



The Practical Guide to All-Electric, Lower Cost Multifamily Buildings with EV Charging

Nick Brown
Robert Fortunato

Build it Green
March 31, 2022

Please sign into chat with: Name, occupation, company, city, and what you would like to get out of today's class

Purpose

To empower attendees to design and build Multifamily All-Electric buildings with the advantage of EV charging that reduce capital and operating expenses... all the while being more durable, safer, futureproof, better for the occupants' health and with better rental demand and market value as a result.

This class is for decision makers and those advising decision makers

Introductions

Nick Brown

Robert Fortunato

Nick Brown

Owner/Builder, Net Zero
President, Build Smart



Net Zero Nest:

Completed in 2016


1,950 sf, 3 BR & 3 Bath

4.4 kW PV array (16 panels)

Green Point Rated

BUILD IT GREEN
CERTIFICATE OF EVALUATION






Congratulations,
your home is now




GreenPoint RATED
Existing Home **Whole House**

180

ADDRESS: 400 Los Altos Ave
Long Beach, CA 90814
BUILT BY: Hardey Construction
RATED BY: Wayne Jensen
RATED ON: 8/5/2016
GREENPOINT RATED EDITION:
Existing Home Single Family v2.1.1

- 11  Community: Green building offers solutions for decreasing traffic, improving access, and making neighborhoods safer and more enjoyable.
- 87  Energy: Efficient energy practices including renewables provide effective strategies for reducing a home's energy use while increasing comfort.
- 29  IAQ/Health: Green building addresses ventilation practices, products, and installation practices to reduce sources of indoor air pollution.
- 22  Resources: Green building favors material and practices that reduce waste, conserve natural resources, and have increased durability.
- 31  Water: Effective water management systems and efficient indoor and outdoor water use protect and conserve freshwater supplies.

Please note the above category points have been rounded, therefore the GreenPoint Rated score may differ slightly from the sum of the above category pts.


KATHERINE A. WEICKERT, EXECUTIVE DIRECTOR

THIS IS A PROGRAM OF BUILD IT GREEN - www.GreenPointRated.org



classes:

homes

using Heat Pumps

standards for Residential Architects

sign

No Electric Charges For 5 Years



BROWN, HOLLAND C / Page 5 of 6

Details of your tracked charges

Your rate: DOMESTIC

Billing period: Feb 5 '16 to Mar 8 '16 (32 days)

Delivery charges

Energy-Winter

Tier 1 (within baseline) -124 kWh x \$0.07682 -\$9.53

DWR bond charge -124 kWh x \$0.00539 -\$0.67

Generation charges

DWR

DWR energy credit -124 kWh x -\$0.00022 \$0.03

SCE

Energy-Winter

Tier 1 (within baseline) -124 kWh x \$0.06909 -\$8.57

Energy Charge Total -\$18.74

Additional information regarding your Net Consumption/Generation:

- Your cumulative energy charge total as of previous month: -\$214.88

- Your current month energy charge total: \$16.74

- Your cumulative energy charge Year-to-Date: -\$233.62*

- Your cumulative kWh Year-to-Date: -1,162 kWh

If you earned a credit on your bill, the amount you receive may be less than your Cumulative Energy Charge which is based on SCE's rates. Your "Compensation Total" is based on the Cumulative kWh Year-to-Date

Robert Fortunato

Owner/Builder, Green Idea House

President, ForStrategy Consulting, Inc.



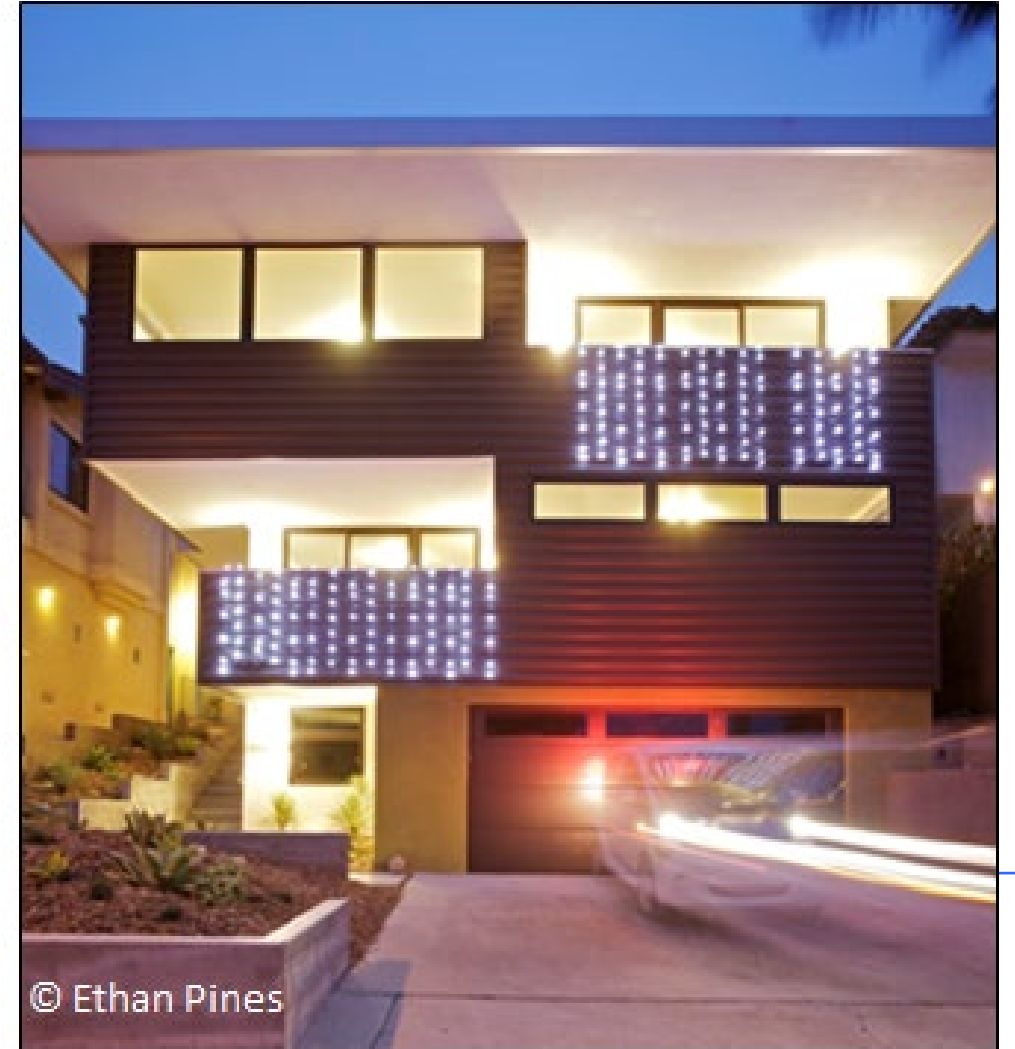
Green Idea House:

Completed in 2012

2,150 sf, 3 BR & 2 Bath

6.5 kW PV array (26 panels)

Green Point Rated, Living Building Challenge NZE Petal



Green Idea House Received Multiple Green Leadership Awards



TEDx in 2014

Over 5,000 people through the project before during and after construction.

Featured in over 40 publications

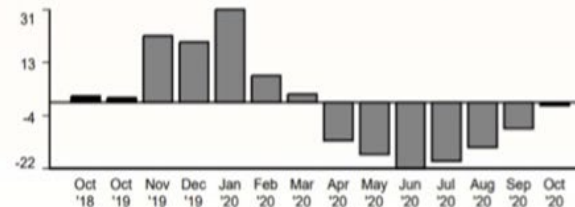


Your past and current electricity usage

	Electricity (kWh)
Winter Season - Consumption	
On peak	62
Off peak	130
Super off peak	230
Winter Season - Net Generation	
On peak	-99
Off peak	-354
Super off peak	-1
Total electricity usage this month in kWh	-32

Your daily average electricity usage (kWh)

2 Years ago: 2.00 Last year: 1.53 This year: -1.03



Additional information regarding your Net Consumption/Generation:

- Your year-to-date energy charges total as of previous month: **-\$1,215.44**
- Your current month energy charge total: **-\$42.36**
- Your year-to-date energy charges: **-\$1,257.80**
- Your year-to-date kWh: **-1,703 kWh**

Agenda

- Understand your needs for the class
- 7 Steps to building All-Electric more cost effectively
- How electrification saves time, money, and aggravation for developers – and also improves NOI and resale value
- The EV charging opportunity
- Summary
- Check our understanding
- Resources listing

A Word From Our Sponsor



SOUTHERN CALIFORNIA
EDISON[®]

Energy for What's AheadSM

- SCE is committed to safely providing our 15 million customers across our 50,000 square-mile service area with affordable, clean, reliable electric service and helping our state meet its greenhouse gas reduction goals. As a longtime leader in renewable energy and energy efficiency, we are continuing to develop innovative ways to help achieve our state's vision of a clean energy future by focusing on opportunities in clean energy, efficient electrification, the grid of the future, and customer choice. To learn more, please visit www.edison.com.
- The products depicted are for illustrative purposes only. SCE does not recommend specific products or vendors.

7 Steps to Cost-Effective All-Electric Multifamily Buildings

1. One Less Utility
2. Embrace Better Technologies
3. More Marketable Buildings
4. Leverage the Garage with EV Charging and Other Amenities
5. Start Early
6. Use Efficient Electric Systems for Easier Code Compliance
7. Avoid Common Missteps

1st Step: One Less Utility



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Project Spotlight: Jefferson 17-unit in Los Angeles



“It just doesn’t make any sense to me to run all those gas lines through my building... just from a financial perspective. We hope to save money and permitting by having one less trade.”

- Steve Kraemer, Rock Development

- All-Electric
- HPWH in each unit/hallway
- Ductless mini in each unit; condensers on the roof
- Required electrical upgrades through LADWP
- Complied with Non-residential energy code

1st Step: One Less Utility

Simplicity

- Savings of time (capital costs) and aggravation waiting for utility hookups

Lower first costs - Less infrastructure

- No teeing into the gas main, 2nd trench, ripping up the street
- No first and ongoing meter charges
- No roof penetrations for gas exhaust, risks of leaks in roof...

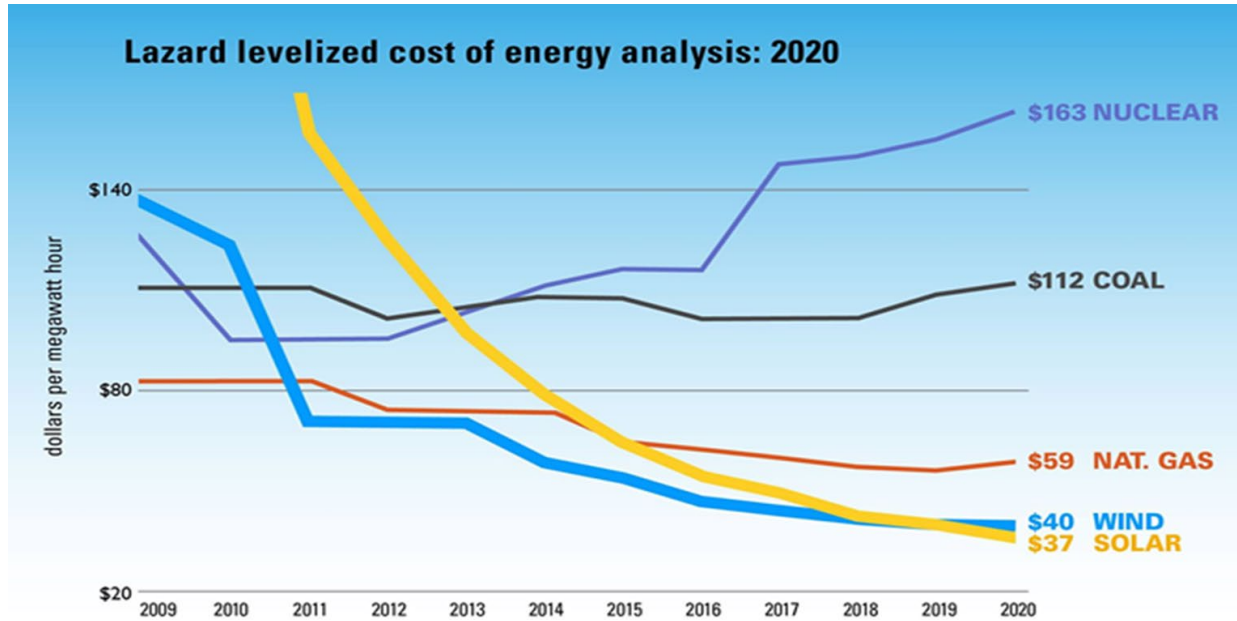
1st Step: One Less Utility

Roof As The Engine Of The Building

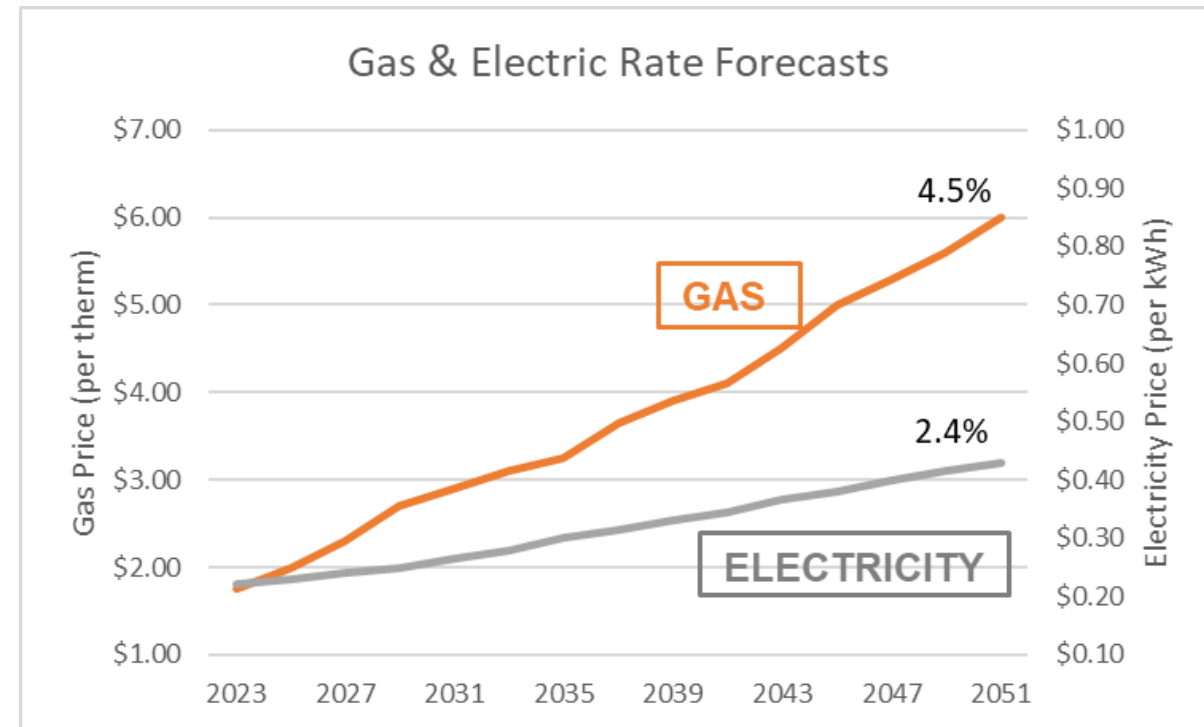


1st Step: One Less Utility

Fuel Costs Now And In The Future



Gas no longer the transition fuel -- other technologies have superseded gas.

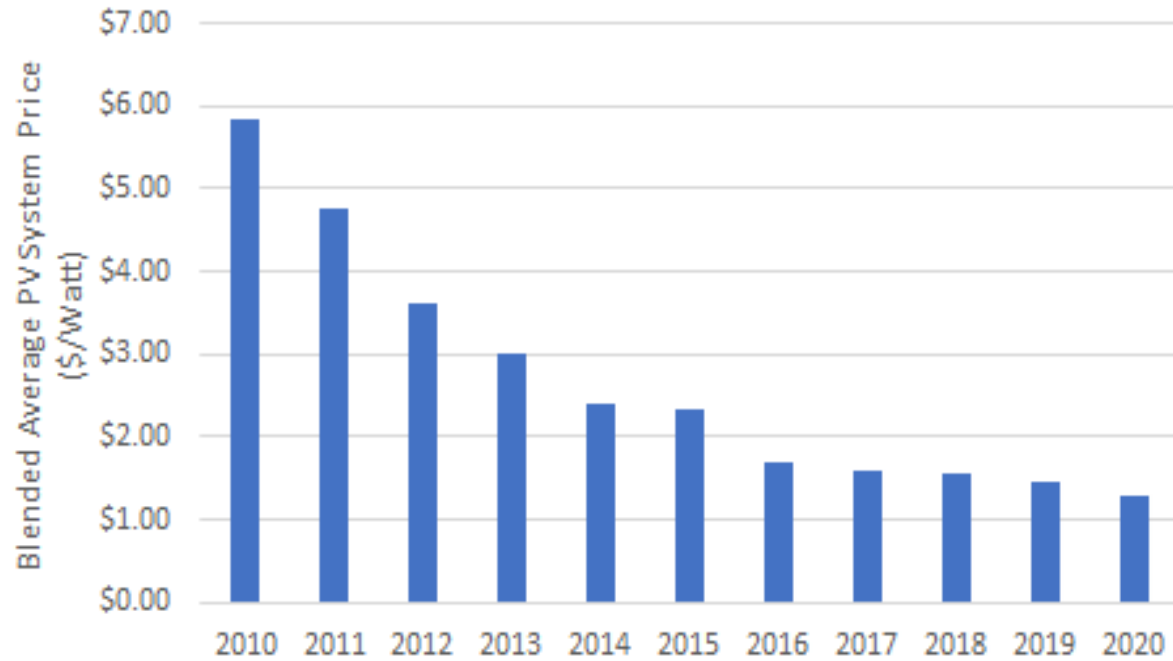


Source: Time Dependent Valuation of Energy for Developing Building Efficiency Standards, May 2020 by E3

1st Step: One Less Utility

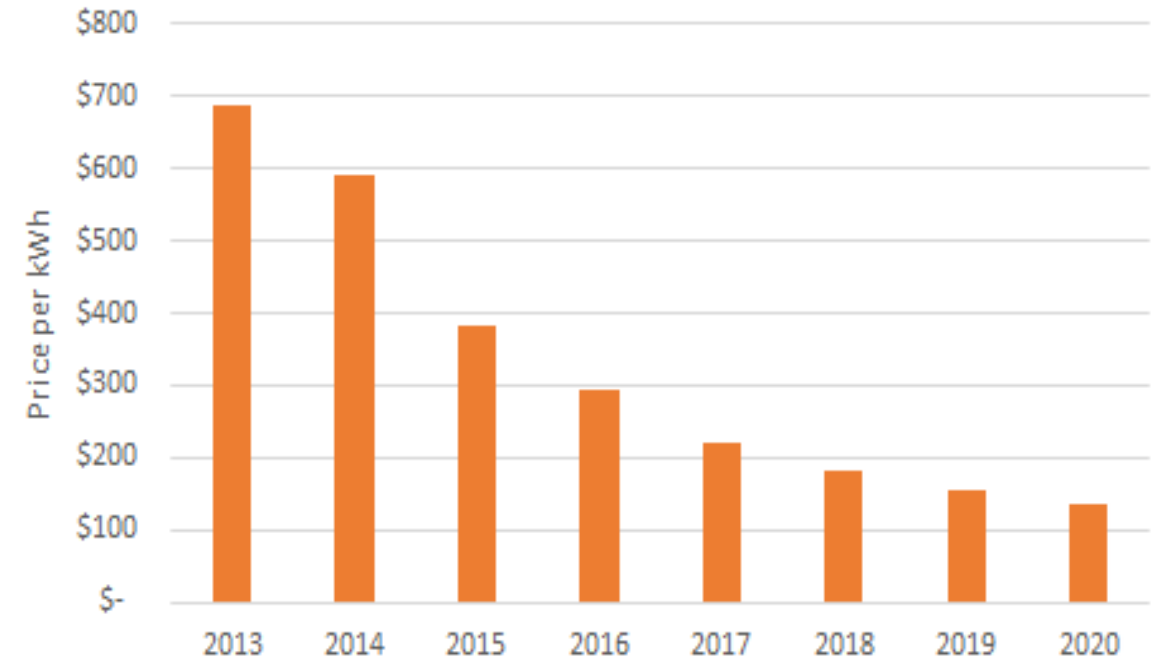
Solar And Battery Price Curves

U.S. Solar PV Price Declines



Source: SEIA

U.S. Battery Price Declines

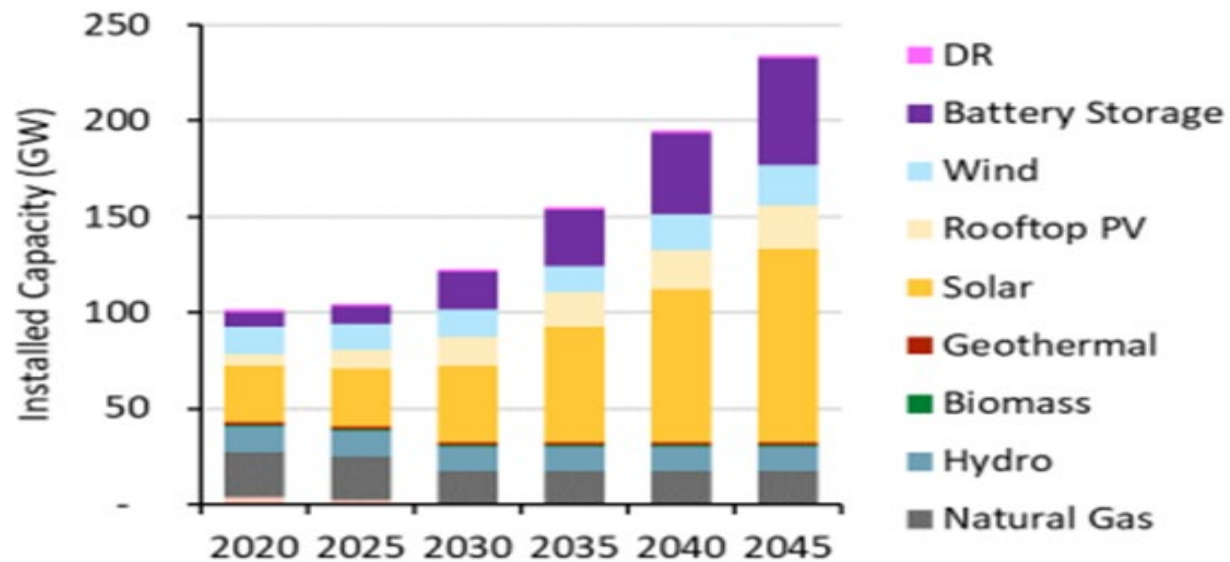


Source: BloombergNEF

1st Step: One Less Utility

100% Renewable Electric Grid

- All electric – proven to be the least expensive way to meet policy goals (not going away)
- CalGreen requires EV charging capability – might as well make it a feature and provide for an all-EV future
- California Internal Combustion Engine vehicle sales will end in 15 years
- Grid going to 100% renewables in 2045 – why build with gas?

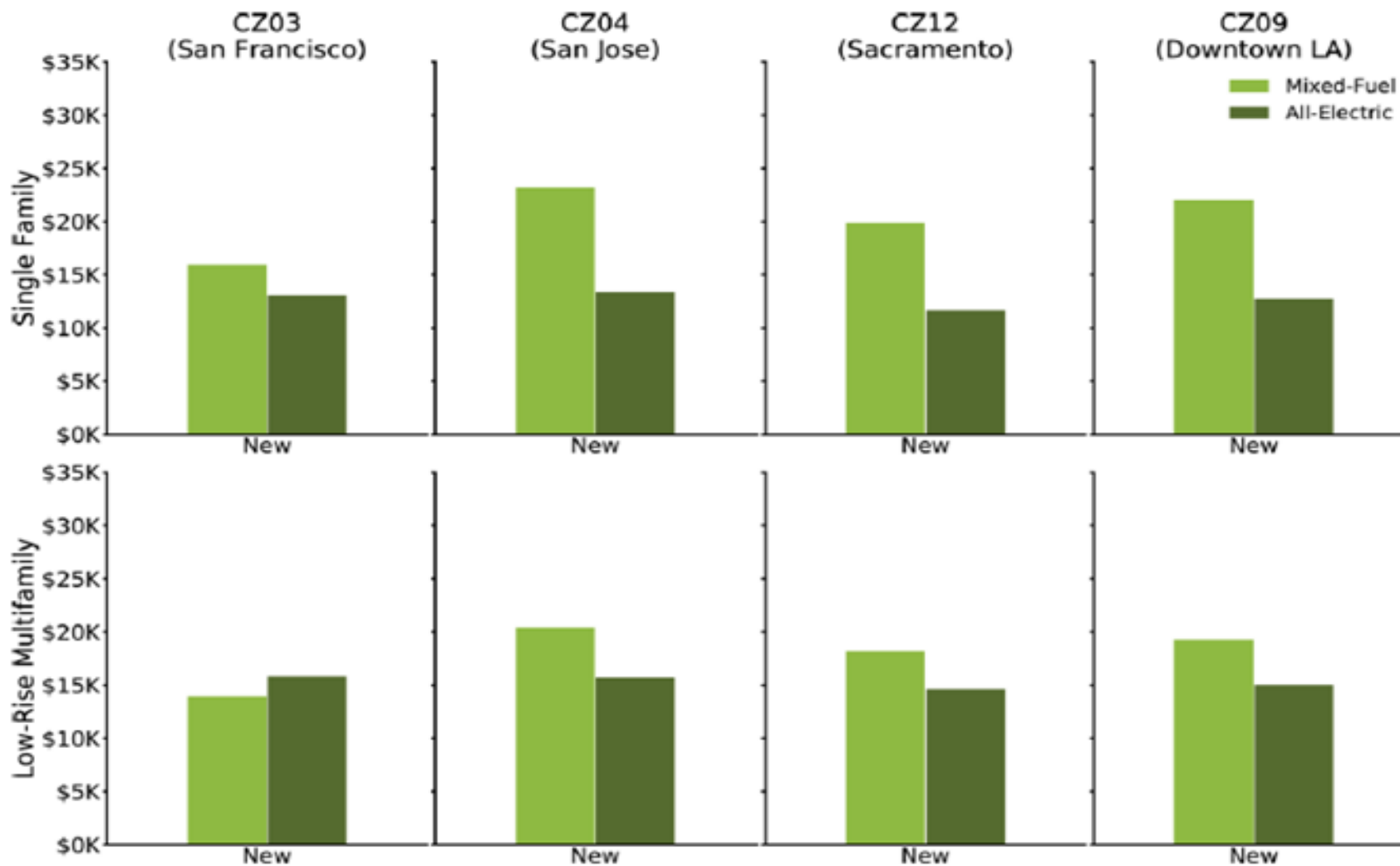


Source: "Title 24 2022 Time Dependent Valuation Updates", March 2020, by E3

1st Step: One Less Utility

All-Electric is Lower Cost

Figure 3-8 Capital costs per unit of all appliances (HVAC, water heater, stove, and clothes dryer) and infrastructure (including gas connection costs) for new construction



Source: "Residential Building Electrification in California", E3, April 2019

ISSUE, JULY

NEWS

DAILY NEWS

Your Competitors Are Already Doing This!

July 2021



SOUTHERN CALIFORNIA'S FIRST ALL-ELECTRIC TOWNHOME COMMUNITY

All-Electric Net-Zero Triplex in Philadelphia

Built for \$130 per square foot and \$249K per unit



ONION
FLATS

CONSTRUCTION COSTS

	PER UNIT	PROJECT TOTAL
GENERAL CONDITIONS	\$1,500	\$4,500
EXCAVATION & GRADING	\$3,000	\$9,000
FOUNDATIONS	\$7,000	\$21,000
HELICAL PIERS	\$6,500	\$19,500
SITE UTILITIES (WATER / SEWER / ELECTRIC)	\$10,000	\$30,000
SOLAR PV (5 KW PER HOUSE - 15KW TOTAL)	\$15,000	\$45,000
TOTAL SITE WORK	\$43,000	\$129,000
FRAMING / INSULATION / SHEETROCK / PAINT	\$50,250	\$150,750
EXT.WINDOWS & DOORS	\$9,850	\$29,550
MECHANICAL SYSTEM	\$8,500	\$25,500
PLUMBING & SPRINKLERS	\$9,500	\$28,500
ELECTRICAL	\$5,500	\$16,500
CABINETS / COUNTERTOPS	\$5,500	\$16,500
APPLIANCES	\$6,200	\$18,600
HARDWARE & FINISHES	\$9,300	\$27,900
EXTERIOR CLADDING	\$4,500	\$13,500
E-MONITORING	\$1,900	\$5,700
LABOR / INSPECTIONS / OH-P / DELIVERY / INSTALL	\$95,000	\$285,000
TOTAL MODULAR	\$206,000	\$618,000.00

TOTAL HARD COSTS

\$249,000 \$747,000

COST PER SQUARE FOOT

\$ 130

All-Electric Net-Zero 28-unit in Philadelphia

Built for \$180 per square foot



- 174 kW PV array uses entire envelope
- Individual unit heating & cooling
- Individual unit ventilation
- Shared water heating
- Single electric meter
- R-34 panelized wall system
- R-54 roof

All-Electric 71-unit in Gilroy, CA

Built for \$295 per square foot

- 71 family units
- Individual unit HPWH
- Individual unit heating and cooling minisplit HPs



All-Electric 51-unit in Eureka, CA

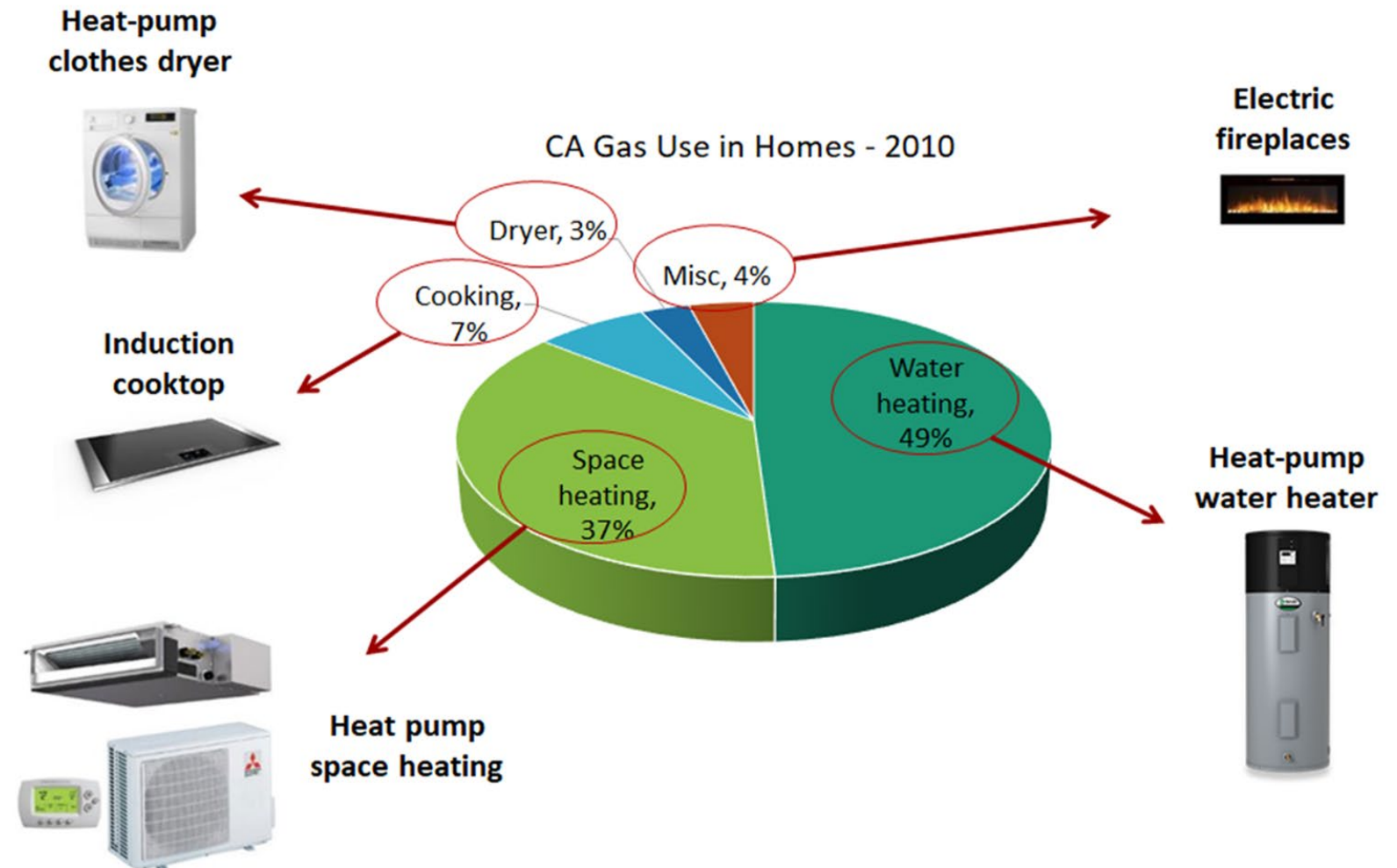
Built for \$357 per square foot

- 51 Family Units
- Individual Unit HPWH
- Individual unit heating and cooling minisplit HPs



2nd Step: Embrace Better Technologies

- Induction cooking
- Heat pump water heaters
- Heat pump HVAC
- Laundry
- Fireplaces
- Pool heating
- Transformers/Electrical panel



2nd Step: Embrace Better Technologies: Cooking

Chefs and Consumer Reports Prefer Induction Cooking!

- 6 of Top 8 ranges for 2020 were electric
- Top 2 ranges were induction



Fuel	Model	Rating	Cost
Induction	GE Profile PHS930SLSS	86	\$2,432
Induction	Kenmore Elite 95073	84	\$1,525
Gas	LG Signature LUTD4919SN	84	\$3,000
Induction	LG LSE4617ST	82	\$2,500
Induction	LG LSE4616ST	82	\$1,700
Smoothtop	Whirlpool WGE745cOFS	82	\$1,000
Gas	Samsung NY58J9850WS	81	\$2,725
Induction	Frigidaire Gallery FGIF3036TF	81	\$1,035

2nd Step: Embrace Better Technologies: Cooking

Induction: SMUD's cooking now



Customer research

SMUD customer panel: How would you rate your impression of induction cooking before and after trying the induction cooktop?



2nd Step: Embrace Better Technologies: Induction Cooktops



SÄRKLASSIG
Induction cooktop, 30"
\$599.00



TILLREDA
Portable induction cooktop
\$49.99
★★★★☆ (36)



TVÄRSÄKER
Range with induction cooktop
\$1,099.00



FRUITEAM 13-Piece Cookware Set
Non-stick Ceramic Coating
Cooking Set, Induction Pots
Pans Set with Lids, Heavy Du...
★★★★☆ ~ 636
\$119.99 ~~\$159.99~~
Save **\$10.00** with coupon
✓prime Get it as soon as Thu, Apr 22
FREE Shipping by Amazon

2nd Step: Embrace Better Technologies: Heat Pump Water Heaters

- **3 times more efficient than gas**
- Demand response/timer capacity acts as a thermal battery
- Dehumidifies and cools garages and surrounding spaces
- Can be installed in 3 square foot closets for ease of servicing and sound management



Heat Pump Water Heaters And EVs Can Soak Up Low-Carbon, Low-Cost Electricity Off-Peak, Without Adding Load On-Peak

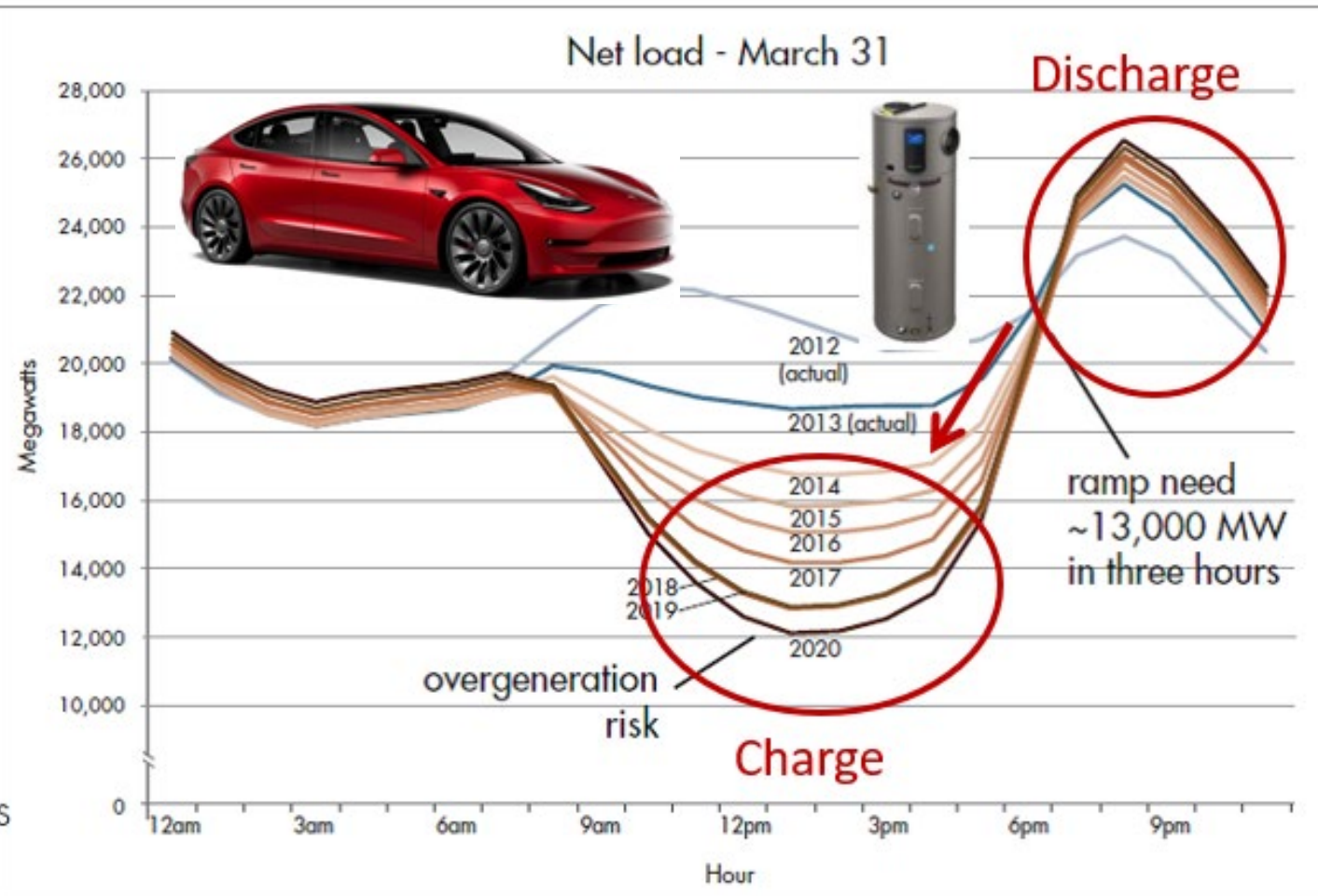
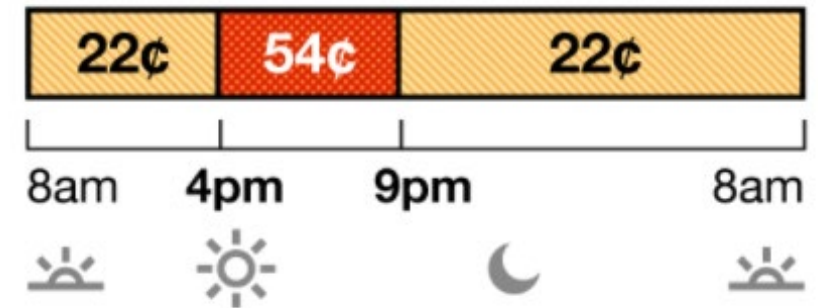
SCE TOU-D-PRIME Rates Have 4-9 pm Peak

Summer Rates

Winter Rates

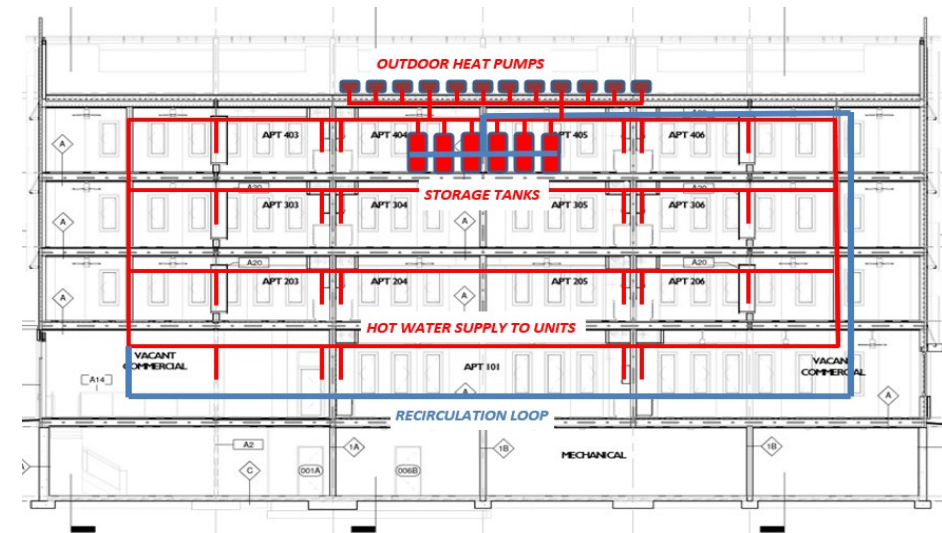
June to September (4 months)

Weekdays

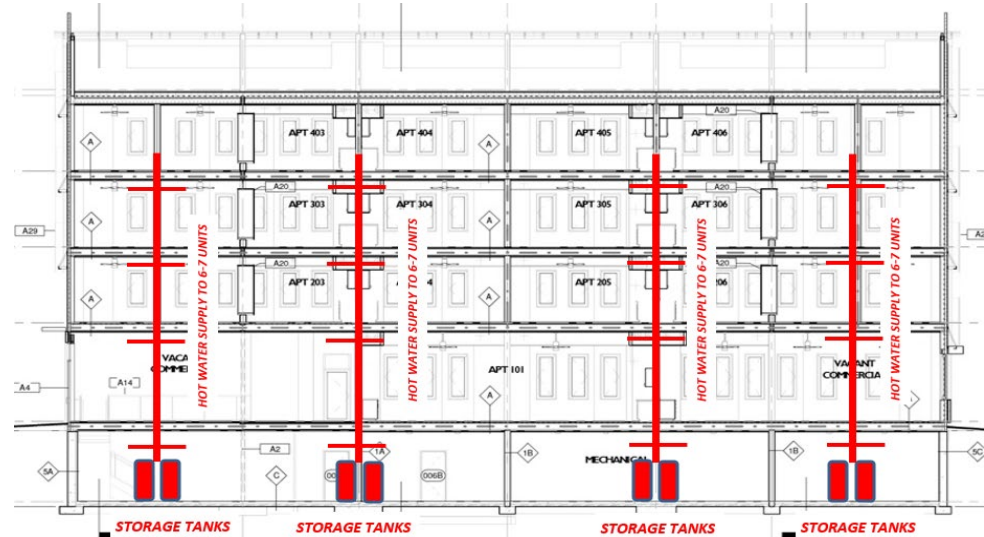


2nd Step: Embrace Better Technologies: HPWH – Centralized, Shared, or Individual

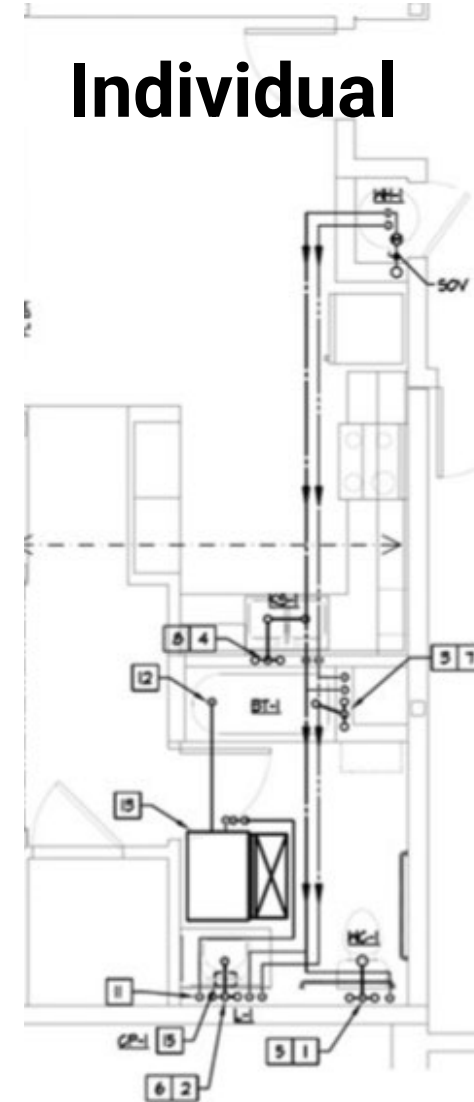
Centralized



Shared



Individual



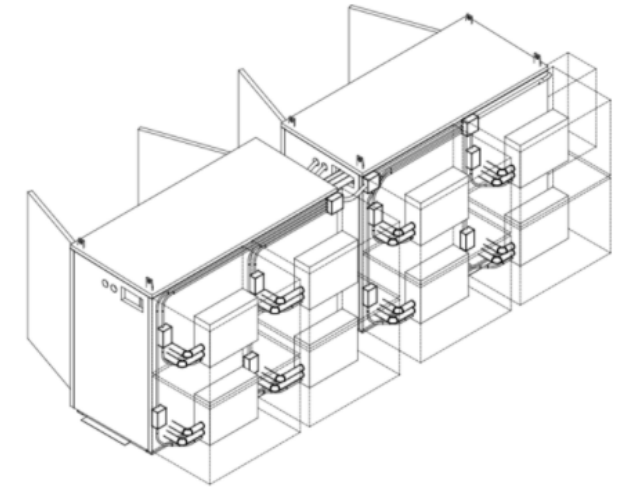
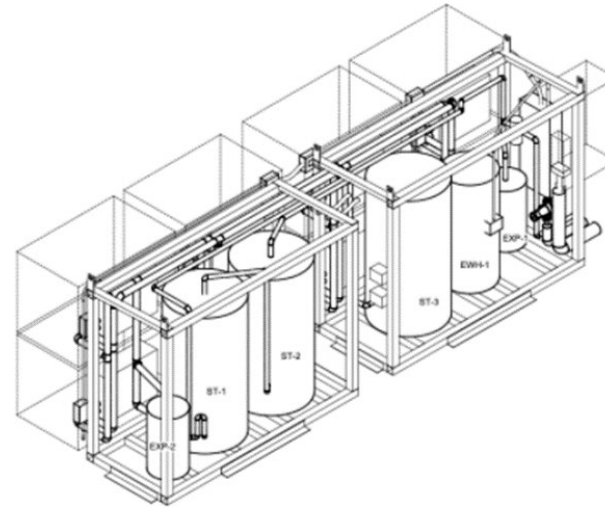
2nd Step: Embrace Better Technologies: Centralized HPHW

Pros:

- Doesn't take up rentable floor space
- Can be centrally monitored and serviced
- Sizing assistance with ECOSIZER
- Water Drop Palletized Units coming

Cons:

- Owner is responsible for all water heating
- One year warranty
- If it fails, the whole building goes down
- Service contract required
- Dual plumbing
- **Significant recirculation line loss**
- Separate tanks
- Roof area
- Structural implications
- Crane required



2nd Step: Embrace Better Technologies: Shared HPHW

Pros:

- **Warranty 3 years**
- **When it fails, that segment of the building goes down**
- Less dual plumbing
- **Less recirculation line loss**
- No Separate Tanks
- **Doesn't use roof area**
- No structural implications
- No crane required
- May not need service contract

Cons:

- **May take up rentable floor space**
- **Owner is responsible for all water heating**
- Requires careful venting
- Requires primed floor drains



2 – 80 gallon HPWH for 6-7 Apartments

2nd Step: Embrace Better Technologies: Individual HPHWs

Pros:

- **Warranty 10 years**
- **When it fails, only one unit goes down**
- **Tenant is responsible for water heating bill**
- No dual plumbing
- No recirculation line loss
- No Separate Tanks
- **Doesn't use roof area**
- No structural implications
- No crane required
- No service contract needed

Cons:

- **Takes up rentable floor space**
- Requires careful venting
- Requires primed floor drains



2nd Step: Embrace Better Technologies: HVAC Heat Pumps

- Efficient All-Electric Heating & Cooling in One System
- Heat pumps are often simpler/less expensive to install
- Wide variety of configurations possible (ductless, ducted, ceiling cassettes)
- Often no ducting and no HERS inspections



2nd Step: Embrace Better Technologies: HVAC Heat Pumps

- No separate furnace
- No gas lines
- No flue vent pipes
- No combustion gases inside building
- Quieter
- Space-saving
- Utility bill savings



Ducted Minisplit HPs provide high efficiency in space-saving cost-effective configurations

2nd Step: Embrace Better Technologies: HVAC Heat Pumps

We surveyed Southern California HVAC Contractors: 600 square foot addition scenario

What would you bid for a gas furnace 80 AFUE Ultra Low-NOx and 14 SEER condensing unit with new R-6 ductwork and smart thermostat? Assume a 2-ton unit. Include all plumbing, electrical, and HVAC costs.

Range of Estimates Provided by Contractors – Gas Split System

\$6,000 \$15,000

What would you bid for a heat pump 8.2 HSPF and 14 SEER? Assume a 2-ton unit and include all plumbing, electrical, and HVAC costs.

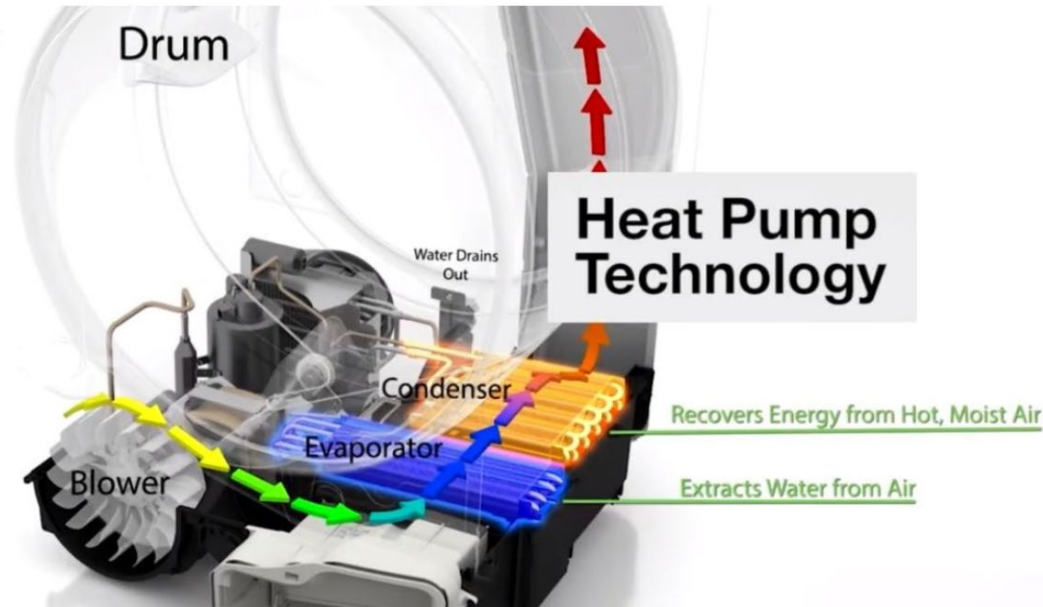
Range of Estimates Provided by Contractors – Heat Pump

\$6,000 \$13,000

100% of contractors gave an equal or lower bid for heat pumps than gas split systems in this scenario.

2nd Step: Embrace Better Technologies: Heat Pump Clothes Dryers

- **No gas lines**
- **No flue vent pipes**
- **No exhaust duct to outside**
- **No combustion gases in building**
- No Backdrafting
- Cools laundry room
- Dehumidifies



Heat Pump Coin Laundry

2nd Step: Embrace Better Technologies: Pool Heating

- Heat pump pool heaters are capable
- This 120,000 btu model costs \$4,000
- Comparable gas models are between \$1000 - \$2,000
- Run year round, ***this unit is estimated to save \$5,000 in the first year*** or 64% in L.A. climate
- It would run 9 hours on the coldest day of the year
- Receive payback in 1 year



3rd Step: More Marketable Buildings

- Today's new multifamily buildings can clearly demonstrate superior indoor air quality to older buildings
- All-electric saves tenants money
- Electrification plus solar make the economics sing
- EV charging is a must-have amenity that futureproofs at minimal cost
- Climate satisfaction
- Resiliency

For More Information: [“Selling Clean Energy Homes”](#)

3rd Step: More Marketable Buildings: Use Health, Futureproofing, and Lower Costs

- Market all-electric buildings on quality of life
- Not in lab coats with SEER ratings, % efficiency, and R-values
- Sell/lease on health, resiliency, futureproofing, utility costs, and climate satisfaction



“10 years ago, Meritage was trying to sell features like low-e windows and insulation packages. That intimidated our customers and slowed down the buying process, so we changed our strategy. Today, we talk about the benefits of green homes. ***We tell them that their homes will be more comfortable and save them money, that their children will be healthier, that their quality of life will improve, and that they’re making a smart investment.***”

- CR Herro, VP Business Innovation, Meritage Homes

All-Electric 44-unit in Irvine, CA



- Southern California's first All-Electric Zero Net Energy (ZNE) townhome community
- 1,868 – 2,171 square feet
- Prices from \$845,000 - \$900,000
- Completed November 2019
- HERS Scores: 11-17
- Builder partnered with SCE to prove concept

All-Electric 44-unit in Irvine, CA



Key Energy Features

- All-Electric
- EV ready garages
- KitchenAid Induction Cooktop
- Whirlpool Heat Pump Dryer
- Heat Pump Water Heater
- 16 SEER Heat Pump
- Smart Wi-Fi Connected Thermostats
- 4 kW Solar panel system on roof of each unit
- Efficient building envelope



3rd Step: More Marketable Buildings: Can Charge Higher Rent With Lower Utility Bills

- 101-unit affordable multifamily building in Southern California
- Typical utility bills: \$134 - \$175 per month
- With upgrades & PV: \$13 - \$17 per month
- **Savings applied to rent add up to \$160,000 per year in added revenue to building owner**



Tool Version: 2.0.0 11/30/2020
Tables Version: 1.1.0 11/30/2020
Printed Timestamp: 12/29/2020 12:03:51 AM
Project Name: Vista Verde
Site Street Address: 110 North Virginia Avenue, Ontario, 91764
Site Contact: Zoe Kraneman
Electric Utility: SCE **Electric Territory:** 10 - Electric
Gas Utility: No Gas **Gas Territory:** All
Tariff Type: CARE **Affordable Housing:** Yes

Utility Allowance Calculator Results

Monthly Usage (\$/month)							
Apartment Type	Units		Electric	Gas	Water	Trash	Total
	Affordable Housing	Market Rate					
Two Bedroom	69	0	\$13.43	\$0.00	\$0.00	\$0.00	\$13.43
Three Bedroom	32	0	\$17.15	\$0.00	\$0.00	\$0.00	\$17.15

<input type="checkbox"/> With Upgrades & PV	\$ 13	\$ 17	0	0	0
Without Upgrades & PV	\$134	\$175			

y)
 33
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 4

3rd Step: More Marketable Buildings: Lower Operational and Maintenance Costs

OPERATIONAL COSTS

- PV requirement for new multifamily projects brings down residents' utility bills
- PV + all-electric makes economic sense together
- \$20 - \$40/month whether mixed fuel or all-electric

MAINTENANCE COSTS

- Natural gas appliances require maintenance
 - Flushing lines of gas tankless water heaters
- HPWHs come with 10-year warranty, longer than gas WHs
- Monthly gas meter service fees

4th Step: Leverage the Garage with Amenities

The garage is a forgotten revenue stream of the building:

- Plan for EV chargers **using incentives available now**
- Futureproof for an all-EV future
- Provide for access for occupants with disabilities, bicycles, motorcycles, storage spaces
- Start on garage layout and electrical distribution early
- Bidirectional charging coming soon

4th Step: Leverage the Garage with Amenities: EV Ownership Growing Fast

- Automakers now committed to all EVs
- All new California passenger cars/trucks must be Zero Emission Vehicles (ZEVs) by 2035
- California goal of 5 million EVs by 2030, 1/3 of the 15 million passenger cars/trucks

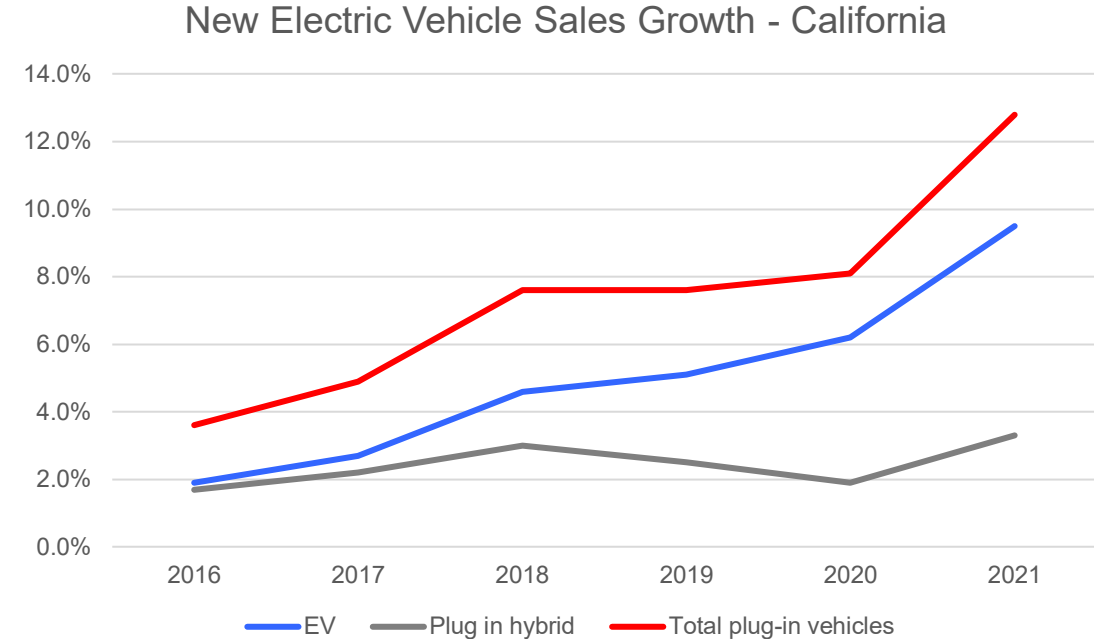


Will Ferrell Takes on Norway



4th Step: Leverage the Garage with Amenities: EV-Owning Tenants Are A Rising Tide

- **Multifamily garages need futureproofing to avoid retrofit costs, meet tenant needs**
- Current and growing tenant demand for EV chargers
- **2020 CA new car sales 13% Plug-in EVs**
- EV sales expected to reach 33% by 2030 = more tenant EVs
- Concentration of EVs is even higher in urban areas
- EV owner preference is to charge at home – important for all multifamily properties



4th Step: Leverage the Garage with Amenities: Tenants Demanding EV Charging

- EV ownership increasingly common for tenants at market rate MF properties
- Demand is there now
- Affordable used EVs are now coming to market for low-income tenants
- New market rate and low-income rate Multifamily properties both need EV chargers
- **SCE rebates support this future-proofing for new/near term tenant needs**

“Electric cars ‘will be cheaper to produce than fossil fuel vehicles by 2027’”

- *The Guardian, May 9, 2021 (Bloomberg New Energy Finance)*

4th Step: Leverage the Garage with Amenities: Multifamily Garages As Gas Stations

- With increasing EVs, Multifamily garage EV chargers are the new gas station
- Tenant EV charger use is a new revenue opportunity – tenants pay owners for fuel
- Smart EV chargers use 3rd parties for phone app fuel payments – easy for owners/staff
- Quarterly payment to owner from 3rd party and tenant fuel payments

Install 10 EV Chargers

Cost With Incentives: -\$9,000

\$ 10,500 extra annual income

\$225,000 higher property value @ 4.5% cap rate



Upgrade to 20 EV Chargers in Year 7

Cost ~ \$20,000 (if planned for)

\$ 23,000 extra annual income

\$510,000 higher property value @ 4.5% cap rate



5th Step: Start Early

Developers Start with Pro-Forma

End of Year	1	2	3	4	5
	3/31/2015	3/31/2016	3/31/2017	3/31/2018	3/31/2019
40 units - Efficiency	\$312,000	\$315,120	\$318,271	\$321,454	\$324,668
60 units - 1 Bedroom / 1 Bath	\$864,000	\$881,280	\$898,906	\$916,884	\$935,221
40 units - 2 Bedroom / 2 Bath	\$1,008,000	\$1,028,160	\$1,048,723	\$1,069,698	\$1,091,092
POTENTIAL RENTAL INCOME	\$2,184,000	\$2,224,560	\$2,265,900	\$2,308,035	\$2,350,981
General Vacancy	(\$196,560)	(\$177,965)	(\$158,613)	(\$138,482)	(\$117,549)
EFFECTIVE RENTAL INCOME	\$1,987,440	\$2,046,595	\$2,107,287	\$2,169,553	\$2,233,432
Property Taxes	(\$146,500)	(\$147,965)	(\$149,445)	(\$150,939)	(\$152,448)
Insurance	(\$15,000)	(\$15,150)	(\$15,302)	(\$15,455)	(\$15,609)
Management Fee	(\$262,080)	(\$266,947)	(\$271,908)	(\$276,964)	(\$282,118)
Repairs and Maintenance	(\$90,000)	(\$91,800)	(\$93,636)	(\$95,509)	(\$97,419)
Office Expense	(\$20,000)	(\$20,200)	(\$20,402)	(\$20,606)	(\$20,812)
Advertising	(\$12,000)	(\$12,120)	(\$12,241)	(\$12,364)	(\$12,487)
Utilities	(\$65,000)	(\$65,000)	(\$65,000)	(\$65,000)	(\$65,000)
Miscellaneous Expenses	(\$25,000)	(\$25,250)	(\$25,502)	(\$25,758)	(\$26,015)
Reserves	(\$35,000)	(\$35,000)	(\$35,000)	(\$35,000)	(\$35,000)
Total Expenses	(\$670,580)	(\$679,432)	(\$688,436)	(\$697,594)	(\$706,909)
NET OPERATING INCOME	\$1,316,860	\$1,367,163	\$1,418,851	\$1,471,959	\$1,526,524
Reversion	\$0	\$0	\$0	\$0	\$17,980,341
CASH FLOW BEFORE TAX	\$1,316,860	\$1,367,163	\$1,418,851	\$1,471,959	\$19,506,865

- Must adjust typical development process
- Develop proformas with all-electric plus EV charging in mind
- Consider orientation for PV and Passive Solar
- Design using the roof as the engine of the building
- HVAC, HW, elevator banks, parapet heights

5th Step: Start Early: Take Advantage Of Incentives

- **SCE Charge Ready:** EV charger incentives for multifamily
- [Energy Smart Homes](#): \$2,200 per MF unit (all-electric required)
- [BUILD](#): \$1,700 per bedroom for low-income & all-electric
- Incentives can reduce first costs
- Attractive electric rates can reduce operating costs of All-Electric buildings (SCE's TOU-D-PRIME)
- EV charger and PV federal tax credit

5th Step: Start Early: Know What you Want & Drive the Process

- Flatten the load curve first
 - Orientation, overhangs, air sealing, insulation
- Set performance targets
 - Heating and cooling demand (kbtu/sq.ft./year)
 - Whole-building airtightness (ACH@50Pa)
 - Primary energy renewable (kbtu/sq.ft./year)
- Issue clear Owner's Project Requirements and Basis of Design Documents



5th Step: Start Early Electrical / Transformers

- Plan for all-electric, EV charging, transformers, PV, and batteries
- Transformers are often oversized
- Design phase should include full electric inventory for MEP engineer
- Contact your SCE local district planning group or Ruby Yepez, ruby.r.yepez@sce.com

Watt Diet Calculator

General Category	Type	Brand / Description	Volts	Amps	Circuit Amps	Spec Sheet Power (Watts)	Calculated Power (Watts)	Source
General	**Select Device**							
Power Management	Car to Dryer (Product Example: DryerBuddy)		240	-30	30		7200	https://www.bsaelectronics.com/co
General	**Select Device**							
EV Charging	EVSE Level 1 (high)		120	15	15		1800	
EV Charging	EVSE Level 1 (low)		120	8	15		960	
EV Charging	EVSE Level 1 (med)		120	12	15		1440	
EV Charging	EVSE Level 2 (high)		240	40	40		9600	
EV Charging	EVSE Level 2 (low)		240	20	30		4800	
EV Charging	EVSE Level 2 (med)		240	30	40		7200	
General	**Select Device**							
Heating, Cooling and Ventilation	Air Handler Fan: General	Air Handler Fan (for ducted systems)	120	7			840	https://www.acwholesalers.com/m
Heating, Cooling and Ventilation	PTHP: Innova DK92 (largest)		120			2740		https://innova-usa.com/wp-content
Heating, Cooling and Ventilation	PTHP: Innova DK92 (second largest)		120			2740		https://innova-usa.com/wp-content
General	**Select Device**							
Kitchen	Oven: Built in GE	Built in Oven: GE single oven 30in	240	11.9	20		2856	https://www.homedepot.com/p/GE
Kitchen	Oven: Built in Whirlpool	Built in Oven: Whirlpool single oven 30in	240	11.6	20		2784	https://www.homedepot.com/p/W
Kitchen	Oven: Counter Top Oster	counter top oven with convection	120	12.7			1525	https://www.homedepot.com/p/Os
Kitchen	Cooktop: Café 5 Element 36in	Induction Café 36in 5 elements	240	46.3	50		11112	https://www.homedepot.com/p/Ca
Kitchen	Cooktop: Empava 2 Element 12in	Empava 2 Element 12in	120	15	20		1800	https://images.homedepot-static.co
Kitchen	Cooktop: Empava 2 Element 20.5in	Empava 2 Element 20.5in	120	15	20		1800	https://images.homedepot-static.co
Kitchen	Cooktop: Frigidaire 4 Element 24in	Frigidaire 4 Element 24in	240	35	30		8400	https://images.homedepot-static.co
Kitchen	Cooktop: Frigidaire 4 Element 30in	Frigidaire 4 Element 30in	240	35	30		8400	https://images.homedepot-static.co
Kitchen	Dishwasher: Frigidaire	Frigidaire 24in	120		10		1200	https://www.build.com/broan-bcdj1
Kitchen	Fridge: Frigidaire 18.3 cuft	Frigidaire Energy Star 18.3 cuft	120	3			360	https://images.homedepot-static.co
Kitchen	Fridge: Frigidaire 20.4 cuft	Frigidaire 20.4 cuft	120	6			720	https://images.homedepot-static.co
Kitchen	Fridge: Frigidaire 27.6 cuft	Frigidaire 27.6 cuft	120	8.5			1020	https://images.homedepot-static.co
Kitchen	Garbage Disposal: GE	Corded, GFC325N	120	4			480	https://www.geappliances.com/appl

[Watt Diet Calculator](#)

All-Electric Affordable 101-unit in Ontario, CA: Built for \$127 per square foot

- Individual unit HPWHs
- Individual unit heating and cooling minisplit HPs
- Builder makes use of incentives:
 - SOMAH
 - TECH
 - CALIFORNIA ENERGY SMART HOMES
 - BUILD
 - LIWEAP
 - MAHEP



Proper Solar And HVAC Placement Optimizes *The Roof As The Engine Of The Building*



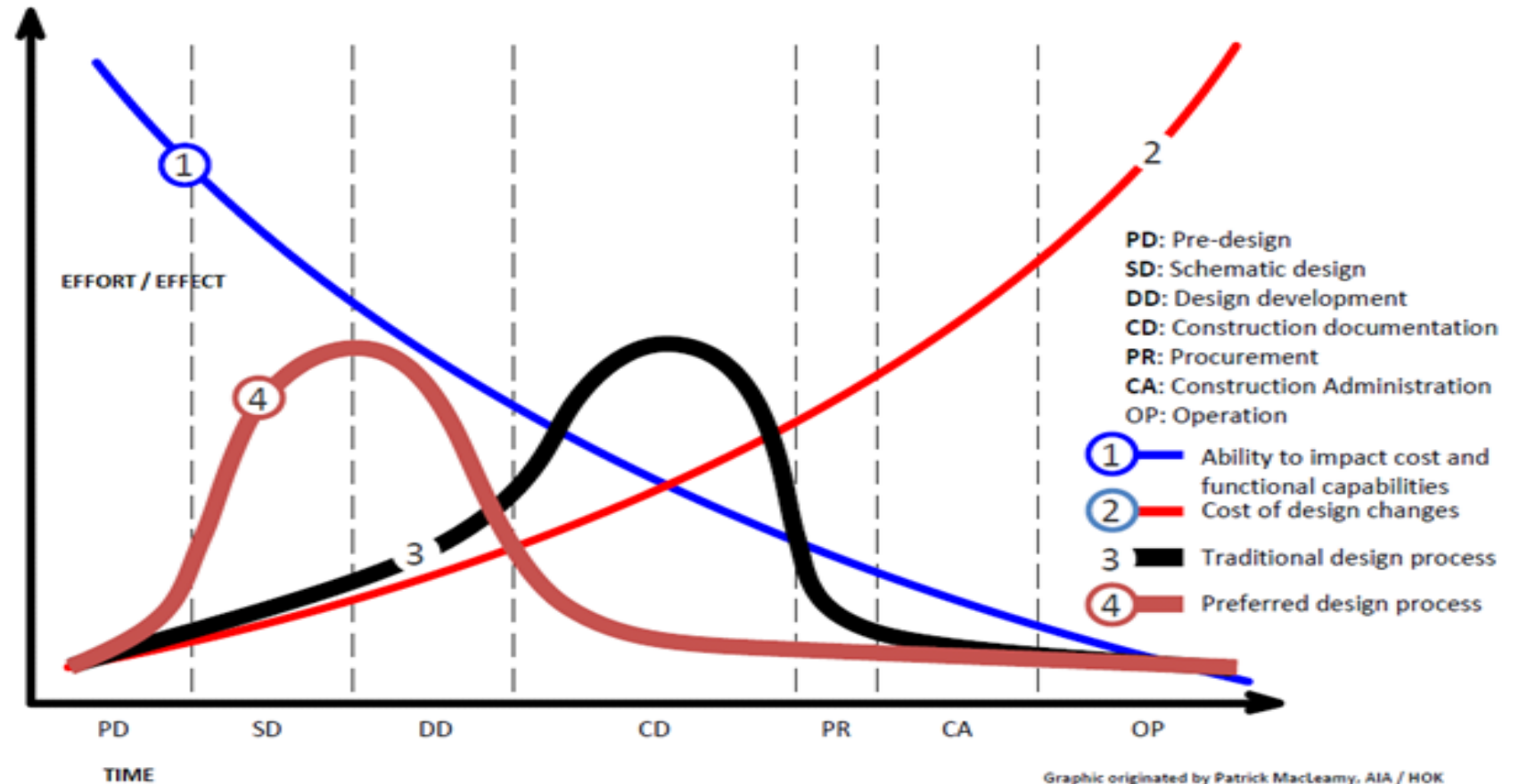
5th Step: Start Early: Integrated Design

Involve more of the team:

- Design-Bid-Build
- Design-Build
- Design Assist

Pick the team based on:

- Experiential interviewing
- Trust



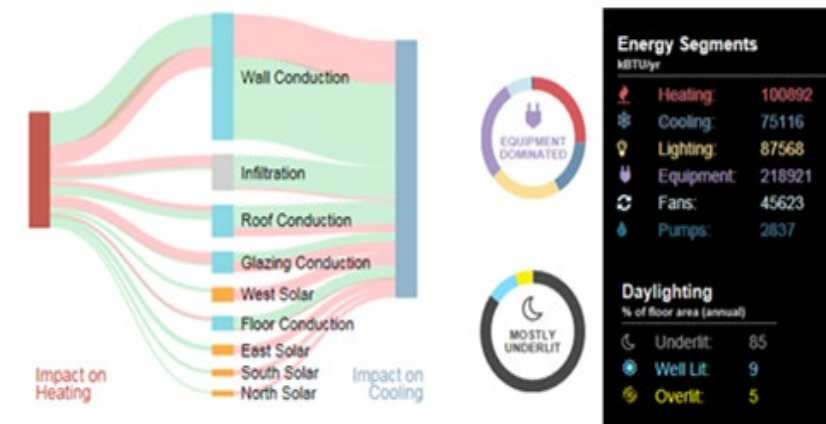
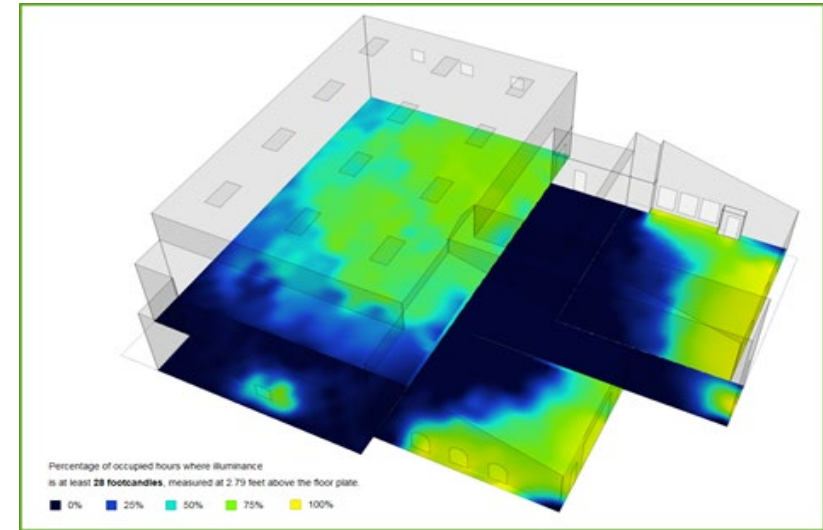
5th Step: Start Early: Energy Modeling Before Entitlements

Use energy models to focus and prioritize where to spend money

- 1) Use Massing & Daylighting tools early to guide orientation, footprint, # units, etc.
- 2) Build the compliance model early with placeholders for items still being designed
- 3) Get an idea of where project stands for compliance, lighting, etc.
- 4) Model what-ifs being considered (orientation, insulation, HVAC, windows, all-electric)

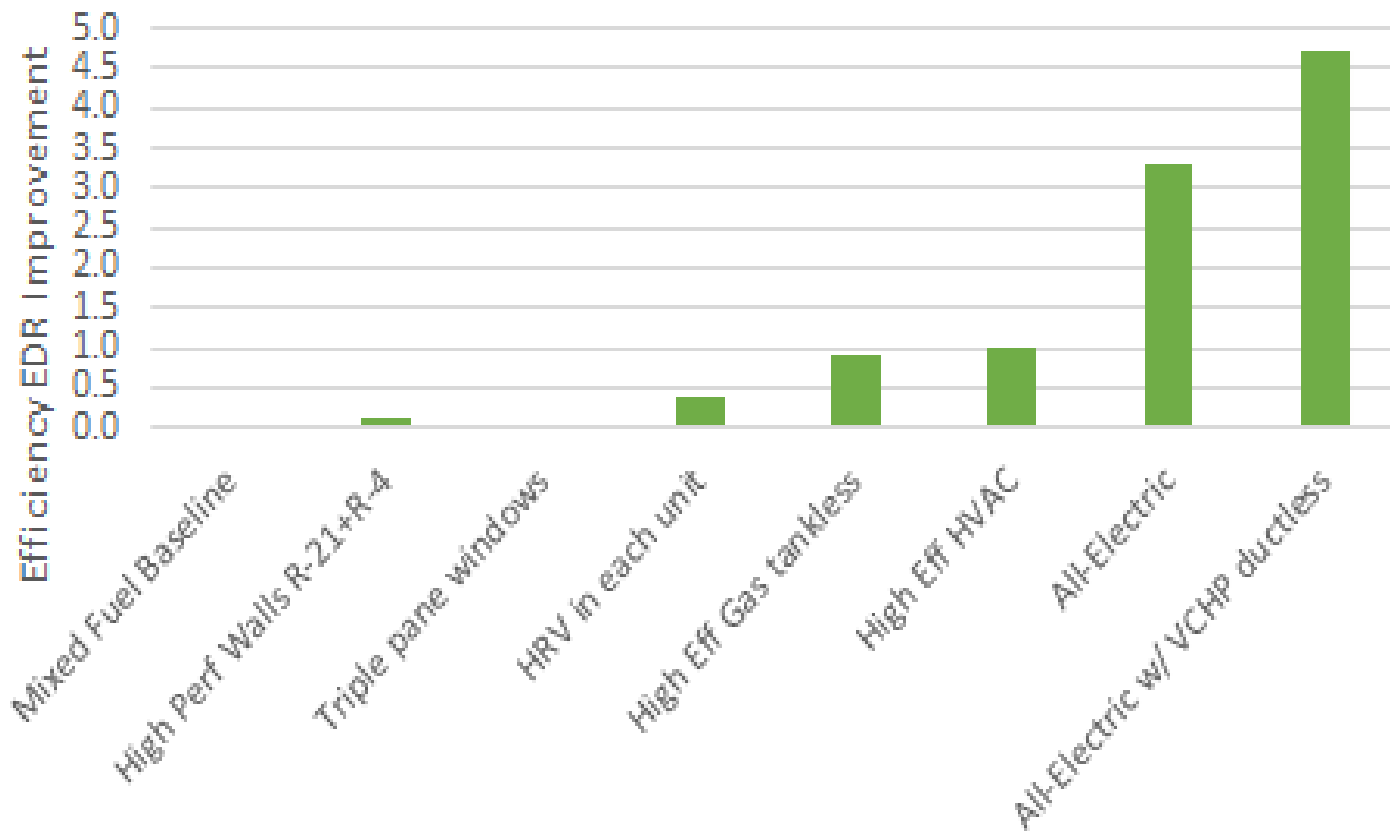
You wouldn't put off structural engineering until the end -
- why energy?

Residential Standards for Architects & Designers



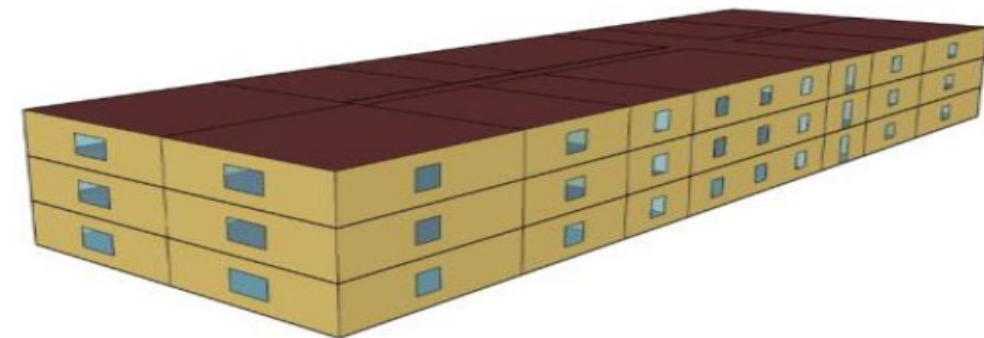
6th Step: Use Efficient Electric Systems For Easier Code Compliance

Compliance Impact of Various Features



36-unit multifamily building in Climate Zone 8 (Irvine):

- **All-Electric helps energy code compliance most**
- Model uses ducted minisplit and HPWH in each unit
- Can reduce PV 9 kW or ~\$25K
- Can add 6' slider to each unit



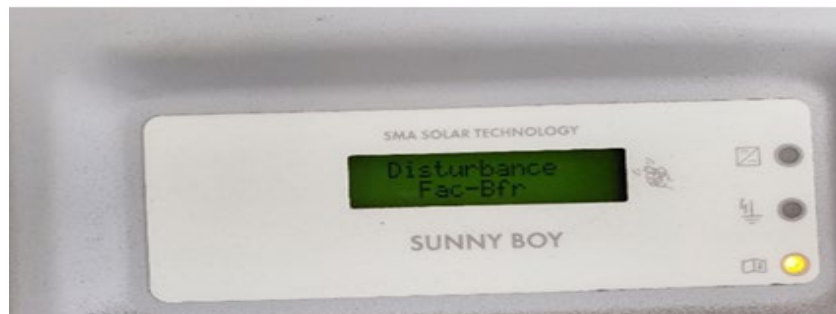
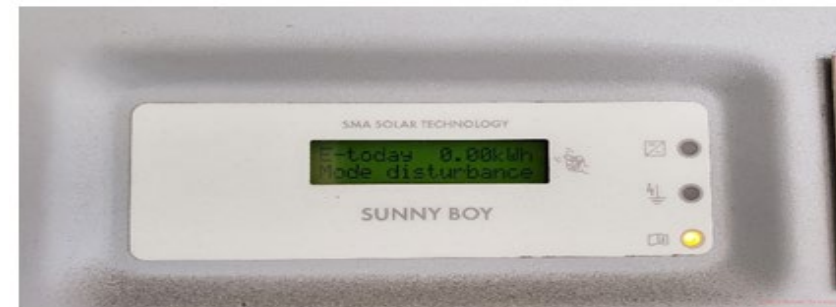
6th Step: Use Efficient Electric Systems For Easier Code Compliance

- **2019 Title 24 code makes electric designs at least equal to gas**
- Advanced heat pumps (minisplits) are worth an average of 5 EDR points (~10%) in compliance models
- Advanced heat pump water heaters are worth an average of 0.6 EDR points (~1%) in compliance models
- Reach codes require or encourage All-Electric
- **2022 energy code will require Electric-ready and set HVAC HP or HPWH as prescriptive standard**
- 2019 CalGreen code makes EV-capable garages required
- **Planning ahead eases compliance with EV provisions**

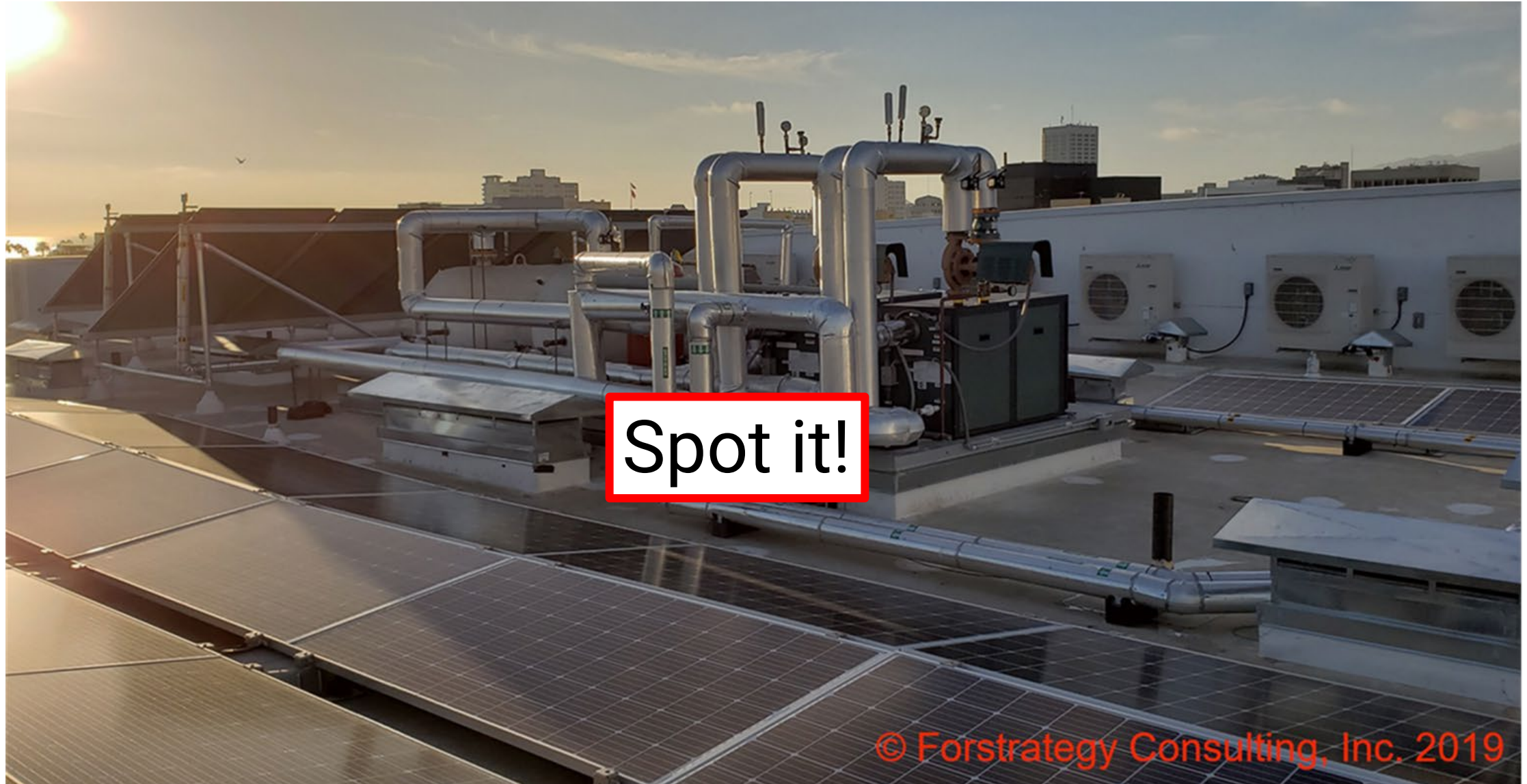
7th Step: Avoid Common Missteps



- Continuous commissioning
- Occupant behavior



7th Step: Avoid Common Missteps



Spot it!

7th Step: Avoid Common Missteps



- Occupant Behavior can be larger factor than design in energy use
- Sliding patio door interlocks with HPs for example
- Time spent in showers
- Servicing HVAC filters



All-Electric 68-unit in Covina, CA



- Live/Work Lofts
- Prices from \$470,000 - \$620,000
- Completed October 2019 by City Ventures

Key Energy Features

- Rooftop solar systems for each home
- ENERGY STAR® Heat Pump Water Heater
- ENERGY STAR® rated high-efficiency appliances
- Energy efficient HVAC heat pump
- Pre-wired ready for electric vehicle charger in Garage
- Bosch™ 30" Benchmark Induction Slide in Cooktop
- Nest Smart Thermostat
- Dual-glazed low-E3 windows

Check Our Progress



EV Charging:

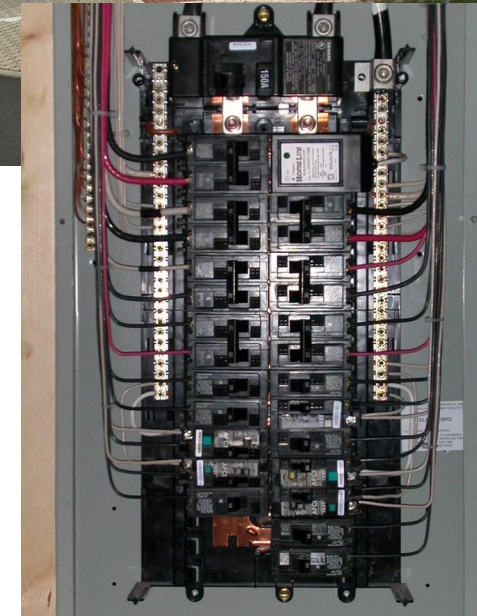
Additional Revenues

Future-proofing

Must-have Amenity

The Minimum: CalGreen Codes

- If you do only the CalGreen Code minimum 10% of spaces EV capable:
 - Cost of initial electric panel circuit and conduit
 - No electric panel space/conduit for expansion beyond minimum
 - No cell or WiFi service for smart chargers
 - No new revenues
- **SCE rebates allow full installation of EV chargers now**
- Also allows for prep work for future expansions



4.106.4.2 New multifamily dwellings. If residential parking is available, ten (10) percent of the total number of parking spaces on a building site, provided for all types of parking facilities, shall be electric vehicle charging spaces (EV spaces) capable of supporting future EVSE. Calculations for the required number of EV spaces shall be rounded up to the nearest whole number.

CalGreen Minimum Impact

- What's a painted parking spot doing for you?
- What's the cost now vs. when you're forced to install chargers?



Step Up To Full Installation

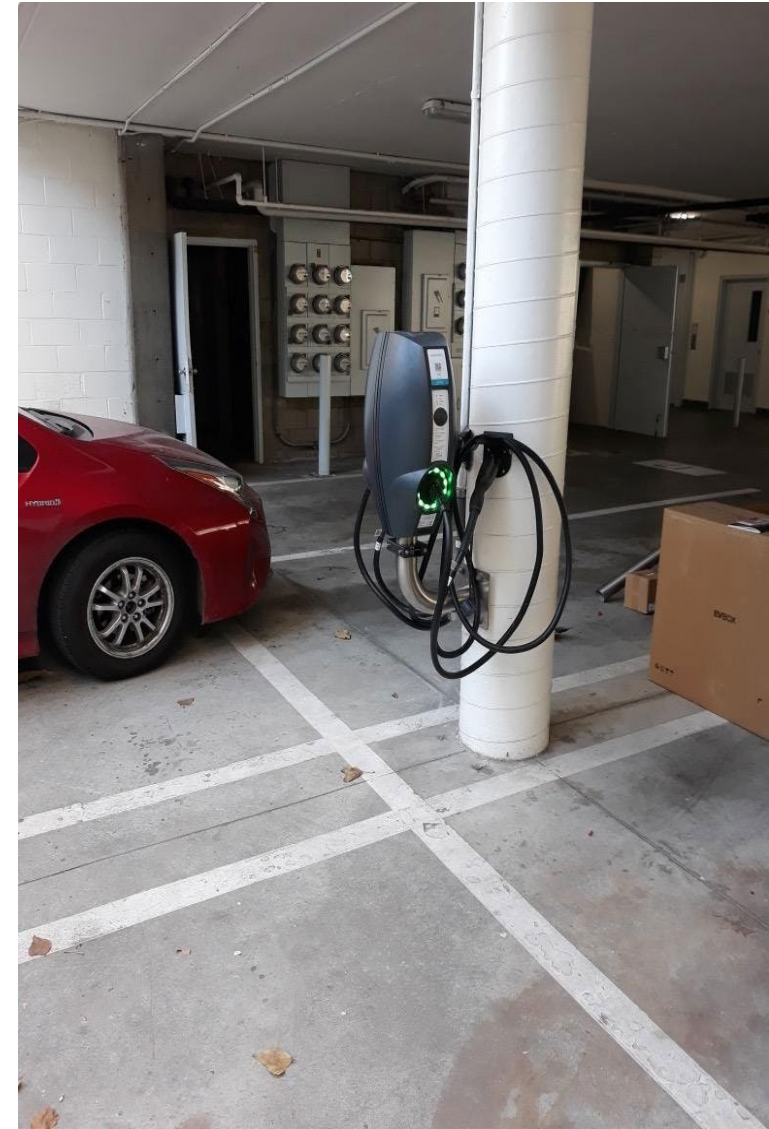
- Attract more tenants
- **Generate charging revenue**
- Take advantage of early mover rebates
- Install when cost is lowest at time of construction
- Market rate and low-income residents will demand EV chargers



Source: *The Irvine Company*

EV Readiness Levels

- CalGreen requires **EV capable**
 - Raceway from electric panel to parking spot & reserved 220V/40 amp circuit
- Some places require **EV ready**
 - Raceway with 220V/40 amp circuit installed in panel with circuit breaker
- **EV installed** means revenue-ready
 - EV charger installed ready to service residents
 - SCE Charge Ready program is designed to encourage this level of readiness



How To Setup For Future EV Adoption

- Design for 10% ports fully installed now
- Expandable to 20% ports in a few years by:
 - Laying out parking lot purposefully
 - Running conduit and wiring to future spots
 - Reserving electric panel capacity
 - Considering Bidirectional charging

Smart Charging Systems

- Load Balancing
 - **Switching power between ports**
 - **Controlling peak demand charges**
 - Adjusting rate of car charging
 - **Managing TOU rates and PV production**
- Manages payments from EV owners and to EV charger owner
- Eases sharing of chargers, like texts when full/need to move
- Generates reports to EV/charger owners and SCE



Charge Ready: EV Charging Infrastructure Program



- 4-year \$432M program to support EV charging infrastructure for light duty EVs
- **Provides significant financial and technical assistance to install charging stations**
- Targeting to install ~30,000 – 40,000 charging ports
- Three program offerings with multiple incentive programs
- Officially launched July 12, 2021

What Charge Ready Pays For

- **Covers 100% of cost of EV charger and infrastructure, up to \$3,500 per port in new multifamily**
- At ~\$2,000 for a new EVSE, that leaves room for the electrical infrastructure and may cover the full expense
- May provide for infrastructure needed for future EV charger expansion
- Targeting 50% disadvantaged communities

Charge Ready: New Construction Program



Purpose

- Incentivize multifamily property developers to exceed CALGreen code and install charging stations at tenant parking spaces

Program Targets

- Up to ~15,000 ports
- 50% in disadvantaged communities

Who

- New construction multifamily buildings


What

- \$3,500 per port to help offset charging station and infrastructure costs

Other 2 Programs Cover Existing Multifamily

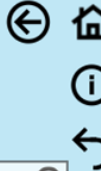
	1 CHARGING INFRASTRUCTURE & REBATE	2 TURNKEY INSTALLATION	3 NEW CONSTRUCTION REBATE
Objective	Provide make-ready infrastructure for EV charging to non-residential and multifamily sites	Provide full turnkey solution to multifamily properties in DACs	Incentivize multifamily developers to install charging stations at new construction projects
Target Customers	Existing non-residential and multifamily properties	Multifamily properties located in DACs	New construction multifamily properties
Offering	Covers make-ready infrastructure up to EVSE stub-out - AND - EVSE rebate to help offset equipment and installation costs	Covers make-ready infrastructure and EVSE – owned and operated by SCE - OR - Customers can choose to own EVSE and receive a rebate on EVSE, maintenance, and networking	\$3,500 per port to help offset charging station and infrastructure costs
Program Targets	<ul style="list-style-type: none"> -19,500 Level 1 or 2 ports and -200 DCFC ports 50% ports in DAC 40% ports at multifamily 	Up to 2,500 Level 1 or 2 ports	<ul style="list-style-type: none"> Up to -15,000 Level 1 or 2 ports 50% ports in DAC

SCE Approved Product List



Charge Ready Light-Duty EVSE Selection Table

Southern California Edison Company's ("SCE") Charge Ready Programs are funded by SCE utility ratepayers and administered by SCE under the auspices of the California Public Utilities Commission. SCE does not make any recommendations or representations regarding any suppliers or products approved for use under any of the transportation electrification programs administered by SCE. SCE makes no representations regarding any suppliers' or products' quality, workmanship or safety and is not liable for the quality or safety of such products.



1 EVSE Type ①

2 Max Power kW ①

3 Charger Type ①

4 Manufacturer ①

5 Rebate Category ①

Customers must select equipment from the Approved Product List and use an Approved Network Provider to participate in Charge Ready Programs.

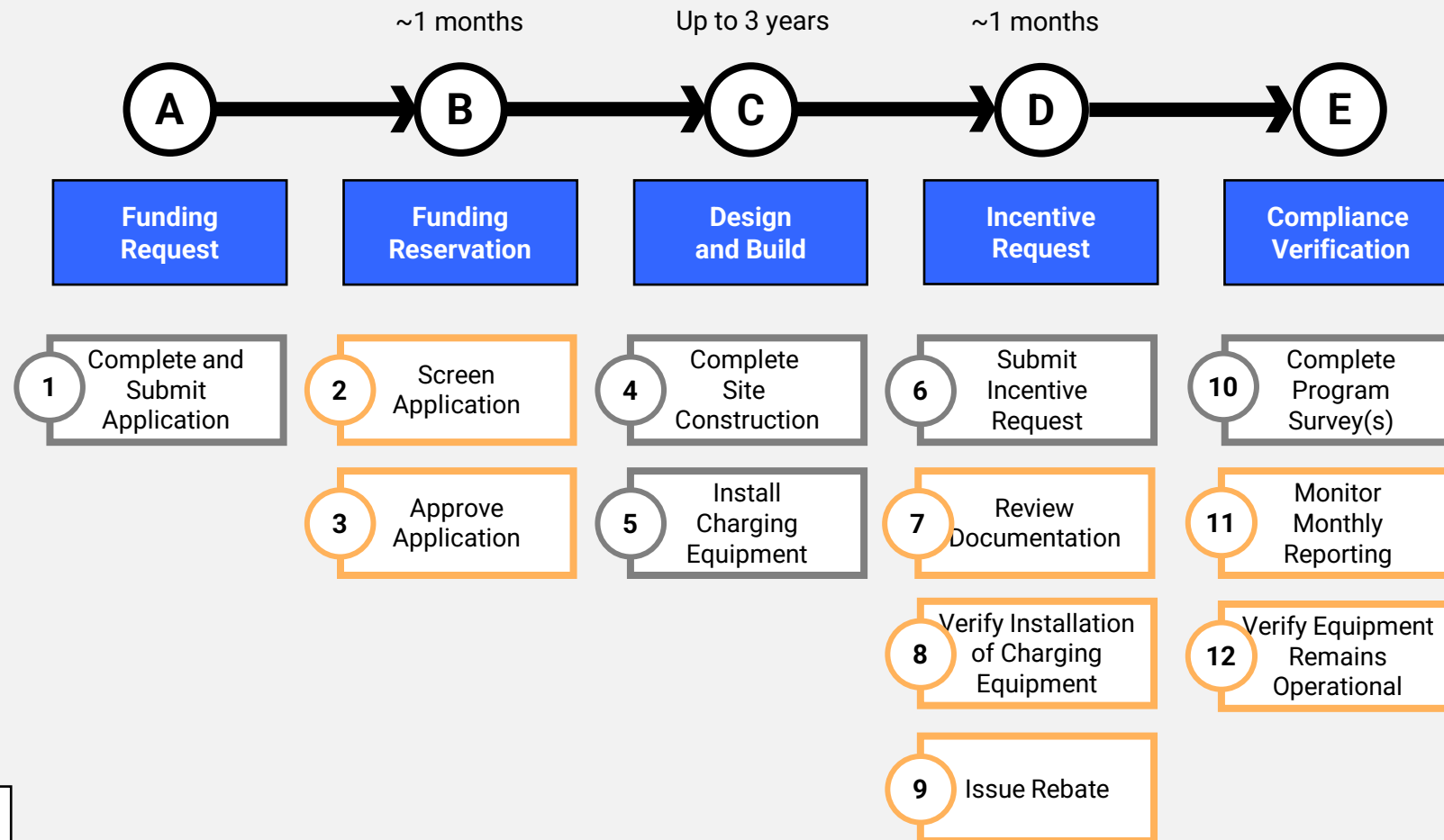
EVSE Manufacturer	EVSE Vehicle Segment	Approved EVSE Model Numbers	Charger Type	Max Power kW	EVSE Type	Rebate Category	Notes
ChargePoint	Light-Duty	CT4025	AC	7.2	Dual Port	L2B	Must acquire Gateway
ChargePoint	Light-Duty	CT4025-GW1	AC	7.2	Dual Port	L2B	Gateway
ChargePoint	Light-Duty	CT4025-GW1-PMGMT40	AC	7.2	Dual Port	L2B	Gateway
ChargePoint	Light-Duty	CT4025-PMGMT40	AC	7.2	Dual Port	L2B	Must acquire Gateway
ChargePoint	Light-Duty	CT4027	AC	7.2	Dual Port	L2B	Must acquire Gateway
ChargePoint	Light-Duty	CT4027-GW1	AC	7.2	Dual Port	L2B	Gateway
ChargePoint	Light-Duty	CT4027-GW1-PMGMT40	AC	7.2	Dual Port	L2B	Must acquire Gateway
ChargePoint	Light-Duty	CT4027-PMGMT40	AC	7.2	Dual Port	L2B	Must acquire Gateway
EFACEC	Light-Duty	Public Charger	AC	7.2	Dual Port	L2A	Standalone network capability
EVBox	Light-Duty	BusinessLine B2323-45###	AC	7.7	Dual Port	L2B	Must acquire Gateway
EVBox	Light-Duty	BusinessLine B2323-D15###	AC	7.7	Dual Port	L2B	Gateway
EVBox	Light-Duty	Iqon IQ2302-XXXXXX	AC	7.2	Dual Port	L2A	Standalone network capability
EVoCharge	Light-Duty	EVO30-#12-00#	AC	7.7	Dual Port	L2A	Standalone network capability
EVoCharge	Light-Duty	EVO30-#22-00#	AC	7.7	Dual Port	L2A	Standalone network capability
EVoCharge	Light-Duty	EVO32-#12-00#	AC	7.7	Dual Port	L2A	Standalone network capability
EVoCharge	Light-Duty	EVO32-#22-00#	AC	7.7	Dual Port	L2A	Standalone network capability
KIGT Inc.	Light-Duty	B24030DC5	AC	6.6	Dual Port	L2A	Standalone network capability
Tellus Power	Light-Duty	UP160J-#MP-###	AC	7.2	Dual Port	L2B	Must acquire Gateway

Manufacturers	Contact Information	Email Contact
Webasto	Greg.White@webasto.com	✉
Tritium	stok@tritium.com.au	✉
Tellus Power	Rania@telluspower.com	✉
Siemens	Thulin.anders@siemens.com	✉
SemaConnect	garrett.johnston@semaconnect.com	✉
Power Electronics	rpyear@power-electronics.com	✉
Nuvve Corporation	lynn@nuvve.com	✉
Noodoe, Inc.	arkshih@noodoe.com	✉

Approved Network Providers	Contact Information	Email Contact
Amply	simon@amplypower.com	✉
AmpUp	matt@ampup.io	✉
Blink	ALopez@BlinkCharging.com	✉
ChargePoint	cody.thornton@chargepoint.com	✉
Chargeie	sales@chargeie.com	✉
Electriphi Inc	Joel.torr@electriphi.ai	✉
Enel X	Karen.hsu@enel.com	✉
EV Charging Solutions	info@evchargingsolutions.com	✉
EV Connect, Inc.	rambatipudi@evconnect.com	✉
EverCharge	charging@evercharge.net	✉

Please contact ChargeReady@sce.com for questions and concerns. ✉

Process Diagram: New Construction Program



New Construction Rebate Requirements

APPLICANT ROLE

- **Non-residential** SCE customer
- **Own, lease, manage,** or be the customer of record of charging site
- Obtain **consent from property owner** (if applicable)
- Project site must be **located in SCE service area**

DEPLOYMENT

- **No minimum port requirements** for New Construction Rebate
- Enroll in a **TOU rate plan**
- Enroll in a **demand response program**

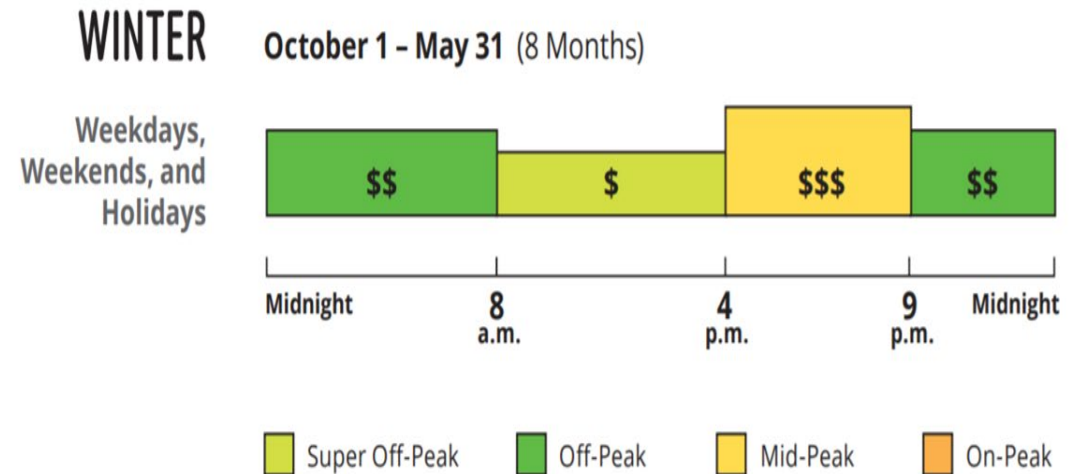
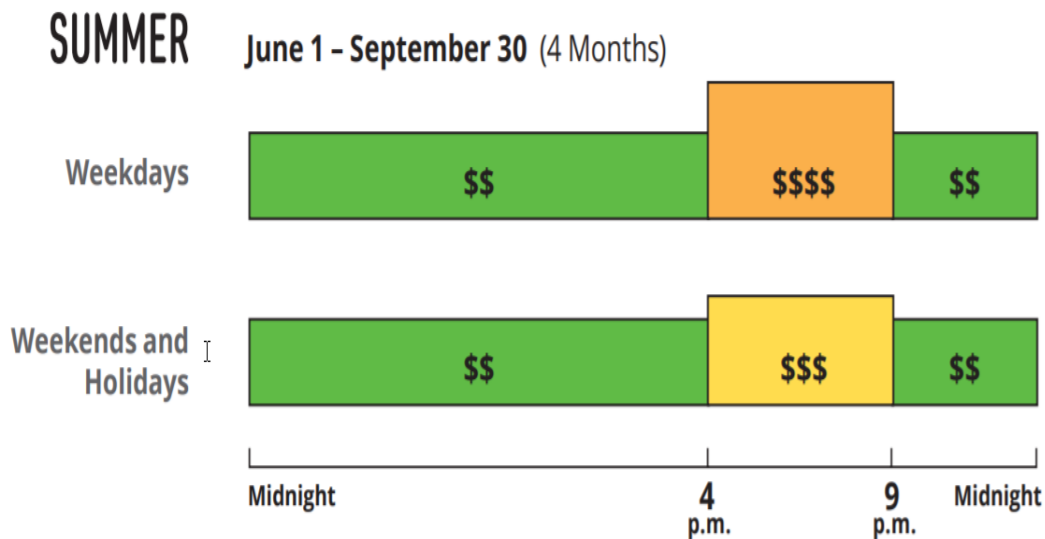
EQUIPMENT

- Select from **SCE's Approved Product List (APL)** to qualify for the rebate
- Keep equipment **operational for 10 years**
- Provide **monthly charging data**
- Report **prices charged** to EV drivers

For more information: www.sce.com/chargeready

SCE Time of Use (TOU) EV Rates

- TOU-EV-7, TOU-EV-8, and TOU-EV-9 rates designed for MF properties
- Rates vary from ~\$0.55/kWh Peak 4-9 pm to ~\$0.08/kWh Super Off-Peak
- **No demand charges until 2024**
- **Demand charges will gradually phase in between 2024-2029**



EV Charging & Demand Response

- Charge Ready Program Requires Participation in Demand Response program
- EV rates with Critical Peak Pricing (CPP) coming soon
- Hot Summer 4-9 pm CPP events offer savings for conserving electricity



Own or Lease EV Chargers?

Own

- Responsible for purchase & install
- Full control over installed equipment
- Responsible for maintenance & network fees
- **Full revenue potential**
- Responsible for electric expenses



Lease

- Responsible for purchase & install
- Limited control over installed equipment
- Responsible for network fees
- **Uncertain revenue potential**
- Responsible for electric expenses

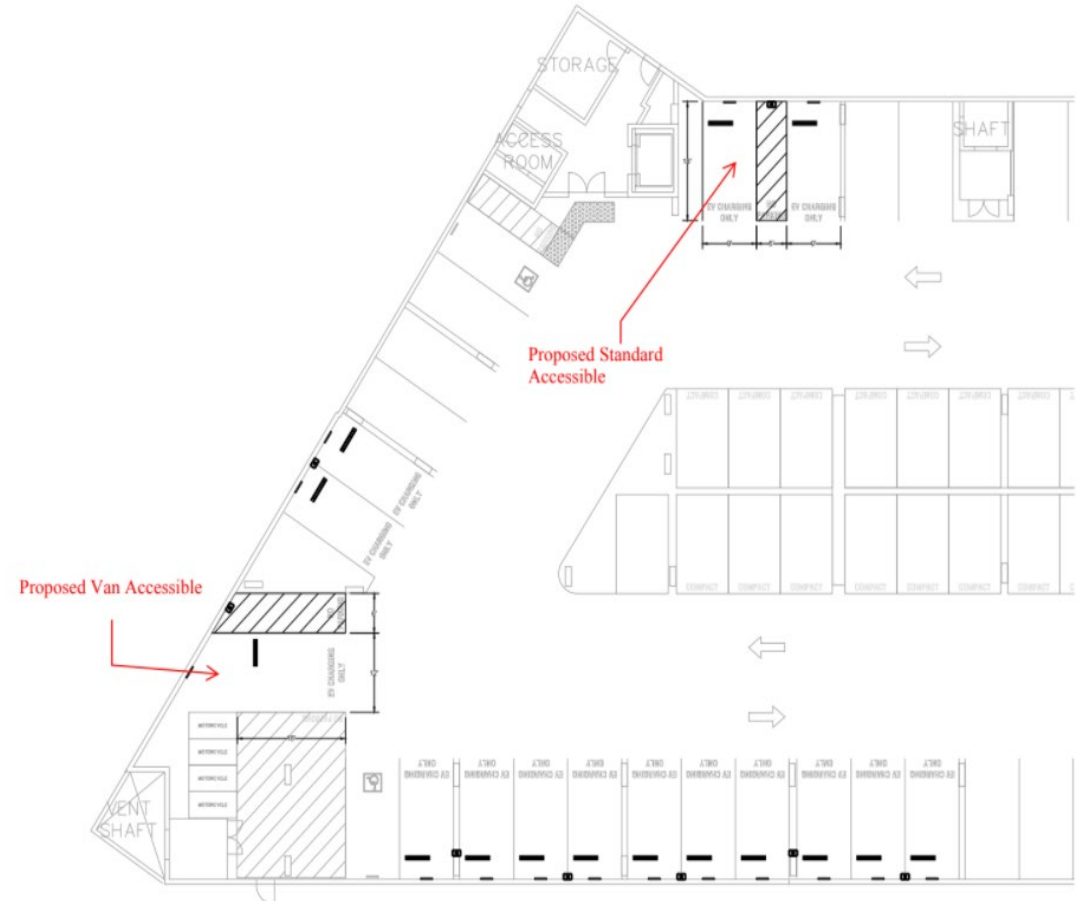
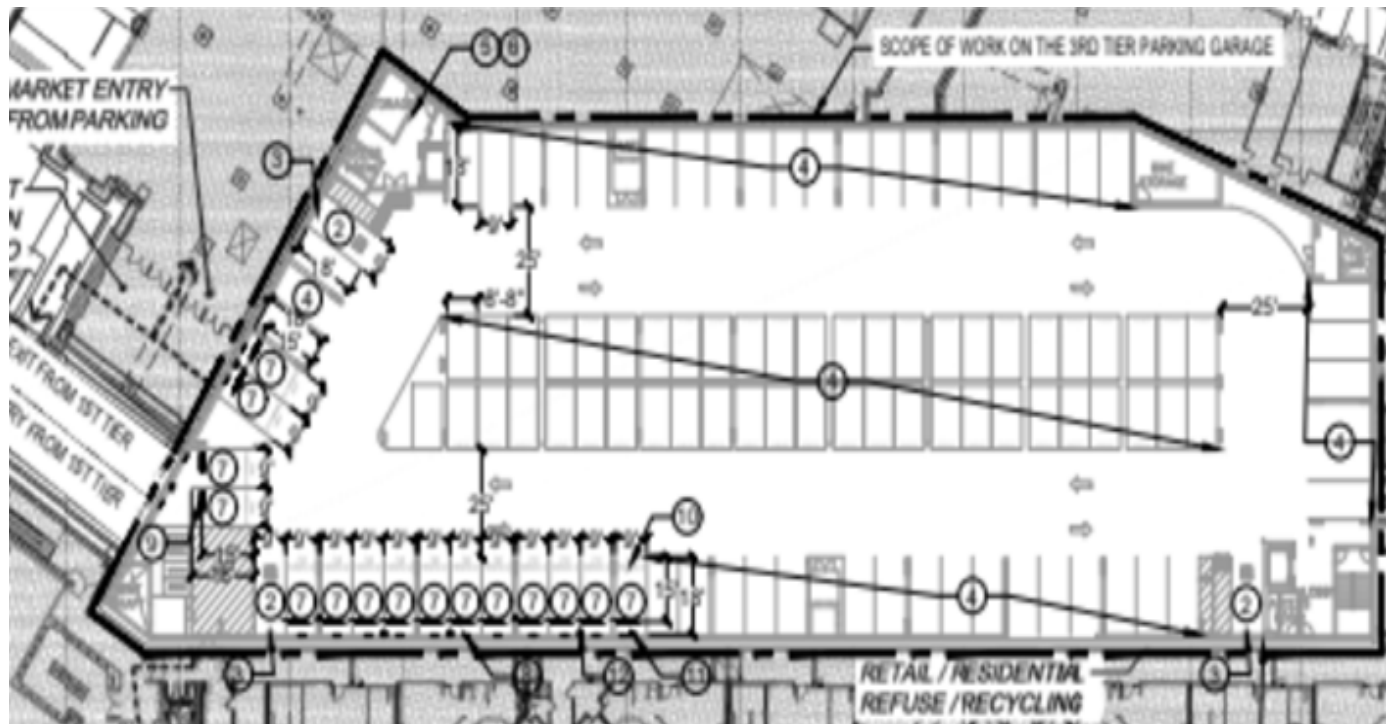


Sample EV Charging Finances: 10 EV Chargers

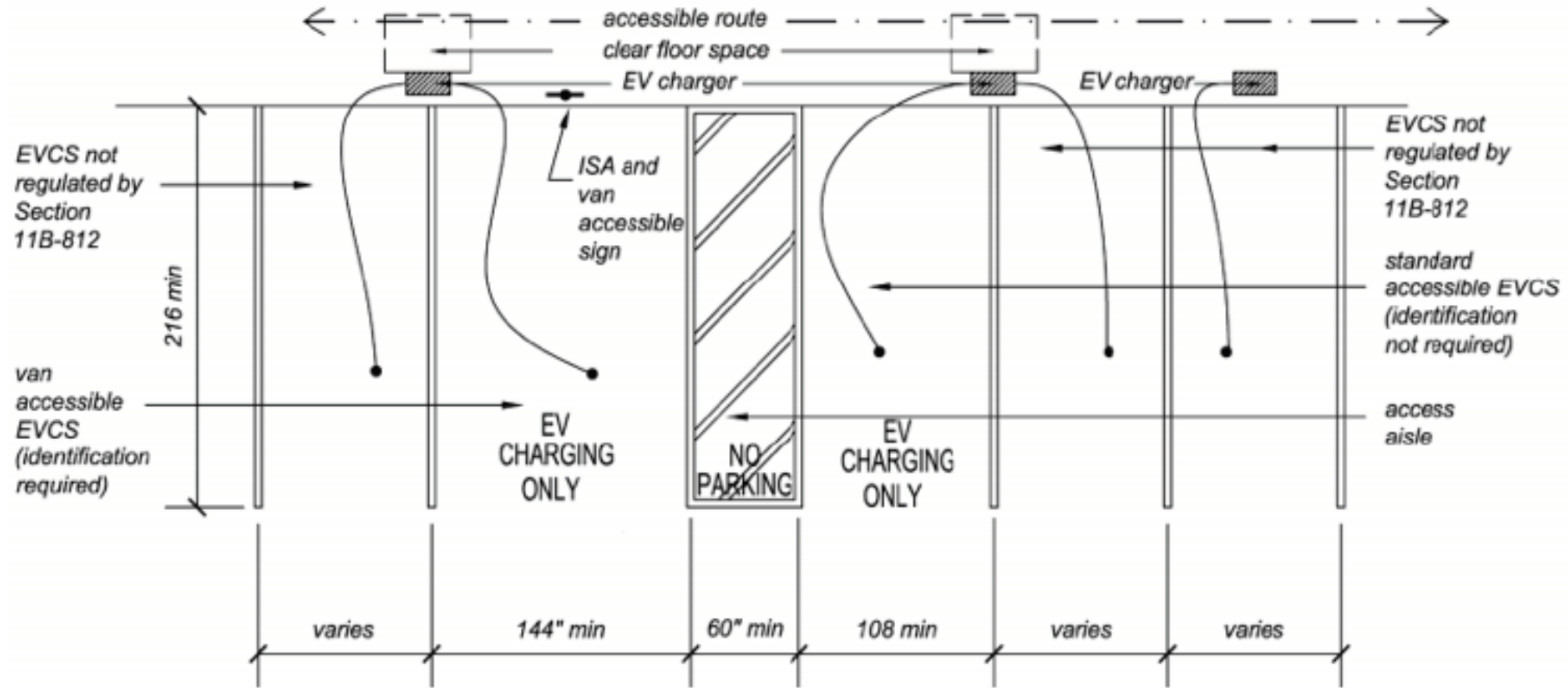
Initial Outlay after Rebate	\$ 1,422
less tax credit	\$ (10,927)
Total Cost	\$ (9,505)
Charging revenue @75,000 kWh year 3	\$ 18,790
plus EV charging monthly fee @ \$20/mo	\$ 6,000
<u>Total Revenue per year</u>	<u>\$ 24,790</u>
Charging electric expense per year	\$ 11,274
plus fixed costs	\$ 3,267
<u>Total expenses per year</u>	<u>\$ 14,541</u>
<i>Net Income - year 3 @ 10 chargers</i>	<i>\$ 10,249</i>
<i>- year 10 @ 20 chargers</i>	<i>\$ 22,970</i>
Property Value increase @ 4.5% cap rate	
Year 3	\$ 227,756
Year 10	\$ 510,444

*Assumes 10 EV chargers to start, additional 10 in Year 7

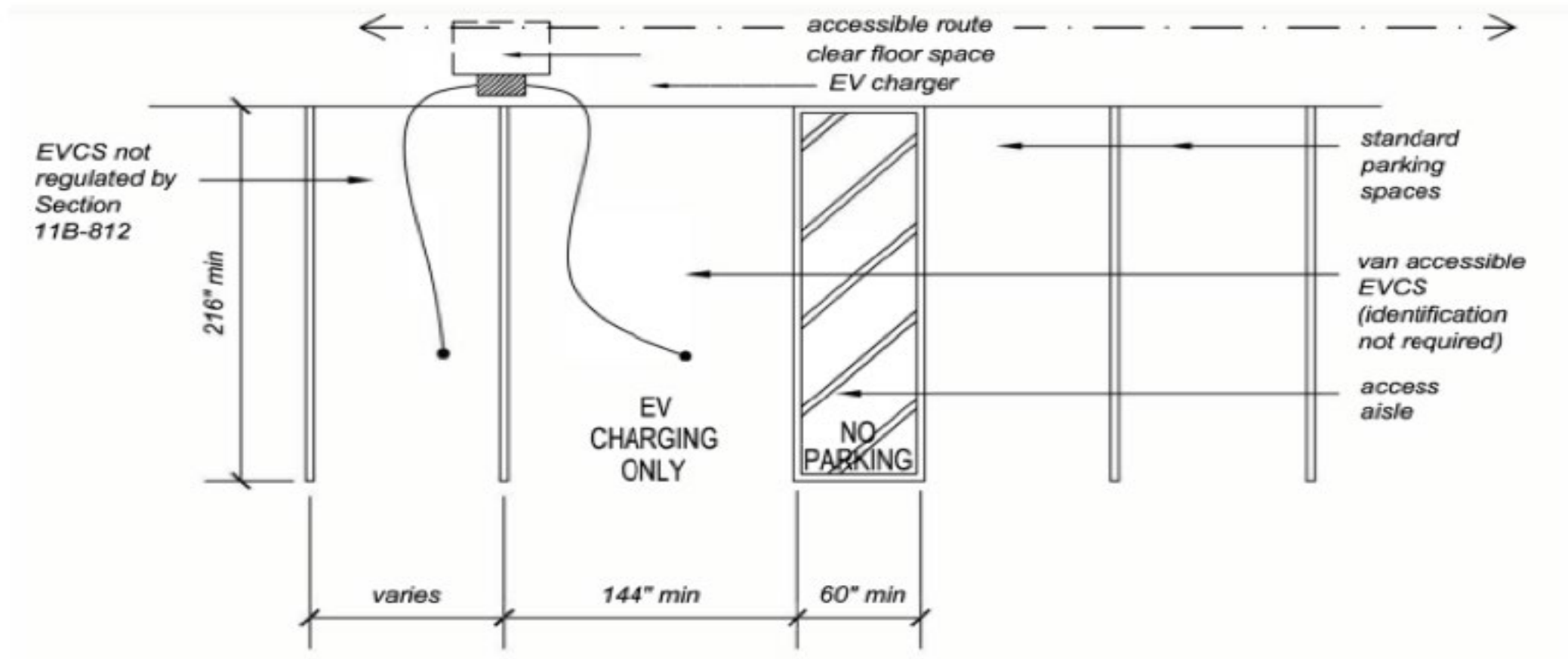
Sample Parking Lot Design: 100-Unit Building: 15 Charging Spaces With 8 EV Chargers



Sample Layout for Smaller Building: 5 EV Chargers w/2 Accessible Spaces Required



Sample Layout for 2 EV Chargers with 1 Van Accessible Space Required



Summary

7 Steps To Building Cost-Effective All-Electric Multifamily Buildings

1. One less utility
2. Embrace better technologies
3. More marketable buildings
4. Leverage the garage with EV charging and other amenities
5. Start early
6. Use efficient electric systems for easier code compliance
7. Avoid common missteps

Funding EV Charging Through Charge Ready

1. CalGreen requires 10% EV capable
2. Charge Ready incentives pay for 100% up to \$3,500 per port
3. Turn the garage into a revenue stream
4. Plan for future EV charger additions
5. Make use of smart charging platforms

Tools & Resources

[SCE – Building All-Electric Energy Code Ace](#)
[Building Decarbonization Coalition “Selling Clean Energy Homes”](#)
[Redwood Energy Watt Diet Calculator](#)
[SCE Rebate Savings](#)
[Electric Vehicle Charging Association](#)
[New Buildings Institute](#)
[National Core](#)
[Indoor Air Pollution](#)
[Los Angeles Better buildings Challenge](#)
[Gas Stove Pollution](#)
[Onion Flats Projects](#)
[A Zero Emissions All-Electric Multifamily Construction Guide Redwood Energy 2019](#)
[Ecotope HW Sizing tool](#)

[A 5-Step Road Map to Zero - Emissions Buildings in CA](#)
[Building Electrification Action Plan for Climate Leaders](#)
[Building Electrification](#)
[A Roadmap to Decarbonize California’s Buildings](#)
[Lazard Cost of Energy Analysis](#)

For Additional Learning Opportunities:
<https://www.sce.com/business/consulting-services/energy-education-centers>

Did We Address Your Needs For The Class?

Three Questions:

1. How can electrification save time and money for developers?
2. What are best practices for saving on change orders in an all-electric build?
3. What is still keeping you from building all-electric with EV charging today?



SOUTHERN CALIFORNIA
EDISON®

Energy for What's AheadSM

Thank You

Questions??

Nick Brown – nick@buildsmartgroup.com

Robert Fortunato – fortunato@forstrategy.com

