COVER PHOTOS (TOP TO BOTTOM):
Solar panel installation at the Lausche Heating Plant at Ohio University (Credit: Ohio University)
FirstEnergy substation in Perrysburg (Credit: FirstEnergy)
EV charging in Columbus (Credit: Smart Columbus)
Solar PV manufacturing at First Solar in Perrysburg (Credit: First Solar)
Support for this report was provided by Environmental Defense Fund.
Ohio can attract investment from world-leading companies, lead a transportation transformation toward efficient electric vehicles and smart transportation systems, and harness a 21st century electric system to lower costs while deploying clean electricity and energy efficiency. **Doing so will benefit all Ohioans.**

Corporate investment, lower energy bills, and innovative consumer products and services will improve lives in all 88 counties. As detailed in *Powering Ohio: A Vision for Growth and Energy Investment*, more than $25 billion of investment and 20,000 jobs are at stake for Ohio. *Powering Ohio* presents a 21st century approach that leverages the state’s industrial, natural, and human resources to foster durable economic growth throughout Ohio.

Where the previous report laid out a pro-growth vision, this report details common-ground actions that, if undertaken, will allow Ohio to begin to realize that vision. The actions outlined here share core objectives: create more well-paying jobs, attract investment, and foster innovation.

As we continued to talk with business and other leaders across Ohio to better understand the opportunities and challenges, those conversations reinforced the following key points:

- **A Changing World**: The American and global energy economies are changing rapidly toward clean energy solutions and new transportation technologies. These rapid changes present Ohio with both economic opportunity and risk.

- **The Value of Action**: Ohio can take action today and over the next few years to pursue these opportunities and mitigate the risks they present to Ohio's economic standing.

- **Political Challenge**: Inconsistency in Ohio’s energy policy has hindered investment and hurt Ohio’s reputation as welcoming to business.

- **Corporate Leadership**: Ohio’s corporate leaders are ready and able to lead a transition in clean energy and innovative clean transportation solutions.

- **Rapid Electric Vehicle Growth**: Ohio has the opportunity to lean in and help automotive supply-chain companies across the state win in the fast-growing electric vehicle (EV) market. Plug-in EV sales in the state are on pace to grow by more than 50 percent this year.1

- **Uneven Clean Electricity Growth**: While solar, offshore wind, and customer-sited generation are advancing in Ohio, onshore wind development—representing over $4 billion in potential investment and more than 1,000 jobs—remains stalled.

- **Powering Forward on the Grid**: The Public Utilities Commission of Ohio (PUCO) *PowerForward* initiative provides a valuable starting point for building and utilizing the 21st Century electric system that will be essential to make the *Powering Ohio* vision a reality.

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Fulfilling the Powering Ohio vision requires a practical approach, grounded in Ohio’s realities. Because Ohio competes with other states to attract investments and create jobs, it must prepare for ongoing transformation in both the energy and transportation sectors. First, Ohio needs to avoid erecting barriers to investment. Better, Ohio must offer superior capabilities—enabling firms to access the state’s foundational strengths in manufacturing, innovation, and workforce. Best, Ohio can strive to be in the top tier—one of the most favorable states in which to locate and expand.

Powering Ohio recommends actions most likely to make concrete, positive differences in both the near term and longer term. If Ohio is to capture the synergistic benefits made possible by economic transformations, its leaders across all sectors must add their voices to the call to action that looks toward Ohio’s future. Business, community, education, and government leaders must further contribute to and expand a shared vision for Ohio’s success.

There are many pathways to success for Ohio, and action will be required to realize the state’s potential. The organizations supporting Powering Ohio recognize that diverse voices and viewpoints will make participation in the energy and transportation transformations more robust. Collaboration and decisive action will enable Ohio to capture opportunities before they are lost to competing states.

The next phase of Powering Ohio depends on engaging business, community, education, and government leaders to take common-ground actions, earn wins for the state, and build greater confidence and momentum for further action. Success will create trust and assure those making long-term corporate or personal decisions that Ohio will have a brighter future in the growing clean energy and advanced transportation economy.
POWERING OHIO:
A PATH FORWARD

STRENGTHEN OHIO’S MANUFACTURING FUTURE
• Enhance EV & clean energy workforce
• Attract EV & clean energy manufacturing facilities
• Support manufacturing excellence and innovation

BUILD FOR THE LONG TERM
• Develop and act upon a state energy strategy
• Enhance innovation and markets on the electric grid
• Expand smart transportation infrastructure

HELP BUSINESSES SUCCEED
• Recognize leaders committed to Ohio’s future
• Use affordable clean energy to attract investment
• Enable small and medium businesses to gain from clean energy
Manufacturing was critical to Ohio’s economic success in the 20th century and can remain so in the 21st. But it will require support from policymakers, investors, innovators, and a dedicated workforce. While Ohio’s advantageous physical location is important, so too are momentum, tradition, and the ongoing support of manufacturers across the state. Clean energy and EV manufacturing sectors will be areas of high growth over the next few decades. Ohio can signal its commitment by working directly with manufacturers and their supply chains to support both on-site expansion and the siting of new facilities.

Ohio is heavily invested in the portions of the auto industry that are most at risk with electrification: internal combustion engines, transmissions, and other drivetrain components. Ohio is home to 18 percent of the country’s engine-manufacturing jobs and 15 percent of the transmission and power train jobs. Investment and growth in the state’s auto sector is at risk if the next generation of vehicles passes Ohio by.

In the Powering Ohio vision report, we estimated that maintaining a status-quo focus on traditional internal combustion drivetrain systems would cost Ohio over $740 million in annual GDP by 2030, with the loss of 7,000 jobs and the associated $675 million in annual wages. If Ohio embraces the electrification opportunity, however, the state’s auto industry could grow by an estimated 2,000 jobs and $135 million in annual wages.

Converting Ohio’s auto-manufacturing risk to economic opportunity requires the development of an in-state supply chain of EV component producers. If Ohio embraces new vehicle platforms and mobility paradigms, it can attract the factories and innovators that will produce them. Combining a robust EV industry with Ohio’s strength in power electronics could also position Ohio as a leader in battery storage, microgrids, and other technologies essential to the future of the electric-power sector.

Ohio has the building blocks for tremendous economic growth in manufacturing: a skilled and flexible workforce, a tradition of quality and innovation, and the policy tools to attract future growth industries. The foundational actions identified here can help Ohio capture a leading position in the growing EV and clean energy industries.

2 U.S. Bureau of Labor Statistics
ACTION 1: Enhance Ohio’s EV and clean energy manufacturing workforce

Who: Manufacturers and trade associations, labor unions, education and training institutions

Why: Workforce talent and training are key to attracting manufacturers to Ohio, to encouraging existing manufacturers to expand their operations within the state, and to Ohio retaining its existing manufacturing base. These attributes are particularly important in areas with small but rapidly growing workforces, such as EV and clean energy manufacturing. Actions to enhance Ohio’s workforce demonstrate that Ohio cares about well-paying jobs, including jobs for workers transitioning from displaced industries into new and growing industries.

How: Manufacturers, labor, and education institutions can form industry-sector partnerships, also called industry workforce alliances, to align training with the specific skills that industry needs to grow and compete. Industry-sector partnerships are employer-driven partnerships convened by a neutral party and focused on a single industry so that they can identify specific, rather than general, needs. Coordinated actions for clean energy and innovative transportation could also include:

- “Engineering technology” degree programs that reflect a digitized and integrated present and future for manufacturing;
- A multi-industry survey of skills needed that complements the industry-sector partnerships and identifies any common gaps across Ohio’s clean energy and smart transportation manufacturers; and
- Identification and promotion of relevant certification programs to document skills developed outside of formal or traditional education programs.

These efforts could be part of broader investment in workforce readiness for growth industries.

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ACTION 2: Target Incentives to EV and clean energy manufacturers

Who: JobsOhio, regional economic development leaders

Why: Supply chains often form geographic clusters. Because the supply chains for EVs are nascent relative to their potential, securing a critical mass of manufacturers in Ohio now is essential for long-term stable growth of manufacturing jobs and investments in these sectors. EV supply chains are developing now in states around Ohio, from Tennessee and the Carolinas to Michigan and Wisconsin. Failure to capture a substantial share of this growth, as has already happened with the onshore wind supply chain, could be a nearly irreversible lost opportunity for Ohio. Other clean energy technologies, such as solar, offshore wind, power electronics, and energy efficient products, are also growing rapidly and Ohio can secure its share of their manufacturing potential as well.

How: Economic development leaders, including JobsOhio, can help Ohio compete for EV and autonomous vehicle component suppliers, as well as for new or re-developed assembly facilities, by directing their incentive programs to target these industries. Potential components include batteries, fuel cells, electric motors, lightweight chassis and frames, electronic sensors and controls, and regenerative braking systems. As the industry matures in Ohio, the state could also offer greater EV purchase or fleet incentives for advanced vehicles that draw upon Ohio’s supply chain.

Economic development assistance for other kinds of clean energy manufacturers and supply chains—such as renewable electricity generating equipment, energy efficiency, and next generation electric grid technologies—would leverage Ohio’s existing strengths in materials, electronics, controls, HVAC, and appliances to yield further investment and jobs.

Today, JobsOhio has programs and staff directed at serving the auto industry and advanced manufacturing in general. They would be well positioned to capitalize on new opportunities by dedicating staff to target the growing EV and clean energy industries. Doing so will help to grow these industries in the state and welcome these firms to Ohio.

Ohio is America’s Number 3 state for auto manufacturing jobs. To date, however, it has not kept pace in EV and autonomous/connected vehicle jobs. With just over 1,000 of these jobs, Ohio ranks 13th in the country according to analysis from the BlueGreen Alliance. As EV supply chains grow and regional networks lock in, Ohio risks being left behind. Today, Ohio is behind its neighbors and competitors in Michigan (where supply chains are developing around the Chevy Volt and Bolt), Tennessee (where the Nissan Leaf is spurring employment), Wisconsin, Kentucky, North and South Carolina, Indiana, Illinois, and Pennsylvania. Carrying over Ohio’s leadership in traditional drivetrains into the EV industry presents a net opportunity of more than 9,000 direct jobs and $900 million in annual GDP.
**ACTION 3: Support manufacturing excellence and innovation**

**Who:** Ohio business and economic development leaders

**Why:** Ohio is well positioned to build on its existing strength in fields that are essential for clean energy. These fields include composites, control systems, and power electronics. Creating public-private partnerships to advance manufacturing excellence would bring additional industry leaders to the state, drive local innovation, and support Ohio’s workforce development.

**How:** The Manufacturing USA network of advanced-manufacturing institutes enhances manufacturing competitiveness by bringing together industry, academia, nonprofits, and government to develop and spread innovation and best practices. Both public and private actors can expand the reach of America Makes, Ohio’s outpost of Manufacturing USA (see box), by supporting Ohio company participation in the institute and increasing the capacity of the institute to assist those companies. Ohio companies can also strengthen their ties to other such institutes. For example, Ohio’s lightweight vehicle and composites firms can tap the expertise of institutes in Michigan and Tennessee focused on advanced lightweight materials and polymer composites, respectively.

Increasing public and private support for Manufacturing Extension Partnerships—like FASTLANE in Dayton, MAGNET in Northeast Ohio, and TechSolve in Cincinnati, as well as other programs that accelerate innovation and spread best practices—would produce immediate returns for companies while laying the groundwork for additional centers of excellence.

America Makes, based in Youngstown, is the Manufacturing USA institute devoted to additive manufacturing and 3D printing. Additive manufacturing adds an entirely new way to produce products, complementing machining, stamping, molding, and forging, and could enable mass customization and cost declines while eliminating waste. The institute has over 220 members from around the country. While it is national in focus, America Makes is also a resource for the growing cluster of additive manufacturing companies in northeastern Ohio. Its presence could enable Ohio to become the leading region for additive manufacturing.

America Makes supports technical advancements in additive manufacturing. (Credit: America Makes)
By enabling energy and transportation infrastructure deployment, Ohio can build a modern economic engine.

Build for the Long Term

Both publicly and privately owned infrastructure are fundamental to broad economic success. By enabling energy and transportation infrastructure deployment, Ohio can build a modern economic engine. 21st century energy infrastructure includes: low-cost renewable energy generation facilities; efficient and intelligent buildings, factories, and transportation systems; and a modern grid that enables market innovation. This infrastructure supports all aspects of the state’s economy. Further, deployment creates jobs across the state, particularly construction, operations, and maintenance jobs.

Policy stability, when combined with critical enabling infrastructure in the electric and transportation networks, is a foundational investment for long-term success and also provides a near-term boost to Ohio’s investment climate.
ACTION 4: Develop and act upon a state energy strategy that supports clean energy and transforming transportation

Who: The governor, the legislature, other policymakers

Why: The benefits of energy efficiency and renewable energy spread throughout Ohio's economy. But today, Ohio's inconsistent policy approach to utility energy efficiency programs and standards, renewable portfolio standards, and siting of wind farms has resulted in uncertainty for these industries. Stable policy support would reduce the policy risk that causes investment deferral and hampers job growth. A comprehensive energy and transportation commitment will also enhance Ohio's image and ability to attract investment, including across the auto supply chain. Ohio's utilities and other energy businesses will also be able to plan their investments, and evolve their business models, to be consistent with a stable long-term direction in the state.

How: The next governor's administration should work with business and policy leaders to develop and publish a state energy strategy that reflects the state's opportunities in clean energy and transportation. This strategy should be grounded in rigorous and transparent analysis of Ohio's energy use and its impacts on the economy and environment. Meanwhile, the legislature, with gubernatorial support, should remove barriers to wind investment by relaxing setback restrictions. Consistent policy support for steady, even-handed expansion of utility energy efficiency resource standard and renewable portfolio standards would help Ohio businesses and employees benefit from Ohio's transition to a clean energy economy. In parallel, strategic state support to develop markets for advanced transportation infrastructure and vehicles can support local sales for Ohio's growing EV and smart transportation companies.
**ACTION 5: Enhance innovation and markets on the electric grid**

**Who:** PUCO, electric utilities, consumer advocates, competitive energy suppliers, Ohioans

**Why:** Allowing innovation and markets to modernize the electric grid will result in lower annual energy costs, increased productivity, and higher customer satisfaction.

**How:** The PUCO, building from the promising start of PowerForward, can create a framework that allows innovations and clean energy solutions to compete on a level playing field, while clearly establishing a pathway for the state’s electric utilities to innovate and evolve their businesses. The PowerForward Collaborative will engage diverse perspectives to wrestle with these issues, starting with distribution system planning, non-wires alternatives to traditional utility investments, and data access and privacy.

Targeting peak-load reductions, including through time-variant rates, will animate markets for advanced products such as EV chargers, smart thermostats and dishwashers, and advanced electric heat pumps and water heaters. Customers will save money directly, and the increased efficiency in grid utilization will create downward pressure on electricity rates for all customers. Meanwhile, PUCO, the utilities, and stakeholders can jointly develop new business models and regulatory structures that provide opportunities for Ohio utilities to thrive while animating new competitive markets.

Policymakers can help businesses cost-effectively meet market objectives by maintaining a clear separation between electricity distribution and competitive energy supply.
**Ohio’s fast EV charging stations**

The 57 fast EV charging stations open to the public in Ohio are concentrated in urban areas, but EV growth will require more stations, in more cities and towns, and along the highway corridors connecting them. (Source: Plugshare.com)

**ACTION 6: Expand a network of smart transportation infrastructure**

**Who:** Ohio’s auto industry, electric utilities, EV charging providers, Ohio Department of Transportation, Smart Columbus, Drive Electric Ohio, planning agencies, real estate holders

**Why:** Ohio is more likely to become a leader in developing, testing, manufacturing, and deploying the vehicles of the future if its highways, cities, and towns have the enabling infrastructure on which these vehicles depend on. Examples include EV chargers, sensors, and communication networks.

**How:** Establish Ohio as a leader along the full supply chain of transportation innovation, manufacturing, testing, and deployment, by:

- Building upon the foundation established by existing smart transportation projects like Smart Columbus and the Route 33 Smart Mobility Corridor;
- Encouraging investments for new markets like fast EV charging, with sustained support from Ohio’s electric utilities and Electrify America; and
- Coordinating and rolling out high-impact practices like shared or bulk procurement to support corporate and municipal fleets, including electric buses.

This infrastructure can best foster innovation and entrepreneurship if it has low barriers to entry for new businesses and ideas. This vibrancy can be fostered by building an open and competitive platform.
Ohio businesses can lower energy costs, secure stable energy prices for years or even decades, meet customer demands, and reach environmental sustainability goals.

Help Businesses Succeed

By implementing clean energy and advanced transportation solutions, Ohio businesses can lower energy costs, secure stable energy prices for years or even decades, meet customer demands, and reach environmental sustainability goals. Ohio can and should make it easier to meet these objectives by supporting companies that are working to meet them within the state.

Because Ohio has tremendous untapped clean energy potential within its borders, a virtuous cycle is possible where increased demand for clean energy, when matched with local supply, results in local experience and positive visibility – driving additional demand for clean energy. As this cycle drives down costs and increases options for businesses, Ohio becomes an even more attractive place to start, continue, or expand doing business.

Ohio businesses have a clear role in kick-starting that virtuous cycle by supporting local clean energy and advanced transportation projects as part of their commitment to Ohio’s success. Government and quasi-governmental agencies also have a part to play by helping to facilitate new clean energy contracts as part of fostering economic development. Finally, small- and medium-sized businesses would benefit from expert assistance and aggregation to access the clean energy benefits available to Ohio’s larger firms.
ACTION 7: Recognize leaders who commit to use and support clean energy and advanced transportation

Who: Ohio companies, institutions of all sizes

Why: Corporate leadership on renewable energy, energy efficiency, and electric vehicles reflects the growing demands from their customers for clean energy—and products produced with clean energy—and also stimulates growth across Ohio’s economy. This leadership also sends a powerful message to key business and governmental stakeholders. Recognizing the leaders who commit to Ohio’s clean energy and advanced transportation future will both demonstrate the breadth of support for that future and encourage companies to choose innovative local products and services.

How: A group of companies and institutions could create a recognition program to identify clean energy and advanced transportation leaders of all sizes. Such an initiative could organize shared branding and events that celebrate their successes and highlight best practices. Members can challenge their peers and competitors to join as well. This program could offer particular recognition for firms that support the state by meeting their objectives with energy, products, and services from Ohio.

Some companies will commit to meeting their electricity needs from renewable resources. Others will commit to dramatic improvements in energy productivity or establish science-based greenhouse gas emissions targets. Already, 48 of Ohio’s 100 largest employers have made these kinds of commitments but are yet to be recognized in the state for their leadership.

These 48 large Ohio employers, which together employ more than 488,000 Ohioans, have made quantified clean energy or GHG emission reduction commitments:

Alliance Data Systems
Amazon
Anthem
AT&T
Cardinal Health
Case Western Reserve University
Cleveland Clinic Foundation
Covelli Enterprises
CVS
Deutsche Post AG / DHL
FedEx
First Energy
Ford
General Electric
General Motors
Goodyear Tire & Rubber
Honda
Home Depot
Huntington Bancshares
J.C. Penney
JP Morgan Chase
Keycorp
Kohl’s
L Brands
Lowe’s
Macy’s
Meijer
Miami University
NASA Glenn Research Center
Nationwide Mutual Insurance
Nestle
Norfolk Southern
The Ohio State University
Ohio University
OhioHealth
PNC Financial Services Group
Procter and Gamble
Sherwin-Williams
Signet Jewelers
Starbucks
Target
TJX
University of Toledo
UPS
Verizon
Walgreens
Boots Alliance
Walmart
Whirlpool

International, national, state, and local programs recognize businesses leading in growth, energy, sustainability, and innovation
**ACTION 8: Use affordable in-state clean energy to attract new business expansion**

**Who:** Any business that is moving to or expanding in Ohio, with support from JobsOhio

**Why:** New business expansion draws more power from the electric grid. If the company gets this power from a new in-state clean energy resource developed to meet its needs, Ohio sees a multiplication of investment, jobs, and tax revenue. Support for pairing clean energy with new or expanded facilities will also provide a competitive advantage for Ohio when seeking investment from the growing number of companies with clean energy commitments.

**How:** Businesses can work with local wind and solar developers to develop on-site or in-state purchase agreements that will lower their electricity price risk and help them meet their business objectives. JobsOhio can encourage pairings by facilitating matches between expanding companies and clean energy developers, and by offering a discount on Ohio clean energy as part of its economic development incentive packages. Assistance from JobsOhio would both reduce the transactional requirements of obtaining local clean energy and provide a competitive advantage when compared to other states in the region.

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Owens Corning uses a 2.4 MW solar array to power its Toledo headquarters. (Credit: Owens Corning)
**ACTION 9:** Enable small- and medium-sized businesses to gain from clean energy through aggregation and matchmaking

**Who:** Organizations working with small- and medium-sized businesses and clean energy providers, with both philanthropic and participant support

**Why:** An aggregated purchasing model can leverage economies of scale for small- and medium-sized businesses that often have clean-energy objectives but do not typically have the energy requirements, internal staffing expertise, or the capital to finance a new renewable energy project.

**How:** Ohio should support more organizations to build on the momentum established by existing regional collaborations like NOPEC and the Council of Smaller Enterprises. These organizations could be funded by philanthropic support to start, while state and local agencies can help them navigate bureaucratic requirements and share best practices. Participant-funded business models should be possible over time. To further innovation, such efforts can:

- Act as an aggregator and “matchmaker” between firms and clean energy providers;
- Create templates and model contracts for on-site and off-site renewable energy, energy efficiency, EV charging infrastructure, and EV purchasing or leasing;
- Facilitate business participation in “community solar” or similar types of projects; and
- Offer expertise in property assessed clean energy (PACE) financing and other financing options for clean energy projects.

**BUSINESS AND INDUSTRIES BUYING AS A GROUP SAVE MORE MONEY THAN BUYING INDIVIDUALLY.**

**BUSINESSES WORKING AS A GROUP GAIN BUYING POWER AND LOWER TRANSACTION COSTS.**

**CLEAN ENERGY PROVIDERS GAIN ECONOMIES OF SCALE AND OFFER LOWER PRICES.**
Conclusion

Powering Ohio means Ohioans working together to execute a shared vision of growth and transformation in the energy and transportation sectors.

This report identifies nine promising steps that Ohio’s leaders should take to create jobs, grow the state’s economy, and make Ohio an attractive place for innovation and business investment. This approach is purposely cross-sectoral and comprehensive, befitting the breadth of the opportunities available to the state.

These actions are designed to address the urgent risks and opportunities facing Ohio today and they can begin immediately. If they are well underway within the next few years, the state can capture multi-billion-dollar opportunities in smart transportation, EV supply chain, renewable electricity, energy efficiency, and grid modernization before they are lost to other states.

While governmental leadership will be a key component of such success, leaders from across Ohio’s strong foundation in manufacturing, innovation, education, business, and finance all have important roles to play. Each of these actions will need one or more champions to carry it forward. Based on the interest and positive response we have received throughout the Powering Ohio process, we are confident that these champions will emerge and inspire others to join them.

Ohio’s leaders can and should harness the widespread and growing interest to power common-ground actions, earn wins for the state, and repeat effective approaches with greater confidence and momentum. Sustained action will allow the state to become a competitor for investment, then a leader, and build a stronger and more prosperous economy for all Ohioans.