CHARGE at HOME

ELECTRIC VEHICLE CHARGING TOOLKIT

FOR NEW OFF-CAMPUS STUDENT HOUSING APARTMENT DEVELOPMENTS

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PURPOSE

This toolkit provides property owners, managers, and developers of off-campus student housing (OCSH) with guidance on installing light-duty electric vehicle (EV) charging infrastructure at their properties and developments. Other stakeholders, like general contractors, electricians, and electrical engineers may also benefit from reviewing certain sections.

This guide is designed to help decision-makers plan for growing EV adoption among residents in the coming years by prioritizing infrastructure planning during the development and initial construction of new OCSH properties and avoiding costly retrofits in the future. [1. 2.]

1. California Air Resources Board's (CARB) 2019 technical analysis report on CALGreen code costs and benefits indicates 86-89% cost savings when EV-capable spaces are installed compared to retrofitting costs. EV Charging Infrastructure: Nonresidential Building Standards
2. This 2016 modeling report shows a 64%–75% reduction in cost when EV charging infrastructure is installed during initial construction rather than retrofitted in existing buildings. Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report from July 20, 2016

EV CHARGING PRIMER

TYPES OF EV CHARGING

For general information about EVs, please see our resources here. EV charging is typically categorized as Level 1 (L1), Level 2 (L2), and Level 3 (L3) or Direct Current Fast Charging (DC fast charging), as shown in the table below:

Slowest → Fastest			
Level	**Level 1**	**Level 2**	**Level 3 (DC Fast Charging)**
Use Case	Home	Home/Work/Public	Public
Power	<2 kW	2.4 - 19.2 kW *(Usually 6-10 kW)*	25 - 350 kW *(New chargers are >150 kW)*
Plug Shape (Into Vehicle)	 J1772	 NACS/ J3400*	 CCS → NACS/J3400*
Outlet Shape	 120 V	 208 or 240 V **	Hardwired only 
Cost	$	$$	$$$$

Level 1 charging equipment provides charging through a common 120–volt (120V) alternating current (AC) wall outlet. A 20–amp circuit is standard. Charging an EV to 80% from empty on a L1 charger/outlet (120V) typically takes 30 to 50 hours, depending on battery size, vehicle settings, and circuit breaker components.

Level 2 charging equipment offers higher–power AC charging speeds through 208/240 volt AC circuitry. Charging an EV to 80% from empty on an L2 charger/outlet typically takes 4 to 10 hours, depending on battery size and charger power output. This is the most commoncharging level for apartments where EVs will be parked overnight.

Level 3, also known as Direct Current Fast Charging (DCFC), offers significantly higher speeds and is typically installed along heavy–traffic corridors, or at charging hubs in urban or suburban locations. DCFC equipment can charge EVs 80 percent in 20 minutes to one hour.

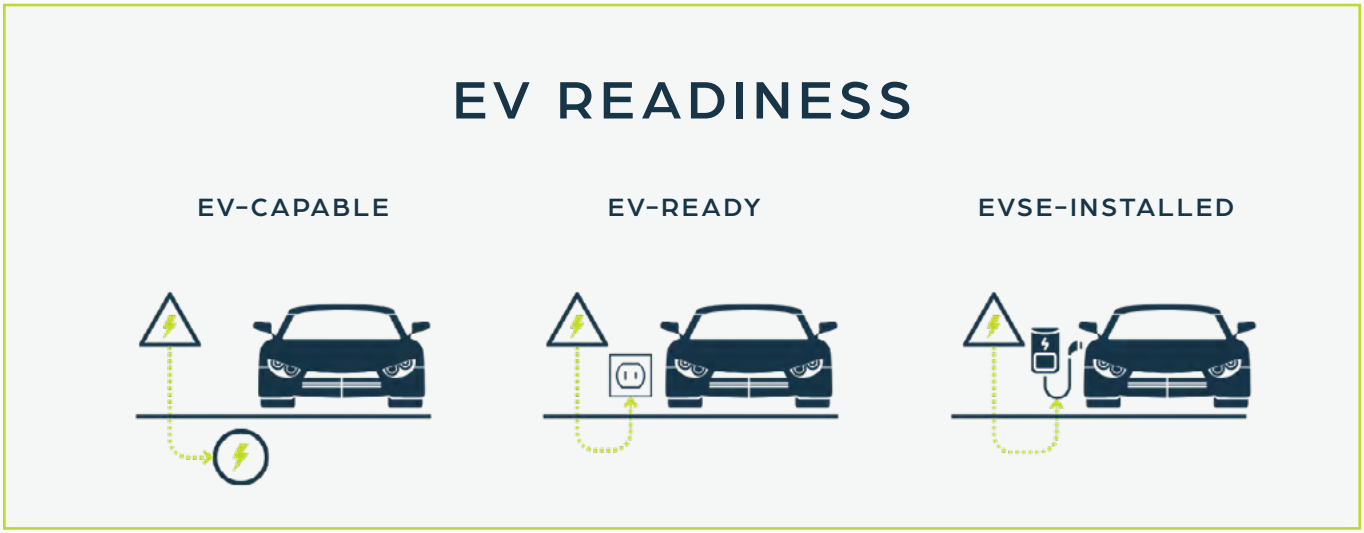
*The Society of Automotive Engineers' (SAE) J3400 standard is official and is being integrated into charging equipment and automotive manufacturing processes. J3400 allows for backwards compatibility with NACS/Tesla ports.

** Circuits greater than 50 amps must be hardwired. (NEC)

UNDERSTANDING EV-READY AND EVSE-INSTALLED PARKING SPACES

There are three different types of EV charging spaces: EV-capable, EV-ready, and EV Supply Equipment (EVSE) -installed.

READINESS LEVEL DEFINITIONS



(SOURCE: EV CHARGING FOR ALL COALITION, 2023)

EV-CAPABLE

EV-capable parking spaces have panel capacity and conduit to the parking space. The parking space is "capable" of being upgraded with circuit breaker, wiring, and receptacle/junction box (J-box) or EVSE at a later time without panel upgrades.

EV-READY

EV-ready parking spaces have panel capacity, an installed breaker, wiring, and conduit, terminating in a receptacle or J-box.

EVSE-INSTALLED OR EV-CHARGER INSTALLED

EVSE-installed or EV-charger-installed parking spaces have an EV charger or EV smart charging outlet installed.

UNDERSTANDING CHARGING SOLUTIONS

NETWORKED VS. NON-NETWORKED CHARGERS

EV chargers are either non-networked or networked. **Non-networked chargers** are typically not connected to the internet and do not provide smart charging capabilities. These chargers are particularly useful in locations without cellular access. Some charging vendors offer chargers with smart features that are not dependent on a direct internet connection.

Networked chargers are typically connected to the internet via wifi, cellular, or ethernet lines. Networked chargers enable features including payment, notifications, access control, load management, reservations, and idle fees. Almost always, networked chargers are better suited to meet both property owner and resident needs than non-networked chargers.

EV smart charging outlets are similar to regular wall outlets but are networked. Residents must bring portable chargers to use these receptacles. EV smart charging outlets, commonly known as smart outlets, can dispense power up to 40 amps continuously at 240 volts depending on the product, wiring, and circuit hardware.

3. "Plugzio | Affordable, Simple, Scalable EV Charging," Plugzio, n.d., https://www.plugzio.com/
4. "Why Orange | Orange," n.d., https://www.orangecharger.com/why-orange.
5. Pando Electric, n.d., https://www.pandoelectric.com/
6. GoPowerEV, n.d., https://gopowerev.com/news

SMART OUTLETS

3

4

5

6

GLOSSARY OF TERMS

USER EXPERIENCE

While evaluating EV charging vendors and solutions, consider the user experience for residents, property owners, and managers.

RESIDENT CONSIDERATIONS

- Ease of account setup and starting a charging session
- Real-time session monitoring and notifications
- Reliable functionality, even without internet access

PROPERTY MANAGEMENT CONSIDERATIONS

- Comprehensive monitoring of charger status, revenue, and long-term usage
- Automated reporting of charger malfunctions or performance issues
- Integration capabilities with third-party accounting and utility management systems

EV CHARGING VENDORS

There are two types of charging vendors to consider:

EV CHARGING NETWORK

EV charging network providers provide networked chargers with smart charging features. Some of them may work with local electricians or have in-house electricians to provide installation services.

EV CHARGING CONSULTANTS

EV charging consultants and management providers can provide a variety of services including long- and short-term planning recommendations, virtual cost estimates, full-service installation, charger management, maintenance, identifying, and vetting charging vendors, etc.

Non-networked chargers (offline chargers with no smart features) can be purchased as standalone hardware from EV charging hardware manufacturers. However, incentive programs often require networked chargers. For more information on incentives, please see Section 2.1.

PLANNING AND DESIGN

1.1 IDENTIFY EV MANDATES

During the project due diligence or planning phase, identify any applicable building codes or ordinances (state and municipal) mandating EV charging at new buildings. These typically mandate a minimum number of EVSE-installed or EV-ready parking spaces and a minimum number of accessible EV charging parking spaces.

Follow this guide to optimize planning and build-out of EV chargers and EV-ready and capable infrastructure to avoid costly retrofits as EV charging demand increases.

> To learn more about incentives and rebates that may subsidize EV charging infrastructure costs, see Section 2.1 and check out the Charge at Home Project Builder Tool.

1.2 DETERMINE CHARGING CONFIGURATION

CHARGING CONFIGURATION DEFINITIONS:

FIRST-COME, FIRST-SERVED EV CHARGING (AKA COMMUNAL)

First-come, first-served EV charging (aka communal) is available for use by any EV driver with access to the parking lot. This is an unassigned parking space.

DEDICATED EV CHARGING

Dedicated EV charging is when an EV charger is available for a specific parking space and the associated resident that has been assigned that space.

For communal charging, residents may be required to move their cars after charging, depending on the supply of chargers and demand from EV-driving residents. OCSH almost always will use communal charging configurations due to unassigned parking or property layouts (i.e. garden-style properties), but dedicated chargers may still be a valuable option if the property has assigned parking spaces (i.e. mid-rise properties).

Review our Resources section or send us a question here.

1.3 DETERMINE THE QUANTITY OF EV-READY AND EVSE-INSTALLED SPACES

After identifying which charging configuration fits the needs of the property, determine how many EV-ready and EVSE-installed parking spaces will be constructed. To start, if any OSCH properties are owned near the development, survey residents of those other properties for if they own an EV or plan to soon. If that is not an option or not feasible given time constraints, review nearby comparable properties, or city and county EV adoption rates provided by state data. Most state Departments of Transportation (DOTs) or Departments of Motor Vehicle (DMVs) show current EV registrations to help track and some show historical and projected increases.

Use the Charge at Home Project Builder Tool to identify the cost estimates and ROI for different build-out scenarios.

Options to consider (arranged in incrementally ascending order in terms of level of effort and futureproofing):

OPTION 01 – BUILD TO CODE

Build charging infrastructure to minimum code requirements.

Building codes and ordinances (both state and municipal) may mandate a specific number or percentage of parking spaces to be EV-ready and/or EVSE-Installed.

PROS

- Cost Savings upfront
- Code Compliance

CONS

- Unmet charging demand if no requirement
- Lost revenue opportunity
- Deferred retrofitting costs

OPTION 02 – BUILD BEYOND CODE

In addition to meeting the legal mandates, plan for more parking spaces to be EV-ready, EV-capable, and/or EVSE-installed, depending on projected EV adoption rates in the next 5-10 years. This strategy can include extending trenching beyond the chargers that will be installed, oversizing the panels that supply power to EV chargers, running conduit to where it will be needed in the future, or even installing breakers, and running wires to where chargers will be installed in the coming years. Any low-cost extensions of existing work should be prioritized. Option 3 below outlines what full buildout requires and whether some steps in that direction can be made at minimal costs. See Section 2.4 to understand how value engineering can reduce costs while maximizing charging buildout.

PROS

- Optimizes for current and near-future demand
- Code Compliance

CONS

- Deferred retrofitting costs
- Higher upfront costs than code compliance

OPTION 03 – FULL BUILDOUT

Full buildout entails designing property parking lots for when all vehicles onsite are EVs. This option future-proofs parking lots by having all or a portion of them made EV-capable or EV-ready. Deploying a charger in an EV-ready space can be completed in under two hours. In an EV-capable space, installation typically takes just a few hours—greatly minimizing future costs and easing the burden on property management.

Recommendations for full buildout for OCSH properties:

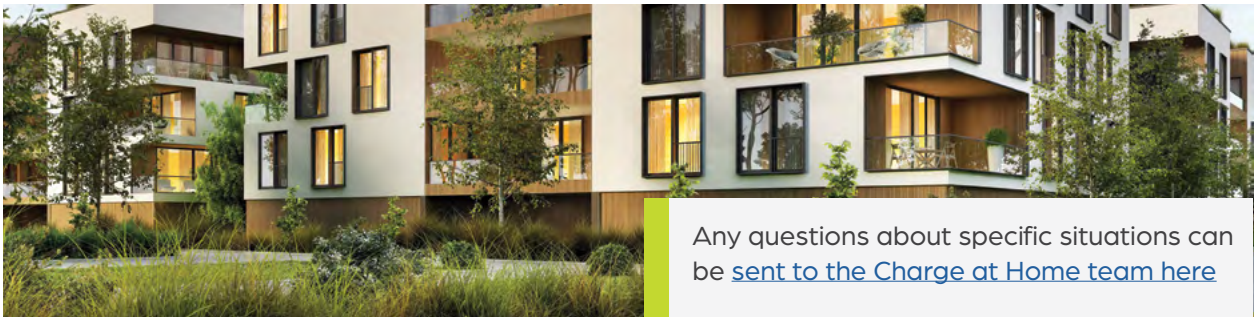
- Use communal chargers. Dedicated chargers are not recommended for OCSH properties unless assigned parking spaces are used.
- Unless local or state ordinances require a certain number of chargers to be installed, install at least 1 dual-port first-come, first-served charger during construction, excluding any mandated handicap-accessible EV-charging spaces. Installing more than 2 ports will be critical in higher adoption regions. Assessing charger utilization at other OCSH properties owned nearby, looking at nearby comp properties, or analyzing EV adoption data can be key to right-sizing the number of chargers installed.
- Beyond EVSE installation, install EV-capable or EV-ready infrastructure for 15–25% of parking spaces depending on typical resident driving patterns. Calculate EV-charging ADA spaces separately from the following, unless a non-ADA parking space can share a charger with an ADA space. While individual property needs will differ when all cars parked onsite are EVs, 20% of spaces is likely on the higher end for OCSH properties.
- Phasing buildout from EV-capable and EV-ready parking spaces to installing an EVSE will require monitoring of existing chargers for utilization and regular resident surveying.
- Look at section 2.4 for strategies to maximize value from the planned infrastructure.

PROS

- Optimizing for current and future demand
- Mitigates retrofit costs

CONS

- Higher upfront costs



Any questions about specific situations can be sent to the Charge at Home team here

1.4 DESIGN STANDARDS

ACCESSIBILITY DESIGN STANDARDS

NUMBER OF ACCESSIBLE PARKING SPACES

Based on local, state, and federal regulations, determine how many ADA-accessible EV charging spaces are required, if any. Typically, specific site factors, local ordinances, and parking lot size determine the number of accessible parking spaces needed.

DESIGNING ACCESSIBLE PARKING SPACES

The U.S. Access Board Design Recommendations for Accessible Electric Vehicle Charging provides guidelines for designing accessible EV parking spaces based on specific Americans with Disabilities Act (ADA) sections. An accessibility consultant can help with where to site accessible parking spaces and design specifications.

The following are suggested guidelines for designing accessible parking spaces adapted from the Access Board Design Recommendations

The US Access Board's Design Recommendations for Accessible Electric Vehicle Charging Stations are not definitive and to avoid a lengthy permitting process talk with the permitting authority early on in the process or consider hiring an accessibility consultant or risk fines or an extended permitting process.

1.

Accessible vehicle charging spaces should be identified as parking spaces connected to accessible routes. Both width and length will be determined by the ADA sections that apply to the property and any state or local ordinances that guide accessible parking space dimensions. Typically, a 9–foot ADA space, with a 5–foot wide hash–marked accessible aisle on one side, or potentially both sides, when multiple accessible parking spaces are required. The space should be positioned for unobstructed access to both vehicle sides to ensure charging cords can reach all vehicle parts.

2.

Positioning chargers in relation to accessible parking spaces:

- Nothing can be placed in the 5–foot accessible aisle.
- The placement of a charger for an accessible space must maintain the accessible Clear Floor Space (CFS).
- A 48" by 24" CFS is required in front of the charger, and chargers must face the CFS.
- Bollards must be outside of the CFS in front of the charger.
- The sidewalk and curb width may need to be altered if chargers for accessible parking spaces are placed on the sidewalk.
- The height of the charger screen and any interactive components must be located below 48" above grade level.

3.

EV chargers should have accessible communication features to enable people who are deaf or hard of hearing, people with vision impairments (but who drive), little people, and others with disabilities who might not need accessible mobility features (like access aisles) to use an EV charger. The need for this may be mitigated in some cases if the connected phone app has such accessible communication features.

4.

Cable management systems, including retractors and extenders, may be required to ensure the area around the vehicle remains clear when charging cables are not extended.

DEVELOPER DESIGN STANDARDS

Developer design standards may vary depending on developer type, property location, EV adoption rate forecasts, property type (garden, mid-rise apartments, etc.), and property class.

1

DESIGN OF EV CHARGING SPACE DIMENSIONS

If possible, consider adding an extra 6 inches to parking space widths to accommodate the maneuverability of the charging cable.

2

EV CHARGING SPACE LOCATION GUIDANCE

Considerations for charger placement:

- Distribute EV charging parking spaces throughout resident-only parking areas (or on each garage level). Utilize scalable approaches like factoring in load management to panel sizing while building EV-capable or ready parking spaces.
- Locate EV charging spaces behind gated areas as the ADA code applies more strictly to public parking spaces than resident-only, restricted parking. Fair Housing Act laws still apply.
- For garden sites, locate EV charging parking spaces beside concrete or landscape medians to avoid sidewalk accessibility concerns.
- Group multiple EV charging parking spaces together to save on equipment and wiring/conduit costs.
- Consider covered EV charging parking spaces to mitigate weather-related damage.
- Place chargers within 150 feet of house panels to minimize equipment costs and voltage loss.

3

WIRING DIRECTLY TO RESIDENT METERS
(NOT FEASIBLE FOR MOST OCSH PROPERTIES)

EV chargers in unassigned parking spaces will connect to a house panel and meter, but assigned-dedicated chargers can be wired directly to a resident's submeter. Unfortunately, OCSH almost always bundles utilities with rent, making wiring directly to a unit's meter not enough to bill a specific individual.

Learn more about direct-to-meter wiring here.

7. ADA 216.5 Exception 2 – "In residential facilities, where parking spaces are assigned to specific residential dwelling units, identification of accessible parking spaces shall not be required."
8. Fair Housing Act – 24 CFR 100.204 – Reasonable Accommodations

1.5 COORDINATE STANDARDS WITH THE DESIGN TEAM

COORDINATION WITH CIVIL ENGINEERING AND ARCHITECTURAL CONTRACTORS

For garden sites, coordinate decisions regarding EV charging parking spaces with the civil engineering lead. For parking garages (e.g., wraps or podiums), coordinate with the architect and engineering lead on the garage plan. Share civil paving and architectural garage plans with the design team for feedback on any conflicts. Consider hiring an EV charging consultant equipped to identify issues and help identify and vet charging vendors.

DETERMINE CHARGING CIRCUIT BREAKER SIZE

Most multifamily new construction builders install Level-2 EV chargers, which typically use a 40-amp breaker per port. The National Electrical Code (NEC) section 625.41 mandates that a circuit breaker should be rated for at 25% more amperage than the charger's continuous output meaning that a 40-amp breaker allows for 32 amps of continuous power.

If circuits with chargers that utilize power-sharing electrical configurations are used, wiring gauge and circuit breaker sizes should be increased. Dual-port power-sharing chargers are a standard product many vendors use. A 60-amp power-sharing dual-port charger should be able to provide an adequate user experience even if both ports are in use, and will be twice as fast if only one vehicle is charging. Load management features are available through some vendors and are often for long-term scalability and minimizing various costs.

Consult with EV charging vendors to identify an optimal circuit breaker size for your property or contact us here. See Section 2.4 for more optimization strategies.

COORDINATION WITH MECHANICAL ELECTRICAL PLUMBING CONTRACTOR (MEP)

Coordinate with the MEP Contractor on two critical aspects:

- **EV location plan:** Share the EV parking space locations with the MEP as identified in the civil and/or architectural plan. When wiring from house panels, keep the wiring length under 150 feet. Require the MEP to label each charger location with the associated house panel so the electrician can better plan the electrical capacity and place J-box symbols on the plan at the precise stub-up location for the conduit.
- **Power requirements:** Share the breaker requirements with the MEP based on the number of EV-ready, EV-capable, or EVSE planned to be installed. If circuits will have load management capabilities through software or hardware solutions, ensure the charging vendor or vendors collaborate with the MEP.

9. This calculation ignores voltage drop. 60 x 80% (NEC) = 48 Amps continuous. 48 Amps split in half is 24 Amps. 24*208 = 4992 Watts. Real life power output may be lower due to voltage drop or may be higher due to a 240 volt circuit. 5kW is enough to get 50kWhs in 10 hours which is 100 miles for a low-efficiency vehicle like a truck, or 250 miles for the most efficient sedans. Trucks will need to charge more often.
10. Load management is often referred to as dynamic load management, automated load management systems – ALMS, and EV energy management systems – EVEMS depending on the context.

ESTIMATE COSTS

2.1 IDENTIFY INCENTIVES

Use the Charge at Home Project Builder Tool to help identify applicable incentives.

FEDERAL INCENTIVES: Alternative Fuel Vehicle Refueling Property Tax Credit, (§ 30C, or IRS form 8911)

STATE INCENTIVES: Alternative Fuels Data Center

UTILITY INCENTIVES: Some utilities offer make-ready programs that cover significant panel, transformer, and other service upgrade costs.

CITY INCENTIVES: Incentivize LEED and other green certification programs with FAR and height bonuses, site variances, permit streamlining and other property design-based incentives.

Many incentive programs restrict incentive funds to chargers or smart outlets from specific service providers for data reporting and demand response program purposes.

Some utilities and states have grant programs that must be applied for in a different manner than rebate programs. These incentives can provide significantly greater funding for EV charging and associated infrastructure costs, but often require lengthy applications. Look to EV charging vendors and installers to support these applications as well as grant writing help from the programs themselves.

2.2 EVALUATE EV CHARGING VENDORS

THERE ARE TWO PRIMARY VENDOR BUSINESS MODELS:

1. **Full Capital Expenditure (CapEx) Option:** The property owner pays all costs for the equipment, installation, and maintenance of EV chargers. The property owner receives the complete revenue from charging sessions subject to the vendor service agreement. The property owner determines charging session prices.
2. **No CapEx Option – often known as Charging-as-a-Service (CaaS):** CaaS involves a service agreement offered by EV charging vendors with no CapEx from the property owner. CaaS provides EV charging equipment, installation, software, maintenance, and support within a predictable monthly payment by residents paying marked prices or, most commonly, by utilizing a revenue-sharing split between the service provider and the MFH property. Charging as a service business model can also be configured to eliminate operational expenditures (OpEx) to the owner as well, but typically requires long contracts. Learn more about vendor business models here.

WHEN CHOOSING A VENDOR, ASK THEM THE FOLLOWING HARDWARE-SOFTWARE RELATED QUESTIONS

1. What hardware and software options are available, and what are their respective costs? What features are offered by each of these options? (e.g., load management, dual-port power-sharing integrated units, and other smart features. See the Glossary for more information)
2. What are the additional hardware costs, such as pedestals and cable management systems – extenders and retractors?
3. Are there bulk order discounts available?
4. What are the hardware warranties? Are extended warranties available, and at what cost?
5. Does the service provider integrate with property management software?
6. Can another charging service provider's software be installed on the hardware? Even if the charging service provider were to go out of business?

INSTALLATION AND INCENTIVE-RELATED QUESTIONS

7. Does the vendor provide full turnkey solutions with installations, or will an electrician manage installations?
8. Does the vendor provide support when applying for incentives?
9. Would the software and hardware components the vendor offers be eligible for incentives? Please seek confirmation from the vendor.

ONGOING COSTS RELATED QUESTIONS

10. What different business models does the vendor offer?
    a. Sometimes, vendors may offer no CapEx/OpEx business models. Establish who has the authority to set rates, (I.E. the vendor or property owner.)
11. What are the ongoing costs associated with EV charging and how are the costs bundled? (licensing, service, software, transaction, networking, and management).
    a. Vendors may term ongoing costs differently. Sometimes, costs are applied to residents when residents pay for charging sessions. In other cases, property owners are responsible for paying these costs monthly or annually.
12. What are the expected maintenance costs for the chargers?
    a. Does the vendor offer the option of purchasing an operations and maintenance service contract, and if so, what does it cost?
13. What service-level agreements are offered?
    a. Please provide documentation on repair time frames for standard wear parts, any uptime guarantees made, and support time terms and conditions.
14. Does the vendor offer training or support resources for the operations and facilities management team?
15. If the team is unsatisfied with the product, will the vendor need to be involved in order for the property owner or manager to move to a different software vendor?

ONBOARDING PROCESS QUESTIONS

16. What does the onboarding process entail?
    a. Are there resources available for residents as well as property owners and managers?
17. What would be the user experience journey for both residents and property owners and managers?
    a. Ask for a demonstration of both the driver app and the management portal.

2.3 DETERMINE ROUGH CONSTRUCTION COSTS

The general contractor (GC) and development team should work with the electrician and other subcontractors to estimate construction costs and integrate them into the budget and timeline. The clearer the design plans are, the more accurately contractors will be able to estimate costs.

2.4 VALUE ENGINEERING

Value engineering can help reduce costs, particularly during the planning and design stages of the project. This section may be particularly useful for the electrical engineering teams and general contractors.

Cost-reduction recommendations for new OCSH properties:

1. Utilize power-sharing dual-port chargers to reduce the number of circuits needed. This is often the default for many EV charging vendors. Minimum breaker sizes of 60-amp circuits are advised for power-sharing dual-port chargers, otherwise, power levels can fall below commonly acceptable rates for communal chargers (5kW).
2. Consider lower-cost chargers or engage more charging vendors to obtain more competitive quotes.
3. Inquire about no-CapEx and no-OpEx options. This will likely not reduce developer infrastructure costs unless vendor includes panel-to-port costs as part of the contract.
4. Consider installing panel capacity closer to where it will be used or shifting which parking spaces will be made EV-capable or EV-ready.
5. Change EVSE-installed or EV-ready parking spaces to EV-ready or EV-capable spaces. Subject to incentives and code compliance.
6. Reduce panel amperage sizes by using EV chargers or panel hardware with automated load management system capabilities. Discuss available technology solutions with vendors. Communal chargers should be careful using this approach to ensure resident experience does not suffer too much.
7. Consider running trunk conduit to where future panels will be installed if the route can be accessed easily or if it is already trenched during construction. Installation of those panels may not be necessary during initial construction. Ensure any infrastructure is physically marked and flagged so future property owners understand what and where it is.
8. Remove EV-capable parking spaces from the plan.

PRE-CONSTRUCTION

3.1 EXECUTING CONTRACTS AND ORDERING MATERIALS

Finalize the selection and coordination of an EV charging vendor and electrician. See section 2.2 for more information on questions to ask EV charging vendors.

3.2 APPLY FOR INCENTIVE FUNDING

As outlined in section 2.1, identify relevant incentives. The incentive application guidelines will provide more information on what is needed to obtain the funding and when to apply. Make sure to review incentive requirements thoroughly with the selected charging vendor. If questions arise, contact the incentive provider team by visiting their webpage. Local electricians and vendors who work in the area will often know of the rebates and grants. Note what installation paperwork needs to be tracked for any rebate processing after the chargers are installed.

CONSTRUCTION

Review this checklist prior to construction to ensure all necessary steps are reviewed.

1. PLAN, DESIGN, COORDINATE

- [ ] Identify EV charger and EV-readiness mandates.
- [ ] Evaluate federal, state, and utility incentives and identify which will be considered.
- [ ] Decide on first-come, first-served or assigned chargers for parking spaces.
- [ ] Integrate EV charging infrastructure into the construction schedule and engage contractors (MEP, architect, etc.)
- [ ] Determine the number of EVSE-installed, EV-ready, and EV-capable parking spaces needed now and in the future.
- [ ] Ensure accessibility and plan charger locations to minimize cost.
- [ ] Determine placement of panels, trenching, conduit runs, and stub-ups.

2. ESTIMATE COSTS

- [ ] Work with contractors to determine installation costs and explore cost-saving options (e.g. value engineering).
- [ ] Contract with an EV charging vendor.
- [ ] Reassess incentives with the charging vendor.
- [ ] Finalize budget.

3. PRE-CONSTRUCTION

- [ ] Ensure EV charging vendor and electrician contractor coordinate to finalize installation details.
- [ ] Apply for rebates and order materials.

4. CONSTRUCTION

- [ ] Install charging equipment in line with the construction schedule.
- [ ] Commission chargers.

5. POST-CONSTRUCTION

- [ ] Onboard management team with EV charging vendor and finalize charging session prices and policies.
- [ ] Confirm maintenance procedures with the EV charging vendor.
- [ ] Communicate charger availability and policies with new and potential residents.

POST-CONSTRUCTION

5.1 SET POLICIES, PRICING, AND BILLING METHODS

The Charge at Home Project Builder Tool can help set the pricing of electricity at the chargers to deliver the desired ROI considering installation and ongoing expenses.

Pricing considerations:

1. Set the price per kWh to be between the property's cost of electricity and the market-rate public DC charging price per kWh.
2. For first come, first serve charging stations, consider imposing idle fees to encourage turnover if chargers have a high utilization rate. Increasing time idle fees should be used rather than abrupt idle fees.
3. Use idle fee structures rather than limiting charging sessions to a set amount of time.
4. Discuss various pricing strategies with vendors before determining price structure. Vendors will be able to advise based on past experience and site specifics.

11. How to calculate these rates can be found in the glossary or by clicking on the links.
12. For example: idles fees of $4/hr for the first hour after an EV is done charging, $8/hr for the second hour, $16/hr for the 3rd hour and so on can go a long way to incentivize people to move their car after it's done charging. Additionally most charging vendors can enable per energy (kWh) pricing as well as per time pricing. Charger owners can charge standard per kWh prices while not charging a time price for the first 4 hours, but after 4 hours, the price could be $5/hr for the 5th hour, $10/hr for the 6th hour, and so on, or just a flat rate per hour after the time limit as an incentive to move after the free parking time period. This can be particularly important for charging spaces available to the public. As many students are on standard schedules, allowing grace periods and no idle fee breaks overnight may be important to ensure a positive resident experience.

RECOMMENDED REVENUE GENERATION METHOD BY CHARGING CONFIGURATION

CHARGING CONFIGURATION	RECOMMENDED METHOD FOR REVENUE GENERATION
Communal and available only to residents	To recover costs and generate revenue from EV charger installations, property management may choose one of the following strategies: 1. Increase parking fees. 2. Adjust base rent. 3. Add a separate "charging rent" fee. If you opt to limit charger access to residents paying "charging rent," you'll need to ensure those residents' charging accounts are added to the approved user list in the charging vendor's software portal. This step is critical—it ensures that only authorized residents (or their approved guests) can access the chargers, helping to avoid unauthorized use and maximize resident satisfaction. To set pricing: Charge a per-kWh rate that is slightly above your average utility cost—this offsets electricity expenses. Remember, most of the charger ROI will come from the recurring "charging rent" fee, not just energy usage. "Charging rent" should be calculated to cover: 1. Ongoing utility costs. 2. Maintenance and software fees. 3. Any additional margin desired by ownership. This approach ensures the chargers remain exclusive, fairly priced, and financially sustainable for the property.
Dedicated	If dedicated chargers are present, a flat monthly fee or per kWh and monthly fee directly to the resident or residents with exclusive access is recommended.
First-come, first-served and available to the public	Price cost per kWh dispensed with a small markup. Set the price to just below the local market rate per kWh. Idle fees and time fees will be useful as demand for charging infrastructure increases.

5.2 COMMUNICATION WITH RESIDENTS

A communication template can be downloaded here.

Here are some recommendations for communication to residents:

1. Communicate EV charging policies to new residents before their move-in date.
2. Provide timely updates if chargers are out of order or if pricing or other policies are changed.
3. Utilize text notifications for time-sensitive issues, e.g., when gasoline cars are parked in EV charging-only spaces, or automated notifications when their car is done charging.
4. Notify residents before imposing idle fees.
5. Use the internal capacity of networked chargers to notify EV drivers when idle fees will be applied to their accounts.
6. Provide proper signage onsite to ensure that residents know where EV chargers are located. This is essential in setting resident-appropriate expectations.

Consider adding chargers available for public use to online or phone apps like Plugshare and Chargeway.

5.3 OPERATION, MAINTENANCE, WARRANTY

OPERATION AND MAINTENANCE

- Check EV charger utilization rates periodically.
- Maintain reliable uptime of chargers with service level agreements (SLAs) with charging vendors or trusted electricians that can service the chargers. Uptime agreements and SLAs need to be clearly defined in any contracts with vendors.

See the Alternative Fuels Data Center's guidance on Operation and Maintenance for Electric Vehicle Charging Infrastructure here.

WARRANTY

- While chargers are under warranty, and if repairs do not resolve charger issues, contact the EV charging vendor to discuss warranty conditions and next steps with the hardware manufacturer.
- Most chargers have three or more year warranties but do not cover standard wear items without purchasing a maintenance add-on.

INSURANCE

- Property owners should consult their property insurance providers to determine whether their policy needs updates with the addition of these assets.

Review state laws and regulations regarding operation, maintenance, warranty, and insurance here.

5.4 ASSESS DEMAND AND MEET THE GROWING NEEDS OF RESIDENTS

As resident demand increases, consider installing more chargers to improve resident satisfaction. The best way to gauge EV charging demand and prices residents are willing to pay is through recurring surveys. Surveying residents during lease signing and renewal time frames will help to enhance user experience and troubleshoot potential issues that can fine-tune the property's charging plans in the first few years. Testimonials from current and past residents can make excellent promotional material to attract new EV-driving residents.

CHARGE at HOME

THANK YOU