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GREEN PAPER SERIES 2020 SUMMARY
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Is Solar the "Free Energy Lunch" of a Decarbonized World?

All solar energy technologies have some drawbacks:

Conventional Silicon:
Silver is limiting and already ~50% of panel cost

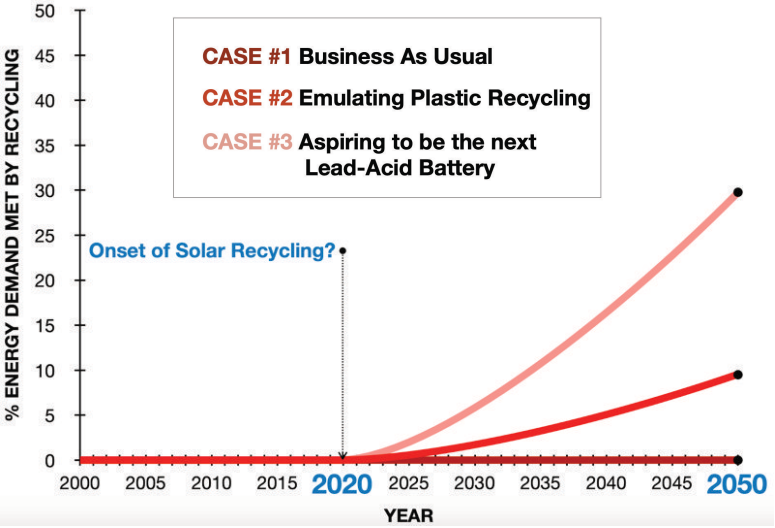
Copper-Indium-Gallium-Selinide:
(thin-film) need to increase extraction of Gallium by over thirty-fold – starting immediately

Thin-Film, Cadmium-Telluride:
Cadmium yields waste that is 10x more hazardous than lead

To provide a balanced overview of the potential impacts of large-scale solar energy expansion, this report compiles support for and against solar scaling up across multiple dimensions. Examples of findings on both sides are provided below:

- **Social**: (+) U.S. Solar jobs have increased by 167% over the last decade
- **Economic**: (+) Cost falling rapidly by 80% since 2010 for conventional PV modules
- **Environmental**: (-) Silicon byproducts pollute rivers
- **Political**: (-) Fossil fuel lobbies outspend renewables by 13 to 1

One way to reduce the material and waste impacts of solar energy systems is to build a circular economy around panel production. This report constructs several models to demonstrate the potential of recycled materials as solar energy production is scaled up. The figure below summarizes the results, using plastic and lead-acid battery recycling rates as proxies for moderately and highly successful recycling programs, respectively.



In order to maximize the potential of solar panel recycling and achieve a curve like that in Case #3, recycling needs to become a priority in the solar industry today. Ecolabels, such as Solar Scorecard, can help by increasing transparency for consumers and therefore producer accountability. For more information, see the full version of this report on our website.

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