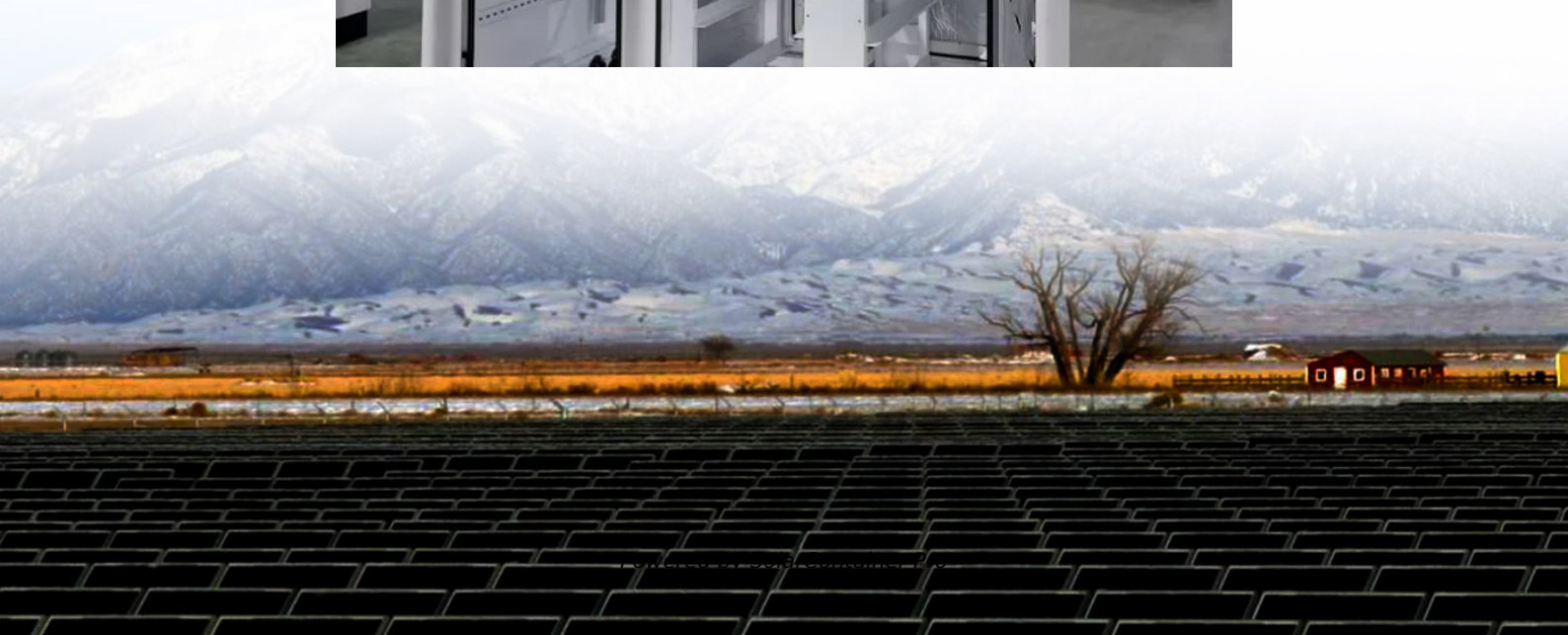


# **Photovoltaic module cost reduction project**





## Overview

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How can R&D help reduce PV module cost?

R&D, both public and private, was a key driver of module cost reduction historically and can be valuable going forward in improving module efficiency and reducing materials use. Improvements to module efficiency in particular would help cut the per-watt cost of all cost components of PV modules (as well as PV systems).

Should PV module efficiency be improved?

Improvements to module efficiency in particular would help cut the per-watt cost of all cost components of PV modules (as well as PV systems). Variables that might face limitations in the short term are manufacturing yield, which is already close to 100%, and wafer area, which is constrained by yield and efficiency considerations.

How are PV production costs modeled?

The costs of materials, equipment, facilities, energy, and labor associated with each step in the production process are individually modeled. Input data for this analysis method are collected through primary interviews with PV manufacturers and material and equipment suppliers.

Can learning-by-doing reduce PV module cost?

A few past studies have begun to develop such a methodology by decomposing technology costs over time (McNerney et al., 2011, Nemet, 2006). A study of the drivers of PV module cost changes from the 1970s to the early 2000s (Nemet, 2006) pioneered a bridge of this kind, and found that learning-by-doing had a limited effect on cost reductions.

How do market-stimulating policies affect the cost of PV modules?

Market-stimulating policies have played a central role in driving down the costs of PV modules, with private R&D, economies of scale, and learning-by-



doing together contributing an estimated 60% of the cost decline in PV modules between 1980 and 2012.

How is module cost reduced?

The reduction in module cost below the 2012 value is shown for each one-at-a-time variable change. Most variables are adjusted up or down by 25%, in a direction that reduces cost. Yield was changed from 95% to 100%. Plant size is increased by a factor of 3 (dark blue) and a factor of 10 (light blue).



## Photovoltaic module cost reduction project

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### Digitalization as a driver for supporting PV deployment and cost reduction

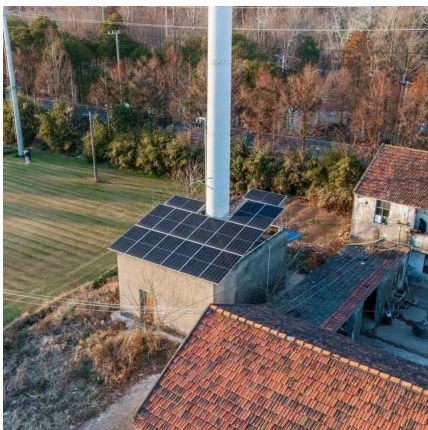
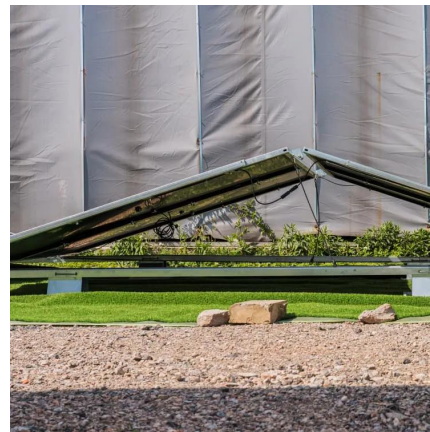
In a second stage, a larger reference group of PV stakeholders will be involved in the cost reduction assessment of the full-developed version of the platform, and thanks to ...

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### Cost-reduction through material optimisation and Higher EnEnergy ...

Cost-reduction through material optimisation and Higher EnEnergy output of solar photovoltaic modules - joining Europe's Research and Development efforts in support of its ...

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### Evaluating the causes of cost reduction in photovoltaic modules

The reduction in module cost below the 2012 value is shown for each one-at-a-time variable change. Most variables are adjusted up or down by 25%, in a direction that reduces cost.

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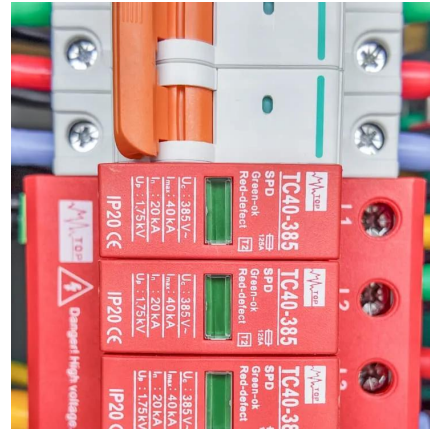
### Two decades of progressive cost reduction: A paradigm shift for

In response to the imperative to mitigate climate change and capitalise on cost-effective renewable energy sources, various companies,



cities, and municipalities are ...

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## The International Supply Chain and Manufacturing Costs for ...

Additional details given in "Crystalline Silicon Photovoltaic Module Manufacturing Costs and Sustainable Pricing: 1H2018 Benchmark and Cost Reduction Roadmap" by M ...

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## [Quarterly Solar Industry Update , Department of Energy](#)

Each quarter, the National Renewable Energy Laboratory conducts the Quarterly Solar Industry Update, a presentation of technical trends within the solar industry. Each ...

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## Evaluating the causes of cost reduction in photovoltaic modules

Photovoltaic (PV) module costs have declined rapidly over forty years but the reasons remain elusive. Here we advance a conceptual framework and quantitative method ...

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## [U.S. Solar Photovoltaic System and Energy Storage Cost](#)

This report benchmarks installed costs for U.S. solar photovoltaic (PV) systems as of the first quarter of 2021 (Q1 2021). We use a bottom-up method, accounting for all system and project ...

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## **Research and Development Priorities to Advance Solar ...**

In the remainder of the report, we categorize R&D advancements that could achieve the Solar Futures Study targets in four cost-reduction areas: PV module costs (Section 3), BOS costs ...

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## **The Global Solar Photovoltaic Supply Chain and Bottom-UP ...**

Global PV Manufacturing Capacities Across the Supply Chain Bottom-Up PV Manufacturing Cost Modelling Methodology Results for Polysilicon, Ingot and Wafer, Solar Cell ...

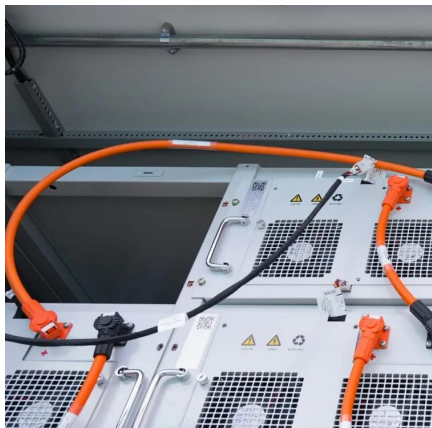
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## [Cost Reduction Strategies for Solar Power](#)

A key challenge for the industry is reducing costs while maintaining efficiency and reliability. In this article, we will explore various cost reduction strategies for solar power, guided by insights ...

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