

Experts call for commitment to multi-terawatt photovoltaic production worldwide

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Global experts on solar power strongly urge a commitment to the continued growth of photovoltaic (PV) manufacturing and deployment to power the planet, arguing that lowballing projections for PV growth while waiting for a consensus on other energy pathways or the

emergence of technological last-minute miracles "is no longer an option."

The consensus reached by participants in the 3rd Terawatt Workshop last year follows increasingly large projections from multiple groups around the world on the need for large-scale PV to drive electrification and greenhouse gas reduction. The increasing acceptance of PV technology has prompted the experts to suggest that about 75 terawatts or more of globally deployed PV will be needed by 2050 to meet decarbonization goals.

The workshop, led by representatives from the National Renewable Energy Laboratory (NREL), the Fraunhofer Institute for Solar Energy in Germany, and the National Institute of Advanced Industrial Science and Technology in Japan, gathered leaders from around the world in PV, grid integration, analysis, and [energy storage](#), from research institutions, academia, and industry. The first meeting, in 2016, addressed the challenge of reaching at least 3 terawatts by 2030.

The 2018 meeting moved the target even higher, to about 10 TW by 2030, and to three times that amount by 2050. The participants in that workshop also successfully predicted the global generation of electricity from PV would reach 1 TW within the next five years. That threshold was crossed last year.

"We have made great progress, but the targets will require continued work and acceleration," said Nancy Haegel, director of the National Center for Photovoltaics at NREL. Haegel is lead author of the new article in the journal *Science*, "Photovoltaics at Multi-Terawatt Scale: Waiting Is Not an Option." The co-authors represent 41 institutions from 15 countries.

"Time is of the essence, so it's important that we set ambitious and

achievable goals that have significant impact," said Martin Keller, director of NREL. "There has been so much progress in the realm of photovoltaic [solar energy](#), and I know we can accomplish even more as we continue to innovate and act with urgency."

Incident solar radiation can easily provide more than enough energy to meet the Earth's energy needs, but only a small percentage is actually put to use. The amount of electricity supplied globally by PV significantly increased from a negligible amount in 2010 to 4%–5% in 2022.

The report from the [workshop](#) noted the "window is increasingly closing to take action at scale to cut greenhouse gas emissions while meeting global energy needs for the future." PV stands out as one of very few options that can be immediately used to replace fossil fuels. "A major risk for the [next decade](#) would be to make poor assumptions or mistakes in modeling the required growth in the PV industry, and then realize too late that we were wrong on the low side and need to ramp up manufacturing and deployment to unrealistic or unsustainable levels."

Reaching the 75-terawatt target, the authors predicted, will place significant demands on both PV manufacturers and the scientific community. For example:

- Makers of silicon solar panels must reduce the amount of silver used in order for the technology to be sustainable at a multi-terawatt scale.
- The PV industry must continue to grow at a rate of about 25% per year over the next critical years.
- The industry must continuously innovate to improve material sustainability and reduce its environmental footprint.

Workshop participants also said solar technology must be redesigned for ecodesign and circularity, although recycling materials is not an

economically viable solution at present for material demands given the relatively low installations to date compared to the demands of the next two decades.

As the report noted, the target of 75 terawatts of installed PV "is both a major challenge and an available path forward. Recent history and the current trajectory suggest that it can be achieved."

More information: Nancy M. Haegel et al, Photovoltaics at multi-terawatt scale: Waiting is not an option, *Science* (2023). [DOI: 10.1126/science.adf6957](https://doi.org/10.1126/science.adf6957)

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