CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Irwindale, California
October 22, 2018

Agenda

Welcome, Introductions, and Objectives	9:00 – 9:15
State of the Standards: Reaching Beyond	9:15 – 9:45
2019 Initial Analysis Status and Results	9:45 – 10:45
BREAK	10:45 – 11:00
Putting It All Together (Discussion) • Reach Code Process • Options for 2019 and What's Right for Your Jurisdiction	11:00 – 12:15
Wrap-Up	12:15 – 12:30

Workshop Objectives

Green Building Ordinances & Reach Codes

California Building Standards Code (Title 24)

Title 24 is Composed of 12 "Parts," Described Below:

- Part 1 - California Building Standards Administrative Code
- Part 2 - California Building Code - Vol. I & II
- Part 3 - California Electrical Code
- Part 4 - California Mechanical Code
- Part 5 - California Plumbing Code
- Part 6 - California Energy Code
- Part 7 - No longer published in Title 24; see Title 8 CCR
- Part 8 - California Historical Building Code
- Part 9 - California Fire Code
- Part 10 - California Existing Building Code
- Part 11 - California Green Building Standards Code
- Part 12 - California Reference Standards Code

Legal Requirements for Reach Codes

- Compliance with local requirements for ordinances
- Compliant with all state laws
- Updated for each new Building Code cycle
- Filed with the State
- Accessible to the public
- **More stringent than state requirements**
- **Cost effective**
- **May not preempt federal regulations**

  (effectively, may not specifically require high efficiency HVAC and DHW equipment or any other appliances for which there is a federal standard)

State of the Standards

Ingrid Neumann
Building Standards Office
CALIFORNIA ENERGY COMMISSION

REACHING BEYOND

Monday, October 22, 2018
Irwindale, California

EXECUTIVE ORDER B-30-15

- April 29, 2015 “Governor Brown Establishes Most Ambitious Greenhouse Gas Reduction Target in North America”
- **greenhouse gas reduction target of 40 percent below 1990 levels by 2030**
- aligns California with leading international governments
- California is on track to meet or exceed the current target of reducing greenhouse gas emissions to 1990 levels by 2020, as established in the California Global Warming Solutions Act of 2006 (AB 32)
- Makes it possible to reach the ultimate goal of reducing emissions 80 percent under 1990 levels by 2050.

Legislative Mandates
Clean Energy & Pollution Reduction Act
SB 350 Overview

- **SB 350 codifies the Governor's aggressive clean energy goals**
- signed into law on October 7, 2015
- SB 350 increases California's renewable electricity procurement goal from **33 percent by 2020** to **50 percent by 2030**.
  - Increases the use of Renewables Portfolio Standard (RPS) eligible resources, including solar, wind, biomass, geothermal, and others.
- SB 350 requires the state to **double statewide energy efficiency savings in electricity and natural gas end uses by 2030**

Legislative Mandates
Clean Energy & Pollution Reduction Act
SB 350 Overview

Directs state agencies to undertake various studies to identify and assess the following:

Barriers to, and opportunities for, solar photovoltaic energy generation as well as barriers to, and opportunities for, access to other renewable energy by low-income customers; and barriers to contracting opportunities for local small businesses in disadvantaged communities. Barriers for low-income customers to energy efficiency and weatherization investments, including those in disadvantaged communities, as well as recommendations on how to increase access to energy efficiency and weatherization investments to low-income customers

This study was conducted by the Energy Commission and was adopted December 14, 2016. "Low-Income Barriers Study"

Legislative Mandates
Supporting Legislation – **Assembly Bill 802**

- Signed into law on October 8, 2015 **authorizing the Energy Commission to create a building energy-use benchmarking and disclosure program**
- Existing law requires electric and gas utilities to maintain records of the energy consumption data of all nonresidential buildings, in a format compatible for uploading to the United States Environmental Protection Agency's ENERGY STAR Portfolio Manager
- Existing law requires the Energy Commission to develop and implement a comprehensive program to achieve greater energy savings in existing residential and nonresidential building stock.

Legislative Mandates
Supporting Legislation – **Assembly Bill 802**

- **AB 802 directed the Energy Commission to create a statewide building energy use benchmarking and public disclosure program for buildings larger than 50,000 square feet.**
  - **require building owners to report building characteristic information and energy use data to the Commission by June 1 annually, beginning in 2018 for buildings with no residential utility accounts, and in 2019 for buildings with 17 or more residential utility accounts.**
- effective January 1, 2017, also requires that energy utilities provide building-level energy use data to building owners, owners' agents, and operators upon request for buildings with no residential utility accounts and for buildings with five or more utility accounts.

Legislative Mandates
Supporting Legislation – **Assembly Bill 802**

- The Energy Commission will publicly disclose some of the reported information beginning in 2019 for buildings with no residential utility accounts, and 2020 for buildings with residential utility accounts.

- ***The cities of San Francisco, Berkeley, and Los Angeles have local benchmarking and public disclosure programs whose requirements exceed those of the state program.***

Legislative Mandates

"The 100 Percent Clean Energy Act of 2018"

SB 100 Overview September 10, 2018

- Under existing law, the California Renewables Portfolio Standard Program requires that the total kilowatt-hours of products sold to retail end-use customers achieve 25% of retail sales by December 31, 2016, **33% by December 31, 2020**, **40% by December 31, 2024**, **45% by December 31, 2027**, and **50% by December 31, 2030**.

- This bill revises the above-described legislative findings and declarations to state that the goal of the program is to **achieve that 50% renewable resources target by December 31, 2026, and to achieve a 60% target by December 31, 2030.**

Legislative Mandates
"The 100 Percent Clean Energy Act of 2018"
SB 100 Overview September 10, 2018

- This bill states that **it is the policy of the state that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to California end-use customers and 100% of electricity procured to serve all state agencies by December 31, 2045**.
  - *The bill would require the PUC and the Energy Commission, in consultation with the state board, to take steps to ensure that a transition to a zero-carbon electric system for the State of California does not cause or contribute to greenhouse gas emissions increases elsewhere in the western grid.*

The **Warren-Alquist Act** is the legislation that created and gives statutory authority to the California Energy Commission

§ 25402. **Reduction of wasteful, uneconomic, inefficient or unnecessary consumption of energy**

- Prescribe, by regulation, lighting, insulation climate control system, and other building design and construction standards that increase the efficiency in the use of energy and water for new residential and new nonresidential buildings.
- Prescribe, by regulation, energy and water conservation design standards for new residential and new nonresidential buildings. The standards shall be performance standards and shall be promulgated in terms of energy consumption per gross square foot of floorspace, but may also include devices, systems, and techniques required to conserve energy and water. The commission shall periodically review the standards and adopt any revision that, in its judgment, it deems necessary.

The **Warren-Alquist Act** is the legislation that created and gives statutory authority to the California Energy Commission

§ 25402.1. Duties of commission; **public domain computer program**; certification process; **manual, sample calculations, and model designs**; pilot project of field testing; technical assistance program; enforcement and resolutions

§ 25402.2. **Building standards**

§ 25402.3. Regional training centers for local building officials and enforcement personnel; locations; sessions; workshops for rural areas

§ 25402.4. Nonresidential building standards; option using passive or semi passive thermal systems; construction techniques

§ 25402.5. Lighting device; lighting subject to § 25402; declaration of existing law; adoption of efficiency standards for outdoor lighting

§ 25402.5.4. General purpose lights; standards; adoption; purchase of lights meeting or exceeding standards

§ 25402.6. **Decrease of wasteful peak-load energy consumption** in existing residential and nonresidential buildings; development and implementation of plan

§ 25402.7. **Support for specified building standards and other regulations by electric and gas utilities**

§ 25402.8. Indoor air pollution; assessment of new building standards

California Building Standards Code
Title 24 of the California Code of Regulations

PART 1 - CALIFORNIA ADMINISTRATIVE CODE
PART 2 - CALIFORNIA BUILDING CODE
PART 2.5 - CALIFORNIA RESIDENTIAL CODE
PART 3 - CALIFORNIA ELECTRICAL CODE
PART 4 - CALIFORNIA MECHANICAL CODE
PART 5 - CALIFORNIA PLUMBING CODE
PART 6 - CALIFORNIA ENERGY CODE
PART 7 - Vacant
PART 8 - CALIFORNIA HISTORICAL BUILDING CODE
PART 9 - CALIFORNIA FIRE CODE
PART 10 - CALIFORNIA EXISTING BUILDING CODE
PART 11 - CALIFORNIA GREEN BUILDING STANDARDS CODE
PART 12 - CALIFORNIA REFERENCED STANDARDS CODE

Title 24

PART 6 - CALIFORNIA ENERGY CODE

Subchapter 1 describes the scope of the standards and includes the definitions and rules of construction that apply to Part 6.

Subchapter 2 contains mandatory requirements for all buildings.

Subchapter 3 contains additional mandatory requirements for new nonresidential, high-rise residential, and hotel/motel buildings.

Subchapter 4 contains still more mandatory requirements for new nonresidential, high-rise residential, and hotel/motel buildings.

Subchapter 5 sets the performance (energy budget) and prescriptive (package of measures) compliance approaches for new nonresidential, high-rise residential, and hotel/motel buildings.

Subchapter 6 establishes the requirements for additions, alterations, and repairs to existing nonresidential, high-rise residential, and hotel/motel buildings.

Title 24

PART 6 - CALIFORNIA ENERGY CODE

Subchapter 7 contains the mandatory requirements for new low-rise residential buildings.

Subchapter 8 sets for the performance (energy budget) and prescriptive (package of measures) compliance approaches for new residential buildings.

Subchapter 9 establishes the requirements for additions and alterations to existing low-rise residential buildings.

Part 6 also includes a set of appendices that are adopted along with and are a part of the standards. Due to their volume and complexity, they are not codified, but are incorporated by reference.

PART 6 - CALIFORNIA ENERGY CODE 2019 UPDATES

Three key areas:

1. proposing new requirements for **installation of solar photovoltaics** for newly constructed low-rise residential buildings
2. updating current ventilation and Indoor Air Quality (IAQ) requirements, including references to ASHRAE 62.1 and 62.2
3. extending Title 24 Part 6 to apply to **healthcare facilities**

PART 6 - CALIFORNIA ENERGY CODE
2019 Residential UPDATES

For **solar**:

- Adding new prescriptive requirements for installing solar photovoltaic systems in newly constructed residential buildings, including exceptions to address conditions where meeting the solar photovoltaic systems requirements are not feasible or cost effective
- specifying use of an Energy Design Rating in the performance approach to compliance to support solar photovoltaic requirements
- adding Joint Appendix 11 and 12 to support solar photovoltaic and battery storage systems installed to comply with Part 6.
- Adding a performance standards exception allowing community shared solar electric generation or battery storage systems to serve as a full or partial option for the onsite solar photovoltaic systems requirements, and adding an administrative process in Part 1 for Commission approval of compliance options for community shared systems that 6 provide equal or greater energy saving benefits to buildings that would otherwise have onsite solar PV systems, in a manner that is both valid and enforceable.

PART 6 - CALIFORNIA ENERGY CODE
2019 Residential UPDATES

For **ventilation**:

- References to ASHRAE 62.2 have been updated to incorporate the current version by reference.
  - Amendments to the current version of ASHRAE 62.2 are proposed as found to be appropriate to ensure efficiency and indoor air quality.
- Increasing air filter filtration requirements to a Minimum Efficiency Reporting Value (MERV) of 13, necessary for filtering out the smallest category of potentially harmful particulates.
- Extending air filtration requirements to apply to supply-only ventilation systems and the supply side of balanced ventilation systems.
- Changes to multifamily ventilation include specifying that dwelling units may either use balanced ventilation or verify leakage rates with a blower door test.
- Updating HERS procedures specified in the Residential Appendix where needed to support the changes in Part 6.

PART 6 - CALIFORNIA ENERGY CODE
2019 Residential UPDATES

For **attics**, increasing the prescriptive R-value for below roof deck insulation from R-13 to R19.

For **walls**:

- Increasing prescriptive R-value requirements from R19 fill and R5 continuous insulation to R21fill with R5 continuous insulation, reflecting an overall decrease in the performance U-factor for the assembly from 0.051 to 0.048
- Adding QII to the prescriptive requirements for newly constructed buildings.

For **fenestration**:

- Updating the definitions of “door” and “glazed door” to match National Fenestration Rating Council (NFRC) definitions. This lowers the threshold for a door to be considered a glazed door from 50% glazing to 25% glazing.
- Updating the prescriptive U-factor for windows from 0.32 to 0.30, and updated the prescriptive Solar Heat Gain Coefficient (SHGC) required in Climate Zones 2 and 5 - 15 from 0.25 to 0.23.

PART 6 - CALIFORNIA ENERGY CODE
2019 Residential UPDATES

For **lighting**, revising JA8 to align testing requirements with current federal, state and ENERGY STAR test procedures, and to allow use of the NEMA 77 test standard for flicker.

For **water heating**:

- The specifications for compact distribution have been revised
- New specifications for Drain Water Heat Recovery have been added.
- Adding an option for prescriptive compliance using a heat pump water heater.

For **furnaces**:

- Updating minimum fan efficacy requirements to 45 cfm per watt.
- Adding options for prescriptive compliance using one or more heat pumps.

For **HVAC**

- Adding airflow requirements specific to Small Duct High Velocity (SHDV) systems. This resolves an issue of flow rates for standard ducting being applied to SHDV systems.

Adding addition and alteration requirements that are specific to creating Accessory Dwelling Units.

PART 6 - CALIFORNIA ENERGY CODE
2019 Nonresidential UPDATES

Extending the Scope of Part 6 to **healthcare facilities**, and incorporating several Exceptions to ensure appropriate application of efficiency standards.

For **ventilation**:

- Incorporate the Natural Ventilation and Exhaust Ventilation Procedures of the 2016 ASHRAE 62.1.
- Updating the ventilation rate table to list the ventilation rate for more spaces.
- New requirements for ventilation air that can be used for recirculation and transfer air.
- Updating filtration requirements to a minimum MERV 13, necessary for filtering out the smallest category of potentially harmful particulates.

PART 6 - CALIFORNIA ENERGY CODE
2019 Nonresidential UPDATES

For **lighting**:

- Updating prescriptive indoor and outdoor lighting power allowance values to assume the use of LED lighting, and added new Power Adjustment Factors for several daylighting devices.
- Reducing wattage thresholds for Exceptions to outdoor lighting controls to account for lower wattage LED fixtures.
- Updating the procedure for determining installed lighting power to allow the efficiency of installed lamps to be considered, and to create a more comprehensive framework for evaluating modular lighting (including track lighting).
- Adding occupancy sensing requirements for restrooms.
- Merging and standardizing the prescriptive alteration requirements for lighting controls, and limiting the projects that can proceed without determining the square footage of the affected spaces.

PART 6 - CALIFORNIA ENERGY CODE
2019 Nonresidential UPDATES

Adding requirements for **laboratory fume hoods** to use efficient fans and incorporate automatic sash closure.

For **HVAC**:

- Updating requirements in several areas to maintain alignment with ASHRAE 90.1:
    - Fan system power requirements
    - Equipment efficiency requirements
    - Transfer air for exhaust air makeup
    - Demand control ventilation requirements for classrooms
    - Occupant sensor ventilation control requirements (with amended setpoints)
- Waterside economizer requirements (with amended minimum efficiency requirements)
- Expanded the Economizer Fault Detection and Diagnostics requirement to all systems over 4.5 tons of cooling that are equipped with an air economizer.
- Amended the sizing calculations and equipment selection criteria to make it applicable to healthcare facilities.

PART 6 - CALIFORNIA ENERGY CODE
2019 Nonresidential UPDATES

- Expanded the water economizer requirement to also be applicable to system that do not utilize a fan.
- New requirements for water economizer operation and design to limit the impact of pumps.
- New prescriptive efficiency requirements for cooling towers
- New condenser efficiency and system control requirements for adiabatic condensers serving refrigerated warehouses and supermarkets

Acceptance Tests

- Nonresidential Appendix 2 – New procedures where added for high-rise residential dwelling unit ventilation and dwelling unit envelope leakage.
- Nonresidential Appendix 7 – New Acceptance Test were added for occupancy zone control, adiabatic condensers, laboratory and factory exhaust, and automatic closing fume hood sashes.

Title 24 PART 11 "CALGreen"

CALIFORNIA GREEN BUILDING STANDARDS CODE

CHAPTER 1 - ADMINISTRATION

CHAPTER 2 - DEFINITIONS

CHAPTER 3 - GREEN BUILDING (Scope)

CHAPTER 4 - RESIDENTIAL MANDATORY MEASURES

CHAPTER 5 - NONRESIDENTIAL MANDATORY MEASURES

CHAPTER 6 - REFERENCED ORGANIZATIONS AND STANDARDS

CHAPTER 7 - INSTALLER AND SPECIAL INSPECTOR QUALIFICATIONS

CHAPTER 8 - COMPLIANCE FORMS, WORKSHEETS AND REFERENCE MATERIAL

APPENDIX A4 - RESIDENTIAL VOLUNTARY MEASURES

APPENDIX A5 - NONRESIDENTIAL VOLUNTARY MEASURES

APPENDIX A6.1 - VOLUNTARY STANDARDS FOR HEALTH FACILITIES [OSHPD 1, 2 & 4]

Mandatory
Energy Efficiency Targets
Title 24 Part 6

Voluntary
Energy Efficiency
Title 24 Part 11

Appendix A4
Residential Voluntary Measures

- Section A4.203.1.1.1
  Performance Approach for Newly Constructed
  - based on **target EDR scores**
    (no longer “Percent better than” mandatory Part 6)

Mandatory Title 24 Part 6

Mandatory
Energy Efficiency Targets
Title 24 Part 6

Voluntary Part 11

Voluntary
Energy Efficiency
Title 24 Part 11

Appendix A4
Residential Voluntary Measures

Required Prerequisites:

- **A4.203.1.1.2 Quality Insulation Installation (QII)**

AND Choose ONE of the Prerequisites below:

- **A4.203.1.2.1 Roof deck insulation, or ducts in conditioned space**
- **A4.203.1.2.2 High Performance Walls (HPW)**
- **A4.203.1.2.3 HERS-Verified Compact Hot Water Distribution System (CHWDS-H)**
- **A4.203.1.2.4 HERS-Verified Drain Water Heat Recovery (DWHR-H)**

Appendix A4
Residential Voluntary Measures

- **A4.203.1.3.1 Tier 1.**

CZ	Mixed Fuel	All-Electric
1	23	36
2	12	16
3	10	14
4	8	12
5	10	16
6	10	12
7	5	7
8	10	10
9	13	13
10	10	11
11	11	12
12	12	13
13	11	13
14	15	16
15	11	8
16	22	39

- **A4.203.1.3.2 Tier 2.**

CZ	Mixed Fuel	All-Electric
1	13	0
2	5	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
11	0	0
12	0	0
13	0	0
14	5	0
15	0	7
16	14	10

- Section A4.204 Performance Approach for Additions has been struck

Appendix A5
Nonresidential Voluntary Measures

Choose **ONE** of the following Prerequisites for **Tier 1** and **TWO** for **Tier 2**:

- **A5.203.1.1.1 Outdoor lighting**
- **A5.203.1.1.2 Service water heating in restaurants**
- **A5.203.1.1.3 Warehouse Dock Seal Doors**
- **A5.203.1.1.4 Daylight Design Power Adjustments Factors (PAFs)**
- **A5.203.1.1.5 Exhaust Air Heat Recovery**

Appendix A5
Nonresidential Voluntary Measures

Section A5.203, Performance Approach

- Retain the "**Percent better than**" mandatory language
- Target Percentages continue to vary depending on whether lighting and/or mechanical systems are included for nonresidential building projects
  - **Tier 1**: 5% or 10% **Tier 2**: 10% or 15%
- For **high-rise residential and hotel/motel projects the target percentages were adjusted** to reflect that there is no additional credit available for lighting improvements
  - **Tier 1**: 5% **Tier 2**: 10%

Questions?

Building Energy Efficiency Program 2019 Update

http://www.energy.ca.gov/title24/2019standards/rulemaking/

Contact Information

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2019 Standards

Initial (**DRAFT**) Analysis Results and Opportunities

2019 Standards Analysis: First, Some Important Terms and Definitions

- **Performance and Prescriptive Methods**
- **CEC Compliance Software (CBECC-Res, CBECC-Com)**
- **Time Dependent Valuation (TDV)**
- **Climate Zones**
  - CZ 6 – Long Beach, Torrance, Santa Barbara…
  - CZ 8 – Lakewood, Anaheim, Irvine…
  - CZ 9 – Glendale, Pasadena, Diamond Bar…
- **High-rise residential (Part 6): Four or more habitable stories**

Avoiding Preemption: High Efficiency Appliances and Equipment

- State and local governments may not "preempt" federal appliance standards (includes HVAC and water heaters)
- State and local building codes must meet seven conditions to avoid preemption (US Code 42, Section 6297)
- If the code includes one or more options to meet the objective:
  - for every option which includes a high-efficiency appliance or equipment, at least one option shall include the same equipment which is ≤ 5% more efficient than the minimum,
  - At least one option which meets but does not exceed the minimum requirement.

DRAFT Analysis: 2019 Cost-effectiveness Studies

- Identify cost-effective, non-preempted measure packages
- New construction only (additions and alterations later)
- Mixed-fuel and all-electric designs and baselines

- Low-rise residential (single family and low-rise multifamily)
  - CALGreen Tier 1
- Nonresidential (office, high-rise residential)
  - PV only

Low-rise Residential New Construction: Climate Zone 6 **DRAFT** Results

Energy Efficiency (EE) Package 1

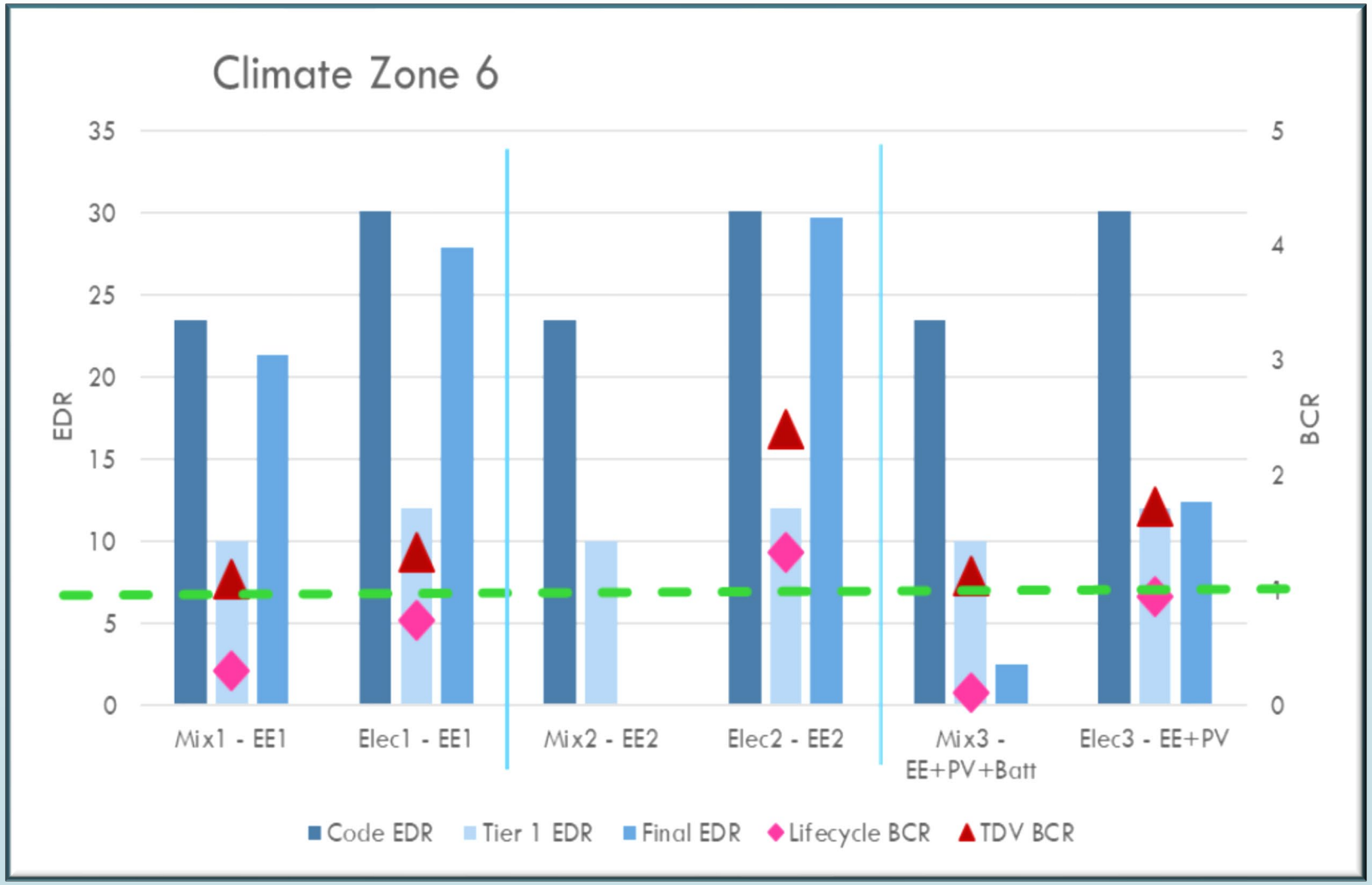
- Mix1 - EE: PV size ≤ annual usage (2.5 kW)
- Elec1 - EE: PV size < Standard Design (2.5 kW)

Energy Efficiency (EE) Package 2

- Mix2 - EE: No pkg at this time
- Elec2 - EE: PV size < Standard Design (2.5 kW)

EE + PV / EE + PV + Battery

- Mix3 - EE+PV+Batt: PV size = 1.2x annual usage (3.2 kW); 7.5 kWh battery
- Elec3 - EE+PV: PV size = annual usage (4.2 kW)



EDR: Energy Design Rating

BCR: Benefit-to-Cost Ratio

Low-rise Residential New Construction: Climate Zone 8 **DRAFT** Results

Energy Efficiency (EE) Package 1

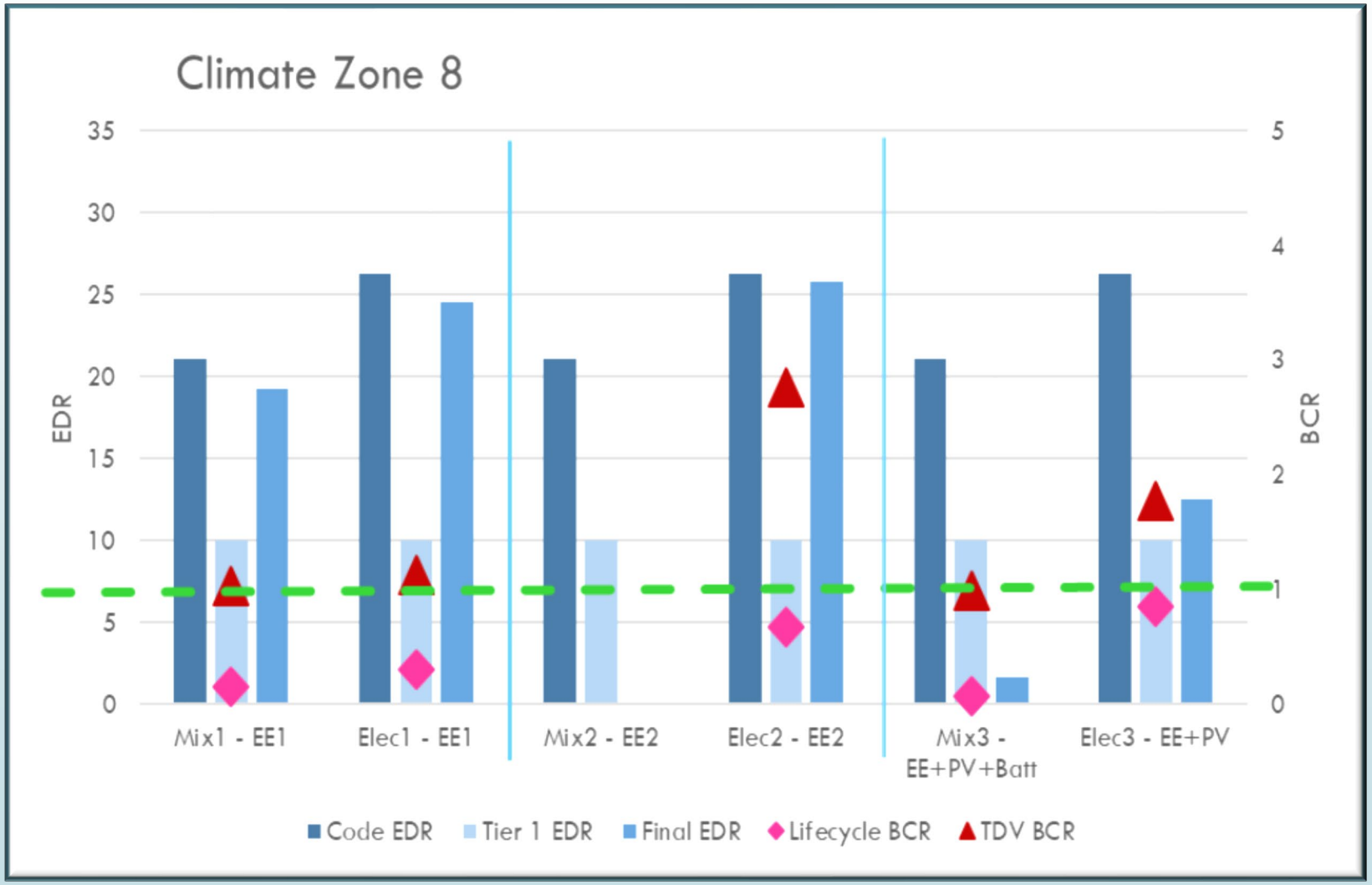
- Mix1 - EE: PV size ≤ annual usage (2.6 kW)
- Elec1 - EE: PV size < Standard Design (2.6 kW)

Energy Efficiency (EE) Package 2

- Mix2 - EE: No pkg at this time
- Elec2 - EE: PV size < Standard Design (2.6 kW)

EE + PV / EE + PV + Battery

- Mix3 - EE+PV+Batt: PV size = 1.2x annual usage (3.3 kW); 7.5 kWh battery
- Elec3 - EE+PV: PV size = annual usage (4.0 kW)



EDR: Energy Design Rating

BCR: Benefit-to-Cost Ratio

Low-rise Residential New Construction: Climate Zone 9 **DRAFT** Results

Energy Efficiency (EE) Package 1

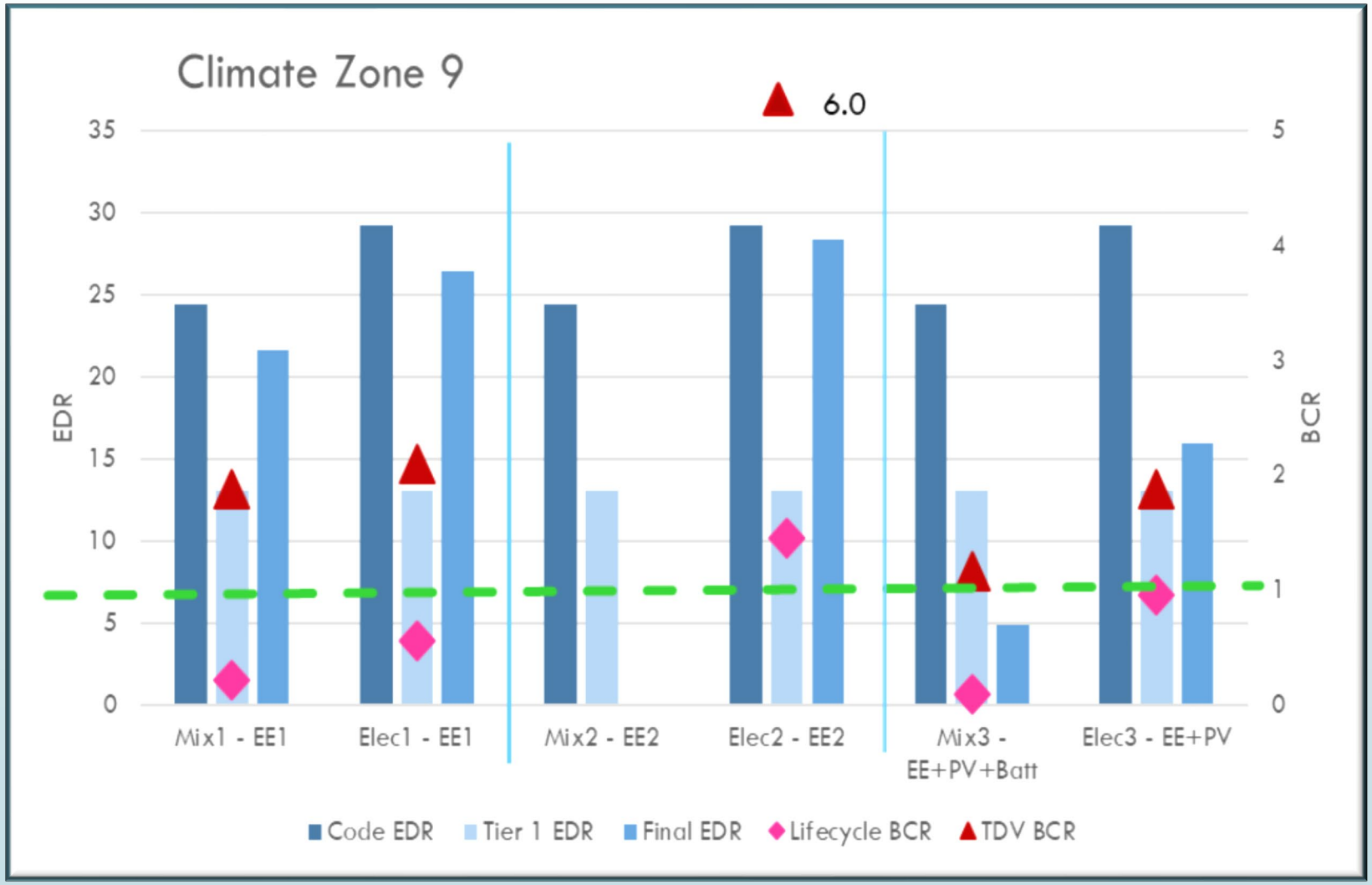
- Mix1 - EE: PV size ≤ annual usage (2.7 kW)
- Elec1 - EE: PV size < Standard Design (2.7 kW)

Energy Efficiency (EE) Package 2

- Mix2 - EE: No pkg at this time
- Elec2 - EE: PV size < Standard Design (2.7 kW)

EE + PV / EE + PV + Battery

- Mix3 - EE+PV+Batt: PV size = 1.2x annual usage (3.3 kW); 7.5 kWh battery
- Elec3 - EE+PV: PV size = annual usage (4.1 kW)



EDR: Energy Design Rating

BCR: Benefit-to-Cost Ratio

Low-Rise Residential: Additional Measures and Options Requested To-Date

Measures that require cost-effectiveness analysis

- CALGreen Tiers 1 and 2
- Storage
  - Including EV load
- Multifamily

Measures that do not require cost-effectiveness analysis

- Electric-ready measures: CBSC
  - Electrical Panel, Clothes Drying, Cooking
- EV-Ready (SF, MF)

Nonresidential and High-Rise Residential New Construction

- Compliance Plus PV scenarios only now
- PV System Sizing:
  - 80% of estimated load
  - 15W/sqft of solar zone (≥ 15% of roof area)
- Nonresidential Next Steps:
  - Analyze CALGreen Tiers
- High-Rise Residential
  - Continue work with CEC to develop new, more representative prototypes

Nonresidential and High-Rise Multi-Family: Climate Zone 6 **DRAFT** Results

Bldg. Type	PV Sizing Method	PV Size (kW)	Lifecycle Costs ($)	Lifecycle Bill Savings ($)	Bill Net Savings ($)	Discounted Payback (years)	Approx. Area Required (sf)
Medium Office	80% Elec. Load	230	552,000	1,072,842	520,842	16	15,300
	15W/sf solar zone	40	96,480	340,723	244,243	7	2,700
High-Rise Multi-Family	80% Elec. Load	227	559,455	2,184,715	1,625,260	9	14,500
	15W/sf solar zone	19	47,424	293,498	246,074	5	1,300

Nonresidential Occupancies: Additional Measures and Options Requested To-Date

- CALGreen Tiers 1 and 2
- Efficiency plus PV packages
- Mid- and high-rise residential
- PV on Parking Garages
- Electric-Ready Construction (no c/e study required)
  - 240V for space heater, clothes dryer, cooktop, panel upgrade
  - Increased EV requirements in Parking Garages
    - EV-capable and EV-ready

Energy Plus Water Nexus

Some potential measures include:

- Preplumb for graywater
  - New construction and retrofits that affect relevant plumbing
- Drain water heat recovery
- Alternate / Dual plumbing for indoor use
- On-demand recirculation pump, thermostatic shutoff valve
- Controls for multifamily central water heating system retrofits
- Recycled water in nonresidential, common areas of multifamily or landscaping controlled by a Homeowner Association (HOA)
  - If available, or if planned within 5-10 years.

Summary of Initial **DRAFT** Analyses

Residential New Construction

- All CZ: Can likely achieve 5-10% reduction in EDR with efficiency-only package
- Generally cost-effective using TDV, not always from consumer perspective
- Tier 1 or near-Tier 1 may require additional efficiency and will require:
  - PV to offset load in All-Electric design
  - PV to offset load plus Battery in Mixed-Fuel Design

Nonresidential New Construction

- PV appears cost-effective across range of occupancies, building and system sizes
- Tier 1 analysis next

Energy Plus Water

- No cost-effectiveness study required for most measures.
- Supporting analysis available

Break

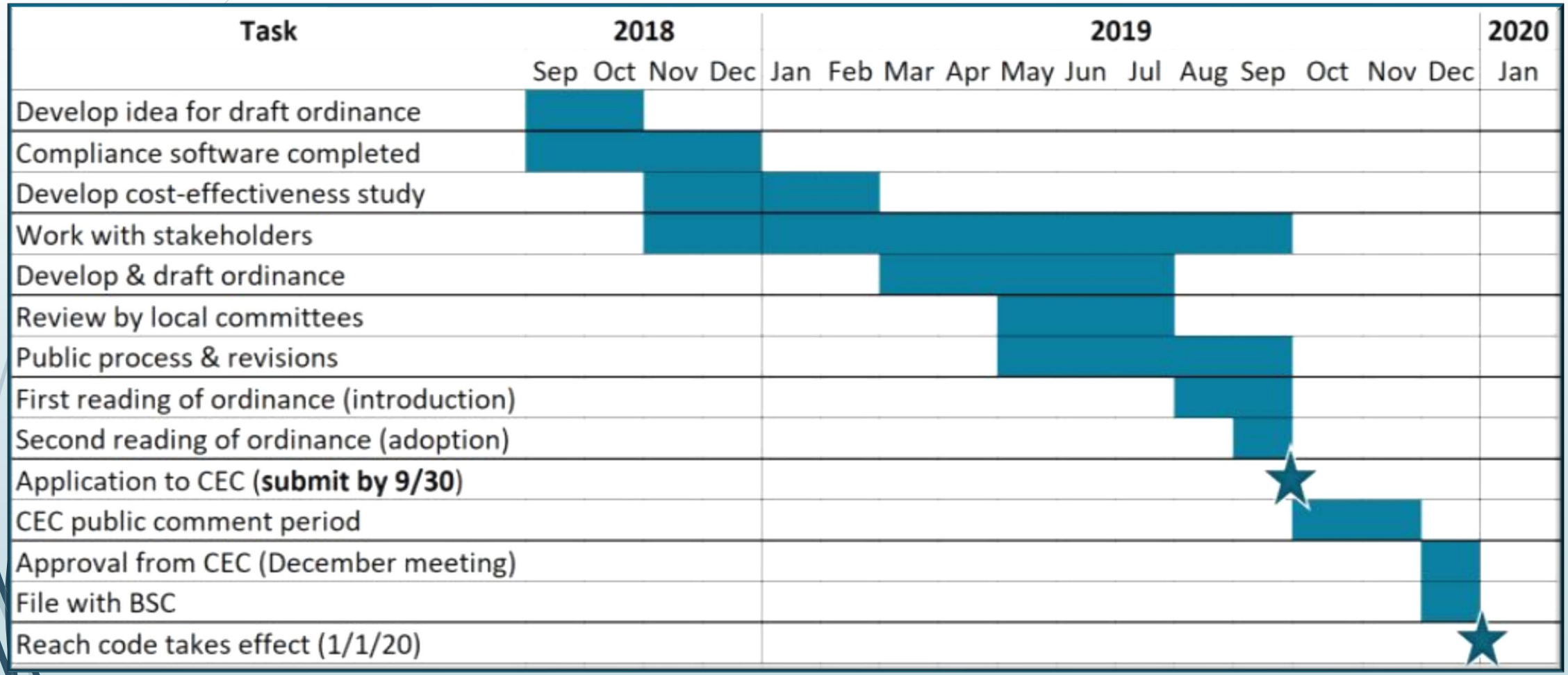
How do the analyses translate to a reach code?

- Study does not establish ordinance requirements
  - Analysis measure packages establish performance requirements
  - Measures used in analysis are representative only. "It can be done."
- Performance levels in study can adopt less stringent than report

- Energy Efficiency only
  - Can achieve approximately 5-10% reduction in EDR score
- Efficiency Plus Renewables Plus Storage
  - Can achieve Tier 1 or near-Tier 1

Reach Code Adoption Process

Sample Timeline for January 1, 2020 Effective Date



Reach Code Process: Hearing from the Experts (you!)

- What has worked well?
- What has not worked well?
- What do you wish you had known?

2019 Potential Reach Codes Opportunities

Scope / Measure		C/E Study Required?	Timing of Reach Code			Project Types				
			At Construction / Entitlement		Other Trigger (Time of Sale, Date-Certain…)	Single Family	Multifamily			Non-Residential
			New	Addition / Remodel / Renovation	Existing Building		Low-Rise (≤3)	Mid-Rise	High-Rise (4+)	
Efficiency and/or Renewables	Whole Building (mixed-fuel and all-electric)	Yes	**X**		**X**	**X**	**X**	X	**X**	**X**
	Solar PV	Yes	**X**	**X**	**X**			X	**X**	**X**
	Single Measures	Yes	**X**	**X**	**X**	**X**	**X**	X	**X**	**X**
	Rental Property	Yes		X	X		X	X	X	
Energy Plus Water Efficiency	Hot Water Distribution	Yes	X	X		X	X	X	X	Some
	Indoor Water	No	**X**	**X**	X	**X**	X	X	X	**X**
	Outdoor Water	No	**X**	**X**	X	**X**	X	X	X	**X**
Process Loads (Equipment)	Commercial Kitchens	Maybe	X	X						X
	Elevators	Maybe	X	X				X	X	X
	Escalators	Maybe	X	X						X
Electric-Ready	240 V Pre-wiring	No	X	X		X	X	X	X	
	Panel Upgrade	No	X	X		X	X	X	X	X
	EV Readiness	No	**X**	**X**		**X**	**X**	X	**X**	**X**
	EV Charging	No	**X**	**X**		X	**X**	X	**X**	**X**
Information Disclosure	Audits	No		X	**X**	**X**	**X**	X	**X**	**X**
	Benchmarking	No		X	**X**		X	**X**	**X**	**X**

NOTE: Items shown in bold indicate types of reach codes that one or more jurisdictions adopted during the 2016 Code Cycle.

2019 Reach Code Opportunities:

Efficiency and/or Renewables

Whole Building (Performance Basis)

- Energy efficiency only or efficiency plus renewables
- Well suited to New Construction
- Establish performance criteria; allow flexibility

Solar PV Systems

- High-rise residential and nonresidential occupancies

Single Measures

- Wide applicability
- New, additions, major remodels

Rental Property

- Mostly multifamily

CA Local Governments' Request for 2019 Reach Code Cost-Effectiveness Study

California Local Governments' Request for T24 2019 Reach Code Cost-Effectiveness Study

For a representative sample of building scales and occupancies under T24 2019 in all CEC climate zones statewide, what is the:

- Maximum cost-effective efficiency for mixed-fuel new construction,
- Maximum cost-effective efficiency for all-electric new construction, and
- Cost-effectiveness of code-minimum all-electric new construction.

Details: http://bit.ly/T242019_reach_request_Sept28

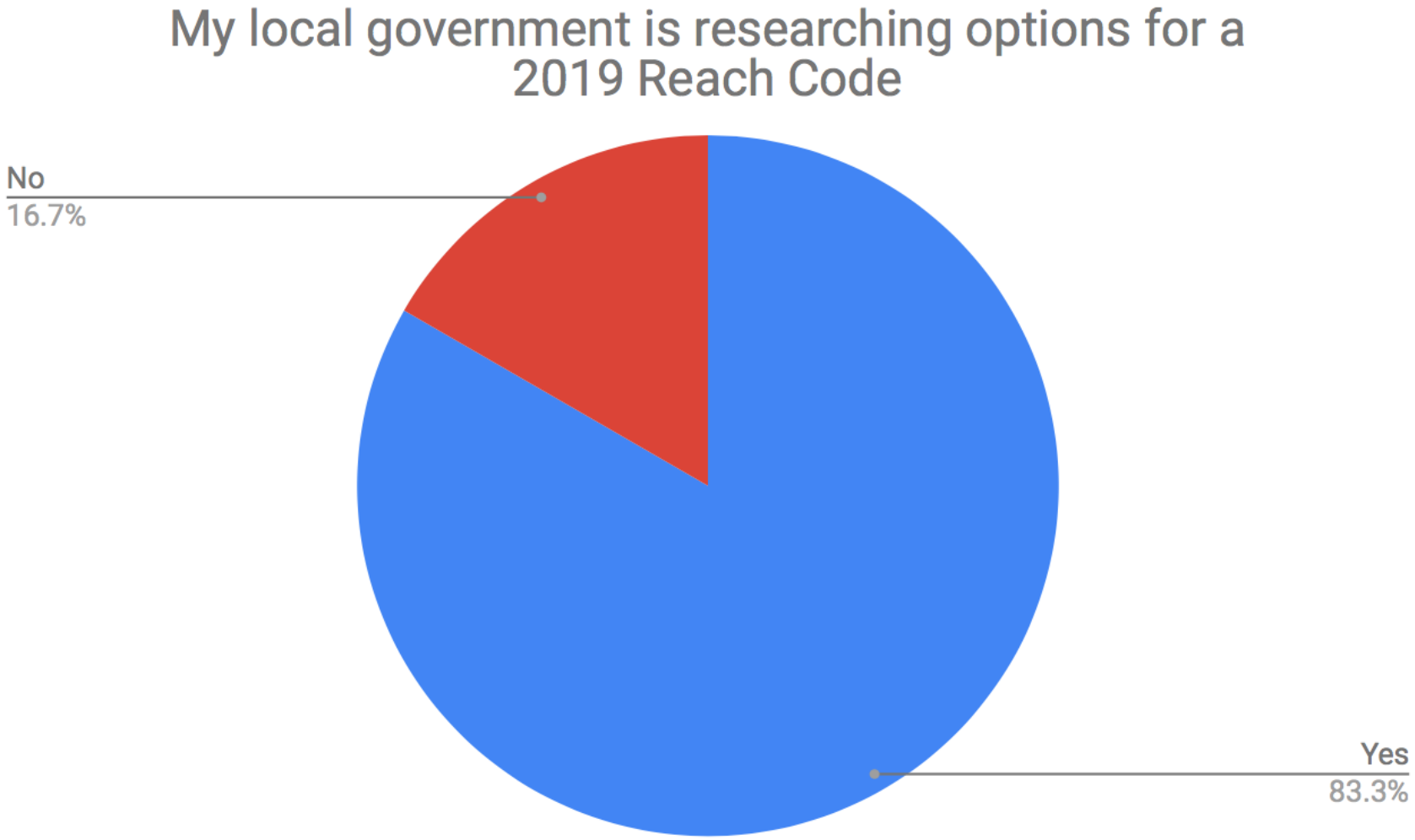
Survey: http://bit.ly/T24_survey

Bells and Whistles Requested

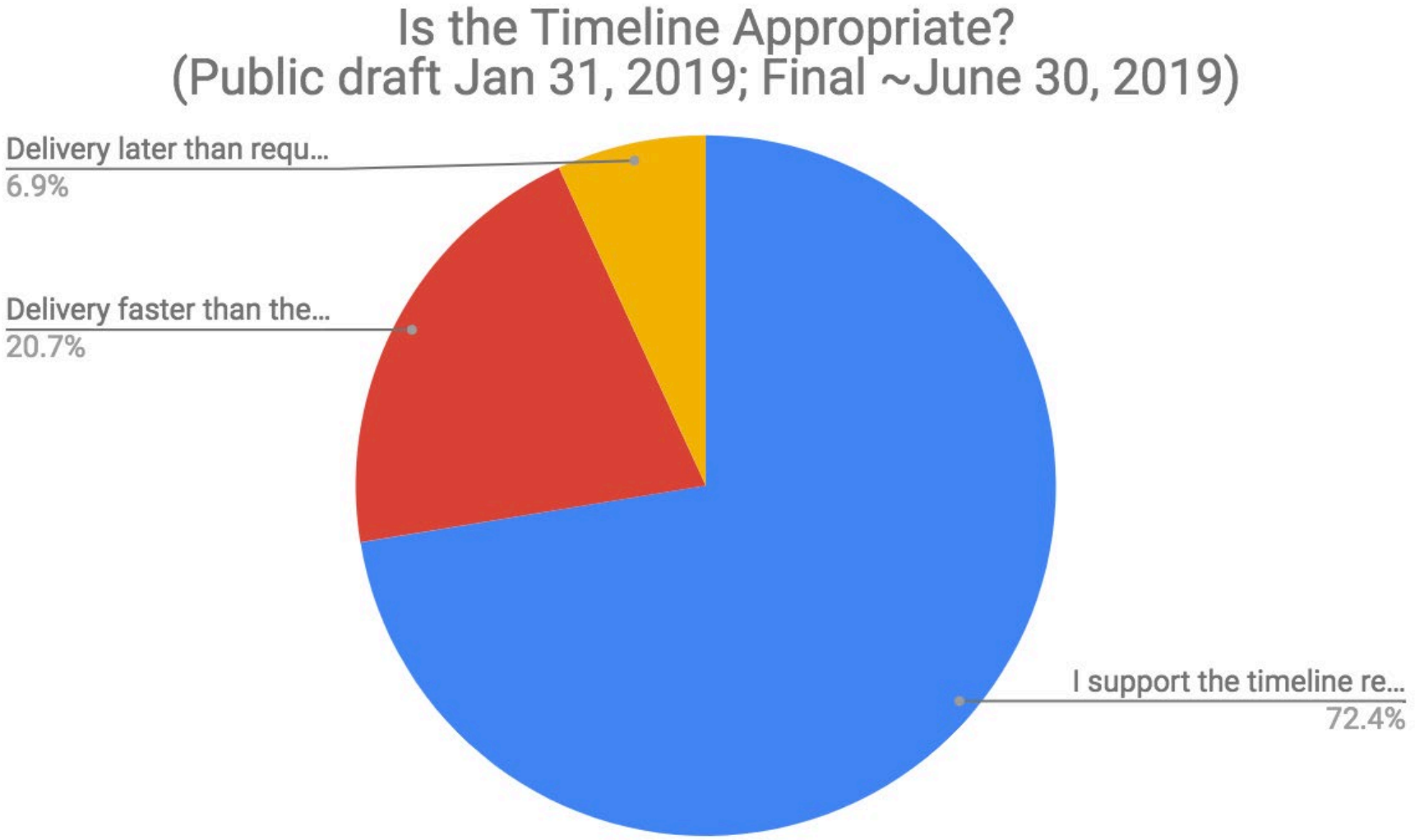
- PV
- Range of building scales & uses
  - Use existing prototypes
  - Develop prototype for hi-rise multifamily if possible within timeline
- Metrics:
  - TDV
  - EDR for low-rise res
  - Customer cost
  - GHG

Results as of October 9

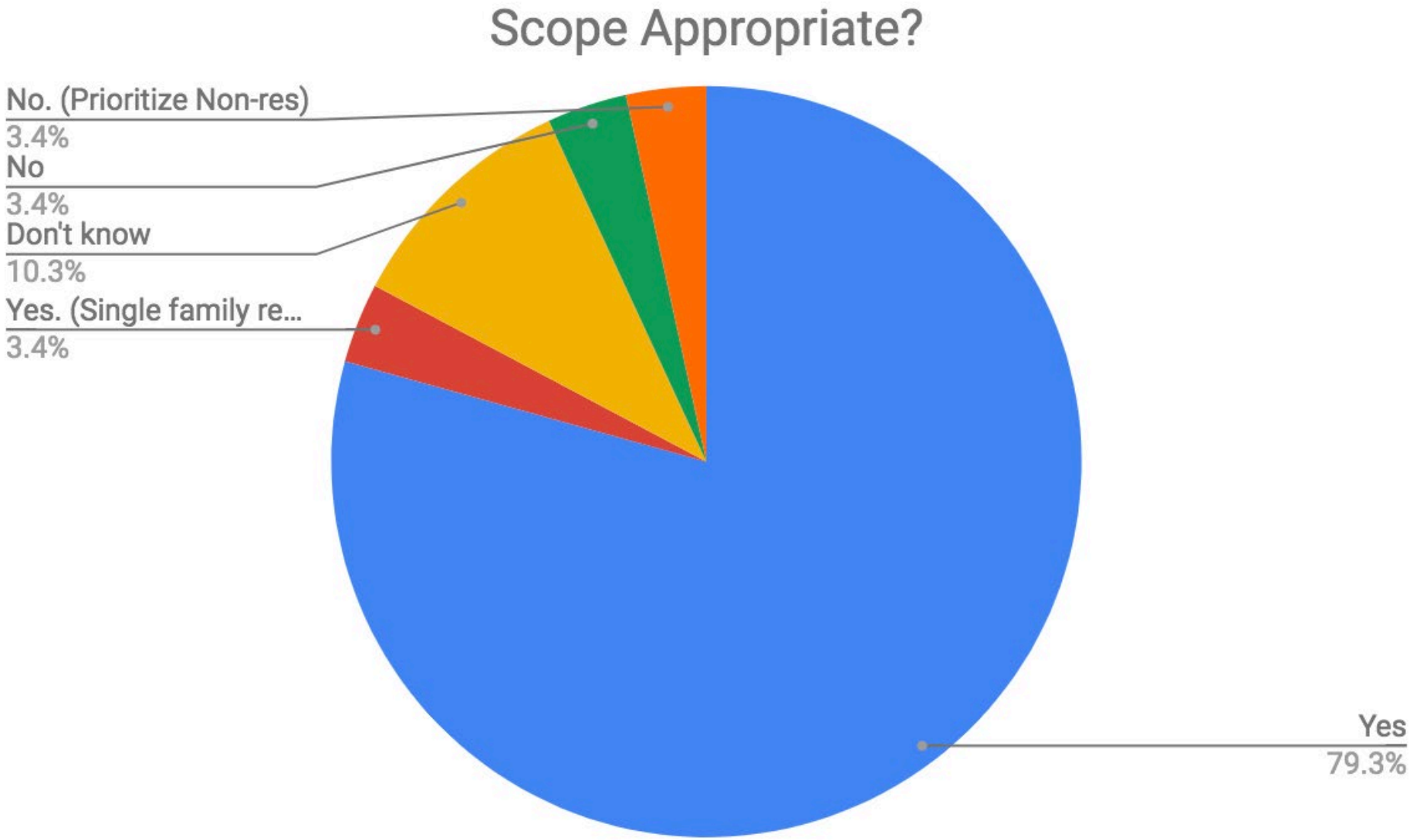
- 30 unique responses



Results as of October 9



Results as of October 9



Reach Code Options: Interests and Priorities

- What is your jurisdiction interested in exploring?
- What are your jurisdiction's priorities?

Three Ways to Start Reach Code Work

- Begin Internal Research
  - Existing policy documents
  - Construction Types and Volumes
- Develop Initial Ordinance Scope
- Begin Informal Outreach
  - Within Jurisdiction
  - Within Community
  - Neighboring Jurisdictions

Wrapping Up

Takeaways

- Start now to have a reach code in effect January 1, 2020
- Options to consider

Next Steps

- Provide all information from today to you electronically
- Complete cost-effectiveness studies
- Best Practices Guide: Early 2019
- Re-Convene First Quarter, 2019

Thank you!

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