January 14, 2022

Re: RFI Supply Chain Review

On behalf of the Solar Energy Manufacturing for America (SEMA) Coalition,[1] an informal group of solar manufacturing companies with operations in the United States, we appreciate the opportunity to provide feedback on the Department of Energy's (DOE) energy sector supply chain review.

With solar poised to be the world's leading source of energy by 2040, American solar manufacturers are taking steps to reshore and rebuild a U.S.-based supply chain. For example, in 2021 alone: Meyer Burger announced an investment in a new 400MW solar manufacturing facility with the potential to scale up to 1.5GW;[2] First Solar broke ground on a new 3.3 GW solar manufacturing facility;[3] Heliene announced expansion plans that will bring their total manufacturing capacity to 900 MW;[4] Silfab Solar secured an additional $100 million in investment to expand U.S. manufacturing capacity;[5] and Hanwha Solutions invested $160.47 million into an idle REC Silicon polysilicon production plant to restart operations for solar grade polysilicon.[6]

Unfortunately, over the last decade, U.S. manufacturing of key components of the solar supply chain has been crowded out by overseas monopolies and choke points on key portions of the value chain. As a result, American workers are poorly positioned to capture the good-paying manufacturing jobs that will result from the pending solar boom. It is essential for the U.S. government to understand these critical challenges and invest in long-term policy solutions to attract and sustain domestic solar manufacturing.

Below, we provide responses to some of DOE's questions in the Request for Information[7] on Area 2: Solar PV Technology.

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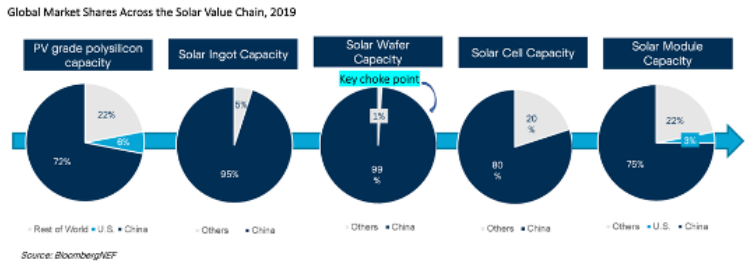
[1] SEMA Coalition
[2] Meyer Burger
[3] First Solar
[4] PV Magazine | Heliene
[5] PV Magazine | Silfab Solar
[6] Q CELLS
[7] DOE RFI

1. What are the current and future supply chain gaps and vulnerabilities as we scale up the adoption and use of solar PV technologies? Of these gaps and vulnerabilities, which are the most crucial for the U.S. to address and focus on and why?

Critical supply chain gaps and vulnerabilities exist around China's domination of key elements of the solar PV supply chain. China has developed a near global monopoly on the solar ingot and wafer segment, with a corresponding dominance of cell manufacturing. The lack of domestic manufacturing of ingots, wafers, and cells is a significant challenge for both ends of the solar PV supply chain. U.S. polysilicon producers have no direct customers for solar-grade polysilicon production and U.S. solar PV module manufacturers have no choice but to import key components and are thus unable to produce panels entirely made in America.



The BloombergNEF graph illustrates China's current domination of the solar supply chain. China has a global market share of: over 70% for PV grade polysilicon; 95% for solar ingots and nearly 100% for solar wafers; 80% for solar cells, and 75% for solar modules. If this trend continues or remains unaddressed, the U.S. could face a situation where nearly all solar PV technologies and key components of the supply chain are produced and manufactured in China or by Chinese companies in third-party nations. This would result in losing even more high-quality manufacturing jobs and further erode America's research and development capabilities in the solar PV sector.

The U.S. must prioritize addressing the lack of domestic ingot, wafer, and cell production as it is the key to reshoring and rebuilding the entire solar supply chain and supporting and expanding the existing domestic solar PV sector manufacturing presence – polysilicon and modules.

For American polysilicon manufacturers whose solar grade production remains mostly idle, having direct access to domestic solar PV supply chain customers is likely their only path to long-term success. Polysilicon, the foundational material necessary for solar PV modules, is also critical for semiconductors, consumer electronics, and next-generation electric vehicle batteries. Given the importance of polysilicon manufacturing to America's economic, energy, and national security, we cannot afford to lose this vital industry and manufacturing capacity to China or other overseas competitors.

For American PV module manufacturers, having domestic ingot, wafer, and cell production will help reduce reliance on imported components, limit exposure to supply chain disruptions, and position them to better compete with vertically integrated overseas competitors.

In addition, domestic capacity of the middle part of the solar PV supply chain can help lower embodied carbon in American-made solar panels given cleaner U.S. electricity sources and manufacturing processes, while guaranteeing strong labor standards in manufacturing throughout the solar PV supply chain. It will also result in the creation of thousands of good-paying clean energy jobs, support research and development and innovation of solar PV technologies, and help us meet our rapid deployment targets to address the growing climate crisis.

2. Where in the solar PV supply chain does it make sense for the U.S. to focus and prioritize its efforts both in the short-term and the long-term, and why? Where in the supply chain do you see opportunities for the U.S. to build durable domestic capabilities of solar PV manufacturing? For areas in the supply chain where U.S. opportunities to build domestic manufacturing capabilities are limited, which foreign countries or regions should the U.S. government prioritize for engagement to strengthen/build reliable partnerships, and what actions should the government take to help ensure resilience in these areas of the supply chain?

The U.S. must focus and prioritize its short-term and long-term efforts in support of the solar PV supply chain on domestic polysilicon, ingot, wafer, cell, and module capacity to grow and preserve the entire value chain. In the immediate term, it is imperative to support the remaining existing manufacturing in both polysilicon and modules. In the medium to long-term the U.S. must foremost ensure American polysilicon producers have domestic off-takers for solar-grade polysilicon. Having domestic manufacturing capacity for ingot, wafer, and cells will ultimately result in support and growth of the remaining solar supply chain and allow 100% domestic content solar panel manufacturing.

The U.S. can support and build durable domestic solar PV manufacturing capabilities for polysilicon, ingots, wafers, cells, and modules. With the right set of smart manufacturing policies, the U.S. can reshore and rebuild each key element of the solar PV supply chain at scale before it is lost for good. By investing at each key step of the solar PV supply chain, existing polysilicon capacity will have domestic ingot and wafer customers and that will result in new and additional investments in U.S.-based cell and module manufacturing. Ultimately, this would allow the U.S. to rely on entirely domestic solar PV modules to meet its deployment demands and remove the need to ship modules across the globe, resulting in significant climate, cost, and supply chain benefits.

3. What challenges limit the U.S.'s ability to realize opportunities to build domestic solar PV manufacturing? What conditions are needed to help incentivize companies involved in the solar PV supply chains to build and expand domestic manufacturing capabilities?

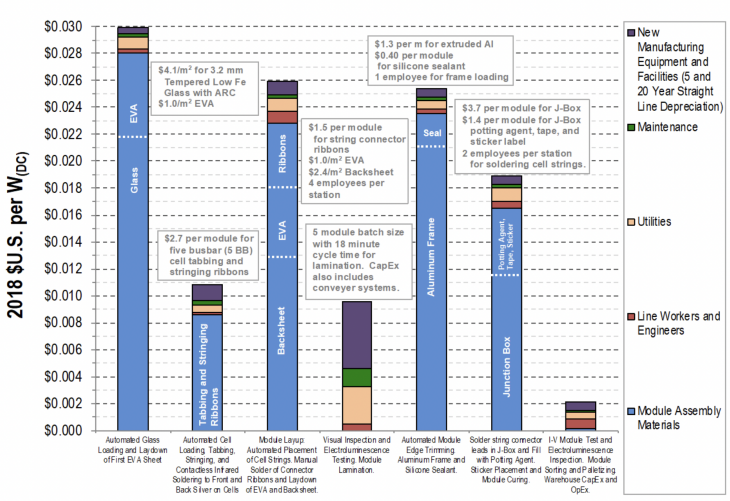
To date, the U.S. has maintained a temporary, subscale, and piecemeal approach to supporting domestic solar PV manufacturing. Policies have been more focused on demand creation with little to no support for domestic manufacturing. Historically, most policies have been focused on

lowering initial capital expenses (CapEx) and as a result, have been less durable. However, American solar PV manufacturers face unsustainably higher operating expenses (OpEx) throughout the supply chain compared to their subsidized overseas competitors. This focus solely on up-front costs has led to smaller investments relative to overseas competitors as the policy uncertainty, particularly against OpEx in subsequent years, creates too much risk for investors at the scale necessary to compete. Alternatively, China has prioritized long-lived, large-scale, and comprehensive policies to de-risk capital investments by giving certainty of return – ensuring domestic demand and subsidizing exports and international expansion. This has allowed them to "go big" in their manufacturing capacity in a way that U.S. manufacturers have not been able to match.

To reverse the last decade's trend in which the U.S. has lost control of key components of the solar PV supply chain, the federal government must invest in long-term, durable policy solutions that address the OpEx challenges to attract and sustain domestic manufacturing investments at scale and at every step of the value chain.

The most important condition needed to incentivize companies involved in solar PV supply chains to build and expand domestic manufacturing is a policy environment that prioritizes OpEx support. Although CapEx (such as new facility costs) can be substantial in some cases, consistent support for annual operating costs is more important in the solar PV manufacturing sector. Reducing upfront costs does little to incentivize scale or increase global competitiveness.

Solar PV manufacturers must regularly procure costly components and materials which is why policies designed to support and/or offset OpEx are more effective in supporting the growth of the domestic industry against heavily subsidized foreign competition. For example, National Renewable Energy Laboratory (NREL) data illustrates how materials and components are the biggest costs to solar module manufacturers. These costs, spread out over several years, makes operating solar PV manufacturing facilities more expensive compared to foreign competitors. NREL writes that in the case of module manufacturing, "[m]aterials constitute more than 80% of costs…."[8]



[8] NREL | Crystalline Silicon Modules

The challenge faced by solar PV module manufacturers proves to be true throughout the supply chain. Several companies considering making a significant investment to domestically produce solar wafers have made clear that while grant or tax credit support for up-front costs can be helpful, it does little to reduce perceived risk, and thus does not incentivize the larger investments needed. Alternatively, a production-based credit is much better designed to quickly turn a positive cash-flow and address investment risk, thus incentivizing much higher upfront investments and speed to market. And while it is true that the OpEx to CapEx ratio for wafer, cell, and polysilicon production is narrower than it is for modules, those factories are necessarily built at a significantly larger scale to compete globally, with much higher perceived investment risk.

4. How can government (federal, state, local, and Tribal) help the private sector and communities involved in solar PV manufacturing build and expand domestic solar PV manufacturing in the U.S.? What investment and policy actions are needed to support domestic manufacturing of solar PV?

The SEMA Coalition strongly believes the most important step the federal government can take is to enact a well-designed solar manufacturing production tax credit, such as the one proposed by Senator Jon Ossoff and Representative Dan Kildee in the Solar Energy Manufacturing for America Act and as included in House-passed Build Back Better Act. A solar manufacturing production tax credit will help spur a robust, end-to-end solar PV manufacturing supply chain to address the gaps and vulnerabilities described above.

The tax incentive structure proposed by Senator Ossoff and Rep. Kildee and included in the Build Back Better Act is designed to encourage more production and larger facilities by defraying early operating costs and guaranteeing a return on investment at each stage of the solar PV supply chain. By incentivizing manufacturing at each stage of the solar PV supply chain directly, it ensures global competitiveness and provides market certainty. If the U.S. wants to realize opportunities to build domestic solar PV manufacturing that is globally competitive, this type of policy design will be essential as it will allow American manufacturers to become profitable sooner and reward innovation, efficiency (for example, allowing vertical integration), and scale, instead of dollars invested.

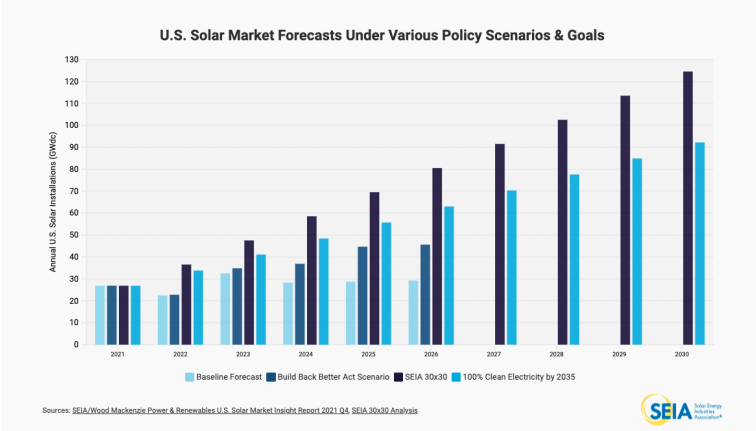
6. What other input should the federal government be aware of to support a resilient supply chain of this technology?

In addition to a solar manufacturing production tax credit, the federal government should be aware of other smart policies to support a resilient solar PV supply chain, including establishing a federal solar manufacturing coordinator and establishing procurement policies in support of American-made ultra-low carbon solar panels.

A high-level federal solar manufacturing coordinator could help ensure coordination between the various federal agencies to ensure a whole-of-government approach to support domestic solar manufacturing. Procurement standards to support the purchase of solar PV panels with lower embodied carbon can also support domestic manufacturing as the U.S. has a "cleaner" supply chain and clear competitive advantage over China. And lastly, we must ensure the federal government procures or uses American-made solar panels, whether it purchases them directly or enters into power purchase agreements, by closing the existing Buy American "solar loophole."

Conclusion

Restoring a U.S.-based solar PV manufacturing supply chain is a true win-win for American workers and the continued technological innovation in our efforts to address climate change. An American solar PV manufacturing supply chain will help reduce our clean energy dependence on China, improve supply chain resilience, and ensure strong labor and environmental standards in clean energy manufacturing.



According to SEIA and Wood Mackenzie, by 2025, the total projected U.S. solar deployment is nearly 30 GW in a baseline scenario (with smart policies like Build Back Better, the projection is closer to 50 GW).[9] We believe with the right policy support and signals from DOE, the Biden Administration, and Congress – such as a solar manufacturing production tax credit – we have a unique opportunity to not only substantially meet the demand in either scenario, but build a globally competitive, environmentally friendly, and socially responsible U.S.-based solar supply chain. As the Biden Administration considers making historic investments in good-paying jobs and takes concrete steps to address climate change, the time to reshore and rebuild the domestic solar supply chain is now. We stand ready to collaborate with DOE as it conducts its energy sector supply chain review and partner on smart policies to support domestic solar PV manufacturing.

[9] SEIA & Wood Mackenzie