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
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
Net Zero Nest:
Completed in 2016
1,950 sf, 3 BR & 3 Bath
4.4 kW PV array (16 panels)
Green Point Rated

Nick Brown
Owner/Builder, Net Zero Nest
President, Build Smart

Instructor for various classes:
- All-Electric Homes
- Demyth-defying Heat Pumps
- Energy Standards for Residential Architects
- Net-zero Design

Congratulations, your home is now GreenPoint RATED
Existing Home  Whole House

180
No Electric Charges For 5 Years

### Details of your tracked charges

**Your rate:** DOMESTIC  
**Billing period:** Feb 5 '16 to Mar 8 '16 (32 days)

#### Delivery charges

<table>
<thead>
<tr>
<th>Energy-Winter</th>
<th>kWh</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tier 1 (within baseline)</td>
<td>124</td>
<td>$0.07682</td>
<td>-9.53</td>
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<tr>
<td>DWR bond charge</td>
<td>124</td>
<td>$0.00539</td>
<td>-0.67</td>
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</table>

#### Generation charges

<table>
<thead>
<tr>
<th>DWR</th>
<th>kWh</th>
<th>Rate</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>DWR energy credit</td>
<td>124</td>
<td>-0.00022</td>
<td>0.03</td>
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<tr>
<td>SCE</td>
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</table>

**Energy-Winter**

<table>
<thead>
<tr>
<th>Tier 1 (within baseline)</th>
<th>kWh</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>124</td>
<td>$0.08909</td>
<td>-8.57</td>
</tr>
</tbody>
</table>

**Energy Charge Total**

<table>
<thead>
<tr>
<th>Amount</th>
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<tbody>
<tr>
<td>-18.74</td>
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</tbody>
</table>

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**Additional information regarding your Net Consumption/Generation:**

- Your cumulative energy charge total as of previous month: -214.88
- Your current month energy charge total: 175.74
- 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*
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

<table>
<thead>
<tr>
<th>Your past and current electricity usage</th>
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</thead>
<tbody>
<tr>
<td>Winter Season - Consumption</td>
</tr>
<tr>
<td>On peak</td>
</tr>
<tr>
<td>Off peak</td>
</tr>
<tr>
<td>Super off peak</td>
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<tr>
<td>Super on peak</td>
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<tr>
<td>Winter Season - Net Generation</td>
</tr>
<tr>
<td>On peak</td>
</tr>
<tr>
<td>Off peak</td>
</tr>
<tr>
<td>Super off peak</td>
</tr>
<tr>
<td>Super on peak</td>
</tr>
<tr>
<td>Total electricity usage this month in kWh</td>
</tr>
<tr>
<td>Your daily average electricity usage (kWh)</td>
</tr>
<tr>
<td>2 Years ago: 2.00</td>
</tr>
<tr>
<td>Last year: 1.53</td>
</tr>
<tr>
<td>This year: -1.03</td>
</tr>
</tbody>
</table>

Additional information regarding your Net Consumption/Generation:
- Year-to-date energy charges total as of previous month: -$1,215.44
- Year-to-date energy charge total: $42.36
- Year-to-date kWh: -$1,257.80
- 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
• 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
“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

- Project Spotlight: Jefferson 17-unit in Los Angeles
- 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
1<sup>st</sup> Step: One Less Utility

Solar And Battery Price Curves

**U.S. Solar PV Price Declines**

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<tbody>
<tr>
<td>Price ($/Watt)</td>
<td>$7.00</td>
<td>$6.00</td>
<td>$5.00</td>
<td>$4.00</td>
<td>$3.00</td>
<td>$2.00</td>
<td>$1.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
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**U.S. Battery Price Declines**

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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Price per kWh</td>
<td>$800</td>
<td>$700</td>
<td>$600</td>
<td>$500</td>
<td>$400</td>
<td>$300</td>
<td>$200</td>
<td>$100</td>
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</table>

Source: SEIA

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
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

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

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Model</th>
<th>Rating</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction</td>
<td>GE Profile PHS930SLSS</td>
<td>86</td>
<td>$2,432</td>
</tr>
<tr>
<td>Induction</td>
<td>Kenmore Elite 95073</td>
<td>84</td>
<td>$1,525</td>
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<tr>
<td>Gas</td>
<td>LG Signature LUTD4919SN</td>
<td>84</td>
<td>$3,000</td>
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<tr>
<td>Induction</td>
<td>LG LSE46I7ST</td>
<td>82</td>
<td>$2,500</td>
</tr>
<tr>
<td>Induction</td>
<td>LG LSE46IGST</td>
<td>82</td>
<td>$1,700</td>
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<tr>
<td>Smoothtop</td>
<td>Whirlpool WGE745cDFS</td>
<td>82</td>
<td>$1,000</td>
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<tr>
<td>Gas</td>
<td>Samsung NY58J9850WS</td>
<td>81</td>
<td>$2,725</td>
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<tr>
<td>Induction</td>
<td>Frigidaire Gallery FGIF3036TF</td>
<td>81</td>
<td>$1,035</td>
</tr>
</tbody>
</table>
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?

Before
- Negative: 21% Positive

After
- Negative: 91% Positive

2nd Step: Embrace Better Technologies: Induction Cooktops

SÄRKLASSIG
Induction cooktop, 30 "
$599.00

TILLREDA
Portable induction cooktop
$49.99

TVÄRSÄKER
Range with induction cooktop
$1,099.00

FRUITTEAM 15-Piece Cookware Set Non-stick Ceramic Coating Cooking Set, Induction Pots Pans Set with Lid, Heavy Duty...

- 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

<table>
<thead>
<tr>
<th>Time</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>8am</td>
<td>22¢</td>
</tr>
<tr>
<td>4pm</td>
<td>54¢</td>
</tr>
<tr>
<td>9pm</td>
<td>22¢</td>
</tr>
<tr>
<td>8am</td>
<td></td>
</tr>
</tbody>
</table>

![Net load - March 31](net_load.png)

- **Discharge**
  - Ramp need: ~13,000 MW in three hours
- **Charge**
  - Overgeneration risk
2nd Step: Embrace Better Technologies: HPWH – Centralized, Shared, or 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
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.
2\textsuperscript{nd} 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 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 intimidates our customers and slows 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
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
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
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
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

![New Electric Vehicle Sales Growth - California](chart.png)
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

- 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
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
Involve more of the team:
• Design-Bid-Build
• Design-Build
• Design Assist

Pick the team based on:
• Experiential interviewing
• Trust

5th Step: Start Early: Integrated Design
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

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!
• Occupant Behavior can be a 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
EV Charging:

Additional Revenues
Future-proofing
Must-have Amenity
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
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

<table>
<thead>
<tr>
<th>Objective</th>
<th>Target Customers</th>
<th>Offering</th>
<th>Program Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide <strong>make-ready infrastructure</strong> for EV charging to non-residential and multifamily sites</td>
<td>Existing non-residential and multifamily properties</td>
<td>Covers <strong>make-ready infrastructure</strong> up to EVSE stub-out and <strong>EVSE rebate</strong> to help offset equipment and installation costs</td>
<td>-19,500 Level 1 or 2 ports and -200 DCFC ports - 50% ports in DAC - 40% ports at multifamily</td>
</tr>
<tr>
<td>Provide <strong>full turnkey solution</strong> to multifamily properties in DACs</td>
<td>Multifamily properties located in DACs</td>
<td>Covers <strong>make-ready infrastructure and EVSE</strong> – owned and operated by SCE - <strong>Customers can choose to own EVSE and receive a rebate on EVSE, maintenance, and networking</strong></td>
<td>Up to 2,500 Level 1 or 2 ports</td>
</tr>
<tr>
<td>Incentivize multifamily developers to install charging stations at new construction projects</td>
<td>New construction multifamily properties</td>
<td><strong>$3,500 per port</strong> to help offset charging station and infrastructure costs</td>
<td>- Up to ~15,000 Level 1 or 2 ports - 50% ports in DAC</td>
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### Note

- **CHARGING INFRASTRUCTURE & REBATE**
- **TURNKEY INSTALLATION**
- **NEW CONSTRUCTION REBATE**
## 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.

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

### EVSE Type
- Dual Port

<table>
<thead>
<tr>
<th>EVSE Manufacturer</th>
<th>EVSE Vehicle Segment</th>
<th>Approved EVSE Model Numbers</th>
<th>Charger Type</th>
<th>Max Power kW</th>
<th>EVSE Type</th>
<th>Rebate Category</th>
<th>Notes</th>
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<tr>
<td>ChargePoint</td>
<td>Light-Duty</td>
<td>CT4027-GW1</td>
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</table>

### Manufacturers
- Webasto: Greg.White@webasto.com
- Teuton: rick@teuton.com.au
- Telius Power: Rania@teliuspower.com
- Siemens: Thulin.anders@siemens.com
- Semac: garrett.johnston@semacconnect.com
- Power Electronics: rupeyara@power-electronics.com
- Nuve Corporation: lynn@nuve.com
- Noodeo, Inc: arshiv@noodeo.com

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

www.sce.com/apl
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

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

*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
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
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?
Thank You

Questions??

Nick Brown – nick@buildsmartgroup.com
Robert Fortunato – fortunato@forstrategy.com