

ENERGY COUNCIL INFO SERIES



Skills and Production Capacity Challenges Faced by Renewables Manufacturers

As demand for renewable energy increases and suppliers try to meet this demand, challenges in both labor and manufacturing capacity are becoming more apparent.

Labor

Labor shortages stem from several factors that are coalescing to the detriment of the industry. Primarily, a lack of available talent with applicable skills is exacerbated by competing industries recruiting high demand skill sets. In particular, in recent years it has become increasingly difficult for the renewables industry to attract high-technology candidates thanks to the higher wages and better benefits on offer by competing industries.

Similarly, the renewables industry must compete with other economic sectors, including the fossil fuels

industry, to attract manual skilled workers. Renewables currently offer a lower average salary and less competitive health benefits than those available to employees working in fossil fuel extraction and processing thanks in part to the higher complexity of fossil fuel extraction. The skills required for drilling, completing, connecting, and maintaining oil wells to pipeline infrastructure and the resulting processing and refining are highly specialized. Thus requiring a significant degree of on-the-job training, despite having no degree requirement. Installing solar panels and servicing wind farms is, by comparison, less technically demanding, and carries significantly less safety risk. The same is true across drilling, fracking, and also in the manufacturing of equipment. As such, salaries in solar and wind

generation jobs range from \$46,850 to \$64,330, compared to a much higher salary of \$70,310 to \$81,460 for jobs in fossil-fuel power generation. Additionally, 75% of fossil fuel workers have health insurance, while it is estimated that only 32% to 57% of clean energy workers are covered by insurance.

Owing to the competitive job market, renewable manufacturers also struggle to retain their employees. The 2019 GETI (Global Energy Talent Index) report showed that 77% of renewable energy professionals were open to moving to a different industry, a 43% increase from the 2018 report. This openness to moving industries is compounded by a lack of stability. Renewables as an industry is incredibly variable and people are wary of the long-term trajectory of the

sector and its ability to hire enough qualified and capable people.

Manufacturing and Deployment

Renewables manufacturers face other hurdles through technological challenges, market regulation, and supply chain issues.

The lack of available technology to store generated energy is a major challenge for stakeholders aiming to advance the sector. The difficulty of estimating demand means renewable energy is often over generated but with nowhere to store it for use during periods of under-generation. However, because wind and solar are highly variable sources, it is important to have a mechanism to mitigate lower levels of production during a drought, low winds, or clouding. Further, the market does not provide strong enough price signals to better match demand with generation. Without viable storage technologies to account for variable weather, relying on renewable energy holds the risk of undersupplying the market unless adequate mitigating measures are developed.

This production ambiguity is compounded by the large land expanse needed for renewable resources, which are predominantly built away from where the load density is, owing to cheaper and more available land. This distance creates the challenge of building expensive transmission lines, which can take up to ten years or more to get through land acquisition, design, and building processes, to transport the energy to where it is consumed.

Further up the production chain, not only is the establishment of renewable energy manufacturing facilities costly,



but the necessary permitting can be extremely time consuming. In addition to state and local assessments and approval processes, there are many federal laws that require studies to be done on the impact of new facilities. For example, for projects of significant magnitude, environmental impact studies (EIS) must be conducted with an average completion time of 4.5 years. In addition to permitting procedures, manufacturers must acquire a sizeable piece of land on which to build. 1 mW of generation capacity requires 2.5 acres for solar whereas the average coal power plant requires only 0.00000019 acres to generate 1mW. To produce a solar plant that provides power in levels on par with fossil fuel plants will require large swaths of land not always readily available and requiring lengthy EIS.

All of this falls within a broader context of U.S. reliance on global markets to build renewable energy generation capacity. The U.S. solar industry is 84% dependent on imports and 30-50% of a wind farm's value is imported. Raw metals, critical minerals, and silicon manufacturing are all essential to the construction of renewable energy sources but require international supply chains to be acquired. The US must also compete with the growing European renewables demand, spurred on by the European green energy initiatives and falling

renewable energy prices there. Over half of energy in the European Union is now generated from renewables. As of now, demand for polysilicon and solar glass, key solar panel ingredients, far exceeds production capabilities. Though new furnaces and facilities being completed are expected to expand this capacity to better meet demand, other production inputs risk similar supply shortfalls.

The raw metals indium, tellurium, germanium and gallium are required to produce a solar panel and rare earth elements and cobalt are essential for making turbines; elements for which the U.S. is heavily import dependent. With an onshore wind plant requiring nine times more mineral resources than a natural gas power plant, this import dependence risks exposing the U.S. to energy insecurity unless the transition to renewables is managed effectively. China is the only country that produces all the materials required to make wind turbines, and no single country produces all four metals needed to construct a solar panel. Finally, the US does not have the manufacturing capability to convert silicon into the correct form to begin the construction of semiconductors. Semiconductors are present in many renewable energy products leaving renewables manufacturers with the challenge of sourcing silicon internationally.