



Office of Utilities Regulation

Stakeholders Consultation Document

PROPOSALS FOR A REGULATORY FRAMEWORK TO FACILITATE THE PENETRATION OF ELECTRIC VEHICLES IN JAMAICA



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ABSTRACT

The Office of Utilities Regulation (OUR/Office), is a multi-sector regulatory agency, with statutory responsibility to regulate the provision of specified utility services (electricity, telecommunications, water and sewerage). The OUR regulates these utilities under the provisions of the Office of Utilities Regulation Act (OUR Act) and where applicable, sector specific legislation and regulatory instruments. A critical aspect of the OUR's mandate is to ensure the provision of economically priced and reliable utility services to consumers throughout Jamaica.

The OUR, in executing its regulatory responsibilities, recognizes the importance of the emerging Electric Vehicle (EV) mobility technology to the Jamaican consumers, the economy and the impact that large scale EV uptake may have on the operation of the electricity sector. In this regard, the OUR formed a working group in 2019 July (the "Working Group"), tasked with formulating regulatory and policy recommendations to facilitate consultations with its key stakeholders. The OUR considers it critical to engage all affected stakeholders to allow for their contributions to the shaping of the Government of Jamaica's (GOJ's) EV policy objectives, and to effectively raise the level of consumer awareness regarding EVs.

This Consultation Document provides a mechanism for stakeholders to participate in the formulation of recommendations to the GOJ in the development of a regulatory framework to incentivize the uptake of electric vehicles in the Jamaican transport sector. It is expected that stakeholder's feedback will contribute to the regulations and policy development activities, by contributing to Government's initiatives to facilitate a high level of EV penetration. Through this consultation process, the OUR expects to receive stakeholders' comments, which will be taken into consideration in making EV policy and regulatory recommendations to the GOJ.

CONSULTATION PROCESS

Persons who wish to express opinions on this Consultation Document are invited to submit their comments in writing to the Office of Utilities Regulation ("OUR") by post, facsimile or email addressed to:

Office of Utilities Regulation
P.O. Box 593
36 Trafalgar Road
Kingston 10
Attention: OUR EV Task Force
Fax: (876) 929-3635
E-mail: EVconsultation@our.org.jm

Confidential information in responses should be submitted separately and clearly identified as such. In the interest of promoting transparent debate however, respondents are requested to limit as far as possible the use of confidentiality markings. Responses which are not confidential pursuant to any relevant legislation, will be posted to the OUR's website (www.our.org.jm). Respondents are encouraged to supply their responses in electronic form to facilitate such postings.

COMMENTS ON RESPONSES

There will be a specific period for respondents to view other responses (non-confidential) and to make comments on them. The comments may take the form of either correcting a factual error or putting forward counter arguments. As in the case of the responses, comments which are not confidential will be posted to the OUR's website.

Comments on responses are requested as shown in the Consultation Timetable

ARRANGEMENTS FOR VIEWING RESPONSES

This Consultation Document and the responses and comments received by the OUR will also be made available to the public through the OUR's Information Centre ("OURIC"). In light of the prevailing Covid-19 pandemic no in person viewing of this Consultation Document, responses and comments will be permitted.

CONSULTATION TIMETABLE

The timetable for the consultation is given in the Table A 1.

Table A 1: Consultation Time Table

Event	Date
Publish Consultation Document	2021 May 12
Receipt of Responses to EV Consultation Document	2021 June 22
Responses to comments received on EV Consultation Document	2021 July 6
Publication of the EV Regulatory Framework	2021 August 3

ABBREVIATIONS

AC	Alternating Current
AER	All Electric Vehicle
AFV	Alternative Fuel Vehicle
BEV	Battery Electric Vehicle
CCS	Combined Charging System
CFV	Clean Fuel Vehicle
DC	Direct Current
DG	Distributed Generator
DFV	Dual Fuel Vehicle
DOD	Depth of Charge
EA	Electricity Act, 2015
EMS	Energy Management System
EV	Electric Vehicle
ESS	Energy Storage System
ESSJ	Economic and Social Survey of Jamaica
EVCS	Electric Vehicle Charging Station
FCEV	Fuel Cell Electric Vehicles
FCHEV	Fuel Cell Hybrid Electric Vehicle
G2V	Grid to Vehicle
GHG	Greenhouse gas emission
GPE	Generation Procurement Entity
H2V	Hydrogen Vehicle
HEV	Hybrid Electric Vehicle
IEA	International Energy Agency
ICE	Internal Combustion Engine
JPS	Jamaica Public Service Company Limited
kW	Kilowatt
kWh	kilowatt hour
MSET	Ministry of Science, Energy and Technology
MTM	Ministry of Transport and Mining
OUR	Office of Utilities Regulation or the Office
PEV	Plug-In Electric Vehicle
PHEV	Plug-in Hybrid Electric Vehicles
PV	Photovoltaic
PVEV	Photovoltaic Electric Vehicles
RE	Renewable energy
RES	Renewable energy source
SOC	State of Charge
TAJ	Tax Administration Jamaica
TCO	Total cost of ownership
TOU	Time of Use
USD	United States Dollars
V2G	Vehicle to the Grid
V2H	Vehicle to Home
V2V	Vehicle 2 Vehicle
ZEV	Zero Emission Vehicle

DEFINITIONS

Alternating Current	Is the flow of the electric charge that periodically reverses direction
Battery Electric Vehicle	This vehicle has no internal combustion engine or fuel tank and runs on a fully electric drivetrain powered by rechargeable batteries. These vehicles need to be plugged in to a power source to charge, and depending on the vehicle, they have varying charging times and driving ranges.
Direct Current	Is the flow of the electric charge in one direction
Electric Vehicle	This is a vehicle which uses one or more electric motors for propulsion
Electricity Licence	Jamaica Public Service Company Limited Electricity Licence 2016
Fuel Cell Electric Vehicles	This is a type of electric vehicle which uses a fuel cell, instead of a battery, or in combination with a battery or super capacitor, to power its on-board electric motor
Hydrogen Vehicle	Is a Vehicle that uses hydrogen as its on board fuel for propulsion.
Hybrid Electric Vehicle	These vehicles are powered by a combination of an ICE (usually fossil fuel-powered) and an electric motor.
Internal Combustion Engine Vehicles	Vehicles which are powered by the combustion of gasoline, diesel, biofuels or even natural gas.
Plug-in Hybrid Electric Vehicles	These engines are in many ways very similar to the HEV in that they have a hybrid vehicle drivetrain and use both an ICE and electric power. They can operate on electric power alone for anywhere from 10 miles to 50 miles. Once their battery power is depleted, plug-ins transition from running on electricity to being powered by the gasoline engine mode to extend their range, allowing them to drive about as far as a regular car, and they can quickly refuel at a typical gas station. The big difference with these vehicles is that their rechargeable battery can be charged by plugging in to a power source.

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EXECUTIVE SUMMARY

The objective of this study is to develop recommendations for a regulatory and policy framework to incentivize the large-scale penetration of Electric Vehicles (EVs) in the Jamaican transport sector.

This report presents the key findings of the study, and provides the recommended regulatory and policy options for consideration by the GOJ and key stakeholders to incentivize the uptake of EVs. The development of the recommendations took into account the experiences from frontrunners of the EV markets.

The study was carried out by the OUR's internal EV Working Group. The scope of activities undertaken included:

- Identifying and assessing the potential benefits and barriers to the large-scale deployment of EVs in Jamaica.
- Benchmarking international business models and best practices utilized for providing incentives to encourage the uptake of EVs in other jurisdictions.
- Reviewing the Jamaican transportation sector infrastructure to assess the suitability for the wide scale introduction of EVs and associated charging infrastructure in Jamaica.
- Reviewing the Jamaican electricity sector regulatory framework, and identifying the implications for the development and operation of vehicle charging infrastructure throughout the country.
- Assessing the overall impact of EV charging on the electricity sector demand and supply constraints for various levels of EV penetration. The impact of EVs charging on the JPS system peak load demand.
- Conducting local consumers' awareness and willingness to purchase EVs, the working group conducted a customer EV awareness survey.
- Developing recommendations for a regulatory and policy framework to facilitate the development of viable and sustainable EV penetration strategies for Jamaica.

The methodology utilized in carrying out the study relied extensively on reviewing research information available in the public domain, which included: or - industry, academic, and various government reports, Government of Jamaica (GOJ) and various governments' policy papers relevant to the subject of EV deployment. The Electricity Act 2015 (EA), the Electricity Licence 2016, (the Licence) and the Office of Utilities Regulation (OUR) Act, were also extensively reviewed.

SUMMARY OF KEY FINDINGS

Electric Vehicle Market Status

In 2019 global sales of electric cars exceeded 2.1 million, surpassing 2018 sales volume, which was also a record year, to boost the stock of electric cars to 7.2 million. Electric cars, accounted for 2.6% of global car sales and about 1% of global car stock in 2019, registering a 40% year-on-year increase¹.

According to the IEA global electric-vehicle sales grew in 2020 even while the rest of the car market suffered from the economic fallout of the coronavirus pandemic. The IEA projects that the global number of battery-powered and hybrid vehicles could increase from just over 5 million to nearly 140 million by 2030.

Recently, a number of major motor vehicle manufacturers have announced that they will be moving from manufacturing conventional internal combustion engine (ICE) vehicle to manufacturing EVs. General Motors, the big U.S automaker is moving to eliminate gasoline and diesel light-duty cars and SUVs manufacturing by 2035. The United Kingdom plans to stop the sales of cars and vans powered by gas and diesel by 2030, five years earlier than planned. Major ICE manufacturers in Europe and Japan are also proposing a move to increase focus on shifting manufacturing emphasis from ICE to EVs in similar time frame. The aforementioned developments have implications for the supply and sustainability of the Jamaican transport sector, and emphasize the need for Jamaica to move with alacrity to ensure the facilitation of rapid take up of EVs to replace ICE vehicles.

Jamaica had approximately 536,579 ICE motor cars registered in 2018, in contrast to only 10 EVs registered. A breakdown of motor vehicle types registered in Jamaica as at 2018 is shown below.

Registered Motor Vehicles in Jamaica

Motor Cars	Motor Cycle	Motor Trucks	Motor Tractors & Trailers	GRAND TOTAL
536,579	20,680	122,119	3189	682,567
78.77%	2.97%	17.89%	0.46%	

Barbados, with 400 EVs operational is one of the world's top users of EVs on a per capita basis, while Cayman has 160 EVs licensed to operate as at 2019 July². Given the strides made by Barbados and Cayman, Jamaica is at the very embryonic stage of introducing EVs in the transport mix, and is significantly lagging behind some Caribbean jurisdictions. Regulatory and policy actions are required to facilitate and support uptake of EVs. Similar to other countries that have successfully integrated EVs in their transport system, the GOJ needs to play a major role to facilitate this achievement.

¹ IEA Global EV Outlook 2020

² Forbes Magazine Electric Vehicle Revolution is alive in Barbados, December 2018

The OUR in its JPS 2019-2024 Tariff Determination has determined that the tariff structure including TOU option for residential customers is applicable for the charging of EVs. This tariff structure will enable consumers access to private charging under the existing electricity supply structure. In addition, the OUR has determined that for public chargers, the applicable tariff rate is the residential rate plus 5 percent. It is expected that this will provide consumers with charging options in the early stages of EV uptake.

The IDB study on electro-mobility in Jamaica has recommended that further policy initiatives are required to accelerate the take up of EVs in Jamaica. These included, inter alia, issuing a general EV charging framework, Issuing charging infrastructure guidelines and issuing technical and safety standards requirements for charging infrastructure equipment.

The average age of the Jamaican motor vehicle fleet is approximately ten (10) years. EVs could therefore be a choice for consumers in the replacement of their current ICE vehicles over the coming years, providing that adequate EV penetration incentives and regulatory actions are implemented in a timely manner.

Road and Electricity Infrastructure Status

Jamaica has a well-defined and extensive road network. The electricity grid is accessible by over 95% of the population. The electricity supply infrastructure generally follows along the main and arterial roads.

Given the extent of Jamaica's road network and the availability of the electricity supply infrastructure, the siting of EV charging stations is not perceived as a barrier or limitation to EVs deployment in Jamaica. However, to directly support EV penetration, new investments in EV charging and associated local distribution grid infrastructure will be required.

The basic infrastructure to facilitate EV adoption is a reasonably priced and reliable electricity power grid. Initially this will form the primary infrastructure upon which the electrification of the transportation sector would rely.

The IEA Global EV Outlook 2020, reported that private chargers accounted for about 90% (6.5 million) of the worldwide light duty vehicle (LDV) chargers in 2019. Convenience, cost-effectiveness and a variety of support policies (such as preferential rates, equipment purchase incentives and rebates) are the main drivers for the prevalence of private charging. Across many EV markets, private homes and workplace charging are the preferred locations. The minimum infrastructure for home charging, namely a compatible electrical socket and charger plug, already exists in most homes. It is estimated that globally, public chargers accounted for just around 12 percent of LDV chargers.

Potential Benefits of large scale EV adoption

The study has identified that similar to the other jurisdictions which have adopted policies to increase the deployment of EVs in their transportation sectors, the following benefits to Jamaica can be achieved³:

Lower Operating Cost

Lower maintenance costs because they have fewer and simpler components.

When combined with a home solar system EV owners are able to realize significant cost saving benefits.

Energy efficiency

EVs are three to five times more energy efficient than conventional ICE vehicles. The much greater EV efficiency provides significant energy efficiency improvement potential for vehicle and road transport economy.

Energy security

Electric mobility improves energy security as it transitions the road transport sector from its strong reliance on imported oil-based fuels. This will reduce dependence on oil imports for the country. Electricity can be produced with a variety of domestic renewable resources including; wind, solar and hydro power, hence improving the country's overall energy security.

Environmental impacts

EVs are well suited to address air pollution issues, especially in urban areas and along road networks, where a large number of people are exposed to harmful pollutants from road transport vehicles.

By 2030, Jamaica could avoid up to 282,000 tonne of CO₂ emissions per annum if EV sales grow at a rate that is required to achieve 30% of vehicles by 2030.

EVs are quieter than ICE vehicles and hence contribute to less noise pollution, especially in the two/three-wheeler category.

Electricity generation

Increasing electric mobility in association with a progressive increase in renewable and low carbon electricity generation system can deliver significant reductions in GHG emissions from road transport relative to ICE vehicles.

³ IEA Global EV Outlook 2020

The Main Barriers to EV Ownership

The Working Group has identified a common set of barriers impeding the take up of EVs in several jurisdictions, and which would most likely be the case in Jamaica. These barriers include:

Upfront costs of acquiring EVs

The upfront price of an EV in Jamaica is estimated at about 30% higher than a comparative ICE vehicle, based on the current manufacturers' prices and the applicable motor vehicle tax and duty regime in Jamaica.

The higher acquisition cost of EVs when compared to conventional vehicles remains an obstacle to EV ownership despite the noted continuing reduction in EV pricing, and the total cost of ownership over the EV lifetime being less than that of the ICE vehicle.

Availability of public charging infrastructure

The shorter driving range of EVs coupled with the time needed to charge EVs have made many consumers concerned that they may run out of energy on a trip, even though it has been proven that the majority of daily car trips are well within EV driving ranges. This concern is also highly linked with the perception of the availability of sufficient public charging infrastructure. EV technology possesses characteristics suited for the transportation needs in a small jurisdiction like Jamaica where travelling distances are relatively short.

The lack of adequate charging infrastructure acts as a disincentive for consumers who would be concerned about the ability of their EVs to complete a round trip.

Globally, concerns have been raised regarding adequate provisions for EV charging. Over time, this concern is expected to be reduced once suitable incentives to develop charging infrastructure are put in place.

EV batteries end-of-life treatment

Policies are required to be put in place to ensure that the treatment of EV batteries at the end of useful lives do not contribute to adverse impacts on the health of the environment.

Stranded ICE vehicles

Stranded ICE vehicles could pose resale and disposal issues if there is a significant uptake of EVs in a relatively short span of time. The GOJ and sector stakeholders should give these issues consideration in developing policies to incentivize EV uptake.

Lack of consumer information

The consumer survey carried out by the working Group indicates that Jamaican consumers are generally unaware of the EV technology and the benefits of owning EVs. Public awareness initiatives are required to inform the public of the benefits and challenges of EV ownership.

Investors main concerns

Uncertain or underdeveloped regulatory policies related to investments in and deployment of charging infrastructure are the main concerns to investors and the electricity utility. These issues must be adequately addressed in order to facilitate deployment of the required charging infrastructure. Through fiscal, non-fiscal and/or regulatory measures, effective policy actions are needed on measures to reduce greenhouse gas (GHG) emissions and air pollution caused by ICE motor vehicles in order to realize the value/benefits of EVs on the environment.

Recommended actions to overcoming barriers to EVs deployment in Jamaica

The Working Group's research on other jurisdictions provided strong indications of the common issues that should be considered and addressed, in order to devise effective and responsible policies to incentivize the take-up of EVs locally. These issues are multifaceted and in some instances correlated.

The following initiatives are recommended by the Working Group for implementation consideration in order to overcome/remove the main barriers to EV ownership identified and to incentivize EV take-up in Jamaica.

Implement legislative and policy measures to remove legal and regulatory barriers to EV Charging Infrastructure

Research has shown that about 90 percent of EV charging are carried out at home. However, because of the limited range of the EV it will be necessary to provide public charging stations in selected locations.

The implementation of public charging infrastructure will require identifying and removing or amending inhibiting legislative and regulatory provisions, while simultaneously introducing facilitating legislative and regulatory provisions.

Implement measures to reduce the purchasing price and ownership cost of EVs

Incentive measures are needed to offset the price differential to purchase EVs as against ICE vehicles. A range of policy options and measures are available to reduce the upfront cost of acquiring EV as demonstrated in other jurisdictions. For example, the provision of financial support from the government, either through grants/subsidies or one-off concessions such as reduction/removal of customs/import duty costs. Non-financial measures to incentivize EV take-

up, including, inter alia, the provision of free dedicated public parking, toll free access or reduced toll fees have also been implemented in other jurisdictions.

Employment of GOJ policy objectives

The Government of Jamaica (GOJ) is encouraged to employ policies to mandate the reduction of pollution and other adverse environmental conditions due to ICE vehicles.

Since EVs are known to be less hostile on the environment, one strategy that could be considered to encourage EV take-up is the establishment of environmental and/or fuel efficiency standards for ICE vehicles that are aligned to GOJ's goal for a healthy environment. Similarly, to its renewable energy portfolio target, the GOJ may consider establishing progressive targets for EV penetration in the transportation mix, starting with public sector entities.

Implement public education/stakeholders engagement

Consideration must be given for the implementation of a robust island wide public education and stakeholders consultation programmes to inform the public on EVs and have their concerns addressed.

Implement measures to increase the availability of EV models

In keeping with the provisions of Jamaica's Motor Vehicle Import Policy, consideration should be given to the implementation of measures that can be adopted to encourage the importation of EV models by dealers. This can be achieved with special provision being given to the different groups that are allowed to import motor vehicles. For instance, financial and non-financial incentives could be provided to importers for EVs that will be used in the public passenger transportation sector, government ministries and private sector companies.

Implement measures to develop the local transportation sector EV maintenance capacity

EV dealers should be required to have staff that are trained and certified to carry out maintenance and repairs of EVs. The HEART academy and the government vocational training institutes should be encouraged to participate in such programs to train and retrain service personnel in electromobility technology with assistance from EV manufacturers. In order to provide assurance to consumers regarding the maintenance and repair of EVs, consideration should be given to requiring EV dealers to maintain adequate inventory of replacement spare parts and trained service personnel.

Specific policies and regulatory recommendations

The approaches identified in other jurisdictions that have successfully introduced EVs on a wide scale have revealed that government and private sector interventions are critical factors in stimulating the development of their respective EV markets.

Policies and legislations are effective instruments used by governments to facilitate rapid deployment of EVs in their transportation sectors. The research has revealed that government policy support is essential when introducing fundamental changes to the market.

The OUR Working Group recommends that the GOJ plays a critical role in facilitating the large-scale penetration of EVs. The degree of involvement should potentially encompass inter alia; providing enabling regulations and policies, fiscal and non-fiscal incentives, in addition to establishing environmental mandates and targets for EV penetration levels over time. The following policy and regulatory initiatives are recommended for consideration.

EV charging infrastructure - Regulatory and policy

There are critical questions regarding development of an EV market, in particular EV charging infrastructure, which the GOJ will have to address whether by way of policy and/or legislative changes. These issues have been highlighted in this document and included:

- Who can participate in the EV charging market?
- Whether EV charging should be considered as supply of electricity?
- Recovery of the utility's investment costs; and
- The pricing arrangements for non-utility owned charging stations.

Based on considerations of the strategies adopted in other jurisdictions and the specificities of the Jamaican context, the relevant issues and the corresponding approaches for policy development are recommended and are detailed in Table ES-1.

Table ES- 1: Recommended approach for EV uptake policy development

Issues to be considered	Recommendations and approach
Should the activities at the EV charging stations be considered as supply of electricity?	<p>This question becomes especially critical where it is the expectation that the EV charging market will become open, even if not at this very nascent stage. In light of the definition of Supply under the Electricity Act, there is the likelihood that the participation will be restricted to the current electricity provider in Jamaica who holds an exclusive Licence to, inter alia, supply electricity. In this regard it is proposed that the GOJ consider the following approaches:</p> <ol style="list-style-type: none">1. Negotiate with current Licence holder (JPS) to facilitate a Licence amendment that would essentially exclude EV charging from an activity that would be considered a “supply” of electricity. This amicable approach would mitigate the risk of legal challenge.

Issues to be considered	Recommendations and approach
	<p>2. Amend the Electricity Act to expressly exclude the activities of an EV charging station from being considered as a supply of electricity.</p>
<p>Who can participate in the EV charging market?</p>	<p>Another issue that the GOJ must consider is whether non-utilities should be permitted to own and operate charging stations. This issue directly relates to the previous issue discussed, as the ability for third parties to participate is dependent on the treatment of the current restriction on who can supply electricity.</p> <p>1. If the activities at the charging stations have been exempted and the participation of non-utility companies is permitted, it is recommended that the GOJ consider doing the following:</p> <ul style="list-style-type: none"> (a) Establish policy for entry of non-utilities including strategies to prevent the exclusion of non-utilities from the market. (b) Establish standards for charging stations to ensure the accommodation of the different types of EVs that may be imported in the country. This may trigger further consideration by the GOJ as to whether there should be policy to dictate the types of EVs that can be imported as it relates to types or method of charging. (c) Establish the policy for the interaction between utilities and non-utilities, including clearly outlining the information to be shared with utility to ensure the reliability of the grid. (d) Restricting how the electricity utility execute the deployment of its own charging infrastructure to prevent monopolization of the market by the utility. <p>2. If the legal landscape remains the same, it is recommended that the GOJ consider doing the following:</p> <ul style="list-style-type: none"> (a) Establish standards for EV charging stations to be implemented by the utility. This is to ensure the accommodation of the types of EVs that may be imported in the country. This may trigger further consideration by the GOJ as to whether there should be policy to dictate the types of EVs that can be imported as it relates to types or method of charging. (b) Establish policy as is necessary to ensure the integrity of the electricity grid.

Issues to be considered	Recommendations and approach
Recovery of the utility's investment cost	<p>In any approach taken by the GOJ; that is whether to open the market or restrict it to the sole supplier, the utility may be required to invest in its current infrastructure to accommodate the additional load on its system. The GOJ will therefore need to consider how the utility will recover this cost. In this regard, it is recommended that the GOJ do the following:</p> <ol style="list-style-type: none"> 1. Determine whether recovery will only be from the EV users or generally from the ratepayers. If the decision is to make recovery from the ratepayers, it is proposed that this be only done where the utility can prove that investment has accorded some benefit to all the ratepayers or is in the ratepayers' interest. It is recommended that this is expressly stated in the electricity Licence or legislation and clearly outline the matters to be proven by the utility.
Pricing Arrangement for Third Parties	<p>Where renewables are not the sole source of the energy used at EV charging stations, the non-utilities would be the customers of the utility companies. One of the challenges of non-utilities in the EV market that has been identified is the energy cost, especially in a market where there is a very small EV market. In this regard, it is recommended that the GOJ and/or the regulator consider the following approach:</p> <ol style="list-style-type: none"> 1. Negotiate with JPS to determine a rate structure for these non-utilities that would assist in offsetting the high billing that may result especially in light of the anticipated low initial usage of charging infrastructure. This may include the removal of the demand charge and consider billing by way of time of use (TOU) method. The demand charge may be phased in based on an agreed schedule; however, the GOJ should bear in mind the level of EV vehicles on the island and the level of usage of the infrastructure in agreeing to the phased introduction of the demand charge.

Possibilities under the current Regulatory Framework

Notwithstanding the regulatory barriers to EV uptake identified, the review of existing electricity sector regulatory provisions has identified some measures that the GOJ can adopt in the short term to encourage EV uptake under the current legal and regulatory framework. These are detailed in Table ES-2.

Table ES- 2: Recommended short term strategies

Recommended Short Term Strategies	Description
Government procurement initiatives	Internationally it is recognized that government procurement is one of the fastest ways of improving the level of EV penetration. The GOJ could establish policy which mandates that EVs be purchased for its ministries, agencies and other GOJ entities. As part of this initiative the GOJ could also consider establishing policy to ensure that each of these entities also build their own charging infrastructure and that these entities grant access and use of these charging stations to each other at no cost within an established framework.
Encouraging EV charging arrangements across entities	While the country awaits the buildout of EV charging facilities in such a manner that minimize the range anxiety issue, the GOJ may consider establishing a public education campaign that encourages commercial entities to establish similar charging arrangements among themselves as discussed in the first point. The GOJ may go further by highlighting the main issues to be settled/agreed in such arrangements.
Free charging in public places	The GOJ may also consider making its own investments and provide free EV charging in certain public places. It would be prudent to first ascertain the roll out plan of the Licensee and make the investment in the areas where there are no immediate plans by the Licensee but which has potential for EV take up (for example, in commercial zones).
Encourage commercial entities to provide free EV charging to its customers	The GOJ may consider encouraging commercial entities to provide free EV charging to their customers and staff. The GOJ may consider coupling this initiative with fiscal incentives that incentivizes these entities to provide these services (e.g. tax breaks/ credits)

It has been demonstrated in other jurisdictions that one of the quickest means and direct route to accelerate EV take up is the deployment of EV in government fleets. The working Group is recommending that GOJ mandate that a percentage of government agencies fleets be EVs, and that a determined portion of on-site charging electricity be produced by solar plant electricity systems.

Economic incentives for EV take up

The assessment carried out demonstrates that the cost of owning an EV relative to an ICE vehicle depends on a number of cost elements including the upfront cost, the relative cost of electricity and gasoline, relative maintenance costs and the annual mileage travelled. A 15 year useful life time of EVs and ICEs are assumed.

Fiscal incentives will be essential to achieve a reduction in the life cycle costs of EVs. These incentives can significantly impact supply-demand dynamics in favour of EV adoption. The implementation of suitable fiscal instruments to remove or reduce the upfront cost gap between EVs and ICEs should create the right incentives to facilitate the growth of an EV market in Jamaica.

From the jurisdictions reviewed by the Working Group, it is clear that the strategies employed to increase EV take up can invariably include both fiscal and non-fiscal incentives. Table ES-3, details the recommended fiscal incentive provisions for consideration by the GOJ. Similarly, the GOJ may consider implementation of non-fiscal incentives in its strategy to achieve EV penetration. In this regard, the GOJ may consider the non-fiscal incentives recommended in Table ES-4.

Table ES- 3: Recommended Fiscal Incentives for consideration

Description	Recommendations for consideration
Import duties and other compulsory payments upon importation.	There is currently an import duty of 20% for hybrid EVs and 30% for BEVs. On the face of it, it does not appear that the current duties support the drive for electrification of the transport sector. The reason for the higher rate for BEVs as opposed to hybrids are not readily apparent. In any case it is recommended that the GOJ negotiate with CARICOM for lower rates that would further its objectives in this regard.
Reduction of GCT and SCT	Currently, BEVs are zero rated under the GCT Act. It is recommended that GOJ consider whether a reduction to the GCT applicable for plug in hybrid EVs may be warranted. It is not proposed that plug-in hybrids should also be zero rated as this does not align with the objective of the penetration of BEVs . However, the reduction in the GCT for plug-in hybrids may assist in increasing the citizen's appetite for completely green technology and would further the environmental objectives of the GOJ. Additionally, the GOJ may also consider reducing the GCT applicable on the second sale of these motor vehicles.
Exemption from Environment Protection Levy	An environmental protection levy of 0.5% of the CIF value of the goods is payable on the importation of goods imported in Jamaica. It is recommended that this levy be waived as it relates to BEVs especially since these vehicles have much lower adverse environmental impact. It is proposed that the Order be amended to expressly exempt these products (especially if the GOJ has also implemented policy to address the disposal of EV batteries when they have reached the end of their useful life, which will further reduce their adverse environmental impact).
Reduction in annual motor vehicle licence fees	The GOJ may also consider a reduction or waiver of the annual compulsory Licence fees that is applicable for all motor vehicles, with phased introduction of these fees once the number of EVs on the island has been increased to an acceptable level. It is proposed that the fees for Hybrid vehicles be reduced while the fees for BEVs be waived at least until a specific penetration level is achieved.
Tax Credits to Commercial Operators	One of the quickest ways to increase the number of EVs on the Jamaican road would be to encourage commercial and government entities to electrify their commercial fleets. It is recommended that the GOJ consider establishing tax credits for the entities that acquire EVs as part of their fleets. It is proposed the GOJ establish a policy that encourages the purchase of the EVs with specific characteristics it deems suitable by granting more or less incentives based on the attributes of the EV purchased.
GOJ Grants to assist with EV Purchases	The GOJ may also consider providing grants towards the purchase of EVs. Since this initiative would be costly, the GOJ may restrict the term of grants to a definite short period of time. This would require collaboration with the car dealerships as it is being proposed that the applicable grant be applied through and paid to the dealership. Similar to the recommendation made in the previous point, the amount of grant available should be tailored to encourage the EVs that the GOJ deems suitable to further its objectives.

Description	Recommendations for consideration
Tax Credits to dealerships	For citizens to be able to consider purchasing EVs, the product must be accessible. If the dealerships are not making the vehicles available for sale, the level of penetration desired may not be realized. In this regard, it is recommended that the GOJ establishes policy that encourages EV sales by offering tax credits to dealerships who offer these vehicles for sale.

Types of Non-fiscal Incentives	Recommended Approach for Policy Development
Remove import restriction for individuals and companies	Remove the restriction at least for a specified time of the limit on EVs imported in the island.
Access to bus lane for EVs	The GOJ may consider granting EV users access to bus lanes. This may encourage EV take up of persons who live in the corporate area that are affected by traffic at certain hours of the day (i.e. peak hours for traffic).
Dedicated free parking for EVs	GOJ may also consider assigning free public parking for EV vehicles. This may be especially impactful in the business districts of cities and towns where parking is a major concern and where parking is accessed by payment of fee.
Public education activities	The GOJ may also consider engaging in public education initiatives that will increase the citizen's knowledge of EVs and by extension, their interests in EVs.
Emissions standards	It is recommended that the GOJ establish motor vehicle emissions standards for Jamaica. This would preclude the purchase of motor vehicles that do not further the GOJ's environmental initiatives and may result in increased interest in low emission vehicles.
Availability of replacement parts and training of dealership staff	The GOJ may also consider establishing policy that requires dealerships to maintain a specified amount of replacement parts for the EVs which it offers for sale and to require dealerships to have trained staff and modern facilities to repair their models of EVs.

Table ES- 4: Types of non-fiscal Incentives

Electricity grid impact

The typical charging rates for Level 1 and 2 charging are 3.6 kW and 6.6 kW respectively for motor cars. An estimate of the charging requirements for various EV penetration levels is calculated based on the above charging rates. It is assumed that the average EV battery size is 40 kWh, and EV average range is 150 miles (241.4 km).

Based on the rate of EV take up, and the timing of the volumes, the demand impact is significantly relative to the inherent load growth, even with prudent smart charging options applied. At an uptake of 15 percent the charging energy demand requirements of EV would be the dominant factor determining system expansion. Table ES-5 also shows that the potential charging demand of EV could have a significant dominant impact on electricity demand.

Based on the current low level of motor cycles in the transport sector, less than 3% of motor vehicles, and with the very low charging requirements of electrified motor cycles, it is expected that even with a very large uptake of electrified motor cycles the impact on the grid operations will be minimal over time.

The assessment of the operation of the electricity grid shows that the transmission system will not experience network loading violations for EV penetration levels up to 5 percent (30,000 EVs). It is estimated that simultaneously charging this number of EVs will impose an incremental electricity demand of 153 MW, which is approximately 24 percent of system current peak demand. It has been reported that analyses in jurisdictions with projected penetration levels of 15-20 percent EVs by 2030, that if the utility is successful at optimizing when and where EVs are charged, they expect an increase in energy demand of 5-10 percent but a 25-33 percent increase in demand for grid capacity. Based on the projection of EV take up shown in Table ES-5, the estimated peak demand increase for a 5 percent take up of EVs is estimated at between 40 -50 MW. Considering the system installed generating capacity reserve margin of 180 MW and the transmission capacity capability, the grid should be able to accommodate an uptake of 5 percent EV penetration without significant grid augmentation, beyond projects already planned.

The major challenge for the utility is at the local distribution level and grid upgrade requirements will vary by regions depending on the existing distribution system capacity and the rate of EV growth in the specific areas. Experts agree that the increased demand will stress the grid, particularly in areas with a high concentration of EVs.

The time of day vehicles are charged is a key part of understanding the increased load from electric vehicles (EVs). The utility therefore need to be proactive in preparing for the electrification of transportation. One of the main challenges for the utility is the level of power demand and the timing of charging. Experts are of the view that it will be necessary to reorient the power systems to meet the requirements of EV influx.

Table ES-5 gives the number of motor car EVs and the charging requirements for various EV penetration levels.

Table ES- 5: EV penetration level and electricity grid impact

% Penetration	EV Number	Unmanaged Charging Power (MW)*	Managed Charging Power (MW)**	Unmanaged % peak demand of 660MW	Managed % peak demand of 660 MW	Increased Energy Requirements %
1%	6,000	30.6	9.2	4.6%	1.4%	0.46
2.5%	15,000	76.5	23.0	11.6%	3.5%	1.14
5%	30,000	153	46.0	23.2%	7.0%	2.28
10%	60,000	306	92.0	46.4%	13.9%	4.56
15%	90,000	460	138.0	69.7%	20.9%	6.84
80%	480,000	2450	735	370%	111.4%	36.5

*Unmanaged charging is a worst case scenario with simultaneous charging.

**Managed charging is smart charging of EVs based on off peak charging, time of use incentives, and applying smart grid technology, resulting in an EV charging coincident factor of 30%.

Integrated resource planning

In terms of system reliability and power quality standpoints, the utility and the GOJ are encouraged to plan now for increased loads as the electrification of the transportation sector is increased. It is recommended that planning for various EV penetration levels be included in the GOJ Integrated Resource Planning (IRP) to determine the timing and type of system augmentation necessary to supply increased demand from EV charging for various levels of EV penetration.

Estimating tariff Impact of EV penetration levels

Increase electricity sales, usually results in reduced tariff rate to electricity customers. EV charging helps to flatten out the load curve, thus encouraging greater efficiency and use of more efficient base load generating plants to reduce production costs.

Table ES-5 shows that for a one percent EV penetration level an increase of electricity demand of over 4.6 percent would result. It is to be noted that the forecast for electricity demand (outside of EVs) is averaging less than 1.5 percent annually. The revenue cap regime prevailing in the sector would suggest that rate reduction due to this level of EV penetration is likely to reduce non-fuel tariff, given that the system infrastructure requirements to provide for the initial increase demand are minimal, and smart charging provisions and time of use tariff incentives are in place to reduce charging during peak demand hours.

1 INTRODUCTION

Electric vehicles (EVs) are increasing in popularity world-wide as a means of providing more economic and environmentally friendly transportation. In recent years, EVs have gained momentum in the marketplace, with most of the world’s major automotive manufacturers as well as new entrants, currently engaging in the process of EV development and market introduction.

In 2019, the global sales of electric cars exceeded 2.1 million, increasing the stock of electric cars to 7.2 million, an increase of about 40% over 2018. Electric cars accounted for 2.6% of global car sales, and about 1% of global car stock in 2019.⁴

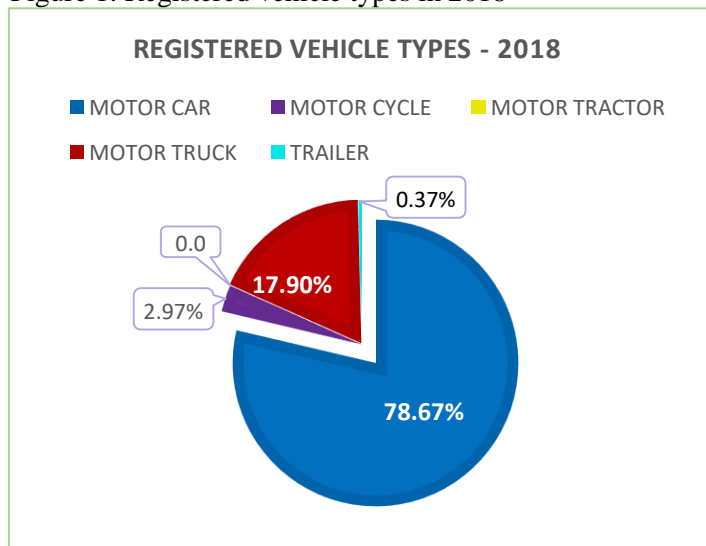
Information available from Tax Administration Jamaica (TAJ) estimated that as at 2018, there were over 536,579 conventional passenger motor vehicles registered in Jamaica. In stark contrast, only 10 battery electric vehicles (EV’s) were registered.

According to statistics from the MTM, there are more than 680,000 motor vehicles registered in Jamaica in 2018. Approximately 79% of these were motor cars. The Table 1 represents the various types of vehicles and Figure 1 shows the percentage of vehicles by type.

Table 1: Motor vehicle registered in Jamaica

MOTOR CAR	MOTOR CYCLE	MOTOR TRACTOR	MOTOR TRUCK	TRAILER	GRAND TOTAL
536,579	20,680	587	122,119	2,602	682,567

Figure 1: Registered vehicle types in 2018



⁴ IEA Global EV Outlook 2020

The composition of the motor vehicle fleet is of particular importance as analysis in a later section of this report will show that with the current pricing of EVs and ICEs, EVs could be particularly attractive for people who operate commercial and public passenger vehicles where there is an expectation of high mileages. This, however, has implication for charging infrastructure as it is expected that these vehicles may need public rather than just private charging infrastructure.

Between 2012 and 2018, the number of registered motor vehicles in Jamaica has grown by an average of 3% per annum with growth rates increasing to approximately 6% per annum over the last 3 years.

The 2019 Economic and Social Survey of Jamaica (ESSJ), indicated that the Jamaican transportation sector is a major consumer of petroleum fuels, accounting for approximately 33 percent of the country's fuel consumption. The fuels utilized in the transport sector are imported. This heavy reliance on imported fuels is not sustainable for the Jamaican economy, given the frequent exposure to supply price fluctuations on the global oil market, and the foreign exchange requirements. EVs thus provide opportunities to diversify energy usage in the local transportation sector and, coupled with the policy to expand the use of cleaner natural gas and more renewable energy capacity in the electricity sector, will be a significant leap towards achieving greater energy independence for Jamaica.

The Office, in executing its regulatory responsibilities, recognizes the importance of the emerging E-mobility technology to the Jamaican consumers, the economy and the impact that large scale EV uptake may have on the operation of the electricity sector. In this regard, the OUR is formulating regulatory and policy recommendations in order to contribute to the shaping of the GOJ's EV policy objectives.

For the purpose of this Consultation, the Stakeholder group are individuals, institutions and organizations that have an interest in, or may be affected by the outcome of the regulatory framework. This document presents the OUR's proposed regulatory recommendations geared to fast track the penetration of EVs in the Jamaican transport sector. The process utilized in developing these recommendations included:

- (a) Identifying and assessing the potential benefits and barriers to the large-scale deployment of EVs in Jamaica;
- (b) Benchmarking international business models and best practices for providing incentives to encourage the uptake of EVs in other jurisdictions;
- (c) Reviewing the transportation sector infrastructure to assess the suitability for the wide scale introduction of EVs and associated charging infrastructure in Jamaica;
- (d) Reviewing the Jamaican electricity sector regulatory framework, and identifying the implications for the development and operation of vehicle charging infrastructure throughout the country;
- (e) Assessing the overall impact of EV charging on the electricity sector demand and supply constraints for various levels of EV penetration;

- (f) Conducting and assessing consumer EV awareness by way of a survey; and
- (g) Developing recommendations for a regulatory and policy framework to facilitate the development of viable and sustainable EV penetration strategies for Jamaica.

The methodology utilized in formulating the recommendations relied extensively on reviewing: the Electricity Act 2015 (EA), the Electricity Licence 2016, (the Licence), the Office of Utilities Regulation Act (OUR Act), research information available in the public domain including industry, academic, and various government reports, and Government of Jamaica (GOJ) and various governments' policy papers relevant to the subject of EV deployment.

1.1 Structure of the Consultation Document

The remainder of this document is structured as follows:

Chapter 2 outlines the Legal Framework that underscores the remit of the OUR to make recommendations to the GOJ on the regulatory framework for an EV policy.

Chapter 3 provides an overview of EV Technology including some of the identified advantages and barriers to EV ownership.

Chapters 4 –10 discuss what the OUR considers as the main issues that the GOJ must consider in the development of an appropriate policy and regulatory framework for EV penetration in Jamaica. In discussing these issues the OUR will indicate its position on these matters and invite stakeholders to respond to a series of consultation questions for the OUR's consideration in finalizing its recommendations to the GOJ.

Annex1 provides a summary of the stakeholders' consultation questions.

2 LEGAL FRAMEWORK

The OUR was established pursuant to the Office of Utilities Regulation Act (“OUR Act”) with the power to regulate “prescribed utility services.” Section 2 and the First Schedule of the OUR Act defines “prescribed utility services” to include *“the generation, transmission, distribution and supply of electricity.”*

The authority of the OUR to regulate the generation, transmission, distribution and supply of electricity is also governed by the provisions of the Electricity Act, 2015 (EA).

Section 4(1) (a) of the OUR Act states that:

“Subject to the provision of this Act, the functions of the Office shall be to-

- (a) regulate the provision of prescribed utility services by licensees or specified organizations”*

While section 4(d) of the EA states that:

“4. In the regulation of the electricity sector, the following persons shall have the following roles –

...

(d) the Office shall regulate the electricity sector generally”

In addition to its general powers of regulation, the OUR Act also sets out specific powers and functions of the OUR which include the following:

At section 4(1):

“4.-(1) Subject to the provisions of this Act, the functions of the Office shall be to –

(c) conduct such research as it thinks necessary or desirable for the purpose of the performance of its functions under this Act;

(d) advise the responsible Minister on such matters relating to the prescribed utility service as it thinks fit or as may be requested by that Minister ...”

At section 4(3):

“(3) In the performance of its functions under this Act the Office shall undertake such measures as it considers necessary or desirable to –

...

(c) encourage the development and use of indigenous resources; and

(d) promote and encourage the development of modern and efficient utility services...”

The OUR is also empowered under section 4(4) and (4A) of the OUR Act to determine the rates to be charged for the generation, transmission, distribution and supply of electricity.

Some of the objects of the EA, as set out in section 3 of that legislation, that are taken into account by the OUR in the exercise of its functions and powers in relation to its regulatory oversight of the electricity sector are–

“ ...

- (d) facilitate the achievement of the efficient, effective, sustainable and orderly development and operation of the electricity supply infrastructure, supported by adequate levels of investment;*

- (e) *promote energy efficiency and the use of renewable and other energy sources;*
- (f) *prescribe the required standards in the electricity sector;*
- (g) *ensure the protection and safety of consumers of the electricity and the public;*
- (h) *ensure that the regulation of the electricity sector is transparent and predictable.”*

The electricity sector is governed by the provisions of the EA and regulations issued thereunder, and is guided by the goals set out in the National Energy Policy 2009 - 2030⁵.

⁵ https://www.mset.gov.jm/wp-content/uploads/2019/07/National-Energy-Policy_0.pdf

3 OVERVIEW OF ELECTRIC VEHICLE TECHNOLOGY

3.1 Electric Vehicle Types

EVs are propelled by one or more electric motors that utilize energy from batteries. Unlike traditional automobiles, these vehicles do not need traditional fuels (gasoline/Diesel) to run, and as such, they do not emit the harmful CO₂ emissions, into the atmosphere like the conventional vehicles with internal combustion engines (ICE). There are three (3) main types of EVs which are classified by the degree to which electricity is used as the energy source and it comprises of battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and hybrid electric vehicles (HEVs).

BEVs, more frequently called EVs, are fully-electric vehicles with rechargeable batteries and no gasoline/Diesel engine. BEVs are charged by electricity from an external source and store electricity on-board with high-capacity battery packs. Their battery power is used to run the electric motors and all on-board electronics.

HEVs are powered by both gasoline and electricity. HEVs batteries cannot be recharged from an external electricity source⁶. Instead, the electric energy is generated by the car's own braking system to recharge the battery.

PHEVs are, in many ways, very similar to the HEV in that they have a hybrid vehicle drivetrain and use both an ICE and electric power. Also, both can operate on electric power alone for anywhere between 10 miles to 50 miles. However, once the battery power for PHEVs depletes, they transition from running on electricity to being powered by the gasoline engine mode to extend their range. This allow PHEV to drive about as far as a regular car. The big difference with PHEVs is that they can quickly refuel at a typical gas station as well as plug in to a power source to charge their rechargeable batteries.

3.2 EV Chargers

EV chargers are classified according to the speed with which they recharge an EV battery. The classifications are Level 1, Level 2, and Level 3 or direct current (DC) fast charging. Level 1 EV charging uses a standard household (110V/120V) outlet to plug into the electric vehicle and takes more than 8 hours to charge an EV for up to approximately 75-80 miles. Level 1 chargers have the capability to charge most EVs currently available on the market. Level 1 charging is typically done at home and at the work place. Level 2 charging requires a specialized station which provides power at 240 V. Level 2 chargers are typically found at workplaces and public charging stations and will take about 4 hours to charge a battery up to 75-80 miles of driving range.

⁶ Source: <https://www.evgo.com/why-evs/types-of-electric-vehicles/>.

Level 3 charging, DC fast charging, or simply fast charging, is currently the fastest charging solution in the EV market. DC fast chargers are found at dedicated EV charging stations and charge a battery up to 90 miles range in approximately 30 minutes.

Research has shown that about 90 percent of EV charging are carried out at home utilizing Level 1 chargers. However, because of the limited range of the EVs, it will be necessary to provide public charging stations in selected locations.

4 ADVANTAGES AND BARRIERS TO EV OWNERSHIP

4.1 Advantages of EV Ownership

The main advantages of EV ownership identified are as follows:

Lower operating cost

Lower maintenance costs because they have fewer and simpler components. When combined with a home solar system, customers are able to realize significant cost saving benefits.

Increased electricity sales

Increase electricity sales, which usually results in reduced rates to electricity customers. EV charging helps to flatten out the load curve, thus encouraging greater efficiency and use of more efficient base load generating plants.

While there are advantages of EV ownership, there are concerns which must be appropriately examined and highlighted before the technology becomes more accepted in Jamaica and consumers become more willing to invest in this vehicle technology.

4.2 Barriers to EV Ownership

The barriers to EV ownership are identified and examined below.

Purchasing cost of EVs

The upfront cost of EVs may seem prohibitive, but the overall lifetime cost of EV ownership is equal to, or even more economical than owning and operating an ICE vehicle for a customer with relatively high usage. Governments seeking to introduce the technology into their country's transportation sector usually implement policies which provide some form of monetary incentives to minimize the burden of the upfront cost.

Range anxiety

There are concerns that the EV may run out of energy during a trip. However, improvements in battery technology have minimized this effect. Additionally, whilst this would be a concern for customers living on large land masses (e.g. USA, Europe, and China), the EV technology possesses characteristics suited for the transportation needs in a small jurisdiction like Jamaica. This concern is also highly linked to the availability of sufficient charging infrastructure.

Availability of charging infrastructure

Globally, concerns have been raised regarding ensuring that adequate provisions are made for EV charging. Over time, this concern will be reduced once the incentives to develop charging infrastructure are put in place.

Regulatory issues related to investment in and deployment of the charging infrastructure are the main concerns to investors, the electricity utility, and consumers. These issues must be adequately addressed in order to facilitate deployment of the required charging infrastructure.

It is important to note that an EV consumer survey conducted by McKinsey⁷ China, Germany and the United States shows that consumers rank not having enough access to efficient charging stations as the third most serious barrier to EV purchase, behind price and driving range. McKinsey indicated that with EV prices declining and ranges expanding, charging could soon become the top barrier to EV ownership. The implication is that accessible charging infrastructure may be one of the biggest enablers of EV growth in Jamaica.

Charging time

Charging time represents the length of time it takes to charge a battery to 80% of capacity. Improvements in battery technology will minimize this concern and recent developments in the market have indicated that the estimated time required to achieve 80 % of charge capacity of the battery will be significantly reduced in the near future. This will be facilitated with the introduction of ultra-fast charging stations.

EV batteries end-of-life treatment

Policies are required to be put in place to ensure that the treatment of EV batteries at the end of useful lives do not contribute to adverse impacts on the health of the environment.

Stranded ICE vehicles

Stranded ICE vehicles could pose resale and disposal issues if there is a significant uptake of EVs in a relatively short span of time. The GOJ and sector stakeholders should give these issues considerations in developing policies to incentivize EV uptake.

⁷ McKinsey Electric Vehicle Survey, Bradley Berman, January 28, 2020

Lack of consumer information

The market research reports reviewed indicate that while consumers' awareness about EV technology is increasing, there is still the need for greater public education and consumer engagement. Locally, the survey "OUR Electric Vehicle Survey" conducted by the Working Group indicates that only 23% of the respondents are extremely aware of EVs, while 34% of respondents are moderately aware of EVs. This low level of EV awareness was also identified as one of the concerns expressed by the new car dealers surveyed, as they reported little to no customer enquiries relating to the availability of EVs.

In order to bridge the information gap relating to EVs and effectively gain buy-in from consumers, consideration must be given to embark on a robust and structured EV public education campaign, with the involvement of all government and private sector interests.

Resale of EVs

The retention/resale value for EVs, when compared with similar ICE models is also of concern to prospective EV owners.

Question 1: Barriers to EV Ownership

- (a) What are your views on the relevance of the identified barriers to EV ownership in our jurisdiction?
- (b) Are there other relevant barriers not contemplated? If so, please provide details?
- (c) What measures would you suggest to surmount these barriers?

5 REVIEW OF JAMAICA’S TRANSPORTATION SECTOR

Jamaica’s transportation sector is comprised of three components namely: air, land and sea. Of the three components, transportation by land (which does not include rail) is considered to be the most dominant, boasting infrastructure comparable to developed countries such as a well-defined road network (including highways), and toll roads.

The Ministry of Transport and Mining (MTM) currently has overall responsibility for the transportation sector and is assisted by several related government agencies such as the National Works Agency (NWA), the Transport Authority (TA) and the Island Traffic Authority (ITA).

The NWA is the main entity tasked with the building, maintenance and management of Jamaica’s road infrastructure. Among its varied responsibilities, the TA is also tasked with the licensing of all public passenger and commercial vehicles while the ITA administers the provisions of the Road Traffic Act, which includes: the testing of vehicles to ensure fitness, roadworthiness and general compliance with safety standards.

5.1 Jamaica’s road network

According to a 2011 study published by the then Ministry of Transport and Works⁸, “*Jamaica’s road network is an interconnection of motorways, highways, main, parochial, farm, housing scheme and private roads*”. This study includes an inventory of the main roads in Jamaica, which are classified by parish and length and defines the types of roads as follows:

- Primary Roads (‘A’ Roads) - refer to arterial roads. These are roads of national importance, which carry daily traffic volumes in excess of 1,000 vehicles linking or more major areas/towns of the island with other major areas/towns.
- Secondary Roads (‘B’ Roads) – refer to roads of regional importance, which connect with arterial roads and normally carry average daily traffic volumes of 1,000 to 8,000 vehicles. These are main roads, which include main residential roads, and would normally be used as bus routes or as heavily used traffic routes through residential areas.
- Tertiary Roads (‘C’ Roads) – refer to roads that are normally of local importance and have a function of allowing communications and contact within districts. It further notes that C roads normally serve traffic volumes of less than 1,500 vehicles per day and are used for direct access to individual lots within a residential area or for access to commercial premises. They should comply with local bylaws, unless otherwise specified in special area development.

⁸ Annual Transport Statistics Report, Jamaica

The extent and condition of the road network is relevant as they will influence the placement of EV public charging stations. Even though the driving range of EVs has increased significantly within the last few years, range concern or range anxiety remains a top issue for potential EV owners and as such, the placement of EV charging stations is an important consideration. Given the driving range of current EVs, it is the practice in many jurisdictions that EV charging stations should at minimum be placed 75 – 85 km apart, and should also be located along highly traversed routes.

Question 2: Jamaica’s Road Network

- (a) What are your views on the appropriateness of Jamaica’s Road Network to support the location of charging infrastructure for EVs?
- (b) What would you consider to be an appropriate distance between EV charging stations in Jamaica to mitigate range anxiety?
- (c) Should the Jamaican Motor Vehicle Registry be allowed to share EV registration and owners location with JPS?
- (d) If the response to (c) is positive, do you think privacy concerns will act as a barrier to EV ownership?

6 BENCHMARKING OF INTERNATIONAL REGULATORY PRACTICES

6.1 International EV market status

In 2019 global sales of electric cars exceeded 2.1 million, surpassing 2018 sales volume, which was also a record year, to boost the stock of electric cars to 7.2 million. Electric cars, accounted for 2.6% of global car sales and about 1% of global car stock in 2019, registered a 40% year-on-year increase⁹.

According to the IEA global electric-vehicle sales grew in 2020 even while the rest of the car market suffered from the economic fallout of the coronavirus pandemic. The IEA projects that the global number of battery-powered and hybrid vehicles could increase from just over 5 million to nearly 140 million by 2030. Figure 2 shows the forecasts of EVs market share.

Recently a number of major motor vehicle manufacturers have announced that they will be moving from manufacturing conventional internal combustion engine (ICE) vehicle to manufacturing EVs. General Motors, one of the big U.S automaker is moving to eliminate gasoline and diesel light-duty car and SUVs manufacturing by 2035. ¹⁰ The United Kingdom plans to stop the sales of cars and vans powered by gas and diesel by 2030, five years earlier than planned.

⁹ IEA Global EV Outlook 2020

¹⁰ General Motors to eliminate gasoline and diesel light cars and SUVs by 2035 by Steven Mufson Jan 28, 2021

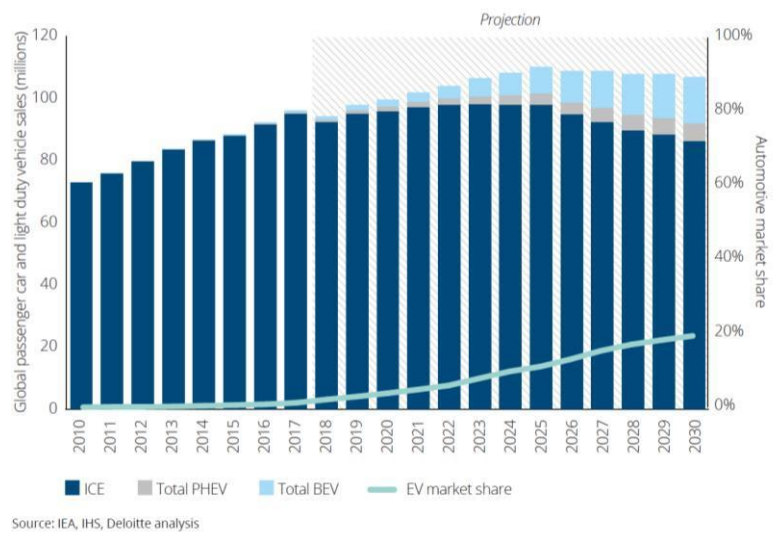


Figure 1: Global EV sales forecast

6.2 The Jamaican EV status

The introduction of EVs in Jamaica is in the very embryonic stage, while over the past 10 years, a number of countries have been gaining good experience in the adoption of EVs in their transportation system. Locally there have been several public announcements by the Ministry of Science, Energy and Technology (MSET) and the Jamaica Public Service Company Limited (JPS) regarding plans to introduce and encourage an uptick of EVs in the local transportation market. A number of studies are currently underway to advise the GOJ on options and methods to incentivize the uptake of EVs in the transportation sector. These included;

- The Inter-American Development Bank (IDB) electro-mobility initiative to assist the Government of Jamaica (GOJ) develop a strategic framework for electric mobility to inform policy and support a seamless transition to battery electric vehicles (BEVs). In its report “ELECTRIFIED ISLANDS The Road to E-Mobility in the Caribbean” the IDB evaluated the status of EV markets in each of the five jurisdiction including Jamaica, which are “among those at the forefront of EV policy planning and adoption and those with the greatest untapped potential”.
- GOJ news release in 2019 February by the Jamaica Information Service announcing that the GOJ is to craft an electric vehicle policy.
- The Minister of Energy, the Hon. Daryl Vaz in his presentation at the Caribbean Renewable Energy Forum (CREF) in 2021 January, hinted that Jamaica has set a goal that 10% of transportation should be powered by electric vehicles by 2030.

- The OUR has developed a draft document “PROPOSALS FOR A REGULATORY FRAMEWORK TO FACILITATE THE PENETRATION OF ELECTRIC VEHICLES IN JAMAICA”, and has, developed this Stakeholders’ Consultation Document to provide a mechanism for stakeholders to participate in the formulation of recommendations to the GOJ in the development of a regulatory framework to incentivize the uptake of electric vehicles in the Jamaican transport sector.
- The JPS has started the process of installing 10 public EV charging stations at locations islandwide, which is expected to be completed during 2021.
- According to a report in the Jamaica Observer newspaper (September 19, 2019), a privately owned and operated hotel in Kingston has constructed three chargers for EVs and PHEVs. It was also reported that the use of the chargers is free to users.
- The OUR in the 2019-2024 Tariff review, has given approval for the establishment of public EV charging rates. These rates shall be based on the TOU rate format and shall be set at a level that is 5% more than the residential rates (RT10) time of use (TOU) charges.¹¹

6.3 The international EV experience

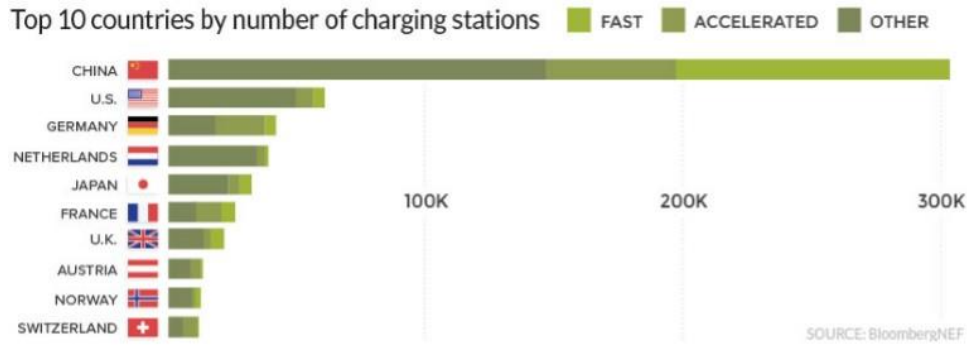
The following section provides the results and insights gained from the research of the approaches taken in other jurisdictions, and which may be used to inform policy and regulatory considerations for Jamaica taking into account the Jamaican perspective. This section will examine how these jurisdictions tackled the policy and regulatory issues to provide appropriate fiscal and non-fiscal responses to overcome the barriers to the widespread take up of EVs in their jurisdictions.

Examples of EV adoption experiences in selected jurisdictions

The countries examined in this section were selected from the world leaders in EV adoption. Figure 1 shows the world leaders in terms of EV sales as a percentage of total vehicle sales and the top three (3) markets by total EV sales in 2018. Figure 3 shows the top ten (10) countries by number of charging stations in 2018.

¹¹ OUR Document JPS 2019-2024 Tariff Review Determination Notice, 2020 December

Figure 2: Countries leading in charging station



Source: Bloomberg NEF

Worldwide, countries have employed varying approaches that have been geared towards encouraging the use of EVs in their transportation sectors. The following outlines the approach used by some of these jurisdictions to encourage the adoption of EVs.

Norway

Norway began its quest to introduce EV as a means of public domestic transport in the late 1980s. Strong support showed by the government, in the form of substantial package of incentives, spurred the transition to developing and promoting zero-emission vehicles into the market. Even though the incentives have been gradually introduced, the Norwegian government remained steadfast on their objective, which is a part of the national goal, that all new cars sold by 2025 should be zero-emission (electric or hydrogen).

According to statistics obtained from the Norwegian Road Federation, at the end of 2018, there were 296,215 registered BEVs and plug-in hybrid in Norway. This represents a 42% increase over that which was recorded for 2017. Electric vehicles (BEV & PHEV) account for approximately 49.1% of the market share. This aggressive adoption is attributed to the Norwegian policy instruments and the wide range of incentives. Figure 4 shows the registered EVs and PHEVs in Norway.

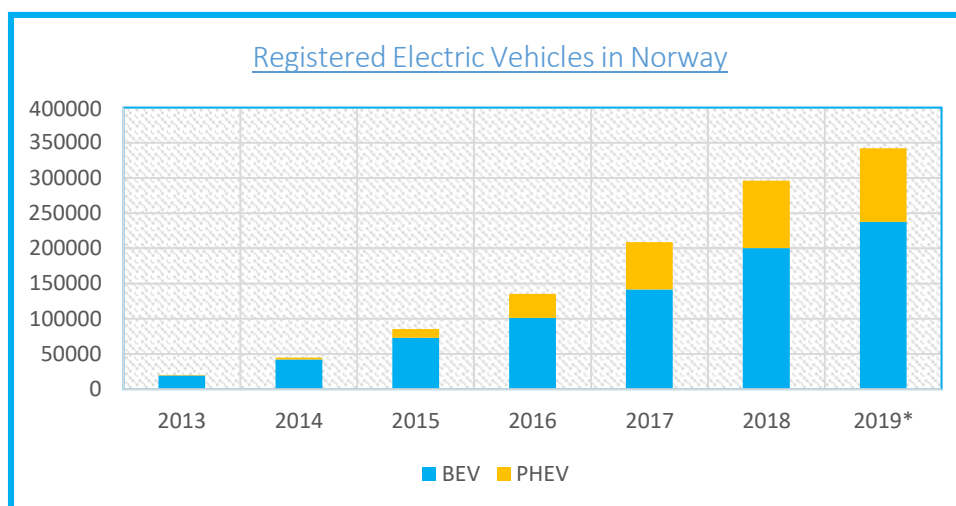


Figure 3: Registered EVs and PHEVs in Norway

Based on the current trend, the government is optimistic about meeting its objective and has decided to keep most of the incentives for zero-emission cars until the end of 2021. The value added tax (VAT) exemption for zero-emission vehicles however, will be lifted at the end of 2022. After 2021, the incentives will be revised and adjusted parallel with the market development. Table 2 provides a summary of EV incentives in Norway.

Table 2: Summary of EV incentives in Norway

Government Incentive	Effective Period
No purchase/import taxes	1990 - present
No annual road tax	1996 - present
No charges on toll roads or ferries	1997 - 2017
Free municipal parking	1999 - 2017
50 % reduced company car tax	2000 - 2018
Exemption from 25% VAT on purchase	2001 - present
Access to bus lanes	2005 - present
Exemption from 25% VAT on leasing	2015
New rules allow local authorities to limit the access to only include EVs that carry one or more passengers	2016
Fiscal compensation for the scrapping of fossil vans when converting to a zero-emission van	2018
Maximum 50% of the total amount on ferry fares for electric vehicles	2018 - present
Parking fee for EVs was introduced locally with an upper limit of a maximum 50% of the full price	2018 - present
Company car tax reduction reduced to 40%	2018 - present
Maximum 50% of the total amount on toll roads	2019

Government Incentive	Effective Period
Allowing holders of driver Licence class B to drive electric vans class C1 (light lorries) up to 4250 kg	2019

Peoples Republic of China

China's contribution towards the electric vehicle revolution started in 1999, when the government passed a law, which allowed electric bikes (two-wheelers) with a maximum speed of 20 km per hour to be operated without a license or registration and ridden in bicycle lanes. Coupled with this approach, the government moved to restrict the ownership of gasoline-powered two-wheelers in the central parts of cities. These two methods have significantly increased the customer's demand towards electric two wheelers, where China now accounts for approximately 99% of the world's 250 million electric two-wheelers.

The successes of implementing this approach have also positively impacted the environment. In 2018, the use of electric two-wheelers accounts for approximately 80% of all the greenhouse-gas emissions avoided by the use of electric vehicles in the entire world. Having realized such benefits, China has turned its attention to the electrification of four-wheelers. Table 2 below shows a few of the steps taken by China, in creating a sustainable EV market that has propelled the country's status of being one of the world's leaders in this emerging technology.

Table 3: Summary of China's EV incentives

Year	Initiatives	Remarks
1999	Incentives for two-wheelers	
2001	China starts the "863 EV Project"	State High-Tech Development Plan intended to stimulate the development of advanced technologies in a wide range of fields.
2004	National Development and Reform Commission publishes Auto Industry Development Policy	The goal of the association is to integrate technological standards and create a mechanism through which stakeholders share information in order to develop a top of the market e-vehicle.
2007	China invests over US\$300 million in new electric vehicle development.	
2008	Chinese automakers provide around 500 independently developed new energy and fuel efficiency vehicles to serve Beijing Olympics	

Year	Initiatives	Remarks
2009	The State Council approves the Auto Industry Restructuring and Revitalization Plan to invest US\$1.50 billion for new e-vehicle industrialization.	The government announces a two-year pilot program of subsidizing buyers of EVs.
2010	An auto industry (including new energy) development plan for 2011 to 2020 was drafted to include a plan to transform the domestic auto industry	China plans to expand a project of encouraging the use of energy-efficient and alternative-energy vehicles in public transport
2011	Several R&D institutes has been built to facilitate EV research	
2018	China manufactured and sold about 1.2 million plug-in electric vehicles in 2018.	New electric cars (EV) had a market share of 4.2% of new cars sold in China for the entire year.

As shown in Table 3 above, China’s strategy was comprehensive, and as such, government policies have invigorated the entire spectrum of the EV market. From developing and promulgating clear financial incentives, national mandates and regulations, China has become the world’s largest market for electric vehicles in every category.

At the end of 2018, over 788,000 electric passenger vehicles were sold in China, which represents a 1.4% increase compared to 2017. In the larger scheme of things, this represents 2.81% of overall vehicle sales in 2018, according to China Association of Automobile Manufacturers. In terms of the mass transit market, out of approximately 425,000 electric buses in the world, china has deployed over 421,000 in the transport sector. According to Bloomberg New Energy Finance, it is expected that by 2025 China will grow its heavy-duty electric mass transit market to around 600,000 units. These numbers are respectable given the fact that the country has bestowed on itself ambitious targets, which denotes that fossil fuel vehicles will be a thing of the past by 2030.

The United States of America

Due to a range of incentives offered by federal, state governments and electric utilities, the USA currently lags only behind China as the largest EV market in terms of EV sales. For example, the US federal government initiated a tax credit for PEVs purchased after 2009 December 31. This ranges from \$2,500 to \$7,500 for each vehicle based on its battery capacity and gross vehicle weight rating. The tax credit is available until a manufacturer sells 200,000 EVs, at which point the credit begins to phase out over time for vehicles sold by that company. The credit halves for the six months following the sale of the 200,000th vehicle, and then halves again for the next six months, and finally disappears entirely.

The research has indicated that more than half of the states are using rebates, tax exemptions, and tax credits to motivate EV purchases. For instance, California offers rebates to light-duty zero emission vehicles and PHEVs. Low-income families are eligible for an extra \$2,000. Washington and New Jersey exempt EVs from motor vehicle sales and use taxes. Louisiana and Maryland provide tax credits of up to \$2,500 and \$3,000 per vehicle, respectively. Almost half of US EV sales are in California, where state and local incentives are added to the federal tax credit and a Zero Emission Vehicle (ZEV) mandate requires that EVs be a certain percentage of sales. ZEVs are mostly electric vehicles, but can also be hydrogen fuel cell vehicles. Currently the requirement is for 2.5% ZEVs.

Beyond the rebate, there are other state-wide, local and utility incentives. Table 4 below provides a summary of the incentives offered in California.

Table 4: Summary of EV incentives in California

Government Incentive	Effective Period
Federal Income Tax Incentive of up to \$7,500 for BEV and 2,500 – 7,500 for PHEV.	2009 - present
State rebate (The Clean Vehicle Rebate Project) offers rebate of 2,500 for BEV and 1,500 for PHEV	1996 - present
Grant - up to \$5,000 and Financing for Lower Income Buyers of Clean Vehicles (Clean Vehicle Assistance Program)	1997 - 2017
Rebate - Additional \$2,000 for low income households (CVRP)	1999 - 2017
Rebate - up to \$15,000 for ZEVs in public fleets	2000 - 2018
Rebate from some utilities for installing EV charging points for residential and commercial utility customers (up to \$500 for residential customers and \$2000 for commercial customers)	2001 - present
Financing program for EV charging stations at small businesses (funded by the California Energy Commission)	2005 - present
Some utilities offer electricity rate discounts for EVs e.g. South California Edison, LA Department of Water and Power etc.	2015
Decal for High Occupancy Vehicle (HOV) lane exemption (DMV)	2016
Free parking & charging at participating hotels	2018
Free on-street metered parking in Santa Monica and other cities	2018 - present
Free EV charging at the Los Angeles International Airport (LAX)	2018 - present
Ride for Free in Toll Lanes - Metro Express Lanes (FasTrak)	2018 - present
Some insurance companies have offered up to 15% discount on insurance for EVs and other alternative fuel vehicles	2019

Public education programmes form part of the initiatives that have been undertaken in the US to provide information about EVs. In some instances, the electricity regulator has played a role by mandating the service providers to develop these programmes. As is seen in California, the California Public Utilities Commission has determined that the service providers should play a role in EV public education by making customers aware of, inter alia, charging options. However, the Illinois Electric Vehicle Advisory Council has recommended that EV public education activities should be carried out by a wider group, which includes: government, auto manufacturers and dealers, electricity providers, EV charging operators, environmental and public interest groups, public safety organizers and educational institutions.

Barbados

With over 400 EVs now on the island, Barbados is one of the world's top users of EVs on a per capita basis (Forbes, December 2018). The introduction of EVs in Barbados was pioneered by a local private company, which began operations in 2013. The company has made considerable progress with rolling out electric charging stations and EVs in Barbados, despite little government policy support and financial incentives. Although policy support is limited, the Barbados government has begun to electrify its fleet and plans to introduce an electric/hybrid bus programme.¹²

Currently, the only financial incentive that the Government of Barbados provides for EVs is a lower duty of 20% for EVs with a motor capacity of 100 hp as opposed to 46.95%. While the public utility, Barbados Power and Light (BP&L) has the exclusive right to supply electricity, the company has publicly acknowledged electric vehicles as part of its growth strategy and have partnered with the company to electrify its own fleet.

The company currently does not claim to sell electricity to its customers but rather charge for time spent at the charging facilities. This could be directly challenged by BP&L as a sale of electricity and not time, but so far, BP&L does not seem to be going in that direction.

Cayman Islands

For years, private investors grappled with government regulations as they try to introduce electric vehicles to the Cayman Island. Many attempt in getting electric vehicles registered were unsuccessful as safety was among the major concerns of the government. It was not until 2012 August 30th at the first Caribbean International Electric Car Show launch, held at the Cayman Motor Museum, investors were made aware that regulations allowing electric cars to be registered in the Cayman Islands had been officially approved by the government. This announcement created a buzz among investors who were relentless in their pursuit of introducing EVs to the Island.

¹² (<http://newenergyevents.com/barbados-government-to-implement-more-incentives-for-electric-and-green-vehicles/>)

Having revised the country's traffic regulations to accommodate electric vehicles, the government demonstrated its acceptance and support of the technology, and the benefits which can be derived by publishing a revised Customs Tariff Law, later in 2012. The updated custom Tariff law indicated that there was a duty reduction on imported electric-powered vehicles as follows:

- For a fully electric powered car, the import duty was reduced from 29.5% to 10%.
- For a hybrid electric-gas vehicle, the import duty was reduced from 29.5% to 15%.

This gave investors added incentives not just to be a supplier of electric vehicles, but to invest in developing the necessary infrastructures that will facilitate the fruition of an Electric Vehicle Market. Therefore, since 2012 investors have constructed numerous charging stations in and around Grand Cayman.

Further support was demonstrated by the government in 2015, when it embarked upon a pilot project, which resulted in the first ever electric vehicle to join the government's fleet of cars. While imported fossil fuels controls the lion share of the energy sector, the government acknowledged that this technology has the potential of minimizing the country's dependency while creating fiscal space by reducing fuel expenditure. By the end of 2016, the status of the market was as follows:

- 15 operational electric vehicle charging stations around Cayman where electric vehicles can be recharged free of cost.
- 44 fully electric cars registered and licensed to operate on Cayman's road.
- 31 hybrid registered and licensed to operate on Cayman's road.

In 2017, the government introduced a new National Energy Policy containing the provisions for a transportation sector strategy. Under this provision, the government clearly outlined what they will be doing to increase the share of fuel efficient, electric and hybrid vehicles in the country. The document specifically indicates that the government will:

“Create and/or maintain incentives to facilitate the usage of electric and hybrid vehicles. The Government will lead with a policy to convert 7 - 10% of its fleet to electric vehicles and hybrids, where appropriate in the first 5 years of the Policy. Support the progressive conversion of the public transportation fleet to more efficient alternatives such as EVs, hybrids and alternative fuel vehicles. Mandate a marketing strategy to be initiated by motor vehicle dealers and resellers to provide information on vehicle fuel efficiency to prospective purchasers. And; Reduce the duty on EV's and hybrids to 0% and 10% respectively for 5 years.”




These moves by the government have created a major impact in the market, given that at the end of 2019 July, there were approximately 160 electric vehicles already licensed to drive on Cayman's roads while the number of charging station have increased to 19.

Recognizing the potential benefits, the government decided to continue its implementation of the National Energy Policy by reducing the custom duty on electric vehicles as indicated below.

- For a fully electric powered car, the import duty was reduced from 10% to 0%.
- For a hybrid electric-gas vehicle, the import duty was reduced from 15% to 10%.

Figure 5 shows the revised custom duties levied on electric vehicles.

Figure 4: Revised EV custom duties in Cayman

PERSONAL USE		COMMERCIAL USE	
 Electric vehicles	 Hybrid vehicles	 Electric vehicles	 Hybrid vehicles
\$1 - \$29,999 0% duty	\$1 - \$29,999 10% duty	\$1 - \$29,999 5% duty	\$1 - \$29,999 12% duty
\$30,000 - \$60,999 5% duty	\$30,000 - \$60,999 12% duty	\$30,000 - \$60,999 10% duty	\$30,000 - \$60,999 15% duty
\$61,000 - \$99,999 10% duty	\$61,000 - \$99,999 15% duty	\$61,000 - \$99,999 15% duty	\$61,000 - \$99,999 17% duty
\$100,000 & above 15% duty	\$100,000 & above 17% duty	\$100,000 & above 17% duty	\$100,000 & above 20% duty

 MINISTRY OF COMMERCE, PLANNING & INFRASTRUCTURE
CAYMAN ISLANDS GOVERNMENT

Source: <https://www.caymancompass.com/2019/07/30/hew-announces-incentives-for-electric-and-hybrid-vehicles/>

With the reduction in tariffs, along with the expansion of Grand Cayman’s electric vehicle charging station infrastructure, the government hoped that this initiative would further strengthen the public’s confidence in the future for electric vehicles on the island. The Table 5 shows a summary of the decisions taken by the Cayman government to introduce an EV market in the country.

Table 5: Summary of EV decisions in Cayman

Year	Initiative	Remarks
2012	Revised the Traffic Regulations Customs Law	Government came under pressure from investors to introduce EV in the Island.
2015	Introduction of a Vehicle Standardization Policy	Government showed further support by implementing a pilot project, which saw the first electric vehicle joining the government fleet.
2017	National Energy Policy was promulgated	The government recognize the benefits of EV to the country’s economy and environment and therefore sets out mandates to increase its market share.
2019	Revised Custom Duty	This was outlined as part of the government strategy under the National Energy Policy.

Proposed approaches and incentives considerations for EV take-up in Jamaica

The research in other jurisdictions provided strong indications of some of the common issues that must be considered and addressed in order to devise policies to incentivize the take-up of EVs locally. These issues are multifaceted and in some instances correlated. In an effort to limit the negative impacts of these issues, it is proposed that the following should be considered in order to encourage EV take-up in Jamaica.

Implement measures to reduce the purchasing price and ownership cost of EVs

Based on the findings of the multiple surveys and reports of other research¹³ conducted, while EV prices have been trending down with advancements in technology, the upfront cost for an EV still remains higher than the cost for a similar model ICE. Accordingly, incentives are needed to offset the price differential to purchase an EV. Example of incentives used by other countries is the provision of financial support from the government either through grants/subsidies or one-off concessions such as reduction/removal of customs/import duty costs. Some governments have also provided exemption from the annual registration fees, free toll road access, tax deductibles for businesses and exemption from fees for public passenger vehicles.

In addition to the abovementioned, some governments have also utilized non-financial measures to incentivize EV take-up. These include inter alia, the provision of free dedicated parking, in public spaces for EV and engaging in comprehensive public education activities.

Development of adequate charging infrastructure

EV driving range has been identified as one of the main factors affecting its take-up. Consideration must therefore be given to the development and expansion of charging infrastructure in order to mitigate against this concern and incentivize EV take-up.

Employ government policy objectives

Mandating the reduction of polluting and adverse environmental conditions: The fourth National Goal in Jamaica's National Development Plan 2030, is for the country to have a "*healthy natural environment*". One of the outcomes of this goal is the reduction of hazardous risks and adaptation to climate change. Additionally, Jamaica is a signatory of the *Paris Agreement on Climate Change*, which Jamaica signed in 2016 November and ratified in 2017 March. In this Agreement, world leaders signalled their intentions to take measures to try to limit global warming to no more than 2degrees Celsius. The signatories of the Agreement also committed to reduce carbon emissions until the world's temperatures stabilizes at 1.5 degree Celsius.

¹³ Delucchi, Mark & Lipman, Timothy. (2010). Lifetime Cost of Battery, Fuel-Cell, and Plug-in HybridElectric Vehicles. 10.1016/B978-0-444-53565-8.00002-6., Comparison of Leading Electric Vehicle Policy and Deployment in Europe Economic Impact of Electric Mobility Transition in St. Vincent and the Grenadines

Since EVs are known to be less hostile on the environment, one strategy that can be considered to encourage EV take-up is the establishment of environmental and/or fuel efficiency standards and benefits that are aligned to the government's goal for a healthy environment. Similar to the GOJ renewable portfolio standard, GOJ can establish a target for EV penetration in the transportation mix, starting with public sector entities.

Implement public education/stakeholder engagement

In order to effectively raise the level of consumer awareness and gain buy-in, it is critical to engage all affected stakeholders. Consideration must therefore be given for a robust, structured and timely public education campaign through which information will be shared on EV.

Implement measures to increase availability of EV models

In keeping with the provisions of Jamaica's Motor Vehicle Import Policy, consideration needs to be given to measures that can be taken to encourage the importation of EV models. This can be achieved with special provision being given to the different groups that are allowed to import motor vehicles. For instance, financial and non-financial incentives could be provided to importers of EVs that will be used in the public passenger transportation sector, government ministries and by private sector companies.

Implement measures to ensure the availability of replacement parts and ability to repair EVs

In order to provide assurance to consumers regarding the maintenance and repair of EVs, consideration should be given to requiring motor vehicle dealers to maintain adequate inventory of a specified amount of replacement parts. Additionally, motor vehicle dealers should also be required to have staff that are trained and certified to carry out maintenance and repairs of EVs.

Government procurement

It is recognized that government procurement is one of the fastest ways of improving the level of EV penetration. The GOJ could establish policy, which mandates that EVs be purchased for its ministries, agencies and other public sector entities.

Free public charging

The GOJ may also consider whether it may be appropriate to make its own investments and provide free EV charging in public places. It would be prudent to first ascertain the roll out plan of any other potential investor and make the investment in the areas where there are no immediate plans for roll out but which has potential for EV take up (for example, in commercial zones).

Import Duties and other compulsory payments upon importation

There is currently an import duty of 20% for hybrid EVs and 30% for BEVs. On the face of it, it does not appear that the current duties support the drive for electrification of the transport sector. The reason for the higher rate for BEVs as opposed to hybrids are not readily apparent. In any case it is recommended that the GOJ consider taking the necessary steps to implement lower rates that would further its objectives in this regard.

Reduction of GCT and SCT

Currently, battery electric vehicles are zero rated under the GCT Act. It is recommended that GOJ consider whether a reduction to the GCT applicable for plug in hybrid EVs may be warranted. It is not proposed that plug-in hybrids should also be zero rated as this does not align with the objective of the penetration of battery electric vehicles. However, the reduction in the GCT for plug-in hybrids may assist in increasing the citizen's appetite for completely green technology and would further the environmental objectives of the GOJ. Additionally, the GOJ may also consider reducing the GCT applicable on the second sale of these motor vehicles.

Reduction of motor vehicle licence fees

The GOJ may also consider a reduction or waiver of the annual compulsory Licence fees that is applicable for all motor vehicles, with phased introduction of these fees once the number of EVs on the island has been increased to an acceptable level. It is proposed that the fees for Hybrid vehicles be reduced while the fees for BEVs be waived at least until a specific penetration level is achieved.

Tax credits to commercial entities and dealerships

One of the quickest ways to increase the number of EVs on the Jamaican road would be to encourage commercial and government entities to electrify their commercial fleets. It is recommended that the GOJ consider establishing tax credits for the entities that acquire BEVs as part of their fleets. It is proposed the GOJ establish a policy that encourages the purchase of the electric vehicles with specific characteristics it deems suitable by granting more or less incentives based on the attributes of the EV purchased.

For citizens to be able to consider purchasing EVs, the product must be accessible. If the dealerships are not making the vehicles available for sale, the level of penetration desired may not be realized. In this regard, it is recommended that the GOJ establish policy that encourage EV sales by offering tax credits to dealerships who offer these vehicles for sale.

Grants to assist with EV purchase

The GOJ may also consider providing grants towards the purchase of EVs. Since this initiative would be costly, the GOJ may restrict to a definite period in which the grant would be available. This would require collaboration with the car dealerships as it is being proposed that the applicable grant be applied through and paid to the dealership. It is proposed that the amount of grant available should be tailored to encourage the EVs that the GOJ deems suitable to further its objectives.

Question 3: Regulatory Approaches and Incentives

- (a) Do you think that the GOJ and its agencies are doing enough to encourage the uptake of EVs? Please provide detailed reasons for your response.
- (b) What steps, in your view, are required to implement the proposed incentives/ approaches?
- (c) What are your views on the proposed approaches and incentives considerations to encourage EV take-up locally?
- (d) Are there any other appropriate incentives and/or approaches not identified? Please provide details.
- (e) Do you share the view that GOJ should mandate EV targets for its own vehicle fleet?
- (f) What difficulties do you think the GOJ will experience in implementing the proposed incentives or adopting the proposed approaches?

7 BENCHMARKING OF BUSINESS MODELS FOR EV CHARGING INFRASTRUCTURE OWNERSHIP

7.1 Business models for charging infrastructure ownership

The review of EV development in other jurisdictions indicates that the provision of adequate infrastructure for EV charging is one of the key enablers of EV growth. In this section, a review of business models for EV charging infrastructure ownership is presented.

The regulatory issues surrounding EV charging infrastructure is whether to:

- a. Regard it as a regulated service, given that in Jamaica, the generation, transmission, distribution and supply of electricity is defined as a prescribed utility service. This prescribed utility service is regulated by the OUR; or,
- b. Regard it as an unregulated service which would allow private investors to own and operate the infrastructure.
- c. In the event the operations of the public charging infrastructures are deemed to be a regulated service, which falls under the definition of a prescribed utility service, then the OUR would be mandated to regulate it; except where an exemption is granted to this type of infrastructure.

Different countries have adopted different ownership business models for public charging stations. Two of the main approaches are described below.

Integrated model

The electric utility owns the EV charging infrastructure and operates it either directly or through their franchisees (or contractors). The EV charging infrastructure forms part of the regulated assets of the utility who operates and maintains the EV charging infrastructure. This model is used in Ireland and British Columbia in Canada. The main advantage of this model is that the utility needs not worry about low volume of business in the initial years as the assets are created under regulated capex route.

Independent model

In this case, independent private (or public-private partnerships) investors establish EV charging stations under licenses from local governments or municipalities. They may appoint EV Service Providers (EVSP) for charging operations and payment settlements, which ensure certain level of interoperability amongst different EV charging station network owners. UK, the Netherlands and Barbados are examples of the Independent Model. Different countries and local governments offer different incentives, tax breaks etc. to EV network owners to compensate for low volumes of business in the initial years.

Both models exist in different parts of the USA. In almost all European countries and the USA, different financial packages are offered under different policy initiatives to incentivize both EVs and EV charging station ecosystem. A number of other potential regulatory issues should also be considered when designing and operating charging stations. These include requirements for interoperability, the assignment of an entity responsible for grid upgrading and how ownership of charging stations may be assigned. Table 6 highlights how some of these issues are tackled in other jurisdictions.

Table 6: Issues summary on EV charging infrastructure

Data Fields	United kingdom	Ireland	Netherlands	United States	Germany
Total EV stock	137,680	2,687	119,332	563,700	59,090
Normal Charge points	11,497	837	32,120	40,862	22,213
Fast Charge Points	2,759	172	755	6,266	2,076
Total Charge Points	14,256	1,009	32,875	47,128	24,289
Charging Market Model	Independent	Integrated	Independent	Independent	Independent
Public Charging	By local authorities, over discrete platforms	By the grid operator	By local authorities, over open access platforms	By charging network operators and property owners on discrete platforms	Over three quarters of charging points are operated by electricity companies
Private Operators of Public Charging	5-10	0-5	15-20	10 networks, many property owners	
EVSE Owner	Infrastructure is tendered by lower governments like cities, region or municipalities	Infrastructure in the hands of e-cars, a subsidiary of ESB (grid operator). ESB tender charging hardware and installation	Cities and provinces tender public charging infrastructure	Third party charging service provider individual residents, homeowner associations etc.	Municipal governments & private investors
EV Service Providers (EVSP)	Operation is done by private parties that subcontract their energy supplier	Sub-contractor of ESB operates the EVSE	Private companies energy companies and contractors operate as EVSPs	Private EVSPs	Private EVSPs
Entity Responsible for grid upgradation	Grid Operator	ESB-Ireland's Grid operator	EVS Owner		Private investor but the government funding will cover network connection cost

Data Fields	United kingdom	Ireland	Netherlands	United States	Germany
Interoperability	No national interoperability between EVSEs in different UK regions, however, interoperability within regions is organized by EVSPs	EVSPs offer subscriptions to EV Owners and delivering interoperability in return, using an RFID card for authentication in the transaction	National interoperability is organized through the Central Registry Interoperability and is managed by non-commercial organization eViolin to which all EVSEs and EVSPs are connected	No national interoperability between EVSEs in USA.	Ladenetz, a government sponsored consortium of utilities, universities, and private EVSPs in Germany and the Netherlands, is creating a Europe-wide network of interoperable charging stations.

Question 4: Business Models for Infrastructure Ownership

- (a) What policy options adopted in other mature EV markets would be appropriate for Jamaica?
- (b) What other challenges can you identify that may be unique to Jamaica and would require a different set of policy options or variations to other jurisdictions?
- (c) What are your views on the appropriateness of the integrated and the independent business models for Jamaica?
- (d) Are you of the view that both approaches are permissible in Jamaica? Please provide reasons for your answer.
- (e) If you are of the view that neither of the approaches in (c) is applicable, what business models for infrastructure ownership do you think would be suitable for Jamaica to successfully deploy EV charging infrastructure?

7.2 The debate on utility ownership of EV charging infrastructure

The research papers reviewed have considered the matter of whether utilities should participate in the market as it relates to public charging facilities. Proponents for the inclusion of the traditional utilities have opined that the utilities participation will allow for the protection of the electricity systems and safe use of the electricity systems since the utilities have the relevant expertise as it relates to the electricity systems.

The arguments against utilities' involvement center on the potential for latent competition in the market. Others also consider the utilities' participation in the market as a deterrent of non-utility investors as utilities may be seen as having a market advantage¹⁴.

Some jurisdictions, at the embryonic stage of the EV market, took deliberate steps to exclude utilities from owning charging infrastructure. This was the case in the state of California, where the California Public Utilities Commission (CalPUC) in its decision document D. 11-07-029 contemplated whether utilities should own electric vehicle service equipment and found that utilities' involvement may limit customer choice and has the potential to "*dampen the competition that may ~~it~~ cost reducing innovation.*" However, the California Public Utilities Commission indicated that the utilities may continue to own electric vehicle service equipment "... *used to charge their own electric vehicle fleets or provide work place charging for utility employees.*"¹⁵

In addressing the concerns of the utilities that the approach of prohibiting utility ownership at an early stage could result in some areas being underserved, the CalPUC stated that it would revisit the prohibition placed on utilities if it brings evidence that there are underserved markets in areas within which utility participation is restricted. The CalPUC did not, therefore, decisively restrict the entrance of utilities as it had reserved the right to reconsider the matter where utilities' non-participation results in underserved markets. In fact, CalPUC seems to have exercised this right and has in recent times approved proposals by utilities to build out EV charging stations¹⁶.

¹⁴ See Public Utility Commission of Oregon Order No. 12 013

¹⁵ Phase 2 Decision Establishing Policies To Overcome Barriers To Electric Vehicle Deployment complying with Public Utilities Code Section 740.2

¹⁶ For example, see: Merchant, E. (2018). California Regulators Approve Landmark Utility EV- Charging Proposals. Retrieved from: <https://www.greentechmedia.com/articles/read/california-cpuc-approves-landmark-ev-charging-proposals#gs.53f3sc>

The state of Arizona also placed restrictions on the utilities involvement in the market. The Arizona Public Service (APS) Company, in its application for approval of proposed electric vehicle readiness demonstration project, proposed a public charging programme to the Arizona Corporation Commission. Regarding the proposal, the Arizona Corporation Commission (ACC) recommended that “APS be directed to work cooperatively with the federally- funded EV infrastructure contractors for the first year of the proposed study.” The ACC further restricted the utility’s involvement to the extent that the utility “...identifies a specific gap in charging infrastructure deployment, or other deficiency in the federally funded EV infrastructure efforts...”¹⁷ The ACC prevented the utility from building out its own public charging infrastructure, at least within the first year of approval of the proposed project. However, it appears that this decision was related to, *inter alia*, the estimated costs that would be borne by the ratepayers for the project and the existence of federally funded efforts at the time.

Similar to the approach in California, there was an attempt to limit utility involvement to areas that are underserved. Like California, the current approach of the ACC differs from its previous position in the APS’ proposal. In recent times, the ACC in a memorandum which outlines the ACC’s policy as it relates to Electric Vehicles, Electric Vehicle Infrastructure and the Electrification of the Transportation Sector in Arizona, stated that the policy is being adopted “...to encourage regulated utilities to invest in infrastructure and develop program[m]es that support Electric Vehicle charging and widespread transportation electrification.”¹⁸

The state of Oregon took an approach much different from California and Arizona from the outset. The Oregon Public Utilities Commission in Order 12 013 considered the matter of utility investment and operation of Electric Vehicle Service Equipment (EVSE). In deciding that utilities should be allowed to participate in the market, the Arizona Public Utilities Commission stated:

“At this early stage of development for the plug-in EV industry, we deem it paramount to allow all market players, including the electric utilities, to have flexibility to respond to emerging market demands. We do not find that allowing utilities to potentially participate in the EVSE market will necessarily impede the vibrancy of the whole market...”

Although there have been different approaches as it regards the involvement of utilities at the very nascent stage of the EV market, it is clear that the complete restriction of utilities from the market has not been a practical approach. A review of the states of California and Arizona that have adopted a more restrictive approach revealed that this has not encouraged competition in the market, which was one of the arguments for the exclusion of the utilities. In fact, both states have recognized that the utility can be an instrumental player in the deployment of the relevant infrastructure. This has resulted in a change of policy in both states.

¹⁷ Arizona Corporation Commission, Docket No. E-01345A- 10-0123, 15 September 2011, retrieved from: <https://images.edocket.azcc.gov/docketpdf/0000129728.pdf>

¹⁸ Arizona Corporation Commission, Memorandum dated 2018 December 12. Retrieved from <https://docket.images.azcc.gov/0000194370.pdf>

Currently, the general sentiment is that utilities should not be precluded from building out their own charging stations and offering charging services. However, the concerns that have been raised is investment by utilities that effectively prevents non-utility investors from competing in the industry. Some jurisdictions have taken steps to mitigate the potential for monopolization by utilities.

Of note the state of California in Code 740.12 (b) provides, in part, that “...[t]he commission shall approve, modify and approve, programs and investments in transportation electrification, including those that deploy charging infrastructure, via a reasonable cost mechanism, if they... do not unfairly compete with non-utility enterprises as required under section 740.3...”

Section 740.3 referred above states that “[t]he commission’s policies authorizing utilities to develop equipment or infrastructure needed for electric-powered... vehicles shall ensure that the costs and expenses of those programs are not passed through to electric ratepayers unless the commission finds and determined that those programs are in the ratepayers’ interest. The commission’s policies shall also ensure that utilities do not unfairly compete with non-utility enterprises.”

The legislation not only mandates the California Public Utilities Commission to approve the investments in charging infrastructure but also provides that the approvals given must not have the effect of enabling utilities to unfairly compete with non-utility providers.

Similarly, the British Columbia Utilities Commission (BCUC) in Canada, in its phase two (2) report on an inquiry into the regulation of electric vehicle charging services, noted that the private sector has a critical role to play in the deployment of the relevant infrastructure. The BCUC in its report also noted the importance of “thoughtful regulation” to ensure that the market is not monopolized by the utilities (“non-exempt utilities”). The report stated that:

“Given the potential role of the private sector in the development of EVCS [Electric Vehicle Charging Services], we find it in the public interest to ensure that the playing field remains as level as possible. There is an opportunity for thoughtful regulation to ensure that non-exempt public utility investments don’t have the end effect of crowding out exempt utility investment [non-utilities].”¹⁹

JPS plans to deploy EV charging stations across the island and had indicated that it was aiming to have island wide coverage by the year 2020. The information published on the JPS’ website indicated that there were plans for full deployment by 2020 March. According to JPS the project should result in 90% of population within 30 kilometers of a charging station.

¹⁹ (2019) British Columbia Utilities Commission: An Inquiry into the Regulation of Electric Vehicle Charging Service (Phase Two Report). https://www.bcuc.com/Documents/Proceedings/2019/DOC_54345_BCUC%20EV%20Inquiry%20Phase%20Two%20Report-web.pdf

The research has not found enough evidence to support the concerns raised in other jurisdictions regarding participation of the utilities in the market. In any case, a review of the jurisdictions that attempt to place tight restriction on utility participation has revealed that, ultimately, the regulatory bodies approve a number of utility projects to drive the market. It has not been expressly stated that this is as a result of limited or nonparticipation by non-utilities. It could however be argued that, had non-utility participation in the market been as anticipated, there would be no need to approve utility EV charging projects in the amounts approved.

International experience in addressing the question of utility exclusivity and regulation of charging activities

The issue of independent entities being allowed to own charging infrastructure in Jamaica is dependent on whether EV charging is classified as the transmission, distribution or supply of electricity. In Jamaica, Condition 2 Paragraph 4 of the Electricity Licence provides that JPS has an exclusive right to transmit, distribute and supply electricity throughout Jamaica. Although the Electricity Licence expires on 2027 July 8, there is still a possibility that an exclusive Licence will be granted upon renewal, in light of the provisions of the Electricity Act, which provides that such Licence may be either exclusive or non-exclusive.

Other jurisdictions were examined to determine whether they faced similar issues as it relates to the exclusive right to transmit, distribute or otherwise supply electricity and to identify the approaches adopted in light of the potential constraints that would be associated with such an exclusive Licence.

A review of the regulation in the state of Oregon in the United States revealed a similar issue as it relates to the exclusivity to supply electricity, albeit in a different context. The territorial allocation law in the state of Oregon pursuant to ORS 758.435 provides that:

“ (1) Any person providing a utility service in a territory that is not served by another person providing a similar utility service may make application to the Public Utility Commission for an order allocating such territory to it....

(2)

(3) Territory within the limits of a city, as fixed on May 31, 1961, shall not be deemed to be served exclusively by any person, if such city is, on such date, served by more than one person having necessary municipal or franchise authority to serve within the entire city”. ORS 758.440 further provides that:

“(2) The commission, before approving an application for the allocation of territory, shall find that the applicant is exclusively serving the territory covered by the application... ”

The term “*utility service*” is defined in ORS 758.400 as “*service provided by any equipment, plant, or facility for the distribution of electricity to users...*”

Except for the exemption made at ORS 758.435 (3) it appears that a public utility authorized to operate in the territory allocated, should be the only public utility operating in that territory.

The state of Oregon has expressly provided for the exemption of persons who provide EV charging services only, from the definition of public utility. Subsection (1) of ORS 757.005 broadly defines the term “*public utility*” to mean any entity that “owns operates and manages or controls all or part of any plant in [the state of Oregon] for the production, transmission, delivery or furnishing of heat, light, water or power, directly or indirectly to or for the public...”. However, subsection (1) (b) (G) clearly provides an exemption for the services that would be provided at a charging station. ORS 757.005 (1) (b) (G) provides that ‘Public Utility’ does not include any entity that “...furnishes natural gas, electricity, ethanol, methanol, methane, biodiesel or other alternative fuel to any number of customers for use in motor vehicles and does not furnish utility services.”

Therefore, an entity that provides charging services but that does not provide any other services that would be classified as a utility service under ORS 758.400 will not be considered a public utility. The concerns raised by the exclusive operations of the public utilities is addressed by the express exemption of charging services from the classification of a public utility.

The GOJ may wish to consider the wording of the existing regulations to determine whether an exemption, is already inherent in the regulation based on its natural interpretation. As previously mentioned the Electricity Licence indicates that JPS has the exclusive right to transmit, distribute and supply electricity. The Electricity Act defines ‘transmission’ to mean “...*the conveyance of electricity by means of transmission lines*.... The Electricity Act also defines ‘distribute’ to mean “...*electricity by means of distribution lines*”. Further the term ‘supply’ is defined in the Electricity Act to mean “... *the activities involved in the sale of electricity to consumers*”. Even if there was the possibility for the services provided by charging stations to be determined not to be in conflict with JPS’ exclusive Licence where the charging station does not make use of transmission and distribution lines, it could be argued that in the absence of an express exemption, those services could be classified as a “supply of electricity”.

The review conducted on other jurisdictions, revealed instances where attempts were made to make technical arguments as to the reasons why the services provided by charging stations fall outside of the activities captured in existing regulations. In particular, the Ministry of Power in India contemplated whether charging stations should require a Licence under its Electricity Act. Section 12 of India’s Electricity Act provides that a Licence is required for a person to transmit, distribute or undertake trading in electricity. Under the Electricity Act of India transmission and distribution is defined in a similar way as the Electricity Act of Jamaica. However, trading of electricity is defined in the Electricity Act of India as the “... *purchase of electricity for resale thereof* ...” In an effort to have the charging of EVs not fall within any of the categories, which require a Licence, the Ministry of Power of India released a clarification. This clarification, inter alia, noted that:

“[the] charging of battery essentially involves utilization of electrical energy for its conversion to chemical energy, which gets stored in the battery. Thus, the charging of battery of an electric vehicle by a charging station involves a service requiring consumption of electricity by the charging station and earning revenue for this purpose from the owner of the vehicle. The activity does not in any way include sale of electricity to any person as the electricity is consumed within the premises owned by the charging station, which may be connected to the distribution system or otherwise for receiving electricity. By the same logic, the activity does not involve further distribution or transmission of electricity.

Therefore, it is clarified that during the activity of charging of battery for use in electric vehicle, the charging station does not perform any of the activities namely transmission, distribution or trading of electricity, which require a Licence under the provisions of the Act, hence the charging of batteries of electric vehicles through charging station does not require a licence under the provisions of the Electricity Act, 2003.”²⁰

It is important to note that India has multiple power transmission and distribution companies and multiple companies that engage in power trading. The electricity market is therefore much different from the Jamaican context. It is therefore questionable whether such an approach as the one adopted by the Ministry of Power in India would be acceptable in Jamaica.

The New York Public Service Commission in 2013 issued a declaratory ruling on whether it had jurisdiction over publicly available electric vehicle charging stations. The New York Public Service Commission determined in this declaratory ruling that it did not have jurisdiction over the charging stations and the owners of the charging stations so long as the owners do not otherwise fall within the Public Service Laws. Under the Public Service Law, the New York Public Service Commission has jurisdiction over, inter alia, “...*the manufacture, conveying, transportation sale or distribution of electricity ... to gas plants and to electric plants and to the persons or corporations owing, leasing or operating same.*”²¹

The New York Public Service Commission considered the crux of the matter to be whether the charging stations could be considered an “electric plant”. Section 2 (12) of the Public Service Law defines “electric plant” as “... *all real estate, fixtures and personal property operated, owned, used or to be used for or in connection with or to facilitate the generation, transmission, distribution, sale or furnishing of electricity for light, heat or power ; and any conduits, ducts or other devices, materials, apparatus or property for containing, holding or carrying conductors used or to be used for the transmission of electricity for light heat or power.*”

In arriving at the determination that a charging station is not an electric plant under the Public Service Law, the New York Public Service Commission stated that:

²⁰ Clarification on the Charging Infrastructure for Electric Vehicles with Reference to the Provisions of the Electricity Act, 2003 (13th April 2018)- Government of India, Ministry of Power

²¹ NY Pub Serv [L § 5](#) (see: <https://law.justia.com/codes/new-york/2015/pbs/article-1/5/>)

“Charging stations do not fall within the definition of “electric plant” because Charging Stations are not used for or in connection with or to facilitate the generation, transmission, distribution, sale or furnishing of electricity for light heat or power. Instead ... Charging Stations are used to provide a service, specifically, charging services. This service requires the use of specialized equipment and allows the customer to do only one thing, charge a PEV’s battery. The primary purpose of the transaction between Charging Station owners/operators and members of the public is the purchase of this service and the use of specialized equipment. While the customer is using electricity, this is incidental to the transaction.”²²

The New York Public Service Commission, rather than a technical argument as the one used by India, looked at the use of electricity as being incidental to a service being offered by the charging station. Notwithstanding the difference in approach by both the Ministry of Power of India and the New York Public Service Commission, the aim is the same; that is, the exclusion of Charging Stations from the licensing or regulatory requirement that may have otherwise applied under the existing regulations.

Similar to the New York Public Service Commission, the California Public Utility Commission attempted to clarify whether the charging stations or electric vehicle service provider falls within its remit by way of a rulemaking. By way of Rulemaking 09-08-009 issued 2010 August 2 the California Public Utility Commission found:

“Pursuant to §§ 216 and 218 the Commission regulates as public utilities corporations and persons owning, controlling, operating, or managing facilities used for the transmission, delivery, or furnishing of electricity to the public. However, the Commission does not have the legal jurisdiction to regulate vehicle service stations.”

Indeed, the non-exemption of charging stations from the existing legislation could be seen as a regulatory barrier to wide scale adoption of electric vehicles. The attempt to clarify the treatment of electric vehicle service providers through various regulatory tools may not be sufficient to allay the concerns surrounding the regulatory treatment of electric vehicles charging service providers. The approach from various jurisdictions, even those that have utilized various regulatory tools such as India’s Ministry of Power and the California Public Utility Commission who sought to bring clarity to the treatment of charging stations and electric vehicle service providers through published clarification and rulemaking document, had to expressly make the activity exempt or is attempting to provide for the express exemption in the relevant legislation.

Following the clarification published by India’s Ministry of Power, the Ministry submitted a Draft Electricity (Amendment) Bill in 2018, which includes a provision exempting the activities of charging stations from being construed as distribution, trading or supply of electricity. Section 14 of the draft Bill states that:

²²State of New York Public Service Commission: Declaratory Ruling on Jurisdiction over Publicly Available Electric Vehicle Charging Stations (Issued and effective November 22, 2013)

“...transactions involving charging of batteries for electric vehicles by charging stations shall not be construed as distribution, trading or supply to the extent undertaken for the said purpose and subject to such terms and conditions, as may be notified by the Central Government from time to time.”

Similarly, after the publication of the rulemaking by the California Public Utility Commission in August 2010, Section 216 of the California Public Utilities Code was amended by the passing of Assembly Bill No. 631 to expressly exempt entities that supplies electricity to the public only for use to charge light duty plug-in electric vehicles. Following the amendment section 216(i) reads:

“The ownership, control, operation, or management of a facility that supplies electricity to the public only for use to charge light duty plug-in electric vehicles does not make the corporation or person a public utility within the meaning of this section solely because of that ownership, control, operation, or management. For the purposes of this subdivision, “light duty plug-in electric vehicles” includes light duty battery electric and plug-in hybrid electric vehicles...”

Further, where regulatory tools are used to create an exemption, there is the risk of legal challenge and a reversal by the courts. This is what occurred in the state of Missouri. In 2018, the Missouri Court of Appeal reversed the commission finding that EV charging stations do not fall in the definition of “electric plant” under the law. The court noted that similar to a self-service gas station the transaction is the sale of gasoline not *“the service of filling the vehicle’s fuel tank with gasoline”*. The Court found that the utility owned charging station and the transaction is sale of electricity *“not the service of charging a battery.”*²³

Question 5: EV Charging Regulation

- (a) What are your views on utility participation in the EV charging market?
- (b) What, in your view, would be the benefits or disadvantages to utility participation in Jamaica?
- (c) What are your views on charging activities being considered a ‘*supply of electricity*’ under the current legislative and regulatory framework?
- (d) Do you think the current electricity regulatory framework facilitates or hinders the private ownership and deployment of EV charging infrastructure? Please provide detailed reasons for your response.
- (e) In your view, do you think that there are aspects of the regulatory framework that can facilitate the rapid uptake of EVs? If yes, what aspects?
- (f) What appropriate steps should the GOJ take to expressly exempt charging activity under the current legal and regulatory framework?
- (g) What are your views on regulation of EV charging activities?

²³ Klass, A (). Public Utilities and Transportation Electrification. Iowa Law Review

8 RELEVANT LEGAL AND REGULATORY FRAMEWORK

In developing a regulatory framework and relevant policy relating to the introduction and penetration of electric vehicles in Jamaica, the GOJ must consider existing legislation, regulations and policies. There must be a comprehensive assessment of the current provisions that may directly or indirectly affect this initiative. This assessment will determine whether it may be necessary to amend existing legislations and policies or whether there should be the promulgation of new legislation to facilitate the development of a viable and sustainable EV market in Jamaica.

8.1 Existing electricity sector legislation, regulation and policies

This section highlights the regulations and policies specific to the electricity sector that are considered of relevance to EV market development. The provisions of the JPS All Island Electricity Licence 2016, the Electricity Act, and the Office of Utilities Regulation Act that may hinder or support the Government’s initiative to introduce EVs in the island are therefore highlighted. The National Energy Policy (2009 – 2030) has also been reviewed and specific sections that support the introduction of EVs highlighted.

Importantly, the main provisions that have been identified as possible restrictions to the introduction and penetration of EVs relate to JPS’ status as the sole supplier and distributor of electricity in the island. However, there are a number of regulatory provisions that could support the introduction and penetration of EVs in Jamaica, such as: (i) provisions that establish requirements and/ or standards that ensure the security and reliability of the transmission and distribution systems or; (ii) provisions that afford the regulator the powers to make decisions or take actions that would touch and concern EV owners. Table 7 highlights elements of the various existing legislation and other instruments which would support or hinder the development of an EV market in Jamaica.

Table 7: Analysis of Jamaica's Electricity Legislation provisions

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
JAMAICA PUBLIC SERVICE COMPANY LIMITED ELECTRICITY LICENCE 2016		
Condition 2 Paragraph 2: The Licensee is granted the licence to generate, transmit, distribute and supply electricity in Jamaica	Condition 2 Paragraph 4: The Licensee has the exclusive right to transmit, distribute and supply electricity throughout Jamaica until July 8, 2027	Supportive:

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
		<p>JPS by way of the All Island Electricity Licence 2016 is granted Licence to generate, transmit, and distribute electricity. While the Licence grants the JPS the exclusive right to transmit, distribute and supply electricity, the Licence to generate electricity is not exclusive to JPS. Other persons may therefore be involved in the generation of electricity. This is especially important since the increase in EV uptake may require more generation capacity. There is therefore no restriction which prevents the participation of other persons that may contribute to any potential increase in generation capacity.</p> <p>Restrictive: The Electricity Licence grants the JPS the exclusive right to transmit, distribute and supply electricity throughout the island. This raises concern that JPS may be the only entity that may be able to participate in any activity that is considered as transmitting, distributing and supplying electricity. If the establishment of the charging stations and the provision of charging services can be classified as the transmitting, distributing and supplying electricity, the JPS may be the only entity allowed to set up charging infrastructure and provide charging services.</p>
Condition 2 Paragraph 3:		Supportive:

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
<p>The Licensee shall provide a safe and efficient service based on modern standards at reasonable rates so as to meet the demands of the island and to contribute to economic development</p>		<p>The Licence mandates that the JPS must provide a safe and efficient service based on modern standards at reasonable rates to meet the demands of the island. This obligation means that the security and reliability of the system must be maintained and should be of a type that can accommodate the increased demand. This is especially important with the introduction of EVs. It is recognized that with the introduction of EVs there will be increased demand even at the outset although localized.</p>
<p>Condition 2 Paragraph 4: No firm or corporation of the GOJ or other entity or person shall be prevented from providing a service for its or his personal use</p>		<p>Supportive: The All Island Electricity Licence provides that no firm or corporation of GOJ or other entity shall be prevented from providing a service for its or his personal use. Notwithstanding the JPS having the exclusive licence to transmit, distribute and supply electricity this does not prevent GOJ or any other entity from providing a service for its personal use.</p>
<p>Condition 2 Paragraph 11: The Licensee shall not show any undue preference or unduly discriminate against any Person or class of Persons as respects the sale or purchase of any goods (including electricity), service (including connections and use of System) or opportunity to access same</p>		<p>Supportive:</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
		Based on this provision, JPS is expressly precluded from unduly discriminating against EV owners as it relates to the sale of electricity and connection to the system or granting access to the system. JPS may not therefore refuse service to EV owners although their connection to the system may result in increased investments by the company on the distribution system or the increase in generation capacity.
<p>Condition 3 Paragraph 1: The term of this Licence shall be from the effective date (that is, March 30, 2001) to July 8, 2027</p>		<p>Supportive: The Licence expires in less than six (6) years. The JPS' status as the exclusive licensee for the distribution and supply of electricity may therefore be limited to the period of validity of the Licence. The government may therefore place limitations on JPS' investment in the charging infrastructures, so as to facilitate a competitive market subsequent to the expiration of the Licence. Further, this gives the Government the opportunity even where the JPS' status as an exclusive licensee is not changed in the future to make a clear exception for the sale of electricity by way of the charging stations.</p>
<p>Condition 15 Paragraph 2: The rates to be charged by the Licensee in respect of the Supply of electricity shall be subject to such limitation as may be imposed from time to time by the Office.</p>		<p>Supportive:</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
		This power granted to the Office enables the OUR to place relevant restrictions on the rates charged which could encourage the uptake of electric vehicles in the island. This allows relevant pricing methods to be introduced which could support the introduction of EVs.
<p>Condition 16 Paragraph 1: At the direction of the Office, from time to time, the Licensee shall prepare and publish codes of practice in respect of the various matters that affect customers. These would address such issues as Efficient Use of Energy; Payment of Bills; Disabled Customers and Customers of Pensionable Age and Handling Customer Complaints</p>		<p>Supportive: The Office has the power to direct the Licensee to publish codes of practice on various matters. Based on this provision, the Office has the power to address matters specific to EV owners by directing the Licensee to develop relevant codes of practice.</p>
<p>Condition 24 Paragraph 1: The Licensee shall follow prudent utility practices, detailed technical design standards relating to the Transmission System and the Distribution System to cover areas such as technical criteria and conditions for connection of customers; reliability targets for major sub-systems of the Transmission System; the configuration and distribution of sub-stations and transformers and design standards for the Transmission System and Distribution System</p>		<p>Supportive: The Licence places an obligation on the JPS to follow prudent utility practices which addresses the maintenance and reliability of the transmission and distribution system. As such, the Licensee is obligated to do all acts necessary to make all relevant adjustments such that the increased demand can be accommodated on the system. This is especially critical as electric vehicle usage on the island increases on a large scale.</p>
<p>Condition 30 Paragraph 1:</p>		<p>Supportive:</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
<p>This Licence may be modified at any time during the term by agreement between the Licensee and the Minister</p>		<p>The Government may negotiate with the Licensee to address issues in the Licence that may be considered a hindrance to the penetration of EVs even prior to the expiration of the Licence.</p>
<p>ELECTRICITY ACT 2015</p>		
<p>Section 2: “distribute”, in relation to electricity means electricity by means of distribution lines and the expression “distribution” shall be construed accordingly</p> <p>“Transmission”, in relation to electricity, means the conveyance of electricity by means of transmission lines and the expression “transmission” shall be construed accordingly</p>	<p>“Supply”, with respect to electricity, means the activities involved in the sale of electricity to consumers.</p>	<p>Supportive: Based on the definition of the terms “distribute” and “transmission” under the Electricity Act, where a person other than the licensee provides charging services by methods other than a distribution line or transmission line, this may not affect JPS’ exclusive Licence to transmit and distribute energy.</p> <p>Restrictive: The definition of the term “supply” under the Electricity Act may preclude the participation of other persons as it relates to the development of the relevant charging infrastructure. However, if one can create innovative ways to provide the service and still make a return in such a way that it is not classified as “supply” as per the EA, this may not affect the JPS’ exclusive Licence to supply electricity. Notwithstanding the foregoing, it may be more prudent to explicitly provide for the provision of charging services under the legislation than to seek to stretch or overextend the interpretation of the term which may result in the Courts being involved to settle the matter.</p>
<p>Section 5:</p>		<p>Supportive:</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
<p>The Office may, where it considers necessary, give directions to any licensee with a view to ensuring that (a) the needs of the consumers of the services provided by the Single Buyer are met; (b) the Single Buyer operates efficiently and in a manner designed to- (i) protect the health and wellbeing of users of the service and such elements of the public as would normally be expected to be affected by its operations; (ii) protect and preserve the environment; and (iii) afford its consumers economical and reliable service</p>		<p>This provision grants the Office the power to give directions to the Licensee to ensure that the needs of its customers are met and that the Licensee operates efficiently. Where it is evident that there are actions that the Licensee must undertake to address matters specific to EV owners, the Office may issue the relevant direction accordingly.</p>
<p>Section 6: (1) The Single Buyer shall provide an adequate, safe and efficient service based on modern standards, to all parts of the Island at reasonable rates so as to meet the demand for electricity and to contribute to economic development. (2) The Single Buyer shall not show any undue preference to or unduly discriminate against any person (whether or not it is any other business of the Single Buyer or an affiliate of the Single Buyer) or class of persons as respects the sale or purchase of any goods (including electricity), service (including connections and use of System) or opportunity or access to same.</p>		<p>Supportive: JPS is obligated to provide an adequate, safe and efficient service based on modern standards at reasonable rates. Similar to Condition 2 Paragraph 3 of the licence, this obligation means that the security and reliability of the system must be maintained and should be of a type that can accommodate the increased demand. This is especially important with the introduction of EVs. Scholars have recognized that with the introduction of EVs there will be increased demand even at the outset although the increased demand may be localized.</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
		<p>The Electricity Act further indicates that the Licensee should not show any undue preference to or unduly discriminate against any person as it pertains to the sale of electricity or connection to the system. Similar to Condition 2 Paragraph 11 of the Licence, the JPS is expressly precluded from unduly discriminating against EV owners as it relates to the sale of electricity and connection to the system or granting access to the system. JPS may not therefore refuse service to EV owners although their connection to the system may result in increased investments by the company on the distribution system or for the increase in generation capacity.</p>
<p>Section 8: (1) Subject to subsection (2), a person shall not - (a) engage in generation, transmission, distribution, dispatch and supply of electricity; or erect, maintain or have any electric line or other works over, along, across or under any street or public road for purpose of the supply of electricity, unless authorized to do so by an electricity Licence issued by the Minister.</p>		<p>Supportive: The legislation precludes certain activities such as the generation of electricity without the issuance of the relevant electricity Licence. However, a self-generator who generates electricity for his personal use is not required to have an electricity Licence where he has not: (i) entered into a net billing arrangement; (ii) A wheeling arrangement; or (iii) Connects to a transmission or distribution line.</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
<p>(2) Subsection (1) shall not apply to a person who generates electricity as a self-generator for that person’s exclusive use, unless that person enters into a net billing arrangement, a wheeling arrangement or connects to a transmission line or distribution line for some other purpose.</p>		<p>Outside of the identified exceptions, any person is legally able to generate electricity for their personal use. As such, a person can self-generate electricity for his exclusive use in his own charging infrastructure.</p>
<p>Section 10: (1) An Electricity Licence granted ... shall be a non-exclusive Licence for the generation of electricity for the entire Jamaica or any part thereof or may be an exclusive or non-exclusive Licence for any or all of the following services, namely the transmission, distribution, supply or dispatch of electricity for the entire Jamaica or any part thereof.</p> <p>....</p> <p>(4) An Electricity Licence may include any restriction or condition ... which appears to the Minister to be necessary or expedient, and he may request the Office to make recommendations in this regard.</p>		<p>Supportive: The provisions highlighted indicate that non-exclusive Licence may be granted for the generation of electricity and that either a non-exclusive or exclusive Licence may be granted for the transmission, supply or distribution of electricity. This is especially critical where it is determined that entrance into the charging station market is construed as the distribution, supply or transmission of electricity. Exercising the option to grant non-exclusive licenses means that there is the possibility for competition in the industry and the introduction of investors as is necessary. Subsection (4) allows for the introduction of restriction and conditions in the Licence. As such, the government may restrict or apply the necessary conditions to the Licenses issued that may support the penetration of EVs in the island.</p>
<p>Section 17:</p>		<p>Supportive:</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
<p>(1) It is the duty of a generation licensee to develop and maintain a reliable, efficient, compatible, safe and economical system of electricity generation in accordance with the electricity Licence held by the generation licensee and the generation code, this Act and any Regulations made hereunder.</p>		<p>Similar to other provisions this section of the Electricity Act, ensures the reliability of the transmission and distribution systems. This is critical in the existing system meeting the increased demand with the penetration of EVs in the island.</p>
<p>Section 22: (1) It is the duty of - (a) a transmission licensee to develop and maintain a reliable, efficient, coordinated, safe and economical transmission system in accordance with the terms of the licensee’s transmission Licence, the transmission code, this Act and any regulations made hereunder; (b) a distribution licensee to develop and maintain a reliable, efficient, coordinated and safe, economical distribution system in accordance with the terms of the licensee’s distribution Licence, the distribution code, this Act and any regulations made hereunder; (c) a supply licensee to develop, and maintain a reliable, efficient, coordinated and economical supply system in accordance with the terms of the licensee’s supply Licence, the supply code, this Act and any Regulations made under this Act</p>		<p>Supportive: Similar to other provisions this section of the Electricity Act, ensures the reliability of the transmission, supply and distribution systems. This is critical in the existing system meeting the increased demand with the penetration of EVs in the island.</p>

SUPPORTIVE PROVISIONS	POTENTIAL RESTRICTIVE PROVISIONS	REMARKS
<p>(2) It shall be the duty of an electricity Licensee to ensure that it does not commit an act or omission that will adversely affect directly or indirectly, the security and stability of the electricity supplied by it or by any other person to consumers.</p>		
<p>Section 44: A generation licensee shall comply with all the directions of the System Operator relating to dispatch activities or to the other functions of the generation licensee that concern the System Operator</p>		<p>Supportive: Similar to other provisions this section of the Electricity Act, ensures the reliability of the transmission and distribution systems. This is critical in the existing system meeting the increased demand with the penetration of EVs in the island.</p>
<p>Section 60: The provisions of this Act shall be reviewed by a Joint Select Committee of the House of Parliament not later than five years after the appointed day</p>		<p>Supportive: The legislation specifically provides for the review of the Act within five years. There is therefore the explicit opportunity to make amendments as necessary. The Government may therefore take the opportunity to make the relevant legislative amendment that will support the introduction and penetration of EVs.</p>

Table 8: The OUR Act

OFFICE OF UTILITIES	REGULATION ACT	
<p>Section 4(2):</p> <p>The Office may, where it considers necessary, give directions to any license or specified organization with a view to ensuring that –</p> <p>(a) The needs of the consumers of the services provided by the licensee or specified organization are met; and</p> <p>(b) The prescribed utility service operates efficiently and in a manner designed to –</p> <p>(i) Protect the health and well-being of users of the service and such elements of the public as would normally be expected to be affected by its operation; and</p> <p>(ii) Protect and preserve the environment; and</p> <p>(iii) Afford to its consumers economical and reliable service.</p>		<p>Supportive:</p> <p>This provision grants the Office the power to give directions to the Licensee to ensure that the needs of its customers are met and that the Licensee operates efficiently. Where it is evident that there are specific actions that the Licensee must undertake to address matters specific to EV owners, the Office may issue the relevant direction accordingly.</p>

JAMAICA'S NATIONAL ENERGY POLICY 2009-2030		
<p>The Vision of Jamaica's Energy Sector is noted as follows:</p>		<p>Supportive:</p>

“A modern, efficient, diversified and environmentally sustainable energy sector providing affordable and accessible energy supplies with long-term energy security and supported by informed public behaviour on energy issues and an appropriate policy, regulatory and institutional framework”

The Policy outlines the seven (7) goals as follows:

Goal 1: Jamaicans use energy wisely and aggressively pursue opportunities for conservation and efficiency

Goal 2: Jamaica has a modernized and expanded energy infrastructure that enhances energy generation capacity and ensures that energy supplies are safely, reliably, and affordably transported to homes, communities and the productive sectors on a sustainable basis.

Goal 3: Jamaica realizes its energy resource potential through the development of renewable energy sources and enhances its international competitiveness, energy security whilst reducing its carbon footprint.

Goal 4: Jamaica’s energy supply is secure and sufficient to support long-term economic and social development and environmental sustainability

The National Energy Policy directly supports the introduction of Electronic Vehicles in the island. The Policy indicates that the accomplishment of the seven goals will enable Jamaica to achieve the country’s energy vision. From a review of the specific activities and strategies to achieve each goal, certain actions are directly supportive of the Government’s initiative to introduce EVs on Jamaican roads. Some of these actions are highlighted below:

Under Goal 1, the key actions and strategies identified includes the promotion of conservation and efficiency in the transport sector by promoting the importation of more fuel efficient vehicles; and the provision of adequate infrastructure for transition to alternative energy vehicles; Under Goal 4, a key action is the introduction of Vehicle Emission Standards and Regulations in Jamaica to reduce vehicle emissions. This is critical as the establishment of a vehicle emission standard will see the introduction of more efficient vehicles in the island. Further, this may prompt citizens to look to EVs as a real alternative. Under Goal 7, two key actions and strategies are the provision of incentives to encourage the employment of high levels of capital to increase the use of cleaner technologies and the establishment, implementation and enforcement of the emissions standards.

Goal 5: Jamaica has a well-defined and established governance, institutional, legal and regulatory framework for the energy sector, that facilitates stakeholder involvement and engagement

Goal 6: Government ministries and agencies are model/leader in energy conservation and environmental stewardship in Jamaica

Goal 7: Jamaica's industry structured embrace eco-efficiency for advancing international competitiveness and moves towards building a green economy.

Possibilities under the current Framework

Notwithstanding the current barriers identified to EV uptake, there are measures that the GOJ can adopt in the short term to encourage EV uptake taking into consideration the current legal and regulatory framework.

As discussed in the previous sections of this document, one of the potential limiting factors in the current regulatory framework is the restriction on entities, other than the licensed electricity provider, participating in the sector. This is based on the current electricity provider having an exclusive licence to transmit, distribute and supply electricity in Jamaica. The Electricity Act defines the terms transmit, distribute and supply. Although the exclusivity of the current Electricity Licence is restrictive, the definitions of the terms may allow for some level of participation of unlicensed entities (*this term is being used in reference to persons other than the current electricity licensee*) in the sector.

In light of the definition of the terms distribute and transmit under the Electricity Act, an unlicensed entity who provides charging services other than by means of a transmission and a distribution line will not be acting in contravention of the provider's exclusive licence to transmit or distribute electricity. Where an entity other than the electricity licensee establishes a charging infrastructure, which operates on renewables without the use of transmission and distribution lines, this will not offend the exclusivity of the current electricity Licence as it relates to the transmission and distribution of electricity.

Although the use of renewables only would not affect the exclusive licence to transmit and distribute electricity, it may certainly contravene the current licensee’s exclusive licence to supply electricity. Even in the instances where there is sole reliance on renewable energy sources to operate the charging station, an entity other than the licensee who provides charging may be contravening JPS’ exclusive licence to supply. The Electricity Act defines “supply” as follows:

““Supply”, with respect to electricity, means the activities involved in the sale of electricity to consumers.”

In the absence of express provisions excluding the activity of EV charging, the unlicensed entity will have to contend with this restriction. As previously discussed, some jurisdictions have tried to apply a wide or technical interpretation of supply/ sale of electricity as a means of excluding such activities through interpretation, a similar approach adopted by the GOJ may raise legal challenges by the electricity licensee.

It appears from the interpretation in the Electricity Act, that where the transaction is one for profit that it would be considered a “supply” of electricity. However, it is unlikely that an entity would invest in such a venture without the anticipation of a return in the investments made. Therefore, it would be prudent for the GOJ to clearly outline its position on this issue before opening up the EV industry. In particular, the GOJ should clearly indicate whether this activity can be carried out by the current licensee only, the current licensee and unlicensed entities or unlicensed entities only. A part of determining the players in the industry will undoubtedly include an assessment on what may obtain under the current regulatory framework. There are strong arguments that under the current framework the only potential player in the EV industry is the licensee with the exclusive licence to transmit, distribute or supply electricity. On the face of it, this restriction limits the scale of EV take up as the licensee would be the only entity that would be building out the relevant infrastructure and would therefore dictate the pace and location of these infrastructure since the current regulatory framework does not contemplate regulatory direction for such matters.

The OUR is of the view that there is still opportunity for the GOJ to employ a strategic approach to increase EV take-up, even with such limitations, in such a way that would not offend the licensee’s exclusive licence to transmit, distribute and supply electricity. Some proposed strategies are stated in Table 9 for consideration by the GOJ:

Table 9: Recommended strategies for early implementation

Proposed Strategy	Description
Government Procurement	It is recognized that government procurement is one of the fastest ways of improving the level of EV penetration. The GOJ could establish policy which mandates that EVs be purchased for its ministries, agencies and other GOJ entities. As part of this initiative the GOJ could also consider establishing policy to ensure that each of these entities also build their own charging infrastructure and that these entities grant access and use of these charging stations to each other at no cost within an established framework.

Proposed Strategy	Description
Encouraging EV charging arrangements across entities	While the country awaits the buildout of EV charging facilities in such a manner that makes range anxiety a non-issue, the GOJ may consider establishing a public education campaign that encourages commercial entities to establish similar charging arrangements among themselves as discussed in the first point. The GOJ may go further by highlighting the main issues to be settled/ agreed on under such arrangements.
Free Charging in Public Places	The GOJ may also consider making its own investments and provide free EV charging in certain public places. It would be prudent to first ascertain the roll out plan of the licensee and make the investment in the areas where there are no immediate plans by the licensee but which has potential for EV take up (for example, in commercial zones).
Encourage Commercial Entities to provide free EV charging to its customers	The GOJ may consider encouraging commercial entities to provide free EV charging to their customers. The GOJ may consider coupling this initiative with fiscal incentive that incentivizes these entities to provide these services (e.g. tax breaks/ credits).

Question 7: Relevant Legal and Regulatory Framework

- (a) Do you agree with the strategies proposed to incentivize EV penetration under the current regulatory framework?
- (b) In your view, what regulatory initiatives can be employed in short order to incentive EV take up.
- (c) What, in your view, are the challenges to any of the proposals identified?
- (d) In your view, what additional strategies can be employed to encourage EV take-up under the current regulatory framework?

9 ASSESSMENT OF THE ECONOMIC AND ENVIRONMENTAL BENEFITS OF EV

The increased uptake of EVs is highly dependent on their affordability relative to the traditional ICEs. Individuals and commercial entities may apply a number of selection criteria when choosing a vehicle for purchase. However, from a purely economic point of view, the life cycle cost or total cost of ownership (TCO) represents a robust decision making criterion. It is assumed that rational individuals would choose the vehicle with the lowest life cycle cost where the life cycle cost is the sum of the net present value of all costs associated with owning the vehicle, including capital and all operating and maintenance costs.

On a macro level, the government is likely to lend its support to an EV initiative if the economic and environmental benefits to the country of a growing EV sector exceeds the costs. Economic benefits could include reduced fuel imports, reduction in emissions, the associated health benefits and job creation, among other things. Conversely, economic costs could include reduction in tax revenues or loss of jobs associated with the reduction in sales of ICEs.

This section examines the factors that impact affordability on the micro and macro level and focuses on how electricity tariff options could increase the attractiveness of EVs in Jamaica. A simplified life cycle cost model was developed to compare the cost of ownership of an EV versus an ICE for similar type cars. An economic model was also developed to provide a preliminary assessment of the economic impact of growth in EV sales.

9.1 Assessing the affordability of EVs

To assess the affordability of EVs, the life cycle cost of EV ownership was compared to the life cycle cost of ICE ownership. Table 10, shows the vehicle types selected for this assessment.

Table 10: Vehicle types for economic assessment

Vehicle	Fuel	Body Type	Engine
Honda Fit	Petrol	Sedan	<1200 CC
Nissan Leaf	Electric	Sedan	40 kWh
Nissan Versa Note	Petrol	Sedan	<1200 CC

The cost of owning either a Honda Fit or a Nissan Note ICE was compared to owning a Nissan Leaf, EV. It is assumed that these vehicles are viewed as similar types by car buyers.

Results of economic assessment EV vs ICE

The assessment considered owning and operating each vehicle identified in Table 9 over a lifetime of 15 years. Based on the current tax and duty regime for motor vehicle the upfront costs of acquiring an EV to a comparable ICE vehicle is between 28% and 30% higher for the EV. In terms of the total life cycle costs and the assumptions, which reflected current market conditions and information, the total life cycle cost for a vehicle travelling 20,000 km (12,500 miles) per annum was calculated and is presented in Table 11. A distance of 20,000 km represents the annual average distance that an individual travels.

Table 11: Comparison of vehicle lifecycle costs

Vehicles	Direct Purchase (US\$)
Honda Fit (ICE)	59,173
Nissan Leaf (EV)	63,313
Nissan Versa Note (ICE)	58,139

The results in Table 11 demonstrate that currently, the economics is not in favour of acquiring an EV for the average Jamaican commuter. It would not be an economical decision at this stage, given that ICEs have already established a reasonable leverage in the Jamaican market in terms of comfort, reliability, and brand appeal. The calculation indicates that the ICEs are approximately between 7 - 10% less expensive to own and operate than EVs over a 15-year lifespan. Figure 6 shows the total Life cycle cost of owning and operating an EV compared to an ICE vehicle.

Figure 5: Life cycle cost comparison EV vs ICE

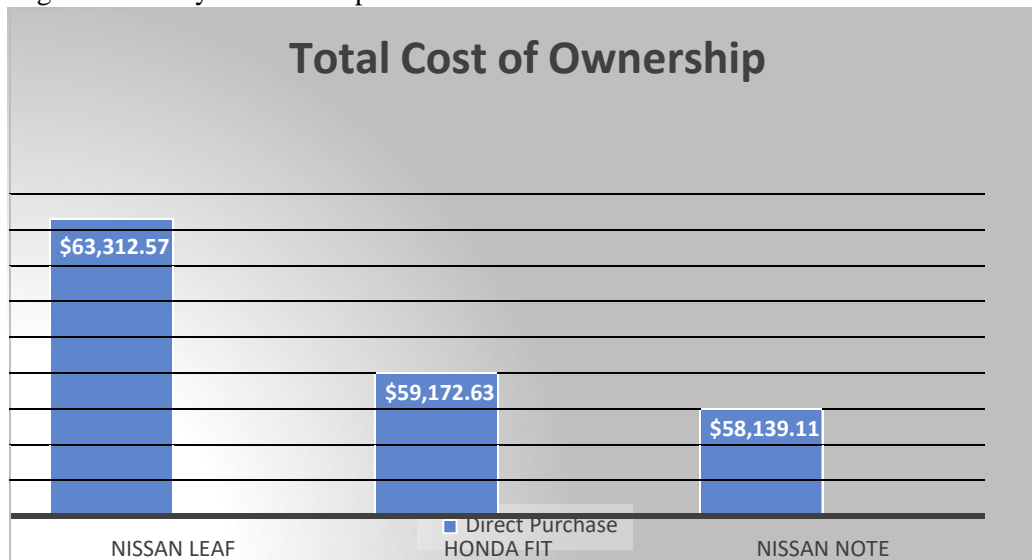
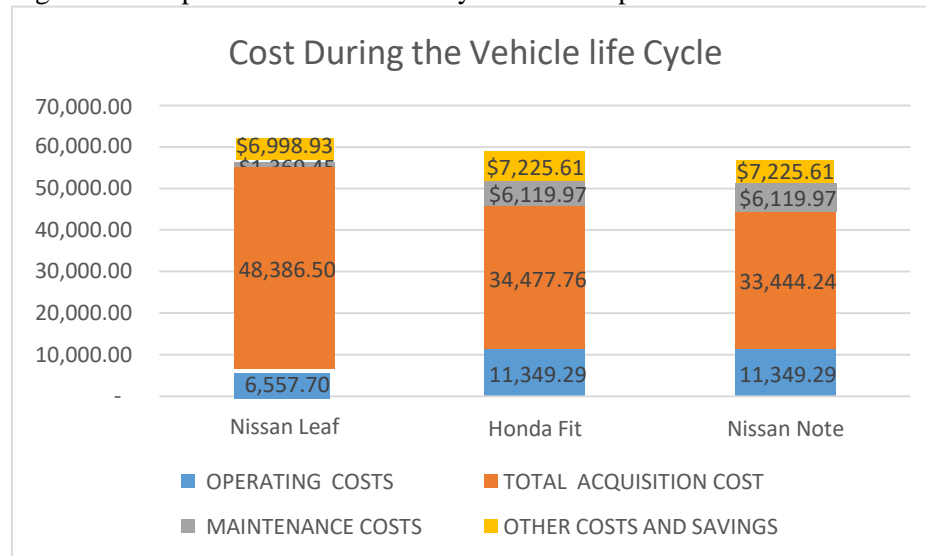


Figure 6: Comparison of vehicle life cycle cost components



As represented in Figure 6, the results indicate that with the existing framework, in terms of the governing legislations associated with the monetary requirements for vehicle importation, total acquisition cost contributes significantly to the total life cycle cost of owning and operating an EV. If import and customs duty (ICD) for EVs were to be reduced from the current level of 30% to under 10%, the acquisition cost of the EVs would be reduced to a level that would make it much more economical²⁴. Table 12 shows that relative to owning an ICE, the simple payback for owning an EV would be reduced to under six (6) years.

Table 12: Payback period EV vs ICE

ICD for EV	Simple Payback
0%	3
5%	4
10%	6
15%	8
20%	9
25%	11
30%	12

The analysis also demonstrated that on average, EVs have a smaller operating cost when compared to the ICE over the period. This is because the EVs are more efficient than ICEs hence, the cost of fuel (electricity) is cheaper for the EVs than for ICEs. The analysis did not consider any major relative movements in electricity or gasoline prices over the period. Figure 8 shows the percentages of the major contributing factors of the TLC.

²⁴ However, incentivizing dealers to restrict mark-ups on EVs to 5% and under, while waiving ICD, Trade Board Application Fee, and Customs Broker Fees would bring about parity if the current rates which is applied to ICE remains

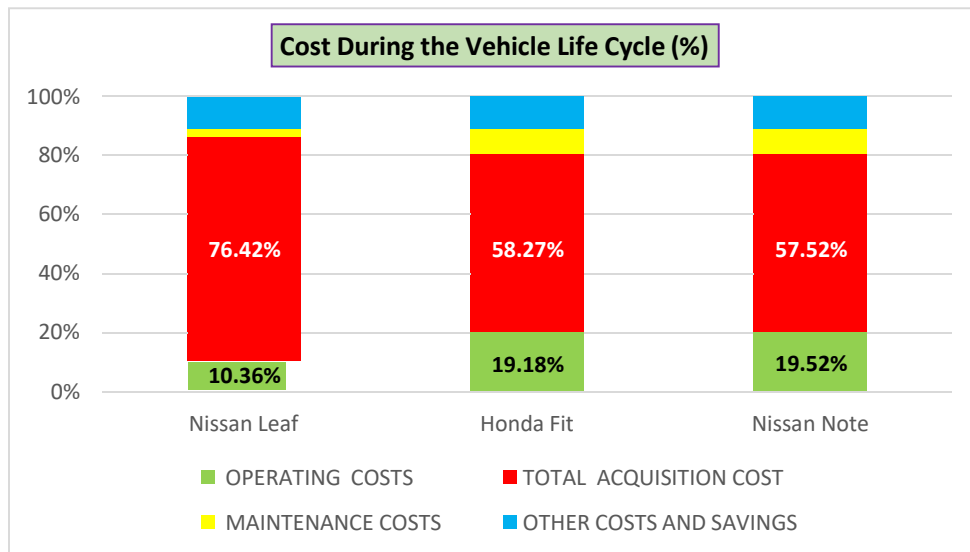


Figure 7: % of life cycle cost components

The analysis shows that while EVs are not currently economical to own for the average driver, it is economic for vehicles that travel above 3 times the distance of the average driver per annum. This include taxis and other public transportation and is illustrated in the Table 13 below:

Table 13: simple payback period based on usage

Distance (Miles/Year)	Simple Payback (yr)
20,000	7
30,000	5
35,000	4
50,000	3
75,000	2

Table 13 shows the simple payback of owning an EV versus an ICE. Payback under 5 years is only achieved if the vehicle travels 60,000 km or above per annum. It is therefore expected, that if properly marketed, EVs may currently be attractive to the class of users who do extensive travelling, e.g. taxis, and commercial vehicles. According to the findings of a study carried out by the Boston Consulting Group (2010), “Batteries for Electric Cars”²⁵ 55% of consumers want to breakeven in three years or less.

The impact of electricity and fuel prices

Electricity prices relative to the price of fuel also has a significant impact on the attractiveness of EVs. Table 14 below shows the variation in simple payback of owning an EV versus an ICE as the price of fuel and electricity varies.

²⁵ Policy options for electric vehicle charging infrastructure in C40 cities for Stephen Croluis, Director – Transportation, Clinton, Climate Initiative.

Table 14: Simple payback EV vs electricity and gasoline prices

		Price of Electricity US\$/kWh									
Price of Gasoline (US\$/litre)		0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
		1.50	14	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years
2.00	12	14	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years
2.50	11	12	14	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years
3.00	10	11	12	13	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years	>15 years
3.50	9	9	10	11	13	14	>15 years	>15 years	>15 years	>15 years	>15 years
4.00	8	8	9	10	11	13	14	>15 years	>15 years	>15 years	>15 years
4.50	7	8	8	9	10	11	12	14	>15 years	>15 years	>15 years
5.00	6	7	7	8	9	10	11	12	13	13	years
5.50	6	6	7	7	8	9	9	10	12	13	13
6.00	5	6	6	7	7	8	9	9	10	11	11
6.50	5	5	6	6	7	7	8	8	9	10	10
7.00	5	5	5	6	6	7	7	8	8	9	9

It is demonstrated that, as the price of electricity decreases, the number of years to payback also decreases, while as the gasoline prices decreases, the number of years to payback increases. As cheaper renewables are placed in the generation mix, it is expected that it will become more attractive to own an EV. Also, offering a special electricity tariff rate to EV owners will also improve the attractiveness of ownership. EV owners could also be offered time of use rates and be encouraged to charge their vehicles during the times when electricity rates are lowest.

9.2 The potential impact of EVs on the economy

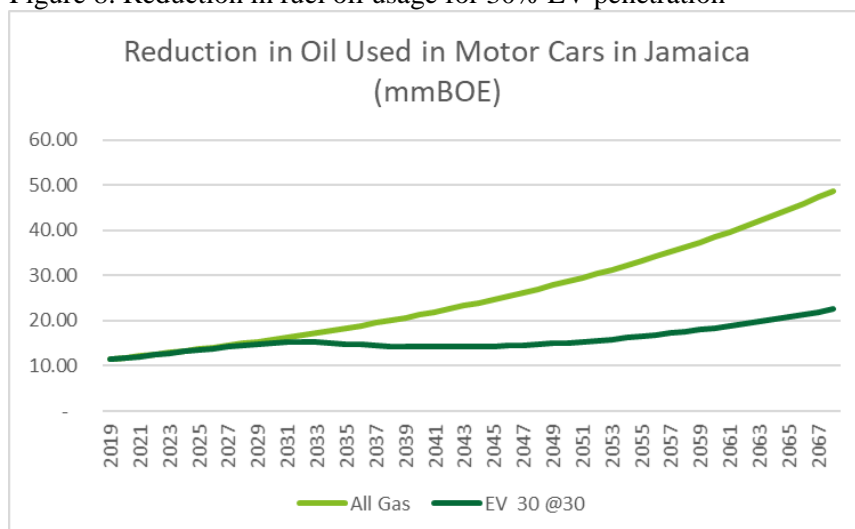
Electric-mobility could potentially provide the following benefits to Jamaica:

- Reductions in emissions from the transportation sector
- Improvement in the air quality and the health of Jamaicans.
- Generation of jobs and revenues from new business models.
- Reductions in outflows of foreign exchange via less reliance on imported fossil fuels.
- Enhance the tourism sector via a green economy and eco-tourism image.
- Reduce the dependency on fossil fuel imports.

A model was developed to assess the impact that EVs will have on carbon emissions and on fuel oil usage in Jamaica. In developing the model, it was assumed that the Government will implement policies to achieve 30% of vehicles sales being EVs by 2030.

Figure 9 shows how oil consumption is expected to vary if the policy objectives for EVs are met. As expected, the growth in EV sales could help the country to significantly reduce oil usage, which could help it to improve its balance of payments.

Figure 8: Reduction in fuel oil usage for 30% EV penetration



By 2030, the country could avoid up to 282,000 tonnes of CO₂ emissions per annum. If EV sales grow at the same rate that is required to achieve 30% of vehicles by 2030.

Question 8: Benefits of EVs Uptake

- (a) Do you think that more EVs in the system will significantly reduce the dependence on imported fuel? If yes, how? If no, why not?
- (b) Do you agree that largescale EV adoption will significantly reduce greenhouse gas emissions in the environment? If yes, how? If no, why not?
- (c) Do you agree that large scale EV adoption will have a positive impact on the economy? If yes, how? If no, why not?
- (d) The economic assessment carried out indicated that the pay-back period is more attractive for EV travelling a high number of miles. Do you think that EVs would be more economical for public passenger vehicles than private vehicles?

10 POTENTIAL IMPACT OF EV CHARGING ON THE ELECTRICITY GRID

It is important to proactively investigate the impact that various levels of EV penetration can have on the electricity grid as this could result in grid security, reliability and stability operating issues. The OUR is mindful of the impact that EV charging requirements may have on investments for the sector, and the subsequent retail tariff for electricity customers. It is also important to understand the operating conditions that could lead to the grid investment requirements. This information will be useful in advising how EV tariffs should be designed and the type of grid standards and regulations that should be introduced to minimize any adverse impacts or maximize the potential benefits that EVs could have on the grid.

This chapter will explore the impact of EVs on the transmission and selected sections of the distribution network under different EV penetration scenarios. The assessment was done using the DigSilent Power factory software suite and utilized JPS' network, load and generation dispatch data.

10.1 Impact of EV charging on electricity system operation

EV charging facilities are usually installed at the low voltage distribution network and are usually single phase supplies. Improper planning and operation of these facilities can create problems for the power grid, as the EV penetration increases. Some of the problems that may be encountered are among the major issues identified and include: grid and local area stability, power quality issues, lines and transformers overloading, circuit breakers and fuse blow out failures.

As EV penetration levels continue to increase and if appropriate mitigating measures are not put in place, the problems will migrate onto the primary distribution network, and eventually onto the high voltage transmission grid. As shown in the article by de Hoog, J²⁶, a centrally coordinated dynamic response programme can be applied to significantly increase EV penetration in residential network without significant adverse impact to the grid. Other authors^{27, 28} etc. have also shown that the impact of EVs may be mitigated by using controlled charging through smart grids or dynamic response schemes.

²⁶ de Hoog, J etal, Demonstrating Demand Management: How Intelligent EV Charging Can Benefit Everyone

²⁷ Avdakovic, S. etal, Impact of Charging a Large Number of Electric Vehicles on the Power System Voltage Stability.

²⁸ Sachan, S. Charging of Electric Vehicles under Contingent Conditions in Smart Distribution Grids

Grid impact assessment methodology

As the penetration level of EVs increases, as noted in a number of international publications, the impact on the electricity grid will become more evident due to implications that they may have on equipment overload, grid stability and power quality. It therefore, becomes imperative that appropriate network analysis is carried out, to determine the impact of EVs on the electricity grid. The assessment was divided into the following tasks:

- Estimating EV allocation and Penetration
- Feeder/Load Selection
- Determination of EV Charging Power Requirements
- Assessment of the power system behaviour.

Estimating different levels of EV penetration.

Regional allocation and penetration

To conduct this task, data from MTM was utilized. The number of registered motor vehicles in 2018 was obtained from MTM. This data was utilized to estimate motor vehicle allocation factors per parish from which, the number of EVs per parish was determined by applying the allocation factors to the 2018 number of motor vehicles. The steps are outlined below.

Step I – Determining EV allocation by parish

Using the information provided in the MTM report, for the period 2018, a percentage breakdown of the number of motor vehicles per parish was estimated.

Parishes with 5% and more vehicles, were selected as candidate parishes that are more likely to have some level of EV penetration.

Using the 5% penetration point as the base, the percentage distribution was then divided by this base point, to calculate the EV distribution ratio given in Figure 10 below.

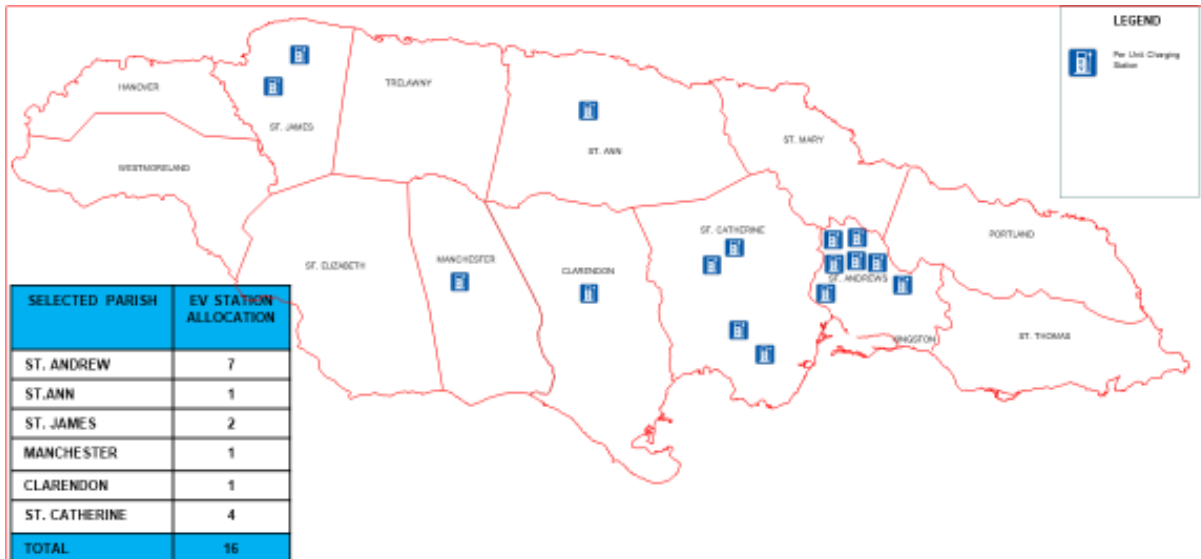


Figure 9: Proposed location of EV public charging stations by parishes

Step 2 – Feeder/Load Selection

The feeders that were selected for assessment were those with a high load factor and with a peak load that is almost coincident with the system peak load. These were selected from areas with a high concentration of motor vehicles, which included upper St. Andrew, Portmore and Montego Bay. Examples of the 24-hour load demand profile for a typical weekday for these feeders are given in Figure 11 and Figure 12 below.

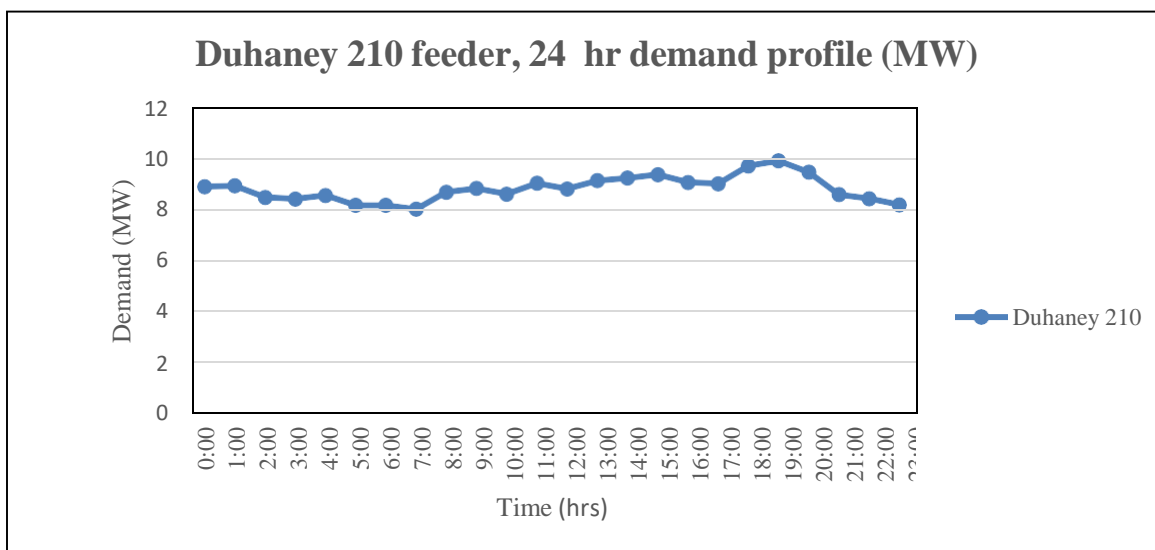


Figure 10: Corporate area feeder typical weekday demand

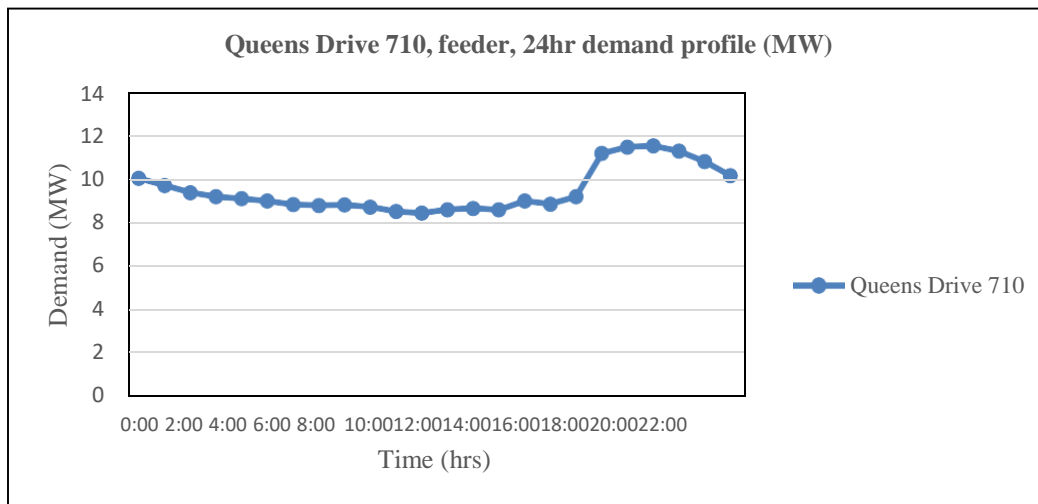


Figure 11: Montego Bay Substation typical weekday demand profile

Step III – EV Charging Power Requirements

The typical charging rates for Level 1 and 2 charging are 3.6 kW and 6.6 kW respectively. An estimate of the charging requirements for various EV penetration levels is calculated based on the following assumptions:

Equal amount of Level 1 and 2 charging were done at the same time, giving an average rate of coincident charging of 5.1 kW. Table 15 gives the number of EVs and the charging requirements for various EV penetration levels using these assumptions.

The charging requirements of electric motorcycles were not taken into account based on the current low level of motor cycles in the transport sector, less than 3% of motor vehicles, and with the very low charging requirements of electrified motor cycles, it is expected that even with a very large uptake of electrified motor cycles the impact on the grid operations will be minimal over time.

Table 15: EV penetration and charging power

% Penetration	EV Number	Charging Power (MW)	% System Peak Demand of 660 MW
1%	6,000	30.6	4.6%
2.5%	15,000	76.5	11.6%
5%	30,000	153	23.2%
10%	60,000	306	46.4%
15%	90,000	460	69.7%
80%	480,000	2450	370%

Step IV – Analysis of JPS transmission system

Analyses of the JPS transmission system was carried out to determine the impact that increase EV penetration will have on the power grid.

Case studies were carried out for 1%, 2.5% and 5% in electric vehicle penetration on the power system.

Off peak charging

This is an eight (8) hour period, lasting from 10:00 pm to 6:00 AM the next day.

Off Peak and daytime charging

This charging period is in two phases:

Phase I – An eight (8) hour period, lasting from 10:00 pm to 6:00 AM the next day, and

Phase II – A four (4), from 10:00 am to 2:00 pm.

The following was assumed in conducting the analysis:

It was assumed that the charging schemes being applied are uncontrolled charging, being done over the period.

EV charging grid impact simulation

The analysis focused on Levels 1 and 2 charging, as they are the most common charge infrastructure available.

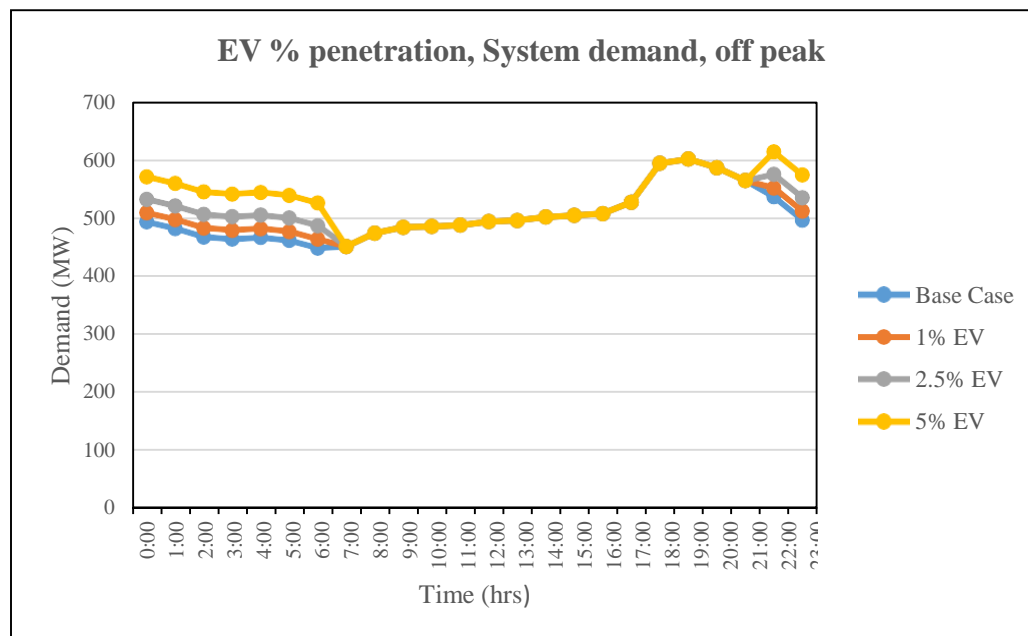


Figure 12: Option 1, system demand profile with EV penetration levels

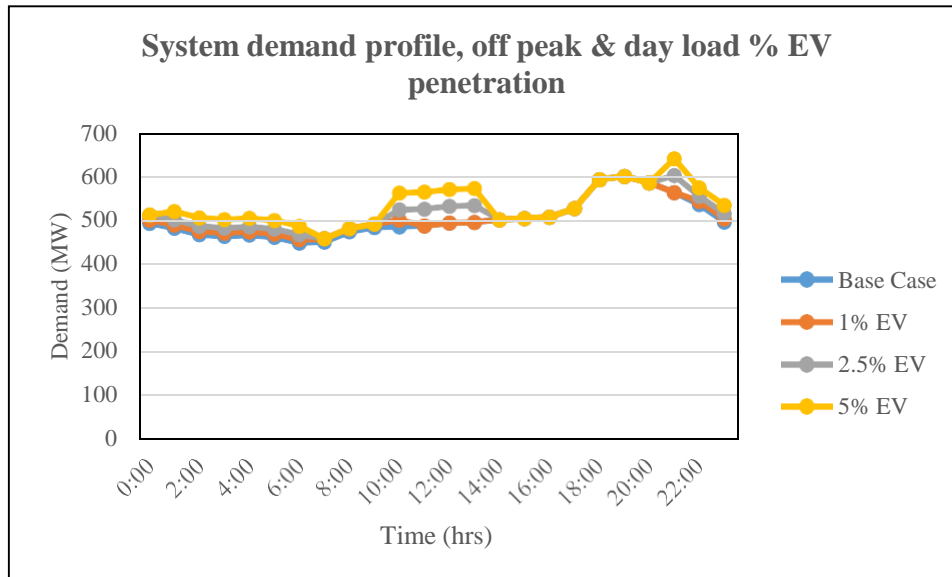


Figure 13: Option 2 system demand profile with EV penetration

Grid impact observations

The transmission network will not experience equipment loading violations for EV penetration levels up to 5%, for both normal system operation and single outage contingency cases.

Table 15 shows that the potential charging demand of EV could have a significant impact on electricity demand.

The assessment of the operation of the electricity grid shows that the electricity transmission system will not experience network loading violations on the transmission system for EV penetration levels up to 5 percent (30,000 EVs). It is estimated that simultaneously charging this number of EVs will impose an incremental electricity demand of 153 MW, which is approximately 24 % of system current peak demand. It has been reported that in jurisdictions with projected penetration levels of 15-20 percent by 2030 and that if the utility is successful at optimizing when and where EVs are charged (managed charge), they expect an increase in energy demand of 5-10 percent but a 25-33 percent increase in demand for grid capacity. Based on the projection of EV take up in Table 16, the estimated peak demand increase for a 5 percent take up of EVs is estimated at between 40 -50 MW. Based on the installed generating capacity reserve margin of 180 MW and the transmission capacity capability, the grid should be able to accommodate an uptake of 5 percent EV penetration without significant grid augmentation, beyond projects already planned.

Table 17 shows the impact on the grid with unmanaged and managed charging. Managed charging is smart charging of EVs based on off peak charging, time of use incentives, and applying smart grid technology, resulting in an EV charging coincident factor of 30%. Table 17 shows the increase in generation required based on various EV penetration levels.

Table 16: Grid impact with managed and unmanaged charging

% Penetration	EV Number	Unmanaged Charging Power (MW)*	Managed Charging Power (MW)*	Unmanaged % peak demand of 660MW	Managed % peak demand of 660 MW
1%	6,000	30.6	9.2	4.6%	1.4%
2.5%	15,000	76.5	23.0	11.6%	3.5%
5%	30,000	153	46.0	23.2%	7.0%
10%	60,000	306	92.0	46.4%	13.9%
15%	90,000	460	138.0	69.7%	20.9%
80%	480,000	2450	735	370%	111.4%

Table 17: EV take up level and generation increased required

% Penetration	EV Number	Charging Power (MW)*	Annual Energy Requirement GWh*	Net Generation Increase %
1%	6,000	30.6	20.0	0.46
2.5%	15,000	76.5	50.00	1.14
5%	30,000	153	100.0	2.28
10%	60,000	306	200.0	4.56
15%	90,000	460	300.0	6.84

* Assuming annual average distance travel of 20,000 km
 40 KWh per 240 km (150 miles).
 Net generation assumed 4384 GWh.

- (a) In order to assess the full grid impact the analyses need to be extended onto the MV and LV networks where the impacts will be more evident. However, the EV impact analysis cannot be a standalone study, by itself but must be incorporated as a part of the entire distribution system expansion plan and by extension into the transmission plant, when the need arises.
- (b) Based on the loading characteristics of some of the distribution feeders, in addition to EV owners driving pattern and style, it would impractical to have all EVs charging at the same time. Furthermore, to control charging and defer investments in infrastructural cost, some jurisdictions reviewed have already incorporated the use of smart grid technologies, of which the Advanced Metering Infrastructure (AMI) plays a key role. Others have also included some aspects of the demand response pricing scheme. This provides more dynamic pricing options to customers. The use of smart grid technologies and demand response will allow for greater penetration levels for EV integration when compared to uncontrolled charging schemes. The results also indicate that the off peak (valley time) charging period, which can provide some financial benefits, due to TOU pricing.

- (c) The major challenge for the utility is at the local distribution level and grid upgrade requirement will vary by regions depending on the existing distribution system capacity and the rate of EV growth in the specific areas. Experts agree the increased demand will stress the grid, particularly in areas with a high concentration of EVs. Greenlots' Singh said the "nature of these high charging loads is to spike quickly, therefore many local grids must be updated to handle rapid upswings in energy demand. This also affects utility rates around peak demand, which were not designed for such variable loads and therefore can create excessive demand charges for site hosts and charging operators. He noted that some areas, though, "may have enough capacity to absorb EV charging load growth, [as] powerplants deployed to support peak summer load will be idle during other times. This spare capacity can be used to address EV charging during non-peak times."²⁹
- (d) From system reliability and power quality standpoints the utility need to plan now for increased loads as the electrification of transportation grows. It is recommended that long term planning for EV penetration levels be included in the Integrated Resource Planning (IRP) to determine system augmentation necessary to be undertaken to
- (e) supply increased demand from EV charging. JPS undertake a comprehensive distribution study on the medium voltage (MV) and Low Voltage (LV) networks, particularly for those in the areas, where the impacts will be more evident. It is recommended that time of use rate incentives be offered to shift charging of EVs from peak periods to off peak periods.

While presenting challenges for utilities EV also presents opportunities for utilities to invest in charging infrastructure, vehicle to grid services (V2G), and utilizing renewable energy sources to provide grid resources.

²⁹ Harmeet Singh, chief technology officer of Greenlots, a California-based EV charging software and solution company.

Question 10: Impact of EV charging on Electricity Supply

- (a) What are your views on the effect of large-scale EV adoption on the electricity supply system?
- (b) What do you think of charging of EVs at home and work place?
- (c) Do you think high adoption of EVs in Jamaica will reduce your electricity bill?
- (d) Do you believe that the use of smart grid charging will allow for a greater penetration level of EVs when compared to uncontrolled charging? If yes, how? If no, why not?
- (e) What are your views on the effects of TOU billing on EV charging behaviour?
- (f) What incentives should be offered for EV private home charging?
- (g) Do you think that a TOU tariff option would reduce the impact of charging load on the grid? What other do you think should be considered to smooth the demand spike that EV charging is expected to produce?
- (h) Should the Jamaican Motor Vehicle Registry be allowed to share EV registration and owners' locations with JPS?

APPENDIX 1: SUMMARY OF STAKEHOLDERS’ CONSULTATION QUESTIONS

Section	Ref.	Subject	Question
4	4.1	Barriers to EV Ownership	<ul style="list-style-type: none"> (a) What are your views on the relevance of the identified barriers to EV ownership in our jurisdiction? (b) Are there other relevant barriers not contemplated? If so, please provide details? (c) What measures would you suggest to surmount these barriers?
5	5.1	Jamaica’s Road Network	<ul style="list-style-type: none"> (a) What are your views on the appropriateness of Jamaica’s Road Network to support locating of charging infrastructure for EVs? (b) What would you consider to be an appropriate distance between EV charging stations in Jamaica to mitigate range anxiety? (c) If the response to (c) is positive, do you think privacy concerns will act as a barrier to EV ownership?
6	6.1	Regulatory Approaches and Incentives	<ul style="list-style-type: none"> (a) Do you think that the GOJ and its agencies are doing enough to encourage the uptake of EVs and why? (b) What steps in your view are required to translate the various initiatives to actions? (c) Do you think that the GOJ and its agencies are doing enough to encourage the uptake of EVs and why? (d) What steps in your view are required to translate the various initiatives to actions? (e) What are your views on the proposed approaches and incentives considerations to encourage EV take-up locally? (f) Are there any other appropriate incentives and/or approaches not identified? Please provide details. (g) Do you share the view that GOJ should mandate EV targets for its own vehicle fleet? (h) What difficulties do you think the GOJ will experience in implementing the proposed incentives or adopting the proposed approaches?
7	7.1	Business Models for Infrastructure Ownership	<ul style="list-style-type: none"> (a) What policy options adopted in other mature EV markets would be appropriate for Jamaica? (b) What other challenges can you identify that may be unique to Jamaica and would require a different set of policy options or variations to other jurisdictions.

Section	Ref.	Subject	Question
			<ul style="list-style-type: none"> (c) What are your views on the appropriateness of the integrated and the independent business models for Jamaica? (d) Are you of the view that both approaches are permissible in Jamaica? Please provide reasons for your answer. (e) If you are of the view that neither of the approaches in (d) is applicable, what business models for infrastructure ownership do you think would be suitable for Jamaica to successfully deploy EV charging infrastructure?
7	7.2	Utility ownership of charging infrastructure- EV charging Regulation	<ul style="list-style-type: none"> (a) What are your views on utility participation in the EV charging market? (b) What, in your view, would be the benefits or disadvantages to utility participation in Jamaica? (c) What are your views on charging activities being considered a '<i>supply of electricity</i>' under the current legislative and regulatory framework? (d) Do you think the current electricity regulatory framework facilitates or hinders the (private?) ownership and deployment of EV charging infrastructure, and why? (e) In your view, do you think that there are aspects of the regulatory framework that can facilitate the rapid uptake of EVs. If yes, what aspects? (f) What appropriate steps should the GOJ take to expressly exempt charging activity under the current legal and regulatory framework? (g) What are your views on regulation of EV charging activities?
8	8.1	Existing legislation, Regulation and Policies	<ul style="list-style-type: none"> (a) Do you agree with the strategies proposed to incentivize EV penetration under the current regulatory framework? (b) In your view what regulatory initiatives can be employed in short order to incentive EV take up. (c) What, in your view, are the challenges to any of the proposals identified? (d) In your view, what additional strategies can be employed to encourage EV take-up under the current regulatory framework?
9	9.1,9.2	Impact of EVs on the environment and the economy	<ul style="list-style-type: none"> (a) Do you think that more EVs in the system will significantly reduce the dependence on imported fuel? If yes, how? If no, why not?

Section	Ref.	Subject	Question
			<ul style="list-style-type: none"> (b) Do you agree that largescale EV adoption will significantly reduce greenhouse gas emissions in the environment? If yes, how? If no, why not? (c) Do you agree that large scale EV adoption will have a positive impact on the economy? If yes, how? If no, why not? (d) The economic assessment carried out indicated that the pay-back period is more attractive for EV travelling a high number of miles. Do you think that EVs would be more economical for public passenger vehicles than private vehicles?
10	10.1	Impact of EV charging on electricity system operation	<ul style="list-style-type: none"> (a) What are your views on the effect of large-scale EV adoption on the electricity supply system? (b) What do you think of charging of EVs at home and work place? (c) Do you think high adoption of EVs in Jamaica will reduce your electricity bill? (d) Do you believe that the use of smart grid charging will allow for a greater penetration level of EVs when compared to uncontrolled charging? If yes, how? If no, why not? (e) What are your views on the effects of TOU billing on EV charging behaviour? Do you think that a TOU tariff option would enable reduce the impact of charging load on the grid? (f) What other do you think should be considered to smooth the demand spike that EV charging is expected to produce? (g) What incentives should in your opinion be offered for private charging of EVs? (h) How should the utility plan for increased uptakeof EVs?