Terawatt-Scale Photovoltaics: Trajectories and Challenges

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It is increasingly well understood and commonly cited that the solar energy resource significantly exceeds the world’s total energy consumption. However, despite rapid advances in deployment and cost reduction, the vision of PV providing a significant fraction of global electricity generation—and ultimately, total energy demand—remains to be realized. In the near term, PV has a clear path for substantial growth. Longer term, the question remains whether PV will be able to provide a moderate (e.g., 20%, ~4 TW in 2030) or a large (e.g., 50%, ~10 TW in 2030) fraction of world electricity needs.

Significant material for this presentation will be drawn from The Terawatt Workshop, held March 17–18, 2016, in Freiburg, Germany. Fifty-seven global leaders in PV came together to highlight the opportunity and discuss the challenges that could impede this vision. This presentation, informed by that unique gathering, explores where PV has been, where it is headed, and what it would take to reach TW-scale PV deployment to simultaneously address energy demand, major greenhouse gas reduction, and global prosperity. Terawatt scale PV deployment is achievable with growth rates substantially below what the industry has achieved over the past decade. But the energy system must be transformed to accommodate this level of PV generation, and investment to drive growth can be aided by lower capex requirements and consistent policies aimed at enabling viable profit margins. Moving to a more flexible grid will enable solar energy to maintain value at higher levels of penetration and play a critical enabling role in addressing climate change.