity Savings
(and on-site generation)



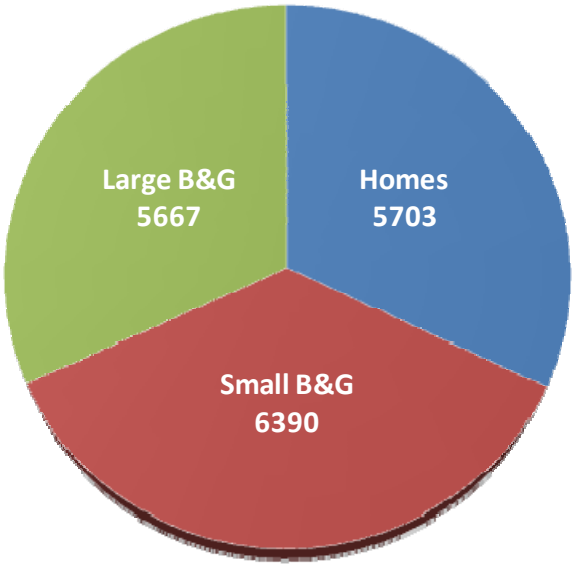


DISTRIBUTION OF SAVINGS

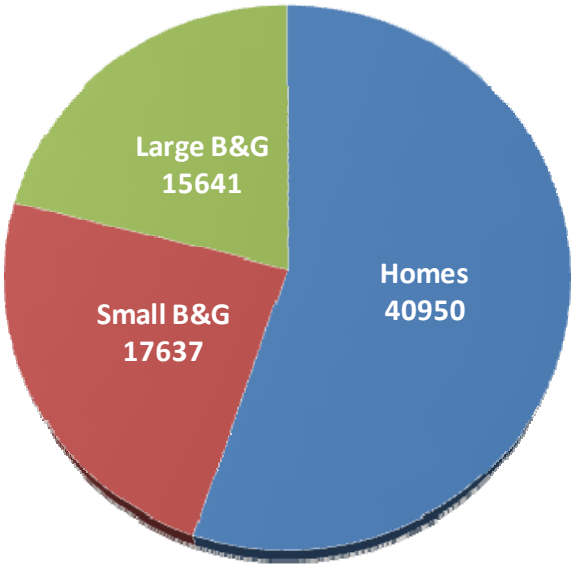
- Electric savings from end-use energy efficiency, when measured on a GWh/year basis, are pretty evenly split between homes (32%), small business and government (36%) and large B&G (32%). Capacity savings occur primarily in homes (59%), with an additional 22% coming from small business and government and 19% from large B&G.

- The majority of *non-electric* end-use energy savings also occur in homes (55%), with the remainder split between small business and government (24%) and large B&G (21%).

Electricity Savings by Sector
(GWh/yr in 2020)



Non-electric Savings by Sector
(BBtus/yr in 2020)



- Power from on-site generation comes primarily from the business and government sectors (for energy and capacity respectively, 45% and 59% from the largest B&G customers, and another 50% and 30% from smaller users); only 5% and 10% respectively of energy and capacity come from on-site power in homes.

- Power from on-site generation is generated primarily from combined heat and power, or CHP (57% of energy and 52% of capacity). Biopower (26% and 15%, respectively), solar photovoltaic (14% and 32%), and on-site windpower (3% and 1%) make up the remainder.

HOW SAVINGS COMPARE WITH EMP GOALS

- **At nearly 18,000 GWh/year in 2020, the strategy exceeds the EMP targets for electricity savings.** In fact, when adjusted for federal incandescent standards adopted but not reflected in the initial EMP analysis, the EMP goal equates to some 14,000 GWh (excluding codes and standards), which our expected efficiency-related savings exceed by 27%. *This does not account for the additional clean, on-site power generation or the impact of new appliance standards or increasing building energy codes.*

- At nearly 6,400 MW by 2020, the strategy exceeds the EMP targets for electrical capacity savings from efficiency programs (excluding demand response and CHP) by

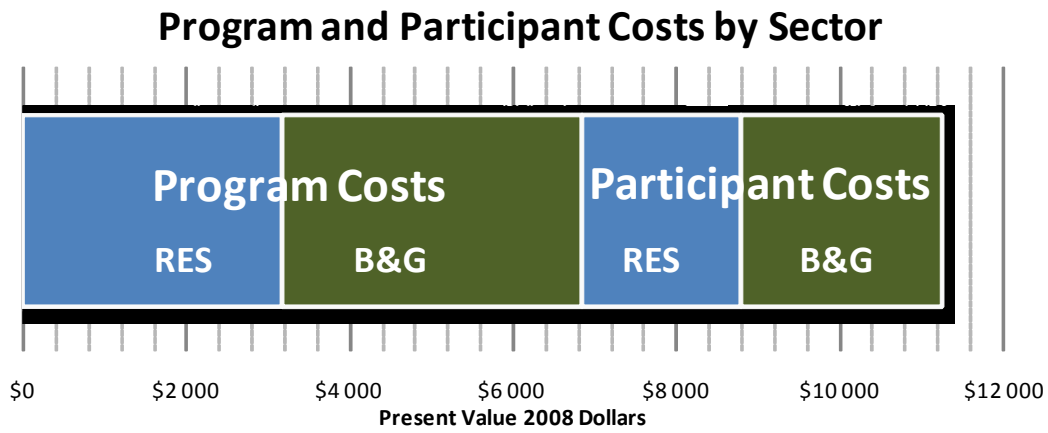
some 94%. *Again, this does not account for the additional clean, on-site power generation.*

- At 74,000 BBtus/year in 2020, the strategy falls just 1% shy of the EMP goals for non-electric savings through energy efficiency. Additional savings from clean, on-site power generation are expected to add a further 32,700 BBtus per year (primarily from CHP).

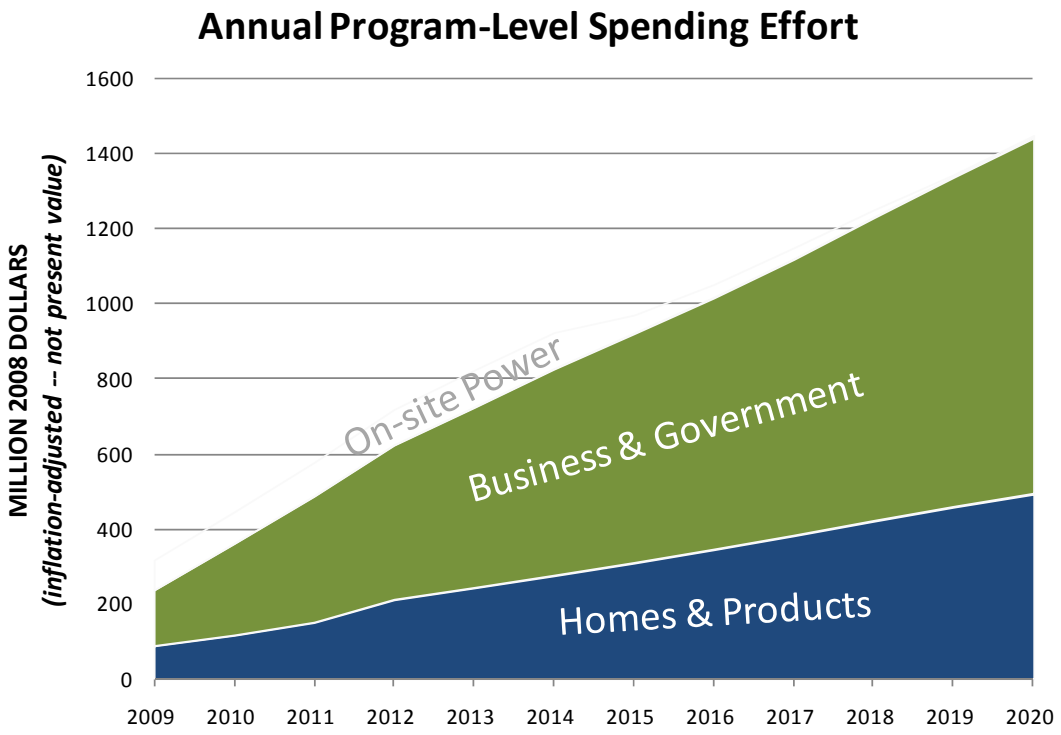
COSTS AND BENEFITS

Note to the reader: *the costs and benefits below, unless stated otherwise, are expressed in present value 2008 dollars, meaning that future costs and benefits have been discounted using an assumed weighted average cost of capital.*

- Over the 12-year period, the statewide energy efficiency program effort could come at a total present value cost of some $6.8 billion (or $10.3 billion on a non-discounted, inflation-adjusted budget basis). Meanwhile, participants would spend an additional $4.4 billion of their own money (measure costs not covered by incentives), for a total *societal* cost of $11.2 billion.



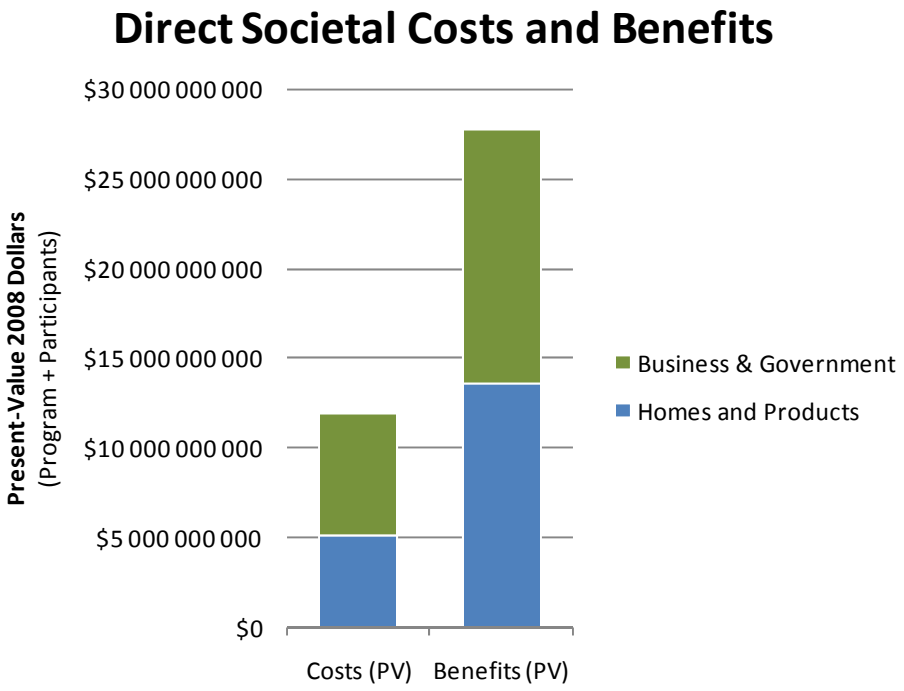
- Over the same period, the average annual cost of the overall strategy could top $550 million in present value dollars (or $900m in inflation-adjusted dollars, as presented in the graph below).



- Accounting only for the energy efficiency savings, the strategy would save New Jersey ratepayers nearly $28 billion in energy-related costs. In other words, in the absence of the $11.2 billion investment, ratepayers would have to pay an additional $28 billion to supply the energy that could otherwise be saved.

- On the whole, the strategy could be very cost effective. Again accounting only for the energy efficiency program component, but including the full societal costs (program and participant spending combined), every dollar spent on the strategy could generate $2.33 in direct benefits to New Jersey. These benefits represent the dollar savings associated primarily with reduced energy purchases and costs, and *do not account for the additional benefits associated with job creation and economic stimulus*.

- The strong cost-effectiveness applies to strategies for both major markets: the Homes and Products strategy offers a benefit/cost ratio of 2.6, while the Business and Government strategy could generate a benefit/cost ratio of 2.1.



- Finally, it is worth noting that contrary to the $28 billion in avoided costs, the bulk of which would be spent out of state for energy imports, the $11.2 billion price tag would be spent largely on services provided by New Jersey businesses and workers.

CONCLUSIONS

Achieving the Energy Master Plan goals will require an unprecedented effort at promoting energy efficiency, as well as clean, on-site power generation. Our high-level analysis suggests that the goals are not only achievable, but also represent a very attractive economic value proposition for New Jersey consumers and taxpayers.

A NOTE ON METHODOLOGY

INTRODUCTION

This section describes the approach used in the studies that form the foundation for New Jersey costs, benefits, and savings estimates. It presents the analytical framework and details the methodology used to develop our high-level assessment of the costs, benefits and savings to be expected from the strategies in this report. It also explains key inputs and data sources.

While not part of the original project scope, the report recommendations are supported by cost-effectiveness and savings potential analyses of each of the sector strategies described herein. These analyses were developed using previous cost-effectiveness and energy savings potential analyses conducted in the Mid-Atlantic region by Optimal Energy and VEIC. For this project the studies were adapted by substituting key factors specific to New Jersey's energy market, including energy sales forecasts, building types, end-use disaggregations, and avoided costs of saved energy and demand. New Jersey-specific data was taken from the best available sources (e.g., Rutgers Center for Energy, Economic & Environmental Policy (CEEEP), Honeywell Market Manager databases and program plans, KEMA studies of New Jersey efficiency potential, Commercial Building Energy Consumption Survey (CBECS)[*], census data) using, wherever possible, the same assumptions used in the New Jersey Energy Master Plan analyses conducted by Rutgers CEEEP. When New Jersey specific data was not available, supplemental data sources included recent Optimal and VEIC studies for New York and Long Island matched to New Jersey energy uses.

Given the high level nature of this report, these analyses, which use methods and data reviewed by peers and regulators in other jurisdictions, are sufficient as general guidance to identify the cost-effectiveness, value and relative contributions of the sector strategies to meet the Energy Master Plan Goals. Detailed planning and implementation of these strategies will require further analyses using methods, tools and assumptions approved by the BPU to support consistent statewide implementation and evaluation. In addition, we previously (see section beginning on page 148) recommended further studies to support program planning and implementation (e.g. baseline and market characterizations studies).

[*] http://www.eia.doe.gov/emeu/cbecs/

ANALYTIC FRAMEWORK

This analysis relies on both "top-down" and "bottom-up" projections of energy efficiency program potential, organized according to sector and individual energy efficiency markets. From the perspective of this report, markets are the arenas in which decisions are made affecting energy use. Broadly, there are three different markets – existing buildings, new construction/major renovation, and occupant installed energy end-uses in buildings such as lighting and appliances. Energy efficiency measures are the technology options, services, or design parameters themselves. Strategies are implementation efforts tailored to specific markets and measure packages. This analysis uses the results of previous studies to evaluate the cost-effectiveness of bundles of technologies, services, or design strategies ("measures"), taking into account the interactive effects of multiple measures and the extent to which the installation of one efficiency measure will reduce the savings from subsequent installations. The Societal Cost Test is used to determine cost-effectiveness. Each of these factors is discussed below.

EVALUATION APPROACHES

The evaluation of energy efficiency measures is not only a function of market but of methodology. There are two basic evaluation methodologies or approaches to determining the energy efficiency potential of an efficiency measure: "bottom-up" or "top-down."

- The "Bottom-up" approach calculates savings by developing an engineering estimate of savings for a single unit of a specific measure and/or action (e.g., 47 watts for replacing an incandescent lamp with a compact fluorescent lamp). This estimate is then multiplied by the number of units forecast to be installed during the course of an energy efficiency program or initiative, which in this case might be a promotion with a retail chain that sells lighting. Costs are calculated in a similar fashion by multiplying the incremental cost of each measure by the number of installed measures, including the program-delivery costs for things like administration, marketing, technical support, etc. Note that administration costs are addressed below, under the sector-specific Budget Development sections (see pages 173 and 175 below).

- The "Top-down" approach determines initiative savings by forecasting total electric energy sales over the analysis time horizon, and then determines what percentage of those sales may be offset by the installation of a given energy efficiency measure in each year. The top-down approach develops costs relative to energy savings, and then multiplies that "cost per energy saved" by the measure's energy savings each year to determine each year's installed costs. These costs, too, include program delivery costs.

The estimate of the potential savings for New Jersey is based on the top-down approach for the commercial and industrial customer segments and building types, and a bottom-up approach for the residential market segments.

MARKETS

This analysis defines energy efficiency measures as being in either the "lost opportunity" or "early retirement retrofit" market, depending upon the circumstances of the measure's installation.

Lost opportunity measures are installed at the time when a purchasing decision is being made anyway, such as during new construction or equipment purchase to replace a failed unit. For such lost opportunity markets, this analysis assumes that the relevant costs are the incremental expenses of installing the more efficient measure over whatever baseline equipment would have otherwise been installed.

Early retirement retrofit measures are installed purely as the result of an initiative which has identified an inefficient technology, and targeted it for retirement and, in most cases, replacement before the end of its operational life. For retrofit applications, this analysis assumes that the relevant costs are the full installed expense of the more efficient measure, because the cost would not have otherwise occurred, although there may also be a credit to account for the likelihood that the cost would have occurred at a much later date (similarly, energy savings are reduced to account for the likelihood of future baseline replacement).

An energy efficiency measure's classification as either lost opportunity or early retirement retrofit can have a significant impact on the analysis and strategy selection. The difference between full cost and savings, as in the retrofit, and incremental costs and savings, as in lost opportunity, can make the difference between a measure that is cost-effective and one that is not.

MEASURES

Measure analysis requires inputs for certain measure characteristics in addition to the base cost and savings of the measure. This is true whether the measure is equipment, an operational strategy, or a service such as design or commissioning. For this analysis, and especially for the B&G and industrial, the measures were aggregated to the end use level. The following inputs were developed for previous analyses and not manipulated for New Jersey except for projected annual net market penetrations. These inputs include:

- *Applicability*: the number of customers eligible for a given measure (bottom-up) or the fraction of the end-use level sales for each building type that is attributable to equipment that could be replaced by the high efficiency measure (top-down). In a top-down example, say for packaged air conditioners, it is the portion of total building type cooling electrical load consumed by packaged systems. Applicability estimates for commercial measures are drawn from a variety of sources including, but not limited to the Commercial Buildings Energy Consumption Survey (CBECS) maintained by the US Energy Information Administration (EIA), and various publications by the American Council for an Energy Efficient Economy (ACEEE). On the residential side, applicability estimates, for example, for residential new construction

come from U.S. Census data for building permits issued, tempered by Market Manager projections for the number of homes expected to be constructed going forward. For products, manufacturer sales data and EIA Residential Energy Consumption Survey (RECS) data provide a sound basis for applicability.

- *Feasibility*: the fraction of the applicable number of customers or end-use sales for which it is technically feasible to install the high efficiency technology. Numbers less than 100% reflect engineering or other technical barriers that preclude adoption of the measure and does not include economic or behavioural barriers. Feasibility rates are assessed at the measure level by building type and are typically based on professional judgement where other data are unavailable. For example, for all cases where exterior compact fluorescent lamps are applicable, only a subset is assumed to be feasible due to aesthetics considerations. For a residential example, only two-thirds of all existing buildings are assumed to be feasible for building envelope retrofits due to structural, aesthetic, health (e.g. lead paint, asbestos, etc.), absentee ownership, moisture, safety or other issues.

- *Turnover*: the number or percentage of existing equipment that will be naturally replaced each year due to failure, remodelling, or renovation. This applies to lost opportunity markets where the goal is to influence the purchase during a replacement or during remodelling or renovation. In general, turnover factors are assumed to be one divided by the measure life. For example, it is assumed that commercial packaged air conditioners have a measure life of 15 years; therefore, one-fifteenth of the existing equipment stock will be eligible for replacement annually. Measure lifetimes are based on generally accepted industry estimates such as those reported by Energy and Resource Solutions (ERS) in their Measure Life Study[*].

- *Effect of Future Updates to Building Energy Codes and Appliance Efficiency Standards*: For simplicity's sake, our analyses generally assume that minimum energy code requirements and appliance efficiency standards increase at the same rate as new technologies develop (i.e., increased stringency in codes and standards is matched by improved energy performance in new products and design practices). See below for the way such updates were integrated into the baseline.

- *Baseline Adjustment*: In general, the energy efficiency of all equipment tends to improve over time. Therefore, the efficiency of new "standard" or baseline equipment is generally higher than older, existing baseline equipment. The baseline adjustment discounts savings in future years for retrofit measures to account for this trend. For B&G, this trend is not strong, and baseline adjustments are typically assumed to be 100%, except in a few cases such as chiller systems where old, existing equipment is likely to be much less efficient than new, standard equipment. For B&G customers, the impacts of potential updates to energy codes and appliance standards are handled by increasing the relevant measure penetrations for both the "no program" (baseline) and "in program" scenarios. In other words, the analysis

[*] Measure Life Study, 2005. Energy and Resource Solutions (ERS).

assumes that codes and standards updates will increase the penetration of efficiency measures both in the absence of efficiency programs and with programmatic effects. For the residential sector, baselines affected by codes and standards are adjusted to account for decreased savings, since standard equipment becomes more efficient after a code change. For example, the federal lighting standards that are due to go into effect starting in 2012 will cause incandescent bulbs to become more efficient without program intervention. Therefore, with a more efficient baseline, claimed savings from measures like CFLs will be reduced.

- *Savings Fraction*: Used only in the top-down approach, the savings fraction represents the percent savings (as compared to either existing stock or new baseline equipment for retrofit and non-retrofit markets, respectively) of the high efficiency technology. Savings fractions are calculated based on individual measure data and assumptions about existing stock efficiency, standard practice for new purchases, and high efficiency options. For example, it is assumed that for a non-retrofit installation, a high-efficiency unitary air conditioner meeting the Consortium for Energy Efficiency's Tier 2 specifications can save approximately 20% over a new baseline unit.

- *Annual Net Penetrations:* are the difference between the Base Case measure penetration and the measure penetrations that could be achieved with sustained efficiency initiatives. For instance, the number of residential SEER 16 central cooling system installations that may be claimed by a residential HVAC program is the difference between the number of applications that the program manager processes, less the number of SEER 16 units that would have been installed without a program, as estimated by distributor and manufacturer sales data.

LOAD SHAPES AND PEAK DEMAND REDUCTION

To determine the coincident peak demand reduction associated with the efficiency potential, we used previously developed kilowatt demand equivalents for the kilowatt hour energy savings. A load shape library consisting of load shapes for a variety of end-uses allowed conversion of annual kWh energy into both summer and winter peak reductions. The B&G load shapes were previously developed by Optimal Energy from ITRON's eShapes for several weather stations including JFK and Macarthur airports. The residential load shapes are based on a study conducted by VEIC and Optimal for the New York State Energy Research and Development Authority (NYSERDA).

STRATEGIES

Finally, strategies, as those discussed earlier in this report, are implementation efforts that affect energy-related decisions in each of these markets. The estimate of achievable savings assumes strategies geared toward capturing efficiency opportunities in all markets. Strategies are the basis for program design and delivery. The strategy defines a host of program

features, including marketing, incentive design and levels, outreach & education, staffing, formulation and implementation of policy, and codes and standards among others. Program strategy is an input for developing the program budget and has a significant impact on both the cost and benefit of a specific program or measure. This analysis assumes the maximum possible achievement in almost every category. For example, in the residential retrofit market, the maximum achievable level for retrofit installations in existing homes is estimated to be two-thirds of the market. This is based on professional judgment, experience with the New Jersey market, and lessons from the Massachusetts National Grid small C&I program that has achieved approximately this level of penetration.

COST-EFFECTIVENESS SCREENING

The analyses from which our New Jersey estimates were developed do not include the energy savings from all possible measures. In many cases, the costs of technology installations, services, or design enhancements – either the technology costs themselves, or the added costs of implementing the strategies – are higher than their benefits. Where the measures fail to meet a cost-effectiveness test, their associated costs, as well as energy and demand savings, are removed from the final results.

The Societal Cost Test as presented in the California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects is the basis for excluding non-cost-effective measures from our assessment of what can be achieved. To the extent made available, the analyses used New Jersey specific data provided by Rutgers. This data was developed for the supporting analysis for the New Jersey Energy Master Plan. The Societal Cost Test includes:

- The total incremental cost to purchase, install and maintain measures over their projected life. For retrofit measures, the incremental cost is the full cost of replacement. For replacement, remodeling or new construction markets, measure costs are the cost differential between a baseline measure and the more efficient measure. In addition, a program cost adder of 15 to 40% is included at the program level of analysis. Measure costs are based on a wide range of studies and program field data from current practice in New England, New York, and California. Program cost adders are derived from current New Jersey program costs and direct experience from program implementation in New York.

- Projected measure life discounted to reflect attrition rates informed by program evaluations and field experience captured in the proprietary Optimal Energy measure cost and savings database.

- Measure energy and capacity savings using the most recent information available from the Optimal Database.

- The avoided costs of producing electric energy and providing peak generating capacity, and the avoided costs of transmission and distribution capacity. The avoided energy and capacity costs are based on data provided by Rutgers University.

- Deferral replacement credit for some retrofit measures (i.e., replacing equipment before the end of its useful life permanently shifts out the capital costs required for future replacement equipment, thereby providing a net reduction in present value capital costs for the customer), using the most recent information available from the Optimal Database;

- Operation and maintenance savings or costs if O&M impacts increase costs (these were mainly assessed on efficient lighting technologies where efficient components such as lamps and ballasts significantly outlive their baseline counterparts resulting in considerable operational savings), using the most recent information available from the Optimal Database;

- Gas fuel costs provided by Rutgers (note: for simplicity, the analyses modeled only gas efficiency measures as their energy savings and costs impacts are similar to the impacts of oil heat measures with results reported in MMBTU); and

- Avoided environmental or social externalities costs (considered on a cost per kWh or MMBtu saved basis for the purposes of this study). These externality values - $0.95 per MMBtu and $0.02 per kWh -were provided by Rutgers University.

Note that, under the Societal Cost Test, incentives are considered to be transfer payments between parties, and thus are not counted as costs or benefits. However, the costs presented in the report ($11 billion cumulative budget over the 2009-2020 period) are the total of all costs of delivering these programs and initiatives, including administrative, marketing and incentive costs (i.e., does not include participant costs).

BUSINESS & GOVERNMENT ANALYSIS

MARKETS & MEASURES ANALYZED

The underlying analyses for the New Jersey commercial and industrial (C&I) sectors estimated savings for 84 electric (including variants and technology combinations) and 41 natural gas efficiency technologies for 10 building types and 14 end uses. A total of 2,698 individual measures targeted to the new construction, renovation, replacement and retrofit markets were aggregated into measure bundles to be analyzed. For each bundle or end use the costs, benefits and maximum achievable market penetrations were estimated. This section describes the methodology for selecting and characterizing the B&G measures.

Individual technology cost and performance characteristics were developed using public and private information sources, including: the NYSERDA Electric Efficiency Potential Study and Natural Gas Efficiency Potential Study; EIA Commercial Building Energy Consumption Survey (“CBECS”); California Energy Commission measure cost and savings database; publications from national organizations such as American Council for an Energy Efficient Economy (“ACEEE”), Lawrence Berkeley Laboratory (“LBL”), and New Buildings Institute (“NBI”); the Efficiency Vermont Technical Reference Manual (“TRM”) developed and continually updated and maintained since 2000; other utility, statewide, and regional

technology, baseline and market assessment studies for areas in the Northeast United States; and direct communications with manufacturers and vendors.

METHODOLOGY

A "top-down" approach begins with the disaggregated electric and natural gas sales forecast, the energy savings potential for each measure (percent of existing measure load) and the existing and forecast load attributable to that measure for each building type to arrive at measure potential. Measure level savings in the underlying analyses were developed from the formula illustrated below.

Measure Savings = *kWh Sales x Applicability Factor x Feasibility Factor x Turnover Factor x Not Complete Factor (Retrofit only) x Savings Factor x Net Penetration Rate*

The product of the above factors provides measure level kWh savings by year.

NET PENETRATION RATE

Net penetration rate is the difference between the level of penetration of the energy efficiency technologies in the absence of any programmatic efforts ("base case") and penetration levels achieved through the program. The study team based its retrofit base case penetrations on penetration curves representative of the degree to which customers in comparable areas have already installed the efficiency technologies. Lost opportunity base case penetrations (e.g., replacement, remodel, renovation, or new construction), are based on best estimates of current saturations from a variety of baseline studies and projections of how markets are likely to advance in the absence of program intervention. As noted previously, the analysis assumes that codes and technology advance at a consistent rate, with two important caveats, when time of sale disclosure and time of sale upgrades occur in 2010 and 2012 respectively. In the case of the time of sale code changes, the analysis reflects a stepped increase in penetration rates for all end uses based on the requirement to disclose or update.

The team used program penetration rates based upon evaluations and results from the best retrofit and lost opportunity programs in North America, tailored to reflect likely acceptance of individual measures.

Based on professional judgment, penetration rates were employed at the end-use level to determine the likely impacts of the time-of-sale policies previously discussed. The net to gross ratio – free ridership net of spillover – is reflected in the calculations of the no-program, with program, and in-program penetrations.

BUDGET DEVELOPMENT

The budget for the Business and Government section was also developed based on the results of previous analyses informed by actual program costs used in several states (e.g., New York, Massachusetts, Connecticut and Vermont). The incentive calculations are an output of the proprietary Portfolio Screening Tool and are based on a percentage of the estimated incremental cost or installed cost of the efficiency improvements.

The other program costs are the result of applying administrative adders to the incentives based on experience with other programs in the region. These vary by market segment and typically range from 15 percent to 40 percent of the incentive totals, including expenses for direct program administration and marketing. Note that this does not include general utility planning and reporting, filing, performance incentives, R&D, evaluation or other costs not directly associated with program delivery. Budgets do include anticipated costs for support and implementation of public policies, such as training and outreach for the time-of-sale ratings and upgrades, but do not include the costs to advocate for and enact any enabling legislation.

In addition to program costs, the cost-benefit analyses included participant costs which total $2.4 billion over the 12 year period. Assessed for each market and sector, participant costs vary from 50 to 75 percent of total costs for specific measures (e.g., 50 percent for retrofit projects and 75 percent for lost opportunity measures).

RESIDENTIAL ANALYSIS

MARKETS & MEASURES ANALYZED

The analysis of the New Jersey residential sector estimated savings for electric and natural gas efficiency measures for new and existing single family, multifamily and low-income households. While oil heat serves approximately 400,000 or 13 percent of all housing units in New Jersey, for simplicity our analyses did not distinguish between oil heat or gas efficiency measures as the costs and savings are very similar. The modeling is based on gas efficiency measures as the prototype for fossil fuel heated homes.

In addition, “Things in Buildings” measures, which may be found in any home, were also analyzed. For each measure the costs, benefits and maximum achievable market penetrations were estimated.

Individual energy efficiency measure cost and performance characteristics were developed using public and private information sources, including the EIA Residential Energy Consumption Survey (“RECS”) and many of the same technical sources used to develop Commercial and Industrial measure savings estimates as described above, in addition to savings from the Honeywell Market Manager team. The data is based on current measure

assumptions – many of which are used in program implementation in New Jersey as well as others states.

RESIDENTIAL METHODOLOGY

A "bottom-up" approach begins with the definition of energy efficiency measure characteristics including electricity or natural gas savings of the measure vs. the estimated baseline energy consumption of a conventional energy end use. In addition, the cost and lifespan of the measure must also be determined.

Total savings attributable to an energy efficiency measure are driven by the projected penetration of that measure into new and existing homes. In most cases, energy efficiency measures have a "natural" rate of diffusion into homes while programs accelerate penetration by increasing that rate. For example, the existing stock of residential central air conditioning (CAC) systems with an average seasonal energy efficiency ratio (SEER) below 10 is being replaced by CAC systems that meet the current minimum federal standard of SEER 13, while the residential CAC efficiency measure included in this analysis uses a SEER of 15 or greater. Penetration projections are adjusted to account for "free-ridership" (measures counted in the analysis which would have been installed in the absence of the program) and "spillover" (increased measure penetration resulting from indirect program effects like broader technology availability).

The team developed measure penetration rates based upon evaluations and results from the best retrofit and lost opportunity programs in North America, tailored to reflect likely acceptance of individual measures and taking into account the effects of codes and standards. For instance, for residential new construction, the starting point for 2009 is based on the Honeywell Market Managers' projections for likely penetration rates in New Jersey, while estimates for existing homes retrofit penetrations are based on experience from National Grid's Massachusetts small C&I retrofit program which has over ten years of field operation experience. .

Measure Savings = *Baseline End-Use annual kWh or Therm Consumption - Measure End-Use annual kWh or Therm Consumption x Measure Life x Free-riders and Spill-over x Net Penetration Rate*

BUDGET DEVELOPMENT

As in the B&G analysis, the residential program budgets are generated by the Portfolio Screening Tool. The residential analysis also assumes representative program costs for marketing, planning, and other implementation costs. In addition the analysis includes estimated expenses associated with time-of-sale initiatives, distributed generation (PV, wind and micro-cogeneration) and smart grid efforts. The initial administration budget for the residential programs was developed by assuming a funding level consistent with the current market manager program implementation contracts in New Jersey. Based on the potential

savings predicted by the analysis, these initial budgets were scaled up over the 12-year analysis period assuming constant spending per unit of saved energy or demand. This was a conservative assumption given that most of the projected program activities would enjoy significant efficiencies of scale if expanded.

Budgets do not include utility planning, evaluation, reporting, filing, performance incentives, R&D or other costs not directly associated with program delivery. Budgets do include anticipated costs for support and implementation of public policies, such as training and outreach for the time-of-sale ratings and upgrades, but do not include the costs to advocate for and enact any enabling legislation.

The residential budgets are expected to total $3.8 billion over the 12 year period, or about 35% of the total $11 billion initiative budget. Total residential marketing budgets, including cross-marketing, education and community initiatives, were assumed to reach approximately $53 million per year by the end of the analysis period, scaled up from the current level of $5 million, proportional to energy savings. Over the twelve-year period, cumulative budget totals are expected to reach approximately $366 million for marketing, $737 million for administration, and $2.7 billion for incentives.

In addition to program costs, the cost-benefit analyses included participant costs which total $2 billion over the 12 year period. Assessed for each program and market, participant costs vary from 0 to 100 percent of total costs for specific measures (e.g., an average of 21 percent for retrofit projects, 55 percent for things in buildings, and 12 percent for residential new construction measures).

NEW JERSEY BUILDERS ASSOCIATION

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September 27, 2010

The New Jersey Builders Association (NJBA) would like to thank the Board of Public Utilities for providing an opportunity to comment on the re-addressing of the Energy Master Plan (EMP). The four key points that NJBA would like to see implemented into the EMP are: (1) assuring new homebuyers achieve a 7-year payback on their investment in higher costing energy conservation methods; (2) removal of municipal restrictive zoning to allow for more energy efficient multi-family housing; (3) availability of electrical meters with real time electrical consumption displays for both existing owners and new home buyers; and, (4) incentives for energy efficient measures performed on existing dwellings.

1. Action Item 2, Goal 1 (page 68) of the *DRAFT: Working Document Preliminary Data Update of the 2008 New Jersey Energy Master Plan* calls for statewide building codes that are at least 30% more energy efficient than current codes. It is critical that the true cost of such additional energy efficient measures on new construction pays for itself within 7-years. The average time period that a homeowner (and family) remains in the same house is 7-years. A new home buyer can absorb the costs of higher energy efficient measures if they can recoup those costs within their ownership period of the dwelling. Increasing the recoup period beyond 7 years will: (1) significantly dampen new home purchases, (2) force new home buyers from the market place; and, (3) discourage the creation of new housing stock which is much more energy efficient than existing housing stock.

Action Item 2 of Goal 1 should contain language clarifying that the cost of increased energy efficient measures in new dwellings shall provide the homebuyer a payback within 7-years on their monetary investment.

2. Due to the insulative benefits of multiple living spaces within the same building envelope, attached housing is 15 to 30 percent more energy efficient than a comparably sized single-family detached home. In addition, higher density housing can be served by public transit systems, thus achieving additional energy savings. Further, demographic changes predict an increase in smaller size households, which prefer smaller homes in attached housing styles when they are available. Smaller home size would also reduce energy consumption. The *National Green Building Standard* (sections 403.12 and 503.9) encourages higher density housing as a means to save energy and reduce the carbon footprint.

A new Action Item should be added in Goal 1 that calls for state, regional and county plans to encourage zoning for higher density attached housing. Municipalities should plan for and zone sewer service areas for higher density attached housing.

3. The energy consumption habits of consumers needs to be steered in the direction of more conserving behavior. The benefits of a home, appliance, or electronic device that is more energy efficient than the market norm (i.e. Energy Star), can be nullified by a consumer (or family) that does not follow energy efficient practices. To encourage electrical energy conservation, electrical meters with real time energy consumption displays should be made available by the utility to both existing and new home owners. A consumer would be able to visually see the exact electrical energy consumption (watts) of their computer, television, air conditioning and other electrical devices by turning the device on or off and watching the display. Providing consumers with the ability to see their precise electrical consumption will encourage the implementation of cost conserving habits as a means to reduce their electric bill.

A new Action Plan should be added to Goal 2 or Goal 4 that requires utilities to provide homeowners, upon request, with electrical meters containing real time electrical consumption displays. The cost of the meters can be subsidized through the societal benefits charge.

4. Older existing home are significantly less energy efficient than newer homes. Newer homes are built to conform to a much higher degree of efficiency through conformance with modern energy codes. Homes built today are already 30% to 40% more energy efficient than those built during the 1970's[1]. Over 75% of existing mid-Atlantic homes were built prior to 1980, when more earnest energy conservation construction practices were implemented[2]. Since newer housing stock replaces older housing stock at an approximate rate of 1% per year[3], the focus of the EMP should be to provide significant rebates and incentives for improving the energy efficiency of homes built prior to 1980 rather than making modern energy codes for new housing more stringent.

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[1] NAHB Resolution 1, Energy in Existing Homes, published by the Green Building Subcommittee of the Construction, Codes and Standards Committee, May 2, 2008

[2] *An Energy Efficiency Strategy for New Jersey, Achieving the 2020 Energy Master Plan Goals*, published by the Northeast Energy Efficiency Partnership (NEEP), page 34.

[3] NAHB Resolution 1

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An Action Item should be added to Goal 1 stressing the need for significant monetary incentives and rebates for improving the energy efficiency of homes built prior to 1980 rather than making modern energy codes for new housing even more stringent.

Sincerely,

George A. Spais
Director of Codes & Technical Services