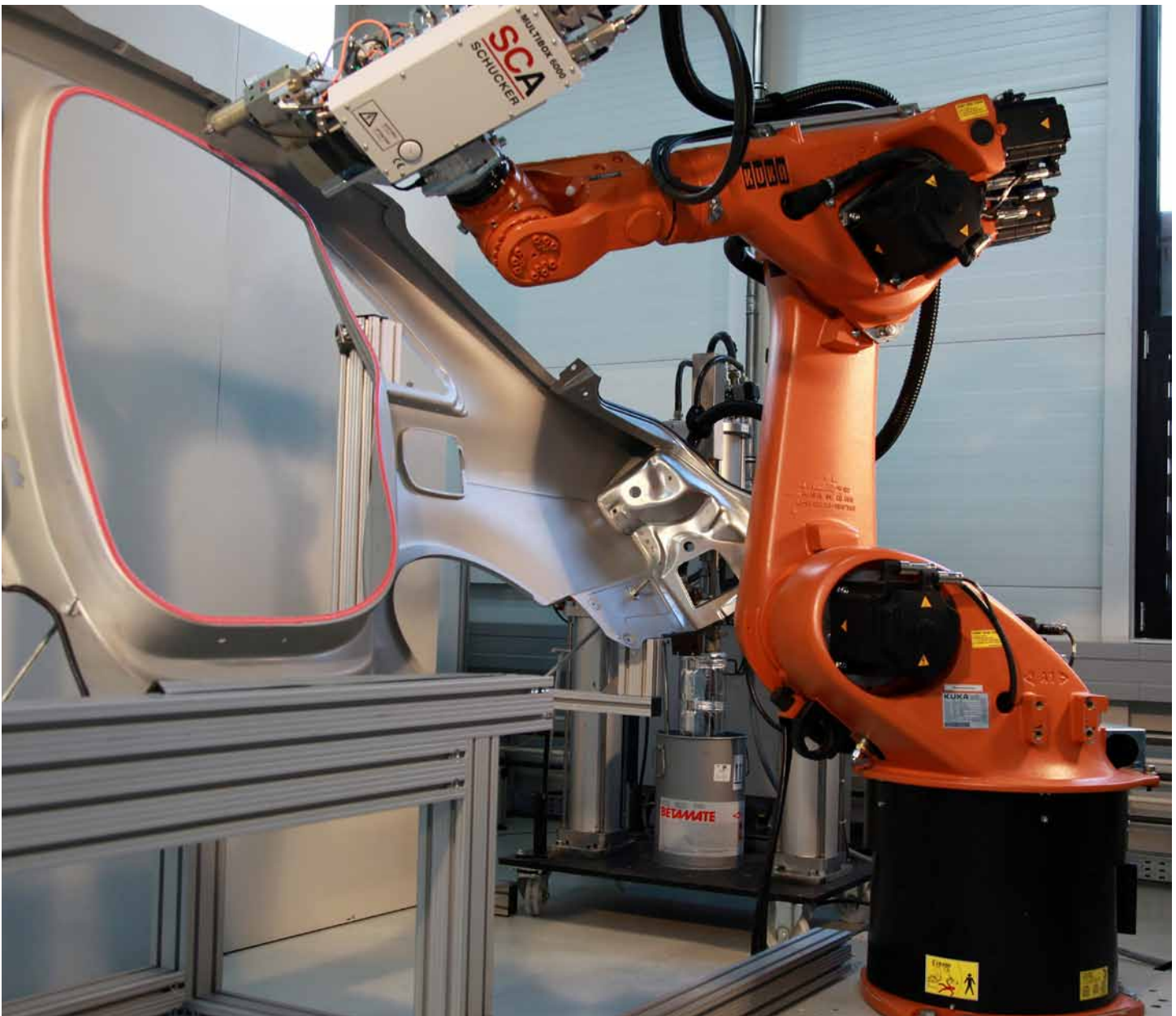




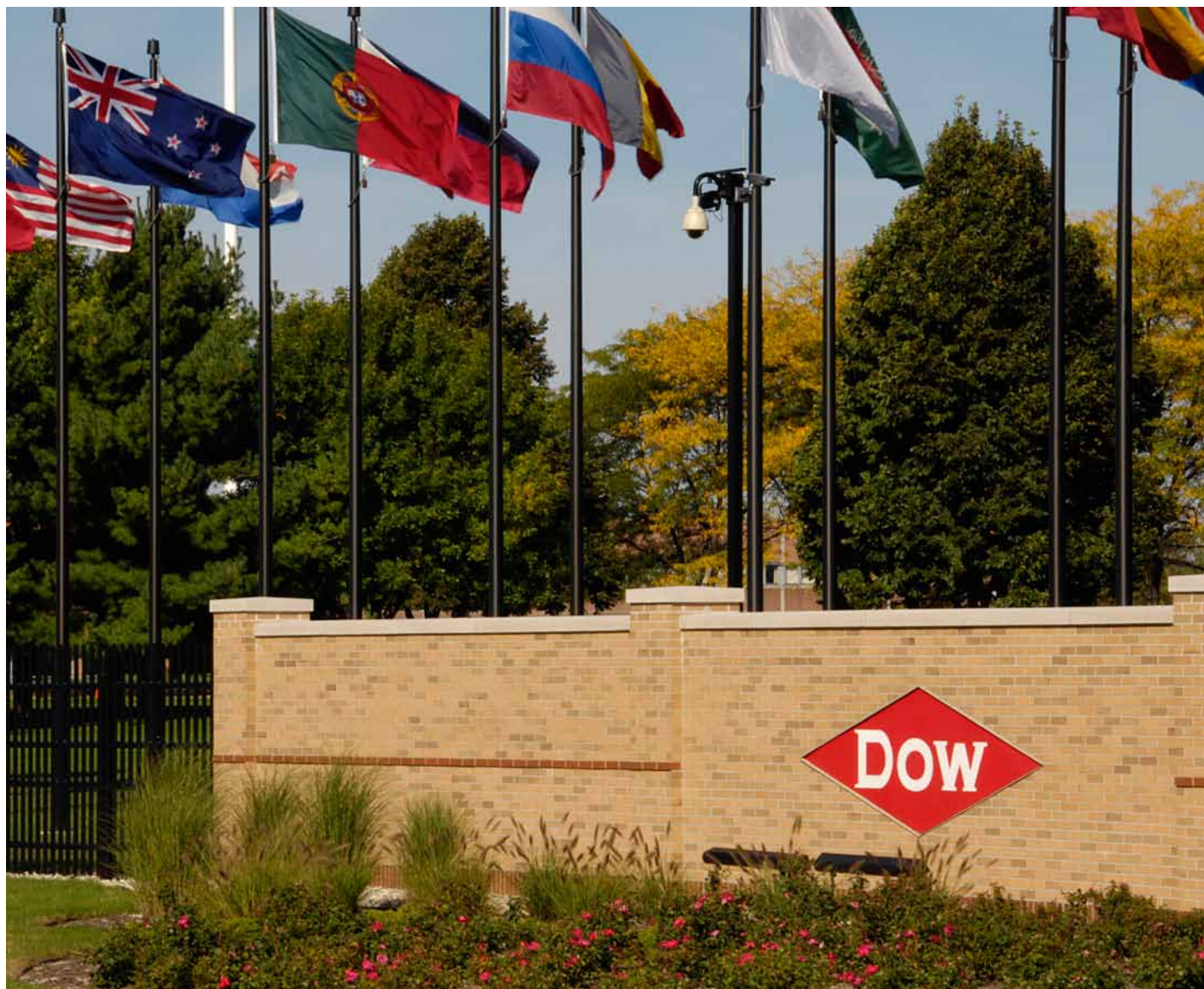
Dow Michigan

## Advanced Manufacturing Plan



# Table of Contents

<b>Why Does Michigan Need an Advanced Manufacturing Plan?</b>	p.3
<b>Energy Policy</b>	
Introduction	p.6
Energy Efficiency	p.7
Optimizing Hydrocarbons	p.9
Renewables	p.11
<b>Tax Policy</b>	p.13
<b>Regulatory Reform</b>	p.15
<b>Education and Workforce Development</b>	p.18
<b>Transportation Infrastructure</b>	p.22



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## Why Does Michigan Need an Advanced Manufacturing Plan?

### **The Need for a Strong, Domestic Manufacturing Sector**

Manufacturing has long been the largest business sector of Michigan's economy. From automobiles to chemicals to furniture, manufacturing employs more than 10 percent of Michigan's workforce. An even greater number of Michigan residents are employed by organizations that support our state's manufacturing base.

As the U.S. economy continues to recover from the Great Recession of 2008, Michigan has proven to be a leader in private sector job growth and swift economic revitalization. Much of this is due to manufacturing. As businesses focus on creating the products of tomorrow, we can continue to grow manufacturing in Michigan and, through it, the economy.



A 2013 Gallup State of the States index found that Michigan is among the top states showing the most improvement in job market conditions, stemming from nationwide gains in manufacturing.

For Michigan to create new advanced manufacturing jobs, regain its economic strength and attract global innovators and businesses to invest here, we must ensure the right policies are in place. Those policies, along with strong business-government collaboration, can help drive innovation, encourage investment and increase production.

Dow is committed to working with policymakers to accelerate the manufacturing rebound over the long term and enable Michigan companies to compete globally. That will help create jobs and build a brighter future for Michigan. A comprehensive approach to public policy as it relates to the manufacturing sector is one of the most vital ways to achieve these goals.

#### **Dow Is Proud to Call Michigan Home**

As a Fortune 500 company with more than 50,000 employees globally, 6,000 in Michigan alone, Dow is committed to revitalizing Michigan and its economy. Our corporate headquarters has been located in Midland, Michigan, since our founding in 1897. We're also invested heavily across the state, with Dow facilities located in Harbor Beach, Hillsdale and Auburn Hills. But our influence extends beyond our facilities. Through planning and improvements, we've expanded the skills of our workforce; made operations more efficient through improved environment, health and safety policies; and lowered the costs of on-site operations to better compete globally. We are committed to helping bring Michigan to the forefront of advanced manufacturing on a global level through our worldwide network of employees, customers, suppliers and industry partners.

#### **The Challenges of Manufacturing in Michigan**

Just as America has learned that the country must evolve to retain or regain its role as a global leader, Michigan is now faced with the challenge of reshaping its manufacturing profile and its economy. Michigan's economy, while improving, still has competitive challenges for attracting and retaining jobs.

For every job Dow creates, six additional jobs are created in the small business sector, ranging from suppliers to the restaurant and retail industry.

The road to a revitalized manufacturing sector is not an easy one. As other countries and states transition to a lower-carbon future, Michigan's energy consumption is significant and challenged further by long winters requiring more energy. Meanwhile, much of our state's infrastructure — which is vital to the success of some of the largest sectors that could help drive a boost in Michigan's economy, including agriculture, manufacturing, services, retail and transportation — is in critical need of repair. Michigan has much work to do.

Within these great challenges, however, lies great opportunity. Michigan became a leader in energy-efficiency programs in the 1980s and, in recent years, has again realized the value a focus on a clean energy future brings.



### What Constitutes an Advanced Manufacturing Plan?

The Advanced Manufacturing Plan for Michigan is meant to provide a framework from which policymakers and businesses together can strengthen Michigan's economy and its backbone, manufacturing. The plan presents Dow's position on a range of policies and programs that play a significant role in the ability of Michigan manufacturers such as Dow to support and grow their operations, increase employee numbers, and expand their role in communities across the state.

By its very nature, an advanced manufacturing policy is the sum of other policies. To rejuvenate the economic base, create jobs and allow industry to regain competitiveness, policymakers must address a range of issues that both directly and indirectly enable the growth of advanced manufacturing.

Dow believes Michigan must address five policy areas that are crucial to the future of manufacturing.

- Energy Policy
- Tax Policy
- Regulatory Reform
- Education and Workforce Development
- Transportation Infrastructure

### Michigan Exports at a Glance

- Manufacturing accounted for 93 percent of Michigan's exports in 2013
- Since 2009, Michigan's exports of manufactured goods have grown 82 percent, far surpassing the national average of 50 percent
- In 2011, nearly 31 percent of the state's manufacturing jobs stemmed from exports
- Michigan manufacturers account for 17 percent of total state output and employ 14 percent of the state's workforce
- In Michigan, manufacturing compensation is \$34,000 higher on average than other, non-farm wages (Source: National Association of Manufacturers)

Just as American manufacturing looks drastically different today than a century ago, Michigan, too, must evolve. We must be prepared to bring these issues to the table; Dow considers them all a part of a broader effort to build Michigan's future. We recognize that fundamental reform is difficult, but Dow firmly believes progress is achievable. By embracing advanced manufacturing, Michigan can rebuild its manufacturing base, thereby growing jobs, spurring investment and boosting state and local economies.

Michigan has already made strides in transforming its manufacturing economy, but there is more that can and should be done. With the right policies, Michigan can continue to redefine and diversify manufacturing to drive a new era of economic prosperity. The Advanced Manufacturing Plan for Michigan provides a comprehensive set of policies that can help lead the way to a stronger manufacturing future for Michigan.





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## Energy Policy

### Introduction

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As the global population grows and incomes rise, the demand and competition for energy will dramatically increase. The U.S. Energy Information Administration estimates that energy consumption will grow 14 percent by 2035 in the U.S. alone. The challenges presented by this growth in energy demand must be met head on, and states must play a critical role. We believe Michigan can be a leader in developing comprehensive energy policy that balances economic, environmental and security concerns.

Michigan has the highest average retail electricity prices in the Great Lakes region and the entire Midwest, according to the Energy Information Administration. At \$10.98 per kWh in 2012, Michigan's electricity price was nearly 10 percent higher than the national average. With peak electric demand forecasted to grow 1.2 percent per year by 2025, a comprehensive policy that explores all options, including a strong focus on renewable energy production and energy efficiency programs, is sorely needed.

Michigan is becoming less competitive because of the high costs and structural impediments within our regulatory system. Michigan needs a competitive energy policy that grows the economy and creates jobs. Unfortunately, what we have now is an uncompetitive market that produces the highest electricity rates in the Midwest, which is alarming and out-of-step with a pro-manufacturing agenda.

Decisions regarding Michigan's energy future are deeply impactful to energy-intensive manufacturers, many of whom are sophisticated electricity customers with the capability to secure reliable electricity supply, capacity and resource adequacy.

Michigan's energy policy should focus on these key priorities to create a competitive energy market for the state's advanced manufacturers:

- Retain and strengthen the self-service power provisions under PA 286.
- Encourage the addition, retention and expansion of Combined Heat and Power (CHP) through cost-efficient expansion and a competitive bid process for new generation capacity.
- Refine the definition of self service to encourage more efficient and renewable generation.
- Encourage partnership between regulators, utilities and power consumers by maintaining the 10 percent customer choice cap, and eliminating the self-implementation of new rates.

At Dow, we believe the future of energy is connected to innovative technologies and materials from chemistry and that energy policies at all levels of government should focus on four fundamental principles to transition to a sustainable energy future. They are:

1. **Conserve** by aggressively pursuing efficiency.
2. **Optimize**, increase and diversify domestic energy and feedstock supplies.
3. **Accelerate** development of alternative clean/renewable energy and feedstock sources.
4. **Transition** to a lower-carbon economy.





## Energy Policy

### Energy Efficiency

#### The Need

The Michigan Department of Licensing and Regulatory Affairs puts it best when it states, “the cheapest energy is the energy you don’t use.” Often referred to as the low-hanging fruit of effective energy policy, energy efficiency is the simplest and most affordable way to reduce energy demand and the emissions that result from burning fossil fuels. The Michigan Public Service Commission (MPSC) estimates that for every \$1 spent on energy efficiency programs, Michigan utility customers will save \$3 in energy costs. Over the next three years, this could be a savings of \$1.2 billion to utility customers.

Energy efficiency works. For example, if the U.S. improved overall building efficiency by 50 percent, the energy saved would be the equivalent to 9.5 million barrels per day of crude oil. This is roughly the equivalent of the nation’s daily imports.

Michigan was a leader in energy efficiency programs from the 1980s through the mid-1990s. Though these programs ceased due to utility restructuring initiatives, the state once again began to realize the value that a focus on energy efficiency brings. In 2008, legislation (Public Act 295) passed requiring all utilities to invest in efficiency programs to help save customers money. This has helped Michigan regain momentum in this critical area. However, there is much more that can be done.

According to the American Council for an Energy-Efficient Economy’s 2014 State Energy Efficiency Scorecard, Michigan ranks 12th in the U.S. The state needs to take the lead in developing policy and investing in programs to encourage efficiency across all sectors of the state’s economy, with particular focus on construction. The building sector is the largest consumer of energy across the U.S. Regularly updating state building codes to encourage efficiency will go a long way in reducing Michigan’s demand for energy and transitioning to a lower-carbon economy.

Michigan households use 38 percent more Btu of energy per home than the national average and spend 6 percent more than the national average on energy per household. With higher energy costs and an older than average housing stock, energy efficiency investments would reduce energy demand and save Michigan homeowners money.

Further, advancing integrated cogeneration for the industrial sector is another key way to encourage efficiency. According to the Environmental Protection Agency, the average efficiency of fossil-fueled power plants in the U.S. is 33 percent. By putting the wasted heat to use, combined heat and power (CHP) is estimated to offer thermal efficiency between 60 and 80 percent. In Midland, at Dow's Michigan Operations, 100 percent of Dow's energy needs are met by CHP.

As the state continues to improve, energy efficiency should be at the forefront of approaches for cutting waste. An energy efficiency program, with a plan for long-term implementation, must be the first step in a comprehensive and sustainable policy.

#### **The Solution**

- Remove state electric utility regulatory barriers to significantly increase the use of CHP and waste heat recovery in the industrial sector.
- Include power produced from CHP or industrial waste energy, and other difficult to recycle materials, as "renewable" under Michigan's renewable electricity standard.
- Regularly update and implement building codes to ensure large-scale energy savings through efficiency in new building stock. Additionally, policies to promote efficiency upgrades in existing buildings and homes are important.
- Maintain the use of targeted incentives, tax credits and rebates to encourage both homeowners and businesses to enhance the efficiency of their buildings.
- Encourage the industrial sector to invest in energy efficiency by lowering the cost of capital through grants, transferable investment tax credits and low-cost loan programs.



#### **Dow's Actions**

- Since 1990, Dow has reduced its energy intensity by 40 percent, saving 5,200 trillion Btu. Our energy efficiency efforts within our operations have returned more than \$24 billion of value to our Company.
- Installed in more than 20 million buildings worldwide, Dow STYROFOAM™ Brand Insulation insulates over 20 billion square feet, saving more than \$10 billion in energy costs annually.





## Energy Policy

### Optimizing Hydrocarbons

#### The Need

As we seek to transition to a low-carbon, sustainable economy, there is little doubt that hydrocarbon resources will continue to play a large role until cleaner energy technologies can be brought online at scale. It also must be recognized that these resources serve a critical role as feedstock for the manufacturing of products and solutions that drive economic activity.

Hydrocarbons are the primary raw material for many of the products we use in our daily lives. Further, these resources enable much of the advanced manufacturing of products that will help move us closer to a lower-carbon, sustainable future including photovoltaics, windmill blades and energy-saving insulation.

In 2008, Michigan spent \$26 billion on importing 97 percent of its petroleum, 80 percent of its natural gas and 100 percent of its coal. This represents 70 percent of the funds used to purchase energy sources. Proposed U.S. Environmental Protection Agency regulations for greenhouse gas emissions from existing power plants are expected to increase natural gas demand, because of fuel switching from coal to gas. To maintain stable supplies and prices, it is crucial that states fully utilize their homegrown energy resources to meet the growing demand of consumers, electricity generators and manufacturers.

Dow believes that the increased supply of natural gas from unconventional sources, such as shale gas, will be an important resource for the U.S. over the next decades, and we support environmentally responsible methods of bringing these sources to market. Michigan is home to tremendous sources of natural gas. The Antrim Shale in the northern portion of the Lower Peninsula is the 15th largest source of natural gas in the U.S. and is estimated to hold 7 to 20 trillion cubic feet of recoverable gas, though to date only 2.5 billion cubic feet have been proved. Additionally, exploration of the deeper Collingwood Shale formation has recently been successful. Fully pursuing these resources is important as Michigan currently depends on natural gas for 13 percent of electricity-generating needs and nearly 80 percent of heating needs. More in-state production means less money flowing to other states to import natural gas.

Additionally, it is critical to avoid any measure that drives increased demand for natural gas without also assuring ample supply is available. As utilities will pay nearly any price to assure heat and electricity for homes, schools and hospitals, it is manufacturing companies that absorb the shock of high gas prices if supply does not keep pace with, or exceeds, demand.

Supply imbalance, which occurs when demand for natural gas exceeds available supply, drives up prices and causes manufacturers to scale back production. While production

resumes when the supply-demand imbalance has been corrected, the resulting volatility in prices ultimately leads to job loss in the manufacturing sector and harm to the overall economy.

Despite importing 100 percent of its coal, Michigan is highly dependent on that resource as it supplies nearly 60 percent of electricity generation. As such, sustainable uses of coal are key for any state energy plan.

### **The Solution**

- Enhance policies to ensure reliable and affordable access to the vast source of natural gas located in the Antrim Shale and deeper shale formations, including the Collingwood Shale.
- Develop clear, science-based policies to resolve environmental, regulatory and other uncertainties in public opinion around use of the hydraulic fracturing process.
- Encourage and accelerate the adoption of available water treatment technologies, especially those for water recycling and reuse in the fracturing process.
- Resist policies that would unduly restrict hydrocarbon production, such as bans on hydraulic fracturing, or policies or zoning regulations that would act as de facto bans.





## Energy Policy

### Renewables

#### The Need

Dow believes that in any comprehensive energy plan, it is important to recognize the critical role renewable sources will play in a more sustainable energy future. Government should prioritize support and effective policy in order to send clear signals and accelerate the development of renewable sources of energy and next-generation energy storage.

According to a U.S. Department of Energy study, Michigan is one of four states with the highest potential for wind manufacturing jobs in the nation.

According to the Energy Information Agency (EIA), Michigan ranks 25th in terms of net renewable electricity generation. However, we have the capacity to do much more. For example, a study by the U.S. Department of Energy (DOE) states that Michigan ranks 14th among states for land-based wind energy potential.

This does not even include the massive 321,000 MW of offshore wind potential the Land Policy Institute at Michigan State University has estimated is available in Michigan. Michigan is beginning to capitalize on its wind energy potential, with the third most new capacity additions in 2013 with 175 MW, according to the American Wind Energy Association. Currently, Michigan ranks 16th in the country in installed wind capacity with 1,163 MW; another 342 MW is currently under construction.

Michigan is one of 31 states to have adopted a Renewable Portfolio Standard (RPS). Michigan utilities are on track to meet the RPS target of 10 percent by 2015, as long as the accelerated development of wind energy projects continues. However, if incentives for clean energy businesses and projects are eliminated, investment in the state is likely to slow, leading utilities to source Renewable Energy Credits (RECs) from projects in other states.



Further, current law limits the ability of manufacturers to source energy from renewable developments. As it stands, utilities have been able to contract available inventory for renewable energy and charge a premium through “green pricing” mechanisms. Providing further flexibility under the “Choice Cap” and expanding the radius for so-called “self-service power” would allow consumers and industry more flexibility to purchase renewable energy more cost-effectively and encourage the market to develop more capacity.

Policies to advance clean energy development in Michigan should focus on boosting research and development, while preventing energy prices from rising significantly, since advanced manufacturers are the ones who will develop the next generation of clean energy technology. Innovation is already making alternative and renewable energy solutions more efficient and affordable. Fully transitioning to a sustainable energy future will take further collaboration between state policymakers and innovative advanced manufacturers.

Advancing renewable energy sources is critical for energy security, economic growth and environmental sustainability throughout the U.S. Michigan has the capacity to accelerate the development of effective renewable sources of energy and, in doing so, could set itself apart as a leader in advanced manufacturing.

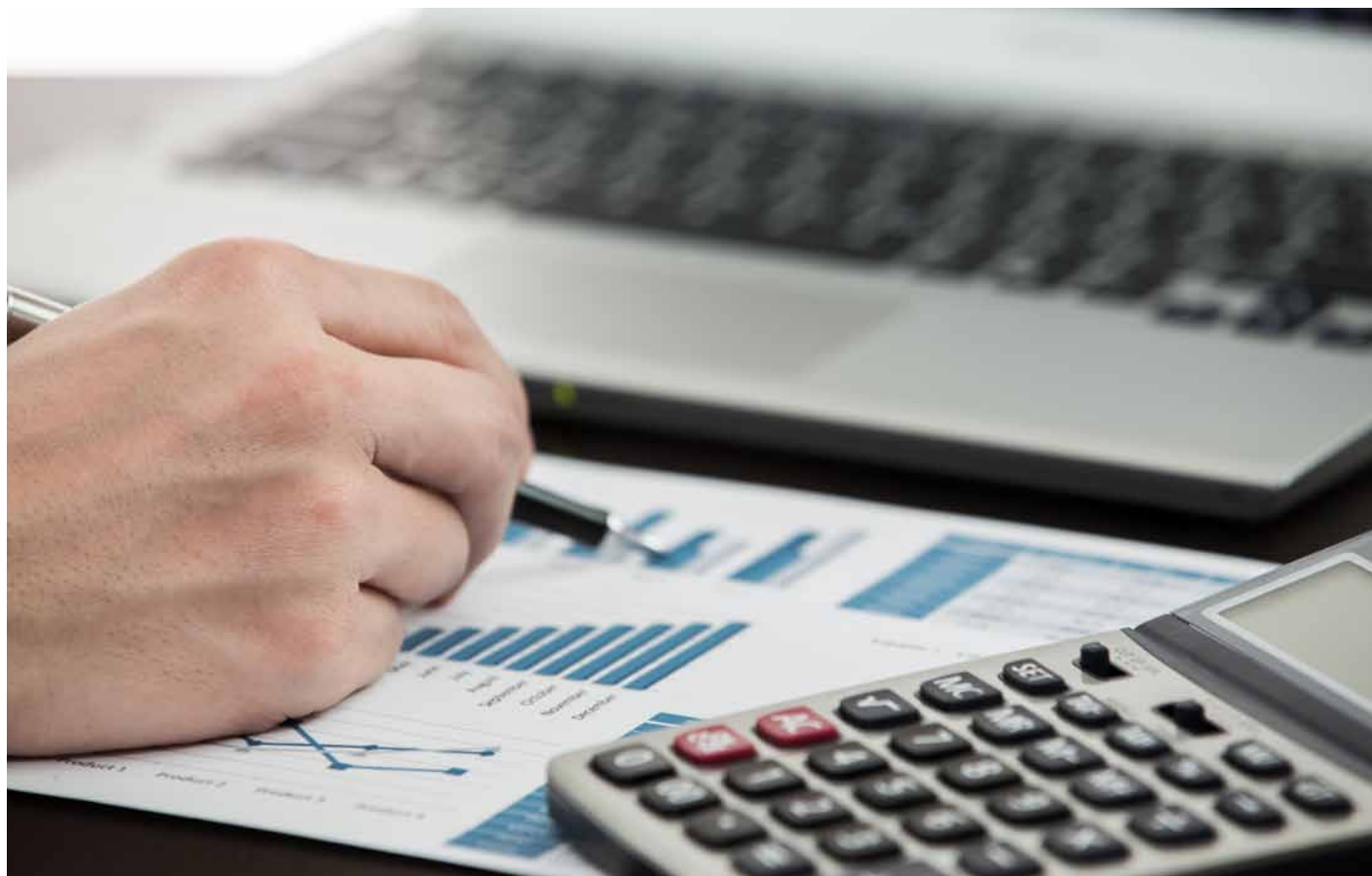
### The Solution

- Expand the “self-service” radius for renewable sources of energy generation in order to increase access, reduce cost and incentivize the market to expand the renewable base.
- Provide greater flexibility under the “Choice Cap” to give customers more flexibility in choosing from many electric providers when purchasing power, including from renewable sources.
- Allow manufacturers to source renewable power directly from suppliers and have such arrangements exempted from the 10 percent choice cap.
- Expand the definition of renewable energy to include energy efficiency improvements and allow for the use of innovative new energy recovery methods.
- Allow utilities to take credit against their RPS obligations for renewable volumes in their footprint.
- Require net metering on any excess self-service, renewable power.
- Eliminate barriers to the ability to efficiently wield power for self service and renewable generation.



### Dow's Actions

- Dow is powering some of its Midland-based facilities using gas created by the City of Midland's landfill. Recapturing the landfill gas, which would otherwise escape into the atmosphere, reduces greenhouse gas emissions by more than 12,000 tons annually, equivalent to the output of more than 20,000 passenger cars.
- Dow received a \$5 million grant from the Michigan Centers of Energy Excellence (COEE) program to help accelerate innovation efforts to manufacture a cost-effective carbon fiber for use in industrial market applications such as wind energy and transportation.
- Dow technologies are helping create lighter, stronger and longer turbine blades that help harness the power of the wind more efficiently. Today, 25 percent of the world's domestic wind turbine blades are made using Dow materials and innovations.
- Dow began sourcing clean power from biomass for its Automotive Systems plant at its Michigan Operations site in 2013, reducing annual energy usage by up to 1.5 MW per year, or the equivalent of nearly 93 billion Btu of natural gas.



## Tax Policy

### The Need

Manufacturing has long been the largest business sector of Michigan's economy. From automobiles to chemicals, medical equipment to furniture, manufacturing employs more than 10 percent of Michigan's workforce, with a much larger number of people employed by third parties – many based in Michigan – further supporting this manufacturing base. However, the national and global competition for these jobs is becoming more intense every day. For Michigan to grow and attract new advanced manufacturing jobs and investment, the tax system must take into account this sector's importance to the state's economy.

Michigan's tax climate has come a long way in the last four years. Governor Snyder's desire to work with manufacturers, along with the Michigan Legislature's commitment to implementing pro-growth policy reforms, has led to a significantly improved tax environment for Michigan.

In fact, as of 2015, the Tax Foundation has ranked Michigan thirteenth in the nation for overall state business tax climate – an impressive climb from twenty-seventh best in 2012. Specifically, the Tax Foundation ranks Michigan in the top ten nationally for corporate tax environment, which is critically important to the state's manufacturing economy and job creation.

Recent tax reform efforts have also contributed to the state's rapidly improving tax climate. The passage of Proposal 1 on August 5, 2014, by Michigan voters marked an important event in Michigan's history with the elimination of the Personal Property Tax for manufacturing. This is another critical step to maintaining a competitive tax environment. Michigan is, and will continue to be, a manufacturing state, and it is imperative that the tax system recognizes this. The passage of Proposal 1 is a strong signal of support to manufacturers presently operating in the state as well as those looking to operate in Michigan.

Creating an environment that encourages expansion of existing investments and attracts new firms will have a ripple effect throughout the Michigan economy. From a Dow perspective, we know that each job we create ultimately leads to the creation of as many as six additional small business jobs in areas such as suppliers, restaurants and the retail industry. As Michigan's economy begins to turn the corner, appropriate incentives are needed to keep Michigan in the running for manufacturers looking to invest.

Most incentives, attractive to larger businesses, have been repealed. This places Michigan at a competitive disadvantage to other states and fails to recognize the important relationship between manufacturing and the state's economy.

### The Solution

- Michigan should continue to refine the tax system to impose a common tax burden on all business activity in state, regardless of legal form of business entity, and ensure out-of-state businesses pay their fair share of the tax.
- Fully phase out the Personal Property Tax for manufacturers by 2022, ending the double taxation on business equipment not levied by most other states.
- Employ vital manufacturing tax credits and metric-based incentives for substantial new investment as the state continues to simplify the tax code and broaden the base. Large capital investment must not be jeopardized by the lack of incentives.
- Michigan should re-enact tax credits related to research and development to ensure R&D is conducted in state.







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## Regulatory Reform

### The Need

Targeted, flexible and compliance-oriented regulations are important tools for protecting human health and the environment. Smart regulations help ensure safe workplaces and a healthy environment while allowing manufacturers to grow and innovate.

According to the Americans for Tax Reform Foundation's Cost of Government Center, the average American worked 69 days in 2012 to pay for the cost of government regulation, which consumed about 19 percent of gross domestic product.

However, when regulations are not well designed, or are overly stringent and difficult to implement, the impact on Michigan's economy is immediate and significant. Costs to existing businesses mount as they struggle to comply with new regulations. New business growth is discouraged, productivity suffers and jobs are lost.

Dow seeks a proper balance between regulation and freedom to innovate. We believe that protection of human health and the environment is of utmost importance; however, we believe there is ample opportunity for regulatory reform.

In 2010, Governor Snyder directed state agencies, alongside the private sector and NGOs, to review, eliminate or streamline the regulatory system in the state. The Office of Regulatory Reinvention (ORR) was formed to direct this effort, and has been focused on prioritizing and implementing key recommendations since that time. The Michigan Occupational Safety and Health Administration (MiOSHA), Michigan's Department of Licensing and Regulatory Affairs (LARA) and Michigan's Department of Environmental Quality (DEQ) have made significant strides to eliminate unnecessary requirements, adopt federal standards where possible, and revise other regulations to promote flexible and cost-effective regulatory compliance. This significant effort incorporates many of the key concepts Dow believes are critical to foster an efficient regulatory climate.

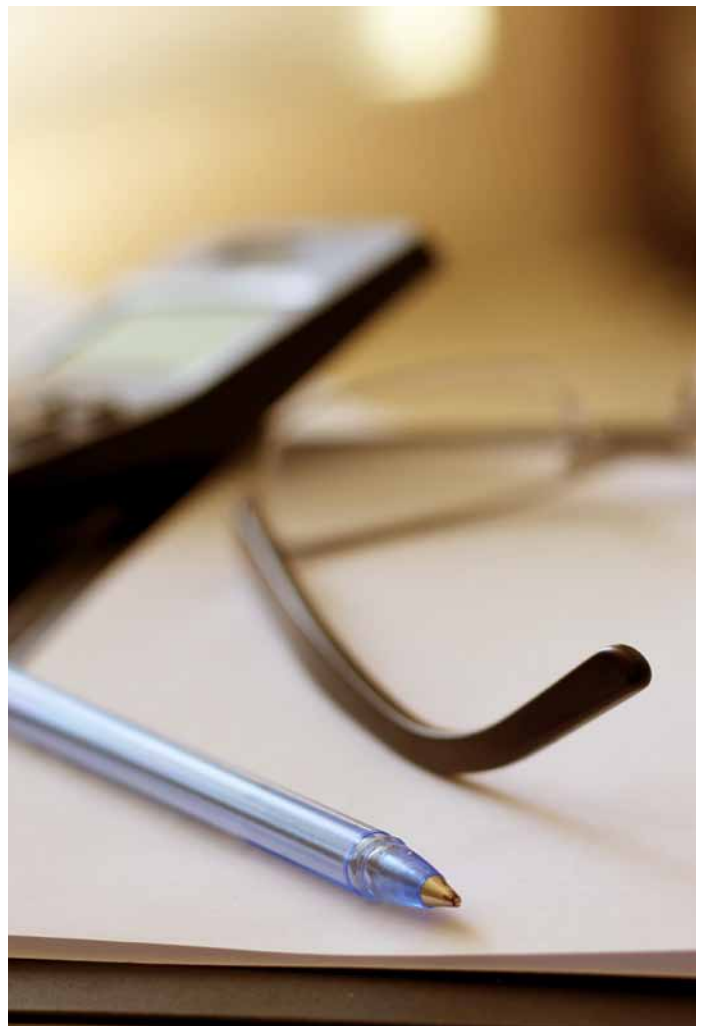
### The Solution

- Michigan regulations should not be more stringent than reasonable federal regulations. A significant amount of time, effort and energy is spent at the federal level to develop, document and justify rulemaking. Unless there is a compelling state-specific need, additional state resources should not be expended to make a state regulation more stringent or to develop a stand-alone state rule. Not only do these state-specific regulations add to the cost of manufacturing operations and downstream finished goods, they make Michigan's business climate less competitive with other states. Agencies should be required to publish an explanation of the regulatory intent when more stringent proposed and final regulations are published.

About one-third of U.S. states have already adopted laws preventing state regulators from exceeding federal standards without some sort of additional review.

- Continue to review existing rules, then simplify requirements or eliminate those that are not effective. The focus should be to eliminate duplicative, ineffective and unnecessary regulations, which can drive up compliance costs and delay or stop economic growth. If an existing rule should be retained, then it should have a strong bias toward simplicity and effectiveness. If the regulation is disorganized or ambiguous, it should be rewritten.

- Refrain from using guidance documents as regulatory tools. While some guidance documents are useful to understand the intent of a rule, they are often used as de facto rulemaking tools. This encourages regulatory bodies to exceed their statutory authority during enforcement activities, which has a net effect of creating regulatory uncertainty and adversely impacts willingness to invest in Michigan. Regulatory agencies should refrain from the use of guidance documents during enforcement activity.
- Accelerate permitting actions for new growth and modifications to create the right growth atmosphere in Michigan. Attracting new business growth and retaining existing business are highly dependent on the ability of state agencies to respond promptly and with certainty, in a fair and reasonable manner. Dow encourages the agencies to leverage best practices and coordinate with industry to build upon recent improvements in the air-permitting program.



- When permits are renewed, give them their maximum allowable life span. State agencies should grant the maximum allowable life span when permits are renewed. Renewals require a major effort from all parties, and the allowable permit life should be utilized.
- Improve permit coordination between agencies and departments. Create an organized multimedia (air, water and waste), project-based approach to permitting. Projects typically need multiple permits from different departments, and each tends to have different timelines. While each area has specific statutory and regulatory constraints, a coordinated approach would help minimize redundant efforts and, at the same time, identify the longest lead times for approvals so an expedited review process could occur.

### **Demonstrate a Bias for Action**

- Performance-based standards generate results. Default to performance-based requirements rather than prescriptive and rigid requirements. This allows industry to provide solutions that are creative, efficient and flexible in order to best achieve the intended outcomes.
- Self-implementation ensures action. Actively create more opportunities that allow industry and state agencies to self-implement actions, whether in permitting or regulatory compliance. For example, the use of pre-approved mechanisms, such as “general permits” or pre-populated lists of approved pollution control equipment (eligible for tax abatement), greatly streamlines the process while minimizing oversight and repetitive decision-making.

By early 2015, ORR eliminated 1,925 rules and regulations, and implemented more than 100 recommendations that make existing regulations more efficient.

### **Accelerate the Work Begun Under Governor Snyder's Office of Regulatory Reinvention**

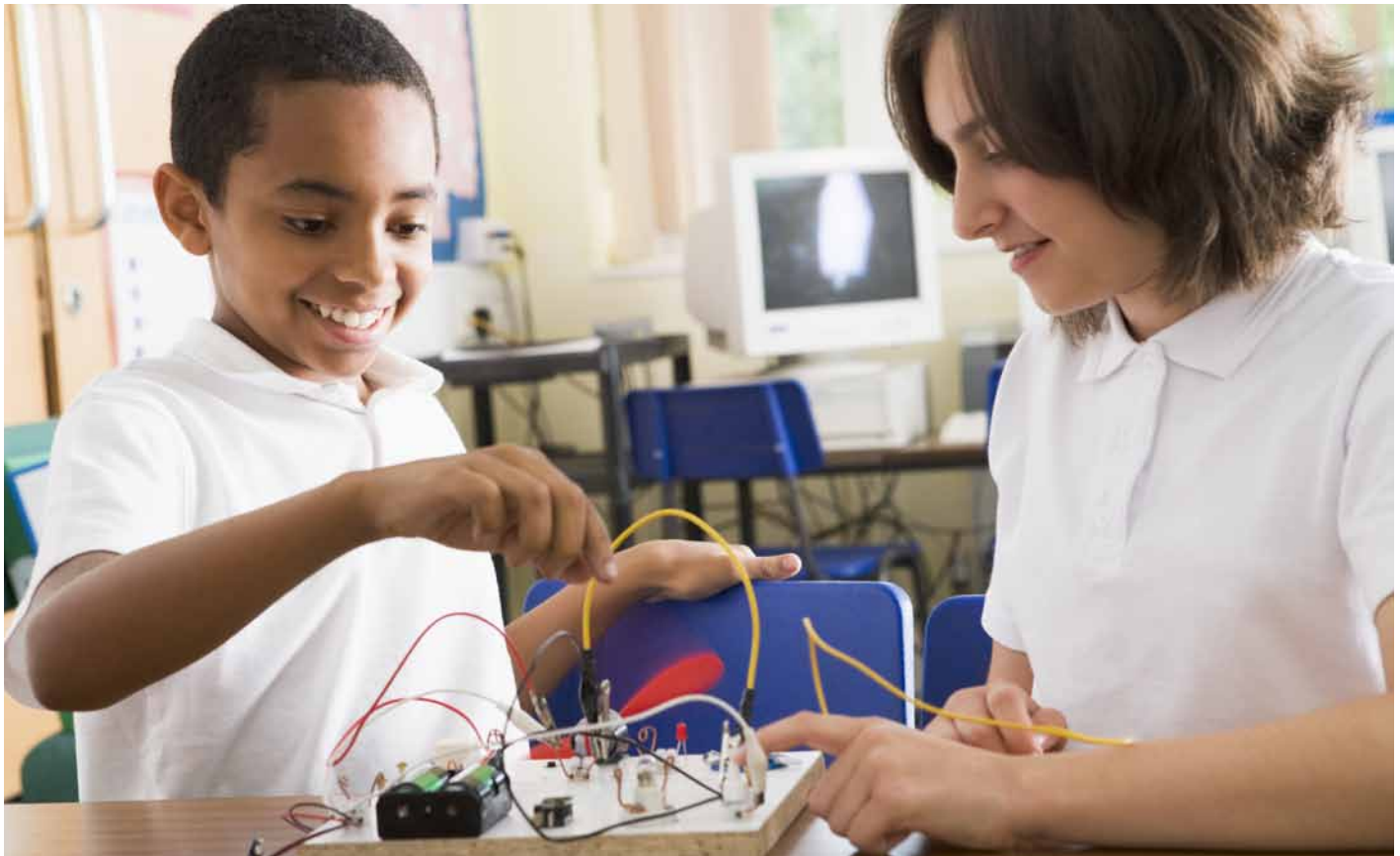
There have been many significant improvements proposed, including streamlining air toxics rules, hazardous waste rules, OSHA regulations, storage tank rules, environmental clean-up criteria, and others. Dow fully supports the multi-stakeholder process that has given rise to these improvements, and we urge the Governor, ORR, state agencies, non-profits and members of the regulated community to continue their work to simplify Michigan's regulatory climate, keeping in mind the importance of protecting public health and the environment.



### **Dow's Actions**

Dow has played an important role in the ORR process to streamline Michigan's regulatory climate since 2011. We participated on the ORR teams that produced the original recommendations and have been an active member of several of the stakeholder work groups that advise ORR on implementation of the individual recommendations. We will continue our work to simplify regulations at the invitation of state agencies.





## Education and Workforce Development

### The Need

Dow believes that the long-term viability of the manufacturing sector requires a workforce with advanced skills in the fields of science, technology, engineering and mathematics (STEM).

STEM jobs in Michigan are projected to grow by 16 percent between 2010 and 2020, according to a 2013 Georgetown Public Policy Institute report.

A 2013 report from the Georgetown Public Policy Institute projects that STEM-related jobs in Michigan will grow by 16 percent between 2010 and 2020. This translates to almost 228,000 STEM and STEM-related jobs that Michigan will need to fill by 2020. Thus, a strong educational foundation in STEM fields is critical to meeting future workforce needs and enabling Michigan to regain its footing in innovation and economic growth.

Sadly, the last decade has seen this foundation gradually erode in Michigan. This is resulting in fewer individuals finishing school college-ready, particularly in STEM fields, as well as a widening gap between the available skill set and employers' workforce needs. In fact, the 2014 State of Michigan Education Report, published by The Education Trust-Midwest, shows clear indicators that Michigan is going through an education recession and is losing ground to other states in terms of educational improvements.

Several trends point to this decline, and Dow firmly believes that unless these trends are reversed, the manufacturing sector will be threatened by a lack of STEM-ready workers.

Michigan ranks in the bottom five states for student learning progress in fourth-grade reading and math, according to a 2014 report by Education Trust Midwest.

These trends include:

- **Lower performance on the National Assessment of Educational Progress (NAEP) exam.** An analysis of a decade's worth of data on the NAEP exam – given regularly to a representative sample of fourth, eighth and 12th grade students nationally – has revealed that Michigan students are not keeping pace with the rest of the nation. Indeed, many states, such as Tennessee, are soaring past Michigan and showing larger improvements. Further, not only did Michigan rank below the national average in 2013 in both reading and math, it also ranked in the bottom five states for student learning progress in fourth-grade reading and math.

- **Decade-long recession impacting education funding:** Michigan is recovering from an economic recession that disrupted how its public schools operate. Presently, 8 percent of Michigan school districts are operating at a deficit, making them more at risk for closure and for being taken over by emergency managers. Unstable funding has also led to larger class sizes, and delayed the implementation of higher academic standards for STEM subjects. This is an untenable situation that Michigan stakeholders must urgently address to achieve much-needed educational reforms.

- **Slow improvement in high school graduation rates:** A 2013 report from the Georgetown Public Policy Institute estimates that by 2020, 70 percent of jobs in Michigan will require some form of postsecondary education. Yet according to a 2014 report by GradNation, Michigan seems to be significantly off pace with improving its high school graduation rate to reach the national goal of 90 percent graduation by the class of 2020. GradNation reported that Michigan's graduation rate was 76 percent in 2012 (versus 80 percent nationally) with only a modest increase from 2006.

High school graduates are more likely to be employed, make higher taxable income and aid in job generation. If Michigan does not overcome its high school dropout crisis, it may not be able to meet the future workforce requirements of Michigan's employers and enable the projected shift toward higher-educated workers.

- **Low rate of college readiness and the need for remedial courses:** Annually, ACT<sup>1</sup> provides each state with The Condition of College & Career Readiness, a report that details the college readiness of students who took the ACT® college readiness assessment. ACT has defined “college and career readiness” as the acquisition of knowledge and skills a student needs to enroll and succeed in credit-bearing, first-year college courses at a postsecondary institution without the need for remediation.

The Michigan Education Dashboard shows that for the academic year 2012-2013, less than 20 percent of Michigan students assessed met the ACT college readiness benchmarks, meaning that far too many high school graduates would require some form of college remediation to progress into higher levels of education. This poor performance is especially worrying in light of new ACT research showing a clear link between student academic readiness and college dropout and transfer rates. The findings of this ACT study suggest students at the greatest risk of dropping out are those who earn lower ACT college readiness assessment scores.

According to the Michigan Education Dashboard, 60 percent of students enrolled in community colleges (during 2012 and 2013) required developmental education in math or English/reading.

### The Solution

To reverse these trends, government, academia and industry need to intensify cooperation in programs to encourage the highest quality STEM education at the K-12 level to fill the talent pipeline and develop ways in which to improve retention of students interested in STEM careers. The good news is that there is an emerging consensus across education organizations, the business community and policy leaders about supporting some core strategies that have been proven to be essential for raising student learning.

As an example, the Michigan STEM Partnership is a public-private collaborative that includes educators, employers, legislators and many others who are concerned about creating the new economy and addressing the current lack of STEM skills in school children and job applicants. The partnership aims to foster a culture of cross-disciplinary education (P-20) in which all subjects are seen to be connected to each other and related to real-world activities. The partnership believes that this culture will develop STEM skills and will prepare every Michigan-based student for a successful future.

<sup>1</sup>Michigan will transition from the ACT to the SAT® College Admission Exam in spring 2016.

The private sector can further help in improving the quality of STEM curricula for K-12 by providing technical expertise and coaching to teachers on a volunteer basis, by contributing to the development of technical curricula, and by inviting teachers into the state's private industries to see and personally experience STEM-related jobs.

The Great Lakes Bay Regional (GLBR) Alliance is a great example of how business, education and community stakeholders can work together to assure a talent pipeline that matches the needs of the region. In late 2014, following the conclusion of the STEM Impact Initiative, the GLBR Alliance began implementing a set of recommendations and a roadmap for building a high-performing STEM region. The goal is for the region to be driven by employer demand, powered by career and college-ready students, focused on strengthening technical skills needed for the economy, and sustained by a culture of STEM. GLBR Alliance members know that this will not happen overnight, but will require a long-term investment for the region with a promise of great returns. As the GLBR Alliance identifies policy gaps, they will make recommendations that Dow encourages policymakers to consider when proposing policies for K-12 education and workforce development.

Dow's STEM strategy is designed to help relieve the current and future shortage of qualified employees by empowering educators, engaging students, retraining workers and enlightening the public.

State, federal, corporate or foundation funding for college loan forgiveness should be provided for STEM graduates who teach STEM-related courses in Michigan's K-12 system. Several successful models exist, such as the federal Stafford Loan Forgiveness Program and the Texas Education Agency Loan Forgiveness Program for Teachers.

Lastly, the Michigan legislature is urged to consider investments in proven educational strategies that have worked in other leading states such as Tennessee and Massachusetts. Dow applauds Governor Snyder's efforts to improve third-grade reading and to make Michigan a national leader in connecting individuals to high-demand, well-paying careers in skilled trades.



#### Dow's Actions

Dow depends on a technically literate workforce and has a responsibility to use its resources to make students and the Michigan workforce stronger. Dow advocates for improvements to the quality of comprehensive STEM education at all levels and is locally active to achieve such improvements. Dow has a longstanding commitment to STEM education through charitable giving and resource support at the national and local levels. To date, Dow's support of STEM initiatives unique to Michigan has exceeded \$5 million.

#### Our National Involvement

- **100Kin10:** The Dow Chemical Company Foundation has pledged \$500,000 over three years to support 100Kin10, a collaborative movement to prepare and deploy 100,000 new, best-in-class STEM teachers over the next 10 years.
- **Change the Equation (CTEq):** CTEq is a nonprofit, CEO-led initiative to move the U.S. to a leadership position in science and math education over the next decade. Dow has joined more than 100 other multinational companies in this effort to enhance careers in STEM.
- **Smithsonian Institution:** Dow has partnered with the Smithsonian Science Education Center to bridge the gap between the classroom and the real world. This has been accomplished through the Dow Smithsonian Teacher Scholars professional development program and the joint development of hands-on activities for ambassadors to bring into classrooms.



- **American Association of Chemistry Teachers:** Dow and the American Chemical Society launched the American Association of Chemistry Teachers (AACT). The organizations will work together to convene a series of teacher summits and create more than 750 lesson plans, multimedia resources, demonstrations and other high-quality chemistry teaching materials for use in K-12 classrooms.
- **Project Lead The Way:** Dow and Project Lead The Way (PLTW) announced a partnership to increase access of K-12 students to high-quality STEM education programs. Dow will fund PLTW programs in 17 schools across key Dow communities, including six schools in Michigan's Great Lakes Bay Region.
- **Dow STEM Ambassadors:** Launched in Midland, Michigan, and expanding across the globe, Dow-trained STEM Ambassadors aim to support teachers and inspire students. They make challenging concepts easier to understand through the use of real-life examples, while sharing exciting opportunities available through the pursuit of STEM careers.
- **U.S. Apprenticeship Program:** Dow is piloting its U.S. Apprenticeship Program at five of its manufacturing sites in Texas, as well as at its manufacturing sites in Pittsburg, California, and Midland, Michigan. The Midland program will focus on hiring veterans.
- **Michigan State University (MSU) Midland Research Institute for Value Chain Creation:** MSU opened a research institute in Midland, Michigan, focusing on value chain creation and management and tackling many of the challenges businesses face today. MSU conducts research through the institute, while offering graduate studies in value chain management. The institute also offers non-degree courses and certificate programs on-site and online.
- **University of Michigan Sustainability Fellows:** The Dow Sustainability Fellows Program at the University of Michigan supports full-time graduate students and postdoctoral scholars at the University who are committed to finding interdisciplinary, actionable, and meaningful sustainability solutions on local-to-global scales. The program aspires to prepare future sustainability leaders to make a positive difference in organizations worldwide.
- **Chemical Educational Foundation:** Dow is a corporate sponsor of the "You Be the Chemist" program through the Chemical Educational Foundation. This program for middle school students makes chemistry concepts fun and easy for students and teachers through a quiz show format. Dow employees volunteer at several of our sites to support the program.
- **Science Fairs:** Dow currently sponsors and supports multiple science fairs and festivals to advance STEM across the U.S., including the Philadelphia Science Festival.

### Our Michigan Priority Initiatives

- **FIRST Robotics:** Dow employees model the excitement of engineering and innovation by mentoring high school teams involved in FIRST Robotics. This program challenges teams from across the globe to design and build robots that compete in events that mirror the excitement and competition of athletic sports. Dow sponsors FIRST Robotics teams throughout the Great Lakes Bay Region and in many other U.S. communities.
- **FastStart Program:** In collaboration with Delta College, Dow fostered the creation of the FastStart Program to support manufacturing in the Great Lakes Bay Region by training workers for the jobs available now, while building a local talent pipeline to meet future needs.
- **Regional STEM Study:** Dow, as a member of the Great Lakes Bay Regional Alliance Education Subcommittee, commissioned a study to assess the region's STEM education system, including recommendations for improvements, to better align the interests and capabilities of residents with the needs of its employers and the opportunities in the region. As mentioned earlier, recommendations from this study are currently under implementation.
- **Dow Science Ambassadors:** Dow is organizing a network of employees interested in advancing STEM, to deploy their time and talents to achieve the greatest impact across the region.

Dow employees model the excitement of engineering and innovation by mentoring high school teams involved in FIRST Robotics.



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## Transportation Infrastructure

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### The Need

Transportation infrastructure is vital to the success of the five major economic sectors that account for 84 percent of the U.S. economy: services, manufacturing, retail, agriculture and natural resources, and transportation providers. Michigan's critical transportation infrastructure is a network of roads, rail, inland lakes and waterways, and airports, and it is funded through state vehicle registration fees and fuel taxes.

Each year, Dow uses inland waterways across the Midwest to ship the equivalent of more than 4,000 railcars or 16,000 tank trucks of raw materials and finished goods.

Across the nation, transportation infrastructure is crumbling. Michigan is no different. Despite the existing annual funding, a study by Ernst & Young and Urban Land Institute notes that this “relatively low” national investment in our transportation infrastructure will soon compromise the nation's ability to compete globally.

Shipment by road is a key link in Michigan's manufacturing chain. Manufacturers rely on freight haulers to move three-quarters of their raw materials and finished goods to world markets. A 2009 infrastructure study by the American Society of Civil Engineers (ASCE) gave Michigan's roads a grade of D. According to ASCE, a significant 38 percent of Michigan's major roads are of mediocre or poor quality, and Michigan has more than 1,350 bridges that are structurally deficient (12.3 percent), with another 1,670 bridges that are considered functionally obsolete.

Rail transportation is by no means new to Michigan. In the 1920s, the state had over 10,000 miles of track carrying both freight and passengers; today, it has just 3,600 miles. This reduction in track miles significantly limits freight capacity and drives shipping prices upwards. In regions with limited track miles and single carriers, shippers regularly pay rates that are over twice that of shippers in areas with competition. This hurts the competitiveness of Michigan's manufacturers.

Michigan's manufacturing sector also relies heavily on Great Lakes shipping and its links to other U.S. inland waterways. Dredging and lock maintenance operations are necessary for the safe operation of vessels on our waterways, but this activity raises financial concerns, as well as environmental concerns regarding the disposal of dredged material, the control of non-indigenous species and physical damage to ecosystems caused by vessel and lock operations.

### The Solution

- It is critical that infrastructure spending in Michigan be prioritized based on economic impact. Spending on Michigan's roadway system and inland waterway maintenance would likely provide the most significant near-term impact to revitalize the manufacturing sector in Michigan. Investment in rail track miles requires a comprehensive long-term strategy to be most effective.

According to the Michigan Infrastructure Transportation Association, for every \$1 spent on Michigan's infrastructure, \$6 is created in spin-off economic activity.

- Great Lakes and inland waterway transport is crucial to growing a cost-competitive manufacturing sector in Michigan. Access to well-run locks and dredged shipping channels is the most important facet of maintaining a viable inland waterway system. However, we recognize that keeping locks open to commercial shipping raises the important question of non-native species entering the Great Lakes. Dow believes that there are effective ways to control the migration of these potentially harmful species into the Lakes and that a total closure of the lock system may not be necessary. Science and careful study have already provided us with some of the keys to solving this challenge. Solutions currently being evaluated include the feasibility of implementing a process for rapid treatment of waterway sections if invasive species are detected, an increase in monitoring efforts in the watershed, and the treatment of ballast and bilge waters prior to discharge into the Great Lakes. We believe that cooperative effort between shippers, NGOs and state and federal authorities can result in a workable solution to combat the threat of invasive species while maintaining shipping in these critical inland waterways.

- Dow encourages the use of public and private partnerships to support critical infrastructure projects. These partnerships can be highly beneficial for residents and businesses and can alleviate some of the financial burden these important projects create. The New International Trade Crossing (NITC) is an example of a public partnership with the Canadian government offering to provide Michigan's \$550 million share of the project funding; these dollars would also be used as part of the state funds that are required to obtain a highway project funding match from the federal government. The Detroit-Windsor Gateway is one of the busiest commercial land border crossings in North America, handling about 28 percent of all U.S.-Canada border crossings; and it sees more freight tonnage than any other U.S. border crossing (14.5 million tons each year).



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