



# The Clean Energy Manufacturing Analysis Center (CEMAC)

Providing Analysis and Insights on Clean Technology Manufacturing

The Clean Energy Manufacturing Analysis Center (CEMAC) provides objective analysis on global supply chains and manufacturing of clean energy technologies and the integration of clean energy into manufacturing. Policymakers and industry leaders seek our insights to inform decisions that promote economic growth and a successful transition to a clean energy economy.

CEMAC develops innovative models, synthesizes data, and prepares high-impact publications in order to deliver analysis, benchmarking, and insights about manufacturing supply chains. We've analyzed a diverse portfolio of advanced technologies, including power electronics, carbon fiber, batteries, turbines, refrigeration, solar panels, and more.

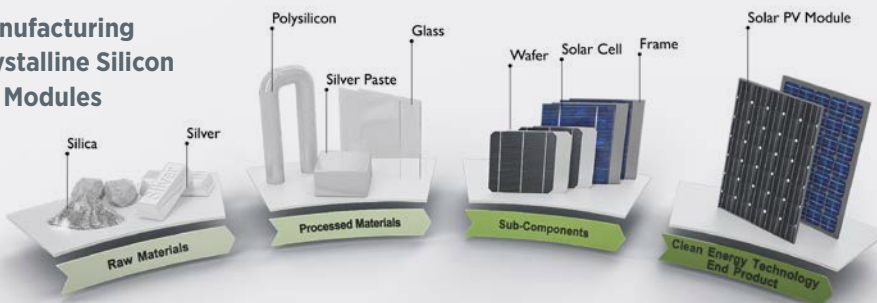
## Unique Value for Industry and Government

CEMAC studies the economic value of advanced technology manufacturing and supply chain innovations to:

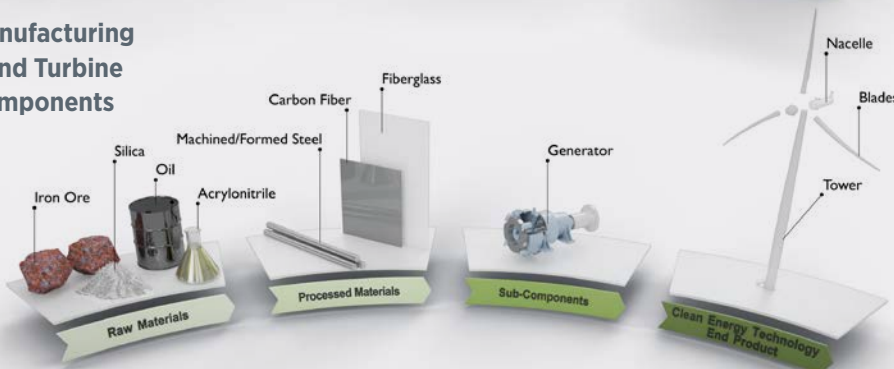
- Partner with industry to increase manufacturing competitiveness throughout supply chains
- Help investors reduce supply chain risk and lower barriers-to-entry for new technology markets
- Provide objective advice and insights to governments for use in establishing technology policy
- Inform research portfolio managers on impacts of technology and manufacturing innovation

## CEMAC's benchmark framework focuses on key elements of the clean technology manufacturing supply chain.

### Manufacturing Crystalline Silicon PV Modules



### Manufacturing Wind Turbine Components



“In this business climate, CEMAC can and will play an important role in helping industry look at clean energy manufacturing as part of an ecosystem—examining the connectivity between the various manufacturing supply chains that may not be obvious at first blush. This type of information can be extremely helpful to companies, showing where they might expand and how their existing infrastructure can support new growth with reduced risk.”

– Steven Freilich  
Director of Corporate Strategy,  
University of Delaware Energy Institute

## The Wind Power Industry—A Successful Approach to Developing Manufacturing

The wind industry is growing rapidly, supported by an expanding network of manufacturing facilities and supply chains. Now, manufacturers are seeking new ways to make their turbines bigger and more efficient. Because it is difficult to transport the large components of a wind turbine (blades can be greater than 50 meters) over long distances to the project sites, domestic manufacturing has been vital for the growth of the wind industry in many countries. CEMAC provides analysis to help policymakers and industry gain deeper understanding about wind turbine manufacturing and other clean energy technologies.

## Work with CEMAC

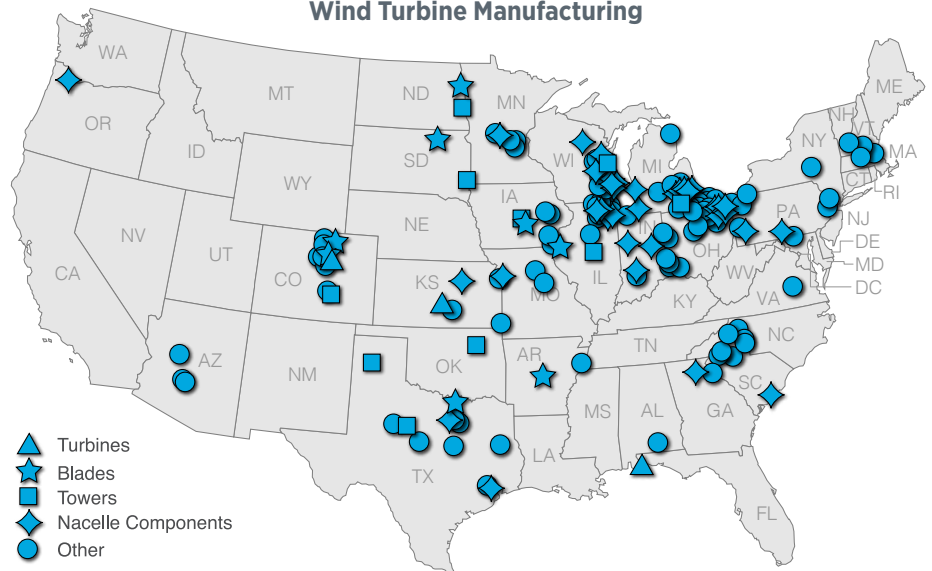
Considering a new manufacturing facility or product? Need to learn more about supply chain risk reduction? Trying to reduce cost of a technology to be competitive? The CEMAC team can inform the answer to your manufacturing question, help you partner on a research project, and much more. Contact us at [cemac.coordinator@manufacturingcleanenergy.org](mailto:cemac.coordinator@manufacturingcleanenergy.org)

## The Manufacturing Supply Chain for Wind Turbines

The 2017 CEMAC Report *Benchmarks of Global Clean Energy Manufacturing* offers numerous insights.

- The wind turbine itself (blades, tower, nacelle) constitutes approximately 75% of initial installed capital costs and approximately 55% of life-cycle costs. The majority of the economic opportunity from wind energy is accrued by the producers of hardware and equipment for wind power facilities.
- Transportation costs shape global trade in wind energy components. As many innovations target continued scaling and growth in wind turbine components, innovative solutions to transport and logistics challenges will become increasingly important.
- Large portions of the wind energy supply chain connect to core manufacturing industries, including steel producers and fabricators, industrial generator and gear producers, and carbon fiber and composite manufacturers.

### U.S.—One of Top Three Countries for Wind Turbine Manufacturing



More than 145 major wind turbine Tier 1 manufacturing and assembly facilities operate in the U.S.

- China, Germany, and the U.S. lead in wind turbine manufacturing. The U.S. produces current 2 MW and next generation 3 MW wind turbines with capabilities for producing blades, towers, generators, and gearboxes. Current U.S. domestic content estimates include 80%–85% for towers, 50%–70% for blades and hubs, and more than 85% for nacelle assembly.
- At 32.5 billion USD in 2014, the value added to the economy from wind component production was the highest among the four clean energy manufacturing products included in *Benchmarks of Global Clean Energy Manufacturing*.

Learn More:  
[www.nrel.gov/docs/fy17osti/65619.pdf](http://www.nrel.gov/docs/fy17osti/65619.pdf)

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