FEDERAL SUPPORT FOR ENERGY EFFICIENCY IN U.S. INDUSTRY: COLLABORATIVELY ADDRESSING ENERGY MANAGEMENT IN SMALL- AND MEDIUM-SIZED MANUFACTURERS (SMMs)

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ABSTRACT

The U.S. industrial sector consumes about one-third of energy in the United States each year. Improving energy efficiency in an industrial environment may come with a host of benefits to the facility owner, including a reduction in annual energy expenses, lower maintenance costs, increased productivity, and improved profitability; but sector-wide improvements in industrial energy efficiency represent even greater advancements to a collective federal agenda relating to the economy, energy, and the environment. Multiple federal agencies—U.S. Department of Energy, U.S. Environmental Protection Agency, U.S. Department of Commerce, U.S. Department of Labor and the U.S. Small Business Administration—have taken a keen interest in industrial energy efficiency due to its clear links to the creation and retention of quality jobs, U.S. economic competitiveness, domestic energy security and global climate change.

This paper explores successful industrial energy efficiency programs established by various federal agencies, as well as emerging collaborative initiatives designed to enhance energy efficiency across U.S. small- and medium-sized manufacturers (SMMs). Authors investigate which of these programs have experienced traction and success among SMMs, as well as the best methods to engage SMMs at the local level. Additionally, this paper identifies existing barriers hindering energy efficiency within SMMs and discusses interagency opportunities to expand the reach and efficacy of federal energy-efficiency resources.

INTRODUCTION

Over the past three decades, federal agencies have been active in identifying opportunities to support U.S. industry across widespread sustainability initiatives1, including energy efficiency; although recently, amidst rising energy costs and a troubled economy, energy has become of universal interest. Today, federal agencies are pursuing collaborative arrangements more aggressively, leveraging interagency resources to reach a greater number of U.S. manufacturers. According to the U.S. Census Bureau, SMMs2 account for 70 percent of—or approximately 10.2 million—manufacturing jobs (23) within the United States and represent nearly 99 percent of all American manufacturing plants (23). SMMs are a vital component of the U.S. economy and will require federal support to successfully and effectively transition to a carbon-constrained economic environment. However, due to a number of barriers including high transaction costs, highly variable production, geographic dispersion, and the sheer number of facilities, small- and medium-sized manufacturers remain among the most difficult subsets to impact. For these reasons, federal programs targeting SMMs must rely on highly coordinated and flexible models to achieve the myriad of benefits an energy efficient manufacturing base can provide.

THE IMPORTANCE OF HEALTHY SMALL- AND MEDIUM-SIZED MANUFACTURERS (SMMs)

SMMs constitute a major portion of the U.S. manufacturing base, and therefore help to drive industrial operations on a global scale. The fiscal health and productivity of American SMMs are critical to both the domestic and world economies, and provide a multitude of benefits to national interest and international commerce. To demonstrate the criticality of healthy SMMs as a significant contributor to the U.S. economy, we explore the various ways manufacturers—including SMMs—stimulate U.S. prosperity.

Innovation. Small manufacturing firms play a central role in the developing innovative, new technologies emerging from the private sector. Many small manufacturing operations spin off from universities, research organizations, or larger parent companies to commercialize a single technology or a specialized suite of technologies. Small company size often fosters a focused, autonomous R&D setting and is more conducive to the financial liability of a risky commercialization endeavor. For these reasons, SMMs

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1 For the purpose of this paper, sustainability initiatives refer to all federal programs linked to air pollution, water pollution and product lifecycle.

2 Authors have elected to use the U.S. Department of Commerce (DOC) definition of a small- or medium-sized manufacturer throughout this paper. SMMs are considered manufacturers with less than 500 employees.
have historically been a driver of breakthrough technology innovation. In fact, small manufacturing firms (<500 employees) produce 13 to 14 time more patents per employee than their large counterparts (15).

**Agility.** Production agility is a critical factor within a broader industrial supply chain. Small manufacturing shops using relatively simple production processes and small batch size enjoy the ability to alter production nimbly according to customer demand. Small manufacturers may also benefit from production agility by quickly mobilizing around specific R&D breakthroughs. This accelerated path to market is critical for SMMs to compete with larger competitors in end-use markets and to satisfy demands as a leading supplier to large manufacturers.

**Quality Jobs.** Manufacturing jobs often require a specialized skill-set, and therefore demand a wage premium over other economic sectors of employment. According to the U.S. Bureau of Labor Statistics, manufacturing employees earn 21 percent more on a weekly basis than the average private sector employee (23).

**U.S. Competitiveness.** Global trade is another critical element of economic health, attracting foreign currency to the U.S. economy. In 2008, American manufacturers exported over $86 billion worth of goods per month with an annual aggregate of nearly $1.04 trillion (16). In fact, in 2008 manufactured goods represented 57 percent of total U.S. exports. However, as of fiscal year (FY) 2000, the largest 1 percent of trading firms (employing an average of 8,000 employees) manufactured approximately 81 percent of American exports (15). This implies that small manufacturers accounted for well below 19 percent of U.S. manufactured exports. In an increasingly globalized economy, this statistic represents a tremendous opportunity to strengthen the reach of SMMs into global markets.

Meanwhile, although greater international opportunities exist for SMMs, many are becoming increasingly globalized. According to the National Association of Manufacturers (NAM), the share of SMMs reporting that exports represent greater than or equal to 25 percent of their total sales, has increased from 3.8 percent in 2001 to 12.8 percent in 2008 (16).

**Attracting Foreign Investment.** Commissioning a U.S. facility provides foreign manufacturing firms access to American markets, convenience to American suppliers, and proximity to American-educated intellectual capital. Alternatively, U.S.-based facilities owned by foreign firms provide jobs to American workers, taxes to American localities, and inject operating capital into the American economy. “Insourcing”—that is, direct foreign investment in the U.S. manufacturing sector—grew from $153 billion in 1990 to $519 billion in 2004 (15). As a result of accelerated insourcing, about 1 in 12 American manufacturing workers are now employed by a foreign-owned firm (16).

**Economic Health.** Manufacturing is tied to U.S. economic health in a number of ways, not the least of which is its contribution to domestic GDP. In 2008, manufacturing GDP accounted for 11.5 percent of the total U.S. GDP (16), valued at $1.63 trillion (36). Today, U.S. manufacturing continues to represent a significant portion of global manufacturing, however other sectors of the American economy have well outpaced the growth of the manufacturing sector. For example, in 1980 value-added manufacturing represented 20 percent of U.S. GDP as compared to today’s 11.5 percent. Over the same period, China’s share of global value-added manufacturing has grown from less than 2 percent to over 14 percent (16). This rapid rate of growth in Chinese manufacturing characterizes the threat of emerging economies as manufacturing competitors. India and Brazil represent similar competitors.

**Indirect Job Creation and the Multiplier Effect.** Manufacturing is intricately linked to the U.S. economy through direct investment, employment, and the production of manufactured goods; although manufacturing also provides a critical indirect link to other U.S. service sectors, agricultural subsectors, and others. According to the National Association of Manufacturers, in 2009 manufacturing directly employed 11.8 million workers in factories and plants across the country. Additionally, manufacturing also indirectly supported an estimated 6.8 million service jobs which depend on a healthy manufacturing base. These services include accounting, legal consulting, wholesaling, transportation, agriculture, finance, insurance, and real estate services, among others (16).

Manufacturing also has the greatest multiplier effect on GDP of sectors in the U.S. economy. According the U.S. Bureau of Economic Analysis, every dollar in output of manufactured products supports an additional $1.40 in output from other sectors of the economy. For context, as manufacturing production ramps up in a single subsector, there is a heightened demand for financial services to capitalize the excess production, logistics consultation to help boost productivity, transportation to distribute product, and so on. By comparison, wholesale and retail trade sectors generate low multipliers—only $0.55 and $0.58 respectively—relative to U.S. manufacturing (16).
ENERGY MANAGEMENT IN A SMALL MANUFACTURING ENVIRONMENT

For many SMMs, energy expenses are often treated as an overhead cost, or simply a cost of doing business (10). Indeed absolute energy consumption among SMMs is typically dwarfed by the energy costs incurred by larger industrial counterparts, and may have a tendency to be overlooked. Furthermore, SMMs often lack the time, money, and expertise required to track and analyze energy consumption trends, not to mention emerging technologies and pending energy-related regulation. Another common obstacle to energy efficiency projects in a small manufacturing environment—and one especially pertinent over the past 18 months—is access to capital. After efficiency projects have been identified, convincing banks and commercial lenders [of an attractive return on investment and a “reasonable” payback period] can be a challenge, as few lenders have the expertise to adequately evaluate energy efficiency projects. For SMMs, this process of searching for a viable source of capital may exceed the time and resources available to the prospective project. As was astutely cited in a 2003 National Institute of Standards and Technology (NIST) report, “Many SMM owners [are consumed with] work in the business rather than on the business (12).” This universal dilemma can have significant impacts on small manufacturers’ productivity, competitiveness and profitability.

THE ROLE OF FEDERAL GOVERNMENT IN SUPPORTING ENERGY EFFICIENCY IN SMMs

Increasing energy efficiency among SMMs represents a major opportunity to revitalize the American manufacturing sector’s role in the global economy, reduce environmental impacts of U.S. industry and advance a secure, reliable domestic energy regime. Because of the systematic societal benefits of energy efficiency in manufacturing facilities, many federal initiatives have been commissioned to promote energy efficiency among SMMs. However, due to the diverse landscape of manufacturing sector—both geographically and operationally—SMMs can be difficult to reach. SMMs are often run on tight production schedules with rigid budgets and find it difficult to engage in intensive programs that may be disruptive to production operations. SMMs also tend to be highly variable in production processes, which may require federal offerings to be customized on a case by case basis. “One size fits all” energy resources are unsuitable for all manufacturers, but especially for small facilities. Therefore, federal agencies tasked with advancing energy efficiency in small manufacturing plants must strike a balance between developing universal, cross-cutting resources that can be effective across industry, and devising initiatives that are highly customized, providing personal assistance and facility-specific recommendations.

Despite a number of valuable energy efficiency programs, resources and incentives available to SMMs, federal initiatives are often unintentionally competing among each other for the time and attention of small manufacturers. SMMs may not understand the differences in federal programs offered by various agencies, and the perception of federal assistance can appear disparate and disjointed. Effective interagency collaboration is one critical factor in productively engaging with small manufacturers, demonstrating the value of federal resources and achieving the highest possible return on federal investment.

SELECTED FEDERAL ENERGY EFFICIENCY INITIATIVES SUPPORTING SMMs

A number of federal programs touch small manufacturers, whether directly targeting SMMs or indirectly including SMMs among other small businesses. The following federal programs provide professional and technical assistance to SMMs, including resources related to energy efficiency.

U.S. Department of Energy, Industrial Assessment Centers. Industrial Assessment Centers (IACs) are network of satellite manufacturing technical assistance centers that are housed within 26 participating universities across the nation. This program, funded by the U.S. Department of Energy’s (DOE) Industrial Technologies Program (ITP), matches teams of IAC energy consultants with surrounding small- and medium-sized manufacturers (SMMs) to examine and evaluate energy use within participating manufacturing facilities. IAC teams, comprised of both engineering students and university faculty, typically conduct a company survey followed by a full-day energy assessment, which inform a thorough facility analysis with energy efficiency recommendations and associated payback periods. IACs also have access to a suite of DOE energy tools and software including system assessment tools for motor-driven systems, steam systems, process heating and combined heat and power (CHP) systems. To date, over 14,000 (24) assessments have been conducted by IACs with each assessment yielding an average of $55,000 worth of energy saving recommendations and additional productivity recommendations (25). Furthermore, IACs provide participating students with targeted training on energy management in an industrial facility. In fact, of the 2,500 IAC program alumni since 1977, 56 percent of students have gone on to pursue energy-related careers (7).

Despite the successes of the IAC program over its 33 year history in both identifying energy efficiency
opportunities and training a next generation of industrial energy experts, many SMMs remain unaware of the low-cost service offerings of the IACs. IACs have experienced rigid budget limitations over the majority of the past decade which has constrained IAC operations and program growth. For context, in fiscal year 2009 the total IAC program budget was capped at approximately $4 million, relative to funding levels in fiscal year 2001 which totaled $8.3 million (2).

The U.S. Department of Energy (DOE) has also devised other robust programs to advance energy efficiency in the industrial sector. Save Energy Now (SEN) is a national partnership initiative that aims to reduce U.S. industrial energy intensity by 25 percent or more over ten years. Companies formally participating in Save Energy Now, known as Save Energy Now LEADER companies, sign a voluntary pledge to reduce their energy intensity by 25 percent over 10 years and receive access to software tools, low-cost assessments, technical materials and training sessions as well as customized technical assistance via a secure online portal (28).

Superior Energy Performance (SEP) is another DOE program that promotes industrial energy efficiency through a lens of continuous improvement. SEP provides a standardized framework for industrial companies to implement energy management throughout their facilities. SEP includes a voluntary, industry-designed plant certification standard that provides a globally-accepted methodology for validating energy intensity reductions and energy management practices in industrial plants. A central element of Superior Energy Performance is implementation of the ISO 50001 energy management standard, with additional requirements to achieve and document energy intensity improvements over a 3-year period. The program will also contribute toward reaching the Save Energy Now goal of reducing industrial energy intensity by 25 percent in 10 years (27).

The MEP program was originally born out of the Omnibus Trade and Competitiveness Act of 1988 when the U.S. Department of Commerce (DOC) was directed to establish Manufacturing Technology Centers through its National Institute of Standards and Technology (NIST). At the commencement of the program, 7 centers were initially housed within qualified non-profit organizations and relied on a minimum of 50 percent of operational funding from the participating organization (12). Today, the MEP program has evolved to 59 principal centers located in every state and Puerto Rico, although services may also be delivered through public and private affiliates comprised of 1600 specialists in 400+ locations nationwide (8). Affiliates include technical experts from private consulting firms, administrators in state energy offices, engineers from partnering universities, and representatives of relevant trade associations. The MEP program has evolved over two decades to boast the broadest network of technical resources for small domestic manufacturers.

Over 21 years of service delivery, the program funding model has also evolved. Currently, the MEP program is supported by a one-third funding contribution from NIST and a two-thirds funding match from a mix of state-level funds, non-profit contributions, university donations and modest service delivery fees (8).

The intent of the MEP program is to enhance the productivity and competitiveness of small- and medium-sized manufacturers by providing training, assessments, consultation and additional resources. Specifically, MEP services delivers programs in lean manufacturing, providing facility assessments and trainings; energy and environmental services to reduce waste streams and enhance productivity; training and implementation support for international ISO standards 9000 and 14000 (related quality control and environmental management, respectively); supply chain management; technology assessments and project support to promote technology transfer to SMMs; and other productivity-centric offerings related to project financing and navigating state and federal regulation. Energy efficiency is not core to the mission of the MEP program, although excessive energy use is addressed as a waste stream within the lean framework.

MEPs have a rich history of effective collaboration with other partners at the federal level, state level, and within professional and trade associations; although historically, these relationships have been forged on an individual MEP center basis. In other words, local MEPs have developed and managed their own relationships at the local level based on the most valuable resources available in the immediate area; although recently, NIST has been active in promoting interagency collaboration in the delivery of federal
resources. The MEP program is actively engaged in a number of joint initiatives with partnering federal agencies including the U.S. Department of Labor, Environmental Protection Agency, National Science Foundation, and the U.S. Department of Energy, among others; however, many of these partnerships are not explicitly intended to bolster the delivery of energy efficiency-specific resources (9).

U.S. Environmental Protection Agency, Green Suppliers Network. The Green Suppliers Network (GSN) began in late 2003 as an initiative developed and funded by the Environmental Protection Agency (EPA) and deployed through the MEP network using existing technical expertise and resource delivery (4). GSN is a voluntary program that works with large manufacturers to engage their supply chain—consisting largely of SMMs—to leverage lean production techniques to ‘green’ operations and boost productivity. In turn, GSN partners with SMMs to conduct low-cost ‘lean and clean’ assessments in participating facilities, and provide detailed recommendations to facility owners regarding limiting operational waste streams, minimizing environmental impacts, maximizing productivity, and enhancing profitability. Energy efficiency is addressed in the GSN lean and clean assessments, as excessive energy use is treated as an energy waste stream. To date, GSN has completed 100 facility reviews yielding over $53 million in cost-saving, lean recommendations (3). GSNs efforts in greening the manufacturing supply chain are widely recognized among large manufacturers and retailers, as pollution prevention and energy efficiency initiatives among SMMs have been endorsed by an independent third party (GSN). These efforts are typically validated by SMM customers when GSN partners are elevated to a ‘preferred supplier’ status.

ADDITIONAL FEDERAL SUPPORT
In addition to dedicated manufacturing resources and personnel available under the aforementioned programs, other federal agencies also administer grant and loan programs for which SMMs may be eligible. Many of these programs have experienced elevated levels of funding through the American Recovery and Reinvestment Act (ARRA) of 2009, and although the intent and focus of each program may vary, all could help to advance energy efficiency in a small manufacturing environment.

U.S. Department of Agriculture (USDA) Energy Programs.
The U.S. Department of Agriculture, charged with federal oversight and support of American agricultural operations, has a broad interest in energy. U.S. agriculture is a major energy end-user requiring large amounts of electricity and primary fuels to power daily operations—often times in rural or remote locations, making issues of reliability especially pertinent—but agricultural producers also hold an interest in biomass as a feedstock for manufactured biofuels. Currently, USDA programs are in place to promote reliable, affordable energy delivery to rural customers; promote agricultural feed stocks for the production of biofuels; deploy renewable energy systems; as well as general energy efficiency programs to advance competitiveness of U.S. farmers, stimulate job creation, and limit environmental impacts. Despite a variety of USDA initiatives that in some way include energy, energy efficiency resources and funding are most prevalent under the USDA’s Rural Development Program.

The Rural Development Program has been tasked with a wide-ranging objective “to increase economic opportunity and improve the quality of life for all rural Americans.” (22) Given the broad scope of the task order, the Rural Development Program is granted the authority to deliver a diversity of resources and services to rural Americans—households, farmers and businesses—including some earmarked for energy efficiency.

It is important to note that for the purposes of the Rural Development Program, USDA has defined ‘rural’ as a community of less than 50,000 people (21). In fact, using data collected in the most recent decennial census (CY 2000), the USDA has classified 97.5 percent of U.S. land as ‘rural’ according to eligibility requirements (13). Therefore, most small- and medium-sized manufacturers located outside urban centers remain eligible for funding and resources offered under the USDA Rural Development Program. Of these, three initiatives are considered most valuable to American SMMs:

Rural Energy for America Program (REAP). REAP, authorized under the 2008 Farm Bill, offers both agricultural producers and rural small businesses—including manufacturers—both loan guarantees and federal grants in support of renewable energy or energy efficiency projects. Energy audits and feasibility studies are also eligible for funding under this program. Energy efficiency grants under this program range in size from $1,500 to $250,000 and cannot exceed 25 percent of the total project costs. Energy efficiency loans range from $5,000 to $25 million, and may not exceed 75 percent of total project costs. Awards are allocated on a competitive basis (20).

Business and Industry (B&I) Guaranteed Loan Program. The B&I Guaranteed Loan Program is USDA initiative to bolster rural America’s access to private capital. Under this program, USDA provides a
federal loan guarantee to private lenders for loan proposals that meet the following criteria:

- Provide employment;
- Improve the economic or environmental climate;
- Promote the conservation, development, and use of water for aquaculture; OR
- Reduce reliance on nonrenewable energy resources by encouraging the development of renewable energy systems and energy efficiency improvements.

Small- and medium-sized manufacturers may use B&I guaranteed loans for facility improvements, facility expansion, equipment upgrades, pollution control and abatement, or projects related to biomass fuel production.

Loan guarantees under this initiative cover 80 percent of the capital advance for loans less than $5 million, 70 percent for loans between $5 million and $10 million, and 60 percent for all loans over $10 million. As with most loan guarantees, terms of the loan—including interest, fees, and collateral—are negotiated between the lender and borrower (19).

Rural Business Enterprise Grant Program (RBEG). The RBEG program is another USDA initiative intended to spur economic development in rural regions of the United States. RBEG funds may be used for the development of land, construction, renovation, new machinery, equipment upgrades, training/technical assistance, and establishing a revolving loan fund, among other uses. Rural SMMs are eligible for funds through the RBEG program, although funds must travel through a municipality or qualifying non-profit as an intermediary. Projects are not required to include any elements of energy efficiency, although energy efficiency projects and training would be eligible for grant awards provided there is a clear link to economic development (21). RBEG program funding levels vary annually according to the USDA budget, although via the American Recovery and Reinvestment Act (ARRA) of 2009, RBEG has been authorized an aggregate $20 million over fiscal years 2009 and 2010. The average award under the RBEG program is approximately $99,000 (18).

U.S. Small Business Administration (SBA). The U.S. Small Business Administration provides federal support to America’s small private enterprises, with the intention of strengthening regional and national economies and enhancing U.S. competitiveness. Among many other initiatives, the SBA oversees the Small Business Develop Center (SBDC) program, consisting of 63 lead SBDCs located in every state as well as in Guam, Puerto Rice, Samoa, and the U.S. Virgin Islands. The SBDC also employs a network model to disseminate program offerings through an additional 1100 service locations (35). Historically, SBDCs have provided management assistance to business owners, but as of late 2009, program offerings will also include energy audits to promote facility energy efficiency, as well as specific technical support to businesses engaged in the development of energy efficient and clean energy technologies. These offerings are available to all types of small commercial businesses, including small manufacturers. SBDC engagement in energy efficiency and clean energy is a direct result of the Energy Independence and Security Act (EISA) of 2007 (33 & 34).

Certified Development Company (CDC)/504 Loan Program. The 504 Loan Program, administered through the SBA, offers small businesses—including manufacturers—access to long-term, fixed-rate financing in support of the acquisition of fixed assets including land, real estate or equipment. The 504 Loan program has been in operation for over 25 years, although recently in early 2009, modifications to the program have included energy efficiency and renewable energy projects as special considerations for project financing (14). Today, small manufacturers may use this program as a vehicle to finance facility retrofits or equipment modernization initiatives. Loans for ‘green projects’ are capped at $9 million and require 10 percent equity from the borrower. The remaining 90 percent is structured with 40 percent obtained from a ‘Certified Development Company’ (community-based economic development organizations) and the 50 percent balance from a commercial lender. The SBA provides a 100 percent loan guarantees for the CDC portion of the loan (32).

U.S. Department of Labor (DOL); High Growth Training Grants. The U.S. Department of Labor promotes the welfare of American workers, job seekers, and retirees. In light of severe job loss throughout the recent recession, the DOL plays an integral role in stimulating job creation throughout all sectors of the U.S. economy. With an influx of funds under ARRA, DOL’s Employment and Training Administration (ETA) has dedicated $500 million in competitive grants for worker training in “high growth and emerging industries” (30). Core industries under this designation include health care, biotech, energy efficiency and renewable energy, among others. These ETA grants are designed to provide job training to workers displaced throughout the recent recession in an effort to reemploy the American labor force and provide specialized skills to advance developing markets. To date, DOL has allocated approximately $440 million in grants to promote “green jobs
training,” including energy efficiency. Additionally, DOI has invested another $190 million in State Energy Sector Partnership (SESP) and Training grants. SESP grants are awarded at the state level and are also intended to promote job training and strategic planning targeting energy efficiency and renewable energy industries. Of the $190 in SESP grants, $25 million are earmarked for training displaced workers of the auto industry, to provide the necessary skills to transition to careers in energy-related manufacturing (31).

REACHING SMMs: IDENTIFYING PROGRAMMATIC BEST PRACTICES AMONG FEDERAL OFFERINGS

Federal initiatives have been configured in various ways to effectively facilitate resource and service delivery. After conducting interviews with representatives of SMMs, technical experts, federal program administrators and IAC specialists, we have identified the following programmatic elements as best practices.

Explore Local Utilities’ Offerings. With demand outpacing supply, rising costs, and mounting environmental concerns, electric utilities face a number of challenges in securing and delivering affordable, reliable energy. Energy efficiency and demand-side management (DSM) programs are among the most constructive, cost-effective ways for utilities to address these challenges. Because industrial customers are typically large power users, they are important contributors to a utility’s energy efficiency goals and peak load reduction strategies. Utility programs targeting industrial customers often include energy audits, financial incentives, low-interest financing, and operations and maintenance training. Many power companies also offer financial incentives or discounts to industrial customers who participate in load shedding or shifting programs.

Some utilities are also subject to energy efficiency resource standard (EERS) requirements (1), requiring measurable reductions in electricity end use. To capture energy efficiency opportunities across a given portfolio, utilities may provide incentives, rebates or project support to their industrial customers.

Utilize Municipalities, State Energy Office and Other State Agencies. Various public resources and personnel are available at the state and local level as local governments have a vested in promoting a healthy, efficient industrial base. Municipalities may offer financial incentives, fast-tracked permitting, or tax breaks to attract or retain local industrial companies. Municipalities have a strong interest in fostering a vibrant industrial sector due to their contributions to the local tax base as well as the synergies between energy efficiency, local job creation and economic competitiveness. Additionally, industrial energy efficiency projects are often evaluated favorably because they demonstrate significant, measurable energy efficiency gains.

Municipalities, including state and local governments, have experienced unprecedented access to federal funds via Energy Efficiency and Conservation Block Grants (EECBG) under the American Recovery and Reinvestment Act (ARRA) of 2009. The EECBG program apportions federal monies to state, local, and tribal grantees, and is intended to reduce fossil fuel emissions, reduce energy consumption, improve energy efficiency, and create/retain jobs. This program, created under ARRA, is capitalized with a total of $3.2 billion (28).

State Energy Offices may also offer a broad-based suite of services to industrial customers. Energy project grants, feasibility studies, training and R&D financing are all examples of resources available to promote energy efficiency across a given state’s industrial portfolio. Of particular note, many State Energy Programs (SEPs) have also experienced a major increase in operating budgets due to the federal economic stimulus. Under ARRA, State Energy Programs were appropriated an aggregate $3.1 billion which has since been allocated through State Energy Program Formula Grants by the U.S. Department of Energy (26).

Similarly, other state agencies may have specific grant and loan programs intended to promote pollution prevention, job creation, or commerce. Developing a persuasive case that links energy efficiency to these types of end goals may qualify a SMM for access to grants, loan guarantees, or capital via revolving loan funds. Cultivating state-level relationships with representatives of the Department of Commerce, the Small Business Association and the Department of Agriculture, among others, may provide inroads for present or future funding opportunities.

Leverage Existing Relationships with SMMs. Getting to know an SMM client is the first step of a successful energy efficiency project. Understanding budget cycles, relationships with local banks, equipment replacement schedules and distinctive manufacturing processes are the types of details that will help to inform the best project-specific decisions on a case by case basis. Similarly, identifying deficiencies in existing energy management, equipment selection and equipment maintenance schedules are also examples of opportunities to for outside intervention.
From a federal perspective, cultivating these relationships with individual manufacturers poses a major challenge. Whenever possible, developing a team to include local technical consultants, MEP centers/associates, universities or utilities leverages preexisting relationships that may help to streamline the delivery of energy assessments and technical resources. Similarly, these collaborative teams help to navigate the complexities of the localized environment—state and local regulation, industrial energy fee structures, access to capital, etc.—from the perspective of a small manufacturer.

Include Local Investors. Often times SMMs may have a longstanding relationship with a local bank. Relationships with investors who take the time to understand the manufacturer, their operations, and the future direction of the company are invaluable. Including a trusted banker in the out-brief of a facility energy assessment or a energy efficiency project proposal helps to validate the associated productivity gains, energy savings, implementation costs and payback periods. An independent third party perspective can be integral in securing project financing for an energy efficiency project, as many small banks lack the expertise to adequately evaluate these types of loan proposals on their own accord. Including a local bank in an energy assessment out-brief may also provide an opportunity to cultivate relationships between a banker and an SBA loan officer, which could lead to opportunities in securing a federal loan guarantee. Loan guarantee programs help to minimize risk exposure for small banks and increase the likelihood of a loan approval for an ambitious energy efficiency project.

Keep SMMs Abreast of Regulatory and Policy Developments. Most SMMs lack the capacity to track regulation, policy and incentives that are introduced at the local, state and federal level. Local or national trade associations may help SMMs with navigating the world of regulation, although these resources are not locally available to many SMMs. SMMs, like all manufacturers, benefit from understanding the regulatory environment, as lead time for required action helps to temper the impacts of drastic change. Understanding the intricacies of impending policy and regulation also enable SMMs to choose the best and simplest compliance path on a facility-specific basis.

Promote Technology Transfer Among SMMs. Many SMMs operate without dedicated energy personnel that may be tasked with evaluating the potential of emerging technologies. Federal and state programs may assist SMMs by developing and maintaining a comprehensive database of both cross-cutting and industry-specific technologies, providing brief descriptions of the capabilities and deficits of each, and their potential to impact facility energy use based on direct energy consumption or by displacing a suite of legacy machines.

Enable Information Exchange Among SMMs. Small manufacturers occupying a specific geographical region may share common opportunities and challenges related to energy procurement, regulation and incentives, among others. Similarly, specific manufacturing subsectors may have a rich density in particular regions of the U.S., and therefore may experience additional shared challenges such as project engineering. Whereas large manufacturers may be less inclined to convene around mutual challenges due to issues of competitiveness, small manufacturers have historically been more open to problem solving on a ‘pre-competitive basis’. Facilitating information exchange among industrial peers can be invaluable in addressing challenges related to energy and pollution prevention. Additionally, regular communication can be a productive tool in establishing industry-specific best practices.

Industry Energy Efficiency and Pollution Prevention Roundtable (E2P2) for Southwest Pennsylvania is a strong example of information exchange among SMMs. This program convenes local SMMs, as well as representatives from Penn State’s Pennsylvania Technical Assistance Program (PennTAP) and Pennsylvania’s Department of Environmental Protection (DEP), to share best practices related to energy efficiency and pollution prevention. This initiative provides an open forum for small manufacturers to engage energy experts and government officials on topics of energy and environment. Participants also organize facility tours of their respective plants and share project engineering challenges and resources.

Involve Owners/Executives Directly in Decision Making Where Possible. Strengths and skills of operations personnel and company executives tend to be complementary in a manufacturing environment and input from both parties is likely necessary in effective decision making. Operations personnel and plant management are likely more fluent in the technical requirements of proposed equipment and process changes, while executives may be more familiar with the capital constraints and financing opportunities related to energy projects. Working with a client team, including representatives from every level of the decision making process can streamline proposed energy efficiency projects and help to close the gap between energy efficiency recommendations and project implementation.
Leverage a Broad Network of Service Delivery Professionals. Among the most difficult aspects of supporting SMMs is reaching them. It is estimated that there are over 350,000 small- and medium-sized manufacturing facilities in the United States, widely dispersed geographically (12). Any successful federal initiative requires a robust delivery strategy to get resources into the hands and facilities of small manufacturers. Today, NIST’s MEP program boasts the largest and broadest network of manufacturing service delivery professionals housed in both MEP centers and within associated organizations. The MEP network offers a well established conduit for federal energy resources, boasting nearly 400 satellite centers occupying every state in the union and Puerto Rico. Further, centers are staffed by workforce of nearly 1600 technical experts, all of whom could be trained using energy-specific software and assessment tools (8).

Develop a Comprehensive Service Offering. Energy-related needs vary widely among small manufacturing facilities, therefore offering individual tools and resources under a myriad of federal programs is perceived by SMMs as overwhelming and overlapping. Bundling “lean”, pollution prevention, and energy efficiency-related services provides a single delivery mechanism for mutually beneficial resources. Additional programmatic layers may include links to feasibility studies, engineering resources, measurement & verification (M&V) services and project financing. This model also streamlines program administration associated with the service suite.

SUCCESSFUL FEDERAL COLLABORATION REACHING AMERICAN SMMs

Interagency collaboration at the federal level is valuable in coordinating resources and the delivery of services efficiently and effectively. Formal collaborative agreements—often initiated through an executive order, specific legislation, or outlined in a memorandum of understanding (MOU)—may also establish funding channels and financial commitments between participating agencies which can be a vital component of successful initiatives. Interagency collaboration may provide value in leveraging existing professional networks, relationships and infrastructure to minimize overlap of federal initiatives and the time, money and energy required to develop programs independently.

Over the past decade a number of collaborative models have been employed at the federal level intended to more effectively support small manufacturers. The following are two active initiatives that have demonstrated promise and yielded quantifiable energy efficiency gains as a direct result of successful collaboration.

E3 (Energy, Environment, Economy) Partnership. The E3 program is an emerging collaborative model supporting American SMMs through the coordination of technical assistance at the local level with tools and training from the federal level. The E3 program is intended to align energy efficiency, pollution prevention and lean manufacturing concepts with enhancing manufacturing productivity, job creation and profitability. E3 has been successful in engaging multiple stakeholders at the federal level, spearheaded by the U.S. Environmental Protection Agency (EPA), the U.S. Department of Energy (DOE), and the U.S. Department of Commerce’s National Institute of Standards and Technology (DOC-NIST), and garnering formal interest from the Small Business Administration (SBA) and the U.S. Department of Labor (DOL) (11).

As an outgrowth of the Green Suppliers Network, E3 was proposed to better coordinate the delivery of technical resources for manufacturers, aligning federal offerings from various agencies to be complimentary rather than competing. Over the course of two successful pilots—San Antonio, Texas and Columbus, Ohio—E3 has offered participating organizations a thorough technical assessment, implementation support for subsequent projects, and staff training related to continuous improvement. Technical assessments incorporated elements of lean and clean manufacturing, a comprehensive energy assessment and a baseline greenhouse gas inventory. All technical assessments were concluded with clear, concise recommendations to be evaluated by the client team. E3 has also successfully engaged local stakeholders including municipal governments, small business development centers and utilities to identify applicable rebate programs, tax incentives, loan guarantees and other financing opportunities including access to Energy Efficiency and Conservation Block Grants (EECBG). Combining the talents and relationships of local technical service providers with the resources, tools and trainings of federal agencies, the E3 model has shown exceptional promise in closing the gap between the identification of energy efficiency opportunities and implementation of energy efficient solutions.

San Antonio E3 Pilot Project. In San Antonio, the E3 pilot convened local and federal stakeholders in support of six manufacturing facilities: Southern Folger, Munters, Danbury (AirCool Motors), San Antonio Aerospace, UEMC and Pratt & Whitney. Facilities were invited to join the pilot based on a review conducted by the local utility, CPS Energy, of energy consumption habits by local industrial rate-payers. Technical assessments, each conducted over
three to four days, were performed by technical experts from the Texas Manufacturing Assistance Center (TMAC), an affiliate of the Manufacturing Extension Partnership program. Technical experts relied on lean manufacturing auditing protocols provided largely through the existing MEP network in addition to the EPA’s Green Suppliers Network. When evaluating energy consumption, technical specialists worked with DOE-developed system assessment software tools, including the Quick Plant Energy Profiler (Quick PEP), as is typically used in IAC energy assessments. Audits were conducted with participation from client teams to ensure an understanding of each subsequent recommendation as well as to provide training and experience with DOE assessment tools. Client participation is an important element of the technical assessment as it provides interactive training to plant managers throughout the assessment, but also helps to develop a clear picture of the comprehensive energy efficiency potential within the plant.

The role of CPS Energy as the local utility was also integral to the success of the San Antonio pilot. CPS has worked hard to expand its energy efficiency offerings to the industrial sector over the past half decade. CPS initially covered 50 percent of the cost associated with the technical assessment, with the balance to be paid by the client. After energy efficiency recommendations were developed in a detailed TMAC report, CPS chose recommendations that were considered high-impact and offered to cover the balance of the assessment cost pending the implementation of these selected projects. Additionally, clients were eligible for conventional rebates offered under CPS’ commercial/industrial energy efficiency program. Having received an ‘investment grade’ out-briefing report, clients could also explore financing options with the local small business development center as well as local banks. Independent energy assessments can be a major step toward securing a line of credit for a prospective energy efficiency project as proposed improvements have been identified and endorsed by third-party energy experts. Banks and commercial lenders without in-house energy expertise often rely on third party specialists to validate energy projects when assessing the proposal for risk.

Further support was offered by City of San Antonio’s Office of Environmental Policy, which helped to convene local stake holders and cultivate a relationship between CPS Energy and TMAC. Additional funding was also secured through the Texas State Energy Conservation Office (SECO) via an Energy Efficiency and Conservation Block Grant (EECDBG) which will be used to conduct additional technical assessments at other local manufacturing facilities. Project participation from state and municipal government can enrich the collaborative process, foster relationships with government officials, leverage funding from various sources of capital and provide additional credibility through the eyes of commercial lenders.

As a testament to the effectiveness of the technical assessment, at the Southern Folger facility—a manufacturer of detention equipment—TMAC specialists identified energy efficiency opportunities totaling $85,000 annually. Specifically, energy efficiency recommendations yielded 159,000 kWh of electricity savings and 36,900 therms natural gas savings annually, in addition to a reduced monthly electric demand of 48 kW (11). Southern Folger has begun to implement selected energy efficiency recommendations.

Interagency Network of Enterprise Assistance Providers (INEAP). The INEAP initiative began in 2005 and was the product of a simple meeting between a representative of the Small Business Administration’s (SBA) Small Business Develop Center (SBDC) program and a counterpart from the National Institute of Standards and Technology’s (NIST) Manufacturing Extension Partnership (MEP) program. The meeting was intended to discuss the details and offerings of their respective initiatives and to identify programmatic overlaps. After a mutually beneficial meeting, it was decided that the two organizations would forge a partnership to promote effective federal support of small American enterprises and establish a collaborative framework whereby other relevant federal agencies could participate (5).

Today, INEAP is in its fifth year and boasts participation from over 40 federally funded assistance and extension programs under 12 federal departments (6). Meetings of member organizations are held once monthly to explore synergies and are conventionally centered on themes related to economic recovery, technology transfer assistance with a focus on energy efficiency and pollution prevention, business management assistance, export assistance, workforce training, finance assistance and disaster preparedness.

To date, INEAP activities have supported a number of efforts with direct implications on energy efficiency in SMMs. Specifically, INEAP was an inspiration to language featured in the Energy Independence and Security Act (EISA) of 2007 including a provision establishing the SBA ‘Energy Efficiency Clean Technology Assistance Program’ to be deployed through participating SBDCs. This program is intended to assist business owners with the development of clean energy technology through the vehicle of small private enterprises. Similarly, INEAP helped to encourage another EISA provision
establishing a SBA “Energy Audit and Energy Efficiency Program” also deployed through participating SBDCs. INEAP has also fostered strong working relationships between select MEP centers and SBDCs. Currently INEAP is focused on revitalizing fiscal health and commerce in areas of economic distress. Energy efficiency and clean energy will be key elements in the revival of these target regions.

CONCLUSION

2010 marks a phase of rebuilding after two years of enduring a tumultuous economic climate. The U.S. economy has shed over 8 million jobs since May, 2008 (17), and small manufacturers—among other small enterprises—are in need of federal support now, perhaps more than ever. Simultaneously, federal agencies and extension programs are facing budget cuts and spending freezes in attempt to control government spending. These factors strengthen the case for federal coordination and collaboration, to stretch federal resources while providing robust and effective support to America’s small manufacturers. Coupled with rising energy costs, the advancement of energy efficiency and equipment modernization represents a major opportunity with implications on job creation, manufacturing productivity, U.S. competitiveness, energy security and greenhouse gas emissions reductions. Energy efficiency among America’s small manufacturers remains a common cornerstone in a collective federal agenda.

PRIMARY REFERENCES

A special thanks to those individuals who contributed their professional experience and expertise to help inform this study:

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- Bernie Linn, USDA Rural Development, Pennsylvania Office
- Bob Brennand, Grays Harbor Paper
- Carl Allsup, Texas Manufacturing Assistance Center (TMAC), Southwest Research Institute (SWRI)
- Dan Pitkin, U.S. Department of Commerce (DOC), National Institute of Standards and Technology (NIST)
- Jeff Pfeifer, MLP Steel
- Kristin Pierre, U.S. Environmental Protection Agency (EPA)
- Lou Dreher, Jergens, Inc.
- Raelyn Pearson, Washburn Iron Works
- Roger Price, Pennsylvania Technical Assistance Program (PennTAP), Pennsylvania State University
- Roland Mueller, Pacific Wood Preserving
- Sandy Glatt, U.S. Department of Energy (DOE)
- Scott Hutchins, U.S. Department of Energy (DOE)
- Sherrie Ford, Power Partners MasTec, LLC

SECONDARY REFERENCES


