

**ADVANCED ENERGY MANUFACTURING:
AN ECONOMIC OPPORTUNITY
FOR THE UNITED STATES**



**ADVANCED
ENERGY
ECONOMY**

Transforming Policy. Expanding Markets.

INTRODUCTION

“The arsenal of democracy.” This was how President Franklin Delano Roosevelt described American manufacturing, mobilized to defeat the Axis powers. The rapid industrialization of the American heartland in the middle of the 20th century, first to win a World War and then to supply peace-time economies around the world with modern manufactured goods (i.e., cars, airplanes, household appliances) is widely attributed with vastly expanding the middle class and a creating an era of US prosperity.

Today, the United States faces a period of economic anxiety brought about by widening inequality, globalization, and technological transformation, made all the more acute by a global pandemic. This anxiety has heightened political appeals to prioritize domestic industry, combat economic adversaries (China the latest target), and protect American jobs – harkening back to an earlier era of prosperity.

The advanced energy industry is uniquely positioned to help address this anxiety by creating middle-class jobs throughout the United States in a sector – clean energy and transportation – that’s poised for sustained and accelerating growth over the coming decades as the global economy seeks to decarbonize. Today, this multibillion-dollar industry already employs more than 3 million Americans, with thousands in every state across the country.

If the United States is to become the arsenal of climate prosperity, however, manufacturing key advanced energy products from wind turbines, solar arrays, and “smart” meters to electric vehicles (EVs) and energy efficient (EE) appliances, it cannot rest on its laurels. While the U.S. has a number of areas of existing domestic strength in advanced energy manufacturing – such as wind turbines, automotive assembly, and an array of EE products – other segments of the industry have migrated, in part or whole, overseas.

Like every other industry, advanced energy is built on globalized supply chains. Any policy to enhance American manufacturing of advanced energy products must recognize this to ensure that the U.S. transition to clean energy and transportation is swift and affordable. Thus, building an effective approach to support domestic manufacturing while not hamstringing our industry will require carefully crafted, multi-level policies, shaped by representatives from across our diverse industry, policymakers at the federal and state levels, as well as an array of other stakeholders.

FEDERAL POLICY FOCUS

The current political environment in Washington presents a clear, near-term opportunity to engage on advanced energy manufacturing. The American Jobs Plan proposed by President Biden has a strong

emphasis on job creation through support for domestic manufacturing of advanced energy technologies, and Congressional leadership has signaled a strong desire to advance infrastructure in the near-term as well as domestic economic packages (e.g. the *United States Innovation and Competition Act*) on a bipartisan basis.

As a result, AEE has made federal policy development and advocacy the top priority of its newly formed **Advanced Energy Manufacturing and Infrastructure (AEMI) Working Group**. The overarching goal of this work is to establish new federal policies that support and sustain domestic manufacturing of advanced energy products, build cost-effective and responsible domestic supply chains, and increase demand for these products.

To further define this work, AEE brought together a cross-section of its member companies, as well as representatives of Congress and the Administration, at an Advanced Energy Manufacturing Forum on April 14. Based on feedback from that forum, as well as our internal research and analysis, we identified four Focus Areas for our federal policy advocacy:

1. Supporting Domestic Advanced Energy Manufacturing
2. Stimulating Demand for Domestic Advanced Energy Products
3. Bolstering Distributed Resources & the Distribution Grid
4. Building a Circular Economy with Responsible Materials Supply

In the pages that follow, we detail policy proposals, both within the American Jobs Plan and beyond it, that comprise these four Focus Areas. We likewise address key policy issues within this rubric, such as the appropriate size of incentives and the role of “Buy American” provisions.

Focus Area #1: Supporting Domestic Advanced Energy Manufacturing

AEE will support and promote policies intended to directly support the development and manufacture of advanced products in the United States while seeking to ensure such policies and programs are accessible to our member companies and effective over the short, medium, and long terms.

American Jobs Plan. As proposed by the Biden Administration, the AJP contains a number of provisions intended to directly support domestic manufacturing, as well as the development of new advanced energy products and technologies in the United States. The following proposals in the AJP warrant particular attention from policymakers:

- \$50 billion to create a new office at the Department of Commerce focused on monitoring domestic industrial capacity and funding investments to support the production of critical goods. We would recommend that critical goods include advanced energy technologies with identified cyber and national security attributes.

- \$52 billion in support for domestic manufacturers, a share of which should go to existing capital access programs that have a proven track record of success in supporting advanced energy.
- \$15 billion to fund ARPA-C, focused on deployment of demonstration projects for next generation advanced energy resources such as long-duration battery storage, hydrogen, advanced nuclear, and floating offshore wind.

Extend & Strengthen the 48C Tax Credit. The 48C tax credit provides a 30% investment tax credit (ITC) to “re-equip, expand, or establish” a manufacturing facility for the production of advanced energy technologies. AEE supports calls for its extension, as the AJP does. To further strengthen the credit, we would recommend (1) that it be made refundable and (2) that the list of eligible facilities be expanded to include those that manufacture battery storage, EV charging, combined heat and power, and home and building automation technologies. To ensure robust domestic demand for the domestic technologies produced via 48C, we would also encourage policymakers to consider demand-side incentives such as those enumerated under Focus Area #2, below.

Beyond what is proposed in the AJP, AEE would recommend policymakers consider the following policy proposals to directly bolster domestic manufacturing of advanced energy products and technologies:

Create a Supply Chain ITC. AEE proposes a technology-neutral ITC for manufacturing products that are part of the supply chain for the same products supported by 48C, provided that at least 50% of the upstream product is used in an advanced energy product.

Establish an Advanced Energy Manufacturing Credit Facility. Such a facility would serve as a clearinghouse of financial support for domestic advanced energy manufacturers, helping them identify and obtain grants, low-interest loans, and tax credits to help them start and scale operations, broadly increasing capital access for clean energy and transportation production. The facility would work in coordination with the new office at Commerce to provide particular support for domestic production of advanced energy technologies that have attributes with critical national interest.

Expand the ATVM. The Advanced Technology Vehicle Manufacturing program has proven to be an effective tool to help support the development of U.S. electric transportation. AEE would recommend expanding the scope of the program to include medium- and heavy-duty vehicles, off-road vehicles, component manufacturing, and the development of a U.S.-based end-to-end supply chain for battery storage.

Other Support for Manufacturing. There are other federal programs that provide support for manufacturing more generally, such as the National Network for Manufacturing Innovation and the

Manufacturing Extension Partnership Program. AEE broadly supports the expansion of these programs, as we assume any expansion of them would also be available to companies within our industry.

Focus Area #2: Stimulating Demand for Domestic Advanced Energy Products

While policies, such as those in Focus Area #1, directly support the growth of domestic manufacturing, federal (and state) policy should also catalyze real and sustained demand for domestic advanced energy products in a non-discriminatory manner.

The **AJP** contains a number of provisions that should create a rising tide for an array of advanced energy technologies, from large-scale renewable and high-voltage transmission projects to electric vehicles and EV infrastructure. Also, technologies to modernize the distribution system will be critical to support the new demands placed on the electric grid. The following proposals warrant particular attention from policymakers:

- A Clean Energy and Energy Efficiency standard, with a robust goal of 100% clean energy in the U.S. electric grid by 2035, will provide perhaps the clearest signal to the industry and spur widespread demand for advanced energy products.
- AEE also supports the extension of existing tax credits for advanced energy technologies, such as the section 48 Investment Tax Credit (ITC) and. As suggested in the AJP, energy storage should be eligible for the ITC. To expand the usefulness of these credits, we also recommend that they be made fully refundable.
- Direct federal procurement of advanced energy products – the AJP explicitly calls out EVs, EV charging, and heat pumps – can also help jumpstart domestic manufacturing. To ensure “Made in America” procurement rules don’t constrain deployment, however, policymakers should make sure that the structure and administration of waiver policies are sufficiently flexible.

Beyond what is proposed in the AJP, AEE would recommend policymakers carefully consider the following policy proposal to bolster demand for domestic advanced energy products:

Create an Additive Credit for Domestic Advanced Energy Products. As the current incentives for our industry largely rely on the tax code, we propose to encourage the use of domestically manufactured advanced energy products by means of additional credits layered on top of existing tax incentives. The goal would be to calibrate the amount of the “adder” so that using domestic products is economically equal to or more favorable than non-U.S. products. AEE has identified eight existing tax credits that could be candidates for a domestic manufacturing adder. These are:

- Investment tax credit (section 48)
- Production tax credit (section 45)
- Carbon capture credit (section 45Q)
- Commercial energy efficiency (section 179D)

- Residential energy efficiency (section 25C)
- Residential solar (section 25D)
- Electric vehicles (section 30D)
- EV charging infrastructure (section 30C)

We would also see key proposed credits, such as those proposed for energy storage, transmission, and microgrids, as candidates for a domestic manufacturing adder.

Key Issue: Amount of Additional Incentive. One challenge for policymakers is identifying the appropriate amount of additional tax credit for each of these sections and what supply chain components to include or exclude. A recent white paper¹ from Erin Mayfield and Jesse Jenkins at Princeton University examined project cost increases for utility-scale solar and onshore and offshore wind when “high road” labor standards and domestic manufacturing requirements are included. Their analysis found that increases in domestic content shares of utility-scale solar resulted in relatively small increases in installed costs. Using 100% domestic content across the entire supply chain (excluding upstream materials like steel and aluminum) would increase installed costs by 7% for utility-scale solar projects. This suggests that a 10% adder to the section 48 ITC could more than cover price premiums for using domestic content – less still if the domestic content threshold is lower than 100% (as it is under the *Buy American Act*). The land-based wind supply chain already has a strong share of domestic content due to the high costs of transporting large wind turbine components. In fact, the paper shows that moving to 100% domestic content is cost-neutral as the increases in manufacturing costs (both labor and non-labor) are fully offset by reduced transportation costs. This suggests that an adder for the section 45 PTC could be modest and still effectively incentivize the use of domestic content in onshore wind projects.

This analysis suggests that a small incentive, relative to total project costs, could close the price differential between domestic and international content, creating sustained demand for domestic content (a shortcoming of prior clean energy stimulus). As the Princeton study is focused exclusively on utility-scale renewables, AEE is in the process of exploring similar analysis of other advanced energy technologies, such as energy efficiency products, EV charging, and distributed solar, to provide a more complete picture of how effective (and cost-effective) this policy could be across the broad advanced energy industry.

Focus Area #3: Bolstering Distributed Resources and the Distribution Grid

In many ways, the distribution grid is the foundation of America’s advanced energy system. It is here that electric vehicles and their charging infrastructure interconnect with our electric system; here that distributed generation, such as rooftop solar, provides electricity to that system; and here that a host of

¹ Mayfield, E.N. and Jenkins, J.D. “Influence of high road labor policies and practices on renewable energy costs, decarbonization pathways, and labor outcomes.” Found online at <http://bit.ly/HighRoadLabor>

distributed technologies, from building controls, distributed energy storage, and energy efficient appliances demonstrate their value. Distributed technologies are a significant source of jobs in manufacturing, installation, and O&M. They are likewise important to empowering consumers and facilitating a cost-effective clean energy transition. And they're essential to maintaining the resilience and reliability of our grid.

The distribution grid, and the distributed energy resources that connect to it – in front of and behind the meter – are essential to a 21st century energy system. Yet the distribution grid and distributed resources are often treated as an afterthought in policy. A wide variety of domestic manufacturers make critical parts of the distribution grid and distributed technologies, from rooftop solar and energy efficient appliances to smart meters, EVs and grid monitoring software. AEE will advance policies that encourage the increased development and deployment of these products and technologies and will seek to bolster those manufactured in the U.S. via non-discriminatory policies.

While the energy and transportation provisions in the **AJP** do not chiefly focus on the distribution grid and distributed energy resources, a number of provisions in the Administration's plan should bolster this segment of the landscape. The following proposals warrant particular attention from policymakers:

- \$27 billion to create a Clean Energy and Sustainability Accelerator, which would “mobilize private investment into distributed energy resources; retrofits of residential, commercial, and municipal buildings; and clean transportation.”
- The deployment of 500,000 EV chargers across the United States by 2030. If effectively deployed, this infrastructure should help expand access to cost-effective electrified transportation while expanding utilization of the electric grid.
- Extension of energy efficiency (EE) tax credits. As noted above in Focus Area #2, AEE supports extension of the Commercial EE credit (Section 179D) and Residential EE Credit (section 25C) Moreover, we would encourage policy makers to make such credits fully refundable and establish an adder for commercial and residential EE projects that meet a domestic content threshold.
- \$100 billion for public school modernization, \$40 billion to repair and upgrade public housing, and \$10 billion to modernize Federal buildings – a share of which should be devoted to investments in EE and energy resilience technologies to ensure these schools, homes, and workplaces are healthy, affordable, and safe.

Beyond what is proposed in the AJP, AEE would recommend policymakers consider the following policy proposals that are designed to help bolster the development, manufacturing and deployment of more advanced distribution grid and distributed energy technologies:

Expand Eligible Industries Under 48C. As noted in Focus Area #1, the 48C tax credit provides a 30% investment tax credit (ITC) to “re-equip, expand, or establish” a manufacturing facility for the production of advanced energy technologies. The types of manufacturing facilities eligible for the credit are defined in statute. While this list is reasonably extensive, we would recommend expanding it to explicitly including domestic facilities involved in the manufacture of EV supply equipment (EVSE) and home and building automation technologies.

Increase Funding for Development & Commercialization of Distributed Resources. Unlocking the full value of distributed resources on an advanced distribution grid requires both additional analysis and more expansive deployment – demonstrating what distributed generation, EE, demand response, battery storage, and EVs working together can do to save money, increase resilience, address peak demand, and so on. This can be achieved through greater funding of our National Labs, expanding the scope of ARPA-C (noted above), and/or ensuring that a share of loans made by DOE’s Loan Programs Office (LPO) are focused on distribution-level technologies. AEE supports all of the above.

Create an Office of Transportation Electrification. Other organizations have called for policymakers to establish a new office at DOE focused on Transportation Electrification. AEE supports such a plan, provided that the office has, as one of its primary focuses, enabling and facilitating the integration of EV infrastructure into the distribution grid.

Focus Area #4: Building a Circular Economy With Responsible Materials Supply

The manufacture of certain advanced energy technologies depends on a set of “critical minerals,” such as lithium, cobalt, nickel, and graphite, the building blocks of lithium-ion batteries in EVs and stationary storage, and silicon, of which the majority of solar panels are comprised. Access to these elemental resources is essential for building a domestic advanced energy manufacturing industry. But irresponsible extraction of these resources can have significant social, environmental, and economic ramifications.

AEE supports policies that will help enhance the efficiency of our domestic AET manufacturing sector, emphasizing the reuse and recycling of advanced energy components and materials to build a more circular advanced energy economy. As a corollary, AEE will also give consideration to policies that support responsible domestic resource development in order to build a reliable U.S. supply-chain of critical minerals and rare earth elements.

The **AJP** recognizes the importance of building an end-to-end domestic supply chain for EVs. AEE supports this provision of the Plan but would encourage the Biden Administration to expand this consideration to other advanced energy technologies vital to our economic and national security. Policymakers should consider proposals, such as those below, that can help reduce need for imported critical minerals, develop effective substitutes, and support cost-effective domestic supply chains:

Support Critical Mineral R&D. The Critical Minerals Institute (CMI) is an Energy Innovation Hub led by the Ames National Laboratory. It brings together scientists and engineers to address national challenges around critical minerals, from processing, manufacturing and substitution to the efficient use and recycling of these resources. As part of an expansion of federal funding for DOE’s National Labs (recommended above), policymakers should ensure CMI has the resources necessary to conduct effective R&D to build a domestic supply chain and cultivate a circular advanced energy economy.

Expand the Scope of the New Commerce Office. As noted in Focus Area #1, the Administration has proposed \$50 billion to create a new office at the Department of Commerce focused on bolstering the U.S. supply chain of critical goods. We would recommend that the purview of this office be expanded to include the critical minerals and rare earth elements vital to advanced energy technologies. Working alongside CMI, EPA, Interior, NIST, and other agencies, this office should be charged with developing a **National Critical Minerals Strategy**, as has been recommended by other organizations. This strategy would identify critical minerals vital to domestic manufacturing and develop a roadmap that would serve to guide R&D toward efficient use, recycling, and reuse of critical minerals, along with responsible domestic development of these resources from conventional and unconventional sources.

Ensure Loans for Recycling & Reuse Commercialization. Policymakers should identify and effectively finance mechanisms, such as DOE’s LPO, to help scale and commercialize recycling and reuse processes for critical minerals in advanced energy production.

Prioritize a Circular EV Economy. As noted in Focus Area #1, AEE supports the expansion of the ATVM program at DOE, and would encourage such an expansion to include the development of a U.S.-based end-to-end supply chain for advanced battery storage. Should policymakers move forward with establishing an Office of Transportation Electrification at DOE, as discussed in Focus Area #3, we would also recommend such an office prioritize critical mineral development, recycling, and reuse in the EV supply chain.

Key Issue: Defining Domestic Content

The supply chains for a majority of advanced energy products and project development are global in nature. Defining just what qualifies as “domestic content” is therefore a critical, and challenging, task. AEE will work to ensure that the definition(s) of domestic content used to promote American-made advanced energy products are workable for our industry. We do not advocate domestic content requirements, but instead seek to ensure that incentives and provisions related to domestic content are practical and feasible in the context of a transition to advanced energy and transportation that the Administration and Congressional leaders seek to accelerate.

The *Buy American Act* (41 USC 8301-8305), which requires federal agencies to procure domestic materials and products when possible, defines a non-iron/steel manufactured product as “domestic” when it is assembled in the United States and at least 55% (by cost) of the upstream components are made in the United States. We take this definition as a starting point, given the broad awareness and acceptance of “Buy American” requirements among policymakers (President Biden specifically referenced the law in his Joint Address to Congress on April 28).

AEE has and will continue to work with its members to identify modifications to “Buy American” provisions, where appropriate, that serve the intent of the law while also ensuring that such provisions do not become an insurmountable barrier to a swift transition to advanced energy.

Increasing Requirements Over Time. One policy lever that has been discussed is to increase over time the amount of American-made content that is required to meet the definition of “domestic content”. As an example, the *Buy America Act* (49 USC 5323), which is similar in concept to *Buy American* but applies only to transportation spending, required 60% (by cost) of components to be produced in the United States for the first two years, 65% for the next two, and 70% thereafter.

While AEE is not endorsing this approach, it is worth considering in the appropriate context. Fundamentally, onshoring or near-shoring product or component manufacturing is a cost-intensive, multi-year process that many companies are only willing to undertake if the economic and policy signals are clear and consistent. Domestic content standards that increase over time, if clearly defined and accompanied by effective policies to support domestic industry and increase demand, may provide such signals.

CONCLUSION

The advanced energy industry offers the U.S. an opportunity to be a strategic, economic, and technological leader on the world stage, creating benefits abroad (cost-effective decarbonization) and prosperity at home. Today, however, America is *not* the manufacturing leader in a number of critical segments of advanced energy. Building U.S. manufacturing strength in advanced energy technologies will require effective policies that address both supply and demand, cover the full range of technologies (both large-scale and distributed), and take into account end-to-end supply chains. The policies detailed above seek to begin that process. AEE stands ready to work with Congress, the Administration, and relevant stakeholders, to advance them.