Addressing **City Council Objective 4.2: Identify City vehicles suitable for scheduled replacement with an electric vehicle** *[This topic is associated with state law and R2012-11, Reducing greenhouse gas emissions.]*

Prepared by Ann Soule, Resource Manager, November 2020

BACKGROUND

"The EV market in the United States is rapidly expanding with the light-duty passenger vehicle and transit bus markets already approaching maturity. EVs have become an attractive alternative to conventional vehicles because they operate at three to four times the efficiency of a conventional vehicle, can have zero tailpipe emissions and very low lifecycle emissions, are fueled by a locally-generated, low-cost energy source, and offer exceptional performance and a quiet driving experience.

"A substantial expansion in the number of EV models available across all vehicle types is coming soon. This expansion of models will include options across all light-duty vehicle segments including ones where there is currently no EV alternative, such as pickup trucks."

"Recommendation: When electrifying vehicles, the state should consider pursuing:

- *Right-sizing or selecting the least expensive EV alternative that meets the operational needs of a given vehicle, which could double the share of EVs deployed.*
- *Electrifying vehicles with high annual mileage.*
- *Smart charging systems or other means to avoid high electricity costs.*
- *Low-cost Level 2 charging solutions for light-duty vehicles."*

(Electrification Assessment of Public Vehicles in Washington, 2020)

In addition to all-electric, other alternative fuels that conserve greenhouse gas emissions over standard ICE (internal combustion engine) vehicles include hybrid electric, propane/LPG, and renewable diesel (R99) (City of Auburn Green Fleet Action Plan, circa 2015). In 2020 the City ordered a propane pickup truck and depending on staff satisfaction that could be a better alternative for many uses in the field, compared to electric.

INTEGRATION OF EVs INTO CITY OF SEQUIM FLEET

The City's ICE vehicles that are most appropriate for replacing with low-cost EVs are when normal uses:

- Don't regularly need >250-mile range
- Don't need 4WD
- Don't need instant refueling (total refuel in less than 2 hours) (police cars and those used in emergency response may need instant refueling)
- Don't need to carry >4 passengers or large cargo, or pull a trailer
- Don't need high horsepower

The following are available in electric or other alternative fuels at a higher cost (since the market is newer):

- 4WD
- High clearance
- Large cargo or 5-passenger capacity
- High horsepower
- Extra-long range

Given the above factors, the vehicles most logical for replacement with an EV include:

- Vehicles driven for in-town inspections or errands/meetings on the North Olympic Peninsula when 4WD is not necessary
- Vehicles used for round trips in the Puget Sound area (round trip to Tacoma or Olympia is 200-230 mi.)
- Vehicles used for one-way trips further away when charging stations can be accessed (one-way to Wenatchee is 250 mi.)
- Vehicles which only need single or double occupancy and low/moderate cargo space
- Vehicles which can be plugged into a charger for 1-3 hours every few days, depending on situation

The following vehicles ***definitely*** meet these criteria (not in order of scheduled replacement) and are highlighted in green in the Addendum table:

- Shared commuter vehicles (both are currently gas hybrids)
- DCD building inspector vehicle (gas hybrid)
- PW engineers' vehicle
- PW Parks vehicles, depending on cargo space (electric cart not in table)
- WRF vehicles (electric cart(s) not in table)
- PW janitor vehicle, depending on cargo space (Might-E-Truck is electric)

The following vehicles ***may*** meet these criteria (not in order of scheduled replacement) and are highlighted yellow in the Addendum table:

- PW light duty pickups or SUVs, depending on cargo space
- Passenger van
- PD cars, depending on range and refueling needs, and cargo space (not included in table)

Another consideration in identifying appropriate ICE vehicles to replace with AFV is whether a vehicle has especially poor fuel efficiency (miles per gallon). These are highlighted in orange in the Addendum table.

Note that the integration of electric vehicles to the City's fleet will require investment in Level 2 (standard speed) charging infrastructure and adjustments to normal operations related to parking and overnight charging. While Level 2 chargers are not expensive, they must be installed near an adequate power supply.

REFERENCES

Electrification Assessment of Public Vehicles in Washington. Atlas Public Policy et. al. November 2020.
PowerPoint summary for above:
https://leg.wa.gov/JTC/Meetings/Documents/Agendas/2020%20Agendas/Nov%2017%20Meeting/Electrification_draftfinalpresentation.pdf

City of Auburn Green Fleet Action Plan. Circa 2015.

RCW 43.19.648 Publicly owned vehicles, vessels, and construction equipment…

ADDENDUM

Excerpt from "Integrating EVs into a City Fleet: Final Internship Report for City of Sequim, WA"
By Connor Holm, Peninsula College, June 2020

Summary: Integration of EVs into the City's Fleet

Certain fleet vehicles require qualities only found in ICE (internal combustion engine) vehicles. For this reason, until more EV options become available on the market, it is unlikely that a large portion of the City's heavy-duty fleet can be replaced with EVs. However, if some compromises are possible in regards to vehicle qualities, such as cargo space and range, replacing some portion of the City's fleet with EVs may be feasible. Passenger vehicles that are used for trips, in-city inspections, and in-city maintenance, for example, would likely be suitable candidates for being replaced by consumer electric vehicles.

Many City vehicles may not often be driven long distances and may not often require large amounts of cargo space even though they currently have the capabilities. Replacing these vehicles with EVs would likely be entirely possible and would also provide the benefit of lower maintenance and fuel costs.

Background

The City currently owns and operates 61vehicles:

- ***5 Commuter/Passenger Vehicles*** – Compact vehicles, sedans, crossovers, and SUVs
- ***22 Pickup Trucks*** – Any pickup truck smaller than a Ford F-450
- ***5 Specialty Pickup Trucks*** – Any pickup truck customized for specific tasks or that is larger than a Ford F-350
- ***29 Specialty Vehicles*** – Dump trucks, street sweepers, bucket trucks, tankers, forklifts, mowers, skidsteers, and cement rollers, among others

For work-related trips, City staff have access to three vehicles for work-related driving: a Honda Insight Hybrid (vehicle #53), a Ford Escape Hybrid (vehicle #54), and a Dodge Grand Caravan (vehicle #84).

During the period from May 2019 – January 2020, City staff checked out these three vehicles for a combined total of 151 times.

The table below summarizes relevant data for May 2019 – January 2020:

Vehicle	Number of Times Checked Out	Trips to Locations on the North Olympic Peninsula	Percentage of Trips to Locations on the North Olympic Peninsula	Average Miles Driven Per Working Day
Honda Insight Hybrid (#53)	61	48	79%	19
Ford Escape Hybrid (#54)	58	48	83%	13
Dodge Grand Caravan (#84)	32	12	38%	29

Overall, combined, 72% of these three specific vehicles' trips were to locations on the North Olympic Peninsula (Sequim, Port Angeles, and Port Townsend). In addition to these locations, other common destinations were Silverdale, Forks, Poulsbo, Shelton, Bremerton, Olympia, Port Ludlow, and Mt. Vernon.

The table below summarizes available fuel log data for City-owned pickup trucks and commuter/ passenger vehicles for 2019:

Vehicle	Model Year	Estimated Combined MPG	Total Fuel Used (Gallons)	Total Fuel Cost (Dollars)	Average Miles Driven Per Day	Average Miles Driven Per Month
WR-02 Chevrolet 2500	1999	7	97	260	3	57
SR-46 F-350	1995	11	70	199	4	73
SR-04 Chevrolet 2500	1994	14	83	251	4	83
TP-36 Chevrolet 1500	1995	11	100	234	6	117
ST-13 Dodge 1500	2007	18	136	351	6	119
SH-75 RAM 3500	2017	12	236	656	10	215
PW-66 Ford Explorer 4WD	2016	17	154	414	10	217
DC-50 Honda Insight Hybrid	2011	30	77	222	12	252
WR-18 Chevrolet 3500	1993	12	264	700	12	257
AD-54 Ford Escape Hybrid Black	2009	29	71	221	13	275
PW-83 Chevy Silverado 4WD Crew Cab Pickup	2017	17	263	672	15	313
PK-49 Ford F-350	2006	8	330	953	15	315
ST-64 Ford F-350 4X2	2015	13	341	962	15	316
SH-03 Ford F-150	2005	16	459	1285	18	372
AD-53 Honda Insight Hybrid	2012	48	51	164	19	393
SR-97 Ram 3500 4x4 Crew Cab Pickup	2018	12	634	2094	21	433
SR-52 Ford F-250	2012	12	416	1202	22	460
AD-84 Dodge Grand Caravan	2017	29	194	807	29	609
WR-73 Dodge Ram 2500	2002	10	537	1500	31	642
WR-65 Chevy Colorado 4WD Ext Cab	2016	15	408	1160	32	670
ST-102 Ford F350 4x4	2019	13	90	303	38	805
TP-98 Ram 2500 4x4 Crew Cab Pickup	2018	13	721	2103	41	864
WR-82 Chevy Silverado 2500HD	2017	9	1012	2718	52	1085
TOTALS			**6741**	**19430**	**428**	**8944**

AVERAGES	**16.3**	**293**	**845**	**19**	**389**

Note: The totals and averages found above were calculated using data from the City's 2019 vehicle fuel-up log [covers non-Police vehicles only]. Where possible, a vehicle's 'Estimated Combined MPG' was averaged from three MPG calculations. However, some vehicles had very few fuel entries, and some vehicles may be missing fuel entries altogether. As a result, the numbers found above are estimates based off of the information provided in the log as of March 13, 2020.

Costs

The purchase price of a new electric vehicle and the costs associated with purchasing and installing EV infrastructure are significantly higher than purchasing a comparable, new ICE vehicle. However, over the course of an electric vehicle's life, maintenance and fueling costs are lower. Therefore, the longer an EV is owned, the better the value.

City of Sequim's fleet management assumes new vehicles will be kept for 20 years. Found below is a comparison of the estimated costs over 20 years or 200,000 miles for the Chevrolet Malibu and the Chevrolet Bolt, based on data presented earlier in this report:

	Chevrolet Malibu	**Chevrolet Bolt**
Purchase Price	$23,000	$37,500
Fuel Cost Per 200,000 Miles	$19,000	$3,800
Maintenance Costs Over 20 Years	$34,000	$4,000
EV Battery Replacement Cost	N/A	$15,000
EV Infrastructure and Installation	N/A	$3,000
Lifetime Totals	**$76,000**	**$63,300**

Note: Vehicle maintenance costs come from New York City's fleet data. New York City uses the Chevrolet Bolt but does not use the Malibu; the City instead uses the Ford Focus and Ford Fusion. Since these vehicles are both comparable to the Chevrolet Malibu, the $1,700 maintenance should provide a relatively accurate estimate. EV battery replacement estimated at $15,000 is not certain within 10 years but can be assumed within 15-20 years (current battery technology is too new to have certainty of its lifespan or cost of replacement**). Finally, the EV infrastructure and installation cost was calculated with the following: $2,200 installation + $800 charger. If it's available to the City, a 30% EV infrastructure tax credit would lower this cost to $2,250. Note that infrastructure costs may be spread over time and may not be required for each new EV.

Given these conservative assumptions, the total cost over a 20-year period is estimated at $76,000 for the Chevrolet Malibu and $63,300 for the Chevrolet Bolt.** Depreciation is assumed to be roughly equivalent for both vehicles.

Post-script by staff: In terms of distance, the average lifespan for a 2020 EV battery is between 100,000 and 200,000 miles (400-800 miles per month for 20 years) – much more than most city vehicles are driven. If the cost of a battery replacement within 20 years were eliminated or pro-rated there would be a much greater cost advantage for the Bolt EV.