**Regional Code Collaboration**

# EV Ready Codes
# Research Summary

**July 2020**

Prepared for: King County
Prepared by: David Fujimoto

## Background

The RCC provides a forum to leverage expertise, coordinate research and organize stakeholder engagement to produce code concepts for adoption by local jurisdictions. This memo compiles research on leading practices and lessons learned for codes addressing light duty electric vehicle (EV) infrastructure as a preface to the development and adoption of a model EV Ready Code.

EV Codes generally provide for the planning and design of electrical capacity, circuitry pathways and parking coverage. Code requirements typically apply differentially based upon land uses or building occupancies and differ in the extent of "readiness" for use as well as more specific factors such as total capacity, parking space coverage and exemptions. In general, codes addressing readiness are in their second generation with the vast majority adopted in 2019 and 2020. The goal of EV Ready Codes is to reduce building-related barriers to widespread market adoption of electrified transportation.

## Climate, Energy and Mobility Goals

Transportation related emissions make up almost 50% of greenhouse gas emissions in the Central Puget Sound region with 27% from on-road gasoline vehicles making up the largest portion (PSCAA). In addition to GHG emissions targets, a number of state, county and municipal policies and goals support clean transportation, including:

- King County Cities Climate Collaboration Shared Commitments
- The Port of Seattle has established a strategic objective to be carbon neutral for both direct and indirect sources of greenhouse gas emissions by 2050
- City of Seattle has set a target of 30% electric vehicle adoption, including a commitment to a fossil-fuel free municipal fleet, by 2030
- Governor Inslee's goal of 50,000 registered EVs by 2020
- Washington is a zero emission vehicle state (ZEV) mandating automakers derive up to 8% of sales from EVs by 2025.

The adoption of the Clean Energy Transformation Act (CETA, 2019) helps to ensure that future electricity supplies, including those to fuel transportation, will be 100% renewable or non-emitting by 2045.

It is perhaps evident, but nevertheless important to note that vehicle electrification is a subset of approaches to decarbonize transportation and increase the market share of vehicles that are electric. This typically resides within broader climate and sustainable transportation goals - such as non-motorized, active transportation, high capacity transit and shared mobility modes of travel and is not viewed as the single solution for transportation emissions or community mobility goals more broadly.

## Number of EVs Currently and Projected

As of July 2020, there are more than 58,300 battery electric vehicles in Washington state, with approximately 44,250 (76%) of those within the King, Pierce, Snohomish and Kitsap County area. [1]

Washington state's EV passenger vehicle market has continued to see considerable growth, with year to year market share increasing 54.5% from 2017-2018, with an overall market share of 4.28%, second only to California at 7.84%.[2] The 53,307 plug-in electric vehicle (EVs) which were registered in the state as of the end of 2019 surpassed Governor Inslee's Results Washington goal of 50,000 registered EVs by 2020.

Seattle City Light recently completed its Transportation Electrification Strategy (2019) and several energy utilities are currently studying EV charging behavior. Puget Sound Energy is anticipated to release an EV strategy in the fall of 2020.

**Plug-in electric vehicle registrations surge upward in Washington**

*2015 through 2019; Number of plug-in electric vehicle registrations by vehicles type; Includes battery electric vehicles and plug-in hybrid electric vehicles*

| Vehicle type | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| BEV | 11,551 | 14,573 | 20,010 | 27,853 | 36,129 |
| PHEV | 5,028 | 7,424 | 10,015 | 15,025 | 17,178 |
| EV totals | 16,579 | 21,997 | 30,025 | 42,878 | 53,307 |

Data source: Washington State Department of Licensing.

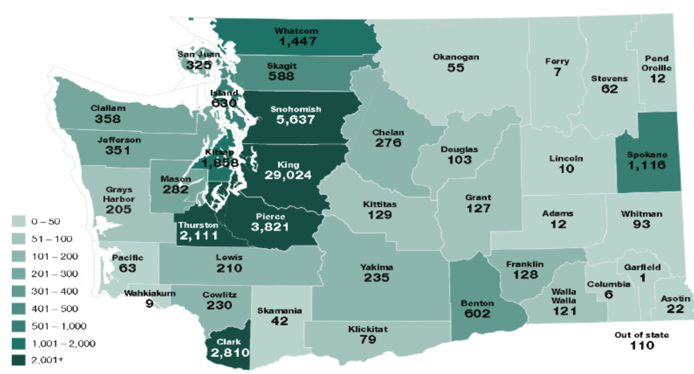
Notes: BEV = Battery electric vehicles. PHEV = Plug-in hybrid electric vehicles. EV = Electric vehicles.

In its Transportation Electrification Strategy, Seattle City Light anticipates seeing a 10-fold increase in passenger vehicles charging within its service territory alone, with up to 50,000 additional vehicles by 2030. More aggressive assumptions indicate up to 140,000 vehicles over the same duration.

Nationally, a report from the Edison Electric Institute projected growth in EVs from 1 million in 2018 to 18.7 million by 2030.[3]

**Washington's total registered plug-in electric vehicles top 53,000**

*Number of plug-in electric vehicle registrations by county; As of December 31, 2019*




Data source: Washington State Department of Licensing.

Notes: Map includes all plug-in electric vehicles produced by major auto makers since 2011. It does not include cars converted to EVs by their owners, neighborhood EVs, or motorcycles. As of December 31, 2019, San Juan County had 325 EVs, Island County had 630 and Kitsap County had 1,858. "Out of state" vehicles are registered in the state of Washington, but the registered owner's address is out of state.

## Barriers to Adoption

New EVs models typically have range greater than 200 miles, substantially reducing range anxiety as a barrier to adoption. However, access to convenient charging continues to be an important consideration in EV purchasing decisions and has been identified as a "key enabler" for the market. A lack of planned

---

[1] Washington Department of Licensing EV Population and Title and Registration Data

[2] EV Market Share by State (PHEV and BEV), see: https://evadoption.com/ev-market-share/ev-market-share-state/

[3] Electric Vehicle Sales Forecast and the Changing Infrastructure Required Through 2030 (November 2018)

charging infrastructure can make the installation of EVSE prohibitively expensive.

Research conducted by the International Council on Clean Transportation (ICCT) indicates that access to home charging is closely correlated to housing type, with drivers in detached houses much more likely to have home charging than those in apartments or attached houses. For single family homes, home charges are anticipated to be the primary location for charging for most EV drivers, with 90% of the charge points and 70% of all required electricity.[4]

In the same study, the ICCT notes that much more charging infrastructure is needed to sustain the transition to electric vehicles, with home charging serving as an "essential backbone of the charging ecosystem" and public and workplace charging needing to grow considerably. Workplaces are typically the second-most frequent parking location. However, more urban areas and areas with larger numbers of renters and unassigned parking are anticipated to need more shared access charging (public or private).

In addition, multifamily properties face difficult challenges to adoption, which is also an equity consideration. In their Transportation Electrification Strategy for Seattle City Light, RMI notes that "Unlike single-family homes, multiunit dwellings have a split incentive since a property manager would likely need to install, own, and operate on-site charging infrastructure. Property managers are unlikely to invest unless it puts them at a competitive advantage. This chicken-and-egg problem will perpetuate the demographic disparity in EV ownership as lower-income individuals live disproportionately in multiunit dwellings."

Anecdotally, to the extent that EV adoption skews towards upper income and single-family homeowners, a focus primarily on single family home charging would tend to exacerbate equity concerns with EV access and related operating cost and health benefits.

City of Seattle stakeholder engagement for their 2019 EV code identified:

- EV readiness is considered a marketable commodity, but is not widespread and is often in housing marketed to higher income, environmentally conscious buyers
- Lack of access in rental vs ownership properties creates disproportionate access to EVs
- Lack of access is a barrier for TNC drivers in diverse communities
- Attention to mitigate housing cost impacts

Current experience with EVSE installation demonstrates considerably higher costs of retrofitting buildings to accommodate EV infrastructure which is considerably less expensive to design and install when a building is developed. More information on costs follows below.

## Costs

A number of studies indicate that the cost of design and installation of EV related infrastructure at the time of development is far less expensive than retrofits.

[4] Quantifying the Electric Vehicle Charging Infrastructure Gap Across US Markets, ICCT 2019

For single family homes and duplexes the cost for wiring a 208/240 volt circuit are estimated to be between $50 - $300 per space. Richmond, BC estimates the cost of providing EV infrastructure in new single-family homes and townhouses at $50-150 per space.

Studies conducted for the Cities of Oakland and San Francisco, CA evaluated the costs for providing EV Ready infrastructure for both new construction and retrofit scenarios. The City of Oakland study[5] estimates the cost of a fully wired EV space at $1,330 for surface parking and $1,380 for enclosed parking and shows that **EV retrofit costs are 2 to 8 times greater than new construction**. A snapshot of Figure 1 from the report is below:

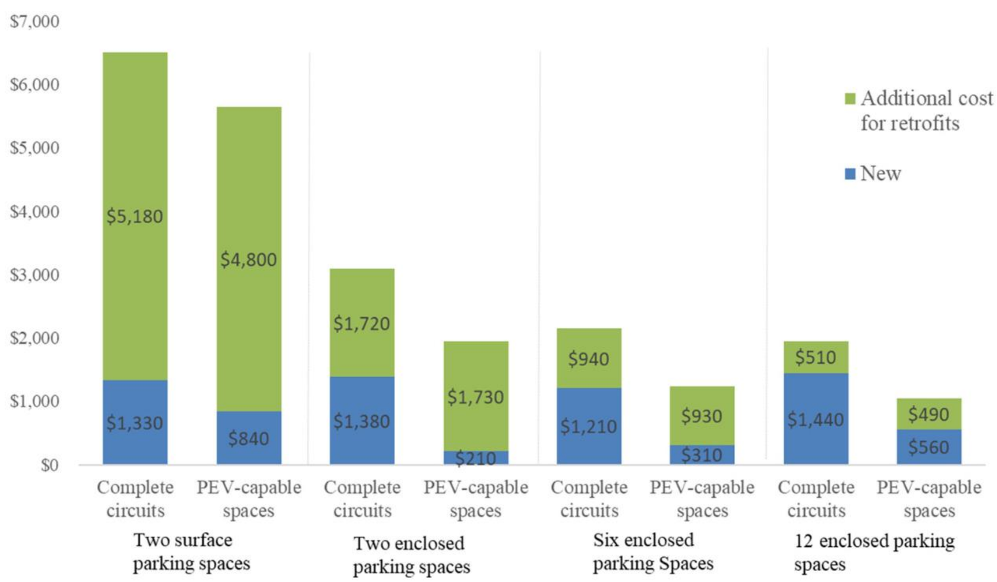



Figure 1. Retrofit costs per parking space are two to eight times higher than new construction costs when installing PEV Charging Infrasturcture, Costs are adjusted from 2016 to 2018 based on RS Means Historical Cost Indexes. *Source:* Pike and Steuben, 2016

The authors attribute "breaking and repairing walls, upgrading electric service panels, breaking and repairing parking surfaces and/or sidewalks, more expensive methods of conduit installation and additional permitting and inspections" as factors driving increased costs with retrofits.

In a study of Electric Vehicle Charging Infrastructure for Multifamily Standards[6], the California Air Resources Board (CARB) estimated that the cost of EV-capable parking spaces with raceway and panel capacity in new multifamily housing averages about $280 per space in parking garages and up $760 per space in surface lots.

In the same study, CARB considered the potential for additional costs for electrical service and transformers when installing EV charging infrastructure in new multifamily housing:

> CARB staff discovered that electrical service fees can be avoided. Developers have the option to designate a blank space for a meter to serve EV charging energy demand. When EV Capable

---

[5] Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report prepared for City of Oakland by Energy Solutions (July 2016)
[6] Electric Vehicle Charging Infrastructure: Multifamily Building Standards, California Air Resources Board (April 2018)

spaces convert to EV Charging Spaces in the future, allowance costs (including rebates) should cover service upgrade fees to install the EV Meter. Dedicated transformers to serve EV charging load may be needed for new construction projects if developers select single phase power; developers of smaller buildings with 9 units or smaller typically opt for single phase power. A dedicated transformer may not be needed if the existing service is adequate. A study prepared by the City of Oakland states that transformer upgrades for EV charging infrastructure are typically not common; less than 0.2% of PEVs on California roads have required transformer upgrades (City of Oakland, 2018). For larger buildings, developers typically require three phase power, and in that case, one transformer can be installed to meet building and EV charging energy demand. Therefore, there should not be any added transformer costs associated with installation of EV charging infrastructure in most new multifamily housing.(SoCal Edison, 2018) However, CARB staff did estimate the upfront added cost of dedicated transformers in smaller buildings with 9 units or less. Upfront costs can vary depending on the location of the transformer and EV Capable spaces. However, typical costs associated with dedicated transformers would add about $2,175 to $3,450 for one to two EV Capable spaces respectively (RS Means Data, 2017).

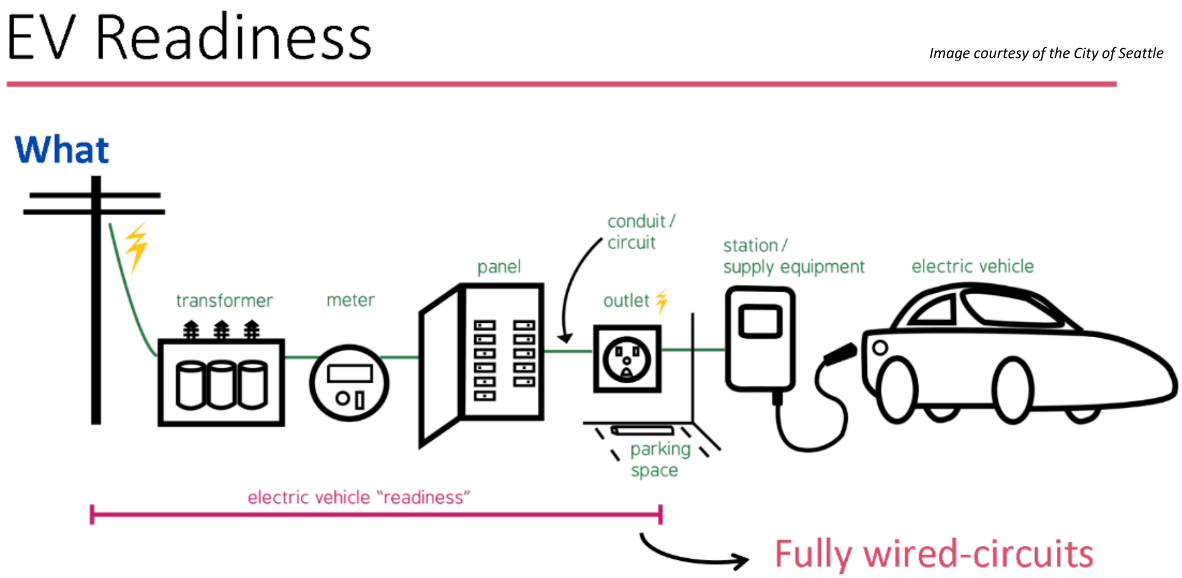
A recent report on Reducing EV Infrastructure Costs by RMI considered a range of hardware, capacity, software, ADA compliance and other costs and noted that “soft costs” for things including permitting, communication between utilities and providers, easements (for public charging) and lack of “future proofing” were, surprisingly, large drivers of EV infrastructure costs.

## Current Code Environment

According to a ACEEE paper on Driving Plug-in Electric Vehicle Adoption with Green Building Codes (2018), more than 50 jurisdictions in Canada and the US have EV infrastructure provisions in building or land use codes, covering more than 82 million people.

In the last couple of years, there has been significant activity in adoption of new or updated codes by communities – representing a “second generation” EV code of sorts. First generation EV Codes, including that of the Regional Code Collaboration in 2012, were largely focused on planning and design for future EV – centered on identifying or providing space for circuits or panels, identifying pathways and requiring calculations for electrical capacity. More recent codes focus on making buildings EV Ready, with electrical capacity, panels, breakers, conduit, communication, wiring and outlets installed. Some jurisdictions require a certain number or percentage of charging stations (EVSE) to be installed.

Figure 2. Map of PEV infrastructure green building code adoption. *Source*: ChargePoint.




The vast majority of current EV codes fall within a progression of installed EV categories and primarily address Level 2 charging capacity, which is appropriate for most residential and workplace charging scenarios:

> **EV Capable:** Electrical panel capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the EVSE (charging stations). Sometimes called "Conduit Only."
>
> **EV Ready:** A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for EVSE servicing Electric Vehicles. The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an EVSE, and be located in close proximity to the proposed location of the EV parking spaces.
>
> **EVSE Installed:** Provision of fully operational EV charging stations for a certain number or percentage of designated spaces.

There are some nuances to the coverage of parking spaces through technologies such as load management (discussed below), and requirements for parking space coverage vary according to land use types or building occupancy types.

With the exception of [state requirements allowing EV-related land uses] such as battery exchange stations along major highways and interstates and basic standards around signage and parking, most jurisdictions do not have provisions currently in place to reduce barriers to EV access. The 2018 WA State Building Code would begin to institute provisions but largely requires only EV Capable infrastructure, and only for some residential occupancies (see Appendix A table for additional details and a link to the code). Lessons learned from communities with EV Capable only codes indicate challenges with compliance and limited value in terms of improving access. For example, cities indicated that planning for capacity and running calculations was a far different exercise than actually designing and installing circuits or a panel.

At a national level, recent modifications to the building code through the ICC included provisions for EV Readiness and were approved through member balloting at the end of 2019 (including several K4C members). These ICC EV Ready provisions would go into effect in 2021 and provide for a combination of EV Ready and EV Capable provisions for single-family and multi-family homes. Despite being approved with final action in 2019, ICC provisions were appealed in May 2020 and are pending final ruling.

A summary table of several EV Codes is attached – see Appendix A.

## Leading Code Practices and Additional Considerations

As noted above, current EV codes generally seek to balance the type of infrastructure and the extent of its coverage for a given occupancy or land use type (single family, multi-family, commercial):

- EV readiness (EV Capable, EV Ready, EVSE Installed)
- Parking space coverage (per du or % of total)

Based upon a summary of EV Codes courtesy of Southwest Energy Efficiency Project[7] and augmented through additional research, EV codes range in the level of access (or readiness) they provide, as follows:

| | **Least Access** | | **Most Access** | |
|---|---|---|---|---|
| Single Family | 1 EV Capable space per dwelling unit | RCC 2012, Honolulu, Lakewood, Sedona, Fort Collins, Atlanta, Aspen, CalGreen base, Palo Alto | 1 EV Ready space per dwelling unit | Seattle, Boulder, Denver, Summit County, Flagstaff, San Jose, Vancouver, CalGreen Tier 1 and 2, IRC 2019 |
| Multi Family | 5% EV Capable | Washington Building Code | 70% EV Capable, 20% EV Ready & 10% EV Installed | San Jose, CA (Denver, CO is similar) |
| Commercial | 5% EV Capable | Sedona | 40% EV Capable 10% EV Installed | San Jose, CA (Denver and Boulder are similar) |

For single family and individual metered residential units, there appears to be general consensus around one EV Ready space per dwelling unit. As noted above, the relative cost of a fully-wired circuit in a single family home is small (estimated at less than $300 for an outlet in proximity to the panel) and planning for the panel capacity removes significant barriers for residents.

Approaches for multifamily and commercial uses vary far more significantly. Of note are the City of San Jose, where requirements provide coverage for 100% of multifamily and 50% of commercial spaces, with a minimum of 10% with charging stations required to be installed. Denver has similar requirements which were adopted earlier this year.

[7] Southwest Energy Efficiency Project or SWEEP provides a good overview of EV Codes online.

Vancouver, BC takes the approach of requiring 100% EV Readiness, but allows load management technologies to meet electrical capacity requirements (load management or load sharing allows multiple charging stations to share circuit or panel amperage without exceeding circuit, panel or transformer capacity). The Cities of Oakland and San Francisco provide for lower levels of EV Readiness (10%) with a slightly higher panel capacity (20%) but require planning for wiring to all parking spaces but only installing conduit in areas where it is more economical during new construction.

Seattle has taken the approach of providing for 20% readiness for multifamily residential applications, recognizing that load management technology may allow for extending charging capacity to up to 100% of the parking spaces. Commercial uses are set at 10%, reflecting a lower level of importance for charging in the overall EV charging "ecosystem."

A couple of points of consideration based upon feedback from cities and charging station manufacturers:

- **Load management:** load management technology allows multiple charging stations to dynamically share the capacity of a circuit, panel or meter. These technologies can help to use panel capacity more efficiently to serve more EV charging spaces than panels that reserve a fixed amount of capacity per space. Load management systems can also be integrated with building management strategies to minimize utility demand charges and potentially avoid utility upgrades. Their feasibility is heavily reliant on the usage patterns and requirements of individual users. Aspects such as daily driving distances, arrival and departure times, vehicle charging capacity and circuit capacity affect how load management affects users. Current feedback on load management is a 4:1 or 5:1 ratio appears to be a reasonable balance between charging times and user convenience and expectations, but could certainly change as vehicle technology evolves and the number of EV drivers and their usage patterns change. Vancouver has established load management performance standards which requires a minimum performance of 12kwh per EVSE on a management system or peer networked/interconnected EVSE for load management/load sharing capabilities over an 8 hour overnight period, assuming all parking spaces are in use by a charging EV.

- **Total number of electrified parking spaces:** there does not appear to be consensus on either the percentage of parking spaces to plan for, or whether 100% electrified parking spaces will ultimately be needed. As battery technology has improved and become more wide-spread, range anxiety has become less of an issue and charging frequency has decreased. Average daily vehicle miles travelled (VMT) in the region was approximately 21.4 miles in 2018 according to PSRC[8], far within the comfortable range of EVs on the market today. However, individual user behavior, parking turnover, assigned parking, access to workplace charging and other factors have a significant impact on total need at a particular site.

---

[8] This takes into account total population in the region, as well as job growth. PSRC tracks both daily VMT in the region and daily VMT per person. From 2017-2018, the region saw a slight increase in total VMT of 1.2%, while daily VMT per person declined by 0.5%. Since 2010, the daily VMT per person has decreased by 5%, with daily VMT at 21.4 miles daily, below the peak of 24 miles per person per day in the late 1990's.

- **Stranded assets and overbuilt infrastructure** – on the balance it is still cheaper to install during design and construction than to retrofit, but because understanding about EV driver behaviors and requirements are still being studied and technologies for both EVs and charging stations are continuing to evolve, care should be taken to avoid overbuilding infrastructure in the near term.

Additional considerations include:

- Exceptions
- Where the Code Lives
- Substantial modifications / Remodels / Existing Buildings
- Affordable Housing & MUD
- Calculation of Stalls
- Rated Power for Circuits
- Communications
- Land Use Incentives
- Permitting
- Uncertainties and Disruptive technology

**Exceptions**

City of Seattle – allows for reductions for certain utility upgrades. Conversations with staff indicate primary concerns were for small townhouse projects such as townhouse conversions where previously single family service had existed. The City estimates approximate 20-40 such exemptions per year and minimal impact on review staff time.

**Where the Code Lives**

Jurisdictions have adopted EV codes in either land use or building codes and recently, there have been some claims about the scope of building codes at the national level. This may ultimately not be of concern, rather something of which to be aware. Depending upon the jurisdiction, more relevant may be consideration of development review processes. Land use code review typically includes parking and circulation and often happens before building plan review processes, which would allow the site design to identify EV requirements earlier in the process.

- British Columbia determined EV charging as "out of scope" under the Provincial Building Act, defining regulation at local government under the authority of other statues.
- Some 2019 ICC code changes are being appealed on the premise that EV codes (and building electrification codes) are out of scope for the IECC.

**Substantial Modifications / Remodels / Existing Buildings**

Many existing code provisions govern when new permitting requirements are triggered, often based upon building size, renovation relative to assessed valuation, structural or other changes. Major improvements to surface parking lots or electrical systems could be relevant triggers for EV codes. Some jurisdictions have requirements to provide additional triggers:

- Marin County: with electrical panel service is upgraded, requires 20% EV Ready; parking lot renovations including removal of paving and curbs, requires conduit to all exposed parking spaces and electrical capacity (up to panel capacity).
- Menlo Park: includes provisions for additions and alterations for larger projects with lower % EV Capable and EV Installed requirements than new construction.

In addition, alternative paths could be considered for existing buildings, following an approach similar to Seattle's Tune Up Ordinance. Property owners could be provided with specific requirements and timelines for coming into compliance, which would allow time for capital planning and timing of infrastructure investments.

**Affordable Housing & Multifamily Development (MUD)**

Stakeholders in the Seattle process identified concerns about the EV Code's impact on housing affordability and equity. Consideration should be given for significant impacts to affordable housing and housing costs overall. For larger affordable housing developments, cost data indicates that there will be clear EV code related project costs, but that in the context of parking facility costs and structured parking costs (if provided) in particular, EV code related costs are minor. Additionally, provision of EV ready infrastructure is critical to address inequities in the EV market access. Cost data shows that the costs for retrofit of facilities is 2 to 8 times higher than the cost during new construction. Design for multifamily development should consider flexibility in parking requirements, encourage shared parking and consider load management strategies. The Puget Sound Clean Air Agency is currently participating in a nation-wide MUD study and may be useful in informing future strategies and code updates.

**Multifamily Housing (also referred to as Multi-Unit Dwellings [MUD]) represent a key market segment in need of charging options. They constitute between 38% and 67% of California's housing stock (depending on the region) but fewer 9% of ZEVs in California have been registered to MUD residents.[27] To achieve 100% ZEV penetration, this market segment likely needs to be addressed through a combination of access to level 2 charging, DC fast charging, and hydrogen fueling. A variety of factors—ranging from ownership structure to available power and parking—have worked against adding charging to existing MUDs at the necessary scale. The following best practices can help address the challenge:**

| Best Practice | Rationale |
|---|---|
| Encourage charging in rental properties to be shared use | EVCS spaces count as two spaces |
| Encourage the highest rate of charging to maximize throughput capacity, while balancing cost | EVCS spaces count as one space |
| Avoid treating EV charging at MUDs as a commercial parking service | EVCS spaces count as one space |
| Allow/encourage load management and battery supported chargers if the service drop to a property is not adequate | EVCS spaces count as one space |
| For new buildings – adopt CALGreen voluntary measures or better (see Advancing Infrastructure through Building Standards section) | EVCS spaces count as one space |

**Calculation of Stalls**

- Prior versions of the RCC code rounded up or down depending upon the fraction value for stall calculations.
- Most codes have provisions which round up stall calculations to nearest whole number.

**Rated Power for Covered Circuits**

- Some jurisdictions require higher (50 amp) or lower (30 amp) amperage ratings for EV circuits. Typical is a 40 amp circuit, which covers the charging rate of most EV's charging rates in the current marketplace. Some models, such as Teslas and newer luxury models can utilize higher capacities.
- Station manufacturers are only recently starting to provide 50 amp EVSE.
- At least one charging station manufacturer has noted that requiring higher amperage circuits can significantly reduce the total number of ports that can effectively be provided by a given transformer capacity.

**Communications**

- Some charging station manufacturers have commented on the importance of ensuring communications infrastructure to EVSE, either through cellular signals (which may require repeaters for enclosed structures), ethernet or distributed antenna systems (DAS). Also raised were questions about building network security for direct connections to building systems versus cellular.
- In their recent study on EV infrastructure costs, RMI commented on soft costs, including data connections and connection fees and suggested wired ethernet might be cost saving measure.
- Most EV Codes do not address standards for communications specifically. Ultimately, these considerations should be taken into consideration with overall building design and operation choices.

**Land Use Incentives**

- Updates to the EV Code could provide an opportunity for a jurisdiction reduce parking space requirements. For jurisdictions with parking minimums, this may have benefits in reducing developer costs, helping to address affordable housing impacts, reducing impervious surface areas and pollution generating surfaces (for surface parking applications) - encouraging less space dedicated to "car habitat" overall.
- In such a case, EV spaces count as two spaces. In several jurisdictions in California, land use codes permit parking spaces with installed EVSE to count as two spaces, providing for an allowed reduction in parking spaces (sometimes with a cap on the total percent reduction).
- Stockton, CA: "a reduction in required parking is permitted up to two required parking spaces for each electric vehicle charging space provided, up to a maximum reduction of 10 percent of the total required parking."

**Permitting**

- The City of Seattle determined that the costs of implementation are not anticipated to be significant relative to overall time and expense reviewing a development overall. Seattle did not identify additional resource requests associated with implementation the ordinance.
- A recent report on Reducing EV Infrastructure Costs by RMI considered a range of hardware, capacity, software, ADA compliance and other costs and noted that "soft costs" for things including permitting, communication between utilities and providers, easements (for public charging) and "future proofing" were, surprisingly, large drivers of EV infrastructure costs.

- California has taken efforts to streamline EV permitting processes and developed an Electric Vehicle Charging Station Permitting Guidebook (2019) as a result of legislation in 2015 (AB 1236) requiring improvements in the permitting processes. The legislation and guidebook outline a number of EVSE Friendly measures and best practices, including expedited permitting processes, checklists, administrative approvals, certain exemptions and other provisions.

**Table 2**: Electric Vehicle Charging Station Permit Streamlining Requirements & Best Practices

| | **AB 1236 Compliant (EVCS Friendly)** | **Not AB 1236 Compliant (Challenging to Deploy Charging)** |
|---|---|---|
| **Required by AB 1236** | Ordinance creating an expedited, streamlined permitting process for electric vehicle charging stations (EVCS) including level 2 and direct current fast chargers (DCFC) has been adopted | No permit streamlining ordinance; and/or ordinances that create unreasonable barriers to EVCS installation |
| | Checklist of all requirements needed for expedited review posted on Authority Having Jurisdiction (usually a city or county) website | No checklist for EVCS permitting requirements |
| | EVCS projects that meet expedited checklist are administratively approved through building or similar non-discretionary permit | Permitting process centered around getting a discretionary use permit first |
| | EVCS projects reviewed with the focus on health and safety | EVCS projects reviewed for aesthetic considerations in addition to building and electrical review |
| | AHJ accepts electronic signatures on permit applications* | Wet signatures required on one or more application forms |
| | EVCS permit approval not subject to approval of an association (as defined in Section 4080 of the Civil Code) | EVCS approval can be conditioned on the approval of a common interest association |
| | AHJ commits to issuing one complete written correction notice detailing all deficiencies in an incomplete application and any additional information needed to be eligible for expedited permit issuance | New issue areas introduced by AHJ after initial comments are sent to the station developer |
| **Best Practice** | Clear EVCS permitting process detailed on AHJ website | Permitting process not explained on AHJ website |
| | ZEV Infrastructure permitting ombudsperson appointed to help applicants through the entire permitting process | AHJ does not offer access to an expert who can support station developers through the entire permitting process |
| | Guidance documents for permitting and inspecting charging stations at single family home, multifamily home, workplace, public (L2 and DCFC), and commercial medium and heavy duty posted on AHJ website | Limited or no information online |
| | Pre-application meetings with knowledgeable AHJ staff are offered | Full permit package needs to be submitted to gain feedback from AHJ staff |
| | AHJ has published an ordinance or bulletin clarifying that a plug-in electric vehicle charging space counts as one or more parking spaces for zoning purposes | EVCS installation projects trigger a parking count review |
| | Concurrent reviews are made available for building, electrical (and planning, if deemed necessary) | Sequential permit reviews only |
| | Planning for ZEVs and supporting infrastructure is incorporated and prioritized within documents such as the general plan, capital improvement plan, climate action plan, and design guidelines | EV charging guidelines are not incorporated into planning documents |
| | EVCS are classified as an accessory use to a site, not as a traditional fueling station | AHJ considers charging stations as fueling stations, leading to additional zoning review |
| | AHJ has established/published timelines for EV permit application review that are expedited when compared to standard building permit review timelines in that jurisdiction. | AHJ does not have expedited permitting process for EV applications – resulting in standard project permitting timelines |
| | AHJ's expedited EV permit review process encourages permit reviewers to conditionally approve permits (aka "approved as noted") | AHJ does not encourage conditional approval of permits |

**Uncertainties:**

Looking forward, the EV marketplace and ecosystem is evolving rapidly and changes in mobility modes, charging behavior, building energy management, urban and rural requirements, and charging technologies (such as induction charging) will likely affect future use of EV infrastructure. Currently there appears to be a high level of uncertainty with many of these factors. A number of utility based EV studies are currently underway which will help to inform future investments of energy utilities and potential regulatory approaches. As more information becomes available, codes should be reviewed and updated to ensure that they are relevant and meaningful. Some uncertainties include:

- Autonomous vehicles and vehicle sharing
- Future total building electrical loads, total building power management
- Vehicle technology advancements
- Charging station user behavior
- Charging station use variables by location (urban in-city vs suburban vs rural commute)
- Charging technologies

## Recommendations

**1. Provide EV Ready spaces, not just EV Capable spaces**

It is clear from research that measures to "future proof" buildings for EV infrastructure are cost effective and are important to removing barriers for both current and future EV adoption. Costs for retrofits can be prohibitive and measures taken now to address new construction will help to stem the number of buildings requiring expensive retrofits in the future.

Particular attention to residential land uses is important as the majority of EV charging is expected to take place at home. In particular, attention to multifamily development is important to address a growing market segment in the Puget Sound region (which is consistent with UGA, infrastructure, mobility, environmental protection, livability, health and other regional goals and policies) and to help ensure more equitable investment in communities with more constrained access to EVs and infrastructure as well as higher levels of vehicle related emissions burden.

**2. Provide progressive but measured requirements**

Research clearly demonstrates the importance of EV Ready infrastructure in supporting access to EVs. Given uncertainties with user behavior, vehicle technology, charging technology, autonomous vehicles and other considerations, care should be exercised to avoid overbuilding infrastructure. On the other hand, given that buildings constructed today have a design life of 50 or more years, it is important to remove known barriers to growing demands wherever possible. It is currently not clear that 100% parking space electrification will be needed either in the mid or long term.

**3. Consider tiers and options for jurisdictions considering adoption**

Because jurisdictions have differing community goals and expectations, development standards and a range of other factors, consider providing a base EV Ready code which employs current leading practices, plus one or two tiers of measures which provide increased access. More specific code options could also be developed to address specific issues such as affordable housing, parking minimums or other aspects.

**4. Provide flexibility in meeting standards rather than outright exemptions**

Given uncertainty in the marketplace and evolving experience (on the part of design professionals, developers, contractors, land use planners, plans examiners, building officials, sustainability professionals, utility engineers and others) an approach that considers flexibility in meeting goals to maximize access and eliminate or reduce building and land use related barriers to EV adoption will more likely address constraints and contribute to learning more so than specific exemptions at this point in time. For example, allowing reductions based upon demonstrated circumstances for specific situations will contribute more to the body of knowledge and refinement of both EV installation strategies and code provisions.

**5. Regularly assess and update code requirements**

As experience is gained with new development projects, national and local studies and programs addressing existing development, measures should be taken to regularly assemble, evaluate and consider more current data to inform updates to code provisions. Regular monitoring and assessment will also help to identify unintended effects of code provisions in place. As the marketplace and technology is evolving rapidly, regular intervals for reporting, collaborative interagency review and other measures may be planned as a part of any code adoption process.

**6. Incorporate load management strategies into code approaches**

Load management strategies help to increase efficiency of electric capacity and have the potential to reduce some infrastructure related hard costs and provide flexibility for meeting future demand, while avoiding overbuilding infrastructure and stranded assets (as through dedicated EVSE circuits). Load management strategies could increase soft costs for EV infrastructure.

**7. Consider approaches to require upgrades to existing buildings over time**

Several studies, pilot projects and incentive programs address existing buildings. As charging station utilization, existing building infrastructure requirements and integrated building management are better understood, the requirements for upgrading existing building will be better understood. A measured approach to set in place future markers for EV readiness in existing building will help property owners and managers plan and organize future investments and identify cost recovery strategies, while increasing access to EV infrastructure.

## A Potential Approach

- **Single family**: require 1 EV Ready space per dwelling unit for single family, duplex and other individually metered projects
- **Multifamily:** require 20% or more EV Ready spaces as well as planned design for 100% of stalls and installed raceways for all inaccessible locations[9]. Panel capacity at 20%.

[9] Inaccessible locations include structural walls, concrete slabs, under asphalt and other similar circumstances where costs for future retrofit are greater than costs for installation with new construction.

- **Commercial:** require 10% or more EV Ready spaces as well as planned design for 100% of stalls and installed raceways for all inaccessible locations. Panel capacity at 10%
- **Substantial Alterations and Existing Buildings:** in the near term, establish incentives, technical assistance, EVSE manufacturer partnerships and other measures to increase voluntary adoption of EV ready measures in existing buildings. Establish mandatory future milestone requirements to signal future requirements and allow for planned capital investments. Require substantial alterations (as defined in code) to comply with EV Ready requirements.
- **Provide advance tiers and/or options for**:
  - EVSE installation. Installation of EVSE immediately provides capacity and provides a visible indication of a site's support of EV drivers. In addition, installed EVSE provides property owners and managers with practical experience in managing and operating EVSE.
  - Increased levels of EV Readiness. Provision of higher levels of EV readiness (>20%) supports more rapid adoption of EVs.
  - Parking reductions. Incentives for parking reductions supports both EV readiness and broader mobility objectives.
- **Allow for reductions in requirements** based upon prepared analysis by a qualified engineer, sustainability professional, certified energy manager, or other professionals demonstrating constraints, benefits and impacts of code compliance for a specific parcel and development type.
- **Establish monitoring, reporting, review and update intervals** at the time of adoption of authorizing ordinances to ensure codes stay present and embody continuous improvement principles.

## Appendices

- Code Summaries and Links
- Interviews Conducted
- Resources, References and Links

## EV Codes Summary Table and Links

See excel table

## Interviews Conducted

Interviewees

- Duane Jonlin, City of Seattle DCI
- Kelly O'Callahan, PSCAA
- Brad Shipley and Shane Hope, City of Edmonds
- Danielle Kievit, PSE
- Andrea Pratt, City of Seattle OSE
- Jim Blaisdell, Charge Northwest
- Matt Egan and Preston Kilman, ChargePoint
- Eric Smith, SEMA Connect

## Resources, References and Links

**Additional Codes, Laws and Incentives**

International Code Council (ICC) - International Code Council 2019 Group B Appeals

Washington State EV Charging Station Signage and Parking Penalty – RCW 46.08.185

Washington Public Fleet Electric Vehicle and Alternative Fuel Procurement (RCW 43.19.648)

US Department of Energy EERE - AFDC - Washington Laws and Incentives

**Guides**

Residential Electric Vehicle Charging: A Guide for Local Governments – City of Richmond, BC and BC Hydro

City of Atlanta EV Readiness Handbook

City of Chicago Installation of Vehicle Charging Stations at Multi-unit Dwellings

Exploring the Role of Cities in Electrifying Passenger Transportation (January 2020) - UC Davis Plug-in Hybrid & Electric Vehicle Research Center

**Load Management / Power Sharing**

Resources to Support Electric Vehicle Charging Infrastructure Implementation and Requirements – City of Richmond, BC and BC Hydro

**Permitting**

Electric Vehicle Charging Station Permitting Guidebook (July 2019), California Office of Business and Economic Development

**Electric Vehicle Strategic Plans**

Seattle City Light Transportation Electrification Strategy (2019)

Denver EV Action Plan (2020)

**Cost Studies**

Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco, prepared for the City and County of San Francisco, November 2016

Plug-in Electric Vehicle Infrastructure Cost-Effectiveness Report prepared for the City of Oakland, CA, November 2016

**Electric Highways**

West Coast Green Highway

**Washington EV Data**

Washington Department of Licensing EV population and title and registration data