

**ENERGY
CODES**

2024

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**Pathways to Zero: Integrating
Renewable Energy in Building Codes**



Renewables and Decarbonization in Building Codes - Colorado Approach

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COLORADO
Energy Office



Colorado Climate Goals/Targets

- 100% zero-emission electricity generation by 2040
- Economy-wide 50% GHG reduction by 2030, 100% by 2050
- Significant growth in building electrification, net zero or zero energy ready construction, and EV deployment
- Fully decarbonized building sector by 2050



Colorado Code Adoption & Enforcement Structure

- Home Rule
- Compliance/enforcement handled at the local level
- State law requires minimum energy code upon local adoption/update of any other building code
- State role is primarily to develop model codes and provide resources and assistance



Decarbonization of Colorado's Electricity Generation

- State legislature has adopted mandatory requirement for electric utilities to reduce emissions by 80% by 2030.
- Currently on a trajectory to reach ~85% emissions reduction from electricity generation by 2030.
- Study conducted by CEO shows Colorado on the path to >94% emissions reduction from electricity by 2040 under business-as-usual scenario.
 - Other scenarios can reach even deeper emissions reductions, but with minimum 20% incremental cost above business-as-usual.



Current On-Site Renewables Ecosystem

- Over 1,300 GWh of generation from small-scale solar (73% residential, 25% commercial, 2% industrial)
- Net metering requires 1:1 cost credit for on-site solar generation
- 96% increase in total small-scale solar generation in Colorado between 2020 and 2022.



Future On-Site Renewables Ecosystem

- Utilities on track to meet or exceed emission reduction targets and rapidly expand renewable energy generation.
- Utility-scale build-out and production of renewable energy generally more cost-effective than distributed renewables.
- Expecting net metering reform in coming years that could drastically reduce cost-effectiveness for rooftop solar.



Colorado's Electric, EV, & Solar Ready Requirements

- Colorado has adopted requirements through codes for new residential and commercial buildings to be:
 - Solar ready: solar ready zone (including orientation), sufficient electric panel capacity and space
 - Electric ready: sufficient electric panel capacity for future electric appliances, conduit & wiring, physical space
 - EV ready: sufficient electric panel capacity for EV charging, allocations for different space types (EVSE installed, EV ready, EV capable, etc)
- Want to ensure that all homes and buildings are prepared for cost-effective installation of solar, EV charging, and high-efficiency electric appliances.



Consideration of Mandatory On-Site Renewables (1 of 2)

- Colorado is developing its next model energy code - low energy and carbon code.
- Will be based on the 2024 IECC, with amendments or adoption of appendices as part of the base code.
- 2024 IECC (as we know it) has mandatory on-site renewables for commercial, and a residential appendix for mandatory on-site renewables.



Consideration of Mandatory On-Site Renewables (2 of 2)

- Early discussions leaning towards removing commercial mandatory on-site renewables requirement, and not adopting the residential appendix.
- Concerns about the up-front cost, coupled with the rapid progress in the decarbonization of utility generation.
- Continued support for enabling on-site renewables without necessarily requiring it - keeping solar ready requirements.



Challenges with Off-Site Alternatives

- A few Colorado AHJs have adopted mandatory on-site renewable requirements.
- Many face challenges with the realities of off-site procurement alternatives:
 - Physical location of the generation
 - RECs and REC retirement requirements
 - Length and structure of PPAs



Takeaways

- Colorado is a state rapidly moving towards utility-scale decarbonization - not all states in the same position.
 - States/AHJs without utility level decarbonization efforts will see greater value from mandatory on-site renewable requirements.
- Strong support for enabling on-site renewable for those that want it (solar readiness), leaning away from mandatory on-site renewable requirements.
- Need consideration of real-world impacts of off-site renewable procurement alternatives.



Thank You!

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Getting To a Solar Mandate: An Industry Perspective

ROBERT E. RAYMER, PE

CONSULTANT

**CALIFORNIA BUILDING INDUSTRY
ASSOCIATION**

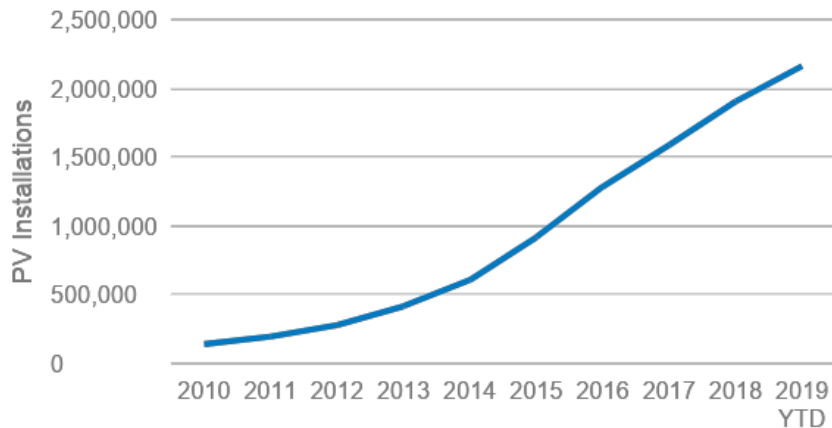


Automated Permitting & the Energy Code

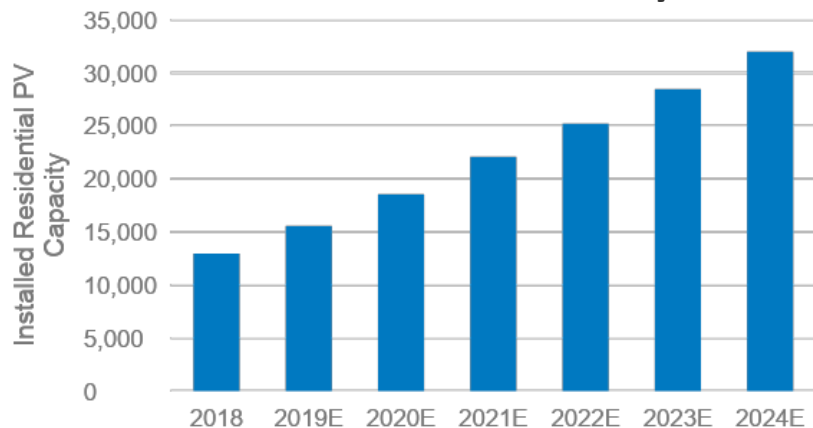
Mark Rodriguez, Executive Director
SolarAPP+ Foundation

Why Develop an Automated Permitting Solution?

- Residential PV markets are expanding
- AHJs must permit and inspect these systems with limited resources
- Automated online permitting can:
 - Ensure safe, code compliant systems are permitted
 - Reduce resource constraints on AHJ personnel
 - Enable economic development
 - Support AHJ clean energy and environmental goals



Cumulative PV Installations by Year



Estimated PV Growth (2018 – 2024)

Embrace the Change

The Impact is Clear.

Tucson's Experience with SolarAPP+



Nationwide

- 41,000 PV permits issued to date
- Over 41,000 hours of staff time saved in plan review
- 14.5 days faster cycle time while still focused on safety

“The permitting process was taking four weeks. Now with SolarAPP+ we give a permit the same day. We just approved about 450 installations in the last 60 days alone.”

- Tucson Mayor Regina Romero

The Future is Here!

If permitting were an encyclopedia.....

....automated permitting is the internet.

What Can an Automated Permitting System Check?

- **Validate Equipment listings**
 - UL 1741 for Inverters
 - UL 61730 1/2 or UL 1703 for modules
 - UL 9540 for Energy Storage Systems (ESS)
 - UL 2703 for specific racking and module combinations
 - Grounding and bonding
 - Fire Classification
 - Utility Interconnection rule 21
- **Verify circuit calculations**
 - PV Source circuit string voltage with temperature correction
 - PV Source circuit ampacity with high irradiance factor
 - Inverter Max AC output current
 - Combined Inverter Max AC output current
 - Wire ampacity
 - Minimum wire size
 - Minimum overcurrent protective device rating
- **Consider site specific criteria**
 - Locates project address in a jurisdiction
 - AHJ Registry
 - Considers local design criteria for every address
 - Calculates PV array area to inform ridge setbacks
- **Check ESS for**
 - Individual unit rating
 - Location
 - Maximum aggregate ratings by location
 - Minimum Spacing of individual units
 - Load Calculations for backup panels
 - Mounting
 - Restrictions for seismic zones
 - Approved Fire Detection solutions
- **Ensures proper interconnection of power production sources at every busbar and conductor within the circuit per NEC article 705**
- **Evaluate performance to energy code mandates**

Roadmap to Efficiency



EV Chargers

Level 2 with new
electrical circuits



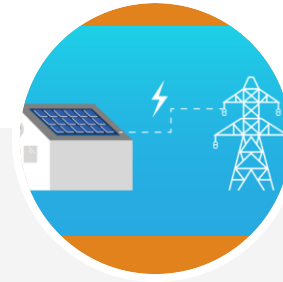
Heat Pumps

In compliance with
Energy Code



HVAC

Standardizing the
Application



Interconnection

Series and parallel
processes



BIPV

Solar as the roofing
material

Thanks for listening.

Contact Team@Solar-app.org for more info