U.S. Department of ENERGY | Office of Manufacturing & Energy Supply Chains

Annual Report

FY24

LETTER FROM THE DIRECTOR

Our economy and our national security depend on affordable, reliable energy, and we cannot power our economy and way of life without secure energy supply chains. Increasingly, over the last few decades, reliance on foreign manufacturers and suppliers has made critical energy supply chains more vulnerable. America is advancing its leadership role in energy manufacturing, and none too soon.

The Department of Energy's (DOE) Office of Manufacturing and Energy Supply Chains (MESC) is proud to be at the forefront of this transformative moment. We are bringing new life to American-made critical materials and energy products, sparking job creation across the nation, and enabling our own country to realize the benefits of our own technologies, instead of allowing others to reap the rewards of American ingenuity. MESC is on track to deploy nearly $20 billion as a partner to private-sector-led projects that will enhance our economic and national security by eliminating vulnerabilities in domestic energy supply chains. In MESC's first two years, it has been our great honor to enable the private sector to rebuild a strong, resilient foundation for America's energy independence, while laying the foundation for a skilled 21st century energy workforce.

At MESC, our work centers on three strategic objectives:

1. **Catalyze American energy manufacturing.** We focus on scaling production of critical materials, components, and finished products for energy supply chains on U.S. soil to meet energy demands and restore our energy independence.
2. **Reinvigorate the domestic manufacturing workforce.** American jobs are at the heart of everything we do. We partner with domestic manufacturers and skilling institutions to cultivate a pipeline of trained workers who can build and operate energy-related factories, securing the future of U.S. energy manufacturing
3. **Identify supply chain risks and mitigation measures that inform key supply chain investment decisions.** We collaborate with DOE's National Laboratories and across the federal government to ensure awareness of energy supply chain vulnerabilities and opportunities, and to enable the private and public sectors to make data-driven, well-targeted investment and policy decisions that will that enhance America's energy independence.

Our impact speaks for itself: at the close of the 2024 government fiscal year, MESC had deployed over $12 billion to transform energy supply chains, catalyzing more than $27 billion in private investment and enabling the construction of 80+ manufacturing facilities across 31 states. Nearly all of the projects we support are funded at least 50% by private capital or balance sheet capital, ensuring that the projects we support have strong market pull and that our capital plays a catalytic, rather than a displacing, role. Our investments have helped companies create or retain nearly 50,000 good-paying jobs. Through initiatives like the Industrial Training and Assessment Center (ITAC) Program, we've also invested $100 million in workforce development, funding over 200 projects to help ensure America has the skilled labor force necessary to sustain our newly restored manufactured momentum. These programs, and others we help administer, such as the Qualifying Advanced Energy Project Credit (48C) Program, are tipping the scales for companies deciding where to base their manufacturing facilities, incentivizing them to keep businesses on U.S. soil and return manufacturing capabilities that had been exported elsewhere.

We also celebrated key milestones for our awardees, including attending the ribbon cutting ceremony for Cirba Solutions' new manufacturing

facility in Lancaster, OH. This was the first ever Bipartisan Infrastructure Law-funded manufacturing facility to come online, highlighting the tangible progress and transformative impact of our investments.

Thanks to investments like these, our country is making great strides in reversing decades of underinvestment in U.S. manufacturing and resilient supply chains. Our federal investments are working to build U.S. capacity and supply chain strength, creating thousands of jobs and economic opportunity across the country.

The progress outlined in this report represents more than just numbers; it is a reflection of what we can achieve through government-enabled, private sector-led investment. This report further reflects the dedication of our team and partners across federal and state governments, of large, medium and small manufacturers, and of communities across the country that are celebrating the rebirth of their manufacturing economies. We are building a stronger, more resilient, and more innovative manufacturing base together—one that secures America's energy future and creates opportunities for generations to come.

Sincerely,

Giulia Siccardo

Giulia Siccardo
Director, Office of Manufacturing & Energy Supply Chains

TABLE OF CONTENTS

U.S. Department of ENERGY | Office of Manufacturing & Energy Supply Chains

Investing in America's Energy Future

2024 MESC MOMENTS

Manufacturing Renaissance Heralded at NYC Climate Week

MESC leadership at NASDAQ Opening Bell Ceremony during New York Climate Week 2024 where there was one clear message —"manufacturing renaissance."
(Image courtesy of NASDAQ)

Industry Leaders Offer Insights Through Inaugural Industry Supply Chain Analysis Network (I-SCAN) Meeting

Modeling, Mapping, and Analysis Consortium's (MMAC's) Industry Supply Chain Analysis Network (I-SCAN) in-person meeting on June 11 in Washington, DC. This inaugural session was co-hosted by the DOE National Labs and convened about 30 CEOs and CxOs. DOE's Under Secretary for Infrastructure, David Crane and MESC Director, Giulia Siccardo delivered keynote introductions and co-led an industry listening session. (Source: MESC)

MESC Takes Leading Role in Nationwide Tribal Consultations

White House Council on Native American Affairs leads Nationwide Tribal Consultations for the Tribal Critical Minerals Initiative, with MESC Tribal Affairs Liaison, Corey Carmack, August 2024. (Source: MESC)

MESC + SXSW = Inspiring the Next Generation

Amashia Mabone, 6K Scholar and Student at Lane College, and Amy Carter, Senior HR Business Partner at 6K Energy, together at SXSW 2024. Amashia Mabone is 6K's first scholarship winner and a newly declared STEM major. Thanks to the $6K scholarship she earned from 6K, Amashia has decided to become a battery engineer. (Source: SXSW)

Women in Engineering and Manufacturing

MESC Director Giulia Siccardo and Chief of Staff Becca Ward meet with young women working in battery engineering at the Sila Nanotechnologies headquarters in Alemeda, CA to discuss the rise of energy manufacturing in the US and career paths for women in energy and resources. (Source: Sila Nanotechnologies, Inc.)

Congressional Hispanic Caucus Institute (CHCI) Leadership Conference

MESC Strategic Engagement Specialist, Virginia Castro, participates in the CHCI Leadership Conference focusing on why supplier diversity matters to Latino economic strength, September 2024. (Source: CHCI)

SECURING AMERICA'S ENERGY FOUNDATION

For decades, the United States had underinvested in manufacturing, with U.S. industry becoming import-dependent for hardware across supply chains. Since the passage of the Bipartisan Infrastructure Law and the Inflation Reduction Act, U.S. manufacturing is booming, reaching unprecedented heights of private investment. (Figure 1).

MESC invests in commercial-scale ventures that are positioned to add meaningful production capacity to the U.S. energy sector industrial base.

Figure 1. Real U.S. private investment in manufacturing structures, 2000-2034. Billions of 2012 USD, seasonally adjusted annual rate. (Source: The White House Briefing Room, December 2023)

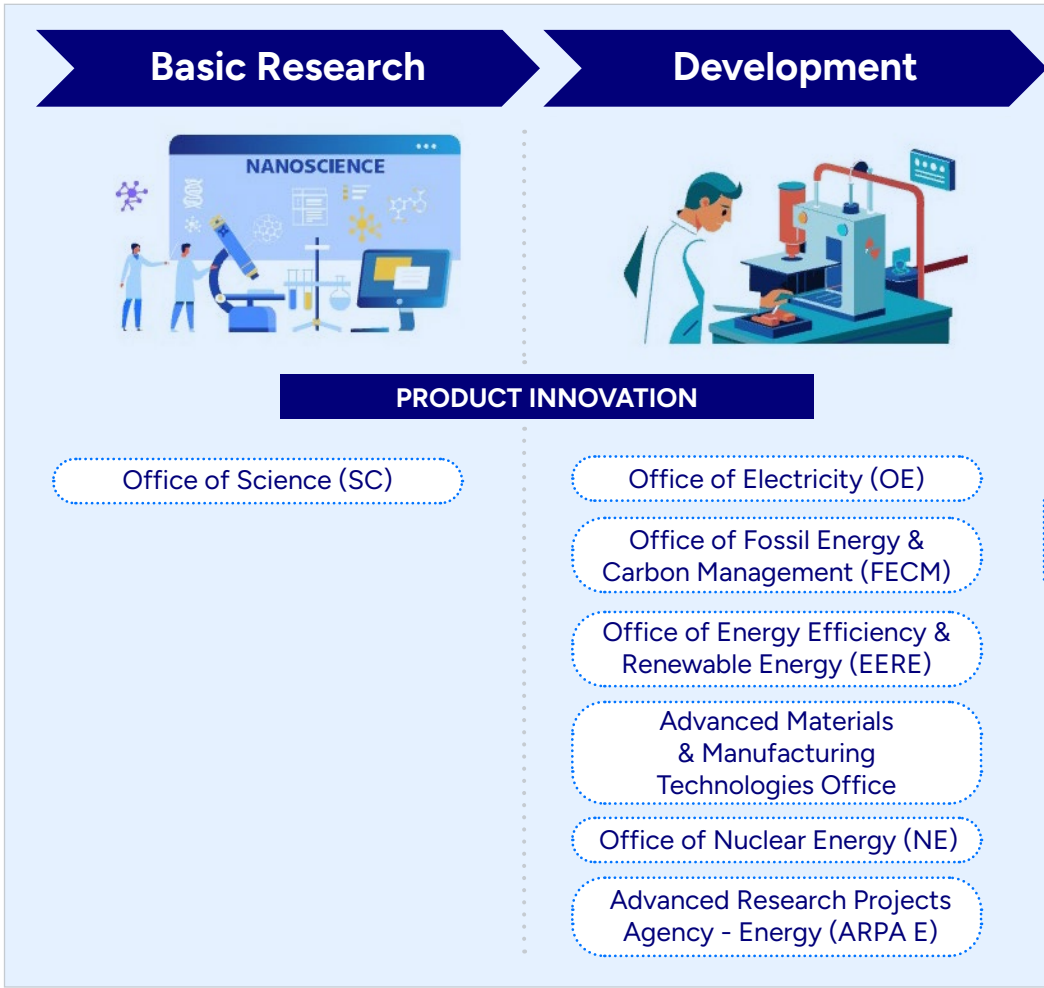
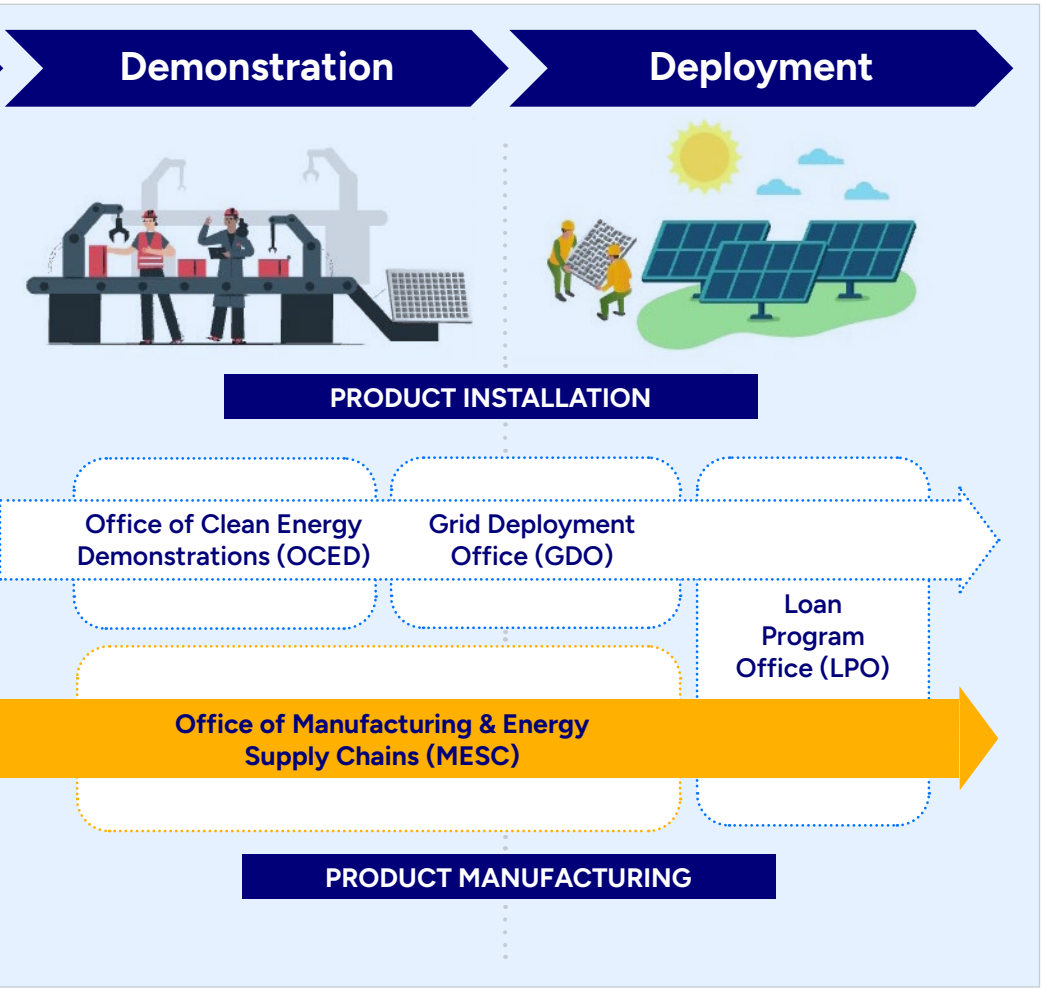


Figure 2. DOE-enabled, private sector-led clean energy development.

Such giga-scale projects often fall at the deepest trough of the "valley of death" of commercial scaling, given they are highly capital intensive and carry high execution risk. Prior to the DOE's reorganization in 2022, the DOE had been oriented to support basic research and technology development for early ventures and (since the Loan Program's Office's founding in 2005) all the way at the other end of the spectrum, to provide preferred debt financing to comparatively mature organizations, but was



not equipped to support or invest in companies embarking on commercial-scale manufacturing.

Two years ago, MESC was founded to focus on providing funding to commercial manufacturing projects in a manner that brings down the risk profile and renders a return level sufficiently attractive to mobilize private capital sources. MESC is the only office at DOE focused exclusively on funding and enabling commercial scale manufacturing of energy products,

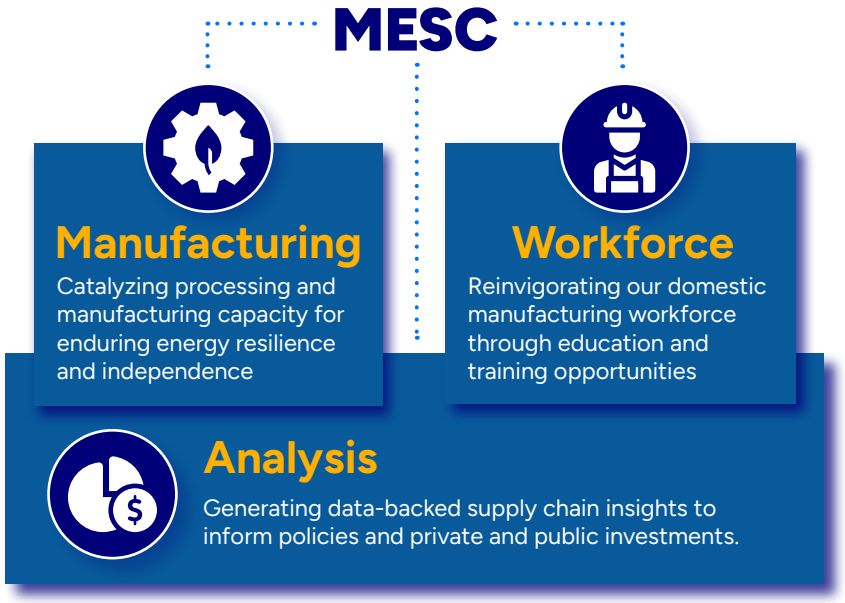


Figure 3. MESC is systematically securing America's energy foundation.

components and precursors (Figure 2).

MESC's investments, across manufacturing projects and workforce development programs, are guided by detailed and supply chain data-driven analysis, which is the foundation of our office's programs and activities (Figure 3). MESC's in-house supply chain analytical experts work closely with DOE's national labs to bring cutting-edge technical analysis, economic modeling, and risk assessment into investment decisions and policy development.

MESC BY-THE-NUMBERS

MESC'S Manufacturing & Workforce Impact

$39.7B Combined federal and private investment to-date

47K+ Jobs created or retained

$12B Deployed to transform energy supply chains and create high-quality jobs

$27.7B Catalyzed in private sector investment

$150M Direct investments in energy workforce

80+ Manufacturing facilities across 31 states supporting batteries, buildings and energy efficiency, energy generation, critical minerals processing and recycling, grid, materials, and transportation

147 Workforce training programs selected, including non-traditional, community colleges, and vocational schools

$79M State and local partnerships supporting advanced manufacturing, consumer batteries recycling, and EV component production

2,400+ Students trained in MESC-funded programs annually

$222M+ Community benefits plans investments

>40% Projects located in disadvantaged communities

Strengthening Our Supply Chains and Our Communities

Today, 98% of lithium-ion batteries use graphite anodes, and about 70 to 80% of that graphite comes from China. Group14's material displaces graphite at a 5:1 ratio, and will displace about 20,000 metric tons of Chinese graphite. Our facility, located in Moses Lake, WA, a historically economically disadvantaged community, has now hired over 180 new employees, paying about double the region's average wages. Funding support from MESC has been critical to accelerate this transformational technology here in the U.S., and is bringing huge economic benefits to our community. We're so thankful to MESC for their support.

Rick Luebbe,
Co-Founder & CEO, Group14

MESC's portfolio is scaling U.S. manufacturing and catalyzing U.S. energy production

Batteries

6K, anthro, Braskem, CABOT, Dow, EnerSys, ENTEK, FORGE BATTERY, Form energy, AICL, MICROPOROUS, Mitra Chem, moment energy, NANOGRAF CORPORATION, Sila, Solid Power, sparkz, URBIX, SOLVAY

Buildings & Energy Efficiency

AO Smith, ALPEN HIGH PERFORMANCE PRODUCTS, Armstrong, Bard, Bitzer, CleanFiber, COPELAND, DAIKIN, hempitecture, Honeywell, Hydro-Temp, ICE AIR World Class Comfort, Infinitum, LUXWALL SEE BEYOND, MITSUBISHI ELECTRIC, MODINE, YORK

Critical Materials & Recycling

Albemarle, ABTC AMERICAN BATTERY TECHNOLOGY COMPANY, ANOVION BATTERY MATERIALS, ASCEND ELEMENTS, BLUE WHALE MATERIALS, Cirba Solutions, CLARIOS, Element 25, GROUP14, Li Industries, NOVONIX, NTH CYCLE, orbia, revex TECHNOLOGIES, BIRLA CARBON, Standard LITHIUM, TALON METALS CORP, TerraVolta

Energy Generation & Fuels

ELECTRIC HYDROGEN, eVAC, Highland materials, John Cockerill, Mainspring, nel, RG RESOURCE TECHNOLOGIES, INC POWERPANEL, SOLARCYCLE, TOPSOE, twelve, VOITH, wallbox

Grid Equipment

COREPOWER MAGNETICS, EATON, HELLENIC CABLES Member of CENERGY HOLDINGS, LS GreenLink, METOX, prolec, prysmian, SIEMENS energy, OTS CONDUCTOR

Materials

ArcelorMittal, BOSTON METAL, furno, JSW USA, TERRA CO2, URBAN MINING INDUSTRIES

Transportation

BALLARD, BLUE BIRD, Cummins, FCA FIAT CHRYSLER AUTOMOBILES, gm, HARLEY-DAVIDSON, MOBIS NORTH AMERICA, NUVERA FUEL CELLS, VOLVO, energy, ZF

MESC's all-of-supply chain approach to energy investing

OUR EFFORTS SPAN MULTIPLE SUPPLY CHAINS. HERE ARE THREE EXAMPLES:

Energy Generation & Fuels

COMPONENT MANUFACTURERS

Boston Metal · eVAC · JSW USA · MP · SolarCycle

PRODUCT MANUFACTURERS

Ballard · Mainspring · RG Resource Technologies, Inc PowerPanel · Voith

FUEL EQUIPMENT MANUFACTURERS

Cummins · Electric Hydrogen · TOPSOE · wallbox · energy

Grid

ELECTRICAL STEEL

ArcelorMittal · CorePower Magnetics

TRANSFORMERS

Eaton · Prolec · Siemens Energy

CABLES & CONDUCTORS

Hellenic Cables · LS GreenLink · METOX · prysmian · TS Conductor

GRID-SCALE STORAGE

Form energy · moment energy

Batteries

PROCESSING & REFINING

Albemarle · Group14 · Novonix · Standard Lithium · TerraVolta

COMPONENT MANUFACTURING

Dow · Entek · NanoGraf · Solvay · Urbix

BATTERY MANUFACTURING

EnerSys · Forge Battery · Form energy · Mitra Chem · sparkz

RECYCLING & REUSE

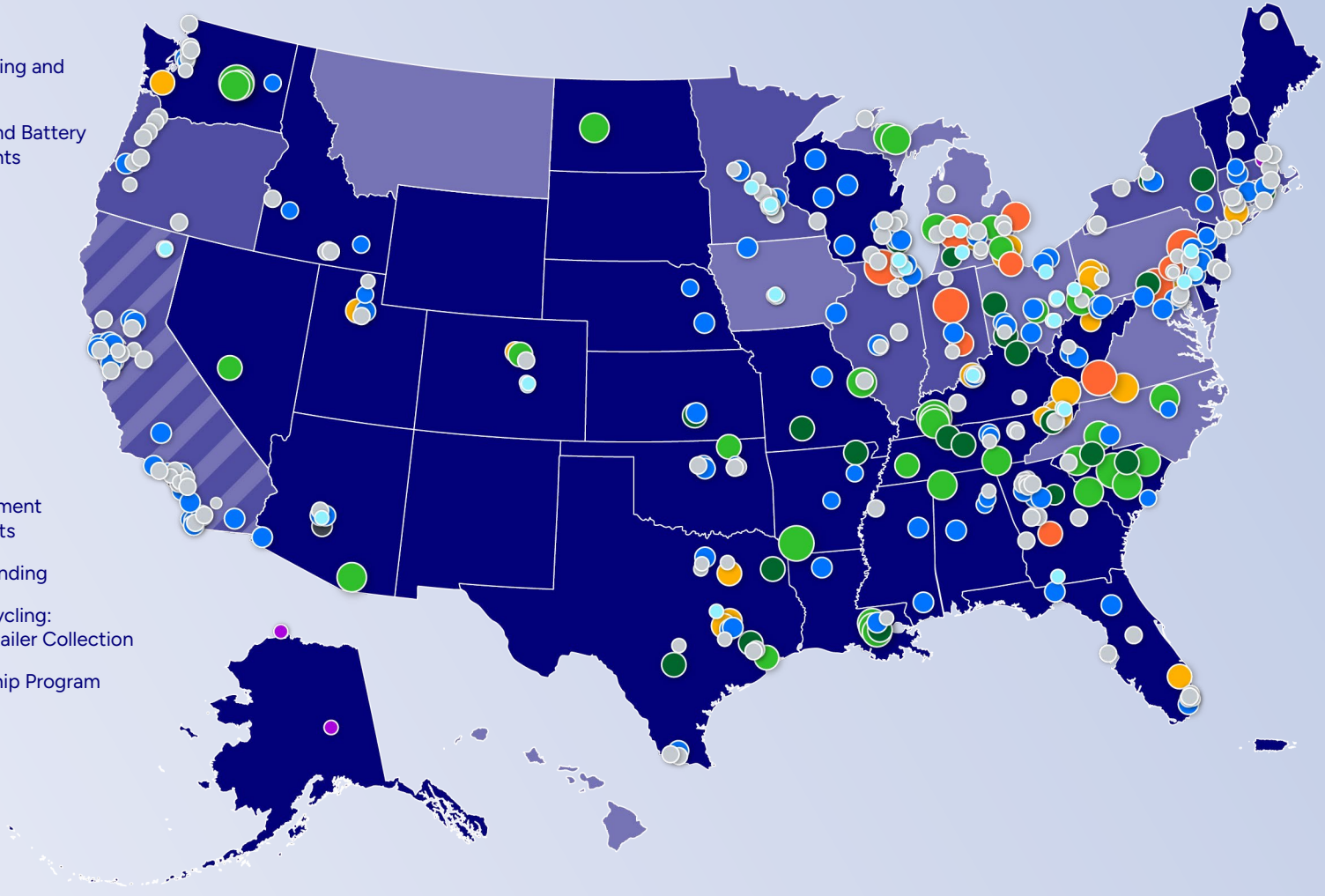
Blue Whale Materials · Cirba Solutions · Clarios · Nth Cycle · revex Technologies

MESC Project Map

SELECTEE & AWARDEE

PROGRAM KEY

- Advanced Energy Manufacturing and Recycling Grant Program
- Battery Material Processing and Battery Manufacturing Recycling Grants
- Domestic Manufacturing Conversion Grants
- Energy Efficient Transformer Rebate Program
- Extended Product System Rebate Program
- Heat Pumps Manufacturing
- Industrial Training and Assessment Centers
- Industrial Training and Assessment Centers Implementation Grants
- Congressionally Directed Spending
- Battery & Critical Mineral Recycling: State/Local Programs and Retailer Collection
- State Manufacturing Leadership Program



FUNDING KEY

- <$100,000
- $100,000 to $999,999
- $1M to $9.99M
- $10M to $99.99M
- $100M to $199.99M
- ≥$200M

Data as of 10/29/2024.
48C Applicant Self-disclosed Projects are not included.
Selectees without finalized location are not included.

FY 2024 IN REVIEW

Catalyzing Manufacturing Capacity

MESC is actively working to enable the United States to further strengthen its leadership in the 21st century global energy economy through domestic national security-focused investments, as critical energy supply chains increase in number and complexity. MESC invests in domestic manufacturing—identifying dependencies and directing energy supply investments where they are needed most—to secure the nation's energy infrastructure and manufacturing base. We partner across the manufacturing base, including with small- and medium-sized manufacturers (SMMs)—**which account for more than 90% of the domestic manufacturing base**[1] —to support critical mineral processing and recycling, advanced energy manufacturing and recycling projects, drive energy manufacturing productivity, and other programs critical to strengthening our nation's energy security and grid resilience.

BATTERY MATERIAL PROCESSING, MANUFACTURING, AND RECYCLING GRANTS

The Battery Materials Processing Program provides grants to companies establishing processing facilities in the United States capable of producing materials to combat China's dominance in the battery industry. The program provides grants to companies establishing domestic manufacturing capabilities for battery components, battery packs and battery recycling.

MESC has announced over $5 billion in federal investments for 39 projects—14 awarded and 25 selected for negotiation—to boost domestic production of materials critical to advancing our national and economic security goals. This includes advanced batteries, battery materials, and battery recycling, catalyzing an additional $11 billion in private capital.

Through these investments, MESC is developing a diversified battery portfolio that will deliver a robust and secure battery manufacturing supply chain for the American people. Below are two examples of manufacturing projects that are working to fortify the U.S. battery supply chain.

> "Increasing the supply of critical materials sourced in the U.S. is crucial to our national security, our pursuit in reducing carbon emissions and our goals around building a closed-loop supply chain. The support from MESC has made it possible for us to expand our operations and operational footprint for the growing battery industry in the U.S., which has never been seen before in North America."
>
> **David Klanecky,**
> **CEO and President of Cirba Solutions**

[1] *Support for manufacturing businesses | U.S. Small Business Administration*

Strengthening America's Energy Resilience with Domestic Lithium-Ion Batteries

Cirba Solutions is at the forefront of critical mineral refinement in North America. The domestic processing of lithium-ion batteries is instrumental in the future of critical materials and a closed-loop battery supply chain, and the collaboration between the DOE and Cirba Solutions is helping to drive that innovation forward. The organization is actively working towards the build out of a domestic supply chain for battery-grade sulfates which serve as material inputs for precursor cathode active materials and cathode active materials (CAM).

With the support of MESC, Cirba Solutions received more than $82 million to expand critical mineral manufacturing in the United States. As a result, the organization is currently undergoing a large-scale expansion at its lithium-ion processing facility in Lancaster, Ohio. The expansion of its battery recycling and materials recovery site will create more than 100 new generational jobs (with 25% of its hiring goal reached), has created hundreds of construction jobs, and is making an impact on the local economy both now and into the future. Additionally, the facility will produce enough battery-grade salts to power more than 250,000 electric vehicle (EV) batteries annually.

In August 2024, representatives from DOE attended a ribbon cutting ceremony—**the very first ribbon cutting ceremony made possible by funding from the Bipartisan Infrastructure Law**—for Cirba Solution's expanded production facility, which will increase the end-of-life and scrap battery processing capacity by 300%. Cirba Solutions held a topping out ceremony in November to commemorate the installation of the last beam.

▲ *Crews signing the last beam to be put into place at Cirba Solutions' lithium-ion processing facility expansion in Lancaster, Ohio. (Image courtesy of Cirba Solutions).*

Students from Augusta Technical College alongside Augusta Tech President Dr. Jermaine Whirl and MESC Director Giulia Siccardo. (Source: MESC)

Creating a Talent Pipeline for Future Workers at Georgia Battery Plant

In April 2024, MESC awarded Syensqo (Solvay Specialty Polymers USA, LLC) a $178 million grant to support the construction of a new facility in Augusta, GA. This facility will produce battery-grade polyvinylidene fluoride, which serves as a lithium-ion binder and separator coating in electric vehicle batteries. Syensqo contributed $750,000 to nearby Augusta Technical College in November 2024 to develop and support a mobile manufacturing learning center. The mobile lab will modernize the way technical training is delivered, using hands-on training, simulations, virtual reality and working models.

The primary mission of the mobile lab is to bring education to rural areas and deliver onsite training to incumbent workers, addressing a critical gap in technical education accessibility. By bringing the training directly to these communities and workplaces, the mobile lab will play a pivotal role in upskilling the workforce and supporting the economy of the Central Savannah River Area.

Syensqo Groundbreaking Ceremony of PVDF facility in Augusta, GA. From left, White House Senior Advisor Tom Perez, Syensqo CEO Ilham Kadri, and MESC Director Giulia Siccardo. (Image courtesy of Syensqo)

"At Syensqo, we believe that investing in education is essential to building a sustainable future. We're proud to support Augusta Technical College in preparing the next generation for high-quality jobs in the growing clean energy sector. We are investing in the future of this community and in the success of our shared vision to advance the sustainable mobility transition."

Mike Finelli, Chief Technology & Innovation Officer and Chief North America Officer at Syensqo

BATTERY AND CRITICAL MINERAL RECYCLING - RETAILERS AS COLLECTION POINTS, AND STATE AND LOCAL PROGRAMS

Consumer products including rechargeable batteries, cell phones, laptops, vacuums, and smartwatches contain critical minerals and materials such as nickel, lithium, and graphite that can be reused across the consumer, transportation, and defense sectors. Recycling spent batteries provides our domestic industry with additional sources of necessary materials to make new batteries or other products.

In FY 2024, MESC invested $14.2 million towards projects that will install portable consumer battery recycling drop-offs at retail companies. Two companies—Staples and Batteries Plus—were each selected for an award of $7.1M to collectively establish over 1,000 new retail battery drop-off locations nationwide. Both companies will hire local subcontractors and employees within their own local communities. With the number of locations across the U.S., the projects make it easier for consumers to help create additional sources of future battery materials.

Additionally, MESC invested $7.2 million across six projects to assist state and local governments in launching or enhancing battery collection, recycling, and reprocessing initiatives. These efforts include expanding drop-off programs and deploying advanced storage and sorting facilities—critical measures to reduce reliance on foreign resources and fortify the nation's critical material supply chains.

Energy Secretary Jennifer Granholm visits Lambeau Field in Wisconsin where the Green Bay Packers announced their partnership with Batteries Plus to kick off a battery recycling initiative in August 2024. (Source: Department of Energy)

ACCELERATING DOMESTIC ENERGY MANUFACTURING IN FORMER COAL COMMUNITIES

MESC has deployed $683 million in grants to small and medium manufacturers in communities with decommissioned coal facilities, enabling them to build or retrofit existing manufacturing and industrial facilities. The 20 projects selected under the Advanced Energy Manufacturing Program are expected to generate over 2,900 high quality jobs and have catalyzed over $1 billion in economic development.

These investments are directly improving our energy manufacturing base and supply chains. The selected projects will enable advanced energy products across five critical supply chain areas: grid modernization components, energy efficiency, clean electricity production, low carbon intensity products, and EV batteries. These products range from fuel flexible generators to critical grid components like transformers and magnets.

EXPANDING DOMESTIC HEAT PUMP PRODUCTION TO LOWER ENERGY COSTS

DOE is using the Defense Production Act (DPA) to boost American production of five critical technologies—including heat pumps—necessary to lower energy costs, support the 21st century energy economy, and strengthen U.S. national security. MESC was charged with accelerating domestic heat pump manufacturing under the DPA to make them more affordable and accessible. Heat pumps can provide efficient cooling and heating for buildings, homes, offices, schools, hospitals, military installations, and other critical facilities. The deployment of heat pump and water heat pump technologies is a critical tool for enhancing the United States' energy independence, as heating and cooling essential spaces drives more than 35% of all current U.S. energy consumption.

In 2024, MESC announced two rounds of selections for increasing domestic manufacturing of heat pumps and heat pump components for residences, commercial uses, and industrial facilities. Totaling $236 million in federal funding, MESC's DPA projects span 12 companies across 19 locations in 15 states creating nearly 2,000 high quality jobs.

MESC's DPA awards will also increase the number of compressors, which are typically manufactured overseas in Europe and Asia, produced on U.S. soil, making it easier for domestic manufacturers to use these key components in American-made heat pumps. Together these investments will allow for U.S. manufacturing of an additional 155,000 residential heat pumps, 440,000 residential heat pump water heaters, 2,000 school heat pumps, and 20,000 large heat pump compressors each year.

Michigan Governor, Gretchen Whitmer and CEO Scott Thomsen attend LuxWall's Litchfield, MI facility ribbon cutting ceremony. The company received an award from MESC to open a second facility in the Delray District in Detroit, MI. (Image courtesy of LuxWall)

QUALIFYING ADVANCED ENERGY TAX CREDIT (48C) PROGRAM

The Qualifying Advanced Energy Project Credit (48C) is a $10 billion federal tax credit to support the manufacturing of advanced energy products from grid components to critical minerals and industrial decarbonization. MESC, in partnership with the U.S. Department of Treasury and the Internal Revenue Service (IRS), announced $4 billion in tax credits in March 2024 for over 100 projects across 35 states to accelerate domestic energy manufacturing and reduce greenhouse gas emissions at industrial facilities.

Mitsubishi Electric's U.S. subsidiary, MELCO HVAC US, Inc. is the recipient of a DPA award and will establish a heat pump compressor facility in Maysville, Kentucky to expand their production to grow their air conditioning and refrigeration business. Exterior of the planned U.S. manufacturing site shown above. (Image courtesy of Mitsubishi Electric)

In April 2024, MESC, Treasury, and the IRS announced up to $6 billion in a second round of tax credit allocations. Through a competitive merit review process, the IRS ultimately encouraged more than 450 projects at concept paper stage across 46 states and the District of Columbia, with over $22.5 billion in tax credits requested, including $4.8 billion in energy communities. The projects span large, medium and small businesses and non-profits, all of which must meet prevailing wage and apprenticeship requirements to receive a 30% investment tax credit. The IRS will finalize allocations in January 2025.

DOMESTIC MANUFACTURING CONVERSION GRANTS PROGRAM

The Domestic Auto Manufacturing Conversion Grants program invests in upgrading auto facilities to serve growing vehicle markets. The program aims to expand domestic manufacturing of light-, medium-, and heavy-duty electrified vehicles and components, including commercial facilities for vehicle assembly and parts manufacturing. In July, MESC announced $1.7 billion to support the conversion of 10 shuttered or at-risk auto manufacturing and assembly facilities across eight states, Michigan, Ohio, Pennsylvania, Georgia, Illinois, Indiana, Maryland, and Virginia. This funding is bolstering local manufacturing capacity serving the electric, hybrid, or fuel cell vehicle supply chains while retaining good paying jobs.

The award selections are subject to negotiations to ensure that commitments to workers, communities, and environment are met. If awarded, the selected projects would collectively create over 2,900 new high-quality jobs and help ensure over 15,000 highly skilled union workers are retained across all selected facilities.

PARTNERING WITH STATE GOVERNMENTS

The State Manufacturing Leadership Program (SMLP) is a $50 million program that provides funding to states to establish programs that facilitate access to smart manufacturing technologies and high-performance computing resources for SMMs. Smart manufacturing is the use of emerging and advanced technologies to increase the efficiency of the traditional manufacturing process. In the long run, the widespread adoption of smart manufacturing by SMMs will lower costs, reduce industrial energy use, improve productivity, and increase the competitiveness of American manufacturers.

MESC announced its first-round selections for the SMLP in late FY 2023 and, over the course of FY 2024, made awards to 12 projects. MESC's investment of $22 million catalyzed an additional $7 million in non-federal funds. As a result of MESC's awards, approximately 3,400 SMMs will receive smart manufacturing training, complete 1,200 smart manufacturing assessments, and earn nearly 300 direct financial assistance subawards.

Reinvigorating the U.S. Manufacturing Workforce

A skilled manufacturing workforce is essential to delivering the energy products that power the grid and fortify our energy infrastructure against disruption. MESC supports workforce education and training through programs at universities, community colleges, unions, and trade schools in order to develop a robust workforce to ensure America remains self-reliant and secure in the face of global challenges.

BUILDING AND SUSTAINING A MANUFACTURING WORKFORCE NETWORK

MESC's workforce investments build on the longstanding training network now known as the Industrial Training and Assessment Centers (ITACs), which have provided over 21,000 no-cost energy assessments for SMMs over the last 40 years. In FY 2024, MESC expanded and updated the ITAC program to go beyond four-year programs by including union training programs, community colleges, and trade schools.

ITACs leverage best practices in workforce development to train participants for in-demand energy and manufacturing jobs by providing hands-on technical assistance to small- and medium-sized manufacturers. The ITAC expansion acknowledges the importance of building and training a 21st century energy workforce, and with $55 million in funding, ITACs develop and enhance workforce training programs with a focus on training in energy jobs that do not require a four-year degree.

To support these energy assessments, qualified manufacturers can also apply for grants to implement recommendations stemming from ITAC assessments. The ITAC Implementation program caught its stride in FY24 and works closely with SMMs to accept and review applications on a rolling basis as needs are identified. In total, the four rounds completed before the end of FY24 resulted in $23.8 million in federal investment—with $48.0 million in non-federal match—reaching 137 SMMs over 34 states. The improvements made will result in $14.8 million in annual cost savings for SMMs and 53,000 metric tons of CO_2 emissions abated per year.

What is an Energy Assessment?

Trained students from a participating ITAC conduct an in-depth evaluation of energy usage in a small or medium manufacturing facility. After a remote survey of the plant, the team conducts a one- or two-day site visit to capture data. The team performs a detailed process analysis to generate specific recommendations with estimates of costs, performance, and payback times. Typically, students identify more than $150,000 in potential energy savings opportunities per assessment. This training equips students with the essential skills needed to support the energy manufacturing base, ensuring they are prepared to contribute meaningfully to improving energy efficiency.

Industrial Training and Assessment Centers 2022-2026

KEY

- Industrial Training and Assessment Center
- Round 1 Expansion
- Round 2 Expansion
- Center of Excellence

ITAC Implementation Spotlight: Bench Dogs

Bench Dogs is a Denver, PA-based manufacturing company specializing in millwork, woodworking, and commercial cabinetry for major architectural and construction firms. As a custom manufacturer, Bench Dogs is committed to continuous improvement, quality, and precision—not only in their products but also in how they operate. With support from MESC's ITAC Implementation Grant, Bench Dogs was able to replace inefficient HVAC units with state-of-the-art systems, significantly improving energy efficiency and performance at their facility.

The upgrade has already resulted in significant energy savings, leading to a considerable decrease in Bench Dogs' HVAC utility costs and overall energy consumption. By reducing energy expenses, Bench Dogs will allocate more resources toward strategic hiring, entering new markets, and expanding their product line.

Product assembly in process at Bench Dogs' modern 97,000-square-foot corporate center in Denver, Pennsylvania. The facility is equipped with high-volume, state-of-the-art Computer Numerical Control machinery and additional panel processing equipment. (Image courtesy of Bench Dogs)

"At Bench Dogs, we are dedicated to reducing energy consumption and minimizing our environmental impact as part of our corporate social responsibility efforts. With MESC's support, Bench Dogs is not only meeting its operational goals but also making a meaningful contribution to a more sustainable manufacturing sector."

Todd Shertzer, VP of Sales, Bench Dogs

Generating Data-Backed Supply Chain Insights

Rigorous analysis is the foundation for meaningful, measurable change. MESC's Analysis and Strategic Investment team serves as DOE's in-house experts on energy sector supply chains, providing the mapping, modeling, and analytical tools required to understand the gaps and opportunities across the energy sector. These tools serve as the analytical backbone for America's energy manufacturing renaissance, providing data-driven insights on supply chain vulnerabilities and opportunities to inform investment decisions and further our national security interests.

ANALYZING ENERGY SUPPLY CHAIN READINESS LEVELS TO GUIDE NATIONAL SECURITY INVESTMENTS

Through the Modeling, Mapping, and Analysis Consortium (MMAC), which MESC developed with several of the Department's National Labs, MESC conducts cutting-edge economic and technical analyses to support the activities of the Department, the National Security Council, and other agencies. In 2024, MESC and MMAC developed the Supply Chain Readiness Level (SCRL) analytic framework to:

- Evaluate global energy supply chain needs, gaps and vulnerabilities;
- Assess the impact of federal investments on U.S. energy supply chains;
- Identify supply chain elements that the U.S. can competitively produce; and
- Identify alternative supply chain element sources or substitutes that are not reliant on foreign entities of concern (FEOCs).

In late 2024, MESC began sharing preliminary insights from its SCRL analysis on battery supply chains. The analysis highlights the impacts of investing in domestic capacity for key battery supply chain elements. Specifically, the analysis reveals that U.S. investments, bolstered by the DOE and critical federal tax credits, are stimulating increased battery cell manufacturing and, if sustained, could make the United States independent from China for battery cell production. The preliminary analysis also found that federal investments in the energy supply chain are measurably improving domestic energy security, with global dependence on lithium processed in China lithium shrinking from 51% to 24%, all while global demand is projected to grow 20x by 2030 (Figure 4).

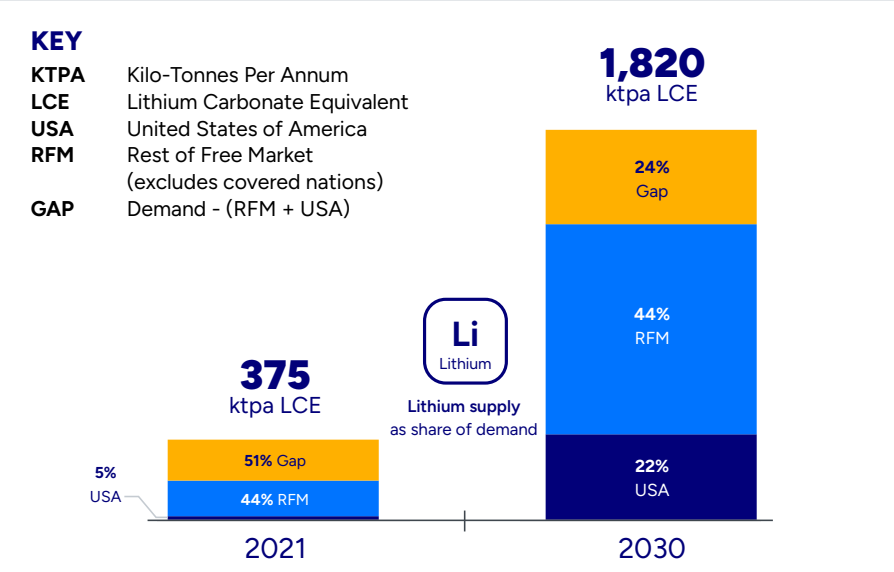


Figure 4. DOE investment is driving U.S. strength in the global battery supply chain.

SAFEGUARDING SUPPLY CHAINS WHILE STEWARDING PUBLIC FUNDS

MESC takes seriously its responsibilities to manage competitive funding opportunities purposefully to the benefit of the taxpayer. We engage in technical, commercial, and national security due diligence and oversight mechanisms to ensure integrity in our programs and to be responsible stewards of taxpayer dollars. Oversight of our awardees and their performance after an award is made is absolutely critical. An award is only the beginning of a long-term relationship between the applicant and the Department.

MESC leverages portfolio-wide mechanisms to safeguard public funds and American manufacturing from the influence of foreign adversaries. For example, DOE issued its final interpretive guidance on the statutory definition of FEOCs in the Bipartisan Infrastructure Law (BIL), which is designed to reduce reliance on FEOCs in battery supply chains and bolster the growth of domestic and foreign trade agreement country battery materials and manufacturing. The DOE final guidance applies to DOE's Battery Materials Processing and Manufacturing and Recycling grant program authorized by BIL section 40207 and the Inflation Reduction Act 30D Clean Vehicle tax credit, which imposes limits when an entity's battery supply chain includes FEOCs.

LOOKING AHEAD

Since its inception in 2022, MESC has made strides in strengthening the nation's industrial base and advancing America's energy independence. Looking ahead, MESC remains committed to securing America's energy future, by continuing to make strategic investments in manufacturing, workforce, and supply chain analyses.

Manufacturing: MESC will complete selections and awards under the Advanced Energy Manufacturing & Recycling grant program, the Domestic Manufacturing Conversion Grants, Auto Conversion grant program, the Defense Production Act (DPA) for heat pump manufacturing, the Qualifying Advanced Energy Tax Credit (48C) program, and others to support domestic energy manufacturing. The momentum is accelerating. These investments are hitting the ground running with job sites coming online, steel going into the ground, and many more ribbon cuttings are expected in the years ahead.

Workforce: The network of Industrial Training and Assessment Centers (ITACs) will continue to deliver nearly $8 in savings potential to American SMMs for every federal dollar spent. Meanwhile, we will start to see impacts from the 23 new Expansion ITACs, which will include developing networks, building curricula, establishing partnerships, and beginning to train students. The third round of ITAC Expansions will be launched in FY25 with opportunities for recipients who were awarded Planning Grants to scale out to a full ITAC. Collectively, these programs will ensure we have a robust pipeline of highly skilled labor to support the expansion of U.S. manufacturing capacity.

Analysis: MESC's data and analytics team will also continue to build out its Supply Chain Readiness Level (SCRL) framework to provide data-driven analyses that will inform future decision-making and programming. MESC's analytics team is currently applying the SCRL analysis framework to other critical energy value chains, including the grid, nuclear energy, electrolyzers, and solar energy. These analytic tools will provide the U.S. government and industry partners with the information needed to ensure critical supply chain gaps are addressed in the interest of national security. The insights on global critical materials and energy manufacturing that only MESC, in conjunction with the National Labs, can provide will be increasingly important to guide both private investment and government efforts. This will ensure a level global playing field for American companies to compete, including tariffs, tax incentives, and other measures.

MESC's investments to-date have served as a necessary downpayment to our national security and energy independence. While MESC's investments, which have already catalyzed the deployment of $27.7 billion of private capital, are positioned to create essential production capacity, further investments are required to build a brighter energy future for the United States. MESC's project portfolio will serve as a blueprint for those investments, which have enabled large venture funds, growth equity, and infrastructure finance players to make some of their first investments in US energy manufacturing in a de-risked structure. The learnings and experience from these projects will enable these and other private financiers to continue to profitably invest in America's energy leadership and energy independence.

MESC continues to move full steam ahead to address the national energy security challenge and to help ensure America's energy and economic success for decades to come.

U.S. Department of ENERGY | Office of Manufacturing & Energy Supply Chains

For more information, visit: energy.gov/mesc

DOE/MESC-0109 • December 2024

MESC@hq.doe.gov

Office of Manufacturing and Energy Supply Chains, U.S. Department of Energy