

MEMORANDUM

Date: January 12, 2021 Project #: 23021.027
To: Mary Brazell (ODOT)
From: Wayne Kittelson
Project: Transportation Electrification Infrastructure Needs Analysis (TEINA)
Subject: January 12 TEINA Advisory Group Meeting #2

MEETING SUMMARY

Meeting Purpose:

- Review and discuss existing Zero Emission Vehicle (ZEV) charging infrastructure serving nine use cases in Oregon
- Review key insights from ZEV charging infrastructure strategies from other leading ZEV states
- Gather input on factors influencing transportation electrification (TE) infrastructure adoption for unique TE use cases

Welcome and Introductions (Amanda Pietz and Stacy Thomas)

- Welcome and team introductions
 - Meeting participants should sign in using the chat
 - Members of the public wishing to make a comment should indicate that they would like to do so in the chat now
- Agenda review
 - Discuss identified Electric Vehicle (EV) use cases (different types of vehicles, different users, different places)
 - Review the best practices from other states
 - Discuss the factors that affect EV adoption
- AG membership roll call – see below for details

Existing Conditions (Chris Nelder, Shenshen Li)

- Reviewed ZEV charging infrastructure serving nine use cases in Oregon
 - Most ZEVs are concentrated in urban areas. Chargers are also concentrated in urban areas.
 - ZEV adoption did not meet the 2020 goal, and is not on pace to meet the 2025, 2030 adoption goals
 - Discussion of identified use cases, including related ongoing and planned efforts in Oregon and best practices from other states. The nine use cases that will be considered include:
 - Urban Electric Light Duty Vehicles (LDVs)
 - Rural Electric LDVs
 - Corridor LDVs
 - Disadvantaged Communities
 - Local and Commercial Industrial Vehicles

- Long-Haul Trucking
- Micro-Mobility
- Transit and School Buses
- Transportation Network Companies (TNC)
- Highlights from other leading ZEV states (CO, NY, CA)
 - ZEV Standard has been adopted by 12 states and has attracted EVs and charging infrastructure to those states
 - Colorado
 - Similar position to Oregon
 - State agency fleets play a major role in the ZEV adoption plan
 - Current focus is on outreach and planning
 - New York
 - Allocated a significant amount of investment to disadvantaged communities
 - Heavy reliance on utility investment in infrastructure
 - California
 - Using a variety of programs to achieve EV adoption, both monetary and non-monetary
 - Clean Transportation Program and utilities are investing in infrastructure
 - California has “EV ready” building codes
- AG questions/comments
 - Charlie Tracy – In rural communities there may be lower population density, but the trip distances are also greater. The use case for EV and cost of ownership is distinct in these contexts. Charging infrastructure provides value to visitors and specialists serving the community.
 - Questions added to the chat were reviewed and briefly answered as follows:
 - Several questions related to funding. This project did not research the funding methods for each state, but funding is expected to be highly variable from state to state.
 - This project did not investigate the reliability or downtime of charging infrastructure.
 - This project did not compare the distribution of gas stations and EV charging infrastructure in rural areas. Since EV charging opportunities face fewer constraints than siting a gasoline station, their locations will probably not be limited to gasoline stations locations.
 - This project did not explore how EVs are being marketed to low-income residents.
 - This project did not reveal any new information on the PGE Mobility Hub in Portland.
- Additional suggestions for edits or additions to the presentation material as well as questions should be sent to Mary Brazell (mary.brazell@odot.state.or.us) and/or Zechariah Heck (zechariah.heck@odot.state.or.us)

Break Out Sessions Introduction and Break Out Sessions (Chris Nelder, Britta Gross, Team)

- Participants in the Future Infrastructure Scenarios Small Group Breakout Sessions will focus on three scenarios to be used in the modeling process. They will bracket the range of future conditions that might reasonably be expected.
 - Scenario 1: Base case scenario, extend economic trends from before COVID to 2035

- Scenario 2: Rapid recovery from COVID, economy returning to previous level by the end of 2021
- Scenario 3: Slow recovery from COVID, economy returning to previous level by end of 2024
- Scenarios are not designed to define what the future will be. Rather they are intended to bracket the range of the way reality may evolve.
- Each group will have two use cases to discuss. Each group should think through the following three questions.
 - How quickly will each use case be adopted in Oregon for electrification and why? It is most important to identify why you think an adoption rate may be achieved.
 - What are the unique challenges to adding charging infrastructure for each use case? What makes this use case unique?
 - What factors should we be sensitive to that could affect the adoption curve for each use case?

Summaries of the discussions within each breakout were provided by the note takers in each breakout group and included the following:

- Micro-mobility
 - **Adoption Rate:** Perceive increasing adoption in the future. May suffer from seasonality issues. Clean Fuels Program is critical for micro-mobility, not a profitable area.
 - **Unique Challenges:** Public charging is a key issue, especially right-of-way (ROW). However, how much infrastructure is needed?
- Transit and School Buses
 - **Adoption Rate:** Increasing adoption over time.
 - **Unique Challenges:** Funding and cost are key issues. Diesel is several times cheaper than electric. Hydrogen may be a more attractive option in 5-7 years.
- Urban
 - **Adoption Rate:** AAA says 99% of EV owners are happy, so optimistic about urban adoption.
 - **Unique Challenges:** Challenge with MUDs, building codes may not take effect fast enough, so may need to consider community based DCFC charging.
 - **Factors:** Education is needed. Regulatory and incentives are important factors. EV market share has held up through COVID which may indicate strength in adoption after COVID. Apartment buildings without EV charging infrastructure may not be marketable in the future. There could be less commuting occurring in the future. The role of utilities including rate design are very important.
- Local Commercial and Industrial vehicles
 - **Adoption Rate:** Duty cycle (trip length) is known, which may allow adoption to increase
 - **Unique Challenges:** Building codes may not take effect fast enough
 - **Factors:** Free parking, building codes
- Rural
 - **Adoption Rate:** Adoption expected to lag behind denser areas
 - **Unique Challenges:** Smaller utility co-ops may have a challenge building infrastructure that mainly supports tourists and people moving through. Drive longer distances so need charging along a corridor which may have lower utilization. A greater portion of people are living in SU dwellings, which can facilitate Level 2 charging.

- **Factors:** As All Wheel Drive (AWD) and pickup trucks become available, adoption may increase. DCFC will be very important due to corridor based travel.
- Long-Haul Trucking
 - **Adoption Rate:** Much further in the future,
 - **Unique Challenges:** Requires concerted national effort.
 - **Factors:** Price of electricity from DCFC charger compared to diesel.
- Disadvantaged Communities
 - **Adoption Rate:** COVID recovery scenario is a big deal for communities that have been hit harder by COVID
 - **Unique Challenges:** Reliance on shared modes (TNC, micro-mobility, transit). Many different communities included with different challenges. Private investment may not be profitable, requiring greater public investment.
 - **Factors:** Public investment available.
- Transportation Network Companies
 - **Adoption Rate:** Slow rate
 - **Unique Challenges:** Reliance on drivers to purchase their own vehicle, if cost for EV is high it will reduce adoption. Competition between TNC and public at public charging stations, considering the downtime it takes for a vehicle to charge (or wait in line for charging) prevents drivers from making money.
- Corridor
 - **Adoption Rate:** A good adoption strategy was having co-workers pass on adoption strategies around the water cooler.
 - **Unique Challenges:** Range anxiety. Balance corridor charging with charging within communities. Site chargers at locations where you can do something to pass the time.
 - **Factors:** Sign and way find charging infrastructure to educate non-users on the prevalence of charging locations. Decrease cost of public charging to similar to what it would be at home. Must be more DCFC along corridors.

Public Comment (Amanda Pietz)

- Notes on all submitted public comments are included in Appendix E.
- There were no public comments made during the meeting

Next Steps (Amanda Pietz)

- Submit additional comments or questions to Mary Brazell (mary.brazell@odot.state.or.us) and Zechariah Heck (zechariah.heck@odot.state.or.us)
- Slides will be provided on the TEINA webpage
- Next meeting topics
 - Preliminary summary of modeling results
 - Overview of listening session feedback
 - Extend next meeting to 2.5 hours
- Report due to the Governor's office by June 30th

MEETING PARTICIPANTS

Project Team Members

Mary Brazell (ODOT Climate Office and TE Program Manager)
Zechariah Heck (ODOT Climate Office)
Jessica Reichers (ODOE and Policy Team Manager)
Wayne Kittelson (Kittelson & Associates)
Chris Bame (Kittelson & Associates)
Stacy Thomas (HDR)
Alexander Nelson (HDR)
Chris Nelder (Rocky Mountain Institute)
Lynn Daniels (Rocky Mountain Institute)
Britta Gross (Rocky Mountain Institute)
Shenshen Li (Rocky Mountain Institute)
Rhett Lawrence (Forth)

Advisory Group Members Present

Amanda Pietz, Director, ODOT Climate Office
Greg Alderson, PGE, he
Tom Ashley, Greenlots, he/him
Phil Barnhart, Emerald Valley EV Assoc.
Chris Chandler, Central Lincoln PUD (experienced connectivity issues)
Marie Dodds, AAA Oregon, she/her
Ingrid Fish, City of Portland, she/her/hers
Jamie Hall, General Motors, he/him
Zach Henkin, Cadeo Group, he/him
Joe Hull, Mid-State Electric Co-op, he/his
Juan J Serpa Muñoz, Eugene Water and Electric Board, he/him
Vee Paykar, Climate Solutions
Cory Scott, Pacific Power, he/him
Charlie Tracy, Oregon Trail Electric Co-op
Dexter Turner, OpConnect
Jairaj Singh, Unite Oregon

Advisory Group Members Not Present

Judge Liz Farrar, Gilliam County, she/her
Stu Green, City of Ashland

Other Attendees

Allan Branscomb
Andrew Dick, Electrify America
Brian Fawcett, Clatskanie PUD
Charlie Loeb, Emerald Valley Electric Vehicle Association
Chris Kroeker, NW Natural
Cory-Ann Wind, Oregon DEQ, Clean Fuels Program
Dan Frye, OLCF MCAT
Dan O'Shea

Don Hamilton, ODOT
Ed Averill, Engineers for a Sustainable Future
Eric Strid, The Strid Energy Report
Gil Tal, UC Davis
Greg Harr, Evergreen Consulting Group
Jaime Duyck, EV Equity
Jay Friedland, Plug in America
Jennifer Joly, OR Municipal Electric Utilities Association
Jim Avitabile
Jim Jensen, WA Green Transportation Program
John Mikulin, US EPA
Joseph Gale, RS&H
Knowledge Murphy, Multnomah County
Meg Rowe, ODOT Office of Innovation
Michael Reish, Washington Department of Commerce
Neil Baunsgard, The Environmental Center
Nicole Blackwell, Idaho Power
Peter Thomas, Electrify America
Rachel Sakata, ODEQ
Rick Teebay
Rob Currier, Emerald PUD
Robert Mullin, RTO Insider
Ryan Perry, Tillamook PUD
Sarah Hackett, ODOT Public Transportation Division
Susan Bladholm, Friends of Frog Ferry
Tiffany Edwards, Lane Transit District
Travis Hargitt, City of Eugene
Wendy Manley, Sunriver Owners Association Dept. Public Works

ATTACHMENT A: Notes from AG Breakout Group #1 (Micro-mobility and Transit/School Buses)

Note Taker: Wayne Kittelson
Facilitator: Zechariah Heck

Participants: Greg Alderson
Stu Green
Zach Henkin
Juan Serpa Muñoz

How quickly will each use case be adopted for micro-mobility in Oregon for electrification and why?

Juan:

- Adoption rate will definitely increase with more emphasis on less use of vehicles, more convenient access, etc., so the adoption rate can be expected to equal or even exceed that of LDV's
- Micro-mobility use in Oregon may be affected by the seasonal nature of weather (e.g., snow, rain)
- Clean Fuels credits will also help to accelerate the use of micro-mobility. If Clean Fuels credits go away then this will tamp down the use of micro-mobility

Greg:

- Agrees with Juan that micro-mobility will be harder to support with ratepayer funds
- In parts of Oregon where it is colder with more snow in the winter, this will probably slow the adoption of micro-mobility. However, in Western Oregon where rain is frequent, people have gotten used to doing things in the rain and micro-mobility would be no exception
- The loads on the electric system are much lower with micro-mobility so there's not as much focus on it within the utility sector, within electricity rate design considerations, etc.
- E-bikes are still expensive and policies do not provide rebates for e-bikes so this may not be adopted by low-income communities as quickly

Zach:

- Currently the e-bike sales are outpacing regular bike sales. A contributing factor is the degree to which cities are supporting active transportation

How quickly will each use case be adopted for transit and school buses in Oregon for electrification and why? (13:20)

Zach:

- The big factor will be cost – how can the cost be brought down (e.g., leasing the battery)

- Behavioral changes may also be necessary: People are used to having a capital budget and an operations/maintenance budget, whereas for these use cases they will need a much larger capital budget

Juan:

- Any of these technologies will need really strong funding
- Electric buses are expensive. You can get a regular school bus and convert it to cleaner diesel much more cost-effectively than buying an electric bus
- It may be hard for utilities to claim cost rebates in this area are a defensible use of funds outside of Clean Fuels credits
- This use case will increase but the rate will be tamped down by the cost factor

Greg:

- Agrees with Juan – in terms of buying the vehicle, the only way that utilities can help is with Clean Fuels dollars; otherwise, the source of funds for such a purpose would be places like VW Settlement dollars (not as reliable in OR); federal dollars (hopefully more available in the future)
- Electric buses can be several times more expensive than diesel versions
- Some proposed changes to the CFP that hasn't been adopted yet could also help, specifically the idea of advance credits
- Utilities can't and don't spend dollars on rolling stock; school bus charging equipment might be eligible for some of their programs but not the rolling stock

What are the unique challenges to adding charging infrastructure to each use case?

Micro-Mobility:

Zach:

- There are some docking solutions that are available
- The largest unique challenge for micro-mobility is right-of-way. Having a situation where a 120-V outlet can be plugged in while parked is pretty rare

Juan:

- It's likely that most micro-mobility devices will be charged at home; most users will go only a few miles for commuting, etc.
- Unsure that charging infrastructure will be much of an issue for adoption of micro-mobility

Greg:

- The charging need is much less because the load is much less, which also means the opportunity to realize benefits in terms of flexible loads and demand/response (which create an opportunity for utilities to invest) are not there as much

Juan:

- Considering the flexibility of the load – if you're plugging it into a 120V outlet then that should be enough considering that these are small equipment
- Micro-mobility equipment should not be putting much load demand onto the grid

Transit and School Buses:

Zach:

- The variety of charging standards that are being used is a problem now and is likely to settle over the next 3-5 years. We're not there yet

Greg:

- The use case of a school bus has value for potential vehicle-to-grid opportunities. It's still kind of early-stage technology but there's an opportunity here
- Managed charging opportunities are much more realistic in the nearer term and this helps manage the loads. But there will be load issues and infrastructure issues to the garages. School District garages currently don't have the infrastructure that they will need in the future

Juan:

- A crossing point may come in the next 5+ years where hydrogen starts taking over for this use case

What factors should we be sensitive to that could affect the adoption curve for each use case?

Juan:

- Government incentives that will facilitate much more expensive technologies to be adopted
- Continued availability of Clean Fuels credits
- Municipality policies around walkability, etc. will also affect this

Zach:

- Indicators are all going to be around:
 - Is there return on investment?
 - Is the funding available?
 - Awareness will follow

ATTACHMENT B: Notes from AG Breakout Group #2 (Urban and Local Commercial/Industrial Vehicles)

Note Taker: Shenshen Li
Facilitator: Britta Gross

Participants: Phil Barnhart
Marie Dodds
Jamie Hall
Dexter Turner

Marie:

Urban

- Urban residents are EV friendly due to their need. Range anxiety is going away as the range is expanding. Customers really like the EV after trying them, so education is important.

Commercial/Freight

- For light duty vehicles, it's easy to make good progress. For larger size vehicles, they are not ready yet.

Phil:

Urban

- Education and public outreach are important
- Key factors: how much work has been done to get the public to touch EV's, test drive them and feel the performance
- Multi-unit dwellings: install chargers, the HOA are supportive. Regulatory effort is needed
- Update the building code. All new construction should be EV-ready, new buildings and new parking lots. And retrofit for existing buildings
- There will be less cars in the future because people no longer travel as much as they did
- Utilities need to develop rate designs that support the infrastructure

Commercial/Freight:

- Demand charges drive the cost high
- Good news: their daily route is fixed. They don't need to go long distance
- Local air pollution is a key driver to promote fleets

Jaime:

Urban:

- It's lower hanging fruit
- Multi-unit dwelling: regulatory are probably necessary
- Corridor network is key for an urban family to travel long distance
- There is headwind associated with building code updates and retrofits
- Both public DCFC across the street and multi-unit chargers are critical to promote EV adoption

Commercial/Freight:

- GM announced delivery trucks effort this morning
- Putting in a lot of chargers into one facility is a challenge. Some facilities are rented, so the local company cannot do much

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ATTACHMENT C: Notes from AG Breakout Group #3 (Rural and Long-haul trucking)

Note Taker: Lynn Daniels
Facilitator: Jessica Reichers

Participants: Chris Chandler
Joe Hull
Cory Scott
Charlie Tracy

Charlie: Not a high density of EVs in rural areas yet. Optimistic about new models that will soon be available, especially pickup trucks and vehicles with all-wheel drive. These new models will make EVs more attractive. Charging infrastructure has people nervous about driving, a lot of miles between available public chargers.

Jessica: Availability of models will have a large impact on how quickly adoption will increase in rural areas. Additional infrastructure needs to be installed because of the longer distances rural folks need to drive.

Charlie: The three economic scenarios will be a challenge, depending on what happens with the economy. Rural Oregon is challenged with its economy, a slow recovery could hit us even harder.

Cory: Reasonable to assume that rural areas will lag behind adoption of denser/urban areas. It's not to say they won't adopt once those vehicles are at a lower price. It doesn't bother me that the focus is currently on urban areas because rural areas will lag. I don't know if rural areas will ever catch up to urban. As a rural service provider (PAC), how do we accelerate what's happening in rural areas so that the lag is not too long? It's not about catching up, just accelerating. If there aren't the models available on the market, nothing utilities can do about that. But utilities can work on other programs to help accelerate adoption of models that are available.

Joe: Pickups will be a huge deal in rural areas. We've gotten a lot of comments in my service territory that the new EVs are fine but they won't replace a Ram 2500 e.g. Rural lags on a lot of things economy-wise. When Bend started growing rapidly, the growth didn't hit the rural areas around it for 3 years afterwards. We expect the same kind of lag.

Jessica: What about medium duty vehicles and bucket trucks?

Joe: Some of our foremen will be onboard with electrifying some vehicles, but the larger vehicles will be a ways off.

Cory: High level of interest, but not seeing the technology for the heavier vehicles. We see a lot of advertisements that suggest products are available right now.

Charlie: We're planning electrification of our passenger fleet as well as when models become available for light trucks. We're interested in hybridization of the larger bucket trucks especially for the operation of the hydraulics. Trucks will go to a job site and run the diesel engine to operate the hydraulics, so there's a real opportunity for a hybrid concept. Big bucket trucks, digger derricks are tough, b/c they're used in emergency situations when the power is out and the truck is out in the field for 3 straight days. It's a unique situation to be aware of, that's long-term to electrify.

Jessica: What are the challenges to more infrastructure?

Cory: The anticipated use in rural areas is very low, so not a lot of market actors that look at rural space as a good opportunity to put charging, not a good business case. Rural areas tend to driver further which suggests they need more charging infrastructure than you'd think, but those will still have low utilization.

Jessica: Do you have a feel for whether we need DC fast charger or Level 2?

Cory: My personal feeling is it's fast charging. No one, in urban or rural spaces, want to waste time in waiting to charge. When it's workplace or at-home, Level 2 is fine. But critical need for fast charging along rural corridors because of their driving patterns.

Joe: As a co-op, we have a different issue in that public charging in our territory maybe wouldn't even benefit our members. People that would use it would likely be tourists/visitors to our territory. Our mission is to serve our members, we have board members that have concerns about using funding to support that. We focus on the highway 97 corridor but we've got a lot of other roadways that need support too. We know it's going to happen the question is when do we make that investment?

Charlie: We have ever-increasing tourist economy, so if we continue to be a "blackout zone" for EV fast charging, more tourists won't come here if they can't charge. As a utility, we have an interest in growing load and providing an opportunity for our members to own EVs, that's another reason we want to support it. What's needed locally is a minimum amount of DC fast charging. A ton of value in Level 2. Many hotels don't even have overnight charging. That will be a future focus of our rebates is to target hotels.

Charlie: The biggest challenge we've had with DC charging is finding decent sites, where people want to be, then getting service to those sites (though that's not as hard if we don't have to do a lot of digging).

Cory: Some counties have struggled with the permitting process because it's new, but that's a near-term hurdle and people learn.

Joe: Challenge is having a three-phase source. Some areas we look at, there already is three-phase power, but have identified other areas as destinations to have charging for tourists, but doesn't have three-phase power and it would prohibitively expensive to extend to there. We looked at single-phase power options with backup battery.

Charlie: Would like to see a single-phase power DC fast charger.

Chris Chandler: So many homes are single family dwellings, which makes it easier for many families to install Level 2 charging. Would like to see a stronger rural focus. Very different dynamic than urban areas with multi-family dwellings. So more credits/rebates focused on rural single-family home installations. Likewise to what others said, we have a tourist-based economy but most public charging will be used by tourists and not our members.

Chris: On trucking, we don't have a major interstate going through our territory. If the prices can be kept to a price point that competes with diesel or gasoline, then it's viable.

Charlie: We have I-84 in our territory with decent economics, but I think it will be a national push to get ready for long-haul trucking. There's opportunity here for short-haul trucking, but a bigger effort.

Cory: We see it happening on I-5 in the near future but will require a coordinated effort between all parties like never before.

ATTACHMENT D: Notes from AG Breakout Group #4 (Disadvantaged Communities and TNC's)

Note Taker: Chris Bame
Facilitator: Amanda Pietz, Chris Nedler

Participants: Thomas Ashley
Ingrid Fish
Vee Paykar
Jiraj Singh
Knowledge Murphy

Disadvantaged Communities

- Unique Challenges
 - Affordability of the vehicle
 - Access to affordable charging infrastructure
 - Access to shared modes – transit, micro-mobility, TNC
 - Rural vs urban – easier for more urban communities to access EVs via the shared resources than rural communities
 - What communities are being considered 'Disadvantaged Communities'? Typically have been talking about low income, BIPOC, rural communities. Could also include climate vulnerable. We will consider all of the above. 'Disadvantaged Communities' should be more clearly defined.
 - Chicken and the egg problem for rural – need to have infrastructure before people are comfortable enough to buy EVs. Example of need to have private-public partnerships.
 - Education is important. Resistance to adopting new technology. Transparency around acquiring EVs. Providing incentives.
- Would like to direct utilities to spend on public charging, for example at offices, MUDs. If you can get charging at home it is typically cheaper
- City of Portland is developing EV charging infrastructure requirements for MUDs
- Analogous to rural broadband. There are some geographies / use cases that may not work economically for private market. These cases have a clear need for public investment
- Will be more affected by the scenarios, people impacted most by COVID are in disadvantaged communities
- We have an opportunity to accelerate economic recovery through the provision of EV / charging infrastructure. Stimulus spending. Utility regulators are asking utilities to provide stimulus. Good potential for federal stimulus in the Biden administration

TNC

- Unique Challenges
 - Best done through dedicated charging, but very few examples of this
 - TNCs have not showed willingness to install or pay for installation of charging infrastructure
 - Not enough public infrastructure exists to support TNC
 - TNC drivers competing with everyone for a shared public resource, especially during morning/evening rush hour periods

- If we had more DCFC would there be a problem not having dedicated chargers? There are options for making reservation/queueing process more efficient. Problem is that while drivers are charging or waiting to charge, they aren't making income – if they have to wait for charging, there is a greater cost. Nothing we can do about charging time, but something we can do about the waiting time. Try to avoid queueing
- What happens to TNC drivers who don't have an EV? How do we prepare for them to be out of their job?
- Down time for charging is more significant, cost is taken on by the driver, rather than the TNC
- Would like to see TNC purchasing vehicles upfront, instead of drivers being responsible for the vehicles

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ATTACHMENT E: Notes from AG Breakout Group #5 (Corridors and Urban)

Note Taker: Stacy Thomas
Facilitator: Mary Brazell and Rhett Lawrence

Participants: Public audience

Eric Strid

- Need fast chargers for remote areas. Hard to drive to Idaho, Eastern Oregon, Northern California
- Automakers scrambling to “productize” EVs – they are going to take off faster than covered in any of the scenarios
- Regarding Greg Harr's comment on small utilities wanting to provide DC fast chargers: OPUC should specify that the big IOUs provide funding for low-use corridors because access to those rural corridors also benefit urban populations

Neil Baunsgard (Central Oregon Environmental Center)

- Charging is challenging in Central Oregon. Mismatch in infrastructure built out compared to need, post electric highway
- Utilities assumed to provide infrastructure but have ended up with large gaps. Need coordinated efforts with all players in the same room
- Charge infrastructure has been built out in Klamath Falls and Bend by Pacific Power, but between areas no DC fast chargers on the US 97 south corridor
- Areas with infrastructure will get more and more based on funding, under all scenarios

Susan Bladholm (Friends of Frog Ferry)

- Talked about Friends of Frog Ferry and planned ferry service in Portland area. Need for shoreline chargers. Anticipating more active commutes post-Covid

James Avitabile

- Could future development be used to help augment the gap in EV Infrastructure? Zoning to be expanded to require new EV charging stations as part of new mixed use, retail, commercial and multifamily development projects
- As you evaluate alternatives for EV sites and means of implementation, take into consideration the maintenance and operational cost of these facilities. The equipment does need to be serviced and keep operational and these costs sometimes get dropped from the discussions.

Rick Teebay

- That's the ideal time to install Get Ready and/or infrastructure. Should anticipate future growth - provided it doesn't require long lead time for substation upgrades
- Renewable diesel is a "drop in" fuel - and can be used with existing fleet with no downside. It is a great bridge fuel
- Agree with Greg on fleet applications. Charging Infrastructure will be key and a trip wire.
- These spots (recharging) could also support local/smaller communities - versus rest stops along the highway

Ed Aveerill / Engineers for a Sustainable Future

- Is there an opportunity to find communities between existing charge points and choose to support community solar with storage as a way to have stored energy for serving

public chargers? I'm imagining that some subsidies allow the solar installation to have the extra capacity to serve the charging

- Hydrogen seems to be enabled by a plan to overproduce wind and solar and use hydrogen as a way to spend surplus electricity. Need truly green grid planning to know when we get there

Jane Stackhouse

- Could Frog Ferries be electric? Would be beneficial if Frog Ferry had public charging at each dock that could help EV users getting to and from the dock and even promote private electric boat use
 - Susan responded yes and discussed best practices the program will follow

Alex

- Building on Neil's comment on utility role. Utilities have critical role and Get Ready. Need to support competitive market moving forward. Not just utilities. Building out market across state

Greg Harr

- Multiple smaller utilities outside of Bend interested in supporting activities but need targeted programs to help with startup costs. Need support to provide infrastructure requested
- Medium and heavy duty EVs. Total cost of ownership nearing breakeven with internal combustion engines (ICE) counterparts, as they are able to meet fleet vehicle requirements. Up front charging is where financing and funding support useful
- Micro-mobility. Impossible to get to Sunset Transit Center early enough to park and get Max. If TriMet had micro-mobility scooters would help with last mile issues
- As I mentioned - upfront costs for DC fast charging for smaller utility territories that cover the needed gaps in corridor charging needs
- Need to focus on demand charge performance. Corridors are great for hotels and restaurants
- Support stations in lower income and disadvantaged areas
- Geographically spaced out across state. Focus where gaps are.

Chris Kroeker

- Availability of hydrogen for medium and heavy trucks has been slow to develop. I feel this will negatively affect how we prioritize hydrogen fueling stations, which will ultimately delay hydrogen truck adoption. How can we ensure hydrogen fueling is in place throughout the corridors to make sure we're not slowing adoption rates?

Andrew Klumpp

- I concur with a previous comment that addressing the few remaining charging deserts in Oregon should be near the top of the 'Corridor' to do list
- A second issue is to focus DC fast chargers for the EV's of tomorrow. The 50kw chargers limit charging speed to around an hour, whereas Tesla chargers provide a user experience of more like 20 minutes. 20 minutes would help unlock travel chargers and this would eliminate the critical barrier of glacial charging speeds of the 50 kw chargers. Consider that an ICE vehicle 'recharges' in a few minutes and EV's infrastructure needs to focus on being as competitive as possible relative to ICE vehicles

Jay Friedland

- From Plug In America's perspective, I'll add that we need urban DC fast chargers and support for MUD charging (low power especially for DACs) to allow the sip and gulp scenarios - commute charging off of Level 1 or low power Level 2 and DC fast charging to augment for additional range

Input from question about how to overcome recharging anxiety to increase adoption:

- Level 2 charging at work or public spaces is important even though will likely to use corridor charging that is less visible. Need better signing and wayfinding, more visible to non-EV charging public not using app
- Follow the Tesla model - build like you know this will happen
- (Daniel Frye) I think a barrier is fear of charging. It's a total unknown outside of the early adopter crowd. I think public service marketing on how easy it is would significantly help adoption beyond natural early adopters
- (Rick Teebay) Pre-Covid, workplace was VERY powerful - seeing your coworker and engaging with your co-worker drove adoption
- (Dan O'shea) – issue in rural areas

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ATTACHMENT F: Public Comments

Eric Strid

- Need fast chargers for remote areas. Hard to drive to Idaho, Eastern Oregon, Northern California
- Automakers scrambling to “productize” EVs – they are going to take off faster than covered in any of the scenarios
- Regarding Greg Harr's comment on small utilities wanting to provide DCFCs: OPUC should specify that the big IOUs provide funding for low-use corridors because access to those rural corridors also benefit urban populations

Neil Baunsgard (Central Oregon Environmental Center)

- Charging is challenging in Central Oregon. Mismatch in infrastructure built out compared to need, post electric highway
- Utilities assumed to provide infrastructure but have ended up with large gaps. Need coordinated efforts with all players in the same room
- Charge infrastructure has been built out in Klamath Falls and Bend by Pacific Power, but between areas no DC fast chargers on US 97 south corridor
- Areas with infrastructure will get more and more based on funding, under all scenarios.

Susan Bladholm (Friends of Frog Ferry)

- Talked about Friends of Frog Ferry and planned service. Need for shoreline chargers. Anticipating more active commutes post-Covid

James Avitabile

- Could not future development be used to help augment the gap in EV Infrastructure? Zoning to be expanded to require new EV charging stations as part of new mixed use, retail, commercial and multifamily development projects
- As you evaluate alternatives for EV sites and means of implementation, take into consideration the maintenance and operational cost of these facilities. The equipment does need to be serviced and keep operational and these costs sometimes get dropped from the discussions

Rick Teebay

- That's the ideal time to install Get Ready and/or infrastructure. Should anticipate future growth - provided it doesn't require long lead time for substation upgrades.
- Renewable diesel is a "drop in" fuel - and can be used with existing fleet with no downside. It is a great bridge fuel
- Agree with Greg on fleet applications. Charging Infrastructure will be key and a trip wire
- These spots (recharging) could also support local/smaller communities – versus rest stops along the highway

Ed Aveerill / Engineers for a Sustainable Future

- Is there an opportunity to find communities between existing charge points and choose to support community solar with storage as a way to have stored energy for serving public chargers. I'm imagining that some subsidies allow the solar installation to have the extra capacity to serve the charging
- Hydrogen seems to be enabled by a plan to overproduce wind and solar and use hydrogen as a way to spend surplus electricity. Need truly green grid planning to know when we get there

Jane Stackhouse

- Could Frog Ferries be electric? And if Frog Ferry had public charging at each doc that could help EV use getting to and from the dock and even promote private electric boat use.
 - Susan responded yes and discussed best practices the program will follow

Alex

- Building on Neil's comment on utility role. Utilities have critical role and Get Ready. Need to support competitive market moving forward. Not just utilities. Building out market across state

Greg Harr

- Multiple smaller utilities outside of Bend interested in supporting activities but need targeted programs to help with startup costs. Need support to provide infrastructure requested
- Medium and heavy duty EVs. Total cost of ownership nearing breakeven with internal combustion engine (ICE) counterparts, as they are able to meet fleet vehicle requirements. Up front charging is where financing and funding support useful
- Micro mobility. Impossible to get to Sunset Transit Center early enough to park and get Max. If TriMet had micro mobility scooters would help with last mile issues
- As I mentioned - upfront costs for DCFC for smaller utility territories that cover the needed gaps in corridor charging needs
- Need to focus on demand change performance. Corridors are great for hotels and restaurants
- Support stations in lower income and disadvantaged areas
- Geographically spaced out and discernment across state. Where gaps are

Chris Kroeker

- Availability of hydrogen medium and heavy trucks has been slow to develop. I feel this will negatively affect how we prioritize hydrogen fueling stations, which will ultimately delay hydrogen truck adoption. How can we ensure hydrogen fueling is in place throughout the corridors to make sure we're not slowing adoption rates?

Andrew Klumpp

- I concur with a previous comment that addressing the few remaining charging deserts in Oregon should be near the top of the 'Corridor' to do list
- A second issue is to focus DCFC's on high power chargers for the EV's of tomorrow. The 50kw chargers limit charging speed to around an hour, whereas Tesla chargers provide a user experience of more like 20 minutes. 20 minutes would help unlock travel chargers and this is would eliminate the critical barrier of glacial charging speeds of the 50 kw chargers. Consider that an ICE vehicle 'recharges' in a few minutes and EV's infrastructure needs to focus on being as competitive as possible relative to ICE vehicles

Jay Friedland

- Hi all, From Plug In America's perspective, I'll add that we need urban DCFC and support for MUD charging (low power especially for DACs) to allow the sip and gulp scenarios - commute charging off of L1 or low power L2 and DCFC to augment for additional range

Input from question about how to overcome recharging anxiety to increase adoption:

- Level two charging at work or public spaces is important even though will likely to use corridor charging that is less visible. Need better signing and wayfinding, more visible to non-EV charging public not using app
- Follow the Tesla model - build like you know this will happen
- (Daniel Frye) I think a barrier is fear of charging. It's a total unknown outside of the early adopter crowd. I think public service marketing on how easy it is would significantly help adoption beyond natural early adopters

- (Rick Teebay) Pre-Covid, workplace was VERY powerful - seeing your coworker and engaging with your co-worker drove adoption
- (Dan O'shea) – issue in rural areas

DRAFT