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Climate Justice and Global Decarbonization

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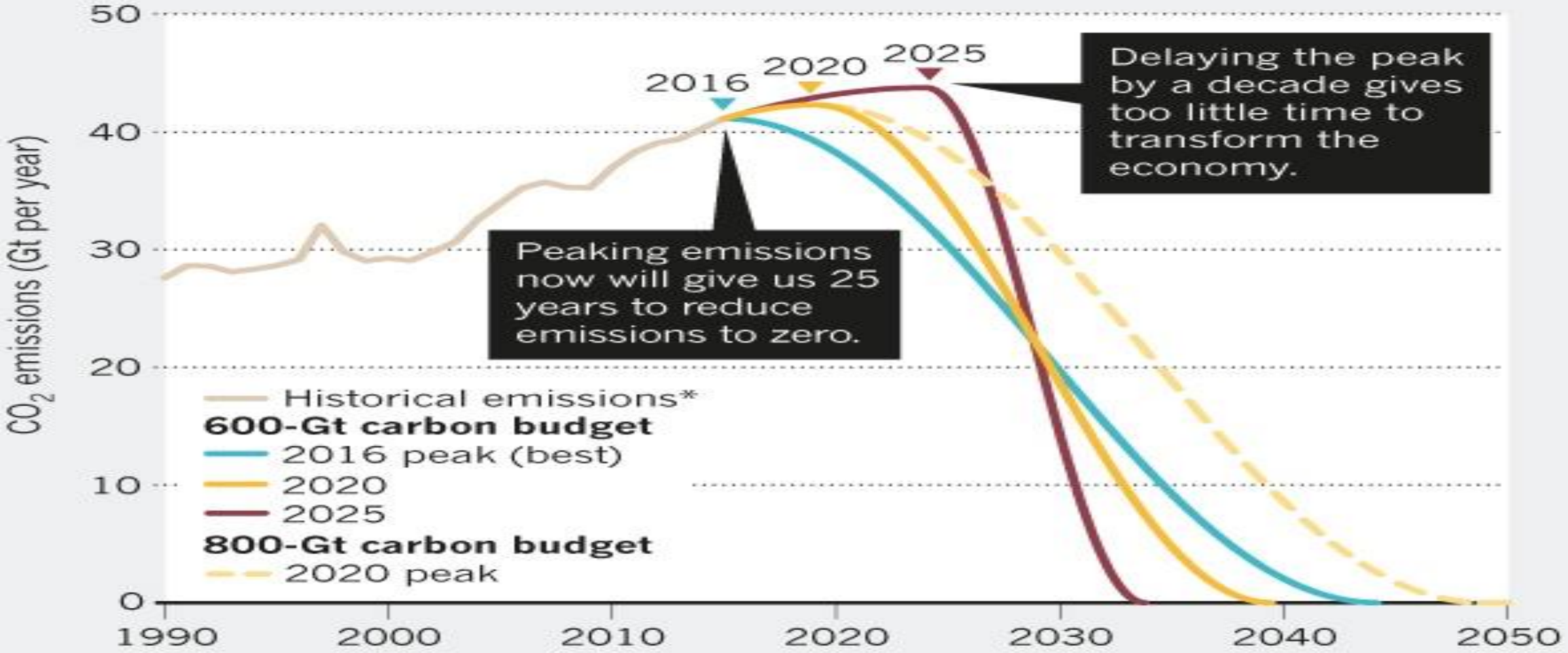
May 27, 2021

C. Figueres, et al, 2017, *Nature*

CARBON CRUNCH

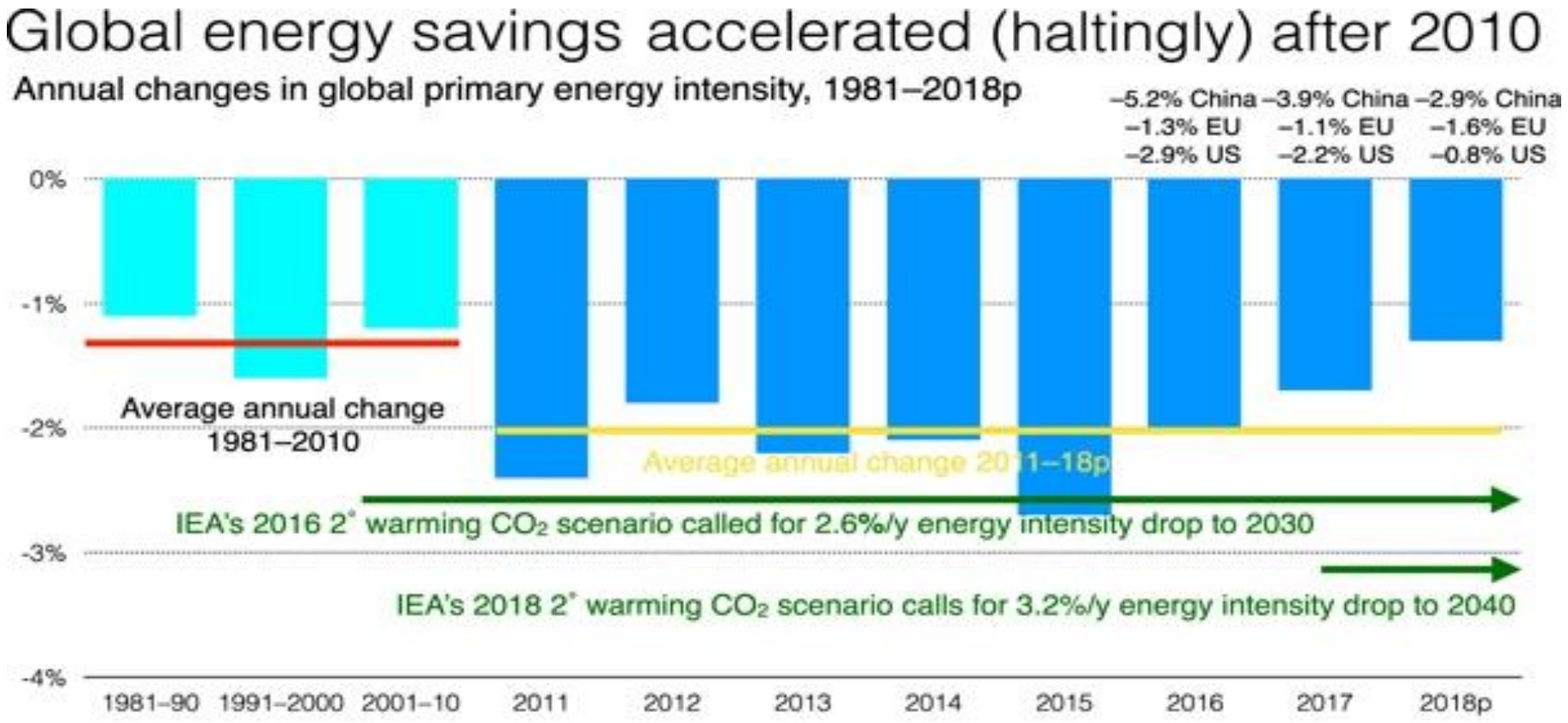
There is a mean budget of around 600 gigatonnes (Gt) of carbon dioxide left to emit before the planet warms dangerously, by more than 1.5–2°C. Stretching the budget to 800 Gt buys another 10 years, but at a greater risk of exceeding the temperature limit.



©nature

*Data from The Global Carbon Project.

The Green Energy Economy



"Recalibrating climate prospects"
Lovins, Ürge-Vorsatz, Mundaca, Kammen & Glassman
Environ. Res. Lett. 14, 120201 (2019)
doi:10.1088/1748-9326/ab55ab

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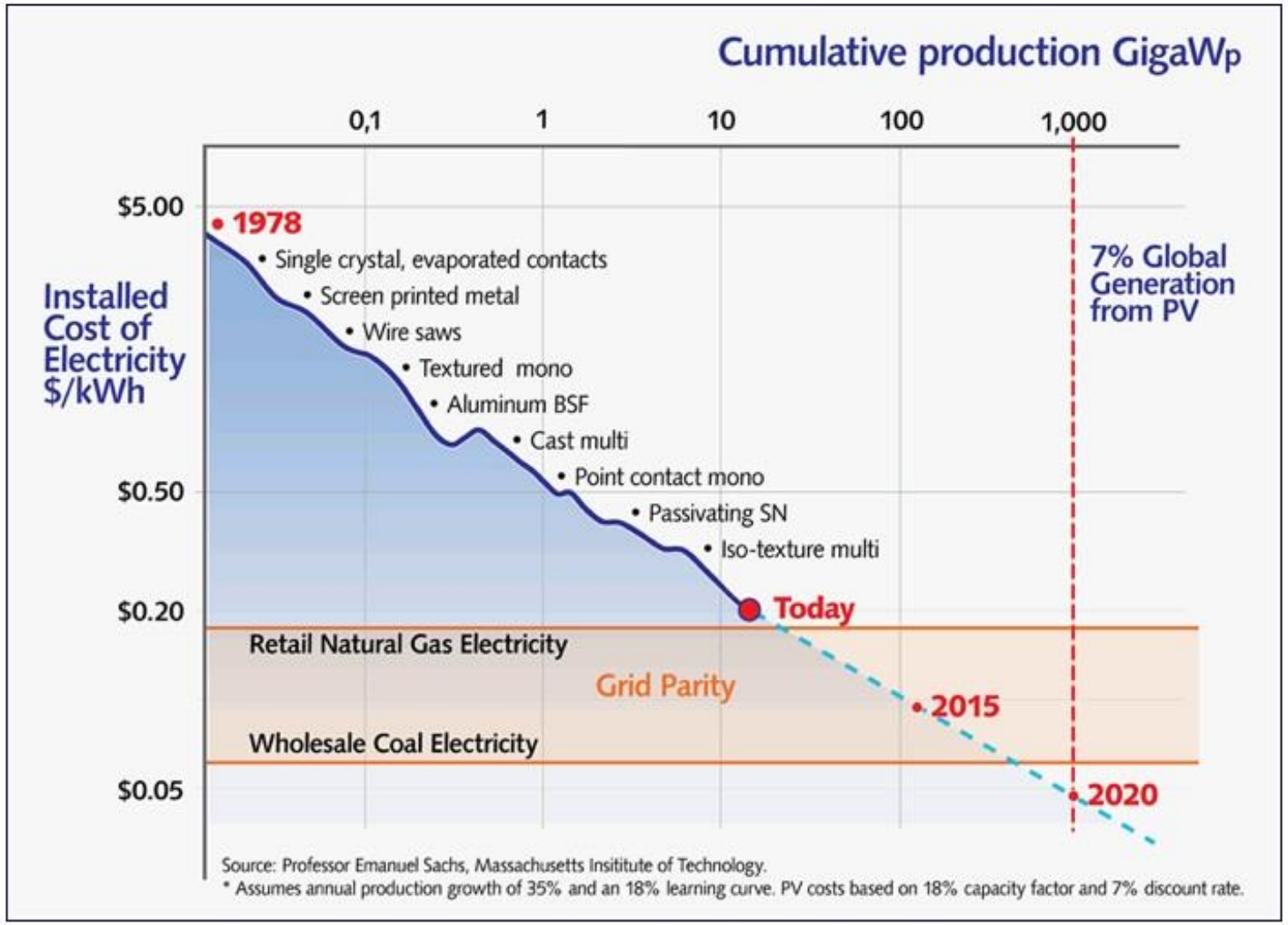
The Learning Curve

Swanson's Law

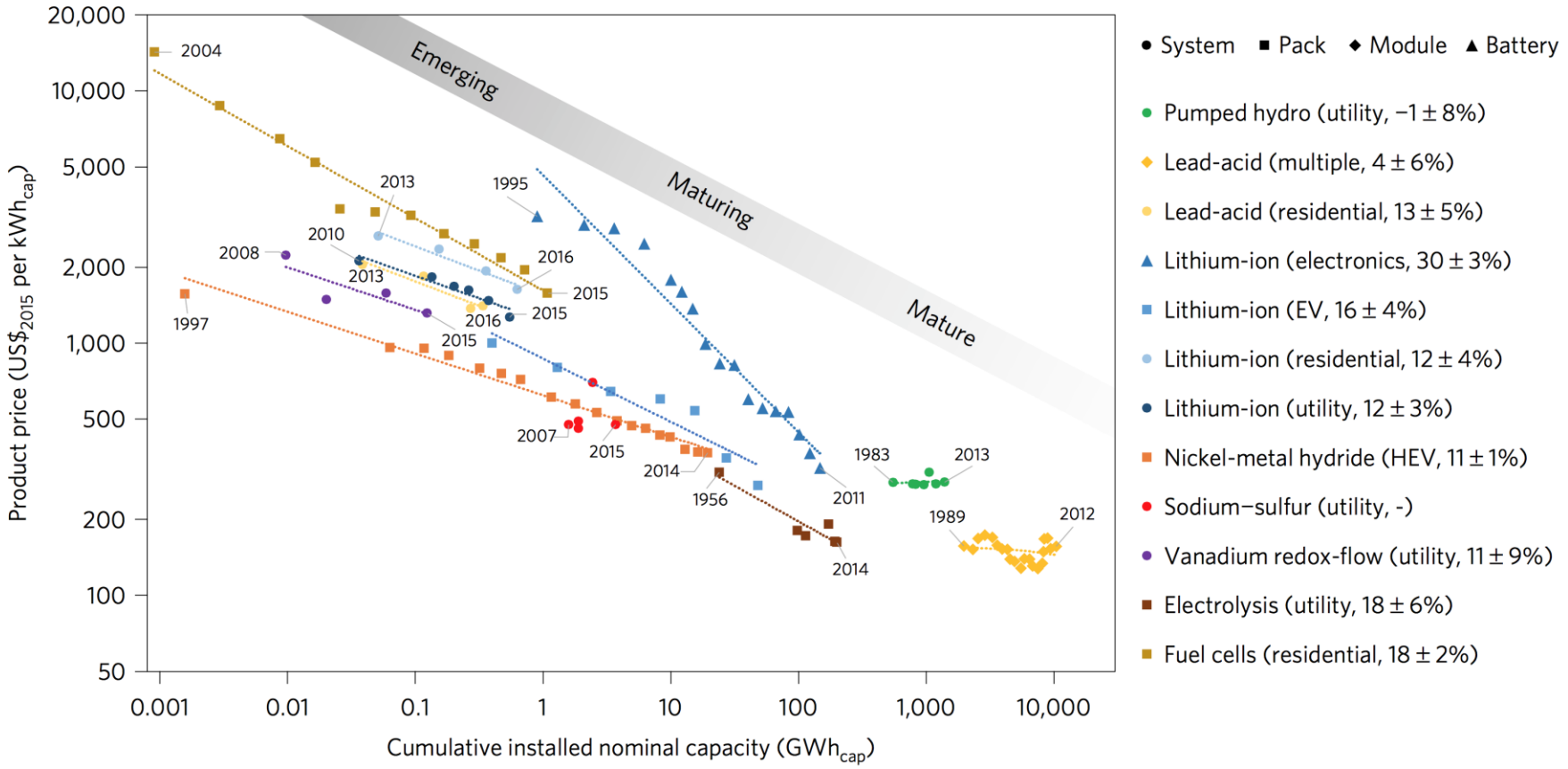
"Moore's Law"

$$\frac{C_2}{C_1} = \left(\frac{V_2}{V_1}\right)^{-b}$$



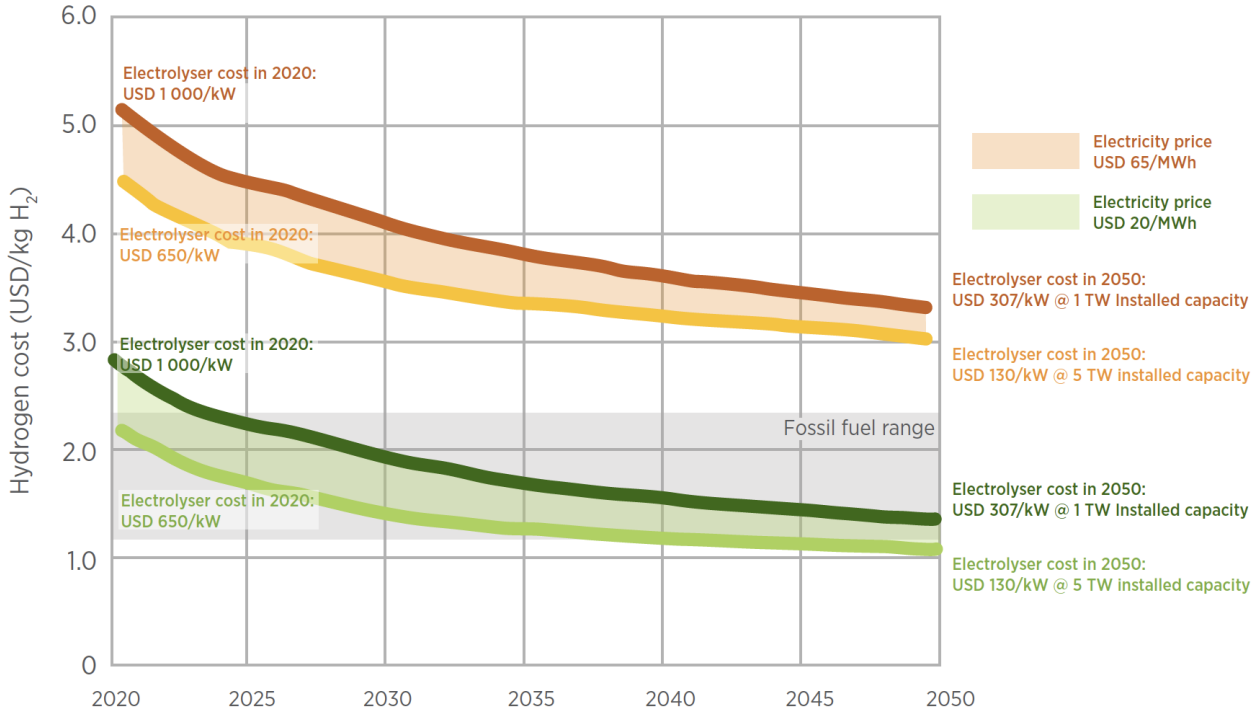
Source: Professor Emanuel Sachs, Massachusetts Institute of Technology.
*Assumes annual production growth of 35% and an 18% learning curve. PV costs based on 18% capacity factor and 7% discount rate.

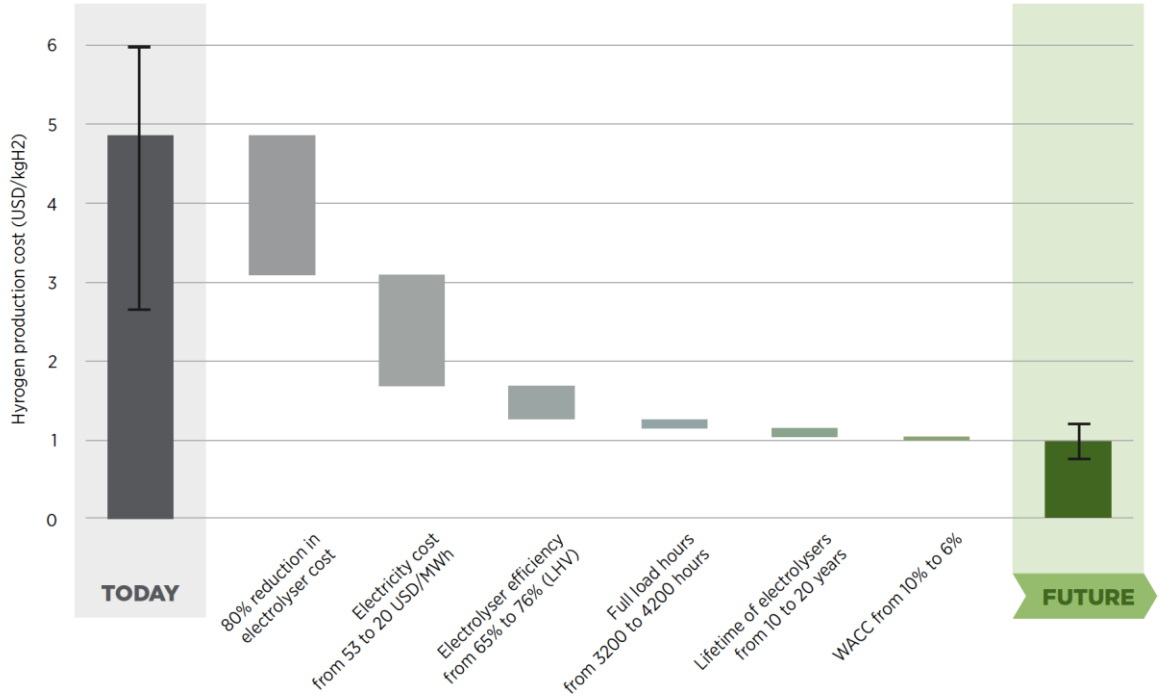
Materials Science for Storage Innovation



Data from: Schmidt, O., Hawkes, A., Gambhir, A., & Staffell, I. (2017). The future cost of electrical energy storage based on experience rates. *Nature Energy, 2,* 2017110. Qiu, Y., & Anadon, L. D. (2012). The price of wind power in China during its expansion: Technology adoption, learning-by-doing, economies of scale, and manufacturing localization. *Energy Economics*, *34*(3), 772-785. ;

The Hydrogen Innovation Potential





IRENA (2020), Green Hydrogen Cost Reduction: Scaling up Electrolysers to Meet the 1.5ºC Climate Goal, International Renewable Energy Agency, Abu Dhabi. ISBN: 978-92-9260-295-6

Iron-Chromium Flow Battery + PV in the California Energy / Storage Market

EnerVault Iron-Chromium Technology
1 MW-hr capacity at 250 kW (4 hour duration)
Turlock, CA

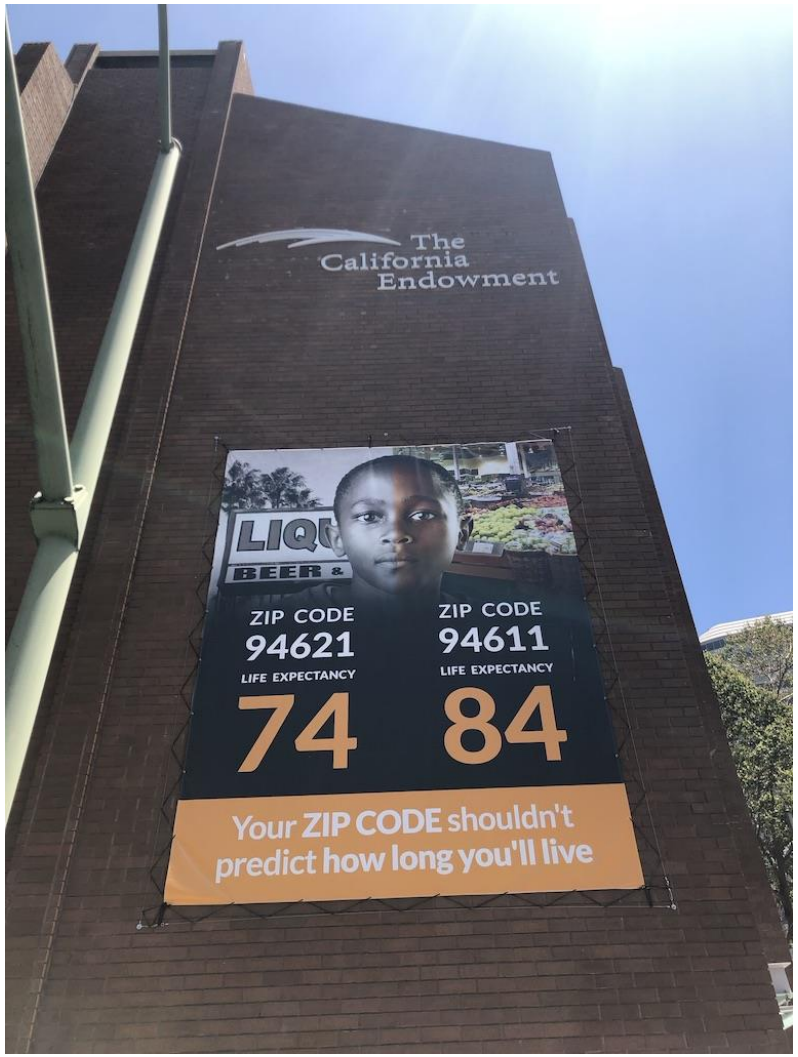
2014: Storage capacity mandate (for 2020) launched, CA AB 2514
2020: CA meets 1.2 GW (2%) mandate
2021: Moss Landing storage facility will exceed entire 2020 mandate

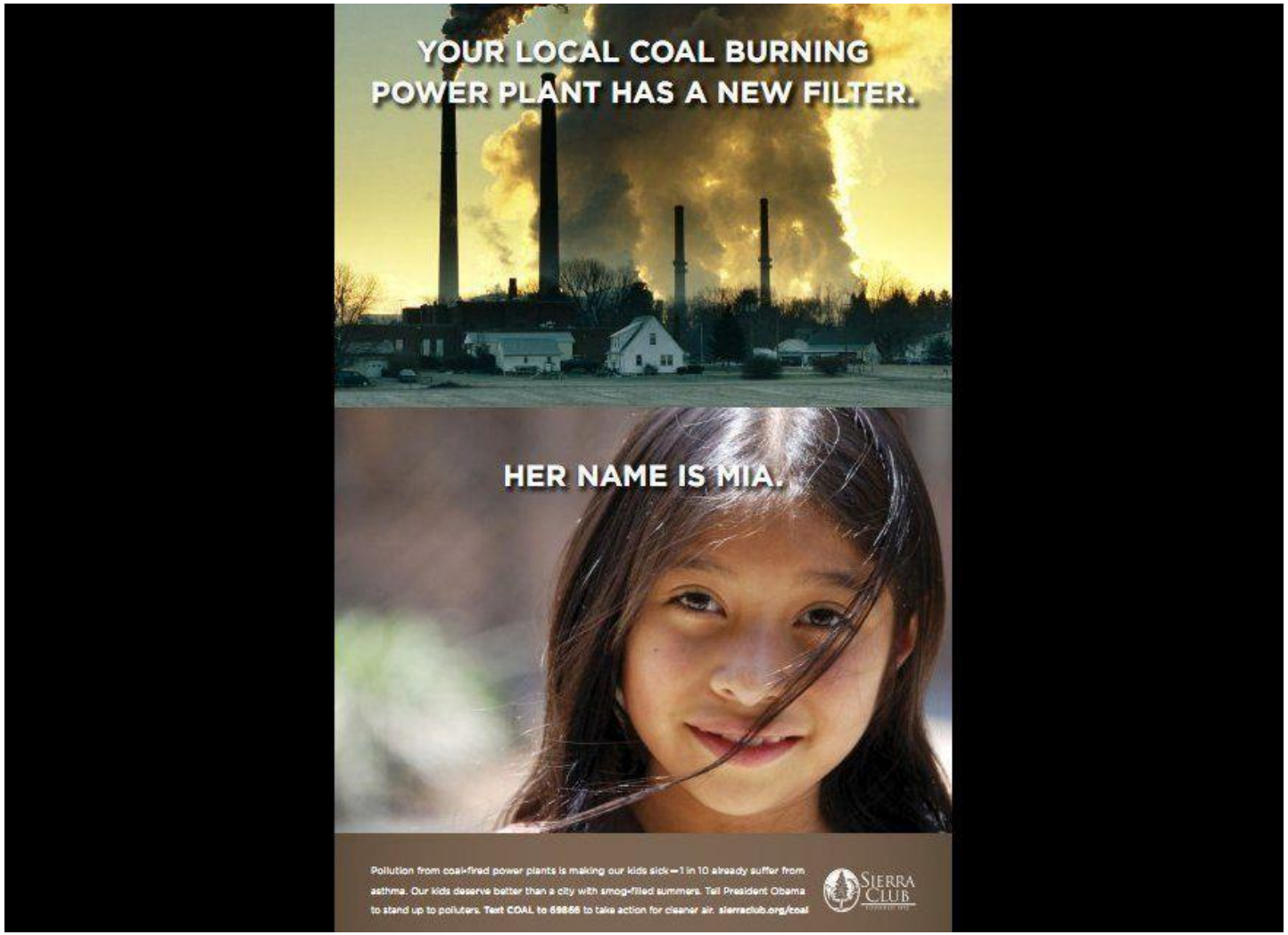
California Energy Efficiency & Solar Policy Drives Innovation

Residential Construction

Zero net energy after January 1, 2020

The demography of discrimination





http://burycoal.com/blog/2011/09/27/sierra-club-new-filter-ads/

nature sustainability

ANALYSIS

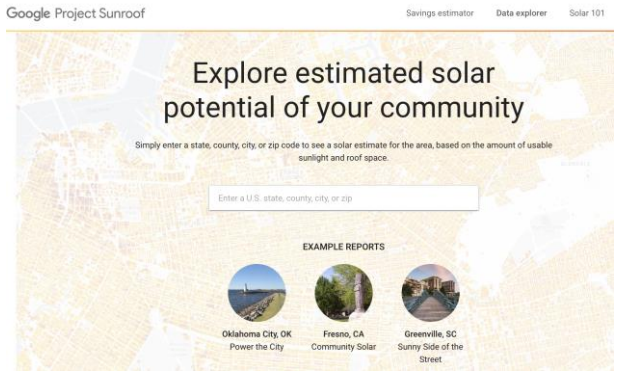
https://doi.org/10.1038/s41893-018-0204-z

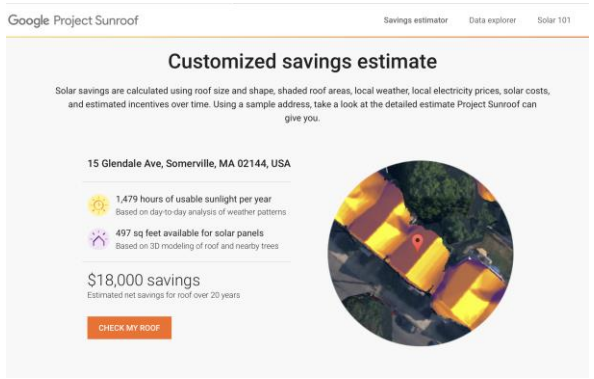
Disparities in rooftop photovoltaics deployment in the United States by race and ethnicity

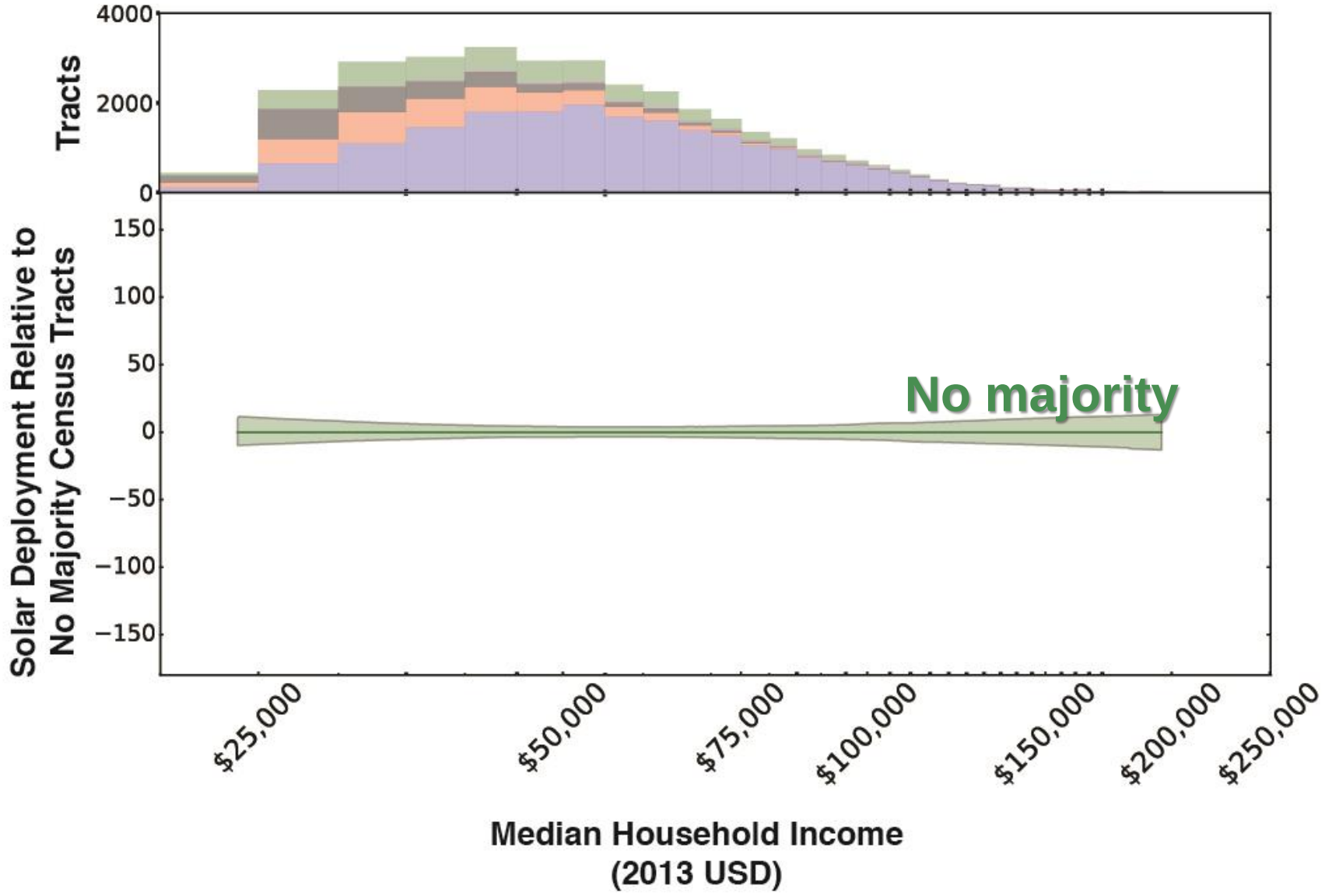
Deborah A. Sunter [1,2,3,4*], Sergio Castellanos [3,4,5,6*] and Daniel M. Kammen [3,4,7]

The rooftop solar industry in the United States has experienced dramatic growth—roughly 50% per year since 2012, along with steadily falling prices. Although the opportunities this affords for clean, reliable power are transformative, the benefits might not accrue to all individuals and communities. Combining the location of existing and potential sites for rooftop photovoltaics (PV) from Google's Project Sunroof and demographic information from the American Community Survey, the relative adoption of rooftop PV is compared across census tracts grouped by racial and ethnic majority. Black- and Hispanic-majority census tracts show on average significantly less rooftop PV installed. This disparity is often attributed to racial and ethnic differences in household income and home ownership. In this study, significant racial disparity remains even after we account for these differences. For the same median household income, black- and Hispanic-majority census tracts have installed less rooftop PV compared with no-majority tracts by 69 and 30%, respectively, while white-majority census tracts have installed 21% more. When correcting for home ownership, black- and Hispanic-majority census tracts have installed less rooftop PV compared with no-majority tracts by 61 and 45%, respectively, while white-majority census tracts have installed 37% more.

Google's Sunroof: 60 million roofs:







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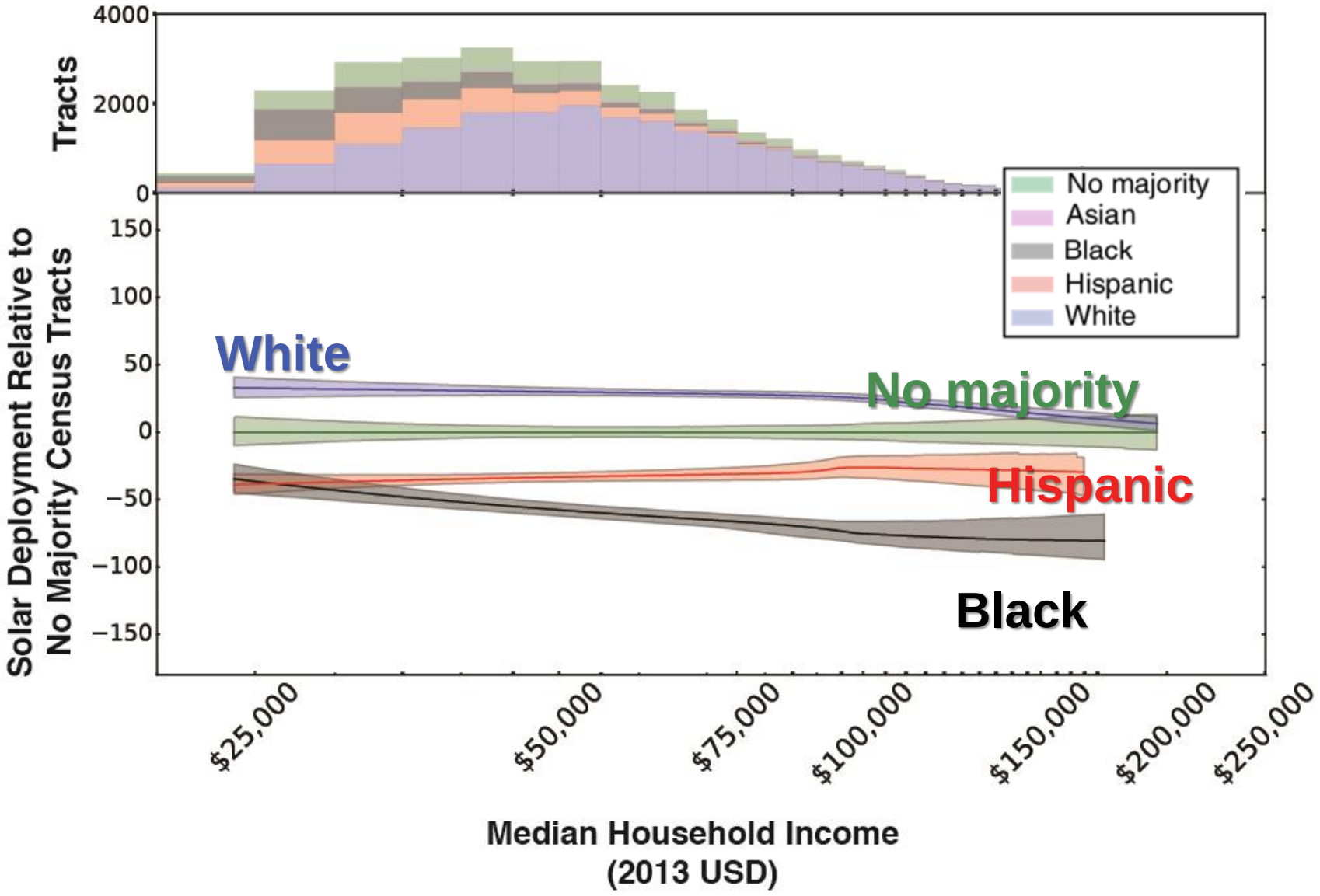
Summary:

Across income levels, solar is:

- 30% more likely in majority White communities
- 30%+ less likely in majority Hispanic communities
- 60%+ less likely in majority Black communities



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Many opportunities to integrate climate & social justice

The New York Times

Opinion

Why Housing Policy Is Climate Policy

In California, where home prices are pushing people farther from their jobs, rising traffic is creating more pollution.

By Scott Wiener and Daniel Kammen

Senator Wiener is the chairman of the California Senate's Housing Committee. Dr. Kammen is a professor of energy at the University of California, Berkeley.

March 25, 2019

https://www.nytimes.com/2019/03/25/opinion/california-home-prices-climate.html

San Francisco Chronicle

WILDFIRES VIRUS LOCAL FOOD ELECTION SPORTING GREEN BIZ+TECH CULTURE DATEB

OPINION

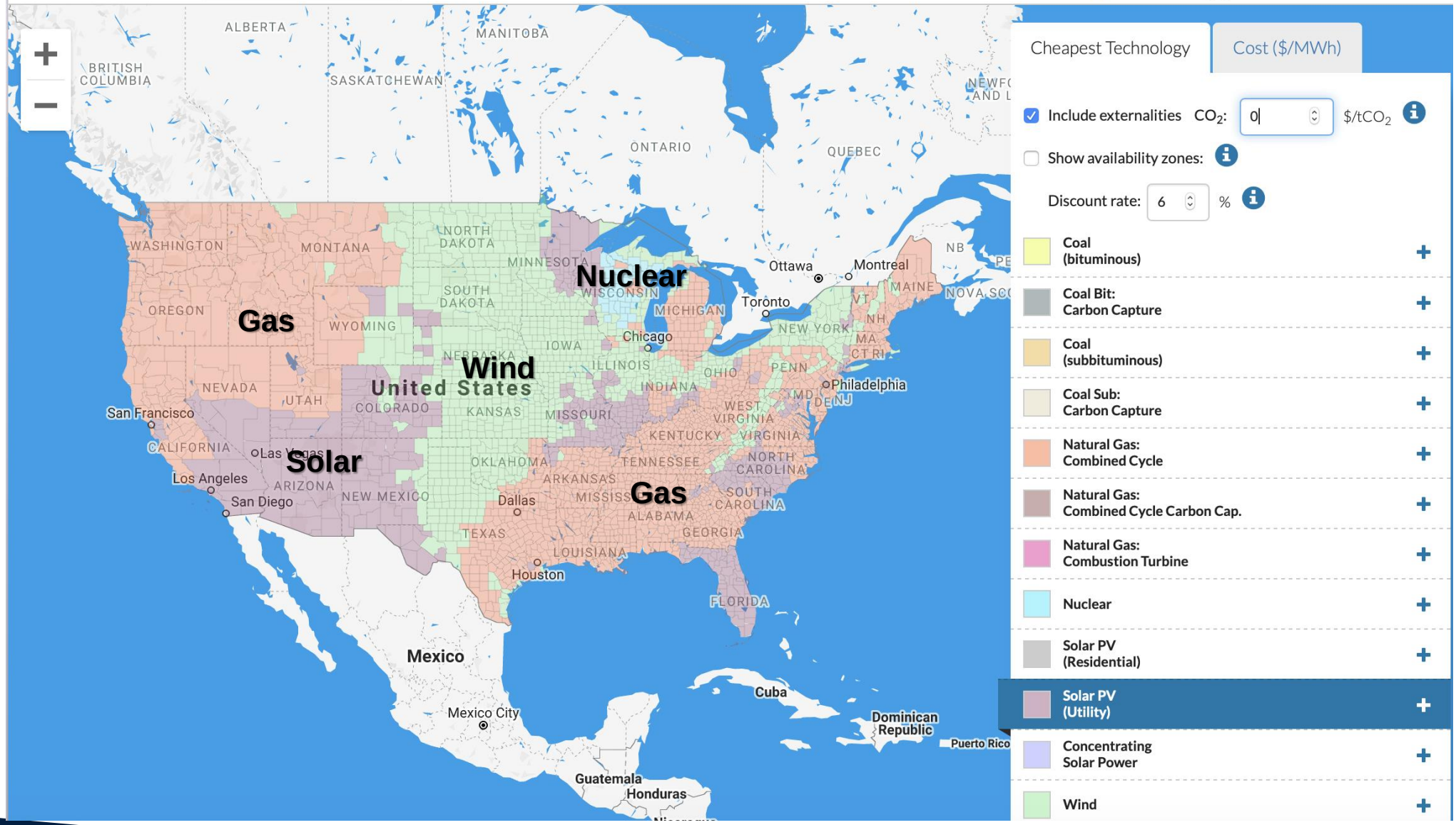
How electric vehicles can help advance social justice

By Daniel Kammen | June 21, 2020 | Updated: June 22, 2020 6:21 p.m.

https://www.sfchronicle.com/opinion/article/How-electric-vehicles-can-help-advance-social-15351293.php

Overnight Energy costs:

$0/tCO$_2$



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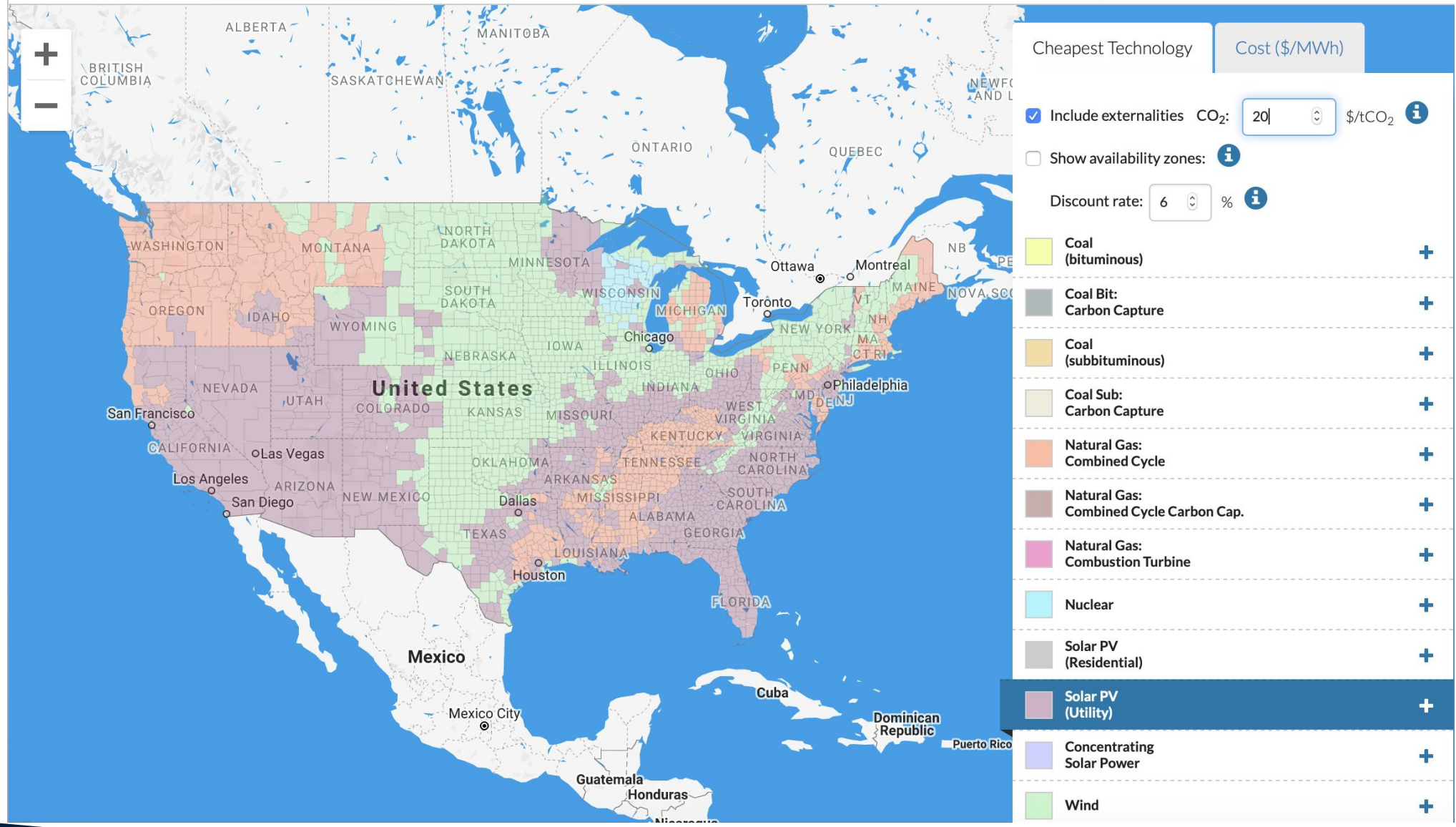
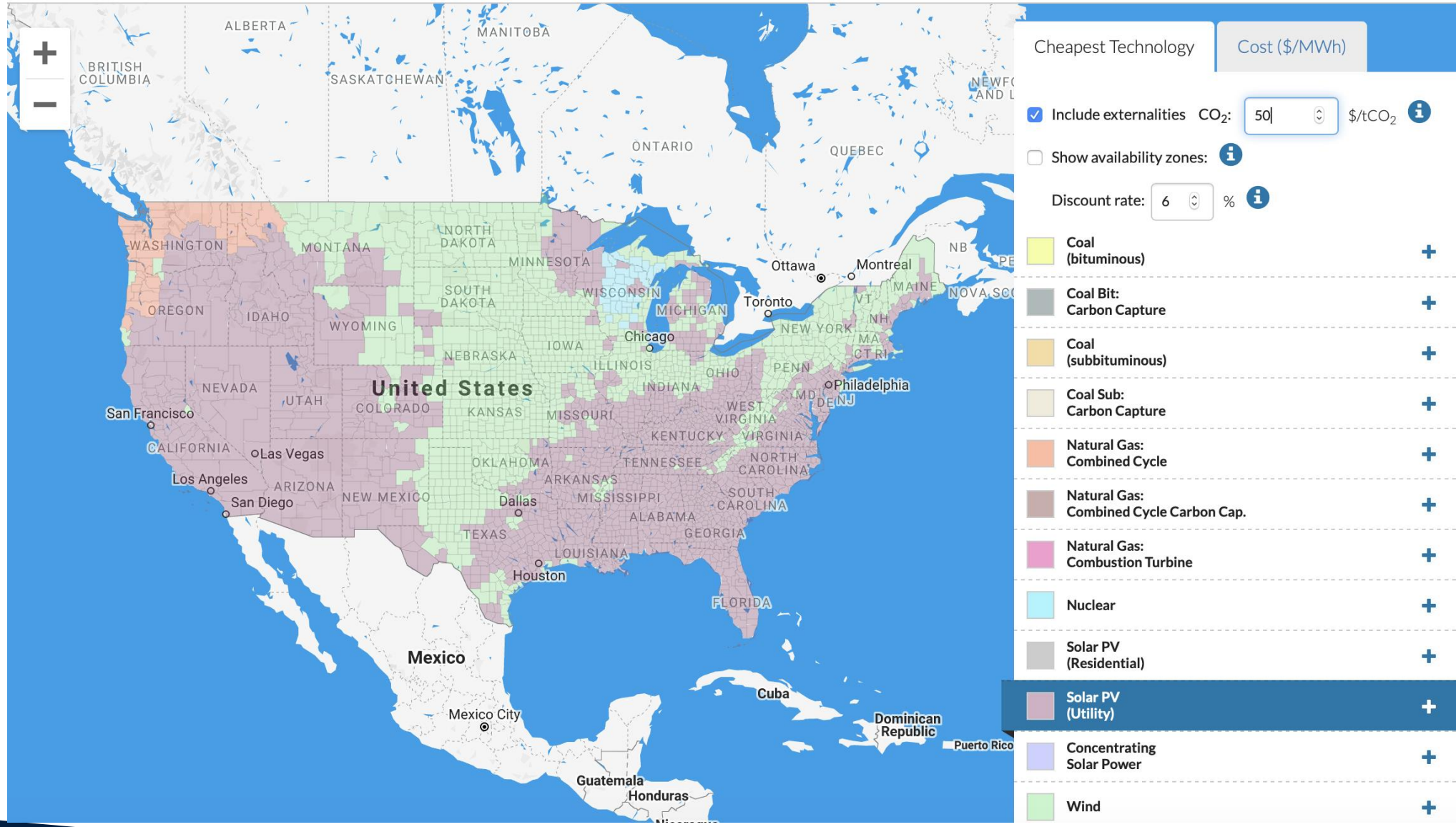
California & Quebec:

$20/tCO$_2$



Social Cost of Carbon:

$50/tCO$_2$



The social cost of carbon now in use in the USA

THE WHITE HOUSE

BRIEFING ROOM

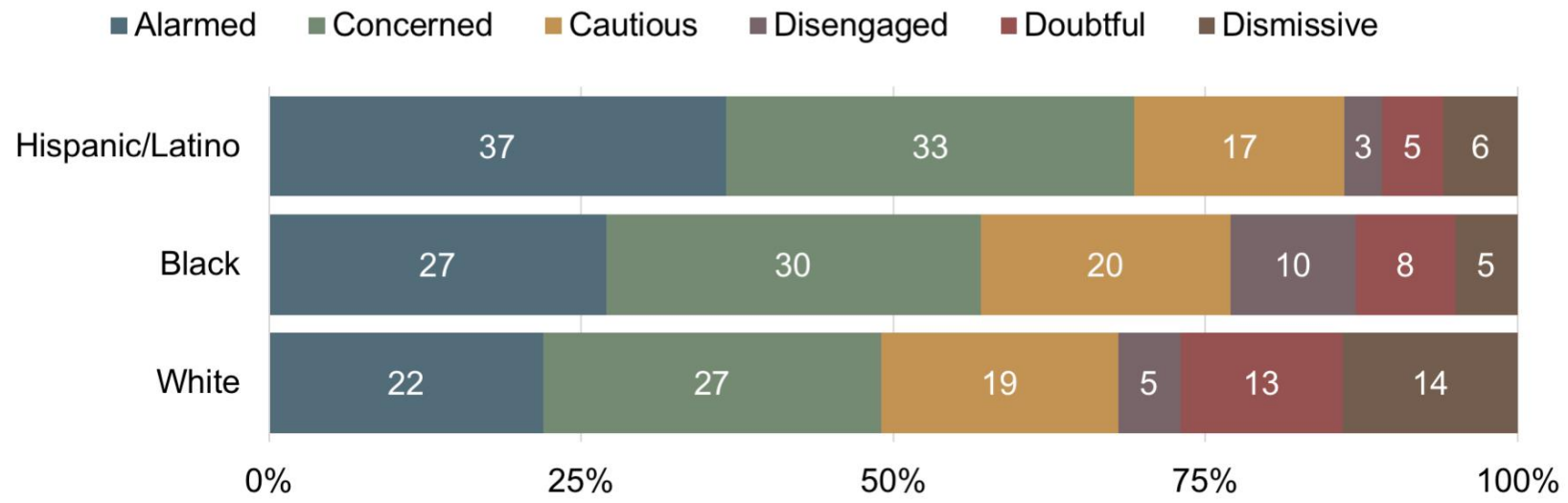
Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis

JANUARY 20, 2021 • PRESIDENTIAL ACTIONS

Sec. 5. Accounting for the Benefits of Reducing Climate Pollution. (a) It is essential that agencies capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account. Doing so facilitates sound decision-making, recognizes the breadth of climate impacts, and supports the international leadership of the United States on climate issues. The "social cost of carbon" (SCC), "social cost of nitrous oxide" (SCN), and "social cost of methane" (SCM) are estimates of the monetized damages associated with incremental increases in greenhouse gas emissions. They are intended to include changes in net agricultural productivity, human health, property damage from increased flood risk, and the value of ecosystem services. An accurate social cost is essential for agencies to accurately determine the social benefits of reducing greenhouse gas emissions when conducting cost-benefit analyses of regulatory and other actions.

Who Cares?

Hispanic/Latino and Black Americans are more likely to be Alarmed or Concerned about global warming than are Whites



Global Warming's Six Americas

April 2019, November 2019. Base: 2,386 U.S. adults
(White *n* = 1,833; Hispanic/Latino *n* = 304; Black *n* = 249)

YALE PROGRAM ON Climate Change Communication

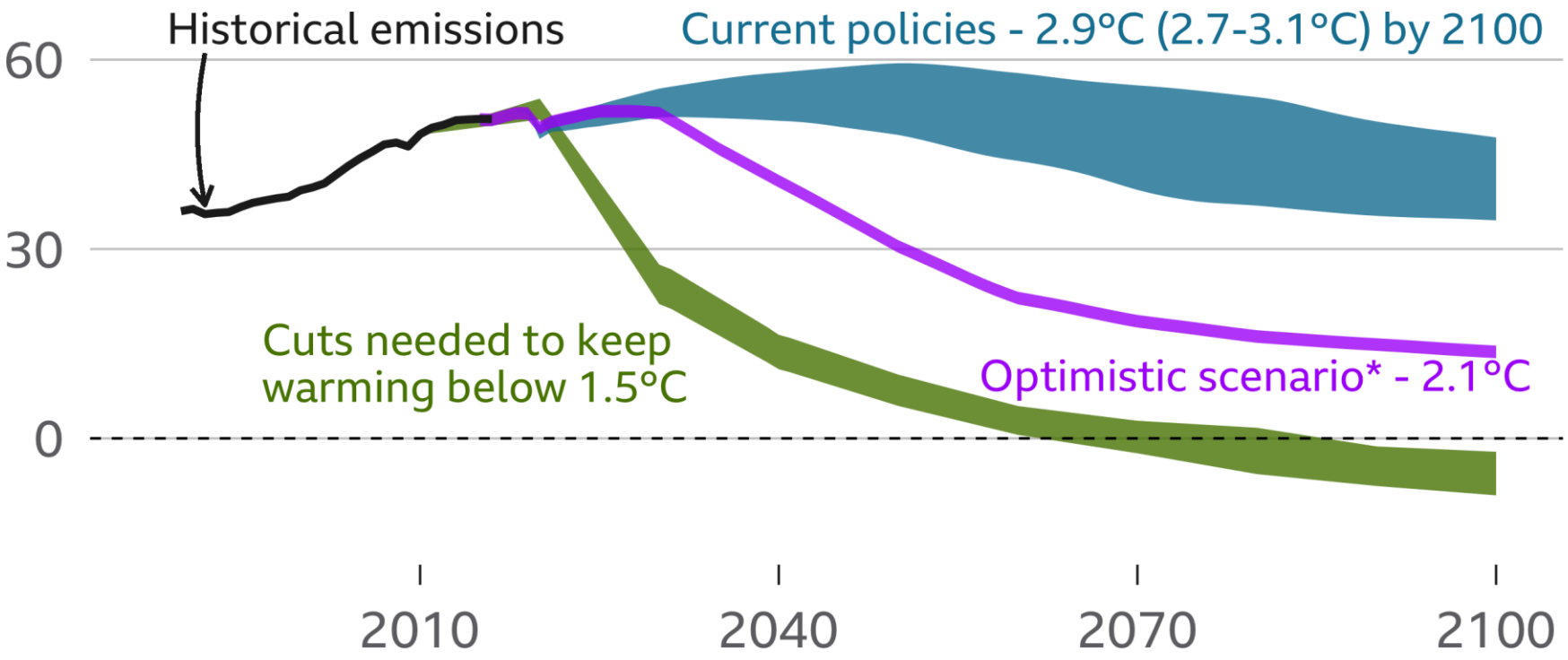
GEORGE MASON UNIVERSITY CENTER *for* CLIMATE CHANGE COMMUNICATION

https://climatecommunication.yale.edu/publications/race-and-climate-change/

Ballew, M., Maibach, E., Kotcher, J., Bergquist, P., Rosenthal, S., Marlon, J., and Leiserowitz, A. (2020). *Which racial/ethnic groups care most about climate change?*. Yale University and George Mason University. New Haven, CT: Yale Program on Climate Change Communication.

Greenhouse gas emissions projections

Gigatonnes of global CO2 equivalent emissions per year



*Based on new long term promises by China, US, EU and others

Source: Climate Action Tracker

BBC