

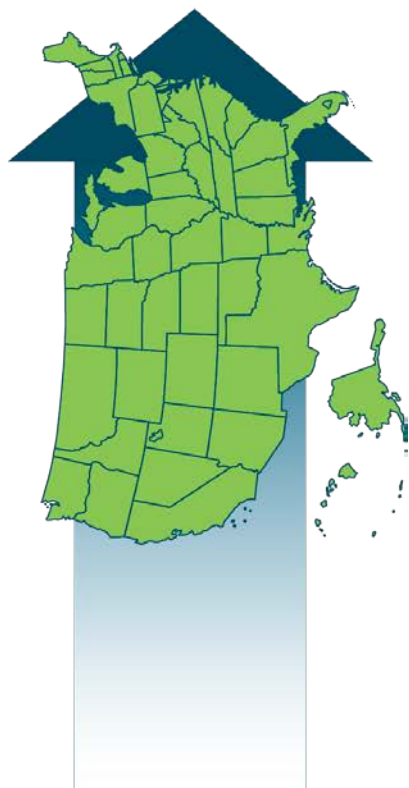
SEE Action

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK


Saving Energy in Industrial Companies: Case Studies of Energy Efficiency Programs in Large U.S. Industrial Corporations and the Role of Ratepayer-Funded Support

**Industrial Energy Efficiency and Combined Heat and Power
Working Group**

March 2017



The State and Local Energy Efficiency Action Network is a state and local effort facilitated by the federal government that helps states, utilities, and other local stakeholders take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.



Saving Energy in Industrial Companies: Case Studies of Energy Efficiency Programs in Large U.S. Industrial Corporations and the Role of Ratepayer-Funded Support was developed as a product of the State and Local Energy Efficiency Action Network (SEE Action), facilitated by the U.S. Department of Energy/U.S. Environmental Protection Agency. Content does not imply an endorsement by the individuals or organizations that are part of SEE Action working groups, or reflect the views, policies, or otherwise of the federal government.

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Executive Summary

Why Energy Efficiency?

Energy is often one of the largest variable costs that companies can actively reduce. Today, many, but certainly not all, large manufacturing companies in the United States have adopted some sort of internal energy efficiency (EE) program. The main reason is for cost reduction, although reputation concerns are gaining in prominence as the public pays a greater degree of attention to issues such as climate change. In the most energy-intensive companies, where energy costs are more than 10% of total costs, the cost-cutting rationale for pursuing energy efficiency is most important. However, the case for pursuing energy cost reduction is often still compelling when energy is a smaller percentage of total costs, as it may be easier to reduce than labor or raw material costs. The net financial benefits of such operating-cost-saving projects directly impact the bottom-line profitability of companies. This contrasts with revenue-generating initiatives, such as growth projects, which contribute only to the gross revenue top line.

About This Report

This report examines primary factors that produce successful EE programs at large industrial companies¹. It also examines the role that ratepayer-funded EE programs² can play in supporting energy efficiency at such companies. The report examines four large industrial companies with robust EE programs who have interacted with many different ratepayer-funded EE programs across a variety of states. The report concludes by (1) defining three requirements for successful EE programs in large companies; (2) providing suggestions for other companies based on the experience of the case study companies; (3) examining how the case study companies view ratepayer-funded EE programs; and (4) providing considerations for ratepayer-funded program administrators on how participation in their offerings for large companies might be increased.

Full case studies, including factory visits, were completed with (1) J.R. Simplot Company, a large, privately held agri-business and food processing company; (2) General Motors, the second-largest automobile manufacturer in the world; and (3) General Mills, one of the largest grain, cereal, and other food processors in North America. A case study was also completed with Intel, the world's largest semiconductor manufacturer, through telephone interviews.

¹ Industry in this report includes manufacturing and mining companies.

² In this report, the word "ratepayer-funded EE programs" refers to ratepayer-financed energy efficiency resource-acquisition programs. These programs are mandated by state governments and public utility commissions in most states. The programs seek to acquire energy efficiency resources from energy consumers, primarily to ensure that available energy efficiency resources are delivered to meet electricity or natural gas demand as a least-cost alternative to more costly supply resources. The programs are implemented by energy-distribution utilities or third parties, using funds collected from ratepayer bills to provide incentives and technical assistance for energy efficiency efforts by the ratepayers. The programs are evaluated by state officials as to how much verified energy savings they deliver at what ratepayer cost.

Table ES-1. Case Study Companies³

| Company | Annual Revenue | Employees | Energy Efficiency Target | Energy Efficiency Achieved |
|----------------|----------------------|----------------------|--|--------------------------------------|
| J.R. Simplot | \$6 billion (Forbes) | 10,000 ⁴ | 20% reduction in energy intensity 2008-2019 | 8% reduction by 2014 |
| General Motors | \$152.4 billion | 209,000 ⁵ | 20% reduction in energy intensity 2010-2020 | 11.3% reduction by 2014 |
| General Mills | \$17.6 billion | 39,000 ⁶ | 20% reduction in energy intensity 2005-2015 | 10% reduction by 2014 |
| Intel | \$55.4 billion | 106,700 ⁷ | 4 billion kWh of cumulative reductions 2012-2020 | 1.6 billion cumulative kWh 2012-2015 |

Capturing Untapped Energy Efficiency Potential

While the U.S. industrial sector has shown progress in energy efficiency, recent studies suggest that even greater levels of EE can be achieved. These studies suggest that the untapped potential for financially attractive EE improvements could further reduce total industrial energy consumption by 15% to 32%⁸. Although they already have achieved strong results from their own EE programs, each of the case study companies has plans to further capture cost-effective EE potential that has not yet been realized.

Capturing financially attractive EE potential is not automatic; it requires a concerted effort. Industrial companies are organizations and all of the different parts within them need to be on board. Most critically, company staff must have the desire, allocated time and expertise, and access to financial resources to identify energy savings opportunities and design and implement solutions. Each of the case study companies had adopted specific measures to meet these needs.

Three Key Requirements for Successful Energy Efficiency Programs

The study team identified three key requirements for an industrial company's EE program to be successful. All four case study companies recognized the importance of these requirements and sought to meet them in ways that suited each company's culture and organization.

Requirement 1: Corporate Commitment

Senior management needs to signal clearly to staff that improving EE is a corporate goal that both plant managers and their staff should care about. This is best achieved by establishing clear EE-improvement targets and making plant management and staff accountable for achieving them. This point was emphasized by staff interviewed at all four companies. Corporate participation in public commitment programs, such as the U.S. Department of Energy's (DOE's) Better Buildings, Better Plants Program and Challenge (Better Plants) or the U.S. Environmental Protection

³ The targets and achievements in this table are taken from the companies' annual reports and corporate sustainability reports. This means that they differ to some extent from the targets and achievements reported to the Better Plants program because of differences between the Better Plants methodology and internal methodologies used by the companies.


⁴ America's Largest Private Companies: Simplot, Forbes, <https://www.forbes.com/companies/jr-simplot/>.

⁵ United States Securities and Exchange Commission Form 10-K: Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for the Fiscal Year Ended December 31, 2016, General Motors Company, https://www.gm.com/content/dam/gm/en_us/english/Group4/InvestorsPDFDocuments/10-K.pdf.

⁶ General Mills Company Overview, <https://www.generalmills.com/en/Company/Overview>.

⁷ Google Finance, Intel Corporation (NASDAQ: INTC), <https://www.google.com/finance?q=NASDAQ%3AINTC&fstype=ii&ei=GJ29V7n4M5C4ugTZ6YuYCCQ>.

⁸ *Barriers to Industrial Energy Efficiency - A Study Pursuant to Section 7 of the American Energy Manufacturing Technical Corrections Act*, U.S. Department of Energy, June 2015, p 38, <https://energy.gov/eere/amo/downloads/barriers-industrial-energy-efficiency-study-appendix-june-2015>.



Agency's (EPA's) ENERGY STAR Challenge, may be useful ways to frame such commitment, with the added benefit of the technical support offered by such initiatives.

Requirement 2: "Boots on the Ground"

Competent staff or outsourced or borrowed experts must work at the facility-level to continually identify site-specific, profitable EE measures and to follow through with implementation. Although a maintenance manager may have interest in energy efficiency, it naturally ranks below other priorities of multi-tasked staff, such as keeping production lines moving. Unless someone is available who has the necessary time and competence to put EE projects together, they are not likely to be undertaken.

All of the companies were able to arrange for energy engineers to provide support at their key facilities. Two companies had energy engineer staff as their "boots on the ground" at most key sites. One company used a long-term outsourced arrangement with local utility partners to place experts at key facilities. Another company used a mix of roving EE engineer staff with part-time, on-site energy champions, interns, and experts supported by local ratepayer-funded EE programs.

It can be difficult to obtain approval from personnel departments for the placement of on-site energy engineers. This is true even if it is proven that the annual financial cost-savings benefits of EE improvements developed by those engineers are many-fold greater than their salaries. Head-count limitations and competition for staff positions may make placement of such staff challenging. In such cases, various outsourcing arrangements and support from outside partners can make a difference between program success and failure.

Requirement 3: Efficient Project Processing Systems

Effective internal systems need to be in place and smoothly operate to allocate financing for portfolios of EE measures deemed to be most attractive to the company. Project development and implementation slows when an inordinate amount of time is needed for internal processing of good EE projects, when basic energy cost saving project rationale needs to be explained over and over, and when even the best projects have uncertain outcomes.


Several of the companies operated annual EE project budget systems. Finance departments set aside specific financial resources based on preliminary pipelines of projects meeting approved hurdle criteria. This lent more predictability and efficiency to the approval process. Processing efficiencies and budget levels also tended to improve over time as the finance department and EE staff worked closely together, and finance staff increasingly observed the cash savings that resulted from the EE portfolios.

The Role of Ratepayer-Funded Programs

Local ratepayer-funded EE programs often provide technical support and sizable incentives for implementation of EE measures by utility customers. At times, incentives may amount to 50% or more of investment costs. They do this by using funds paid by the same groups of customers on their utility bills. Although there may be other accountabilities as well, a key program accountability to regulators is the delivery of as much verified energy savings as possible in return for the funds used.

How Large Industries View Ratepayer-Funded EE Programs

Large industries generally view ratepayer-funded EE programs from a business proposition perspective, weighing the costs of paying into the programs against the programs' benefits to the company. Companies with little interest in energy efficiency (and thereby few projects) see little benefit from the ratepayer-funded programs and naturally want to opt out of incurring any costs if possible. Companies with active EE programs, such as the four case study companies, review their participation in local ratepayer-funded EE programs on a case-by-case basis. Participation choices may include (1) a choice to opt out of both paying into the program and receiving program



benefits, in states where this is allowed; (2) a choice to “self-direct”⁹ the ratepayer-funded EE program or not, in states where self-direction is allowed; or (3) full program participation to receive maximum technical assistance and incentive offering benefits.

The cost side of the equation is generally fixed with applicable utility rates and fees. The company benefit assessment side tends to follow review of the EE project pipeline anticipated at specific facilities. Companies will assess the potential value of technical assistance they might obtain for the work program they envisage at a facility and, especially, the potential investment incentive value they may receive. Both of these assessments depend on facility-specific opportunities and the individual rules of the program offerings. Although ratepayer-funded EE programs also can provide broader benefits for all consumers as a whole, in terms of lower system supply costs and hence lower future electricity prices, such less explicit benefits were not commonly assessed.

Where any of the four case study companies paid into local ratepayer-funded EE programs, they made concerted efforts to gain as much from those programs as they could. They have been successful at that, gaining expert support and especially project incentives that allowed them to process more projects through internal hurdles than would otherwise have been possible. The companies considered it an unacceptable waste to pay into the ratepayer programs and not receive ample benefits in return.

Many other industrial companies in the United States pay into ratepayer-funded EE programs but do not participate strongly in program offerings. This may be due to the lack of an effective internal EE program (stemming from lack of commitment, on-site staff and/or effective internal project processing systems), or may be due to poor ratepayer-funded EE program outreach or offerings. Based on interviews with company and utility staff, poor participation seems to be caused by a mixture of both of these.

Considerations for Program Administrators

For ratepayer-funded EE program administrators, an effort to expand industrial customer participation and booked industry program energy savings must focus on providing benefits relative to program costs. They must help customers overcome any bottlenecks in project pipeline development and provide as much benefit (as perceived by the customer) as possible. However, these goals must also be balanced against pressures to keep program costs down so that overall verified unit energy savings costs achieve levels in line with the expectation of regulators.

As noted in a previous State and Local Energy Efficiency (SEE) Action Network study¹⁰, the industrial customer class is different from other customer classes and requires special attention. In general, industrial programs can achieve the best results through:


- Development of multiple-year relationships between program administrators and company personnel, focusing on a steadily evolving program of multiple projects over time
- Assignment of program staff or trusted contractors to work as account managers with key customers
- Program offerings that include both custom project incentives and prescriptive incentives, with flexibility to structure offerings to best meet the budgeting, processing, and implementation needs of industrial customers.

Active outreach and engagement of industry staff is essential. Programs need to work with industrial customers to tailor solutions together as opposed to handing them a catalog of incentives and asking them to apply when ready.

To effectively meet these needs requires an upfront and steady investment in program capacity building. However, these program investments have been shown to pay off attractively for program administrators. Industrial

⁹ Under “self-directed” programs, industrial customers self-direct fees that otherwise would be paid to a ratepayer-funded program to EE investments they identify in their facilities, instead of using services from the ratepayer-funded program. Self-directed customers are still obligated to spend money and deliver energy savings.

¹⁰ A. Goldberg, R.P. Taylor, and B. Hedman, *Industrial Energy Efficiency: Designing Effective State Programs for the Industrial Sector*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, 2014, http://energy.gov/sites/prod/files/2014/03/f13/industrial_energy_efficiency.pdf.




program life-cycle savings for delivery costs are generally under 3 cents per kilowatt-hour (kWh) of saved energy (and often less than 2 cents/kWh), providing an excellent source of both large and relatively low-cost energy savings (see Table 3 in section 3).

In medium- and small-scale companies, ratepayer-funded programs may help customers to create EE programs where none had existed before. For most larger interstate industrial company customers, however, the role of ratepayer-funded programs is usually to assist companies in the rollout and expanded operation of their own programs in different facilities. This means that ratepayer-funded program staff must understand the EE programs of specific corporation customers. This includes understanding of how different staff are placed; what staff roles are; what issues matter most to the company; and the specific procedures, time lines, hurdle rates, and benefit-cost calculation methodology used in the EE project approval process. It is especially important to understand issues relating to each of the three challenges posed for company EE programs mentioned earlier.

Much of the focus for ramping up partnerships with large industrial customers is most effectively placed on addressing barriers in project pipeline development, financing, and implementation. In cases where insufficient corporate management commitment is one of the challenges facing a large customer, the toolkit available to ratepayer-funded programs may be more limited than for smaller customers. Even so, local programs created to challenge customers to make and achieve energy savings target commitments, or to support piloting a new EE program at one or several local facilities, may help.

As discussed further in this report's following chapters, some suggestions for working with customers to expand project pipelines and the throughput of implemented EE measures include:

- **Listen for specific technical assistance needs.** Interviews suggested that company staff views on the most valued lines of technical assistance support varied substantially. Generally, larger customers will have the potential for bigger or more complex projects, in addition to those that are relatively straightforward. If catered to specific needs, strong technical assistance can both deepen the trust that needs to underpin good partnerships and help expand the project pipeline.
- **Consider piloting and roll-out of programs for providing staff to facility sites, and/or financing placement of facility EE engineers.** Lack of on-site company staff for EE project development and implementation can be a critical constraint for the companies. The increased energy savings bookings that may result from utility support for new expert placement may be highly cost-effective for ratepayer-funded programs if robust project pipelines can result. However, on-site EE engineers only make economic sense in facilities large enough to provide a robust pipeline of projects with sufficient savings to outweigh the cost of such an engineer. Development of an on-site EE engineer placement and/or partial financing program also does not change the important need for strong industrial account managers in ratepayer-funded EE programs. Indeed, in some cases, a strong industrial account manager program also can go a long way to help resolve customer needs for on-site EE capacity and can be instrumental in helping to identify and implement projects.
- **Cater assistance to match and support the internal project development, approval, and implementation procedures and timing of customers.** Matching assistance with internal company project development processes is important with all industrial customers, but especially for large companies, which often have very different practices.
- **Strive for maximum flexibility to structure and size incentives to help good projects overcome corporate hurdles.** Some programs specifically design incentives to enable projects with large life-cycle energy savings potential to meet corporate projects' financial approval hurdles where they otherwise would not have. Some present a menu of options for incentive size and structure, such as a choice of reduced incentives paid up front or larger incentives with a portion paid out after sufficient project operation. While a few programs may adjust incentive amounts on a project-by-project basis with a view to



overcoming specific hurdle rates, the key point is to keep the objective of overcoming hurdle rates generally in mind when structuring program incentives.

- **Consider facility strategic energy management (SEM) and/or other behavioral energy savings program support.** Potential for additional energy savings through changes in staff behavior remained in all four case study companies, as in most industrial companies. Ratepayer-funded program support can both yield direct low-cost savings and help expand project pipelines¹¹.
- **Consider programs to support energy efficiency in projects involving investment in new assets.** Ensuring high energy efficiency in new assets was an area of importance in all of the case study companies.

Company Case Studies

This paper provides detailed profiles of the four studied companies in the appendices. These profiles include:

- Company Overview
- Energy Efficiency at the Company: Goals and Achievements
- Identification, Selection, and Implementation of Energy Efficiency Measures
- Role of Outside Support and Ratepayer-financed Programs.

¹¹ The Consortium for Energy Efficiency Industrial Strategic Energy Management Initiative includes detailed information about strategic energy management approaches for energy efficiency program administrators. The Initiative and associated resources are available at <https://library.cee1.org/content/cee-industrial-strategic-energy-management-initiative/>.



1. Introduction

1.1. Purpose of This Report and Its Organization

This report examines and details various models of EE programs at large U.S. industrial corporations that have a presence in multiple states. This paper seeks to highlight key elements of successful EE programs at these large corporations and to identify how ratepayer-funded EE programs¹² can support the strengthening of corporate EE programs at large industrial companies. This report:


- Presents four detailed case studies of successful industrial EE programs at large U.S. industrial corporations with operations in multiple states. Three of these case studies involved facility site visits. The primary source of information for the case studies was interviews with the company, third-party service providers, and cooperating ratepayer-funded EE program staff.
- Identifies three key elements of successful programs: a high-level corporate commitment to energy efficiency; personnel available to identify and implement EE projects; and a clear, effective internal financing system for EE projects
- Discusses the relative merits of different models of these three key elements of successful programs
- Identifies ways in which ratepayer-funded programs and other sources of outside support can help large corporations develop and expand successful EE programs
- Explains the perspectives of the case study corporations as provided through interviews on ratepayer-funded programs and their process for deciding on their level of participation in such programs
- Gives recommendations on how large industrial corporations can develop and expand their EE programs and how ratepayer-funded programs can help them to do so.

1.2. Introduction to Corporate Industrial Energy Efficiency Programs

Of the 123 Fortune 500 companies assessed as relatively energy-intensive manufacturing companies, more than half are reported to have sustainability targets, and about a quarter have stand-alone EE targets¹³. Although reputational reasons for pursuing environmentally conscious EE efforts typically form part of the rationale for developing corporate EE programs, the primary reason given by staff of the companies reviewed for this study was cost reduction and hence direct financial benefit. In the most energy-intensive companies (e.g., where energy costs are more than 10% of total costs), the cost-cutting rationale for pursuing EE is most obvious. However, the case for pursuing energy cost reduction is often still compelling when energy is only a small percentage of total costs. Whereas depreciation cannot be impacted through operations, aggressive pursuit of labor cost reductions is particularly complex, and the reduction in the cost of core raw material procurement and use typically poses special challenges, tackling energy costs may be the best remaining area to achieve operating cost savings. Moreover, the net financial benefits of operating cost saving projects, such as EE projects, also directly impact the bottom-line profitability of companies, as opposed to revenue-generating initiatives, such as growth projects, which contribute only to the gross revenue top line. Accordingly, all four of the case study companies reviewed were actively pursuing energy efficiency even though energy made up less than 5% of their total costs

¹² In this report, the word “ratepayer-funded EE programs” refers to ratepayer-financed energy efficiency resource acquisition programs. These programs are mandated by state governments and public utility commissions in most states. The programs seek to acquire energy efficiency resources from energy consumers, primarily to ensure that available energy efficiency resources are delivered to meet electricity or natural gas demand as a least-cost alternative to more costly supply resources. The programs are implemented by energy distribution utilities or third parties, using funds collected from ratepayer bills to provide incentives and technical assistance for EE efforts by the ratepayers. The programs are evaluated by state officials as to how much verified energy savings they deliver at what ratepayer cost.

¹³ J. Kefer, “Industrial Opt-Outs: Exploring the Business Landscape,” David Gardiner and Associates, unpublished presentation, October 2015.



The role of local ratepayer-funded EE programs with large, interstate companies may at times be different than what it may be for smaller companies. Large companies with industrial facilities across a variety of states (and countries) deal with different utilities and different ratepayer-funded EE programs across their organization, while small and medium companies may only have facilities within one state and deal with one utility. At times, local ratepayer-funded EE programs may be able to provide substantial help to local facilities of large companies; this includes piloting new types of EE initiatives, which may then be expanded across the company. However, local programs are rarely large enough relative to these large industrial companies to be able to push the company to create a corporate EE program where none existed before or to make a major difference in shaping the company's existing EE program. Instead, it is usually critical for local ratepayer-funded programs to understand and fit into the broad, cross-state internal EE programs operated by large companies as major EE initiatives typically require headquarters (HQ) support to access necessary financing and resources. Local ratepayer-funded EE programs can prove essential to translating broad corporate EE goals into concrete action, but rarely can cause a large company that has been uninterested in pursuing energy efficiency to begin developing a program.

Where large companies have active EE programs in their key facilities, the role of ratepayer-funded EE programs focuses more on assisting in the implementation of the large company's own EE program, rather than driving the development of it. This contrasts significantly with the small- and medium-sized industrial companies discussed in the recently published white paper, *Sustained Energy Savings Achieved through Successful Industrial Customer Interaction with Ratepayer Programs: Case Studies*, as the ratepayer programs were able to play a significant role in driving EE programs at reviewed, smaller industrial company facilities¹⁴. Because of this inability of any given ratepayer-funded program to drive a company-wide EE program at the larger industrial companies, successful EE programs at these active firms are driven from within the companies' organizations and then supplemented by ratepayer programs where applicable.

In other cases, however, corporate macro-level EE plans may be broad and more aspirational, with little real effect on on-site energy use. In these cases, a local ratepayer-funded program may be able to help a local facility pilot effective new EE efforts, which then may feed back into the corporation and perhaps positively impact the effectiveness of the broader corporate program.

1.3. Introduction to Case Study Companies and Utilities

The four companies examined in this report are the J.R. Simplot Company, General Motors, Intel, and General Mills. All of these companies have announced corporate targets for EE and have made significant progress toward reducing their energy intensity of production.

¹⁴ A. Goldberg, B. Hedman, and R.P. Taylor, *Sustained Energy Savings Achieved through Successful Industrial Customer Interaction with Ratepayer Programs: Case Studies*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, 2015, https://www4.eere.energy.gov/seeaction/system/files/documents/IEE%20Case%20Studies_1002.pdf.

Table 1. Case Study Companies¹⁵

| Company | Annual Revenue | Employees | Energy Efficiency Target | Energy Efficiency Achieved |
|----------------|----------------------|-----------------------|--|--------------------------------------|
| J.R. Simplot | \$6 billion (Forbes) | 10,000 ¹⁶ | 20% reduction in energy intensity 2008-2019 | 8% reduction by 2014 |
| General Motors | \$152.4 billion | 209,000 ¹⁷ | 20% reduction in energy intensity 2010-2020 | 11.3% reduction by 2014 |
| General Mills | \$17.6 billion | 39,000 ¹⁸ | 20% reduction in energy intensity 2005-2015 | 10% reduction by 2014 |
| Intel | \$55.4 billion | 106,700 ¹⁹ | 4 billion kWh of cumulative reductions 2012-2020 | 1.6 billion cumulative kWh 2012-2015 |

J.R. Simplot is the largest producer of frozen french fries in North America and the primary supplier of french fries to fast food restaurants such as McDonald's. The company has emphasized vertical integration, including phosphate mining, fertilizer production, agribusiness, and food processing industries. Simplot operates 13 large industrial facilities in Idaho, Wyoming, Utah, Nevada, California, Oregon, Washington, and North Dakota. These facilities interact with 22 different electricity and natural gas utilities, including public utilities associated with the Bonneville Power Administration, Idaho Power, and Rocky Mountain Power. Energy is a relatively small (<2%) cost across all of Simplot, though it is one of the largest costs at some of their facilities. For instance, energy is the second-largest cost at the Smoky Canyon Phosphate Mine, and has, at times, been their largest cost.

General Motors is the second-largest automobile manufacturer in the world, owning brands such as Chevrolet, Cadillac, GMC, and Buick. GM has more than 30 manufacturing facilities in the United States, primarily in Michigan, but also in states such as Ohio, Indiana, New York, Texas, Missouri, and Maryland. The utilities covering the largest numbers of GM plants are DTE Energy (formerly the Detroit Edison Company) and Consumer Energy, both in Michigan. Energy makes up less than 1% of GM's total costs and their most energy-intensive process is painting, which accounts for approximately 50% of their automobile manufacturing energy use.

General Mills is one of the largest grain and cereal processors in North America, owning brands such as Cheerios and Pillsbury. The company produces cereal, yogurt, flour, and other food products at approximately 25 plants in New York, Illinois, Minnesota, California, Tennessee, Iowa, Ohio, Missouri, New Jersey, and Georgia. Major utilities of which General Mills is a customer include National Grid and Commonwealth Edison Company (ComEd). Energy makes up less than 2% of their costs at all of their facilities.

Intel is the largest semiconductor manufacturer in the world. It has manufacturing facilities in Oregon, California, Arizona, and New Mexico, and data centers in several other states. Ratepayer-funded programs Intel's facilities participate in include those of the Energy Trust of Oregon and the Salt River Project. Energy makes up less than 1% of their costs, but it is their second-largest variable cost after labor. The study team interviewed Intel staff by telephone and did not visit Intel sites.

¹⁵ The targets and achievements in this table are taken from the companies' annual reports and corporate sustainability reports. This means that they differ to some extent from the targets and achievements reported to the Better Plants program because of differences between the Better Plants methodology and internal methodologies used by the companies.

¹⁶ America's Largest Private Companies: Simplot, Forbes, <https://www.forbes.com/companies/jr-simplot/>.

¹⁷ United States Securities and Exchange Commission Form 10-K: Annual Report Pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934 for the Fiscal Year Ended December 31, 2016, General Motors Company, https://www.gm.com/content/dam/gm/en_us/english/Group4/InvestorsPDFDocuments/10-K.pdf.

¹⁸ General Mills Company Overview, <https://www.generalmills.com/en/Company/Overview>.

¹⁹ Google Finance, Intel Corporation (NASDAQ: INTC), <https://www.google.com/finance?q=NASDAQ%3AINTC&fstype=ii&ei=GJ29V7n4M5C4ugTZ6YuYCO>.

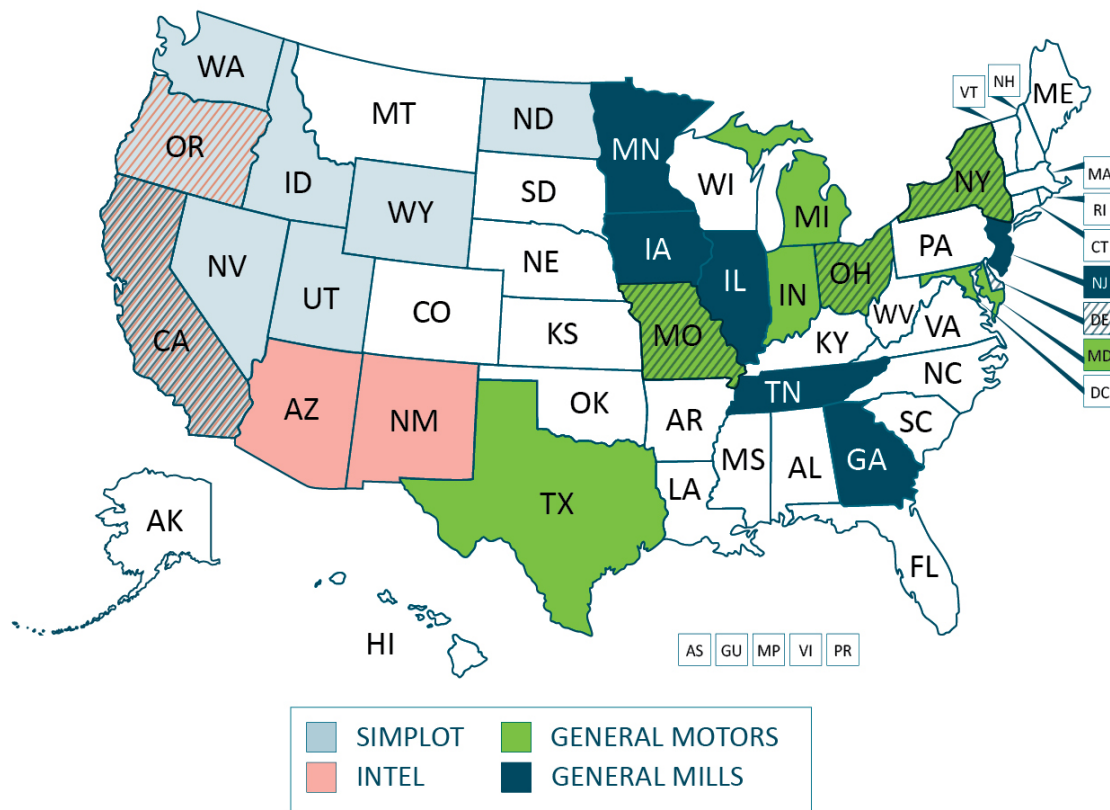


Figure 1. Geographic Distribution of Case Study Company Manufacturing Facilities



2. Addressing Energy Efficiency-Related Challenges in Large Corporations

2.1. Untapped Energy Efficiency Potential

Recent studies conclude that the currently untapped potential for improved energy efficiency in the manufacturing sector as a whole using existing, mature, and cost-effective technologies and practices is in the range of 15% to 32% of total energy use²⁰. Although many EE projects have high internal rates of return and/or short payback periods, often they are not implemented. Someone in the company must have the incentive, interest, skill set and time to identify project opportunities, to prepare and package together the project technical, financial and procurement documents, and to push for project approval and implementation. In addition, the relevant corporate departments must be willing to accept, review and potentially approve the typically small size and technically diverse nature of the projects. Reviewing and approving authorities need to accept how these projects affect the corporate bottom-line through cost savings rather than revenue generation, and how risks inherent in translating estimated project savings into realized cash savings can be minimized. Review and funding mechanisms also need to be efficient to enable substantial portfolios of projects to be implemented every year. Capturing financially attractive EE investment potential requires corporate commitment, project champions, and effective organization practices.

Behavior measures to improve energy efficiency offer even more potential savings. Recognized as an area with potential to achieve up to 40% of a given enterprise's total potential energy savings²¹, these measures involve little capital investment and hence bring exceptional financial benefit. However, capturing these opportunities requires dedicated education, awareness-building and training efforts, incentives to generate broad interest, and strong organization at the plant level.

Even though they work in companies that have developed strong EE programs, the energy management staff and factory personnel interviewed in the case study companies are still among the first to recognize that many financially attractive EE measures remain to be undertaken. They aim to continue capturing the benefits of that potential. Indeed, as recognized by most industrial EE practitioners, the effort to capture cost-effective opportunities is never "completed," as technologies continue to change and opportunities continue to evolve.

2.2. Working within Corporate Structure and Culture

Companies do not behave the same as individuals. Operations are conducted and matters decided through the interplay of different departments and staff groups, each of which has different perspectives stemming from different core responsibilities.


Table 2 illustrates key corporate roles (or groups) that are important for an EE agenda in a corporate setting. It is easy to see that the accountabilities and responsibilities of the various groups are quite different. Each of these roles is important for the success of the company, and their perspectives and interests differ for good reasons. Reconciling these differing perspectives and creating a successful EE program is not simply about convincing other roles to adopt the energy management team's perspective, but rather about creating a system where energy efficiency is supported in a way that suits all of the different roles.

²⁰ Barriers to Industrial Energy Efficiency - A Study Pursuant to Section 7 of the American Energy Manufacturing Technical Corrections Act, U.S. Department of Energy, June 2015, p 38, <https://energy.gov/eere/amo/downloads/barriers-industrial-energy-efficiency-study-appendix-june-2015>.

²¹ Ulrika Wising, Jingjing Liu, and Julia Vetromile, Why is This Facility Different? Measuring Energy Culture to Achieve Continual Improvement in Energy Efficiency, American Council for an Energy-Efficient Economy Summer Study on Industry, 2015, <http://aceee.org/files/proceedings/2015/data/papers/3-139.pdf>.

Table 2. Key Corporate Actors Important for the Energy Efficiency Agenda

| Actor | Corporate Accountabilities | View of Energy Efficiency |
|--|--|--|
| Corporate Management | To drive long-term profitability and increase shareholder value; to articulate a strategic vision for the company and ensure its realization | Senior management can ensure success in an EE program through leadership, but energy efficiency is only one of many concerns and may not be considered important enough for management attention. Where senior management does monitor efforts to reduce energy use, this typically is one of many actions in broader cost containment and/or corporate sustainability agendas. |
| Finance | To ensure the financial health of the company; to keep costs down; to fund projects in line with the company's strategic agenda | EE projects are typically viewed in the same ways as other cost-cutting investments. They therefore must compete for funds against other investment agendas, such as investments for growth and maintaining production reliability and safety. They also must compete against other cost-saving projects, based on benefit-cost metrics. Finance staff may be skeptical if EE projects will actually yield visible and reliable cost savings in line with estimates. EE staff members need to ensure that financial attractiveness of projects is clear. |
| Personnel | To operate all human resource functions; to ensure staff is as productive as possible; to tightly manage head counts and keep labor costs within targeted levels | The case for adding or maintaining energy management positions must be weighed against the case for adding or maintaining a wide variety of other positions (also with their proponent departments) in a tightly controlled environment. |
| Headquarters Energy Management (if in place) | To ensure achievement of corporate energy management and savings goals | |
| Energy Procurement | To ensure reliable and least-cost energy supply; responsible for contractual relations with utilities | Key energy efficiency proponent |
| New Production Asset Design and Construction | To efficiently design, construct, and commission new production assets in line with the company's strategic vision, within assigned budget and time line | A key decision-maker on opting in or opting out of ratepayer-financed EE programs |
| Plant Management | To meet production targets while ensuring efficient and safe plant operation | Energy efficiency is a low priority, unless mandated by corporate strategy, especially if increased costs or delays are involved. |
| Plant Maintenance, Utility | To ensure that the plant runs reliably, | Energy use may or may not be well |



| | | |
|---------------------------------|---|---|
| Service Operation ²² | safely, within environmental requirements, and cost-efficiently; to ensure that energy services such as steam, electricity, cooling, compressed air, etc. meet production needs | monitored, and there may not be specific EE performance targets in place. EE is just one of many agendas. |
|---------------------------------|---|---|

| | | |
|--|---|--|
| Production Line Operational Management | To ensure maximum performance in production | Energy efficiency is one of a list of five to 10 responsibilities competing for maintenance/utility service staff attention. Assignment of an EE engineer can make a significant difference in developing and implementing projects. |
|--|---|--|

A program that provides year-in and year-out success in saving energy for the company requires successful cooperation on the EE agenda between most, if not all, of the various internal groups. Some examples of key relationships include the following:

- Productive interaction between staff responsible for energy procurement (who primarily see the costs of opting into ratepayer-funded programs) and staff involved in energy management (who directly see the benefits that may arise from these programs) when these roles are separate
- Relationships between those proposing EE projects and the finance staff who decide on the funding of them
- Relationships between facility staff tasked with energy management and production line operational management
- Productive interaction between staff involved in energy management and staff in charge of relevant new production asset design and construction projects.


Working successfully with internal stakeholders to deliver on the EE agenda will necessarily vary from company to company based on how the different corporate roles are set up and how they relate to each other. Company cultures and their institutional legacies are strikingly different, including among the four case study companies. It is clear that there are no correct or incorrect ways to structure the effort, except that organizational arrangements must fit each company's culture and legacy.

2.3. Successful Organization Arrangements for Energy Efficiency

The successful organizational arrangements for energy efficiency in our case studies varied substantially, however all case study companies translate their corporate commitment to energy efficiency into EE targets for each plant. The differences in organizational arrangements had much to do with company history, structure, and culture. For example, Intel's highly centralized and standardized corporate model led them to create a centralized EE program that seeks to implement basically the same EE measures across many plants. On the other hand, General Mills' history of relatively autonomous plants has led them to leave most of the EE program decisions at the plant level, with a small central team focused on helping plant-level EE staff share ideas and get funding for large projects that require central approval.

At Simplot, each facility has at least a part-time energy champion, who watches over EE efforts at the plant, and interns and other occasional experts in some cases. Two full-time energy engineers work with the corporate energy manager and on-site staff, one assisting facilities in the food business group and the other covering facilities in the agribusiness group. The energy staff identifies projects that then compete for funding based on internal rate

²² If an energy efficiency engineer is present at the plant, he/she is usually part of this group.



of return (IRR) with other, non-energy projects. The EE team has developed a strong esprit de corps, and operates under a principle of “partner with everyone,” seeking technical, financial, and/or reputational support from both inside and outside of the company. The corporate energy manager is in charge of energy procurement and energy efficiency, working to reduce energy costs to the company through efforts on both fronts.

At General Motors, plant managers are held accountable for meeting plant-level EE targets. The plant-level EE staff in North America comprises about 10 energy engineers and 22 subcontracted energy engineers who report directly to the headquarters EE team, in coordination with the plant and facility utility managers. Together, these staff identify projects that are selected for funding by GM out of the EE program's annual budget based on payback period metrics. The EE program's spending is closely monitored by the finance department, which has proven helpful in demonstrating the high returns of energy efficiency investments, leading to larger EE budgets in recent years. The EE team is part of the Global Facilities Engineering team, which has helped the EE team optimize EE in designs for new plants. GM has found that integrating EE into the Global Facilities group provides synergies to optimize energy efficiency in new construction design, project management, and energy procurement.

General Mills also includes plant EE targets as part of the greater responsibility of plant management. The base of the program is the full-time, plant-level energy engineers at each “Big ‘G’” plant who report to the plant manager and coordinate with the corporate EE team and the other plant-level EE engineers. The energy engineers request funding for projects out of the plant budget, with approval coming from the plant-level finance team for smaller projects and the corporate finance team for larger projects. The plant’s energy engineers also share responsibility for energy procurement with the plant finance team. There is no formal process for the EE team to be consulted on new facilities engineering, though they get involved informally in building energy efficiency into new projects.


In addition to plant level EE goals, Intel also has EE goals for each region in which sites are located. The key staff for reaching these targets are typically the full-time energy engineers at each of Intel's sites, who all report to their plants' management and matrix-report to the corporate EE manager. These energy engineers identify projects that then compete for a piece of the company's energy efficiency budget (currently about \$30 million annually) based on energy saved and economic return. EE upgrades are approved through Intel’s change control process, which results in all design standards and construction standards being updated to reflect the latest requirements. The design and construction specifications are used for all retrofit projects and new construction. Once part of the same unit, the corporate EE manager and the corporate energy procurement manager are now separate rolls in different units, filled by staff sitting in different countries, though they maintain close contact and consult with each other.

More details are available in the case study appendices.

2.4. Three Key Elements of Successful Corporate Energy Efficiency Programs

While there are many ways to structure an EE program in order to suit a particular company, there are three key elements that are consistently present in all successful EE programs that the authors have studied. These elements are (1) a **high-level corporate commitment to energy efficiency**; (2) **facility-level personnel (internal or out-sourced) to identify, package, and implement energy efficiency projects**; and (3) a **clear internal financing system for EE projects**. If even one of these three elements is missing, research indicates results suffer, as EE is given less priority, financially attractive projects are not identified, and/or identified projects are unable to attain funding.

A **commitment to energy efficiency** from senior leadership is what makes energy efficiency a corporate priority. Typically, such commitments take the form of a public commitment by the executive management to reduce energy usage or intensity by a specified percentage. These commitments are then usually paired with goals and targets for plant-level management, which prove indispensable in making EE a priority and helping the EE team to get support and cooperation from other groups in the organization.



EE personnel are necessary in order to turn the commitment to EE into action. Personnel must work on-site at major facilities or be frequently on-site if roving between facilities to be able to cover the bulk of project-identification and -development tasks needed at the facility level. These identifiable EE personnel may be full- or part-time (although full-time is preferred by staff interviewed, where possible). At times, EE personnel may be factory energy-utility management staff, working part time on EE measures and part time on secondary energy production and distribution in the factory. This arrangement can work well but may also raise challenges in dealing with production line management on production line operational improvements to achieve energy savings (which production line management may consider outside of the work scope of such utility management staff). No matter what form the EE team takes, these “boots on the ground” are necessary to identify, champion, and implement EE projects, encourage energy-saving behaviors, and to help promote EE in new projects. Without such personnel, there is no one with sufficient time to translate the corporate EE goals into concrete EE measures that produce the desired energy savings.

A **clear internal financing system for EE projects** ensures that the projects that the EE personnel identify are actually implemented if they meet established criteria. Such systems may include a dedicated bucket of funds for energy efficiency and usually have a set metric, whether IRR, net present value (NPV), or simple payback, for deciding which EE projects get funded. Having a clear system ensures that the EE team knows how to package EE projects for internal approval, what financial profile they should look for in projects, and where to go to get projects funded. Without such a clear system, the EE team can end up spending an inordinate amount of their time preparing proposals and searching for funding for their projects, with little certainty as to probable outcomes. Projects that meet corporate cost-effectiveness standards may be left unimplemented due to processing confusion or temporary fund-allocation problems.

3. Role of Ratepayer-Funded Industrial Energy Efficiency Programs

3.1. Overview

In this report, the term “ratepayer-funded EE programs” refers to ratepayer-financed EE resource-acquisition programs. These programs may be mandated by state governments and public utility commissions to acquire EE resources from energy consumers, primarily to ensure that available EE resources are delivered to meet electricity or natural gas demand as a least-cost alternative to more costly supply resources. The programs use incentives and technical assistance support to foster implementation of new EE measures, and deliver the verified savings against targets set by regulators. The programs are administered by electricity and natural gas utilities, by non-profit third party institutions, or, occasionally, by other entities. Their EE resource acquisition is funded by the energy-consuming ratepayers that they serve, as an explicit charge on energy bills or an implicit increase in energy rates agreed during rate-setting procedures^{23, 24}.

In 2015, 45 jurisdictions in the United States operated ratepayer-funded EE programs, with a total spending of \$7.7 billion²⁵. Most of these programs included specific programs for commercial and industrial customers, in addition to residential customers. However, the breadth, scope, and quality of programs to acquire EE resources from industrial customers vary dramatically. Some programs include only basic rebates for purchase of specified types of more energy-efficient equipment. Other industry EE programs include a suite of offerings, focusing on strong customer service. Some industry EE programs have grown to deliver the largest share of the total EE program’s energy savings of any customer sector.

Table 3. Role of Commercial and Industry Programs in Overall Ratepayer-Funded EE Programs²⁶

| Ratepayer-Funding EE Program | Share of Total Savings from Commercial and Industrial Programs (%) | Levelized Cost of Commercial and Industrial Program Savings (cents/kWh) |
|------------------------------|--|---|
| Energy Trust of Oregon | 70% | 2.4 cents |
| National Grid Rhode Island | 63% | 2.8 cents |
| Xcel Colorado | 54% | 1.9 cents |
| Focus on Energy Wisconsin | 57% | 1.8 cents |

The average levelized costs of delivering savings from commercial and industrial programs vary significantly from program to program. However, in relatively large and sophisticated commercial and industrial programs, average costs are typically lower than costs for other sectors. As Table 3 shows, commercial and industrial programs now account for more than half of the energy savings delivered by several well-established ratepayer-funded EE programs. In these cases, costs of energy savings delivery from industry (and often the commercial sector as well) tend to be substantially lower than the costs of savings delivery from the residential sector²⁷. In Bonneville Power


²³ For a full review of EE resource acquisition programs, see: Taylor, Trombley and Reinaud, *Energy Efficiency Resource Acquisition Program Models in North America*, Institute for Industrial Productivity, December 2012, http://www.iipnetwork.org/IIP_resource_acquisition.

²⁴ Additional background can be found in: *Sustained Energy Savings Achieved through Successful Industrial Customer Interaction with Ratepayer Programs: Case Studies*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, October, 2015, https://www4.eere.energy.gov/seeaction/system/files/documents/IEE%20Case%20Studies_1002.pdf.

²⁵ Weston Berg, Seth Nowak, Meegan Kelly, Shruti Vaidyanathan, Mary Shoemaker, Anna Chittum, Marianne DiMascio, and Chetana Kallakuri; *The 2016 State Energy Efficiency Scorecard*, American Council for an Energy-Efficient Economy, September 2016, <http://aceee.org/sites/default/files/publications/researchreports/u1606.pdf>.

²⁶ Estimates by the American Council for an Energy Efficient Economy (ACEEE), using 2014 annual reports, as presented in *Industry Efficiency Programs Can Achieve Large Energy Savings at Low Cost* (ACEEE fact sheet, 2016, <http://aceee.org/sites/default/files/low-cost-ieep.pdf>).

²⁷ In a comprehensive review of many different programs operating from 2009 to 2011, the average levelized administrator cost of delivering commercial and industrial sector savings was calculated at 2.1 cents/kWh, which was slightly higher than for the residential sector. (See M.A. Billingsley, et.al., *The Program Administrator Cost of Saved Energy for Utility Customer Funded Energy Efficiency Programs*, Lawrence Berkeley



Administration’s overall EE resource-acquisition program, for example, the 2.9 cents/kWh combined participant and administrator estimated cost for industrial program energy-savings delivery was far below the 5 cents/kWh cost registered for the residential sector. In a number of other well-established programs, industry or industry and commercial programs also delivered savings at less than half the cost of residential programs²⁸.

Energy management staff at all four case study companies reported that specific ratepayer-funded industrial EE programs definitely helped them in their efforts to deliver and expand EE investments in their companies. In these large companies, the role of the EE programs was very much as a “facilitator” or “assistor,” rather than as a co-creator of company EE programs where none had existed before (as is at times the case for smaller companies). Nevertheless, local ratepayer-funded programs were often appreciated as steady partners, offering investment incentives and technical support that at times made a critical difference in delivering EE project portfolios.

Interviewed energy management staff all appreciated how ratepayer-funded EE program incentives could make the difference between a “go” and “no-go” decision for a number of EE investments by helping projects get below internal financial hurdle rates. Although valuable in this way regardless of the financial metric used, the value of the incentives is perhaps easiest to illustrate for companies that use simple paybacks of 1 or 2 years as their financial hurdle for EE project, which is a common practice. Typically, there are many valuable EE projects with simple payback periods of 3–5 years and strong internal rates of return over the life of the projects (e.g., more than 15% and often greater than 25%). These projects would be left on the table under a 1 to 2 year payback requirement without EE program incentives. The incentives can buy down the costs to enable such projects to come in under existing payback ceilings. One headquarters energy manager noted in particular how it was more difficult for his colleagues at plants where utility incentives were not available to access the company’s budgeted EE funds by coming under financial hurdle rates, compared to colleagues at plants where incentives were available.


Interviewed energy management staff also appreciated various technical services provided by local ratepayer-funded EE programs, although their assessments of the value of certain specific services provided by different programs were mixed (see section 7.6). Some of the services provided by EE programs that were highly valued included energy consumption diagnostic assessments, support for project design and feasibility studies, programs to provide or help finance specialized energy experts for discrete, technical work requested by the companies, and support for on-site energy engineers. One program that was particularly appreciated by Simplot was Lower Valley Energy’s co-financing of an energy engineer at Simplot’s largest phosphate mine. Financing was contingent upon delivery of an agreed-upon minimum annual level of verified energy savings from projects prepared and implemented through the services of the placed expert. Simplot is now pursuing a similar arrangement with the local utility for a different mine in another state. Staff interviewed in other companies were particularly interested in this type of arrangement.

Table 4 shows a list of just some of the ratepayer-funded EE programs that had developed successful partnerships with the four case study companies. The types of program administrators vary substantially—from investor-owned electric power companies to public power utilities, electricity cooperatives, and third-party programs. The programs also range from large, well-established programs, such as those of the New York State Energy Research and Development Authority (NYSERDA), National Grid, DTE, Consumer Energy, and the Energy Trust of Oregon, to programs with fewer customers, such as Lower Valley Energy or the Salt River Project.

Table 4. Sample List of Ratepayer-Funded EE Programs Partnering with Case Study Companies

National Laboratory, March 2014). However, comparison of the costs of savings between these two sectors has changed in more recent years where industrial programs are well established.

²⁸ A. Goldberg, R.P. Taylor, and B. Hedman, *Industrial Energy Efficiency: Designing Effective State Programs for the Industrial Sector*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, 2014, http://energy.gov/sites/prod/files/2014/03/f13/industrial_energy_efficiency.pdf.



| Company | EE Program | Type of Institution | Custom Projects? | Staffing Support? |
|----------------|----------------------------|-----------------------------------|------------------|-------------------|
| Simplot | Idaho Power | Investor-Owned Utility | Yes | No |
| | Lower Valley Energy | Electricity Cooperative | Yes | Yes |
| General Motors | DTE Energy | Investor-Owned Utility | Yes | Yes |
| | Tennessee Valley Authority | U.S. Government Agency | Yes | Yes |
| | Consumer Energy | Investor-Owned Utility | Yes | Yes |
| General Mills | NYSEDA | Third-Party Program Administrator | Yes | Planned |
| | National Grid | Investor-Owned Utility | Yes | No |
| Intel | Energy Trust of Oregon | Third-Party Program Administrator | Yes | No |
| | Salt River Project | Public Power Utility | Yes | No |

3.2. Ratepayer Programs Can Provide Value and Help Companies Overcome Challenges

One message that was very clear from the case study interviews was that the assessed value of participation in ratepayer-funded programs to the companies varied greatly from program to program. Programs that simply published a list of basic incentives for EE measures, waited for companies to approach them to request the incentives, and then processed incentive requests slowly were assessed lowest. Moreover, for other companies that may lack interest in EE, lack staff to find EE projects eligible for incentives, or lack a clear path to internal co-financing of projects, participation in relatively passive EE programs can be expected to be poor. As detailed further in the next three chapters, companies face serious challenges as they try to develop effective EE programs. However, ratepayer-funded EE programs that take a more active role in partnering with their industrial customers can be effective in helping companies overcome challenges to getting the benefits from EE.

In the following sections, the company challenges are grouped into the three themes of this report to guide an exploration of how ratepayer-funded programs can most effectively service these large customers: developing commitment to EE, putting “boots on the ground,” and creating internal systems for developing and financing EE projects.



4. Vision and Direction: Developing Commitment to Energy Efficiency

4.1. Reasons to Pursue Energy Efficiency

The case study companies reported that they pursued energy efficiency for both cost reduction and reputational reasons. Generally, cost reduction is the most conventional reason for implementing a corporate EE program. For energy-intensive industries, the need to keep energy costs as low as possible is obvious. However, for less energy-intensive industries, the cost reduction rationale for EE investments is less obvious but no less real. For instance, energy may be a relatively small cost for a company but still be the largest variable cost after labor, and perhaps easier to reduce. Moreover, at these large industrial companies, the absolute value of total annual energy costs can be massive, usually in the hundreds of millions of dollars or even the billions.

In recent years, corporate reputation also has begun to play a major role in encouraging energy efficiency. As concerns about climate change, air quality and fossil fuel dependence have grown, the public has become more interested in seeing companies offer products that align more closely with customer values, which can lead companies to pursue EE to add to product appeal.

4.2. The Necessity of Senior Management Commitment

In order for EE to be a priority across the company's organization, a commitment from senior management is necessary. These commitments best come from executive management, including visible targets and goals for the entire company. If the company is to reap the reputational benefits of making a commitment to EE, the commitment and the company's progress towards its goal need to be public—included in the publicly available corporate reports, for example. To be operationally effective, the targets also can be paired with accountability for delivering energy savings down to key facility level. As underscored throughout this report, corporate commitment alone is insufficient to create a successful program if it is not accompanied with financing and personnel to implement the commitment.

Because this report's case studies are all companies with successful EE programs working with DOE's Better Plants initiative²⁹, senior management in each company had made public commitments to EE. In all of the plants that were visited for these case studies, the plant had specific energy targets to be achieved. However, the relative importance of these plant-level targets, compared to the many other commitments of plant management, varied from company to company and plant to plant. In some cases, such as General Motors and General Mills, the plant's performance on EE targets played a direct role in the plant manager's performance evaluation, giving the plant management a direct incentive to capture EE, even if this was only one of many ratings.

²⁹ DOE's Better Buildings' Better Plants Program and Challenge (Better Plants) works with leading manufacturers to improve energy efficiency in the industrial sector. Manufacturers set a specific goal, typically to reduce energy intensity by 25% over a 10-year period across all of their U.S. operations. DOE supports these efforts with technical assistance and national recognition. As of fall 2015, 157 industrial organizations were Better Plants partners, representing 11.4% of the total U.S. manufacturing energy footprint, www.energy.gov/eere/amo/better-plants.

Table 5. Case Study Commitments³⁰

| Company | Commitment Maker | Commitment Program | Year Made | Target | Role of Commitment in Organization |
|----------------|-------------------------|--------------------|-----------|--|---|
| Simplot | Chief Executive Officer | DOE Better Plants | 2008 | 25% reduction in energy intensity at manufacturing facilities by 2019 | Commitment divided into goals for each business segment and plant |
| General Motors | Chief Executive Officer | DOE Better Plants | 2008 | 25% reduction in energy intensity at manufacturing plants and facilities by 2020 | Commitment divided into goals for each plant with progress towards the goals posted at the plant and factored into the plant management's performance evaluation. |
| General Mills | Chief Executive Officer | DOE Better Plants | 2012 | 20% reduction in energy intensity at manufacturing facilities by 2023 | Commitment divided into goals for each plant with progress towards the goals posted at the plant and factored into the plant management's performance evaluation |
| Intel | Chief Executive Officer | DOE Better Plants | 2012 | Cumulative energy reductions of 4 billion kWh across the company by 2020 | Commitment divided into goals for each region and plant |

4.3. How Can Ratepayer-Funded EE Programs Help?

Visible programs that challenge companies to make public commitments to EE improvements, and gain public recognition and other benefits in return such as energy cost reductions, are one way to support public corporate management commitment. These platforms are not typically provided by ratepayer-funded programs, although there are such cases. For large, interstate companies, however, federal government programs such as DOE's Better Plants initiative or EPA's ENERGY STAR program provide a platform for commitments that are broad in geographic scope. However, local programs can and do help. Efficiency Vermont, a program administrator, has encouraged its customers to commit to EE through its Energy Leaders program, which challenges companies to achieve ambitious EE targets and involves public recognition by local and state political leaders and the media. In addition, local programs may be able to convince a local facility of a large company to pilot EE efforts as a first step in developing a new, more ambitious corporate EE program.

³⁰ These commitments and achievements were taken from the Better Plants programs' data and, therefore, differ to some extent from the companies' own reporting on targets and achievements as reported in their reports, due to methodological differences.



5. Implementation: Putting “Boots on the Ground”

5.1. Energy Efficiency Programs Require People

People managing energy play a crucial role for any successful EE program. While many simple projects may be found by outside auditors, more complicated—and more valuable—projects require people who understand the plant to identify the project. Then someone is needed to summarize its technical and financial feasibility and package it for finance and management approval. Once approved, someone must manage and implement the project. Finally, someone must often monitor operation of the project assets after a project has been implemented and make any periodic adjustments necessary to enhance energy savings. Each of these steps requires someone to be moving the project forward, and without personnel tasked to specifically work on energy efficiency, such tasks are often neglected.

In addition to all of these roles for investment project implementation, promotion of behavior change that reduces energy consumption or uses it more efficiently requires people as well. Behavioral measures can be as simple as turning off lights when they're not needed, or as complicated as optimizing shovel and truck operations at an opencast mine, but they all require people. Someone must identify the optimum behavior, teach all of the plant staff what the behavior is, and then promote the behavior. Such behavioral measures require plant-level personnel working with the rest of the plant and encouraging their adoption.

People are also needed, usually at corporate headquarters, to ensure that energy efficiency gets incorporated into major capital projects and major upgrades. When new plants or production lines are being designed, it is essential that someone with a background in EE be involved to incorporate EE in the design so as not to miss key opportunities. The authors have seen cases where new facilities were designed without the input of any EE personnel, leading to energy inefficient designs that were immediately retrofitted after the plant was opened—a costly oversight.

5.2. Challenges in Putting “Boots on the Ground”

Putting together a strong EE team requires a concerted effort. Outside the specific examples of this report's case study companies, in most plants energy management is left to the maintenance manager, who has many priorities—such as production reliability and safety — that are a higher organizational priority than EE, leaving him or her with little time to carry out the tasks necessary to successfully implement EE measures. Getting additional people to work on EE is usually difficult because of the challenges of creating new positions. With labor as one of the highest costs in most industrial companies, careers are made by cutting head counts and labor costs, not by hiring and creating new positions. Convincing executive management and the personnel department that new EE staff positions are more important than other personnel priorities can be very difficult or impossible, despite the fact that EE-focused staff can “pay for themselves” and more from energy use reduction cost savings.

However, most large companies have begun to recognize the value of full-time energy staff, at least fulfilling the role of corporate-level energy manager. As of 2015, 63% of companies with more than \$10 billion in revenues have a corporate energy manager³¹. While this points to increasing recognition of the value of full-time energy staff, it also highlights how many companies still have not been able to overcome the challenges associated with securing energy staff — 37% of companies with \$10 billion in revenues, and the majority of companies with lower revenues, still do not have a corporate energy manager or plant-level energy staff.

³¹ Joel Mackower, State of Green Business 2014, GreenBiz.com, 2014, <http://info.greenbiz.com/rs/greenbizgroup/images/state-green-business-2014.pdf>.

5.3. Approaches to Putting “Boots on the Ground”


There was a mix of approaches among the case study companies for ensuring that staff were available at facilities to undertake EE work. General Mills, General Motors, and Intel hired full-time energy staff to work at key facilities. General Motors also brought on long-term contract engineers to supplement the energy role in their plants. Simplot followed an “all-of-the-above” approach of hiring staff where possible, bringing on contractors where that was a more feasible option, and supporting part-time “energy champions” where full-time energy staff or contractors were not possible. Which approach to takes is determined primarily by what can gain personnel department approval, what can be accommodated in the budget, and labor relations in the company. In some cases where the workers in the company are represented by a strong labor union, relations with the labor union may be a deciding factor.

Table 6. Case Study Approaches for On-Site EE Staff Presence

| | Simplot | General Motors | General Mills | Intel |
|--------------------------------|---|--|--|----------------------------|
| Part-Time or Full-Time | Both | Full-time | Both | Both |
| Reporting Relationship | To HQ EE team | Site utility managers to plant managers and contract engineers to HQ EE team | To plant manager | To site facilities manager |
| Sites Covered by Each Engineer | Varies: several sites have their own engineers, others share an engineer across the business group | Varies: one per site in larger sites; some smaller sites and non-manufacturing sites share resources | One large site or two to three smaller sites | One major site |
| Outside Support | Business-group energy engineers were initially co-financed by the American Recovery and Reinvestment Act. Plant energy engineers were co-financed by utilities. | All plant-level energy engineers are contractors from one of GM's major electric utilities and facility service providers. | Not applicable | Not applicable |
| Behavioral Measures | Encouraged through energy scans and energy savings “treasure” hunts | Encouraged through treasure hunts, integrated into business plan, and suggested into payment plan | Unknown | Unknown |

5.4. How Can Ratepayer-Funded Programs Help?

One of the major challenges many companies face is having the knowledge and time to identify new energy-savings opportunities and successfully analyze and develop projects (and, at the same time, take advantage of ratepayer-funded EE program offerings). Assisting companies to overcome staffing constraints for project development can be a key way for local ratepayer-funded programs to provide value. In the case studies,




particularly Simplot and General Motors, government, and/or the local ratepayer-funded programs helped the companies to overcome the personnel and labor relations issues that made it difficult to put the “boots on the ground” needed to ramp up company EE programs.

In a number of western states, including some of the utilities working with Simplot, ratepayer-funded EE programs operate effective strategies to share the staff costs of on-site EE engineers. Typically, continuation of the cost-sharing arrangement is contingent upon delivery of projects yielding a specified amount of annual energy savings. For the industrial company, the cost-sharing arrangement (covering at least 50% of salary and benefits) can make the difference between corporate approval or rejection of a proposed EE staff assignment. For the ratepayer-funded EE program, the arrangement can provide an attractive stream of energy savings to meet program delivery requirements at an attractively low cost.

More state and local programs are beginning to launch such strategies. NYSERDA, for example, is proposing to pilot an on-site EE engineer support program as part of its new market transformation work.

Supporting the hiring of a dedicated on-site energy efficiency engineer is not always cost-effective, particularly for smaller facilities. In such cases, local programs can help industrial customers to meet the need for “boots on the ground” by providing energy engineers or account managers that cover multiple sites and help to identify and implement projects, as well as to coordinate technical assistance from the program.



6. Implementation: Corporate Systems for Developing and Financing Energy Efficiency Measures

6.1. Introduction

Deciding which projects to implement and fund is a key aspect of any corporate program, EE included. The mainstay of corporate EE programs are retrofit projects involving upfront investment in equipment or system upgrades or reconfigurations that yield energy savings, and, often, other productivity or resource saving benefits as well. For such standard cost-saving projects, companies usually set metrics of either simple payback period, IRR, or NPV for determining which projects will be funded. Simple payback metrics are most common, but the other metrics were also observed among the case study companies. In addition, some companies also strive to include EE improvements in new asset construction projects, involving new production lines or major facility overhauls. Although these projects can yield critical life-cycle EE gains, they can involve additional organizational and performance metric challenges. Some companies are undertaking energy performance contract (EPC) projects with third-party companies. For all of these types of projects, ratepayer program incentives can play an important role in helping the projects get past the selection criteria and get implemented.


6.2. Retrofit Projects

Retrofit projects involve replacing an energy inefficient piece of equipment or a specific part of the production system with a new, more energy efficient one. Each of the case study companies has a notably different method for selecting and financing these projects, with the key differences being the metric used to choose projects, where the decisions regarding projects are made, and whether the funds for projects come from a dedicated EE budget or from a more general budget. The differences are typically derived from the corporation's general method of dealing with investment projects, as well as the corporation's history and structure.

Each of the metrics used to select projects comes with its own set of advantages and disadvantages. The simple payback method is popular with many companies because it is easy to understand and it encourages less risky projects that pay off quickly, though it can lead to the exclusion of large, long-term projects even if they have an excellent rate of return. Choosing projects based on IRR is the most common metric for selecting investments more generally, but it alone does not account for the opportunity cost of making the investment and can lead to long-term investments that may not pay off if the plant is closed in a few years. Using NPV as the metric is the most economically thorough metric, although its use in U.S. companies for project analysis is rare. NPV can take into account the cost of funds and discounting future payoffs, but it has the disadvantage of being more complicated than the other methods and, therefore, less easily explained to all team members.

Where within an organization the decisions regarding retrofit projects are made is also a key differentiator. In most companies, smaller projects are decided at the plant level, with funding coming out of the operating budget, while larger projects that require capital funding must go to HQ for approval. There are also companies, such as General Mills, that have a substantial plant-level capital budget that does not require headquarters' approval unless the project investment exceeds a predefined cap. The cap can range greatly from company to company, such as \$10,000 to \$250,000 or more. Most companies involve the finance department in overseeing the approval of projects, at plant or corporate level.

The source of funds for EE retrofits is another important factor in corporate EE programs. In our case studies, Intel and General Motors both had a dedicated pool of funds for EE retrofits, while General Mills drew from the cost control budget for retrofits. At Simplot, EE retrofits compete with other investment projects based on IRR. The companies which had an annually approved dedicated pool of funds for retrofits preferred that approach because it gave them more certainty about project funding as long as they achieved the required metric hurdle rates. Flexibility was retained to add projects throughout the year if funds still remained or if a given project had not been implemented.



In General Mills and General Motors, the link between EE investment and cost mitigation was especially close, as both companies decrease future plant energy budgets in line with the projected energy budget savings estimated from project implementation. This proved particularly valuable for the EE team to demonstrate the value of the EE program to the finance team at General Motors, and reduced pressure for monitoring and verifying the energy savings from projects as the sole means of demonstrating project success.

Table 7. Case Study Company Approaches to Metrics

| Company | Metric | Pool of Funds for Retrofit Projects? |
|----------------|----------------|--------------------------------------|
| Simplot | IRR | No |
| General Motors | Simple Payback | Yes |
| General Mills | IRR | No |
| Intel | NPV | Yes |


6.3. New Production Projects

All of the energy management staff interviewed in the case study companies appreciated the importance of seizing the opportunity of equipment renewal or new production line design and construction to make large, long-term EE gains. However, achieving high energy efficiency in a new production or major overhaul project is institutionally quite different from improving EE through retrofits, involving different internal groups which respond to different incentives. New production design is usually undertaken by departments organizationally distant from energy management staff. As upgrades usually are done primarily to increase or change production, with EE as a secondary consideration, they are ineligible for standard retrofit project incentives from ratepayer programs. In addition, there is usually pressure to keep the initial investment cost down and the project time line short, which may lead to the shortsighted decision to neglect EE in favor of less expensive, inefficient equipment. This can be particularly true if the EE team is not present to provide input on designs. The end result of not building energy into new production projects can be a significant cost to the company in the form of higher energy bills or EE retrofits on new equipment. In our discussions, some energy management staff were frustrated with current inability to secure new investments that would have a long-term bearing on the energy-use levels that they were responsible for managing.

In order to overcome these challenges and build EE into new development projects, some companies have made organizational and process adjustments. At General Motors, the EE team resides in Global Facilities Engineering and therefore works in conjunction with the New Project Engineering Team. Continuing improvement is planned with formalization of an “energy gate” to decide if the added cost of incorporating specific EE measures into a project is of greater benefit or not. At General Mills, staff also have sought to formalize the incorporation of EE into all projects by requiring that all new project applications confirm that project designs are energy efficient. At Intel, energy management staff has developed internal, best-practice EE performance criteria for key equipment and ensures that this data is considered in the development of all new facilities and equipment upgrades. While, in many cases, more can be done to ensure that EE is built into new projects, such organizational and process adjustments can make an important difference.

6.4. Energy Performance Contracting

Although energy performance contracting is not a common method for implementing EE measures in U.S. industry, two of the case study companies had made use of EPCs for delivering energy projects. At General Motors, EPCs had been used for projects that did not easily fit financing from the dedicated company pool of funds for EE measures. GM requires EPCs to have a life cycle of 10 years or less and to be cash flow positive for GM throughout the project life cycle. Ford Motor Company had adopted very similar criteria for EPCs and had made extensive use



of EPCs over the last five years as a means to finance EE projects³². For example, Ford developed a strong relationship with one energy service company who had carried out the same project removing steam from their production process at five different plants.

Other case study companies had made far less use of EPCs. The reasons for not using EPCs were varied and included the preference to avoid sharing the benefits of energy savings with an outside company to the belief that energy service companies are primarily interested in working with government entities as opposed to private companies.

6.5. How Can Ratepayer-Funded Programs Help?

The most important role of ratepayer-financed programs in helping projects get financed is helping them get over internal financing hurdles with project incentives. At companies that have facilities in states without ratepayer programs, the facilities that do not receive incentives have a much harder time getting projects over the financing hurdle compared with the facilities that do get incentives. This leads EE engineers to have a strong interest in program participation in order to get their projects funded and meet their targets, though their interest may, in some cases, be over-ridden by the perspectives of the energy procurement or finance staff.

The existence of incentives is not, by itself, enough to make sure that projects can be financed. It also is essential that the incentives are disbursed in a timely and reliable manner so that they align with accounting schedules in use by the finance team and fully included in the project analysis. Programs that are slow to disburse their incentives can see their value discounted if they aren't realized until years into the project, and therefore do not improve the rate of return or payback period as much as they could. Similarly, if incentive amounts are not assured until monitoring and verification procedures have been completed (many months after project commissioning), finance departments may not consider them solid enough to include them in benefit-cost calculations required for project approval. One way we have seen programs address this problem is by providing a portion of the incentive up front once the equipment is installed and then paying out the balance once the savings are verified, as NYSERDA does for projects exceeding 500,000 kWh. In addition, funds meant to be set aside for EE projects in self-direct programs may not help EE projects get over the hurdle at all if they are held in escrow (see 7.4 below).

³² Interview with Ford energy staff.



7. Ratepayer Program Participation Choices

7.1. Perspectives on Participation Choices

As of September 2016, industrial companies have a choice in 12 states to opt into ratepayer-funded programs, paying the applicable surcharges and receiving program benefits, or to opt out of the payments and programs altogether³³. Additionally, in some states they may have a choice either to self-direct their own EE program, assessed to provide similar savings (usually with a similar expenditure requirement), or to fully participate in the program by both paying in and receiving benefits from the program (see section 7.4).

Many state regulators and program advocates believe that industries should be required to pay into ratepayer-funded EE programs, by fully participating or by implementing meaningful and verified self-directed programs, with the argument that industrial customers should participate in the society-wide effort to ensure least-cost energy supply to all customers. As noted earlier, the primary rationale for the ratepayer-funded EE programs is to help ensure that especially low-cost EE resources are part of the resource mix to meet energy service demand, thereby minimizing needs for expensive new supply capacity, bringing down pressure on average electricity prices³⁴, and yielding substantial economic and environmental benefits. Program advocates argue that it is unfair and poor economic policy to allow industrial customers to opt out of the EE programs when this option is not available to other customer classes—especially since industrial customers will still benefit from the energy system investment reduction, decreasing price pressure, and environmental benefits of the programs that everyone else does.

The private company perspective is naturally not the same as the public policy perspective. Industrial companies logically weigh their participation choices as business decisions, assessing the tangible costs that must be incurred against the tangible benefits they expect to receive. Companies are generally skeptical of having to pay an additional surcharge on their energy bills, particularly if they are unconvinced of the value the EE program can provide. In addition, they view these types of investment decisions as theirs alone to make, preferring that their EE programs be left up to the company, especially if they do not believe that the ratepayer program has anything to contribute to improving the effectiveness of their EE program. Finally, if energy efficiency is not a priority at the company and there are no plans to initiate a significant EE program, the funds paid into the ratepayer program are seen as a waste, as the company is unlikely to invest resources in the preparation of many EE projects at all—including projects that might be eligible for program incentives.

7.2. Corporate Decision-Making on Participation

As can be expected with almost any decision at a private sector company, the decision to participate in ratepayer programs is usually based on the business case for participation and a cost-benefit assessment of the options. If management believes they will be able to derive greater value from participation than the cost of the program surcharge, then they will choose to participate; if the cost of the surcharge is higher than the expected value of the program, they will prefer to opt out if possible. In some cases, due to low levels of participation from other industrial customers, companies are able to get more in incentives than they pay into the program, making the decision to opt for participation clear. In other cases, the amount of incentives received may be less than what they pay in, but the engineering support and services provided by the program make participation worthwhile and cost-effective anyway.

³³ Weston Berg, Seth Nowak, Meegan Kelly, Shruti Vaidyanathan, Mary Shoemaker, Anna Chittum, Marianne DiMascio, and Chetana Kallakuri, *The 2016 State Energy Efficiency Scorecard*, American Council for an Energy-Efficient Economy, September 2016, <http://aceee.org/sites/default/files/publications/researchreports/u1606.pdf>.

³⁴ C. Taylor, B. Hedman, and A. Goldberg, *State Approaches to Demand Reduction Induced Price Effects: Examining How Energy Efficiency Can Lower Prices for All*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency & Combined Heat and Power Working Group, 2015, https://www4.eere.energy.gov/seeaction/system/files/documents/DRIPE-finalv3_0.pdf.



7.3. Public vs. Private Interest in Program Decision-Making

Balancing the different public and private perspectives to reach state decisions on whether or not to allow industrial companies to opt into or opt out of ratepayer-funded EE programs is a significant regulatory policy issue. In essence, does the public and ratepayer interest in minimized average electricity costs through low-cost EE supply, environmental benefits, and perceptions of fairness across consumer groups outweigh the private interests of a number of large consumers? These questions are answered on a state-by-state basis, and are beyond the scope of this report. However, the related issue of how to increase the value of ratepayer-funded EE programs to industrial companies viewing the programs from their natural private perspective is discussed in both the previous and following sections.

7.4. Choices between Self-Direct and Full Participation³⁵

As of September 2016, 15 states offered large customers the option to implement a self-directed energy efficiency program as an alternative to full participation in ratepayer-financed EE programs³⁶. In some cases, these programs have few requirements, and involve minimal reporting and little, if any, outside evaluation of expenditures and results. In such cases, the self-direct program option is not much different from a full program opt-out option. In most cases, however, companies with self-direct programs must demonstrate EE project expenditures and energy savings must be verified in some way to ensure that the effort meets the public policy goal. Self-direct programs offer companies flexibility to use the equivalent of their ratepayer-funded EE program contribution for the projects they identify themselves as highest priority, without the help of EE program administrators. However, companies then generally cannot avail themselves of the incentives and technical support programs offered for customers who fully participate in the ratepayer-funded programs by paying in.

All four case study companies used benefit-cost logic to evaluate whether or not their facilities should self-direct or not in states where there was a choice. Staff at three of the case study companies ended up often choosing self-direction or full participation for specific facilities based on specific review of the expected EE project pipelines and circumstances at different plants. Where pipelines and incentive cap structures could yield greater incentives through participation than through self-direction, staff reported the choice of full participation. Where pipelines involved complex projects or there were other needs for technical support which staff felt the ratepayer-funded EE program could provide at good value, staff chose full participation.

One company noted an example where the ratepayer-funded program's use of a system to hold amounts equivalent to a facility's full participation contribution in an escrow account for disbursement of funds for self-directed projects brought unintended negative consequences for both the program and the facility's energy manager. Because the escrow account was legally owned in part by the company, funds were logically assessed by the company's finance department to be the company's own money. This meant that the funds must be disbursed internally based on the company's overall allocation policies—in this case, for project investments meeting the standard investment hurdle rates. This in turn meant that the funds could not be viewed and used as external funds to help “buy down” project costs to meet hurdle rates, which was their basic original purpose. For the energy manager proposing projects, the funds could not provide the intended value.

³⁵ For more information on self-directed programs see: Ann Chittum, *Follow the Leaders: Improving Large Customer Self-Direct Programs*, American Council for an Energy-Efficient Economy, 2011, http://energy.ky.gov/Programs/SEE%20KY/Interim%20Groups/March%202012/ACEEE%20Industrial%20Self%20Direct_Final%20Paper.pdf; and A. Goldberg, R.P. Taylor, and B. Hedman, *Industrial Energy Efficiency: Designing Effective State Programs for the Industrial Sector*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, March 2014, http://energy.gov/sites/prod/files/2014/03/f13/industrial_energy_efficiency.pdf.

³⁶ Weston Berg, Seth Nowak, Meegan Kelly, Shruti Vaidyanathan, Mary Shoemaker, Anna Chittum, Marianne DiMascio, and Chetana Kallakuri, *The 2016 State Energy Efficiency Scorecard*, American Council for an Energy-Efficient Economy, September 2016, <http://aceee.org/sites/default/files/publications/researchreports/u1606.pdf>.



7.5. Needs to Increase Levels of Participation

Many cases are reported where industrial companies pay into ratepayer-funded EE programs but do not participate very actively, undersubscribing available incentives and not utilizing technical support offerings. The cost of surcharges, either explicitly listed on electricity bills or less transparently included in the overall rates, is therefore not sufficiently recouped with benefits by these companies. Therefore, as noted above, such undersubscribing companies may consider surcharge payments as a waste, which increases pressure to advocate for opt-out provisions. This situation can stem from insufficient facility staff incentives to pursue energy efficiency, and the lack of an EE project pipeline, due to a shortage of personnel to identify and process such projects and/or lack of a clear internal process to make project processing efficient. In the four case study companies, where corporate systems were in place to largely meet those challenges, staff were determined to obtain the maximum incentive payments they could from ratepayer-funded programs that the company paid into, and were ensuring the company got value out of participation.

However, poor industry participation in EE programs often is also due to problems on the program administration side. Active outreach and steady, personal engagement is necessary to reach these customers effectively, requiring approaches and skills commensurate with the task at hand. Program offerings will be most effective in meeting the specific needs of industrial companies when they are structured to do so, with sufficient flexibility to accommodate the differences between these companies and their EE initiatives. These points are further discussed below, with specific recommendations listed in section 8.4.

7.6. Concerns Raised by Industrial Companies

Most of the interviewed staff at the case study companies knew their applicable ratepayer-funded EE program offerings for industry quite well. Staff expressed appreciation but also certain concerns about the programs they had experience with, and the concerns expressed were often shared by most or even all of the companies. One major concern was the caps on incentives either for individual projects or for eligible total incentive amounts per year; companies preferred caps to be higher. In some cases, strong low-cost industry projects met seemingly arbitrary single-project incentive caps, which then became a point of contention. In cases where annual individual customer caps make it impossible for a company to receive amounts at least close to what it paid in, companies argued that this is unfair and will logically encourage them to push for opting out. While it is understood that programs have budget constraints that limit possible support levels for individual consumers, caps can be designed to allow program booking of large projects if they result in low-cost energy savings, and to allow customers to recoup maximum value for what they paid in.

Another major concern expressed by two of the case study companies was the need to navigate bureaucracies, and the impact of delays and/or slow payment of incentives. In some programs, applying for incentives required a large amount of time from the EE team, adding to the cost of participation. This problem was often then compounded by delays in the payment of incentives due to monitoring and verification requirements. Such concerns around the timely payment of incentives and their predictability can diminish the value of the incentives and decrease the overall benefits of participation.

The relevance of projects promoted by the program and the value of the engineering support provided were also concerns expressed by the case study companies. While such large industrial companies usually can get their largest energy savings out of larger, more complex custom projects, some programs may focus primarily on prescriptive incentives for simple projects, such as lighting, which are not as relevant for these companies and limit the value that they can easily extract from the program. In addition, concerns were raised about limitations in needed specialized knowledge and expertise from auditors and others. However, significant value was perceived by some companies that were provided with competent experts with extensive specialized knowledge who could help identify and engineer complicated projects.



7.7. Programs Opportunities to Increase Industry Participation

As a whole, the case study companies identified many good ideas and practices among the various ratepayer-funded EE programs working with them. Naturally there is a spectrum of programs operating across the United States, and a difference in real and perceived value at different ends of that spectrum. Program administrators have opportunities to increase the practical value of industry programs to customers, thereby both making the private-versus-public policy debate on allowing industrial customers to opt out of programs less urgent, and increasing customer participation and energy saving results in existing programs. For example, an important reason reported by one of the case study companies for choosing to opt out of a local ratepayer-funded program was that the local program was not viewed as a strong provider or partner. In contrast, one of the case study companies chose specifically to opt in at one of its facilities because the program was offering needed expertise.

Creating high value for industrial customers of EE programs requires a proactive, multi-year approach with personal service for large clients. This translates into a considerable investment of time and human resources. Knowledgeable and experienced experts will need to be hired, and program features need to be customized for the industrial sector. Face-to-face time yields a significant payoff in understanding how best to help customers overcome their challenges and gain their trust. Although these costs may be considerable, so, too, are the benefits. As noted earlier, mature programs have found that industrial programs tend to yield the lowest-cost, verified energy savings that program administrators can deliver, with levelized costs of 1-3 cents/kWh saved³⁷, ³⁸. In addition, good relationships with key industrial customers can yield steady streams of projects, including large ones.

³⁷ A. Goldberg, R.P. Taylor, and B. Hedman, *Industrial Energy Efficiency: Designing Effective State Programs for the Industrial Sector*, 2014, State and Local Energy Efficiency Actions Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, 2014, http://energy.gov/sites/prod/files/2014/03/f13/industrial_energy_efficiency.pdf.

³⁸ *Overview of Large-Customer Self-Direct Options for Energy Efficiency Programs*, American Council for an Energy-Efficient Economy, fact sheet, 2016, <http://aceee.org/sites/default/files/low-cost-ieep.pdf>.



8. Conclusions and Recommendations

8.1. Key Conclusions

Cost-effective EE projects remain to be implemented in all of the companies and facilities reviewed. The authors believe that this also is true in virtually all industrial companies worldwide. Strong and effective company EE programs can make a huge difference by supporting the implementation of large percentages of the available projects. However, as production facilities, technology, and output mixes constantly change, the EE effort is never truly “finished” and more savings are available to be obtained. The goal is to make continual efforts to capture as many of the cost-effective potential measures as possible.

Capturing cost-effective EE projects in industrial companies does not happen automatically. Efforts to identify and implement measures need to be effectively organized internally, involving different parts of the organization, each with different roles and perspectives. The specific ways that different companies do this vary substantially. However, following the review of both the successful programs of the case study companies and programs in other large and small companies, the study team concludes that three requirements must be met for an industrial company’s EE program to live up to potential:


- Senior management needs to demonstrate commitment to achieving visible and clear EE goals, with targets allocated down to key facility level.
- Competent staff or outsourced or borrowed experts must work at the facility-level to continually identify site-specific, profitable EE measures and to follow through with implementation.
- Effective internal systems need to be in place and smoothly operated every year to allocate financing for portfolios of the prepared EE measures deemed to be most attractive to the company.

Each of the case study companies have sought to address all three categories of need reviewed above and discussed in sections 4-6. Some suggestions from good practices identified are further highlighted below for other companies to consider.

Local ratepayer-funded programs have proven useful to each of the case study companies in their efforts to implement and continually improve their corporate EE programs. However, clients consider that some ratepayer programs have been more useful than others. Suggestions are compiled below from client observations on how ratepayer programs might best meet the needs of large industrial customers.

8.2. Emerging New Opportunities

The current EE promotion systems of the case study companies each operate fairly well for identification and implementation of portfolios of financially attractive retrofit projects year after year. The companies also work well with local ratepayer funded EE programs to utilize incentives for many of their projects, and, in some cases, to gain on-site staff expertise for project identification, packaging, and implementation. Continual operation and further improvement of these systems is one challenge for the future. Additional major challenges exist, to broaden the scope of EE programs well beyond the current retrofit and upgrade approaches and to produce even larger impacts. Two such areas to pursue include (1) use of integrated system approaches to improve production efficiency through production-line operational changes, and/or to promote low-cost and energy-savings behavioral change among operators and other employees; and (2) adoption of internal mechanisms to help ensure that new key equipment, production lines, and plants are as energy efficient as possible. Both areas require even more coordination and internal cooperation between staff involved in energy management and other parts of the organization. However, they may also be able to deliver large savings at especially low, incremental cost savings. Both are areas where well-designed, local ratepayer-funded programs also may be able to provide assistance.



Projects to improve productivity through optimization. Although the presence of opportunities varies from plant to plant, many plants have significant potential to improve EE, as well as other resource efficiencies and output levels or quality, through further production-process optimization. Expanded metering and the introduction of various “smart” technologies may be part of the equation for identifying and designing such efforts. From the perspective of energy management staff or experts, however, tapping into such potential is fundamentally different from discrete retrofit projects, such as energy utility system upgrades or heating, ventilation, and air conditioning and lighting projects. Working effectively but in isolation will do little to capture the system optimization opportunities—production management and staff need to be at the core of the effort. EE staff can help, but production staff, ideally with the strong engagement of plant management, need to drive initiatives. Among the companies and facilities visited by the study team, organizing to try to better meet system optimization challenges was something which was understood, but which would require renewed efforts.

Efficiency gains through behavior change. Low or no-cost changes in behavior among equipment operators and others at facilities often can save at least 1%-2% on energy costs per year³⁹, adding up to substantial savings if pursued methodically over a number of years. This involves cross-plant efforts with cooperation and support from management, production operations, unions, and others. One of the case study companies was beginning to get results in this area, using approaches akin to those promoted by EPA’s ENERGY STAR for industry. In general, however, achievement of greater behavior savings will require concerted promotion efforts in the future.


Strategic energy management. Implementation of continuous improvement SEM systems, such as DOE’s 50001 Ready Navigator tool or ISO50001 and Superior Energy Performance (SEP) certifications or other energy management systems with similar methodology, can be effective to operate cross-department, all-facility EE initiatives. Several of the case study companies have already implemented measures that were related in part to SEM, but none of the facilities visited had implemented comprehensive SEM-type systems. The companies reviewed may wish to consider implementing comprehensive SEM on a pilot basis in one or more facilities that have an interest. If the value of the effort proves high, pilots could be expanded. Many of the stronger ratepayer-funded industrial EE programs include programs to assist in piloting of SEM, typically involving a “cohort” of participating facilities who learn from each other as their work proceeds.

Achieving high energy efficiency in new production assets. Locking in high energy efficiency in the design and equipment procurement for new production lines, equipment upgrades, and new facility infrastructure are among the most important things that companies can do to ensure maximum EE well into the future. However, ensuring that EE is incorporated into new production design involves substantially different systems from delivering EE retrofits, and has proven challenging for some of the case study companies. Two of the case study companies had made organizational adjustments to bring the EE team closer to the new production design team or had begun to formalize systems for incorporating EE into new production design and upgrade projects. Such systems for ensuring the EE team is involved in new production design are sure to yield significant energy savings over the coming years.

8.3. Recommendations for Large Industrial Companies

Obtaining strong results in a corporate EE program requires steady and concerted internal effort to foster commitment, to organize effectively, to institute new, internal implementation programs, to allocate both financial and human resources, and to partner with useful outside groups. As a business proposition, an effective corporate EE program should yield persistent cost-saving benefits several times higher than program investment and operating costs, saving the corporation money. Additional benefits include a “green” reputation and a variety of project co-benefits, often including broader productivity gains and additional savings of non-energy resources.

³⁹ J. Eskil, T. Amundson, S. Brooks, S. Martin, S. Mulqueen, *Promoting Reliability of Industrial SEM Savings Through Multi-Year Engagements*, 2015 ACEEE Summer Study on Energy Efficiency in Industry.




As emphasized throughout this report, an effective industrial company EE program requires senior management commitment, placement of competent staff at facility level (“boots on the ground”), and internal project financing and implementation processes for EE projects that are smooth and increasingly routine. Noteworthy good practices and lessons learned from the case study companies in meeting these three needs include the following.

8.3.1. Commitment

- Senior management's public commitment to time-bound corporate EE targets is important, both to establish EE as a strategic corporate goal and to establish a framework for internal accountabilities. Senior management of all four case study corporations had made public commitments to aggressive EE targets as part of DOE's Better Plants program, and report on progress in annual corporate sustainability reports. Energy management staff that were interviewed at all four companies underlined the importance of this for their work.
- EE targets can be clearly set at energy-intensive facilities of the corporation, and routinely monitored as an operational accountability of facility management. Among the case study companies, facility progress against EE targets was monitored as part of operations or cost control accountabilities, part of environmental accountabilities, or both. A good indication that the system is working is if key plant staff can readily answer questions about how the effort to achieve energy efficiency targets is progressing at the plant. In addition, it may be useful to openly display progress towards EE goals on visible boards at factory sites to help engender awareness and buy-in from plant staff.

8.3.2. “Boots on the Ground”

- Corporate energy managers are essential. All four case study companies had one or more full-time energy managers at corporate level overseeing the corporate EE program. In some cases, EE program managers also were responsible for oversight of energy procurement functions; in other cases, other staff assumed those responsibilities.
- Staffing is needed at facility level. Someone must be available to systematically identify, package, process for approval, implement, and evaluate EE projects at plant level. Among the case study companies, some placed EE company staff at key facilities, some hired third parties to provide staff at key facilities, and some relied on staff placed by ratepayer-financed EE program at key facilities. Often there was a mix of these approaches. At a minimum, an “energy efficiency champion” was identified as a staff member with other primary responsibilities who agreed to undertake EE work as well. Interviewees noted that assignment of staff with full-time responsibility for EE work was preferred over part-time staff assignments, if arrangements could be made. As one energy manager noted, “One full-time EE engineer provides more than double the EE value of two engineers charged with overseeing EE work part-time.”
- Justification of staff may be made through cost savings. Two of the case study companies justified addition of energy efficiency staff for work at key facilities by calculating energy costs savings that could be expected from their work and comparing it with the staff cost. Annual energy cost savings achieved from the work of the staff were estimated to be 4–10 times higher than their all-in salary cost, based on past company experience. However, although this is a powerful line of argument and may help greatly to obtain results, it still is possible that EE positions will not be supported by executive management and therefore not allocated by HR departments. HR departments are typically incentivized by management to keep head counts to minimum targeted levels, and it may not be possible to free a position for EE work for other reasons, whatever the argument made.
- Facility EE staff normally report to both facility management and a corporate energy manager. In some companies, the primary reporting relationship is to the facility manager; in others, it is to the corporate energy manager. Proponents of primary reporting to the facility manager pointed out that at times an EE



staff member or assigned third-party expert may be pulled into non-energy assignments, but the clear membership of the staff in the facility operational team outweighed any disadvantage. Proponents of primary reporting to a corporate energy manager pointed out that this helped foster a strong, professional EE team within the corporation, with staff assigned to different facilities commonly meeting together and helping each other.

- Interpersonal skills are important for facility EE staff, especially to meet emerging new challenges and encourage energy efficient behaviors. Facility EE staff may at times tend toward isolation, delving into their primary tasks to prepare and deliver many renovation projects. However, frequent engagement with many others at the facilities is necessary if they are to fully capture operational opportunities in areas where others are responsible.


8.3.3. Project Financing

- A predictable and stable system is needed for allocation of internal funds specifically to EE projects. Criteria and procedures need to be clear to applying staff and approvers so that staff can expect funding in most cases if projects meet agreed criteria. Two of the case study companies have annual corporate EE budgets approved at the beginning of each fiscal year, with a portfolio of pre-identified projects (although there is flexibility to adjust the list). This appears to work quite well for all concerned. In three of the companies, EE projects are approved at corporate level for all but the smallest projects. In one company, EE project budgeting and approvals is delegated to facility management, unless projects are particularly large.
- Interviewed staff reported that ratepayer-funded EE programs clearly help to get more projects through internal financial hurdles and into implementation. Most companies deduct incentives from investment costs, although one company instead factors in the incentive as revenue in the year or years it is received.
- Linkage between finance department approval of EE project investments and facility energy cost budgeting may strengthen the transparency and understanding of direct EE project cost-saving benefits. In two of the companies, the forecast energy cost savings of projects approved by the financial department are subsequently subtracted from the facility's baseline energy cost budget in future years. As one energy manager remarked, this serves to bolster the understanding of financial staff of the concrete energy cost-saving benefits of projects and their enthusiasm for allocating more investment capital. At the same time, it discourages over-estimation of energy-saving benefits in project-funding applications.

8.4. Recommendations for Obtaining the Best Value from Ratepayer-Funded EE Programs

Each of the case study companies actively availed themselves of benefits from ratepayer-funded EE programs in states where they paid in. Although they pointed out that some programs were more helpful and efficient than others, energy managers were often appreciative of the assistance they received. Some suggestions for other companies based on discussions with the case study companies' staff include the following:

- When facilities in different states are presented with different participation choices, ensure that potential benefits and costs of participation are properly assessed. Evaluation of potential program participation benefits should consider both potential financial incentives and technical support, even if they are more difficult to quantify.
- Where facilities pay into ratepayer-funded programs, efforts must be made to secure the greatest incentive and technical assistance benefits possible through strong project pipeline development. Currently, in some cases, it is possible for facilities to obtain financial incentives totaling more than their program contribution because other industrial customers are poorly subscribed.

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- Facilities fare best when they insist on good service. A number of the case study companies pushed for and obtained important program changes to better meet the industrial customer environment, such as abolition of arbitrary project caps, stronger support for cost-effective custom projects, and improvements in procedural efficiency. This can be achieved by providing feedback directly to the program administrator as well as by providing feedback to the evaluators.
 - Facilities can inquire about the possibility of receiving multiyear on-site expert staff assistance if needed, and get the best value by ensuring competence from any assigned staff.
 - Companies can explore options for support in developing strategic energy management approaches.
 - It is prudent to explore options for financial incentives for new equipment that is more energy efficient than business-as-usual. Finance departments may need information from EE staff to document that while these investments may involve higher upfront cost, the energy and cost savings provide significant value in over the life of the equipment.

8.5. Recommendations for Ratepayer-Funded Energy Efficiency Programs


As recommended in other reports by the SEE Action Network and other groups, strong participation of industrial customers in ratepayer-funded EE programs requires the design and careful, multi-year implementation of specific industrial-sector EE programs. The needs of this customer class are different from other customer classes, and must be specially attended to if partnerships with industrial clients are to successfully deliver the potential, highly cost-effective energy savings still untapped in this sector.

Many of the main recommendations for ratepayer-funded, industrial EE program development from the SEE Action Network's recent review of successful partnerships between local ratepayer-funded EE programs and medium-sized industrial facilities in different U.S. regions also hold true for partnering with the large industrial corporations^{40, 41}. In particular, for industrial clients, programs usually can achieve the best partnership results through:

- Development of multi-year relationships between program administrator and industrial company personnel, focusing on a steadily evolving program of support and efforts to identify and implement multiple projects over time rather than the development of single projects here and there.
- Assignment of dedicated, technically competent program staff or trusted contractors to work as account managers with key clients, maintaining medium-term staff continuity as much as possible.
- Program offerings that include both custom project incentives and prescriptive incentives, and flexibility to specifically structure offerings in ways to best accommodate the budgeting, processing, and implementation needs of industrial customers.
- Active outreach and engagement of industry staff is essential. Programs should make it easy to participate in the program and save energy. Programs need to work with industrial customers to tailor solutions together to their specific needs as opposed to handing them a catalog of incentives and asking them to apply when ready.

⁴⁰ A. Goldberg, R.P. Taylor, and B. Hedman, *Industrial Energy Efficiency: Designing Effective State Programs for the Industrial Sector*, State and Local Energy Efficiency Actions Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, 2014, http://energy.gov/sites/prod/files/2014/03/f13/industrial_energy_efficiency.pdf.

⁴¹ A. Goldberg, B. Hedman, and R.P. Taylor, *Sustained Energy Savings Achieved through Successful Industrial Customer Interaction with Ratepayer Programs: Case Studies*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, 2015, https://www4.eere.energy.gov/seeaction/system/files/documents/IEE%20Case%20Studies_1002.pdf.




For key facilities of large interstate and international corporations, however, development of successful partnerships also involves some differences compared to small- or medium-sized industrial or commercial companies. In medium- and small-scale companies, ratepayer-funded programs may help clients to create and shape company EE programs where none had really existed before. For most larger interstate industrial company clients, however, the role of ratepayer-funded programs is usually to assist companies in the rollout and expanded operation of their own programs in different facilities and to help them translate broad corporate goals into concrete action at actual industrial sites. This means that ratepayer-funded program staff must understand the specific corporate EE programs, usually including how different staff are placed and what their roles are; what issues matter most to the company; and the specific procedures, time lines, hurdle rates, and calculation methodology used in the EE project approval process. Each of the EE programs reviewed in this study were remarkably different in such specifics.

The extra time and effort needed to successfully engage the facilities and plants of large companies is well worth it. Engagement may yield large-scale savings from large projects. Engagement can also lead to strong multi-year portfolios with projects year after year, even if large projects may make the portfolios ‘lumpy’ for the ratepayer-funded program. These industrial projects typically yield among the lowest-cost energy savings that ratepayer-funded programs can attain. Specific recommendations for dealing with facilities of large, industrial corporations include the following:

- **Consider strategic partner participation and recognition programs.** Programs to strategically engage key clients, involving client commitment to energy savings targets, public recognition of companies, and strong, customized EE program service for partners, can provide companies with both reputational and service benefits, and EE programs with a platform implementation of multiple offerings. Just one example of such a ratepayer-funded program initiative is Efficiency Vermont’s Energy Savings Challenge⁴².
- **Understand specific technical assistance needs.** The types of technical assistance that interviewed energy management staff mentioned that they would most appreciate from ratepayer-funded programs varied significantly. One energy manager emphasized the need for training programs and training and diagnostic tools. Others emphasized the need for highly competent experts in specialized areas well beyond what facility staff could cover. Another emphasized assistance in systemic metering and system diagnostics. Flexibility in contractual arrangements (e.g., who contracts whom) is desirable. Several energy managers expressed disappointment with third-party basic energy diagnostic work, reporting that value added was often not high. Although needs vary, well-placed and successful technical assistance can go a long way to both deepen partnerships and strengthen the project pipeline.
- **Consider piloting and rollout of programs for supporting staff at facility sites, and/or financing placement of facility EE engineers.** Lack of staff at facilities to identify, prepare, process, and implement EE projects is recognized as a critical constraint for many companies. Programs can fund or partially fund the placement of EE engineers on-site (or roving between a few similar sites), contingent upon the delivery of a specified amount of verified energy savings (including projects subsequently incentivized by the program). The additional net cost of added booked savings for the program can be attractively low, and the company benefits from long-term energy cost savings⁴³.
- **Understand project development, approval, and implementation procedures within key industrial clients, and cater assistance to match and support these cycles and procedures.** Of particular importance are internal project development and processing time lines, internal regulations in terms of processing requirements for different types and sizes of projects, and options to package projects to enable

⁴² See Greg Baker, “Vermont Businesses Lead the Way to Energy Savings”, (April 9, 2013, blog post, <http://www.efficiencyvermont.com>)

⁴³ For more information, including practical review of several of such current offering by EE programs, see: Neil Kolwey, “Energy Manager Co-funding: You Can’t Manage Without a Manager,” Southwest Energy Efficiency Project January 2016, http://www.swenergy.org/data/sites/1/media/documents/publications/documents/Energy_Manager_Cofunding_SWEEP_Jan-2016.pdf.



processing in the most convenient and timely manner. Project-specific technical support and incentives are best then fashioned to work within the existing corporate framework.

- **Strive for maximum flexibility when structuring and sizing incentives to best help good projects overcome corporate hurdles, such as simple payback periods.** Programs must balance calls from industry for flexibility with needs to be transparent and fair to all industrial customers across the board. However, if focus is maintained squarely on helping companies to overcome internal hurdle rates, incentive structures, and perhaps incentive choices, may be designed in ways that best help the company staff obtain internal project approval and still achieve low-cost energy savings delivery per dollar of incentive spent. Arbitrary caps on incentive amounts for projects should be avoided if they pose an obstacle to such a focus.
- **Consider facility SEM and/or behavioral energy savings program support where clients wish to pilot such efforts⁴⁴.** The potential savings for large companies may easily justify a stand-alone pilot project. For smaller companies, launching SEM or more narrow behavioral savings initiatives in “cohorts” or small groups of companies often meeting together for training, peer exchange, and sharing of experience, has become both popular and successful within a number of ratepayer-funded EE programs.
- **Consider programs to provide incremental cost financial incentives for purchase of new technology and equipment that has above business-as-usual EE performance.** However, programs must operate efficiently and not present a drag on the critical schedule time lines of new production projects or other batch procurement activities. A number of ratepayer-funded EE programs have already launched such programs, which may provide ideas—Efficiency Vermont is one example⁴⁵.

⁴⁴ The Consortium for Energy Efficiency Industrial Strategic Energy Management Initiative includes detailed information about strategic energy management approaches for EE program administrators. The Initiative and associated resources are available at <https://library.cee1.org/content/cee-industrial-strategic-energy-management-initiative/>.

⁴⁵ *Sustained Energy Savings Achieved through Successful Industrial Customer Interaction with Ratepayer Programs: Case Studies*, State and Local Energy Efficiency Action Network, Industrial Energy Efficiency and Combined Heat and Power Working Group, October, 2015, page 28, https://www4.eere.energy.gov/seeaction/system/files/documents/IEE%20Case%20Studies_1002.pdf.



Appendix 1: Energy Efficiency at the J. R. Simplot Company

A1.1 Overview of the J. R. Simplot Company

Simplot is one of the largest privately-held companies in the United States, with annual revenues of approximately \$4.5 billion and approximately 10,000 employees worldwide⁴⁶. Founded in 1929 by J. R. Simplot, the company experienced rapid growth following World War II, as they pioneered the production of frozen french fries for the nascent fast food industry. The pivotal moment for Simplot came in the form of a handshake between J.R. Simplot and Roy Croc, agreeing that McDonald's would use Simplot's frozen french fries instead of cutting fries at each of their restaurants. The post-war period also included expansion into other areas, such as fertilizer production, phosphate mining, and cattle ranching.

Today, Simplot has developed a highly vertically integrated company. Simplot's primary businesses are food processing, agribusiness, ranching, meatpacking, and potato production. Simplot is one of the largest frozen potato processors in the world, with annual output of more than 3 billion pounds of frozen potato products. In addition, Simplot is the fourth-largest phosphate mining company in North America, and has the second largest cattle herd in the United States residing on ranch land twice the size of the State of Delaware⁴⁷.

Simplot has 120 facilities, including 13 large industrial facilities; all of the large industrial facilities are in the food processing and agribusiness groups. These large industrial facilities are distributed across eight states and consist of seven food processing plants, two phosphate mines, a silica mine, and three fertilizer plants. These plants are supplied by 22 different electricity and natural gas utilities. In addition to what is supplied by utilities, diesel accounts for a significant portion of the energy bill, with the diesel consumed by the Smoky Canyon phosphate mine alone accounting for approximately 25% of the agribusiness energy bill.

A1.2 Energy Efficiency at Simplot: Goals and Achievements

Simplot has been implementing significant EE projects since at least 2000. Beginning in 2005, Simplot designated part-time energy champions at its large industrial sites with the support of the Northwest Energy Efficiency Alliance. The creation of a corporate-level energy efficiency team in 2007 then boosted the EE program and led to the designation of energy champions across the food processing group in 2007 and across the agribusiness group in 2009. The corporate energy group also partnered with EPA in 2008 to achieve ENERGY STAR certification, with two of their plants becoming the first ENERGY STAR-certified frozen vegetable plants in 2010⁴⁸.

The years of 2009 and 2010 proved to be pivotal for EE at Simplot. In December of 2009, Simplot signed onto the Energy Leader program, committing itself to reducing energy intensity by 25% by 2020. "That's when things really got going," said Corporate Energy Director Don Sturtevant. The effort to meet this goal then received a significant boost in the spring of 2010 as the Idaho Office of Energy Resources used American Recovery and Reinvestment Act funding to sponsor a pilot project at Simplot to hire energy efficiency engineers. This project involved the Idaho Office of Energy Resources covering approximately half the cost of two energy efficiency engineers for the first 18 months, with the hope that they would identify energy savings worth twice the personnel cost of the engineers. The energy savings that the engineers managed to identify greatly exceeded these hopes, and the success of the project inspired some of Simplot's utilities to also sponsor the hiring of energy engineers.

⁴⁶ Don Sturtevant, "Energy Efficiency: The Simplot Way," presentation to Western Governors Association, March 16, 2011, http://www.westgov.org/component/docman/doc_download/1410-ieee-simplot?Itemid=.

⁴⁷ Ibid.

⁴⁸ J.R. Simplot Co. "2014 J. R. Simplot Company Sustainability Summary." 2014. http://techsheets.simplot.com/sustainability/2014_Sustainability_Report/files/assets/common/downloads/publication.pdf.

Since committing to reduce energy intensity by 25%, Simplot has made significant advances in EE and, as of 2015, has seen an 18% reduction in energy intensity over the baseline year of 2008 for the Food Group and a 4% reduction in energy intensity over the baseline year of 2009 for the AgriBusiness Group^{49, 50}.

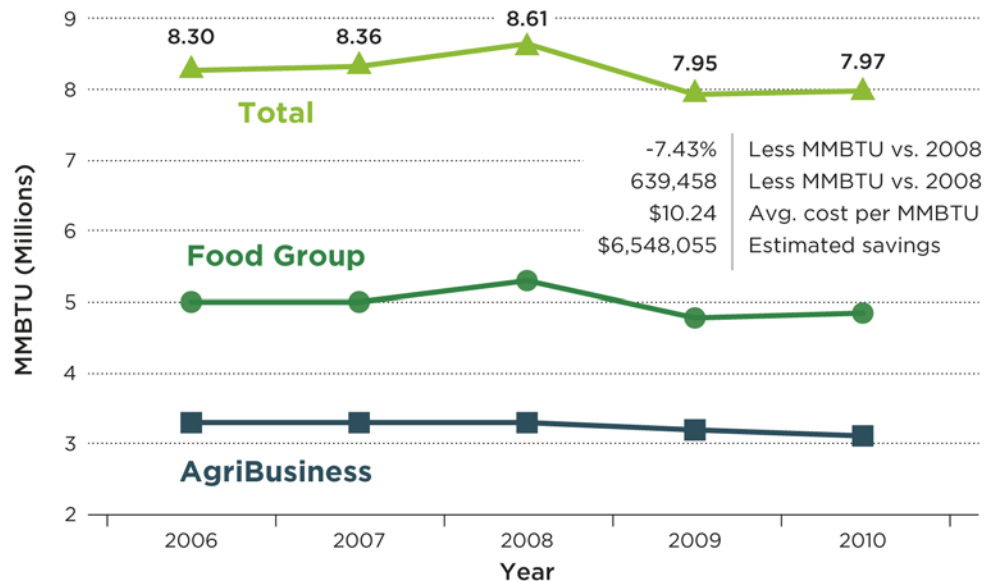


Figure A1.1. Energy Savings at Simplot⁵¹

Acronyms MMBTU—millions British thermal units.

Simplot's present EE team is led by a small nucleus of full-time staff, supported by many energy champions who take on energy-related responsibilities in addition to their primary work. The team is headed by the corporate energy director, whose responsibilities include energy procurement, in addition to energy conservation. Reporting to the corporate energy director are two EE engineers, one for agribusiness and one for food processing. In addition, there are two on-site energy engineers in industrial facilities in the agribusiness group. This core full-time team is then supplemented by energy champions at every large industrial site. These champions work to identify EE projects at their facilities and to foster a culture of energy conservation. These efforts are then mainly rewarded through recognition and through participation in an annual energy scan, in which all of the energy champions across the company gather at one facility to share ideas and to look for EE projects at that facility. Incentivizing work on EE through recognition has been quite successful; as Don puts it, “never underestimate the value of a \$150 trophy.”


A1.3 Identification, Selection, and Implementation of Energy Efficiency Measures

Simplot has come to rely heavily on its plant-level EE team in order to meet the goals set out for EE. The energy champions and plant-level energy engineers, where they have been hired, are the “boots on the ground” that observe and understand the plants' operations in order to identify potential opportunities for energy savings. The

⁴⁹ Energy Performance—Better Plants Data, J.R. Simplot Company, U.S. Department of Energy, Better Buildings Initiative, April 2016, <http://betterbuildingssolutioncenter.energy.gov/energy-data/J.R.%20Simplot%20Company>.

⁵⁰ Energy Performance—Better Plants Data, J.R. Simplot (AgriBusiness Group), U.S. Department of Energy, Better Buildings Initiative, April 2016, <http://betterbuildingssolutioncenter.energy.gov/energy-data/J.R.%20Simplot%20AgriBusiness%20Group%29>.

⁵¹ Don Sturtevant, “Energy Efficiency: The Simplot Way,” presentation to Western Governors Association, March 16, 2011, http://www.westgov.org/component/docman/doc_download/1410-ieee-simplot?Itemid=.



plant-level team also receives support from the business-unit-level energy engineers as they package the measures to compete for funding.

Training and support for the plant-level staff is a key element of Simplot's EE program. Within Simplot, the energy champions receive training and get exposure to new EE ideas through the annual energy scan, which is hosted at one of the company's large industrial sites. Such events help to foster a culture of EE, which can have very significant effects on energy use patterns at the plants. For instance, the Helm Fertilizer plant in California managed to achieve a 30.4% reduction in energy intensity through behavior change alone, with no investment in capital at all⁵². DOE training and tools have also proven quite valuable for the on-site energy staff to learn to identify projects and optimize EE in areas such as steam management. At some facilities, the plant-level staff is also supported by interns, who have added significant value. For example, at the Don Fertilizer Plant, the interns are conducting regression analysis in order to identify the key determinants of the plant's energy use.

Once EE projects are identified, they are then packaged by the energy engineers and compete for the capital budget based on IRR. Simplot considers EE projects to be cost-effective only if they have an IRR of 15% or greater⁵³. Some small projects may be able to avoid the more lengthy and rigorous capital budget approval process if the funding can be found in the operating cost budget; however, the threshold for being considered a capital project as opposed to an operating cost is relatively low, at around \$10,000.

One significant challenge that has arisen in implementing EE measures is in new plants. While this system has been quite effective at identifying EE measures in existing plants, it does not include a system for planning energy efficiency into the designs for new plants. Furthermore, given that Simplot is a privately held company, decisions regarding new plants may be made privately without giving the energy team an opportunity to give any input. This can lead to new plants being constructed with relatively energy inefficient engineering.

A1.4 Role of Outside Support and Ratepayer-Financed Programs


On energy efficiency, Simplot has adopted a “partner with everyone” approach. This includes working with DOE, with various state governments, and with the various utilities who serve their facilities.

DOE has provided support to Simplot's EE program by encouraging leadership commitments to EE and through the training and tools they provide for plant-level staff. The Energy Leaders program commitment to reduce energy intensity by 25% over 10 years has been a major boost to EE at Simplot as it sent out a message that EE was to be prioritized across the company. DOE's training and tools have helped Simplot meet this commitment by giving on-site staff greater ability to identify and implement EE measures. For instance, DOE's Steam System Assessment Tool was used at the Don Plant in 2006 to save 75,000 million British thermal units in annual fuel consumption through improved steam management and boiler operation.

State governments have also provided support for EE at Simplot. The most notable example of such support was from the Idaho Office of Energy Resources in using American Recovery and Reinvestment Act funds to partially fund the hiring of two energy engineers. Starting in the spring of 2010, the Idaho Office of Energy Resources provided \$179,000 over 18 months towards the hiring of two energy engineers, one for each of the two main industrial groups—agribusiness and food processing. Simplot cost-shared the program and paid for the remainder of the total costs of \$422,625. These two engineers then implemented a whole slew of EE measures, ranging from a leak tag program at the Don Fertilizer Plant that saved \$448,253 in one year, to a new set of efficient compressors at the Moses Lake Potato Processing Plant that saves \$12,000 annually. In total, these engineers

⁵² Don Sturtevant, “Energy Efficiency: The Simplot Way,” presentation to Western Governors Association, March 16, 2011, http://www.westgov.org/component/docman/doc_download/1410-ieee-simplot?Itemid=.

⁵³ Ibid.



implemented projects in their first year to achieve savings valued at more than 10 times their salaries and associated costs, convincing Simplot to keep them on well after the grant funding ended⁵⁴.

Utility ratepayer-funded programs have also proven beneficial to Simplot's EE program. The most significant contribution they typically make is by providing incentives that make EE projects more attractive, with higher IRRs, so that they can successfully compete with other projects for capital budgets. In some cases, the ratepayer-funded programs can help with hiring EE personnel. For example, at the Smoky Canyon phosphate mine, Lower Valley Energy assisted the mine to hire a full-time EE by offering to cover half of his costs so long as he was able to save 1 million kWh of electric energy. The support for hiring an energy engineer at the Smoky Canyon mine is particularly noteworthy in that it represents an example of a utility indirectly supporting greater EE for fuels not delivered by the utility. In this case, 78% of the energy consumed at the Smoky Canyon mine comes from diesel, and the energy engineer is working to reduce the diesel bill in addition to meeting the target set out by the utility.

As part of the philosophy of 'partnering with everyone,' Simplot has typically chosen to participate in ratepayer-funded programs. In some cases, Simplot has opted to self-direct, with the decision on opting-in or going self-direct usually based on the costs and benefits to the company for each option. For example, Simplot originally chose to self-direct with Idaho Power's energy efficiency program, but later chose to participate in the program because full participants do not have a cap on incentives for EE measures.

A1.5 Looking Forward

As Simplot continues towards its energy efficiency goals, significant opportunities exist to expand and deepen its EE program. The continued development of the EE team will prove essential. These “boots on the ground” who identify and implement EE projects require the training and tools to pursue ever-more complex EE measures as the simplest and most obvious projects are completed. DOE has been very helpful on this front, and continued support with tools and training will prove beneficial.

Another major opportunity to deepen the EE program would be to establish a system to incorporate EE into the designs for new plants. The building of a new plant represents a unique opportunity to incorporate energy efficient engineering throughout the entire facility without concerns about the production downtime required to carry out some retrofits. Furthermore, the rate of return from using energy efficient equipment from the beginning is much higher than from replacing an existing and functioning piece of equipment with a more efficient version. Ensuring that Simplot takes full advantage of such opportunities will provide a great boost to the EE program, mitigate operating costs, and make achieving the firm's efficiency goals far easier.

⁵⁴ *Idaho Office of Energy Resources and DOE Demonstrate the Value of Strategic Energy Management through a Pilot Project at the J.R. Simplot Company*, Idaho Governor's Office of Energy Resources, 2013, https://energy.idaho.gov/informationresources/d/simplot_case_study.pdf.



Appendix 2: Energy Efficiency at General Motors

A2.1 Company Background

General Motors (GM) has a history in automobile manufacturing for more than 100 years. GM has long been the largest U.S.-based automobile manufacturer and held the title of largest automobile manufacturer in the world for decades. Declining sales and high debt led the company to declare bankruptcy following the financial crisis in 2009. The bankruptcy led to the entire company being reincorporated, with major restructuring taking place across the organization.

Since the bankruptcy, GM has been experiencing sales growth as it implements significant innovations in its product line to produce smarter and more fuel-efficient vehicles to meet rapidly evolving consumer preferences. The rapidity of the changes in the automotive industry is noted on the cover of GM's 2015 Sustainability Report: "The automotive industry will change more in the next five years than in the previous fifty years⁵⁵."

In 2014, GM sold nearly 3 million vehicles in the United States and earned more than \$150 billion in revenue globally. This included brands such as GMC, Chevrolet, Buick, and Cadillac, while GM's overseas brands include Vauxhall, Jie Fang, and Wuling. GM has more than 30 manufacturing facilities in the United States, primarily in Michigan, but also in states such as Ohio, Indiana, New York, Texas, Missouri, and Maryland.

A2.2 History of Energy Efficiency at General Motors: Goals and Achievements

General Motors has developed a sophisticated EE program over the past 15 years. A team and pool of resources dedicated exclusively to EE was first created in 2000 as the Energy Savings Project Initiative (ESPI). The ESPI budget varies year to year based on market conditions. When ESPI began, it had an initial budget of \$5 million a year to fund various energy saving projects. In recent years, this budget has grown gradually to approximately \$20 million.

Even before the launch of ESPI, GM had entered into an agreement with DTE Energy and Consumers Energy to provide full-time energy engineers for GM's plants. Engineers are provided by the utility company in their respective services areas and in other states. This long relationship between contracted utility energy engineers and GM has built trust between the two partners.

In 2008, GM signed onto DOE's Energy Leaders program and made a commitment to reduce energy intensity per vehicle produced by 25% by 2018. This goal is ambitious given the rapid pace of change in the automotive industry, which, due to the nature of the changes demanded in the product lines, has placed upward pressure on the energy intensity of production. Additionally, GM publicly committed to reducing energy intensity by 20% by 2020 from a 2010 baseline and is on track to keep this commitment, with an 11% reduction in energy intensity over the 2010 baseline as of 2014. As GM Chief Executive Officer Mary Barra said, "People care about more than the cars. They care about how we build them and how we engage with the world around us. GM has made public environmental commitments because meeting these goals is the right thing to do for our environment and our economy."

⁵⁵ General Motors. 2015 Sustainability Report. 2015, <http://www.gmsustainability.com>.

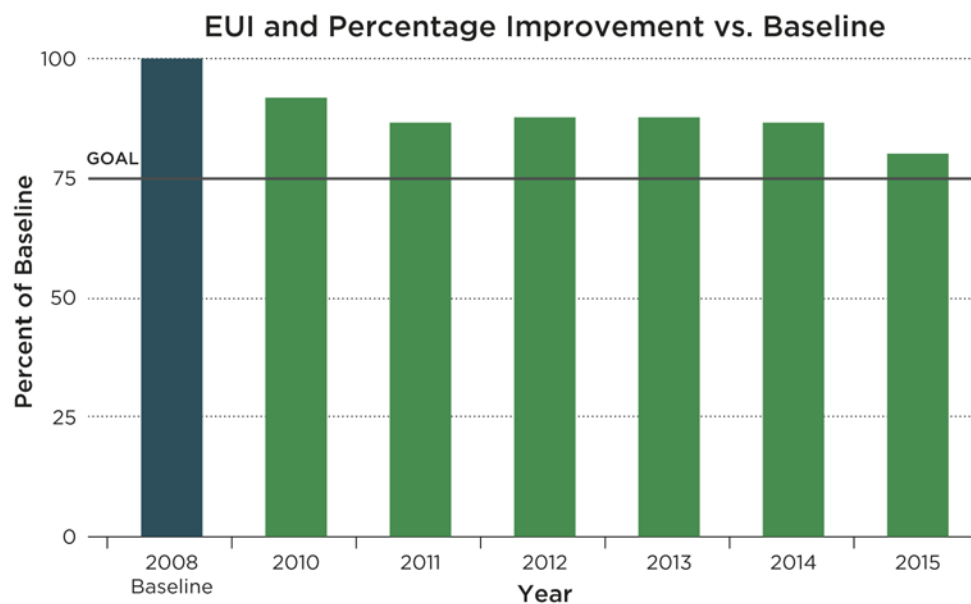


Figure A2.1. Energy Intensity Reductions at GM Compared to 2008 Baseline⁵⁶

Acronym: EUI—energy use intensity.


A2.3 General Motors' System for Identifying, Selecting, and Implementing Energy Efficiency Measures

The company's commitment to EE is supported by EE targets for plants and facilities. As these targets and the progress toward achieving them are prominently displayed in many plants under the plant business plans for environmental goals, the importance of implementing EE measures is widely recognized among the staff. At every plant visited by the authors of this report, the targets were shown on notice boards in the plant. Furthermore, these targets form a part of the general targets for the plant manager and can factor into the manager's evaluation, which provides an important incentive to encourage EE.

EE projects typically originate from the on-site utility manager and energy engineers. These engineers, who are contractors provided by GM's two largest electric utilities, identify projects that are placed in a pipeline of projects to be approved by the corporate-level energy efficiency team. These engineers are selected based on a combination of technical skills and people skills, and often remain at the same facility for many years in order to build up a strong relationship with the plant staff. These relationships help the engineers to get a better pipeline of projects and to get a greater buy-in from the plant when implementing projects.

The projects are then vetted by the energy leadership team with different criteria depending on the type of funding that will be used for each project. In the case of projects to be funded by ESPI, it is required that they form part of a portfolio with an average payback period of 2 years. This requirement has been broadened; it was originally a firm cutoff at a payback of 1 year, then an average payback of 1 year for a portfolio, before reaching the current requirement. For projects to be implemented via energy performance contracting, it is required that they have a 5-year life cycle and remain cash flow positive throughout the entirety of the project's life cycle.

⁵⁶ Energy Performance—General Motors, U.S. Department of Energy, Better Buildings Initiative, April 2016, <http://betterbuildingssolutioncenter.energy.gov/energy-data/General%20Motors>.



EPSI funding helps meet the utility budget, for which it is seen as a cost-mitigation measure. The connection between EE and the utility budget goes even further, as GM simply cuts the plant's utility budget according to the projected energy savings. This means that overestimating EE savings is severely penalized as projects that fail to deliver on the estimated savings will cause the plant to lose budget and miss targets for energy use overall. This system also avoids incentivizing underestimating EE savings because the projects must bring sufficient savings to achieve the 2-year payback and because the utility budget cannot be used by the plant for anything other than utilities. Gary Londo, a Senior Energy Manager at GM says, "Reducing the plant energy budgets really shows the value of the EE program to the finance people and it keeps my energy engineers accountable."

Given the rapid changes occurring in the automotive industry, and therefore the rapid changes in GM's product lines, ensuring EE is built into new or renovated plants is a crucial element of the EE program. The location of the EE team in the Global Facilities Engineering Group has proven beneficial to the inclusion of EE considerations into new facilities, as the team responsible for designing new facilities reports to the same manager as the EE team. Furthermore, two EE engineers participate in the meetings to design new plants; this ensures that energy considerations are taken into account in the plant design. Currently, the criterion for investments in energy efficiency in new production is typically a payback in half the life cycle of the new assets.

A2.4 Role of Outside Support and Ratepayer-Financed Programs


Outside support, from local utilities to the federal government, have had a significant role in the advancement of EE at GM. GM's Energy Management program has been recognized as an ENERGY STAR Partner of the Year for Sustained Excellence for 5 years. This award recognizes GM for its energy management program and incentivizes further investments in EE. The award also generates positive publicity, in addition to environmental achievements and cost savings.

In addition to ENERGY STAR, DOE's Energy Leader program has proven beneficial to GM. As part of their participation in the program, GM has committed to reducing energy intensity by 20% by 2020. The formalization of this commitment with DOE, as well as with shareholders, has provided a significant boost to the EE program. Because GM integrated energy into their business plan, plant managers have EE targets among their performance targets for accountability.

Ratepayer-financed programs have proven useful to GM in many cases. The primary benefit of the ratepayer programs is that the project incentives can often shorten the payback period to below the 2-year threshold, allowing it to meet GM's criteria for funding. This also means that projects in states that provide incentives are often more likely to be funded than projects in states without programs, as the projects that receive no incentive must compete on rate of return against projects with incentives. In addition, GM aims to use all available incentives and hit the cap on incentives wherever they participate in a program, as they view possible incentives that have not been used as money left on the table. This has been quite successful and has helped GM hit the cap on incentives from Tennessee Valley Authority, Consumer Energy, and DTE Energy for the past several years. However, this push to max out the incentives has at times added to the preference for projects in geographies where ratepayer-financed programs exist.

Another important benefit of ratepayer programs for GM has been the engineering support that they can provide. For example, NYSERDA has proven useful in providing engineering support to the GM plant that participates in New York's ratepayer program. Such support can make participation in ratepayer-funded programs more attractive, even if the company will pay more into the program than it will receive in incentives.

Perhaps the most significant type of outside support has been from the two largest utilities GM uses in Michigan, Consumer Energy and DTE Energy, who provide the on-site energy engineers for the company's plants across the U.S. The system is flexible and has been a major factor in GM's success in EE so far. There is also some degree of cost sharing by the utilities. Some smaller utilities within the GM footprint also offer a similar resource, albeit at a smaller scale, elsewhere in the United States.



GM bases its decisions on whether or not to participate in ratepayer-funded EE programs on the business case for participation. GM participates in ratepayer-funded programs when the benefits to the company, in terms of both incentives and engineering support, outweigh the costs of paying into the program. This decision can be complicated by how program participation can affect the energy rates paid by GM. For example, while the engineering support provided by NYSERDA has proven quite beneficial to GM, participation in the program would require giving up the very low legacy electricity prices at two of the company's plants in New York, and the benefits of the engineering support and EE incentives are simply outweighed by the higher cost of electricity associated with participation.

A2.5 Looking Forward

As the automotive industry evolves rapidly over the coming decade, the energy efficiency program at GM will confront more challenges and further major opportunities. In many plants, the major accomplishments so far have been on lighting; heating, ventilation and air conditioning; some motive power efficiency improvements; and efforts to reduce steam use in production. To further expand energy cost-savings benefits will likely require a steady “deepening” of the EE effort, including involvement in new multiple-benefit production-optimization projects and other efforts close to production-line operation; further piloting of behavioral change EE initiatives; and continuing progress on the effort to integrate best-practice EE designs and technology into new production systems. While these areas can yield excellent low-cost energy cost savings, they also involve further organizational challenges.

One important area is the continued strengthening of the working relationships between EE personnel and production operations staff and management. Clearly any projects relating to production must be proven very low risk and involve tight scheduling together with other work to minimize any production downtime. The obvious key is to integrate knowledge of EE opportunities into overall programs for production line scheduled maintenance or renovation.

Another important area is continued, ever-stronger involvement of EE personnel in design and implementation of new production facilities. EE in new production facilities is perhaps the most important aspect of EE work in the long run as the industry continues to evolve so quickly. GM's current organizational setup provides advantages for capturing this potential.

It may also be possible to improve the system for ensuring the most energy efficient new equipment is bought by formalizing the incorporation of EE in production line overhaul or new design. This is in addition to the development of new buildings and their energy infrastructure, through the institution of an “energy gate” for energy staff to sign off on key relevant projects, or by formalizing the existing trend to incorporate EE features with paybacks of 10 years or less. Already a leader in energy efficient and electric vehicle design and production, GM can also increasingly highlight parallel sustainable energy contributions through the greener production of its vehicles.

Another opportunity for GM lies in further improving energy efficiency culture and getting more attention from plant management on EE. One of the main ways that GM has begun pursuing this opportunity is by holding energy treasure hunts, according to ENERGY STAR guidance, where workers spend two and a half days looking for energy savings throughout the plant. These have proven effective at getting the workers to think of EE and at highlighting all of the potential savings from EE for the plant management. Another way in which GM has aimed to foster EE culture is by having “bring your green to GM” campaigns, based on ENERGY STAR's program. Employees are encouraged to implement EE measures at work as well as in their homes as a way of getting them to personalize energy efficiency.



Appendix 3: Energy Efficiency at General Mills

A3.1 Overview of General Mills

General Mills has a long and storied history as one of the largest grain and cereal processors in North America. Their brands, from Betty Crocker to Cheerios, have long been staples in many American households. Over the years, General Mills has built and spun off many companies, ranging from Parker Brothers to the Olive Garden, while also acquiring others—the most recent major acquisition being Pillsbury.

In recent years, General Mills cereal brands have been facing a challenging food industry, leading the company to seek to aggressively cut costs in order to maintain profitability. In addition, General Mills has sought to move into growing segments of the food market, such as Greek yogurt, and to broaden the appeal of its cereal line by producing all of its cereals with whole grains.

In 2015, General Mills made over \$17.6 billion in net sales globally. They produce cereal, yogurt, flour, and other food products in states such as New York, Illinois, Minnesota, California, Tennessee, Iowa, Ohio, Missouri, New Jersey, and Georgia.

A3.2 Energy Efficiency at General Mills: Goals and Achievements

General Mills has been implementing EE measures for more than a decade, with company-wide EE targets first being introduced in 2005, though the EE program remained relatively small until the past few years. The shift to a more aggressive EE program began with the hiring of an energy engineer, Graham Thorsteinson, in one plant in Georgia as a pilot project in 2008. When this engineer managed to cut the plant's energy spending from \$13 million to \$7.5 million over a 4-year period, it provided a strong case for hiring an energy engineer in every major factory.

Though there was some resistance from the personnel department at first, the company's vice president of manufacturing strongly backed the proposal to hire energy engineers, making the case that “other staff aren't saving three to seven times their salary” and so it was decided as part of a reorganization that all large plants were to have energy engineers. Eventually, 15 energy engineers were hired, with 5 cereal plants getting their own energy engineers and about 20 other plants sharing the remaining engineers. The new energy engineers were given a target of each saving four times their individual salaries in energy at their sites. Graham became a corporate energy manager and designed continuous improvement tools, as well as a set of energy analytics tools, to be used across the corporation's EE program. This has also come with a shift towards viewing “energy as an ingredient” in their products which, much like ingredients such as flour or sugar, is not to be overused or wasted.

In 2005, General Mills set the target of reducing energy use per ton of product produced by 20% by 2015. However, as of 2014, the energy use per ton of product had only been reduced by 10%, largely due to a shift in the product mix towards more energy-intensive products, such as Greek yogurt. In 2015, a new target was set of a 2% reduction in energy usage per year through 2025, coupled with a goal of a 28% reduction in greenhouse gases for their whole supply chain over the same 10 year period. So far, General Mills has succeeded in exceeding this goal and is delivering reductions in energy intensity of more than 3% per year.

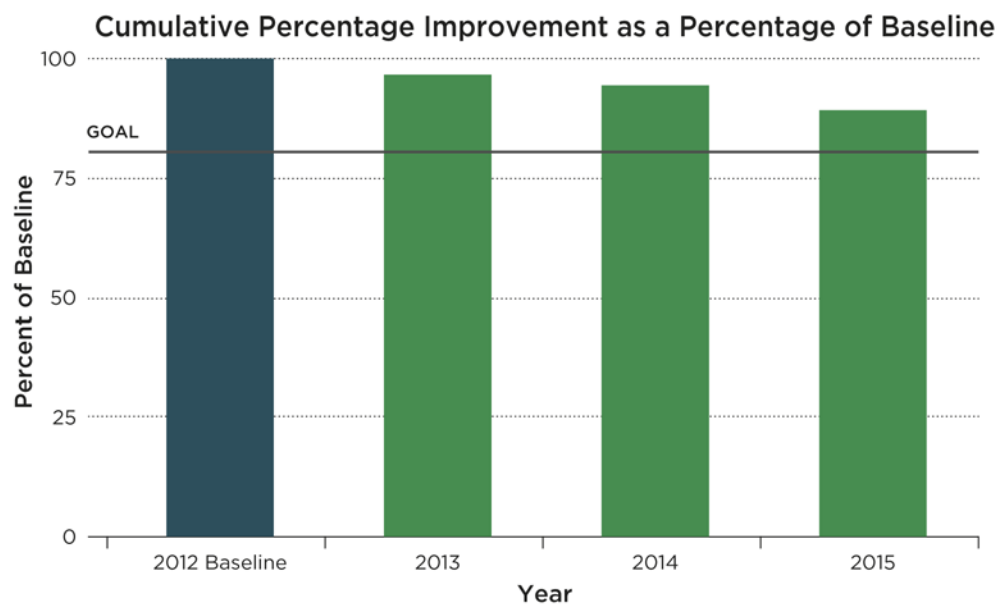


Figure A3.1. Energy-Intensity Reductions at General Mills Compared to 2012 Baseline⁵⁷

A3.3 Identification, Selection, and Implementation of Energy Efficiency Measures


The corporate EE targets play a major role in encouraging EE across the organization, as they are translated into targets throughout the corporate structure. Each plant has environmental targets, which include energy targets, that factor into the plant's ratings. The plant's ratings then factor into the plant management's ratings and therefore their evaluations, giving them a strong interest in pursuing EE measures and ensuring that the plant meets its energy efficiency targets.

The EE program at General Mills is relatively decentralized to suit their corporate structure and culture, which was built over mergers and acquisitions. The EE program relies primarily on the team of full-time, plant-level energy efficiency staff. These plant-level energy engineers report up to the plant manager and matrix into the corporate EE team who provide the engineers with tools and training; the engineers also help promote EE projects and share ideas for projects from other plants. In some cases, the plant-level energy engineer has other roles at the facility as well, though all energy engineers at the large "Big G" plants are dedicated full-time to energy; this includes energy procurement, which is a joint responsibility of the energy engineer and the plant finance team.

Smaller projects can be approved by the plant-level finance team, even if they are deemed capital projects as the plant has a capital budget. Larger projects, above a specific threshold, must also be approved by the corporate finance group, though they still come out of the plant's budget. Projects are selected based on exceeding a specific IRR, which is calculated on a standard spreadsheet produced by the corporate finance group and given to all of the EE team.

There is no dedicated pool of funds for EE projects; instead, EE projects must be approved on a project-by-project basis. These projects must be identified and put in the annual budget, making it difficult to do ad hoc projects if any arise through the year. There is a limit on funds for EE projects that varies from year to year depending on capital availability. As the EE program has been justified to the finance team as a cost-reduction measure, the finance team has cut the plant energy budgets according to the projected energy savings since the beginning of the

⁵⁷ Energy Performance—General Mills, U.S. Department of Energy, Better Buildings Initiative, April 2016, <http://betterbuildingssolutioncenter.energy.gov/energy-data/General%20Mills>.



EE program. In order for non-energy benefits to be included in the returns on a project, they must be demonstrated to reduce the budgets of other areas.

General Mills has invested heavily in sub-metering, which has allowed them to implement energy targets for each piece of equipment. This has proven helpful in identifying possible EE projects by giving the EE team extensive visibility into the energy-use situation at the plant. It is also hoped that these meters will help with behavioral EE measures going forward by increasing staff awareness of the energy used by each machine.

General Mills is yet to fully formalize a system for ensuring that energy efficiency is built into all new production and new facilities. They do presently have a box that must be checked on applications for funding for new projects, asking if the project is energy efficient. Aside from this, the system for incorporating EE into projects is informal, with the engineers on other projects consulting with the energy engineers to ensure the projects are energy efficient.

A3.4 Role of Outside Support and Ratepayer-Financed Programs

Both government and utilities have played a role in encouraging and helping General Mills to build out its EE program. DOE's Better Plants initiative provided the platform for General Mills to publicly commit to EE and to publish their results towards their announced targets.


With sites in many different states in the United States, the role of ratepayer program support has varied significantly from site to site. In the states where General Mills participates in the ratepayer programs, the programs' primary benefit has been providing incentives. These incentives play an important role in getting projects above the company's IRR hurdle for approval, though they are not as relevant as in some companies because they are not counted as a reduction in the project cost but rather as a one-time payback in the first year. In addition, the value of the incentives are decreased a bit by being based on the verified energy savings at the plants in Buffalo, New York, and West Chicago, Illinois, as this adds an element of uncertainty to the financial models for the projects. The incentives are also viewed as more valuable in states that allow for complex custom projects as this encourages the EE team to pursue deeper and deeper energy savings, as opposed to simply focusing on getting incentives for relatively simple prescriptive projects. "Well-designed programs that incentivize good projects can really drive better and better projects," says Graham Thorsteinson, the Energy Platform Leader at General Mills.

Engineering support and technical assistance has also been a valuable contribution from some ratepayer programs. In New York, for example, NYSERDA allows industrial customers to pick an expert to help with projects and co-finance the cost of the expert. This program has proven useful for some more complex projects, though the usefulness of such programs is very much dependent on the quality of the experts provided, and some programs have less talented experts who are simply not as useful for designing projects.

The decision to participate or not in ratepayer-funded EE programs is always based on the business case. In deciding on participation, the energy team looks at the pipeline of projects at the plant, the types of incentives available and the total amount they are allowed to take, and the potential engineering support that the program can provide, and then weighs these benefits against the cost of participating. In cases where the energy team believes they can derive more value from participation, they opt in, and where the costs outweigh the benefits, they opt out. They have also chosen to self-direct in cases where the incentives provided were primarily simple, prescriptive projects that would not suit the pipeline of more complex EE projects that the energy engineer had identified.

A3.5 Looking Forward

General Mills has created a strong program in the past few years and has significant opportunities to further strengthen their existing program. One potential way to further strengthen their program would be to create a dedicated pool of funds for EE. The advantages to such a system are that it allows for more flexibility for



implementing projects throughout the year and removes the need to go to the finance department for approval on each individual project. This added flexibility could save some of the energy managers' time dedicated to getting approval for projects and could help increase the number of projects implemented each year.

Another opportunity to expand the EE program at General Mills is to increase the focus on behavioral EE measures. This can be significantly aided by encouraging an EE culture through a variety of measures, such as treasure hunts and home EE assistance for employees. General Mills is particularly well positioned to implement behavioral EE measures given the presence of full-time EE staff in all of the company's large plants, since it is ultimately plant-level staff who must implement such measures. Helping the plant-level energy engineers to engage their co-workers on energy efficiency could prove a low-cost means of adding significant energy savings.

Further formalizing the process for including EE in non-energy projects is yet another opportunity to expand the EE program at General Mills. Ensuring that the energy team is formally consulted on new production projects avoids the possibility that retrofits will be required later on. Furthermore, it can help bring in energy efficient equipment that might not make the IRR threshold as a retrofit, but for which the relative cost as compared to the alternative does indeed make the IRR threshold.



Appendix 4: Energy Efficiency at Intel

A4.1 Overview of Intel

Intel⁵⁸ is the largest semiconductor manufacturer in the world. Founded in 1968, Intel has experienced rapid growth over the past 3 decades, driven by the proliferation of personal computers around the world, as it is the company that invented the most common type of microprocessor used in personal computers. In addition to manufacturing semiconductors, the company also operates several large data centers. In 2014, Intel had revenues of nearly \$56 billion, representing a 6% increase over 2013. In the United States, Intel operates manufacturing facilities in states such as California, Arizona, Oregon, and New Mexico.

A4.2 Energy Efficiency at Intel: Goals and Achievements

Intel has a long history of sustainability leadership, with both greenhouse gas (GHG) emissions and EE in their operations serving as key pillars of their sustainability efforts. This led Intel to begin publicly reporting energy use and committing to reduce greenhouse gases in 1996. This commitment to reduce greenhouse gas emissions was followed in 2003 by the announcement of a goal to reduce energy intensity by 4% per cm² of silicon per year. Subsequently, the metric of energy intensity was replaced with a system where all of the energy-use reductions made by the company's specific EE measures are aggregated to a nominal corporate energy savings number, which can then be compared with total consumption.

Intel presently has a 2020 total corporate annual EE goal, which is divided up by region and then site. As of 2015, Intel had recorded over 1.6 billion kWh of energy reductions from its energy efficiency measures since 2012.

A4.3 Identification, Selection, and Implementation of Energy Efficiency Measures


Intel has a relatively centralized corporate organization, which is reflected in its EE program. Each Intel manufacturing site has a full-time energy champion who reports directly to the site facilities operations manager and matrix reports to the central EE manager. The EE group includes 16 people in total, each with their own local expertise. The EE team has standing team meetings via teleconferences and videoconferencing and seeks to share ideas and opportunities while also proliferating standardized EE measures across multiple sites.

Once identified, EE projects go to the central EE team to establish if there is an opportunity to optimize the proposal in terms of savings and cost. The projects then seek funding through the annual EE budget (currently set at about \$30 million), with opportunities being prioritized based on NPV. All projects seeking capital funding are fully positioned for approval ahead of the EE group's annual capital request, though the EE team has some flexibility to substitute a project for another project that was not implemented. Projects that meet the NPV threshold are generally approved. The company prefers to complete projects with internal capital as opposed to using energy performance contracting.

The company's rationale for pursuing EE projects is partially driven by a desire to reduce their carbon footprint, support a sustainability leadership position, and reduce costs. Although energy accounts for less than 1% of Intel's total costs, it is the second-largest variable cost after labor. This high position in the variable costs leads EE to play an important role in cost mitigation for the company, since it is one of the largest costs that they are actually able to reduce and helps drive competitiveness in their market.

EE measures have been largely confined to facility services, such as chilled water, heat recovery, compressed air, heating systems, and lighting. EE can be important in production line upgrades, as well as new building design and

⁵⁸ Unlike the other three cases studies, no site visits were conducted with Intel. Instead, all information was gathered through a series of phone interviews with energy staff.



building infrastructure. The intent is that the EE team is linked into all new construction activity so as to influence designs to ensure that EE is taken into account.

A4.4 Role of Outside Support and Ratepayer-Financed Programs

While Intel primarily relies on its internal program for delivering EE measures, outside support has, at times, played a role in Intel's EE program. Utility ratepayer-financed programs have provided some valuable support. The most important role of ratepayer programs for Intel has been providing incentives that help projects get over the NPV threshold for funding. In addition, some programs, such as the Energy Trust of Oregon, have proven useful at providing verification and third-party evaluation, as well as other technical assistance.

Intel has also found it useful to engage utility ratepayer-financed programs in order to help shape the programs in a way that suits both the program and the company. For example, one utility had originally capped incentives at a level that would provide large customers far less in incentives than they paid into the program. Intel and other customers worked with their utility provider to fairly reform this system to make program participation less equitable, and successfully came to a solution where the cap on incentives is more closely related to the amount paid into the program. Large industrial customers typically have some of the most impactful and cost-effective project solutions and, ultimately, have the most influence to reduce utility supply costs and supply costs for all customers.

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