

# Gas supply channels break the solar container bottleneck

<div class="df\_qntext">Could a bottleneck slow the energy transition?

Low-carbon energy technologies are growing, but bottlenecks could slow the energy transition at a time when the rollout of clean technologies needs to accelerate.

<div class="df\_qntext">What is a bottleneck in solar energy production?

Nickel remains a bottleneck for structural components and BOS elements, while silicon constrains solar PV production, and REEs, such as terbium, neodymium, praseodymium, and dysprosium, limit the manufacturing of direct-drive wind turbines.

<div class="df\_qntext">Are metals bottlenecks affecting the deployment of strategic energy technologies?

The potential risks from metals bottlenecks to the deployment of strategic energy technologies. Energy Policy 55, 556-564 (2013). Gervais, E., Shammugam, S., Friedrich, L. & Schlegel, T. Raw material needs for the large-scale deployment of photovoltaics--effects of innovation-driven roadmaps on material constraints until 2050.

<div class="df\_qntext">What can stakeholders do about energy bottlenecks?

Stakeholders could also review systems and encourage investments ahead of bottlenecks (for example, in power grids), repurpose existing infrastructure where possible (for example, gas pipelines for hydrogen blending), and encourage the development and adoption of flexibility and demand-side response by industry and households.

<div class="df\_qntext">What are the bottlenecks for solar PV scale-up?

The major bottlenecks for solar PV scale-up are projected to center on materials scarcity. Copper and tin are the most critical materials and will constitute the main bottleneck of solar PV development in most scenarios. However, unlocks are available, as supply could ramp up (especially for tin).

<div class="df\_qntext">Are energy bottlenecks a risk for achieving net-zero commitments?

In our energy transition scenario that would achieve existing climate commitments, two-thirds of the potential bottlenecks assessed run a risk of delaying the path to net-zero commitments. Around a quarter of these potential bottlenecks are classified as high risk, without unlocks identified to date.

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future roadmap for the development of lead-free perovskite solar cells.

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