



Summit County's EV Charging Station Infrastructure Report and Strategic Plan

November 20, 2019

This report presents a summary of the strategic development of Summit County's EV charging station network and outlines the plan to complete the infrastructure.

Terms and Abbreviations

DC – Direct current

EV – Electric vehicle

EVSE – Electric vehicle supply equipment (aka charging station)

FTA – Federal Transit Authority

GHG – Greenhouse gas emissions

PHEV – Plug-in hybrid electric vehicle

RMP – Rocky Mountain Power

Background

In 2017, Summit County Council adopted Resolution 2017-19 that stated the objective to transition 50% of its passenger fleet to alternative fuel, hybrid, and electric vehicles by 2022. To support this vision, Sustainability staff has work with Facilities, Engineering, and Community Development to build the EV charging network needed to support EVs. The network consists of both Level II and DC Fast charging stations. Charging at a Level II station can add up to 25 miles of range per hour of charging. Meanwhile, a DC Fast Charging station can add up to 250 miles of range within an hour. While DC Fast Charging station will support fleet vehicles that need a quick top-off, it is better for the battery life to, generally, charge as slowly as possible.

EV Stations Installed to Date

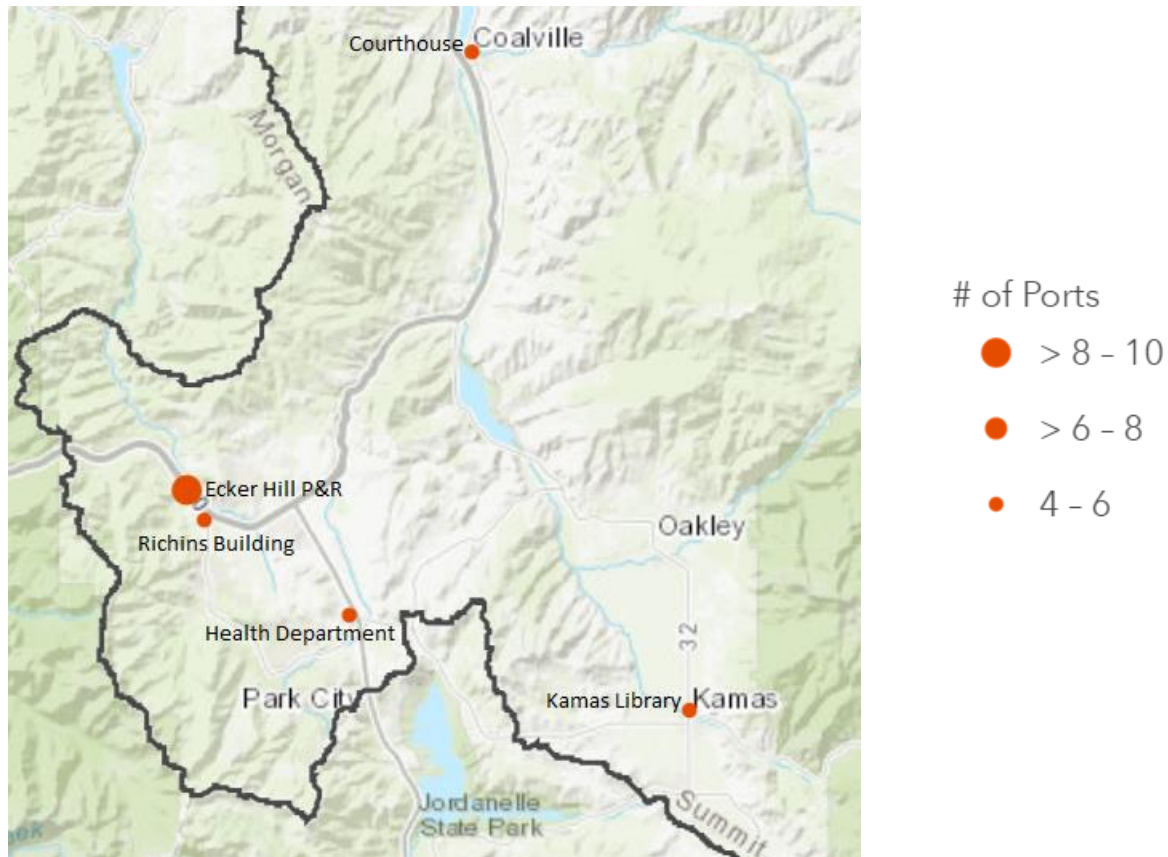
There have been four electric vehicle supply equipment (EVSE) installation projects. The first project was a non-networked, dual-port Level II station at the Courthouse in Coalville. The second installed a non-networked, dual-port Level II stations at the Richins Building. Because the non-networked stations are not sub-metered, their usage cannot be measured. The third project installed two networked, single-port DC Fast Charging stations at the Richins Building. They came with two connector types, but each station can only accommodate one car at a time. Because they are networked, they collect data on every charging event, including start time, end time, electricity used, etc. The fourth installation project placed networked, dual-port, Level II stations throughout the County. Five were installed at Ecker Hill Park-and-Ride, two at the Health Department, two at the Kamas office, and two at the Courthouse in Coalville. This project removed and replaced the Courthouse station installed during the first EVSE project. An additional networked, single port, DC Fast Charging station was also installed at the Courthouse. Table 1 summarizes the installations to date. Map 1 shows the current coverage of Summit County’s EVSEs.

Table 1: EV Charge Station Network (Existing)

Year	Qty, type of charge station	Location	# Charge Ports	Total Installed Cost	Revenue	Net Installed Cost to County	Funded by others	Revenue Source
2016*	(1) Level II, non-network (Clipper Creek)	Courthouse	2	\$1,500	\$0	\$1,500	0%	
2017	(1) Level II, non-network (Clipper Creek)	Richins/KJ Transit	2	\$1,500	\$1,500	\$0	100%	Builder
2018	(2) Level III, 50 kW DC networked (BTC)	Richins, Kimball Junction	2	\$183,140	\$183,140	\$0	100%	RMP Westsmart Grant
2019	(1) Level III, 50 kW DC networked (ChargePoint)	Courthouse	1	\$158,580	\$120,500	\$38,080	76%	RMP STEP funds
	(2) Level II, networked (ChargePoint)	Courthouse	4					
	(2) Level II, networked (ChargePoint)	Kamas	4					
	(2) Level II, networked (ChargePoint)	Public Health	4					
2019	(5) Level II, networked (ChargePoint)	Ecker Hill Park and Ride lot	10	\$60,160	\$17,258	\$42,902	29%	RMP EV Rebate
TOTAL TO DATE			27	\$404,880	\$322,398	\$82,482	80%	

*The Level II station at the Courthouse was removed and replaced in 2019.

Map 1: Existing EV Charging Station Locations



All EV charging stations are located within 25 miles of each other. Level II stations can charge at about 25 electric miles/hour. Therefore, a one-hour charge session provides enough charge to reach another station. The stations are within the range of both plug-in hybrid and all-electric vehicles. The majority of plugin hybrids (PHEV) have an electric range of around 25 miles, while all-electric vehicles (EV) typically have over 100 miles of range. Pending execution of the Renewable Energy Service Contract (expected December 2019) and use of net 100% renewable electricity—a goal stated in Council Resolution 2017-16—an employee’s round trip to another county office could be powered by entirely clean, renewable electricity. Employees could be making zero-emissions trips as early as 2023.

To date, the County has invested \$84,661 to build a network of 15 EV charging stations, capable of charging 27 EVs simultaneously. Sustainability staff secured grants and rebates to fund 80% of the actual cost to construct the network (\$404,880).

Current Operating and Maintenance Cost

Since the installation, the county has paid about \$31,200 in operating costs: an estimated \$30,600 in electricity and approximately \$600 in staff maintenance. In 2018, as part of the original project grant, RMP reimbursed \$19,120 in operating and maintenance costs for the two DC Fast Charging stations at Richins. Staff maintenance covers the staff time needed for two visits per site per year.

The County currently has one PHEV and one EV. From 2016 to 2018, the PHEV saved an estimated \$1,193 in gasoline costs.

The new Level II ChargePoint stations are on a three-year maintenance plan, which covers parts and service. This plan has already allowed ChargePoint to run diagnostics and restart stations in need of service. It has also allowed a technician to come out and inspect two stations that could not be fixed remotely. The technician was able to repair one station, but the second station's issue was related to an unsteady electricity supply. The electrician who set up the station was called back to check on the station's connection.

The Level II stations have J1772 plugs, and the DC Fast Charging stations have both Combo and CHAdeMO plugs. These plugs are compatible with nearly all other PHEVs and EVs sold in the United States. The plug needed for Tesla EVs is unique, proprietary, and is not compatible with the County's EV charging stations. Tesla drivers who wish to use the EVSEs must have an adaptor to connect to the J1772-type charge ports.

One of the most frequent public complaints staff has received is from Tesla drivers who are unable to connect to the County's stations. Tesla offers mobile connector kit/adaptor that is compatible with the County's Level II stations at a cost of \$95. The County could provide an adaptor for the DC Fast Charging stations at a cost of \$450, if desired.

Station Use

Station usage is best understood when compared to a baseline. The Idaho National Laboratory's EVSE behavioral study will be used to benchmark the County's EVSE usage. It is currently the most comprehensive study of EVSE use behavior in the US. The Idaho National Laboratory collected data from 17 regions across the United States. They found that the median charge frequency was 1.4 charges per week for Level II stations and 7.2 charges per week for DC Fast Charging stations.

The County's Level II ChargePoint stations saw a significant increase in use since their installation. In the first two months (June-July 2019), there was an average of 1.0 charges per port per week, 26% below the national median. In the past three months (August-October 2019), average usage has increased to 1.6 charges per port per week, 17% above the national median. After a mere five months of being operational, the Ecker Hill Park-and-Ride is a close second for total monthly charging events of any location.

DC Fast Charging stations are expected to see more charging sessions than Level II. Factors such as shorter charging times and destination versus convenience charging contribute to their higher use. Both the Richins and Coalville DC Fast Charging stations had more frequent charging events than the Level II stations. In 2018, the DC Fast Charging stations at the Richins Building saw about 6.6 charges per station per week. From January-October 2019, that has increased to 8.2 charges per week. This increases the charging frequency from 8% below the national median to 14% above the national median charge frequency. The DC station in Coalville saw an average of 0.9 charges per week during the first two months of installation. That has increased to 2.7 charges per week during the most recent three months (Aug – Nov 2019). DC Fast Charging stations are more likely to be used as destination charging than Level II stations. As the public becomes more aware of its location, use is expected to increase.

Future Infrastructure Strategic Plan

Moving forward, dual-port Level II EVSEs are planned at all major County operation hubs. These include Public Works, the Justice Center, and the Ledges Event Center at the Summit County Fairgrounds. Additional networked stations are planned to be added at the Richins Building, presently the location with the highest total monthly charging events. Installations are planned for Jeremy Ranch and Kamas Park-and-Ride lots. An electric bus charger is being designed into the Kamas Park-and-Ride lot to support the transition of the Summit County and Park City transit fleet to electric buses. See Table 2 for a summary of the EV charging network planned expansion.

Level II stations work best as convenience chargers. Prime station locations have been where staff already park their cars. Summit County employees will be able to charge their personal EVs and fleet EVs at their primary work location. If built as planned, there will be EV charging stations at all major county facilities by 2022. The completed network of charging stations will help ease employees' range anxiety, provide EV charging for staff and residents to utilize county-owned park and ride lots, and facilitate the transition to a 50% alternative fuel, and electric fleet by 2025.

Future EV Charging Station Installation Cost

The equipment and installation costs expected to complete the County's EV charging network are divided into three projects during 2020-2022 (Table 2). Map 2 shows the location of both current and future charging stations when built as planned.

The first project planned is the installation four dual-port Level II stations at the overflow parking lot on the south side of the Richins building, three at the Justice Center, and three at Jeremy Ranch Park-and-Ride. The total cost estimated is \$212,080. Of that amount \$85,211, or 40%, is expected to be funded by grants and/or rebates.

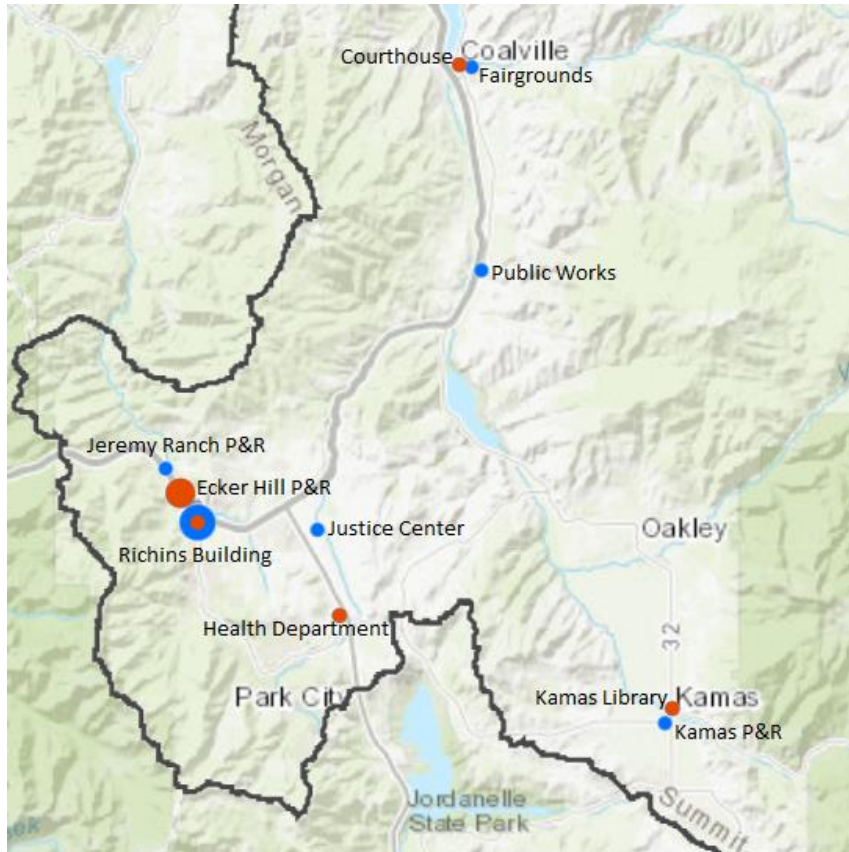
The second project planned will install two dual-port Level II stations at Public Works, two at Summit County Fairgrounds, and four at the Kamas Park-and-Ride. The estimated cost to the county is about \$129,808. Of that amount \$41,535, or 32%, is expected to be covered by grants and/or rebates. Installation costs vary significantly according to site conditions.

The final project is an electric bus charging station at the Kamas Park-and-Ride. An overhead charger unit is expected to cost \$241,600. Of that amount \$169,120, or 70%, is expected to be funded by grants, rebates, and/or FTA funds. Staff will collaborate interdepartmentally to obtain a portion of the total project funds.

Table 2: EV Charging Network Planned Expansion

Year	Qty, type of charge station	Location	# Charge Ports	Total Installed Cost Estimate	Expected Revenue	Net Installed Cost to County	Expected Funding by others	Expected Revenue Source
2020	(4) Level II, networked (ChargePoint)	Richins, Kimball Junction Transit	8	\$100,422	\$64,211	\$36,211	64%	RMP Rebate, RMP Custom Project Grant
	(3) Level II, networked (ChargePoint)	Jeremy Ranch Park and Ride	9	\$42,754	\$10,500	\$32,254	25%	RMP Rebate
	(3) Level II, networked (ChargePoint)	Justice Center	9	\$68,904	\$10,500	\$58,404	15%	RMP Rebate
2021	(2) Level II, networked (ChargePoint)	Ledges Event Center	4	\$30,086	\$7,000	\$23,086	23%	RMP Rebate
	(2) Level II, networked (ChargePoint)	Public Works	4	\$70,386	\$7,000	\$63,386	10%	RMP Rebate
	(2) Level II, networked (ChargePoint)	Kamas Park and Ride	4	\$29,336	\$27,535	\$1,801	94%	RMP Rebate, RMP Custom Project Grant
2022	(1) Bus Charger, non-networked	Kamas Park and Ride	1	\$241,600	\$169,120	\$72,480	70%	RMP Custom Project Grant
Total Additional			39	\$583,488	\$295,866	\$287,622	51%	

Map 2: Planned Expansion of EV Charging Stations Locations



of Ports

- > 8 - 10
- > 6 - 8
- 4 - 6

of Ports

- > 10 - 12
- > 8 - 10
- > 6 - 8
- 4 - 6

RED = Existing EV Charging Stations

BLUE = Planned EV Charging Stations

Ongoing Operating and Maintenance Costs

The new Level II stations are expected to add approximately \$15,000 to the electricity bill per year. The bus charger is expected to cost approximately \$75,000 per year to power. Upon complete of the EV charging station network, the County can expect a total additional increase of approximately \$133,000 on electric bills to charge EVs (passenger vehicles and a transit bus operating between Kamas and Park City).

A cellular network fee is required to allow the County to monitor usage and implement fees, if deemed necessary. The current ChargePoint three-year networking contract fee is \$700 per port. The existing three-year maintenance plan that covers parts and service on the ChargePoint stations can be renewed in one- to five-year increments. A three-year maintenance plan costs \$2,400 per station. The total annual network contract and maintenance plan costs range between \$22,605 and \$45,148 per year, depending on where the County is in the three-year cycle. Staff time to visit each site twice a year is estimated at \$650 annually when all stations are installed.

The ongoing operating and maintenance costs can be offset in part, or in full, by implementing a usage fee. It should be noted that any fee structure has the possibility of discouraging use that will decrease revenue. A typical 10% of transaction fee would be incurred as well. However, fees can be structured to encourage turnover at stations and prioritize employee and county fleet vehicle use over resident use. With ChargePoint, the County can keep charging sessions free for the majority of customers, but begin billing users after a car has been plugged-in for an excessive amount of time. The rates can be separated, so the fleet and employees would not pay to use County stations.

The real source of revenue to offset the operational costs of the EV charging network is the fleet fuel cost reduction of switching from gasoline vehicles to EVs: the elimination of gasoline and its price volatility as the number of EVs increases toward the Council goal of 50% alternative and electric vehicles by 2025. A single PHEV is expected to save about \$840 in gasoline annually. This number fluctuates greatly with gasoline prices.

Conclusion

Implementation of this strategic plan to complete the County's EV Charging Infrastructure will contribute to the reduction of GHG emissions from government operations. Together, tailpipe emissions from the County's vehicle fleet, transit fleet, and employee commutes make up 23% of the County's total operational emissions. Transitioning to EVs, coupled with the transition to net 100% renewable electricity, will be critical to meeting Council's goal to reduce GHG emissions of county-operations 80% below 2016 level by 2040 as stated in Resolution 2017-16.

If built as planned, all stations will be within 25 miles of each other. The complete EV charging network will support County fleet, employees, and residents as they transition to electric vehicles. The value added of the County's network allows us to monitor usage and adjust stations use to fit the County's needs and make significant progress toward achievement of Council's goals.

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