

Western Smart Regional EV Adoption and Infrastructure at Scale – WestSmartEV@Scale

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Organization: PacifiCorp
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Project ID: ti128



Overview

Overall Goal

Identify pathways to accelerated growth in freight, business and consumer use of electric vehicles.

Timeline

- Start: October 1, 2020
- End: December 31, 2023
- 33% Complete

Budget

Total project funding	\$17,066,146
DOE share	\$6,040,647
Cost share	\$11,025,499
Budget period 1	\$1,099,091
Budget period 2	\$2,883,163
Budget period 3	\$2,058,394

Any proposed future work is subject to change based on funding levels.

Barriers Addressed

- Limited availability of charging infrastructure for destination corridors outside of Interstates
- Limited options of charging infrastructure for multi-modal transport to reduce costs
- Limited access of electric transportation solutions and benefits in underserved areas

Partners

- PacifiCorp
- Utah State University, University of Utah
- National Renewable Energy Laboratory
- Giv Group, Leaders for Clean Air
- Forth Mobility, FlexCharging
- Rocky Mountain Institute, Utah Inland Port
- Breathe Utah, Doglatin
- Utah CCC, Yellowstone-Teton CCC, Treasure Valley CCC, Valley of the Sun CCC

Project Objectives

Objectives

Create an enduring regional ecosystem across the Intermountain West to sustain accelerated growth in freight, business and consumer use of EVs that will reduce petroleum use and greenhouse gas emissions

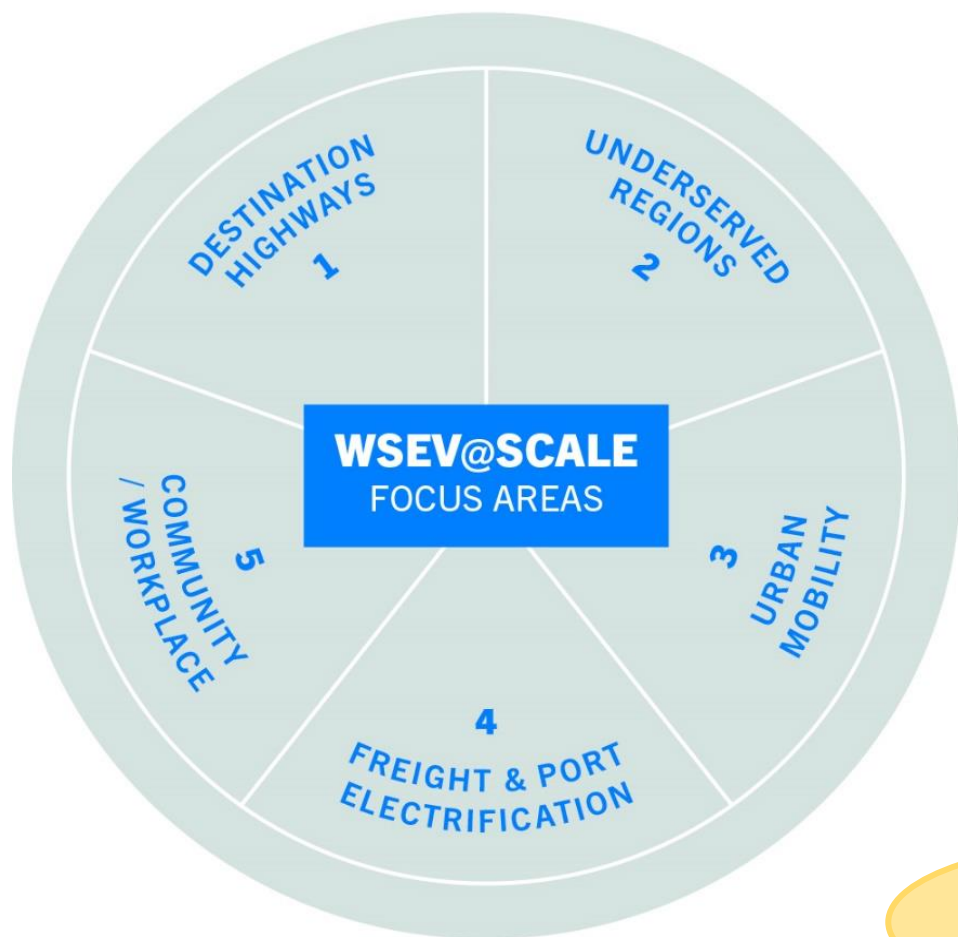
Support of VTO Tech Goals

- Improving Fuel Diversity: reducing use of oil and natural gas
- Increasing Local Resiliency: planning for grid impacts and developing solutions for infrastructure reliability and enhancing transportation options
- Reducing Greenhouse Gas Emissions: increasing alternative fuel use in both consumer and commercial sectors

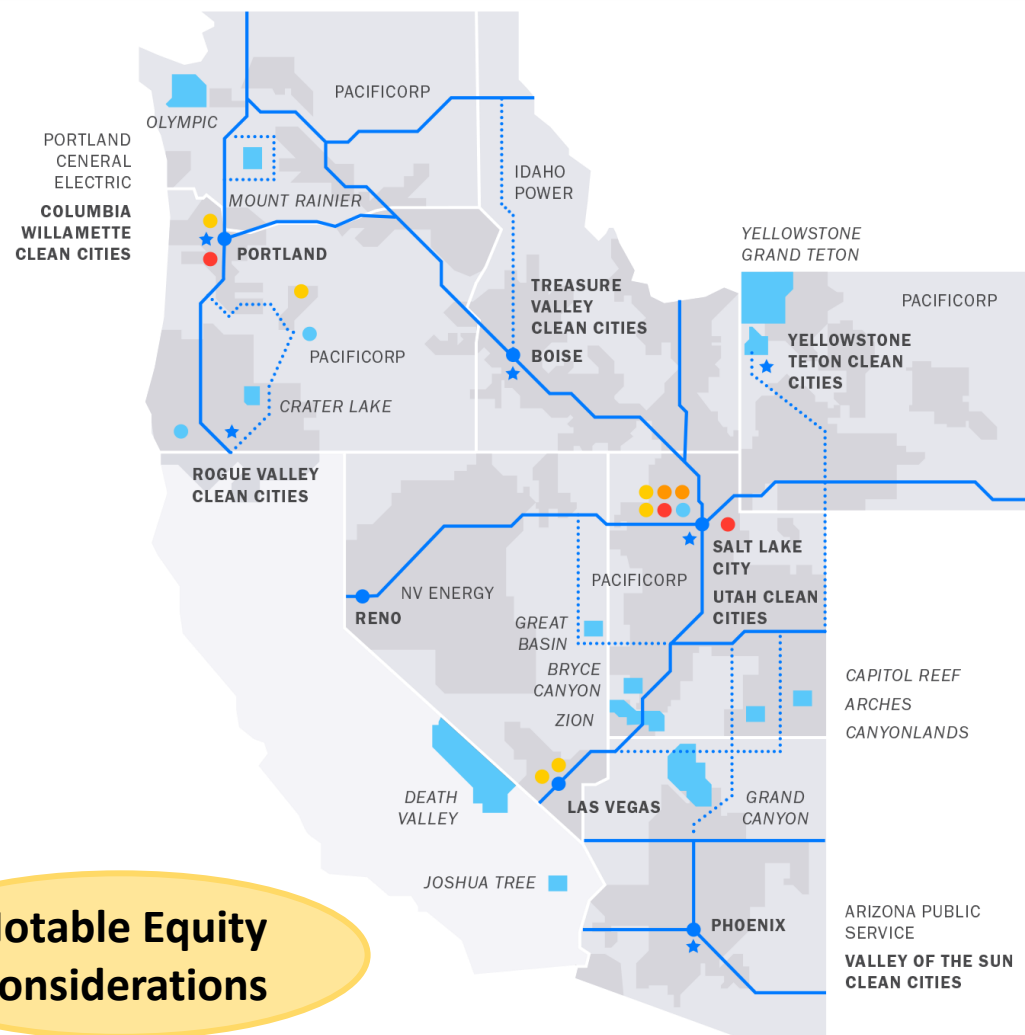
Impact

- Identify EV charging infrastructure to address consumer needs along corridors
- Expand EV options for underserved communities
- Develop solutions for co-location of charging infrastructure to enhance mobility
- Assess potential to integrate freight and port electrification into charging infrastructure electric mobility solutions to connect technologies and communities
- Evaluate smart charging capability at workplaces and emobility hubs in communities

Project Approach



Notable Equity Considerations



Phase 1: Modeling, Planning, and Design => Phase 2: Implementation and Operation => Phase 3 Outreach and Education

Project Approach: Milestones

Modeling, Planning and Design Milestones

	Type	Progress
Heavy duty fleet data agreements in place to collect information	Technical	Achieved
Destination gap analysis: Report on National Parks and recreation gap analysis	Technical	Achieved
75% of projects passed modeling, analysis & design; >5 Direct-current fast charger (DCFC) and 100 L2 chargers installed across sub-projects	Go/No Go	Achieved

Expansion Phase Milestones

	Type	Progress
Surveys developed with IRB approval	Technical	Achieved
Install 15 DCFC chargers as part of charger installation	Technical	Achieved
Data collection in process on subprojects	Technical	In Progress
Report on EV training and career opportunities for underserved community	Technical	In Progress
Analyzed data of >50 TNC drivers, analyzed performance of eCar share and evaluated grid impacts of smart charging from >5 e-buses	Go/No Go	In Progress

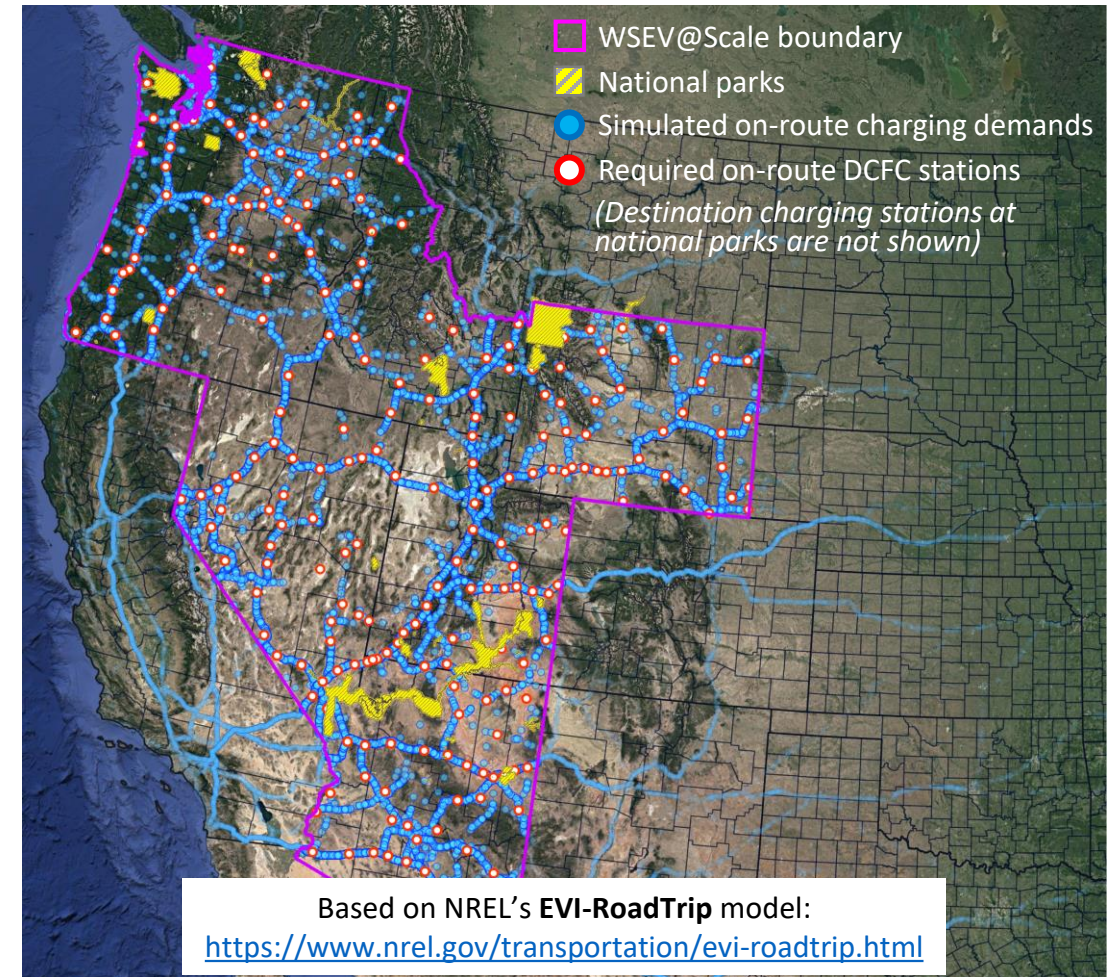
Outreach and Education Milestones

	Type	Progress
Develop outreach & education plan	Technical	In Progress
Report on project roll-out plans at scale	Technical	In Progress
Host workshops in each of the participating communities presenting best practices in each focus area	Technical	In Progress
Develop best practices for adoption at scale, reflect 30% adoption levels	Technical	In Progress

National Parks & Rec Electrification

Estimated charging station network required to enable electrified road trips to/from/between/through national parks

- Leveraged NREL's EVI-RoadTrip for sophisticated, large-scale, and high-resolution simulation of individual road trips between origins and destinations, as well as corresponding energy use and charging demands
- Accounted for the co-utilization of charging station network between general road trips within/through/to/from the region, and those to/from national parks
- In addition to DC fast chargers (DCFC) along the routes (for waypoint charging), required destination chargers (Level 2 and DCFC) at national parks were also estimated



National Parks & Rec Electrification

Finalized an online "EV Road Trip" consumer survey

- Received human subjects research approval from USU's Institutional Review Board.
- 15-minute survey asks about experiences, perceptions, barriers, and opportunities of using EVs to make road trips to recreational areas.
- 59 survey responses received
(as of April 15, 2022)



Electric Vehicle Road Trip Study

Researchers at Utah State University are looking for adults who own, drive, and/or use electric vehicles (EVs) to participate in a research study about **experiences and perceptions of using EVs for recreational road trips**. Specifically, we are interested in learning about the experiences, perceptions, barriers, and opportunities for using EVs to make road trips to recreational areas (such as national parks, state parks, national forests, etc.) and for recreational activities (such as camping, hiking, boating, fishing, skiing, etc.).

You are invited to complete a **15-minute online survey** about your EV information, experiences using an EV for a recreational road trip, perceptions of those experiences and other aspects of EVs, and socio-demographic characteristics. To participate in this study, you must be an adult (age 18+) and have experience using an EV on road trips to recreational areas and for recreational activities. Click the link below to proceed to the survey:

<https://engineering.usu.edu/cee/research/labs/patrick-singleton/studies>

If you complete the entire survey, you will be offered the chance to enter a drawing to **win one of ten \$100 Amazon e-gift cards**.

Questions? Email transportation.study@usu.edu. This research, conducted by Regan Zane, Patrick Singleton, and Antje Graul, was approved by the Utah State University Institutional Review Board, Protocol #12642.

Screenshot of Utah State University webpage

EV Training for Underserved Communities

- Met with local community councils and state government officials
 - Information sharing events with councils on research project and opportunities
- Roundtable with Utah Inland Port participating companies
 - Apprenticeship and pathways training programs
 - Foster school/community connections

Ongoing Focus

- Formation of Community Advisory Board in Salt Lake City area with focuses in:
 - Employment equity
 - Educational equity
- Continuation of outreach with transit authorities, inland port industry partners, community programs and council meetings

eCarshare @ Affordable Housing

Lessons Learned

After stakeholder interviews, best practice research, literature reviews, meeting with similar groups, and coordination meetings, some themes emerged:

Planning gaps can be risky & expensive

Management partners need thoughtfully coordinated product and service integration

Vehicle experience is important

Not much user support for 2013-2014 Nissan Leafs, due to shorter battery range

Free use isn't adequate incentive

Factors related to time, safety, reliability, ease of use, familiarity, and user risk impact carshare use

Attorneys come in handy

Complex partnerships and business structures require detailed risk and liability management

Photos: Giv Group



eCarshare @ Affordable Housing

Giv Group launched EV carshare 2.0 at the start of 2022
Finalized legal/managerial partnerships, and developed a participant sign-up process, including user experience/behavior/satisfaction survey

Higher range & quality

Chevy Bolt Premier 2019

- Best cost/range/quality combination
- Safety + interior specs ideal for shared mobility

Improve app reliability

Coordinate with App developer

- Add software capacity for subsidized carshares
- Solve software/hardware integration issues

Fast charging access

- To expand to include TNC

Photos: Giv Group



**Notable Equity
Considerations**

Accomplishments & Progress



Photos: Park City

Previous Project Collocating charging Park City Mobility hub

- Electric buses
- Electric bikes
- Public DC Fast Charger

Intermodal Hub



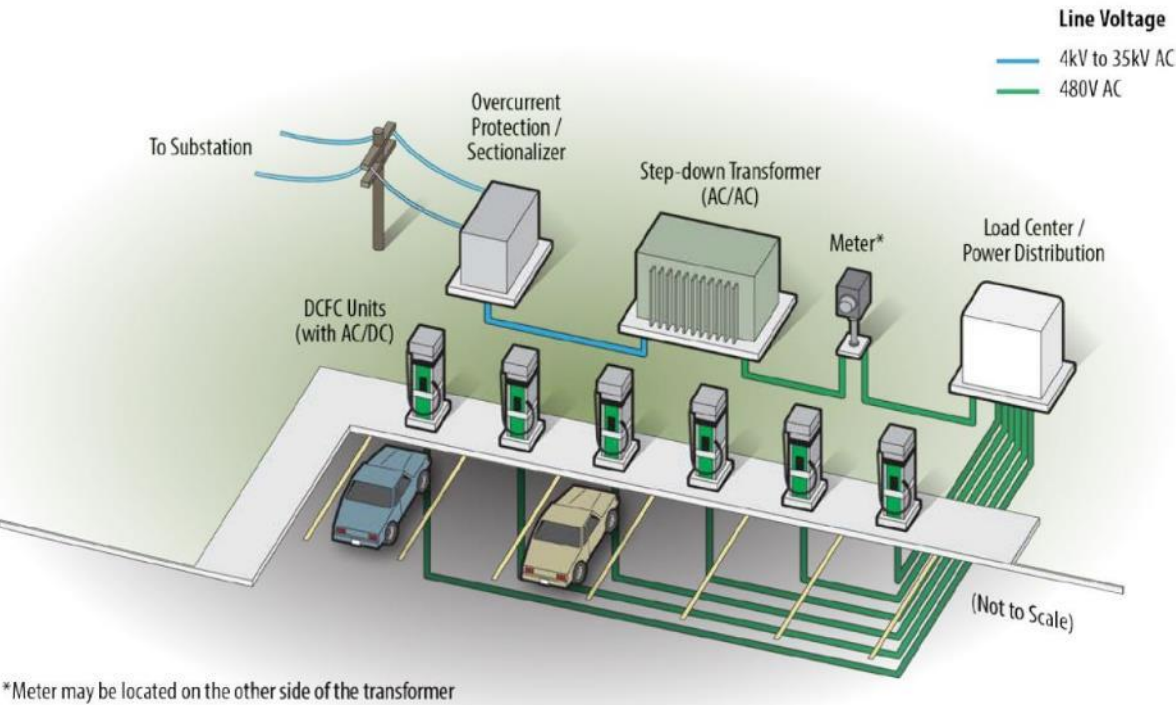
Photos: Park City



Photos: Rocky Mountain Power

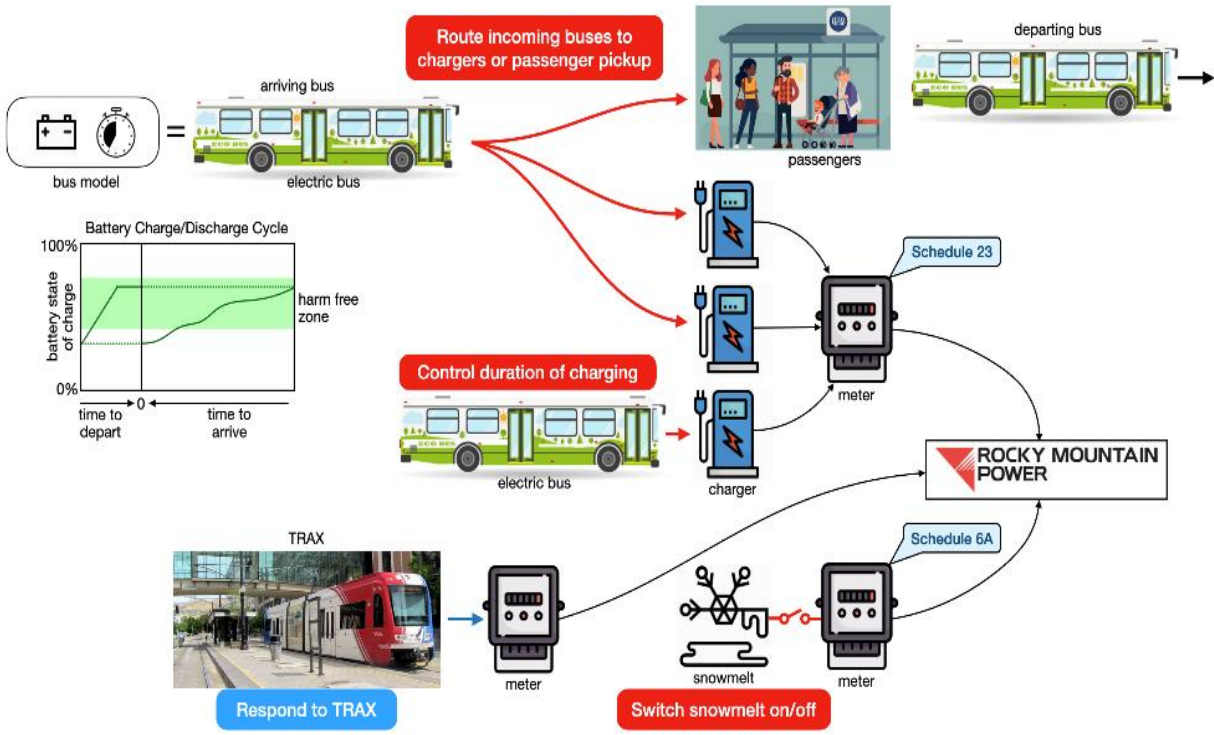
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Intermodal Hub



Stacking of loads “worst case” particularly for low utilization

Conduct Cost Benefit Analysis for co-location



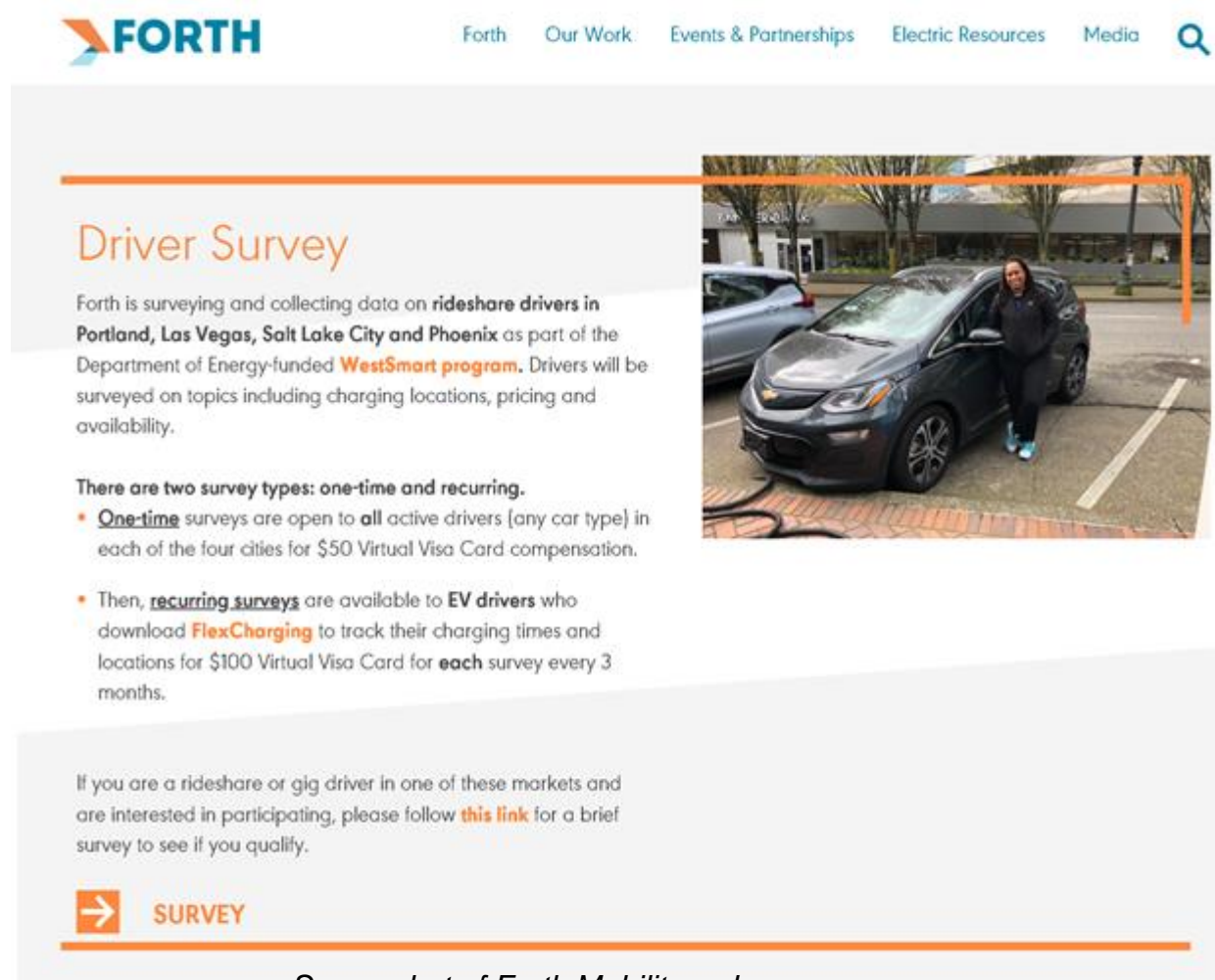
Charging infrastructure co-location can reduce costs

Notable Equity Considerations

TNC EV Study

- Team have developed a bilingual survey focused on EV perceptions, charging habits and gig work generally
- Collateral providing educational and access information has been designed and printed in both English and Spanish
- All outreach material has been fully approved by Utah State University's Institutional Review Board

Notable Equity Considerations

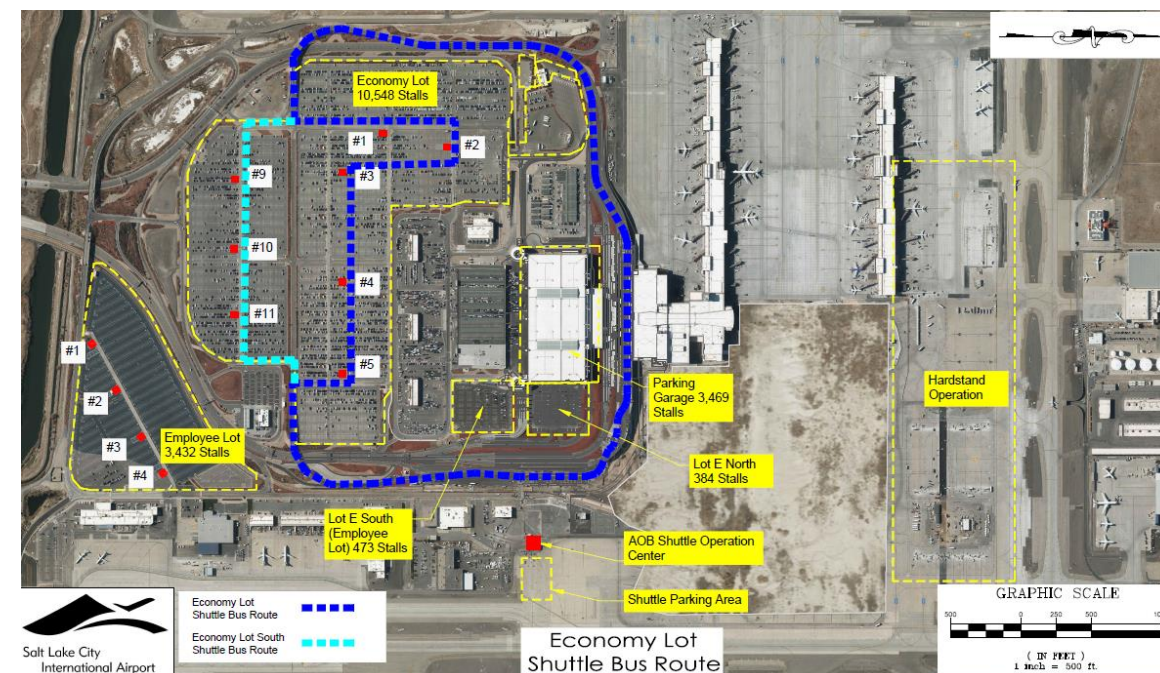


Screenshot of Forth Mobility webpage

SLC International Airport Electrification

Team has had significant engagement with airport, Delta airlines, and rental car fleets

- Worked with SLC airport to acquire data on shuttle bus usage (3 routes), fueling events data and route definitions. Data is being used for a high-level bus electrification analysis
- Further discussions on options for GSE electrification analysis continuing as deployed vehicles at SLC have shortcomings for data collection and analysis

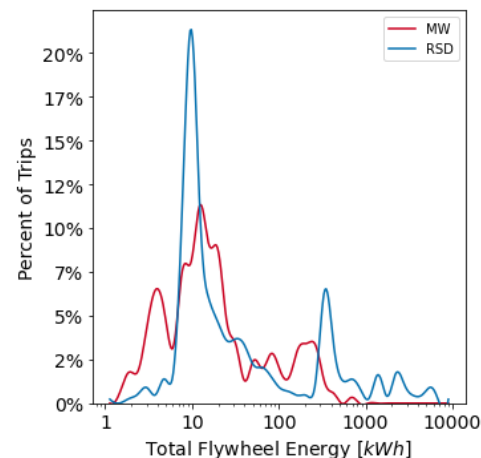
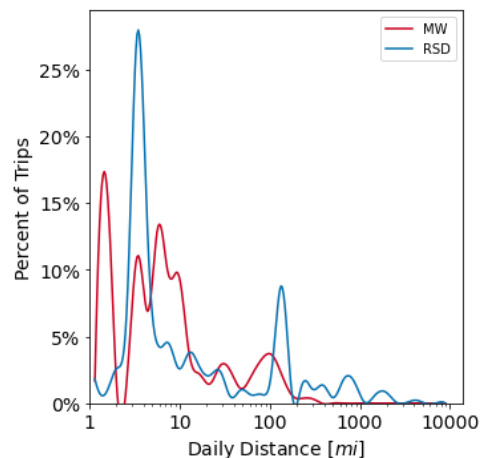


Mark-up of Google map

UT Inland Port Heavy Duty Electrification

Team has had engagement with Port representatives, individual fleets and stakeholders

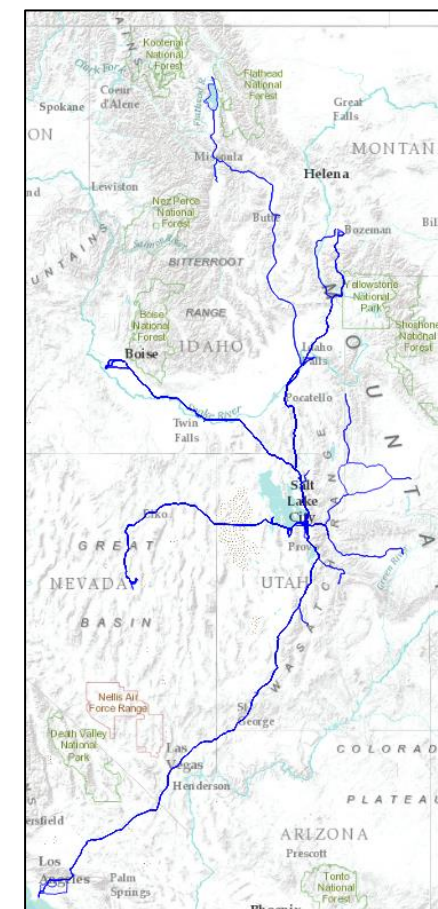
- Team has instrumented drayage trucks and container lifts with 2 partner fleets.
 - 19 trucks, 72k miles, 1,277 trips
- Analysis of distance, fuel economy, energy use, idle energy completed



Mountain West



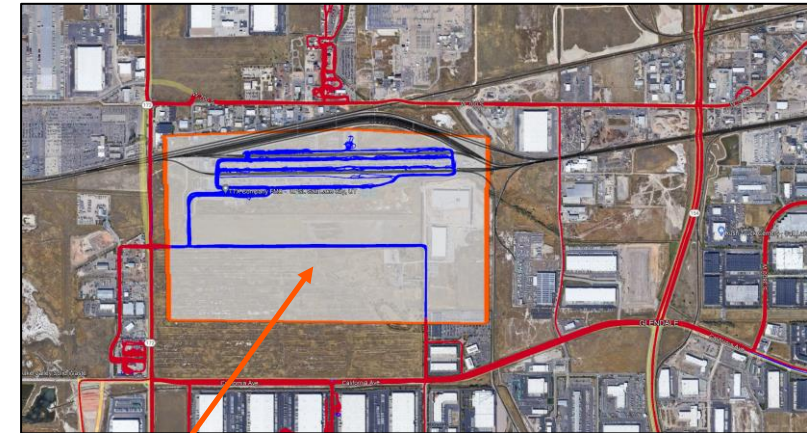
RSD Container



UT Inland Port Heavy Duty Electrification

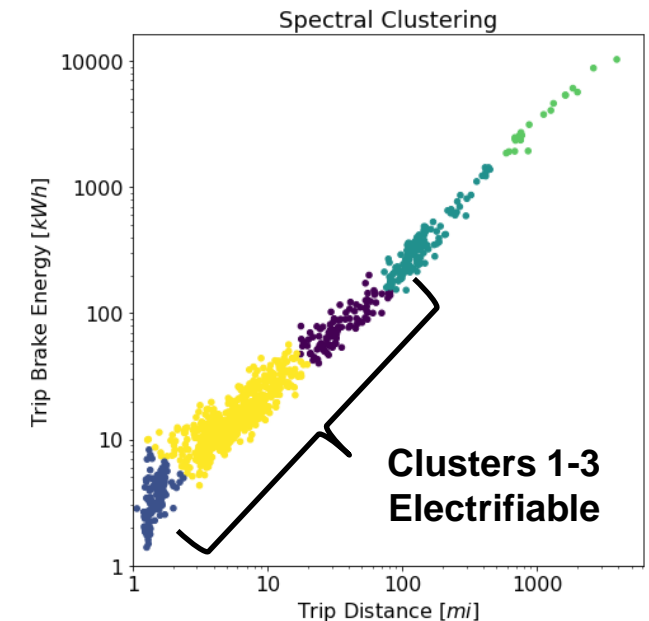
Statistical analysis of high resolution (1hz) data is underway including geofencing areas of activities of particular interest.

- Trips have ben clustered by electrification potential.
 - Clustering helps identify unique trip types to understand which types of trips can be electrified
 - Clustered On:
 - Trip distance [mi]
 - Brake Energy [kWh]



Geofence

Notable Equity Considerations

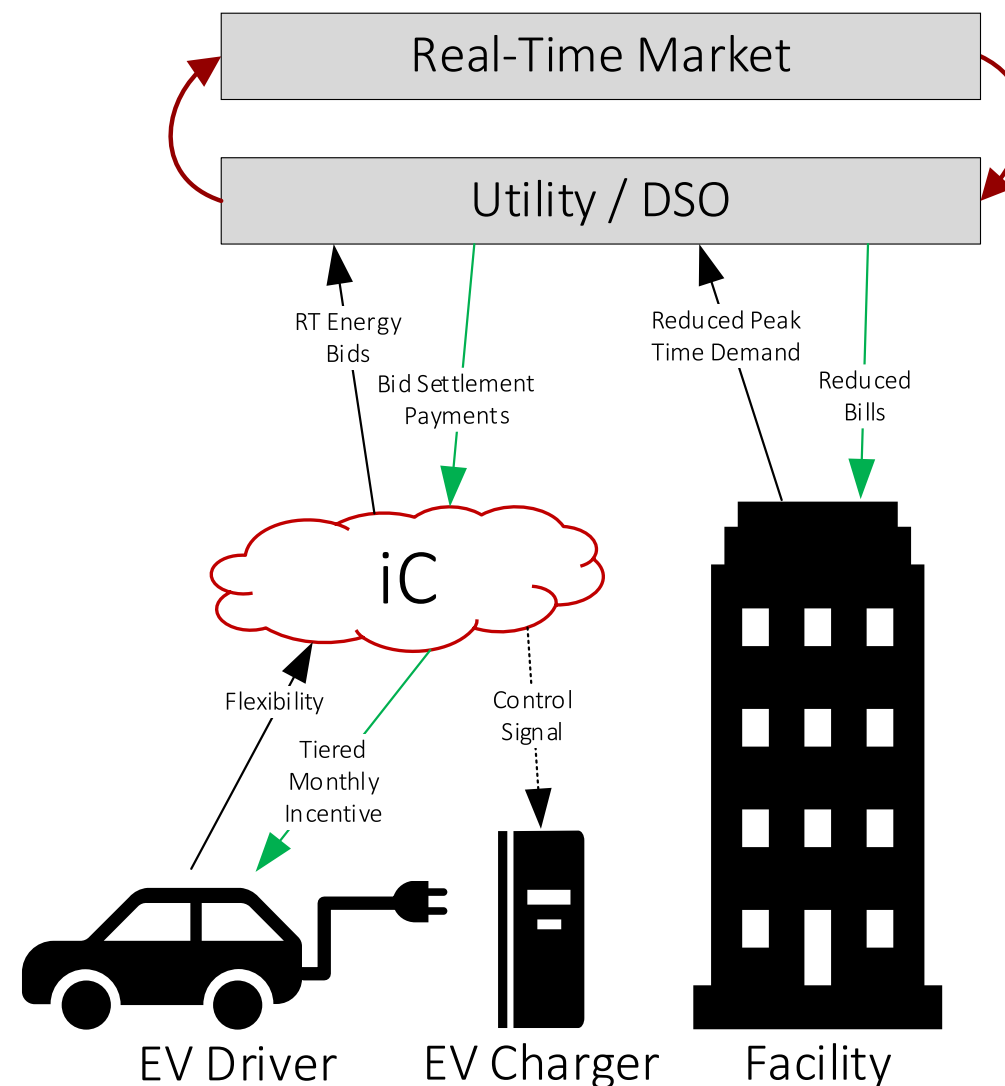


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Workplace Charging Case Study

Development of Data Management Module:

- API & Databroker: central handler for data, requests, and optimization
- SQL Database: data warehousing for databroker
- Data Interfaces
 - Wholesale Market API: real-time and day-ahead load, DER generation, and pricing data for optimization and visualization
 - EV Charge Request Synthesizer: probabilistic, data-driven EV charge request model for development and demos
- MPC Optimization:
 - Pythonic, real-time model prediction control
- Visualization and user interface (UI):
 - Web-based dashboard to monitor performance (including flexibility offered) and user UI for initiating EV charge requests



Collaboration & Coordination Among Project Team

Lead Organization

PacifiCorp, a Berkshire Hathaway Energy Company

Partner Organizations (subrecipients)

Utilities: NV Energy, Idaho Power, Arizona Public Service

Clean Cities: Utah, Yellowstone (ID and WY), Treasure Valley (Boise), Valley of the Sun (Phoenix), Columbia-Willamette (Portland)

Additional Partners: Utah State University, University of Utah, National Renewable Energy Lab, Rocky Mountain Institute, Doglatin, Flexcharging, Forth Mobility, GIV, Park City, Leaders for Clean Air

Community Partners

Utah Transit Authority, Utah Inland Port Authority, Salt Lake City International Airport, Utah Department of Transportation, Packsize

- PacifiCorp/USU led Bi-weekly program management calls
 - Bi-weekly calls with each task area team
- Quarterly entire team meetings with presentations from sub-project teams



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Contribution to Energy Equity and Environmental Justice

WestSmartEV@Scale is having a direct benefit to underserved and overburdened communities thru the following subprojects:

EV Training: is focused on expanding EV skills in underserved communities

eCarshare@Affordable Housing: is expanding EV options in underserved communities

Intermodal Hub: is located within an underserved community. Expanding zero emissions mobility solutions directly benefits the community

TNC EV Study: is helping TNC drivers transition to EVs, since many of the drivers reside in underserved communities this subproject is beneficial

UT Inland Port Heavy Duty Electrification: the inland port authority is located within an underserved community and is adjacent to other underserved communities. Expansion of the Inland Port will result in increased heavy-duty trucking and associated emissions. Transitioning the heavy-duty vehicles to zero emitting is critical for these communities.

Summary

Three key takeaways

- The project's overall goal to create an enduring ecosystem to accelerate growth in freight, business and consumer use of EVs in the Intermountain West is **being achieved**.
- The **primary methods** of achieving this goal include
 - Identify charging infrastructure needs
 - Expand EV options in underserved communities
 - Co-locate charging infrastructure to enhance mobility and lower costs
 - Integrate freight and port charging infrastructure into infrastructure solutions
 - Expand smart charging and community mobility solutions
- Approach transportation electrification by integrating infrastructure needs and usage with consumer perspectives and think of the future!