'19AUG22 PM 4:09 CITY CLERK

City and County of Honolulu

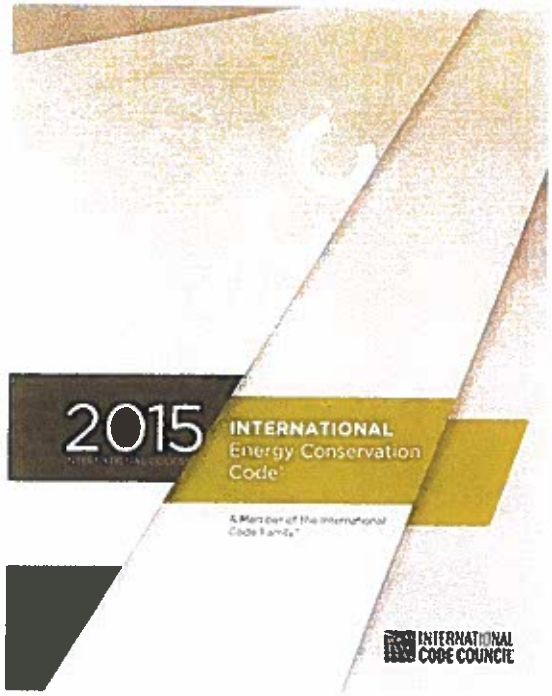
# Bill 25 (2019)
# Energy Code Update

Prepared by the Department of Planning and Permitting &
Office of Climate Change, Sustainability and Resiliency
July 25, 2019

MAYOR'S MESSAGE 107

## Update to Energy Code

- Update the City's **Energy Conservation Code ("Energy Code") from 2006 to 2015** (current code is 13 years old)
- Energy Code update is based on the **2015 International Energy Conservation Code ("IECC")** as adopted by the State
- Ordinance would adopt the State code with **specified local amendments for EV Readiness and Renewable Water Heating**



## Update to Energy Code

- Updates to the Energy Code support Hawai'i's transition to 100% clean energy.
- In 2018, a six-year old home that was constructed to the 2006 (current) code instead of the 2015 (proposed) version, has been using approximately 33% more energy than needed for the past six years, and will continue to throughout the life of the home.

| Residential Energy Code | States | Percent |
|---|---|---|
| IECC 2015 or ASHRAE 90.1 2013 | 17 | 33.3% |
| IECC 2012 or ASHRAE 90.1 2010 | 9 | 17.6% |
| IECC 2009 and/or IRC 2009 Chapter 11 | 16 | 31.4% |
| IECC 2006 and/or IRC 2006 Chapter 11 | 1 | 2.0% |
| IECC 2003 and/or IRC 2003 Chapter 11 or e: | 1 | 2.0% |
| Locally Developed Code | 2 | 3.9% |
| No statewide adoption | 5 | 9.8% |
| Total | 51 | |

| Commercial Energy Code | States | Percent |
|---|---|---|
| IECC 2015 or ASHRAE 90.1 2013 | 19 | 37.3% |
| IECC 2012 or ASHRAE 90.1 2010 | 11 | 21.6% |
| IECC 2009 or ASHRAE 90.1 2007 | 14 | 27.5% |
| IECC 2006 or ASHRAE 90.1 2004 or earlier | 2 | 3.9% |
| Locally Developed Code | 1 | 2.0% |
| No statewide adoption | 4 | 7.8% |
| Total | 51 | |

## Notable Local Additions to the Energy Code

- **R401.2.1 - Tropical Zone –** For those that choose to opt-in, *residential buildings* in the tropical zone can comply with this section by satisfying the following conditions:
  - Not more than one-half of the area of the *dwelling unit* is air conditioned
  - The *dwelling unit* is not heated
  - Glazing in conditioned space shall have a maximum a *solar heat gain coefficient* as specified in Table R402.2.1.
  - **Note: The Tropical Zone track is an <u>optional</u> compliance pathway**

## Benefits of R401.2.1 Tropical Zone

- **Tropical Zone** allows naturally cooled homes and buildings:
  - More appropriate and lower cost compliance requirements for homes built in O'ahu's hot and humid climate
  - A point system that rewards Energy Star appliances, large lanais, downsized homes, and natural ventilation
  - Reduces building costs in tropical climate by avoiding unnecessary insulation, among other things
  - Option requires ceiling fan stub ins; installed ceiling fans use less than 5% electricity consumption compared to AC usage
  - Allows walls to be shaded or reflective in lieu of commercial insulation
  - Saves up to 48% more energy than standard 2015 IECC option

## Notable Local Additions to the Energy Code

- **R403.5.5 - Solar Water Heating -** Residential single-family buildings shall use solar, wind or another renewable energy source for not less than 90 percent of the energy for service water heating:
  - Exception: If an architect or mechanical engineer licensed under Chapter 464, of the HRS, attests and demonstrates that installation is impracticable due to poor solar resource or installation is cost-prohibitive based upon a life cycle cost-benefit analysis that incorporates the average residential utility bill and the cost of the new solar water heater system with a life cycle that does not exceed fifteen years, then one of the following technologies advancing renewable energy shall be used for service water heating: 1) a grid-interactive water heater; 2) a heat pump water heater; or 3) a gas-powered water heater that is fueled by a source that is not less than 90% renewable. For the purpose of this section, "grid-interactive water heater" means an electric resistance water-heater fitted with grid-integrated controls that are capable of participating in an electric utility load control or demand response program.

## Notable Local Additions to the Energy Code

- **R404.3 - Electric Vehicle Readiness –** In addition to what is required by the Electrical Code, a dedicated receptacle for an electrical vehicle must be provided for each residence which provides minimum, Level 1 Service.
- **C406.8 - Electric Vehicle Infrastructure -** New residential multi-unit buildings that have eight or more parking stalls, and new commercial buildings that have twelve or more parking stalls, shall be electric vehicle charger ready for at least 25 percent of the parking stalls. As used in this section, "electric vehicle charger ready" means that sufficient wire, conduit, electrical panel service capacity, overcurrent protection devices and suitable termination points to connect to a charging station capable of providing simultaneously an AC Level 1 charge per required parking stall for residential and multi-unit buildings. For non-residential commercial buildings, at least 25 percent of the parking stalls are required to be AC Level 2 charger ready

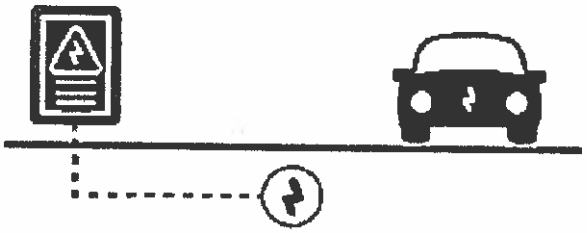
## Notable Local Additions to the Energy Code

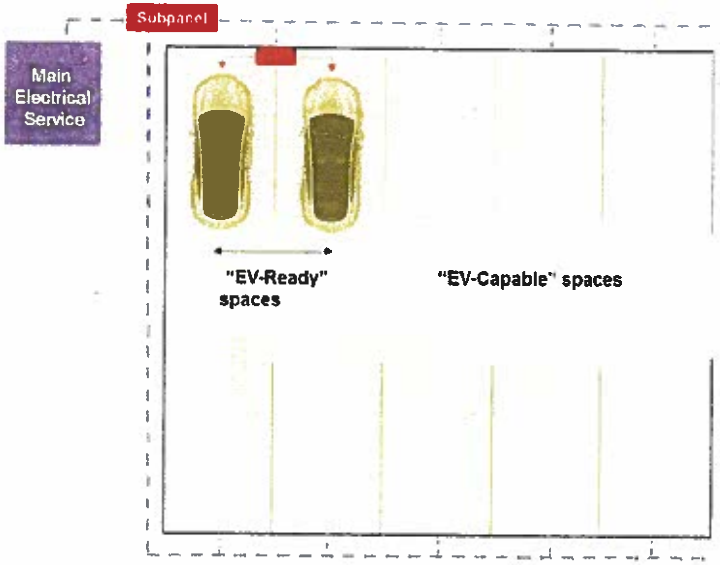
- **C406.8 - Electric Vehicle Infrastructure** (continued)

### CHARGE METHODS ELECTRICAL RATING

| Charge Method | Normal Supply Voltage (Volts) | Maximum Current (Amps- Continuous) | Supply power |
|---|---|---|---|
| AC Level 1 | 120V AC, 1-phase<br>120V AC, 1-phase | 12A<br>16A | 120VAC/20A<br>(12-16A continuous) |
| AC Level 2 | 208 to 240V AC, 1-phase | ≤ 80A | 208/240VAC/20-100A (16-80A continuous) |

# Notable Local Additions to the Energy Code






| Charging Level | Vehicle Range Added per Charging Time and Power | Supply Power |
|---|---|---|
| **AC Level 1** | 4 mi/hour @ 1.4kW<br>6 mi/hour @ 1.9kW | 120VAC/20A<br>*(12-16A continuous)* |
| **AC Level 2** | 10 mi/hour @ 3.4kW<br>20 mi/hour @ 6.6kW<br>60 mi/hour @ 19.2 kW | 208/240VAC/20-100A<br>*(16-80A continuous)* |
| **DC Fast Charging** | 24 mi/20minutes @24kW<br>50 mi/20minutes @50kW<br>90 mi/20minutes @90kW | 208/480VAC 3-phase<br>*(input current proportional to output power; ~20-400A AC)* |

## Benefits of EV Readiness & Infrastructure

- EV Readiness for new construction directly supports the City's commitment to transform all ground transportation to renewable fuels by 2035
- Retrofitting for EV conduits costs **4 to 8 times more** than ensuring EV Readiness during new construction
- Average residential buildings have a 50-year lifespan on average. It is critical that charging infrastructure is incorporated in the pre-construction stage to ensure buildings can accommodate future EV-driving residents

**Cost of Installing "EV Ready" Infrastructure**

| Scenario | Cost Per EV Parking Space with 40A Circuit | |
|---|---|---|
| | New Build | Retrofit |
| 5-10 EV spaces | $920 | $10,273 |
| 26+ EV spaces | $860 | $3,634 |

Source: "Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco" and "Southern California Edison 'Charge Ready' Program Advisory Board Meeting #5 (August 2017) – Slide 11"

## Economic and Environmental Comparison of Water Heating Options

| Per Household[1,2,3] | Solar Hot Water Heater – Single Family, Bulk[4] | Solar Hot Water Heater – Single Family | Instantaneous Gas Heating[5] | Heat Pump | Grid Interactive |
|---|---|---|---|---|---|
| Installation Cost | ($3,600)[6] | ($5,250)[6] | ($2,500)[7] | ($2,000)[8] | ($1,000)[9] |
| Total Rebate & Tax Credit[10] | $1,080 | $1,575 | $0 | $300 | $48 / year[11] |
| Cumulative Homeowner Savings – 12Y | $5,352[12] to $8,063[13] | $4,197[12] to $6,940[13] | $1,288[14] to $2,732[15] | $4,508 to $6,617 | ($391) to $2,512 |
| Cumulative Homeowner Savings – 15Y | $5,243 to $8,684 | $4,088 to $7,561 | ($494) to $1,338 | $3,916 to $6,593 | ($227) to $3,323 |
| Net Present Value (NPV) – 12Y | $3,259 to $5,250 | $2,104 to $4,122 | $282 to $1,342 | $2,857 to $4,406 | ($553) to $1,212 |
| Net Present Value (NPV) – 15Y | $3,258 to $5,619 | $2,103 to $4,490 | ($551) to $706 | $2,613 to $4,449 | ($470) to $1,621 |
| Simple Payback (years) | 3.0 to 4.0 | 4.3 to 5.8 | 5.9 to 9.9 | 2.6 to 3.4 | 4.4 to 20.8 years |
| Internal Rate of Return (IRR) | 23.4% to 30.9% | 13.9% to 21.2% | 6.9% to 13.4% | 28.1% to 38.7% | n/a |
| Return on Investment (ROI) | 24.6% to 33.1% | 16.8% to 22.7% | 11.9% to 16.5% | 28.7% to 38.5% | n/a |
| Annual Maintenance Costs | $75[16] | $75[16] | $87.5[17] | $45.0 | $45.0 |
| Avoided Barrels of Oil (per household)[18,19] | 50.5 to 66.9 | | 38.4 to 47.8 | 40.1 to 53.5 | n/a |
| Avoided Emissions ($MTCO_2$ per household) | 21.8 to 28.6 | | 16.6 to 20.7 | 17.3 to 23.1 | n/a |

[1] Assumptions based on discount rate of 5% and 1.0% annual inflation.
[2] Assumption of $0.295 per kWh (Hawaiian Electric).
[3] Based on a comparison to a standard electric resistance water heater as the baseline number.
[4] Bulk price assumes 100 or more installations.
[5] Assumption of $4.50 per therm based on residential service rate, O'ahu Gas District.
[6] Installation costs between $3,600 and $5,250 provided by industry channel checks and are based on new construction. Assumptions not based on retrofit scenarios, which assume greater acquisition and administrative mark-up costs.
[7] Installation cost of $2,500 provided by Hawai'i Gas.
[8] Based on channel check, e.g., Rheem Performance Platinum range of $1,300 to $1,900 per tank, assuming an average equipment cost of $1,600 and $400 install fee.
[9] Grid interactive water heater installation based on typical cost of a standard electric resistance storage water heater ranging from $300 to $500
[10] Solar hot water figures assume a 30% federal tax credit.
[11] Benefit range assumes $4 monthly rebate for grid services, and $200 per year of load shift value, assuming an average $600 equipment cost and $400 install fee.
[12] Assumption of 2,459 kWh used for household electricity consumption toward water heating; 2,459 kWh is equivalent to a 6.4 minute shower per person at 2.1 gallons per minute for a typical Hawai'i household (Hawai'i Energy). Does not include other hot water uses such as dishwashing and laundry.
[13] Assumption of 3,184 kWh used for household electricity consumption toward water heating; 3,184 kWh is equivalent to a 8.2 minute shower, the national average (SmarterHouse.org, home-water-works.org). per person at 2.1 gallons per minute. Does not include other hot water uses such as dishwashing and laundry.
[14] Assumption of 93.3 therms used for household gas consumption toward water heating. 93.3 therms is equivalent to a 6.4 minute shower per person at 2.1 gallons per minute for a typical Hawai'i household (Hawai'i Energy). Does not include other hot water uses such as dishwashing and laundry.
[15] Assumption of 120.8 therms used for household gas consumption toward water heating. 120.8 therms is equivalent to a 8.2 minute shower, the national average (SmarterHouse.org, home-water-works.org) per person at 2.1 gallons per minute. Does not include other hot water uses such as dishwashing and laundry.
[16] Hawai'i Energy recommends maintenance tune-ups for solar water heating systems every 3-5 years and offers a $100 rebate. An average tune-up will cost $400; the annual cost of $75 is calculated by ($400 -$100)/4 years =$75.
[17] Periodic water heater maintenance is recommended by the Department of Energy and will vary greatly based on the manufacturer's recommendations, but expect to pay standard hourly plumber fees of $45-$65 an hour for water heater maintenance, with most maintenance taking one to two hours for a yearly total of $45 to $130. *$87.5 = ($45+$135)/2.* (https://www.fixr.com/costs/install-tankless-water-heater)
[18] Avoided barrels of oil is an estimate over a 15 year time-frame.
[19] EPA Greenhouse Gas Equivalencies Calculator.

## Bill 25 (2019) Summary

# Bill 25 (2019), with local amendments, DOES:

- Apply only to new construction
- Reduce the cost of living/energy costs for residents and businesses – 33% to 65% going forward
- Give builders more options to utilize tropical zone building standards
- Decrease carbon pollution and improves air quality and public health
- Enable new alternatives to reduce costs for hot water heating
- Improve resilience to natural disasters by providing homeowners with distributed storage and charging options
- Make it easier for the public to have an EV and find convenient charging stations

## Bill 25 (2019) Summary

### Bill 25 (2019), with local amendments, DOES NOT:

- Ban natural gas
- Restrict gas for cooking in any way
- Restrict water heating options for the commercial, multi-family, or hospitality sectors; for single-family, gas is still allowable if the source is renewable or used as a back-up
- Preclude common-sense hot water heating options in low sun-zones
- Require installation of charging stations, or location of rough-ins
- Require EV charging for existing facilities (no retrofitting)
- Force conversion of existing water heating systems (no retrofitting)
- Pick technology winners
- Increase the long-term cost of housing