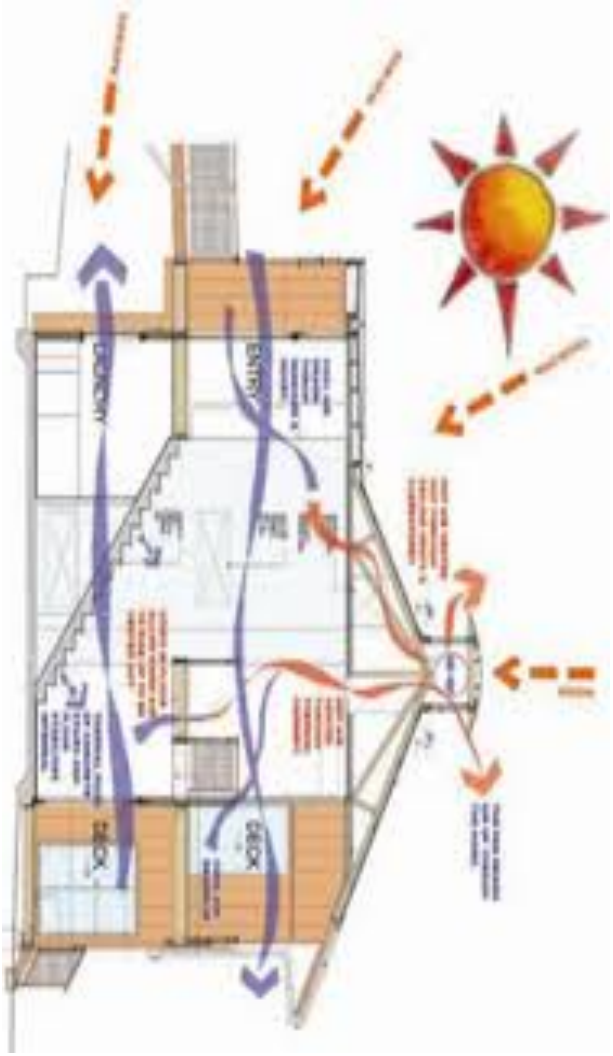


# **Building Officials Energy Efficiency and Sustainability**

California Building Officials Conference, 2017  
Walker Wells, AICP LEED AP

# Historical Code Innovation

In the early days of green building the focus was on alternative building technologies and passive solar and ventilation systems.



## Emergence of Third-Party Standards

Following the introduction of LEED in 1998, a number of cities started to create local green building standards.

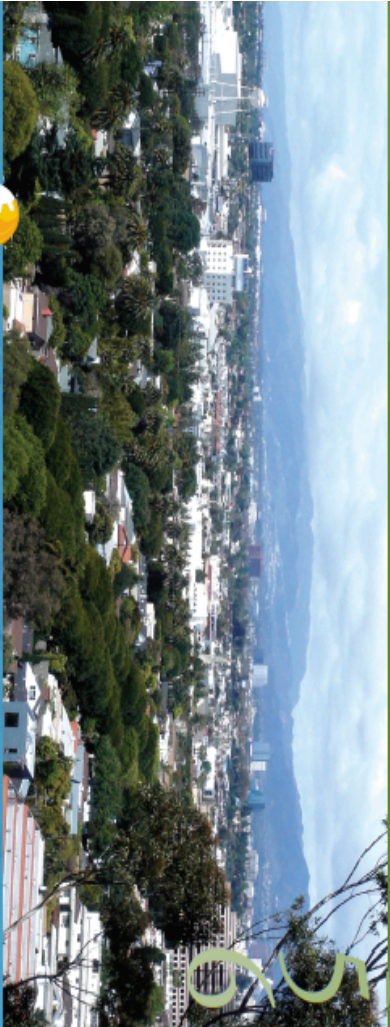
These programs were typically adopted as part of the planning/zoning code.

# DEVELOPING GREEN BUILDING PROGRAMS

A STEP-BY-STEP GUIDE FOR  
LOCAL GOVERNMENTS

STEP

1  
2  
3  
4  
5  
6





- Long Beach
- Irvine
- Pasadena
- West Hollywood
- Los Angeles
- Malibu
- San Francisco
- Cupertino
- Mountain View
- Stockton



# State Green Code

- CalGreen was first state green building code.
- Provided a standard platform for addressing fundamental green building strategies.
- Required coordination among the usual suspects (BSC, HCD, DSA, and OSHPD) and CALEPA, CEC, Water Resources Board.
- Tiers created to advance innovation.

# Emerging Codes and Standards

- ASHRAE Standard 189
- LEED Version 4
- Title 24, Part 6 – PV Credit and Commissioning
- Passive House
- Net Zero Energy
- Living Building Challenge
- Energy Star Portfolio Manager/Benchmarking

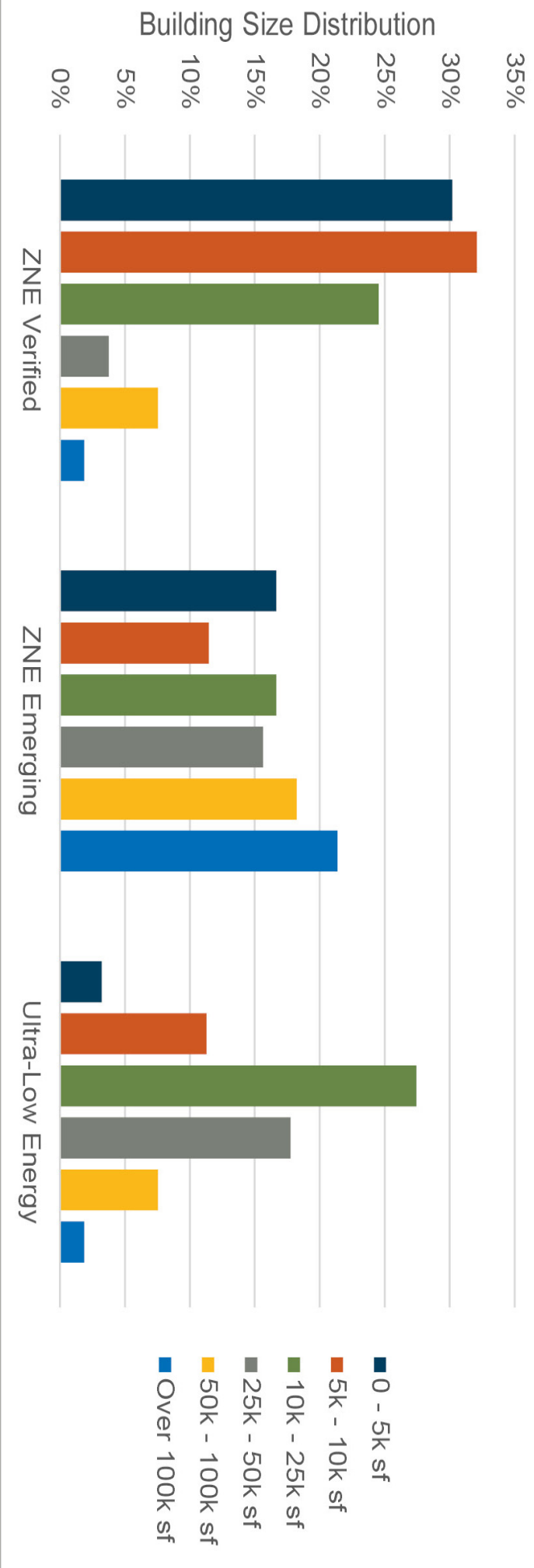


# Emerging Code Issues

- Integrating PV with battery storage
- On-Site Water Management
- On-site water management (LID, on-site treatment)
- Water neutrality
- Microgrids
- EcoDistricts
- Existing buildings

# Net Zero Energy

## Building Size by ZNE Status



# National Model Codes – ASHRAE 90.1 and IECC

- ASHRAE’s Board of Directors approved energy use targets that achieve ZNE in 2031.
- The International Energy Conservation Code (IECC) is tracking a path to ZNE by 2050.
- However, there are no mandates that these ZNE goals be achieved in model codes.
- The State of California was the first major jurisdiction in the U.S. to set policy goals favoring ZNE, with ZNE low-rise residential slated for 2020 and non-residential by 2030.

# Mission Zero House, Ann Arbor, MI

## REVEAL.

THE ENERGY EFFICIENCY LABEL

**Project Name:** Mission Zero House

**Project Owner:** Matt and Kelly Goodoff

**Project Architect/Engineer:** Dan's Electric/Dan

**Manufacturer:** Dan's Electric/Dan

**Builder:** Dan's Electric/Dan

**Location:** Ann Arbor, MI

**Climate Type:** Cold

**Climate Type Code:** 500

**Time stamp:** 2015-2017

20

Energy use  
intensity  
of the  
building of  
its type

EUI

(btu/sf/yr)

61%

reduction from baseline  
RCCs - 2009

+103%

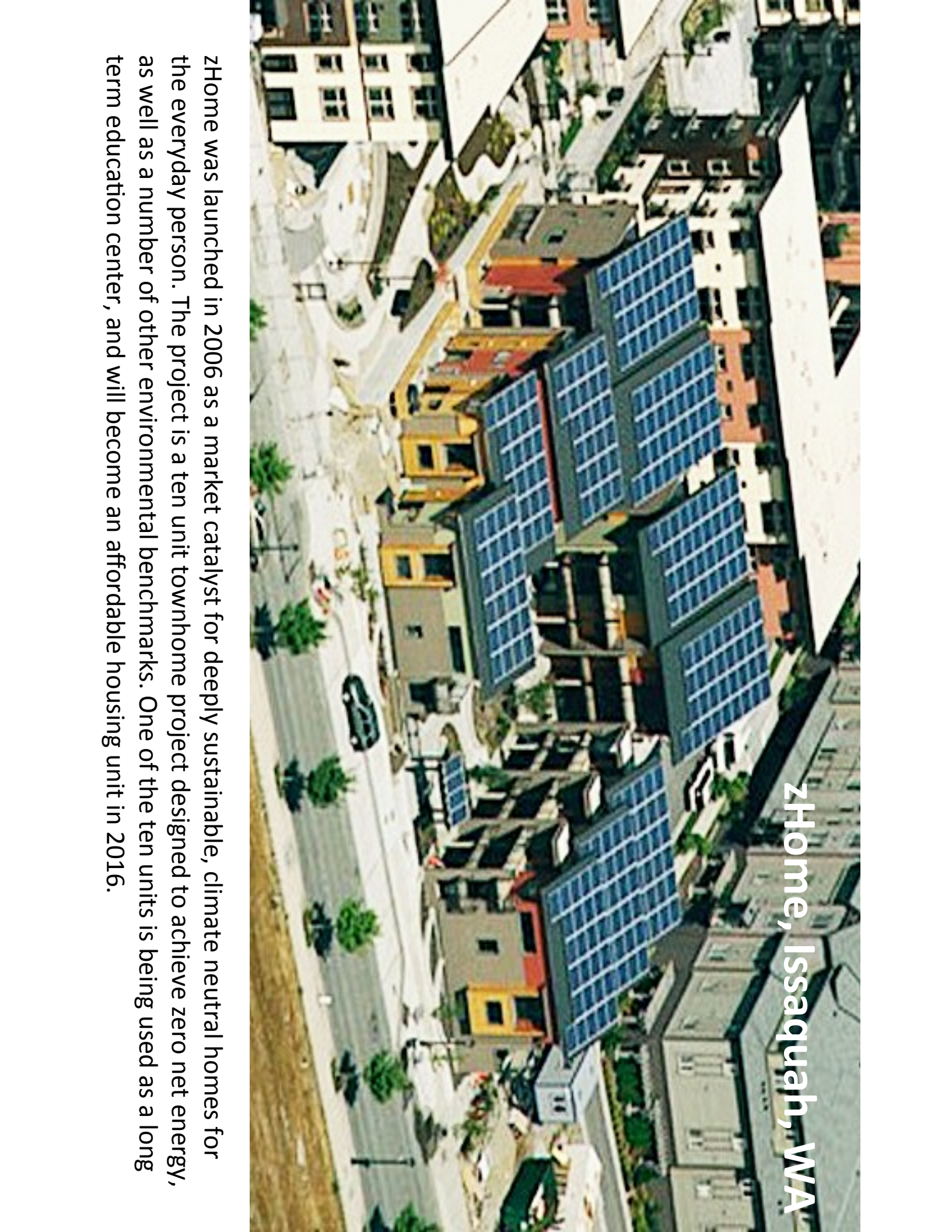
renewable production  
% of energy use

INTERNATIONAL LEADERSHIP INSTITUTE™ [www.leadip.org](http://www.leadip.org)



The Mission Zero House, a 1901 historic preservation in Ann Arbor, Michigan, is a 1,500 square foot single family home in a climate with four distinct seasons (temperatures ranging from 95°F to -20°F [35°C to -28°C]).





## zHome, Issaquah, WA

zHome was launched in 2006 as a market catalyst for deeply sustainable, climate neutral homes for the everyday person. The project is a ten unit townhome project designed to achieve zero net energy, as well as a number of other environmental benchmarks. One of the ten units is being used as a long term education center, and will become an affordable housing unit in 2016.



# Net Zero Energy

- Typically results in all-electric buildings
- May require upgraded electrical service
- Roof area usually sufficient for single-family.
- Can be challenging to achieve for buildings over two stories.

# Passive House Standard

1. Space Heating Energy Demand is not to exceed 15 kWh per square meter of net living space (treated floor area) per year or 10 W per square meter peak demand. In climates where active cooling is needed, the Space Cooling Energy Demand requirement roughly matches the heat demand requirements above, with an additional allowance for dehumidification.
2. The Renewable Renewable Primary Energy Demand, the total energy to be used for all domestic applications (heating, hot water and domestic electricity) must not exceed 60 kWh per square meter of treated floor area per year.
3. A maximum of 0.6 air changes per hour at 50 Pascals pressure (ACH50).
4. Thermal comfort must be met for all living areas during winter as well as in summer, with not more than 10 % of the hours in a given year over 25 °C.



Passive House, Monterey, CA

# On-Site Water Management

- Relatively common for single-family through septic or package systems.
- Use of recycled water for toilet flushing in commercial builds fairly common.
- Not common for multi-family.
- Challenge is 24-hour restriction on water storage and lack of remote monitoring systems.



## Cedar Springs, La Verne



A greywater treatment and reuse system designed to collect greywater from the building lavatory sinks, showers, and laundry machines and treat it to meet 100% of the non-potable demand for in-building toilet flushing and site irrigation. The system consists of a textile filter, followed by microfiltration and disinfection. The use of the system is projected to save 605,000 gallons of potable water annually, or about 12.1 million gallons over a 20 year period. Cedar Springs has earned LEED for Homes Platinum Certification. - Biohabitats



## Bullitt Center, Seattle, WA



0 commercial office building, the Bullitt Center uses a variety of methods to conserve and manage including the following: rainwater harvesting; a green roof and a bioswale to treat graywater; and including toilets. Challenges related to permitting the water treatment system are requiring the use of



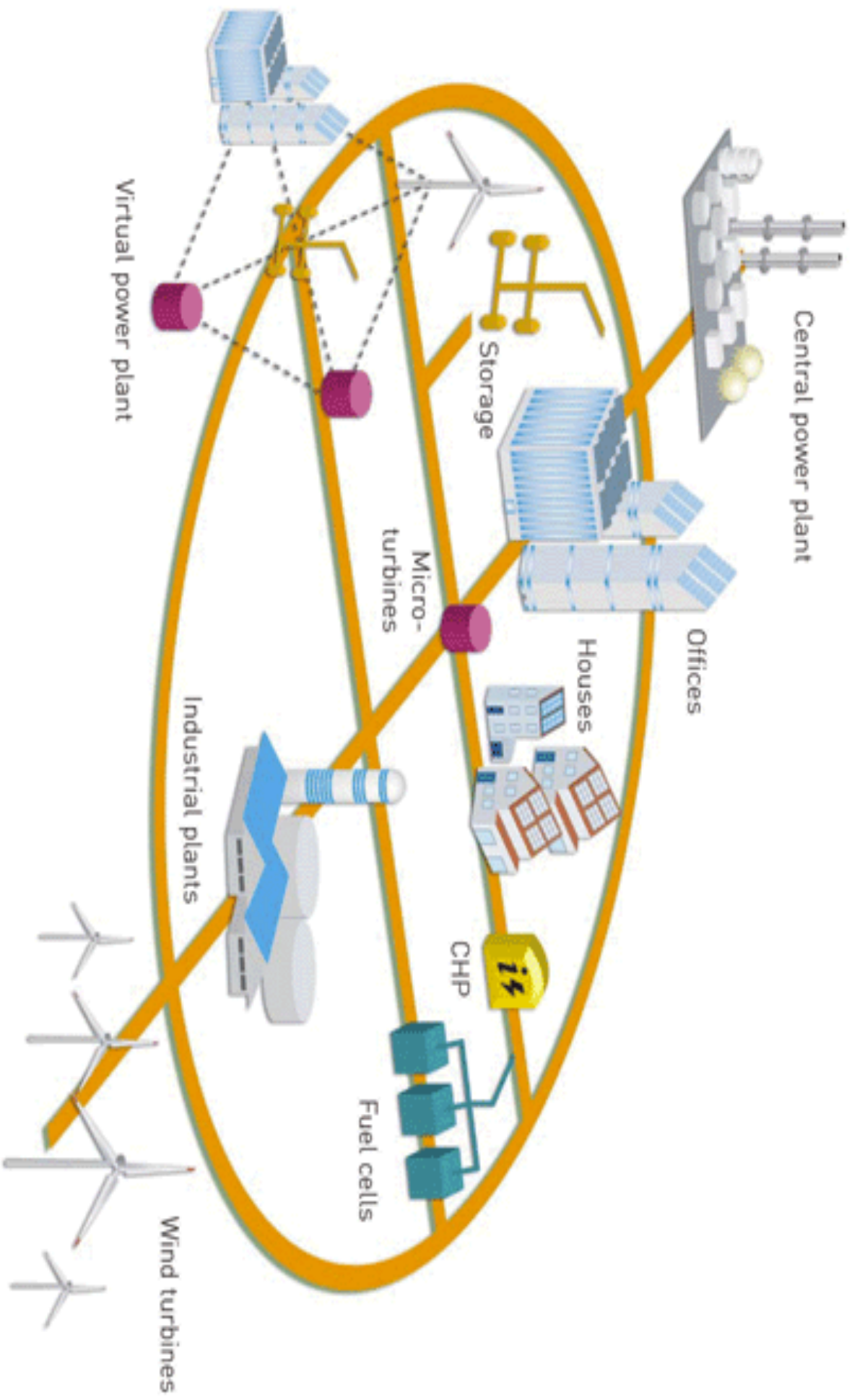
# Living Buildings

	BUILDINGS	RENOVATIONS	LANDSCAPE + INFRASTRUCTURE	
PLACE	SCALE JUMPING		SCALE JUMPING	01. LIMITS TO GROWTH
			SCALE JUMPING	02. URBAN AGRICULTURE
WATER				03. HABITAT EXCHANGE
			SCALE JUMPING	04. HUMAN-POWERED LIVING
ENERGY			SCALE JUMPING	05. NET POSITIVE WATER
			SCALE JUMPING	06. NET POSITIVE ENERGY
HEALTH + HAPPINESS				07. CIVILIZED ENVIRONMENT
				08. HEALTHY INTERIOR ENVIRONMENT
MATERIALS				09. BIOPHILIC ENVIRONMENT
			SCALE JUMPING	10. RED LIST
EQUITY				11. EMBODIED CARBON FOOTPRINT
				12. RESPONSIBLE INDUSTRY
BEAUTY				13. LIVING ECONOMY SOURCING
			SCALE JUMPING	14. NET POSITIVE WASTE
				15. HUMAN SCALE + HUMANE PLACES
				16. UNIVERSAL ACCESS TO NATURE + PLACE
				17. EQUITABLE INVESTMENT
				18. JUST ORGANIZATIONS
				19. BEAUTY + SPIRIT
				20. INSPIRATION + EDUCATION



# Microgrids

- Small network of electricity users with a local source of supply that is usually attached to a centralized national grid but is able to function independently.
- Combines generation, usually with solar photovoltaic, and battery storage.
- Designed to operate autonomous to the main electrical grid.
- Requires space and ventilation for battery storage.
- Cross the boundary between building systems and infrastructure.
- Codes for battery storage not fully developed.
- Permitting for shared systems is a challenge – who is responsible?



# EcoDistricts

- Holistic approach to a neighborhood or district.
- Encourages multi-functional and shared systems.
- Requires innovation in design standards, governance, and maintenance responsibility.





# Existing Buildings

- Benchmarking ordinances are becoming increasingly common – mandated for commercial buildings by AB 802.
- Use Energy Star Portfolio Manager as the platform.
- Require various levels of audits and upgrades.
- Results in Building Departments needing to engage more deeply with existing building stock.

# Issues with Code Advancement

- Pushing the envelope of green means using systems and materials that are not time-tested.
- What is the level of tolerable system failure?
- Who should take the risk in code innovation?
  - Upside risk is low (it works and is safe)
  - Downside risk is high (it breaks and creates harm)

# Issues with Code Advancement

- Green projects and standards are often the drivers of design innovation.
- Stakeholder groups, trade organizations, are often the drivers of code innovation.
- State agencies develop the code.

**Who Connects the Designers with the  
Code Developers?**

# **Code Innovation - Connecting the Dots**

- Portals are needed for code innovation and advancement.
- CalGreen Tiers were supposed to be testing grounds but evolved into optional codes.
- Emerging issues require more collaboration.

## **Collaborative Skills**

Effective Listening

Effective Speaking

Facilitation

Conflict Management

Continuous Evaluation

## **Collaborative Behaviors**

Willingness

Openness

Validation

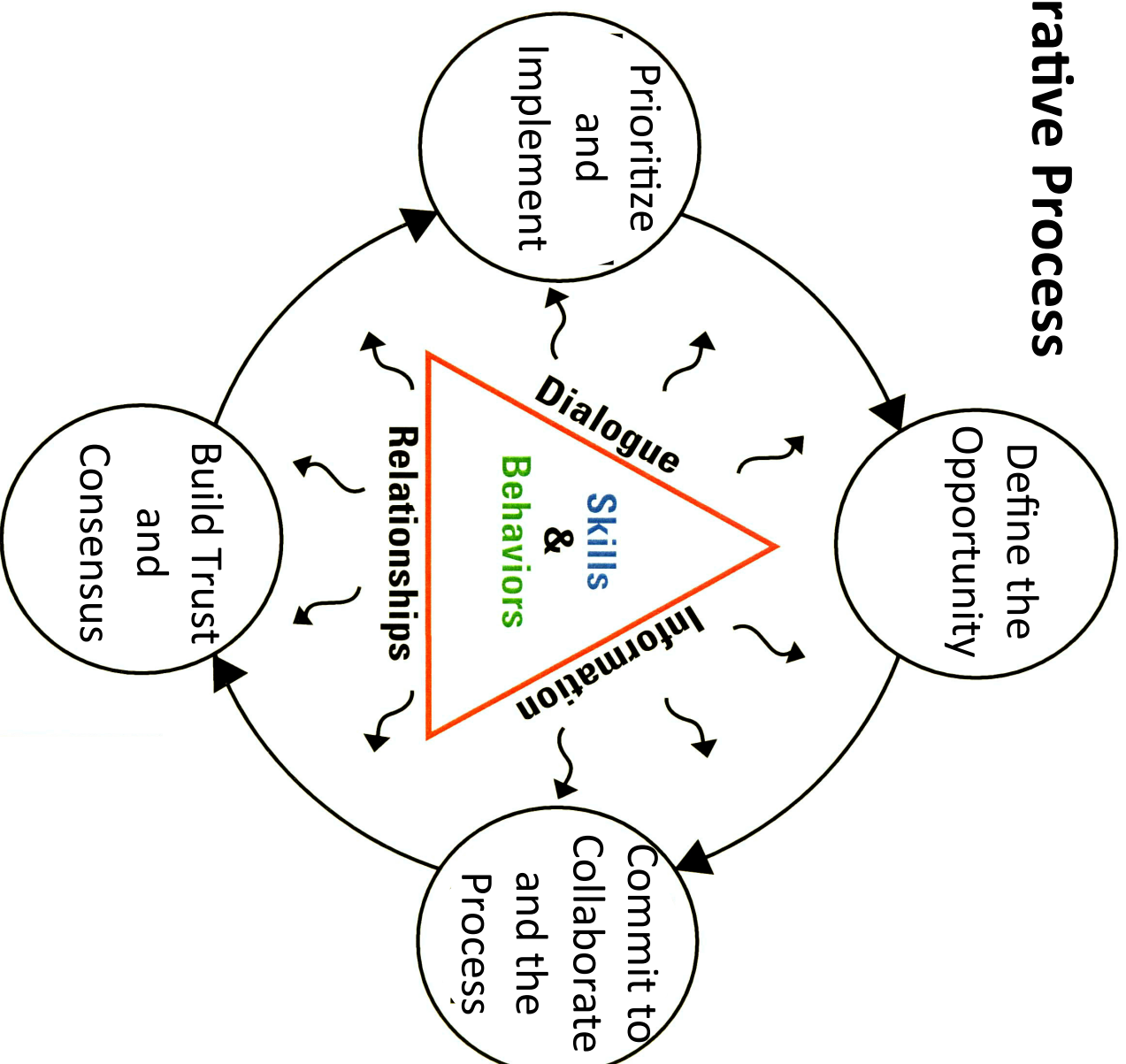
Respect

Humility

Mutuality



# The Collaborative Process



**Thank You!**

**Questions or Comments?**