Local Renewable Energy Transition Strategies

NorCal AEE Chapter Webinar

Gerald Braun, IRESN

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IRESN

Outline

Global, National and State

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

Local Renewable Energy

- Deployment
- Costs
- Benefits

Local Renewable Energy Transitions

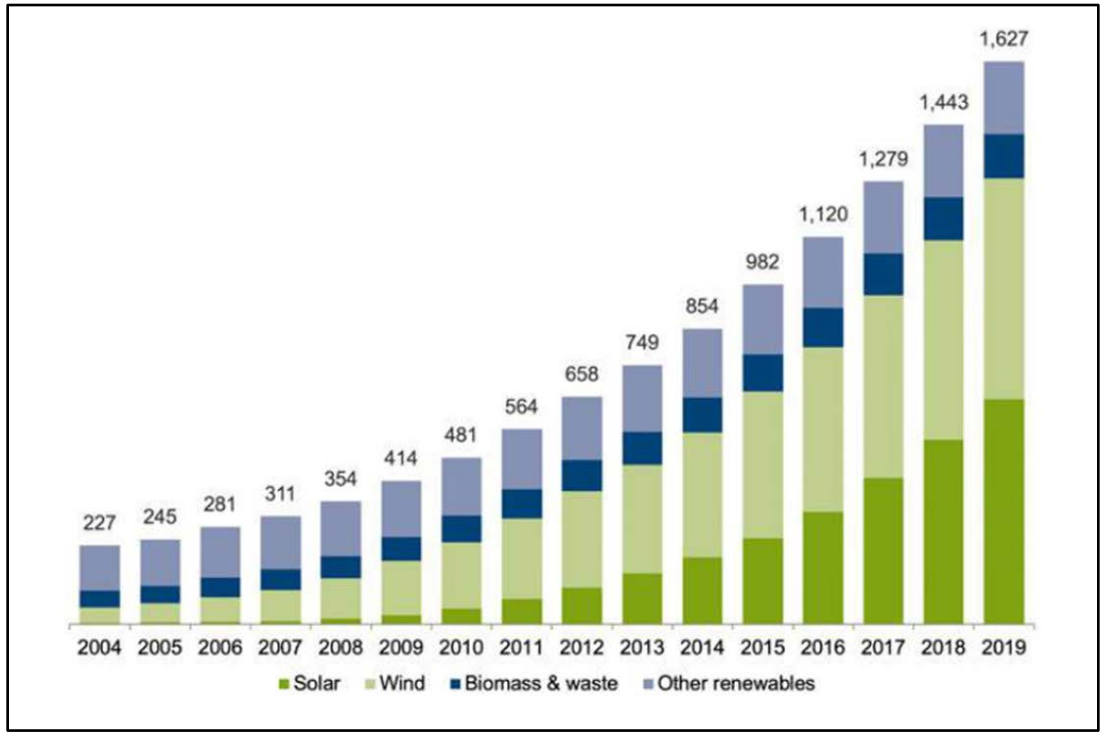
- Targets
- Strategies
- Implementation

Global Renewable Transition

A global renewable electricity transition is ramping up on the strength of solar and wind component manufacturing scale economies and opportunities to replace aging thermal power plants.

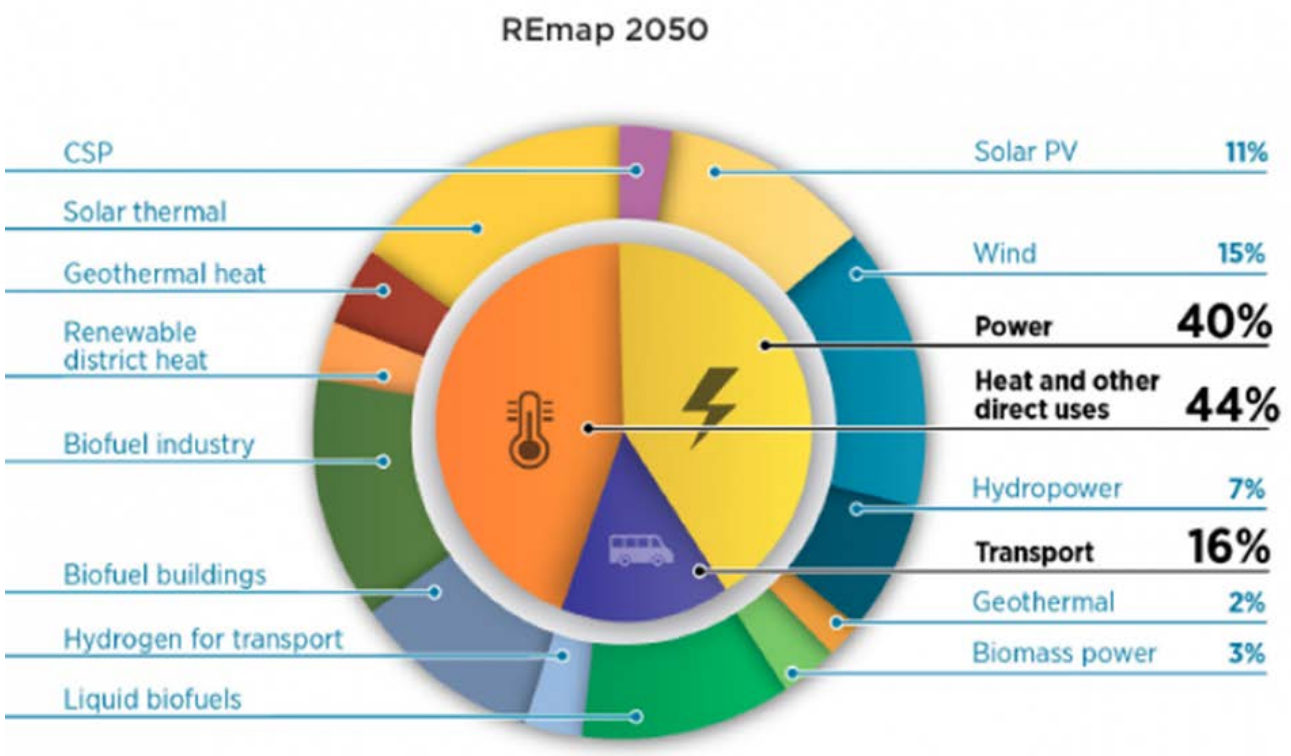
Scale economies in battery and fuel cell manufacturing will ramp up a parallel and synergistic transition in the transportation sector that will enable local energy resilience as well as smoothing of daily electricity demand.

Renewable hydrogen will enable smoothing of seasonal and emergency demand as its production for use as a transportation fuel expands.



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

Electricity Is Only 40% of Global Energy



Replacing transport and heating fuels with electricity would require 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.

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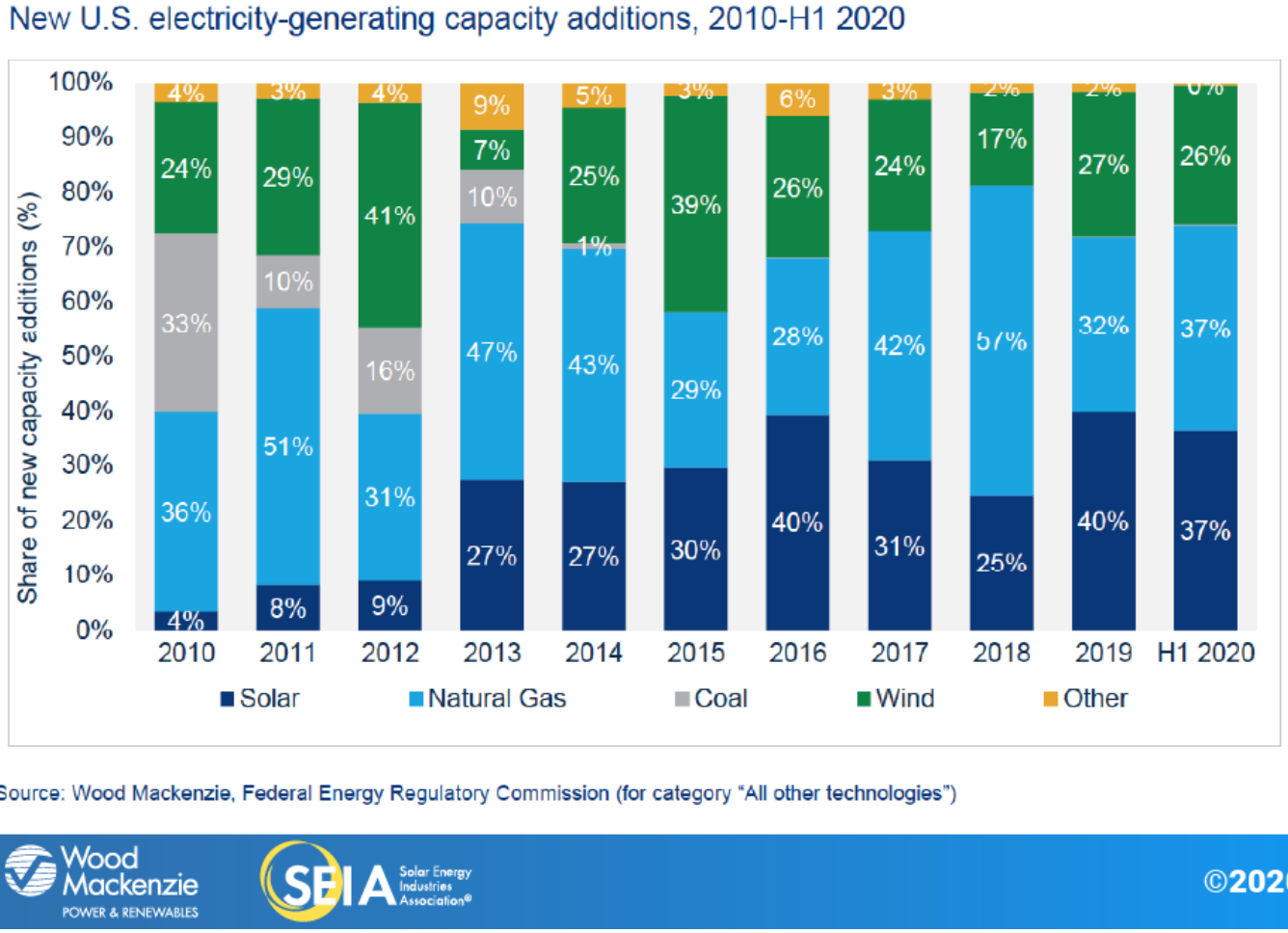
Solar Electrification Retrofits are Affordable in Northern California

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.

California has the largest solar market in the U.S. and has been a longtime champion of solar because of California's excellent solar resource and the many economic and environmental benefits it provides, including billions in local investment.

Solar supplies more than 20 percent of California's electricity today, but it must play a bigger role if the state is to reach climate and energy goals.



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

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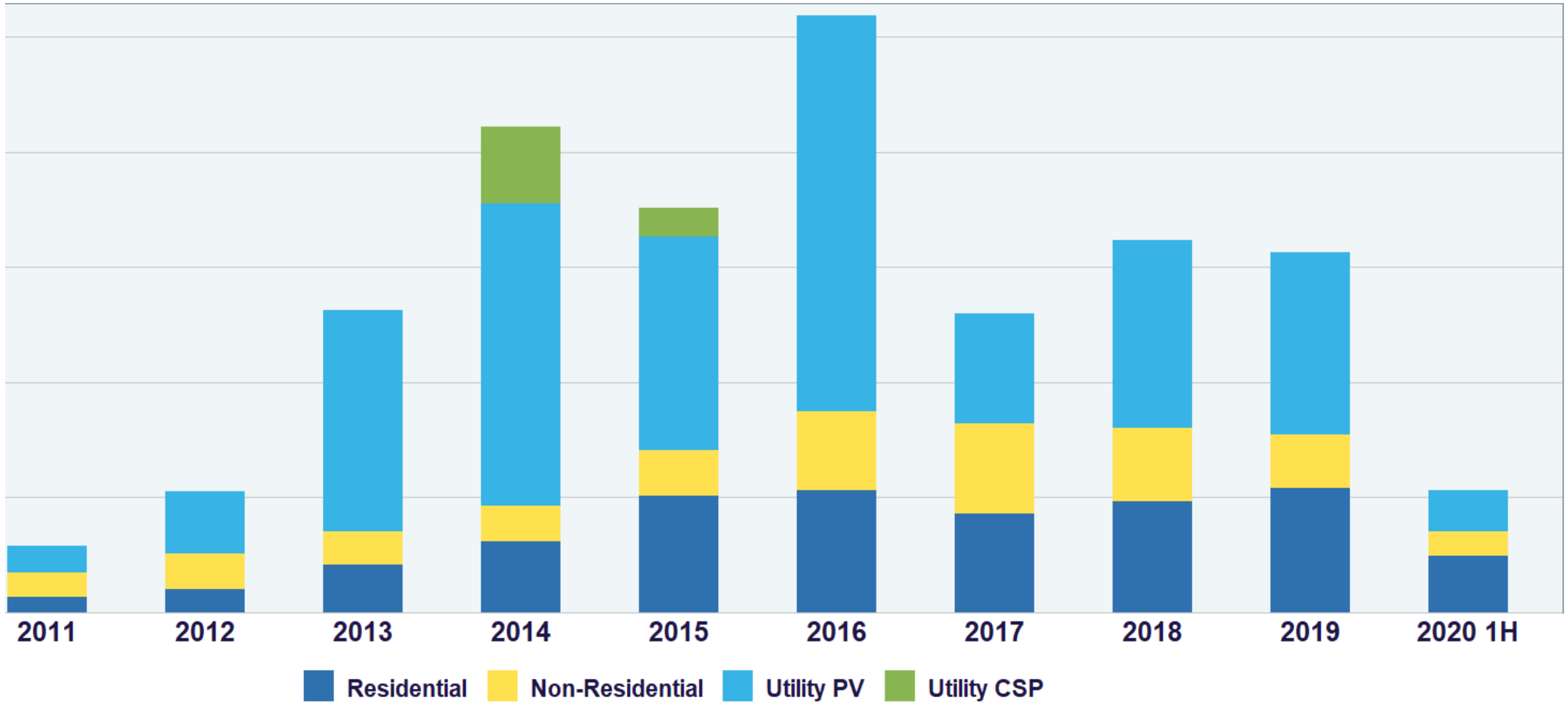
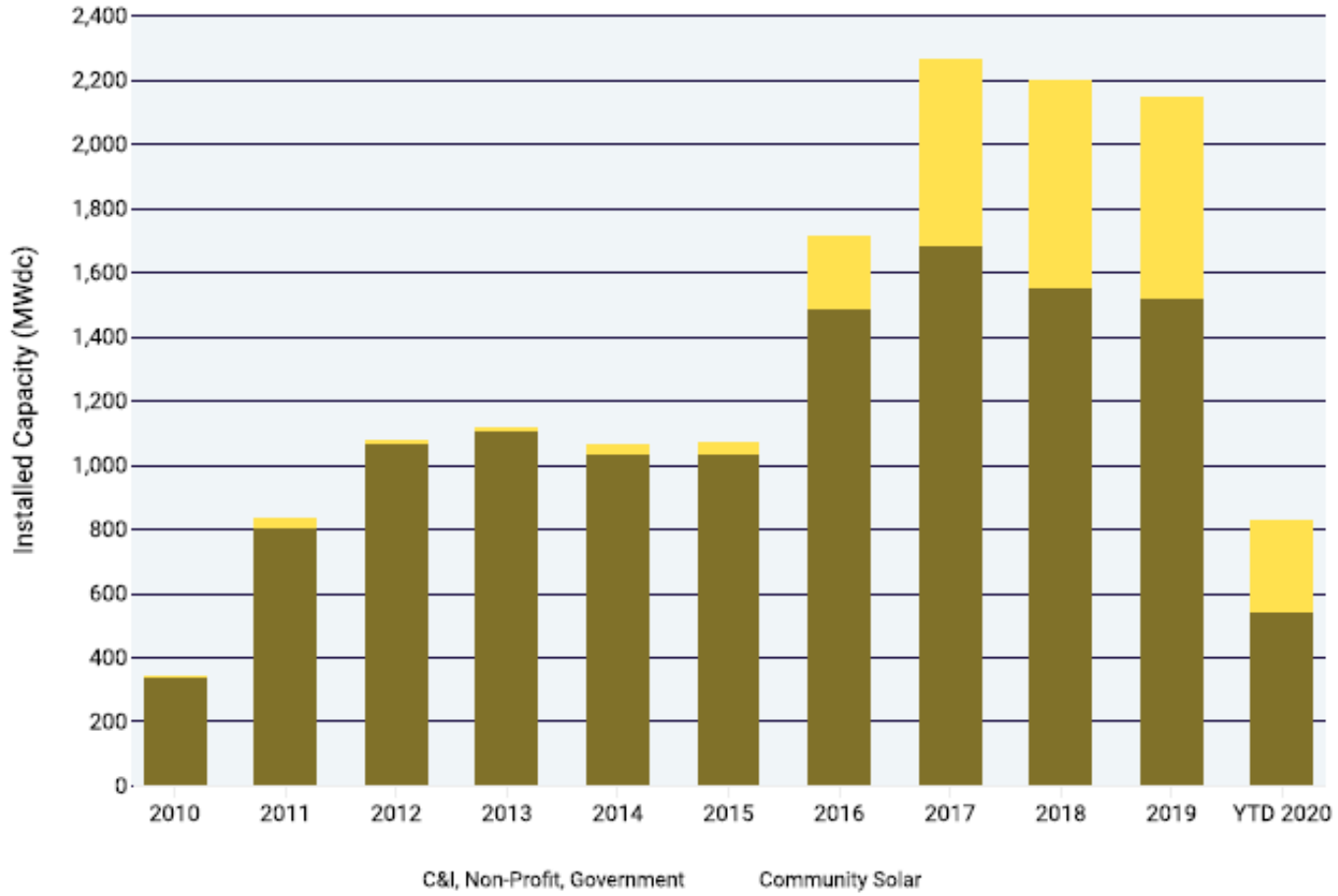
SEIA Solar Energy Industries Association®

California Annual Solar Installations



Non-Residential Solar PV Installations



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2020 Q2

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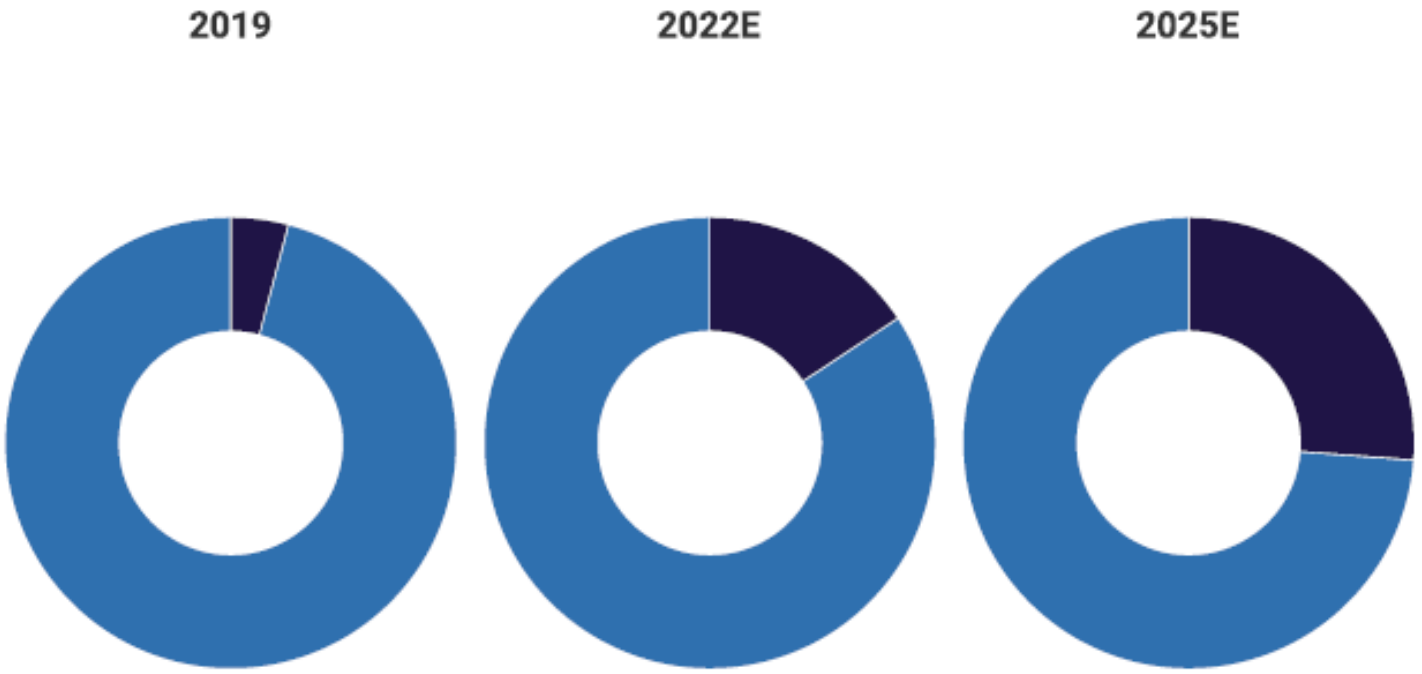
Percentage of Distributed Solar Systems Paired with Energy Storage

Solar + Storage Solar Only



Source: SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2020 Q3

Local renewable decarbonization and resilience

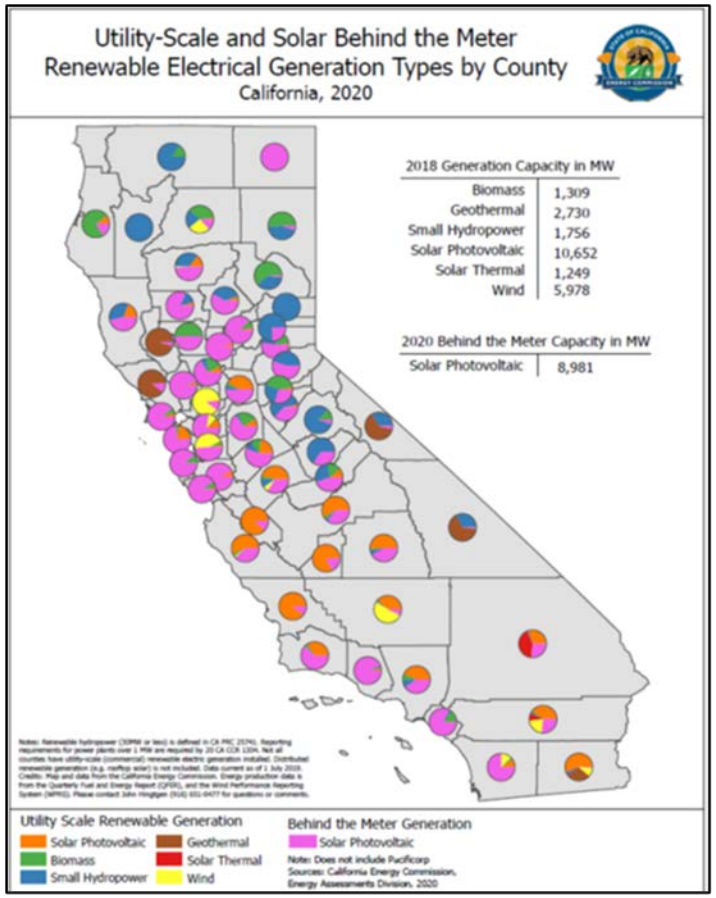
Acceleration is possible if there is progress on parallel paths.

Electricity		Gas Fuel
On-site solar electricity production Increased renewable electricity imports	and and	Carbon negative gas from local waste Increased carbon negative gas imports
Solar/battery powered microgrids	and	Hybrid solar/gas powered microgrids
Solar powered heat pump water heaters	and	Hybrid solar/gas water heating
Solar powered heat pump space heating	and	Hybrid solar/gas space heating
Solar powered battery electric vehicles Solar powered hybrid electric vehicles	and and	Solar hydrogen fueled vehicles Carbon negative gas fueled vehicles
High renewable content retail electricity	and	Micro combined heat and power

Source: G. Braun, Local Gaseous Fuel Decarbonization and Resilience for Southern California, 2020

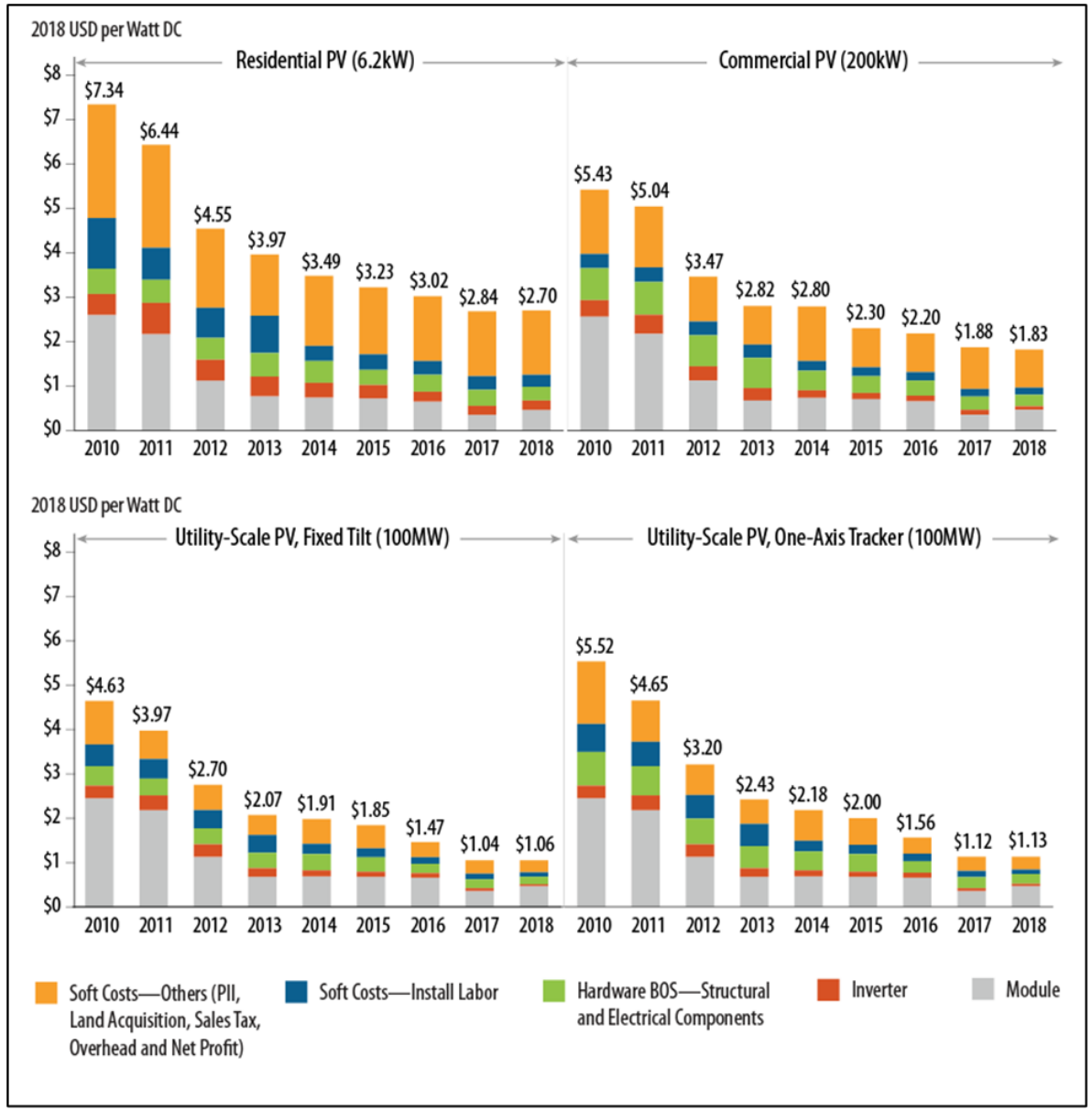
Renewable Energy Deployment Trade-offs

All new and replacement electricity supply capacity in the U.S. now relies on solar, wind and natural gas sources. About half of solar electricity deployment in California to date has been local. By contrast, the U.S. has a utility solar sector four times as large as its combined local (residential and non-residential) solar sectors.



Trends in US Solar PV Systems Cost

Comparative economics of centralized vs. local renewable energy production will continue to shift in favor of local production as small projects proliferate, and as large projects come on stream and drive slow and costly expansion of high voltage transmission capacity and create a need for longer duration and more costly energy storage.



Other Trends in Northern California Energy

Reliability. Electricity service reliability has plummeted in recent years for communities and energy users subject to "public safety power shut-offs" during seasons when high winds increase wildfire risks.

Resilience. Energy resilience is the local capacity to restore energy service quickly and indefinitely. Increased local renewable energy production and judicious renewable fuel use can provide partial energy resilience, thus mitigating local energy service disruption. Full energy resilience requires fully resilient local sources.

Equity. Solar energy saves money and backs up traditional energy service for local businesses and homeowners and can do the same for renters, who, on average, may have greater need for cost savings and energy security.

Local Deployment Capacity. Deployment capacity matures as experience accumulates. California counties and cities with mature local solar deployment capacity are seeing sustained double digit annual on-site solar expansion.

Valuing Local Renewable Energy Benefits*

Estimated $90 millions in benefits to the Yolo County economy include desirable jobs and less money leaving the county to pay for grid electricity imports. Additional economic benefits, harder to quantify on an annual basis, include mitigation of economic productivity losses during public safety power shutoffs, plus faster recovery of local economies in the wake of disasters, physical attacks and cyber-attacks.

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

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

Local Electric Systems and Local Control

Future local electric systems will include sources and storage. Local grids will adapt. The alternative is “grid defection”.

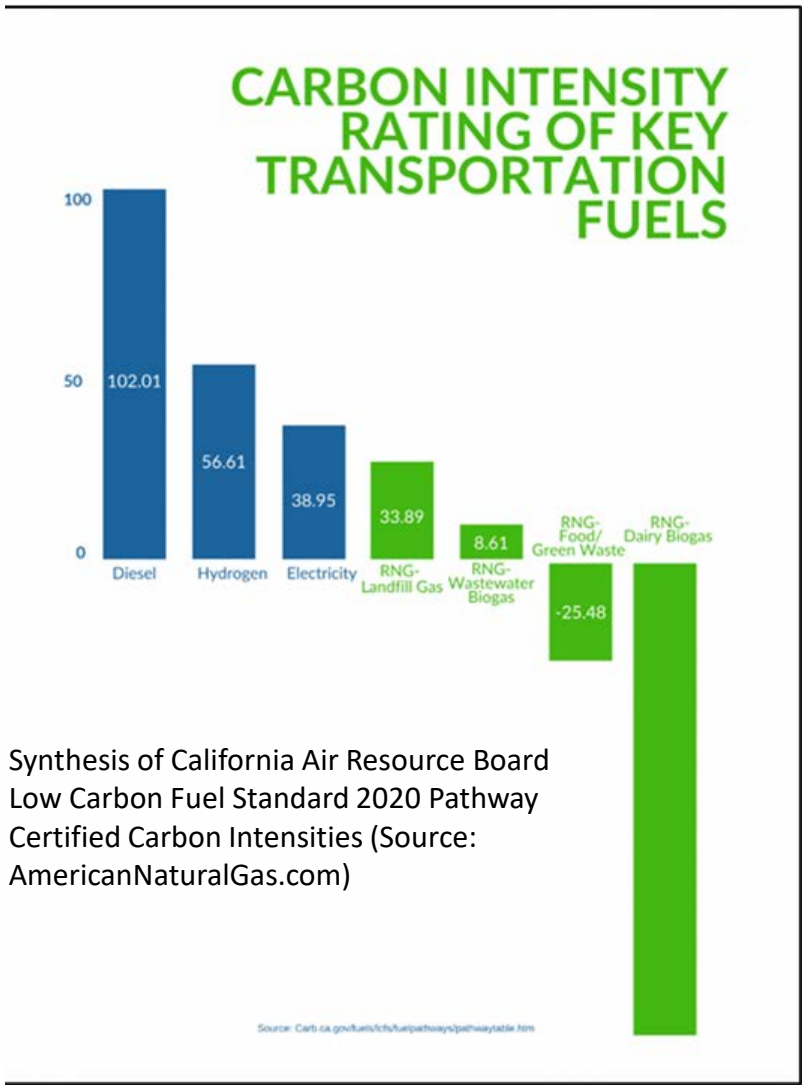
California cities served by municipal utilities have more flexibility and control to plan and implement local renewable energy transitions and capture economic benefits for their communities. Will they?

Municipalization, which could empower local renewable energy transitions served by regional monopolies is still stymied at the city and county level in California. So, transformative change may have to proceed at the grid edge.

Collaboration is required when you do not have complete control.

Local Energy Collaboration Targets

- Net Negative Carbon Local Fuel Production. Bio-methane produced from organic waste streams has widely varying carbon intensities, some deeply negative and some modestly positive.
- Net Positive Renewable Electricity. In California and most other US states, “net metered” solar electric arrays on new buildings can be sized to meet projected electricity usage. By contrast, arrays on existing buildings can only be sized to meet historical annual usage.
- Local Energy Resilience. Neither utilities nor local governments, acting alone, can achieve the best economic and resilience outcomes for a community.



Synthesis of California Air Resource Board Low Carbon Fuel Standard 2020 Pathway Certified Carbon Intensities (Source: AmericanNaturalGas.com)

Strategies - 1

Locally Specific Vision. A locally specific vision is a statement of the changes the jurisdiction has authority and aspires to make that empower economically beneficial local renewable energy investment.

Essential Local Government Roles. Cities and counties can play roles they already play in other areas. **New roles are required that require energy management and engineering skill sets!**

Renewable Energy Site Inventories. Sites suitable for renewable energy development should be inventoried and assessed to determine their economic value for purposes of renewable project development.

Strategies - 2

Decarbonization and Resilience Program Planning and Implementation. The same trade-offs confront each local jurisdiction, but choices will differ because local energy profiles and trends differ.

1) on-site solar vs. community renewables,
2) imports vs. local production,
3) new projects vs. retrofits,
4) zero carbon vs. fully energy resilient,
5) expedient vs. cost-efficient actions,
6) formerly affordable vs. newly affordable technologies, and
7) readiness for action now vs. later.

Growth and Maturation of Local Deployment and Retrofit Capacities. Lack of mature local deployment capacity is a main barrier to local renewable energy transitions and solar electrification retrofits.

Implementation

Cities and counties are taking roles in local renewable energy deployment that mirror their roles in other areas - enforcing codes, permitting projects, licensing local service providers and generally securing the public interest in safe, competent and environmentally appropriate services supportive of local renewable energy transitions.

Cities and counties will also take on new roles, assessing renewable resource potential and zoning options, determining and prioritizing which local public facilities require energy resilience upgrades, identifying sites that are suitable for renewable project development, and enforcing local ordinances and regulations governing renewable energy transition services - for example, regulating community renewable energy production and community microgrid operations to ensure equitable cost recovery and service delivery.

Technical and analytical support for energy related roles can and likely will be outsourced, but implementation will require new staff competencies – primarily energy engineering and energy management

Recap

More than $2.7 trillion has been invested over the past decade in building up global renewable energy capacity. Renewable sources more than doubled their share of the global power mix, from 5.9% in 2009 to 13.4% last year.

Proportionate expansion of local renewable supply and storage is essential to timely, just, safe and economically beneficial local renewable energy transitions. It buys time as the climate clock approaches midnight. 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.

US cities and counties that accelerate local renewable transitions are acting in their self-interest. Planning and action in California to encourage investment in local solar energy production strengthens local economies in many, major ways while turbo-charging local decarbonization and energy resilience.

Thank You!

gbraun@iresn.org

www.iresn.org

Link to preprint: Local Renewable Energy Transition Strategies