



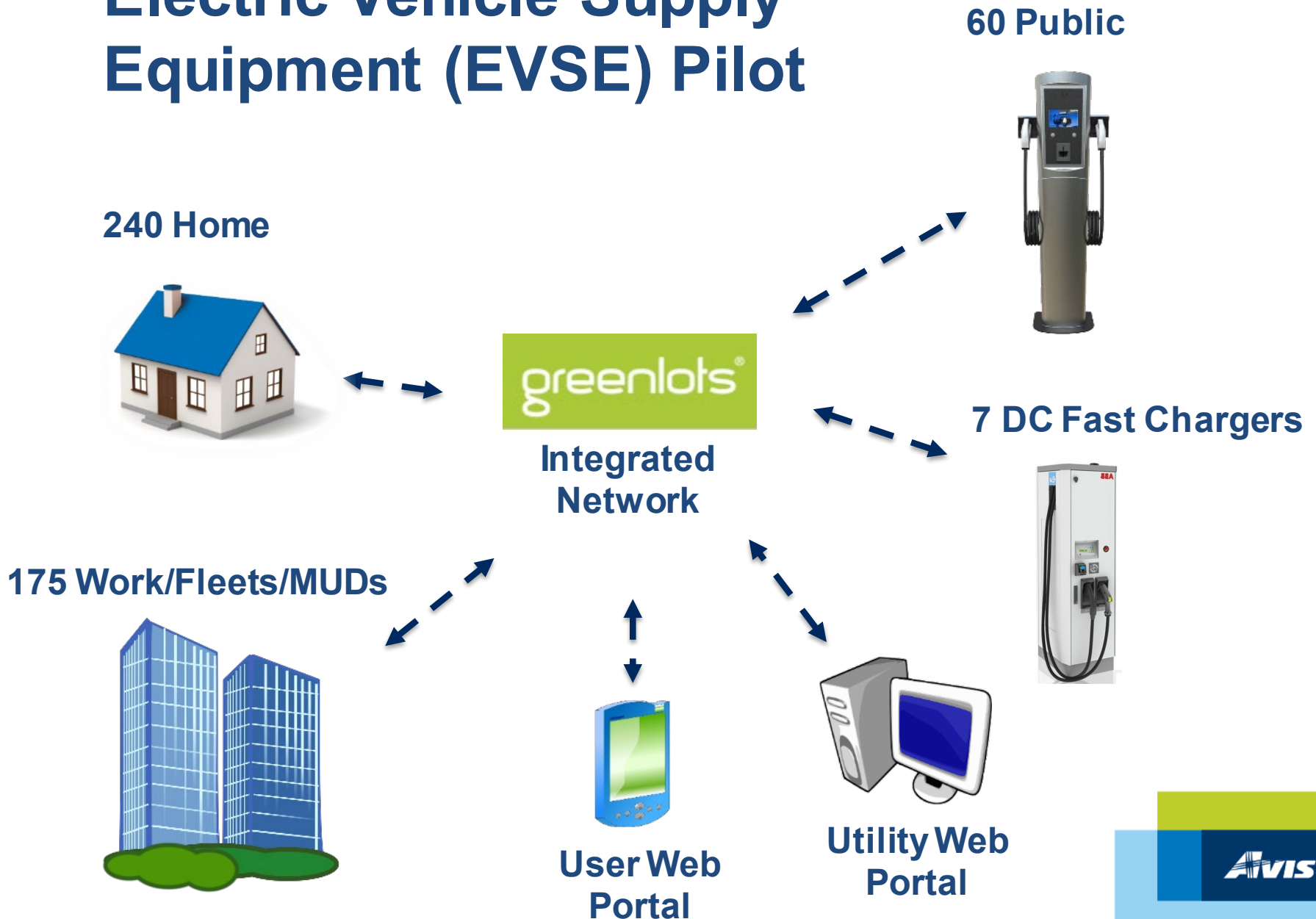
EVSE Pilot – Costs & Reliability

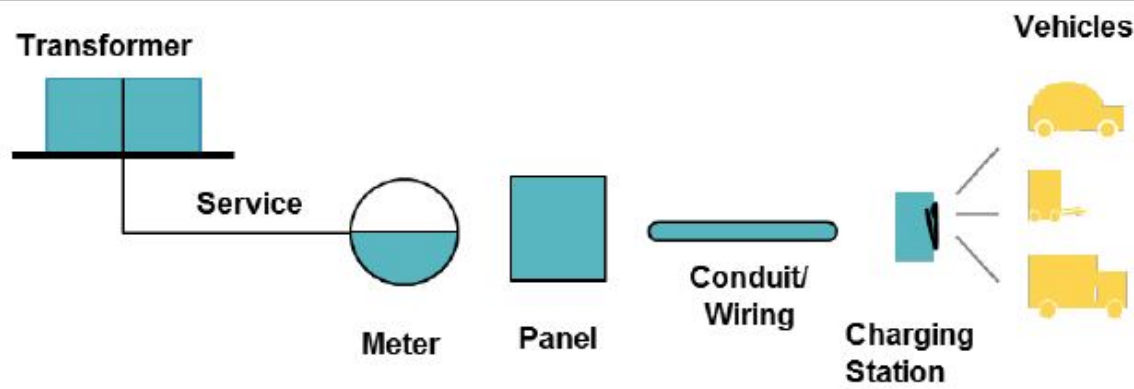
Rendall Farley, P.E.

EPRI Infrastructure Working Council

March 20, 2019

Electric Vehicle Supply Equipment (EVSE) Pilot





	Service Connection	Supply Infrastructure	Charger Equipment
1	Electric Company	Customer	
2	Electric Company		Customer
3	Electric Company	Customer	Electric Company
4	Electric Company		

Business As Usual

"Make Ready"

Charger Only

Full Ownership





cing
ELS
D
RE
NO SMOKING
FLAMMABLE





4 HOUR LIMIT
ELECTRIC VEHICLES CHARGING ONLY
ORANGE OR GREEN PERMIT REQUIRED
PLEASE MOVE VEHICLE WHEN CHARGE IS COMPLETE

NO PARKING EXCEPT FOR ELECTRIC VEHICLE CHARGING



4 HOUR LIMIT
ELECTRIC VEHICLES CHARGING ONLY
ORANGE OR GREEN PERMIT REQUIRED
PLEASE MOVE VEHICLE WHEN CHARGE IS COMPLETE





RESERVED FOR DCFS



RESERVED AREAS ONLY










NO PARKING
EXCEPT FOR
ELECTRIC VEHICLE
CHARGING

to Emission



NO PARKING
ELECTRIC VEHICLE CHARGING STATION



efacec

AVISTA

electric vehicle
fast charger



AVISTA
ELECTRICITY FOR THE PEOPLE

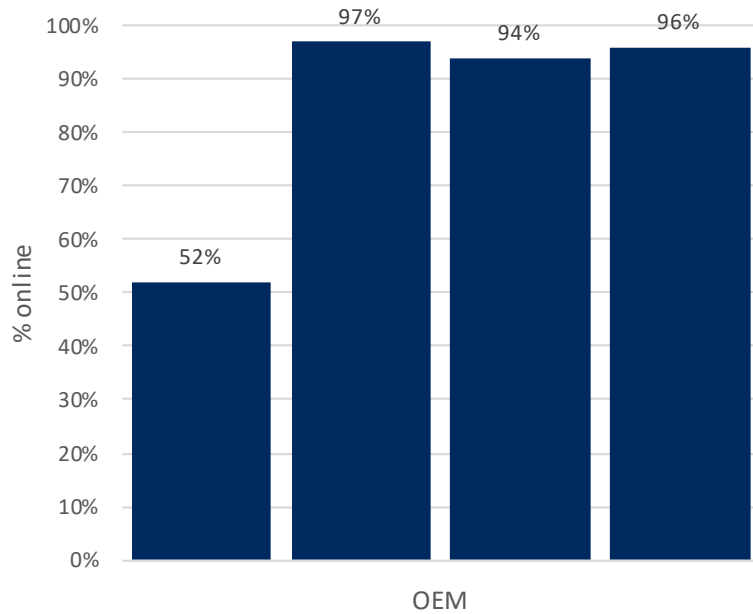
Reliability & Operational Metrics

- Notification lead time
- Corrective lead time
- Spares & maintenance costs
- Corrective costs
 - Warranty
 - Non-warranty
- % online
- % uptime

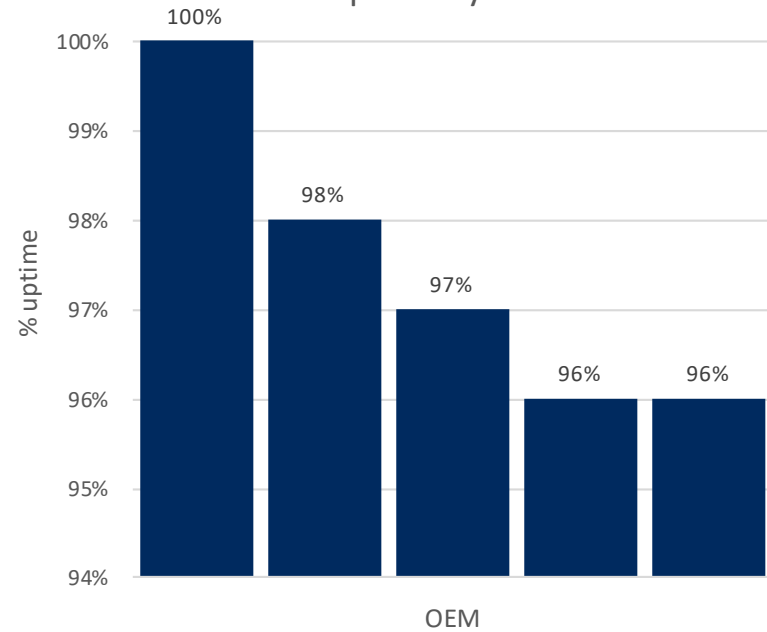
- Mean time between failure (MTBF)
- Root-cause analysis & Continuous Improvement

Priority	corrective lead time goal (days)	Criteria
Urgent	1	No backup ports. Critical, high use location. DCFC.
High	2	One other back up, high use location, remote location.
Medium	5	Still safely functional, moderate customer inconvenience
Low	7	Still safely functional, minor customer inconvenience

L2 connectivity by manufacturer



L2 uptime by manufacturer



Avista EVSE summary

OEM	L2				DCFC			
	Units	Ports	% online	% uptime	Units	Ports	% online	% uptime
	97	97	NA	100%	0	0	-	-
	109	109	52%	98%	0	0	-	-
	15	15	97%	97%	0	0	-	-
	9	18	94%	96%	3	3	100%	100%
	38	76	96%	96%	3	3	89%	89%





ETC Power

NO PARKING
EXCEPT FOR
ELECTRIC VEHICLE
CHARGING

NO PARKING
EXCEPT FOR
ELECTRIC VEHICLE
CHARGING

NO PARKING
EXCEPT FOR
ELECTRIC VEHICLE
CHARGING

Debra
~~HOMELESS~~



uGm
UNION GOSPEL MISSION

243374

LAMAR



TRACY
JEWELERS

WHERE STYKANI GETS ENGAGED

LAMAR

STEAM PLANT SQUARE

STEAM
PLANT



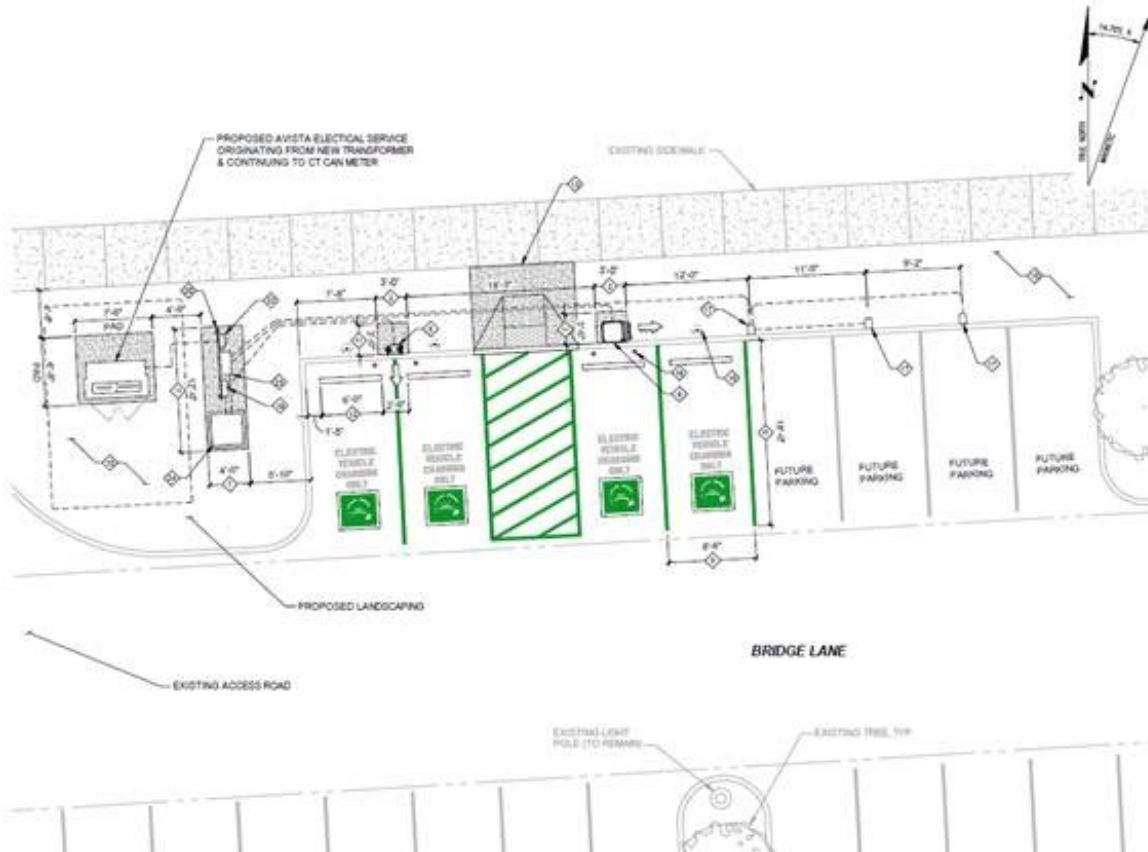




DCFC Site Design

Phase I – 50kW CHAdEMO + dual L2

Phase II – 150kW + two 50kW dispensers



CONSTRUCTION PLAN KEYED NOTES

- ◆ PROPOSED CONCRETE SLAB FOR CHARGER STATION. (ALL) (XXX)
- ◆ PROPOSED AVISTA BTC L2 DUAL CHARGER UNIT. (ALL) (XXX)
- ◆ PROPOSED AVISTA SPACED DCFC CHARGER UNIT. (ALL) (XXX)
- ◆ PROPOSED CONCRETE SLAB FOR ELECTRICAL SERVICE. SEE SITE NOTE 1. (ALL) (XXX)
- ◆ PROPOSED GREEN PAINTED PARKING LINES AND DECAL TYP. (XXX)
- ◆ LANDSCAPING AROUND XFRM & H-FRAME, & IN EXISTING AREA BETWEEN CURB & CHARGER ISLAND COMPLETED BY GREENSTONE.
- ◆ PROPOSED 8'x6' CONC WHEEL STOP, TYP (4 TOTAL). (XXX)
- ◆ RAMP INSTALLED BY GREENSTONE.
- ◆ PROPOSED AVISTA PARKING SIGNAGE OR OTHER SIGNAGE AS PROVIDED BY AVISTA. (XXX)
- ◆ PROPOSED BOLLARD, TYP. (XXX)
- ◆ PROPOSED FLUSH MOUNTED HANDHOLES FOR FUTURE EV STATIONS. SEE SITE NOTE 1.
- ◆ PROPOSED DISCONNECT.
- ◆ PROPOSED UTILITY H-FRAME.
- ◆ PROPOSED ELECTRICAL SERVICE ORIGINATING FROM A PROPOSED AVISTA TRANSFORMER. (ALL) (XXX)
- ◆ PROPOSED CT CAN METER.
- ◆ PROPOSED 400A MILBANK ENCLOSURE.
- ◆ PROPOSED STEP-DOWN TRANSFORMER.

DCFC Site Installation Costs

High	Low	Item
\$ 30,000	\$ 26,000	50kW DC fast charger
\$ 4,700	\$ 2,100	Dual port AC level 2 EVSE
\$ 5,000	\$ 1,000	Site acquisition
\$ 7,100	\$ 1,500	Engineering & Design
\$ 5,300	\$ 3,500	Project Management
\$ 72,900	\$ 51,000	Contractor Labor & Materials
\$ 36,300	\$ 14,000	Utility Labor & Materials
\$159,300	\$100,200	Total

DCFC Annual O&M Costs

\$ 525 network license, software support & cellular fees

\$ 400 planned maintenance

\$ 500 unplanned troubleshooting & repairs

\$ 250 minor offsite/onsite connectivity restoration

\$ 200 tests & inspections

\$ 200 site maintenance (snow plowing, trash, etc)

\$1,550 annual total, each DCFC

+ electricity billing net of user fees

issue	frequency/ year	material cost	hrs labor & travel	labor cost	total cost	expected annual cost
CHAdemo/CCS connector/cable replacement	0.06	\$1,500	4	\$360	\$1,860	\$112
fuse replacement	0.14	\$50	3	\$270	\$320	\$45
push button replacement	0.06	\$100	3	\$270	\$370	\$22
screen replacement	0.08	\$700	4	\$360	\$1,060	\$85
credit card reader	0.02	\$300	3	\$270	\$570	\$11
PC board replacement	0.12	\$1,000	4	\$360	\$1,360	\$163
other electronics diagnostics and repair/replacement	0.1	\$200	4	\$360	\$560	\$56
					expected annual cost	\$494

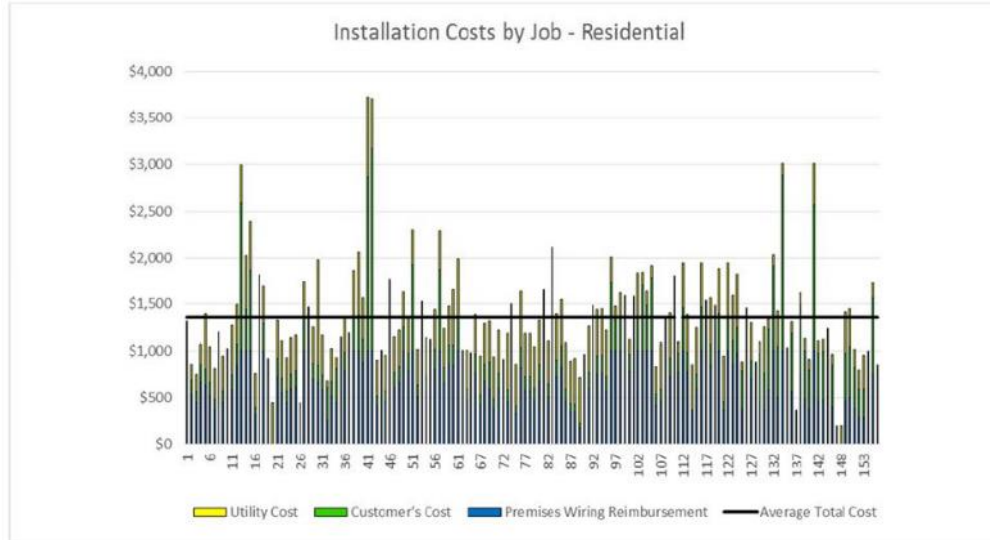


Table 3 – Networked Residential Installations (114 ports installed)

Premises Wiring Reimbursement	Customer's Cost	Utility Hardware & Installation Cost	Total Installation Cost	EVSE Cost	Total Costs Installation + EVSE
\$659	\$437	\$266	\$1,362	\$1,061	\$2,423

Table 4 – Non-networked Residential Installations (41 ports installed)

Premises Wiring Reimbursement	Customer's Cost	Utility Hardware & Installation Cost	Total Installation Cost	EVSE Cost	Total Costs Installation + EVSE
\$603	\$205	\$491	\$1,299	\$551	\$1,814



Table 5 – Networked Installation Costs (49 job sites, 110 ports installed)

Premises Wiring Reimbursement	Customer Cost	Utility Hardware & Install Cost	Total Install Cost	EVSE Cost	Total Cost EVSE + Installation	Avg. # Ports	Total Cost per Port
\$3,516	\$1,616	\$2,904	\$8,036	\$5,238	\$13,273	2.2	\$5,913

Table 6 – Non-networked Installation Costs (9 job sites, 16 ports installed)

Premises Wiring Reimbursement	Customer Cost	Utility Hardware & Install Cost	Total Install Cost	EVSE Cost	Total Cost EVSE + Installation	Avg. # Ports	Total Cost per Port
\$1,679	\$1,428	\$2,756	\$5,864	\$1,943	\$7,807	1.8	\$4,391



Networked L2 Annual O&M Costs per Port

\$ 436 network license, software support & cellular fees

\$ 0 planned maintenance

\$ 100 unplanned troubleshooting & repairs

\$ 75 minor offsite/onsite connectivity restoration

\$ 100 tests & inspections

\$ 100 site maintenance (snow plowing, trash, etc)

\$ 811 annual total (per port, assuming dual port station)

+ electricity billing net of user fees

issue	frequency/ year	material cost	hrs labor & travel	labor cost	total cost	expected annual cost
Display screen	0.02	\$250	2.5	\$225	\$475	\$8
Cable replacement	0.10	\$253	2.5	\$225	\$478	\$48
PCB replacement	0.02	\$420	2.5	\$225	\$645	\$11
RFID reader	0.02	\$286	2.5	\$225	\$511	\$9
Energy meter / breaker / contactor / power supply	0.02	\$200	2.5	\$225	\$425	\$7
					Per dual-port station	\$82
					per port	\$41

Transportation Electrification



DRIVEN BY ENERGY

The adoption of EVs by more drivers, like the Avista customer in Spokane shown below, provides Avista with new opportunities. Current technologies enable EVs to achieve energy costs per mile of less than \$1.00 per equivalent gallon of gasoline, while reducing CO₂ and other pollutants by more than 75 percent. Avista has initiated a two-year pilot program by offering installation of 120 residential EV charging stations.



Next Up: 5-year Electrification Plan

- EV Infrastructure
- Commercial Fleets
- Education & Outreach
- Community & Low-Income
- Grid Integration / R&D