11.4 Review of Electric Vehicles for Council's Fleet

Delivery Program	Operations Support
Objective	To consider the feasibilty of introducing Electric Vehicles into Council's Fleet.

Background

This report responds to a resolution of Council to consider the feasibility and benefits of introducing electric vehicles (EV) into Council's fleet.

To respond to this resolution staff have reviewed Australian EV trials and various technical papers as well as contacting nearby Councils that have purchased EVs.

Key Issues

- Considering the use and cost of Electric Vehicles
- Optimum plant selection to minimise operational costs

Information

Types of Electric Vehicles

The types of EVs available in the current market are summarized below.

Hybrid Electric Vehicle (HEV)	Petrol powered vehicles which are supplemented with electrical energy stored in batteries. This energy is captured from the braking system. Models: Toyota Prius, Honda Civic Hybrid, Toyota Camry Hybrid.
Plug-in Hybrid Electric Vehicle (PHEV)	Similar to the HEV with the addition of a plug to charge the battery of the vehicle. They differ in their choice of using petrol or electricity as their primary energy source. These can also be referred to as extended range vehicles. Models: Holden Volt, Mitsubishi Outlander
Battery Electric Vehicle (BEV)	Vehicles which use electricity as their sole energy source. Models: Nissan Leaf

Therefore only passenger vehicles are available as an EV, with no utility or vehicle types currently in the market. Council has a fleet of passenger vehicles for operational purposes. These vehicles are available to certain staff for private and commuter use purposes. Staff pay a lease fee to cover the costs of the private use associated with these vehicles. The passenger vehicles are primarily based at the Council Administration Office.

The specific models of electric vehicles compared throughout this report, are popular models which are available on NSW Buy Government Contract. These include: Nissan Leaf (BEV), Holden Volt (PHEV) and Mitsubishi Outlander (PHEV).

Charging Electric Vehicles

Electric vehicles can be charged by using a designated charging station or utilising the charging cable provided with the vehicle to charge from a standard power supply wall socket.

It is recommended to utilise a 15amp power supply although a 10amp charging cable is available from manufactures, this extends charging time significantly.

Charging a battery differs between the vehicle models. For most batteries it is recommended to charge to 80% capacity to prolong battery life (however the Mitsubishi Outlander does not specify these restrictions on battery charging).

The following provides details on the time to charge a battery in three specific EVs utilising different power supplies.

Nissan Leaf (BEV)	**Holden Volt** (PHEV)	**Mitsubishi Outlander** (PHEV)
A designated charging station, providing 22amps. • 'Quick charge' can take the battery to 80% in 30 minutes. • 'Normal charge' takes around 7-8 hours to full charge • 'Trickle charge' takes around 14 hours*.	A power supply providing: • 15amps, will fully charge the battery in under 4 hours. • 10amps, will fully charge the battery in under 8 hours.	A power supply providing: • 15amps will fully charge the battery in under 5 hours.

In the future EVs may come with the ability to swap batteries with fully charged replacements at dedicated swap stations and/or the possibility to charge using wireless induction-charging. However, the majority of electric vehicles are currently charged by using a plug-in connection.

Dedicated Charging Stations

If needed, a dedicated charging station can be installed – the benefit to this is the ability to charge the EV at a higher current. A higher current decreases the time to charge the battery.

Brisbane City Council currently operated eight EVs and do not utilise a dedicated charging station as they consider the cost is not warranted. They charge their vehicles by 10/15 amp connections to a standard power plug.

Lismore City Council operates two electric vehicles and have installed a charging station utilising the solar panels at their waste facility. The cost of their charging station was $1,375.

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Staff have sought an indicative quote for the supply of a charging station in Ballina with the indicative price being $1,800 ex GST plus installation and cost of charging leads at $390 each.

Typical Travel Range

A typical travel range for an electric vehicle is between 100 and 150km, depending on the vehicle. Of the three vehicles listed previously the estimated travel range from a fully charged battery is as follows (subject to driving conditions).

Nissan Leaf (BEV)	**Holden Volt** (PHEV)	**Mitsubishi Outlander** (PHEV)
170 km from full charge.	70 km from full charge. 600 km including a full backup generator tank & fuel tank.	52 km from full charge.* 824 km including a full fuel tank. *Indicative figures. Hasn't had the ADR testing done.

Brisbane City Council currently utilise six Nissan Leaf and two Holden Volt. They charge batteries to 80% charge for optimum battery life and obtain a range of approximately 120km from both vehicles (depending on operator).

Lismore Council operate one Nissan Leaf and are looking to add more to fleet and achieve approximately 150km with full charge.

Cost to Purchase

The following electric vehicles are available from a NSW Buy Government Contract.

Nissan Leaf (BEV)	**Holden Volt** (PHEV)	**Mitsubishi Outlander** (PHEV)
$29,809 (ex-GST)	$50,373 (ex-GST)	$41,973 (ex-GST)

By way of comparison, Council has a number of Hyundai ix35 in its fleet and the current purchase price for these is $28,355.

Vehicle Servicing

The difficulty with electric vehicles within this region is that there are no local servicing facilities. Lismore City Council currently transports the Nissan Leaf to Southport for servicing. This would also be required for the Holden Volt (PHEV) or Mitsubishi Outlander (PHEV).

Quayside Motors are looking at the viability of becoming a certified service agent for Mitsubishi Outlander although there are significant costs to the dealer in training and workshop setup.

Residual Sale Value

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To ascertain the estimated resale values of the electric vehicles, various sources have been utilized, such as Redbook, Auction sales and data from other councils.

Vehicle	Milage	Resale Value	Retail Price	Residual on Sale
Nissan Leaf 2012 (BEV)	30-50,000 km	$17-19,000	$29,809 (Gov contract)	58% over 3 years
Holden Volt 2012 (PHEV)	30-50,000 km	$27-30,400	$50,373 (Gov contract)	53% over 3 years
Mitsubishi Outlander 2014 (PHEV)	*15-25,000 km*	*$28-31,300*	*$41,973 (Gov contract)*	*59% over 1 year*

This compares favourably to a current petrol engine vehicle, the figures for the Hyundai ix35 are shown below. If it were replaced after a 3 year period (inline with the above EVs) it would have a residual of 55%.

Hyundai ix35	45,000 km	$15,000	$28,355 (Gov contract)	55% over 3 years

It appears that EVs are receiving high residuals, although the EVs generally have a lower utilisation than a petrol engine vehicle due to the limited travel range. Current petrol engine vehicles in Council's fleet are held for 5 years as this is seen as the optimum replacement time. At this turn over time, the petrol passenger vehicles have a residual of around 30%.

Whole of Life Costs

Estimating and comparing a vehicle's 'whole-of-life' cost enables fleet managers to gain a more accurate picture of vehicle costs over time and assists in making more strategic purchasing decisions.

The 'Whole-of-life' cost calculations include the following elements:

- purchase price
- depreciation
- recurring fixed costs (registration, insurance, roadside assistance)
- operating costs (fuel, tyres and maintenance).

The table attached to this report (attachment one) makes assumptions and uses available data to determine the 'whole-of-life' cost of the EVs and the Hyundai ix35 petrol vehicle. The estimated cost to Council per km for each of these vehicles (after trade-in), are as follows:

- Nissan Leaf (BEV) $0.41 / km or $6,158 / year
- Hyundai ix35 (Petrol) $0.45 / km or $6,691 / year
- Mitsubishi Outlander (PHEV) $0.55 / km or $8,211 / year
- Holden Volt (PHEV) $0.61 / km or $9,175 / year

Sustainability Considerations

- **Environment**

Several studies reviewed by staff show that EVs, even when charged by grid energy, have reduced emissions of pollutants, greenhouse gas, and improving energy efficiency when compared to petrol vehicles.

Purchase of an EV would allow Council to demonstrate leadership and promote EVs as a feasible alternative to the community.

- **Social**
  Not Applicable

- **Economic**
  Not Applicable.

Legal / Resource / Financial Implications

Passenger vehicles are funded by lease charges received from the vehicles operator. This can be under a private use or commuter use arrangement.

Changing the selection of vehicles available would result in adjusting lease rates for accommodating that vehicle, which would be worn by the operator if they chose that vehicle.

Consultation

Consultation has occurred with experienced fleet coordinators in other regions of Local Government in relation to incorporating and/or considering Electric Vehicles into their fleet.

Options

If the Council was inclined to purchase an EV there are essentially two options. The first option is to include an EV under the arrangements in Council's Light Vehicle Protocol. The second option is to purchase a vehicle which is not leased and retained as a pool vehicle. The merits of these options are discussed below.

1. Include EVs in the Council's Light Vehicle Protocol

   Under this option, suitable EV models would be listed as an option under this policy for staff to select at a vehicle changeover. The key advantages of this option is that the Council does not incur the expense of an additional vehicle in the fleet, Council will receive a lease fee for the private use of the vehicle, and the staff member allocated the vehicle will be responsible for the cleaning of the vehicle (on their own time) and the overnight garaging of the vehicle.

   A disadvantage of this option is that the private use potentially reduces or removes the opportunity for Council to display any educational type message on the vehicle in regards to promoting the awareness of this action as a sustainability initiative. A further disadvantage is staff may not be inclined to select the vehicle due to the range limitations. To manage that issue the Council could provide an incentive by reducing the lease fee, thereby increasing the net operational cost to Council.

If this is the preferred option for Council, it Council needs to also consider the vehicle type. Due to the greater operational range of a Plug-in Hybrid Electric Vehicle (PHEV), utilization of the vehicle would be less constrained due to its ability to still be used when charging stations are unavailable and it is more likely that staff will have an interest in select this vehicle from the options available to them under the policy. However, the PHEVs are significantly more expensive to purchase and arguably do not carry the same sustainability message that Council could achieve from the Battery EV option.

2. Purchase an EV as a General Pool Vehicle

   The advantage is the Council is unrestrained in respect of education and promotion of the vehicle.

   The preferred approach to managing general maintenance, cleaning and garaging would be to provide commuter use for the vehicle to a staff member. Under this arrangement there is only a very small income to Council from staff compared to the full lease, however the new EV could easily replace an existing utility that is used for commuter purposes. The Council would incur an additional Fringe Benefit Tax liability as currently the Council does not pay any FBT for commuter vehicles as the utilities qualify for an exemption. The FBT liability is dependent on the number of kilometres travelled and would be in the order of 20% of the purchase price per annum, meaning this is a significant cost.

   To avoid the FBT costs the Council could garage the vehicle without any commuter or private benefit. The difficulty with this option is that the Administration Centre does not have any secure parking for a vehicle regularly parked outside the building overnight. To avoid this risk, the car could be garaged overnight and collected/returned to and from Council's depot. Combined with the need for staff to complete cleaning and general maintenance of the vehicle, this is considered an inefficient use of Council's human resources. The car could be based operationally at the depot, however there is limited demand for an additional vehicle at this location.

   The purchase of the vehicle could be undertaken by using funds from the Plant Reserve budget, or the vehicle could be procured by lease. Under either option, an annual expense budget would need to be created to meet either the internal operating costs or the lease expenses. Assuming an FBT liability within the operating costs, this budget would need to be in the order of $10,000.

   If this is the option preferred by Council, then the BEV type of vehicle is recommended. The BEV is more aligned with the objectives behind Council's interest in this proposal and the range limitation for the vehicle is not a constraint having regard to the local use of the vehicle.

3. Maintain the status Quo

   The range limitations for EVs mean it is not possible for the Council to consider at this point in time a strategic change from petrol vehicles to EVs for its fleet. Therefore the Council needs to consider whether there are sufficient education and sustainability awareness benefits from the

purchase of one or a few vehicles compared to the costs. As noted above, option one can be considered reasonably close to cost neutral, however option two is a significant cost.

Furthermore, this technology can still be considered in its early stages of development. Therefore it is expected that vehicle, battery and charging technologies will significantly improve over the next few years. As EV costs come down and performance improves, the proposition of EVs adding value to Council's operations and sustainability objectives will be strengthened and will be more attractive to Council.

The purchase of an EV would allow Council to demonstrate leadership and promote EVs as a feasible alternative to the community. Option Two adds significant costs to the increasingly difficult challenge of developing a budget for the organisation that delivers on the community's expectations for services. For this reason, and mindful of the comments in respect of option three, option two is not recommended at this point in time, however ultimately the allocation of resources is a key task of the elected Council who may perceive there are sufficient benefits in the program to justify the costs.

Option One is considered feasible, however there is some uncertainty as to whether, or when, there will be an approved staff member willing to select an EV under Council's current policy. Noting this limitation, the recommendation allows the option to at least be created. Further discussions may be needed in regards to whether a subisdised lease fee is appropriate and the extent the car can be marked for educational awareness purposes. The recommendation limits this option to a BEV for the reasons discussed in the above report.

Regardless of the option selected by Council, the Fleet Coordinator will continue to monitor trends in the commercial EV sector as it develops, including any incentives which would assist with the take up of EVs within Council.

RECOMMENDATIONS

1. That Council endorse a Battery Electric Vehicle option be added to the list of passenger vehicles available for selection by staff members under the Council's Light Vehicle Protocol.

2. That Council note the contents of the above report regarding electric vehicles and request the General Manager continues to monitor trends in the commercial electric vehicle sector as it develops, including any incentives which would assist with the take up of electric vehicles within Council.

Attachment(s)

1. Whole of Life Cost Comparison - Electric and Petrol Vehicles

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Whole of Life Cost – Comparison of Petrol, Plug-In Hybrid Electric Vehicles (PHEV) and a Battery Electric Vehicle (BEV)

	Petrol Vehicle	Plug-In Hybrid Electric Vehicle (PHEV)		Battery Electric Vehicle (BEV)
	Hyundai ix35	**Holden Volt**	**Mitsubishi Outlander PHEV**	**Nissan Leaf**
Capital Costs				
EV Purchase Cost	$28,355	$50,373	$41,973	$29,809
Charging Station	$0	$2,000	$2,000	$2,000
Total Capital Cost	**$28,355**	**$52,373**	**$43,973**	**$31,809**
Assumptions				
Mileage / Year	15,000	15,000	15,000	15,000
Average Fuel Consumption (L/100km)	9.8	1.2	1.9	0.0
Operational Costs				
Fuel Cost / Year (@ $1.45l)	$2,132	$261	$413	$0
Servicing Cost / Year	$350	$247	$247	$370
Electric Charging Cost / Year (15kWh/recharge x 5/week x $0.25/kWh tariff)	$0	$975	$975	$975
Ancillary Costs / Year (tyres etc.)	$240	$240	$300	$240
Total Cost / Year	**$2,722**	**$1,723**	**$1,935**	**$1,585**
Assumptions				
Number of Years Retained	5	5	5	5
Total Running Costs over Retained Life (5 Yrs)	$13,608	$8,613	$9,675	$7,925
Total Purchase & Running Cost (5 Yrs)	$41,962	$60,986	$53,648	$39,734
Residual Value @ Trade (%)	30%	30%	30%	30%
Expected Trade Value ($)	$8,506	$15,112	$12,592	$8,943
Cost to Council				
After Trade (5 Yr Life)	$33,456	$45,874	$41,056	$30,791
After Trade / Year	$6,691	$9,175	$8,211	$6,158
After Trade / Km	$0.45	$0.61	$0.55	$0.41