



BETTER PLANTS 2021 PROGRESS UPDATE

Partnering with Leading
Manufacturers to Save
Energy, Increase
Competitiveness, and
Decarbonize Industry



Better Plants: Year in Review

Through **Better Buildings, Better Plants**, the U.S. Department of Energy (DOE) partners with leading U.S. manufacturers and water and wastewater treatment agencies to improve their energy efficiency and sustainability. Reducing energy and water waste in the industrial sector not only saves money and increases competitiveness, but also strengthens resiliency and leads to a stronger workforce. DOE supports partners' efforts towards these goals by providing technical assistance, peer-to-peer networking opportunities, and recognition of their achievements.

This year, DOE welcomed 20 new partners to Better Plants, which now includes **3,500 facilities** and **13.8%** of the U.S. manufacturing energy footprint. Despite the challenge of a global pandemic, partners continued to reduce energy intensity – often in new and creative ways. To date, Better Plants partners have reported cumulative savings of more than **1.9 quadrillion Btus** of energy and **\$9.3 billion** in cost savings.

Partner Achievements by the Numbers



1.9 QBTU
energy savings



2%
average annual energy
intensity improvement rate



\$9.3 billion
cost savings



Partners in Action

To help partners achieve their aggressive energy efficiency goals, DOE provided support through several focus areas:

Peer exchange

- Hundreds of participants engaged in several industrial-focused sessions during the 2021 Better Buildings, Better Plants Virtual Summit (see page 7).

Workforce development

- Over 600 total participants attended the Better Plants Virtual In-Plant Trainings (VINPLTs) on a variety of industrial topics throughout the year (see page 12).

Innovation

- Better Practice and Better Project Awards were presented to 14 partners to recognize their leadership in adopting innovative energy efficiency solutions (see pages 8-9).
- Four partners are engaging in the Industrial Technology Validation pilot to evaluate innovative energy and water-treatment technologies (see page 13).
- Better Plants helped facilitate collaboration between partners and DOE's 17 National Labs, which are engaging in cutting-edge R&D (see page 16).

Tools and resources

- Partners took advantage of DOE technical resources such as the MEASUR software suite, Diagnostic Equipment Program, and new guidance documents on achieving energy reduction goals, using renewable energy, and better understanding utility bills (see pages 14-15).

Technical expertise

- Many partners also expanded their sustainability commitments by joining the Low Carbon Pilot (see pages 10-11), the Waste Reduction Pilot (see page 17), or the Industrial Water Savings Network (see page 18).
- Complementary DOE programs like the CHP Deployment Program (see page 19), 50001 Ready and SEP 50001 (see page 20), and the Industrial Assessment Centers (see page 21) provided partners with additional opportunities to lower operating costs and improve energy management.

How Much Have Our Partners Saved?

Over the length of the program, Better Plants partners have saved a cumulative **1.9 QBTU** in energy and **116 million metric tons** of CO₂. **That's equivalent to:**



More energy than the state of **Wisconsin** uses in one year.



GHG emissions of over **25,100,000** passenger vehicles driven for one year.

Above: Equivalency statistics from the [U.S. Energy Information Administration](#) and the [EPA Greenhouse Gas Equivalencies Calculator](#).



"Better Plants partners are essential to re-establishing U.S. manufacturing leadership and meeting President Biden's goal of a carbon-neutral economy by 2050. They're proving that industrial energy efficiency and sustainability measures pay off – often with

high returns at relatively low risk – and that a decarbonized industrial sector is within reach. Every Btu of energy avoided helps reduce our collective carbon footprint and address climate change. Every dollar saved can be reinvested in improving our infrastructure, training workers, and hiring new ones."

*Dr. Carolyn Snyder
Deputy Assistant Secretary for Energy Efficiency,
Office of Energy Efficiency and Renewable Energy,
U.S. Department of Energy*

Attracting New Partners to Better Plants

Better Plants continued to grow throughout the past year and welcomed **20 new partners**, with 16 partners joining at the program level and 4 partners moving up to the Challenge level. By joining Better Plants, partners voluntarily pledge to reduce portfolio-wide energy intensity by roughly 25% over 10 years, with Challenge partners making the extra commitment to share their energy efficiency solutions and data so that other industrial companies may benefit. **More than 250 industrial companies** and wastewater treatment organizations now partner with Better Plants to save energy, with facilities in every single U.S. state and territory.

New Challenge Partners



Autodie LLC is a designer and manufacturer of large-scale dies for metal stamping.



Thermo Fisher Scientific offers analytical instruments, laboratory equipment, software, services, consumables, and reagents.



Coca-Cola Consolidated is a Coca-Cola bottle manufacturer and beverage processor.



Zebra Technologies Corporation manufactures and sells marking, tracking, and computer printing technologies.

New Program Partners



Colgate-Palmolive produces household, health care, and personal care products.



IAC Group manufactures instrument panels, consoles, door panels, overhead systems, and other vehicle components.



Connector Castings manufactures electrical grounding products for industry, commercial business, and home.



Isringhausen manufactures seating systems for commercial vehicles as well as technical springs.



Danaher Corporation is a manufacturer of professional, medical, industrial, and commercial products.



Perrone Aerospace makes and distributes performance leathers and textiles for the aerospace and rail markets.



DETROIT

Detroit Diesel Corporation makes equipment for engines, axles, and transmissions for freight trucks.



RING Container Technologies is a plastic container manufacturer in North America.



Dura-Line Corporation provides infrastructure for telecommunications, enterprise networking, energy, and transportation.



SL Corporation is an automotive supplier specializing in exterior lighting, side view mirrors, and gear shifters.



E&L Construction Group is a general contracting, construction management, and design-build company and General Motors supplier.



Tarkett USA Inc. produces flooring and sports surface solutions.



EnerSys is a manufacturer of batteries, chargers, technology and accessories.



TRAM Group manufactures automotive switch-related components such as window regulators, cruise control, turn signals, multifunction, and HVAC switches.



FLEXCO Corporation manufactures rubber and vinyl flooring products.



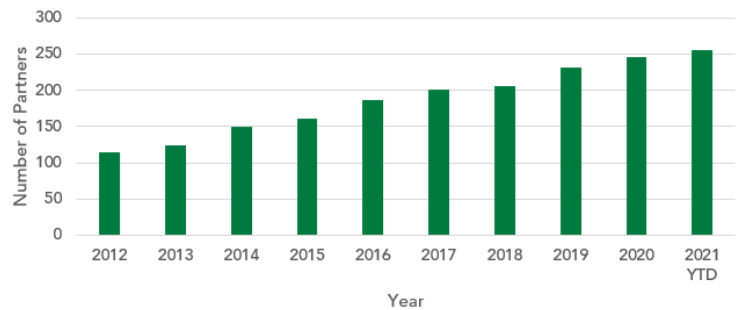
Valvoline is a manufacturer and distributor of automotive oil, additives, and lubricant.

Working with More Than 250 Partners

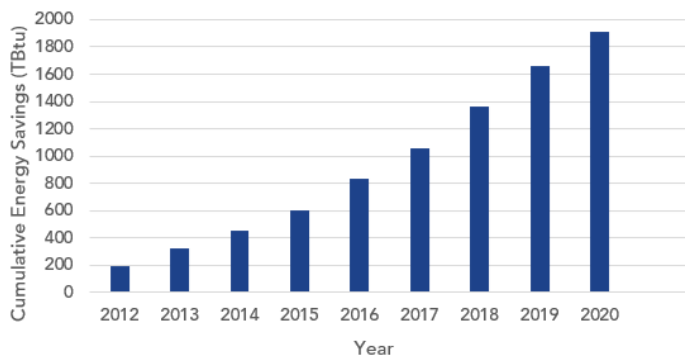
Both Better Plants' list of partners and scope have steadily grown over the years as more and more industrial organizations have looked to improve their energy efficiency and sustainability in meaningful ways. Over time, Better Plants partners have grown to represent every major U.S. industrial sector, including water and wastewater treatment organizations, with facilities in every single state and collectively encompassing 13.8% of the total U.S. manufacturing energy footprint. Informed by partners' ambitions, Better Plants now also works with them to set and meet **water and waste reduction goals in addition to energy reduction goals**.

250+ Partners
3,500+ Plants

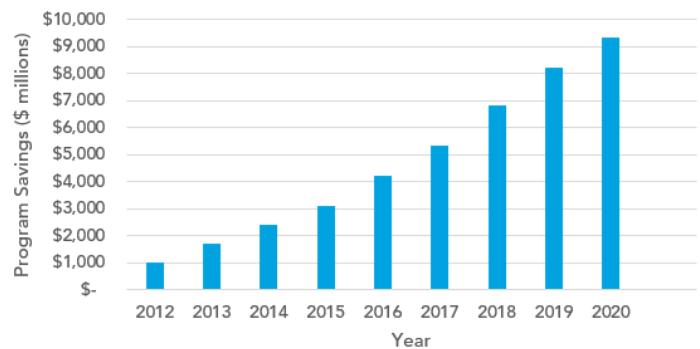
Program Growth in Number of Partners



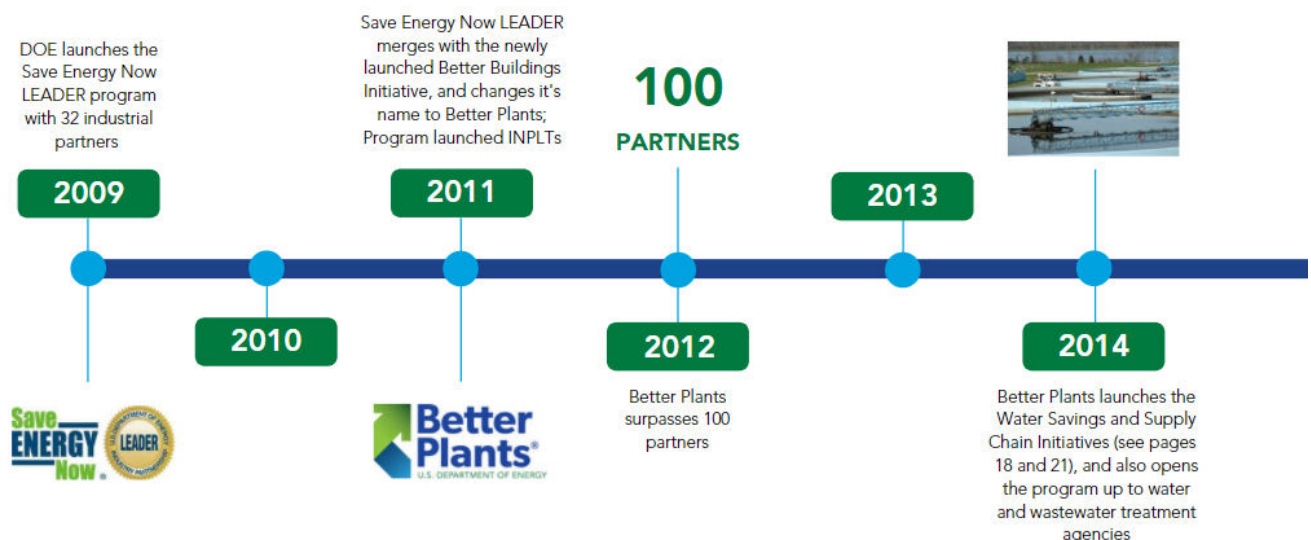
Cumulative Program Energy Savings



Cumulative Program Cost Savings



A History of Partnering with Industry



Doubling Down on Efficiency

Two Better Plants Challenge partners – **Ingersoll Rand** and **Sherwin-Williams** – and two Program partners – **Comau** and **Graphic Packaging International LLC** – have achieved their original energy intensity reduction goals and repledged with new goals this year. Three other Program partners – **HNI Corporation**, **Neenah Foundry**, and **SunOpta** – stepped forward



Spotlighting Re-Pledgers



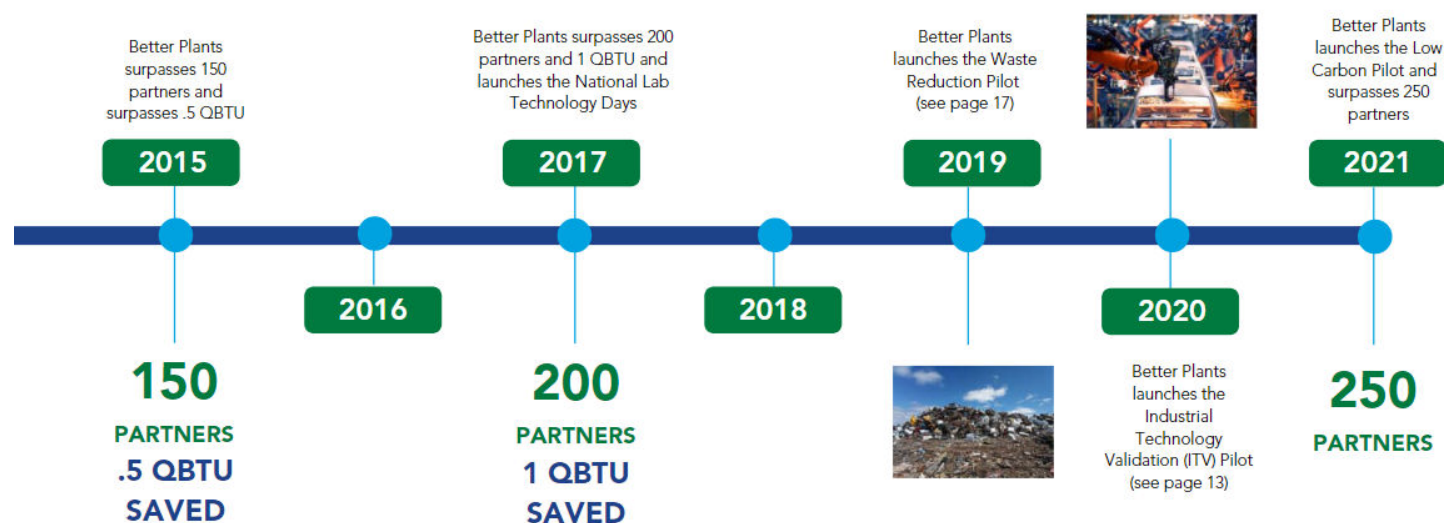
Graphic Packaging Merger Increases Energy Savings Opportunities

Graphic Packaging merged with a division of International Paper and became Graphic Packaging International LLC, which increased their energy footprint and offered more opportunities to save energy. The new company ramped up its efforts on sustainability by installing CHP at a plant in Louisiana and installing a large paper recycling plant in Kalamazoo, MI.



Sherwin-Williams Growth Expands Energy and Climate Projects

Sherwin-Williams acquired Valspar, which was the world's 6th largest paint manufacturer, increasing Sherwin-Williams' energy footprint. Sherwin-Williams repledged to Better Plants and established important energy and carbon goals: 30% carbon reduction, 50% increase in renewable energy, and 20% energy efficiency improvement by 2030 from 2019 baseline.



Showcasing Goal Achievers

Four Challenge partners – **Ford Motor Company**, **Orange Water and Sewer Authority**, **Owens Corning**, and **Steelcase** – and three Program partners – **Alumalloy Metal Casting Company**, **AstraZeneca**, and **Proctor & Gamble** – achieved their ambitious energy intensity reduction goals in the past year.

Seventy-four energy and water goals have now been met and exceeded by Better Plants partners, who are setting a high standard of sustainability leadership for the rest of the U.S. industrial sector. See the full list of Better Plants goal achievers on the last page, 24, of this report.



Surpassed goal of 25% reduction in energy intensity in 10 years and achieved 26% reduction in energy intensity in 5 years



Surpassed 2nd goal of 12% reduction in energy intensity in 7 years and achieved 15% reduction in energy intensity in 2 years – after meeting an initial 25% goal in 2018



Surpassed goal of 25% reduction in energy intensity in 10 years and achieved 27% reduction in energy intensity in 10 years



Surpassed goal of 20% reduction in energy intensity in 10 years and achieved 21% reduction in energy intensity in 10 years



Surpassed goal of 25% reduction in energy intensity in 10 years and achieved 25% reduction in energy intensity in 9 years



Surpassed goal of 25% reduction in energy intensity in 10 years and achieved 26% reduction in energy intensity in 10 years



Surpassed goal of 25% reduction in energy intensity in 10 years and achieved 25% reduction in energy intensity in 9 years

Follow Better Plants on social media for the latest on our partners' accomplishments:

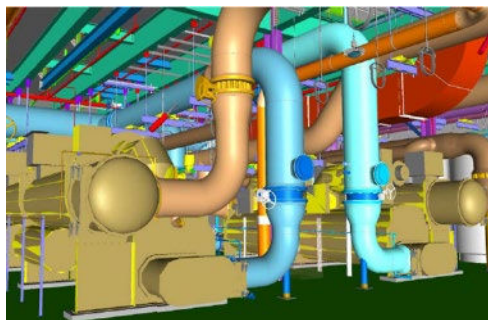


Twitter
@BetterPlantsDOE



LinkedIn
Better Plants

How Did They Do It?



Ford Used a Digital Twin Tool for Energy Plant Management

A digital twin is the virtual representation of a physical object or system across its life cycle. Ford used **digital twin technology** to accurately detect energy losses, pinpoint areas where energy can be conserved, and improve the overall performance of production lines. Ford has several digital twins that make up the company's vision for its "Factory of Tomorrow." Digital twins increase the visibility of plant operations and drive early intervention for more efficient design, construction, and operation of new and existing plants.



Owens Corning Leverages Multiple Resources to Achieve Energy Goals

Owens Corning utilizes a variety of resources to help achieve their ambitious energy goals. For example, they received five **IAC assessments** (see page 21) at some of their smaller plants and In-Plant trainings yielded nearly \$200,000 in compressed air energy savings. Attendance at two **Technology Days** led to the use of the REopt tool to install solar PV at four plants, and they entered into power purchase agreements for 250 MW of renewable energy.

Fostering Peer Exchange and Networking for Partners

Whether through the annual [Better Buildings, Better Plants Summit](#), online learning sessions, or new pilot initiatives, Better Plants offers a variety of opportunities for partners to engage with each other, as well as with industry experts. In transitioning to virtual exchanges, Better Plants has orchestrated online sector meetups, interactive workshops, and engaging learning sessions to help partners along their journey to energy, water, and waste reduction. These networking opportunities incorporate a mix of tools to foster engagement, such as audience polling, digital Q&A with upvoting, trivia, and more.

Keynote Summit Speakers

- ▶ **Jennifer M. Granholm**, Secretary, U.S. Department of Energy
- ▶ **Gina McCarthy**, White House National Climate Advisor
- ▶ **Dr. Jane Flegal**, Senior Director for Industrial Emissions, White House Council on Environmental Quality

Industrial Sessions from the Virtual 2021 Better Buildings, Better Plants Summit

▶ Industrial Sector Meet-up

Better Plants partners and stakeholders convened to hear an update on new tools and resources, celebrate partner achievements, and discuss current challenges in breakout rooms.

▶ Best of the Betters – 2021 Better Project and Better Practice Presentations

2021 Better Project and Better Practice Award-winners (see pages 8-9) gave short, TED-talk style presentations.

▶ Choose Your Own Solution: An Interactive Panel on Solving Common Energy Efficiency Barriers

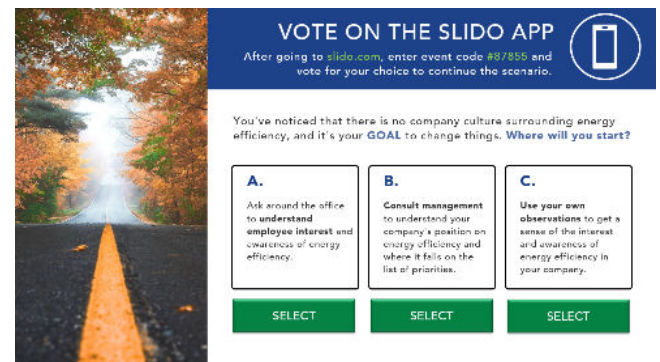
Using attendee votes to drive decisions, this interactive session walked attendees down the path of finding potential solutions to common energy efficiency barriers.

▶ Have It Your Way: An Energy Efficiency Round Robin

Attendees joined small breakouts based on energy efficiency topics of interest - such as decarbonization, renewables, supply chain, and finance, discussing topics as a group.

▶ Accelerating Technological Innovation in the Water Space

In this workshop, attendees discussed the role of leadership in water security, innovation, and investment and ways to help accelerate the scaling of innovation in the water space.



Above: At the opening plenary, Secretary of Energy Granholm delivered the keynote address; Screen capture of the Choose Your Own Solution Summit Session voting process; A word cloud from a poll asking the audience about the challenges of adopting renewable energy in the industrial sector.

Celebrating the 2021 Better Project and Practice Winners

The **Better Practice award** recognizes partners for innovative and industry-leading accomplishments in implementing and promoting practices, principles, and procedures of energy management and for implementing energy-savings projects.

Winners of both the Better Practice and Better Project (see next page) awards are recognized at the annual Better Buildings, Better Plants Summit, as well as other industry conferences. Speaking opportunities and other special promotional options are also given to award winners. Better Plants strives to highlight all applications, regardless of their ultimate award status, by converting them into solutions and case studies published online.

Here are the 2021 Better Practice award winners:



For developing a zero waste to landfill certification process that led to a 98.5% reduction in the total waste sent to landfill in one year.



For creating a sustainability checklist that is being rolled out for all new capital projects greater than \$50,000 across the company.



For establishing an "Energy and Carbon Optimization (ECO) Toolbox" that has helped identify cumulative annual energy savings opportunities of more than \$2 million at six sites so far.



For developing an innovative data science team that has earned 13 patents and saved millions of dollars in annual energy costs through advancements in energy operations and technology adoption.



For creating a "Green Awards" program to highlight and recognize individual researchers for their sustainability-related research and development projects.



For launching a "Hack the Pack" workshop with a cross-functional team to reimagine product packaging, saving more than 13,000 pounds of wood reinforcements a year and completely eliminating the use of foam packaging for two products.



Above: Before and after images of packaging improvements, like eliminating foam, implemented by Steelcase's "Hack the Pack" workshop.

Celebrating the 2021 Better Project and Practice Winners

The **Better Project award** is presented to partners for outstanding accomplishments in implementing industrial energy, water, and waste projects at individual facilities. Better Project award applications can include improvements to industrial systems, the use of new and innovative technology, a focus on resilience and energy security, and also explore other savings goals such as water and waste. In 2021, the Better Plants program awarded eight partners with the Better Project award listed below.

Here are the 2021 Better Project award winners:



Above: Sonic imaging readout detects previously hard-to-access air leaks through SugarCreek's award-winning project.



For implementing a real-time, battery-less steam trap cloud monitoring system that saves 10.6 million pounds of steam per year.



For redesigning and rebuilding an existing bread plant to produce organic bread and includes a variety of sustainability features that reduced annual energy and water consumption by 22% and 64%, respectively.



For upgrading a facility air and water management system that led to an 11% reduction in annual electricity usage.



For optimizing a facility's CHP system and central utility plant, saving \$1.5 million in annual energy costs with a 2.2-year payback.



For upgrading air handling unit-controls to enable automatic maintenance of temperature and air quality, saving over \$200,000 and 1,800 metric tons of CO₂ per year.



For implementing an advanced HVAC control system at two facilities that optimizes the use of outside air and adjusts equipment sequences and setpoints, saving a combined \$350,000 per year.



For utilizing a sonic imaging tool to improve leak detection surveys in a plant's compressed air system, leading to reduced energy costs and non-energy benefits totaling \$60,000 per year.



For leveraging Virtual In-Plant Trainings (VINPLTs) on industrial refrigeration systems to help identify annual energy savings opportunities of more than \$4 million.

Decarbonizing the Industrial Sector

An increasing number of manufacturers have set **goals to reduce their carbon dioxide emissions**. While there are known strategies for meeting portions of these goals, innovation will be critical in achieving the most ambitious of these targets. To support these bold goals, DOE launched the Better Buildings, Better Plants **Low Carbon Pilot**. Through this pilot, DOE is working with partners to evaluate their carbon dioxide emissions and demonstrate pathways to deep industrial decarbonization.

Achieving decarbonization in the energy-intensive industrial sector is a challenge that will require solutions that extend beyond the deployment of renewable energy. With the Low Carbon Pilot partners, DOE will explore innovations in decarbonization, such as hourly matching of off-site renewable generation with on-site consumption, novel low carbon production technologies, and targeted fuel switching.

DOE will also work with industrial leaders as they establish priorities and make progress towards their low and zero carbon emission goals. Over the Pilot's two years, partners will work with DOE to **demonstrate real world pathways to achieving low carbon manufacturing** and will share these solutions with their peers and the market more broadly.



What is a Low Carbon Plant?

A **low carbon plant** is one that has achieved deep decarbonization in scopes 1 and 2 greenhouse gas (GHG) emissions. These plants are ultra-efficient and have lowered their facilities' carbon emissions through emerging or transformational technologies. A low carbon plant procures its low carbon power through innovative purchasing mechanisms, such as buying local renewable energy that adds new green power resources to the local grid.

Goals of the Pilot

Through the Low Carbon Pilot, DOE will work with partners to showcase real world pathways that represent innovative examples of low carbon manufacturing. Partners will work with DOE to demonstrate what is possible, highlight remaining challenges, and promote effective solutions. **By the end of the pilot, DOE and partners will:**

- ▶ Convene with a community of organizations dedicated to carbon dioxide emission reduction
- ▶ Understand the correlation between carbon emission reductions, energy efficiency, cost savings, and resilience
- ▶ Obtain data and experience for a future initiative addressing the integration of renewables
- ▶ Advise DOE's R&D investments by identifying needs for transformational technologies
- ▶ Inform partners of new DOE technologies and research that can contribute to their missions

Tackling the Top Challenges to Decarbonization

Through these new initiatives, DOE will seek to understand the top three barriers to decarbonization, as cited by the Low Carbon Pilot's Industrial Partners:

Obstacles to Electrification

Reliance on Natural Gas

Financing Decarbonization Projects

Decarbonizing the Industrial Sector

Industrial Partners in the Low Carbon Pilot



Benefits to Partners

In addition to reducing energy costs, partners that make progress toward carbon goals increase the resilience of their facilities while also progressing toward organization-wide sustainability goals. **DOE supports partners by providing the following:**

- ▶ **Guidance, resources, and technical assistance** for optimizing carbon reduction pathways
- ▶ **Networking opportunities with peers** to share real-world challenges and solutions through webinars, conferences, and other events
- ▶ **Opportunities for recognition** for demonstrating progress and leadership in carbon reduction

Low Carbon Tools and Calculators

The Department of Energy and Oak Ridge National Lab have developed several tools to help jump start organizations' journey to lower carbon emissions. Partners are encouraged to take advantage of these free tools and calculators, below, to plan projects, calculate carbon emissions, and determine the impact of electrification.



Carbon Inventory Calculator

This calculator lets the user **determine carbon dioxide emissions** for given combustion fuel, biofuel, refrigerant charge, purchased gases, purchased electricity from the grid. It also helps to calculate the emissions from fuel use for transportation.

[Click here to access.](#)



Electrification Impact Calculator

Use this calculator to estimate **potential cost and CO₂ emissions savings** resulting from changing from fuel-based equipment to electrical equipment (output rates determined by the EPA and Electronic Code of Federal Regulations).

[Click here to access.](#)



Low Carbon Action Plan Tool

DOE has developed this Action Plan Tool, which you can use to **think through your low carbon strategy and develop low carbon pathways** for your plants and account for carbon emissions from onsite fuel consumption and purchased energy.

[Click here to access.](#)

Strengthening the Industrial Workforce

Going Virtual with In-Plant Trainings

After piloting two successful sessions on Industrial Refrigeration and Wastewater Treatment operations, Better Plants and Oak Ridge National Lab expanded **Virtual In-Plant Trainings (VINPLT)** offered in 2021. Led by industry-recognized experts, these workshops have trained over **600 Better Plants partner employees** and helped partners identify more than **\$2 million** in energy efficiency opportunities, quantify facility savings, and implement projects to realize the identified energy and cost savings.

Completed VINPLTs cover the following topic areas: Water Efficiency, Steam Systems, Fan Systems, Pumping Systems, 50001 Ready, Process Heating, Ammonia Refrigeration, and Wastewater Treatment. The recorded video sessions, tools and resources, and briefing materials from past VINPLTs are available to view and download at bptraining.ornl.gov.



"I just wanted to reach out and express my praise for 50001 Ready Virtual In-Plant training. The instructions, demonstrations, and instructor were straightforward and helpful. It made the subject much more approachable and easier to understand. I've been familiar with the ISO standards prior to the training but this event opened my eyes to many more ideas and ways to improve our energy systems at my facility. I really hope that I can take this training and apply it to our energy program so that we can continue to see results and improve our energy efficiency. I now feel very confident that I will be able to thanks to this virtual training. "

- Tyler Rodey, Plenco

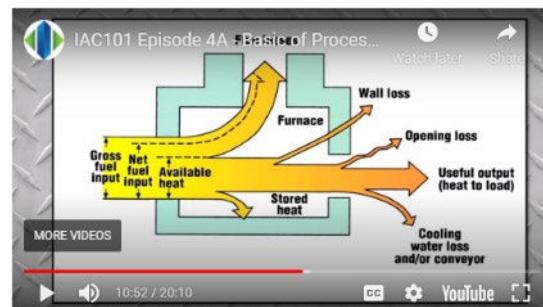


Above: Group photo from the Steam Virtual In-Plant Training (VINPLT), which was comprised of eight 2.5-hour online training sessions conducted across eight weeks. Attendees earned Professional Development Hour (PDHs) Certificates at the completion of the training.

Industrial Assessment Center (IAC) Trainings

As part of DOE's Industrial Assessment Centers (see page 21), university faculty and students conduct research and present on a range of energy management topics. IAC webinars feature research projects and share solutions and new technologies for industrial energy management. Recent webinars looked at opportunities to improve the economics of industrial battery storage and strategies for net-zero wastewater treatment plants. These webinars are recorded and can be accessed through the IACs, here: <https://iac.university/webinars>

Additional training materials have been recently developed as part of the **IAC 101 series**. These sessions cover multiple topics on industrial energy systems in twenty-to-thirty-minute segments, including training videos on compressed air, industrial cooling, process heating, and steam. The IAC 101 training videos and accompanying quizzes can be viewed here: <https://iac.university/iac101>



Above: The IAC 101 Webinar training on The Basics of Process Heating and Heat Efficiency; Dr. Michael Muller of Rutgers University talks about process heating basics and heating efficiency. Topics include heating applications and methods, combustion and electrical heating, losses, and performance improvements. This is one of several webinar training videos available through the IAC 101 series.

Online Learning Series

The Better Plants team hosted a 12-part online learning series with technical presentations on a variety of energy management topics, including compressed air systems, energy treasure hunts, waste heat recovery, and more. Expert speakers from DOE's national labs and the Better Plants network shared knowledge, resources, and best practices to drive energy savings and achieve energy management goals. All of the webinars from the learning series are recorded and posted here: <https://betterbuildingssolutioncenter.energy.gov/better-plants/online-learning-series>

Validating Innovative Technology

Better Plants partners across the country have set ambitious sustainability goals to reduce energy, water, and waste.

Emerging technologies can be integral to achieving these goals, but the risks involved in installing and objectively validating performance in high-stakes industrial environments can often impede adoption.

To overcome the risks inherent in adopting emerging technologies, the **Industrial Technology Validation (ITV) pilot** has partnered with DOE's National Labs to validate performance in dynamic industrial environments. The results will be shared broadly and help Better Plants partners understand the viability of a solution while mitigating many of the risks associated with being the first to install an emerging technology.



"To achieve net-zero carbon emissions by 2050, we must rapidly scale-up the development and deployment of clean-energy technologies by American manufacturers. By bringing these emerging technologies out of the laboratory and onto the factory floor, DOE's Industrial Technology Validation program moves us one step closer to commercializing the innovations that will make our clean energy future possible."

- Kelly Speakes-Backman, Acting Assistant Secretary for Energy Efficiency and Renewable Energy

During **Phase I**, the selected testbeds will evaluate innovative energy and water-treatment technologies in facilities operated by the following DOE **Better Plants partners**:



CLIFFS

NISSAN

TOYOTA

For each selected technology, a team of experts led by DOE's Advanced Manufacturing Office, Lawrence Berkeley National Laboratory, and Oak Ridge National Laboratory will develop a measurement and verification plan, conduct on-site data collection and testing, analyze performance, and draft a field-validation report. These **reports will be made publicly available** to help inform future initiatives in industrial energy and water conservation.

In addition, the ITV Pilot released a new Request for Proposals (RFP) for **Phase II** of the pilot. The new RFP is seeking additional technologies that can cost-effectively transform the operational efficiency of American industry and meet the following criteria:

- ▶ Improves industrial decarbonization, energy efficiency, and/or performance efforts
- ▶ Reduces water use, wastewater effluent, or waste creation
- ▶ Qualifies as "emerging/innovative" as defined in the RFP
- ▶ Potential to lead to demonstrable performance improvement due to wide-scale replicability.

This RFP is open to both vendors already teamed with a host site and individual technology vendors who have not yet identified a host site. This aims to identify new technologies Better Plants partners may not yet be aware of, alleviating the need for them to also serve as "tech scouts."



Above: (Left) Nissan Engineering and Operations team members after Side-Stream Precipitator and Water Enhancement device installation; (Center) ElectroCell Systems training of Toyota's facilities team (Right) The Via Separations team following the setup of the Black Liquor Concentration System at the Ahlstrom-Munksjo Mosinee mill

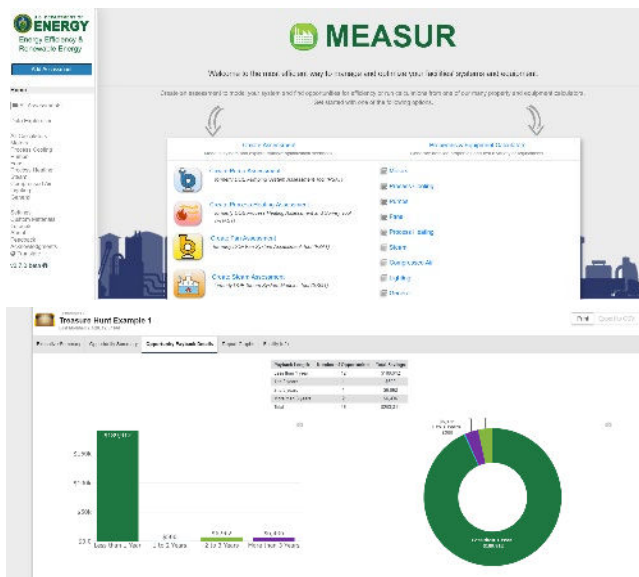
Providing Resources for Partners: Software and Tools

In addition to technical guidance, Better Plants partners have access to [no-cost tools](#) and [software](#), on-site [In-Plant Trainings](#) on various energy savings topics, access to [technical assistance programs](#), and more. The DOE Advanced Manufacturing Office provides a wide variety of tools to increase efficiency at both the plant-level and within specific systems. Categories of tools and calculators offered include energy management, energy systems analysis, carbon management, and water management, with waste management tools coming soon.

MEASUR Software Suite

MEASUR (Manufacturing Energy Assessment Software for Utility Reduction) is a software suite that allows end users (such as energy engineers or facility personnel) to create a model, using facility data, that will optimize and improve the industrial systems for facilities. Using plant-specific operating data, MEASUR helps energy managers assess how much energy each piece of equipment uses annually, as well as the estimated energy costs.

The open-source software is continually adding new calculators to the suite and can **analyze most major energy support systems** found within industrial plants, including compressed air, fans, process heat, pumps, and more. Through the various modules and 40+ **equipment calculators**, users can analyze and quantify energy savings. There have been several additions to the software, which now includes a **waste module**.



Diagnostic Equipment Program

The **Diagnostic Equipment Program (DEP)** enables partners to borrow more than 20 different kinds of tools to collect energy data and improve equipment performance. Through the DEP, partners can test tools before deciding to purchase their own or help justify the cost of purchasing tools by demonstrating their value first-hand.

- ▶ Anemometer
- ▶ Combustion Analyzer
- ▶ Conductivity Meter
- ▶ Current Transformer
- ▶ Digital Manometer
- ▶ Digital Thermometer
- ▶ HOBO Data Logger
- ▶ Infrared Camera
- ▶ Infrared Thermometer
- ▶ Laser Distance Meter
- ▶ Light Meter
- ▶ Pitot Tube
- ▶ Power Logger
- ▶ Pressure Transducer
- ▶ Pyrometer
- ▶ Sonic Imager
- ▶ Strobe Tachometer
- ▶ Temperature/RH Logger
- ▶ Thermocouple
- ▶ Thermocouple Logger
- ▶ Time of Use Logger
- ▶ Ultrasonic Flow Meter
- ▶ Ultrasonic Leak Detector



SONIC IMAGER

Creates a sound map of an area to identify leaks in compressed air and gas lines.

Why it matters:

This tool is a faster alternative to ultrasonic leak detectors, and can help you quickly identify leaks from a greater distance.



"The Better Plants program has been instrumental in helping Deschutes Brewery meet many of our sustainability goals. The Diagnostic Equipment Program (DEP) has helped the brewery identify some energy savings opportunities that previously were not quantified. For example, an anemometer allowed for better HVAC balancing, pressure transmitters and logging devices have allowed us to fine tune our air compressor output pressure and patch up leaks, and the infrared camera we borrowed helped us to identify areas where adding insulation will reduce utility costs. This program has been wonderful to work with, and we look forward to taking advantage of these tools for future energy efficiency investigations."

- Scott Mellinger, Deschutes Brewery

Providing Resources for Partners: Guidance Documents

Trailblazers and Goal Achievers: How Better Plants Partners Achieved Ambitious Energy Goals



This document serves as a high-level planning resource for new partners and interested manufacturers that seek to establish ambitious energy efficiency goals. It presents common, real-world strategies that were implemented by the 56 Better Plants partners that had already met their goals as of 2019, as well as best practices and estimates of energy savings potential for various industrial systems. [Click here to access this guide on the Solution Center.](#)

Energy Management During a Pandemic

This guide explores four primary challenges that impacted manufacturers and the industrial sector when faced with the pandemic, as well as solutions for responding to these changes. This document examines shifts in industrial energy management as a result of the pandemic, strained budget for energy projects, increases in energy intensity from low production rates and other safety practices, limited access to energy systems, and tips to help compensate for lost knowledge and experience as a result of staff changes. [Click here to access this guide on the Solution Center.](#)



Understanding Your Utility Bills: Electricity, Water, and Natural Gas



This trio of documents was designed to help Better Plants partners meet the program's reporting requirements by helping them learn about and analyze their electric, natural gas, and water and sewer bills. Data collected from utility bills can be used with the DOE Energy Performance Indicator software tool to establish an energy baseline and track progress over time. Although these guides are intended to assist Better Plants partners, the tips within these documents are applicable to any organization.



Understanding Your Electric Bill

- How electricity is generated and delivered
- Overview of charges like consumption, demand, and riders
- Discussion of rate structures
- Cost and energy savings opportunities
- Example bill analysis

[Click here to access.](#)



Understanding Your Gas Bill

- How natural gas is produced, transported, and delivered
- Overview of charges for usage and transportation
- Discussion of rate structures
- Cost and gas savings opportunities
- Example bill analysis

[Click here to access.](#)



Understanding Your Water Bill

- How water is sourced, treated, supplied, and used
- Overview of charges like consumption, sewer, and riders
- Discussion of rate structures
- Cost and water savings opportunities
- Example bill analysis

[Click here to access.](#)

Working with the National Labs

The Department of Energy's **17 National Labs** tackle the critical scientific challenges of our time and possess unique instruments and facilities, many of which are found nowhere else in the world. They address large scale, complex research and development challenges with a multidisciplinary approach that translates basic science into innovative solutions.

Through the national labs' user facilities, independent groups can take advantage of equipment and facilities in order to advance their own understanding and work. Additionally, Technical Account Managers regularly facilitate meetings for Better Plants partners with lab experts to explore areas of collaboration. Manufacturers who partner with DOE through the Better Plants Program can **leverage many of the tools and resources that DOE has to offer**, whether through the annual [Technology Days](#) with the National Labs or their own private partnerships.

A Successful Partnership with the National Labs



For more than 20 years, researchers at **Argonne National Lab** have led major research efforts and developed tools and methodologies to support local, state, and federal sponsors in enhancing the security and resilience of the nation's critical infrastructure in the face of natural and manmade disasters. The Center for Climate Risk and Decision Science was established in 2021 to inform decisions that governments, businesses, and other agencies can make to identify risks, guard against them, or recover more rapidly from their impacts. Many industries have leveraged Argonne models and tools to help manage climate risk, increase asset resilience, and develop energy storage.

Zebra Technologies met many times with the Argonne team as they were exploring the issue of climate risk and trying to assess how the climate risks over time could impact their operations, supply chain, and customer markets based on geographical locations. They wanted to take a granular look at their physical locations for each functional area of the company, including limited company-owned label manufacturing, joint development manufacturing supplier locations (direct suppliers), and third-party distribution locations. They examined climate hazard level, exposure, and vulnerability at each physical location for issues like flooding and other hazards. Lab experts at Argonne helped review the report Zebra developed, and Zebra Technologies and Argonne are continuing to explore opportunities for joint research.

Ways to Leverage National Lab Capabilities

Whether through receiving short-term technical assistance, exploring research and development opportunities, forming a strategic partnership, or something that falls in between, there are many ways partners can work with the National Labs to advance their energy efficiency interests.

To better assist private industry in connecting with the lab network, DOE's office of Technology Transitions (OTT) launched the [Solutions Exchange](#) to help companies discover opportunities to work with the different labs and their technologies. Here, businesses can submit information on the challenges they wish to tackle and their partnership interests via an online form and find options for working with the appropriate labs. **These relationships include:**

- **Strategic Partnership Project**
- **Technology Licensing Agreement**
- **User Facility Agreement**
- **Technical Assistance**
- **Small Business R&D Program**
- **Agreements for Commercializing Technology**
- **Material Transfer Agreement**



Reducing Waste in the Industrial Sector

Energy Recovery, Circularity, and Sharing Best Practices Take Center Stage

As the Waste Reduction Pilot comes to its conclusion, Better Plants is distilling the lessons learned from working with almost **30 Better Plants partners** that participated in the pilot. Because of the multitude of waste streams and technologies and techniques to recycle and reduce them, no single approach or technology applies across all sectors and end users. In 2021, waste data from Better Plants partners showed important results. Despite the pandemic, partners in 2020 were able to improve waste diversion by **an average of 1.7%**.

In addition to significant recycling and landfill diversion three other aspects related to waste reduction emerged: **energy recovery, circularity**, and **knowledge-sharing**

Energy Recovery

Many manufacturers are able to recover energy from some of their waste streams. Often, this occurs from combustion of waste streams such as woody residues or solvents to avoid sending these streams to landfills. For most Better Plants partners, the energy recovery took place offsite from their locations. In 2020, more than 55,000 tons of waste were diverted towards energy recovery. In a few cases, partners in the waste pilot were able to recover energy content from waste streams and offset the purchase a fossil fuel. In the case of **Flowers Foods**, the company is able to recover spent oil from its baking process and reuse it as a form of bio-diesel."

Circularity

One prominent trend was taking a lifecycle approach to raw materials, final products, and waste streams. This was evidenced by partners like **Bristol-Myers-Squibb** and **Armstrong Flooring** that applied lifecycle frameworks to their production to minimize waste streams and increase the salvageability of products at end of life. Armstrong Flooring utilizes a lifecycle software platform to simulate the carbon sources within a product and to see how the footprint changes depending on how different materials are used to make it. By applying certain types of coatings on their floor panels, they can reduce the carbon associated with the area of floor paneling over its lifecycle.

Knowledge-Sharing

Early on, it was apparent that many partners were interested in sharing best practices. To facilitate this, we encouraged partner presentations in the quarterly calls, which yielded valuable presentations from partners including **Steelcase**, **Armstrong Flooring**, and **Flowers Foods**. In addition, working groups on plastic recycling and healthcare/pharmaceuticals offered opportunities to drill down on specific waste streams and introduced partners to new tools and technologies that could support their waste reduction efforts. One such tool is the [Materials Flows through Industry \(MFI\) Tool](#) that enables organizations to analyze and reduce energy, material, and carbon intensities associated with multiple production processes.

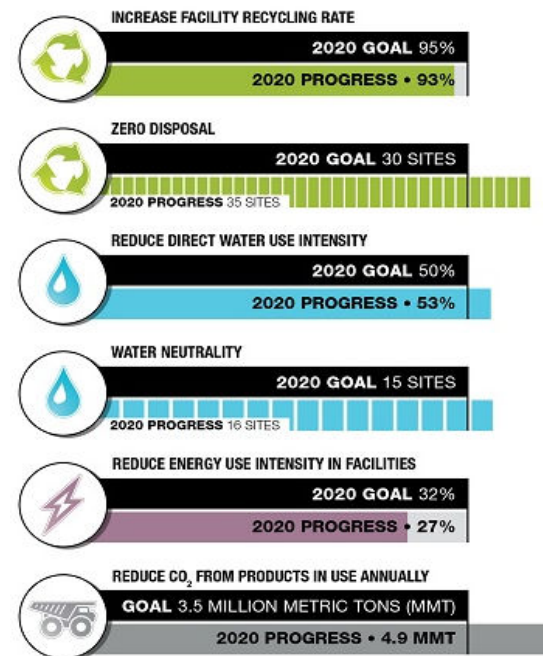
Promoting Water and Wastewater Efficiency

The Industrial Water Savings Network

Water is essential to manufacturers – whether for powering complex steam processes or use in simple domestic purposes. It is also a resource that has come under increasing risk in recent years, making it more imperative to reduce water waste. Factors like drought, population growth, and changing watersheds due to climate change are putting pressure on available water sources. This can lead to higher costs and increases the risk that limits could be placed on water supplies in highly stressed regions.

Recognizing this, more manufacturers are expanding their sustainability efforts to include water efficiency and conservation. Through the Better Buildings **Water Savings Network**, DOE brings organizations together to discuss and demonstrate successful approaches to conserving water in buildings and plants. Partners that would like to join the network will set a tailored water savings goal and engage in one or more water-savings activities each year, such as publishing a case study, tracking and reporting water savings processes, participating in peer exchanges, and sharing successes and challenges. [Click here to learn more.](#)

Better Plants Partner **Cummins Inc.** used resources from the Water Savings Network to set a goal of 40% reduction in portfolio-wide water use intensity from a 2010 baseline by 2021. Cummins exceeded that goal and has seen a 45% cumulative reduction in water use intensity, saving money and improving company-wide resilience.



Above: Better Plants Challenge partner, Cummins Inc., set six goals including water efficiency and leveraged resources from the Water Savings Network to achieve their 45% cumulative reduction in water intensity.

Sustainable Wastewater Infrastructure Accelerator (SWIFT) 2.0

In phase one of the **Sustainable Wastewater Infrastructure of the Future (SWIFT) Accelerator**, DOE worked with 70+ water resource recovery facilities to accelerate a pathway toward sustainable infrastructure. SWIFT Phase 2 (SWIFT 2.0) continues the momentum by providing access to resources, networking, technical support, and recognition. SWIFT 2.0 includes two separate tracks to accommodate a wide range of facility needs. Facilities that were not part of SWIFT Phase 1 but are interested in achieving **5% short-term and 25% long-term** facility-wide energy savings can participate in the SWIFT Wastewater Energy Management Toolkit Training.



Above: Technology tracks available to partners through the SWIFT Accelerator program.

Facilities that are ready to adopt more advanced energy technologies can join the **SWIFT Energy Recovery (SWIFter) Accelerator**, which includes scoping meetings, tailored workshops, training on energy savings resources and data analysis tools, consultations, and peer exchanges. SWIFT 2.0 Accelerator partners commit to implementing at least one next-generation infrastructure improvement project and demonstrating at least a 5% reduction in energy intensity.

If you would like to learn more or are interested in signing up for the SWIFter Accelerator please contact Shannon Zaret at Shannon.Zaret@ee.doe.gov.

Leveraging Complementary Programs

CHP Deployment Program

Combined heat and power (CHP), also known as cogeneration, can help manufacturers lower operating costs and reduce carbon emissions while offering fuel flexibility, improved reliability, and improved energy resilience. CHP is an efficient technology that generates electricity and uses the thermal energy that is otherwise wasted as heat to provide steam or hot water, achieving overall efficiencies of up to 80%.

Better Plants partners have access to a **range of no-cost CHP resources** provided by DOE's ten [CHP Technical Assistance Partnerships](#) that can:

- Identify CHP opportunities for plants, considering multiple fuel and technology options.
- Access engineering support for project planning throughout a project's lifespan.
- Provide CHP portfolio screenings, including economic payback analyses.



**CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS**



Above: Aerial view of the General Mill's plant in Murfreesboro, TN. Photo courtesy of General Mills

Better Plants Challenge Partner **General Mills** constructed an anaerobic digester at its Murfreesboro, TN, location to utilize the acid whey byproduct from yogurt production processes. Prior to installation, the cost of storage and disposal of the whey byproduct exceeded \$2.5 million per year. Initially, the biogas (methane) produced by the digester was flared. In 2015, the new CHP system went online, facilitating the generation of electricity and capturing waste heat to funnel back into the process. The system produces 1.6 MW of electricity, which is approximately 20% of the plant's demand and reduces power purchased from the local utility. The recovered heat from the system is harvested and used in dairy sanitation processes. Net reductions in operating and utility costs exceed \$500,000 per year. On top of those savings, the project reduces the facility's GHG emissions by over 9,000 metric tons of CO₂e per year by using power from waste-generated biogas rather than from the grid.

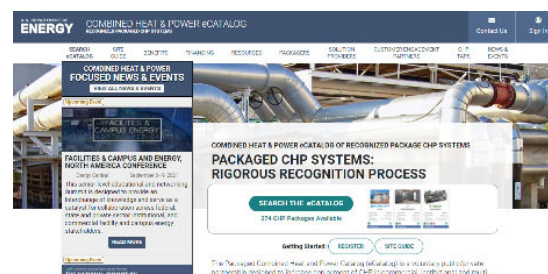


Miami-Dade Water and Sewer Department (MD-WASD) is a Better Plants partner and water and wastewater treatment county utility that utilizes biogas for CHP. Biogas is produced via anaerobic digestion at two of its facilities with a total cogeneration capacity of 12.8 MW, of which 3.2 MW was installed for resiliency to protect against downtime. To sustain a continuously renewable fuel cycle, waste heat from the reciprocating cogeneration engines is then used on site for anaerobic sludge digestion. Total CHP utilization is currently 5.0 MW, limited by current biogas production and utility requirements for minimum import. After planned in-process plant rehabilitation and expansion projects are completed, including new FOG facilities, MD-WASD looks to increase its CHP utilization to its full operational capacity of around 10.0 MW. MD-WASD is also considering an additional 2.0 MW microturbine CHP engine to produce additional heat for biosolids treatment. CHP has made MD-WASD more resilient by protecting against downtime and outages, cutting energy costs, creating redundant energy sources, and reducing its carbon footprint.

Other CHP Resources

The U.S. DOE [CHP eCatalog](#) is an open source, routinely updated web-based system that is designed to increase the deployment of CHP by providing tools for users to learn about, select, and compare packaged CHP systems. Additionally, two CHP-focused webinars were hosted during the 2021 webinar series. View these and other [CHP-focused webinars](#) on the Solution Center.

Right: The CHP e-catalog which helps users compare and select CHP systems.



Leveraging Complementary Programs

50001 Ready

The U.S. Department of Energy's 50001 Ready program recognizes facilities and organizations that attest to the implementation of an ISO 50001-based energy management system. The program is a self-paced, no-cost way for organizations to build a culture of structured energy improvement that leads to deeper and sustained savings that does not require any external audits or certifications.

DOE has recognized 35 Better Plants partner sites and its companies for completing the 25 steps of the 50001 Ready Navigator. Each site has implemented an energy management system aligned to the globally recognized ISO 50001 energy management system standard. An additional 42 non-Better Plants industrial sites and non-industrial partners have also completed the steps necessary to become 50001 Ready.



33%

Growth of
US users in
FY21

32%

Growth of US
projects in
FY21

35

Better Plants
partners
engaged

Updates to the 50001 Ready Navigator

- ▶ **Tailored Navigator:** 50001 Ready now offers a tailored version of the 50001 Ready Navigator for the federal government, military, and wastewater treatment facilities (WWTF). The tailored versions include specialized guidance, case studies, and Sample Playbook files. The WWTF version even includes a full dataset for a generic WWTF.
- ▶ **Virtual cohorts:** The cohort program includes six to twelve months of support from national ISO 50001 experts delivered via monthly cohort group training webinars, virtual one-on-one coaching sessions, on-demand guidance on the use of 50001 Ready tools and resources, and opportunities for peer-to-peer learning. Please send an email to the Help Desk, 50001Ready@lbl.gov to arrange a call to share more information about your site, hear more about the technical assistance available, and learn how to join.

[Learn more at energy.gov/50001Ready](https://energy.gov/50001Ready)

SEP 50001

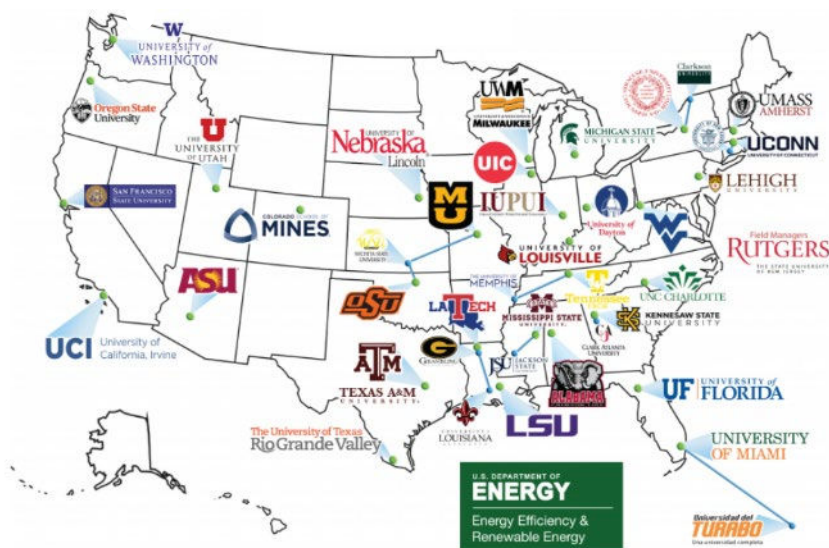
Facilities or organizations that achieve sustained excellence using their energy management systems (EnMS) may get certified to the **Superior Energy Performance 50001™** (SEP 50001™) program and achieve elevated levels of DOE recognition. Better Plants partners **3M, AstraZeneca, Cummins Inc., Nissan, Schneider Electric, and Volvo** were all recertified to the SEP 50001 program over the past year. 3M, Nissan, and Schneider Electric each demonstrated leadership by achieving verified improvements in energy performance across multiple sites.



Supporting Small to Medium Manufacturers

Industrial Assessment Centers

DOE **Industrial Assessment Centers (IACs)** help small and medium-sized U.S. manufacturers save energy, improve productivity, and reduce waste by providing no-cost energy assessments conducted by university-based teams of engineering students and faculty. **A new cohort of IACs at 32 universities** will focus on improving productivity, enhancing cybersecurity, promoting resiliency planning, and providing trainings to entities located in disadvantaged communities. The cohort will also engage in a new pilot project to expand to the commercial building market. As part of the pilot, selected IACs will partner with community colleges and technical college programs to train diverse students and professionals to conduct energy-efficiency assessments of small to medium-sized buildings, including those located in disadvantaged communities. These IACs will be **funded through 2026 and are located in 28 states** across the country. **See the map below for more details.**



Above: The West Virginia University Industrial Assessment Center (WVU-IAC) conducted an industrial assessment for Better Plants partner Volvo Group Trucks in June 2021. The team was led by the Director of the WVU-IAC, a lead student, and three additional students. The team developed several energy efficiency recommendations related to process energy systems.

Better Plants Supply Chain Initiative

Sustainability is gaining more importance within the industrial landscape and is pushing deeper into supply chains. As a result, pressure for improved environmental and energy performance continues to work itself up supply chains as consumer-facing companies face more pressure to show progress on environmental performance.

Better Plants helps companies by working with suppliers in the Supply Chain initiative. Currently, the initiative includes five cohorts each sponsored by a larger partner that is further downstream within their sector, with a total of 39 supplier companies across the five cohorts.

Despite the pandemic, several supplier companies had impressive accomplishments in 2020. **Alumalloy**, a metal casting company, met the program goal with a 26.1% cumulative improvement in energy intensity. An automotive supplier of brakes and brake system components, **Bendix**, achieved energy savings of approximately 29,000 MMBtus and was awarded a Better Practice award for a highly effective waste reduction project. Another supplier, **American Mitsuba**, ramped up its waste reduction and began recycling 100% of its industrial waste in 2020. This effort yielded annual cost savings of \$11,000 in reduced hauling charges and helped create about 30-50 jobs for disabled citizens. Additionally, **NSK Americas**, a manufacturer of metal parts for the automotive sector, successfully used the Better Plants Diagnostic Equipment Program acoustic imaging camera to detect compressed air leaks.



Above: (Left) Bendix Huntington Plant Zero Waste to Landfill Certification; (Top and Bottom Right) Fluke ii900 Sonic Industrial Imaging camera used to detect leaks.

Partners as of October 2021

3M*	Chapco, Inc.	<u>Dura-Line Corporation</u>	Graphic Packaging International, LLC*
AbbVie Inc.	Charleston Water System	Durable Products	
Agropur	Charter Steel*	Durex, Inc.	<u>Great Lakes Crystal Technology</u>
Ahlstrom-Munksjö	Chippewa Valley Ethanol Company	<u>E&L Construction Group</u>	HARBEC*
Alcoa Corporation	Citrus World, Inc.	EARTH ₂ O	Harley-Davidson
Alexandria Renew Enterprises	City of Fort Wayne – City Utilities	East Penn Manufacturing, Inc.	Harrison Steel Castings Co.
Alumalloy Metal Casting Company*	City of Grand Rapids Water Resource Recovery Facility	Eastman Chemical Corporation	The Harva Company
Amcord Rigid Plastics	City of Phoenix Water Services Department	Eaton Corporation*	Haynes International
American MITSUBA Corp.	City of Roseville, Environmental Utilities Department	Eck Industries	HNI Corporation
Archer Daniels Midland	Clearwater Engineering, Inc.	Electrolux	Honda North America
Armstrong Flooring	<u>Cleveland-Cliffs Inc.</u>	Encina Wastewater Authority*	Huntsman Corporation
Asama Cold Manufacturing	Co-Operative Industries Aerospace and Defense	<u>EnerSys</u>	Imerys Performance Minerals
AstraZeneca*	<u>Coca-Cola Consolidated</u>	The Estée Lauder Companies	<u>IAC Group</u>
AT&T*	Coilplus, Inc.	Flambeau River Papers	Ingersoll Rand*
Autodie, LLC	<u>Colgate-Palmolive</u>	<u>FLEXCO Corporation</u>	Ingevity*
Autoliv, Inc.	Comau*	Flowers Foods, Inc.	Intel
Avon Lake Regional Water	Commercial Metals Company	FMC Corporation	International Paper
Ball Corporation	Commercial Vehicle Group, Inc.	Ford Motor Company*	Intertape Polymer Group Inc.
BD	<u>Connector Castings, Inc.</u>	GB Manufacturing	Intralox
Bendix Commercial Vehicle Systems	Cooper Standard	General Aluminum Manufacturing Company	<u>Isringhausen</u>
Bentley Mills*	Cummins Inc.*~	General Dynamics Ordnance and Tactical Systems Scranton Operation*	Ithaca Area Wastewater Treatment Facility
Boardman Foods	Custom Glass Solutions	General Electric	J.R. Simplot Company*
Bosch Rexroth Corporation	Daikin Applied Americas*	General Mills*	JBT Corporation*
BPM Inc.*	<u>Danaher Corporation</u>	General Motors*~	Jedco, Inc.
Bradken*	Darigold	General Stamping and Metalworking, Inc.	Johnson & Johnson*
Bridgestone Americas, Inc.	Delta Diablo	Gibraltar Industries	Johnson Controls*
Briggs & Stratton, LLC	Denison Industries	GKN Aerospace	Johnson Matthey Emission Control Technologies Division
Bristol-Meyers Squibb	Des Moines Water Works	Golden Renewable Energy, LLC	Kent County Department of Public Works
Bucks County Water and Sewer Authority*	Deschutes Brewery	Goodyear Tire and Rubber Company, U.S. Plants	Kenworth Truck Company
C. F. Martin & Company*	<u>Detroit Diesel Corp.</u>	Graham Packaging Company	Kingspan Insulated Panels, Inc.*
CalPortland Company*	Didion Milling		
Campbell Soup Company	Dixline Corporation		
Cardington Yutaka Technologies*	Donsco, Inc.		
Carlton Forge Works	The Dow Chemical Company		
Cascade Engineering Technologies, Inc.	DSM North America		
Celanese Corporation*			

KEY

Bold – Better Plants Challenge Partner

Underline – New Partner

Asterisk* – Energy Goal Achiever

Tilde~ – Water Goal Achiever

Partners as of October 2021

Krage Manufacturing	Newman Technology, Inc.	Roche Diagnostic*	Textron, Inc.
KYB Americas Corporation	NEW Water (Green Bay Metropolitan Sewerage District)*	Rowley Spring and Stamping	<u>Thermo Fisher Scientific</u>
Lafarge-Holcim U.S.	Nissan North America, Inc.*	Saint-Gobain Corporation	TK Elevator Corporation*
Land O' Lakes	Novati Technologies, Inc.	Saputo Dairy Foods USA, LLC	TitanX Engine Cooling, Inc.
Leggett & Platt	Novelis, Inc.	Savage Precision Fabrication	Toyota Motor Engineering and Manufacturing North America*
Legrand North America, LLC*	NSK Americas	Schneider Electric*	TPC Group, LLC
Lennox International*	NY DEP – Bureau of Wastewater Treatment	Sears Seating	Tri-State Plastics, Inc.
Lineage Logistics	O'Fallon Casting	Selmet, Inc.	<u>TRAM Group</u>
Lockheed Martin	Occidental Chemical Corporation	Shape Corporation	Tyson Foods
Los Angeles Bureau of Sanitation	OFD Foods, LLC	Shaw Industries Group, Inc.*	United Mechanical and Metal Fabricators, Inc.
Los Angeles Department of Water & Power	OMNOVA Solutions, Inc.	Sheboygan Regional Wastewater Treatment Facility	Valmont Industries
Lynam Industries, Inc.	Orange Water and Sewer Authority*	The Sherwin-Williams Company*	<u>Valvoline</u>
L'Oréal USA	Oshkosh Corporation	Silgan Closures	Vanguard Space Technologies
Magnetic Metals Corp.	OSRAM SYLVANIA*	Silgan Containers	Vermeer Corporation
MAHLE Engine Components USA, Inc.	Owens Corning*	Silgan Plastic Food Containers	Verso Corporation*
Manitowoc Grey Iron Foundry	Ozinga Brothers, Inc.	<u>SL Corporation</u>	Victor Valley Wastewater Reclamation Authority*
Mannington Mills	Pactiv	Solberg Manufacturing, Inc.	Vitro Architectural Glass
Marquis Energy, LLC	PaperWorks Industries	Sony DADC	Volvo Group North America*
Marquis Energy Wisconsin	Parker Hannifin	Southwest Cheese	W. L. Gore and Associates
Massachusetts Water Resources Authority	Patrick Cudahy, LLC*	Spirax Sarco, Inc.	Waupaca Foundry, Inc.
MB Aerospace East Granby	Patriot Foundry & Castings*	St. Petersburg Water Resources Department	Weber Metals, Inc.
McCain Foods USA, Inc.	PepsiCo	Stanley Spring & Stamping Corporation	Western Lake Superior Sanitary District
McWane, Inc	<u>Perrone Aerospace</u>	Steelcase Inc.*	WestRock
MEKRA Lang North America	Pharmavite	Stellantis	Weyerhaeuser*
Metal Industries, Inc.*	Philadelphia Water Department	Sugar Creek Packing Company	Whirlpool Corporation
Miami-Dade Water and Sewer Department	Pima County Wastewater Reclamation Department	SunOpta, Inc.	Xerox
Michels Corporation	Plastics Engineering Company (Plenco)	<u>Tarkett USA, Inc.</u>	<u>Zebra Technologies Corp.</u>
Mitsubishi Electric Automotive America	PPC Broadband, Inc.	TE Connectivity*	Zimmer Biomet
Mohawk Industries	PPG Industries	Tenaris	
Mulgrew Aircraft Components, Inc.	Procter & Gamble*	Texas Instruments Inc.*	
Narragansett Bay Commission	Quad/Graphics, Inc.	Texas Nameplate Co.	
Navistar, Inc.*	Raytheon Technologies		
ND Paper	Research Electro-Optics		
Neenah Foundry	<u>Richmond Industries</u>		
	<u>Ring Container Technologies</u>		

KEY

Bold – Better Plants Challenge Partner

Underline – New Partner

Asterisk* – Energy Goal Achiever

Tilde~ – Water Goal Achiever



74

ENERGY
AND WATER
GOALS MET

63

GOAL
ACHIEVING
PARTNERS