Industrial Decarbonization Innovation Challenge
Developing the Carbon Neutral Factory of the Future
NASEO Event Sept 13, 2023
https://www.centrepolis.org/industrial-decarbonization
Centrepolis Accelerator mission is to…

1) help cleantech “hardware” product developers in designing and manufacturing their products in Michigan; and

2) help existing Michigan manufacturers adopt energy efficiency and industry 4.0 technologies to reduce emissions and improve their operational efficiencies allowing them to be more globally competitive.

Our Mantra…
To enable those with ideas for physical products to create and recognize their dreams, to help them build businesses and manufacturer their products right here in Michigan
Build4Scale training

0 Course Introduction
1 Self-Assessment
2 Detailed Design Package
3 Design for Mfg, Assembly, & Reliability
4 Beta Prototype & Test Plan
5 Communication, Selection, & Negotiation
6 Regulation, Certification, & Industry Stds
7 Sustaining Quality & Warranty Plan

Resource Library
Why Focus on Industrial Decarbonization

**Scope 1**
DIRECT SOURCES
- Onsite energy consumption and materials processing
- Company-owned vehicles
- Downstream transportation and distribution

**Scope 2**
INDIRECT SOURCES
- Emissions from purchased electricity for own use

**Scope 3**
UPSTREAM AND DOWNSTREAM SOURCES
- Processing of sold products
- Business travel
- End-of-life treatment of sold products
- Use of sold products

Common greenhouse gases:
- CO₂
- SF₆
- CH₄
- N₂O
- HFCs
- PFCs
- NF₃
## DOE Roadmap Table for Achieving Net Zero by 2050

### Table 1. Decarbonization pillars with examples of technologies for industry

<table>
<thead>
<tr>
<th>Energy Efficiency</th>
<th>Industrial Electrification</th>
<th>Low-Carbon Fuels, Feedstocks, and Energy Sources (LCFFES)</th>
<th>Carbon Capture, Utilization, and Storage (CCUS)</th>
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<tbody>
<tr>
<td>Energy efficiency advancements minimize industrial energy demand, directly reducing the GHG emissions associated with fossil fuel combustion.</td>
<td>Industrial process technologies that utilize electricity for energy, rather than combusting fossil fuels directly, enable the sector to leverage advancements in low-carbon electricity from both grid and onsite generation sources.</td>
<td>Substitution of low- and no-carbon fuels and feedstocks for fossil fuels can further reduce combustion-associated emissions for industrial processes.</td>
<td>This multi-component strategy for mitigating difficult-to-abate emissions involves capturing generated CO₂ before it can enter the atmosphere; utilizing captured CO₂ whenever possible; and storing captured CO₂ long-term to avoid atmospheric release.</td>
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#### Energy efficiency technology examples:
- Energy management approaches
- Thermal integration of process heat
- Smart manufacturing
- Improved technologies and processes; system integration

#### Industrial electrification technology examples:
- Electrification of process heat (e.g., heat pumps)
- Electrification of hydrogen production for industrial process use

#### LCFFES technology examples:
- Fuel-flexible processes
- Clean hydrogen fuels and feedstocks
- Biofuels and biofeedstocks
- Concentrating solar power
- Nuclear
- Geothermal

#### CCUS technology examples:
- Post-combustion chemical absorption of CO₂
- CO₂ pipelines and other CCUS-supportive infrastructure
DOE Roadmap Graphic for Achieving Net Zero by 2050

Slide from DOE Industrial Decarbonization Roadmap
Challenge Partners

We’re sponsored by world class organizations across the public and private sectors

State and Federal Organizations

Private Sector Industry Sponsors

at Lawrence Technological University
This Challenge globally crowdsources best in class process energy efficiency, electrification and low carbon fuel technology firms and connects these solutions to our corporate partners to address problem statements and support their Scope 1, 2 & 3 emission reduction goals. https://www.centrepolis.org/industrial-decarbonization
Focus Areas - Green Factory of the Future

**AVOID**

1. Optimize logistics network to minimize distances traveled
2. Optimize material handling through intermodal transportation
3. Replace conventional fossil-energy-based power with renewables
4. Deploy energy monitoring and a management system to reduce consumption
5. Apply operational excellence levers to reduce scrap and other waste
6. Establish a closed-loop system to recycle and reproduce parts and products
7. Replace high-emission processes and technology with low-emission processes and technology
8. Produce the equivalent of a new product by reusing parts from used and returned products (remanufacturing)

**REUSE OR STORE**

9. Optimize the energy efficiency of equipment and buildings (including heat recovery)
10. Replace fossil-based fuels with biofuels, biomass, or other fuels
11. Use 3D printing to minimize material waste, packaging, and transport emissions
12. Capture process-related carbon byproducts, and reuse them in chemical processes
13. Compensate for carbon emissions through offsetting measures such as reforestation

**OFFSET OR COMPENSATE**

Industrial Decarbonization Innovation Challenge Ideas

- **Decarbonize How We Manufacture Things** - How might we enable traditional machine applications to switch to sustainable energy sources. How might we improve carbon capture? To reach Net-Zero, we need to use clean energy and production processes. Some Examples of technologies we’re looking for:
  - Unique fuel switching technology for traditional machine applications
  - Breakthroughs in Hydrogen fuel or electric boiler
  - Substitutes for natural gas equip, methods to retrofit and electrify natural gas
  - Carbon capture systems for manufacturing procedures and plants
  - Decarbonizing and or electrifying paint curing and drying ovens
  - Decarbonized water heating technologies
  - Decarbonizing dewatering and moisture removal
  - Affordable and scalable biofuel technologies

- **Decarbonize the built environment** - Making how we run and monitor the buildings we occupy is important, but we need to decarbonize the way we build these environments. How might we make current buildings more efficient and at the same time build new structures without emitting carbon?
  - Low cost energy consumption metering
  - Dynamic supply balance across multiple energy sources (Grid, Wind, Solar, Battery)
  - Dynamic load balancing
  - Breakthrough energy efficient building technologies
  - Water monitoring and reduction
  - Systems that heat or cool isolated work areas locally without having to cool and heat the whole building

- **Decarbonize through the Circular Economy** - How might we leverage new circular design processes, materials, and manufacturing technologies to eliminate new carbon from the industrial supply chain?
  - Material, product recycling and waste reduction technologies
  - Improve onsite scrap recycle and reuse
  - Increase the use of non-virgin materials in manufacturing
  - Create new materials and manufacturing processes that are carbon neutral or carbon negative
  - How can we recycle and reuse foams (insulation foams) throughout the product life cycle?
  - How can we reuse parts of returned products that can be recycled back into the manufacturing process?
  - How can we utilize “digital passport” to improve the circularity of our products for supply chain transparency
Demo and Pilot Opportunities

Up to $250,000 to support Industrial Decarbonization Pilots & Demonstration and / or product development services

https://www.centrepolis.org/industrial-decarbonization
How We Scout Technology Solutions
Working with a network of cleantech incubators nationally
Working with a network of cleantech accelerators across the globe
Targeting Tech Solutions Funded Already by...
PLANT-WIDE CASE STUDIES
ALCOA: C-SUITE PARTICIPATION IN ENERGY EFFICIENCY INCREASES ACCOUNTABILITY AND STAFF ENGAGEMENT THROUGHOUT THE ORGANIZATION
SUCCESS STORY: CHROME DEPOSIT CORPORATION
COOK COMPOSITES AND POLYMERS COMPANY ACHIEVES SUPERIOR ENERGY PERFORMANCE GOLD CERTIFICATION
ECK INDUSTRIES, INC. REALIZES SAVINGS THROUGH SMARTER LIGHTING SOLUTIONS
FLAMBEAU RIVER PAPERS MAKES A COMEBACK WITH A REVISED ENERGY STRATEGY
FREESCALE SEMICONDUCTOR SUCCESSFULLY IMPLEMENTS AN ENERGY MANAGEMENT SYSTEM
HARBEC PLASTICS: 750KW CHP APPLICATION - PROJECT PROFILE
SUCCESS STORY: INGERSOLL RAND DISCOVERS HIDDEN SAVINGS WITH A THREE-TIERED ENERGY AUDIT MODEL
MID-SOUTH METALLURGICAL MAKES ELECTRICAL AND NATURAL GAS SYSTEM UPGRADES TO REDUCE ENERGY USE AND ACHIEVE COST SAVINGS
NISSAN SHOWCASES THE RESULTS OF AN ENERGY-WISE CORPORATE CULTURE
OWENS CORNING AND SILICON VALLEY POWER PARTNER TO MAKE ENERGY SAVINGS A REALITY
SAVE ENERGY NOW ASSESSMENT HELPS EXPAND ENERGY MANAGEMENT PROGRAM AT SHAW INDUSTRIES
SOLUTIA: UTILIZING SUB-METERING TO DRIVE ENERGY PROJECT APPROVALS THROUGH DATA
VOLVO TRUCKS ACHIEVES LOFTY ENERGY AND CARBON GOALS
STEAM CASE STUDIES
BOISE INC. ST. HELENS PAPER MILL ACHIEVES SIGNIFICANT FUEL SAVINGS
CHRYSLER: SAVE ENERGY NOW ASSESSMENT ENABLES A VEHICLE ASSEMBLY COMPLEX TO ACHIEVE SIGNIFICANT NATURAL GAS SAVINGS
DOW CHEMICAL COMPANY: ASSESSMENT LEADS TO STEAM SYSTEM ENERGY SAVINGS IN A PETROCHEMICAL PLANT
GOODYEAR TIRE PLANT GAINS TRACTION ON ENERGY SAVINGS AFTER COMPLETING SAVE ENERGY NOW ASSESSMENT
J.R. SIMPLOT: BURNER UPGRADE PROJECT IMPROVES PERFORMANCE AND SAVES ENERGY AT A LARGE FOOD PROCESSING PLANT
LONGEST-SERVING ACTIVE PAPER MILL IN THE WESTERN UNITED STATES UNCOVERS NEW WAYS TO SAVE ENERGY
SAVE ENERGY NOW ASSESSMENT HELPS EXPAND ENERGY MANAGEMENT PROGRAM AT SHAW INDUSTRIES
STEAM SYSTEM EFFICIENCY OPTIMIZED AFTER J.R. SIMPLOT FERTILIZER PLANT RECEIVES ENERGY ASSESSMENT
TERRA NITROGEN COMPANY, L.P.: AMMONIA PLANT GREATLY REDUCES NATURAL GAS CONSUMPTION AFTER ENERGY ASSESSMENT
MOTORS CASE STUDIES
IMPROVING EFFICIENCY OF TUBE DRAWING BENCH
MOTOR SYSTEM UPGRADES SMOOTH THE WAY TO SAVINGS OF $700,000 AT CHEVRON REFINERY
OPTIMIZING ELECTRIC MOTOR SYSTEMS AT A CORPORATE CAMPUS FACILITY
PROCESS HEATING CASE STUDIES
ENERGY ASSESSMENT HELPS KAISER ALUMINUM SAVE ENERGY AND IMPROVE PRODUCTIVITY
LARGEST PRODUCER OF STEEL PRODUCTS IN THE UNITED STATES ACHIEVES SIGNIFICANT ENERGY SAVINGS AT ITS MINNTAC PLANT
INDIRECT-FIRED KILN CONSERVES SCRAP ALUMINUM AND CUTS COSTS

COMPRESSED AIR CASE STUDIES
BRIGGS & STRATTON: PUTTING ALL ENERGY EFFICIENCY OPTIONS ON THE TABLE
FUJIFILM HUNT CHEMICALS U.S.A. ACHIEVES COMPRESSED AIR SYSTEM ENERGY-REDUCTION GOALS WITH A THREE-PHASED STRATEGY
SUCCESS STORY: INGERSOLL RAND DISCOVERS HIDDEN SAVINGS WITH A THREE-TIERED ENERGY AUDIT MODEL
NISSAN NORTH AMERICA: HOW SUB-METERING CHANGED THE WAY A PLANT DOES BUSINESS
SHERWIN-WILLIAMS’ RICHMOND, KENTUCKY, FACILITY ACHIEVES 26% ENERGY INTENSITY REDUCTION; LEADS TO CORPORATE ADOPTION OF SAVE ENERGY NOW LEADER
SOLUTIA: UTILIZING SUB-METERING TO DRIVE ENERGY PROJECT APPROVALS THROUGH DATA
SOLUTIA: MASSACHUSETTS CHEMICAL MANUFACTURER USES SECURE METHODOLOGY TO IDENTIFY POTENTIAL REDUCTIONS IN UTILITY AND PROCESS ENERGY CONSUMPTION

PUMPS CASE STUDIES
CASE STUDY - THE CHALLENGE: IMPROVING SEWAGE PUMP SYSTEM PERFORMANCE
NEW WATER BOOSTER PUMP SYSTEM REDUCES ENERGY CONSUMPTION BY 80 PERCENT AND INCREASES RELIABILITY
OPTIMIZING ELECTRIC MOTOR SYSTEMS AT A CORPORATE CAMPUS FACILITY
OPTIMIZED PUMP SYSTEMS SAVE COAL PREPARATION PLANT MONEY AND ENERGY
CASE STUDY - THE CHALLENGE: SAVING ENERGY AT A SEWAGE LIFT STATION THROUGH PUMP SYSTEM MODIFICATIONS

FAN CASE STUDIES
CASE STUDY - THE CHALLENGE: IMPROVING THE PERFORMANCE OF A WASTE-TO-ENERGY FACILITY
CASE STUDY - THE CHALLENGE: IMPROVING VENTILATION SYSTEM ENERGY EFFICIENCY IN A TEXTILE PLANT

Targeting DOE Funded Industrial Decarbonization Projects
# Industrial Decarbonization Innovation Challenge Timeline

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<td>Work with sponsoring companies to prioritize innovation needs</td>
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<td>Prep for Challenge launch including marketing and communications assets</td>
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<td>Launch</td>
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<td>Recruit technology developers to provide innovative solutions</td>
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<td>Review applications and match solutions to prioritized needs</td>
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<td>Downselect and set up interviews with sponsors to evaluate solutions</td>
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<td>Work with sponsors and solution providers to evaluate strategic relationships</td>
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<td>Option: Includes Pitch Day to highlight best in class solution providers</td>
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