Michigan's New Gold

Green is the new gold in Michigan, at least according to the state's economic development agency. With the large-scale loss of auto manufacturing jobs, the state of Michigan is working aggressively to rebuild its economy with a new focus—alternative energy. Materials research and manufacturing is taking center stage in this effort, in areas ranging from transportation to solar panels.

Through tax incentives, state and federal grants, and partnerships, new opportunities in the research, development, and manufacturing of materials are emerging across Michigan.

"New developments in materials always lead to new science, new science leads to new technology, and new technology to new products," according to Stephen Forrest, Vice President for Research at the University of Michigan. New products are just what Michigan is after.

Michigan has lost hundreds of thousands of jobs in the automotive industry, its economic pillar for the last century. According to Alan Taub, Vice President of Global Research and Development for General Motors Company (GM), the industry is going through a massive restructuring. Next-generation vehicles will be electrically driven, controlled by electronic systems, and totally connected to the world, he said. "There is really an opportunity for the global research community to recognize that our product is being reinvented. Materials invention is a fundamental requirement for that reinvention."

Developing advanced batteries for electric and hybrid cars has been one major area of focus for the automotive industry. As first-generation electric cars like the Chevy Volt move into production, Michigan has been aggressively recruiting manufacturers with tax credits and incentive packages. Companies LG Chem, A123, and Johnson Controls all have plans for lithium-ion battery plants in Michigan.

In addition to advanced batteries, key areas of research include fuel cells, hydrogen storage systems, low-rolling resistance tires that improve fuel efficiency, and smart vehicle applications such as intelligent sensors. Although Detroit's historic automotive supply chain was not conducive to start-up companies, Michigan is now following in the footsteps of Silicon Valley and actively seeking entrepreneurs to advance the field. Michigan leaders hope that this, combined with southeastern Michigan's skilled manufacturing workforce, proximity to major research universities, centralized location, and local automobile expertise will help reinvigorate the community and the economy.

Michigan is also investing heavily in the solar energy supply chain, from research to commercialization. Several companies developing and manufacturing photovoltaic modules and solar cells have relocated to or expanded in Michigan in the last few years, such as Hemlock Semiconductor, Evergreen Solar, and United Solar Ovonic (Uni-Solar), in large part due to state incentives. In addition, new research groups working to improve the efficiency of solar cells have formed or expanded at many local universities.

One of these companies, Uni-Solar, recently decided to establish some high-tech solar cell manufacturing facilities in Michigan despite attractive incentives from other states. Michigan Governor Jennifer Granholm worked with the company to offer a matching package, bringing hundreds of new jobs to the state. The state is very supportive of companies that want to relocate or expand in Michigan and there is a well-trained pool of students from local universities, according to Uni-Solar Chair Subhendu Guha. "We have great universities here and they are at the forefront of research."

University laboratories and partnerships are an integral part of Michigan's strategy for economic recovery in solar energy and other areas. One example of this is the Department of Energy's Energy Frontier Research Center (EFRC) program, which recently established two EFRCs in Michigan. The University of Michigan (UM) is now home to the Center for Solar and Thermal Energy Conversion, which is under the direction of Peter Green, Chair of the Department of Materials Science and Engineering at UM and a past president of the Materials Research Society. Michigan State University (MSU) is home to the Center for Revolutionary Materials for Solid State Energy Conversion, which is led by Donald Morelli, Professor of Chemical Engineering and Materials Science at MSU.

Another major project is the University Research Corridor (URC), a collaboration between the University of Michigan, Michigan State University, and Wayne State University to accelerate economic development in Michigan. The URC aims to help grow and diversify the state's economy by strengthening ties between universities and businesses. According to Forrest, Michigan is looking at other examples of how universities interact with industry, such as Research Triangle Park in North Carolina and Boston's Route 128 Corridor in Massachusetts. But, he said, "Michigan has to find its own way. We are creating our own future."

Michigan also has a growing wind turbine industry. Its manufacturing expertise and windy landscape position Michigan as a potential leader in the industry, and the state is pursuing many related opportunities. With the aid of state grants, the University of Michigan and Grand Valley State University established a $1.36 million project investigating the feasibility of deploying offshore wind technology in Michigan. General Electric Co. is investing $100 million in a new research and development facility in southeastern Michigan and anticipates that suppliers will follow. More than $18 million in Recovery Act funding went to Michigan businesses for manufacturing composite turbine blades and related components.

Michigan's focus on renewable energy research and manufacturing is very new, said Forrest. "It's new, but we're doing it with a great deal of commitment." We have had to readjust our thinking about what the drivers of our economy could be, he said. Renewable energy is a job provider now and in the future and Michigan is well poised to become a leader in this area.

The outlook is encouraging, but rebuilding and diversifying Michigan's economy will take a collective effort of government officials, universities, start-up companies, and existing businesses. Sales of automobiles in North America went from about 17 million to 10 million across the industry in a one-year period during the worst of the economic crisis. "We are starting to see the recovery now," said Taub, "but it will be a long time before we get back to those kinds of volumes."

KENDRA RAND

2010 TIP Competition Focuses on Manufacturing Technologies

www.nist.gov/tip/

The Technology Innovation Program (TIP) of the National Institute of Standards and Technology (NIST) has announced that it is seeking proposals for high-risk, high-reward research projects in the area of "Manufacturing and Biomanufacturing: Materials Advances and Critical Processes." Based on FY 2010 funds, TIP expects to award a total of approximately $25 million in first-year funding for research and development (R&D) projects.

New materials have the potential to open new markets for novel or dramatically improved manufactured products but, as TIP staff noted in a recent white paper describing the justification and scope of the competition, a major challenge for manufacturers is efficiently moving new materials currently in the laboratory into production and the market. Improvements in critical manufactur-

https://doi.org/10.1557/mrs2010.565 Published online by Cambridge University Press

ing processes that reduce costs, save time, increase quality, or reduce waste can dramatically improve the competitiveness of process-based industries, including biomanufacturing—the sector that produces vaccines and other biopharmaceuticals—chemical production, and fuel producers, among others.

The merit-based, competitive program can fund R&D projects by single small- or medium-sized businesses or by joint ventures that also may include institutions of higher education, nonprofit research organizations, and national laboratories. TIP awards are limited to no more than $3 million total over three years for a single company project and no more than $9 million total over five years for a joint venture.

The 2010 TIP competition is open to research proposals in three areas:

- process scale-up, integration and design for materials advances—addressing how new materials are moved from the laboratory to full production;
- predictive modeling for materials advances and materials processing—using the power of modern analysis, modeling and computation to streamline the design and production scale-up of new materials by more accurately predicting their performance; and
- critical process advances—novel production technologies that dramatically improve the processing of new materials or resolve important bottlenecks and inefficiencies in the production of existing materials.

The due date for submission of proposals is 11:59 p.m. Eastern time, July 15, 2010. Proposals may be submitted electronically through Grants.gov (search for Catalog of Federal Domestic Assistance [CFDA] program 11.613 or Funding Opportunity Number TIP-2010-B01) or on paper to the National Institute of Standards and Technology, Technology Innovation Program, 100 Bureau Drive, Stop 4750, Gaithersburg, MD 20899-4750.

DOE, USDA, and NSF Launch Joint Climate Change Prediction Research Program

The U.S. Departments of Energy and Agriculture and the National Science Foundation (NSF) announced in March the launch of a joint research program to produce high-resolution models for predicting climate change and its resulting impacts. Called Decadal and Regional Climate Prediction Using Earth System Models (EaSM), the program is designed to generate models that are significantly more powerful than existing models and can help decision-makers develop adaptation strategies for addressing climate change. These models will be developed through a joint, interagency solicitation for proposals.

The goal of EaSM is to generate predictions of climate change and associated impacts at more localized scales and over shorter time periods than previously possible. The program is unique in its innovative interdisciplinary approaches to addressing the interdisciplinary sources and impacts of climate change. These interdisciplinary approaches will draw on biologists, chemists, computer scientists, geoscientists, materials scientists, mathematicians, physicists, computer specialists, and social scientists.

"The impacts of energy production and use on climate and the impacts of a changing climate on our future energy infrastructure are among the most critical challenges facing the Department of Energy," said William F. Brinkman, director of DOE's Office of Science. "This research will help us better understand how much our climate is changing and what that will mean at both a global and regional level over the next few decades."

The joint solicitation for EaSM proposals enables the three partner agencies to combine resources and fund the highest-impact projects without duplicating efforts. The FY 2010 EaSM solicitation will be supported by ~$30 million from NSF, ~$10 million from DOE, and ~$9 million from USDA.

This solicitation is the first solicitation for the five-year EaSM program, which will run from FY 2010 to FY 2014. Submitted proposals will be reviewed through NSF's peer review process, and awards will be funded by all three partner agencies. About 20 NSF grants under EaSM are expected to be awarded.

DOE is particularly interested in developing models that better define interactions between climate change and decadal modes of natural climate variability, simulate climate extremes under a changing climate, and help resolve the uncertainties of the indirect effects of aerosols on climate.

NSF is particularly interested in developing models that will produce reliable predictions of climate change at regional and decadal scales, resulting impacts, and potential adaptations of living systems to these impacts. Related research may, for example, include studies of natural decadal climate change, regional aspects of water and nutrient cycling, and methods to test predictions of climate change.

The USDA is particularly interested in developing climate models that can be linked to crop, forestry, and livestock models. Such models will be used to help assess possible risk management strategies and projections of yields at various spatial and temporal scales.

Two types of interdisciplinary proposals will be considered for EaSM funding: Type 1 proposals should be capacity/community-building activities, address one or more goals, and last up to three years; these proposals may receive up to $300,000 in annual funding. Type 2 proposals should describe large, ambitious, collaborative, interdisciplinary efforts that advance Earth system modeling on regional and decadal scales, and last three to five years; these proposals may receive $300,000 to $1 million in annual funding.

India and Korea Sign Agreement for Cooperation in Science & Technology

The Program of Cooperation (POC) in Science & Technology with India and South Korea for the period of 2010–2012 was signed by Prithviraj Chavan, Minister of State for Science and Technology with his Korean counterpart H.E. Byong Man Ahn. The new POC would provide opportunities in working on application-oriented joint research projects of mutual interest in several areas, including materials science and technology, renewable energy, and water resources and environment. The POC will provide opportunities to scientists of both countries to visit each other's laboratories.

PM of India Meets with Scientific Advisory Council

Prime Minister Manmohan Singh met with Chair C.N.R. Rao and other members of the recently reconstituted Scientific Advisory Council to Prime Minister (SAC to PM) in January to discuss the Council's future plans and programs and areas that require attention on a short-term as well as a long-term basis. Prithviraj Chavan, Minister of State (Independent Charge) for Science and Technology (S&T) and Earth Sciences also participated in the meeting.

In the past five years, Rao said, the Science Advisory Council established two new S&T Ministries/Departments—namely, the Department of Health Research and Ministry of Earth Sciences—and set up five Indian Institutes of Science Education and Research. The Council also established a new autonomous structure to support innovation, research, and development—the newly approved National Science and Engineering Research Board (SERB)—to fund scientific research in India.

The main item discussed was a roadmap for making India competitive in science and a global Innovation hub in the next five to 10 years. They also discussed aspects related to the mobility of scientists. □

https://doi.org/10.1557/mrs2010.565 Published online by Cambridge University Press