Boosting Energy Efficiency in the Industrial Sector

An Action Plan for NRDC

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Section I: Executive Summary

Today, the industrial sector consumes one-third of energy used in the United States and accounts for 12% of U.S. gross domestic product and nearly 20% of the world’s manufacturing output. This important component of the U.S. economy can be more efficient. There are NPV positive energy efficiency (EE) savings of approximately $47 billion which have the potential to reduce energy consumption by 18-21% from 2009-2020. Looking ahead to 2040, the industrial sector is projected to be the largest source of growth of primary energy demand in the U.S. This growth rate coupled with increasing amounts of manufacturing returning to the U.S., in part due to lean manufacturing, illustrates the urgent need to address industrial EE for the U.S. to be a globally competitive manufacturer and increase energy security.

Energy efficiency is the cheapest and fastest solution to increasing the competitiveness of American businesses and mitigating climate change impacts, yet its potential has not been fully realized. Traditional industrial EE programs, designed by utilities, have pursued capital-based savings such as upgrades to lighting, HVAC, variable speed drives and compressed air equipment. While these measures have achieved savings, been cost-effective and built trust between utilities and industrial customers, they have not fully captured possible savings because to date they have failed to target EE associated with manufacturing processes. To change this, private companies, governments, and NGOs are interested in reducing market barriers to take advantage of process savings.

Government action at the federal and state level is necessary to set standards and encourage utilities to demand industrial EE savings. Action by the federal government to date has focused on providing research and development and target setting programs. EE programs, such as the U.S. Department of Energy’s Advanced Manufacturing Office, which focuses on identifying and developing next-generation process technologies, provided technical assistance through its assessment centers, and target setting programs such as its Save Energy Now program which involves a voluntary 25% reduction in industrial energy intensity in 10 years. DOE is also focusing on industrial energy management through its newly developed Superior Energy Performance program. State level efforts have facilitated utility programs that demand efficiency goals be met and provide incentives to further drive energy reduction.

Utilities are the critical link to driving efficiency at small and medium industrial organizations through incentives, information and technical assistance. With the fear that any energy efficiency modification will affect the quality of their product output, industrial organizations face uncertainty when making changes to processes; both trust and incentives can help a small to medium customer overcome the perceived risk of making changes to current operations. For example, Bonneville Power Administration has built up trust with local industrial customers, and through pilot programs aimed at process savings, has helped their industrial customers realize almost three percent savings (about 8,200 MWh) since 2009.

Stakeholders such as industry workgroups and non-profits are valuable sources of information sharing to reduce energy usage. Information shared greatly increases the acceptance of new processes or technologies. Regional Energy Efficiency Organizations (REEOs) have been particularly effective at providing tools and educational materials. For example, one of the oldest REEOs, the Northwest Energy Efficiency Alliance, has helped the region accumulate an average of 802 MW of savings from 1997 to 2011—which is enough energy to power Seattle, Portland and Seattle each year.
Looking ahead, leadership from the federal government, states, utilities and industrial organizations are crucial to unlock the vast savings potential industrial EE provides. Based on the research of Columbia University’s Capstone team, including extensive interviews with industry experts, highlighted below are the key recommendations for NRDC to pursue with various stakeholders.

NRDC should:

- **Drive the development of EE information clearinghouses.** A number of stakeholders from diverse sectors can collaborate to create and utilize multiple online EE Clearinghouses to share a vast array of information related to EE. To make these resources as relevant and useful as possible, different Clearinghouses could be established for different industrial sectors, or for various regions of the country (e.g. one Clearinghouse each for the Northeast, Southeast, Midwest, etc.). NRDC should draw on its diversity of connections with NGOs, REEOs, utilities, PUCs, and utility customers to, identify which of these groups would be best prepared to supply the different elements of the Clearinghouses, and implement them. Elements for the clearinghouse include: general industrial EE information, best practices, a way to segment utilities and their customers in order to provide tailored services, technical expert reviews, and a peer discussion board.

- **Provide tailored recommendations to utilities on how they can expand, improve or tailor their EE programs for industrial customers.** NRDC has the resources and expertise to recommend actionable industrial EE programs that utilities can implement with their customers.

- **Promote the hiring of energy managers through executive management outreach.** Interviews with EE experts have reiterated the critical importance of having staff dedicated to energy management in the push for EE improvement. In some companies, only one motivated employee was needed to facilitate greater savings, but in other cases, available staff time is insufficient for achieving progress. NRDC should work with its industrial partners and utilities to encourage the hiring of energy managers.

- **Motivate partner companies to set EE targets.** Establishing greenhouse gas (GHG) or energy reduction targets has proven to be an effective means of reducing energy consumption. NRDC should leverage its existing partnerships with industrial organizations and utilities to engage in an energy target setting program, or to encourage utilities to get their industrial customers to engage in a target setting program. Examples of programs include: federal programs such as DOE’s Superior Energy Performance certification program, climate related programs such as the Carbon Disclosure Project or The Climate Registry, or municipal programs like Mayor Bloomberg’s Carbon Challenge.

NRDC should work with state governments and Public Utility Commissions (PUCs) to:

- **Promote energy efficiency as baseload power.** Cost-effective EE bid first into the loading order could serve to increase the amount of industrial EE pursued in states. For example, the mandate in the Northwest that cost-effective EE be bid in first has served as a catalyst to increase the amount of EE pursued. NRDC should advocate that EE be bid in first, in partnership with the American Council for an Energy Efficient Economy (ACEEE) in front of states or groups such as the National Association of Regulatory Utility Commissioners (NARUC).

- **Provide public recognition for successful industrial customers.** The power of recognition is an undervalued but powerful tool to motivate success. NRDC can utilize its nationwide network to ensure existing public recognition ceremonies include categories for industrial process efficiency savings.

- **Reevaluate the cost–effectiveness tests to include non-energy benefits (NEBs) of industrial energy efficiency measures.** All EE measures must prove that they are cost-effective in order for PUCs to approve allocation of ratepayer funds. While many untapped industrial EE measures exist, including the
NEBs of measures could increase the number of industrial EE measures pursued. Examples of NEBs include operational savings and maintenance, worker health and safety and environmental benefits. NRDC should work with ACEEE and states to find cheap and easy ways to quantify NEBs.

**NRDC Should Work with Utilities to:**

- **Provide temporary utility-backed energy managers.** To facilitate energy management at industrial facilities in a more cost-effective manner, utilities could provide an Energy Account Executives (EAEs) to two or more small or medium sized facilities. These EAE’s would provide assistance with initiatives ranging from basic assistance in developing an energy management plan to the more complex process efficiency measures. NRDC could help utilities develop programs such as these through either direct contact or by developing educational materials on program design options.

- **Segment industrial customers based on their energy usage and engagement in energy management.** NRDC should work with utilities to segment customers based on their size and existing engagement in EE. Utilities could use this strategy to handhold, build trust, design customized programs to meet industrial customers’ needs and lead them toward deeper and more profound process efficiency measures.

- **Reduce industrial customers’ perception of risk with financial incentives.** Utilities can help meet most industrial company’s management’s goal of an 18-month payback through incentive programs. These initiatives could further incentivize savings by providing additional funding if the firm achieved savings beyond the agreed upon reduction goal. This insurance against a worst-case scenario could help company management make the decision to invest.

Current government policies at the federal and state level to incentivize industrial EE provide a foundation for accelerating progress in industrial EE. Yet, as the U.S. industrial sector’s demand for energy continues to grow, the current policy framework needs to be both further developed and implemented by coordinated stakeholder action. It is critical for the federal and state governments, utilities and industrial customers to drive adoption of industrial EE measures if the U.S.’ industrial sector is to remain globally competitive in the coming years.
Section II: Introduction

The industrial sector is a critical part of the U.S. economy. It accounts for roughly 12% of national GDP\(^1\) and consumes one-third\(^2\) of the country’s energy. While energy efficiency (EE) is a promising and cost-effective means of reducing energy demand that is already being leveraged in industry. McKinsey & Company estimates that nearly $1.2 trillion in cost-effective EE savings exist, while $47 billion of this total specific to the industrial sector remains untapped.\(^3\)

Traditional industrial EE programs have been designed by utilities and have pursued simple upgrades to lighting, HVAC, variable speed drives and compressed air equipment. While these programs have achieved savings, been cost-effective and built trust between utilities and industrial customers, they have not fully captured possible savings by failing to target EE associated with process savings. To change this, private companies, governments, and NGOs are interested in reducing market barriers to take advantage of this cost-effective source of savings.

NRDC recognizes the importance of EE as a cost-effective resource that lowers energy bills, improves air quality, reduces greenhouse gases (GHGs), increases U.S. energy security and defers the need to invest in new infrastructure. NRDC is already pursuing multiple avenues to promote greater EE deployment in various sectors, such as working with utilities to improve residential, commercial, and industrial customer EE programs, working with federal and state agencies to establish EE standards and codes for appliances and buildings, and piloting innovative financing mechanisms to improve the EE of commercial buildings. This report investigates further actionable strategies for both NRDC and other stakeholders to pursue to increase deployment of EE in the industrial sector over the next few years.

Research and interviews with more than 20 industrial energy practitioners, policymakers and industrial organizations have made it clear that there is no one-size-fits-all solution to the problems of industrial EE. While many believe the lack of industrial EE uptake stems from capital constraints and management demand for short payback periods, this report’s findings yield a more nuanced picture. Industrial EE may be boosted by reducing industrial management’s perceived risk of investment, organizing available information to be more accessible, and increasing both industrial management attention to and staff availability for implementing EE projects. These findings underpin the recommendations provided to NRDC in this report.

The report is organized in four sections. The first section examines existing barriers to EE; the second section reviews the current landscape of industrial EE both from a policy and implementation perspective; the third section provides recommendations to NRDC and other entities; and the last section concludes the report with a proposed pilot program for Northeast Utilities to pursue with its industrial customers.

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Section III: Barriers to Boosting Industrial Energy Efficiency

Given the cost savings associated with EE improvements, it may seem puzzling that more utilities and manufacturers have not implemented industrial EE projects. Yet both research and interviews uncover a number of recurring themes pointing to several barriers that have kept utilities and their customers from reaching their full potential.

Insufficient Management Attention

One of the most important barriers to boosting industrial EE identified is the difficulty of attracting the attention of top management to make EE savings a corporate priority. Since the allocation of resources and incentives for any large-scale initiative is made at the top management level, and since an effective EE scheme requires a holistic approach, senior management focus on moving forward EE initiatives is critical to their success. Some of the initiatives requiring senior management focus may include hiring dedicated staff for energy management and EE target-setting.

Insufficient Staff Time

 Discussions with EE experts point to the critical importance of having sufficient staff hours dedicated to energy management. With vastly different processes used in different manufacturing sectors, a one-size-fits all approach to EE fails to work for industry, particularly when considering process-based efficiency projects. This creates a need for more energy managers who understand the manufacturing processes being modified by EE upgrades, or at the very least, industrial managers who are able to allot more of their time to implementing EE projects. Indeed, the need for informed, well-trained energy managers is so great that EE experts perceive this resource as even more highly valued than monetary incentives to drive EE projects. However, as suggested in the prior section, hiring new staff requires buy-in from top levels of management. Particularly during a slow economy suffering from an often jobless recovery, making this case to management can be challenging. Thus, industrial companies that may be interested in increasing their EE efforts are left without the resources they would need to do so properly.

Lack of Confidence in Savings

The lack of confidence many manufacturers have in the certainty of process efficiency savings is a barrier to facilities implementing EE measures. Because credible data supporting energy experts’ cost savings projections are still sparse, or because savings can be difficult to quantify, many senior managers of industrial companies perceive there to be a risk that savings projections will not come true. While small and medium-sized firms face capital constraints, for larger firms the issue is not as much a lack of available capital –to which there is typically cheap, abundant access, due to relationships with banks– as it is that EE investments must compete with other types of investments for that capital. Moreover, those competing investments often have more data that provide manufacturers with greater certainty on how long it will take for them to recoup their investments.

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Lack of Information Filtering

Lastly, another important barrier is the lack of accessible and organized information on EE practices. While a great deal of information on EE exists, this information may not always be organized or publicized in a way that makes it accessible to the stakeholders who need it. It may be scattered, with different organizations providing information on different elements of EE, making it hard to find relevant or high-quality information especially as it relates to industrial energy efficiency. In short, current informational resources are not sufficiently “user-friendly.” With staff time and top management buy-in already strained, information facilitating EE must be easily accessible, or projects are even less likely to occur. Thus, the current lack of accessible information creates a further barrier to implementing industrial EE.
Section IV: Background on Policies Promoting Industrial EE

While the barriers outlined above remain, there has been some leadership on industrial EE by federal and state governments, as well as utilities, suppliers, industry workgroups and nonprofit organizations. This section provides an overview of this current policy landscape, while pointing to the insufficiencies of these policies in addressing current barriers to industrial EE.

**Regulatory Framework**

Regulatory policies can send market signals to industrial EE facilities based on efficiency levels of incentive programs. EE policies pursued at the federal, regional and state levels have varying strengths and weaknesses. Understanding these issues can help to continue formulating stronger policy moving forward. To date most action to accelerate EE, and more specifically industrial EE, has been administered and promoted primarily at the state level.

**Federal Initiatives**

Action by the federal government to date has focused on providing research and development and target setting programs. The Obama administration’s “all of the above” energy strategy, which supports both low-carbon energy sources and traditional fossil fuels, has generated some criticism. However, EE is often supported by both sides of the aisle, as it promotes job creation, saves consumers money, reduces oil imports, increases the reliability of the electric grid, reduces air pollution and lowers electricity prices. As a result, EE may be the most politically feasible energy issue for President Obama to tackle during his second term in office.

There are three main strengths of actions taken at the federal level as it:

1. Allows for wide-spread adoption;
2. Minimizes the burden for manufacturers to comply with state or local laws by creating a single standard, and;
3. Provides the option for special technical assistance.

There are two primary agencies charged with developing and implementing federal EE policies including the U.S. Department of Energy (DOE), and the U.S. Environmental Protection Agency (EPA). EPA and DOE oversee EE programs like the consumer-friendly ENERGY STAR program. DOE also administers the Superior Energy Performance (SEP) program, which incorporates ISO 50001, sets targets for continuous improvement and requires verification of the outcomes by a third party.

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A common theme of federal policies aimed at improving industrial EE is flexibility in order to account for the diversity of industrial operations. Some of the needs that the federal government can address are incentives, (both financial, such as loans, and non-financial, such as expedited permitting), technical assistance and research and development. Federal action in the past year has been limited to an executive order and draft federal legislation. These share the common themes of cross-agency coordination, dialogue, harmonization of policies and standards, the development of best practices and identifying avenues for technical assistance.

**A closer look at two leading energy management standards**

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<th><strong>ISO 50001</strong></th>
<th><strong>Superior Energy Performance</strong></th>
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| ISO 50001 is a standard that requires organizations to establish, implement, maintain, and improve energy management systems in order to achieve continual energy savings. It is primarily aimed at large industrial organizations and requires organizations to:  
• Develop a policy for how they will use energy more efficiently,  
• Establish targets and objectives to meet their policy,  
• Use data and measurement to better understand and make decisions about energy use, and ;  
• Continually improve energy management by reviewing findings. | DOE’s Superior Energy Performance Program is a market-based, ANSI-Accredited certification program for energy management aimed at large industrial organizations that spend more than two million dollars per year on energy. It uses the ISO 50001 standard as a base and “adds teeth” to it by establishing a tiered program with the additional requirement of certification.  
There are three levels of certification including:  
• Self – certification  
• Third-party desk certification  
• Third-party on-site certification |

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State Initiatives

While all states now have some form of EE policy, much of it does not apply to industrial customers, and little of it is designed to target industrial processes. Instead, industrial customers are able to take advantage of some of the same incentives that apply to residential or commercial projects, or to energy-efficient appliances, vehicles, or buildings.¹¹ For instance, of the industry-applicable tax incentives that exist in 11 states, most address building efficiencies. Even states that strongly incentivize EE generally, like Oregon,¹² may lack programs geared specifically toward industrial processes, instead offering tax incentives for new construction, combined heat and power, and other initiatives that apply to multiple sectors.¹³

There are a handful of state EE programs that apply specifically to industry and typically involve technical assistance and audits, but in a few cases also apply to grants, financing, and training. State funding for these initiatives ranges from a few hundred thousand dollars to up to $14 million. One such program is Alabama’s Reducing Industrial Energy Intensity initiative. This program, with just under $1 million in funding,¹⁴ brings together the state’s Department of Economic and Community Affairs, the Alabama Technology Network, and the Alabama Industrial Assessment Center to provide manufacturers with the support they need to make optimal use of the DOE’s Industrial Technologies Program. This support includes energy assessments, training programs, and marketing assistance.¹⁵ Another way states provide support for industrial EE efforts is by providing funding to NGOs, as in the case of the Colorado Industrial Energy Challenge (CIEC), which is sponsored in part by the Colorado Governor’s Energy Office.¹⁶

Leadership on EE is needed at every level. For example, California’s EE work has served as a model for other states, the federal government and has led to market transformation in the technologies and vehicles manufactured. One of the most prominent examples of this is California’s 1983 Standard Practice for Cost-Benefit Analysis of Conservation and Load Management Programs manual, developed five cost effectiveness tests for evaluating EE programs, which are now used across the United States.¹⁷


Boosting EE in the Industrial Sector
Case Studies: International Initiatives

According to the EIA’s “International Energy Outlook 2011,” industrial sector energy consumption is highest in the U.S. among all OECD countries.\textsuperscript{18} In formulating solutions, it is beneficial to look at other existing initiatives outside the U.S. to give context for the U.S. efforts. While the relatively limited timeframe that EE measures have been in practice makes comprehensive evaluation of their effectiveness difficult to assess, this section will examine international examples, which could serve as innovative cases when considering policy recommendations to American industrial EE.

**United Kingdom:** Ranked the top country on ACEEE’s 2012 International Energy Efficiency Scorecard\textsuperscript{19} for EE generally, industrial consumption represented 18% of total UK final consumption of energy products in 2011. The figure represents a decline of 56% since its consumption level in 1970.\textsuperscript{20} As UK, like the rest of industrialized Europe, transitions to a service economy, the shift away from manufacturing has meant lower industrial energy consumption. However, that is not to say that EE improvements have not also helped the decline in industrial energy use. UK’s central energy policies are the Climate Change Agreements (CCA) between government and industry associations, as well as the EU Emissions Trading System (EU ETS), the mandatory cap-and-trade system launched in 2005.

**Netherlands:** With one of the largest harbors in the world, the Netherlands boasts significant refining and chemicals sectors, which make up more than half of its industrial CO\textsubscript{2} emissions. The high energy-intensity of Dutch industry has driven its focus on EE improvements. Since the early 1990s, the emphasis in the Dutch energy policy landscape has been on negotiated agreements between industry sector and government. The EU Emissions Trading System is expected to become the principal driver of EE improvements, in the Netherlands. The combined energy efficiency index, which groups industry, households, and transport, shows an improvement of 16% between 2000 and 2010, with improvements in industry representing the highest (21%). This improvement in industrial efficiency in the Netherlands is notable as higher than the EU average.\textsuperscript{21}

**Germany:** As of 2009, manufacturing industry accounted for 13% of CO\textsubscript{2} emissions in Germany. Germany’s two main energy policies are the EU ETS and the Voluntary Agreement with German Industry II. The Voluntary Agreement was started in 2000 between 19 German industry associations and the federal government to reduce GHG. In return for this commitment by businesses, the German government agreed to abstain from administrative regulations, for example the introduction of mandatory energy audits. The government also reportedly ensures that agreement participants are not put at a competitive disadvantage internationally, or otherwise burdened.

**Japan:** Since 1970, Japan has reduced the energy intensity of its manufacturing by 50%, making it a global leader in EE. While slow economic growth has been one reason for lower industrial energy use in Japan, this reduction in industrial energy intensity is also a result of EE improvements and a structural shift toward lighter manufacturing.\textsuperscript{22} Traditionally, voluntary agreements between industry and government have driven EE schemes in Japan, namely the Keidanren Voluntary Action Plan and the Japanese Voluntary Emissions Trading Scheme (JVETS). Since 2009, the Act on the Rational Use of Energy has introduced mandatory EE targets via to-be-determined benchmarks, as well as a 1% annual EE improvement obligation for all businesses.


Institutional Context

On top of policy governing industrial EE at the federal and state level, other types of organizations, including utility companies, nonprofits, EE equipment suppliers and industry workgroups drive industrial EE policies and initiatives forward through implementation.

Utility Initiatives

Utilities can play an important role in industrial EE because, often, they have a significant amount of resources and expertise that can help guide industrial companies as they work to operate more efficiently. While both public- and investor-owned utilities are subject to either government control or regulation, which often instructs them to create EE initiatives, it is also in their interest to do so. While at first it may seem counterintuitive that a utility would want to sell less of its product, utilities’ greatest concern is being able to meet future energy demand. It takes a tremendous amount of resources to build new generation facilities, and by decreasing energy use, especially during peak load, utilities can postpone making these large capital investments. Because the industrial sector tends to be energy intensive, it can often be a focal point for utility programs.

The degree to which utilities engage their industrial customers on EE varies significantly. For the majority of utilities engagement in EE tends to be general educational information provided via a website, often focused much more on residential or commercial. This typically focuses on traditional replacement of energy-using hardware, such as air conditioners and lighting, and does not usually touch on process efficiency, where industrial customers often find the greatest savings. Utilities also offer financial rebates or incentives for rebates or incentives for certain EE technologies, such as lighting or HVAC. These rebates vary greatly, and may be administratively burdensome for an industrial customer, which is a disincentive for companies to make energy efficient purchases when another option might be cheaper upfront.

Industrial process efficiency is often only addressed by the most engaged utilities due to its inherent complexity and diversity by industry or sector. One important difference between process and hardware-based programs is that process-based programs tend to offer financial incentives based on kilowatt hours (kWh) saved per unit of production, as opposed to a flat rebate for each purchase of energy efficient equipment. Southern California Edison is an excellent example of a highly engaged utility, although PG&E, NYSERDA and others have similar programs because they offer individualized plans for their industrial customers that allow for a deep look into process saving opportunities. To be able to address the myriad issues that all work together as a holistic industrial system, these energy account executives audit each customer and provide a broad spectrum of services including information, training, technical investigations, measurement and quantification, implementation support, financial incentives, and linkages to existing programs to achieve sustainable energy and demand reductions.23

Supplier and Industry Workgroup Initiatives

Suppliers of industrial EE-related equipment and services can play an important role in industry’s quest for increased savings. Indeed, supply chain management is a key concept in lean manufacturing. Depending on a sector’s complexity, a supply chain can be extensive, with a “tier one company” representing the highest level of that chain, supplying components directly to the company making the equipment in question, also known as “original equipment manufacturer” (OEM). Tier one companies, in turn, are supplied by tier two companies, who are supplied by tier three companies, and so on.

Decisions about supplier choice and management have significant impacts on savings and performance. Generally, tier one companies have the greatest technical and other resources in the supply chain and often have established processes for the management of suppliers in the tiers below them. This makes tier one companies crucial partners for EE measures. In the case of aircraft parts manufacturing sector in Connecticut, for example, GKN Aerospace is a tier one company, which works with the Aerospace Components Manufacturers (ACM), a non-profit regional network of CT-based aerospace companies. GKN Aerospace has recognized that the costs of packaging, pallets, and disposal of used transportation materials represent an overlooked but very real cost in the aviation business and has identified cost-saving suppliers in the tiers below them to member companies of the ACM. Thus, it becomes critical for manufacturers requiring an extensive supply chain to build a collaborative relationship with such tier one-supplier companies as to ensure alignment of incentives and actions.

In terms of energy suppliers, for much of the 20th century, utilities enjoyed monopolies over the electricity market in the U.S., being the only ones with the capacity to both generate and distribute electricity to consumers. However, in the last few decades, this paradigm has shifted, with energy deregulation emerging as part of the U.S. government’s response to rising energy prices and the need for greater EE. The Public Utilities Regulatory Policy Act (PURPA) of 1978, the Energy Policy Act of 1992, and regulations issued by the Federal Energy Regulatory Commission (FERC) in the mid-1990s encouraged competition in the electricity market. As a result, today, consumers in deregulated states now have the so-called retail choice, or the freedom to choose between a utility and an energy supplier based on who offers more competitive pricing. To date, 17 states and the District of Columbia have adopted electric retail choice programs. The retail choice has gained wide support from industrial customers—a majority has signed up for it in 12 states—with the highest participation rates in the Northeast, Mid-Atlantic, and Texas. As of 2010, 16% of total U.S. retail sales by volume were provided by retail suppliers.

In addition to suppliers, industries are often supported by industry groups that allow for information-sharing, networking and attracting business opportunities for certain types of industries or geographies. These groups often have close relationships with senior management at large players in their industry and also can help focus lobbying efforts for government regulation between several different companies with similar interests. Due to the relationships and influence that these industry groups have with decision makers in their industry, they present an excellent opportunity for EE information-sharing and could work with federal and state governments as well as utilities to help educate management on the benefits of process efficiency and initiatives that incentivize efficiency upgrades.

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Nonprofit Initiatives

Many nonprofit organizations also work to facilitate industrial EE. Nonprofits play a unique role in the discussion because, unlike governmental bodies, their stances can often afford to be less politically neutral. They are also mission-driven and not funded by taxpayer money. On the other hand, they are also not profit-driven or fundamentally designed to sell energy, making it likelier for industrial customers to trust their guidance over that of utilities on some efficiency matters.

Industrial EE-related nonprofits fall into a number of categories. First, there are national energy efficiency focused organizations like the American Council for an Energy Efficient Economy (ACEEE) which primarily provides technical and policy analysis and the Consortium of Energy Efficiency (CEE) which looks to advance energy efficiency products. These types of organizations provide research and analysis on energy efficiency policies and programming, as well as advocate for energy efficiency and convene discussions among key players on how best to advance energy efficiency. Some nonprofits focus on partnering with utilities to increase their EE. Still other nonprofits partner with state, local, or regional industrial customers to assist these entities with their EE efforts. For instance, the Colorado Industrial Energy Challenge, an initiative of the Southwest Energy Efficiency Project, and Energy Trust of Oregon both provide resources, guidance, or recognition to manufacturing companies developing EE projects in these locations. Some of these regionally focused nonprofits are known as regional energy efficiency organizations, or REEOs (described below).

While many nonprofits play an important role in advancing energy efficiency, it bears mentioning that few, if any, of these entities are focused exclusively on promoting industrial energy efficiency, often sharing programmatic resources with other initiatives.

Regional Initiatives

The primary coordinators of regional EE efforts have been REEOs which currently exist in a formalized manner in the Northwest, Southeast, Midwest, Northeast and Southwest and cover all states but Texas, California, Alaska and Hawaii. Regional efforts to improve EE have been met with varied results. The varied economies, energy mixes, politics, and industrial bases of each region have shaped each regional alliance’s development and progress. A summary of these regional efforts appears below.
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<td>Budget</td>
<td>$40 million</td>
<td>$8.6 million</td>
<td>$3 million</td>
<td>$6 million</td>
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<tr>
<td>Perceived Strength</td>
<td>Very Strong</td>
<td>Medium</td>
<td>Weak</td>
<td>Strong</td>
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<tr>
<td>Goals</td>
<td>Accelerate the adoption of EE products, technologies, and practices.</td>
<td>Promote EE for economic development and a cleaner environment. Goal to be more like MEEA in the future.</td>
<td>Bridge gap between state and local policymakers; raise awareness of opportunities for EE among region’s industrial sub-sectors.</td>
<td>Facilitate regional partnerships to advance the efficient use of energy in homes, buildings and industry.</td>
<td>Promote utility EE policy and programs: CHP, buildings and transportation efficiency; the industrial sector.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Challenges</td>
<td>Expanding into new sectors.</td>
<td>Low electricity prices make energy conservation more difficult. New SEEA leadership.</td>
<td>Navigating entrenched state and utility EE policies; accessing financial and technical resources.</td>
<td>Pursuing savings beyond technology swaps.</td>
<td>Lack of state funding and goals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Types of Industrial Organizations</td>
<td>Paper and food processing, which derive from the area’s vast timber and agricultural resources.</td>
<td>Paper, food processing and textiles, as a result of the region’s longer growing seasons and ample water resources.</td>
<td>Iron and steel and concomitant sectors (automobiles and fabricated metal parts) as a result of local iron ore deposits.</td>
<td>Microelectronics, biomedical and computer as a result of high density of experts.</td>
<td>Petroleum, aerospace as a result of geology and land availability (and low population density) for testing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Information</td>
<td>Places particular emphasis on its Continuous Energy Improvement (CEI) initiative, which is designed to be holistic, targeting utilities, trade allies and end users. Aiming to be like MEEA. Created a conduit for manufacturers to express hurdles and related needs to organizations that can help directly. Feedback is guiding the development of new resources to drive EE improvements and strengthen manufacturing sector.</td>
<td>Developing a regional EE steering committee to develop a roadmap for industrial plants in the region. Seeks to encourage more companies to participate in voluntary federal programs like DOE’s Energy Star for Industry and SEP.</td>
<td>Recently published the Regional Energy Efficiency Database (REED), which allows policymakers to analyze program design and outcomes.</td>
<td>Able to maintain independence, since funding comes from foundations, not utilities.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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The only state that is a part of two regional energy efficiency organizations is Kentucky, which participates in both the Southeast Energy Efficiency Alliance and the Midwest Energy Efficiency Alliance.
Section V: Recommendations

Research and interviews with over 20 industrial energy leaders led to findings that industrial EE may be boosted by reducing industrial management’s perceived risk of investment, organizing available information to be readily accessible, and increasing both industrial management attention and staff availability. These findings underpin the recommendations provided to NRDC in this report. A key take-away is that leadership by states, public utility commissions, regulated utilities and industrial facilities will be crucial for unlocking the industrial base’s energy efficiency opportunities.

Table 2: Summary of Recommendations

<table>
<thead>
<tr>
<th>Policy</th>
<th>Barrier</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE Clearinghouse</td>
<td>Information Filtering</td>
<td>Providing go-to resources and information sharing will lower the opportunity cost to EE implementation</td>
</tr>
<tr>
<td>Segmentation of Utilities</td>
<td>Information Filtering</td>
<td>Organizing utilities according to their current level of interest in industrial efficiency will allow appropriate step by step increases in engagement</td>
</tr>
<tr>
<td>Public Recognition</td>
<td>Management Attention/Priority/Focus</td>
<td>Giving recognition to firms that have achieved their targets in process efficiency will give both facility and senior management incentives to compete and increase implementation</td>
</tr>
<tr>
<td>Energy Managers</td>
<td>Staff Time Availability</td>
<td>Engaging with senior management to hire energy managers would allow for increased focus on EE and more sophisticated process improvements</td>
</tr>
<tr>
<td>Energy Efficiency Managers</td>
<td>Staff Time Availability &amp; Information filtering</td>
<td>Staffing EEMs at utilities will allow them to provide industry-specific process expertise to customers and display the benefits of energy management</td>
</tr>
<tr>
<td>EE 1st in the Leading Order</td>
<td>Lack of Confidence in Savings</td>
<td>By putting EE 1st in the leading order in energy markets it will incentivize using EE as a resource before generating energy is purchased</td>
</tr>
<tr>
<td>Reevaluate the Cost Effectiveness Test</td>
<td>Lack of Confidence in Savings</td>
<td>The monetization and recognition of non-energy benefits will allow for increased implementation of EE projects</td>
</tr>
<tr>
<td>Segmentation of Industrial Customers</td>
<td>Information Filtering</td>
<td>By segmenting industrial firms into different baskets according to their size and level of interest, utilities can prescribe appropriate “next steps” to EE engagement</td>
</tr>
<tr>
<td>Set Targets</td>
<td>Management Attention/Priority/Focus</td>
<td>If management commits to public targets it will incentivize them to explore more process savings and commit more staff time to energy management</td>
</tr>
<tr>
<td>Risk Reduction</td>
<td>Lack of Confidence in Savings</td>
<td>By reducing upfront cost to process efficiency investments the “perceived risk” of cost saving projections coming true will be mitigated</td>
</tr>
</tbody>
</table>
NRDC Should Pursue:

The Creation of EE Clearinghouses

A number of stakeholders from diverse sectors can collaborate to create and utilize multiple online EE Clearinghouses to share a vast array of information related to EE. To make these resources as relevant and useful as possible, different Clearinghouses could be established for different industrial sectors, or for different regions of the country (e.g. one Clearinghouse each for the Northeast, Southeast, Midwest, etc.). NRDC should draw on its diversity of connections with NGOs, REEOs, utilities, PUCs, and utility customers to identify which of these groups would be best prepared to supply the different elements of the Clearinghouses described below. In partnership with these stakeholders, NRDC will also play a significant role in facilitating the Clearinghouses’ implementation.

While certain aspects of the EE Clearinghouses will be addressed more specifically in other recommendations in this report, these resources will be designed to provide the following information and services:

A) General EE Information

First, each Clearinghouse can provide a variety of users, in particular utilities and their industrial customers, with general information on EE. This information can include a review of possible types of EE upgrades, both process- and hardware-based; cost savings data, and other categories that would be informative for each Clearinghouse’s user base. This section of each Clearinghouse will help organizations interested in, but unfamiliar with, EE get up to speed on the field and understand what their first steps should be in approaching EE initiatives.

B) Best Practices

Each online Clearinghouse should also provide a compendium of research on the best practices of specific industrial customers or utilities that have been highly successful in implementing EE projects. These case studies can include entities that have used EE improvements to reduce costs significantly, increase the efficiency of their entire manufacturing operations, or garner substantial positive publicity, among others. By making this information available to other groups wanting to implement EE in their own operations, those groups are likelier to achieve similar levels of success by following the best practices outlined in this part of each Clearinghouse.

C) Stratified Action Plans for Utilities and their Customers

Another goal of the Clearinghouses will be providing information to facilitate utilities’ and industrial customers’ self-identification into one of several segments in order to help them assess sensible next steps in their pursuit of EE. To do this, the Clearinghouses will describe the different categories a utility or customer might fall into, based both on its size (in terms of energy use and economic activity) and its level of engagement in pursuing EE thus far. The Clearinghouses will also provide a list of questions utilities and customers can ask to determine into which segment they fall. The purpose of facilitating this self-stratification is to enable utilities and customers to assess their next steps in implementing EE, given their size and motivation.

D) Technical Expert Reviews

Similar to the web site “Angie’s List,” the Clearinghouses will also supply a forum where utilities and industrial customers can share their feedback on technicians or technical experts who assess EE opportunities and complete EE projects. For greater applicability to Clearinghouse users, the contents of each forum would be specific to the Clearinghouse of which it was a part. For instance, if Clearinghouses are divided by manufacturing sector, a Clearinghouse for aerospace manufacturing would include a forum where users could give feedback on contractors who assess opportunities for implementing aerospace-related EE projects. Including this type of resource in the Clearinghouses assists industrial customers in the practical task of identifying the best people to

26 A chart later on in this section provides one example of possible segmentation.
help them create an EE plan or implement an EE project once they have decided to do so. By allowing peer companies to review technicians, this forum may also increase industrial customers’ confidence in the potential success of their EE efforts.

E) Peer Discussion Board

Lastly, the Clearinghouses will also facilitate manufacturers sharing information on their experiences with EE projects by providing a closed discussion board for peer-to-peer exchange. Like the “Best Practices” section of each Clearinghouse, the Peer Discussion Board will disseminate information on what sorts of projects work well. However, unlike the “Best Practices” section, it will be exclusive to industrial companies, enabling businesses to ask their peers directly and candidly about their experiences implementing EE, and facilitating greater trust in fellow industrial companies’ answers. It will also give private sector stakeholders interested in increasing EE efforts a chance to build coalitions to influence governments, NGOs, corporate convening organizations, and more.

The extensive, customized and centralized resources provided through these Clearinghouses will enable industrial companies’ energy managers to access the information they need to make the business case for EE to their management, and to do so easily to avoid straining their often-limited staff. Additionally, the Clearinghouses’ forums for industrial peer-to-peer exchanges will foster a sense of peer validation and support surrounding EE practices.

The Stratification of Utilities

NRDC has the resources and expertise to take the lead on designing the portions of Clearinghouses that include recommendations utilities can follow when working to improve their own EE practices. As explained above, these recommendations will be stratified by interest level and probability of success in engaging in EE improvements. This will clarify appropriate “next steps” that utilities can take as they progress their EE programs.

Table 3: Example of Utility Stratification

<table>
<thead>
<tr>
<th>Utility Status</th>
<th>Not Motivated</th>
<th>Somewhat Motivated</th>
<th>Engaged</th>
<th>Highly Motivated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recommendation</strong></td>
<td>Basic website information about EE. Minimal rebates for preapproved technologies; no focus on process efficiency.</td>
<td>Simple rebates and incentives. Dedicated webpage to industrial efficiency with educational resources and some simple programs highlighted.</td>
<td>Many process-related incentives and resources. Has EE manager and resources at its disposal to help customers progress.</td>
<td>Has robust risk reduction plans and EE managers placed within customers’ staffs.</td>
</tr>
<tr>
<td><strong>Increase the sophistication of rebates for simple upgrades; create educational resources for different sectors of EE participants.</strong></td>
<td>Engage in process efficiency education and create incentives that are kWh-per-widget-based. Offer resources to engage customer with EE manager.</td>
<td>Fully engage with EE Clearinghouse and implement risk-reducing financial incentives. Offer support for in-house full- or part-time EE manager.</td>
<td>Share success with others!</td>
<td></td>
</tr>
</tbody>
</table>

Boosting EE in the Industrial Sector
NRDC should follow up on this stratification by creating a plan to work with utilities to implement their recommendations. As NRDC’s engagement work will vary with each utility, it should create both an overall strategic plan of its aims for getting utilities as a group to enhance EE efforts and a specific plan outlining its goals for engaging with each utility.

Utilities that have already begun offering sophisticated EE programs and services to customers should be used as a resource by sharing their expertise and experiences with less engaged utilities and connecting them with entities that can help begin to implement plans for increased EE among their industrial customers.

*Executive Management Outreach to Encourage the Hiring of Energy Managers*

Interviews with EE experts have reiterated the critical importance of having staff dedicated to energy management in the push for EE improvement. In some companies, only one motivated employee was needed to facilitate greater savings, but in other cases, available staff time is insufficient for achieving progress. Unlike in the residential market, there is not a one-size-fits-all approach for industrial EE, since each organization has its own custom processes which makes EE efforts complex. Hence, there is a greater need for advocates of EE in the form of individual company energy managers who have the time and experience to customize EE strategies and make compelling business cases to senior management.

NRDC can play an important role in raising awareness around this topic through its convening power to organize meetings and conferences. It can even offer PR help: one possible scenario, for example, is for NRDC to pool its resources with other reputable energy nonprofits like ACEEE or REEOs to raise funds for something like a documentary that covers companies trying to “go green,” one component of which would be hiring energy managers. Given the massive funds large industrials spend annually on advertising, this type of project not only serves an educational or awareness-raising purpose among the public but also serves as a carrot for top management to push them in the direction of EE improvements.

*Motivating Partner Companies to Participate in EE and GHG Target-Setting Programs.*

Establishing targets has proven to be an effective means of reducing energy consumption. Companies may set efficiency or climate targets to improve their bottom line and drive innovation, but also to increase their resiliency and attention to the climate through investments over the long term. NRDC should leverage its existing partnerships with industrial organizations and utilities to engage in an energy target setting program, or to encourage utilities to get their industrial customers to engage in a target setting program.

Some of the existing programs that can be used as a reference to help companies set targets include:

- **City-level carbon reduction goals (e.g. NY City’s Carbon Challenge).**
- **Climate Targeting Programs: voluntary & self-defined:** Carbon Disclosure Project, The Climate Registry and historically, Climate Leaders.
- **DOE’s Better Plants Program** – voluntary: 25% reduction over 10 years.

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30 *Ibidem.*

Boosting EE in the Industrial Sector
Table 4: Examples of Corporate Target-Setting and Achievements

<table>
<thead>
<tr>
<th>Organization</th>
<th>Energy Savings</th>
<th>GHG Savings</th>
<th>Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>DuPont</td>
<td>Reduce total global GHG emissions by 15 % 2004-2015</td>
<td>Reduced GHG emissions by 68% since 1990—exceeding their 2010 target of 65%</td>
<td>$3 billion</td>
</tr>
<tr>
<td>BP</td>
<td></td>
<td>Corporate-wide energy use has remained flat since 1990, despite a 35% increase in production</td>
<td>$650 million</td>
</tr>
<tr>
<td>3M</td>
<td>Since 2000, 3M has challenged 150 company sites to reduce their energy consumption 4% annually—they have exceeded this goal every single year.</td>
<td>1990-2005 (62% absolute reduction) 2006-2011 (55% absolute reduction)</td>
<td>$190 million</td>
</tr>
<tr>
<td>United Technologies</td>
<td>Pledges to reduce GHG emissions by 16 percent from 2006 levels</td>
<td>Reduced global GHG emissions by 46% per dollar revenue 2001-2006.</td>
<td></td>
</tr>
</tbody>
</table>

NRDC Should Work with State Governments and PUCs to:

Promote Energy Efficiency as First in the Loading Order

The loading order determines which energy source will be used first in an unregulated market. Historically, it has favored low-cost baseload resources such as hydropower, coal or nuclear power. Energy suppliers bid into capacity markets in order of the cheapest resource they can provide in the future. While energy efficiency is often the lowest-cost resource, cost-effective EE is only prioritized in Rhode Island, Maine, California and the Pacific Northwest. The Northwest prioritizes energy efficiency through a 10% discount in the price that is bid in. California has learned from this protocol and now places energy efficiency first in its own loading order. Establishing these types of incentives for placing cost-effectiveness EE first in the loading order can increase the extent to which a state pursues EE.

Of course, defining what qualifies as EE is an important part of this process. For example, California currently defines EE programs that qualify as first in the loading order as “programs that require buildings and appliances to use less energy, provide incentives for purchasing energy efficiency equipment and provide information and education to encourage people to save energy.” To date, behavioral changes that improve process-based EE have been left out of states’ definitions.

Prioritizing cost-effective EE in the loading order could dramatically alter the U.S. EE landscape. To illustrate, comparing the Northwest and Southeast permits us to see that these regions are similar in their abundance of low-cost electricity. However, only the Northwest leads the nation in efficiency. This is no accident. It is a result of policies in the Northwest that prioritize EE in the loading order through a 10% discount. This sends utilities the message that EE should be pursued first and, as a result, increases demand-side management programs.

Steps NRDC could take to assist in this effort include:

- Presenting at the National Association of Regulatory Utility Commissioners (NARUC) annual or regional meeting. These meetings may provide a concentrated forum for dispersing ideas to the correct stakeholders on the importance of EE in the loading order.
- Establishing partnerships with DOE and ACEEE to increase research for and promote the prioritization of EE in the loading order.
- Working with state governments to promote energy efficiency as first in the loading order.

Provide Public Recognition for Successful Industrial Customers

NRDC should utilize its nationwide network to promote the idea of public recognition ceremonies for industrial companies investing in EE to state governments throughout the country. Where applicable, NRDC should also partner with existing federal programs such as Energy Star to achieve this type of recognition for industrial customers.

As explained earlier in this report, industrial companies may perceive EE upgrades as an unnecessary investment, or as an investment that fails to provide a sufficiently rapid payback. Hence, rewarding a company’s commitment

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33 Ibidem.

Boosting EE in the Industrial Sector
to efficiency improvements with positive publicity may provide the marketing boost companies need to make a business case for investing in EE. Providing this recognition through state governments can be particularly effective. For a larger manufacturer that contributes significantly to the state economy, public gubernatorial recognition of that manufacturer’s EE progress may facilitate good will among the many citizens who interact regularly with the company, perhaps improving its employee loyalty or easing progress in other company initiatives that affect the state. For a smaller company, a public ceremony and subsequent news coverage may significantly increase market penetration. Getting state governments involved in encouraging industrial EE benefits these entities as well. It provides them with an easy opportunity to publicly support both energy development and environmental stewardship while also being a low-cost solution, particularly by taking advantage of existing federal energy leadership programs that provide these types of incentives.

Government recognition initiatives of this nature have already demonstrated effectiveness in certain states. The Southwest Energy Efficiency Project (SWEEP)’s Colorado Industrial Energy Challenge (CIEC) works with Colorado industrial companies to design long-term plans for implementing energy efficiency improvements, and then works with the governor to give these companies an annual ceremony recognizing their efforts. CIEC participants regularly cite this as their top reason for involvement in and satisfaction with the program.34

Re-evaluate Cost–Effectiveness Tests

U.S. policymakers and utility regulators require that initiatives promoting demand-side management be cost-effective before being approved to receive ratepayer funds. This means that only those measures with a positive benefit-to-cost ratio are funded. However, by not including the non-energy benefits (NEBs) of industrial EE (e.g., benefits associated with improved worker safety) the numerator of the test is skewed, preventing cost-effective projects from being recognized and approved by public utility commissions (PUCs).

There are currently five different tests assessing a primary stakeholder’s consideration. The tests consider the net present value of a stream of benefits to the net present value of costs over the lifetime of an investment.35 While not every jurisdiction uses the same test, the most common test is the total resource cost test (TRC), which comes from the perspective of society as a whole and compares the value of the avoided energy (and other factors) from all sources with the full cost of the efficiency measure and all non-measure program costs. The TRC has been the principle test used by states but ignores non-energy benefits.36 However, some lesser-used tests do incorporate NEBs.37


Boosting EE in the Industrial Sector
The largest complaint against quantifying NEBs is how time consuming and difficult, if not impossible, it can be. Part of the difficulty in quantifying non-energy benefits may be a result of who is counting the costs and benefits. Traditionally, engineers develop utility programs, but non-energy benefits have been demonstrated to be most easily quantified by non-engineers. Other complaints include that weighting already cost-effective measures with NEBs, which are perceived as “fluffy”, undermines the fact that there are many untapped, cost-effective industrial energy efficiency measures.

The process for including NEBs from process improvements in the cost effectiveness test for EE is both difficult to quantify and politically contentious to institute at the state level. However, if successful, it could incentivize utilities to develop programs or measures that increase process efficiencies. These programs would help utilities meet EE mandates and pivot the measures utilities pursue towards process savings.

NRDC could promote non-energy benefit inclusion into the cost-effectiveness either in a direct or indirect way.

Two indirect approaches include:

- Work with ACEEE to further research cheap and easy calculation methods for non-energy benefits to assist states in quantifying the benefits of process efficiency measures.
- Convene a cross-functional working group (e.g. backgrounds that include engineering, human resources, compliance, sociologists and environment, health and safety specialists from utilities, manufacturing, energy efficiency consultants and public utility commissions) to develop quantification methods for accounting for NEBs.

A direct approach would be to:

- Target states with more process-based EE opportunities, and as an intervener in Public Utility/Service Commissions hearings on cost-effectiveness tests, to ensure the inclusion of NEBs in cost effectiveness tests. As California developed the Standard Practice Manual, which outlines the approach for the cost-effectiveness test that was then adopted by other states, it may be a candidate for a first state to target.


NRDC Should Work with Utilities to:

*Provide Temporary Utility-Backed Energy Managers*

Large and small industrial companies have divergent needs. While large companies may have payback period constraints, they rarely suffer capital constraints that would prevent them from pursuing efficiency measures. Large manufacturers also tend to have the resources necessary to hire process engineers on staff—though not all of these may focus on energy—and they see their relationships with utilities as contract-based suppliers of reliable power, but rarely as drivers of change. However, an area where utilities could play a larger role is with small industrial companies.

Some small industrial operations have arisen out of start-up operations and lack basic management systems and energy management systems, highlighting the need for qualified energy managers at such facilities. Some smaller facilities may not have the need for a full-time energy manager. To facilitate energy management at these locations in a more cost-effective manner, utilities could provide an Energy Account Executives (EAEs) to two or more small or medium sized facilities. EAEs are those at utilities who are part-account manager and part-technical expert, who can act as the utility-level counterpart of an industrial customer’s energy manager while providing the industrial sector credibility necessary for gaining customers’ trust to implement EE modifications. An EAE shared between multiple facilities could help with initiatives ranging from basic assistance in developing an energy management plan to the more complex process efficiency measure. Major utilities like PG&E have recognized this resource as being more valuable and effective than financial incentives.40

NRDC could help utilities develop programs such as these through either direct contact or by developing educational materials on program design options.

*Stratify Industrial Customers Based on their Energy Usage and Engagement in Energy Management*

Because process efficiency is far more complex than traditional hardware-based efficiency programs, the variance in engagement among industrial customers is substantial. While some industrial customers have developed sophisticated energy management systems, other might still be struggling to learn and implement basic management principles. This variance stalls EE implementation because while there is no shortage of information available to industrial customers it is infrequently organized into an easily understandable series of steps these customers can take. This may serve as a roadblock for industrial firms working to implement EE, even if they are highly motivated to do so.

To reduce this information-based barrier, NRDC should work with utilities to break industrial customers up into different segments based on their engagement in EE, much as utilities would be stratified as outlined prior in this report. These segments would be clearly defined and would each include “next steps” toward process efficiency that would be appropriate to the stakeholder’s ability to implement such measures. Utilities could use this strategy to handhold, build trust, design customized programs to meet industrial customers’ needs and lead them toward deeper and more profound process efficiency measures in a gradual and more communicative way.

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Boosting EE in the Industrial Sector
### Table 5: Example of Stratification of Customer Engagement

<table>
<thead>
<tr>
<th>Size/Level of Engagement</th>
<th>Not Motivated</th>
<th>Low Motivation</th>
<th>Motivated but not very Active</th>
<th>Motivated &amp; Active</th>
<th>Very Motivated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>No standardized management principles; do not monitor energy use. Typically “Mom and Pop” enterprises.</td>
<td>Have implemented some management principles, but have not engaged in any sort of EE measures.</td>
<td>Technology-based retrofits have been addressed; no engagement in process efficiency.</td>
<td>Some simple process efficiency steps have been taken, but opportunities for complex process savings remain; targets have not been set.</td>
<td>Fully engaged in process efficiency with devoted staff time and qualified and ample energy management.</td>
</tr>
<tr>
<td></td>
<td><strong>Recommendation from Utility:</strong> Basic management principles training</td>
<td><strong>Recommendation from Utility:</strong> Offer incentives for hardware-based retrofits, e.g., CFLs, HVAC, variable speed fan drives.</td>
<td><strong>Recommendation from Utility:</strong> Perform process-focused audit with EAE; offer risk-reducing incentive</td>
<td><strong>Recommendation from Utility:</strong> Support an in-house full- or part-time energy manager financially; offer risk reducing incentive</td>
<td><strong>Recommendation from Utility:</strong> Share your success!</td>
</tr>
<tr>
<td>Medium</td>
<td>Grown quickly due to demand but do not utilize standardized management principles.</td>
<td>Hired experienced managers but have yet to focus on energy savings as a cost reduction measure.</td>
<td>Engaged in hardware-based efficiency but do not have sufficient resources to realize process savings.</td>
<td>Process efficiency is addressed and industry norms are adopted, but deeper retrofits could be made if more resources available.</td>
<td>Leading firm for size and production level. Process efficiency is continually improved and staff time is dedicated.</td>
</tr>
<tr>
<td></td>
<td><strong>Recommendation from Utility:</strong> Basic management principles training</td>
<td><strong>Recommendation from Utility:</strong> Low hanging fruit education incentives and giveaways. Start the kWh per widget-based conversation</td>
<td><strong>Recommendation from Utility:</strong> Process audit with EAE and risk reducing incentive</td>
<td><strong>Recommendation from Utility:</strong> Support an in-house full- or part-time energy manager financially; offer risk reducing incentive</td>
<td><strong>Recommendation from Utility:</strong> Share your success!</td>
</tr>
<tr>
<td>Large</td>
<td>Do not consider energy costs to be a large enough portion of total operating costs; do not participate in any programs.</td>
<td>Taken minimal steps to comply with regulation, but have not addressed efficiency as a cost saving measure.</td>
<td>Have addressed “low-hanging fruit” but have not bought in to deeper process savings.</td>
<td>Process efficiency is addressed and senior management is aware of the opportunity but a system wide approach has not been identified.</td>
<td>Leading firm. Process efficiency is addressed and ISO and SEP are being upheld.</td>
</tr>
<tr>
<td></td>
<td><strong>Recommendation from Utility:</strong> Work with customers to comply with regulations and build trust through hardware-based retrofits</td>
<td><strong>Recommendation from Utility:</strong> Create incentives for low-hanging fruit retrofits and educate management on savings opportunities</td>
<td><strong>Recommendation from Utility:</strong> Work to engage senior management and facility management on process savings. Offer an audit from a Utility staffed EAE</td>
<td><strong>Recommendation from Utility:</strong> Provide financing for an in-house energy manager and offer risk reduction financing help</td>
<td><strong>Recommendation from Utility:</strong> Share your success!</td>
</tr>
</tbody>
</table>
In categorizing their industrial customers using these segments, utilities should focus on what data they have available. A utility-defined, weighted formula that considers different variables like a customer’s energy use, operating profit (for large publicly traded industrials), energy as a percentage of total costs, and number of employees could be used to stratify companies into “small”, “medium” and “large” categories. Utilities could seek out the advice of industry groups and leaders to help create these formulas. Similarly, companies’ level of engagement could be defined either by the amount of efficiency work they have done with utilities in the past, or through a self-assessment of the company’s level intended to maximize what the utility can do for the customer. Utilities should consider their data constraints and existing relationships with their industrial customers and decide which strategy would be more fitting to facilitate the greatest amount of customer involvement. These data could help explicitly define what is considered a small, medium or large industrial customer and provide guidance on which customers need the most assistance.

Provide a Forum for Feedback

A utility could provide an online forum that would allow its industrial customers to share information on process efficiency, following the model of the website “Angie’s List.” Firms would be able to rate and comment on strategies, ESCOs, auditors and other service providers that would give firms that are looking to start making these changes a greater level of expertise and reduce the risk of a bad investment. A utility, as a neutral party, could allow for increased information sharing amongst firms that will allow for some of the more engaged firms that have seen both good and bad outcomes from different strategies and providers to share these experiences and increase the efficiency of future projects in firms that are not on the bleeding edge of process efficiency.

Reduce Industrial Customers’ Perception of Risk through Financial Incentives

Firms are often wary of EE investments because there is a lack of data confirming the cost savings projections that energy auditors make. Due to this lack of credible information, firms will have a perceived risk of EE investments that might be higher than the actual risk of the cost saving projections not being realized. Most firms do not want to see a simple payback of longer than 18 months and are reticent to make an investment in something complex like process efficiency if they are uncertain these projects will achieve their alleged goals.

By measuring energy output on a per-widget basis and setting per-widget-produced targets (e.g., a 10% reduction in costs), a firm will be able to directly tie its behavior to the energy portion of its production costs. If a utility fronts the capital needed to reduce the implementing firm’s capital outlay, management’s 18-month payback goal could be met, making it more likely that they would pursue such a project. If the utility follow ups with further financial incentives based on savings exceeding reduction target, firms are likely to strive for shortening their payback periods even further. To further incentivize participation, a guarantee of a maximum two-year payback could support this mechanism, transferring risk from customers to utilities. While approaching this maximum would not be ideal for a firm, this insurance against a worst-case scenario could help company management make the decision to invest.
## Table 6: Policy Recommendations & Actors

<table>
<thead>
<tr>
<th>Policy</th>
<th>Barrier</th>
<th>Why?</th>
<th>NRDC</th>
<th>Partners*</th>
<th>States &amp; PUCs</th>
<th>Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE Clearinghouse</td>
<td>Information Filtering</td>
<td>Providing go-to resources and information sharing will lower the opportunity cost to EE implementation</td>
<td>☑</td>
<td>☑</td>
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</tr>
<tr>
<td>Segmentation of Utilities</td>
<td>Information Filtering</td>
<td>Organizing utilities according to their current level of interest in industrial efficiency will allow appropriate step by step increases in engagement</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Public Recognition</td>
<td>Management Attention/ Priority/Focus</td>
<td>Giving recognition to firms that have achieved their targets in process efficiency will give both facility and senior management incentives to compete and increase implementation</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Energy Managers</td>
<td>Staff Time Availability</td>
<td>Engaging with senior management to hire energy managers would allow for increased focus on EE and more sophisticated process improvements</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Energy Efficiency Managers</td>
<td>Staff Time Availability &amp; Information Filtering</td>
<td>Staffing EIMs at utilities will allow them to provide industry specific process expertises to customers and display the benefits of energy management</td>
<td>☑</td>
<td>☑</td>
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</tr>
<tr>
<td>EE 1st in the Loading Order</td>
<td>Lack of Confidence in Savings</td>
<td>By putting EE 1st in the loading order in energy markets it will incentivize using EE as a resource before generated energy is purchased</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
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<tr>
<td>Reevaluate the Cost Effectiveness Test</td>
<td>Lack of Confidence in Savings</td>
<td>The monetization and recognition of non-energy benefits will allow for increased implementation of EE projects</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Segmentation of Industrial Customers</td>
<td>Information Filtering</td>
<td>By segmenting industrial firms into different baskets according to their size and level of interest, utilities can prescribe appropriate “next steps” to EE engagement</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>Set Targets</td>
<td>Management Attention/ Priority/Focus</td>
<td>If management commits to public targets it will incentivize them to explore more process savings and commit more staff time to energy management</td>
<td>☑</td>
<td>☑</td>
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</tr>
<tr>
<td>Risk Reduction</td>
<td>Lack of Confidence in Savings</td>
<td>By reducing upfront cost to process efficiency investments the “perceived risk” of cost saving projections coming true will be mitigated</td>
<td>☑</td>
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*Partners such as REEOs, ACEEE, CEE, etc.

**Boosting EE in the Industrial Sector**
Section VI: Pilot Program for Northeast Utilities

The following is a pilot program designed for Northeast Utilities (NU) to implement with its industrial customers serviced by Connecticut Light & Power (CL&P), to illustrate how some of the recommendations made in this report could apply to an existing utility. Specifically, NU has identified three manufacturing sectors (aircraft parts, medical or high-tech measurement equipment, and pharmaceuticals) that represent their key industrial customer bases. The pilot program is thus designed with these sectors in mind, though is applicable across the industrial sector.

Stratification

The first component of the pilot program is stratification, which begins by determining engagement levels with EE by each industrial customer, developing a system that stratifies each by engagement level and size, and then by clearly maps out next steps towards greater efficiency. To implement this aspect of the pilot program, a scoring mechanism to facilitate stratification by size is necessary. Some of these variables include:

- Energy Use
- Energy as a percentage of costs
- Number of employees

To understand each one’s level of engagement, large industrial customers would be surveyed to determine the:

- Presence of energy targets
- Presence of an energy manager
- Participation in any Connecticut Light & Power (CL&P) programs (e.g. Lighting retrofit experience)

NU could use information gained from categorizing its industrial customers to handhold, build trust, design customized programs to meet industrial customer needs in order to lead them toward deeper and more profound process efficiency savings.

Targeting

Second, the pilot program would include an element of targeting for energy savings to reduce customers’ perceived risk. NU could work with interested pilot customers to set per-widget energy savings targets and provide funding to shorten the payback period of EE-related investments. This strategy would complement or exist in conjunction with the “Dividend” program that NU is already pursuing that gives increasing rewards for increasing per-widget energy savings. Increasing financial rewards would act as incentives to reach—and exceed—energy savings target. As detailed in the Recommendations section above, a ground-floor payback provision could reduce perceived risk by improving the worst-case scenario for the customer and acting as a guarantee for investment. Furthermore, a performance-contracting model could be introduced to cover a portion of upfront costs. This could also serve to reduce customers’ perceived risk of investing in EE improvements by shortening projected payback periods to meet management guidelines.
Technical Capacity-Building of Account Managers

Hiring of Energy Account Executives (EAEs) could be a means to providing high quality services to industrial customers and help build trust between customers and the utility. Although CL&P, for example, currently has the “Small Business Energy Advantage” program designed to assist small industrial and commercial customers without the resources or in-house expertise to develop an EE plan, there is still a gap to be filled in terms of servicing larger industrial customers who have in-house energy managers but want “equals” in their utility counterparts, who can match their technical expertise and EE experience. EAEs would possess both the technical expertise and client-facing skills that give them credibility in the eyes of customers as impartial experts with the necessary sector-specific knowledge to make appropriate recommendations on EE savings. Where hiring external, experienced EAEs with sector experience or training is not possible, arrangement should be made for current account executives to be paired with an engineer or a technical expert.

Furthermore, in sectors with extensive existing networks, such as Connecticut’s aerospace industry, EAEs could add value by tapping into this network and organizing meetings to facilitate dialogue on EE and encourage peer-to-peer exchanges of information among member companies. This may be a role best suited by someone with former sector experience and expertise. Not only would such meetings help to keep a dialogue going about EE among these companies, but also they would strengthen the relationship between NU and its industrial customers.

Program and Staff Continuous Improvement

Assessing the quality of programs and staff is one of the lowest-cost methods to increasing program participation and the effectiveness of existing programs. Rather than relying on customer initiative to provide feedback, establishing post-engagement questionnaires online through free services such as Survey Monkey could quickly and seamlessly provide feedback to help provide suggestions on program design and staff support. These could be logged in Sales Force™ accounts in order to provide all CL&P staff with an understanding of that industrial customer’s experience with the utility to date.

Public Recognition

Finally, NU’s pilot program must incorporate recognition. The following are suggestions for which customers may be selected:

1) Customers that achieve the greatest savings within their stratification levels, in keeping with the stratification element of the program;
2) Customers that have the largest absolute energy savings; and
3) Customers that achieve the greatest reductions within their sectors.

To implement this recognition scheme, CL&P should seek out partnership opportunities with organizations that already recognize EE savings, such as Energy Star, NEEP, the Connecticut Department of Energy & Environmental Protection (DEP), or Environment Connecticut. Existing award ceremonies used for reference include Power of Change or DEP’s Summer Savers Awards program. Another potential partner would be a regional industry network, such as the Aerospace Components Manufacturers (ACM), which brings together Connecticut-based aerospace companies. Though ACM does not seem to have formal recognition scheme for EE savings, CL&P could greatly benefit from the extensive network and industry expertise of networks such as ACM.
Section VII: Conclusion

The industrial sector is projected to be the largest source of growth of primary energy demand by 2040 in the U.S.\textsuperscript{41} With this projected increase in demand, a fundamental part of ensuring a vibrant economy and a cleaner environment will hinge on the country’s ability to maximize EE in the industrial sector. This currently under-used resource can either continue to be deployed at its current pace or can begin to embrace the additional savings that are possible. Companies that have prioritized energy management have found substantial and continuous benefits in cost savings, increased productivity and operational efficiency, as well as operational and maintenance. Reducing the perceived risk of industrial EE investments, providing increased access to complete, well-organized information, examining non-energy benefits, increasing capacity through EAEs and creating internal incentives through target setting and recognition have the potential to produce long-term benefits for the economy and environment. Clearly, industrial EE is not just a win for the economy and the environment, but for industrial facilities as well.

Suggestions on strategies to pursue first based on easier, or “light-lifting,” and short term are provided in the upper right hand quadrant below:


Boosting EE in the Industrial Sector
### Section VIII: Appendix

#### Glossary of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACEEE</td>
<td>American Council for an Energy Efficient</td>
</tr>
<tr>
<td>ACM</td>
<td>Aerospace Components Manufacturers</td>
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<tr>
<td>CEE</td>
<td>Consortium for Energy Efficiency</td>
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<tr>
<td>CL&amp;P</td>
<td>Connecticut Light &amp; Power</td>
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<tr>
<td>DEP</td>
<td>Connecticut Department of Energy &amp; Environmental Protection</td>
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<tr>
<td>DOE</td>
<td>U.S. Department of Energy</td>
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<td>EE</td>
<td>Energy efficiency</td>
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<tr>
<td>EAE</td>
<td>Energy Account Executive</td>
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<tr>
<td>EIA</td>
<td>U.S. Energy Information Agency</td>
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<tr>
<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
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<td>EU ETS</td>
<td>EU Emissions Trading System</td>
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<tr>
<td>FERC</td>
<td>Federal Energy Regulatory Commission</td>
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<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
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<tr>
<td>kWh</td>
<td>Kilowatt hour</td>
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<tr>
<td>MEEA</td>
<td>Midwest Energy Efficiency Alliance</td>
</tr>
<tr>
<td>MW</td>
<td>Megawatt</td>
</tr>
<tr>
<td>MWh</td>
<td>Megawatt hour</td>
</tr>
<tr>
<td>NEEA</td>
<td>Northwest Energy Efficiency Alliance</td>
</tr>
<tr>
<td>NEEP</td>
<td>Northeastern Energy Efficiency Program</td>
</tr>
<tr>
<td>NU</td>
<td>Northeast Utilities</td>
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<tr>
<td>OEM</td>
<td>Original equipment manufacturer</td>
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<tr>
<td>PUC</td>
<td>Public Utility Commission</td>
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<tr>
<td>PSC</td>
<td>Public Service Commission</td>
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<tr>
<td>PURPA</td>
<td>Public Utility Regulatory Policies Act</td>
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<tr>
<td>REEO</td>
<td>Regional Energy Efficiency Organization</td>
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<tr>
<td>SEP</td>
<td>Superior Energy Performance</td>
</tr>
<tr>
<td>SWEEP</td>
<td>Southwest Energy Efficiency Program</td>
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