How Solar Fits into the Bigger Picture

Scott Williams, Research and Education Coordinator,
Wisconsin Energy Institute

About Me: Main Job Responsibilities/Highlights

Certificate Programs

- Undergraduate: Engineering for Energy Sustainability
- Graduate: Energy Analysis and Policy

Public Outreach Events

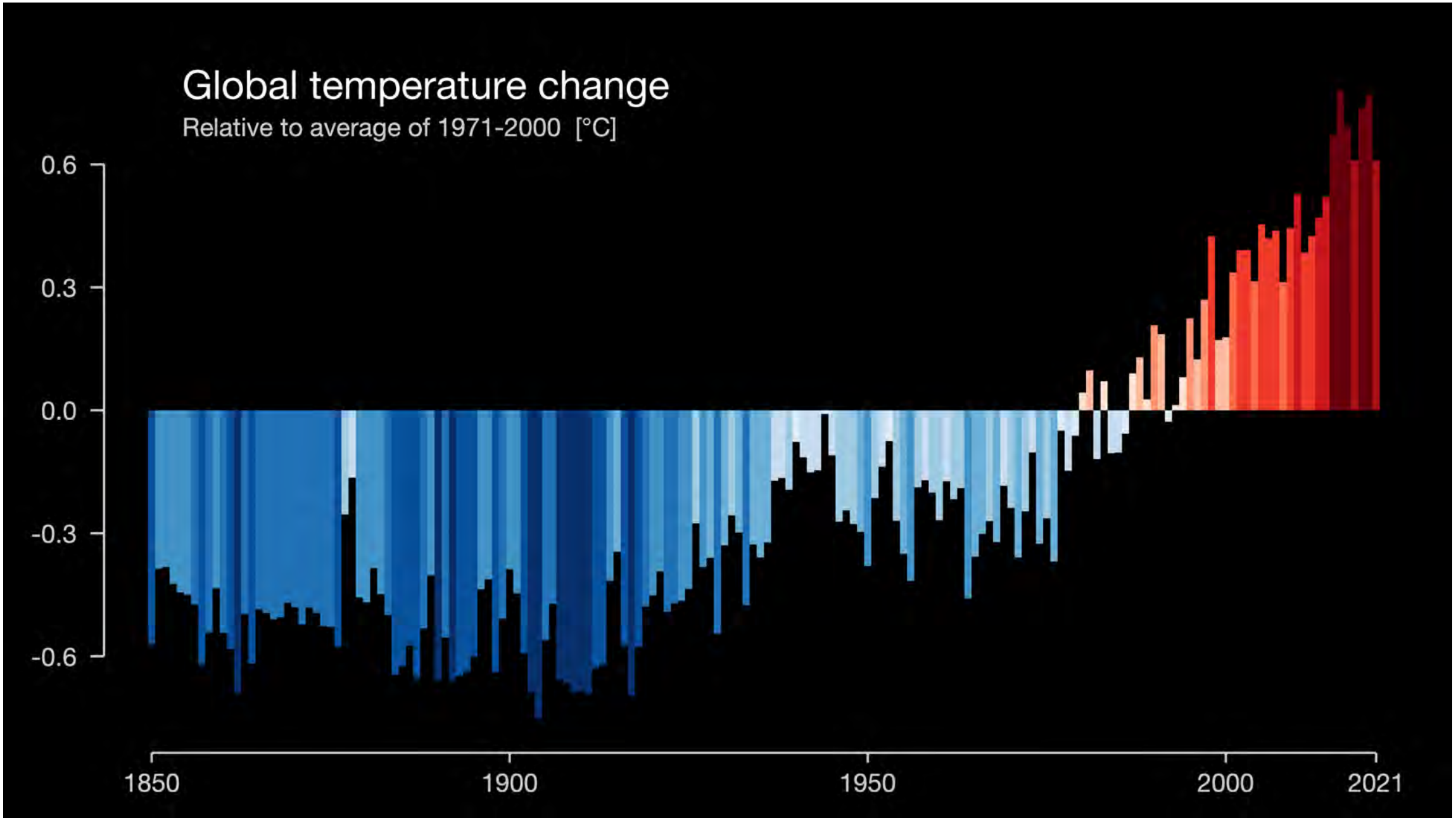
- Sustainable Energy Seminar
- Forward in Energy Forum
- KidWind Challenge

Other Energy Education

- Collegiate Wind Competition
- Career Workshops/Presentations

“The evidence is clear: the time for action is now. We can halve emissions by 2030.”

-IPCC Sixth Assessment Report, Working Group III: Mitigation
(released April 4, 2022)


Global temperature change
Relative to average of 1971-2000 [°C]
0.6
0.3
0.0
-0.3
-0.6
1850
1900
1950
2000
2021

Climate Change is Already Impacting Us

The New York Times

How Bad Is the Western Drought? Worst in 12 Centuries, Study Finds.

Fueled by climate change, the drought that started in 2000 is now the driest two decades since 800 A.D.

Give this article 917

Water levels at the Great Salt Lake in Utah, the largest saltwater lake in the Western Hemisphere, have dropped to the lowest levels ever recorded. Justin Sullivan/Getty Images

The New York Times

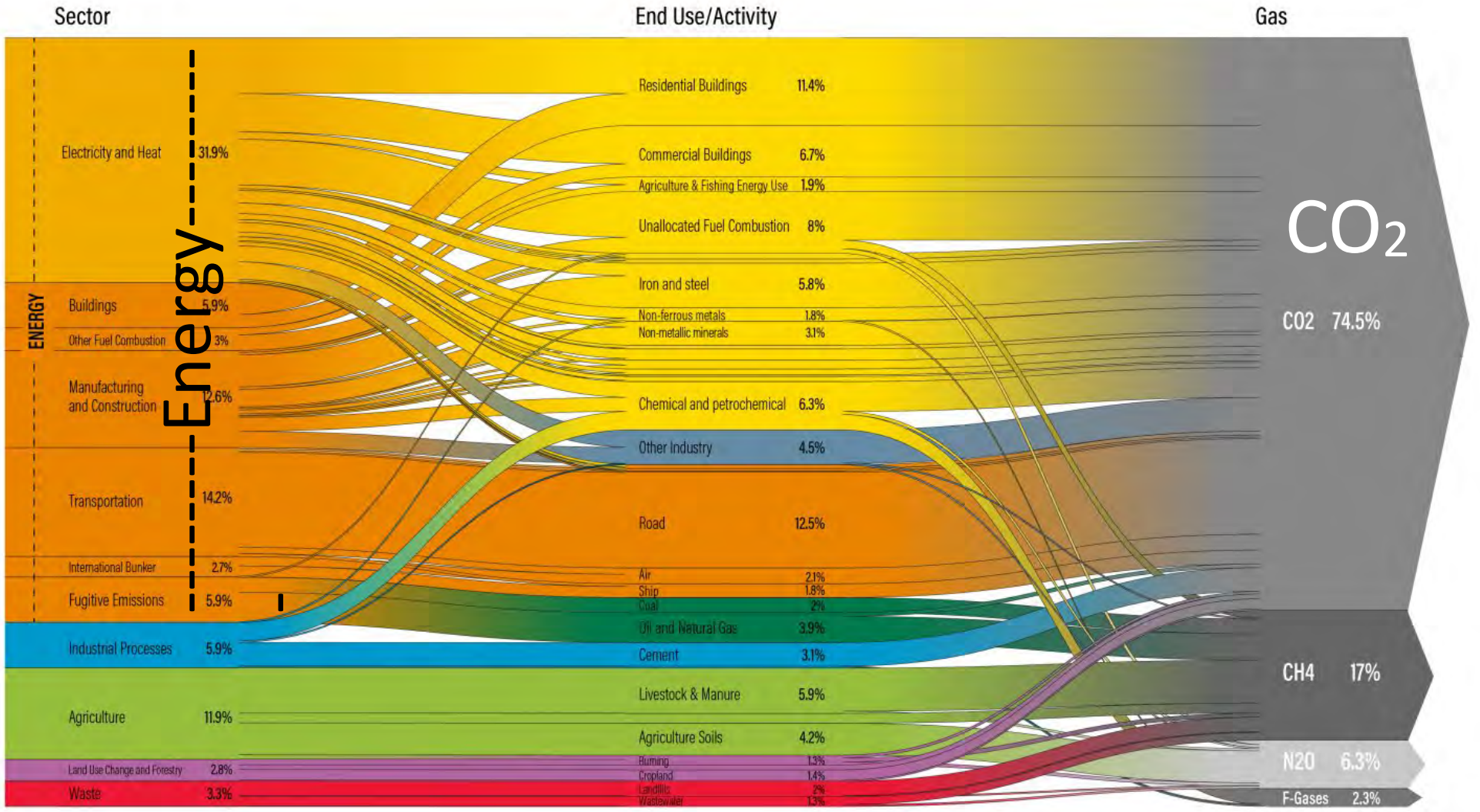
What Is Owed to Pakistan, Now One-Third Underwater

Sept. 3, 2022

A flooded residential area in the Dadu district of Sindh Province. Husnain Ali/Agence France-Presse — Getty Images

World Greenhouse Gas Emissions in 2018

Total: 48.9 $GtCO_2e$



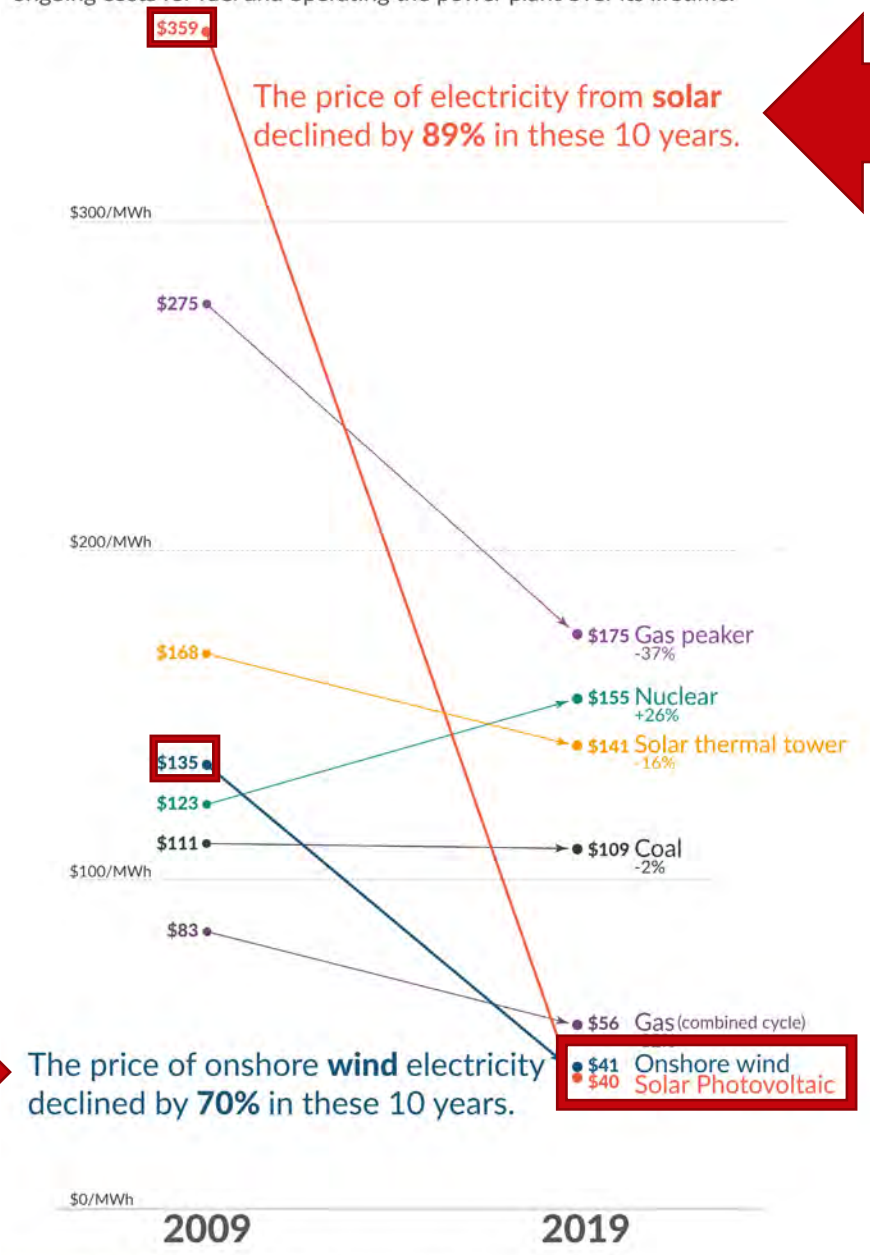
Source: Greenhouse gas emissions on Climate Watch. Available at: https://www.climatewatchdata.org

WORLD RESOURCES INSTITUTE

The price of electricity from new power plants

Our World in Data

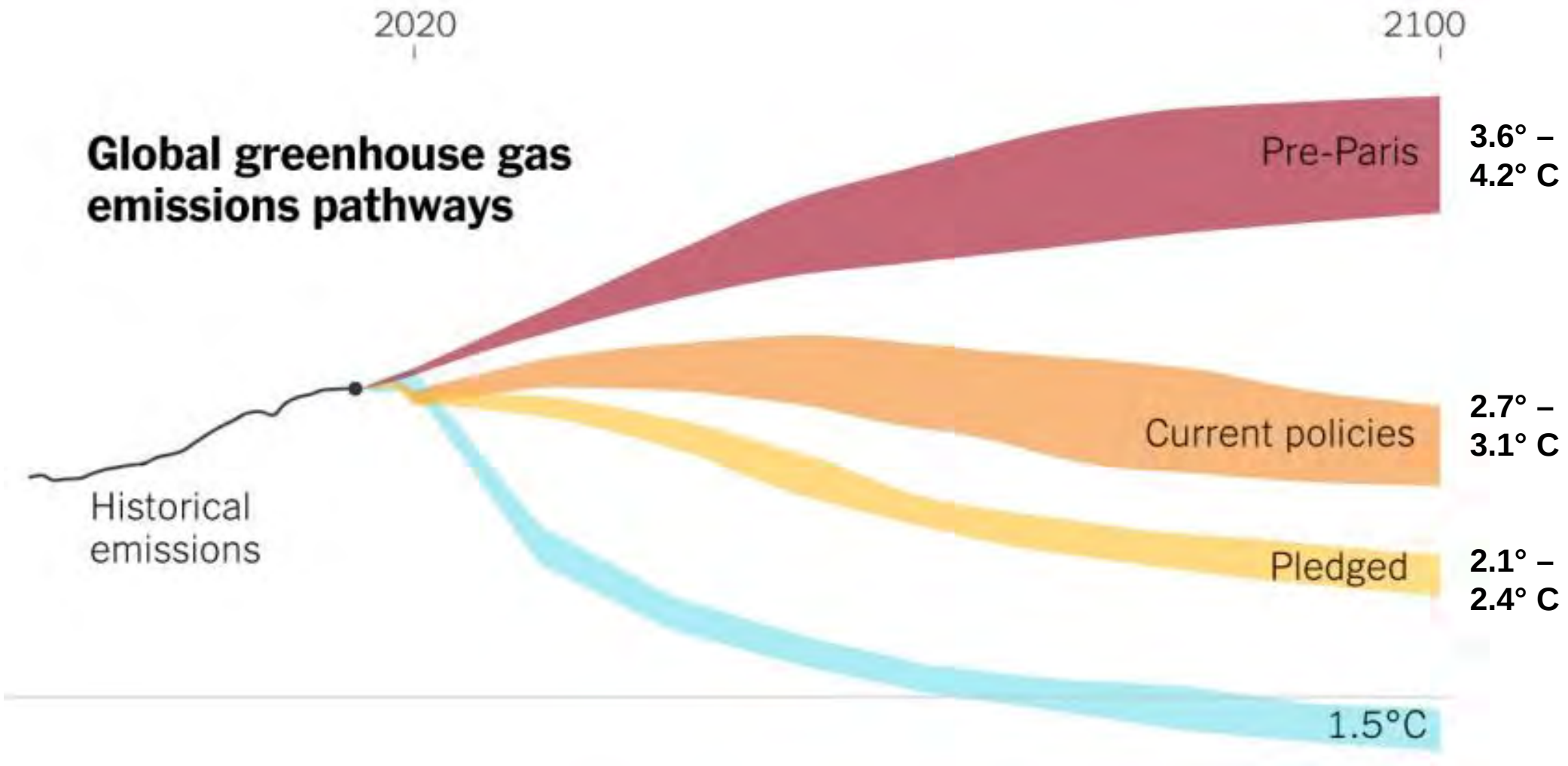
Electricity prices are expressed in 'levelized costs of energy' (LCOE). LCOE captures the cost of building the power plant itself as well as the ongoing costs for fuel and operating the power plant over its lifetime.

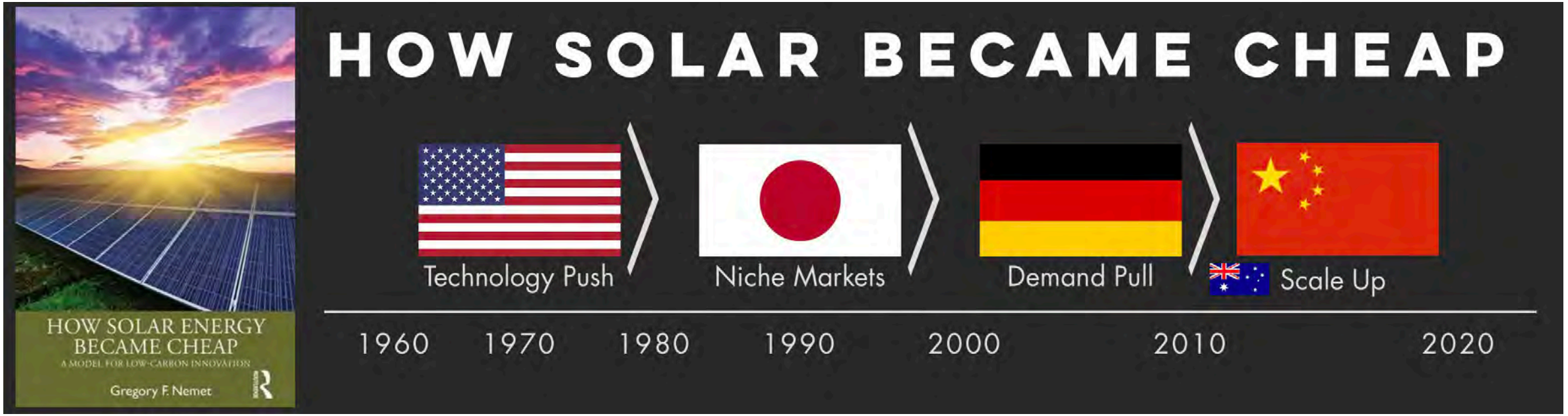


Data: Lazard Levelized Cost of Energy Analysis, Version 13.0

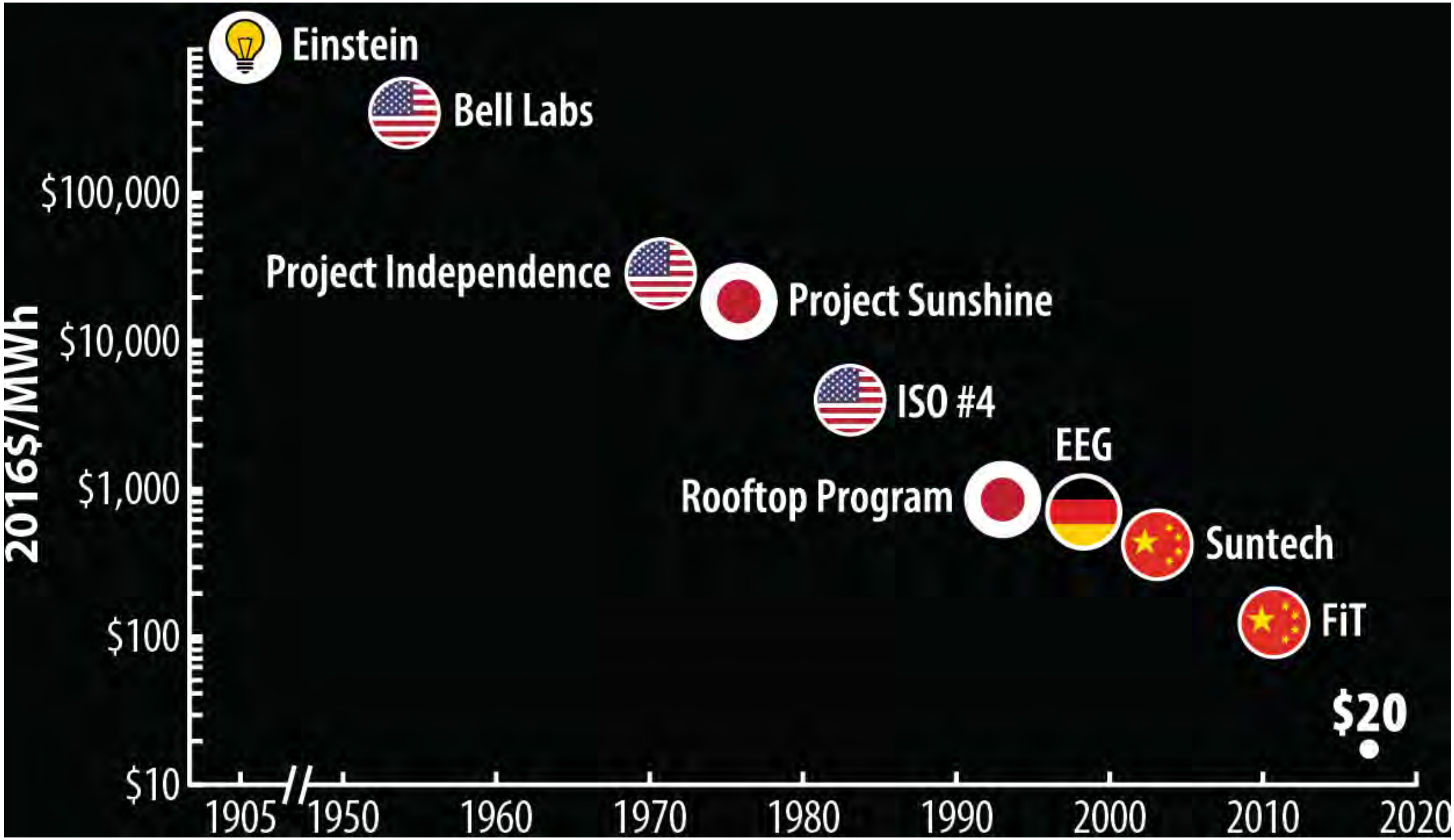
OurWorldinData.org – Research and data to make progress against the world's largest problems.

New York Times (Oct. 25, 2021)**: <u>Yes, There Has Been Progress on Climate. No, It's Not Nearly Enough</u>**



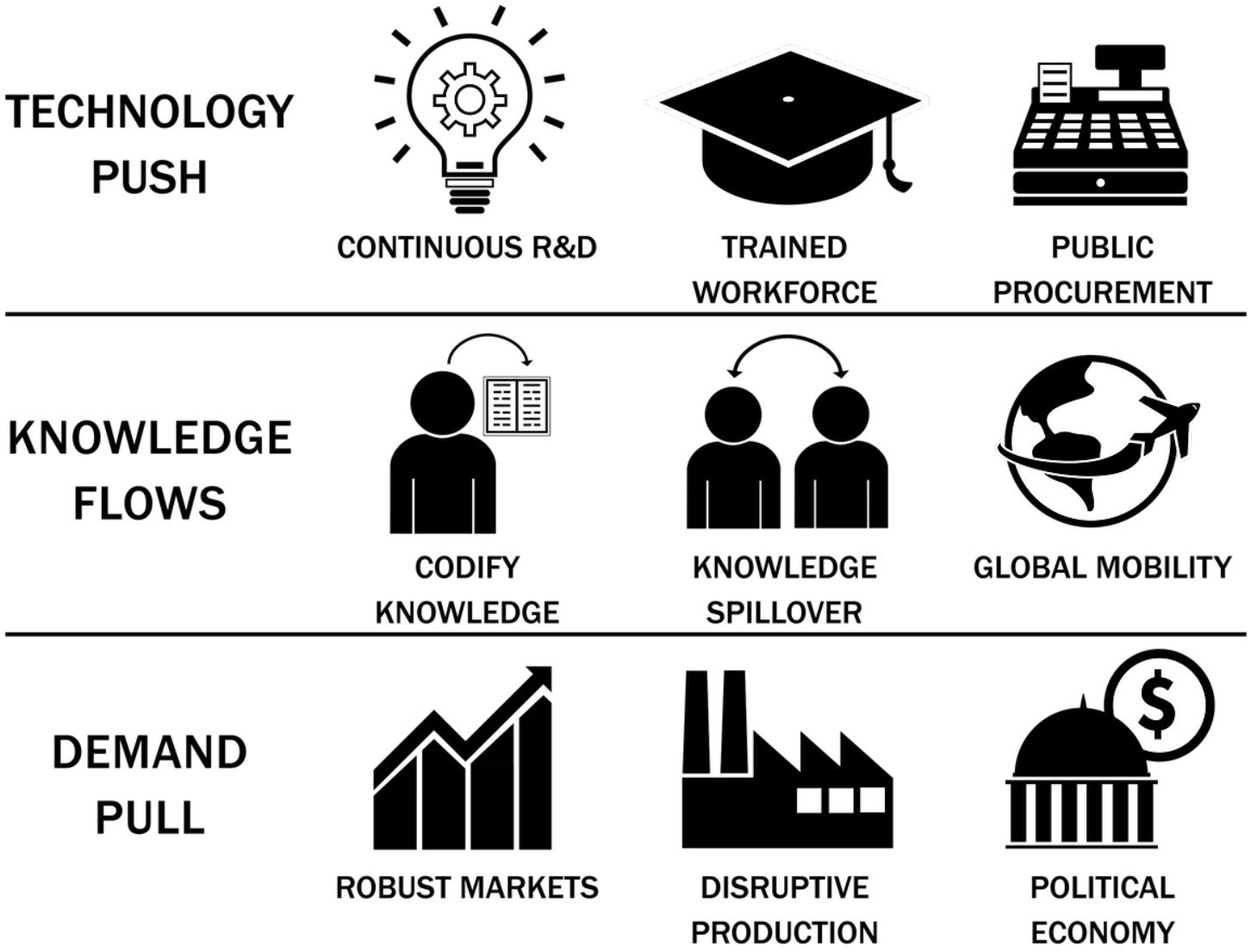


Source: https://www.howsolargotcheap.com



Source: https://www.howsolargotcheap.com

Cost Reduction Accelerators



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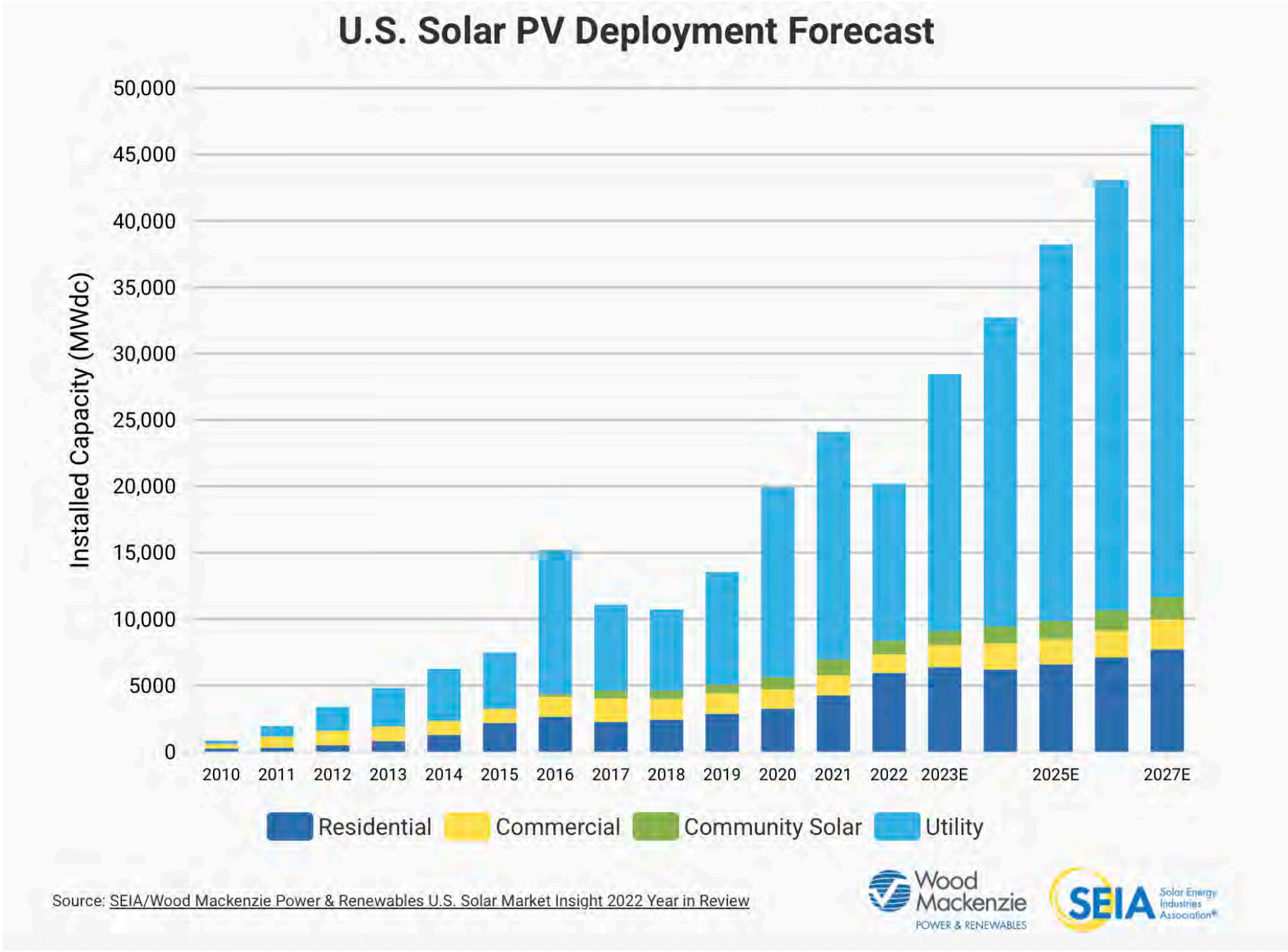
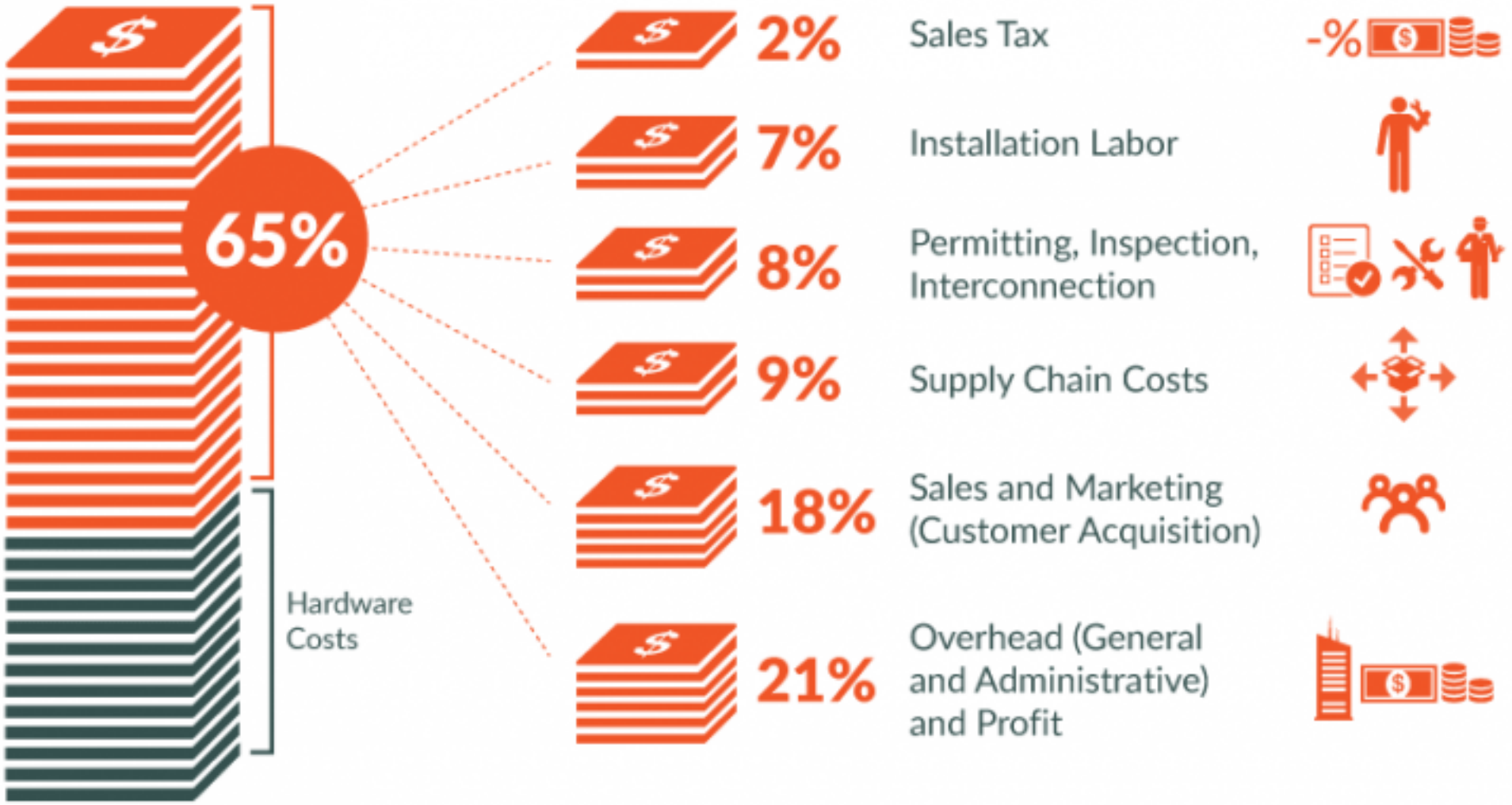
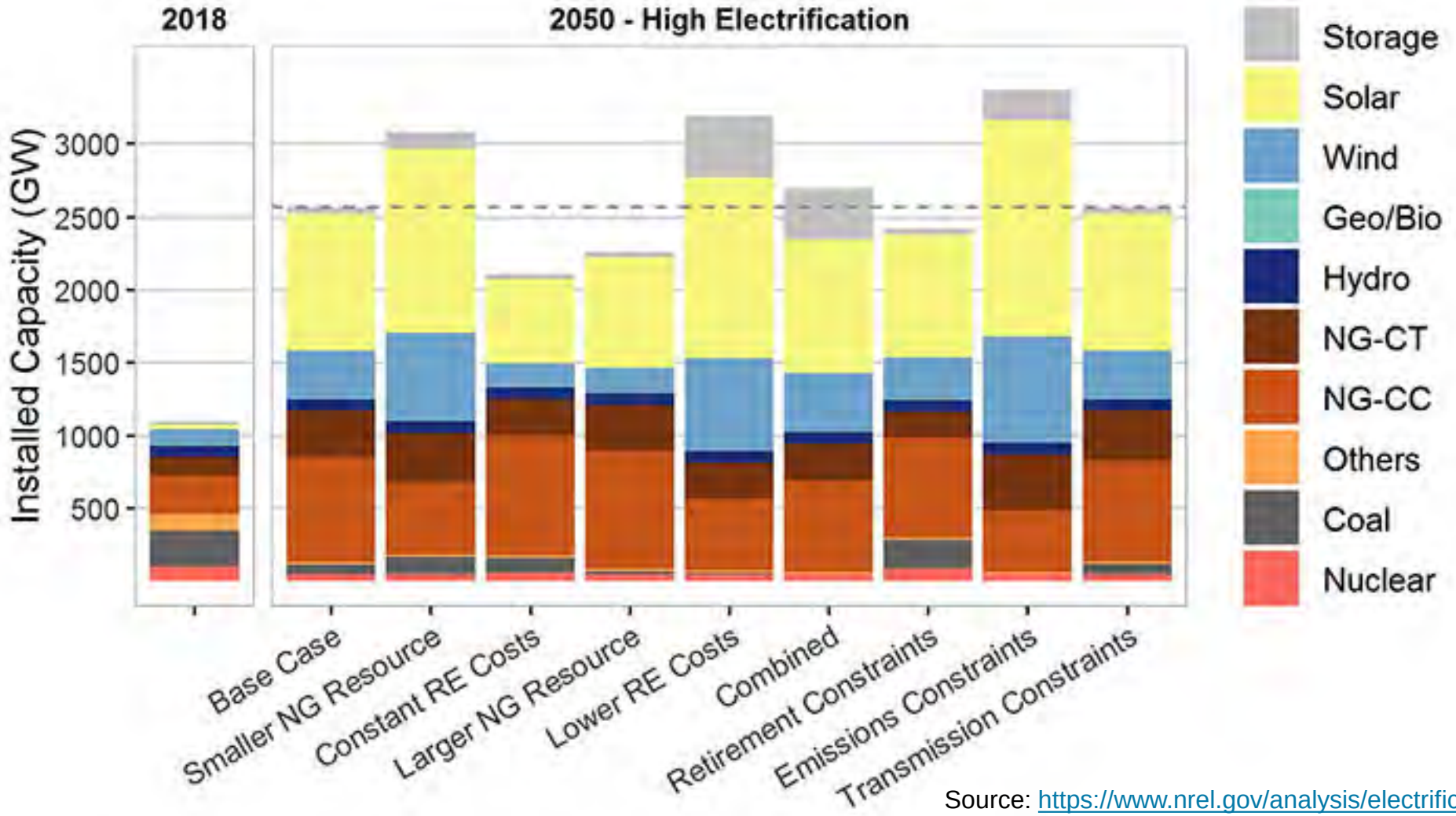

U.S. Solar PV Deployment Forecast
Installed Capacity (MWdc)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5000
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023E
2025E
2027E
Residential
Commercial
Community Solar
Utility
Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2022 Year in Review
Wood Mackenzie
POWER & RENEWABLES
SEIA
Solar Energy Industries Association®

SOFT COSTS BREAKDOWN



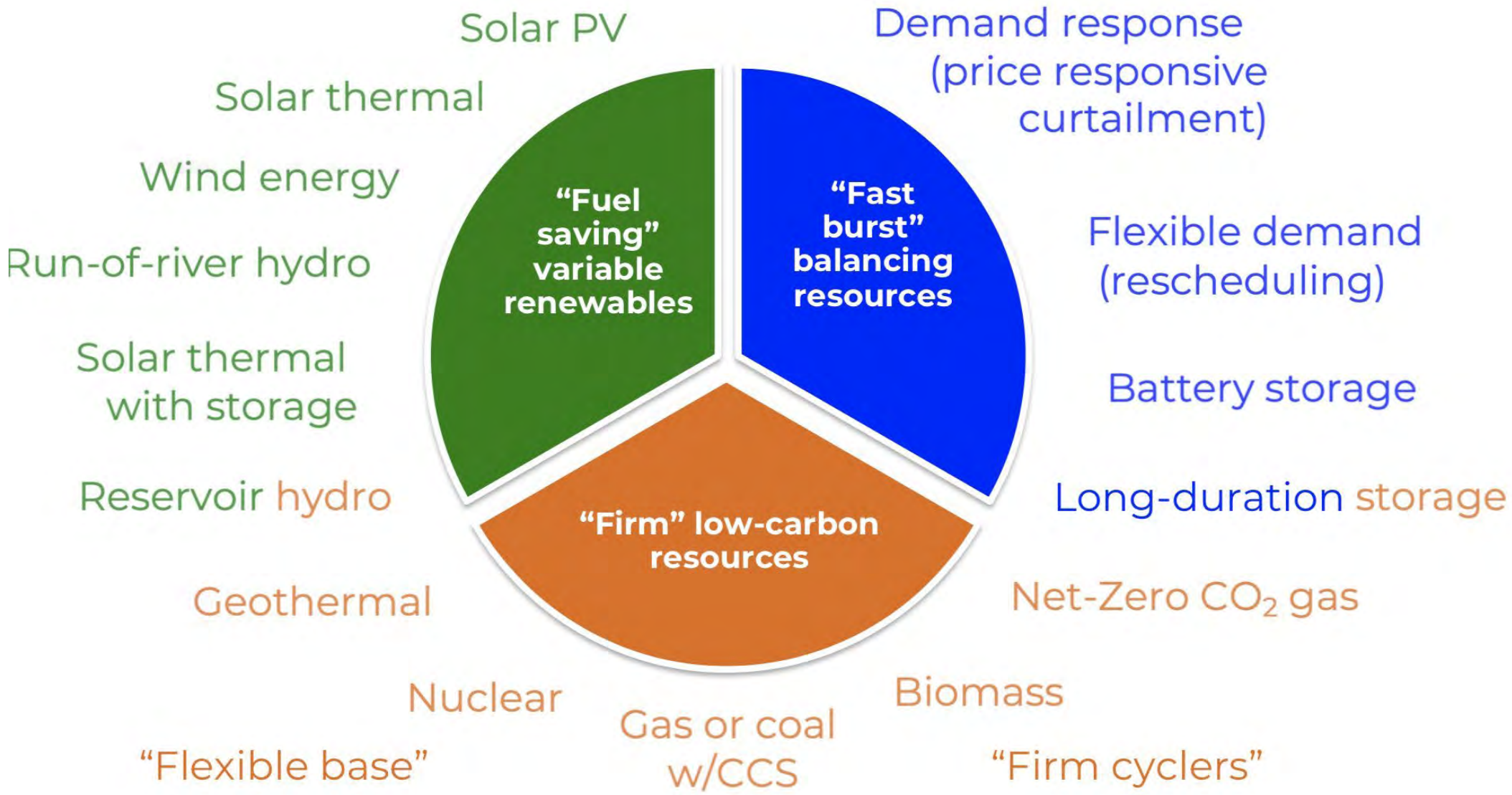
Source: National Renewable Energy Laboratory "U.S. Solar Photovoltaic System Cost Benchmark: Q1 2021 ."

Electrify (almost) everything, decarbonize electricity



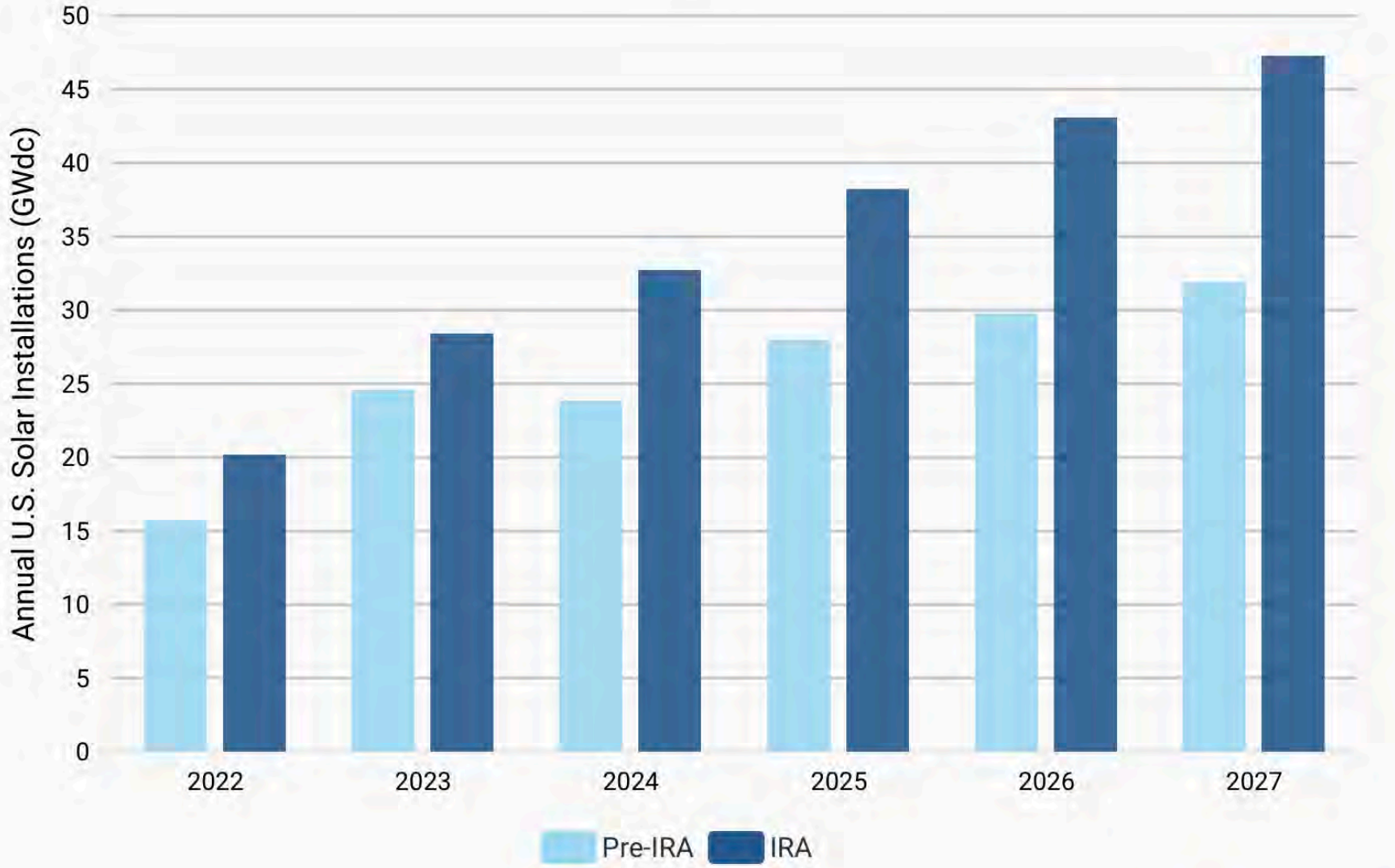
Source: https://www.nrel.gov/analysis/electrification-futures.html

Variety of Resources Needed



Source: Jesse Jenkins, Princeton Univ.

U.S. Solar Market Forecasts Before and After the Inflation Reduction Act



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2022 Year in Review

SEIA Solar Energy Industries Association®

Key Benefits and Remaining Concerns

- A crucial piece to meeting climate targets
- Co-benefits (air quality, water use/quality)
- Learning curve
- If we do it right, whole energy system will be cheaper
- Job creation
- Choice/independence

- Local opposition to large-scale solar projects
- Transmission constraints
- Long-duration storage
- Compensation for distributed solar and third-party ownership
- Equity
- Manufacturing/labor practices (especially in China)
- Supply chain & labor shortage