Renewable Energy Powered Electric Transport Options for Rarotonga, Cook Islands

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Background

- Rarotonga is completely dependent on import fuels for transport and the majority of electricity generation on the island is using large diesel plants
- Problem: Fuel supply risks and price fluctuations for the transport and electricity sector

Objective

- Investigate the potentials of using electric vehicles (EVs) and electric bikes (E-Bikes) as the main forms of transport options on Rarotonga
- Identify the cost effectiveness of using solar energy to power the electric transport options

Methodology

1. Investigate suitable electric transport technologies to be used on the island
2. Investigate the electricity sector and relevant renewable energy policies
3. Data collection and feasibility studies
4. Result analysis

Key Findings

- EV Nissan Leaf is not feasible in comparison to Toyota Corolla without a 2kW solar system and grid incentives (see Table 1)

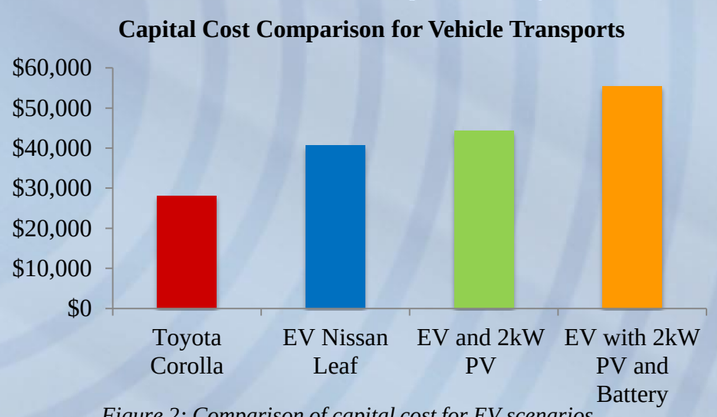

Figure 2: Comparison of capital cost for EV scenarios

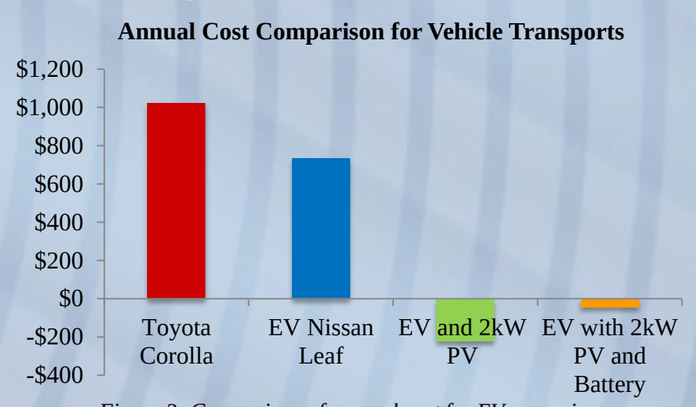

Figure 3: Comparison of annual cost for EV scenarios

Figure 1: Rarotonga, Cook Islands

Table 1: Net present value for EV scenarios

	EV Nissan Leaf	EV and 2kW PV	EV with 2kW PV and Battery
Net Present Value	-$7445	$14745	-$1258
Feasible?	N	Y	N

- E-Bike Easy Motion is feasible in comparison to the motor bike Yamaha Cygnus in all scenarios (see Table 2)

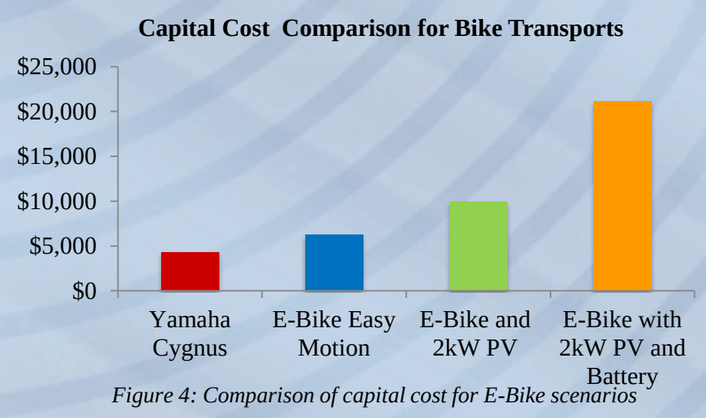

Figure 4: Comparison of capital cost for E-Bike scenarios

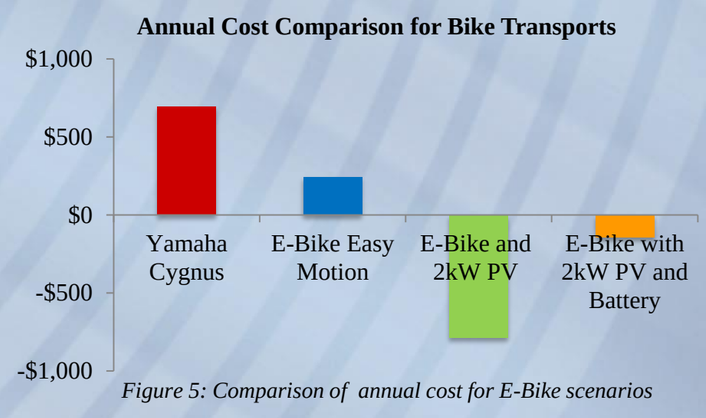

Figure 5: Comparison of annual cost for E-Bike scenarios

Table 2: Net present value for E-Bike scenarios

	E-Bike Easy Motion	E-Bike and 2kW PV	E-Bike with 2kW PV and Battery
Net Present Value	$3052	$25241	$9239
Feasible?	Y	Y	Y

- The change of future petrol prices impact most on the NPV of EV, while the NPV of E-bike is most sensitive to the change of capital and maintenance costs

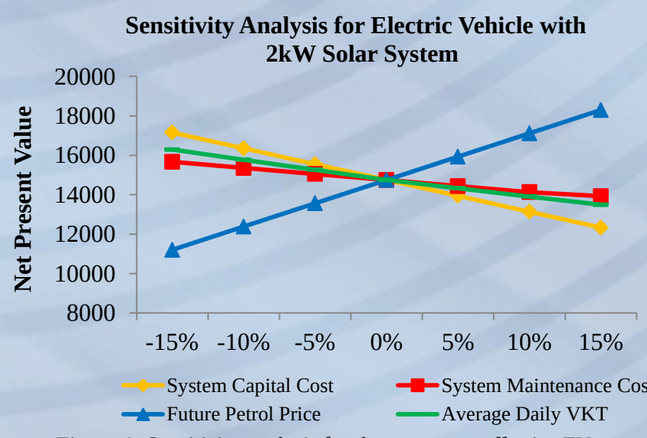

Figure 6: Sensitivity analysis for the most cost effective EV scenario

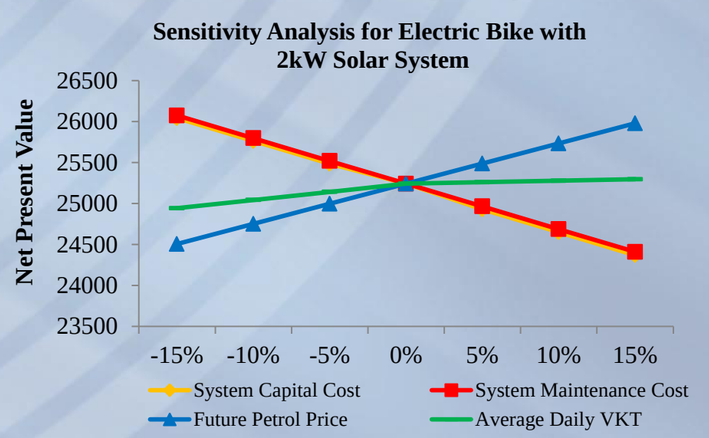

Figure 7: Sensitivity analysis for the most cost effective E-Bike scenario

Figure 8: EV Nissan Leaf

Figure 9: Toyota Corolla

Figure 10: E-Bike Easy Motion

Figure 11: Yamaha Cygnus

Conclusion

- Network incentive policy on Rarotonga made household solar systems (less than 2kW) very affordable
- Electric transport technologies use electricity as the main fuel source, thus they are also attractive by using in compliment with a household solar system
- Electric transport technologies effectively reduce the fuel supply risk as well as the level of carbon emissions on Rarotonga