



Renewable & Appropriate Energy Laboratory

RAEL

The Just Energy and Climate Transition in California

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To access materials presented today:

<http://rael.berkeley.edu>



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OPINION // OPEN FORUM

Carbon neutral isn't good enough. California needs to be carbon negative by 2030

Daniel Kammen and Manuel Pastor

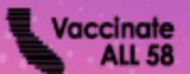
July 30, 2021 | Updated: July 31, 2021 4 a.m.



COVID-19 vaccines
ARE SAFE
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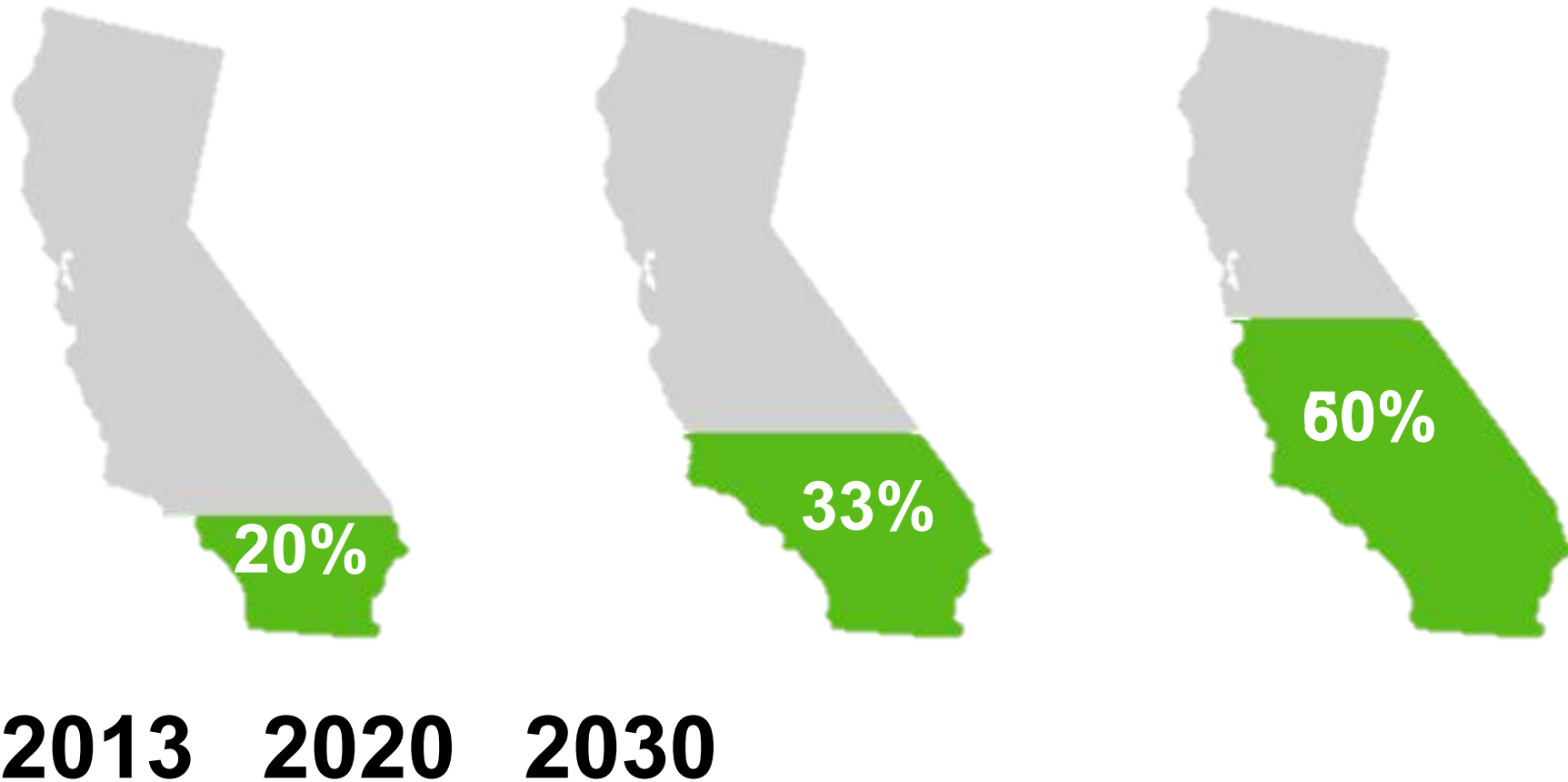
They have been proven to help **PROTECT YOUTH 12+.**

LEARN MORE



California Energy & Environmental Justice Path

35% of Carbon Cap & Trade Funds for Under-Served Communities



California Senate Bill 100: 100% clean energy by 2045 and 2030 standard now 60% (without nuclear or large hydro)

California Energy Efficiency & Solar Policy Drives Innovation

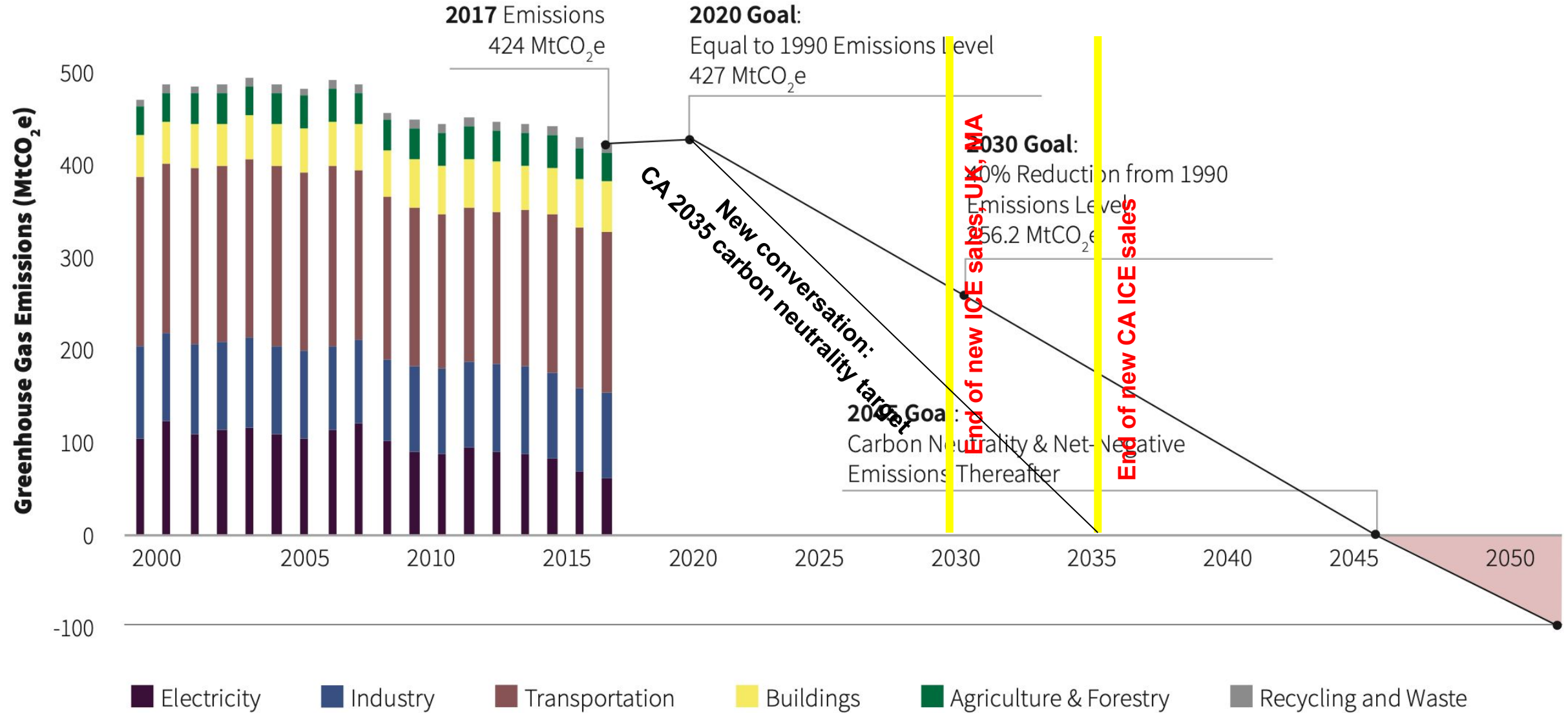


Residential Construction

Zero net energy after January 1, 2020



CALIFORNIA'S HISTORIC EMISSIONS & FUTURE EMISSION REDUCTION TARGETS



California has already met its 2020 emission reduction target; however, it has increasingly stringent goals in 2030 and by midcentury that require additional technologies, policies, and decarbonization solutions. *Source: Energy Futures Initiative and Stanford University, 2020.*

The SWITCH Modeling Framework

<http://rael.Berkeley.edu/project/SWITCH>

Dispatch in 2030 for a Carbon Neutral California

Flexibility and variable renewables dominate

- Storage almost exclusively moves solar to the night
- Geothermal only remaining substantial baseload

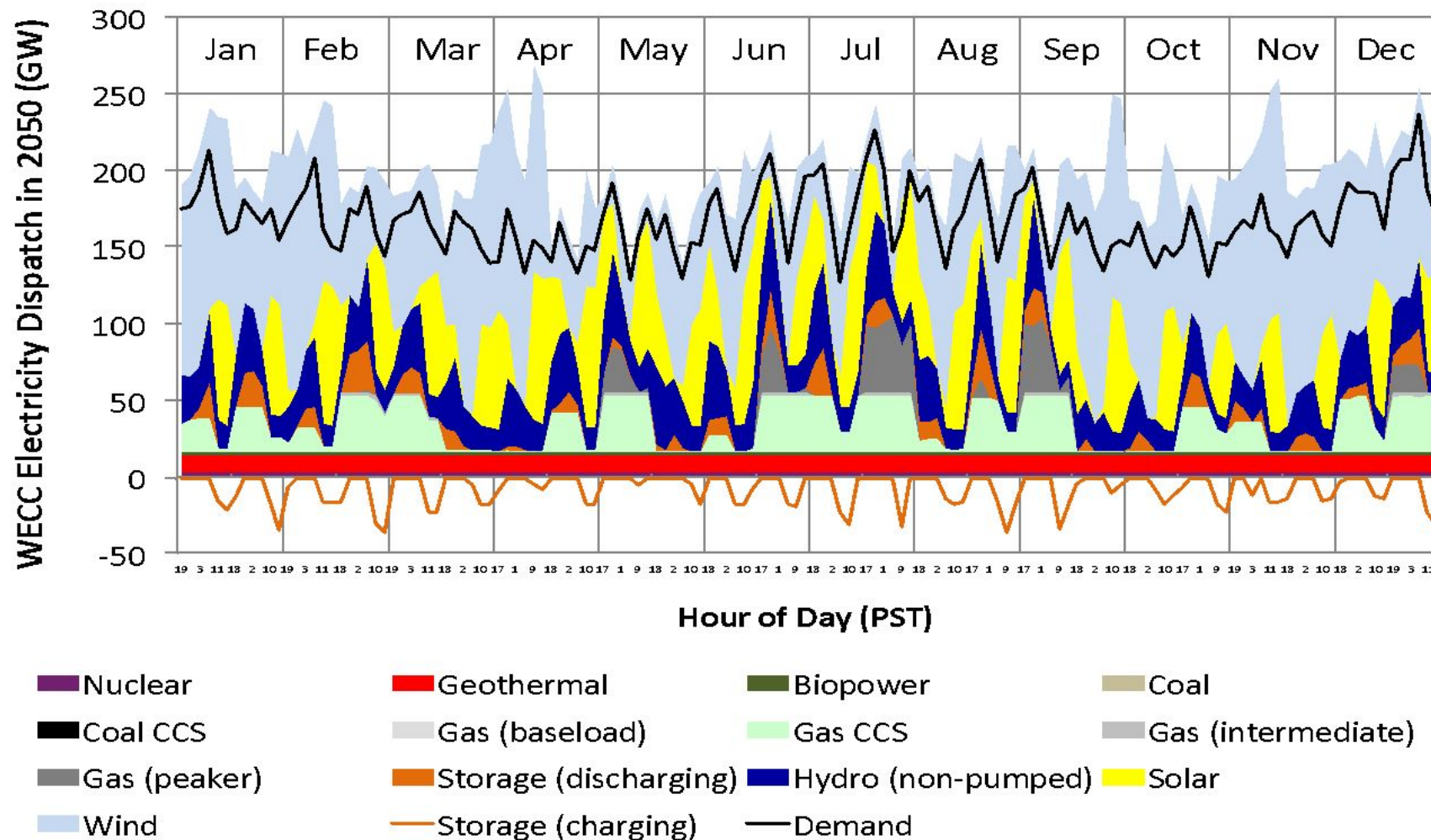
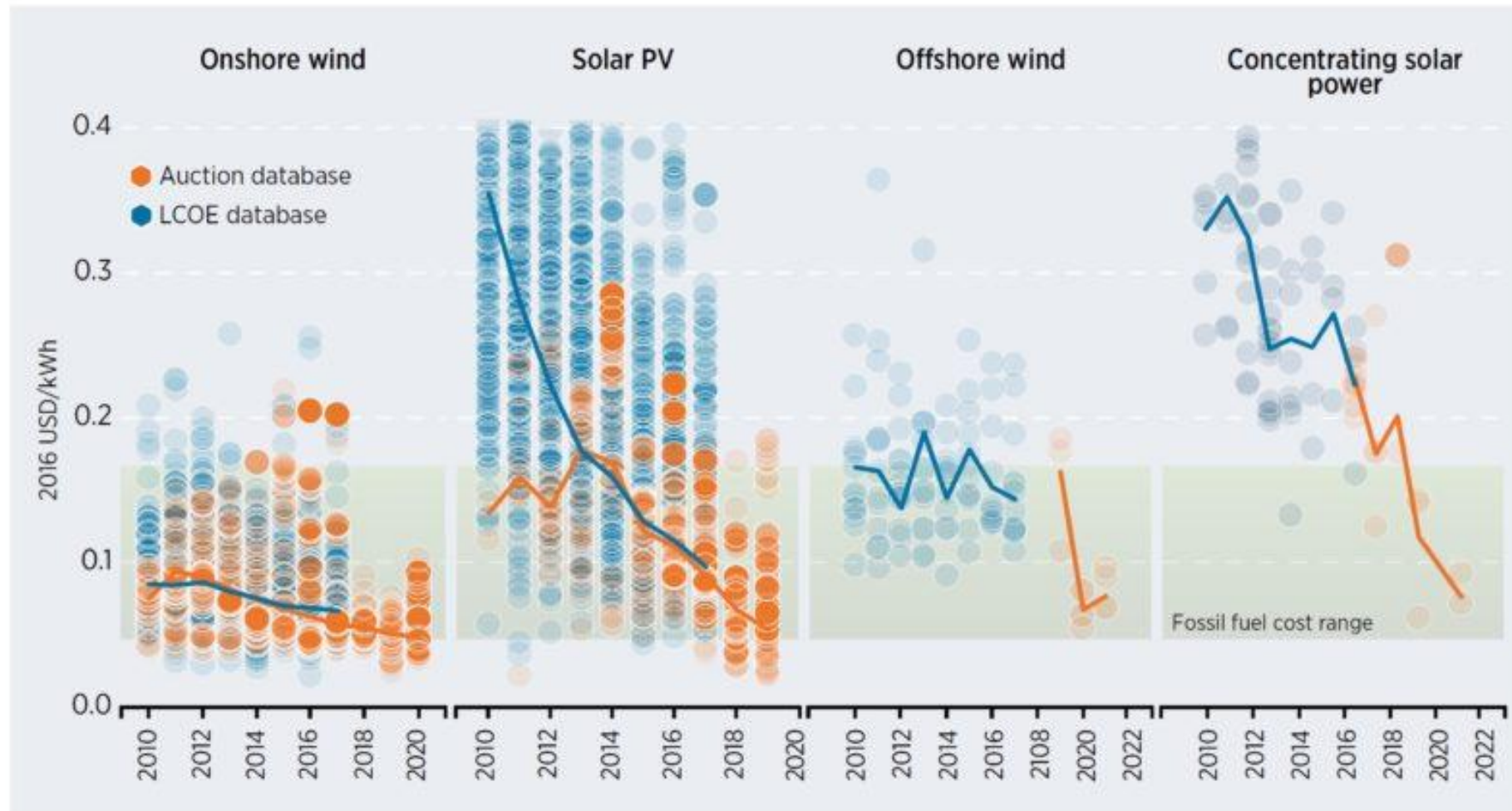


Figure ES.2 The levelised cost of electricity for projects and global weighted average values for CSP, solar PV, onshore and offshore wind, 2010-2022



It is now cheaper to build new solar and wind than to operate fossil fuel power plants.

<https://rameznaam.com/2019/04/02/the-third-phase-of-clean-energy-will-be-the-most-disruptive-yet/>

California sets new clean energy records

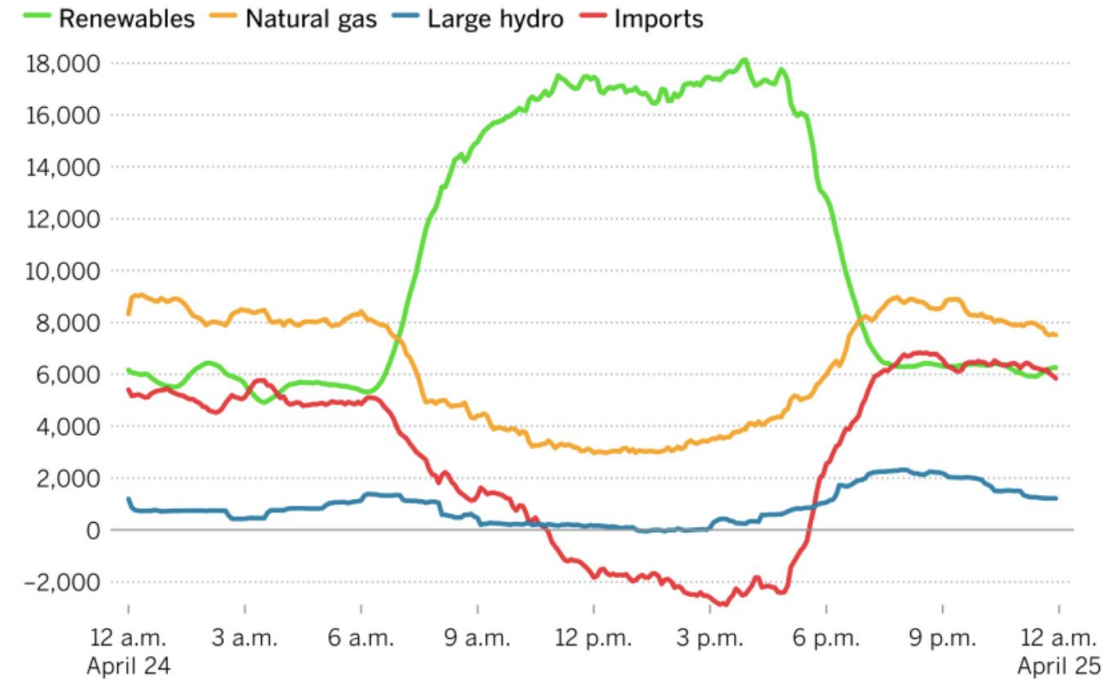
Los Angeles Times

California just hit 95% renewable energy.
Will other states come along for the ride?



California power supply, April 24

Megawatts



California Independent System Operator

Today's Outlook AS OF 11:00 04/29/2021



22,507 MW
Current demand



29,026 MW
Forecasted peak



15,257 MW
Current renewables



68%
Renewables serving load



California Actions



What is the California Climate Credit?

A Message from the California Public Utilities Commission

This October* your electric bill will include a credit identified as the "California Climate Credit." Your household and millions of others throughout the state will receive this credit on your utility bills.

The California Climate Credit is part of California's efforts to fight climate change. This credit is from a state program that requires power plants, natural gas providers, and other large industries that emit greenhouse gases to buy carbon pollution permits. The credit on your bill is your share of the payments from the State's program.

The Proposed NEM Structure:

- Prioritizes **solar + storage**
- \$600+ million Social Justice Fund

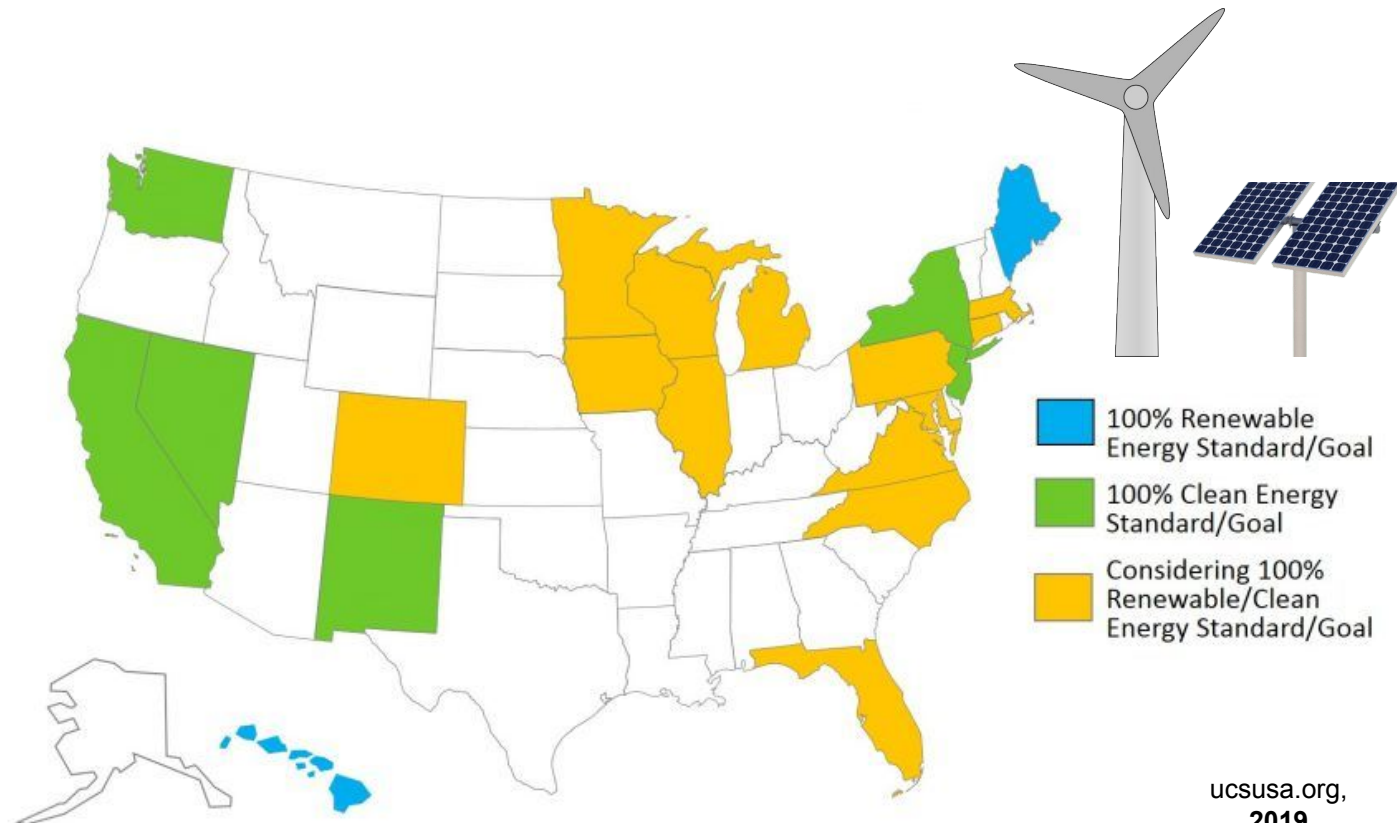
Overall:

The California PUC's proposed new structure for rooftop solar compensation strikes a reasonable balance among some fiercely opposed business interests, keeping in mind first and foremost the public interest in an affordable clean energy transition.

Several that have mandated 100% carbon-free electricity systems by midcentury.

California - SB 100.
Washington - SB 5116.
New Mexico - SB 489.
Nevada - SB 358. (Goal)
New York - SB S6599.
Virginia - HB 1526.
Maine - LD 1494.
Hawaii - HB 623.
Puerto Rico - SB 1121.
D.C. - Law 22-257.

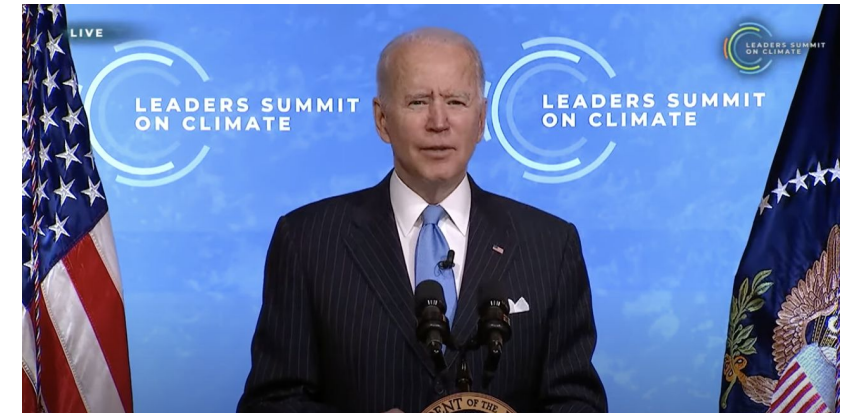
www.ncsl.org
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RE standards are arguably *not* the most interesting aspects of these standards: Environmental Justice Spending (CA, NY) are

California – At the April Climate Leaders Summit

GRID Alternatives CEO Erica Mackie on stage with President Biden, Sec. of Energy Granholm
Sec. Kerry, Domestic Climate Leader McCarthy
<https://www.youtube.com/watch?v=-wjkHVq1S9E>



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}

Q1 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.

Shenzhen Taxi Fleet Transformed to an EV Fleet



As of 2020: 95% EV taxi fleet in Shenzhen, China (29,000+ vehicles)

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

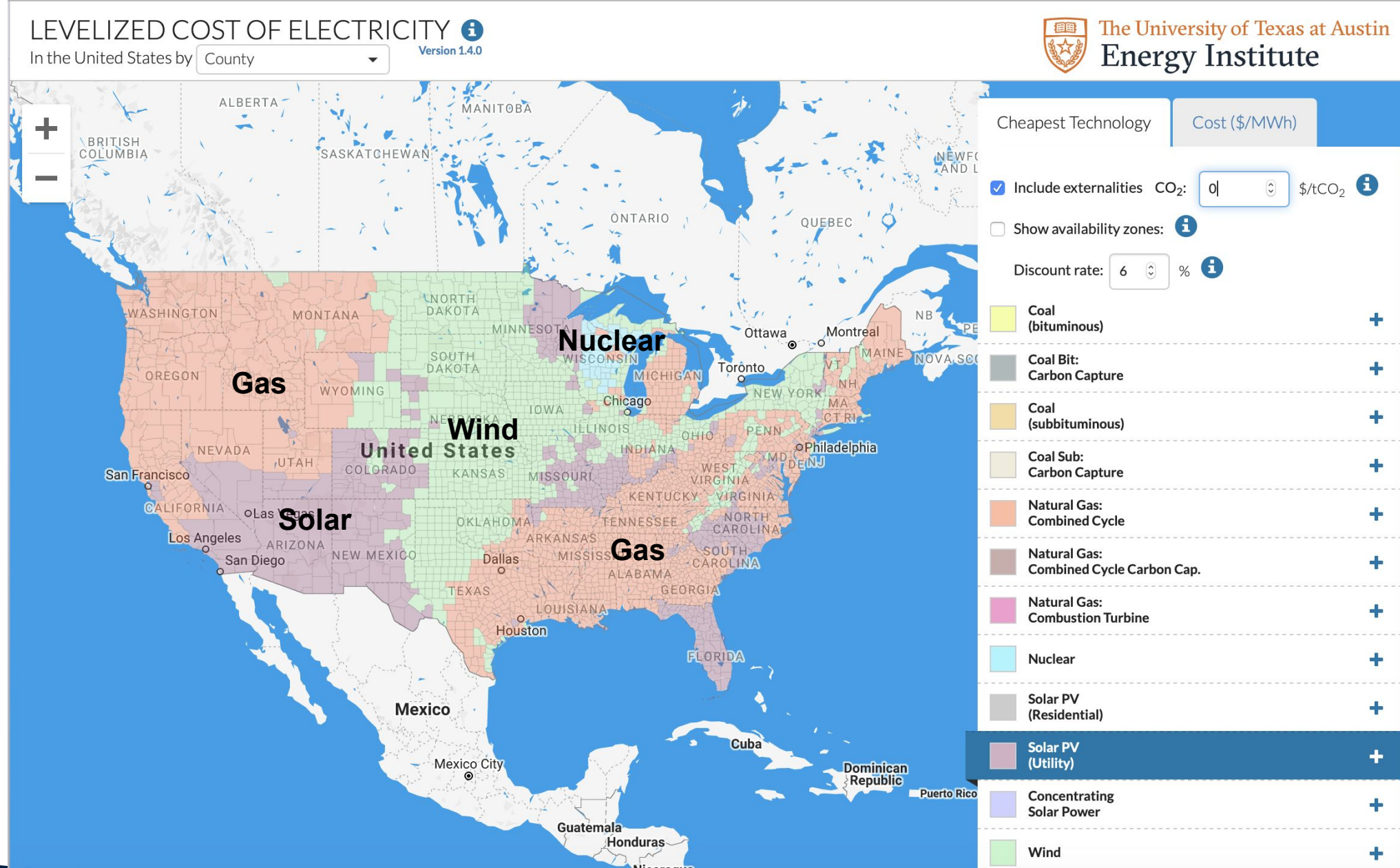
JANUARY 20, 2021 • PRESIDENTIAL ACTIONS

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.



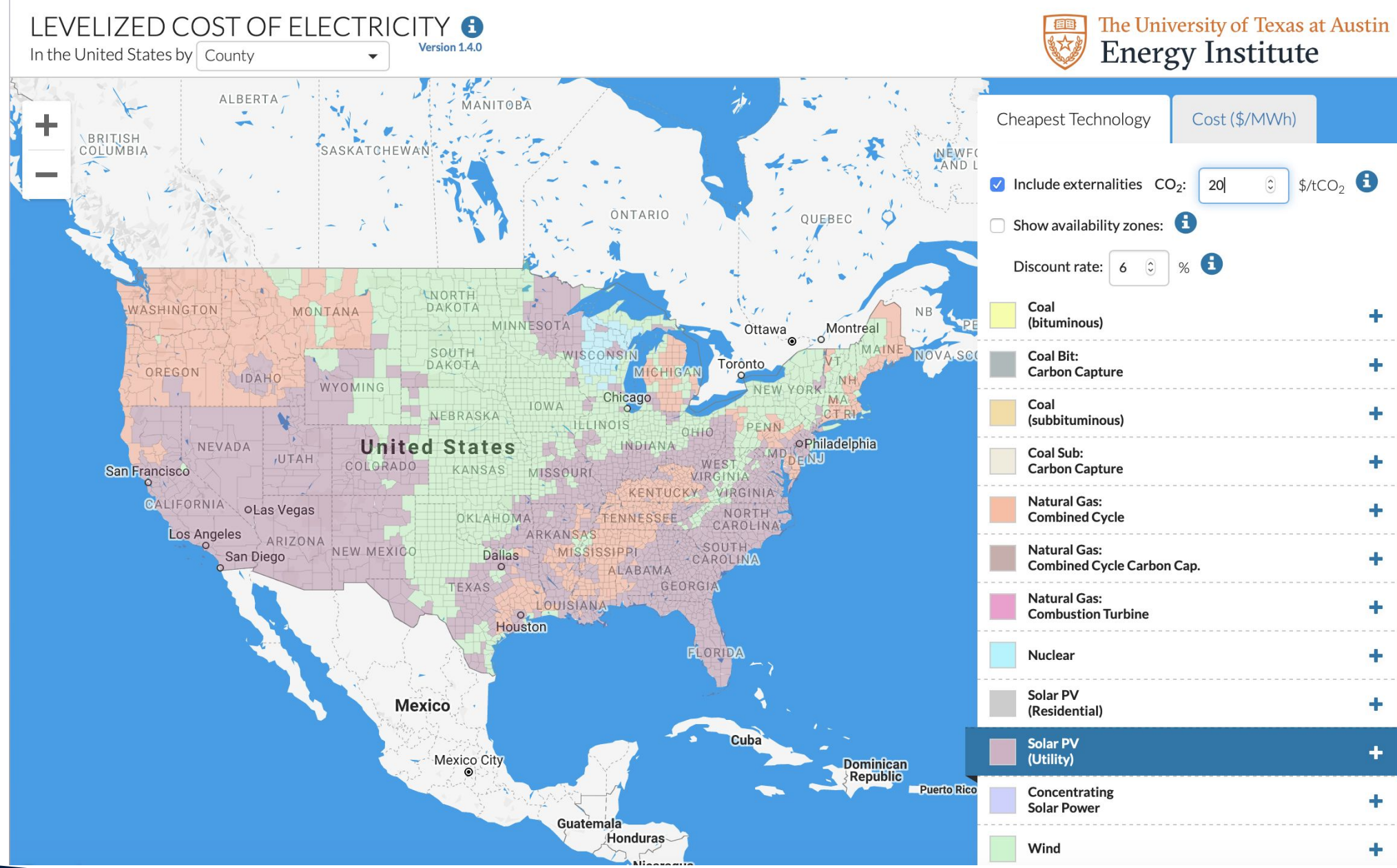
Overnight
Energy costs:

$\$0/\text{tCO}_2$



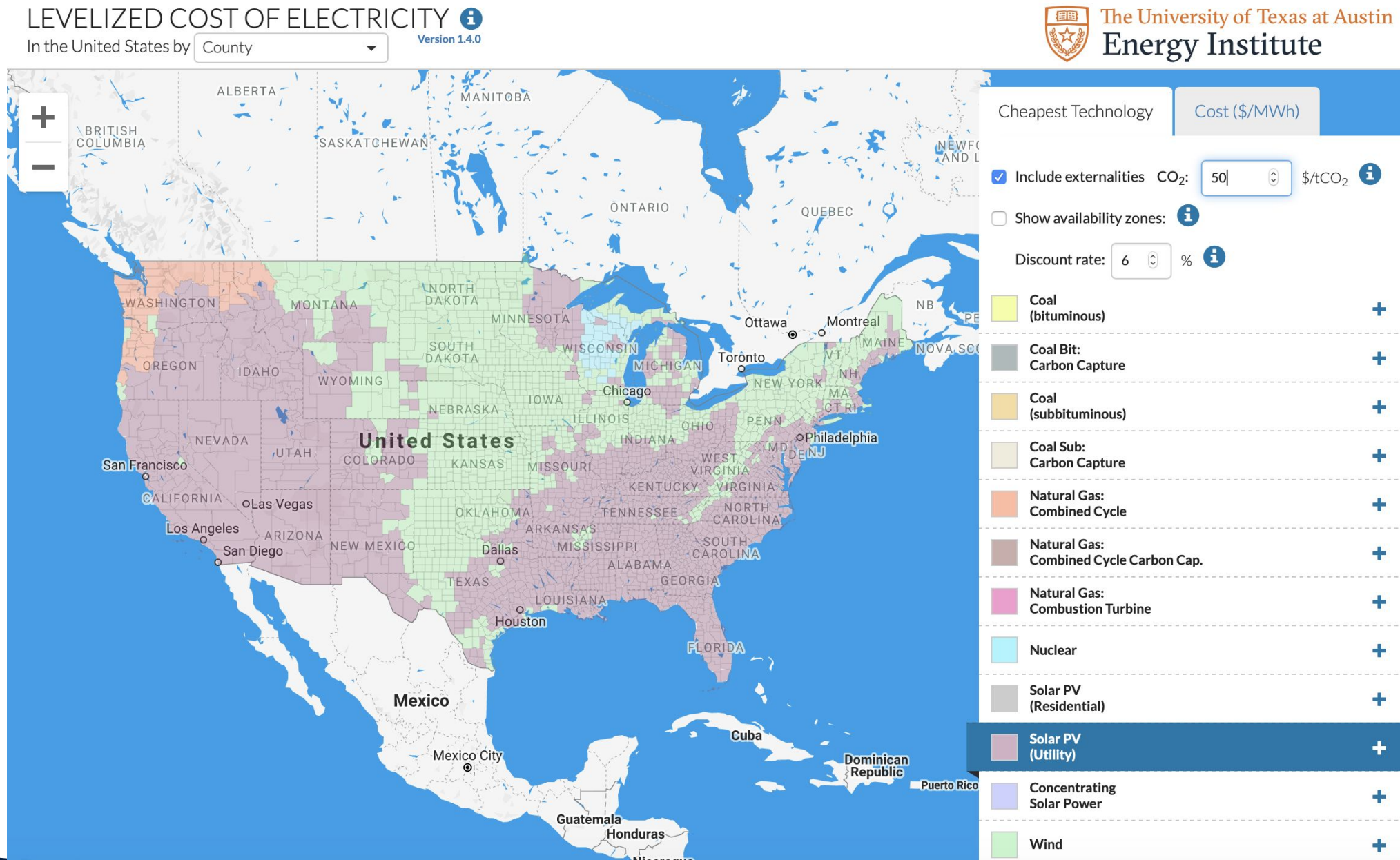
California's
market price for
carbon
emissions

\$20/tCO₂

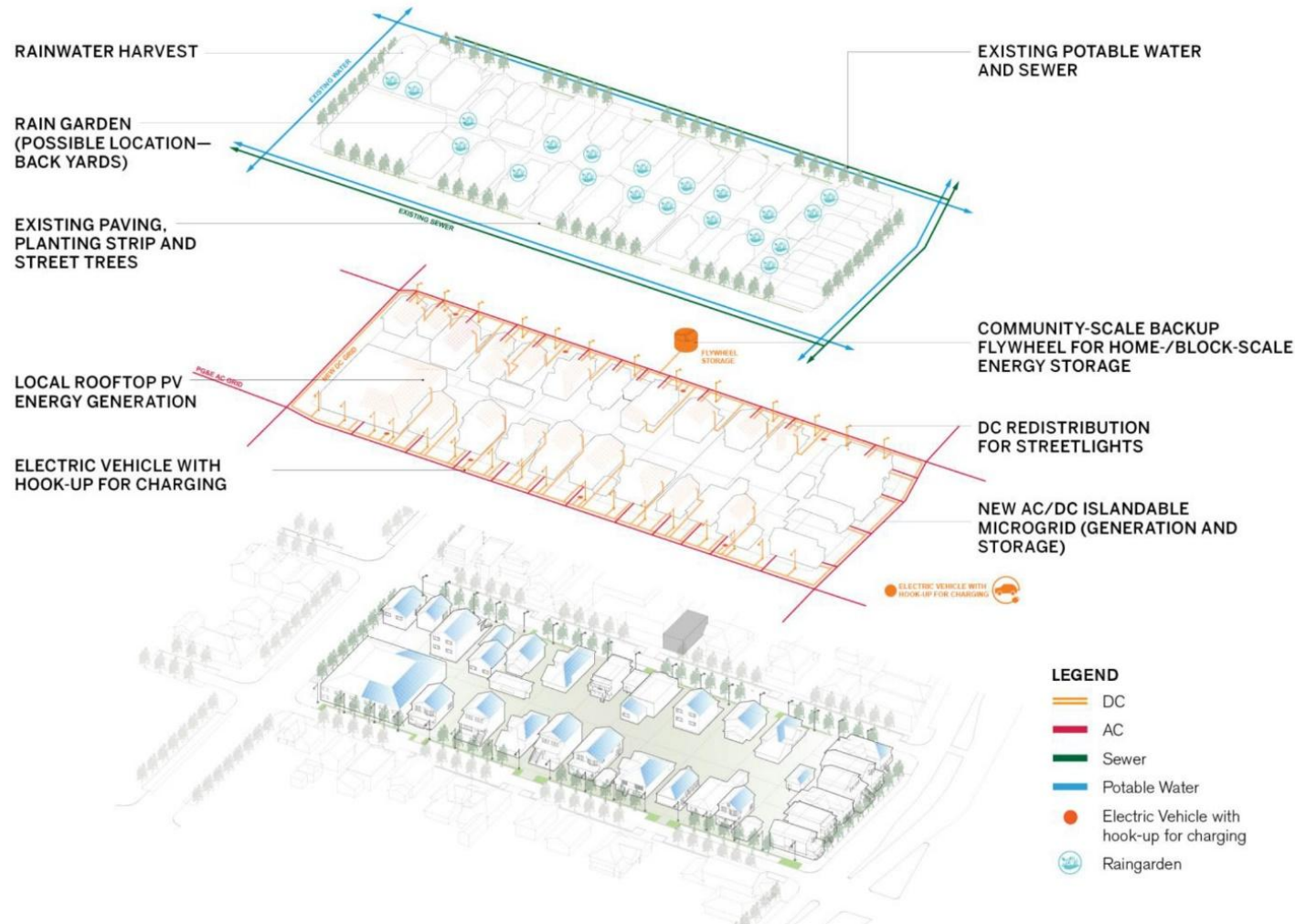


A Social Cost of Carbon:

> \$50/tCO₂



Why a block? A question of scale & justice



Global

Continent

Country

Region

City

District

Neighborhood

Block

Family

Individual

Too abstract

Too big

Sweet spot

Too small



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