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The Roosevelt Project

Industrial Heartland Electric Vehicle Case Study Working Paper Series

Reimagine Manufacturing in the Heartland

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Reimagine Manufacturing in the Heartland

by Amanda K. Woodrum

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The Roosevelt Project
A New Deal for Employment, Energy and Environment

About the Roosevelt Project

The Roosevelt Project takes an interdisciplinary approach to the transitional challenges associated with progress toward a deeply decarbonized economy. The project aims to chart a path forward through the transition that minimizes worker and community dislocations and enables at-risk communities to sustain employment levels by taking advantage of the economic opportunities present for regional economic development. The first phase of the project involved an analytical assessment of cross-cutting topics related to the transition. The second phase of the project assesses the transition through the lens of four regional Case, working with local partners on the ground in the Industrial Heartland, Southwest Pennsylvania, the Gulf Coast, and New Mexico. The project was initiated by former Secretary of Energy, Ernest J. Moniz, and engages a breadth of MIT and Harvard faculty and researchers across academic domains including Economics, Engineering, Sociology, Urban Studies and Planning, and Political Science.

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Policy Matters Ohio

November 2021

Sustainable Communities

ReImagine manufacturing in the Heartland

Growing clean and efficient manufacturing White Paper #5

Amanda K. Woodrum

Introduction

For a good portion of the 20th century, jobs in manufacturing allowed people throughout Appalachia and the Heartland to make a decent living and provide good lives for their families. These jobs built strong, vibrant communities and helped expand opportunity for people of all races. Today, once plentiful, well-paying union jobs in manufacturing are harder and harder to find.

Too many policy choices over the past five decades have weakened union protections and enabled corporations to send jobs overseas, hold down wages and damage the environment and, ultimately, our health. Today politicians, civic leaders and community members across Appalachia and the Heartland have a chance to reimagine manufacturing by embracing public policies that encourage corporations to change inefficient, polluting practices of the past while ensuring that working people are paid well and treated fairly on the job. Federal policymakers can start by dedicating resources to spur industrial energy efficiency by increasing resources for industrial assessment centers and manufacturing energy partnerships to provide low-cost industrial energy audits, and energy-efficiency training for the workforce.

Reimagining manufacturing also means retooling existing facilities, investing in research and development of next generation technology and promoting circular manufacturing practices. With the right federal resources, communities can build upon existing assets for these purposes. Shuttered coal plants and former steel facilities can be repurposed into eco-industrial parks where:

- One company's waste becomes another's raw material.
- Companies have access to clean and efficient energy—including wind, solar, energy storage and combined heat and power—as well as shared resources and services such as waste management (green incentives).
- Coal plant boilers and turbines at existing sites can be repurposed into combined heat and power facilities, providing a more efficient way to meet the heat and power needs of manufacturers.

With policies that direct public funds in the right way, the Heartland of America and Appalachia, together, can become a hub for creating products responsive to the needs of the future, such as energy storage technology, alternatives to single-use plastic, green building materials, data processing and, of course, electric vehicles. The region can also tap into its creativity for developing materials needed for the future. For example, plastic alternatives can be made from farm-grown resources in the region, such as hemp. Policymakers should require all publicly funded project adhere to community and labor standards that ensure that the people who do the work to craft our 21st century manufacturing economy are paid enough to support stable families and communities.

Meeting climate challenge in Heartland

The working people of America's Heartland have an important role to play in stemming damage to the climate by helping the nation achieve carbon neutrality. Indiana, Ohio and Michigan, combined, represent almost 11% of carbon emissions nationwide, more than their share of the nation's population. To meet the region's climate challenge, however, we must first understand how the region uses energy, spends its energy dollars and where emissions come from.

1. As shown in Figure 1 below, 86% of the emissions in Indiana, Ohio, and Michigan come from the electric power sector, industry and transportation combined. Aggressive carbon reduction strategies in these three sectors will go a long way toward achieving the region's carbon goals, while also being a critical component for achieving national climate goals.

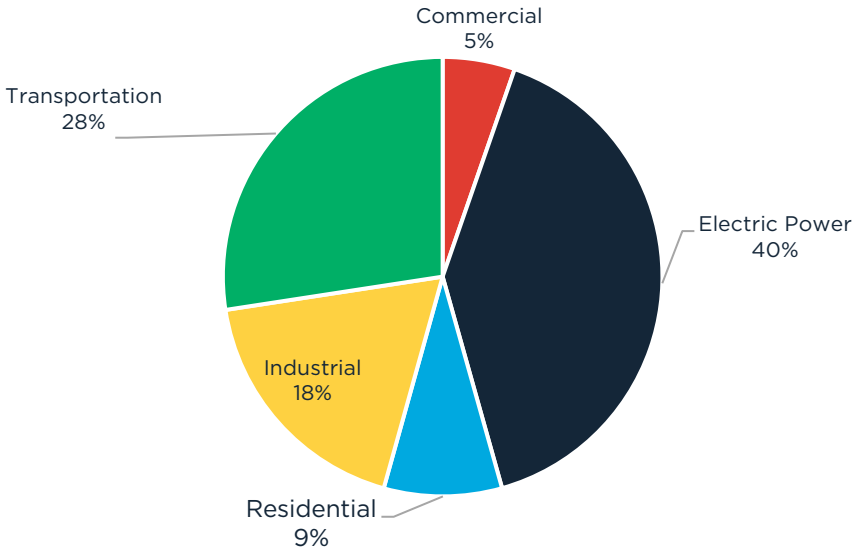
2. As demonstrated in Figure 2 below, the industrial sector consumes more energy than any other sector, accounting for one-third of all energy used. Manufacturers burn fossil fuels on-site to heat metals, chemicals, and glass, and — separately — purchase electricity from the grid to light their factories and power electric motors, welding tools, conveyor belts and the like. Both uses of energy produce emissions and contribute to the carbon footprint of manufacturing. In addition to carbon pollution's contribution to climate change, pollutants from industry and power plants are responsible for thousands of cases of respiratory disease, asthma attacks, and premature deaths.

3. Nearly one in five of the $105.6 billion in energy dollars spent in 2019 in these three states — $20.3 billion — went toward meeting the heat and power needs of industry in the Heartland's tri-state region (as demonstrated in Figure 3).

Figure 1

IN, OH and MI account for 10.6% of U.S. carbon emissions, most from electric power, transportation, and manufacturing

562.1 million metric tons

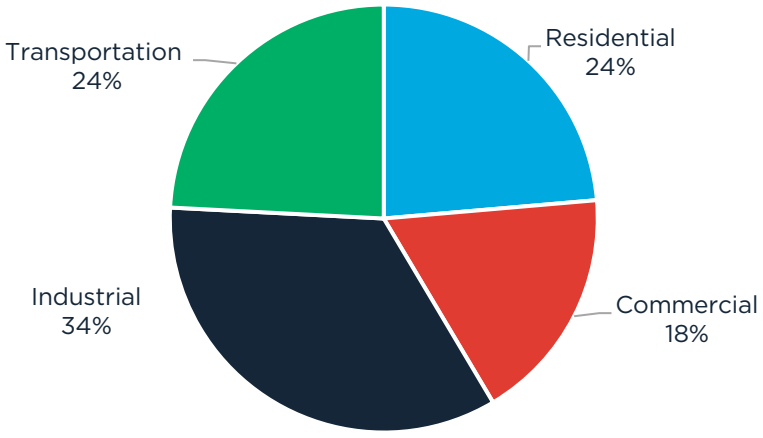


Source: Energy Information Administration, 2018

Figure 2

Industrial sector, mostly manufacturing, uses more energy than other sectors

9.3 quadrillion BTUs in 2019



Source: Energy Information Administration, 2019

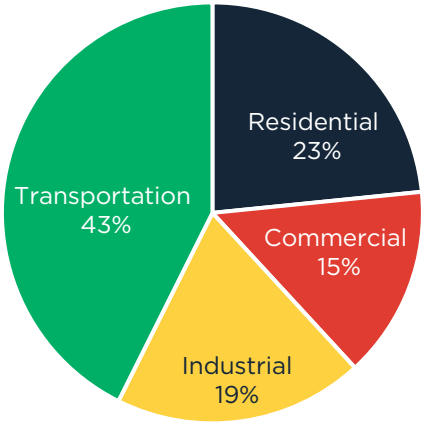
Energy saving opportunities for manufacturing

By making our manufacturing sector cleaner and more energy efficient, industry can reduce their energy costs and emissions while increasing productivity, expanding plant capacity, increasing wages and jobs. On average, manufacturers spend hundreds of thousands of dollars on energy—roughly 40% for fuels consumed on site and 60% on electricity.[i] Policy and investment incentives can encourage and assist manufacturers in adopting better practices. It is a good time for federal leaders to help manufacturers invest to become cleaner and more energy efficient.

Figure 3

Nearly 1 in 5 of region's energy dollars spent by industry

$105.6 billion spent collectively across IN, MI and OH



Source: Energy Information Administration, 2019

Energy efficiency in the manufacturing process

For energy-intensive industrial consumers, such as the chemical sector, energy can represent as much as 60% of total costs.[ii] For most manufacturers, it represents less than 5% of total operating costs. But in both cases, it is a much higher percentage of controllable costs.[iii] It is in society's interest — as well as manufacturing firms and their employees — for policymakers to use public resources to educate manufacturers about energy saving opportunities, encourage manufacturers to take steps to achieve these savings, and help ensure availability of capital financing for these specific purposes. The result will be increased effectiveness, more jobs, and reduced emissions.

Nationwide, even manufacturers that receive thorough energy assessments implement fewer than 40% of recommendations, on average.[iv] According to manufacturers and industry analysts, the low adoption rate is because capital costs for energy saving measures compete with other capital investment projects that may have higher returns on investment and faster payback periods. Social benefits from reduced emissions are typically not factored into the cost/benefit equation. Short-term demands and gains take priority. Public sector requirements and incentives can alter the equation.

The Department of Commerce's Manufacturing Extension Partnerships (MEPs) and the Department of Energy's Industrial Assessment Centers both provide technical expertise and education to manufacturers on how to achieve energy savings. An analysis by Policy Matters Ohio of data from the University of Dayton Industrial Assessment Center found:[v]

- Industrial energy auditors recommended an average of seven efficiency improvements. Manufacturers implemented only about half the recommendations.
- The average cost per manufacturer to implement recommended measures would have been recouped within slightly less than one year, on average. Some payback periods were instant, while others, such as using the most efficient type of electric motors, had paybacks between 20 and 65.5 years. Manufacturers were more likely to adopt measures with instant paybacks than measures with longer payback periods. Financial incentives can improve payback periods.
- More than 1,100 of the recommendations had no cost (e.g., rescheduling to avoid peaks, turning off equipment when not in use, less wasteful packaging).
- Energy savings recommendations range from low-cost measures involving changing procedures, equipment, or operating conditions to higher price measures such as installing sensors to detect defects.
- Other recommendations included installing storm windows and doors, turning off equipment during breaks, repairing faulty insulation in furnaces, reusing or recycling hot and cold exhaust air, more efficient lighting, rescheduling plant operations to avoid peak load hours, and recovering heat from exhaust steam.

Generating cleaner energy: Save the heat (and recycle it)

Decentralizing electricity production by adopting CHP will result in more efficient use of scarce resources and lower associated emissions by burning smaller amounts of fossil fuels. Where there is a need for both electricity and process steam at an industrial location, CHP facilities use fuel to make steam, which is then used to turn an electric generator, for power. The remaining steam is used in the factory's processes. Our current system of producing electricity is enormously inefficient. This inefficiency yields vast amounts of wasted energy and unnecessary emissions, largely the result of heat wasted in the electricity production process.

Between heat loss during electricity production, and grid losses during transmission, we lose nearly 70 percent of energy used to produce electricity. In other words, every kilowatt-hour of electricity we use in our homes, businesses, and industry, means 3.3 kilowatt-hours worth of polluting fossil fuels must be burned at an electric power plant. Or, for every three lumps of coal you put in, you only get one lump out.

Heat generated during the production of electricity is discarded through pressure release vents and cooled using lake or river water, or cooling towers. At the same time this heat is being discarded, however, manufacturers are purchasing fuel to create heat to meet their heating and cooling needs. Particularly energy-intensive industries include chemicals, primary metals, paper, and food.

If we could transfer the heat lost from the electric power sector to these manufacturers and others, we could reduce enormous amounts of waste in the production of electricity, while also reducing the need for manufacturers to purchase additional fuel for heating and cooling. However, transporting heat requires the use of expensive, heavily insulated pipes. Heat dissipates over any distance, so transportation becomes impractical beyond three miles. Our existing power plants are too far from our industrial centers to transfer their waste heat to the manufacturers who could use it.

We can remedy the problem by co-locating electricity production with industry and business. We discuss below two opportunities that can be created by taking advantage of existing infrastructure at shuttered and shuttering coal plants and repurposing them into industrial parks with access to CHP facilities and other services.

Untapped CHP potential

According to a study of untapped CHP potential, conducted by the Department of Energy in 2016, Indiana, Michigan and Ohio, combined, have roughly 23.6 gigawatts of CHP potential: enough to power more than 12.9 million homes, more than the number of housing units in these three states (12.8 million).[vi]

Breaking barriers to energy choice for industry

Given all the benefits of industrial efficiency for the manufacturing sector, why are we not doing more of it? Manufacturers need energy partners to make the transition. Electric utility companies or third-party energy suppliers and consultants can provide energy-related expertise, shoulder some of the inherent risks, provide upfront capital, participate in project development, and handle operations and maintenance. However, electric utility corporations lack incentive to seriously engage in these critical partnerships and have blocked the development of third-party energy providers, viewing them as competitors. The primary obstacles to this partnership include:

1. Lack of competition in the electricity market removes incentive for utilities to produce power more efficiently or encourage efficiency. Our region's mostly centralized private system of producing electricity yields an electric power sector that operates at very low levels of efficiency.
2. Electric monopolies often erect barriers to competition from Independent Power Providers (IPP). The three biggest barriers to competition come in the form of 1) utility rate structures that integrate power-generation charges from the utility into unavoidable distribution charges for all customers; 2) exorbitant charges by utilities to manufacturers for back-up power that may be needed during routine maintenance of CHP facilities or unplanned outages ("stand-by charges"), and 3) side deals with manufacturers for below-market prices subsidized by residential and commercial ratepayers that render independent power producers unable to compete.
3. Without assistance from an energy partner, there is limited interest from manufacturers in self-generating power. Many manufacturers are not inclined to self-generate for their power needs in the absence of an energy partner because most manufacturers are not in the energy business and do not have the expertise or desire to become experts. Plus, manufacturers have many competing needs for capital and tend to put the money they have into projects with short payback periods, thwarting a more long-term investment approach like CHP that requires sizeable upfront capital.

PRIME EXAMPLE: AEP-Ohio, Solvay, and DTE Energy Services[1]
Marietta, Ohio

Public policy can help dismantle the institutional barriers to CHP adoption by driving stakeholder partnerships. Until very recently, Ohio had clean energy laws in place that required investor-owned electric utilities to achieve certain levels of efficiency. CHP projects qualified as a mechanism for utilities to achieve their efficiency requirements. As a direct result, AEP-Ohio, an electric utility with 1.5 million customers in Ohio, adopted a performance-based incentive program designed to encourage CHP project development. To qualify, CHP projects had to pass a basic cost-effectiveness test showing a net benefit to the utility and its customers (i.e. costs avoided from having to generate and deliver the energy to the customer must be greater than program costs).

The Solvay site in Marietta, Ohio, an industrial complex built in 1950, with more than 300 full-time employees, specializes in high-performance polymers found in plumbing, water filtration, medical and cell phone components, the aviation market and kidney dialysis filters. Solvay was driven to CHP technology from a need for a more reliable supply of steam and electricity, following a number of outages that caused the plant to shut down, sometimes for weeks.

AEP-Ohio, Solvay, and DTE Energy Services, continued.

In February 2015, in partnership with DTE Energy Services and AEP-Ohio, a new CHP plant went into operation to increase energy reliability and reduce costs. DTE Energy Services, a third-party publicly traded energy company headquartered in Ann Arbor, Michigan, designed, built, owns, operates and maintains the CHP facilities, in close partnership with Solvay. Solvay partnered with DTE Energy Services because it did not have the expertise within its organization for steam and power production and preferred to maintain its focus on its core business of producing polymers. Plus, as with many manufacturers, Solvay did not have capital set aside for utility-related investments.

The 8-megawatt CHP facility consists of a gas turbine with a large heat recovery steam generator that serves 100 percent of Solvay Marietta's steam needs and 97 percent of its electric requirements. The CHP facility helped save more than 300 jobs at Solvay Marietta as well as 50 jobs at the neighboring industrial plant, Americas Styrenics, by providing the steam the company needed. Both companies were affected by the shutdown of the AMP-Ohio Gorsuch coal plant, which they had previously relied on for steam needs. In addition, DTE Energy Services hired nine employees previously laid off from the AMP-Ohio Gorsuch coal-fired power station (including experienced boiler and turbine operators).

The overall project cost was $35 million. The AEP incentive — AEP paid ½ cent for every kilowatt- hour generated for the first five years in operation — amounted to more than $1 million over the five-year life of the incentive program. DTE Energy Services also used a federal investment tax credit for efficiency projects to finance the transition.

Solvay remains an AEP-Ohio customer, and AEP provides the balance of its electricity from the grid while also serving as back-up power. Solvay Marietta dramatically reduced its operating costs and estimated it would see a net benefit of $6 million in savings over the 20-year life of its supply agreement with DTE. However, natural gas prices have declined since the start of the project and the company now expects to save substantially more.

Old coal plants, new eco-industrial parks

Policymakers can break down market barriers to industrial efficiency and CHP technology by bringing industry together with the right partners and services, along with the right policies, requirements, incentives and capital financing. The innovative concept of eco-industrial parks is designed to do that.

Eco-industrial parks bring together local businesses and manufacturers to share services, transportation infrastructure, energy, and waste streams. The United

Nations Industrial Development Organization defines an eco-industrial park as a "community of businesses located on common property in which businesses seek to achieve enhanced environmental, economic and social performance through collaboration in managing environmental and resource issues. This is known as industrial symbiosis, which allows companies to gain an economic advantage through the physical exchange of materials, energy, water and by-products, thereby fostering inclusive and sustainable development."[vii]

CHP technology requires co-location of electricity production with consumers of heat energy, such as commercial businesses and industrial parks, something that can be achieved in eco-industrial parks. With the right public policy and dedicated resources, shuttered or shuttering coal plant sites, with their existing infrastructure, can be turned into eco-industrial parks that provide businesses and manufacturers access to clean and efficient energy. Boilers and turbines at these sites can be repurposed for use in CHP facilities. Figure 4 below describes the basic elements of eco-industrial parks and gives examples of eco-industrial parks across the country.

PRIME EXAMPLE
Widows Creek Coal Plant Development, Jackson County, Alabama

The Widows Creek Coal Plant began power generation in 1952 and provided energy to the state of Alabama until its final operating units were decommissioned in 2015. That same year, Google announced it would redevelop part of Widows Creek into a data center. Google cited the plant's pre-existing power infrastructure as helpful for meeting electricity needs of the data center. Data centers are energy intensive. Google also committed to 100% matching the energy usage of the plant with renewable energy purchases (either wind or solar).

The data center project broke ground in April of 2018. In 2019 Google came to an agreement with the Tennessee Valley Authority (TVA) to purchase the solar generation of new solar projects totaling 413 megaWatts for usage at both Widows Creek and another Tennessee based data center. The TVA has spent $66 million to clear the rest of the Willow Creek Plant property for redevelopment. As of 2020, the TVA projected the land would be ready for resale in 2021.

Significant Features:

1. Redeveloped coal plant that required significant remediation
2. Current major tenant, Google, running primarily off solar developed for its use

Source articles: https://blog.google/inside-google/infrastructure/a-power-plant-for-internet-our-newest/; https://www.tva.com/energy/our-power-system/coal/widows-creek-fossil-plant; https://www.gem.wiki/Widows_Creek_Fossil_Plant; https://www.datacenterdynamics.com/en/news/google-announces-600-million-data-center-in-alabama/; https://datacenterfrontier.com/google-makes-major-investment-in-solar-energy-to-power-its-cloud/; https://www.madeinalabama.com/2018/04/google-kicks-off-construction-on-alabama-data-center/; https://www.timesfreepress.com/news/business/aroundregion/story/2020/dec/03/towering-infernoone-worlds-biggest-chimneys-t/537250/

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Figure 4

Elements and examples of eco-industrial parks for public officials to consider

Eco element	Description	Examples
Network of businesses, manufacturers, and/or services companies	Some parks are a mix of residential, office, retail, tech and consulting groups. Others include warehouse/ distribution companies, heavy and light manufacturers, environmental service companies, and industries that re-manufacture and re-use existing products.	Chattanooga, TN; The Green Gold Initiative (Buffalo, NY); Red Hill Ecoplex (Choctaw County, MS); Coffee Creek Center (Chesterton, IN)
Co-location with power plant, access to clean energy resources	Can develop industry network around anchor power plant and/or incorporate energy systems. Examples include parks that convert landfill gas into energy, run a biomass electricity generation plant, co-locate with a gas-fired power plant; demonstrate and promote technologies that use indigenous renewable resources.	Berks County, PA; Intervale Food Center (Burlington, VT); Red Hill Ecoplex (Choctaw County, MS)
Offer businesses lower overhead costs, access to infrastructure, incentives	Some parks attempt to bring new industry into town by offering infrastructure, lower overhead costs, and incentives. Some house companies in a solar-powered or eco-enterprise building. One marine-based park includes an oil recycling business, an ecologically-designed water reclamation system, renewable energy, and a compost business. Another has LEED certified building options.	Seasons Greene (Hudson, OH); Brownsville Eco-Industrial Park (TX); Port of Cape Charles Sustainable Technologies Industrial Park (VA); Franklin County Eco-Industrial Park (NC); Shady Side Eco-Business Park (MD);
Resource recovery facility and joint operations	Nearly all eco-industrial parks facilitate opportunities to identify where one factory's waste can serve as another industry's raw material. Many parks incorporate resource recovery facilities, or centers for reuse, recycling, remanufacturing, and composting. Some redistribute usable materials to the public. One park focuses on selling salvaged building materials, another remediates and recycles non-hazardous soil. Developers can ID businesses with core capabilities that benefit from coordinating activities, sharing resources, and participating in joint operations, such as water treatment, thereby increasing competitiveness.	East Shore Eco-Industrial Park (Oakland, CA); Green Institute Eco-Industrial Park (Minneapolis, MN); NWLCC-Northwest Louisiana Commerce (Shreveport, LA); Trenton Eco-Industrial Complex (NJ); Civano Environmental Technologies Park (Tucson, AZ); Mecca Remediation Facility (Mecca, CA)
Maximize use of intermodal transportation of raw materials and waste streams	Transportation is treated as an important element in many eco-parks. Developers can use port, rail, and interstate access to maximize the intermodal transit of raw materials and waste streams and facilitate creation of industrial "closed loop" production process.	Seasons Greene (Hudson, OH); Fairfield Park (Baltimore, MD); Plattsburgh Eco-Industrial Park (NY)
Process waste streams on site	One park, located within a sustainably harvested forest, processes waste streams on site to avoid transporting waste to overloaded wastewater and solid waste facilities.	Raymond Green Eco-Industrial Park (WA)
Brownfield development	Brownfields, former military bases, coal plants or existing industrial parks can be redeveloped into an eco-industrial park.	The Green Gold Initiative (Buffalo, NY); ReVenture Park (Charlotte, NC); Fort Devens (Devens, MA); Port of Cape Charles Sustainable Technologies Industrial Park

Sources: http://indigodev.com; https://remediationfacility.com/start-here/; https://ced.sog.unc.edu/charlottes-reventure-park-sustainability-focused-industrial-redevelopment/; https://www.mytownneo.com/article/20121212/NEWS/312129369

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Potential industry hubs for the region

With aggressive public policies to promote industrial efficiency and CHP technology, and repurpose former coal plants into eco-industrial parks, the Heartland could become a hub for products that meet the needs of the future. With additional federal investments to develop the supply chain and expand research and development, the region can lead in the industries of the next generation, such as alternatives to single-use plastic, energy storage technology for renewable energy resources, or electric vehicles (as much of the rest of this paper focuses in on).

As global leaders in plastics, states like Ohio, Indiana and Pennsylvania can also lead in the next generation of single-use plastic alternatives that can be grown from agricultural products produced in the region, like hemp and soybeans. Goodyear, headquartered in Akron, Ohio recently committed to replace its petroleum-based rubber with soy-based rubber by 2040.[viii] In addition to solid foundations in the plastic industry, and assets like University of Akron's Polymer Institute, the states Indiana and Ohio also rank in the top ten states for production of soybeans (4th and 7th respectively).[ix]

There are important assets in the region to produce next generation battery technology as well, important components of electric vehicles and renewable energy storage. Carnegie Mellon University in Pittsburgh is internationally renowned for its battery research. Warren, Ohio is home to an energy tech incubator, BRITE, focused on battery technology and related energy storage opportunities for the region. The region also has a strong chemicals sector, positioning it well to play a role in the production of batteries and fuel cells for renewable energy storage. As a result, Ohio is home for a strong Fuel Cell Coalition devoted to exploring these opportunities.

Federal policymakers and economic development practitioners should prioritize identifying opportunities for existing local businesses and manufacturers when developing supply chains in the region. Companies and industries can be assisted and even converted to serve different markets. For example, the U.S. mobilized resources during the COVID-19 pandemic to assist companies to convert to production of masks, ventilators, COVID vaccines and other necessary items. The federal government can do the same for the climate crisis to help firms transition to climate change-sensitive markets, and to seize opportunities in clean manufacturing.[x]

The federal government should allocate resources for:

- Mapping opportunities for local companies to enter new markets and providing services that enable companies to enter new markets.
- Conducting feasibility studies to assess local company needs and options to gain entrance to new markets.
- Promoting capital investment in companies for retooling or upgrades.
- Offering union apprenticeship, pre-apprenticeship and training services.

- Investigating opportunities for legacy companies to re-shore in Appalachia and the Heartland.

All federal resources should be made contingent on a firm's willingness to promote sustainable manufacturing and industrial efficiency practices, diversity in hiring and training, and workers' rights to form unions.

Modernizing manufacturing creates good jobs

Federal funding to grow clean and efficient manufacturing in the region can create good jobs. Investments in industrial efficiency, including CHP technology and research and development, can put people to work in the short term, as a counterforce to the economic collapse associated with COVID-19, while also laying the foundation for a more sustainable and vibrant manufacturing sector in Appalachia going forward.

The funding levels, job numbers and compensation figures outlined in this section are based on an October 2020 report titled, "Impacts of the ReImagine Appalachia & Clean Energy Transition Programs for Ohio: Job Creation, Economic Recovery, and Long-Term Sustainability." A $1.1 billion federal investment into Ohio's manufacturing sector for industrial efficiency and research and development would leverage an estimated $990 million in private investments and create more than 17,000 jobs. See section on community and labor standards for ways to ensure these jobs are good union jobs and inclusive.

Figure 5

Modernizing manufacturing creates good jobs

$1.1 billion in federal investment creates more than 17,000 Ohio jobs annually

	Spending amounts	Direct jobs	Indirect jobs	Direct + indirect jobs	Induced jobs	Direct, indirect + induced jobs	Average compensation (including benefits)
Industrial efficiency, including CHP	$1.1 billion	2,970	1,980	4,950	3,300	8,360	$64,300
Manufacturing R&D	$500 million	1,650	1,350	3,000	1,500	4,500	$72,200
Bioplastics R&D	$500 million	1,650	1,350	3,000	1,500	4,500	$72,200
TOTALS	$2.1 billion	6,270	4,680	10,950	6,300	17,360	

Source: PERI: Impacts of the ReImagine Appalachia & Clean Energy Transition Programs for Ohio (2020)

Recommendations for action

To Reimagine manufacturing, federal leaders can take the following concrete actions:

1. Provide federal funding, possibly via a dedicated redevelopment program within the Partnership for Workforce and Economic Revitalization (POWER) Initiative, to repurpose shuttered coal power plants, former steel facilities and other abandoned industrial infrastructure. Funds should be designated to remediate coal ash ponds on decommissioned power plant sites and nearby water systems; provide electric grid, freight rail and port improvements; and to turn these sites into eco-industrial parks.

2. All federal funding should come with community and labor standards to maximize the benefits to communities. Require use of Project Labor Agreements for federally funded projects (including those developed by independent power producers). Funding for redeveloping shuttered industrial assets should include eco-industrial requirements designed to promote industrial symbiosis. All federal economic and community development funding should prioritize brownfield development over development of greenspace.

3. Significantly expand funding for Manufacturing Extension Partnerships and Industrial Assessment Centers to provide industrial energy audits, asset assessments for repurposing (i.e. boilers and turbines), support the development and ongoing needs of eco-industrial parks, including the provision of eco-services, industrial energy audits, recycling centers, and training of workers to identify energy efficiency opportunities.

4. Provide free or low-cost industrial energy assessments, efficiency training, and implementation assistance to manufacturers to encourage private investment. Provide resources to do the assessments and ensure availability of capital for this purpose, by ensuring access to low-interest loans from revolving loan funds. Companies receiving state or federal public funds for retooling should be required to undergo energy assessments and implement recommendations.

5. Develop a modern freight rail system in the region and a national strategy to better fund it. Every rail project should set aside 2% of total project dollars for union apprenticeship training and pre-apprenticeship workforce development purposes, the latter effort targeted toward ending labor market segregation and bringing higher numbers of women, Black, Indigenous, and people of color into high quality, unionized manufacturing and construction jobs.

6. Enact fair trade policy, global carbon footprinting, consider border tax for countries with weaker environmental and labor standards. In the recent past, increasingly global markets and trade practices that prioritize corporate profit at the expense of working people in the US and abroad have undermined

domestic manufacturing. Trade practices and policies encourage corporations to hold down workers' wages and cut corners on protecting our health and the environment.

7. Provide federal funding to map the Heartland's potential to enter new markets, such electric vehicles, energy storage, plastic alternatives and other responsible products of the future. Allocate resources for identifying and assisting local companies to enter these new markets and build related networks.

8. Coal plant workers and coal miners should be given priority in the hiring process for the new economy. Create a "first source referral system" to build pipeline of qualified workers.

9. In exchange for federal CHP development funding to states for CHP development purposes, require state public utilities commissions to develop a statewide, uniform system for reasonable stand-by charges from electric utilities. Manufacturers need a back-up plan for emergency power. Utility companies should not be allowed to take advantage of this and charge exorbitant rates designed to hinder competition.

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