ACEEE developed this memorandum in response to the Pennsylvania Department of Environmental Protection (DEP) Energy Programs Office (EPO, aka the Energy Office) request to provide information on available energy efficiency programs for the industrial sector and identifying gaps between current offerings in Pennsylvania and existing programmatic needs in the state.

This memo includes a list of programs currently available in Pennsylvania (Appendices A and B) and a list of program types that could be added in the future (Appendix C). The list includes state and federal programs. The narrative includes examples of both along with links to more information.

In this review, ACEEE describes how EPO might focus its future work targeting the industrial sector.

DEP's EPO also has an interest in those facilities that may not have knowledge of energy efficiency opportunities or the resources to pursue them. With this in mind, this memo covers programs and strategies that could help the EPO reach the greatest number of organizations and workers.

Addressing the Needs of PA's Industrial, Agricultural and Large Commercial Businesses

We start with a discussion of the needs of small and medium size businesses, (under 500 employees). Though we focus on manufacturing facilities, the same program features will produce the same benefits in similar size commercial and institutional facilities. Small and medium size manufacturers (SMMs) often need technical expertise and more one-on-one attention than their counterparts in the commercial sector. While such investment of time by program implementers with large customers is usually worth the high transaction cost because of potential energy savings, the lower savings per plant make it harder to justify one-on-one technical assistance for smaller manufacturing firms.

SMMs also have different needs than their larger counterparts. A 2009 fact sheet by the American Council for an Energy-Efficient Economy (ACEEE) (Elliott and Kaufman 2009) and a study by the Alliance to Save Energy (Bostrom, Harris & Lung 2010) identified the following barriers to industrial energy efficiency:

- Access to industry-specific technical expertise, assessments, and training for workers
- Availability of a trained and capable workforce
- Lack of access to industry associations and best-practice sharing
- Purchasing decisions driven by equipment failure, not planned strategically
- Lack of investment in new technologies, products, and processes
- Access to capital to make needed investments
- Capital constraints that lead to lower-cost initial measures

As we discuss how DEP might help the 12,000 businesses in Pennsylvania to become more energy efficient, we will keep these barriers in mind.

Existing Programs in Pennsylvania

Appendix A contains short descriptions of all the programs offered by Pennsylvania electric distribution companies (EDCs) that serve the industrial sector. In addition to the programs offered by EDCs, there are technical assistance, financial assistance, and workforce development programs provided by several state agencies, universities, regional and municipal governments, and non-profits. The list developed by EPO is contained in Appendix B.

For the purpose of this memo, it is useful to think of assistance programs as serving one or more of our purposes: creating awareness, providing technical assistance, providing financial assistance, and developing worker skills.

The purpose of awareness initiatives, as the title indicates, is to educate the public about what is possible and available. Initiatives include providing information through websites, presentations at events, and publishing materials such as fact sheets and case studies.

Technical assistance tends to be user specific. Activities often include tasks such as providing assessments of energy savings opportunities, helping companies developing project cost-benefit analyses, and developing an implementation roadmap.

Training and workforce development programs provide workers with knowledge and skills training that can help them identify and implement energy savings projects. Many programs, such as the Building Operator Certificate, provide transportable credentials.

Financial Assistance provide rebates, grants, loans, and other resources to help companies invest in energy efficiency projects. The utility sector Act 129 programs fit into this category as to the grants and loans provided by Pennsylvania's Small Business Ombudsman program.

Many assistance programs focus on a specific group of customers by tailoring the nature of the assistance provided to meet the needs of the targeted group. Other programs are technology-focused programs selecting a specific type of energy-intensive technology such as compressed air that is common in multiple segments of the economy. All four types of programs can be designed to be segment or technology focused.

GAP ANALYSIS

We identified gaps in terms of scope, availability, and capacity. There are few technology-focused and sector-focused programs. Many areas of the state do not have access to financial assistance programs because they are in utility service territories not covered by Act 129. In addition, the details of programs vary by EDC service territory. Although there are several training and workforce development programs, they have small budgets and therefore they can only engage a few organizations per year.

Technology focused programs: we did not identify many programs targeting common energy-intensive systems like compressed air, fans and blowers, water pumps, chillers, steam, and process heating. These systems are often referred to as "cross-cutting" technologies because they are common to most manufacturing facilities and a significant portion of commercial and institutional facilities. Programs targeting these systems range from on-line materials with

information on best practices, to workshops that train workers to identify and implement low-cost solutions, to technical assistance and financial that includes assessments of client's systems and installation of new equipment and controls.

An example of this is Efficiency Vermont's technical assistance for compressed air systems that connects companies with specialists that will log system performance and recommend improvements.

> Link: https://www.efficiencyvermont.com/products-technologies/industrial-special-equipment/compressed-air-systems

Another example is UGI utilities HVAC Tune-Up Program. The program is designed to increase the operating performance of electric HVAC systems in commercial buildings. The program offers financial incentives to HVAC contractors to diagnose performance inefficiencies and make energy-saving retrofits. Customers are eligible for a HVAC tune-up once every three years with areas of focus including refrigeration components, air distribution systems, and controls.

Sector focused programs: a review of programs in the appendices confirms the concern expressed in the June 11th meeting that the agricultural sector is underserved. This is common as many rural communities are served by rural electric cooperatives. Agribusinesses have many opportunities to save energy but are frequently unaware of them or of technical and financial assistance programs. In the Agricultural Programs section below, we provide examples of three programs, two focused on the dairy industry and one of irrigation.

Availability of assistance programs: Each electric distribution company (EDC) determines the set of programs it will offer its customers. They will deliver the programs directly or through a contracted third party. Figure 1 lists Pennsylvania's EDCs and shows their approximate service territories. Not shown are the rural cooperative and municipal utilities not covered by Act 129.

The details of programs vary by EDC territory so not every EDC customer will have access to the same programs. Since most rural cooperatives and municipal utilities do not offer financial assistance programs, organizations located in those areas do not have access to the same programs as those located in EDC territories.

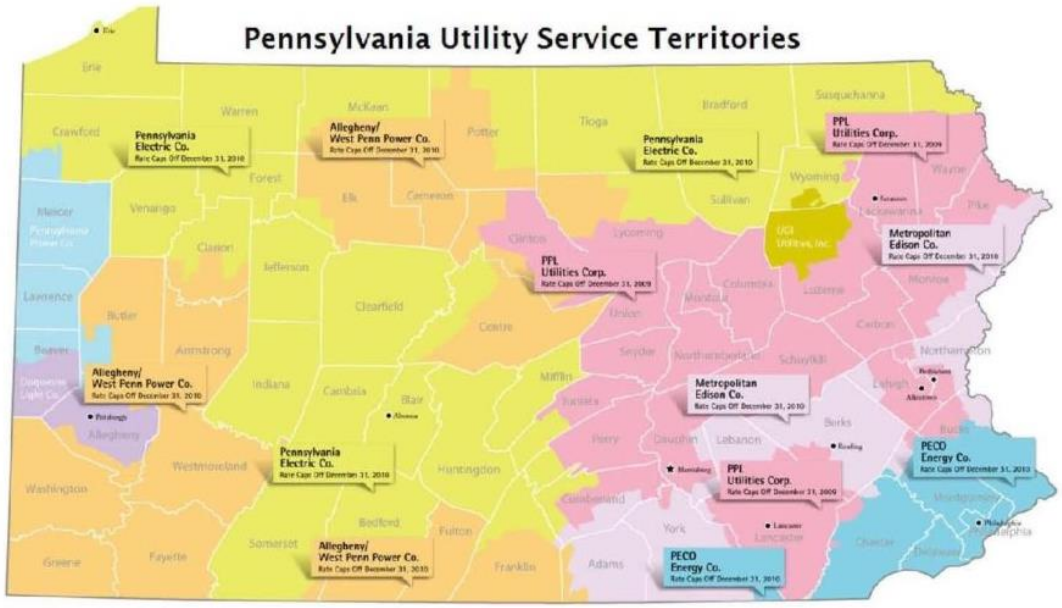

FIGURE 1: ELECTRIC DISTRIBUTION COMPANY SERVICE TERRITORIES. SOURCE : PA ENERGY BIZ. 2010.

The ability of DEP's EPO to address this issue is limited, especially regarding financial assistance. However, it could identify common educational, technical assistance, and workforce development needs and work to create statewide availability of those resources. These are discussed in more detail later in this memo.

Limited capacity: service providers like PennTAP, ETAC, and Penn State's PSFEI (Facilities Engineering Institute) have limited capacity to provide technical assistance. Industrial Assessment Centers (IAC) provide approximately a dozen energy audits per year per center. Since there are several organizations providing energy audits, DEP could work with all of them to coordinate their activities. For example, organizations could refer requests from clients to each other based upon specialization, timing, or facility location. Alternatively, a program within state government such as the DEP Small Business Ombudsman program could become a clearinghouse for such referrals. It would require an educational effort of stakeholders and of the clearinghouse staff.

There is also a gap in availability of information. This was a key concern expressed during the stakeholder meeting. People are not aware of other organization's offerings. Everyone saw value in the development of a common resource that will include information on all programs and services.

Potential PA Energy Office Activities

We can think of activities that PA DEP's EPO might undertake as a matrix of technical assistance (TA), workforce development (WD), and support of Act 129 programs. Some activities will be possible immediately (near term), may take a year to implement (mid-term), or more than a couple of years (long term).

The EPO will lead some activities but play supporting roles in others. One of the EPO's greatest strengths may be its ability to convene stakeholders. This is a role DOE often fills to great success at the national level. We can thank of this as a facilitating role.

With these set of metrics, we frame potential Energy Office activities into two tables, one that breaks them down by focus and timeline, the other by focus and role.

TABLE 1. EPO ACTIVITIES BY FOCUS AND TIMING

	Technical Assistance	Workforce	Act 129 Programs
Near Term	Organize educational materials & events	Organize best practices workshops	Convene groups to share information
Mid Term	Assist in developing a website	Convene groups to identify workforce training priorities and identify resources	Convene groups to coordinate resources
Long Term	Assist with maintaining and growing a website	Develop or secure and implement new training resources	Connect participants in Act 129 financial assistance programs with new training programs

TABLE 2. EPO ACTIVITIES BY FOCUS AND ROLE

	Technical Assistance	Workforce	Act 129 Programs
Lead	Development of website parameters	Host workshops at regional offices	n/a
Facilitate	Awareness events by other organizations	Development or sourcing of energy efficiency and energy management training programs	Convening of groups to share information and coordinate resources
Support or Participate	Energy audits by other organizations	Training of workers in E2, P2, and water conservation	Participate in awareness events. Include information about Act 129 in marketing materials and website

ORGANIZING EDUCATIONAL MATERIALS AND EVENTS:

The first step in helping an organization to become more energy efficient is to help them become aware of the benefits that result from saving energy. Awareness and educational events and materials can set the hooks that bring companies into other programs offering technical and financial assistance. Materials can range from information and links on a website, to fact sheets, to presentations at events. DEP already provides many of these resources. It may want to review all of the materials it currently has in its inventory and look for gaps that it can fill with new links and materials. One of the gaps identified in the E4 meeting is the need for case

studies. The US DOE Advanced Manufacturing Office and many other organizations have published case studies that the Energy Office can use while it plans how to develop its own.

The following federal program have funded hundreds of projects over the past ten years and are a good resource for case studies:

- US DOE Advanced Manufacturing Office (AMO): https://www.energy.gov/eere/eere-success-stories-projects-map
- US DOE Industrial Assessment Center (IAC) at Lehigh University: https://www.energy.gov/eere/amo/locations-industrial-assessment-centers#leh
- US DOE Combined Heat & Power Technical Assistance Partnership (CHP TAP) at Penn State University: http://www.midatlanticchptap.org/
- USDA energy tools: https://energytools.sc.egov.usda.gov/
- Pennsylvania Manufacturing Extension Partnership: www.PAMade.org/Network

The EPO can work with other stakeholders to develop a list of events at which it can present information on the features and benefits of energy efficiency.

The new website, discussed below, would be in addition to these resources.

MARKETING

DEP's EPO has three key challenges with respect to marketing: it must communicate a complicated value proposition, to a diverse set of stakeholders, with limited funds. The Energy Office is most likely to be successful if it leverages the resources of other state agencies and private sector organizations to push out its message.

A first step might be to make a list of organizations with which EPO might collaborate. The next step will be to prioritize which organizations to reach out to first. Discussions with them will influence the next step, determining which programs and associated promotional materials to push. Thinking in terms of near-, mid-, and long-term marketing efforts may be a useful tool to prioritize efforts.

ASSIST IN DEVELOPING A WEBSITE:

At the E4 meeting on June 11, there was considerable interest in support for some type of resources that stakeholders could access. The common theme that people expressed is that they were unaware of what other organizations were doing in Pennsylvania nor who to contact. The features attendees hoped to see in such a resource are:

- A one-stop shop where information on the details of energy efficiency training, technical assistance, financial assistance, and workforce development programs
- Information that is up-to-date
- Contact information
- Downloadable marketing materials

Although EPO was the organization everyone thought should host such a website, there was realization that it may not have all the resources to create it or maintain it. Keeping information

current requires a feature that allows organizations to update their information and a routine proactive effort to collect information from assistance providers.

DEP's EPO could approach this project incrementally. Assembling a core set of utility and agency provided technical and financial assistance program profiles initially and then adding over time information about trade association initiatives, professional society training, and educational institution courses.

CONVENING GROUPS TO SHARE INFORMATION AND COORDINATE RESOURCES:

During and after the E4 meeting, attendees expressed appreciation for the opportunity to learn about other organizations' programs. Such meetings are excellent opportunities for people to network and discuss how they might coordinate and leverage each other's resources. State energy offices (SEOs) are ideal conveners for energy related issues. They are known and respected by almost all energy-related organizations. The EPO can host such convenings or work with other stakeholders to organize them.

The goals for such meetings could be any collection of the following:

- Sharing information about attendees' assistance resources
- Developing plans to work together to promote and deliver assistance
- Identifying gaps and developing plans to fill them

Getting attendance to such meetings is often challenging. Attending such meetings competes with other work activities including attending other events. Networking with other resources is not likely to be a priority for most organizations. Therefore, the Energy Office should seek opportunities to leverage other events and to utilize technology.

Organizing side meetings at larger events is also an option. DEP's EPO could leverage large events that attract many desired participants by hosting a side meeting just before or just after the anchor event takes place.

Although having people meet in person usually produces the greatest outcomes, there are instances in which webinars and listservs will suffice. These activities may be suitable for follow-up activities to an in-person meeting.

Examples of SEOs convening activities

NYSERDA has convened stakeholder around the topic of combined heat and power (CHP) for many years. It has resulted in frameworks for programs later offered by NYSERDA and in multiple publications that have helped regulators, utilities, and potential end users understand the features, benefits, and challenges to implementing CHP.

Virginia's energy office has been central to the state's recent efforts to develop a state energy plan. Staff have convened diverse stakeholder groups and facilitated meetings. Its website hosts information on the process and updates on its progress. Although development of state energy plans is not something an SEO would start on its own – they are usually initiated by the Governor's Office – the tasks Virginia Department of Mines, Minerals, and Energy (DMME) has

undertaken are representative of the power of convening a SEO has.
https://www.dmme.virginia.gov/de/VirginiaEnergyPlan.shtml

ORGANIZING BEST PRACTICES WORKSHOPS:

A common point of entry to energy efficiency is through training workers how to identify and address low-cost and no-cost energy measures. Simple maintenance activities such as fixing compressed air or steam leaks can save companies thousands of dollars a year in energy costs. The most effective training is done on-site and is sustained over time. However, this is often difficult to arrange and has limitations in scalability. Therefore, many programs organize best practices workshops for maintenance and engineering staff from multiple organizations to attend. The Building Operator Training program offered by OEP is an example of a state agency supporting a training program that results in workers earning transportable credentials.

Several years ago, the US Department of Energy provided a series of best practices workshops to help workers understand how to minimize the use of energy in their motor-driven systems, steam systems, and process heating operations. Each of these workshops lasted a full day and was facilitated by a DOE Qualified Instructor. DOE no longer supports this program, but much of the training material still exists and has been incorporated by private sector companies into their own training services. DEP could identify such resources and work with other stakeholders such as EDCs to provide them. Partnering organizations might provide a training location and help with promotion.

US DOE Best Practices Workshops

- Motor Challenge: learn how to determine energy cost savings with high-efficiency motors
- Compressed Air Challenge: learn how to save energy with proper maintenance practices
- Pump Challenge: learn how to save energy with proper system design
- Steam System: learn how to properly operate system and optimize steam use
- Process Heating: learn how to minimize fuel consumption
- Fans: learn how to save energy with proper fan selection and operation

A workshop might attract 20-40 people representing one or two dozen facilities. By organizing workshops around the state, the EPO might reach several hundred workers each year. Sustaining such an initiative over several years will reach several thousand workers and several hundred facilities.

Example of state workshop program

Ohio's state energy office, the Ohio of Energy, within the Ohio Development Services Agency, partnered with Energy Industries of Ohio (EIO) to establish a cooperative program to assist industrial companies become more efficient by providing assessments as part of the in-plant training effort that is part of the US DOE's Better Plants Program. The initiative also provided best practices workshops that covered motor-drive systems and natural gas fueled processes.

- The initiative provided 14 assessments, 8 workshops, 1 demonstration event and developed 2 case studies.
- https://www.energy.gov/eere/amo/ohio-center-industrial-energy-efficiency

DEP's EPO will likely need partners to organize workshops. Doing so will spread the costs and increase the volume of outreach activity promoting the workshops. The following organizations are likely candidates:

- Utilities
- Rural Electric Co-Ops
- Gas utilities (PECO, UGI, PNG,…)
- Industrial Assessment Center at Lehigh University
- Penn State University outreach programs
- Department of Community and Economic Development
- PASBO, PA STMA, Etc.
- Local economic development organizations
- Agricultural Extension Offices
- Trade organizations
- PA Manufacturers Association
- Energy Association of Pennsylvania
- Trade Unions
- SEFs (state energy funds)
- PennTAP, ETAC
- Schools (AVTSs, CCs, SSHE, state-funded universities, etc.)
- KEEA
- PA's (3) USGBC chapters
- EnergyStar, FEMP, DOE, EPA, Etc.

ENERGY EFFICIENCY, POLLUTION PREVENTION, AND WATER CONSERVATION TRAINING:

No single entity is taking on all three of these issues. In fact, electricity savings and natural gas savings are seldom addressed at the same time given the fact that Act 129 programs can only focus on electricity savings. New training resources can help Pennsylvania companies connect these issues. Combining the training is in itself an efficiency. The training may already exist and the EPO only needs to find it and work with other organizations to make it available across the state. A first step is to convene stakeholders to identify needed training. The list needn't be exhaustive. Just enough to get the ball rolling. If the desired training isn't readily available, there are organizations within PA that can develop it (perhaps a group of them can work together). The Energy Office's role is to bring people together to come up with a plan and then keep them marching towards the implementation of that plan.

The Pennsylvania Department of Community and Economic Development (DCED) recently received several million dollars for workforce development. This may represent an excellent opportunity to incorporate E2, P2, and water conservation training into local economic development. Such knowledge and skills are transferrable across companies and across

business sectors. Many employers are seeking workers with such skills. One activity that might ensure E2 and P2 training is included is to bring those employers' voices into the discussion of the training DCED will provide.

Arizona Public Service Solutions for Business

The Arizona Public Service (APS) Solutions for Business program is a program that provides a combination of technical assistance, prescriptive rebates, and custom incentives. It offers cash incentives, training, and energy information services to help nonresidential customers increase energy savings and reduce demand.

Training workshops are open to customers and industry professionals on a variety of program-specific information (trade ally orientation and application training) as well as specific energy-related topics and technologies. APS collaborates with the Arizona chapter of the Association of Energy Engineers to coordinate and conduct training; over the past two years, more than 600 participants have attended this program-sponsored training. Topics range from energy studies, to motor systems and energy codes. Local subject-matter experts serve as instructors and continuing education credits offered to attendees for most training topics. In 2012, the program collaborated with the Governor's Office of Energy Policy to conduct training on energy codes and standards, and pump systems for wastewater treatment facilities.

Energy Efficiency Opportunity Assessments:

Analyzing a facility's opportunities to save energy is a necessary first step to saving energy. It is for this reason that many programs provide energy assessments. However, given their ubiquity, there is not a consensus in the energy efficiency community as to whether or not they lead to action. A common opinion is that recipients should either incur a cost share or commit to following through on a certain number of recommendations. The thinking is that if recipients have "skin in the game" they are more likely to implement projects.

Since DEP's EPO is seeking suggestions that lead to engaging the greatest number of companies, it may want to consider leveraging existing services provided by other programs or private sector activity. The EPO can support existing energy assessment programs with its awareness activities, its marketing, and outreach. It may also choose to provide financial assistance to such programs so that they can provide more audits. Providing assessments to a specific sector is also an option. For example, the Minnesota state energy office has a program focused on local governments.

Examples of SEO-funded energy assessment programs

The Minnesota Commerce Department, Division of Energy Resources provides local units of government and school districts assessments to identify, study, implement, and finance energy efficiency and recommissioning projects. The Local Energy Efficiency Program (LEEP) makes it easy to identify site-specific goals, find high-quality firms to perform an investment grade audit, and gain access to low-interest lease-purchase financing. Participants gain access to Commerce's technical assistance through each stage of the process, ensuring a comprehensive, cost-effective, quality project.

- https://mn.gov/commerce/industries/energy/technical-assistance/leep.jsp

ACT 129 PROGRAMS:

PA's Energy Office has a supporting role in the Act 129 programs provided by the state's energy distribution companies (EDCs). It can help increase participation in these programs through its marketing, awareness, educational, and training activities. The website discussed above could be a key part of this activity. Another important activity is to organize activities around the state and every year that bring together key stakeholders so that they can learn of each other's programs, have the opportunity to network, and discuss working together. The EPO has the statewide view of activities and interested parties to ensure that such events are as comprehensive in scope and coverage as possible.

Contact information and the details of business-focused EDC programs are listed in Appendix A.

CONTINUOUS IMPROVEMENT PROGRAMS:

Many efficiency programs across North America have created continuous improvement programs that target energy. They help companies implement a systematic approach to managing their facility's energy use and to seek opportunities to save energy. These programs provide training and mentorship as well as access to financial incentives.

Such programs help companies implement a systematic approach to managing their facility's energy use and to seek opportunities to save energy. These programs provide training and mentorship as well as access to financial incentives. The most advanced programs help companies achieve ISO 50001 certification, an accreditation the International Organization for Standards developed for energy management systems (somewhat analogous to ISO 90001 for quality management and ISO 140001 for environmental management). The Department of Energy has developed an additional voluntary Superior Energy Performance program to certify facilities that adopt ISO 50001 and demonstrate energy savings.

50001 Ready is a new US DOE program that is intended for companies that are either not ready to take on all the tasks and costs of full ISO50001 certification, or that do not have sufficient energy consumption to justify the allocation of resource. 50001 Ready is a self-guided approach for facilities to establish an energy management system and self-attest to the structure of ISO 50001, a voluntary global standard for energy management systems in industrial, commercial, and institutional facilities.

- 50001 Ready Navigator is an on-line tool with a set of 25 tasks that set up an energy management system
- https://www.energy.gov/eere/amo/50001-ready-program
- Several utility sector energy efficiency programs such are considering how they might incorporate the 50001 Ready Navigator.

Pennsylvania's EDCs do not currently offer continuous improvement programs like strategic energy management (SEM) or ISO50001. The people we talked with gave us two reasons for this: uncertainty whether or not a SEM program fits within Act 129 and uncertainty if

customers' receptivity to such programs. Given the success of such programs in other states, it is worth investigating whether or not an EDC could include it in its Act 129 programs. As a solution to the second issue, we suggest working with organizations such as NIST MEP Centers that are already engaging customers on implementing continuous improvement.

Pennsylvania's Industrial Resource Center Foundation, the operator of Pennsylvania's NIST Manufacturing Extension Partnership (MEP) Center has a network of seven centers that provide Lean Manufacturing continuous improvement training and consulting to small and medium size manufacturing concerns to help them reduce operating costs and improve productivity. Some of them include energy efficiency and sustainability in their engagement activities. DEP could work with PA MEP to build energy efficiency into the training and technical assistance its centers provide and to connect their representatives with those of the EDCs' representatives. It is much easier for MEP Center trainers to focus on energy efficiency when they are familiar with the financial assistance available from EDC programs.

Energy Manager Co-Funding Programs

Bonneville Power Administration (BPA), BC Hydro, and Puget Sound Energy have programs that pay a portion or all of the salary of a full-time on-site energy manager for their larger customers. BPA's program is typical of such initiatives. To be eligible, companies must have the potential for over 1000 MWh/year of energy savings. The portion of the salary covered by BPA depends upon expected customer savings. At 1000 MWh/ year, BPA will pay 25%. At 5000 MWh/year, it will pay 100%.

Most energy manager programs place managers at large energy-intensive facilities. An energy manager could be shared by two or more facilities if they were not direct competitors. Energy managers can be new hires or reassigned existing employees. The key requirement is that the person is dedicated to focusing on energy savings. Many programs also require the manager to set up an energy team, identify projects that are eligible for incentives from other utility programs, and lead the implementation of a continuous improvement program.

- Guide on setting up an energy manager program: Kolwey, N. 2016. "Energy Manager Co-funding", Boulder, CO: Southwest Energy Efficiency Project. www.swenergy.org/data/sites/1/media/documents/publications/documents/Energy_Manager_Cofunding_SWEEP_Jan-2016.pdf

Agricultural Programs

Through the Rural Energy for America Program (REAP), the USDA has provided financial assistance in the forms of grants and low-interest loans for many years. Unfortunately, most agribusinesses remain unaware of these services. The EPO can work with rural co-ops and local economic development organizations to bring greater awareness to the REAP and technical assistance provide by local ag extension offices. EPO can also tailor some of the awareness and training events to the needs of agribusinesses. For example, it might develop a best practices workshop just for dairy farmers.

NEEA Irrigation Initiative

The Northwest Energy Efficiency Alliance (NEEA) developed a program to save energy by helping agribusiness optimize their use of irrigation. The program consists of four parts:

- Demonstrations: fund projects that demonstrate energy savings from precision flat rate irrigation, variable speed irrigation, and variable rate irrigation.
- Data standards: fund development of software tools to help farmers determine optimal irrigation
- Business cases: build case studies to help communicate features and benefits
- Outreach and marketing: develop awareness among industry stakeholders

PG&E Dairy and Winery Industry Efficiency Solutions Program

- Program administrator CLEAResult provides energy efficiency experts to help customers identify and implement solutions that can reduce expenses, improve operations, and strengthen overall energy performance.
- Customers can apply for incentives up to 100% of incremental costs or up to 50% of total project costs, not to exceed $2000.
- https://www.pge.com/pge_global/common/pdfs/save-energy-money/business-solutions-and-rebates/savings-by-industry/agriculture-and-food-processing/2017-3rdParty-DairyIndustry-FIN-ADA.pdf

Minnesota Department of Commerce - Dairy Energy Efficiency

- The Minnesota energy office partnered with a local milk cooperative. The program team project surveyed 57 cooperative member dairies to gather data about dairy farm size, equipment use, and energy behavior toward targeted energy efficiency services. Using the data collected, the team identified 30 cooperative member dairies with significant energy savings potential and provided 30 on-farm energy audits to quantify energy savings potential and determine specific recommendations. The project team also developed an energy benchmarking tool so dairies could determine how their energy use measures relative to hundreds of dairies in the region. Upon completion of the dairy farm audits, the project connected dairies with local electric utility staff, USDA program agents, and dairy equipment suppliers who might have financial and technical assistance to help them implement energy audit recommendations. Energy efficient lighting, placement of variable speed drives on milk pumps, and efficient water heating were found to be the most cost-effective energy savings projects. (MN DOC DER 2015)
- Program Flyer: http://mn.gov/commerce-stat/pdfs/dairy-energy-efficiency.pdf
- Program Report (MN DOC DER 2015): http://mn.gov/commerce-stat/pdfs/card-report-tmp-dairy-ee.pdf

An agribusiness-focused program in Pennsylvania could follow the same structure as the NEEA program. Identify and bring attention to emerging best practices through demonstration projects. Make educational materials such as software tools available. Develop case studies based upon demonstration projects. Spread information through events, websites, and engagement activities.

Recommendations and Suggestions

In this memo we have suggested a wide assortment of tasks and project that the EPO will want to prioritize and address strategically as time and resources allow. Intuitively it makes sense to start with a few and then add others as time and resources allow. To help it narrow down its list, EPO held a meeting of its advisory group on August 29. At this meeting, it presented a set of initiatives for consideration and discussion. Getting the group's responses to each item was a key goal of the meeting.

Prior to the meeting, ACEEE suggested to the EPO staff that it include in the list the following three initiatives. We also suggested they add two or three more.

- Dairy Program: EPO could issue a RFP for the development of a list of best practices such as that undertaken by the Minnesota Department of Commerce, or it could contract with an implementer to provide technical assistance, similar to PG&E's dairy and winery program. The technical assistance provider could direct clients to local EDCs for financial assistance as it identifies potential energy measures.
- Energy efficiency resources website: EPO can set the parameters for a website and identify resources to include. It could issue an RFP for development of the website and fund some or all of its development and maintenance.
- Workshops: EPO could convene an advisory group to determine the types of workshops that could be of greatest value, the target audiences, and where to hold them. With that information the next step will be to develop a list of potential providers, develop a budget, and develop a funding plan.

EPO staff discussed these recommendations and developed the following list of issues to discuss at the August 29 meeting.

- Dairy and agriculture programs
- University-based programs that train students in energy efficiency and energy management
- Subsidized energy manager programs
- Effective marketing to increase participation in Pennsylvania Act 129 programs and other initiatives
- Development of a resource such as a website to list all energy efficiency-related programs and initiatives in Pennsylvania

The advisory group engaged on all of these topics and produced several actionable suggestions. A few attendees committed to some initial steps that could lead to new collaborations and new initiatives. The most promising discussions revolved around outreach to the dairy industry. There was also interest in various workforce development initiatives and collaborative marketing efforts. Based on the interest shown by advisory group members at the August meeting and earlier this year at the June meeting, we suggest EPO consider the following three initiatives.

DAIRY/AG INITIATIVE

The group expressed interest in learning more about both the MN Department of Commerce's Dairy Cooperative Partnerships for Improved Energy Efficiency Program Adoption and the PG&E Dairy and Winery Industry Efficiency Solutions Programs, and how to apply lessons learned from both programs towards outreach and engagement with Pennsylvania's dairy industry. It could be used to train conservation district staffs and program allies. The PG&E program might be duplicated within each EDC's Act 129 programs, as well as by rural electric cooperatives.

Participants also identified ways to work together to duplicate the Minnesota model of leveraging existing trade association relationships. Pennsylvania's Department of Agriculture and The Center for Dairy Excellence are both potential channels to reach those businesses. Many dairies are in EDC service territories and can take advantage of their assistance programs. Attendees quickly concluded that they had the necessary resources and could easily move forward on this opportunity. Several attendees committed to further interaction and determining how to move forward. EPO should continue to engage with all of the people who expressed interest in this topic. Conversations with stakeholders could focus on determining the scope of a new initiative.

MARKETING INITIATIVE

Attendees also expressed an interest in developing an informational resource that sector stakeholders can access to learn about energy efficiency programs and initiatives across the state. The generally preferred format among participants seemed to be a website. Suggested elements of the website include information and links to Act 129 efficiency programs, service providers, implementers, as well as case studies. To help organizations develop case studies, attendees suggested that collectively the group should identify and define common key performance indicators (KPIs). This way, programs could focus on KPIs in their marketing materials and call them out in their case studies. This will communicate the full value of efficiency to potential program participants.

Though it was not discussed in detail in the meeting, the EPO has the opportunity play a key role in advancing this initiative by setting the parameters for a website and the materials to be listed. For example, it can determine the scope of program types to be included. EPO can also reach out to programs and initiatives to submit their materials once the platform is launched. In the near-term task the EPO can gauge interest beyond the advisory group, and request financial and in-kind support for the development of a new resource.

The organization of public outreach and awareness activities is another strategy that the group discussed. Utilities often schedule short awareness events to let their customers know about Act 129 programs. EPO could support or participate in these types of events around the state to increase awareness of Act 129 programs and other resources.

One suggestion from the group was to cobrand awareness and training events. A cobranding marketing strategy would reach more people and communicate a broader support for the events and the initiatives they promote.

The development of a web resource and scheduling of awareness events should create greater awareness of Act 129 programs. That awareness in turn could translate into more small and medium companies taking advantage of Act 129 programs and potentially, facilitate collaboration between utility programs and the other energy efficiency resources in Pennsylvania.

Workforce Development Initiatives

Several universities and technical schools across Pennsylvania already train students in energy efficiency and energy management. Penn State, Penn College, and Northampton Community College have existing programs. PennTAP and ETAC work with some of them. These programs are popular and currently operating at or near capacity. The group discussed how they might expand or duplicate these programs to assist more companies and train more students, but did not come to any conclusions. This is an opportunity for EPO to explore further. What actions could it take to expand the capacity of existing programs?

Several of the organizations represented at the meeting organize workshops and certification training programs. The availability of training is inconsistent across the state and so there is an opportunity for more and for coordination among providers. Attendees recognized this and several of them expressed interest in coordinating with each other. To bring structure and scope to such collaboration, EPO could convene an interest group to determine what training is already available and what types of workshops that are likely to be of greatest value. The group could also identify potential target audiences and training locations. Information related to providers should be included in the web resource once it is created and perhaps it could also have a calendar feature to list training events.

The group was intrigued by the examples of energy manager programs operated by several utilities in the US and Canada. None of the utilities in Pennsylvania currently offers such a program. There was some interest in EPO developing such a program, but it was not identified as a priority. A potential follow-up activity is to contact utility, economic development, and business organization stakeholders and ask them if they see a demand for such a program. If there is, follow-up actions to determine the scope of such a program should identify the target audience, funding sources, and programmatic goals.

Next Steps

The next steps for EPO will be to determine which initiative or initiatives to pursue. Once it makes its selections, it will go through its normal process of developing project or program proposals inclusive of scopes of work, identification of needed resources, timelines and all the typical logistics of implementing a new initiative. Since each of the initiatives recommended requires the involvement of several other organizations besides DEP, a key EPO activity will be convening working groups, facilitating discussions, and communicating decisions. As a state energy office, EPO is well suited for these activities.

We hope this information and these suggestions are helpful to you as you move forward with your strategic planning. Thank you for this opportunity to provide EPO technical assistance.

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We have enjoyed working with you. We wish you great success as you move forward and look forward to continued association in the future.

Appendix A: List of Existing Programs

We have attempted in this list to capture all of the programmatic activity in Pennsylvania targeting small, medium, and large industrial customers. Some of these programs also target commercial and institutional facilities. Although we have attempted to capture all relevant programs, it is unlikely that this list is comprehensive.

In addition, this list does not include any private sector initiatives such as those offered by trade organizations, trade unions, educational institutions, NPOs, and engineering societies such as American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) and Building Operators and Managers Association (BOMA).

EXISTING UTILITY C&I PROGRAMS

UGI Utilities, Inc.

Headquartered in Reading, PA, UGI utilities consists of two divisions – gas service and electric service – and two wholly owned subsidiaries, UGI Penn Natural Gas, Inc. and UGI Central Penn Gas, Inc. A map of UGI's coverage area is available here.

Custom Incentive Program: Through partnership with local trade allies, UGI offers a variety of custom incentive options for projects including retrofits of inefficient equipment, new construction, major renovation and remodeling, new equipment purchases/replacements, and operations and maintenance improvements. (Link)

HVAC Tune-Up Program: The program is designed to increase the operating performance of electric HVAC systems in commercial buildings. The program offers financial incentives to HVAC contractors to diagnose performance inefficiencies and make energy-saving retrofits. Customers are eligible for a HVAC tune-up once every three years with areas of focus including refrigeration components, air distribution systems, and controls.

Small Commercial Fuel Switching Program: The program encourages energy efficiency on a total fuel cycle basis by promoting the use of natural gas appliances (such as furnaces, water heaters, and clothes dryers) that use less energy and emit less carbon than electric appliances.

Natural Gas Business Rebates (for UGI Gas commercial customers with a rate class of N or NT): Including rebates for commercial boilers, water heaters, kitchen fryers, steam cookers, pre-rinse spray valves, warm air unit heaters, and steam traps.

PPL Electric Utilities

Headquartered in Allentown, PA, PPL Electric serves approximately 1.4 million customers in 29 counties across central and eastern Pennsylvania. A map of its service territory can be found here.

Efficient Equipment Program: The program offers incentives for lighting, equipment (HVAC, refrigeration, motors, food service, and office), and agriculture equipment through three delivery channels—standard path, direct discount, and Distributor Discount. This program targets small C&I, large C&I, GNE, and agricultural customers.

Commercial and Industrial (C&I) Custom Program: This program offers financial incentives to customers who install equipment that is not offered in PPL Electric Utilities' other commercial programs. These products may include new or replacement energy-efficient equipment, retrocommissioning, repairs, equipment optimization, new construction, operational and process improvements, combined heat and power (CHP), and behavioral changes that result in cost-effective energy savings. The program also includes a continuous energy improvement component, through which PPL Electric Utilities works closely with customers, primarily school districts, to identify ways to reduce their electricity usage through improved operations and maintenance and behavioral changes. The program offers performance-based incentives for the avoided or reduced energy consumption—in kilowatt hours per year (kWh/yr)—that result from the project.

https://www.pplelectricbusinesssavings.com/rebates/grants-loans-and-tax-credits

Duquesne Light Company

Headquartered in Pittsburgh, Pa, Duquesne Light Company serves nearly 600,000 customers in Allegheny and Beaver counties.

Express Efficiency programs: These programs provide rebates to offset the higher cost of high efficiency equipment when compared to standard efficiency equipment. They target all Duquesne Light commercial and industrial customers with maximum demand less than 300 kW, that are not already participating in other Act 129 programs.

Commercial Efficiency: These programs provides rebates to offset the higher cost of high-efficiency equipment when compared to standard efficiency equipment. The CEP also includes energy audits which provide business customers a readily available, reliable source of information about their energy use and outline ways to save energy, that when implemented, result in energy savings, reduced operating costs, lowered carbon emissions and improved air quality. The CEP targets all Duquesne Light commercial customers with maximum monthly demand equal to or greater than 300 kW.

Small/Medium and Large Nonresidential Midstream Lighting Program: This program was designed to remove barriers by providing point of sale incentives to commercial customers. Common barriers in traditional programs include lengthy application processes and rebate delays. However, this nonresidential program offers instant rebates (discounted pricing) at point of purchase to eligible customers who purchase program LEDs from participating DLC distributor partners. DLC electric commercial-rate customers and contractors are eligible to participate with the exclusion of new construction projects.

Small Commercial Direct Install Program: This program offers no-cost direct installation of energy efficient measures at small and medium C&I customers with monthly demand less than 300 kW. The program addresses 'split-incentives' and other barriers by providing no-cost efficiency upgrades, whereby landlords received no-cost building upgrades and small business tenants benefit from lower electric bills. While others are eligible, the program is targeting primarily independent small commercial customers (typically convenience stores and restaurants) with some refrigeration measures which contribute to more cost-effective projects.

Multifamily Housing Retrofit Program: offers multifamily facility operators a "one-stop shop" to receive project cost-share incentives as well as energy efficiency audits, technical project review, property aggregation, contractor negotiation, and equipment bulk purchasing services. Operated in conjunction with the Public Agency Partnership Program, the MFHR can be a technical financial resource for public housing authorities as well as private owners of low income housing with more than four units. Duquesne Light works with the Housing Alliance of Pennsylvania (PHFA), affordable housing trade groups and other interested parties to coordinate and tailor services focused on the development of affordable housing.

Industrial Efficiency Program: Helps industrial business customers make smart, energy-efficient decisions to reduce energy consumption and energy costs. Nexant, the approved program administrator, provides technical assistance to identify energy-saving projects; assistance identifying financing options; estimates of project cost and savings; and program rebates to help offset projects. Common efficiency measures include variable frequency drives, compressed air, refrigeration systems controls, process cooling, lighting.

PECO Energy Company

Headquartered in Philadelphia, PECO delivers power to more than 1.6 million electric customers and more than 511,000 natural gas customers in southeastern Pennsylvania. PECO is a subsidiary of Exelon Corporation and covers the southeastern PA counties of Bucks, Chester, Delaware, Lancaster, Montgomery, Philadelphia, York.

Small C&I Energy Efficiency Program: Four solutions and two targeted market segments make up the Small C&I EE Program: the Equipment and Systems Solution, the Whole Building Solution, the Behavioral Solution, the New Construction Solution, the Data Centers Targeted Market Segment, and the Multifamily Targeted Market Segment.

Large C&I Energy Efficiency Program: Two solutions and two targeted market segments make up the Large C&I EE Program: the Equipment and Systems Solution, the New Construction Solution, the Data Centers Targeted Market Segment, and the Multifamily Targeted Market Segment.

Combined Heat and Power Program: PECO's Call for CHP Projects (CfP) program provides interested customers the opportunity to compete for financial incentives based on the merits and qualifications of their project submission. To participate in this CfP, a Customer must submit a completed Project Submission Form to PECO via email within the CfP window. The CfP window is the period of time between the issuance of a call and the deadline for project submission form. The call schedule is maintained on the CHP website at www.peco.com/chp.

First Energy

First Energy's service territories cover most of Pennsylvania and include utilities Metropolitan Edison (Met-Ed), Pennsylvania Electric Company (PENELEC), Pennsylvania Power Company (Penn Power), and West Penn Power Company (WPP). A map of respective service territories is

available here. Commercial & industrial efficiency programs provided by First Energy utilities generally include the following:

Commercial & Industrial Demand Response Program: Commercial, industrial, governmental and institutional customers of Met-Ed, Penn Power and West Penn Power can receive financial incentives for reducing their demand for energy in the summer months during peak load days. Load reduction techniques include temporarily reducing or shutting down an industrial process, turning off lights in groups or sequences, reducing the use of HVAC systems, shutting down large motors and compressors, or starting back-up generation.

Business Energy Analyzer: An online tool to review your business's energy usage and identify way to improve efficiency.

Appliances & Electronics Incentives: offered to Pennsylvania small commercial, industrial, government and institutional customers of Met-Ed, Penelec, Penn Power and West Penn Power. The Program offers incentives to participants to install high-efficiency equipment such as ENERGY STAR® certified appliances and electronics, such as heat pump and solar water heaters, office equipment, and uninterruptable power supplies.

Lighting Incentives: offered to commercial, industrial, governmental and institutional customers. This Program is available for retrofit/renovation of existing facilities and new construction projects. The Program provides incentives to encourage participants to install high-efficiency lighting equipment and control.

Custom Building Incentives: offered to commercial, industrial, governmental and institutional customers for retrofits and new construction projects that include technologies or customer-specific energy efficiency projects that do not meet the eligibility criteria for other business programs. Custom projects include building shell and systems improvements that reduce energy consumption and demand by improving building energy performance. To qualify for incentives, projects must show minimum savings estimates.

Custom Equipment Incentives: offered to commercial, industrial, governmental and institutional customers. Custom projects include technologies or customer-specific energy efficiency projects that do not meet the eligibility criteria for other business programs. Projects must have a Total Resource Cost (TRC) test score of one or greater. Eligible measures include, industrial process upgrades, energy management system installation, compressed air system upgrades, air cooled chillers, motor upgrades, water/wastewater system improvements, and others.

Facility Audits: offered to commercial, industrial, governmental and institutional customers. This program encourages customers to acquire a detailed audit of industrial processes or systems or detailed ASHRAE Level 2 third party energy audit for their buildings. The Program provides financial support through incentives to customers who implement qualifying audit-recommended energy efficiency prescriptive or custom measures.

Food Services Incentives: offered to small commercial and industrial customers. This Program offers incentives to encourage participants to install high-efficiency food service equipment and equipment controls. Typical participants in the Food Service Incentive Program include grocery, convenience stores and restaurants, as well as schools, hospitals and lodging facilities, which include food service equipment.

HVAC Incentives: offered to commercial, industrial, governmental and institutional customers. The program offers incentives to encourage participants to install high-efficiency heating, ventilation and air conditioning equipment.

Municipal Traffic Lighting: offered to governmental customers to encourage participants to install high-efficiency traffic signals through per-unit incentives. Flat-rate incentives per signal are offered for converting to LED round signals, LED 8″ and 12″ red, yellow and green turn signals, and LED pedestrian signals.

Energy Efficient New Homes (for builders): provides financial incentives for construction of more energy-efficient single-family, multifamily and manufactured homes. The program offers at minimum 30¢ per kWh saved for homes that meet energy efficiency requirements. Additional incentives are available for builders who comply with ENERGY STAR® V3.0 certification requirements or who build housing for low-income residents.

Low-Income Multifamily Programs: offered to landlords and building owners with income-qualifying tenants and includes programs for common area energy-efficient, as for both individually metered and master-metered buildings.

Appendix B: Other Technical and Financial Assistance Programs

Organization	Program Name	Website	Brief description of services provided
ETAC	p2/e2 Assessment Program	https://northampton.edu/noncredit/center-for-business-and-industry/technical-trades-and-computer-training/emerging-technology-applications-center/energy-management.htm	On-site energy assessments for small to mid-sized manufacturers
Industrial Resource Center	Catalyst Connection (IRC)		Manufacturing Extension Partnership Center that provides technical and managerial support to small and medium size manufacturers
Industrial Resource Center	Innovative Manufacturing Center (IRC)		Manufacturing Extension Partnership Center that provides technical and managerial support to small and medium size manufacturers
Industrial Resource Center	Northeast PA IRC		Manufacturing Extension Partnership Center that provides technical and managerial support to small and medium size manufacturers
Industrial Resource Center	Mantec (IRC)		Manufacturing Extension Partnership Center that provides technical and managerial support to small and medium size manufacturers
Industrial Resource Center	Manufacturer's Resource Center (IRC)		Manufacturing Extension Partnership Center that provides technical and managerial support to small and medium size manufacturers
Industrial Resource Center	Northwest IRC	https://www.nwirc.org/	Manufacturing Extension Partnership Center that provides technical and managerial support to small and medium size manufacturers
Industrial Resource Center	Delaware Valley IRC		Manufacturing Extension Partnership Center that provides technical and managerial support to small and medium size manufacturers
Lehigh University	Industrial Assessment Center	https://www.energy.gov/eere/amo/locations-industrial-assessment-centers#leh	
PA DCED	ACE (Alternative Clean Energy) Program	https://dced.pa.gov/programs/alternative-clean-energy-program-ace/	Grant program for alternative clean energy projects
PA DEP	SBAG (Small Business Advantage Grants)	http://www.dep.pa.gov/Citizens/GrantsLoansRebates/SmallBusinessOmbudsmanOffice/Pages/Small%20Business%20Advantage%20Grant.aspx	Small grants for P2 or E2 projects at eligible small businesses in PA
PA DEP	PPAA (Pollution Prevention Assistance Account)	http://www.dep.pa.gov/Citizens/GrantsLoansRebates/SmallBusinessOmbudsmanOffice/Pages/PPAA%20Loan.aspx	Low interest loans for P2 or E2 projects in PA
PA DEP	PEDA (Pennsylvania Energy Development Authority)	http://www.dep.pa.gov/Business/Energy/OfficeofPollutionPrevention/FInancialOptions/PagesPEDA.aspx	Grant program for renewable energy and E2 projects in PA (currently closed)
PA DEP and Reinvestment Fund	GELF (Green Energy Loan Fund)	https://www.reinvestment.com/GELF/PAGELF.html	Loan fund for large energy conservation and energy efficiency projects
PennTAP	p2/e2 Assessment Program	https://penntap.psu.edu/energy-environment/pollution-prevention-energy-efficiency/	Energy efficiency and pollution prevention assessments and technical assistance for small to mid-sized manufacturers
PennTAP	Building Operator Certificate (BOC) Training	https://www.pct.edu/business/national-sustainable-structures-center/building-operator-certification	Building operator certification (BOC) training and credential program provides best practices training in energy efficiency and operational maintenance
PennTAP	Building Energy Codes Training	https://www.pct.edu/business/national-sustainable-structures-center/building-operator-certification	
PennTAP	Building Re-tuning Training (BRT)	https://www.pct.edu/business/national-sustainable-structures-center/building-operator-certification	
USDA	Energy Tools website	https://energytools.sc.egov.usda.gov/	Energy estimator tools for animal housing, irrigation, nitrogen, grain drying, and tillage
USDA (Rural Development)	REAP (Rural Energy for America Program)	https://www.rd.usda.gov/programs-services/rural-energy-america-program-renewable-energy-systems-energy-efficiency	Loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make E2 improvements

Appendix C: An Overview of Industrial Energy Efficiency Programs

The industrial sector represents a third of the nation's energy consumption and an equally significant portion of opportunities to save energy. Fortunately, many companies in the industrial sector understand their energy issues and know how to implement energy savings measures. The challenge they face in investing in energy efficiency projects is that those projects compete for time and capital with all the other priorities and opportunities they have.

To encourage companies to make such investments either sooner or at all, many utilities, and federal and state agencies offer incentives programs. Such programs offer some combination of technical and financial assistance. Technical assistance ranges from fact sheets to on-site energy managers who identify and justify projects. Financial assistance provides incentives to utility customers, product distributors, and service providers.

There are many types of programs and many ways to organize them. The following program descriptions explain through example how programs in North America are serving large energy users and helping them save energy, manage their energy usage, and contribute to utility energy savings targets.

Technical Assistance Programs

Most programs offer some level of technical assistance. At a minimum, they might include mailers that recommend best practices and contain links to resources such as those provided by the Department of Energy. They might also include on-line tools for benchmarking and performing rudimentary bill analysis.

One of the most common types of technical assistance program is to provide an energy audit. These range from an inexpensive cursory walk through to identify opportunities to engineering grade analyses. Some programs pay some or all of the salary of on-site energy managers to help companies organize energy teams, conduct training, and identify projects. Such programs often require multi-year commitments to implement projects and to achieve energy savings goals.

NEEA Irrigation Initiative

The Northwest Energy Efficiency Alliance (NEEA) developed a technical assistance program to help agribusiness save energy optimize their use of irrigation. The program consists of four parts:

- Demonstrations: fund projects that demonstrate energy savings from precision flat rate irrigation, variable speed irrigation, and variable rate irrigation.
- Data standards: fund development of software tools to help farmers determine optimal irrigation
- Business cases: build case studies to help communicate features and benefits
- Outreach and marketing: develop awareness among industry stakeholders

Prescriptive Programs

Providing rebates to customers who purchase qualifying equipment is one of the most common types of energy efficiency programs. The basic concept is that the incentive is close to the value

of the average amount of energy a customer will save. Programs will determine or "deem" the savings for a specific measure based on historical field and research data for that measure. The incentive is "prescribed", or a fixed amount. Many programs offer prescriptive rebates for NEMA Premium™ induction motors or for variable speed drives. Such programs are easier to manage and evaluate than programs that determine energy savings on a project by project basis.

CUSTOM PROGRAMS

Custom programs allow customers to develop specific projects that may be a mix of technologies and practices. For building systems, programs typically structure rebates based on the amount of energy savings achieved, typically in terms of $/kWh saved. To receive custom rebates, participants are first required to complete an engineering and cost analysis of a proposed project. Sometimes program staff or contractors perform this assessment, while in other instances, customers are responsible for performing the analyses.

Some custom programs assist industrial customers upgrade their manufacturing processes. In such a program, program administrators will base financial incentives on a per-unit-of-production method. These types of programs emphasize savings from the entire manufacturing process rather than from individual devices. Here are three ways to organize a custom C&I program portfolio:

1. *By customer class (commercial versus industrial)*. Some C&I custom programs allow both commercial and industrial customers to participate, while others have separate offerings for customers with only buildings (commercial and institutional) and for those with industrial processes (factories, mining, water, and water treatment facilities).
2. *By customer type (e.g., health care, schools)*. Similar to categorizing by customer class, using a framework of customer types enables administrators to cater offerings to specific types of buildings and facilities.
3. *By customer size*. Small business programs are often a separate category because they are good targets for direct install projects. Large customers with energy-intensive processes are good targets for standard offers ($/kWh) and for process efficiency programs.

PG&E Dairy and Winery Industry Efficiency Solutions Program

Pacific Gas and Electric Company's (PG&E) program targeting dairies and wineries provides both technical and financial assistance. Program administrator CLEAResult provides energy efficiency experts to help customers identify and implement solutions that can reduce expenses, improve operations, and strengthen overall energy performance. Customers can apply for incentives up to 100% of incremental costs or up to 50% of total project costs, not to exceed $2000.

Arizona Public Service Solutions for Business

The Arizona Public Service (APS) Solutions for Business program is a program that provides a combination of technical assistance, prescriptive rebates, and custom incentives. It offers cash incentives, training, and energy information services to help nonresidential customers increase

energy savings and reduce demand. APS targets four customer project types: large existing (retrofit), large new construction, small (retrofit) and schools (retrofit).

The program offers incentives for a range of existing and new construction projects that implement energy-saving equipment or controls to reduce energy use and qualify under the program's offerings. Technologies include lighting, HVAC, refrigeration, motors, controls and building envelope materials.

Training workshops are open to customers and industry professionals on a variety of program-specific information (trade ally orientation and application training) as well as specific energy-related topics and technologies. APS collaborates with the Arizona chapter of the Association of Energy Engineers to coordinate and conduct training; over the past two years, more than 600 participants have attended this program-sponsored training. Topics range from energy studies, to motor systems and energy codes. Local subject-matter experts serve as instructors and continuing education credits offered to attendees for most training topics. In 2012, the program collaborated with the Governor's Office of Energy Policy to conduct training on energy codes and standards, and pump systems for wastewater treatment facilities.

Xcel Energy, Colorado Self Directed Custom Efficiency Product

The Xcel self-direct program provides increased rebates to large commercial and industrial electricity customers who engineer, implement and commission qualifying projects at their facilities. Under the Self-Directed Custom Efficiency Product, the customer performs the design, engineering, measurement, verification, and reporting of energy efficiency projects approved by Xcel Energy. Eligible business customers must be in the Colorado service territory, have aggregate peak demand at all meters of at least two megawatts (MW) in any single month, and have an aggregate annual usage of at least 10,000,000 kWh.

Any technology, process, or system improvement that saves electricity and meets rebate eligibility requirements can be rebated through the program. Self-Directed was designed to provide a path for customers who have access to appropriate resources to properly identify, quantify, scope and implement a project, without the assistance of Xcel Energy. Due to this increased reporting and validation burden placed on the customer, Xcel Energy is able to provide a larger rebate.

The Self-Direct Product also allows the customer to "bundle" electric energy saving opportunities into one project, which allows them to more accurately define a project and capture all of their qualifying energy saving activities. All measures included in the bundled project must have electric energy (kWh) or demand (kW) savings on Xcel Energy's service.

The intent of the offering is to allow customers with the internal expertise, or access to expertise, to drive their own energy efficiency projects while providing utility incentives to help them overcome financial barriers to implementation. This work can either be performed by the customer, if they have the available internal resources, through a third party such as an ESCO (Energy Service Company), or by utilizing an engineering firm in order to meet the Product participation requirements.

CONTINUOUS IMPROVEMENT AND ENERGY MANAGEMENT PROGRAMS

Many programs across North America have created continuous improvement programs that target energy. They help companies implement a systematic approach to managing their facility's energy use and to seek opportunities to save energy. These programs provide training and mentorship as well as access to financial incentives. The most advanced programs help companies achieve ISO 50001 certification, an accreditation the International Organization for Standards developed for energy management systems (somewhat analogous to ISO 90001 for quality management and ISO 140001 for environmental management). The Department of Energy has developed an additional voluntary Superior Energy Performance program to certify facilities that adopt ISO 50001 and demonstrate energy savings.

Bonneville Power Administration (BPA) Energy Smart Industrial (ESI)

Some program administrators like BPA consider their continuous improvement programs a platform for coordinating their engagement of large energy users. The ESI program targets industrial market segments common to the Pacific Northwest, including pulp & paper, wood products, food processing, and water/wastewater. However, any industrial customer of a participating utility is eligible for program participation. ESI engages customers with the following resources:

- Traditional custom projects (e.g., energy efficiency measures in systems such as, refrigeration, compressed air, wastewater and lighting).
- Simplified deemed calculator projects for lighting and small compressed air.
- No-cost/low-cost operations and maintenance improvements
- Behavior-based/continuous improvement methods.

The BPA ESI program is designed to offer a fully integrated set of components for participating utilities to choose from and uses several innovative delivery approaches. Everything from custom projects to energy management savings to "small industrial measures" that provide simplified tools and streamlined processes to handle everything from small capital projects to a robust lighting trade ally component that leverages a strong team of lighting specialists in the field to identify, support, and process prescriptive lighting projects.

BPA's ESI program helps companies implement continuous improvement practices through three initiatives.

- Energy Program Manager (EPM): funding of energy efficiency resources at qualifying industrial facilities to alleviate staffing impediments to energy conservation. The manager is an employee of the facility and is charged with achieving sufficient energy cost savings to cover his or her salary.
- Track and Tune (T&T): low/no-cost operations and maintenance improvements with incentive funding for three-to-five years and include tools for interval data acquisition and performance tracking.
- Strategic Energy Management (SEM): a 12- to 24-month management systems approach to energy efficiency, using behavior-based and continuous improvement methods. Measurement and incentive funding is available for three-to-five years.

Focus on Energy – Large Energy Users Program

Program targets Wisconsin's largest and most energy-intensive industries, and those with the greatest opportunities for energy savings: pulp and paper mills, food processors, metal casters, plastics manufacturers, printers, ethanol producers, and wastewater facilities. Since 2012, the program has successfully reached 74% of large energy users.

All end uses for which there are energy efficiency best practices are or have been included. Electric efficiency measures include lighting, motors/drives, compressed air, pumps, blowers, controls, filtration, refrigeration, aeration, vacuum, HVAC, information technology, process heating and cooling, and other manufacturing processes. On the natural gas side, the Program has targeted steam systems, hot water, process heating, comfort heating, building shell, heat recovery, biomass and biogas conversion.

Recruitment is done through trade organizations, local chapters of engineering societies, utility key account managers and existing customers. Best Practice training events, in the form of classroom courses and webinars, have been delivered for a wide array of technologies and systems, including steam, process heat, ventilation, pumps, compressed air, refrigeration, and Practical Energy Management. The Program has applied its Energy Best Practice Guidebooks to bring Best Practices to key cluster industries.

Their strategic energy management (SEM) continuous improvement type programs are housed within the LEU program. They have two programs in place, a "Leaders SEM" program for large customers and a "Partners SEM" program for smaller or less committed customers. The Leaders programs is based on ISO 50001 energy management standard. They engage each customer one-on-one with Energy Advisors and other technical experts as needed.

There are five types of incentives offered:

1. Prescriptive Incentives - hundreds of prescriptive incentive offerings for technologies such as lighting, compressed air, VFDs, and boiler tune-ups have been offered by the Program
2. Custom incentives - $0.03 per kWh, $100/kW peak reduction, and $0.80/therm
3. Feasibility Studies – up to 50 percent of the cost of a study, not to exceed $7500, was paid to studies that showed good potential for energy saving projects.
4. Staffing Grants – for customers who could demonstrate need for human resources to complete projects.
5. Project Grants – Focus on Energy issues competitive solicitations that award large grants to industrial facilities for process improvements.

ENERGY MANAGEMENT SYSTEMS

Another type of energy management program is to help companies with energy data management systems. These hardware and software packages automatically harvest energy use data from key devices within a facility and may even perform trend analysis. The automating data collection and analysis simplify much of the time-consuming and menial steps of energy management and in doing so, address a common barrier to implementing energy management.

Many new building automation systems have this capability. In manufacturing, some of the more advanced production control systems include dashboards for operators to monitor energy usage. In this fact sheet, we refer to these types of products generically as energy management information systems (EMIS).

Efficiency Nova Scotia EMIS Program

Efficiency Nova Scotia, a Canadian electricity efficiency utility, has offered an EMIS-based program that targets industrial and institutional facilities since 2012. The program provides financial incentives to cover up to 50% of the cost to develop, design, and implement an EMIS. Program participants complete three steps: EMIS audit, EMIS Implementation Plan, and implementation. To date, seven organizations have participated in the program.

The program creates a management infrastructure and provides EMIS training to operators and management. Operators learn how to determine key performance indicators and enter relevant product data into the EMIS, which gives them and management the information for optimizing facility energy use. After implementation, participants benefit from a customized 12-month support plan.

After installation and worker training, the EMIS translates various data streams into information that operators and management can use to develop and carry out energy efficiency plans. Plant personnel can track the performance of each energy efficiency measure using the data automatically collected by or entered into the EMIS.

Cost effectiveness in the first couple of years was $0.03/kWh saved. Efficiency Nova Scotia and program participants consider the EMIS program a success. In program year 2016, four of the seven participants reported savings totaling 2.0 GWh. When combined with savings persisting from prior years, savings totaled 4.7 GWh.

Hydro Quebec, Efficiency New Brunswick, NB Power, and Focus on Energy Wisconsin launched similar EMIS-based programs in recent years and will report program savings in the next year or two. The success of these EMIS-based programs is leading to development of similar programs in San Francisco, California, Portland, Oregon, and other cities.

Recommissioning and Continual Commissioning Programs

One of the last steps involved with building a new office building and then turning it over to the owners is to commission it, which is a process of tuning all of the equipment and controls within the building. Ideally, those adjustments optimize the performance of each piece of equipment relative to its intended use and the performance of the building. However, the operation and occupancy of buildings change over time. Equipment performance degrades and one-time adjustments become permanent changes. Best practice is to routinely reset all of the equipment. To do so in a holistic way is referred to as recommissioning (RCx). To install smart technologies that continuously monitor equipment performance and make routine adjustments is called monitoring-based commissioning (MBCx).

Significant energy savings are possible as well as improved building performance and occupant comfort with these practices. It is for these reasons that many program administrators are including RCx and MBCx programs in their portfolios.

Commonwealth Edison (ComEd) RCx and MBCx programs

These two programs are joint efforts between ComEd and Nicor Gas, North Shore Gas, and Peoples Gas. They fall within ComEd's "Smart Ideas for your Business" portfolio of programs.

Customers receive a free expert analysis of the performance of their building's energy-using systems conducted by an approved engineering firm. In return, they agree to spend at least a minimum amount on implementation of low and no-cost operational improvements with a combined simple payback of 18 months or less. The program targets retail/office buildings, commercial real estate, hospitals, education, hospitality, and other building types with more than 150,000 ft2 of air-conditioned floor space.

The monitoring-based commissioning option was introduced to give customers the opportunity to look for operational improvements on a longer-term basis. A cash incentive is provided to help defray the cost of installing enhanced building automation software, and then participants are paid 7 cents per kWh (and $1.00 per therm in Nicor territory) for verified savings that result from the project during a monitoring period of at least 18 months.

Pacific Gas and Electric (PG&E) Industrial Recommissioning (IRCx) program

IRCx program targets the heavy industry and manufacturing sector and generates energy savings by helping PG&E customers optimize their manufacturing processes by systematically studying low-profile energy losses that commonly occur in manufacturing facilities.

Under the IRCx program, industrial customers receive a free recommissioning audit as well as financial incentives for implementing both recommissioning measures and preventive, proactive maintenance plans. Primary elements of the IRCx program include:

- A preliminary energy audit (or walkthrough) identifies the energy-using equipment at each facility that is a good candidate for recommissioning (RCx).
- More detailed survey is conducted by a vendor with expertise in the targeted processes, such as quantifying steam trap leaks, optimizing compressed air system performance, or documenting boiler operating efficiency.
- A final implementer-approved study report is presented to the customer to inform management of the benefits of such measures and to encourage the long-term implementation of recommissioning.
- The facility owner engages in energy measure and persistence method planning and execution, the implementer verifies savings produced and the maintenance plan, and PG&E renders the qualifying incentive payment to the customer with the implementer's final approved energy savings.

To ensure savings persistence, the IRCx program requires the customer to implement a maintenance plan. Once the program is implemented, cash incentives based on verified savings

are paid directly to the customer to offset up to 50% of the recommissioning cost and the maintenance plan.

MARKET TRANSFORMATION PROGRAMS

Market transformation programs attempt to change the types of products in the market. Examples of market transformation programs include the EPA ENERGY STAR program that labels higher performing products. Over the years, various programs have provided incentives to retailers to stock more ENERGY STAR labeled products in their showrooms and as a result, people came to recognize the label and seek it out. The same process happened with the NEMA (National Electrical Manufacturers Association) Premium ™ label for high-efficiency induction motors. Programs offered incentives to distributors to promote the high-efficiency motors.

Organization's purchasing specifications can also affect markets for high-efficiency products. For example, several government agencies and later private companies built the NEMA Premium™ label into their purchasing specifications transforming the market. This forced manufacturers and distributors to provide high-efficiency motors.

PG&E Midstream Water Pump Incentive Program

Pacific Gas and Electric Company (PG&E) provides prescriptive incentives to pump distributors who sell qualifying equipment into PG&E territory and who will agree to give to use their online platform to track product sales. The goal of the program is to increase commercial sales of high-efficient clean water pumps through stocking and upselling of high efficiency equipment. PG&E is using the new Hydraulic Institute's Pump Energy Rating (http://er.pumps.org/ratings/home) performance testing and labeling program to select qualifying equipment.

HIGH PARTICIPATION

Regardless of the type of program, attracting high participation requires program designs that are attractive to customers. Programs should offer services that meet customer needs and reduce barriers to taking the types of actions sought by programs, such as purchasing an energy-efficient product or undertaking a comprehensive retrofit. Customers must perceive value in the services and incentives provided by a program. It should be easy for companies to participate in programs. The programs should conform to the nature of private sector projects, not the other way around. This is particularly true for project timing. Customer projects start at all times of the year and many companies cannot wait for a once-a-year application window. Rolling application periods are one way to address this issue.

Well-designed programs should also have effective marketing. This includes promotional materials that effectively communicate the features and benefits of programs, an established mechanism for reaching customers such as through trade allies and program partners and sharing information on successful program engagements.

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