



How the U.S. Can Stop Losing the Race for Clean Energy

Bentley Allan, Milo McBride, Noah Gordon, Daniel Helmecci, Jonas Goldman, Daevan Mangalmurti, Debra Goh, and Leonardo Martinez-Diaz

Over the past year, the Carnegie Endowment for International Peace convened the inaugural U.S. Foreign Policy for Clean Energy Taskforce, composed of former officials from recent U.S. administrations as well as industry leaders. Their mission: identify gaps in U.S. clean energy diplomacy and recommend strategies for future administrations. Members identified three core themes: clean energy technologies are critical to America's economic future, global competition is intensifying, and the United States is falling behind in leading new technologies.

THE PROBLEM

The development of global energy technologies is accelerating, driving intense geopolitical competition. More than a decade before the U.S. Congress passed the Inflation Reduction Act (IRA), the Infrastructure Investment and Jobs Act (IIJA), and the CHIPS and Science Act, China invested heavily in domestic manufacturing—and now other nations are also moving quickly. India launched a Production Linked Incentive scheme before the IRA, while Japan, South Korea, and the European Union have since followed suit. Emerging and developing markets—including Gulf petrostates—are strategically positioning themselves in these new supply chains.

Meanwhile, the United States faces challenges in commercializing next-generation clean energy systems despite a strong innovation ecosystem. Many breakthrough technologies remain in pilot or demonstration phases and will require sustained public and private investment to reach market.

WHY BUILDING OVERSEAS CLEAN ENERGY SUPPLY CHAINS MATTERS

Achieving true “energy dominance” means controlling the energy systems of the future, not just the fuel sources of the past. U.S. participation in global clean energy supply chains is essential to:



For the complete analysis, read the complete paper “How the U.S. Can Stop Losing the Race for Clean Energy,” Carnegie Endowment for International Peace, February 26, 2025, <https://carnegieendowment.org/research/2025/02/how-the-us-can-stop-losing-the-race-for-clean-energy?lang=en>.

- Develop geopolitical leverage by providing an alternative to Chinese goods and investment
- Reduce reliance on foreign powers and enhance energy security
- Strengthen national security, as many clean technologies have military applications
- Maintain global leadership by pioneering energy and technology revolutions with partners rather than clinging to outdated systems

Collaboration with allies and partners will be crucial in developing the expertise, resources, and infrastructure needed for long-term economic growth.

WHAT SUCCESS LOOKS LIKE

To meet these goals, the United States must integrate domestic industrial policy with international collaboration to build resilient supply chains and advance leapfrog technologies. Each of the fourteen supply chains assessed by the taskforce requires a tailored strategy:

- **Onshore** when existing U.S. strengths—such as an industrial base, skilled labor, or intellectual property—align with supply chain needs.
- **Friendshore** when domestic constraints limit production capacity, particularly in critical minerals, or when achieving competitive advantage would be impractical.
- **Leapfrog** when U.S. firms hold intellectual property that could bypass an incumbent technology and supply risks, especially on established technologies that China dominates.

Table One provides a framework for selecting strategies based on factors like domestic industrial capacity and global net-zero goals. For some technologies—like solar, where China’s lead is overwhelming, added-value manufacturing is marginal, and the global gap to net zero is small—the strategy is clear. For others, a two-pronged approach is best suited to advance U.S. competitiveness while supporting similar strides by allies and partners. In nascent supply chains, policymakers must support early commercialization efforts at home while laying the groundwork for future exports abroad.

HOW TO ACHIEVE SUCCESS

Implementing these strategies requires a coherent foreign policy backed by meaningful financial commitments. A key step is the executive reform of the Office of the U.S. Coordinator for Partnership for Global Infrastructure and Investment (PGI) to serve as a new central hub for U.S. foreign industrial policy. Expanding PGI’s authority would allow it to:

- **Targets:** setting technology-specific quantitative targets to assess supply chain bottlenecks
- **Project pipeline:** develop an interagency process to build a fully integrated USG approach
- **Industrial policy support:** provide feasibility and technical assistance for global partners
- **Finance:** organize funding flows from U.S. financing institutions and multilateral banks
- **Market creation:** create demand-pull among partners for de-risked supply of key technologies

Table 1. Identifying Strategies for U.S. Clean Energy Success: Maintain, Onshore, Friendshore, or Leapfrog?

	Domestic Industrial Potential	Supply Chain Resilience	Innovation Opportunity	National Priority	Global Net-Zero Market	Strategy
Solar	Medium	Low	Medium	Low	Low	Friendshore: Develop a supply chain for silicon ingots and wafers that circumvents China in places such as Vietnam, India, and the Gulf states; expand commercial ties in the Quadrilateral Security Dialogue (Quad) plus South Korea for perovskite solar cells.
Wind	Medium	Medium	Medium	Low	Low	Onshore: Maintain domestic onshore production while expanding offshore to promote domestic supply of alloys, magnets, and ships.
Battery	High	Low	High	High	Medium	Leapfrog and Friendshore Upstream: Promote next generation tech, such as lithium metal and long duration storage at home and abroad to phase-out Chinese tech; expand Mineral Security Partnership (MSP) for chokepoints.
Magnet	Medium	Low	High	High	Low	Onshore and Leapfrog: Onshore processing and metallization through public procurement and domestic content and continue research and development (R&D) for non-rare earth element magnets.
Heat Pump	Medium	High	Low	Low	Low	Maintain: Design incentives for heat pump producers to procure metals from domestic and allied sources and advance domestic labor force for installations.
Electrolyzer	Low	Medium	Low	Low	High	Friendshore: Focus on proton exchange membrane (PEM) technology and foreign policy for iridium in South Africa and Canada and continue R&D for next generation clean hydrogen.
Nuclear	Low	Medium	Medium	High	Medium	Onshore: Innovate on domestic strength and leverage DFC/EXIM for exports of incumbent and next generation reactors. Friendshore uranium fuels via Sapporo 5.
Geothermal	High	High	High	Low	High	Leapfrog: Promote next-generation geothermal at home and in Europe, Southeast Asia, and Africa, while expanding and diversifying supply chains. Pursue R&D for supercritical resources at home and with key players like Iceland or Italy.
Clean Steel	Medium	High	Medium	High	Medium	Onshore: Promote electric arc furnace (EAF), hydrogen in direct reduced iron (H ₂ -DRI) production, and novel low-carbon processes with the aim to export into the European Union's and United Kingdom's carbon border adjustment mechanism (CBAM).
Aluminum	Low	Medium	Low	High	Medium	Onshore and Friendshore Upstream: Continue onshoring aluminum smelters while deploying public finance to scale bauxite extraction in Australia, Canada, and Brazil.
Clean Ammonia	High	High	High	Medium	High	Onshore: Indigenize clean ammonia production and promote exports for fertilizer and as fuel via USTDA and ITA, with a focus on Japan, South Korea, and the EU.
Carbon Capture, Utilization, and Storage (CCUS)	Medium	High	Low	Low	High	Maintain: Leverage U.S. industry expertise and export to key markets in Europe, Australia, Japan, South Korea, and the Gulf states—some emerging and developing markets like Indonesia and Chile.
Direct Air Capture (DAC)	High	High	Low	Low	High	Maintain: Finalize long-term demonstrations, ensure viability of domestic pipeline, and consider long-term export markets (such as Kenya, Canada, and the Gulf states).
Sustainable Aviation Fuels	High	High	Medium	Low	Medium	Leapfrog: Focus domestic production to third generation fuels and pair foreign development to co-locate with CCUS and DAC hubs abroad.
Ships	Low	Medium	Low	High	Medium	Onshore: Work with Japanese and South Korean conglomerates to re-industrialize the U.S. maritime manufacturing base and ensure that U.S. ships are ammonia and methanol ready.

Note: For analysis on specific minerals, please see the taskforce's "Assessing Progress in Building Clean Energy Supply Chains: The Technical Paper of the U.S. Foreign Policy for Clean Energy Taskforce."

Domestic industrial base is quantified by U.S. current and pipeline production capacity divided by expected U.S. demand in 2035. For geothermal and nuclear, present capacity was measured as a five-year average of production based on annual capacity additions. (Please see the Annex for exact metrics.) **Supply chain resilience** is based on internal analysis of Chinese and Russian shares of manufacturing capacities of these technology verticals and critical upstream inputs. (Please see the Annex for exact numbers on supply chain vulnerabilities). **Innovation potential** is based on Milo McBride’s working paper “Catching Up or Leaping Ahead? How Energy Innovation Can Secure U.S. Industrial Stature in a Net-Zero World” from the Carnegie Endowment for International Peace, September 19, 2024. “Low” means that there are no observed next-generation technologies in that vertical, “medium” means that there are next-generation systems with varying likelihood to supplant the incumbent (rated both “low” and “medium” in the Catalytic Impact on Resilience metric), and “high” means that the next-generation technology could fully supplant the incumbent and its supply chains. **Global gap to net-zero** is the sector’s production gap to net-zero manufacturing capacity benchmarks based on the global production gap divided by the global current capacity. (Please see the Annex for exact metrics and the associated technical paper Allan et al. for further analysis.)

However, expanding PGI’s mandate while refining its focus will require careful oversight. It should be elevated to a directorate under the authority of the national security advisor or an independent coordinating office within the White House. Additionally, an industrial policy secretariat could be created to collate information from federal agencies and financing bodies, ensuring coordinated action.

Consolidating responsibilities currently disbursed across more than a dozen federal departments, agencies, and development finance institutions would streamline the U.S. approach to foreign industrial policy. Managed by PGI and an industrial policy secretariat, “Energy Security Compacts (ESCs),” as proposed by taskforce member Katie Auth, create a holistic framework to support energy project development abroad. Compacts would function as bilateral coordination platforms between the United States and priority countries to create a pipeline of bankable projects. It would create a structured interagency process—managed by PGI—to assess priorities and deliver targeted support ranging from early-stage feasibility studies to large-scale project financing.

The ESC framework, managed by PGI, would harmonize tactical, project-level engagement and overarching strategic goals. To compete with China, the United States must enhance coordination across government agencies and with external partners to achieve the necessary scale of strategic action.

SUMMARY OF TASKFORCE RECOMMENDATIONS

- **Focus domestic industrial policy** on leapfrog opportunities while using foreign policy to expand export markets and drive joint R&D.
- **Strengthen PGI** with clear supply chain goals and a coordinated foreign policy approach.
- **Establish a domestic interagency process**, such as Energy Security Compacts (ESCs), to create a project pipeline for overseas supply chains.
- **Enhance the role of DFC, EXIM, and other agencies** to make them more effective tools for strategic overseas industrial policy.



CARNEGIE
ENDOWMENT FOR
INTERNATIONAL PEACE

© 2025 Carnegie Endowment for International Peace. All rights reserved.

Carnegie does not take institutional positions on public policy issues; the views represented herein are those of the author(s) and do not necessarily reflect the views of Carnegie, its staff, or its trustees.