

## DOCKETED

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# 2019 Building Energy Efficiency Standards Adoption Hearing

May 9, 2018

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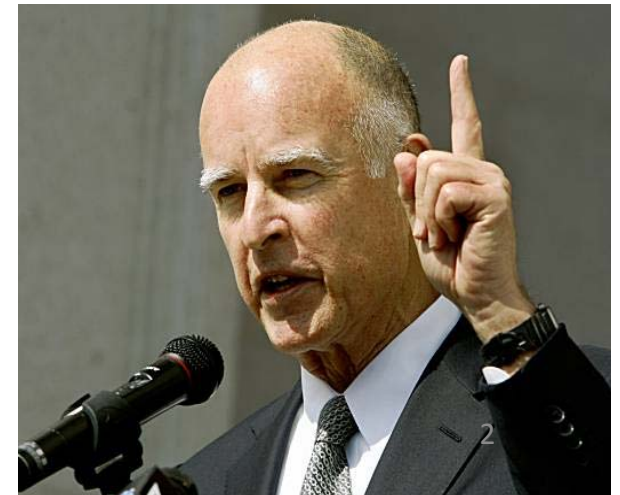




# Policy Drivers For Building Standards

The following policy documents establish the goal for new building standards to achieve zero net energy levels by 2020 for residences and by 2030 for nonresidential buildings:

- 2008 CPUC/CEC Energy Action Plan – ZNE for Residential buildings by 2020 and nonresidential buildings by 2030
- 2008 CARB Climate Change Scoping Plan
- 2007 (and later) CEC Integrated Energy Policy Report (IEPR)
- Governor's "Clean Energy Jobs Plan"





# How Standards Were Updated

- Energy Commission staff, with help from the utility partners and stake holders input developed the triennial Standards update.

## Opportunities for public participation

- **Utility-Sponsored Stakeholder Meetings**

- 9 In-person Meetings
- 10 Webinars

- **Commission Held Workshops**

- 14 Pre-rulemaking Staff Workshops
- 2 Commissioner Hearings

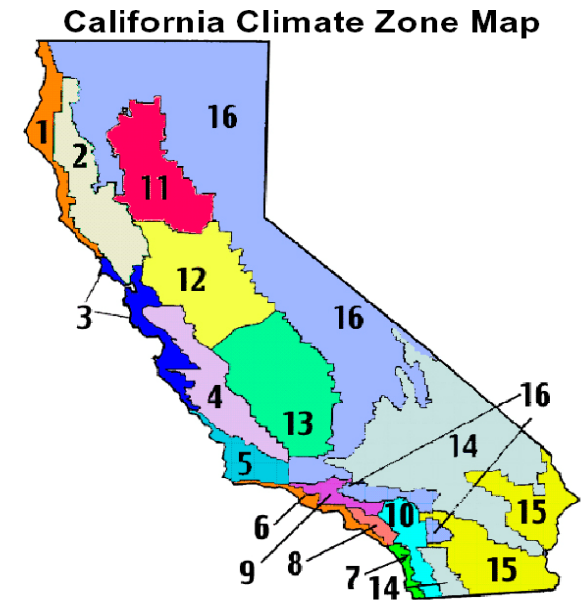




# How Standards Are Updated: Life Cycle Costing

## Standards measures must be cost effective!

1. Using Life Cycle Costing Methodology (LCC)
  - i. Discounted cash flows for costs and benefits
  - ii. Accounts for maintenance costs/benefits
  - iii. Appropriate discount rates and life of measures -  
30 years for residential measures  
15 years for nonresidential measures
2. Time Dependent Valuation (TDV)
  - i. Value of gas and electricity changes depending on the season and the time of day
  - ii. 8,760 TDV multipliers, one for each hour of the year
  - iii. Favors measures that reduce energy use during high demand periods





# 2019 Energy Standards

## Administrative Regulations (Part 1)

- Updated the Sub-Sections in part 1 for clarity
  - ATTCP application requirements (Quality Assurance) (§10-103.2)  
Labeling requirements for fenestration products and exterior doors
- Added a new Section Community Shared Solar Electric Generation System or Community Shared Battery Storage System Compliance option (§10-115)

## All Occupancies – General Provisions (Part 6)

- **Updated Buildings Covered by the Energy Standards**
  - Adding Healthcare Facilities to Scope
  - Added Many New Exceptions For Healthcare Facilities



# 2019 Standards Nonresidential Mechanical Measures

- **Provided Updates in Ventilation:**
  - High-rise Ventilation, Natural Ventilation, Exhaust
- **New Requirements:**
  - HVAC
  - Covered Process
  - New air filtration standard of MERV 13 all Nonresidential Buildings

## Demand Response

- Primarily Clean-Up
- New Allowance for Cloud-Based Systems





# 2019 Standards Nonresidential Measures

## 2019 Standards – Lighting Devices & Controls

- **Updated/Clarified and Added New Measures**
  - Indoor and outdoor lighting requirements
- **Moved maximum wattage allowance to LED baseline**
  - Single largest savings in the 2019 Standards







# 2019 Standards Nonresidential Measures

## 141.0(b) – Alterations, Prescriptive

- **Continued to improve lighting options from 2016**
  - Merged three Sections into single “Altered Indoor Lighting Systems” Section
  - Aligned both reduced power options to require same controls
  - Floor plans required for projects over 5,000 square feet



# 2019 Residential Standards

## Mandatory Measures:

- Updated insulation requirement for walls
- Fan efficacy for new gas furnaces updated to 0.45 w/cfm (from 0.58 w/cfm)
- Small Duct High Velocity Systems now have their own fan efficacy and airflow requirements
- **Air Filtration Updated:**
  - MERV 13 starting filter
  - 2-inch minimum depth air filters, **OR**
  - 1-inch depth air filters if sized properly
- **Adopted ASHRAE 62.2-2016 with Amendments:**
  - Kitchen range hood to verify Home Ventilating Institute (HVI) ratings
  - Multifamily dwelling Indoor Air Quality ventilation





# 2019 Residential Standards

## Prescriptive Measures:

- **Photovoltaic Systems Requirements**
- **Envelope:**
  - More efficient fenestration requirement
  - Door Insulation requirements (U-factor 0.20)
  - Quality insulation installation now a Prescriptive requirement
  - Roof Deck - Increased R-value of below deck insulation (13 to 19)
  - Wall Assembly - U-factor for framed walls from 0.051 to 0.048
- **Water Heating:**
  - New prescriptive options for heat pump water heaters in newly constructed buildings, additions and alterations
  - Updated existing prescriptive options for storage gas water heaters





# 2019 Reference Appendices

## JA, RA , NA

### Updated/Clarified and Added New Sections

- **All Existing Joint Appendix, Residential Appendix and Nonresidential Appendix Sections have been Updated and Clarified.**
  - Updated existing JAs, including JA8 ENERGY STAR references
  - Added three new covered process tests to the NAs, and a new high-rise residential ventilation test
  - Updated the Third Party Quality Control Program and the Residential Field Verification and Diagnostic Test Protocols
  - Added Joint Appendix JA11 Qualification Requirement for Photovoltaic System
  - Added Joint Appendix JA12 Qualification Requirement for Storage Systems

# Proposed 2019 Standards PV Requirements

**Maziar Shirakh, PE**

**Project Manager, Zero Net Energy**





# 2019 Benefits – Path to the Future

1. Increases building energy efficiency cost effectively
2. Contributes to the State's GHG reduction goals
3. Substantially reduces the home's impact on the grid through efficiency and PV.
4. Promotes demand flexibility and self-utilization of PV generation
5. Provides independent compliance paths for both mixed-fuel and all-electric homes
6. Provides tools for Part 11 Reach Codes and other beyond code practices





# 2019 Standards Approach

The 2019 Standards recognize the following priority for efficiency and generation resources:

1. Envelope efficiency,
2. level playing field for all-electric homes,
3. Appropriately sized PVs, and
4. Grid harmonization strategies that maximize self-utilization of the PV output and limit exports to the grid

PV are a prescriptive requirement, but batteries are a compliance option





# Parallel Prescriptive Paths

There will be two parallel prescriptive paths for compliance for each of:

1. Mixed Fuel Homes
2. All-Electric Homes – All-electric homes have lowest GHG emissions, especially with coupled with PVs and storage

NEEA Tier 3 HPWH models can easily be used to meet or exceed standard design using the performance path







# PV Cost Effectiveness

All Standards measures , whether efficiency or renewables, must be cost effective in each CZ, using life cycle costing (LCC)

**Complying with NEM and LCC rules, appropriately sized PVs that displace annual kWhs are found to be cost effective in all climate zones, even if the NEM2 rules are changed in the future to compensate hourly exported kWhs at avoided cost**

No prescriptive requirements for the battery storage systems for the 2019 Standards, only a compliance option





# Here Comes the Sun...

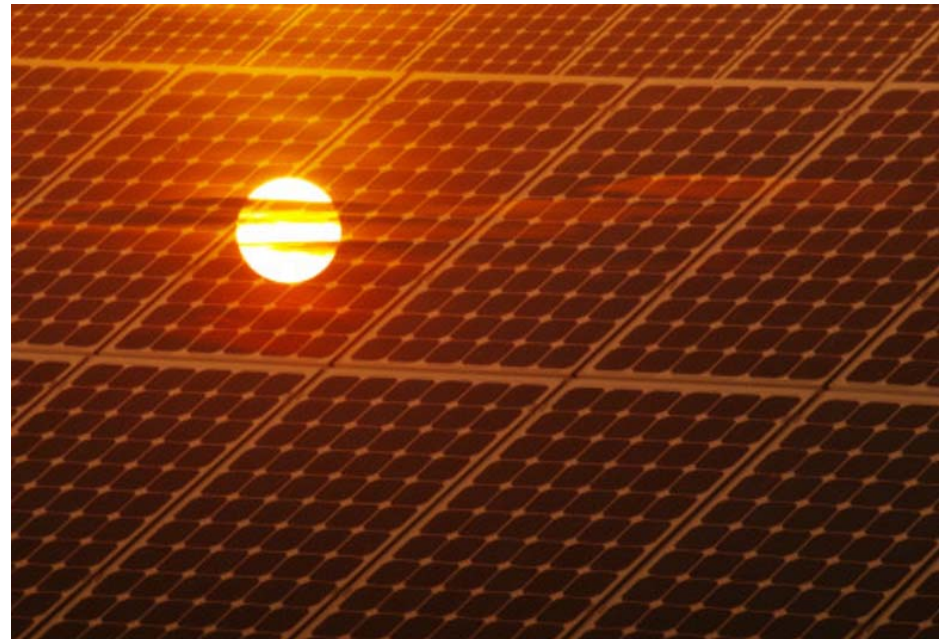
**For the first time, 2019 Standards are proposed to have prescriptive solar PV systems, sized to displace the annual kWhs of a mixed-fuel home**

There are several Exceptions, including:

- Shading due to external barriers
- Multi-story buildings with limited roof space

## **Community Solar:**

Homes can instead be served by Commission approved community solar projects that provide equivalent benefits (energy savings, bill reductions, durability) to the homes as onsite PV systems.





# Joint Appendix 11 & 12

**In developing proposed photovoltaic and battery storage specifications the Energy Commission recognized a need to optimize the operation of these systems, to the benefit of California's electricity distribution grid.**

## **JA11- Qualification Requirements for Photovoltaic Systems:**

1. The PV system must meet orientation and shading requirements
2. The PV system must provide lifetime web & mobile based monitoring capabilities to allow occupants monitor the performance of their systems

## **JA12- Qualification Requirements for Battery Storage Systems:**

Turns the battery into a dynamic device that when coupled with a PV system brings maximum benefits to the environment, grid and the occupants.



# Cool Tools

## 2019 CBECC-Res a powerful state-of-the art building simulation tool

Includes new tabs to evaluate real time CO2 impacts of building features, EE options, PV, and demand responsive choices:

2019\_CZ12\_2100ft2\_Std\_NGAS-2016 Features - CZ12 STD2100 EGLASS20 NGAS

Compliance Summary		CO2 Emissions		Energy Design Rating		Energy Use Details		CO2 Design Rating		CO2 Details	
End Use	Std Design Electric CO2 Emis. (kg)	Std Design Fuel CO2 Emis. (kg)	Std Design Total CO2 Emis. (kg)	Prop Design Electric CO2 Emis. (kg)	Prop Design Fuel CO2 Emis. (kg)	Prop Design Total CO2 Emis. (kg)	Design Rating CO2 Emissions Margin (kg)				
Space Heating	26	992	1,018	30	1,161	1,191	-173				
Space Cooling	265		265	319		319	-54				
IAQ Ventilation	33		33	33		33	0				
Other HVAC			0			0	0				
Water Heating	16	521	537	16	521	537	0				
Self Utilization Credit						0	0				



# Electrified Buildings Have Lowest CO2 Emission Levels

**2019 Standards result in significant CO2 reduction in buildings**

2700 sf prototype, CZ12		
CO2 Impact of Housing Choices		Metric Tons of CO2 Emitted/yr
Mixed Fuel	2000 Compliant Building, No PV	6.5
Mixed Fuel	2016 Compliant Building, No PV	3.26
Mixed Fuel	2019 Standard Design, with 3.1 kW PV	2.29
All-Elect	2019, 3.1 kW PV	1.12
All-Elect	2019, 6 kW PV	0.46



# Savings, Savings, Savings

Statewide average costs of \$9,500, with a present value savings of \$19,000 for a net savings of \$9,500 for a residential building.

Statewide monthly levelized costs of \$40 and bill savings of \$80 for a “typical” residential, for a net saving of \$40 per month.

Energy Savings of 7 percent of all regulated, plug, lighting, and appliances loads, without PVs.

Energy Savings of 53 percent of all regulated, plug, lighting, and appliances loads, with PVs.

Three-year CO<sub>2</sub>e savings of 700,000 metric tons, equivalent to taking 115,000 gas guzzlers (18 MPG) off the roads.





# Implications of Future Standards

Although the 2019 Standards project is a major success on many fronts, it reveals the need for attention on the following going forward:

- Move to a more GHG-based metric that promotes electrification
- Move away from “netting” – must have a metric that advances building measures that support grid flexibility
- Maintain an energy efficiency first priority but advance 2019 Standards’ second priority on PV self utilization and demand responsive measures
- Continue to advance compliance software information enabling users to take GHG reduction into account in design and construction



# 2019 Standards Update

## Efficiency and Energy Savings

**Residential:** Each kilowatt goes twice as far in a 2019 home as it did in a 2005 home: a 2019 house uses just under half of the energy of a 2005 house, before considering solar PV. With PV, savings is over two thirds:

Percent Savings Between 2005 and 2019 Standards Cycles

Statewide Average	Residential Energy Savings	Residential CO <sub>2</sub> e Reduction
	68%	52%

**Nonresidential:** LED lighting in nonresidential construction will save over 480 gigawatt-hours in the first year, enough to power a fleet of 190,000 electric cars.

**Combined:** The efficiency improvements alone, in residential and nonresidential buildings, save over 650 GWh of electricity and avoid 75 megawatts of demand each year, equivalent to the output of a 120-turbine wind farm. Including residential PV, staff estimates emission reductions of 1.4 million metric tons CO<sub>2</sub>e over three years.





# 2019 Alternate Calculation Method Approval Manual

Clarifying language regarding major and minor software changes and added ability for nonresidential software to use alternate simulation engines

# Proposed Negative Declaration

**Peter Strait**  
Supervisor





# Requested Commission Action

## **Staff hereby requests the following:**

- The Commission approve the Initial Study and adopt a Negative Declaration based on its findings
- The Commission adopt the proposed 2019 update to the Building Energy Efficiency Standards in Title 24, Part 6, the associated administrative regulations in Title 24, Part 1, the Reference Appendices, and the Alternate Calculation Method Approval Manual, inclusive of the errata identified in the Resolution



# Questions

