



ENERGY STAR Certified Homes

Preparing for EV-Ready ENERGY STAR Homes

May 17, 2017



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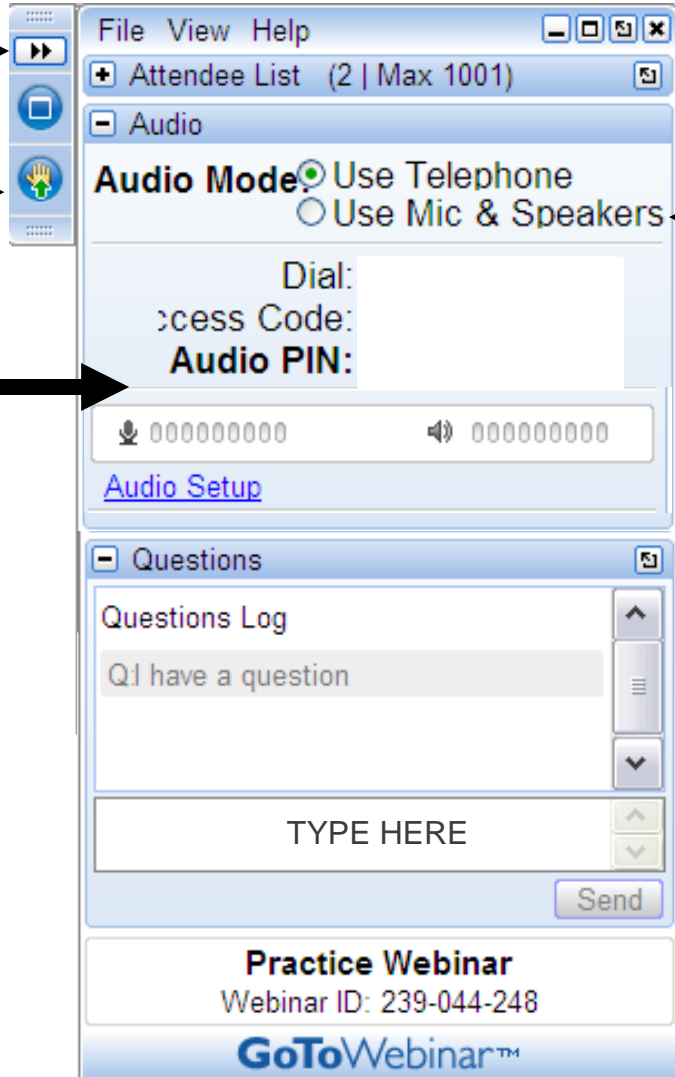
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Learning Objectives

- Learn about the electric vehicle (EV) market and key trends.
- Gain understanding of the state and local codes and regulations that support electric infrastructure.
- Learn about technical requirements for EV-ready construction and cost-savings opportunities.
- Hear about builders' perspectives related to EV-ready construction.
- Get your questions answered!



Agenda

2:00 **Welcome**

2:05 **ENERGY STAR EV Spec**
Peter Banwell, EPA



2:10 **EV Market & State/Local Code Alignment**
Ed Pike, Energy Solutions



2:30 **Results of EV Market Assessment**
John Morris, D+R International

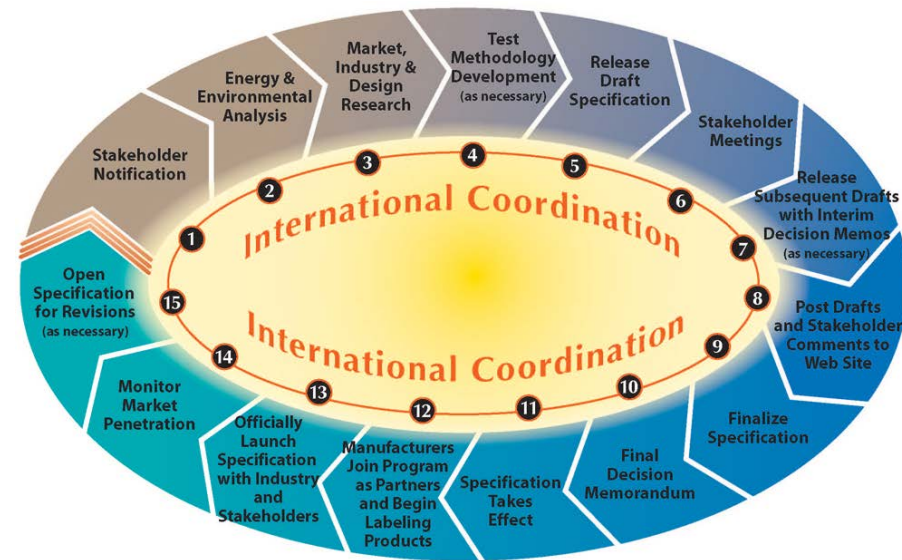


2:45 **Q&A**



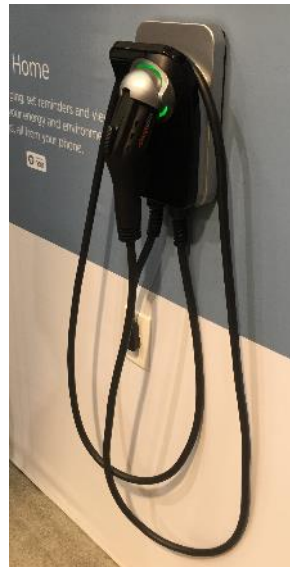
ENERGY STAR EVSE Specification Development

Event	Date
<i>Scoping Report Published</i>	<i>September 2013</i>
<i>EVSE Specification Development Launch and Draft 1 Test Method Published</i>	<i>June 2015</i>
<i>Draft 2 Test Method Published</i>	<i>October 2015</i>
<i>Draft 1 Specification and Draft 3 Test Method Published</i>	<i>March 2016</i>
<i>Draft 2 Specification and Final Draft Test Method Published</i>	<i>August 2016</i>
<i>Final Draft Specification and Final Test Method Published</i>	<i>December 2016</i>
<i>Final Specification Effective</i>	<i>December 27, 2016</i>



ENERGY STAR Electric Vehicle Chargers

- *Level 1 and Level 2 AC EVSE are included in the scope of the Version 1.0 EVSE Specification:*
 - **Level 1** has an input voltage nominally 120 V AC and maximum output current less than or equal to 16 amp AC
 - **Level 2** has an input voltage range from 208 to 240 V AC and maximum output current less than or equal to 80 amp AC





Additional Resources

Program details, qualified product list:

- <https://www.energystar.gov/products/other/evse>

EPA/Volkswagen settlement and plans

- www.epa.gov/vw
- www.electrifyamerica.com

ENERGY STAR® EV Charging Infrastructure Webinar



gywst/Flickr

Ed Pike, P.E.,
Senior Engineer

May 17, 2017

Energy Solutions background

Energy Solutions' mission is to create large-scale environmental benefits for our clients by implementing market-based solutions and developing policies that contribute to these goals.

- Energy Solutions has provided research and/or program implementation for over 100 energy efficiency measures
- Founded in 1995
- 100 employees in Oakland and Orange California, Boston, Portland
- Employee-owned
- Clients and customers served:
 - Energy and water utilities
 - California and other State agencies
 - Local and regional government agencies
 - Federal and international government agencies
 - NGOs
 - Private sector: retail and commercial

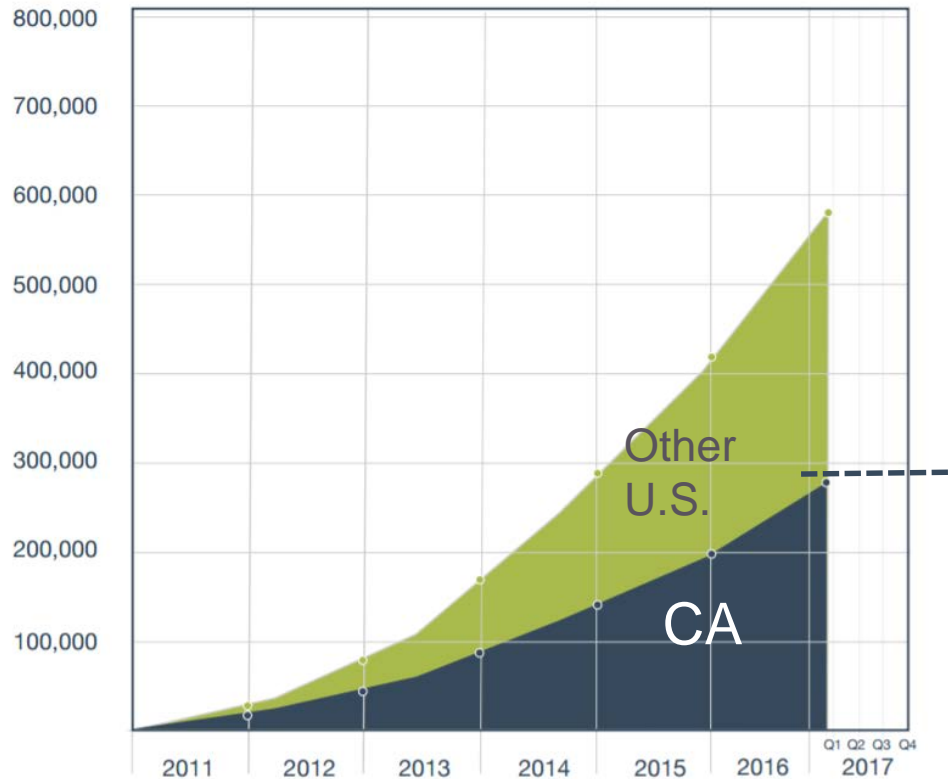


WHY INCLUDE EV INFRASTRUCTURE IN NEW CONSTRUCTION?



EV Sales Ramping Up

US & CA EV Cumulative Sales



CA Goals Require >15x increase in cumulative sales by 2030

CA EV Status & Goals (Vehicles on the Road)	
2017, current	>275k ¹
2025, goal	1.5M ²
2030, goal	4.3M ³

Sources: (Figure, 1) The California Plug-In Electric Vehicle Collaborative (2) Executive Order B-16-2012 – includes hydrogen fuel cells (3) ARB draft Scoping Plan Update 2030 goals, which assumes the implementation of ARB’s Mobile Source Strategy, Cleaner Technologies and Fuels Scenario



Cost Savings

- EV infrastructure in new construction can reduce cost:
 - Avoid costly potential retrofits to electrical panels and service
 - Avoid potential cost of breaking and repair of hardscape
 - Reduce soft costs (permitting, inspection, project management, etc.)



Example EV Infrastructure Cost-Effectiveness (per EV parking space)

	New Construction Cost	Retrofit Cost	Potential Cost Savings
City of Oakland, Surface Parking, Two EV Charging Full Circuits	\$1,300	\$6,300	\$5,000
San Francisco Large Enclosed Garage, 12 EV Charging Full Circuits	\$900	\$2,400	\$1,500

Costs estimates include:

- electrical panel capacity, raceway, wire, breakers, termination point
- for surface parking, trenching
- breaking of concrete/ asphalt and repairs as needed for retrofits.
- permits, fees, overhead, profit

Not included:

- any required upgrades to main electrical service for commercial buildings
- any step down transformer (480 V to 240 V) and related hardware if required for medium/large commercial buildings



Source: Energy Solutions cost-effectiveness studies funded by California Energy Commission, City of Oakland and Pacific Gas & Electric.

CALIFORNIA BUILDING CODES



California Green Building Code



2016 CALIFORNIA GREEN BUILDING STANDARDS CODE

CALGreen® NEW 2016 CODE
EFFECTIVE JANUARY 1, 2017

- Located in Title 24, Part 11
- Adopted by Building Standards Commission, Department of Housing and Community Development, other agencies
- Sets state mandatory standards
- Also includes a “voluntary” section
 - Voluntary section provides a model code that becomes mandatory if adopted at the local level
 - Local agencies can also adopt their own tailored amendments



Single Family Residential



	CALGreen
Electrical panel capacity; Raceway	Mandatory
Wiring	Voluntary



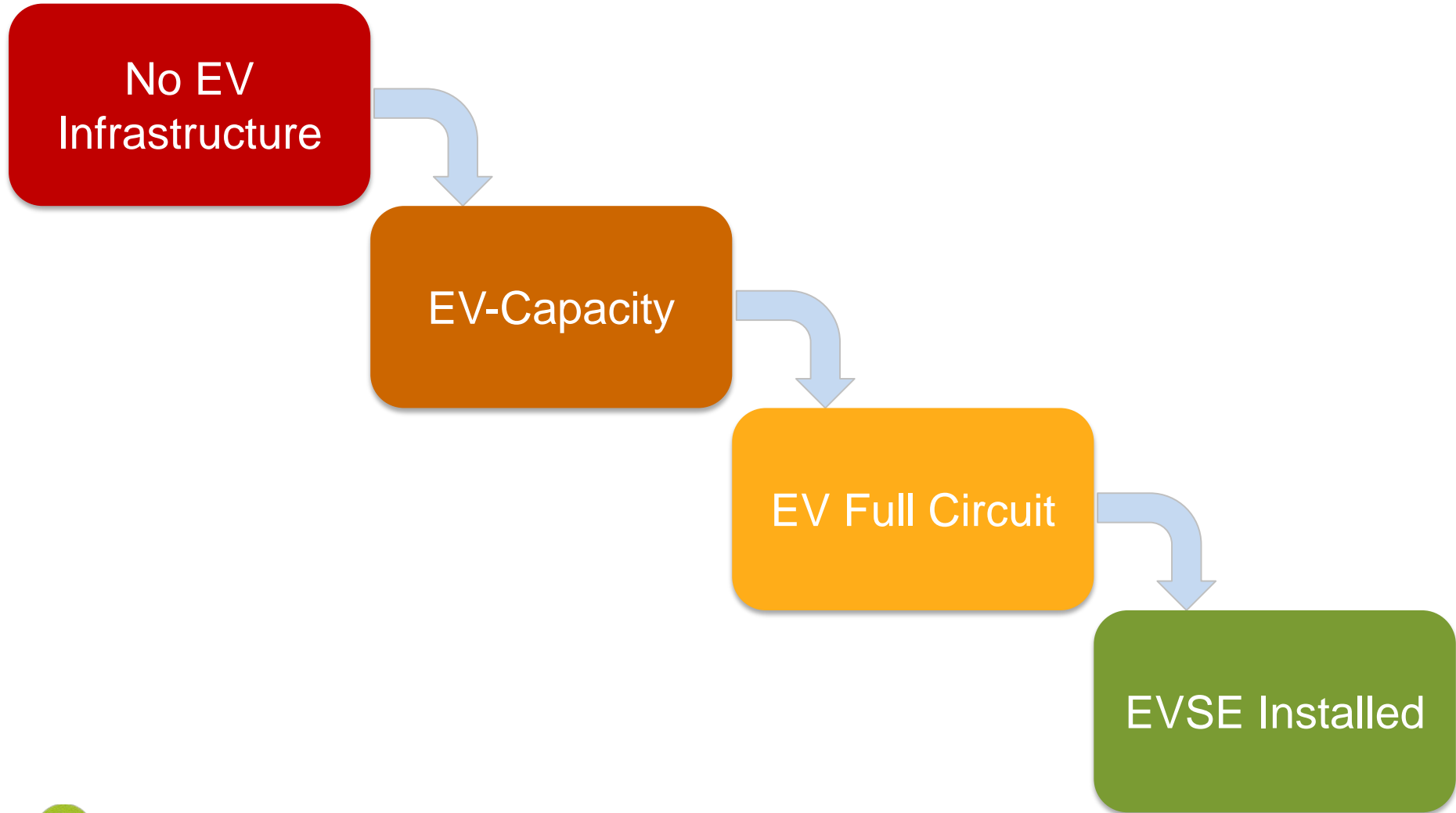
CALGreen Multifamily

	Multifamily	
	Mandatory	Voluntary
Minimum threshold for standards to be effective	17 units	17 units
Percent of new parking spaces with EV Capacity	3%	5%

- Amendments to multi-family building code are required by the 2016 California ZEV Action Plan.
- The CALGreen mandatory non-residential code requires that buildings with 10 or more parking spaces have 6% of spaces with EV capacity; and the voluntary code levels are up to 10%.



Stages of EV Infrastructure



Details

EV-Capacity

Rational: Provide certain hard-to-retrofit elements while minimizing up-front cost.

Electric Panel Capacity – Under CALGreen, electrical panels must have space and electrical capacity to accommodate 208/240 V, 40-amp circuits and electrical supply system must have similar capacity.

Raceway (conduit) – Raceway that will be difficult to access or alter after construction (e.g. enclosed within walls or pavement, etc.) must be installed during construction. In some cases building codes require that all raceway must be installed.



Details

EV-Ready (Full Circuit)

Rational: Minimize total costs and additional barriers to installing EVSE. Several local building codes such as Fremont, Oakland and San Francisco require EV charging full circuits at 10% of new multi-family parking spaces.

Full Circuit – Full circuits are ready for the addition of electric vehicle supply equipment. Full circuit installations include 208/240V, 40-amp panel capacity, raceway, wiring, receptacle, and overprotection devices similar to a dryer circuit. For multi-family, raceway can often be shared by more than one circuit.



Details

EVSE Installed

- **Rational:** Maximize access to EV charging in buildings/locations experiencing high demand. A few local codes require EVSE installation at some parking spaces, though in general this is left to builder or occupant's discretion.



Design for Accessibility

- California code accessibility requirements apply to EVSE and associated parking for specific buildings
 - Details are listed in Title 24 Chapters 11A and 11B
- Standards for parking spaces with accessible EV charging include slope, vertical clearance, path of travel, dimensions
- Equipment standards for EVSE
- In practice, a dual-head EVSE is often shared between an accessible and non-accessible EV parking space



NATIONAL ELECTRIC CODE



National Electric Code Article 625

- Scope includes:
 - EVSE
 - Electric circuits for EVSE
 - EV loads are treated as “continuous loads”, and circuits must be rated at 125% of load
 - Input cord to EVSE and output cord to EV
 - Specifications for plug and cord connected EVSE
 - See Article 625 for additional details



THANK YOU

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Senior Engineer

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Making ENERGY STAR Certified Homes EV Ready

Northwest Perspectives on Electric Vehicles and New Home Construction

John Morris
Vice President Market Development
D+R International



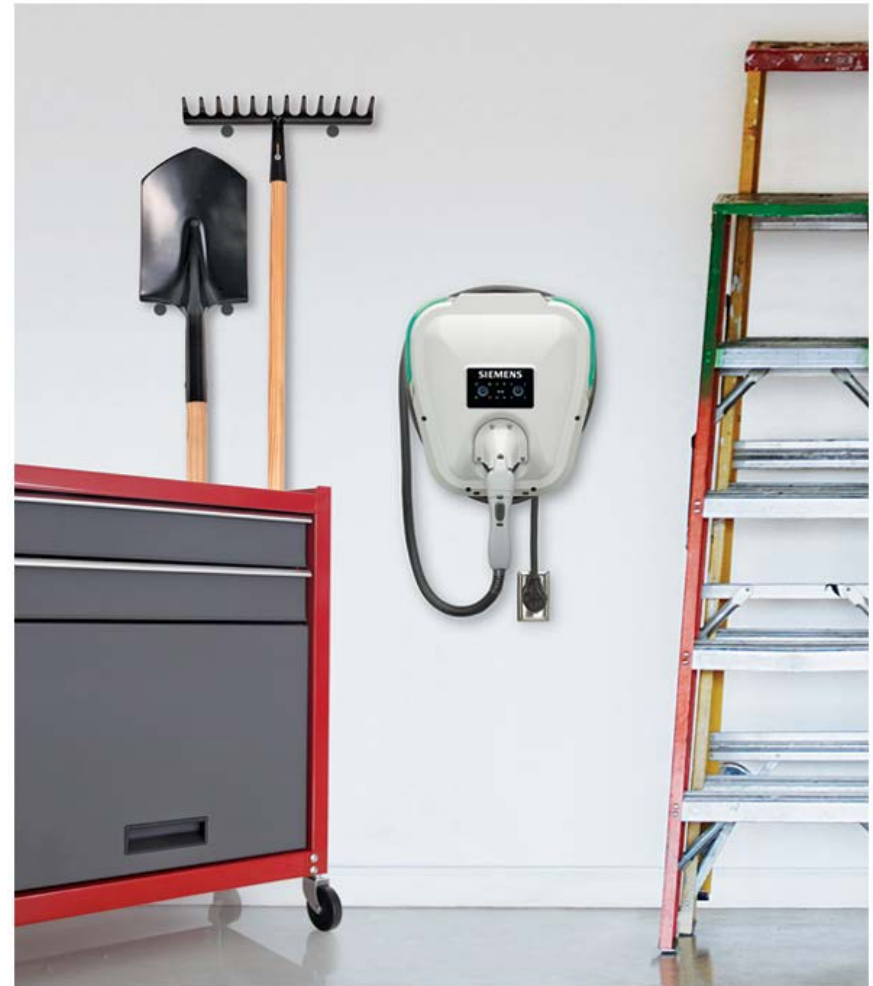
- **John Morris leads the EV Practice.**
- **John Morris represents D+R International on the board of Directors of Forth- (Formerly Drive Oregon)**
- **John was a strategic advisor on the first EV Bulk Buy Campaign in the State of Oregon.**
- **John designed and implemented the Northwest ENERGY STAR Homes program from 2006-2008.**



- In July of 2016 we produced a report for NEEA that was designed to articulate the potential implications of electric vehicle charging on residential new home construction in the NW.
- The report included the following components
 - EV Policy Snapshot
 - EV Utility Engagement
 - EV Residential New Construction Builder Interviews



- **240V 40 amp dedicated breaker**
- **240V dedicated socket**
- **Installed in garage or on the property.**
- **You are then “ready” to plug in the EV charger.**



- **Geographic Coverage**
 - W. & E. Washington
 - W. & E. Oregon
- **Number of Builders Interviewed**
 - Outreach to 20 builders with the goal of securing interviews with between 3-7 builders overall
 - 6 builders were willing to be interviewed
- **Builder Type**
 - Production
 - Custom
 - Single Family
 - Town Home
 - Multi-Family
- **Construction Programs**
 - ENERGY STAR
 - LEED
 - 5 STAR Built Green
 - Net Zero
 - Passive Home



- **One builder is constructing 100% EV and PV Ready Homes.**
- **3 builders have noticed an increasing interest in homes to come with battery storage**
- **Average price to make homes EV Ready was \$200**
- **Builders on the I-5 Corridor are more likely to build EV Ready Homes**



- **Some builders have been constructing EV Ready for the past 4 years.**
- **1 builder is constructing homes that generate power on site to charge the vehicles.**
- **2 builders are not building EV Ready Homes. Due to lack of requests by customers for this addition and cost to imbed EV Ready for all new homes being built.**



- **Legislative initiatives in WA and OR will potentially open up a path forward for utilities to participate in electrification of transportation.**
- **Utilities will see tremendous value in having customers charging at home and in the evening hours.**
- **Utilities will increase education and awareness of EV for their customers.**
- **Customers will begin to expect new homes to be EV ready.**
- **Builders can expect an increase in interest for EV/PV and Storage capable homes in certain regions.**

Contact Information

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Q&A

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Upcoming webinars

Webinar	Date
Preparing for ENERGY STAR Version 3.1 in CT, NY, and TX	Tues., June 6th

- Visit www.energystar.gov/newhomeswebinars



ENERGY STAR Certified Homes

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