First-Annual Global Clean Energy Manufacturing Report Shows Strong Domestic Benefits for the United States

The Energy Department's Office of Energy Efficiency and Renewable Energy (EERE) commissioned the Clean Energy Manufacturing Analysis Center to conduct the first-ever annual assessment of the economic state of global clean energy manufacturing. The report, *Benchmarks of Global Clean Energy Manufacturing*,[1] makes economic data on clean energy technology widely available.

Manufacturing has a significant economic multiplier, spurring jobs and investments in the broader economy. Clean energy manufacturing is a small but growing part of the global economy, and U.S. manufacturers and policymakers alike are focusing on extracting as much economic value as possible from the manufacture, sales, and installation of clean energy technologies.

Benchmarks of Global Clean Energy Manufacturing provides economic data on manufacturing of four leading clean energy technologies—wind turbine components, solar photovoltaic (PV) modules, vehicle lithium-ion battery cells, and light-emitting diode (LED) packages (Fig. 1)—in the 12 economies that are their primary manufacturing hubs. Several key takeaways about the U.S. role in clean energy manufacturing are clear:

- **The United States is one of the top five clean energy manufacturing economies globally and retains the highest clean energy manufacturing value added of the economies evaluated** (Fig. 2). Although the United States' clean energy manufacturing sector is far smaller than China's, China retains fairly little value domestically. The United States, in contrast, has the highest retained value added of the top 12 producing countries—which means that money spent on clean energy products in the United States tends to stay in the United States, benefitting domestic manufacturing plants and workers.
- **The United States has significant manufacturing output in multiple technologies**. The United States has high production of all four of the technology components—especially wind turbine components, for which the United States was a net exporter and a lead global producer in 2014. The United States also both imports and exports LED packages, vehicle lithium ion battery cells, and solar PV modules.
- **The U.S. domestic market has strong demand for a variety of clean energy technologies, which compares favorably to other economies in this report** (Fig. 3). This robust demand is promising because consumer proximity can be a major factor when deciding where to locate manufacturing, especially for technologies that are difficult and costly to transport such as wind turbine components. This means there is great potential to increase domestic production, which can then lead to lower costs for consumers.

Figure 1. The four leading clean energy technologies—wind turbine components, solar PV modules, vehicle lithium-ion battery cells, and LED packages

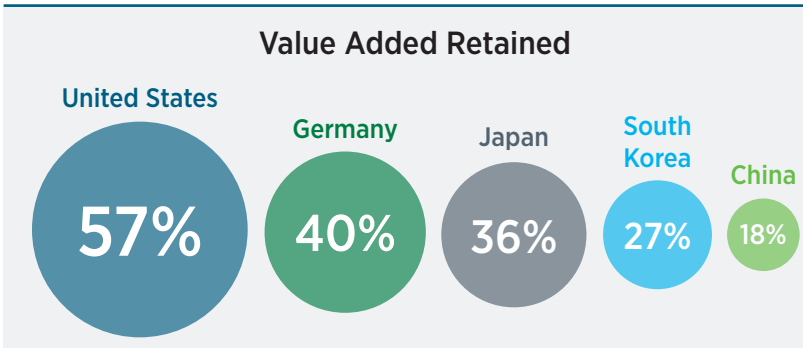

Figure 2. Value added retained (a measure of domestic benefit) of the top 5 producers of clean energy technologies

[1] *Benchmarks of Global Clean Energy Manufacturing*, U.S. Department of Energy and Clean Energy Manufacturing Analysis Center, January 2017, http://www.manufacturingcleanenergy.org/benchmark.

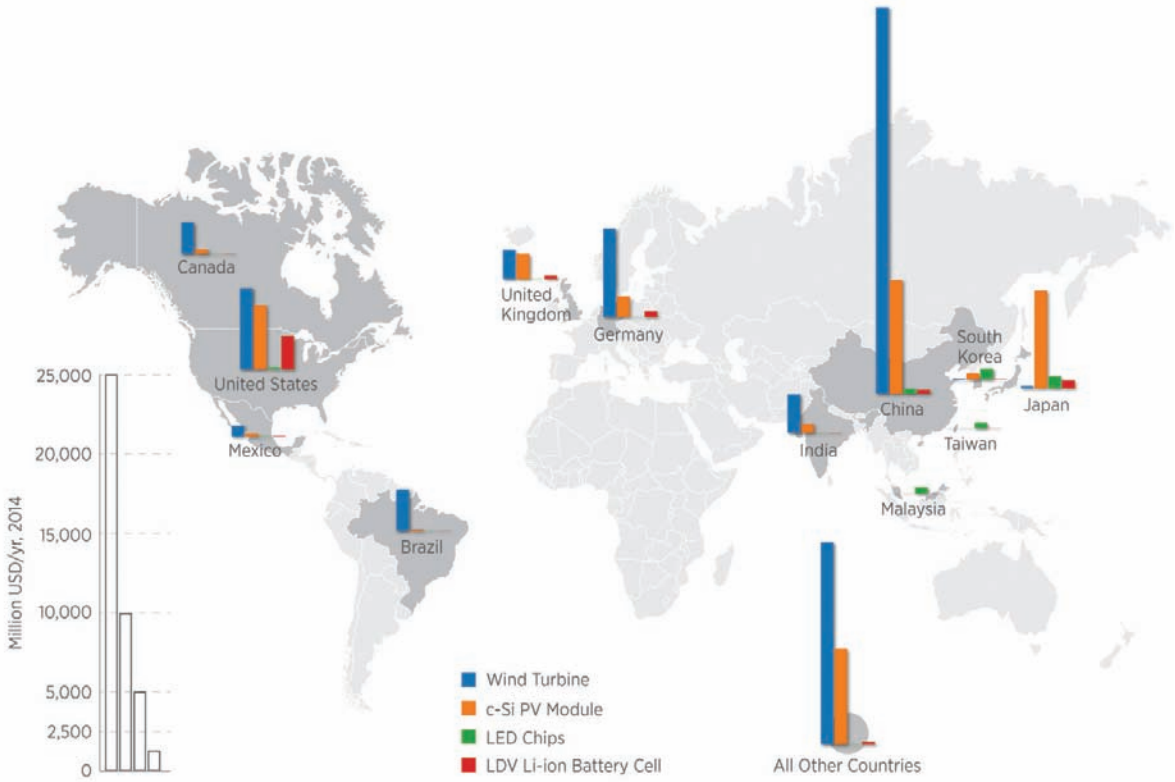

Figure 3. Domestic market size (2014) in 12 economies for wind turbine components, crystalline silicon (c-Si) photovoltaic (PV) modules, and lithium-ion (Li-ion) battery cells

EERE's Role

Given the bold commitments being made by other nations in clean energy, and the rapid growth of these markets, the stakes in the clean energy race will continue to grow in the years ahead.

EERE invests in research and development (R&D) to lower the cost of cutting-edge clean energy technologies, including the four analyzed in this report. Just as clean energy technology components vary in their global trade considerations and value to the U.S. economy, EERE funds a diversified R&D portfolio to accelerate the adoption of multiple clean energy technologies.

Energy innovation is proving itself as an important driver of economic growth in America, producing 14% of new jobs in 2016 according to the new Energy Department *U.S. Energy and Employment Report.*[2] The report shows that in 2016, more than 800,000 workers contributed to the production of low-carbon electricity. 2.2 million workers were employed in the design, installation, and manufacture of energy efficiency products and services, and 259,000 employees worked on alternative fuels vehicles.

In recent years, decades of investment by the federal government and private industry have led to massive cost reductions that have accelerated the adoption of five clean energy technologies. Since 2008, the cost of land-based wind has decreased by 41%, utility-scale solar PV by 64%, distributed solar PV by 54%, LED light bulbs by 94%, and lithium-ion batteries by 73%.[3]

The U.S. domestic market could both catalyze domestic production and lower costs further for consumers.

[2] *U.S. Energy and Employment Report*, U.S. Department of Energy, January 2017, https://energy.gov/downloads/2017-us-energy-and-employment-report.

[3] *Revolution…Now: The Future Arrives for Five Clean Energy Technologies—2016 Update*, U.S. Department of Energy, September 2016, https://energy.gov/eere/downloads/revolutionnow-2016-update.

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