**Summary of Recommendations:**

- Adding in exceptions we discussed at the last BFRW meeting.
    - An exception for if utility cannot provide 100% of capacity.
    - Allowing R-2 to calculate based on dwelling units or parking spaces.
    - Charging infrastructure that exceeds requirements for a greater category can count towards the requirements of a lesser.
- Small changes to definitions to have them better align with other codes or the current code and to be more accurate.
    - Removing the definition for EV Charger because it's inaccurate and the one or two times it was actually used in the code can be better served by EVSE.
- Changing the names of terms to match the IECC/market and making the formatting consistent throughout the section.
    - *EV Charging Stations* to *EVSE spaces*.
    - *EV Ready parking spaces* to *EV ready spaces*.
    - *EV Capable parking spaces* to *EV capable spaces*.
- Small wording tweaks to make things more consistent or use more accurate terminology.
- A few grammatical changes.

**Analysis**

On the following two pages, I provided a comparison of the current code to this proposal to show an estimate of how much this proposal reduces the total electrical load from EV charging infrastructure. Commercial panels can be purchased reconditioned or brand new, they can also be custom made and can cost tens of thousands of dollars (even when buying used or reconditioned). The cost for increased EV capable stalls is likely outweighed by the cost reduction in panel size needed to meet initial minimum requirements. Although these savings will turn into cost increases when EV capable spaces are upgraded to EV ready spaces in the future and will require panels and outlets to be installed.

Note: The analysis and estimates are for informational purposes and were not performed by a professional electrician or account for project specific details.

**Current Code and BFRW Proposal Comparison**

| Code | Dwelling Units | Parking Ratio | Total Parking Spaces | EVSE Spaces | Ready Spaces | Capable Spaces | Total EV Spaces | EV Spaces to DU[a] | Nights of Weekly Charging Per DU[b] | Total Load (all) (amps) | Total Load w/o Capable (amps) | Total Load Reduction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BFRW | 12 | 1 | 12 | 2 | 2 | 5 | 9 | 0.75 | 5.3 | 360 | 160 | 56% |
| Current | 12 | 1 | 12 | 2 | 3 | 2 | 7 | 0.58 | 4.1 | 280 | 200 | 29% |
| BFRW | 12 | 1.5 | 18 | 2 | 2 | 8 | 12 | 1.00 | 7.0 | 480 | 160 | 67% |
| Current | 12 | 1.5 | 18 | 2 | 5 | 2 | 9 | 0.75 | 5.3 | 360 | 280 | 22% |
| BFRW | 12 | 2 | 24 | 3 | 3 | 10 | 16 | 1.33 | 9.3 | 640 | 240 | 63% |
| Current | 12 | 2 | 24 | 3 | 6 | 3 | 12 | 1.00 | 7.0 | 480 | 360 | 25% |
| BFRW | 24 | 1 | 24 | 3 | 3 | 10 | 16 | 0.67 | 4.7 | 640 | 240 | 63% |
| Current | 24 | 1 | 24 | 3 | 6 | 3 | 12 | 0.50 | 3.5 | 480 | 360 | 25% |
| BFRW | 24 | 1.5 | 36 | 4 | 4 | 15 | 23 | 0.96 | 6.7 | 920 | 320 | 65% |
| Current | 24 | 1.5 | 36 | 4 | 9 | 4 | 17 | 0.71 | 5.0 | 680 | 520 | 24% |
| BFRW | 24 | 2 | 48 | 5 | 5 | 20 | 30 | 1.25 | 8.8 | 1200 | 400 | 67% |
| Current | 24 | 2 | 48 | 5 | 12 | 5 | 22 | 0.92 | 6.4 | 880 | 680 | 23% |
| BFRW | 36 | 1 | 36 | 4 | 4 | 15 | 23 | 0.64 | 4.5 | 920 | 320 | 65% |
| Current | 36 | 1 | 36 | 4 | 9 | 4 | 17 | 0.47 | 3.3 | 680 | 520 | 24% |
| BFRW | 36 | 1.5 | 54 | 6 | 6 | 22 | 34 | 0.94 | 6.6 | 1360 | 480 | 65% |
| Current | 36 | 1.5 | 54 | 6 | 14 | 6 | 26 | 0.72 | 5.1 | 1040 | 800 | 23% |
| BFRW | 36 | 2 | 72 | 8 | 8 | 29 | 45 | 1.25 | 8.8 | 1800 | 640 | 64% |
| Current | 36 | 2 | 72 | 8 | 18 | 8 | 34 | 0.94 | 6.6 | 1360 | 1040 | 24% |
| BFRW | 100 | 1.5 | 150 | 15 | 15 | 60 | 90 | 0.90 | 6.3 | 3600 | 1200 | 67% |
| Current | 100 | 1.5 | 150 | 15 | 38 | 15 | 68 | 0.68 | 4.8 | 2720 | 2120 | 22% |

[a] Ratio of EV charging infrastructure spaces to number of dwelling units. The exception we suggest for R-2 to calculate based on dwelling units would essentially cap this at ~0.6-0.7 ratio (10% EVSE rounded up + 10% EV ready rounded up + 40% EV capable rounded up).

[b] Calculates maximum possible charging spaces (eventually ready and capable spaces are upgraded). Assuming each space is only used once per night, no charging per day. BFRW proposal increases the effective maximum capacity for charging through the lifecycle of the building.

**Average Total Load Comparison between Current Code and BFRW Proposal**

| Row Labels | Avg of Total Load (all) (amps) | Avg of Total Load w/o Capable (amps) |
|---|---|---|
| **BFRW** | **1192** | **416** |
| 12 | 493.33 | 186.67 |
| 24 | 920 | 320 |
| 36 | 1360 | 480 |
| 100 | 3600 | 1200 |
| **Current** | **896** | **688** |
| 12 | 373.33 | 280 |
| 24 | 680 | 520 |
| 36 | 1026.666667 | 786.67 |
| 100 | 2720 | 2120 |
| **Grand Total** | **1044** | **552** |

Based on my basic modeling, the current code on average results in a total electrical load of 896 amps when meeting the minimum requirements of the code. The BFRW proposal will result in an average total electrical load of 416 amps. This is an average reduction of 480 amps or ~53.5% savings. If all EV capable spaces are upgraded to EV ready (or the EV capable spaces are required to be included in capacity sizing) under the BFRW proposal, then this will result in an average ~133% increase in electrical load.

**Chapter 202**

**AUTOMATIC LOAD MANAGEMENT SYSTEM (ALMS).** A system designed to manage electrical load across one or more *EVSE spaces ~~charging stations~~* and *EV ~~R~~ready ~~parking~~ spaces*.

**ELECTRIC VEHICLE (EV) CAPABLE ~~PARKING~~ SPACE.** A parking space that is provided with raceways~~a conduit, electrical panel and load capacity~~ to support future installation of ~~EV charging equipment~~*EVSE*.

**~~ELECTRIC VEHICLE (EV) CHARGER.~~** ~~Off-board charging equipment used to charge electric vehicles.~~

**ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) ~~CHARGING STATION~~SPACE.** ~~*EV Ready parking space*~~A parking space that is provided with installed *EVSE ~~charger~~*.

**ELECTRIC VEHICLE (EV) READY ~~PARKING~~ SPACE.** A parking space that is provided with a branch circuit and a receptacle outlet ~~allowing charging of electric vehicles~~that will support the future installation of *EVSE*.

**ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE).** ~~The conductors~~Equipment for plug-in charging, including the ungrounded, grounded, and equipment grounding conductors, and the electric vehicle connectors, attachment plugs, personnel protection system, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises wiring and the electric vehicle.

**Section ~~429~~—Electric vehicle charging infrastructure.**

**429.1 General.** The provisions of this section shall apply to the construction of new buildings and accessory structures, including parking lots and parking garages.

*Electric vehicle supply equipment* (*EVSE*) shall be installed in accordance with applicable requirements of chapter 19.28 RCW and the National Electrical Code, Article 625.

EXCEPTION: Electric vehicle charging infrastructure is not required if any of the following conditions are met:

1. There is no public utility or commercial power supply.
2. Dwelling units without garages or other on-site parking.

~~2.~~ Where the local electric distribution entity certifies in writing that it is not able to provide 100 percent of the necessary distribution capacity within 2 years after the estimated certificate of occupancy date, the required EV charging infrastructure shall be reduced based on the available existing electric distribution capacity.

**429.2 Electric vehicle (EV) charging infrastructure.** Buildings and accessory structures shall be provided with ~~*EV*~~*electrical vehicle supply equipment (EVSE) spaces ~~charging stations~~*, ~~*EV R*~~*electric*

**Commented [PH1]:** Changing the naming of the spaces to match IECC terminology and have consistent case usage throughout.

**Commented [PH2]:** Better aligns with 429.2.2. Raceways are a broader term that include conduits. Also better aligns with IECC Appendix CG.

**Commented [PH3]:** Technically an off-board charger and EVSE are two different things. Direct current fast chargers are off-board chargers, level 2 EVSE are not. The code is only mandating essentially level 2 EVSE so I don't think the EV charger definition is necessary and technically inaccurate.

**Commented [PH4]:** Changing this to match the same definition in NFPA 70-NEC (2023) 625. Which it seems it was originally based on.

**Commented [PH5]:** From the 2024 IECC Appendix RE.

*vehicle (EV) r*eady ~~*parking*~~ *spaces*, and ~~*EV*~~ *electric vehicle (EV) capable* ~~*parking*~~ *spaces* in accordance with Table 429.2. Calculations shall be rounded up to the nearest whole number. Where one shared parking facility serves multiple building occupancies, parking spaces that are designated separately for each occupancy shall comply with the requirements for that occupancy. Parking spaces that are shared between occupancies shall comply with which occupancy has the greater requirement or the required number of *EVSE spaces*, *EV ready spaces*, and *EV capable spaces* shall be determined proportionally based on the floor area of each building occupancy. ~~Where a building contains more than one occupancy, the electric vehicle charging infrastructure percentages of Table 429.2 shall be applied to the number of spaces required for each occupancy.~~

EXCEPTIONS: 1. Except for Group A, Group E, and Group M occupancies, on-site parking with less than 10 parking spaces shall not be required to comply with Section 429.2.

2. Group A, Group E, and Group M occupancies shall comply with one of the following, whichever is greater:

2.1. The provisions of Section 429.2 shall apply only to designated employee parking spaces.

2.2. One of each 200 parking spaces or fraction thereof shall be an *EV r~~R~~eady space*. One of each 200 parking spaces or fraction thereof shall be an *EVSE space* ~~Charging Station~~.

3. For R-2 buildings, the requirements of this section shall be based on the total number of *dwelling units* or the total number of parking spaces, whichever is less.

4. Installed *EVSE spaces* that exceed the minimum requirements of this section may be used to meet the minimum requirements for *EV ready spaces* and *EV capable spaces*.

5. Installed *EV ready spaces* that exceed the minimum requirements of this section may be used to meet the minimum requirements for *EV capable spaces*.

**Commented [PH6]:** IECC Appendix CG determines requirements for mixed use parking by floor area of each occupancy. I'm trying to expand this to provide more flexibility as some mixed use may have a majority of parking spaces serve commercial during the day and residential at night.

**Commented [PH7]:** Note that RCW 19.27.540(2)(b) says that for occupancies A, E, and M the requirements apply only to employee parking spaces.

**Commented [PH8]:** From 2024 IECC CG101.2.1.

This addresses an issue where if apartments provide more parking spaces than dwelling units they can end up having to put in more EV charging infrastructure spaces than they have dwelling units. Based on where current adoption is in the state, I think this is unnecessary and can be reevaluated in future code cycles.

**Commented [PH9]:** 2024 IECC CG101.1.1 (2 and 3).

**Table 429.2**

**Electric Vehicle Charging Infrastructure**

| **Occupancy** | **Number of EV~~SE~~ Spaces ~~Charging Stations~~** | **Number of EV~~-~~Ready ~~Parking~~ Spaces** | **Number of EV~~-~~Capable ~~Parking~~ Spaces** |
|---|---|---|---|
| Group A, B, E, F, H, I, M, and S occupancies | 10% of total parking spaces | 10% of total parking spaces | 10% of total parking spaces |
| Group R occupancies | | | |

| | | | |
|---|---|---|---|
| Buildings that do not contain more than two dwelling units | Not required | One for each dwelling unit | Not required |
| Dwelling units with private garages | Not required | One for each dwelling unit | Not required |
| All other Group R occupancies | 10% of total parking spaces | 10%~~25%~~ of total parking spaces | 40%~~10%~~ of total parking spaces |

**429.2.1 EV~~SE charging stations~~ and EV ~~-R~~ready ~~parking~~ spaces.** A minimum of 40-ampere dedicated 208/240-volt branch circuit shall be installed for each *EV ~~R~~ready ~~parking~~ space* and each *EV~~SE space~~ ~~Charging Station~~*. The branch circuits shall terminate at a receptacle outlet or *EV~~SE charger~~* in close proximity to the proposed location of the *EV ~~R~~ready ~~parking~~ space* or the *EV~~SE space~~ ~~Charging Station~~*.

**429.2.2 EV ~~-Cc~~apable ~~parking~~ spaces.** A listed raceway capable of accommodating a minimum of 40-ampere dedicated 208/240-volt branch circuit shall be installed for each *EV~~- Cc~~apable ~~parking~~ space*. A continuous raceway shall be installed between an enclosure, end cap, or outlet located within close proximity of the ~~*electric vehicle (EV) capable parking*~~ *spac*e and future or existing panelboard or switchboard location(s).~~The raceway shall terminate into a cabinet, box or other enclosure in close proximity to the proposed location of the EV-Capable parking space.~~ Raceways and related components that are planned to be installed underground, and in enclosed, inaccessible or concealed areas and spaces, shall be installed at the time of original construction.

**429.3 Electrical room(s) and equipment.** Electrical room(s) ~~and/~~or areas for dedicated electrical equipment shall be sized to accommodate the requirements of Section 429.2.1 through 429.2.2.

The electrical service and the electrical system, including any on-site distribution transformer(s), shall have sufficient capacity to simultaneously charge all EVs at all required *EV~~SE spaces Charging Stations~~*, and *EV ~~R~~ready ~~parking~~ spaces*~~, and EV-Capable parking spaces~~ at a minimum of 40-amperes each.

EXCEPTION: Automatic Load Management System (ALMS) may be used to adjust the maximum electrical capacity required for the *EV~~SE spaces Charging stations~~* and *EV~~- R~~ready ~~and EV-Capable parking~~ spaces*. The ALMS must be designed to allocate charging capacity among multiple current or future *EV~~SE Charging Stations~~* at a minimum of 16 amperes per *EV~~SE~~* charging connector ~~charger~~.

**429.4 Electric vehicle charging infrastructure for accessible parking spaces.** Ten percent of the accessible parking spaces, rounded to the next whole number, shall be *EV~~SE spaces Charging Stations~~*. An a~~A~~dditional 10 percent of the accessible parking spaces, rounded to the next whole number, shall be *EV ~~R~~ready spaces*. Not fewer than one for each type of EV charging system shall be accessible.

The electric vehicle charging infrastructure may also serve adjacent parking spaces not designated as accessible parking. A maximum of 10 percent of the accessible parking spaces, rounded to the

next whole number, are allowed to be included in the total number of electric vehicle ~~parking spaces~~ charging infrastructure required under Section 429.2.

**Commented [PH10]:** Changing this to match how the three types of spaces are referred to earlier in 429.

**Section 1106—Parking and passenger loading facilities.**

**1106.7 Location.** Accessible parking spaces shall be located on the shortest accessible route of travel from adjacent parking to an accessible building entrance. In parking facilities that do not serve a particular building, accessible parking spaces shall be located on the shortest route to an accessible pedestrian entrance to the parking facility. Where buildings have multiple accessible entrances with adjacent parking, accessible parking spaces shall be dispersed and located near the accessible entrances. Wherever practical, the accessible route shall not cross lanes of vehicular traffic. Where crossing traffic lanes is necessary, the route shall be designated and marked as a crosswalk.

EXCEPTION: 1. In multilevel parking structures, van accessible parking spaces are permitted on one level.

2. Accessible parking spaces shall be permitted to be located in different parking facilities if substantially equivalent or greater accessibility is provided in terms of distance from an accessible entrance or entrances, parking fee and user convenience.

This revision references the NWPCC Power Plan data to align the current and 'anticipated' levels of EV stock. With this approach, Table 429.2 has a specific reference that gets updated every 5 years to align immediate (5% current, set by statute at minimum of 10%), near-term (current code cycle = 5 year = 19.4% = 10+10%), and long-term (20 year = 57.1% = 10+10+40%).

## Electrification

For this case, sales of electric vehicles in the LDV category are modeled to increase along a much steeper trajectory than the Reference Case, especially for the states of Oregon and Washington which may be influenced by state policy regarding electric vehicles. The following tables display the percent of sales and stock that are electric for the case.

**Market Share of Electric Vehicle Sales in LDV Category - High Electric Case**

| Region | Market Share | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|
| ID | % Sales Electric | 1.3 | 6.9 | 30.0 | 71.8 | 94.0 | 99.7 |
| MT | % Sales Electric | 2.0 | 10.6 | 40.7 | 80.4 | 96.0 | 99.5 |
| OR | % Sales Electric | 5.8 | 37.3 | 86.2 | 99.7 | 99.7 | 99.7 |
| WA | % Sales Electric | 6.4 | 39.6 | 99.7 | 99.7 | 99.7 | 99.7 |
| Total | % Sales Electric | 5.3 | 33.0 | 83.4 | 94.5 | 98.6 | 99.6 |

**Percent of Electric Vehicle Stock in LDV Category - High Electric Case**

| Region | Market Share | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 |
|---|---|---|---|---|---|---|---|
| ID | % Stock Electric | 0.2 | 0.9 | 4.5 | 14.9 | 29.8 | 43.6 |
| MT | % Stock Electric | 0.2 | 1.1 | 5.6 | 16.4 | 29.7 | 41.7 |
| OR | % Stock Electric | 0.9 | 4.8 | 17.1 | 32.0 | 44.5 | 54.5 |
| WA | % Stock Electric | 0.9 | 5.1 | 19.4 | 35.0 | 47.3 | 57.1 |
| Total | % Stock Electric | 0.8 | 4.3 | 15.9 | 30.4 | 43.1 | 53.7 |

10% EVSE-installed + 10% EV-ready = 20% also exceeds the RCW 19.27.540 requirements for electrical room size. EV-capable parking spaces are considered in the required electrical room size, but not installed electrical service and electrical system requirements.

PDF **RCW 19.27.540**

**Electric vehicle infrastructure requirements—Rules.**

(1) The building code council shall adopt rules for electric vehicle infrastructure requirements. Rules adopted by the state building code council must consider applicable national and international standards and be consistent with rules adopted under RCW **19.28.281**.

(2)(a) Except as provided in (b) of this subsection, the rules adopted under this section must require electric vehicle charging capability at all new buildings that provide on-site parking. Where parking is provided, the greater of one parking space or ten percent of parking spaces, rounded to the next whole number, must be provided with wiring or raceway sized to accommodate 208/240 V 40-amp or equivalent electric vehicle charging. Electrical rooms serving buildings with on-site parking must be sized to accommodate the potential for electrical equipment and distribution required to serve a minimum of twenty percent of the total parking spaces with 208/240 V 40-amp or equivalent electric vehicle charging. Load management infrastructure may be used to adjust the size and capacity of the required building electric service equipment and circuits on the customer facilities, as well as electric utility-owned infrastructure, as allowed by applicable local and national electrical code. For accessible parking spaces, the greater of one parking space or ten percent of accessible parking spaces, rounded to the next whole number, must be provided with electric vehicle charging infrastructure that may also serve adjacent parking spaces not designated as accessible parking.

(b) For occupancies classified as assembly, education, or mercantile, the requirements of this section apply only to employee parking spaces. The requirements of this section do not apply to occupancies classified as utility or miscellaneous.

(c) Except for rules related to residential R-3, the required rules required under this subsection must be implemented by July 1, 2021. The rules required under this subsection for occupancies classified as residential R-3 must be implemented by July 1, 2024.

(3)(a) The rules adopted under this section must exceed the specific minimum requirements established under subsection (2) of this section for all types of residential and commercial buildings to the extent necessary to support the anticipated levels of zero emissions vehicle use that result from the zero emissions vehicle program requirements in chapter **70A.30** RCW and that result in emissions reductions consistent with RCW **70A.45.020**.

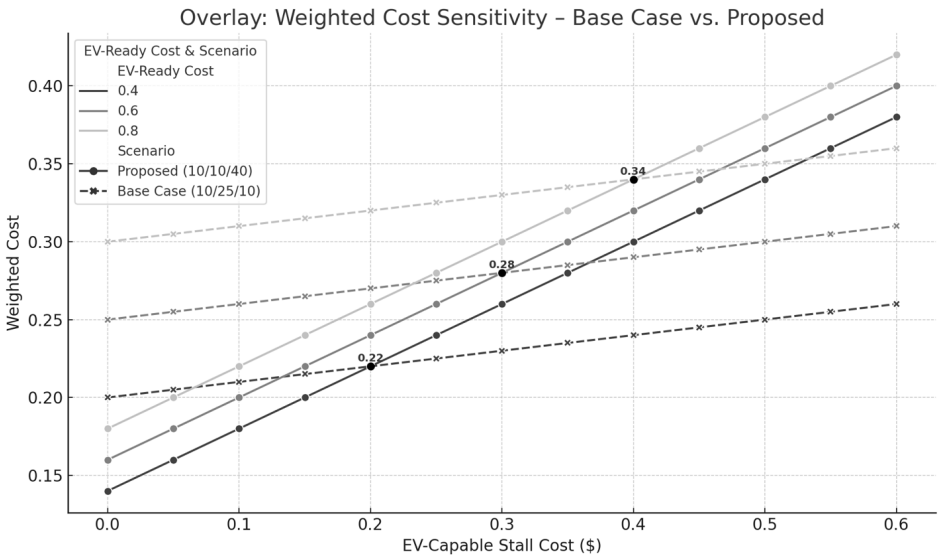
(b) The rules required under this subsection must be implemented by July 1, 2024, and may be periodically updated thereafter.

[ **2021 c 300 s 4**; **2019 c 285 s 18**; **2009 c 459 s 16**.]

These amendments argue a 2025 / 2030 / 2045 mix for EV / EV-ready / EV-capable of:

10% / 10% / 40% from current 10% / 25% / 10%.

The sensitivity chart below visualizes the base case vs. proposed case (EV-required vs. EV-ready vs. EV-capable). Actual costs can be applied to this simple model for first-cost comparisons.




For example:

EV-required = $1.00 cost (normalized)

EV-ready = $0.80, $0.60, or $0.40 cost (relative)

EV-capable = $0.00 to $0.60 cost (relative)

The intersections are the 'break even' costs to the existing base case (10/25/10). Real cost data should be requested from developers to populate the model.