

Local Renewable Energy Transition Planning & Climate Resilience

UC Davis Tahoe Environmental Research Center

Science Speaks Series

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Introduction

In the past decade, renewable sources more than doubled their share of the global power mix, from 5.9% in 2009 to 13.4% in 2019.

Local renewable energy transitions can out-pace state and national renewable expansion, while addressing local environmental and economic injustices and filling a growing energy resilience gap.

Local solar energy production strengthens local economies in many, major ways while turbo-charging local decarbonization and energy resilience.

Outline

Global, National and State

- Global Renewable Transition
- Renewable Power in the US and California

County and City

- Solar and Net Zero Carbon Investments and Their Benefits to Local Economies
- Local Renewable Transitions

Tahoe Area

- Climate Action Planning
- Energy Utilities and Solar Companies

Implementation and Awareness

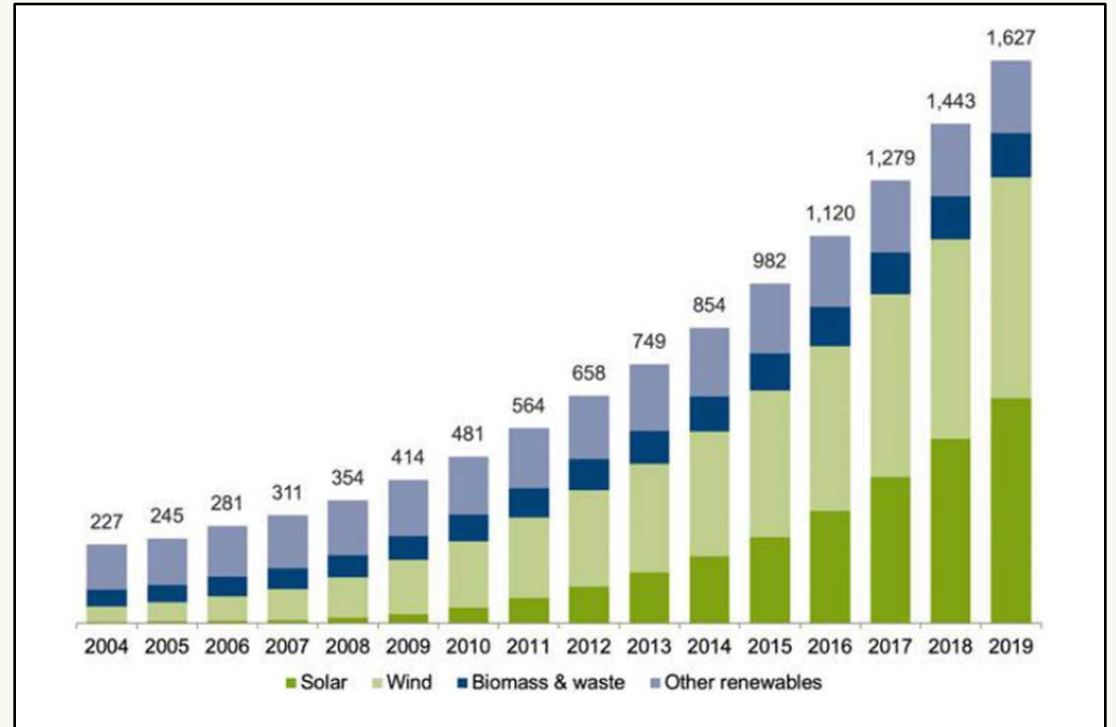
Summary Points

Global Renewable Transition

A global renewable electricity transition is ramping up.

Scale economies in battery and fuel cell manufacturing will ramp up a parallel renewable transition in the transportation sector.

Renewable hydrogen will enable smoothing of seasonal electricity demand as its use as a transportation fuel expands.

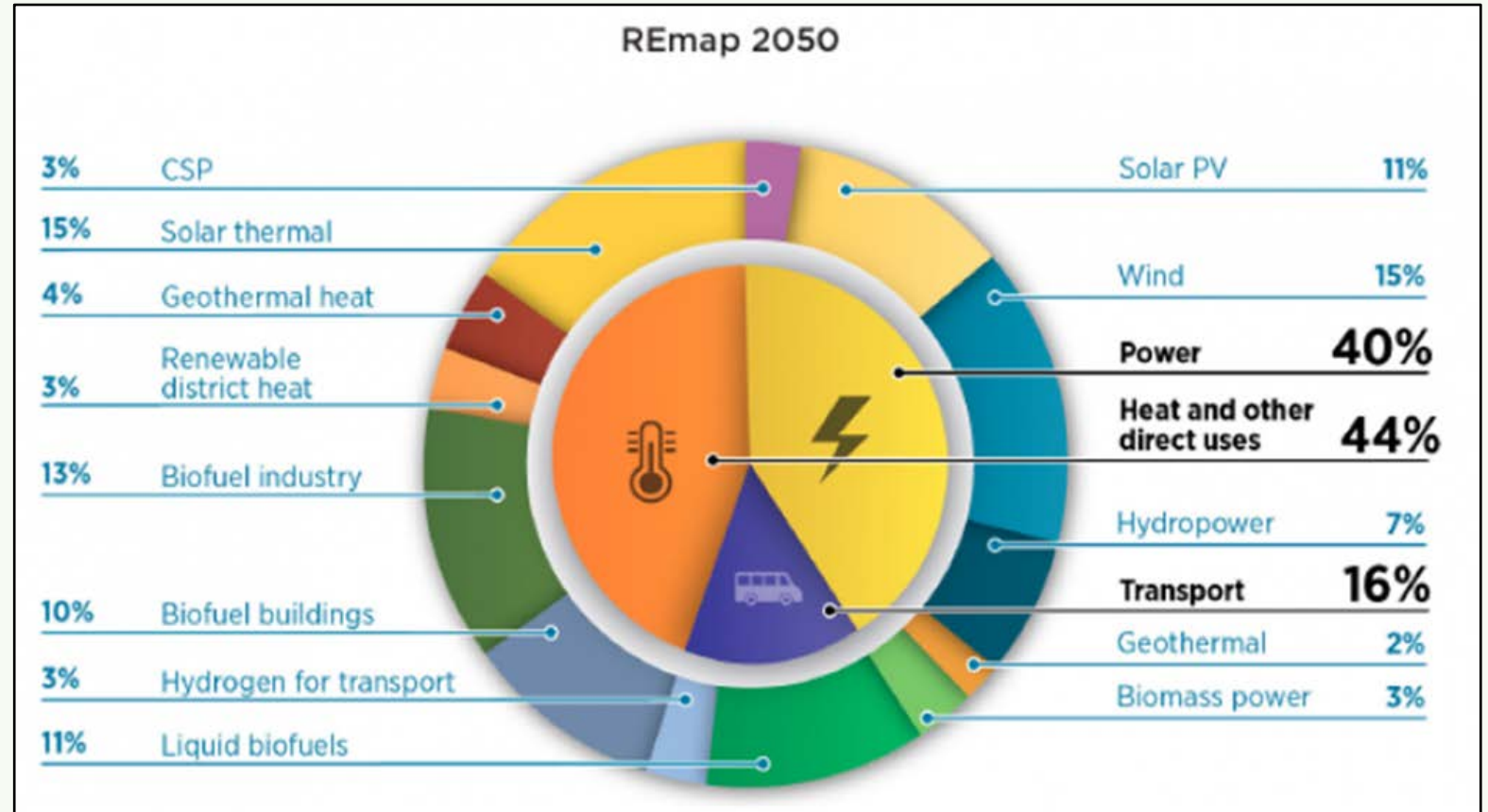


Global Capacity in Renewable Power, 2004-2019
Source: Bloomberg NEF

But Power Is Only 40% of Global Energy

Replacing transport and heating fuels with electricity would require as much as two and a half times the amount of current global electricity usage.

Bio-fuels, renewable hydrogen and renewable heat are essential complements to renewable electrification.



Source: IRENA

Solar Power in the US and California

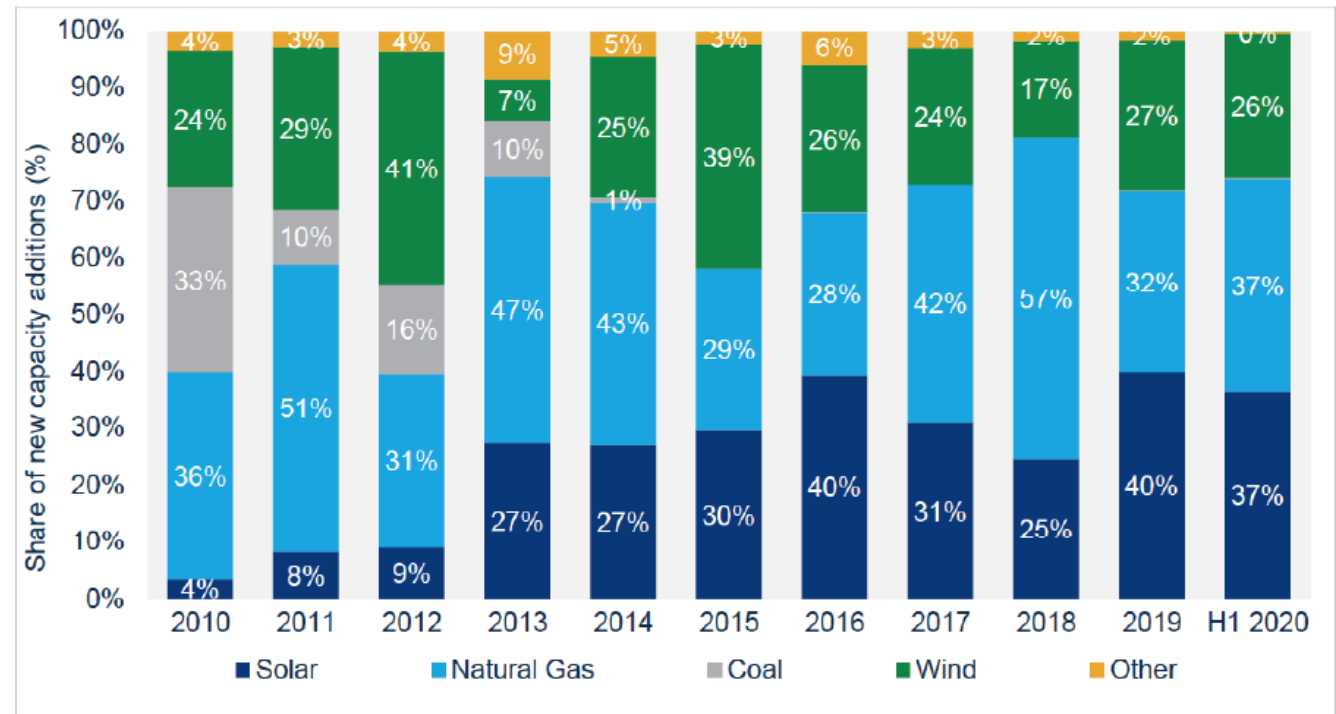
Solar and wind power now account for more than 65% of power generation capacity additions in the US.

Reductions in in coal and natural gas use for electricity production are proportionate but not identical.

California has the largest solar market in the U.S.

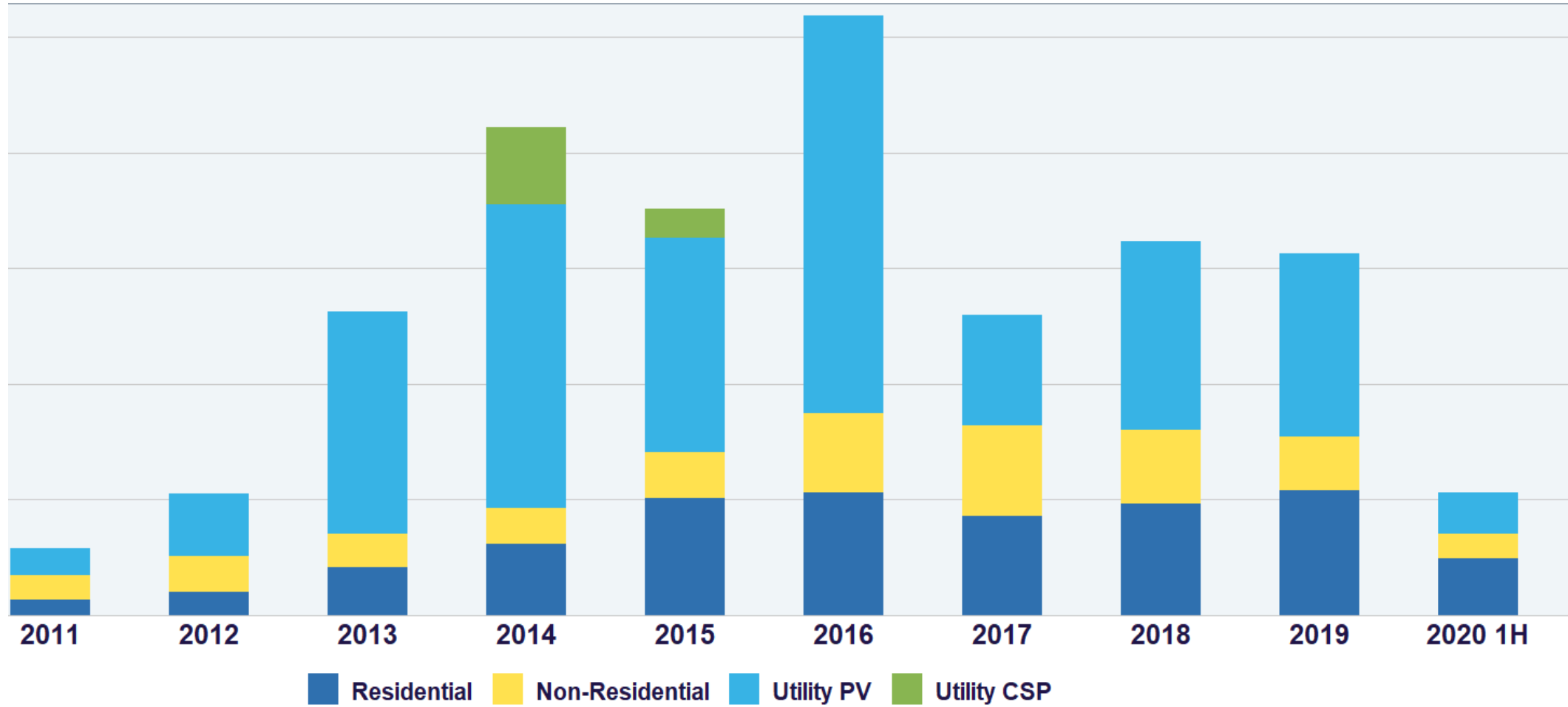
Solar supplies more than 20 percent of California's electricity today.

New U.S. electricity-generating capacity additions, 2010-H1 2020



Source: Wood Mackenzie, Federal Energy Regulatory Commission (for category "All other technologies")

California Annual Solar Installations



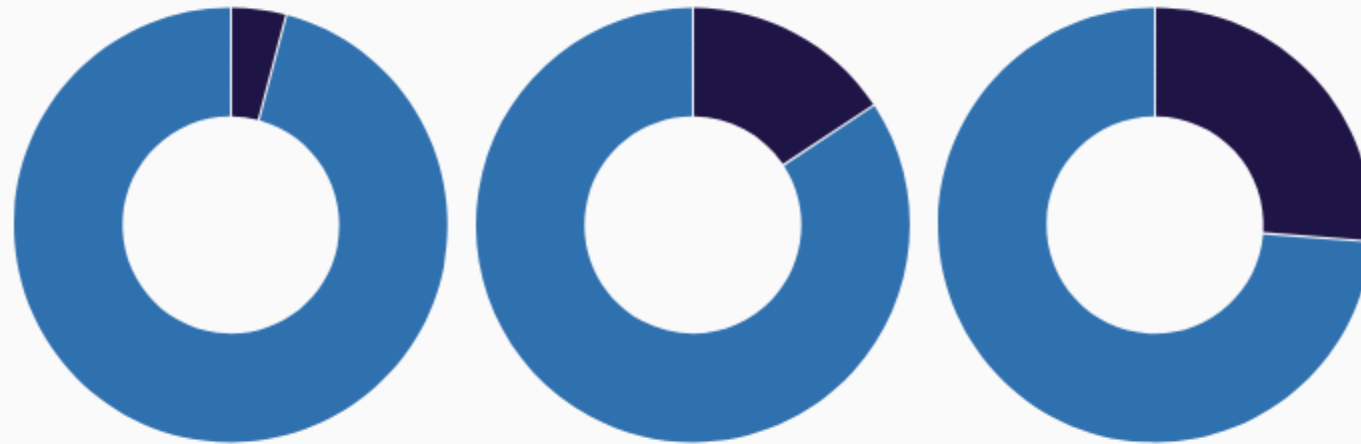
Percentage of Distributed Solar Systems Paired with Energy Storage

■ Solar + Storage ■ Solar Only

2019

2022E

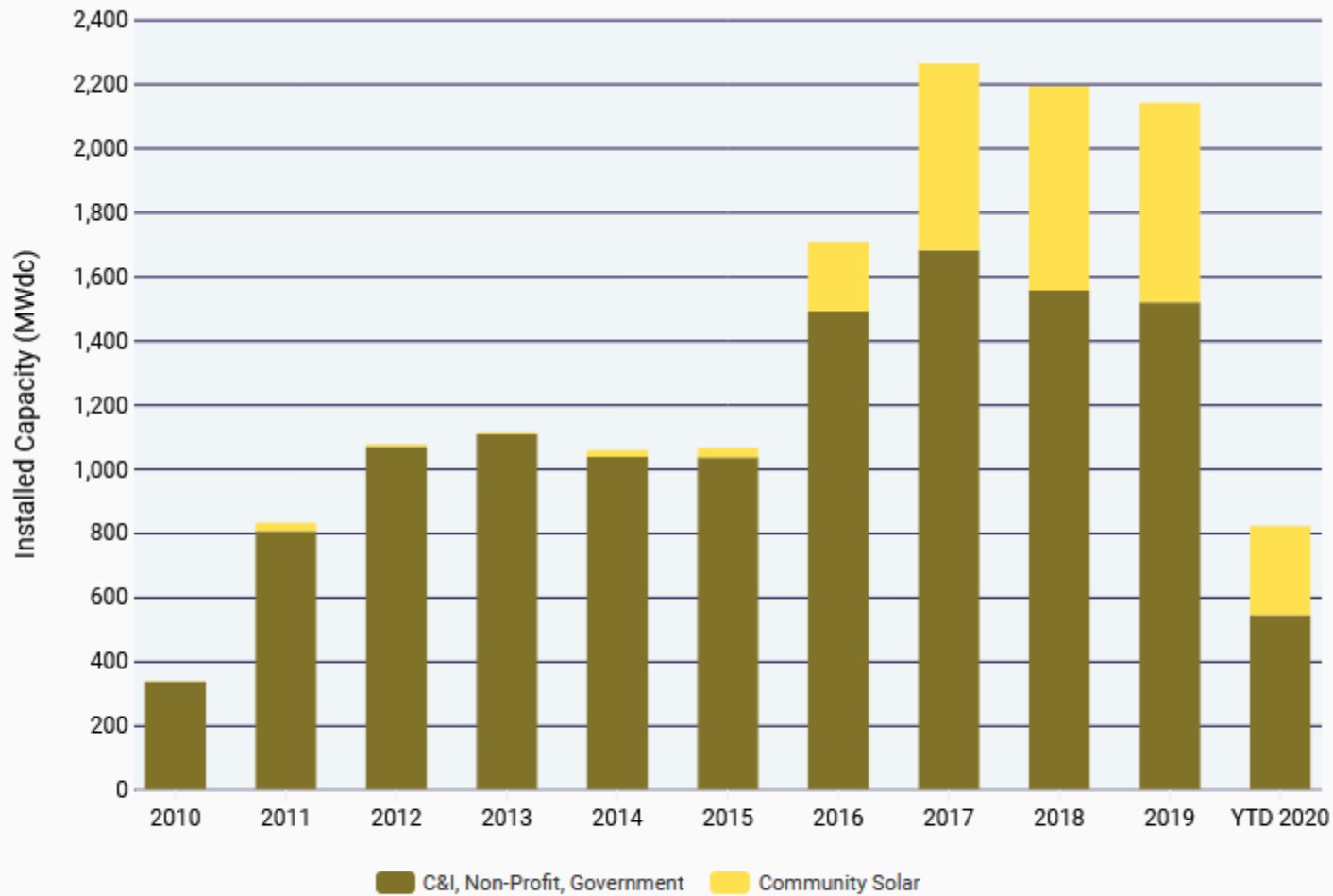
2025E



Source: [SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2020 Q3](#)



Non-Residential Solar PV Installations

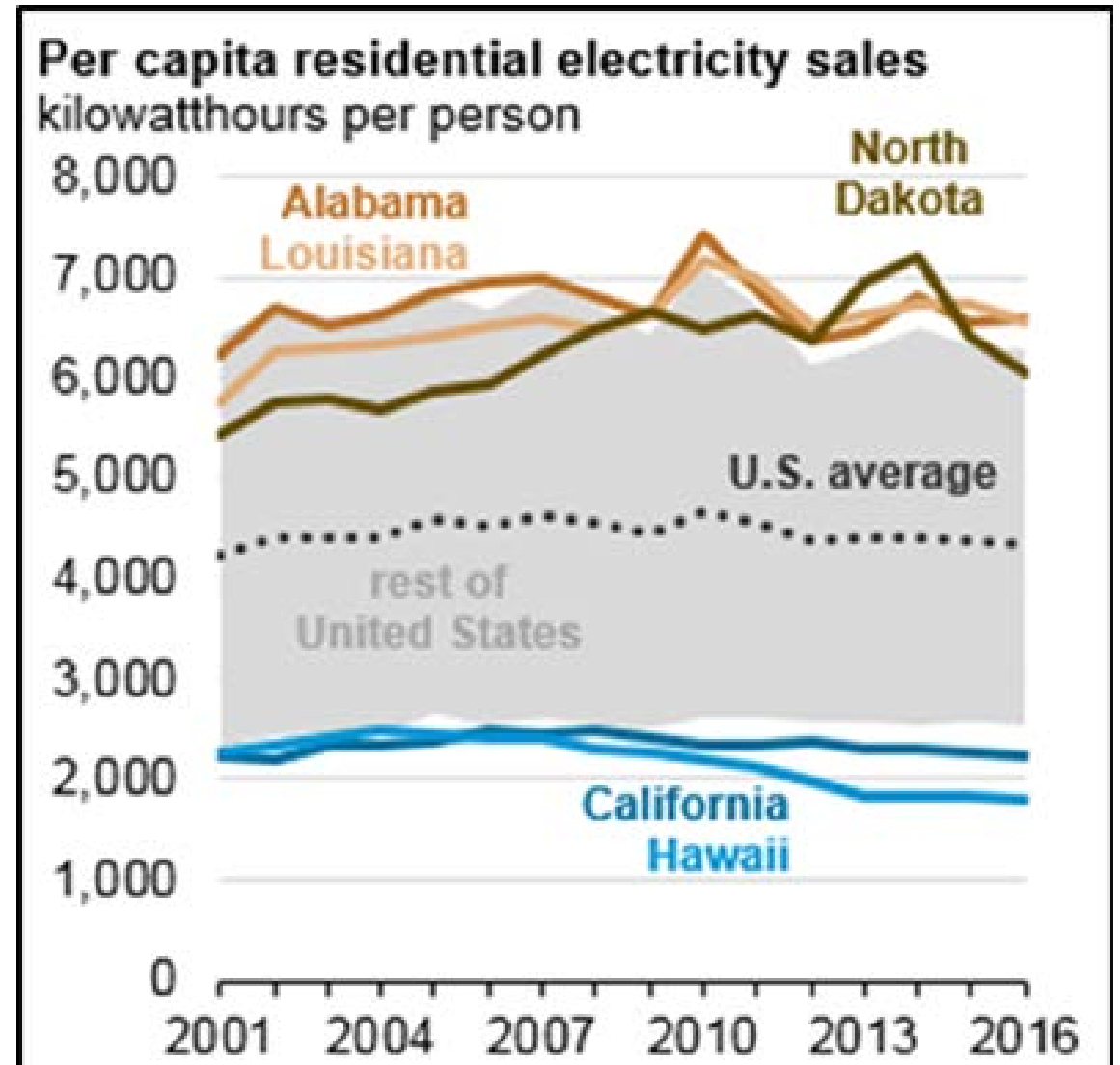


Source: [SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2020 Q2](#)



Climate Action Through Solar Electrification

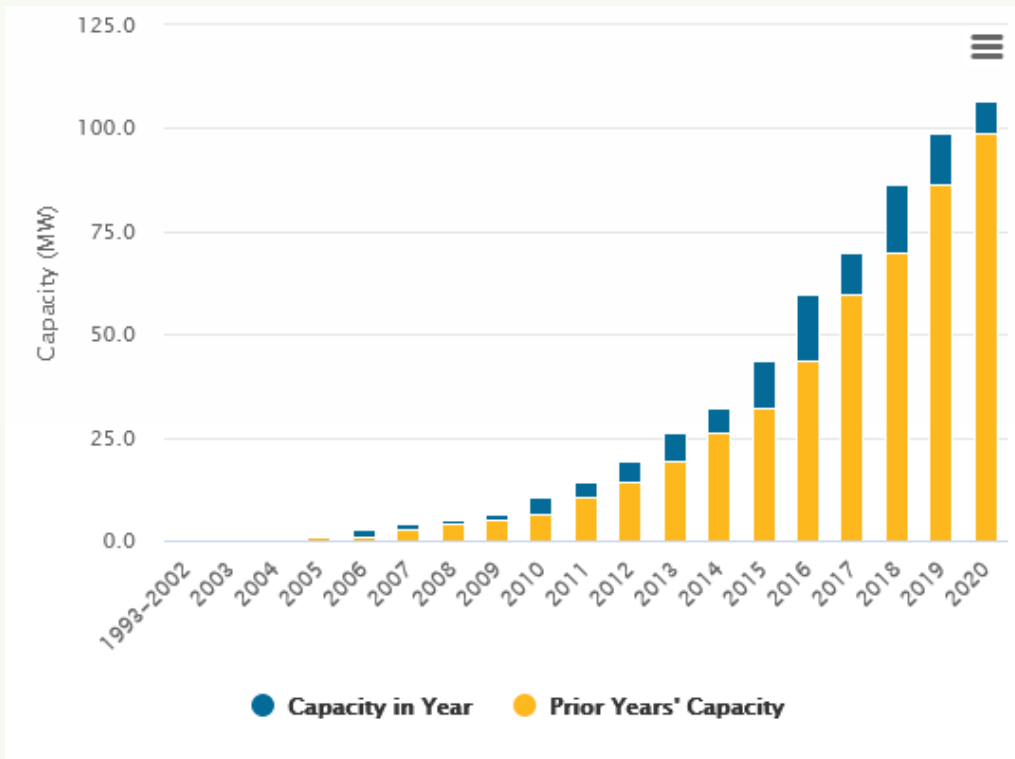
In the past decade, on-site (typically rooftop) solar deployment in states with moderate cooling and heating usage began to bend down the demand for grid electricity.



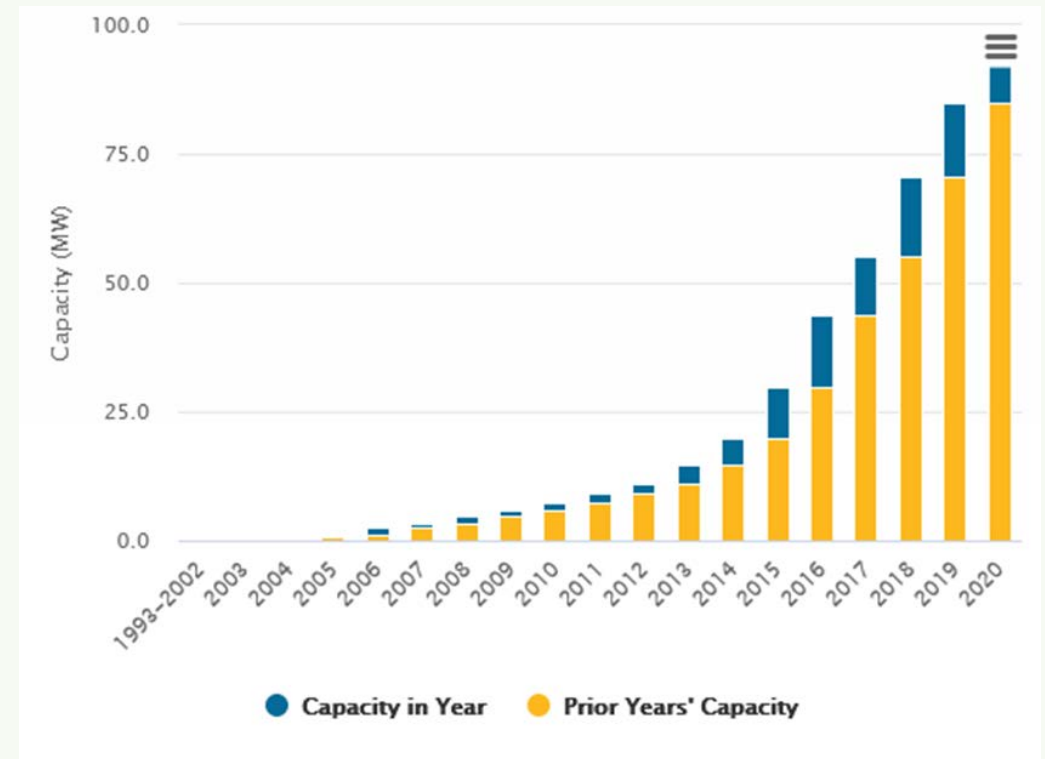
Solar and Net Zero Carbon Investments and Their Benefits to Local Economies and the Environment

A Tale of Two Counties – On-site Solar Capacity Build-up

Yolo (55% residential)



El Dorado (90% residential)



Source: <https://www.californiadgstats.ca.gov/charts/>

Net Zero Carbon Investments

Energy user actions for net zero carbon include:

Supply – Produce and store solar electricity on site to match present and future electricity usage and/or produce and store solar heat on site to off-set fuel use for space and water heating .

Buildings – Water heating and space heating and cooling retrofits and/or purchases of renewable 100% renewable electricity and/or renewable natural gas.

Vehicles – Replace gasoline and diesel vehicles with electric vehicles

Energy transport and exchange – encourage local government engagement with energy transport infrastructure owners for community microgrids, renewable natural gas and green hydrogen.

50% of decarbonization investments are locally actionable.



Estimated On-site Solar Benefits to the Yolo County Economy at 2020 Year End

On-site solar supplies 12% of Yolo County electricity usage, resulting in economic benefits

“Bundled” electricity cost avoidance and job creation benefits equal or exceed the county-wide cost of electricity imports.

Solar improvements are exempt from property tax until property is sold, delaying and reducing tax base effects. The value of new solar property improvements in Yolo County is approaching \$0.5B.

Disaster recovery value increases as storage capacity is added and as solar capacity is connected to microgrids.

- Investments in space and water heating system retrofits to achieve site-level net zero carbon can add to job creation and disaster recovery benefits.

- Incremental on-site solar capacity additions to charge electric vehicles result in greater solar capacity per site.

County Electricity Usage (MWH)	1749000
On-site Solar Percent (%)	12
Number of Systems	11801
Combined Capacity (kW)	117134
Estimated Annual Production (MWH)	210841
Avoided PG&E Supply Cost (\$M)	21
Avoided Electricity Import Cost (\$M/yr)	53
Number of Direct, Indirect and Induced Jobs	361
Job Creation Benefit to Local Economy (\$M/yr)	37
Jobs Plus Avoided Imports Benefit (\$M/yr)	90
Property Tax Value (\$M)	463
Disaster Recovery Value (\$M)	??

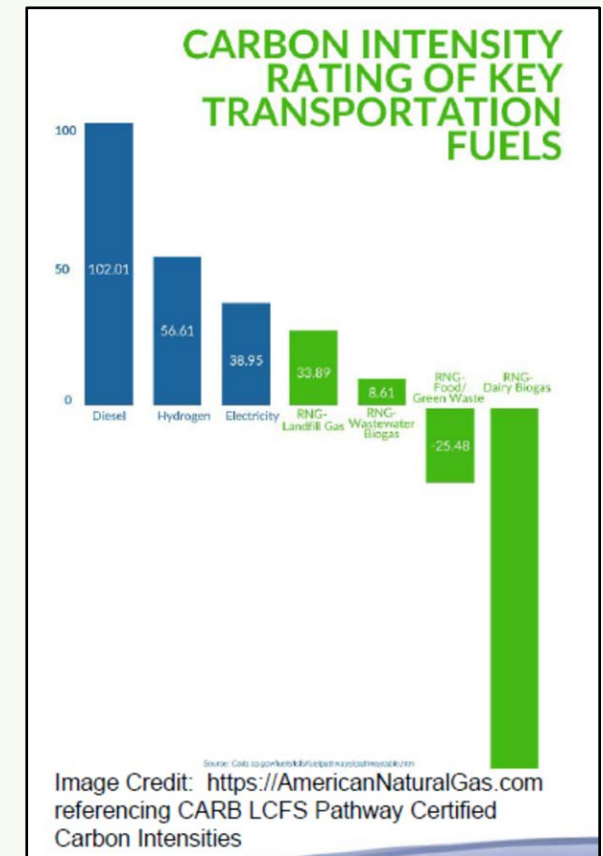
Local Renewable Transitions

The Future of Renewable Decarbonization is Net Positive and Net Negative

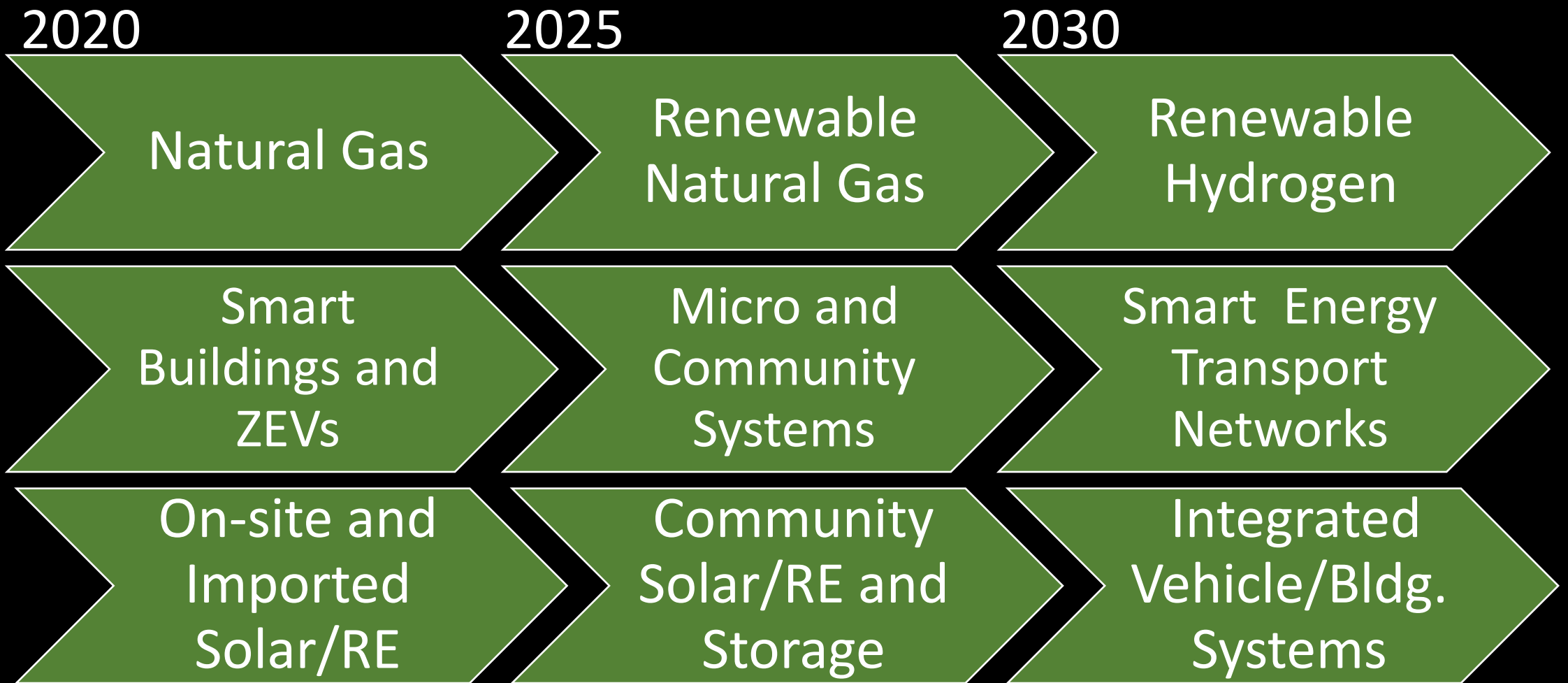
Net Positive Energy Buildings



Net Negative Carbon Fuel and Food Production



Local Clean Energy Pathways



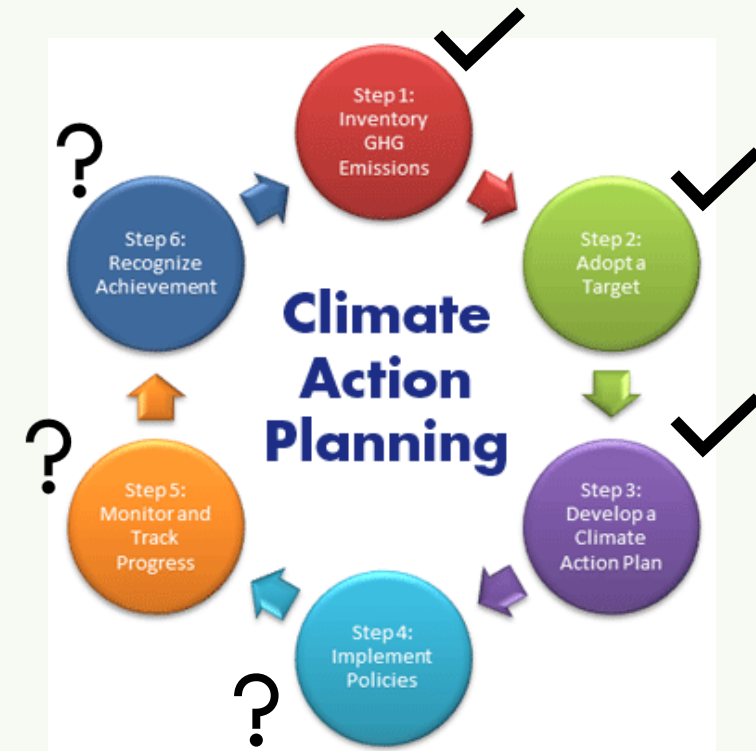
Three main local renewable transition pathways (gas, energy transport and electricity) are increasingly interdependent, because new supply, transport and usage technologies are interdependent.

The future of local renewable decarbonization and resilience is “both/and”, not “either/or”

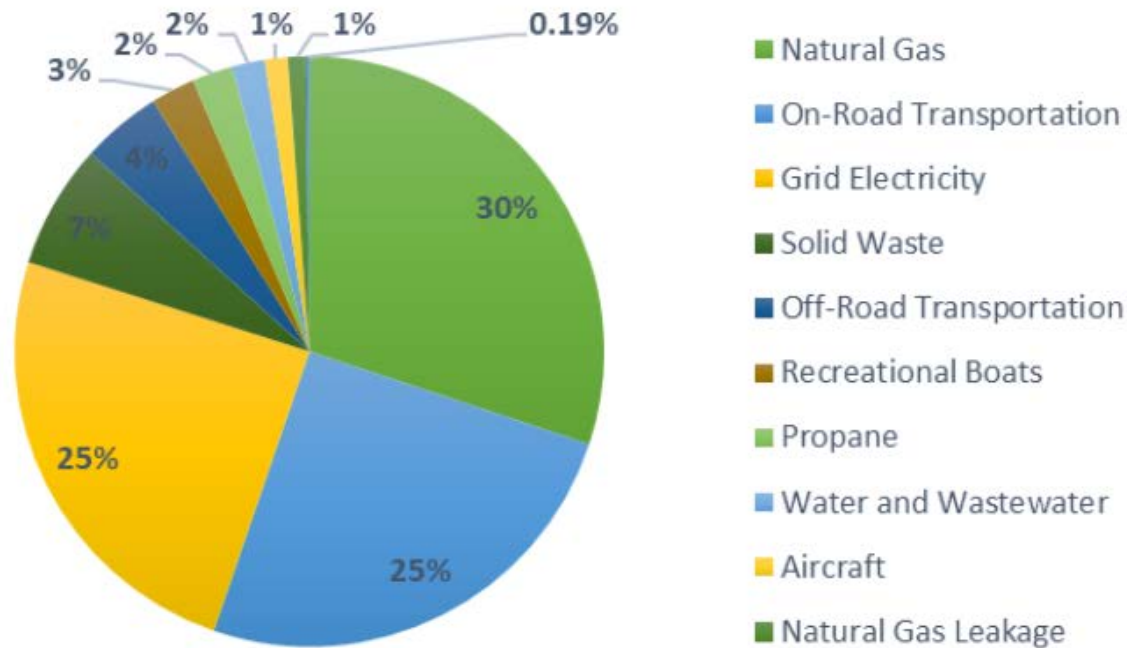
Electricity		Gas Fuel
On-site solar electricity production	and	Renewable gas (RNG) from local waste
Increase renewable electricity imports	and	Increase RNG gas imports
Renewable microgrids	and	Renewable/gas hybrid microgrids
Heat pump water heaters	and	Hybrid solar/gas water heating
Heat pump space heating	and	RNG space heating
Battery electric vehicles	and	RNG fueled commercial vehicles
Plug in hybrid electric vehicles	and	RNG/RH2 fueled personal vehicles
Competitive higher renewable content retail electricity	and	Industrial combined heat and power
	and	Reduce methane leakage

Tahoe Area Climate Action Planning

South Lake Tahoe recently approved a thoughtful and well-researched climate action plan. Truckee is preparing to initiate planning, and inter-jurisdictional discussions are underway.



South Lake Tahoe Community-Wide GHG Emissions by Sources & Activities



The split between electricity, natural gas and transportation emissions varies from county to county and city to city. To the extent electricity sources can be quickly decarbonized, natural gas and transportation related emissions can also be reduced by encouraging adoption of heat pump appliances and electric vehicles.

Liberty Utilities relies on electricity from power plants that burn coal and natural gas to produce power. It recently added solar to its generation portfolio.

<https://california.libertyutilities.com/truckee/residential/evolve/solar-generated-power.html>



Version: July 2019

2018 POWER CONTENT LABEL		
Liberty Utilities (Calpeco Electric), LLC (U 933-E)		
https://california.libertyutilities.com/north-lake-tahoe/residential/evolve/eliminating-coal-from-our-power-mix.html		
ENERGY RESOURCES	Power Mix	2018 CA Power Mix**
Eligible Renewable	27%	31%
Biomass & Biowaste	3%	2%
Geothermal	0%	5%
Eligible Hydroelectric	0%	2%
Solar	23%	11%
Wind	1%	11%
Coal	0%	3%
Large Hydroelectric	0%	11%
Natural Gas	0%	35%
Nuclear	0%	9%
Other	0%	<1%
Unspecified sources of power*	73%	11%
TOTAL	100%	100%
* "Unspecified sources of power" means electricity from transactions that are not traceable to specific generation sources.		
** Percentages are estimated annually by the California Energy Commission based on the electricity generated in California and net imports as reported to the Quarterly Fuel and Energy Report database and the Power Source Disclosure program.		
For specific information about this electricity product, contact:	Liberty Utilities (Calpeco Electric), LLC 562-299-5117	
For general information about the Power Content Label, please visit:	http://www.energy.ca.gov/pcl/	
For additional questions, please contact the California Energy Commission at:	Toll-free in California: 844-454-2906 Outside California: 916-653-0237	

Aim Higher?

PG&E serves parts of Placer and El Dorado Counties outside the Tahoe area.

The sum of the electricity PG&E purchases and delivers to other parts of Placer and El Dorado county has a carbon intensity (tons of CO2 per kWh) about 50% lower than the California average.

PG&E has implemented California's solar net metering mandate effectively with good public visibility to progress and offers a 100% solar "green tariff" at a modest price premium.

PG&E's 2018 Power Content Label as reported to the California Energy Commission.¹

ENERGY RESOURCES	PG&E 2018 POWER MIX			2018 CA POWER MIX ² (For Comparison)
	Base Plan	100% Solar Choice	50% Solar Choice	
Eligible Renewable:	39%	100%	69%	31%
• Biomass and waste	4%	0%	2%	2%
• Geothermal	4%	0%	2%	5%
• Small hydroelectric	3%	0%	1%	2%
• Solar	18%	100%	59%	11%
• Wind	10%	0%	5%	11%
Coal	0%	0%	0%	3%
Large Hydroelectric ³	13%	0%	6%	11%
Natural Gas	15%	0%	7%	35%
Nuclear	34%	0%	17%	9%
Other	0%	0%	0%	<1%
Unspecified ⁴	0%	0%	0%	11%
TOTAL	100%	100%	100%	100%

¹ The figures above may not sum to 100 percent due to rounding.

² Percentages are estimated annually by the California Energy Commission based on the electricity generated in California and net imports as reported to the Quarterly Fuel and Energy Report database and the Power Source Disclosure program.

³ A significant amount of energy generated by PG&E comes from clean, large hydroelectric power stations which do not qualify as an eligible renewable resource under California law.

⁴ "Unspecified sources of power" means electricity from transactions that are not traceable to specific generation sources.

On-site Solar in the Tahoe Area

Incentives

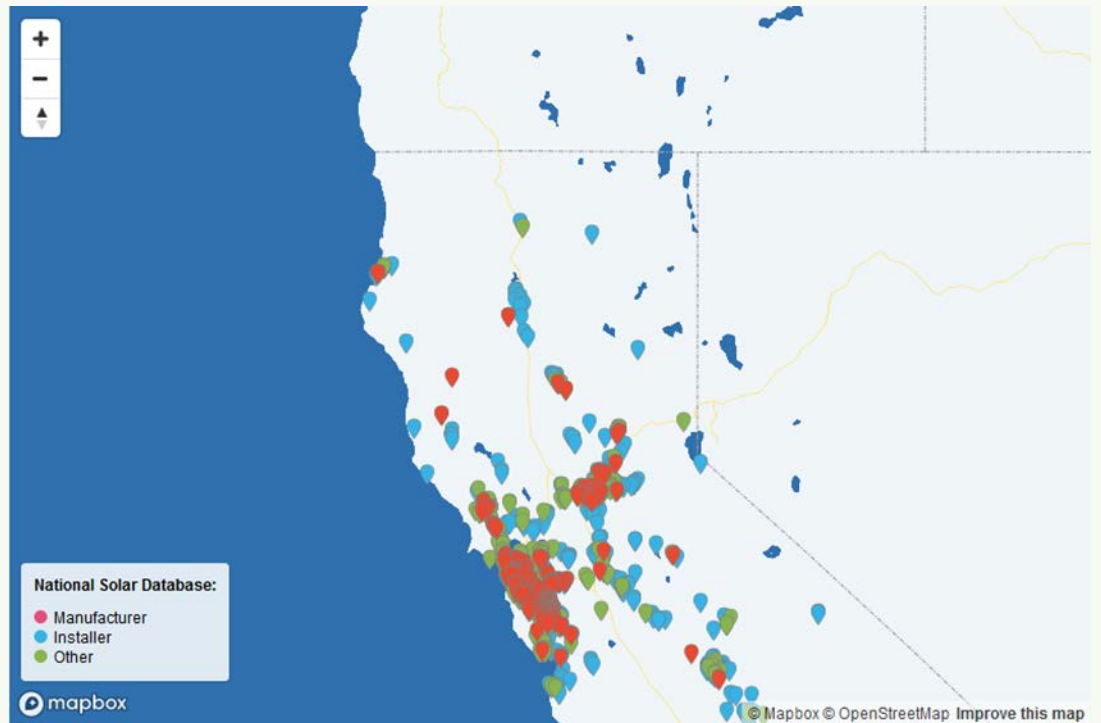
“Liberty Utilities will reserve up to \$330,000 in solar incentives for 2020.”

Incentives off-set 15-20% of the cost of a net metered residential or small commercial installation up to an incentive limit of \$11,000. Incentives are reserved on a first come, first served basis.

About 2000 solar companies are operating in California, including 2 in the Tahoe area.

Southwest Gas offers no incentives for solar space or water heating, but Federal tax credits (of 22% in 2021 and 10% thereafter) apply to both solar electricity and heating systems.

Northern California Solar Companies



Implementation and Awareness

Implementation. Throughout California, the first local climate action plans, adopted a decade or more ago, though well grounded in data and relatively unambitious, were not, for various reasons, fully implemented in the subsequent decade.

Awareness. Awareness of economic and environmental climate action benefits and risks can motivate elected official attention. Ad hoc groups have an important role in raising public and local government staff awareness.

We Can Do It! COOL DAVIS

Go Solar Davis!
@cooldaviscity

DOUBLE UP
ON SOLAR DAVIS

3182 total systems
as of Dec 31 2017

total residential systems
4500 by 2020

Davis
California

Recap

- The global renewable transition is the sum of a half million local transitions. Globally, about 10% of the work has now been done, and 90% of it remains on the path ahead.
- Well integrated local solar is California's best (fastest and affordable) climate solution, but there are many more.
- Money for on-site solar, net zero buildings, and community solar is invested by people, businesses, and energy utilities. Everybody wins, including the investors, local economies and the environment.
- A key benefit of pervasive local renewable decarbonization is the opportunity to make local public services more resilient.
- Faster local climate action is the sum of net positive renewable and net negative carbon projects.
- Speeding up local renewable transitions should be a main thrust of local climate action plans.
- Don't just plan. Implement while planning.

Thank You!

Questions?

Contact:

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www.iresn.org

