



Michigan's Wind Strategy

*Center of Excellence for Advanced Materials
and Manufacturing Innovation*

October 12, 2010

Steve Bakkal
Michigan Economic Development Corporation
bakkals@michigan.org

Michigan Economic Development Corporation (MEDDC)



- The state's economic development authority, administers all state level incentive programs.
- Partnership between the State of Michigan and local communities.
- One-stop resource for business retention, expansion and relocation projects.
- Structure allows for speed, continuity and flexibility.

MEDC Services to Wind Turbine Companies & Suppliers

- Provide ideal home for your product design and manufacturing operations
- Provide support for your business development (introduce you to utilities and project developers)
- Provide support for your R&D and product development initiatives
- Provide connections to critical manufacturing suppliers
- Provide connections to other go-to-market partners (installation and logistic firms)
- Provide connections to design, engineering, product development and university partners
- Provide connections to Michigan investors (Invest Michigan Fund, VC's, Private Equity, Industry Investors)
- Provide options for Joint Venture, Joint Development Agreement, Licensing partners if desired
- Provide business strategy consulting with MEDC wind energy expert strategic partners
- Provide support for your future federal funding initiatives

Strategy:

Targeted Industry Clusters

- Targeted industries
- Potential for significant growth
- Leverage state strengths
- Generally not mature
- Gap exists – requires economic assistance

1. **Advanced Energy Storage**
2. **Solar/Photovoltaic**
3. **Wind Turbine Mfg.**
4. **Bioenergy**
5. **Advanced Materials & Manufacturing**

Different Strategies / Common Approach

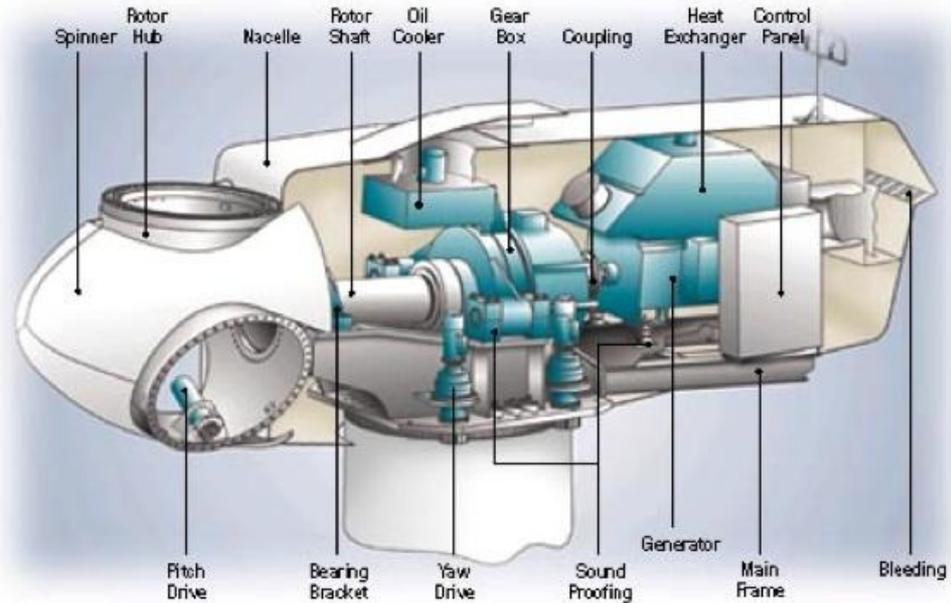
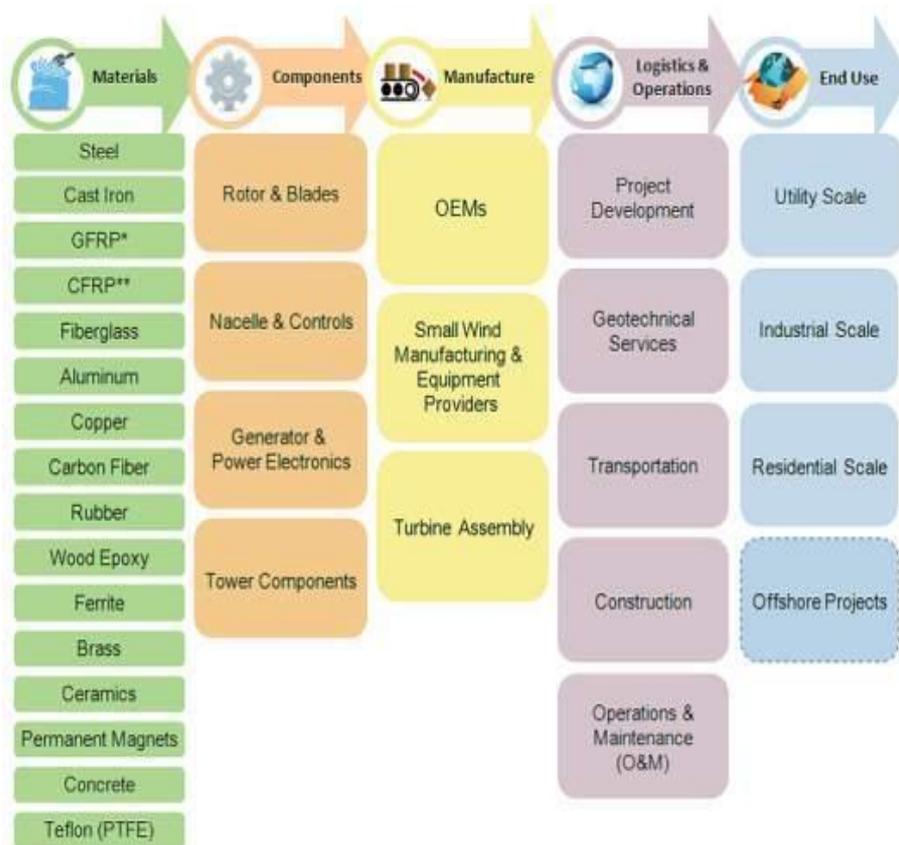
- Public/Private Partnerships to support growth of sector
- Close relationship with Michigan's federal delegation
- Engaged with national labs, DOE, to identify focus areas, funding opportunities, evaluate technology
- Develop a cross-functional team focused on industry cluster development comprised of industry sector specialists, PhD's, marketing & research support, business development managers, all immersed in industry.

Why Wind in Michigan?

- Michigan Strengths – Advanced manufacturing capabilities, product development & engineering resources, materials & composites expertise
- Onshore and Offshore Capacity – 16,650 MW potential in onshore alone
- 10% Renewable Portfolio Standard by 2015 – requires nearly 1100 turbines.
- Logistically located to supply Midwest and Ontario



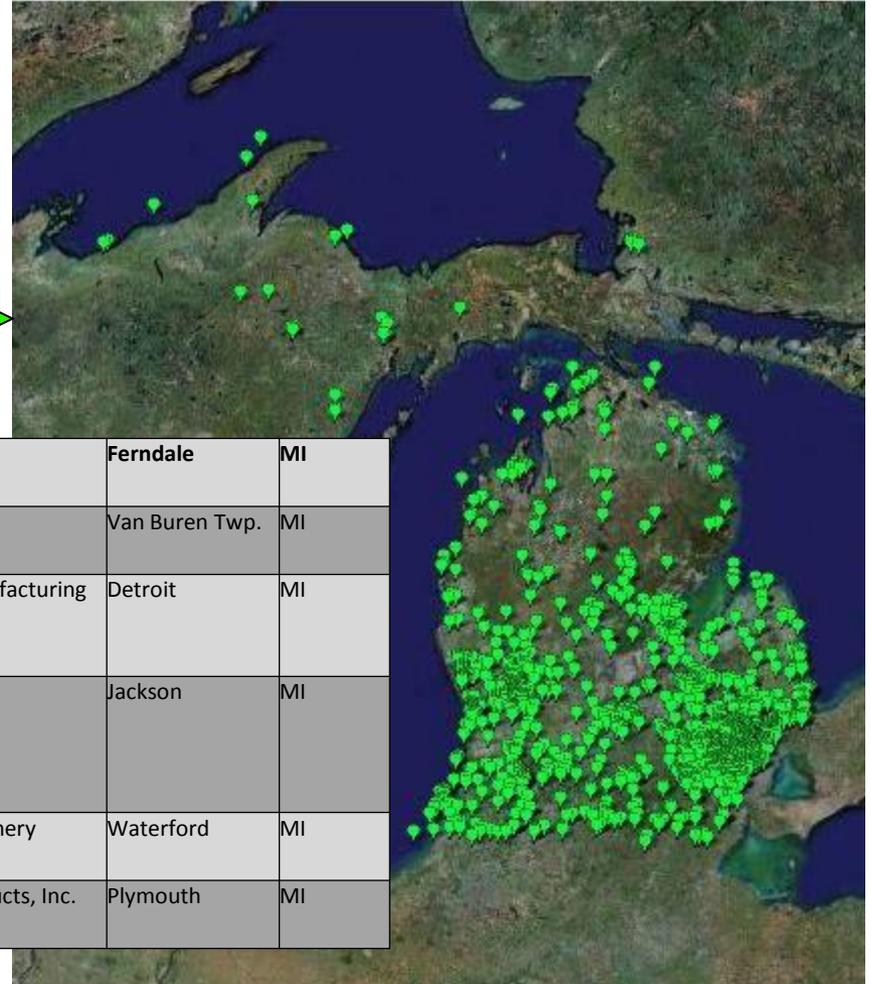
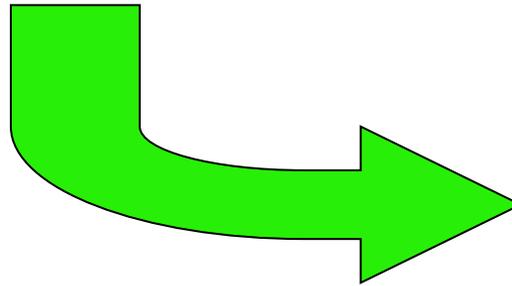
Detailed Wind Value Chain Analysis



SOURCE: Center on Globalization, Governance & Competitiveness

Michigan's Supply Chain

Potential Michigan Suppliers to the Wind Industry?



Mechanical Drivetrain & Bearings	Brakes	Axle Tech	Ferndale	MI
Mechanical Drivetrain & Bearings	Gearbox Design	Ricardo Inc	Van Buren Twp.	MI
Mechanical Drivetrain & Bearings	Gearbox	American Axle & Manufacturing	Detroit	MI
Mechanical Drivetrain & Bearings	Gearbox - large gear cutting, grinding	Great Lakes Industry	Jackson	MI
Mechanical Drivetrain & Bearings	Gearbox Housings	Three M Tool & Machinery	Waterford	MI
Mechanical Drivetrain & Bearings	Pitch and Yaw Drives	Loc Performance Products, Inc.	Plymouth	MI

Michigan Manufacturing Wind Diversification Activities

- 35+ match making events/activities
 - Wind Turbine OEM's:
 - Clipper, GE, Nordex, Vestas, Siemens, GAMESA, Acciona, Enercon India, Nordic Wind Power, Northern Power, Mariah Power
 - Wind Energy Tier 1 Suppliers:
 - Gear Boxes: Moventas, Bosch, Hansen
 - Bearings: SKF
 - Generators: Danotek, Elin Motoren
 - Brakes: Svendborg, Sime Stromag
 - Pitch/Yaw Drive Systems: MLS SIPCO

Michigan Manufacturing Wind Diversification Results

- \$675 million in new awarded contracts for Michigan companies
- \$118 million in new business investment to upgrade machinery, equipment, and facilities
- 1,496 new and retained jobs

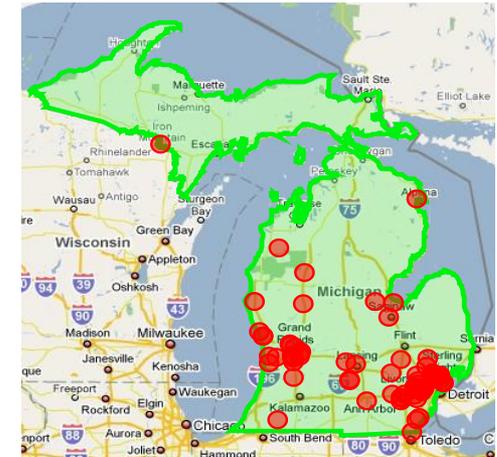
August 2006 through July 2009, led by NextEnergy and MEDC.

Michigan Wind Supply Chain

From Potential to Active...

- **Contractors Building Supply-Automation and/or Assembly**
- **Forberg Scientific-Automation and/or Assembly**
- **Gexpro-Automation and/or Assembly**
- **KMT Robotic Solutions, Inc.-Automation and/or Assembly**
- **MARELCO Power Systems, Inc.-Automation and/or Assembly**
- **Performance Assembly Solutions-Automation and/or Assembly**
- **VALLEY CITY METAL PRODUCTS-Automation and/or Assembly**
- **Windemuller-Automation and/or Assembly**

- **Kaydon Corporation-Bearings**
- **NSK Corporation-Bearings**
- **SKF USA Inc.-Bearings**
- **Axson North America-Blade Materials - Adhesives**
- **Dow-Blade Materials and Molds, Composites**
- **Gougeon Brothers Inc.-Blade Materials, Composites**
- **Owens Corning Composites System-Blade materials, composites**
- **McHugh Composites-Composites Service Firm**
- **Creative Foam Composite Systems-Blade Materials, foam support, insulating foam for nacelles**

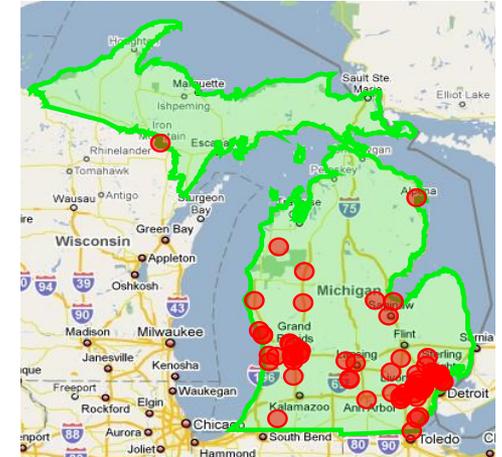


- **Lach Diamond-Blade tooling**
- **Carter Products Company Inc-Blades, Laser Lay-up Alignment Systems**
- **Unimerco Inc-Tooling for Blades, Base, Housings**
- **ETM Enterprises, Inc.-Blades, Nacelle housings, nose cones - Composite Structures**

Michigan Wind Supply Chain

- **Great Lakes Gear Technologies, Inc.-Gear Box Machinery**
- **CMS North America-Machinery - Blades and CNC**
- **Three M Tool & Machinery-Machining - Gear Box Housings**
- **Dowding Industries-Machining and Fabricating - Hubs and Rotors**
- **AmeriChip-KSI-Machine & Engineering**
- **Multisync-Power-Material Formulation**
- **Diversified Tooling Group-Material Formulation, Part of Component Mach/Fab**
- **TEL-X CORPORATION-Material Formulation, Part of Component Mach/Fab**
- **Vehma Engineering-Material Formulation, Part of Component Mach/Fab, Automation and/or Assembly**

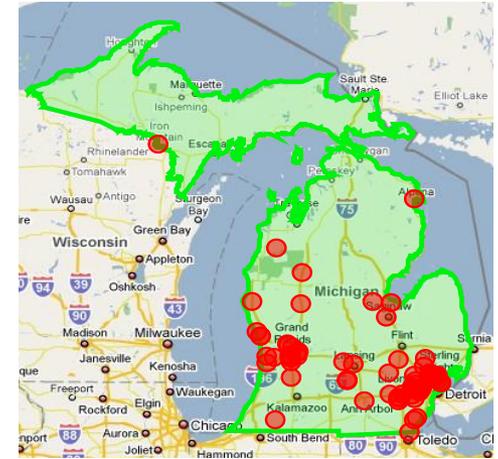
- **Viking Products-Material Formulation**
- **Macsteel, div of Gerdau-Material provider-Steel**
- **Cascade Renewable Energy Solutions-Plastic Injection Molding, Machining**
- **Danotek Motion Technology-Generators, Permanent Magnet**
- **Seeger-Orbis-Retaining Rings for Gear Boxes**
- **Williams Form Engineering Corp-Foundation Studs, Tower Anchors**
- **Nord-Lock-Tower Anchoring Systems**
- **Fabory North America-Tower bolts, fasteners**
- **Great Lakes Heavy Haul-Transportation and Logistics**
- **Metro Wire & Cable-Wiring and tubing**
- **Bauer Power-Renwable Energy System Intergrator**



- **Wind Power Services LLC-Full system small wind service provider**
- **Wolverine Power Systems-Generator and small wind distributor and installer**
- **ICR-Industrial Control Repair-Robotics**
- **Trialon Corporation-Test engineering**

Michigan Wind Supply Chain

- Applied Process-Castings
- ATI Casting Service/ Allegheny Technologies-Castings
- Citation Corp.-Castings
- Systems Control-Electronic controls and substation control centers
- RLE International-Engineering and Design
- Ricardo Inc-Engineering and system integration firm
- Ort Tool & Die-Fabrication and Machining - Gear Box Housings
- K&M Machine-Fabrication and Machining - Nacelle frames, rotor hubs, gearboxes, bearing blocks Genzink Steel-Fabrication
- Merrill Fabricators-Fabricator, Machining and Custom Equipment Builds
- Ideal Fabricators-Large Fanfabrication
- Grosse Tool & Machine-Machining/Fabrication
- Hegenscheidt MFD Corporation-Machining/Fabrication
- OptoAtmospherics-Machining/Fabrication
- Proos Manufacturing-Machining/Fabrication
- Rapid Line-Machining/Fabrication
- Roush Industries-Machining/Fabrication
- Master Mfg., Inc.-Machining/Fabrication, Automation and/or Assembly
- Agritek Industries, Inc.-Machining/Fabrication, Automation/Assembly, Hardening, Plating, Coating or other
- Hines Corporation-Machining/Fabrication, Hardening, Plating, Coating, & Other Finishing, Automation and/or Assembly



2010+ Wind Strategy – Innovation Cluster Development

- Identify weaknesses in wind industry for opportunities
- Identify Department of Energy focus for federal funding opportunities
- Match with MI companies strong in those areas
- Concentrate state funding to build the cluster (with Federal cost share)

Center of Excellence for Advanced Materials and Manufacturing Innovation

Why focus on innovation?

- Federal/DOE
 - Improve domestic competitiveness of US wind supply chain
 - Improve US wind supply chain capacity, increase content
- Industry
 - Reduce wind turbine capital cost
 - Improve energy capture of wind systems
 - Improve wind turbine reliability (including life cycle costs)
- State
 - Create sustainable manufacturing jobs for wind industry
 - Position Michigan as the clear leader in turbine technology and manufacturing innovation

DOE Wind Manufacturing Workshop

Manufacturing Challenges and Needs

- **Limited domestic casting capacity to support market**
- **Automated, repeatable, and lower-cost blade manufacturing processes , utilize “lean” manufacturing processes**
- **Improving quality with increasing blade lengths, design complexity, and use of lighter-weight advanced materials**



Michigan's Strategic Solution: 2010 Centers of Energy Excellence

- Dow Chemical - \$5 million – Lower cost carbon fiber for wind blades
- Astraeus - \$6 million – Automation systems for wind blade production
- Energetx - \$3.5 million – Highly durable wind blade production
- URV - \$3.5 million - Next generation casting process



Michigan's Innovation Cluster Solution:

Next Generation Durable Wind Blades

Marriage of...

Advanced Materials + Automation Process

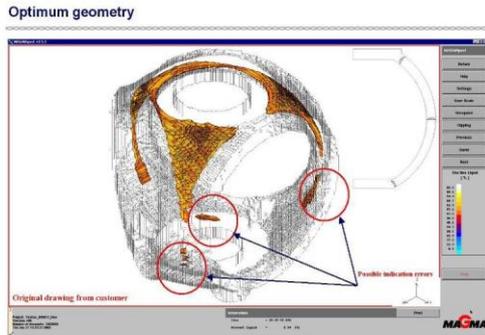


+



Michigan's Solution to domestically produced, market priced, best-in-class quality wind castings

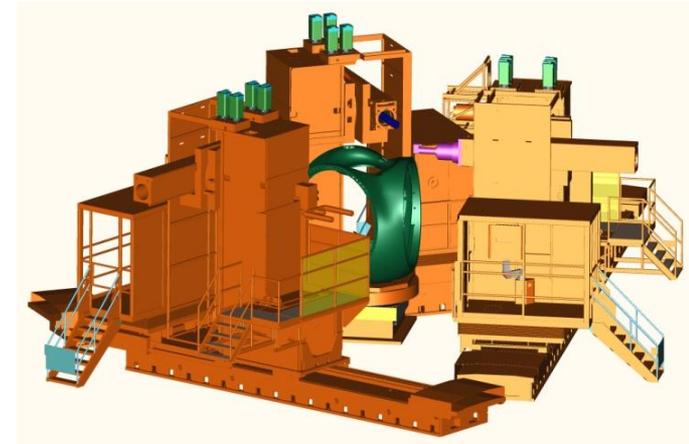
Advanced Materials + Casting Expertise + Automation Process



+



+



State and Federal Direct Grant Support (Excludes traditional State incentives)

Company	State COEE Grants	Federal Funds	Total Project Investment	
Dow Chemical, Midland, MI <ul style="list-style-type: none"> Next generation low cost carbon fiber materials for wind blades 	\$5M COEE	\$5M DOE ITP	\$20M	
Astraeus, Eaton Rapids and Port Huron, MI <ul style="list-style-type: none"> Automation systems for hub machining Automation systems for wind blade spar cap production Joint Development Agreement between MAG Automation and Dowding Ind. 	\$6M COEE	\$7M SEP grant (ARRA Funding)	\$15M	
Energetx, Holland, MI <ul style="list-style-type: none"> Next generation utility scale wind blades 	\$3.5M COEE	\$3.5M SEP grant (ARRA Funding)	\$37M	
URV USA, Eaton Rapids, MI <ul style="list-style-type: none"> High quality large castings at prices below Asian sources (hubs, bedplates) 	\$3.5M COEE	\$3.5M SEP grant (ARRA Funding)	\$40M	
Merrill Technologies, Saginaw, MI <ul style="list-style-type: none"> Large nacelle and drivetrain component manufacturing assembly for community and utility scale wind turbines 		\$3M SEP grant (ARRA Funding)	\$8.4M	
LOC Performance, Plymouth, MI <ul style="list-style-type: none"> Pitch and yaw drive systems for utility scale wind turbines 		\$1.5M SEP grant (ARRA Funding)	\$14M	
VenTower, Monroe, MI <ul style="list-style-type: none"> Utility scale steel fabricated wind towers 		\$2.3M SEP grant (ARRA Funding)	\$19M	
Great Lakes Industry, Jackson, MI <ul style="list-style-type: none"> Large gears, gearbox component manufacturing for utility scale wind turbines 		\$2 million SEP grant (ARRA Funding)	\$15M	
KC Jones Plating, Warren, MI <ul style="list-style-type: none"> Next generation surface finishing technology to wind turbine components to improve metal parts resistant to corrosion and decrease wear. 		\$150k SEP grant (ARRA)	\$354k	
TOTAL Investment	\$18M	\$27.95M	\$168.8M	

Michigan's Supply Chain Supports Enabling Technologies for Offshore Developments

- **Dow** – *Increased carbon fiber content for larger blades needs economical solution*
- **Astraeus** – *Larger , better quality, repeatable blades using lighter weight materials*
- **Energetx** – *Partnering with an industry leading blade design company and manufacturer (Aeroblade)*
- **URV** – *Lighter weight castings, globally competitively*
- **Danotek** – *Permanent magnet generators*
- **Ventower** – *Located in Port of Monroe*

MICHIGAN
ECONOMIC DEVELOPMENT CORPORATION
MichiganAdvantage.org

**Michigan gives wind companies
the Upper Hand**

Manufacturing expertise and experience
Active Wind Industry
Demand for wind resources
Research, training and first class collaborations.

Michigan Companies

**ADVANCED
MANUFACTURING/LARGE
COMPONENT MACHINING,
FABRICATION, ASSEMBLY
& CASTINGS**

Astraeus (MAG/Dowding Industries)
K & M Machining and Fabrication
Merrill Technologies
On Tool
Three M Tool
ATI Casting
Betz Industries

BLADES/ADVANCED MATERIALS

Astraeus (MAG/Dowding Industries)
Creative Foam
Dow Chemical
Dow Corning
Energetx Composites
Carter Products
Aeroblade

TOWERS

Vanlower
W. Soule
Williams Form

**GEARBOXES/PITCH & YAW SYSTEMS
GENERATORS/BRAKING SYSTEM**

LOC Performance
Great Lakes Gear Technologies
American Axle & Manufacturing
Danotek Motion Technologies
L3 Combal Systems/ Magnet Motors
Williams Intl
Axle Tech
Arvin Meritor

**R&D/DESIGN/PRODUCT
DEVELOPMENT & VALIDATION**

Burke E. Porter
LHS International
Ricardo
Horiba
Romax Technology
AVL

INSTALLATION/CONSTRUCTION

LOGISTICS

Rockford Berge
Walbridge
Windemuller
Barton Malow

BEARINGS

Kaydon Corp
SKF

DEVELOPER

DTE Energy
Consumer's Energy
Mackinaw Power
Orisul
Heritage Sustainable Energy

Thank You

Steve Bakkal

**Michigan Economic
Development Corporation**

bakkals@michigan.org

www.MichiganAdvantage.org