CARICOM Regional Electric Vehicle Strategy (REVS)

May, 2022

CARICOM

GOBIERNO DE LA REPÚBLICA DOMINICANA
ENERGÍA Y MINAS

TAPSEC
Technical Assistance Programme for Sustainable Energy in the Caribbean

Co-funded by the European Union

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Prepared by
Deutsche Gesellschaft für
Internationale Zusammenarbeit (GIZ) GmbH

Registered Offices
Sitz der Gesellschaft
Bonn
Friedrich-Ebert-Allee 36 + 40
53113 Bonn, Deutschland

Eschborn
Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Deutschland

T +49 228 44 60-0
F +49 228 44 60-17 66
E info@giz.de
I www.giz.de

Programme
Technical Assistance Programme for Sustainable Energy in the Caribbean (TAPSEC)

Responsible
Simon Zellner, Programme Leader
Sparkle Prentice, Senior Policy, Regulations & Resilience Advisor

Authors
Christina Becker-Birck (Team Leader), Geoff Morrison (REVS Lead Author), Rebecca Coombs, Elise Emil, Jesse Way (Cadmus)

Oversight from the REVS Steering Committee:
Dr. Devon Gardner, CARICOM Secretariat
Ms. Nadia Mohammed, CARICOM Secretariat
Dr. Gary Jackson, Caribbean Centre for Renewable Energy and Energy Efficiency
Dr. Charlin Bodley, Caribbean Center for Renewable Energy and Energy Efficiency
Dr. Ulric Trotz, Caribbean Community Climate Change Centre
Dr. Donneil Cain, Caribbean Community Climate Change Centre
Mr. Joseph Williams, Caribbean Development Bank
Mr. Leighton Waterman, Caribbean Development Bank
Dr. Curtis Boodoo, University of Trinidad and Tobago
Dr. Sanjay Bahadoorsingh, University of the West Indies, St. Augustine Campus

On behalf of

Co-funded by
the European Union

This document has been produced with the financial support of the European Union and the German Federal Ministry of Economic Cooperation and Development. The views expressed herein can in no way be taken to reflect the official opinion of the European Union, or the German Federal Ministry of Economic Cooperation and Development.

TABLE OF CONTENTS

ABBREVIATIONS

CADE	Caribbean Advanced Proficiency Examination
CAREC	CARILEC Renewable Energy Community
CARICOM	Caribbean Community
CARIFORUM	Caribbean Forum
CARILEC	Caribbean Electric Utility Services Corporation
CCREEE	Caribbean Centre for Renewable Energy and Energy Efficiency
CDB	Caribbean Development Bank
CEP	CARICOM Energy Policy
CRIP	Caribbean Regional Indicative Programme
CROSQ	Caribbean Reqional Organization on Standards and Quality
C-SERMS	Caribbean Sustainable Energy Roadmap and Strategy
CXC	Caribbean Examinations Council
DCFC	Direct Current Fast Charging
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
EVSP	Electric Vehicle Service Providers
FIs	Financial Institutions
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
HEV	Hybrid Electric Vehicles
ICC	International Code Council
IUS	Integrated Utility Services
ISO	International Organization for Standardization
NASEO	National Association of State Energy Officials
NDC	Nationally Determined Contributions
OCPP	Open Charge Point Protocol
OOCUR	Organization of Caribbean Utility Regulators
PEV	Plug-In Electric Vehicle
PHEV	Plug-in-Hybrid Electric Vehicle
PPF	Project Preparation Facility
REVS	Regional Electric Vehicle Strategy
RUN	Regional University Network
SIDS	Small Island Developing States
TAPSEC	Technical Assistance Programme for Sustainable Energy in the Caribbean
TOU	Time-Of-Use

INTRODUCTION

Aim of the Regional Electric Vehicle Strategy (REVS)

The transport sector is in an era of disruption, ignited by emerging transport technologies, changing stakeholder needs, and climate change. With change comes opportunity. The introduction of electric vehicles (EVs)—including on-road vehicles as well as maritime and riverine vessels—promises to lower greenhouse gas emissions, improve air quality, lower vehicular noise, and improve health outcomes, particularly in underserved communities. This Regional Electric Vehicle Strategy (REVS) provides guidance on policies, instruments, and actions that support surface transport electrification in the Caribbean region, while accounting for the unique needs of the Caribbean people regarding transport systems, driving behaviors, and mobility preferences. At its core, the REVS is a set of 27 one-page descriptions of measures to catalyze transport electrification. Transport electrification is defined at the bottom of this page.

REVS Overarching Aim
"*To deliver intelligent, modern, affordable, clean, efficient, and safe mobility solutions for CARICOM citizens and businesses through the electrification of surface transportation within the Community*." - CARICOM and CCREEE

The **primary audience** for the REVS includes a wide range of electric vehicle stakeholders, such as:

- National ministries and local departments of Caribbean Community (CARICOM) Member States
- The CARICOM Secretariat, Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE), Caribbean Electric Utility Services Corporation (CARILEC), CARILEC Renewable Energy Community (CAREC), Caribbean Development Bank (CDB), Organization of Caribbean Utility Regulator (OOCUR) and other key regional bodies
- Local agencies involved in transport planning
- Universities, research laboratories, think tanks, and consultants
- Electric utilities
- Development organizations
- Car dealerships and auto associations
- Electric vehicle service providers

As noted in the next section, most CARICOM Member States are in the early stages of transportation electrification. Similarly, only a handful of literature exists on transportation electrification topics in the Caribbean region. In general, studies and reports discuss policy ideas and proposed actions broadly but do not describe the mechanics of implementation, level of incentivization, and/or the specific agencies/entities that would lead implementation. Therefore, the region has not coalesced around a set of best practices for advancing vehicle electrification in the Caribbean.

Definition of Transport Electrification
In the REVS, the terms "transport electrification" refers to shifting petrol-powered vehicles and vessels to *battery electric or plug-in hybrid electric*. Furthermore, the REVS takes a broad interpretation of electrification to include *public and privately-owned vehicles* across multiple modes of domestic surface transport, including *household vehicles, fleet vehicles, public transit vehicles, riverine vessels, passenger ferries, and other domestic vessels*).

The REVS aims to fill this gap by providing a blueprint for Member States in developing and implementing their own electric vehicle strategy for on-road and domestic marine vessels. The Caribbean has a long history of working together as a region to advance economic, sustainable energy, and climate change goals. The REVS will support the CARICOM Secretariat, CARICOM Member States, and regional institutions in coordinating their efforts to advance transportation electrification.

Background on the REVS Development

Context within the CARICOM Energy Policy and C-SERMS

Approved by Regional Energy Ministers in 2013, the CARICOM Energy Policy (CEP) promotes a shift to sustainable energy through increased use of renewable energy sources and improvements in energy efficiency. The Caribbean Sustainable Energy Roadmap and Strategy (C-SERMS), also approved in 2013, provides the basis for a targeted approach to advancing sustainable energy development under the regional policy and, in so doing, acts as a framework for articulating, monitoring, and adjusting regional-level strategies and for securing commitments from Member States towards achievement of the targets that are established. Through the CEP and the C-SERMS, the region is addressing the planning and innovation needs of the entire energy system.

C-SERMS Working Group on Electric Vehicles and Inception of the REVS

A C-SERMS Working Group on Electric Vehicles (EVs) was established in 2017 with the aim to assess global as well as the region's experiences in regard to electric vehicles, to identify suitable electric vehicle options for the Caribbean, and to identify the techno-economical, socio-political, and other considerations that are necessary for developing a regional approach to an electric vehicle roll-out within CARICOM. Though targets for renewable power generation are set at a regional level—and the recent completion and development of a regional energy efficiency strategy provides guidance and targets for energy efficiency—there is no approved strategy for transportation electrification and general energy use within the transportation sector.

Oversight, Framework, and Process for the REVS Development

The CARICOM Secretariat requested support under the GIZ-implemented Technical Assistance Programme for Sustainable Energy in the Caribbean (TAPSEC) for the development of the REVS for the Caribbean Community. The development of the REVS included the coordination and collaboration of the CARICOM Secretariat Energy Programme, GIZ TAPSEC Programme, and the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE). A framework for the REVS was developed by the CCREEE on the basis of outputs of the CARICOM Policy Working Group Electric Vehicle subgroup. Building upon this framework, the consulting team (Cadmus) drafted the REVS in close collaboration with the CARICOM Policy Working Group on Electric Vehicles. As explained on page 1 of the Introduction, the REVS includes more than just on-road electric vehicles. Rather it expands to also include riverine vessels, passenger ferries, and indigenous maritime vessels.

The Case for Electric Vehicles in the Caribbean

Transportation electrification presents opportunities for the Caribbean to advance sustainability and energy goals in the Caribbean Energy Policy, C-SERMS, and the United Nations Framework Convention on Climate Change's Nationally determined contributions (NDCs) and transition to a cleaner transportation sector. This section summarizes the benefits of electric vehicles to the Caribbean region.

The transportation sector is an important contributor to energy demand. The Caribbean region's transportation sector share of total energy consumption exceeds the global average. Regionally, the transportation sector accounts for over 40% of the share of end-user energy in most CARICOM Member States.[1] Energy consumption varies at a national level. For example, the transportation sector is 68% of energy consumption in Saint Vincent and the Grenadines.[2] Similarly, the transportation sector share of energy consumption is also quite high in Saint Lucia, making up 63% of energy consumption.[3] However, the transportation sectors of Haiti and Trinidad and Tobago both account for lower rates of energy consumption, at only 12% and 8%, respectively.[4]

The Caribbean region has high reliance on diesel and heavy fuel oil. Caribbean jurisdictions as a region rank among the world's 10 most oil-dependent economies.[5] Most CARICOM member states rely heavily on oil imports and are thus vulnerable to oil price fluctuations and foreign exchange risk.[6]

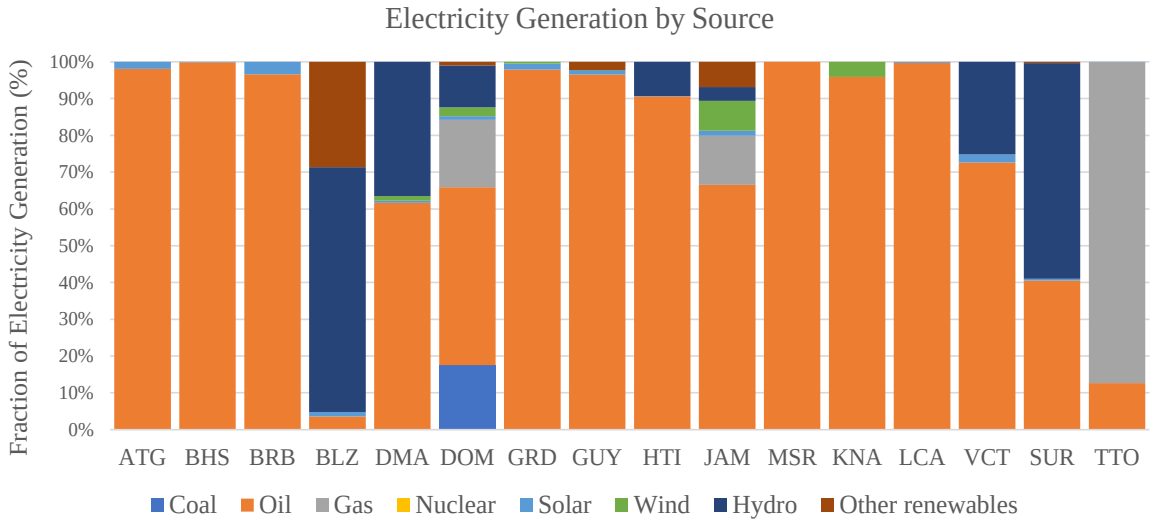


Figure 1. Fraction of electricity generation in CARICOM Member States and the Dominican Republic, by energy source, 2019. Source: Our World in Data (2021) Electricity Mix, https://ourworldindata.org/electricity-mix. Country abbreviations below.

Notes: Antigua and Barbuda is ATG; Haiti is HTI; Bahamas is BHS; Jamaica is JAM; Barbados is BRB; Montserrat is MSR; Belize is BLZ; Saint Kitts and Nevis is KNA; Dominica is DMA; Saint Lucia is LCA; Dominican Republic is DOM; Saint Vincent and the Grenadines is VCT; Grenada is GRD; Suriname is SUR; Guyana is GUY; Trinidad and Tobago is TTO.

Moreover, electricity generation in the region contains high shares of oil, as shown in Figure 1.

Electric vehicles reduce greenhouse gas emissions even when the electricity is generated from fossil energy. Fossil fuel-based electricity plants convert approximately 30% to 45% of primary energy to electricity (oil and coal plants are the least efficient, while natural gas plants are the most efficient). Approximately 5% of the electricity is lost during transmission and distribution to the end users. Finally, electric vehicles convert about 75% of the electrical energy in the battery to power the movement of

[1] Bodley, Charlin. (2018). *The Potential of Electric-Mobility in CARICOM Member States*. GIZ. Link: https://caribbean-community.energypedia.info/img_auth.php/0/08/GIZ_Study_Electromobility2.pdf.
[2] Econoler. (2019). Development of a Regional Sub-Policy, Strategy and Action Plan on Energy Efficiency for the Caribbean Community. CARICOM.
[3] Bodley, Charlin. (2018). *The Potential of Electric-Mobility in CARICOM Member States*. GIZ. Link.
[4] Ibid
[5] Ragnar Grímsson, Ólafur, Adnan Z. Amin, Anatoly Chubais, Carlos Lopes, Christiana Figueres, Joschka Fischer, Fu Chengyu, et al. (2019). *A New World: The Geopolitics of the Energy Transition.* 37. https://www.irena.org/publications/2019/Jan/A-New-World-The-Geopolitics-of-the-Energy-Transformation
[6] Viscidi, Lisa, N. Graham, et. al. (2020). *Electrified Islands: The Road to E-Mobility in the Caribbean*. OAS, IDB, Inter-American Dialogue. https://ecpamericas.org/wp-content/uploads/2020/12/Electrified-Islands-Final-1.pdf

the vehicles. Overall, this implies a well-to-wheel efficiency of approximately 21% to 32% for electric vehicles powered by fossil fuel electricity. In contrast, internal combustion engine vehicles only convert about 12% to 30% of primary energy movement (gasoline is less efficient than diesel).[7] Thus, even with an electricity grid using 100% fossil fuel generation, electric vehicles have similar or lower greenhouse gas emissions as internal combustion engine vehicles. Converting to electric vehicles will lower countries' greenhouse gas emissions, which supports progress towards meeting NDCs.

As the electricity grid shifts towards renewables, electric vehicle emissions further improve. As CARICOM member states integrate higher fractions of renewable energy into the electricity grid, the emissions benefits of electric vehicles are further magnified. Higher renewable penetration also reduces countries' vulnerability to oil price and supply fluctuations (caused by natural disasters and disruption in other markets).[8]

Improved air quality results in better health outcomes. Petrol-powered vehicles produce air pollution, which adversely affects health outcomes. Populations in disadvantaged communities are particularly vulnerable to air pollution stressors and often live closer to roadways than people in other communities.[9] Transportation electrification eliminates tailpipe emissions and can create emissions at the site of the electricity generation, depending on the source. While no study exists that examines health impacts from electric vehicles in the CARICOM region, a few studies do so in other parts of the world and demonstrate overwhelmingly that electric vehicles improve health outcomes by eliminating tailpipe emissions.[10] Health impacts show large spatial variability, making it crucial to assess location-specific impacts.[11]

Electrifying Maritime and Riverine Transportation
As the Caribbean region is a worldwide destination for maritime and riverine experiences, electrifying this sector is particularly important given the number and scale of maritime and riverine fleets (both public and private). Electric battery packs are already available for boats, ferries, and other vessels and can power a variety of recreational and commercial applications. Older vessels can be retrofitted with battery packs to either run solely on stored electricity or become an electric-diesel hybrid. Battery technology is ideal for short, fixed routes vessels. Long-haul, irregular routes, and open sea travel is more challenging.

Households save on fuel and maintenance expenses. Due to the relatively high efficiency of electric vehicles, the fuel savings achieved by substituting electricity for gasoline can generate significant economic value to private households. Electricity as fuel tends to be lower cost than petroleum as fuel. Similarly, maintenance costs are roughly 25% lower on electric vehicles relative to a comparable petrol car, because they do not need oil changes or other similar maintenance.[12]

Electric utilities see increased revenue. Electric vehicles shift spending from the petroleum industry to the electric utility industry. For many CARICOM member states, this implies a greater fraction of total spending is done locally. This local spending, in turn, has other indirect benefits for other sectors in the economy. By strategically adding new electric load at the right times (such as at night when grid use is lowest), electric vehicle adoption in the Caribbean region can support increased utilization of renewable wind energy. As Caribbean utilities increasingly allow third parties (e.g., residents,

[7] U.S. Department of Energy. "All-Electric Vehicles." Accessed Jan 21, 2021. http://www.fueleconomy.gov/feg/evtech.shtml

[8] Gay, D., T. Rogers, and R. Shirley. (2018). Small island developing states and their suitability for electric vehicles and vehicle-to-grid services. Utilities Policy, 55, pp. 69-78.

[9] Hajat, Anjum, et al. 2015. Socioeconomic Disparities and Air Pollution Exposure: Global Review. https://doi.org/10.1007/s40572-015-0069-5

[10] W.J. Requia, M. Mohamed, C.D. Higgins, A. Arain and M. Ferguson, Atmos. Environ., 185 (2018), pp. 64-77, 10.1016/j.atmosenv.2018.04.040

[11] S.P. Holland, E.T. Mansur, N.Z. Muller and A.J. Yates
Am. Econ. Rev., 106 (2016), pp. 3700-3729, 10.1257/aer.20150897

[12] Consumer Reports (2020) Pay Less for Vehicle Maintenance with an EV.

businesses, developers, etc.) to generate distributed renewable energy, electric vehicle adoption can help offset a decrease in demand for electricity generated by the utility.

Demand for certain professions expand. Electric vehicles require the installation and operation of new electrical infrastructure, which expands demand for electricians, architects, engineers, and mechanics and the related training programs that support these professions.

Implications of Electric Vehicles on the Grid

Vehicle electrification at a large scale presents both challenges and opportunities for the electric grid and utilities. On one hand, vehicle electrification increases electricity demand, thus offering new sources of revenue for utilities. At the same time, this increase in electricity demand from electric vehicles must be properly managed to avoid grid overload, maintain grid reliability, and minimize infrastructure expansion costs.

The effect of vehicle electrification on the electric grid depends on the total electricity demand of electric vehicles, the location of charging, the time of day vehicles are charged, among other factors. For example, in the case of small electric passenger vehicles, charging typically takes place at home or at businesses during the evening and nighttime. This timing can correspond with peak electricity consumption times and potentially overload the grid. Electric fleets with higher charging loads may exceed local feeder capacity and require new or upgraded utility feeders, substation updates, or even a new substation.

At the same time, opportunities exist for utilities to get out in front of the challenges of vehicle electrification. Utilities should evaluate the implications of vehicle electrification on the grid, e.g., via an electric vehicle grid integration study (described in the REVS measure "Electric Vehicle Grid Integration Study"). In tandem, utilities would benefit from articulating an internal electric vehicle strategy which could articulate a market strategy for vehicle electrification, identify strategic investments, and identify potential issues and mitigating measures. Developing such a strategy early can help increase the benefits of vehicle electrification to the utility and reduce the overall costs of any necessary infrastructure upgrades. To inform these strategies, utilities may want to assess the needs of all segments of the electric market—single-family homes, multi-unit dwellings, commercial workplace sites, public and privately-owned fleets, etc. In some cases, it may be most suitable for utilities to develop and own public charging infrastructure. In other cases, it may be more prudent for a third party to develop and own public charging stations. In either case, utilities will need to consider a balance of prudent investments in infrastructure upgrades and maintaining reasonable rates for all customers.

Technologies and approaches may offer opportunities for utilities to effectively manage the grid as electric vehicles are deployed. This includes smart charging (described in the REVS measure "Support the Deployment of Smart Charging"), vehicle-to-grid technologies, EV-specific tariffs (described in the REVS measure "Develop Electric Vehicle Tariffs"), among others. However, whether these technologies and approaches viable or suitable for a specific jurisdiction will depend on a variety of factors, including the status of existing infrastructure, the utility's in-house administrative capacity to manage their deployment, among other factors. Additionally, CCREEE's Integrated Resource and Resilience Planning (IRRP), which it leads for Montserrat, is one example of a long-term energy plan that considers electric vehicles and their impacts to the electricity grid. Electric vehicles are connected to demand and supply analyses in energy planning through the IRRP process. CCREEE will engage in project development from IRRP investment portfolios and will also play a lead role in implementing the REVs. Electric vehicles also offer an opportunity to improve local resilience, such as through Vehicle to Everything (V2X) after natural disasters and power outages, as well as possibilities to repurpose EV batteries for household battery storage. One valuable resource for utilities planning for electric vehicle deployment is the Smart Electric Power Alliance's "Preparing for an Electric Vehicle Future: How Utilities Can Succeed."[13]

[13] SEP (2019) Preparing for an Electric Vehicle Future: How Utilities Can Succeed. https://sepapower.org/resource/preparing-for-an-electric-vehicle-future-how-utilities-can-succeed/

Policies Targeting Electric Vehicles in the Caribbean

Although some Caribbean countries have made advancements towards vehicle electrification, most are at a relatively early stage in the process deploying on-road electric vehicle and charging infrastructure and of adopting electric vehicle-related policies, measures, and instruments. Electrified maritime and riverine transportation is also in an early stage in the region. The REVS draws upon the work of existing studies, such as by Bodley and by Viscidi et al,[14,15] that detail the status, barriers, and potential for vehicle electrification in the Caribbean.

Status of Vehicle Electrification in National Plans, Policies, Incentives and Actions

Most CARICOM member states have mentioned electric vehicles in their national energy policies, plans, or strategies, though in some cases these documents are still in a draft stage.[16] Nearly half of CARICOM member states have adopted incentives specifically for electric vehicles.[17] Additionally, nearly half of CARICOM member states are exploring either integration of electric vehicles in public fleets and/or an Integrated Utility Service (IUS) model. Table 1 provides an overview of some of the measures planned or being implemented by CARICOM member states, though this is not intended to be an exhaustive list.

Table 1. National plans, strategies, and incentives for Electric vehicles in CARICOM Member States

Country	Existing Policies, Measures, Strategies and Actions Related to Electric Vehicles *(per GIZ study from 2018)*
Antigua and Barbuda	• Support for HEVs, flex-fuel or EVs. Government shall explore the feasibility of introducing EVs into its fleet. Efficiency standards for imported vehicles. • Waiver of duty and environmental levy for electric vehicles and hybrids.
The Bahamas	• Discourage the importation of inefficient motor vehicles through tax regime & lowering import duties on HEVs & electric vehicles. • Reduction of import duties to 25% compared to ICE vehicles (≥ 65%).
Barbados	• Customs and fiscal policies for providing incentives to private vehicle buyers to purchase fuel efficient vehicles including electric vehicles. • Development of alternative fueling infrastructure to include charging stations for electric vehicles. • 17% reduction in import duties compared to ICE vehicles. • Utility-imported & installed charger.[18] • Integrating e-buses in public transit fleet.[19] • Solar energy powers some charging infrastructure.[20] • Considering CO2 emissions tax of passenger vehicles to replace the current system of road taxes.[21] • Barbados Smart Fund II Program, offering fiscal incentives for EV purchases.[22]

[14] Bodley, Charlin. (2018). *The Potential of Electric-Mobility in CARICOM Member States*. GIZ. https://caribbean-community.energypedia.info/img_auth.php/0/08/GIZ_Study_Electromobility2.pdf

[15] Viscidi, Lisa, N. Graham, et. al. (2020). *Electrified Islands: The Road to E-Mobility in the Caribbean*. OAS, IDB, Inter-American Dialogue. https://ecpamericas.org/wp-content/uploads/2020/12/Electrified-Islands-Final-1.pdf

[16] Bodley, Charlin. (2018). *The Potential of Electric-Mobility in CARICOM Member States*. GIZ. https://caribbean-community.energypedia.info/img_auth.php/0/08/GIZ_Study_Electromobility2.pdf

[17] Ibid.

[18] GFA Consulting Group and GIZ. (2020). *Integrated Utility Services Pipeline of Investment Opportunities*; Gordon, X., and Escoffery, C. (2019). CARICOM GIZ E-Mobility Fleet Inception Report.

[19] Cornelia Schenk, personal contact. December 2020.

[20] Science and Tech (2018). *The Electric Automobile Transformation Lives in Barbados.* https://scienceandtechblog.com/the-electric-automobile-transformation-lives-in-barbados/

[21] Moore, W., and S. Howard. (2015). Assessment of the Economic Impact of Greening Vehicular Transport in Barbados.

[22] Bodley, Charlin. (2018). The Potential of Electric-Mobility in CARICOM Member States. CARICOM.

Country	Existing Policies, Measures, Strategies and Actions Related to Electric Vehicles *(per GIZ study from 2018)*
Belize	• Instigate change-over to more energy-efficient and environmentally friendly vehicles and modes of transport.[23] • EV-specific electricity rates offered.[24]
Dominica	• Studying the feasibility of integrating EVs into the transportation sector. • Introducing policy to facilitate replacing government fleets with hybrid EVs. • No duties on electric buses, electric cars, and electric motorcycles (2019 Budget). • Two-tiered environmental levy on imported vehicles (under 5 years old and over 5 years old). • Support for electric vehicles in 2019 National Energy Policy. • Conduct cost-benefit analyses to estimate economic impact of alternative vehicles (including EVs) and supporting infrastructure.
Grenada	• Develop tax regime to encourage importation of fuel-efficient vehicles and development of supporting infrastructure. • Consider introduction of mandatory annual quotas for dealers regarding HEVs, EVs and other inefficient vehicles Concessions on domestic duties relative to renewable energy and energy efficient technology.
Guyana	• Foster the development of electric vehicle industry to substitute fossil fuels with electricity while enhancing the ability of electric grid to integrate high levels of intermittent renewable energy (draft). • Reduction of excise tax on HEV and electric vehicles. • Granting of tax exemptions to set up electric vehicle charging stations. • 0% duty on electric vehicle imports.[25] • Investigating IUS model.[26] • Climate technology needs assessment includes introduction of EVs & HEVs as recommended technology options.
Haiti	Not available
Jamaica	• Discourage importation of inefficient motor vehicles. • Import duty reductions for both individuals and dealers. • Study investigating electric vehicle public bus feasibility.[27] • Exploring IUS model feasibility.[28] • Exploring electric vehicle procurement and infrastructure installations.[29] • Utility initiative pilot study and plans for charging station expansion.
Montserrat	• Promote the development of EVs, HEVs, and advanced vehicle technologies. • Facilitate public awareness campaigns to promote efficient transportation. • Investigate potential for using renewable energy in the ferry system in Montserrat. • EV Trial Program.
Saint Kitts and Nevis	Not available
Saint Lucia	• Introduce tax systems to promote the purchase of more energy-economical vehicles, including new generation of HEVs and EVs. • 25% reduction in import duties. • Utility electric vehicle procurement and electric vehicle infrastructure installations.[30] • Fleet Transition roadmap developed for transition of the government fleet to EVs, HEVs, or PHEVs.
Saint Vincent and the Grenadines	• Study the potential for introducing EVs & HEVs. Government can introduce EVs into its own fleet.

[23] GFA Consulting Group and GIZ. (2020). *Integrated Utility Services Pipeline of Investment Opportunities*. Guyana, Belize, Barbados, and Jamaica.
[24] Gordon, X., C. Escoffery. (2020). E-Mobility Market Analysis for Belize: Market Opportunity, Fleet examples, and Public Charging Network Development for the Belize Electricity Limited Company. Belize, Jamaica.
[25] Gordon, X., and C. Escoffery. (2020). E-Mobility Market Analysis for Guyana: Market Opportunity, Fleet examples, and Public Charging Network Development for the Guyana Power and Light Corporation. Guyana.
[26] GFA Consulting Group and GIZ. (2020). *Integrated Utility Services Pipeline of Investment Opportunities*. Guyana, Belize, Barbados, and Jamaica.
[27] Singer, Mark, and Caley Johnson. (2019). *Jamaica Urban Transit Company Drive-Cycle Analysis*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-5400-73381. Jamaica.
[28] GFA Consulting Group and GIZ. (2020). *Integrated Utility Services Pipeline of Investment Opportunities*. Guyana, Belize, Barbados, and Jamaica.
[29] Ibid.
[30] GFA Consulting Group and GIZ. (2020). *Integrated Utility Services Pipeline of Investment Opportunities*; Gordon, X., and Escoffery, C. (2019). CARICOM GIZ E-Mobility Fleet Inception Report.

Country	Existing Policies, Measures, Strategies and Actions Related to Electric Vehicles *(per GIZ study from 2018)*
	• Proposed duty-free import of electric vehicles for taxi fleet.[31] • Electric vehicle demonstration project.
Suriname	Not available
Trinidad and Tobago	• NDC target of 30% reduction in GHG emissions in the public transportation sector by 2030. • The regulator has an electric vehicle and public charging stations. • University training program on the installation of electric vehicle charging stations.
All data in this table are sourced from the GIZ Study "The Potential of Electric Mobility in CARICOM Member States."[32] According to the study's author, data sources include the NEPs and information gathered from Energy Units at the time of publication. Recognizing that this study was published in 2018, it is likely that the status of some of the policies has evolved. Data in the column "Other EV-specific measures" was identified as part of a Desk Study & Literature Review conducted in 2020.	

[31] Romer, B., and Y. Julliard, Siemens Energy Business Advisory. (2017). *Electric Mobility Readiness Assessment – Saint Vincent and the Grenadines.* Report for Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ). Saint Vincent and the Grenadines.
[32] Bodley, Charlin. (2018). *The Potential of Electric-Mobility in CARICOM Member States*. GIZ. Link: https://caribbean-community.energypedia.info/img_auth.php/0/08/GIZ_Study_Electromobility2.pdf

Status of Vehicle Electrification Adoption

The state of electric vehicle adoption in most Caribbean countries remains relatively low in terms of total electric vehicles in operation, with most CARICOM Member States having fewer than 20 or no electric vehicles deployed as of 2018. The Caribbean also has an undetermined but low number of electrified maritime or riverine transportation options, as of early 2021. The two leading electric vehicle markets in the region have over 400 electric vehicles on the road and charging infrastructure installed (e.g., Barbados and Dominican Republic), this adoption rate remains a small share of total registered vehicles (0.33% of total registered vehicles in the case of Barbados, and 0.01% in the case of Dominican Republic).[33] Table 2 summarizes available data on adoption rates of electric vehicles and electric vehicle charging infrastructure for all CARICOM Member States and the Dominican Republic.

Table 2. Estimated Number of Electric Vehicles in CARICOM Member States and the Dominican Republic[34]

Country	EVs in Operation	Year EVs were Introduced
Antigua and Barbuda	29**	2016
The Bahamas	>200***	2016
Barbados	690*	2013
Belize	<10	2017
Dominica	<10	2016
Dominican Republic	472*	-
Grenada	<10	2012
Guyana	<10	N/A
Haiti	-	-
Jamaica	20*	2016
Montserrat	3****	N/A
Saint Kitts and Nevis	0	N/A
Saint Lucia	<10	2013
Saint Vincent and the Grenadines	<10	2015
Suriname	0	N/A
Trinidad and Tobago	143*****	2016

Note: Some data in this table are sourced from the GIZ Study referenced in the footnote unless otherwise specified with an asterisk (*). Recognizing that this study was published in 2018, it is likely that EV adoption has since increased in most or all countries. More recent data were not identified/available.
**Charlin Bodley, CCREEE, May 2022.*
*** Stanley Barreto, Project Developer & Consultant, Megapower LTD. 2021 [Email].*
**** R. Cooper, Interviewee, Interview on Electric Vehicle. [Interview]. 9th July 2021.*
***** Marissa Allen, Energy Officer, 2021*
****** Y. Jean-Marie, Interviewee, Ministry of Works and Transportation. [Interview]. 30th August 2021.*
(-) indicates data not available or not provided.

[33] Viscidi, Lisa, Graham, N. et. al. (2020). *Electrified Islands: The Road to E-Mobility in the Caribbean*. OAS, IDB, Inter-American Dialogue. Link: https://ecpamericas.org/wp-content/uploads/2020/12/Electrified-Islands-Final-1.pdf
[34] Bodley, Charlin, (2018). *The Potential of Electric-Mobility in CARICOM Member States*. GIZ. Link: https://caribbean-community.energypedia.info/img_auth.php/0/08/GIZ_Study_Electromobility2.pdf

Theory of Change from REVS Measures

How do the measures in the REVS create beneficial long-term outcomes for the CARICOM region? To answer this question requires first understanding the barriers to electric vehicle adoption in the region. Table 3 below provides a non-exhaustive list of barriers based on the existing literature, consumer surveys, and expert input from the REVS Steering Committee.[35] In the table, "Low," "Medium," and "High" refer to the extent to which a barrier is impeding the growth of electric vehicles. In general, the table demonstrates that barriers to light-duty electric vehicles are lowest of all vehicle segments. Further, medium-heavy duty vehicles and non-road vehicles share many of the same barriers. The table is meant to be illustrative—the relative magnitude of each given barrier depends on several factors, including location, consumer segment, and technology.

Table 3. Barriers to Vehicle Electrification, by vehicle type

Subsector or Segment	Relevance of Barrier to Each Subsector or Segment		
	Light-duty vehicles	Medium- and heavy-duty vehicles	Non-Road Vehicles
Electrical distribution system upgrades	Medium	High	High
High initial purchase price, compared with new and used ICEVs	Medium	High	High
Insufficient model availability within CARICOM	High	High	High
Lack of interoperability of equipment	Medium	Medium	Unknown
Long charge times	Medium	Medium	High
Public charging access	Medium	Medium	Low
Public perception and awareness	High	Medium	Medium
Residential charging access	Low	--	--
Warm, humid weather impact on battery range	Low	Low	Unknown
High import duties and/or taxes	Medium	Medium	Medium
Regulatory barriers	High	Medium	Medium[36]

Figure 2 below is a conceptual diagram of how the REVS measures address the barriers in the market and result in long-term outcomes. Beginning at the top, the diagram shows the set of barriers being addressed. Evaluation and monitoring of the measures results in key performance metrics, which can be used for improving future implementation. Finally, the bottom of Figure 2 shows the short, medium, and long-term outcomes and linkages from the measures.

[35] For example, see US National Research Council (2015) "Overcoming Barrier to Deployment of Plug-in Electric Vehicles." https://www.nap.edu/catalog/21725/overcoming-barriers-to-deployment-of-plug-in-electric-vehicles

[36] Competition with low oil prices in oil-producing countries such as Trinidad and Tobago and Guyana is also a significant barrier for light-duty vehicles, medium- and heavy-duty vehicles, and non-road vehicles.

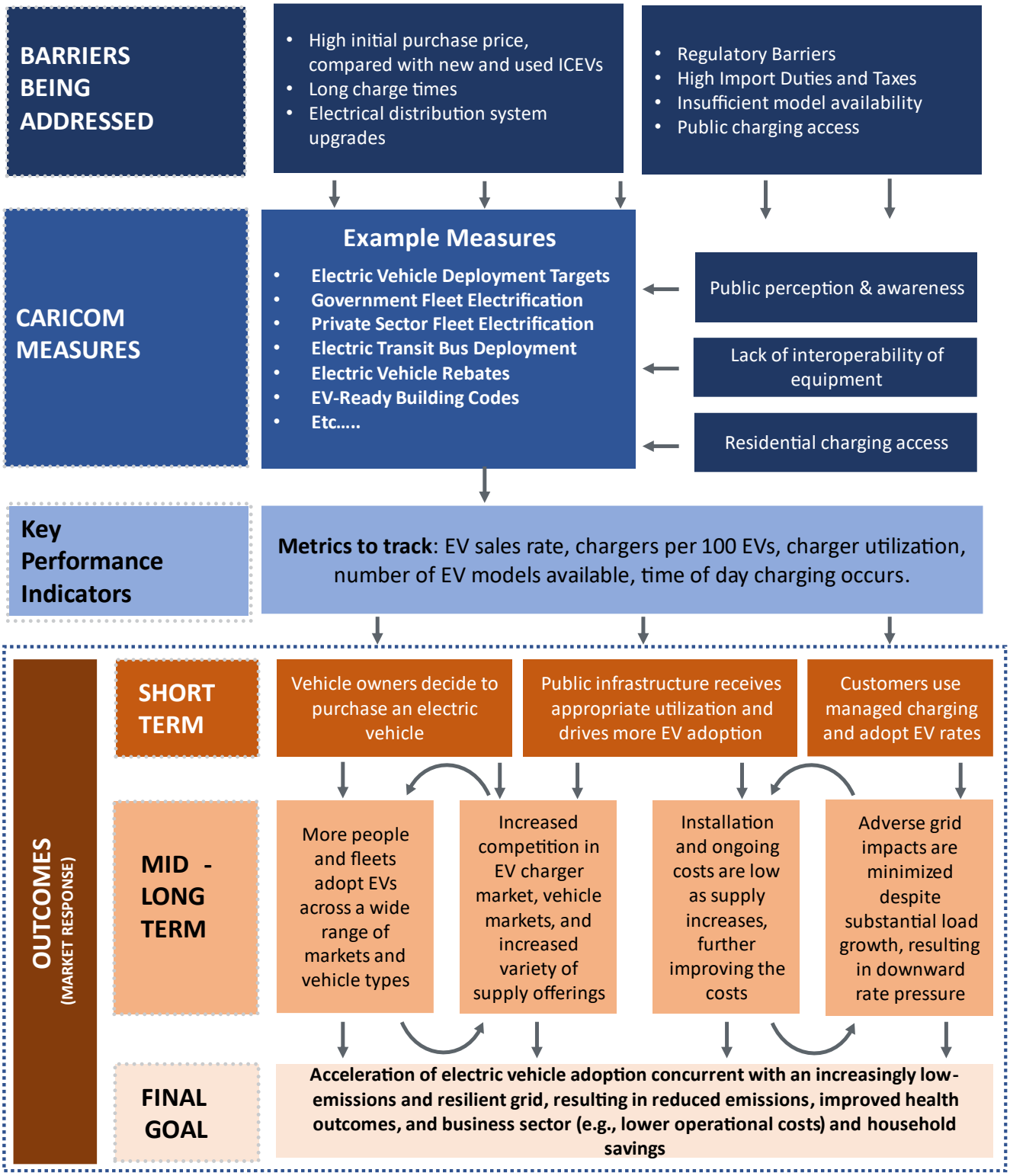


Figure 2. Theory of change showing how the REVS measures address barriers and result in desirable long-term outcomes.

Organization of the REVS

The REVS is structured with the following chapters:

- **Chapter 1: Framework for the Regional Electric Vehicle Strategy.** This chapter lays out the framework used to develop the Regional Electric Vehicle Strategy, as set out by the CARICOM Secretariat and the CCREEE. Its "Strategic Initiatives for Implementation" corresponds to the categories of Chapters 3 through 6.
- **Chapter 2: Visioning and Planning.** This chapter provides guidance to CARICOM Member States on envisioning and planning vehicle electrification actions in consultation with stakeholders. It also lays out considerations in identifying a suitable phasing of actions.
- **Chapters 3 through 6.** These chapters include one-page summaries of actions (policies, instruments, and other actions) that CARICOM Member States can execute to advance vehicle electrification. The chapters are organized around the **four Strategic Initiatives for Implementation** from the REVS Framework (Figure 3):
    - Chapter 3: Policy and Regulation
    - Chapter 4: Technology and Infrastructure
    - Chapter 5: Capacity Development and Awareness
    - Chapter 6: Finance, Market Development, and Innovation
- **Chapter 7: Implementing, Monitoring, and Evaluating the REVS.** This chapter provides guidance and a framework for CARICOM Member States to implement, monitor, and evaluate the progress of vehicle electrification actions.

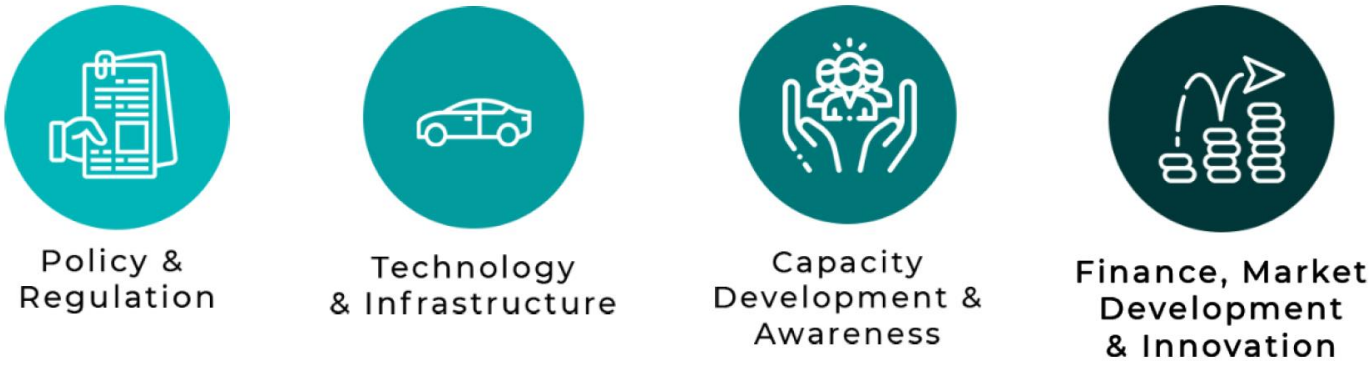


Figure 3. Four Strategic Initiatives as outlined in the REVS Framework.

To locate the one-page summaries of vehicle electrification actions included in Chapters 3 through 6, refer to Table 4 below. An "X" to the right of the action corresponds to the stage at which a user of the REVS should consider implementing an action. In general, early-stage actions are lower time, cost, and difficulty than mid- or long-term actions.

Table 4. REVS actions (policies, instruments and other actions), organized by early, mid-, and long-term actions, and corresponding to the relevant "Strategic Initiatives for Implementation"

Early Actions			
Mid-Term Actions			
Long-Term Actions			
POLICY AND REGULATION			
Electric Vehicle Deployment Targets			X
Government Fleet Electrification			X
Private Sector Fleet Electrification			X
Electric Transit Bus Deployment			X
Electric Vehicle Rebates			X
EV-Ready Building Codes			X
Streamlined Permitting for Charging Infrastructure			X
Electric School Bus Deployment		X	X
Right-of-Way Charging Program		X	
Multi-Unit Dwelling Charging Program		X	
Develop Electric Vehicle Tariffs	X		
Electric Medium- and Heavy-Duty Truck Deployment	X		
Used Electric Vehicle Incentive Program	X		
TECHNOLOGY AND INFRASTRUCTURE			
Open Access and Interoperability Standards			X
Battery Recycling and Repurposing Program		X	
CAPACITY DEVELOPMENT & AWARENESS			
Public Electric Vehicle Awareness Campaign			X
Electric Vehicle Curriculum			X
Uniform Signage Requirements			X
Data Collection and Sharing Strategy		X	X
Electric Vehicle Think Tank		X	
FINANCE, MARKET DEVELOPMENT, AND INNOVATION			
Electric Utility EV Programs			X
Support the Deployment of Smart Charging	X		
Import Tax Reduction on Electric Vehicles and Chargers			X
Electric or Hybrid Ferry Feasibility Study and Deployment		X	X
Purchase Incentives for Electric or Hybrid Ferries		X	X
Incentives for Auto Dealers to Sell Electric Vehicles			X
Leasing Opportunities for Electric Vehicles	X		
Carbon Tax on Transportation Fuels	X	X	X
Electric Vehicle Grid Integration Study			X

This page is intentionally left blank.

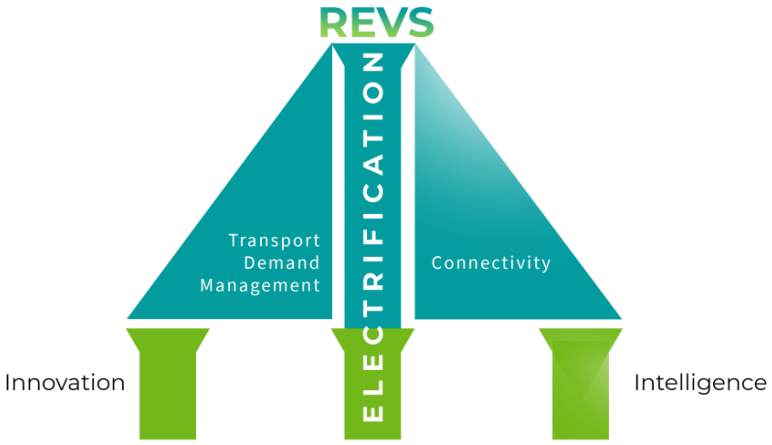
CHAPTER 1: CARICOM & CCREEE's FRAMEWORK FOR THE REGIONAL ELECTRIC VEHICLE STRATEGY

The Framework for the Regional Electric Vehicle Strategy was developed as a collaboration between CARICOM and CCREEE. This chapter is a copy of the original document published by CARICOM and CCREEE.[37]

The REVS framework provided the building blocks for the more detailed strategy for electric mobility transition in the Caribbean Region. The strategic imperatives and strategic initiatives for implementation from this framework (Chapter 1) form the basis of the structure of the REVS (this document).

As Caribbean countries pursue the transition towards a sustainable, efficient and effective transportation sector, the accompanying successful delivery of future transport services will be driven by three main disruptors: (1) Electrification, (2) Connectivity through Digitalisation and (3) Shifting and Managing Transport Demand.

Strategic Imperatives



To harness the three main disruptors and facilitate the transition to a modern, sustainable and affordable transportation system, the REVS relies on three strategic imperatives/pillars—. These strategic imperatives are at the heart of the strategy and are the basis for the strategic initiatives recommended for implementation at the regional and national levels. These strategic imperatives guide key considerations spreading across the full gamut of economic, fiscal, technical, institutional, policy and even climate and resilience dimensions; towards achieving the aim of this regional strategy. The three pillars/imperatives are innovation, intelligence and electrification and are detailed below.

Innovation

Innovative business models–including policy makers, utility companies, consumers and the private sector; particularly gas stations, commercial centres, telecommunication providers, insurance companies, car dealers and technicians (electricians and auto-mechanics)—will be essential to meet the demands of a transition to electric mobility. This means that robust business cases related to electric mobility will be required to support sustainable solutions.

[37] *CARICOM Regional Electric Vehicle Strategy (REVS) Framework*, CARICOM, CCREEE, 2017. https://www.ccreee.org/wp-content/uploads/2020/06/regional_electric_vehicle_strategy_revs_framework.pdf.

The large-scale integration of electric vehicles into the transport and energy systems requires innovation in energy supply and infrastructure for charging, to encourage uptake and to meet consumer demands. Innovative technology and infrastructure solutions must also meet the needs of consumers in ensuring safety and reliability in the transport sector.

Intelligence

Intelligence in electric mobility encompasses intelligence in vehicle operations, power supply, and integration. A connected network of cars and drivers, infrastructure and communities are important elements of sustainable electrified transport systems, which will require an intelligent network. Intelligence must be incorporated to ensure optimized accessibility to infrastructure for charging including interactions with the electric grids, traffic management systems, and data mining. The latter is important in the regional context to support tracking electric vehicle uptake, calculating emissions, economic benefits, among other measurable and replicable successes. Notwithstanding, the data sharing requirements to effectively manage the operation of the transport system, cyber-security is an important element to ensure the sustainability and safety of the system

Electrification

The integration of mobility into the electricity sector through the deployment of digital technologies, requires flexibility options for grid management, appropriate storage capacities and options. These options should be based on a renewable and efficient energy supply, to the benefit of Caribbean countries. With electrification, the region can benefit from reduced fuel import dependence, a diversification of their fuel mix, price stability and a healthier environment and society. Electrification of the sector means fundamental changes in the traditional interaction among policy instruments, complex political economies, technology deployment, electricity production capacity and energy mix, market dynamics and supply chains. This disruptive transition must consider major changes in political tax economies, import and insurance regimes, maintenance and first responder strategies.

These areas of consideration come with opportunities and challenges which manifest beyond environmental benefits; and include factors such as automotive industry supply chains, job creation, market structures, international and regional trade relations, electricity networks, diversification of roles of incumbent companies, and the introduction of new competitors. Therefore, at the heart of electrification is the meticulous and timely investment in technologies, modernization of power grids to accommodate electricity demand growth, more renewable energy, and establishing the right policies; all these aspects are critical to large scale electric mobility integration.

Strategic Initiatives for Implementation

A series of initiatives will facilitate the achievement of the overall aim of the REVS, taking the three strategic imperatives into account and creating a dynamic enabling framework for electric mobility in the areas of policy & regulation, technology and infrastructure, and capacity development & awareness.

Policy & Regulation

The CARICOM region strives to create a favorable policy, legal and regulatory framework to support the transition to sustainable mobility which is conducive to innovations in technology and transport services. Policies and regulations will be designed to appropriately capture the challenges and opportunities of an increasing wealth of data and intelligence, including data protection and security issues, and to support the electrification of the sector.

A regionally coordinated multi-stakeholder approach will be applied to facilitate the e-mobility transition, by 1) encouraging greater cooperation between relevant actors; 2) strengthening the integration of the energy-climate-transportation nexus; and 3) creating an attractive regional market for electric vehicles with more favorable market conditions than what can be offered in individual markets.

The attractiveness and competitiveness of sustainable transportation options will be enhanced through a mix of support measures, including the introduction of vehicle efficiency and emission standards, digital information platforms and appropriate incentives. The establishment of national data collection systems, regimes and harmonized methodologies will enhance data management and intelligence in the sector. This shall include the data collection and assessment of the health-related and environmental impacts of the current transportation system. The flow of data and information through the system shall be governed by the creation of a Regional Intelligent Transportation System (ITS) Architecture.

The electrification of public and private surface transportation will be guided and supported through the development of national transport demand management models and programs, and the creation of enabling frameworks, minimum standards and incentives for:

E-Mobility Strategy
The most favorable transport options within the Caribbean context will be identified and deployed, giving particular regard to the potential of e-mobility to enhance climate resilience and simultaneously improve existing road and other transport infrastructure. This will be achieved through enhanced R&D, techno-economic feasibilities, and total-cost-ownership studies.

- The prioritization of public and private high-use vehicle fleets.
- The deployment of the necessary charging infrastructure (to include energy storage devices).
- The management of charging demand, including smart charging and smart metering.
- The further integration of telecommunication and transportation networks.

Based on a regional needs assessment, appropriate policy, legal and regulatory measures will be developed and introduced to encourage and support the electrification of riverine and indigenous maritime transportation.

Technology & Infrastructure

The region is committed to supporting innovation in vehicle technologies and infrastructure as well as the provision of sustainable transportation services across its Member States.

With the advent of electric vehicle data mining and the increasing digitalization of the sector, the application of advanced technologies and datasets can strengthen the regional knowledge base and intelligence. These developments will have to be guided by appropriate regional and national policies and regulations to ensure the necessary data protection and cyber security in the sector.

Strategic interventions shall further include the digitalization of public transport information through online information platforms and services like payment systems, route schedules and multi-modality management to enhance the intelligence and attractiveness of public transportation options.

Technology pilots for surface transportation shall serve to enable the application of innovative technologies, such as vehicle-to-grid (V2G) or vehicle-to-home (V2H) integration, battery swapping services, public and private fleet transition or second-life applications for vehicle batteries. Additionally, riverine and maritime transportation pilot projects will test the utilization and scale-up potential of hybrid and electric ferries.

Capacity Development & Awareness

Capacity building and awareness in all Member States is essential to initiating widespread local/national action toward the transformation of the transport sector to one characterized by electric mobility. Capacity must be built, and awareness raised at all levels and among all stakeholders to encourage the large scale and transformative integration of electric transport. Capacity building initiatives must target both incumbent and future private sector firms and relevant government agencies.

Institutional capacity must be built among the relevant government agencies responsible for transportation, energy, climate, infrastructure and finance. Policy and decision makers must be equipped with the correct information and long-term understanding of the transport and energy sectors; and how they will be affected by the disruption of electric mobility. This will result in the development and implementation of the appropriate policies and regulation for a successful transition.

Utility companies, regulators and private sector companies shall also be sufficiently equipped as key stakeholders and agents of change for such a transition. Member States shall therefore promote and encourage greater co-ordination, collaboration and information and experience sharing between regulators and their utilities, at national levels with the aim of encouraging electric vehicle adoption.

Another major strategic intervention for capacity building on a regional level, is the exchange among Member States through the hosting of workshops, and exhibitions. The flagship event, a Regional Clean Transportation Tradeshow and Exposition, will be held annually with a rotation of the host country.

The training program will include components or specialized training to enhance and build capacities in maritime and riverine electric mobility among operators and technicians. Big data analytics and machine learning content must also be incorporated into the Caribbean Advanced Proficiency Examination (CAPE) curriculum and other tertiary level curricula, across the region. This training program would involve key stakeholders such as the Regional Network of Universities, among others.

With a focus on private transportation, the effective training of first responders, technicians (electricians and auto-mechanics) and emergency personnel must be given priority. For private consumers, raising awareness is critical to the market uptake of electric vehicles across the region. Consumers must be made aware of the benefits, opportunities and challenges of electric mobility.

Finance, Market Development & Innovation

Development of the electric vehicle market must engage stakeholders ranging from government agencies to utilities and non-utility participants in the e-mobility transition. For initiatives within the transport sector to encourage multi-modality and ride sharing, they should include the promotion of transportation tariff options, bundled mobility packages, and the development and use of digital traveler-based technologies.

Regional Approach
Across all transport sectors, a regional approach must include the following: • The establishment of a community of best practice that allows for the exchange of knowledge and experience among regional electric mobility stakeholders; and • The design and mainstreaming of a technical-vocational training program

Initiatives to provide project preparation support toward accessing grant and loan funding from developmental partners and other international and regional funding agencies for the electrification of transportation in the region, are key to the REVS. The CCREEE

Project Preparation Facility (PPF) shall serve the region in this regard by providing this support to both public and private sector actors.

For the transition of public and private surface transportation, the appropriate tailored financing packages must be made available by regional and local commercial and development financial institutions (FIs); this can be accomplished in tandem with the CCREEE PPF. Support and capacity building should also be provided to the FIs to better equip them to provide these specialized services.

Business innovation involving incumbent utilities and regulators, other incumbent and future non-utility private sector participants shall be encouraged through the development of new financial programs and models.

The application of innovative business models and financing mechanisms like the Integrated Utility Services model is encouraged to enable technology and infrastructure deployment. The Integrated Utility Services model typically involves a utility offering integrated packages of solar and efficiency to customers using on-bill repayment and resulting in savings to customers. This would diversify the utility's business model with new revenue from service charges for solar and efficiency. CCREEE and CARICOM have ongoing and future work promoting this business model.

Strategic interventions include encouraging battery or electric vehicle leasing programs and arrangements, demand response programs and transportation tariff options which include time-of-use tariffs, pay as you go tariffs and bundled mobility packages that combine mobility services as a pre-paid service, technology partnerships, solar charging garages, bundled energy solutions, among others.

Strategic interventions which will particularly benefit indigenous marine and riverine electric mobility transitions include learning from the experiences of existing electrification initiatives.

The strategic adoption of relevant applied technology options, financing and business models is important to the successful deployment of electric mobility to diversify and meet the needs of marine and riverine transportation in the region. Furthermore, support shall be provided to financial institutions in the development and provision of specified financial instruments to encourage this market.

This page is intentionally left blank.

CHAPTER 2: GETTING STARTED

The four-step process below describes how CARICOM Member States and other users of the REVS can get started with developing a set of actions for their jurisdiction. The four steps are developing a vision statement, building the case for vehicle electrification, identifying a program of actions, and engaging stakeholders.

Step One: Developing a Vision Statement

A critical first step is to articulate a vision statement that conveys the underlying aim of vehicle electrification specific to the Member State. Ideally, the text is as succinct as possible (e.g., four sentences or less) and is useful in subsequent communications, brainstorming, or planning. Even if the CARICOM Member State has already made significant progress on vehicle electrification, a vision statement will help align all interested parties towards a common objective.

Step Two: Building the Case for Vehicle Electrification

The CARICOM Member State should build a strong case for vehicle electrification that appeals to diverse stakeholders and decision-makers by on the objectives, benefits, and business case for vehicle electrification. Particularly for private sector stakeholders (e.g., fleet owners and operators, car dealerships, among others), a strong business case is most often associated with added value, added revenue, decreased risk, and improved customer satisfaction.

The following outline is an example of how national ministries could articulate a case for vehicle electrification, using a single memorandum or planning document, in preparation for consultation with stakeholders:

- Provide a concise summary of the challenges in the transport sector regarding emissions, costs, equity, public health, climate change, resilience, energy prices, economic growth, and other related topics.
- Describe the quickly changing landscape of electric vehicles at a regional and national level, including greater investment from automakers (e.g., General Motors pledged to eliminate gasoline cars and trucks by 2035), targets on vehicle electrification in the international community,[38] and decreased battery costs.
- Describe how vehicle electrification addresses each challenge in the near-, mid-, and long-term.
- Describe or quantify the benefits of vehicle electrification in terms of total social costs.

[38] ICCT 2020. *Update on the global transition to electric vehicles through 2019*. https://theicct.org/sites/default/files/publications/update-global-EV-stats-sept2020-EN.pdf

Step Three: Identifying a Program of Actions

CARICOM Member States can develop a program of actions on vehicle electrification, using the information provided in the next four chapters (Chapters 3 to 6), and following these best practices when selecting and prioritizing actions:

- **Prioritize actions.** Sort actions by their overall level of attractiveness and potential impact (e.g., cost, time to implement, level of effort, impact, political buy-in/approvals necessary). Chapters 3 to 6 provide a point of reference on this. Categorize actions as high, medium, low, and no priority. This step of prioritizing actions should build upon the vision statement (Step One above) and the overall case for vehicle electrification (Step Two above).
- **Begin with easiest actions to implement.** The easiest actions can be determined using the categories outlined in the first bullet. Some actions typically have a short payback period. It is frequently easiest to gain the necessary support and buy-in of stakeholders by beginning with actions that show some immediate and visible progress.
- **Look to build momentum over time.** Actions that galvanize interest and buy-in from diverse stakeholders, particularly when paired with communication activities to raise awareness, can help build the necessary momentum to further expand initiatives on vehicle electrification.
- **Seek actions that maximize co-benefits**. To further support momentum and gain broader buy-in, it is helpful to seek actions that maximize the co-benefits that are important to key stakeholders and the public (e.g., improvements in air quality, reduced costs of electricity or transportation services, and others).
- **Do not be constrained.** The actions in Chapters 3 to 6 are suggested starting points. Users of the REVS should feel empowered to develop other electric vehicle actions based on the unique interests and conditions of their jurisdiction.

Once a list of actions are prioritized, the user should formalize the selection in a memorandum or planning document that could include the following elements:

- Articulate the vision statement
- Summarize the shared objectives of vehicle electrification and the priority objectives
- Summarize the benefits, business case, and priority opportunities of vehicle electrification
- Summarize the planned early, mid-term, and long-term vehicle electrification actions, including details on roles and responsibilities, as well as timelines and indicators to measure progress

Step Four: Engaging Stakeholders

Stakeholder consultation will be key to fostering alignment on key objectives and converging on a final set of actions. Responsible national ministries may approach this step through a workshop or series of consultations. Such a convening or consultation process could be organized to achieve the following key objectives:

- Review the vision statement and discuss a shared vision for vehicle electrification
- Discuss stakeholders' objectives for vehicle electrification and foster alignment on priority objectives
- Discuss the diverse benefits and business opportunities of vehicle electrification and prioritize opportunities
- Discuss possible joint vehicle electrification actions that advance priority objectives

- Prioritize the early, mid-term, and long-term actions for vehicle electrification and determine roles and responsibilities needed for successful implementation (Chapters 3 through 6 may serve as a resource)

Navigating Chapters 3 through 6

Chapters 3 through 6 detail potential actions for CARICOM Member States to consider when identifying an initial program of actions for advancing vehicle electrification. Each action is a concise, one-page description of the action, stakeholders, and key decision-making information.

The chapters, organized around the four Strategic Initiatives for Implementation from the REVS Framework, are Chapter 3: Policy and Regulation; Chapter 4: Technology and Infrastructure; Chapter 5: Capacity Development and Awareness; and Chapter 6: Finance, Market Development, and Innovation. A framework for implementing, monitoring, and evaluating the actions follows in Chapter 7.

Each one-page summary in Chapters 3 through 6 contains the following information:

- **Market stage:** Refers to when in the development of the electric vehicle market a government should consider implementing the action. Options are early-, mid-, or long-term. In general, early-stage actions have shorter time, lower cost, and less difficulty than mid- or long-term actions.
- **Target user:** Refers to the transportation sector addressed by the action. Options are household, transit, fleet (i.e., non-transit fleet), riverine, and maritime.
- **Time to implement:** Refers to estimated time to implement action. Options are short (one to three years), medium (four to seven years), and long-term (eight or more years).
- **Cost to implement:** Refers to the cost to the government that implements the action.
- **Difficulty to implement:** Refers to the political, cultural, and budgetary resistance to implementing a given action.
- **REVS disruptor:** Refers to the REVS disruptor categories, as discussed in Chapter 1 – Electrification, Connectivity through Digitalisation, and Shifting and Managing Transport Demand.
- **REVS strategic imperative:** Refers to the REVS strategic imperative categories, as discussed in Chapter 1, which are innovation, intelligence, and electrification.
- **REVS strategic initiative for implementation:** Refers to the REVS strategic initiative categories, as discussed in Chapter 1, which are policy & regulation, technology & infrastructure, capacity development & awareness, and finance, market development, & innovation.
- **Description of action:** Provides a concise description of action.
- **Key stakeholders:** List of key stakeholders for implementation and their roles.
- **Supporting stakeholders:** List of supporting stakeholders to implement the action.
- **Key performance indicators (KPIs):** List of example KPIs relevant to monitoring and evaluating progress on the action.
- **Regional or non-regional example:** In some cases, an example of where this action has been implemented is included, with preference given to regional examples as available.

This page is intentionally left blank.

CHAPTER 3: POLICY AND REGULATION

Electric Vehicle Deployment Targets

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Private Vehicles 	Short 1-3 Years	Low $	Medium 	Electrification 	Electrification 	

Setting targets for electric vehicle adoption is one of the first electrification measures typically taken by government agencies. Aspirational, yet achievable, targets for electric vehicle deployment signal a government's priorities to a wide range of stakeholders and create a common goal and direction for the market. Electric vehicle targets also support consistency of planning efforts across government departments and support appropriate resources to be directed to policies that enable electric vehicle adoption. Targets should be set for short- and long-term planning, such as by 2025, 2030, 2050, etc. Effective targets are measurable, specific, time bound, and set clear goals for implementing actors.

Key Stakeholders

- National ministries responsible for transport, energy, finance, and/or environment to coordinate a consultation with stakeholders on reviewing a vision and establishing targets for vehicle electrification
- Ministers or local heads of government who can announce targets and direct government planning efforts

Supporting Stakeholders

- Cross-section of stakeholders consulted on vision and priority actions for vehicle electrification (as elaborated in Chapter 2)
- Local or international consultants to evaluate scenarios and potential of electric vehicle deployment to inform target-setting, including potential to advance other existing national targets (e.g., greenhouse gas emissions reductions, renewable energy penetration)
- Cross-section of stakeholders consulted on potential targets and feasibility of achieving those targets (auto manufacturers, electric vehicle charging infrastructure suppliers, banks, auto dealerships, nongovernmental organizations, electric utilities, among others)
- Regional bodies and entities such as CARICOM and CARILEC to support ambitious target-setting and foster knowledge sharing on best practices between Caribbean countries

Key Performance Indicators (KPIs)

- Share of vehicles on the road that are electrified (%). Specify if "on the road" electric vehicles include vehicles landed, registered at least once, currently legally registered, etc. Ensure there is a mechanism immediately in place to monitor progress without any gaps.
- Number of electric vehicle models for sale in jurisdiction or country (#)
- Greenhouse gas emissions per kilometer traveled (CO_2/km), linked to NDC targets. Note that this aggregates many components—grid emissions, efficiency, and size of vehicles across all model types (ICE and EV)—which may be difficult to monitor or make determinations about electric vehicle deployment.

Regional Example

Belize has set a goal of achieving a 20% reduction in conventional transportation fuel use by 2033. Jamaica also has a target of 10% electric vehicle uptake as a share of the transport mix by 2030.

Government Fleet Electrification

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Government Fleets 	Short 1-3 Years	Medium $$	Medium 	Electrification 	Electrification 	

Government fleet electrification is a “lead by example” measure that helps increase the total stock of electric vehicles in a jurisdiction. Agencies can develop requirements for government fleet procurement of electric vehicles and set electrification targets. Beyond emissions and resilience benefits, fleet electrification can also reduce maintenance and fuel costs and increase public awareness of electric vehicles within the community. Challenges of fleet electrification include financing upfront vehicle costs; matching vehicle range; training staff for managing power outages, operations, and maintenance; and identifying locations for fleet charging stations. Governments may consider converting or assessing the feasibility of converting some of their existing ICEV fleet vehicles to electric.

Key Stakeholders

- National or local agencies with fleets
- National ministries responsible for coordinating or funding procurement of electric vehicles
- Electric vehicle suppliers to provide on-the-ground technical expertise for vehicle repairs or to educate local fleet drivers and technicians on electric car, truck, or bus technology

Supporting Stakeholders

- Local, national, regional and/or international banks (e.g., CDB among others) that provide loans or financing support for local public agencies to purchase electric vehicles and charging infrastructure.
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE that raise public awareness on electric transport and coordinate capacity building activities
- International development agencies that support the above actors via technical support and capacity building (e.g., fleet assessments and feasibility studies, training series)

Key Performance Indicators (KPIs)

- Share of agency fleet that are electrified (today most fleets use 20% to 100%)
- Kilometers traveled per kilowatt hour (km/kwh)
- Replacement ratio (i.e., number of conventionally fueled vehicles replaced by each EV, typically greater than 1.0)
- Total fuel consumption or total running cost (readily calculated by measuring changes in fuel consumption over the fleet, normalized vs. distance traveled)
- Cost per kilometer of fleet vehicle operation
- Cost reductions in fuel bill

Regional Example

The Government of Jamaica is beginning (as of 2021) to pilot a program to integrate electric vehicles into a government fleet, possibly with electric buses. Additionally, St. Lucia has completed the conversion of some of its government fleet vehicles to electric.

Private Sector Fleet Electrification

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Fleets 	Medium 3-10 Years	Medium $$	Medium 	Electrification 	Electrification 	

Governments can work with the private sector to develop and provide incentives for the electrification of high-use, private sector fleets. Incentives could include grants, loans, or other designated funds for both vehicles and charging infrastructure. Corporate fleets used for mail or product delivery, taxi or on-demand ride service, and other high-mileage services (e.g., tourism buses) can be ideal opportunities for vehicle electrification. Companies may assess the feasibility of converting existing ICEVs within their fleets to electric. Fleet electrification helps companies reduce their overall carbon footprint and can improve their public image as an environmentally responsible company. Fleet electrification will also improve air quality and public health and potentially encourage market peers to participate in electrification efforts.

Key Stakeholders

- Private sector fleet managers
- National ministries or transportation agencies to support coordinating or funding grants to assist in the procurement of electric vehicles
- Electric vehicle suppliers and electric utilities who supply and install charging infrastructure

Supporting Stakeholders

- Electric vehicle suppliers to provide on-the-ground technical expertise for vehicle repairs or to educate local fleet drivers and technicians on electric car or truck technology
- Local, national, regional and/or international banks (e.g., CDB, among others) that provide loans or financing support for local private agencies to purchase electric vehicles and charging infrastructure.
- Regional bodies and entities such as CARICOM, CARILEC and CCREEE
- International development agencies who support the above actors via technical support and capacity building (e.g., fleet assessments and feasibility studies, training series)

Key Performance Indicators (KPIs)

- Share of company fleets that are electrified (%)
- Kilometers traveled per kilowatt hour (km/kwh)
- Replacement ratio (see previous action for definition)
- Total fleet fuel consumption
- Cost per kilometer of fleet vehicle operation
- Cost reductions in fuel bill

Regional Example

DHL in Barbados electrified eight vans in its fleet. DHL uses smart metering and charges overnight during a low-demand period, which increases its electricity consumption but does not increase demand charges.

Electric Transit Bus Deployment

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Transit 	Medium 3-10 Years	Medium $$	Medium 	Electrification 	Electrification 	

Bus electrification improves local air quality, public health, and quality of rider experiences and reduces greenhouse gas emissions, air pollution, and noise. Electric buses are a particularly attractive measure in dense urban areas where pedestrians and traffic converge. Implementation challenges include the higher upfront costs of new electric buses (currently two to three times that of diesel buses), lower vehicle range (currently 100 km to 300 km depending on model), charging infrastructure installation, and staff training. However, electric buses save money on maintenance and fuel and build public awareness of transportation electrification within the community. Overall, electric buses are one of the first electrification measures typically taken by the public sector. Fleet managers can assess the feasibility of converting some of their existing ICEV transit buses to electric.

Key Stakeholders

- National or local transit or transportation agencies who lead public transit operations.
- National ministries responsible for transport, energy, and/or environment.
- Electric bus supplier(s) to provide on-the-ground technical expertise for vehicle repairs or to educate local transit or other agency staff.

Supporting Stakeholders

- National ministries who develop environmental or sustainability targets and policy.
- Local, national, regional and/or international banks (e.g., CDB, among others) who provide loans or financing support for local public transit agencies to purchase electric buses and charging infrastructure.
- Electric utilities who supply charging infrastructure and install infrastructure.
- Regional bodies and entities such as CARICOM, CARILEC and CCREEE.
- International development agencies who support the above actors via technical support and capacity building (e.g., fleet assessments and feasibility studies, training series).

Key Performance Indicators (KPIs) (Note, several are likely to be normalized vs. number of passengers.)

- Share of public bus fleet that is electrified (% of buses or % of pass-km that are electrified)
- Kilometers traveled per kilowatt hour (km/kwh)
- Replacement ratio (i.e., number of diesel buses replaced by each electric bus, typically >1.0)
- Greenhouse gas emission reductions per kilometer (CO_2/km)
- Cost per kilometer of bus operation
- Cost reduction in fuel bill

Regional Example

Barbados is the first CARICOM country to integrate electric buses into its public transit fleet (though the first electric bus in the region arrived in 2016 in Trinidad). The Barbados Transport Board began operating 33 Build Your Dreams (BYD) battery-electric buses in 2020.

Electric Vehicle Rebates

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Households 	Short 1-3 Years	High $ $ $	Medium 	Electrification 	Electrification 	

Electric vehicle rebates provide a direct financial incentive for the purchase of an electric vehicle. Despite having lower maintenance and fueling costs, the high upfront cost of electric vehicles often deters car buyers from choosing electric over gasoline/diesel-powered vehicles. Though electric vehicle rebates are expensive for governments, they are one of the most effective actions to increase the adoption of electric vehicles. Once the market reaches a critical mass and electric vehicles reach upfront price parity with gasoline-powered vehicles, electric vehicle rebates may no longer be needed.

Key Stakeholders

- National ministries responsible for transport, energy, and/or environment to manage the incentive program
- Ministry of finance, or other national ministries responsible for the disbursement of money, to ensure adequate funding

Supporting Stakeholders

- Local auto dealerships who can provide information to potential customers and help implement the incentive
- Nongovernment organizations that can help promote the program
- Electric utilities that may be interested in helping to promote the program
- Regional bodies and entities such as CARICOM, CARILEC and CCREEE
- International development agencies that support the above actors through technical support and capacity building (e.g., feasibility studies, incentive mechanism design)

Key Performance Indicators (KPIs)

- Number of electric vehicle rebates given, by income category, geography, household type, etc.
- Share of public vehicles on the road that are electrified (%)
- Fraction of eligible electric vehicle owners who applied for and received the rebate (%)
- Average upfront cost of electric vehicles ($)
- Average incremental upfront cost of electric vehicles compared to comparable internal combustion engine vehicle ($)
- Number of electric vehicle models for sale in jurisdiction or country (#)

Regional Example

Barbados, with CARICOM's support, studied which financial and non-financial electric vehicle incentive mechanisms might be attractive for potential electric vehicle purchasers. This effort is still in the visioning phase.

EV-Ready Building Codes

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Households and Businesses 	Medium 2-6 Years	Low $	Medium 	Electrification 	Electrification 	

The typical electric vehicle owner does most recharging at home or at the location of their business, making the availability of affordable home or business charging an essential component to increasing adoption of electric vehicles. EV-ready building codes require that new buildings be equipped with the electric infrastructure necessary to support the installation of an electric vehicle charger. This typically involves ensuring the building has sufficient electrical capacity and the appropriate electrical panels, outlet, and conduits. Though EV-ready building codes can slightly increase the cost of new construction, such codes preempt the need for costly retrofits in the future, significantly reducing the overall cost of installing electric vehicle chargers. EV-ready building codes can be adopted for commercial and residential construction. At the beginning of 2020, the International Code Council (ICC) adopted EV-ready measures into its building codes. Governments can choose to adopt the ICC's EV-ready building codes.

Key Stakeholders

- National ministries and agencies responsible for building codes to adopt policies, codes and/or garner support for EV-ready building
- Local government agencies responsible for the implementation and enforcement of codes
- Electrician trade groups to disperse the necessary information to local electricians, directly responsible for compliance with respect to electrical installations
- Construction companies who are responsible for complying with building codes

Supporting Stakeholders

- Regional bodies and entities such as CARICOM, CARILEC, CARICOM Regional Organization for Standards and Quality (CROSQ), and CCREEE to coordinate regional capacity building on EV-ready building codes via training series, informational booklets, revised sample building codes for the Caribbean context, etc.
- Development agencies who provide technical support and capacity building

Key Performance Indicators (KPIs)

- Private electric vehicle charger sales (#)
- Availability of public chargers (plugs per 1,000 vehicles or plugs per parking space)
- Availability of workplace chargers (plugs per 1,000 vehicles or plugs per parking space)

Non-Regional Example

California has EV-ready requirements for new construction and major alterations. All residential construction must be EV-ready, while the number of EV-ready parking spots for commercial buildings depends on the total parking available (averaging about one EV-ready parking space per 20 parking spaces).

Streamlined Permitting for Charging Infrastructure

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage	Households/ Fleets/ Charging Providers	Medium 2-6 Years	Low $	Medium	Electrification	Electrification	Technology & Infrastructure

Installing electric vehicle chargers can be an expensive and time-consuming process for installers, particularly when installing direct current fast chargers (DCFCs). In some jurisdictions, receiving the permits to install the chargers is the lengthiest part of the charger installation process. To reduce this burden, some jurisdictions are implementing streamlined permitting for electric vehicle supply equipment (EVSE). An authority having jurisdiction can take several actions to streamline permitting, including standardizing the process, making it easy to find application materials, implementing concurrent reviews by the necessary departments, and allowing electronic submission of permits. Streamlined permitting can attract investors and accelerate the deployment of electric vehicle infrastructure.

In addition to streamlining permitting, governments should ensure a safety protocol is in place for electric vehicles and charging infrastructure. Governments can consider protocols for responses to battery fires and for promoting charging station installation safety.

Key Stakeholders

- National ministries responsible for transport, energy, and/or environment to develop requirements on streamlining permitting process and/or create permit streamlining guidance
- Local governments and agencies that approve building and electrical permits
- EVSE developers to inform development of permit streamlining guidance

Supporting Stakeholders

- Electric utilities to provide guidance on the aspects of EVSE installation
- Government agency responsible for inspections (e.g., Bureau of Standards)
- Electrician trade groups to disperse the necessary information to local electricians
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE
- Development agencies who provide technical support and capacity building

Key Performance Indicators (KPIs)

- Average length for an EVSE permit application to be approved (days)
- Availability of public chargers (plugs per 1,000 vehicles), which may be a function of density or distance one has to travel to a charging point.
- Share of public vehicles on the road that are electrified (%)

Non-Regional Example

California passed a law requiring local jurisdictions to adopt a streamlined EVSE permitting process. To provide guidance to local jurisdictions, California released the Electric Vehicle Charging Station Permitting Guidebook,[39] which outlines strategies around the EVSE permitting process.

[39] California Governor's Office of Business and Economic Development (July 2019). *Electric Vehicle Charging Station Permitting Guidebook.* Link

Electric School Bus Deployment

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early- to Mid- Stage 	Transit 	Short 1-3 Years	Medium $$	Medium 	Electrification 	Electrification 	

School bus electrification improves local air quality, public health, and quality of rider experiences while reducing greenhouse gas emissions and noise. In particular, electric school buses improve the air for children and are therefore an important long-term health consideration. Fleet managers may face several challenges when integrating electric school buses into their fleets, including higher upfront costs of new electric buses (currently two to three times that of diesel buses). One solution for school bus fleet managers could be to assess the feasibility of converting their existing ICEV buses to electric.

Key Stakeholders

- National ministries or local education or transportation agencies that manage school bus operations
- Local school systems
- National transportation, energy, and/or environment ministries
- Electric bus suppliers to provide on-the-ground technical expertise for vehicle repairs or to educate local school bus drivers and technicians on electric bus technology

Supporting Stakeholders

- Local, national, regional and/or international banks (e.g., CDB, among others that provide loans or financing support for local school districts to procure electric buses)
- Electric utilities that supply charging infrastructure and install infrastructure
- Regional bodies and entities such as CARICOM, CARILEC and CCREEE
- Development agencies who provide technical support and capacity building

Key Performance Indicators (KPIs)

- Share of school bus fleet that are electrified (%)
- Kilometers traveled per kilowatt hour (km/kwh)
- Replacement ratio (i.e., number of diesel buses replaced by each electric bus, typically >1.0)
- Greenhouse gas emission reductions per kilometer (CO_2/km)
- Cost per kilometer of bus operation

Regional Example

In Antigua and Barbuda, the Department of Environment and the Antigua and Barbuda Transport Board are collaborating with the Italian government to deploy an electric school bus pilot project, which already includes two electric school buses in operation.[40]

[40] https://antiguaobserver.com/donated-electric-buses-to-be-added-to-school-bus-fleet/

Right-of-Way Charging Program

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Mid-Stage	Households	Medium 2-6 Years	Medium $$	Medium	Electrification	Electrification	Technology & Infrastructure

A right-of-way charging program provides electric vehicle chargers in public, on-street public parking spaces. Most early adopters of electric vehicles live in single-family homes, with dedicated off-street parking. However, as electric vehicles reach the mass market, those who live in apartments or other dwellings without off-street parking will need a convenient and affordable way to charge their vehicles. Given that most charging is expected to occur at home, right-of-way charging can be critical to allowing a broader market to purchase electric vehicles. Governments should consider both DCFC for dense downtown areas with high vehicle turnover and level 2 chargers for areas with longer turnover, including residential neighborhoods.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment to contract study on barriers and solutions
- Local governments to provide on-the-ground knowledge and experience
- Electric utilities to provide expertise on connecting the right-of-way charging to the grid

Supporting Stakeholders

- Nongovernment organizations that can help promote the right-of-way charging program
- Electric vehicle supply equipment companies to provide expertise on the equipment
- Local, national, regional and/or international banks (e.g., CDB, among others) that provide loans or financing support for local public transportation agencies to purchase electric vehicle charging infrastructure for public use.
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE
- International development agencies that support the above actors via technical support and capacity building

Key Performance Indicators (KPIs)

- Availability of public chargers (plugs per 1,000 vehicles)
- Share of households within 100 meters of a public charging station (%)
- Share of public vehicles on the road that are electrified (%)

Non-Regional Example

In 2019, the city of Los Angeles installed over 130 public charging stations on light poles, utilizing the existing electric infrastructure to minimize costs

Multi-Unit Dwelling Charging Program

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Mid-Stage 	Households 	Medium 2-6 Years	Medium $ $	Medium 	Electrification 	Electrification 	

A multi-unit dwelling charging program would study the barriers and solutions to installing chargers at multi-unit dwellings. Multi-unit dwellings are residential buildings that contain many living units, such as apartment buildings or condominiums. These buildings represent a unique challenge for electric vehicle charging infrastructure because neither building owners nor occupants have a strong incentive to install a charger. However, given that most electric vehicle charging occurs at home, charging availability at multi-unit dwellings is important to ensure electric vehicles are a viable option for those who live in them.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment to study barriers and solutions
- Building managers to provide insights on barriers and solutions
- Electric vehicle supply equipment (EVSE) companies to provide insights on barriers and solutions
- Building occupants to provide insights on charging challenges and needs

Supporting Stakeholders

- Electric utilities to provide insights on grid-related issues with multi-unit dwelling electric vehicle charger installations
- Non-government organizations that can provide research on multi-unit dwelling charging programs
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE
- International development agencies that support the above actors via technical support and capacity building

Key Performance Indicators (KPIs)

- Share of multi-unit dwellings residents with reliable access to an electric vehicle charger at home (%)

Non-Regional Example

Massachusetts provides an incentive for the installation of level 2 charging stations at multi-unit dwellings. The program covers up to 60% of the hardware and installation costs, with a maximum benefit of $50,000 per building.

Develop Electric Vehicle Tariffs

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Late Stage 	Households/ Fleets 	Medium 2-6 Years	Medium $$	High 	Electrification 	Electrification 	

One challenge of vehicle electrification to utilities is managing an increase in electricity demand during peak times, which may increase costs of electricity. Time-varying rates for electric vehicles are one approach to incentive charging at off-peak hours. Electric vehicle time-varying rates can facilitate load management, result in cost savings for electric vehicle owners, and encourage off-peak charging. However, time-varying rates can also be costly to administer and are most suitable when utility and regulatory administrative capacity is in place to properly administer a time-varying rate. One valuable resource for regulators and utilities considering electric vehicle time-varying rates is the Smart Electric Power Alliance's "Residential Electric Vehicle Rates that Work: Attributes that Increase Enrollment."[41]

Key Stakeholders

- Energy regulators to lead rate design process and enforce electric vehicle tariffs
- Electric utilities to work closely with energy regulatory authorities to design electric vehicle tariffs and implement them once in place
- National ministries responsible for energy to set out a clear legal framework for transportation electrification that enables energy regulators and utilities to develop electric vehicle tariffs and educate consumers

Supporting Stakeholders

- Regional bodies and entities such as CARICOM, CARILEC, CAREC, and CCREEE to coordinate knowledge-sharing activities to spotlight best practices of electric vehicle tariffs and support studies on the subject
- International development agencies that support the above actors by funding technical support and/or capacity building

Key Performance Indicators (KPIs)

- Number of customers (electric vehicle owners) participating in the electric vehicle tariff program
- Avoided costs of infrastructure upgrades through strategic load management

Regional Example

Hawaiian Electric Co. (utility) offers electric vehicle time-of-use rates designed to incentive customers, through lower rates, to charge their electric vehicles during off-peak times of day. The rate options differ for customer types: residential single-family dwelling, multi-unit dwelling, commercial facility, and electric bus facility.[42]

[41] https://sepapower.org/resource/residential-electric-vehicle-time-varying-rates-that-work-attributes-that-increase-enrollment/
[42] https://www.hawaiianelectric.com/products-and-services/electric-vehicles/electric-vehicle-rates-and-enrollment

Electric Medium- and Heavy-Duty Truck Deployment

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Late Stage 	Fleets 	Medium 2-6 Years	Medium $$	High 	Transport Demand 	Electrification 	

CARICOM countries can develop policies for transitioning to electric medium- and heavy-duty freight delivery and work trucks. Policies could include electric vehicle and charging infrastructure purchase incentives, vehicle emissions regulations, and clean energy and zero emission vehicle targets. Electrifying medium- and heavy-duty vehicles provides significant reduction of harmful air pollutants and noise. Private fleets may be reluctant to transition to electric vehicles due to challenges with the higher upfront costs of new electric trucks, lower vehicle range, charging infrastructure installation, and maintenance and driver training. Medium- and heavy-duty electric vehicles are expected to reach upfront cost parity with internal combustion engine vehicles by around 2030.

Key Stakeholders

- Private companies deploying vehicles, e.g., freight delivery and work trucks
- National ministries responsible for transportation, energy, and/or environment for coordinating policies or providing purchase incentives for electric medium- and heavy-duty vehicles
- National ministries that develop environmental or sustainability targets and policy

Supporting Stakeholders

- Local, national, regional, and/or international banks (e.g., CDB, among others)
- Electric utilities that may supply charging infrastructure and install infrastructure
- Regional bodies and entities such as CARICOM, CARILEC, Regional University Network (RUN) and CCREEE
- International development agencies that support the above actors via technical support key performance indicators (KPIs)

Key Performance Indicators (KPIs)

- Share of truck fleet that is electrified (%)
- Efficiency (kilometers traveled per kilowatt hour [km/kwh]) (may integrate freight tonnage)
- Replacement ratio (i.e., number of diesel trucks replaced by each electric truck, typically >1.0)
- Greenhouse gas emission reductions per kilometer (CO_2/km)
- Cost per kilometer of truck operation

Regional Example

A global company, Amazon, committed in 2019 to purchasing 100,000 electric freight trucks from a company called Rivian for its North American and European deliveries to help eliminate its carbon footprint by 2040. It plans to have all new trucks on the road by 2030.[43]

[43] *Amazon orders 100,000 electric delivery trucks, doubling the fleet in Europe and North America*, Quartz, 2019. https://qz.com/1712151/amazon-orders-100000-electric-delivery-trucks/.

Used Electric Vehicle Incentive Program

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Late Stage 	Households 	Short 1-3 Years	High $ $ $	Medium 	Electrification 	Electrification 	

A used electric vehicle incentive program would provide direct financial incentives for the purchase of used electric vehicles. As the market for electric vehicles matures, electric vehicles will become increasingly available on the used vehicle market. Though this will provide an opportunity for lower-income households to purchase an electric vehicle, the upfront cost of the vehicles may still be too expensive. Providing a purchase incentive for used electric vehicles will allow low-income households to purchase an affordable electric vehicle. Electric vehicle incentives can be expensive for governments; nevertheless, many governments offer incentives because they are one of the most effective actions to increase the adoption of electric vehicles. As the market matures further and the cost of electric vehicles continues to decrease, the used electric vehicle incentive program can likely be phased out.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment to manage the incentive program
- The finance ministry, or other national ministries responsible for the disbursement of money

Supporting Stakeholders

- Electric utilities that may be interested in helping to promote the program
- Non-government organizations that can help promote the program
- Local auto dealerships that can provide information to potential customers
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE
- Development agencies who provide technical support and capacity building

Key Performance Indicators (KPIs)

- Share of public vehicles on the road that are electrified (%)
- Incentive amount per used electric vehicle purchased ($ per vehicle)
- Upfront cost of electric vehicles ($)
- Total cost of ownership of electric vehicles ($)
- Average household income of electric vehicle owners ($)
- Average lifetime of use of an electric vehicle before being sold or salvaged

Non-Regional Example

The State of Oregon has adopted electric vehicle purchase incentives of $2,500 for any resident, with an additional $2,500 for low- and moderate- income residents to purchase a used electric vehicle.

CHAPTER 4: TECHNOLOGY AND INFRASTRUCTURE

Open Access and Interoperability Standards

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Mid-Stage 	Charging Providers 	Medium 2-6 Years	Low $	High 	Electrification 	Electrification 	

Many electric vehicle charging station networks restrict access to their chargers or allow vehicles only from a certain manufacturer (e.g., Tesla) to use the charger. This can limit charging station availability overall for electric vehicle drivers. Open access protocols are requirements for charging station networks to allow electric vehicle drivers to use any charger regardless of membership. Such standards may help ensure vehicle and charger compatibility, which can be particularly useful for countries in the early stages of electric vehicle adoption and charging station availability.

Interoperability refers to the ability of electronic systems to communicate with one another. Systems that are interoperable can effectively communicate with each other. Interoperability standards create requirements that electric vehicle chargers and their networks use nonproprietary communication protocols, which prevents EVSE networks from locking their systems behind proprietary communication protocols. Note: Member States should be aware of the de facto OCPP standard and the under development de jure IEC 63110 Management of Electric Vehicles Charging and Discharging Infrastructure Standard. Governments can work with each other regionally to develop regional standards. Regional standards guiding electric vehicle imports may be relevant (e.g., developed via a regional committee or working group).

Key Stakeholders

- National ministries responsible for transportation, energy, Bureaus of Standard, and/or environment to develop regulations or standards
- Electric vehicle supply equipment (EVSE) companies and utilities to provide input

Supporting Stakeholders

- International standards organizations, such as ISO, to provide expertise on open standards
- Electric utilities that may be interested in creating interoperable standards to allow vehicle-to-grid capabilities
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE that raise public awareness on electric vehicles, advance environmental goals, set interoperability standards, and coordinate capacity building activities
- International development agencies that support the above actors via technical support and capacity building

Key Performance Indicators (KPIs)

- Availability of public chargers (plugs per 1,000 vehicles)
- Share of electric vehicle supply equipment using open access standards
- Share of public vehicles on the road that are electrified (%)

Non-Regional Example

California has adopted open access standards for all public electric vehicle supply equipment, including a provision requiring networked public chargers to be equipped with credit card chip readers that accept credit cards from the major companies.

Battery Recycling and Repurposing Program

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Mid-Stage 	Households 	Long 5-10 Years	Medium $$	Medium 	Electrification 	Innovation 	

CARICOM Member States can collaborate to develop a regional program for battery recycling and repurposing. The modern era of electric vehicle use began in 2011 and though most manufacturers have a five- to eight-year warranty on their batteries, the typical electric vehicle battery lifespan is 10 to 20 years. As a result, there will be an increasing need for battery recycling programs in the next five to 10 years (as of January 2021). Spent batteries can be useful for electric vehicle or other electronic manufacturers that require critical materials for key components. The recycled lithium-ion batteries from electric vehicles could serve as a useful secondary source of materials. Electric vehicle battery recycling and repurposing programs can build on existing private initiatives, such as those by Megapower in Barbados, which is described further below.

Key Stakeholders

- National or local customs, solid-waste, and recycling agencies that could facilitate battery recycling efforts
- Vehicle manufacturing companies or utilities that can model private recycling efforts and work with governments to organize similar programs
- National ministries responsible for transportation, energy, and/or environment to fund or facilitate recycling programs
- Electric vehicle owners that can recycle their used batteries

Supporting Stakeholders

- National ministries that develop environmental or sustainability targets and policy
- Electric utilities that may assist or promote electric vehicle battery recycling programs
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE that raise public awareness on, promote, and organize battery recycling programs
- International development agencies that support the above actors via technical support and capacity building (e.g., training)

Key Performance Indicators (KPIs)

- Number and/or aggregate capacity of batteries recycled through the program

Regional Example

Megapower in Barbados has an electric vehicle battery re-use program. This program involves collecting and repurposing used batteries for several applications, including storage for renewable/solar PV energy, and selling some for reuse as electric vehicle batteries if the batteries have not yet been depleted.

This page is intentionally left blank.

CHAPTER 5: CAPACITY DEVELOPMENT AND AWARENESS

Public Electric Vehicle Awareness Campaign

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage	Households	Medium 2-6 Years	Low $	Medium	Electrification	Electrification	Capacity Development & Awareness

One of the primary barriers to electric vehicle adoption is a lack of awareness among the public. To overcome this barrier, government agencies can implement public awareness campaigns to highlight the benefits of electric vehicles. These public awareness campaigns can take many forms and could include promotional activities, fact sheets, ride-and-drive events, and the development of electric vehicle clubs. Promotional activities could include publicizing electric vehicles on government websites or through a conventional advertising campaign. Fact sheets could include information on cost savings for consumers, public health, resilience, climate benefits, and how and where to charge the vehicles. Ride-and-drive events are an opportunity for the public to test drive an electric vehicle, which often results in a more positive attitude about electric vehicles for the participant. Electric vehicle clubs create a community of electric vehicle drivers who share experiences and information about their vehicles and electric vehicle charging.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment
- Local car dealerships that supply vehicles for ride-and-drive events and distribute fact sheets
- Auto manufacturers that may be interested in funding or promoting the campaign
- Utilities that may be interested in funding or promoting the campaign

Supporting Stakeholders

- Non-government organizations that help promote or develop awareness materials and events
- Electric utilities that may be interested in helping to fund or promote electric vehicle awareness campaigns
- Local car dealerships to educate car buyers about the benefits of purchasing electric vehicles
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE that support awareness campaigns at a regional level, including the Regional University Network (RUN)
- International development agencies that support the above actors via funding, technical support, and capacity building

Key Performance Indicators (KPIs)

- Share of public vehicles on the road that are electrified (%)
- Awareness of electric vehicles among the public (% of people who can name at least one EV)
- Favorability of electric vehicles (% of people who are seriously considering purchasing an EV)

Regional Example

Barbados' utility (BL&P) and the Government of Barbados launched communication campaigns around a vision of Barbados as a 100% renewable energy island, including vehicle electrification. BL&P emphasized the role of a transition to 100% electrification in its "100/100 Vision." In 2018, Barbados, with the support of CARICOM, provided electric vehicle test drives at an expo where the public could learn about electric vehicle designs, charging technologies, battery technology, cost, and performance trends.

Electric Vehicle Curriculum

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage	Fleets	Short 1-3 Years	Low $	Low	Electrification	Electrification	Capacity Development & Awareness

Local drivers, mechanics, and electricians should be knowledgeable about safe electric vehicle operation, maintenance, and charging infrastructure installation. Educating local officials and technicians on electric vehicles and charging infrastructure technology can help countries to build institutional knowledge and develop a workforce of competent technicians. Creating an electric vehicle curriculum and training local officials is a low-cost and early measure that can be taken by the public sector. By developing an electric vehicle curriculum, officials can also be more informed participants in developing and in enforcing policies, codes, and standards related to charging infrastructure. Additionally, programs targeted to underserved communities can help improve social equity because assemblers, electric vehicle technicians, and electricians are all positions with higher wages and higher satisfaction.

A key resource for countries looking to build an electric vehicle curriculum is to work with local organizations who specialize in this topic area. One such organization is CCREEE (and their thematic hub for E-mobility which includes UWI St. Augustine, and the RUN). CCREEE implements, coordinates and supports regional activities related to electric vehicles, among other issue areas, and "provides action and service-oriented services to a broad range of public and private partners and clients. The Centre partners with the Energy Programme of the CARICOM Energy Unit and CARICOM Member States in the technical implementation of sustainable energy commitments on common SIDS sustainable energy issues and solutions." CCREEE has produced training curricula related to electric vehicles in the past and can be a great resource. In November 2020, CCREEE-hosted an Electric Vehicle Maintenance Training of Trainers Programme and has provided curriculum for Barbados.

Key Stakeholders

- National ministries or agencies responsible for transportation
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE to support curriculum development and delivery across multiple Caribbean nations, as well as the Caribbean Examinations Council (CXC) and technical vocational institutes in the region.
- International development agencies to support regional bodies and/or national ministries via provision of technical support on curriculum development and delivery
- Transportation agencies, auto dealerships and maintenance shops, and other entities that may staff electricians, mechanics, and technicians to coordinate staff to participate in training

Supporting Stakeholders:

- Electric vehicle suppliers to information on proper vehicle maintenance
- EV supply equipment companies to give information on proper and safe installation of charging equipment
- Electric utilities to provide training session specific to charging infrastructure

Key Performance Indicators (KPIs)

- Number of electric vehicle courses completed segmented by level (secondary, vocational, tertiary)
- Number of professionals trained, including a breakdown by gender
- Number of institutions that offer electric vehicle courses

Regional Example

Barbados has an extensive training program on electric bus technology for bus drivers, technicians, fire service personnel, ambulance service personnel, and existing partners of the country's Transport Board. The training program helps United Commercial Autoworks Limited and the Defense Force personnel to prepare for large-scale deployment.

Uniform Signage Requirements

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Households 	Short 1-3 Years	Low $	Low 	Electrification 	Electrification 	

Developing uniform signage requirements for electric vehicle charging stations can help build awareness and instill confidence in the availability of electric vehicle charging. Signage includes standing signs and painted pavement markings to indicate charging spaces that are reserved for electric vehicle charging. These signs and markings help prevent drivers of gasoline-powered vehicles from parking in these spaces, increasing the likelihood charging stations will be available when needed by electric vehicle drivers. Jurisdictions can further place penalties for non-electric vehicles that park in electric vehicle charging spaces.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment to develop the signage requirements
- Local governments or other responsible agencies to implement and enforce the signage requirements

Supporting Stakeholders

- Electric vehicle supply equipment developers to implement the signage when installing equipment
- Non-government organizations that can help promote awareness of the signage
- Regional standards body, CROSQ, to support development of regional standards
- Regional bodies and entities such as CARICOM, CARILEC and CCREEE to raise public awareness on the benefits of uniform signage requirements and spotlight examples
- International development agencies that support the above actors by integrating this component into capacity building and training activities in vehicle electrification

Key Performance Indicators (KPIs)

- Share of public vehicles on the road that are electrified (%)
- Share of charging stations with uniform signage
- Awareness of electric vehicles among the public (% of people who can name at least one EV)
- Share of people who cite range anxiety as top reason for not purchasing an electric vehicle (%)

Non-Regional Example

The State of Washington has adopted uniform signage requirements for electric vehicle charging stations. These standards include standing signs and that the parking space be painted green. Gasoline-powered vehicles parked in a properly labeled electric vehicle charging space are assessed a monetary fine of $124.

Data Collection and Sharing Strategy

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early- to Mid-Stage 	Households/ Fleets/Transit 	Medium 3-6 Years	Medium $ $	High 	Electrification 	Intelligence 	

CARICOM Member States, regional institutions, and universities across the region can collaborate to develop an electric vehicle data collection reporting framework. Once adopted and implemented, the framework can incorporate regional consolidation of feasibility studies and reports on research and development efforts (e.g., grid integration, electric vehicle technologies, repurposing equipment) as well as any other sources of key data on vehicle electrification (e.g., total number of electric vehicles). This strategy would establish a process for data sharing to increase knowledge of electric vehicles regionally and enable sharing, comparison, and analysis. This strategy should also include a program to track and analyze electric vehicle charging infrastructure utilization. Charging stations with high daily use can be profitable and encourage future investment in infrastructure. However, understanding the factors that lead to high use is a complex task that requires a dedicated data-tracking program.

Separately, governments can enhance the insurance and credit compatibility with electric vehicle ownership by continuing to develop robust processes for managing data streams to enable cost savings for vehicle owners (e.g., through new payment schemes and insurance platforms) and for the public sector (e.g., through improved management of transportation systems).

Key Stakeholders

- Regional bodies and entities such as CARICOM, CARILEC and CCREEE that can spearhead the establishment and execution of a data sharing framework
- National ministries that can initiate a data collection and reporting framework as part of their renewable energy or sustainability targets and policy
- Transportation agencies and electric vehicle suppliers to share data with national ministries
- Electric vehicle service providers (EVSPs) to provide information on charging station utilization
- Utilities to share data with national ministries

Supporting Stakeholders

- Academic institutions to support framework development and provide data sharing recommendations
- National ministries responsible for transportation, energy, and/or environment

Key Performance Indicators (KPIs)

- Number of Member States that adopt the framework and share data
- Number of EVSPs that provide charging infrastructure utilization data

Non-Regional Example

The United Kingdom has an Energy Data Taskforce that could serve as a resource on the structure and processes of establishing an electric vehicle data collection and sharing framework.[44]

[44] Gov.UK (accessed February 2021). "Energy Data Taskforce." Link.

Electric Vehicle Think Tank

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Mid-Stage 	Households 	Medium 3-6 Years	High $$$	High 	Electrification 	Intelligence 	

One tool CARICOM can use to grow capacity and spread awareness on electric vehicles is to develop an electric vehicle "think tank," which would provide policy and program recommendations and electric vehicle solutions to the CARICOM Member States. The think tank could be led by CARICOM EV Working Group under the Caribbean Sustainable Energy Roadmap and Strategy (C-SERMS). The electric vehicle think tank—with input from universities, regional institutions, consultants, and others—could conduct research relating to an array of electric vehicle policy issues, such as digitalization; autonomous driving; shared mobility; electric mobility; intelligence in vehicle operations, power supply, and integration; grid management and electricity storage capacities; favorable market conditions and policy incentives; and telecommunication and transportation networks.

Key Stakeholders

- Think tank employees and/or members
- National ministries that develop renewable energy or sustainability targets and policy
- Academic, research-oriented electric vehicle stakeholders to guide think tank strategy and recommendations
- Regional bodies and entities such as CARICOM, RUN, CARILEC and CCREEE that can coordinate, steer and guide such a think tank
- International development agencies that can assist in financing the electric vehicle think tank and identifying areas of interest for research

Supporting Stakeholders

- National ministries responsible for transportation, energy, and/or environment who may coordinate workshops.

Key Performance Indicators (KPIs)

- Number of white papers, or similar documents, published by the think tank
- Number of events or workshops facilitated by the think tank
- Number of stakeholder organizations engaged by the think tank
- Uptake and/or consideration of research, policy and program recommendations by ministries across Member States

Non-Regional Example

The University of California-Davis has developed a policy think tank called the “Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center,” which is associated with the academic institution but conducts research and produces technology and policy guidance to the state. This think tank was funded in part by the California Air Resources Board and the California Energy Commission.

CHAPTER 6: FINANCE, MARKET DEVELOPMENT AND INNOVATION

Electric Utility EV Programs

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Households 	Short 1-3 Years	Low $	Medium 	Electrification 	Electrification 	

Governments can work with utilities to develop programs that offer incentives for the use of electric vehicles. Utilities are a critical partner in helping spur public adoption rates of electric vehicles and can be one of the earliest private sector partners to engage. Utility providers can electrify their own fleets and can also create incentives and investment for public infrastructure installations; provide analysis on electricity distribution, the lining process, and build out; and serve as a resource to support electric vehicle policies. Utilities can also build out infrastructure along routes using a strategic location approach. Some common utility practices to incentivize electric vehicle adoption include participating in the integrated utility as a service (IUS) model or offering discounted EV-specific rates, time-of-use rates, and charging incentive programs.

Key Stakeholders

- Electric utilities that can offer incentive programs to their customers
- Electric utility regulators to regulate electricity sales and work with utilities on incentive structures
- International or local consultants to provide analyses and recommendations on rate design

Supporting Stakeholders

- Regional bodies such as CAREC and OOCUR to support knowledge sharing between utilities on best practices in EV-specific rates
- Regional bodies and entities such as CARICOM, CARILEC, CCREEE, to raise awareness regionally on EV-specific rate development and highlight best practices
- International development agencies to support the above activities via technical support and capacity building

Key Performance Indicators (KPIs)

- Number of utility customers participating in electric vehicle or TOU rate programs
- Number of utilities offering electric vehicle incentives
- Share of utility fleets that are electrified (%)

Regional Example

The Public Utilities Commission in Belize has set public electric vehicle rate classes for utilities, such as Belize Electricity Limited, to offer to electric vehicle owners.

Support the Deployment of Smart Charging

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Late Stage 	Households and Utilities 	Long 5-8 Years	Medium $$	Medium 	Electrification 	Electrification 	

Inadvertent impacts from existing electric vehicle charging are high demand for electricity on the electric grid at peak load times, poor load management, and transformer and substation impacts (which may require the replacement of existing transformers). To distribute charging events across the full span of off-peak hours or even to time vehicle charging so that it aligns with periods of high renewable energy production, agencies can encourage smart charging (also called managed charging, V1G, intelligent, or adaptive charging). This allows a utility or third party to remotely control and adjust vehicle charging to correspond to the needs of the grid.

Utilities can play a key role in facilitating smart charging. They can participate in the smart charging communication standards development process, work with industry to develop standards and best practices, engage vendors, pilot solutions, set protocols to deploy solutions into the systems, educate their consumers, consider alternative rate structures to leverage renewable energy production (e.g., flexible incentives), promote deployment of charging infrastructure, and influence beneficial charging habits through smart charging programs.

Key Stakeholders

- Electric utilities responsible for offering electric vehicle rates and facilitating a smart charging program
- Ministries responsible for transportation, energy, and/or environment to coordinate initiative to encourage smart charging pilot programs
- Electric vehicle and EVSE suppliers to supply the equipment and charging infrastructure and provide on-the-ground technical expertise for vehicle repairs

Supporting Stakeholders

- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE to coordinate knowledge-sharing activity to spotlight best practice case studies of smart charging

Key Performance Indicators (KPIs)

- Share of utility's electric vehicle drivers who participate in smart charger program (%)
- Number of utilities in country that offer smart charging solutions

Non-Regional Example

San Diego Gas & Electric, a utility in the United States, offers price-varying electric vehicle rates linked to circuit and system conditions and the changing price of energy throughout the day. The utility offers a user-friendly phone app to electric vehicle drivers who can save money by setting vehicle charging times to low-priced hours of the day.

Import Tax Reduction on Electric Vehicles and Chargers

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Households 	Short 1-3 Years	Medium $$	Medium 	Transport Demand 	Electrification 	

Reducing import taxes on electric vehicles and their associated charging infrastructure sends a price signal to the market, encourages imports, and reduces the cost for consumers. Reducing import costs is a key factor in ultimately contributing to greater electric vehicle adoption because it creates favorable prices for households and private fleets such as taxi services. Reducing import duties or excise taxes on electric vehicles is a common action taken in the Caribbean region.

Key Stakeholders

- National ministries and agencies responsible for developing and enforcing import tax policies
- National ministries responsible for transportation, energy, and/or environment to integrate within policy development processes

Supporting Stakeholders

- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE to coordinate regional knowledge-sharing activities on electric vehicle import taxes and promote common standards in the Caribbean
- International development agencies to provide capacity building support and raise awareness of the incentives

Key Performance Indicators (KPIs)

- Average cost of electric vehicle sold ($)
- Share of vehicle population that is electrified (%)

Regional Example

Guyana reduces excise taxes on hybrid-electric vehicles and electric vehicles and grants tax exemptions for installing charging stations. Guyana also has a 0% rate duty on new electric vehicle imports.

Electric or Hybrid Ferry Feasibility Study and Deployment

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early- to Mid-Stage 	Riverine/ Marine 	Short 1-3 Years	Medium $$	Medium 	Electrification 	Electrification 	

Electric or hybrid-electric (e.g., powered both by diesel and an electric battery) ferries improve a port's local air quality, public health, and noise while potentially also reducing greenhouse gas emissions. A first step for electric or hybrid-electric ferry integration is to conduct a feasibility study to examine the impacts of ferry electrification on ferry operations, economics, and port electricity infrastructure. The distance of the ferry route and the duration the ferry is in port between legs will determine the size of the battery and speed of charging needed. Ferry operators can electrify ferries either with new acquisitions or by converting existing ferries to electric engines or hybrid engines.

Key Stakeholders

- Transportation agencies and companies that operate public ferries
- Ministries responsible for transportation, energy, and/or environment to coordinate initiative to electrify ferries and/or support ferry procurement
- Electric or hybrid-electric ferry suppliers to supply the equipment and charging infrastructure and provide on-the-ground technical expertise for vessel repairs
- Ministries of Tourism to be involved given oversight over ferries as part of the tourism industry

Supporting Stakeholders

- Local, national, regional, and/or international banks (e.g., CDB, among others) that provide loans or financing support for local public transit agencies to purchase electric vehicles and charging infrastructure
- Electric utilities that may supply charging infrastructure and install infrastructure
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE to coordinate knowledge-sharing activity to spotlight best practice case studies of ferry electrification and/or to support regional feasibility studies
- International development agencies that offer technical support and capacity building

Key Performance Indicators (KPIs)

- Share of ferry fleet that is electrified (%)
- Efficiency (kilometers traveled per kilowatt hour [km/kwh]) per total tonnage of cargo or number of passengers transported via ferry (%)
- Replacement ratio (i.e., diesel ferries replaced by each electric ferry, typically > 1.0)
- Cost per kilometer of ferry operation ($/km)
- Cost reduction in fuel bill ($)

Non-Regional Example

Norway is the leading country for electrifying its ferries. Norway has a goal of electrifying two-thirds of the boats that carry passengers and cars around its coast by 2030. Additionally, Washington State, USA, has electrified some of its ferry fleet and will have 22 hybrid-electric ferries by 2038. This state's fleet has 16 terminals with electric chargers.

Purchase Incentives for Electric or Hybrid Ferries

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early- to Mid-Stage 	Riverine/ Marine 	Medium 2-6 Years	Medium $$	Medium 	Electrification 	Electrification 	

Electric or hybrid-electric (e.g., powered both by diesel and an electric battery) ferries can deliver to consumers emissions and noise reductions, energy cost savings, and a more sustainable way to travel. However, purchase incentives such as rebate programs, loans, or dollar for dollar matching programs are an important way for governments to encourage electric ferry or electric charging infrastructure purchases. Offering purchase incentive opportunities can be stated as a goal in a long-term action plan outlining that these opportunities are critical for the Member State to provide in order to achieve its target emissions reductions.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment to manage the incentive program and develop partnerships
- Finance ministry, or other national ministries responsible for the disbursement of money, to ensure adequate funding
- Electric or hybrid-electric ferry suppliers to supply the equipment and charging infrastructure and provide on-the-ground technical expertise for vessel repairs

Supporting Stakeholders

- Local, national, regional, and/or international banks (e.g., CDB) that provide loans or financing support for local public transit agencies to purchase electric vessels and charging infrastructure
- Electric utilities that may supply charging infrastructure and install infrastructure
- Nongovernmental organizations that can help raise awareness among maritime and riverine transportation operators
- Electric battery manufacturers that can help provide training for vessel operator staff
- Regional bodies and entities such as CARICOM, CARILEC and CCREEE that may support national ministries in exploring structure and feasibility of such incentives and/or coordinate opportunities for Caribbean countries to explore partnerships with electric battery suppliers
- Development agencies who provide technical support and capacity building

Key Performance Indicators (KPIs)

- Share of ferry fleet that are electrified (%)
- Number of incentives offered per year (and total dollar amount $)
- Cost per kilometer of ferry operation ($/km)

Non-Regional Example

Washington State, USA offers a sales tax abatement for qualifying electric marine applications. Washington State also incentivizes electric propulsion retrofitting opportunities.

Incentives for Auto Dealers to Sell Electric Vehicles

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Households 	Short 1-3 Years	High $ $ $	Medium 	Electrification 	Electrification 	

Auto dealerships often do not sell many electric vehicles because sales staff may not be knowledgeable about electric vehicles. To counteract this dynamic, some governments offer financial incentives for auto dealers to sell electric vehicles, providing a motivation for dealerships to stock and sell electric vehicles. These incentives can accrue to the dealership, the salesperson, or both. As the market matures and electric vehicles become more profitable, incentives to auto dealers may no longer be needed and can likely be phased out. In addition to offering financial incentives, governments can also develop partnerships with automakers. These unique and innovative partnerships are designed to bring more electric vehicles and greater model availability to the country. Governments can also partner with nongovernmental organizations to integrate awareness-raising, training, and capacity-building tools into educational programs for auto dealers.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment to manage the incentive program and develop partnerships
- Finance ministry, or other national ministries responsible for the disbursement of money, to ensure adequate funding
- Auto dealerships

Supporting Stakeholders

- Nongovernmental organizations that can help raise awareness among auto dealerships
- Auto manufacturers that can help provide training for dealership sales staff
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE that may support national ministries in exploring structure and feasibility of such incentives and/or coordinate opportunities for Caribbean countries to explore partnerships with electric vehicle suppliers
- Development agencies who provide technical support and capacity building

Key Performance Indicators (KPIs)

- Share of vehicles sold that are electrified (%)
- Electric vehicle availability at dealerships (calculated as number of electric vehicle models divided by total vehicle models available)
- Number of electric vehicle models for sale in jurisdiction or country (#)

Regional Example

Barbados, with CARICOM's support, studied which financial and non-financial electric vehicle incentive mechanisms might be attractive for potential electric vehicle purchasers. This effort is still in the visioning phase.

Leasing Opportunities for Electric Vehicles

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Late Stage 	Fleets 	Medium 2-6 Years	Medium $$	High 	Transport Demand 	Innovation 	

There are both public and private sector leasing opportunities to increase the daily use of electric vehicles. One opportunity to rent more electric vehicles is through competitive private-sector leasing. Rental car companies and car dealers could participate in a rental or car leasing program supported by government tax incentives for these entities and users. The benefit to governments from this type of program could be that the vehicles would be financed by the private sector and draw in economic activity. Governments could work with the private sector on supporting competitive vehicle lease schemes. They can encourage companies to consider electric vehicles through education on benefits such as lower maintenance costs than internal combustion engine vehicles.

Additionally, government agencies that have already electrified their vehicle fleets may wish to rent out their vehicles on weekends and holidays to create a revenue stream for the fleet and increase electric vehicle use among the public. This type of electric vehicle rental program is popular in tourist destinations because demand for rental cars is higher on holidays, which corresponds with times when government vehicles are mostly idle. However, government rental of electric vehicles may not always be a feasible option. Alternatively, a rental car operating company could purchase electric vehicles and lease them to municipal governments for use during the week, while renting the same vehicles to tourists on weekends and holidays. A strategic partnership linking car rental operators, government agencies, and tourist groups promotes the use of electric vehicles and could spark increased electric vehicle adoption.[45]

Key Stakeholders

- National or local agencies with fleets
- National ministries responsible for coordinating or funding procurement of electric vehicles
- Car dealerships, rental or carsharing service companies; Motor insurance companies

Supporting Stakeholders

- National ministries that develop environmental or sustainability targets and policy
- Local, national, regional, and/or international banks (e.g., CDB, among others) that provide loans or financing support for local public agencies or car rental groups to purchase electric vehicles
- Electric utilities that supply charging infrastructure, implement rates, and install infrastructure
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE
- Development agencies who provide technical support and capacity building

Key Performance Indicators (KPIs)

- Share of agency fleet that are electrified (%)
- Electric vehicle utilization (days per year)
- Cost per kilometer of fleet vehicle operation

Non-Regional Example

New York City has implemented an electric vehicle car sharing program between the city and some car rental agencies.

[45] NY State Energy Research and Development Authority. 2015. "Electric Vehicle Tourism in New York State."

Carbon Tax on Transportation Fuels

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early to Late Stage 	Households 	Medium 2-6 Years	Low $	High 	Electrification 	Electrification 	

A carbon tax places a price on carbon dioxide and other greenhouse gases. When applied to transportation fuels, a carbon tax increases the cost of those fuels proportional to their carbon content. The price sends a long-term signal to the market and, in turn, encourages investment in cleaner technologies. In the near-term, the increased cost on gasoline and diesel would improve the value proposition of owning an electric vehicle versus a gasoline-powered vehicle. A carbon tax would also raise revenue for the government, which can be invested in other clean transportation initiatives. Consideration could be given to speeds above the speed limit to attract a carbon tax on speed tickets.

Key Stakeholders

- National ministries responsible for transportation, energy, and/or environment to help implement the carbon tax and determine appropriate use of revenue
- National finance ministry to help implement and administer the carbon tax
- The public

Supporting Stakeholders

- Transportation fuel distributors that will be subject to the carbon tax
- Trucking companies or other industries that may be impacted by a carbon tax
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE that raise awareness on the advantages and disadvantages of a carbon tax, as well as best practices for the Caribbean region
- International development agencies that support the above actors via technical support and capacity building

Key Performance Indicators (KPIs)

- Total revenue from carbon tax, segmented by fuel type
- Reduction in total fuel imported (e.g., in MBTU or other common unit)
- Carbon price ($ per ton of CO_2e)

Regional Example

Barbados is considering the introduction of a tax on the carbon dioxide emissions from passenger vehicles to replace the current system of road taxes. The proposal is a flat price of $100 per vehicle.

Electric Vehicle Grid Integration Study

Market Stage	Target User	Time to Implement	Cost to Implement	Difficulty to Implement	REVS Disruptor(s)	REVS Strategic Imperative	REVS Strategic Initiative
Early Stage 	Households/ Fleets/Transit / Utilities 	Short 1-3 Years	Medium $$	Medium 	Electrification 	Electrification 	

An important early-stage step for electric vehicle integration is to conduct a study to determine the impacts of vehicle electrification on the electric grid. The electricity demand from new electric vehicle charging will have impacts on the utility's distribution system and may require upgrades to the distribution system. The impact is dependent on the size of the new electric charging load, the time vehicles are charged, the location of charging, and other factors. The energy demand and the resulting grid capacity impact should be understood to ensure the electric grid can accommodate these changes.

Key Stakeholders

- Electric utilities that may serve as the focal point a grid integration study
- Ministries responsible for energy, or the power sector regulatory commission, which may commission such a study in coordination with the electric utility
- Transportation agencies which coordinate or provide oversight on the electric vehicle charging infrastructure planning
- Developers of electric vehicle charging infrastructure (which may be the utility or a third-party) to communicate electric vehicle charging infrastructure needs

Supporting Stakeholders

- Local, national, regional, and/or international banks (e.g., CDB, among others) that provide loans or financing support for such a study
- Regional bodies and entities such as CARICOM, CARILEC, and CCREEE to coordinate knowledge-sharing activities to spotlight best practice case studies, or help secure funding for such a study
- International development agencies that support the above actors through technical support and capacity building, as well as funding

Key Performance Indicators (KPIs)

- Whether study is used to integrate electric vehicles into grid

Non-Regional Example

The VGI (Vehicle Grid Integration) working group, comprising four Californian companies, created a VGI use case framework. The aim of this document was to define, screen, evaluate, and prioritize the different ways in which electric vehicle charging can be integrated with the grid.[46]

[46] https://gridworks.org/wp-content/uploads/2020/07/VGI-Working-Group-Final-Report-6.30.20.pdf

CHAPTER 7: IMPLEMENTING, MONITORING, AND EVALUATING THE REVS

An important part of any program is to develop a plan for implementation, monitoring, and evaluation. Each of these components serves a distinct function, and all are critical to ensuring an effective and comprehensive program. This chapter (Chapter 7) has four sections: Implementing, Improving Data Collection, Monitoring and Evaluation, and Communications.

Implementation is the adoption of policies and plans that produce financial resources and incentives, technology development, knowledge transfer, regional coordination and integration, inclusion of multiple communities for accessing services, capacity building, regulatory structures, trade, and an enabling market environment.

Monitoring refers to the collection and analysis of data about a program to identify and address challenges that arise during implementation.

Evaluation refers to using the data collected during the monitoring process to assess the effectiveness of the program, identify whether it is achieving the desired outcomes, and determine how it could be improved. Monitoring and evaluation are important so implementers can ensure programs are effective and can facilitate course corrections if components of a program need to be modified.

Foundational to monitoring and evaluation is meaningful, complete, and reliable data. Program implementers must be able to analyze relevant metrics to understand how the program is operating and to gain insights into any elements that may need to be modified. Though data are important for monitoring and evaluation, data collection processes need to be considered in the planning stage and during implementation of the program.

Implementing

The Regional Electric Vehicle Strategy (REVS) is a framework for individual CARICOM Member States and the Caribbean region to advance vehicle electrification. One of its primary functions is to serve as a resource for Member States to develop their own unique program of actions on vehicle electrification by identifying the measures that best address their transportation electrification goals and vision. The first step of visioning and planning is described in Chapter 2. Sample measures to be incorporated within a program of actions are elaborated in Chapters 3 through 6. CCREEE is a lead regional implementing hub for the REVS.

Implementation Plan for Each Measure

As part of developing a program of actions, Member States should consider concrete plans for implementation for each measure. Implementation plans should be as specific as possible about the information they include, such as priority level, target start and completion dates, scope, specific action items, human, financial and other resource needs, lead agencies and other responsible parties, schedule and benchmarks, and deliverables. These implementation plans should be developed in coordination with the stakeholders accountable for implementation, monitoring, and evaluating the programs.

An example template that Member States can use to develop an implementation plan for each measure is presented in Table 5. This template structure is just one example and can be adapted to include other important criteria or elements as needed.

Table 5. Example Implementation Plan for Each Measure

Measure Implementation Plan (Example)	**Example**
Description of Measure(s):	*Electric Vehicle Deployment Targets*
Key Action Item(s):	*Set 2025, 2035 electric vehicle deployment targets*
Start/End Dates/Schedule/Milestones:	*2022-2025, 2025-2035*
Applicable REVS Strategic Initiative for Implementation/Disruptor/Strategic Imperative:	*Policy and Regulation*
Lead Agencies/Stakeholders Responsible: (Including point of contact)	*CCREEE*
Supporting Stakeholders:	*CARICOM, Ministry of Transport*
Target Beneficiaries of the Measure: (Emphasis on inclusion with respect to socio-economic status, race/ethnicity, gender, among other factors)	*All*
Scope:	*Conduct policy analysis that examines strength of policies needed to reach various electric vehicle adoption. Identify suite of policies that are aggressive but achievable.*
Priority (High/Med/Low):	*High*
Deliverables:	*Forecast of electric vehicle adoption and associated suite of policies*
Resource Needs (Staff, Financial, etc.):	*Low administrative burden*
Metrics/KPIs:	*Share of vehicles on the road that are electrified (%).*
Status:	*Conduct study/forecast in 2021, implement targets with 2022*

Iterative Process for Implementation

The Caribbean Sustainable Energy Roadmap and Strategy (C-SERMS) offers a framework useful for consideration in implementing the REVS. The C-SERMS provides a strategic planning, management, and implementation framework to integrate renewable and sustainable energy in CARICOM. This framework (as illustrated in Figure 4) depicts an iterative approach to setting objectives and targets, developing and implementing actions, monitoring, and reviewing progress, and reviewing and resetting—all in close consultation with stakeholders.[47]

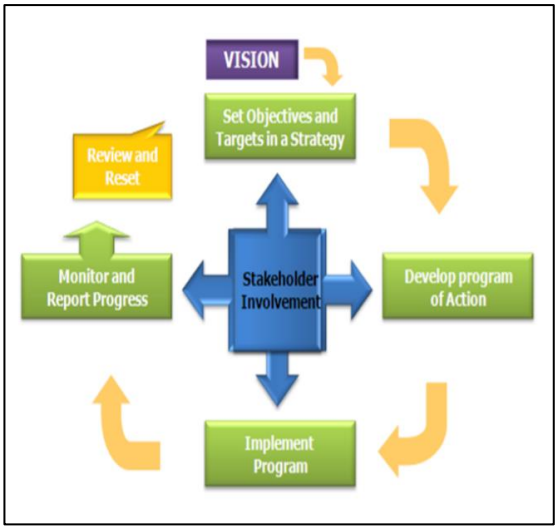


Figure 4. C-SERMS Strategic Framework for Implementation

Such an iterative approach provides a framework for the implementation of the REVS, both at a regional and a national level. By developing and implementing an initial set of actions, CARICOM Member States can begin to advance vehicle electrification, gain insights from measures that demonstrate success, and learn from those that gain less traction. Such lessons can be incorporated in the "review and reset" step to subsequently improve upon existing initiatives and integrate new measures as appropriate.

Stakeholder Roles

An important aspect of such an implementation approach is identifying and bringing key stakeholders into the process. Using a consultative approach, stakeholders can build on existing commitments and structures, garner more widespread support for implementation, and ensure that new projects reinforce previous successes. Consultative processes can also help to identify partnerships for implementation and specify roles and responsibilities. Specifying key actors for each implementation measure and within each implementation plan can strengthen the success of implementation and establish accountability to achieve priorities.

Table 6 summarizes the types of roles that key stakeholders and stakeholder groups in the Caribbean could play in implementing the REVS and advancing transportation electrification.

[47]CARICOM Energy Programme. "Caribbean Sustainable Energy Road Map and Strategy (C-SERMS)." (n.d.). https://caricom.org/documents/12911-c-serms_booklet_-_c-serms_resource_mobilisation_forum.pdf.

Table 6. REVS Implementation: Potential Stakeholder Roles

Stakeholders to Implement REVS	Description of Roles
CARICOM & CCREEE	• Encourage CARICOM Member States to begin (or continue) setting and implementing a vision and program of action for vehicle electrification • Help Member States mobilize resources (financial and technical) to develop and execute national programs of action on vehicle electrification • Initiate regional knowledge-sharing activities to highlight opportunities of vehicle electrification and further encourage action • Initiate development of high-demand resources for vehicle electrification to support the Member States' deployment of vehicle electrification actions (e.g., how-to guides for high-demand actions within the REVS, training, and curriculum booklets) • Spearhead the Data Collection and Sharing Strategy measure to collect data that will foster regional evaluation and monitoring of vehicle electrification • Governments can work with each other regionally to develop regional standards. Regional standards guiding electric vehicle imports may be relevant (e.g., developed via a regional committee or working group).
Regional institutions such as CARILEC, CAREC and OOCUR.	• Lead and/or support regional knowledge-sharing activities on opportunities of vehicle electrification • Initiate knowledge-sharing on opportunities, barriers and solutions for the utility in vehicle electrification, including utility-led programs, EV-specific rates, etc. • Governments can work with each other regionally to develop regional standards. Regional standards guiding electric vehicle imports may be relevant (e.g., developed via a regional committee or working group)
National ministries for energy, finance, transportation, development/urban planning, and/or environment; energy regulators	• Spearhead and coordinate national processes to develop program of actions on vehicle electrification; host stakeholder consultations • Set national transportation electrification, emissions reduction, sustainability, and renewable energy targets • Establish policies and regulations • Fund and/or assist in mobilizing funding for electric vehicle procurement • Spearhead electrification of government fleets • Coordinate implementation, monitoring, and evaluation of measures • Establish incentive schemes • Governments can work with each other regionally to develop regional standards. Regional standards guiding electric vehicle imports may be relevant (e.g., developed via a regional committee or working group)
National or local transportation or transit agencies	• Lead public transportation electrification operations, public fleet electrification efforts • Lead public awareness campaigns on vehicle electrification
Local, national, regional and/or international banks (e.g., CDB)	• Provide loans or financing support for national and local transportation electrification initiatives and procurement of electric vehicle or charging infrastructure
Insurance companies	• Provide insurance products for electric vehicles and electric vehicle supply equipment
Electric utilities	• Lead or support development and installation of electric vehicle charging infrastructure • Lead analysis on capacity planning such as electricity distribution, the lining process, and build out • Invest in smart meters to monitoring the customer-level electricity usage resulting from electric vehicles • Design rate structure with special tariffs that incentivize off-peak charging of electric transportation • Manage impacts on electricity demands, tariffs, charging coordination, and rebound peaks • Support public awareness activities on vehicle electrification
Electric vehicle supplier(s)	• Supply the charging infrastructure • Supply informational materials on the benefits of vehicle electrification • Provide on-the-ground technical expertise for vehicle repairs or to educate local users or agency staff (e.g., bus drivers, technicians) on electric vehicle technology
Other private sector stakeholders including automakers, auto insurance companies, private sector	• Ensure adequate supply of electric vehicles; offer reduced rates for bulk procurement initiatives • Assist in the development and implementation of training curricula for vehicle technicians and mechanics

Stakeholders to Implement REVS	Description of Roles
associations and representatives, fuel-based business segments and value chain (e.g., gas station owners)	• Contribute to education and outreach campaigns
Car Dealers	• Serve as a resource for car buyers who are considering purchasing electric vehicles, including information about range, charging vehicles, and how they operate differently than gasoline-powered vehicles • Host or provide vehicles for ride-and-drive events
International development agencies	• Support regional and national actors through funding of technical support and capacity building (e.g., fleet assessments and feasibility studies, training series). • Provide funding and/or assist regional and national actors in identifying funding for implementation of actions
Academic Institutions/Universities (e.g., auto-mechanic training institutions)	• Research and publish reports on innovative transportation electrification initiatives, technologies, economic and policy instruments, etc. • Support regional data collection on vehicle electrification • Education • Develop technical studies
Renewable Energy Provider	• Build out renewable energy to support increasing electricity demand of vehicle electrification
NGOs and Nonprofit Organizations	• Lead or support public awareness activities for the public on the opportunities and benefits of vehicle electrification • Lobby and advocate on behalf of the public interests relating to vehicle electrification
Public	• Advocate for transportation electrification, purchase electric vehicles, ride on public transit

Equity and Inclusion

Member States should also consider their approach to equity and inclusion. Centering equity and inclusion, including gender-sensitive considerations, involves incorporating these aspects into each step of the process—from vision development to implementation. The following key questions provide a framework for Member States to consider how equity is incorporated into each aspect of a transportation electrification strategy or program of actions:

- **Internal structure: How is equity defined within the agency/agencies leading transportation electrification efforts?** How are equity, diversity, and inclusion part of the internal workplace? Are the agency's internal processes transparent and accessible?
- **Participation in decision-making**: **Who can participate in decision-making processes on transportation electrification?** Are such processes transparent, accessible, and iterative as well as inclusive of diverse groups? Agencies leading transportation electrification initiatives should consider ways to engage the public and other key stakeholders throughout the process. This may include consultation on developing a vision and program of actions, informed outreach as programs are being implementing, and re-engaging stakeholders as plans are iteratively adapted to incorporate feedback.
- **Beneficiaries: Who benefits from transportation electrification measures and are the benefits distributed equitably?** Agencies leading transportation electrification initiatives should consider and identify the beneficiaries for each of the measures for implementation. A stakeholder mapping exercise may also provide further insights into transportation habits and patterns for diverse members of the community (e.g., by income, race, gender, age, geographic location, housing type). In identifying how diverse members of the community will benefit from transportation electrification measures, some of the following questions can be considered:

What is the cost to participate? Are subsidies or financing available to help those with lower incomes to participate? Does the program create local, and if so, how will people apply for and receive those jobs? Is training or development part of the program, and if so, who is benefitting from these trainings?

Improving Data Collection

Data on the progress of vehicle electrification by Member States is a critical element of REVS and policy implementation. The systematic collection and analysis of information can help governments improve policy planning, project design, and resource decisions. Data can also help governments evaluate the effectiveness of transportation electrification policies and programs. Sharing data contributes to overall understanding and improves public awareness of EVs. Sharing data also enables regional bodies (e.g., CARICOM, CCREEE) to assess progress on vehicle electrification at a regional level, provide critical information on regional studies, share best practices for regional knowledge-sharing, and help the region determine its future policy direction and actions. Opportunities also exist at a regional level for data collection to track vehicle electrification efforts and electric vehicle availability across Caribbean countries.

Data Collection Methods

A variety of data collection methods may be useful for agencies or organizations to track transportation electrification progress. Potential data collection methods include:

- Calculate numerical figures that capture daily, monthly, annual counts. Governments can work with private companies such as auto dealerships, electric vehicle producers, utilities, transit agencies, and other groups to tally sales data, ridership data, number of electric vehicle program participants, etc.
- Leverage regulatory tools for data collection. For example, governments can incorporate critical fields for data collection within documentation that is already required along the lifetime of an electric vehicle and/or charging equipment (e.g., filings for import, vehicle registration, permitting applications).
- At the national level, track data for assessing equitable and accessible distribution of services and overall community inclusion efforts. Governments can track the types of transportation benefitting from the measure (e.g., public, private) and the types of users benefitting from vehicle electrification measures (by income, gender, education level).
- Conduct surveys or questionnaires that can gauge public opinion on perspectives such as electric vehicle readiness. These questionnaires can be used repeatedly to gauge changing opinions over time.
- Design structured observations forms.
- Develop rating systems or scales that allow users to submit positions and preferences on a continuum.
- Interview key informants (or groups) that provide qualitative information.

These methods can be used to track the key performance indicators listed for each of the REVS measures listed in Chapters 3 through 6.

Additionally, governments may use existing policy rubrics to assess the strengths of policies and track efforts in electric vehicle deployment at a regional level. One such policy framework is the *Plug-In Electric Vehicle Policy Impact Rubric* developed by National Association of State Energy Officials

(NASEO) in the United States.[48] This four-page, easy-to-use guide enables jurisdictions to self-assess the strength of their light-duty PEV policies on a scale of 1 to 100. A higher score implies a stronger set of policies. The rubric's 13 policy categories fall into three tiers based on their impact on light-duty PEV adoption. Tier 1 policies have the most impact and Tier 3 the least. In the U.S., the rubric is intended for state government offices, such as state energy offices, local governments, utilities, regional government bodies, and other stakeholders that are interested in supporting PEV adoption.

Monitoring and Evaluation

Monitoring and evaluation are two critical program components, which are described below.

Monitoring

Monitoring occurs in the near term, typically during implementation, and is intended to identify and remedy any challenges that arise or any unintended effects of the program. Monitoring should include a combination of data collection, data analysis, and direct engagement with key stakeholders. Data should be collected to track the key metrics (KPIs) identified during the planning phase of the project. These data should be analyzed to ensure the program is having the desired effect and is on track towards achieving the identified targets or goals.

However, it is also important to recognize that data often do not provide a holistic assessment of the program. Program implementers should engage with key stakeholders, identified during the implementation phase, to gain first-hand insights about program implementation that can highlight program successes, identify potential improvements, and anticipate challenges that need to be mitigated.

To aid the monitoring process, consider creating informational dashboards so implementation staff can easily track and analyze relevant data. These dashboards should include easy-to-understand graphics that can be manipulated to show data at a variety of levels to gain insights and make decisions about program modifications.

Member states will need to determine the appropriate frequency for collecting and analyzing data and gathering stakeholder feedback. In the early stages of program implementation, the more frequent the better. A reasonable baseline for Member States could be more general monthly assessments with more in-depth yearly assessments. Each Member State should work within its own limitations and determine the most appropriate cadence for its circumstances. Each could also consider using regulatory tools for data collection, whether leveraging existing tools or creating new ones.

Member States should also consider setting up regular meetings with stakeholders and a method, such as an email address or online forum, through which stakeholders can report problems between meetings. This will allow problems to be identified early, mitigating the scale of potential impacts by encouraging early intervention.

Evaluation

The second phase occurs in the long term, typically after implementation, and is intended to determine the effectiveness of the program and identify how it may need to be modified in its next iteration. Evaluation is similar to monitoring, but it typically involves a deeper assessment of the program's

[48] https://cadmusgroup.com/papers-reports/plug-in-electric-vehicle-policy-impact-rubric/

effectiveness and can lead to larger changes in program design. Lessons learned during a program evaluation can also provide insights for other programs and include both related and unrelated efforts.

An important component of an evaluation is comparing the outcomes of a program to a baseline. Sometimes this baseline can take the form of a counterfactual, that is, a hypothetical scenario of what would have happened in the absence of the program. Though this can be a useful exercise, it is challenging to do effectively. For this reason, a more common approach is to set as a baseline a specific time period prior to program implementation. For example, if the metric being tracked is electric vehicle adoption, the baseline would be the number of electric vehicles prior to program implementation. Evaluators can then determine how much progress has been made towards meeting targets or achieving goals after the program was implemented. Developing this baseline requires foresight, as program staff should gather the necessary data prior to implementation so the baseline is relevant and comprehensive enough for future comparisons.

As stated above in the Improving Data Collection section, the ability of an evaluator to adequately assess the program is predicated on the availability of reliable and meaningful data to support the analysis of key metrics. Another very important component is to assess how the program could be improved in the future. This involves gaining insights from implementation staff and key stakeholders on what went well, what did not go well, and what changes would improve the program. Effective ways to gather these valuable insights is in workshops, focus groups, interviews, or surveys. Information can be synthesized in a report that clearly identifies the effectiveness of the program, its progress towards targets, and how it can be improved. The report can also identify broader lessons learned that could inform related programs.

Communications

Both regional entities and national governments may find it useful to develop a communications strategy on vehicle electrification to enhance their efforts. This section provides sample elements of a communications strategy and approach to complement other aspects of the REVS. The overarching aim of a communications strategy on vehicle electrification is to ensure that key information is shared and that the public and private sector are educated and made aware of vehicle electrification efforts. A communications campaign may promote the benefits of vehicle electrification through specific channels (social media, webinar, radio) and specific audiences (elected officials, decisionmakers, fleet operators, public) with the following specific objectives:

- Raise awareness of initiatives supporting the transition to electric mobility
- Increase awareness on the benefits of vehicle electrification among key stakeholders and the public
- Share and promote important findings from vehicle electrification studies
- Educate key public and private sector stakeholders in the transportation sector on the business case for electric vehicle adoption

Target Audiences and Communications Channels

Potential target audiences for a regional or national communications strategy can include:

Public Sector Stakeholders

- CARICOM Member States and ministry representatives
- Transportation agencies
- Public fleet managers

Private Sector Stakeholders

- Car dealerships
- Private fleet operators and managers
- Electric utilities
- Businesses with potential for converting to electric vehicles and/or siting for electric vehicle charging

Public

- Users of diverse modes of transportation (cars, buses, ferries, etc.)
- Local environmental and conservation organizations

Communication and Outreach Impact Metrics

The following performance metrics will help CARICOM Member States measure whether the engagement activities are meeting the stated marketing objectives. These quantitative and qualitative metrics could be provided at regular intervals during implementation of the campaign or provided in a summary evaluation report at its conclusion. The purpose of the performance metrics would be to assess effectiveness of the campaign tactics and provide recommendations for refining future marketing campaigns:

- Number of media outlets/sources that publish press releases
- Number of social shares of press releases
- Social media engagement
  - Number of likes, shares, tweets/retweets for each of the social media posts
- Events (radio/webinar)
  - Number of attendees at events
  - Number of event likes and shares on social media
- Project site web page views
- Project site material downloads

This page is intentionally left blank.

APPENDIX A: RECENT RELEVANT REPORTS REVIEWED

Table 7. Literature reviewed for REVS development.

Document Name	Author	Year of Publication
IUS Readiness Report Barbados	Elizabeth Butler, Jan W. Bleyl for GIZ	2020
Integrated Utility Services Pipeline of Investment Opportunities	GFA Consulting Group and GIZ	2020
Draft Regional Electric Mobility Policy for Pacific Island Countries and Territories (PICTs) for Validation	Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE) and the United Nations Industrial Development Organization	2020
Draft Regional Electric Mobility Policy for Pacific Island Countries and Territories (PICTs) for Validation	Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE) and the United Nations Industrial Development Organization	2020
Draft Project Document for Validation: Regional Program to Promote Electric Vehicle Markets in PICTs	Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE) and the United Nations Industrial Development Organization	2020
E-Mobility Market Analysis for Belize: Market Opportunity, Fleet examples, and Public Charging Network Development for the Belize Electricity Limited Company	Xavier Gordon, Carey Escoffery for GIZ	2020
E-Mobility Market Analysis for Guyana: Market Opportunity, Fleet examples, and Public Charging Network Development for the Guyana Power and Light Corporation	Xavier Gordon, Carey Escoffery for GIZ	2020
Stakeholder Alignment: Key to Enable Renewably Powered Electric Mobility on Island States - A Caribbean Island State Case Study	Benedikt Römer, Ken Aldonza, Ellsworth Dacon, Simon Zellner, CIRED	2019
Development of a Regional Sub-Policy, Strategy, And Action Plan on Energy Efficiency for the Caribbean Community	Econoler, for GIZ	2019
Draft Jamaica Urban Transit Company Drive-Cycle Analysis	Mark Singer and Caley Johnson, National Renewable Energy Laboratory	2019
Catalyzing an Electric Vehicle Market in St. Kitts and Nevis	Caley Johnson, National Renewable Energy Laboratory	2018
Innovation Labs on E-Mobility Powered by Renewables (Elmo Lab)	GIZ	2018
The Potential of Electric-Mobility in CARICOM Member States	Charlin Bodley for German International Development Cooperation (GIZ)	2017
Electric Mobility Readiness Assessment – Saint Vincent and the Grenadines	Dr. Benedikt Romer, Dr. Yannick Julliard, Siemens Energy Business Advisory, for GIZ	2017

Document Name	Author	Year of Publication
Economic Impact of E-Mobility Transition in St. Vincent and the Grenadines	Suzanne Shaw, Damien King for GIZ	2016
Electric Mobility Solutions in the Caribbean Inception Project Report	Dr. Yannick Julliard, Siemens Business Transformation Services	2015
Assessment of the Economic Impact of Greening Vehicular Transport in Barbados	Winston Moore and Stacia Howard, Antilles Economics for GIZ	2015
CARICOM Energy Policy	The Heads of Government of the Caribbean Community Task Force on Energy Policy	2013
CARICOM GIZ E-Mobility Fleet Inception Report	Xavier Gordon, Carey Escoffery, XERGY ENERGY	2013

APPENDIX B: BARBADOS CASE STUDY

Case Study Overview

Barbados is a leader in transport electrification in the Caribbean region, with a higher number of electric vehicles deployed (estimated at 690) and a higher share of electric vehicles (estimated at 0.3% of total registered vehicles) than other CARICOM member states.[49] Table 8 and Table 9 summarize key transportation, economy, electricity sector, and electric vehicle statistics for Barbados. Although Barbados still has headway to reach its 2030 vision of eliminating the use of diesel and gasoline in local transportation and transitioning to be a 100% renewable energy and carbon-neutral island,[50] the lessons learned from Barbados' transport electrification progress to date offer valuable insights for other Caribbean countries seeking to advance transport electrification. This case study explores how Barbados has achieved its successes in transport electrification by providing an overview of key context; outlining policies, measures, and actions on transport electrification; and examining success factors.

Table 8. Key statistics on electric vehicles in Barbados.

Key Statistics	
Total Electric Vehicles on the Road (2019)	690[51]
Electric Vehicles as Share of Total Registered Vehicles (2019)	0.3%
Electric Vehicles as Share of New Car Sales (2018)	1.28%[52]
Charging Points (2018)	> 600 (600 Residential, 61 restricted locations, 42 public stations).
Population Size	286,641
Total Area Size	430 sq km
Total GDP	US$5.145 billion
Share of GDP on Fuel Imports	6%
Gross National Income Per Capita	US$15,410
Urban Population Percentage	31.2%

[49] *Electrified Islands: The Road to E-Mobility in the Caribbean,* Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[50] *Barbados National Energy Policy 2019 – 2030,* Ministry of Energy and Water Resources, 2020. https://sandbox.7scorp.com/nrd2020/download/national-energy-policy-2019-2030/?wpdmdl=3330&refresh=60ca239ca63191623860124.
[51] Charlin Bodley, CCREEE, May 2022.
Note: Per an interview in 2021 with Barbados Light & Power, the number of electric vehicles in Barbados has since exceeded 700. Official reporting on the number of electric vehicles in Barbados has not been identified.
[52] Ibid.

Context: Economy, Energy, and Transportation

Economy

With a ranking of 58 in the 2020 Human Development Index,[53] Barbados has one of the highest standards of living in the Americas, preceded only by Canada, the United States, Chile, Argentina, and Panama (and tied with the Bahamas). Barbados' economy has diversified in recent decades, from being primarily agriculture to having four main sectors: retail trade, business and other services, government services, and tourism.[54] Between 1980 and 2019, the nominal per-capita income increased fourfold, from US$3,458 to US$15,410.

Energy

Like many Caribbean countries, Barbados' energy and transportation sectors are heavily reliant on imported oil products: over 90% of Barbados' average daily oil demand is met through imported oil products, and oil and diesel account for over 95% of its electricity generation mix.[55] Further, Barbados' fuel prices are particularly high, being among the highest in the Caribbean[56] and, at times, among the highest globally.[57][58]

Table 9. Key statistics on the electricity and transportation sectors in Barbados.

Electricity Sector Overview[59]	
Total Installed Capacity	286.6 MW
Renewable Energy Installed Capacity Share	10.5%
Peak Demand (2018)	152.3 MW
Electricity Generation Mix	Oil and Diesel: 95.5% Solar: 4.6%
Electricity Access	100%
Average Electricity Rates (USD/kWh)	Residential: $0.25 Commercial: $0.28 Industrial: $0.25
Transportation Sector	
Transport Sector as Share of Energy End Uses (2018)	~33%[1]
Total Vehicles Registered (2019)	132,000[1]
Public Service Vehicles as Share of Total Vehicles	20% (buses, taxis, minivans, other)[60]
Average Kilometers Per Day Driven by Car Owners	40 km[61]

This dependence on fossil fuels, accompanied by exposure to high and volatile fuel prices, is a key reason for Barbados' goal to become a 100% renewable energy and carbon-neutral

[53] *Human Development Index (HDI) Ranking,* Human Development Report Office, 2020. http://hdr.undp.org/en/content/latest-human-development-index-ranking.
[54] *Achieving Sustainable Energy in Barbados,* Espinasa et al., 2016. https://publications.iadb.org/publications/english/document/Achieving-Sustainable-Energy-in-Barbados-Energy-Dossier.pdf.
[55] *Barbados National Energy Policy 2019 – 2030,* Ministry of Energy and Water Resources, 2020. https://sandbox.7scorp.com/nrd2020/download/national-energy-policy-2019-2030/?wpdmdl=3330&refresh=60ca239ca63191623860124.
[56] *11 Caribbean Countries Where Regular Gas Will Cost You Over USD 4 Per Gallon,* News Americas, 2019. https://www.newsamericasnow.com/11-caribbean-countries-where-regular-gas-will-cost-you-over-usd-4-per-gallon/.
[57] *Diesel prices, litre, 01-Nov-2021*. Global Petrol Prices. https://www.globalpetrolprices.com/diesel_prices/
[58] *Barbados gas prices third highest in the world,* Stabroek News, 2018. https://www.stabroeknews.com/2018/11/13/news/regional/barbados/barbados-gas-prices-third-highest-in-the-world/.
[59] *Barbados: Energy Snapshot,* U.S Department of Energy, 2020. https://www.energy.gov/sites/default/files/2020/09/f79/ETI-Energy-Snapshot-Barbados_FY20.pdf.
[60] *Ibid*
[61] *Ibid*

island by 2030.[62] The share of renewable energy in the energy mix has steadily increased since 2010, primarily from solar PV. As of 2019, the share of renewable energy reached 10% of total installed electricity generation capacity,[63] ranking among the highest in the Caribbean.

Transportation

Barbados' transport infrastructure includes 1,600 km of paved roads, two active marine ports, and one airport.[64] Domestically, Barbados has an estimated 132,000 registered vehicles.[65] While passenger vehicles comprise the largest share of registered vehicles, public transportation is also prominent. Public service vehicles comprise over 20% of Barbados' total registered vehicles. This includes approximately 300 buses with 45 seats, the Barbados Transport Board's large maxi-taxi fleet, and a fleet of privately owned taxis, mini-buses, and 14-seater minivans.[66] More than 20% of Barbados residents are entirely reliant on public transportation, and more than 75% of residents who use public transport do so daily.[67]

Transportation accounts for an estimated 33% of total energy consumption in Barbados.[68] Given this substantial share within the energy sector, Barbados' *National Energy Policy* highlights the importance of the transportation sector—particularly vehicle electrification—in achieving Barbados' 100% renewable energy vision.[69]

Policies, Measures, and Actions Implemented to Advance Transport Electrification in Barbados

In Barbados, vehicle electrification has been advanced through collaborative efforts from private- and public-sector stakeholders. Key stakeholders include Barbados Light & Power (BL&P), the Ministry of Transport, and Megapower (a regional electric vehicle importer and charging infrastructure provider headquartered in Barbados), as well as international agencies.

Table 10 provides an overview of transport electrification policies, measures, and actions that have been implemented within the past decade in Barbados. As further detailed in Table 10, the growth of electric vehicle sales began when Megapower established its headquarters in Barbados in 2013 and sold approximately 150 electric vehicles (primarily passenger vehicles) within the first two years of operation. In parallel, Megapower deployed electric vehicle charging infrastructure, working closely with BL&P. In 2015 and 2016, BL&P and the Government of Barbados (in collaboration with other stakeholders) launched

---

[62] *Barbados National Energy Policy 2019 – 2030,* Ministry of Energy and Water Resources, 2020. https://sandbox.7scorp.com/nrd2020/download/national-energy-policy-2019-2030/?wpdmdl=3330&refresh=60ca239ca63191623860124.
[63] *Barbados: Energy Snapshot,* U.S Department of Energy, 2020. https://www.energy.gov/sites/default/files/2020/09/f79/ETI-Energy-Snapshot-Barbados_FY20.pdf.
[64] *Barbadian and Bajan Transport Stats*, NationMaster, https://www.nationmaster.com/country-info/profiles/Barbados/Transport/All-stats.
[65] *Small island developing states and their suitability for electric vehicles and vehicle-to-grid services,* Gay et al., 2018. https://rael.berkeley.edu/wp-content/uploads/2018/09/EVs_Journal-of-Utility-Policy.pdf.
[66] Ibid.
[67] *An Analysis of The Demand for Public Transport in Barbados,* Robinson, 2013. https://www.researchgate.net/publication/267042228_An_Analysis_of_The_Demand_For_Public_Transport_In_Barbados.
[68] *Barbados National Energy Policy 2019 – 2030,* Ministry of Energy and Water Resources, 2020. https://sandbox.7scorp.com/nrd2020/download/national-energy-policy-2019-2030/?wpdmdl=3330&refresh=60ca239ca63191623860124.
[69] Ibid.

campaigns around the vision of Barbados as a 100% renewable energy island and transitioning to 100% electrification. In the six years since 2015, Barbados has expanded beyond passenger vehicles to electrify select private fleets and public transit buses and has expanded policy initiatives to support vehicle electrification (such as reducing import duties for electric vehicles). Combined, these efforts have fostered a favorable environment in Barbados for the continued expansion of electric vehicles.

By March 2022, Barbados had deployed more than 600 electric vehicles.[70] While official estimates were not available, an interviewee from BL&P in 2021 indicated that the number of electric vehicles deployed in Barbados has since surpassed 700.[71]

Table 10. Transport Electrification Policies, Measures, and Actions Implemented in Barbados

Policy, Measure, or Action	Year Initiated / Timeframe	Key Stakeholder(s)	Short Description
Megapower founded	2013	Megapower	Megapower was founded, a regional electric vehicle importer and supplier of electric vehicle charging infrastructure in the Caribbean, establishing its headquarters in Barbados.[72] Megapower began importing Nissan Leaf passenger electric vehicles and sold approximately 150 within their first two years of operation, despite limited regulatory financial incentives.[73]
Electric vehicles purchased by utility	2013 to present	BL&P	BL&P began purchasing Nissan Leaf electric vehicles for their own fleet in 2013[74] Each year since, BL&P has increased their fleet of electric vehicles.[75]
Public charging stations deployed	2013 to present	Megapower, BL&P, landlords, and landowners	Megapower deployed two solar PV-covered carport charging stations for electric vehicles in 2013,[76] and has further deployed charging stations in Barbados since then, now numbering over 130 public electric vehicle chargers (including two high-speed charging stations) and over 600 residential charging stations.[77] Megapower had a central role in driving these developments, working in collaboration with other stakeholders (and developing some charging stations with funding from BL&P).
"100/100 Vision" electrification campaign launched	2015 to present	BL&P	BL&P launched a campaign for a "100/100 Vision," representing 100% renewable energy and 100% electrification (including vehicle electrification).[78]
DHL's private delivery fleet was electrified	2015	DHL, Megapower	DHL began electrifying its delivery fleet, beginning with four vans and since expanding to nine electric delivery vehicles. The fleet electrification approach

[70] REVS Steering Committee, Personal contact, March 2022.
[71] Interview, BL&P Antonio Sealy.
[72] *Vision,* Megapower, https://www.megapower365.com/about/vision/.
[73] *Small island developing states and their suitability for electric vehicles and vehicle-to-grid services,* Gay et al., 2018. https://rael.berkeley.edu/wp-content/uploads/2018/09/EVs_Journal-of-Utility-Policy.pdf.
[74] Interview, Barbados Light & Power.
[75] Interview, Barbados Light & Power.
[76] *Barbados Welcomes First Solar Carport, Electric Vehicle Charging Station,* Barbados Information Service, 2013. https://gisbarbados.gov.bb/blog/barbados-welcomes-first-solar-carport-electric-vehicle-charging-station/.
[77] *Electrified Islands: The Road to E-Mobility in the Caribbean,* Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf; 600 charging stations figure is from Charlin Bodley, CCREEE, May 2022.
[78] *BL&P pushing for 100 percent electric vehicles,* Smith, 2017. https://barbados.loopnews.com/content/blp-pushing-100-percent-electric-vehicles.

Policy, Measure, or Action	Year Initiated / Timeframe	Key Stakeholder(s)	Short Description
			uses smart metering and staggers the vans' charging during low-demand periods (overnight).[79]
100% renewable energy island vision launched	2016 to present	Government of Barbados	The Government of Barbados began communicating a 100% renewable energy island vision, including vehicle electrification.[80]
EV grid integration studies began	2017	BL&P	BL&P began conducting electric vehicle grid impact studies on the effects of electric vehicles on future demand and grid asset health, aided by its early investments in advanced/smart metering to monitor customer-level power usage.[81]
Government fleet electrification project began	2017	Ministry of Energy	The Government of Barbados launched a pilot project to electrify a fleet of eight vehicles (five vans and three cars), which was unveiled in 2017. The Government plans to electrify two additional buses and trucks.[82]
Barbados' *National Energy Policy 2017–2037* developed	2017	Government of Barbados	The Government of Barbados developed a *National Energy Policy 2017–2037*, which includes a range of objectives and measures specific to electric vehicles.[83]
Electric vehicle expo and workshop hosted	2018	CARICOM, GIZ, Renewable Energy and Efficiency Technical Assistance, Organization of American States, The University of the West Indies	CARICOM hosted a two-day electric vehicle workshop and an electric vehicle exposition in June 2018 in Barbados, intending to jump-start the dialogue on vehicle electrification. The exposition was open to the public and allowed individuals to increase their knowledge of electric vehicle technologies, costs, and performance trends.[84]
Barbados' *National Energy Policy 2019–2030* adopted	2019	Government of Barbados	The Government of Barbados adopted the *National Energy Policy 2019–2030*, which solidifies a range of objectives and measures specific to electric vehicle.[85]
Import duties on electric vehicles reduced	~2019	Ministry of Finance	The Government of Barbados reduced import duties on electric vehicles relative to similarly sized internal combustion engine vehicles (10% versus 45% import duty, and 20% versus 46.95% excise tax).[86]

[79] *Electrified Islands: The Road to E-Mobility in the Caribbean,* Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[80] *Government's Vision: 100% Renewable Energy Island,* Barbados Advocate, 2016. https://www.barbadosadvocate.com/news/government%E2%80%99s-vision-100-renewable-energy-island.
[81] *The Impact of Electric Vehicles Deployment on Production Cost in a Caribbean Island Country,* Taibi & Fernandez, 2017. https://mobilityintegrationsymposium.org/wp-content/uploads/sites/7/2017/11/2B_5_EMob17_009_paper_Taibi_Emanuele.pdf.
[82] *Electric Vehicle Pilot Project Launched in Barbados,* Nurse, 2017. https://today.caricom.org/2017/11/28/electric-vehicle-pilot-project-launched-in-barbados/.
[83] *Barbados National Energy Policy (2017 – 2037),* Ince, 2018. https://www.greengrowthknowledge.org/sites/default/files/downloads/policy-database/BARBADOS%29%20Barbados%20National%20Energy%20Policy%20%282017-2037%29.pdf.
[84] *"Electrification of transport" in focus in Barbados,* Nurse, 2018. https://today.caricom.org/2018/06/19/electrification-of-transport-in-focus-in-barbados/.
[85] *Barbados National Energy Policy (BNEP),* The Ministry of Energy, Small Business and Entrepreneurship Barbados, https://energy.gov.bb/publications/barbados-national-energy-policy-bnep/.
[86] *Electrified Islands: The Road to E-Mobility in the Caribbean,* Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.

Policy, Measure, or Action	Year Initiated / Timeframe	Key Stakeholder(s)	Short Description
Electric vehicle–related curriculum developed	2020	Barbados Transport Board, Ministry of Transport Works and Maintenance, Samuel Jackman Prescod Institute of Technology, BL&P	The Government of Barbados began working with the Samuel Jackman Prescod Institute of Technology to develop an electric vehicle maintenance curriculum.[87] As of 2020, 12 technicians from the Transport Board's Quality Assurance Department had completed initial training.[88]
Electric buses deployed in Barbados	2020 to present	BYD, Megapower, Barbados Transport Board	In 2020, BYD, Megapower, and the Barbados Transport Board collaborated to launch new electric buses in Barbados.[89] In 2021, Barbados incorporated 14 additional electric buses, reaching a total of 49 BYD electric buses in Barbados.[90]

Transport Electrification in Barbados' National Energy Policy Framework

The Government of Barbados has incorporated transport electrification into its vision for the energy sector, as laid out in the *Barbados National Energy Policy 2019–2030* and corresponding *Implementation Plan*. The country's stated goals for the energy sector are to eliminate the use of diesel and gasoline in local transportation and transition to a 100% renewable energy and carbon-neutral island.[91]

Barbados National Energy Policy 2019–2030

The *Barbados National Energy Policy 2019–2030* includes a series of objectives and strategies that directly or indirectly relate to electrification of the transport sector; these are listed in Table 11.

Table 11. Vehicle Electrification–Related Sector Policy Objectives within Barbados National Energy Policy

Policy Objectives
Provide tax incentives to vehicle dealerships that train their mechanics to maintain and repair EVs
Establish a program for identifying appropriate international sources of funding to facilitate and assist the government in transitioning from fossil fuels to EVs
Create a system that includes mobile charging stations for vehicles
Implement more stringent regulations on vehicles' exhausts and emissions
Integrate charging stations with traditional gas stations and construct more charging stations for EV
Establish a system that facilitates the change from traditional vehicles to those powered by renewable energy, taking transition costs into consideration
Provide cost incentives that encourage investment in required infrastructure with charging stations etc.

[87] *Electrified Islands: The Road to E-Mobility in the Caribbean,* Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[88] *Newly Trained Technicians to Maintain Electric Buses,* Rollock, 2020. https://gisbarbados.gov.bb/blog/newly-trained-technicians-to-maintain-electric-buses/.
[89] *BYD Delivers 33 New Electric Buses to Barbados Transport Board,* The Auto Channel, 2020. https://www.theautochannel.com/news/2020/08/24/851828-byd-delivers-33-new-electric-buses-to-barbados-transport-board.html.
[90] *14 additional electric buses on island,* Jones, 2021. https://www.cbc.bb/cbctest/news/local-news/14-additional-electric-buses-on-island/.
[91] *Barbados National Energy Policy 2019 – 2030,* Ministry of Energy and Water Resources, 2020. https://sandbox.7scorp.com/nrd2020/download/national-energy-policy-2019-2030/?wpdmdl=3330&refresh=60ca239ca63191623860124.

Establish standards in charging and other renewable energy infrastructure related to fueling
Develop a regulatory framework for the implementation of vehicle to grid storage and supply technology

Implementation Plan for Barbados National Energy Policy

The *Implementation Plan for Barbados National Energy Policy* was developed to support the implementation of the *Barbados National Energy Policy 2019–2030*. The *Implementation Plan* includes measures that aim to accelerate a full integration of renewable energy into the Barbados' energy mix. Among the identified measures, several relate directly or indirectly to electrification of the transport sector. These are listed in Table 12.

Table 12. Transportation Measures within the Implementation Plan for Barbados National Energy Policy

Measures
Provide tax incentives to vehicle dealerships that train their mechanics to maintain and repair EVs
Establish a program for identifying appropriate international sources of funding to facilitate and assist the government in transitioning from fossil fuels to EVs
Remove duties and VAT from EVs and encourage a scheduled approach to increasing their use in the national transportation fleet, while at the same time, not harming government's revenue stream
Create a system that includes mobile charging stations for vehicles.
Integrate charging stations with traditional gas stations
Construct more charging stations for EVs
Establish a system that facilitates the change from traditional vehicles to those powered by renewable energy, taking transition costs into consideration
Provide cost incentives that encourage investment in required infrastructure with charging stations etc.
Establish standards in charging and other renewable energy infrastructure related to fueling.
Develop a regulatory framework for the implementation of vehicle to grid storage and supply technology

Key Success Factors

The progress of vehicle electrification in Barbados has been driven by several success factors that also provide insights for other Caribbean nations seeking to advance vehicle electrification. These successes are outlined below.

Early deployment of charging infrastructure for electric vehicles and ensuring an enabling environment. Early progress on deploying charging infrastructure was critical in Barbados. Megapower began developing public charging stations within their first year of operation in Barbados in 2012 and 2013. By 2019, over 40 public electric vehicle chargers had been developed,

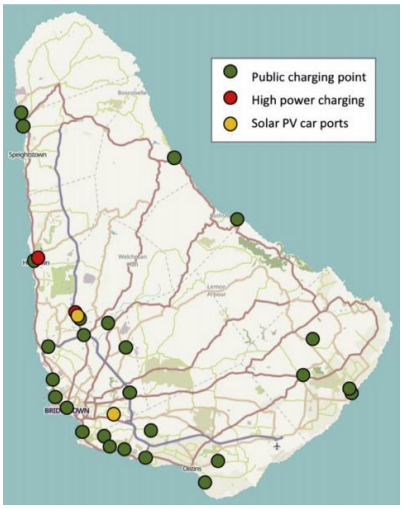


Figure 5. Map of Barbados with Major Roads and Public Charging Points (2018). Original map source: OpenStreetMap and Plugshare, 2018.

as depicted in Figure 5, including two high-speed charging stations.[92] By 2022, over 130 charging stations had been deployed.

In addition to collaborating closely with the utility on financing and deploying charging infrastructure, it should be noted that a unique approach has been adopted in Barbados enabling charging points to be operated by a third party. In Barbados (as in many Caribbean nations), the utility is designated as the sole entity permitted to sell electricity. Legal frameworks that permit such independent operators of charging infrastructure are uncommon in the Caribbean.[93] In the Barbados model, the service provided by Megapower is classified as an access service, rather than electricity delivery. This classification facilitates the development of charging infrastructure as a collaboration between the electric utility and third-party operators, rather than sole reliance on the electric utility.

The number and density of charging stations was also critical in Barbados. The chargers are spaced out so that drivers are never more than three miles from a charging location.[94] As the number of charging stations increased, Megapower launched a campaign highlighting that there were "more charging stations than gas stations in Barbados," increasing public awareness of the ease and benefits of electric vehicles.[95]

Early and sustained utility involvement. The role of the utility is critical more broadly. In the case of Barbados, Megapower approached BL&P early in its vehicle electrification efforts, communicating the benefits of vehicle electrification to the utility and assessing opportunities to collaborate. BL&P supported financing for several charging stations, including two high speed charging stations; was an early adopter by purchasing electric vehicles for its own service fleets; and has since advanced studies on electric vehicle grid impacts, vehicle-to-grid integration, and time-of-use tariffs. Utilities are critical to advancing vehicle electrification: they may benefit from the additional revenue of electricity sales via electric vehicles and may have access to capital that can be leveraged to deploy needed charging infrastructure. In other Caribbean jurisdictions, stakeholders seeking to advance vehicle electrification—whether from the private sector, government, or other—would benefit from early and sustained utility involvement in vehicle electrification efforts.

Communicating a vision for vehicle electrification to the public. Communication campaigns were key to raising awareness of vehicle electrification in Barbados. BL&P and the Government of Barbados launched communication campaigns around a vision of Barbados as a 100% renewable energy island, including vehicle electrification, and BL&P emphasized the role of a transition to 100% electrification in the "100/100 Vision." Such a campaign can help to increase consumer demand for electric vehicles, raise awareness among key stakeholders on the role of vehicle electrification in advancing energy and transport goals, and send an important signal to automakers, dealers, and other private-sector stakeholders on the longevity of the electric vehicle market in the country.

---

[92] Map copied from: https://rael.berkeley.edu/wp-content/uploads/2018/09/EVs_Journal-of-Utility-Policy.pdf
Original data sources for map: OpenStreetMap and Plugshare (https://www.plugshare.com/)
[93] *Electrified Islands: The Road to E-Mobility in the Caribbean,* Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[94] Ibid.
[95] Interview, BL&P Antonio Sealy.

Targeting high-use government and commercial fleets. In Barbados, targeting high-use government and commercial fleets (such as fleet operators) was an integral success factor. According to an interview with BL&P, Megapower's approach of targeting fleet operators and other high-mileage users resulted in a greater number of electric vehicle sales than would have been possible by targeting drivers of passenger vehicles. This included working with DHL to electrify their delivery fleet and working with the Barbados Transport Board to procure and deploy electric buses. Such high-use vehicles offer an opportunity to enhance the visibility and performance of electric vehicles for the broader public.

Leveraging multi-lateral funding. Private- and public-sector stakeholders in Barbados benefitted from multilateral funding for vehicle electrification efforts. Grants and concessional loans from multilateral sources facilitated pilot projects and procurement efforts in the early stages of vehicle electrification.[96]

Summary and Outlook

Barbados has assumed a leading role in the Caribbean in advancing vehicle electrification, having deployed more electric vehicles than any other CARICOM member state. Several factors contributed to these early successes, including early and sustained utility involvement, communication campaigns, charging infrastructure deployment, high-use fleet electrification, and multilateral funding. Yet, with only 0.3% of all registered vehicles being electric as of 2019, Barbados still has much progress to ensure its vision of being a 100% renewable energy island and its accompanying vision for electrification of the transport sector.

An interview with a key stakeholder in Barbados' transportation sector indicated that while the business case for electric vehicles exists for many potential electric vehicle users, hesitancy nonetheless remains high, in part due to limited options. As public charging stations gain more use, congestion has become an issue. Queues at charging stations are not uncommon, particularly at the two high-speed charging stations on the island.

The interviewee indicated that in the next phase of vehicle electrification, it will be critical to expand public charging networks (particularly high-speed charging stations). Further, the interviewee suggested that future progress on vehicle electrification will involve more closely assessing the role of the utility and the impacts of electric vehicles on the grid. BL&P is currently conducting studies to further investigate electric vehicle grid impacts as well as measures to mitigate technical challenges. BL&P is also exploring questions on the role of smart charging and the need for an electric vehicle data registry and collection processes, among other efforts. Given Barbados' early and successful transport electrification programs, its future decisions will be watched closely and may continue to help inform the decisions of its CARICOM neighbors.

[96] Interview, BL&P Antonio Sealy.

This page is intentionally left blank

APPENDIX C: BELIZE APPLICATION EXAMPLE

Overview

The Central American and Caribbean country of Belize is in an early stage of introducing electric vehicles, with approximately five electric vehicles on the road (as of December 2021) and one charging station. The Government of Belize has made a strong commitment to increase the share of renewable energy sources in its power sector, as indicated by its endorsement of climate and energy goals.

This application example presents an overview of the economic, energy and transportation landscape in Belize and identifies potential early actions that Belize may consider taking to promote electric vehicle adoption.

Context: Belize's Economic and Energy Landscape

Economy

Belize, classified by the World Bank as an upper middle-income country,[97] has the second highest per-capita income in Central America. About 25% to 30% of the population live in Belize City, which is Belize's most populated city as well as a commercial and cultural hub, and another 23,000 people live in Belmopan, Belize's capital.[98] The labor force is 61.9% of the population, with an unemployment rate of 9%.[99] Table 13, Table 14, and Table 15 summarize key transportation, economy, and electric vehicle statistics for Belize.

The largest industries in Belize are food processing, tourism and construction.[100] The economy relies primarily on tourism and exports of marine products, citrus, sugar and bananas.[101] Belize has a 174-mile coastline with several small islands.

Energy

About 92% of the country's population had access to electricity in 2019.[102] Energy consumption per capita is 31.55 million Btu per person.[103]

According to the *2020 Annual Energy Report*, Belize's energy imports accounted for 76.7% of total primary energy supply.[104] A decline in electricity demand contributed to a higher portion of indigenous electricity generation from renewable energy sources. The total installed capacity for Belize was 131.7 MW, comprising 58% of renewable energy and 42% of nonrenewable generation.

---

[97] *Belize: Economy*, GlobalEDGE, 2020. https://globaledge.msu.edu/countries/belize/economy.
[98] *Belize Central America*, World Fact Book, CIA, 2021. https://www.cia.gov/the-world-factbook/countries/belize/.
[99] Main Labor Force Indicators, 2021, Statistical Institute of Belize, 2021. http://sib.org.bz/statistics/labour-force/.
[100] *Belize: Economy*, GlobalEDGE, 2020. https://globaledge.msu.edu/countries/belize/economy.
[101] *2021 Rank of Economic Freedom Belize*, Heritage Foundation, 2021. https://www.heritage.org/index/country/belize.
[102] *Energy Consumption in Belize*, World Data Info, 2019. https://www.worlddata.info/america/belize/energy-consumption.php.
[103] *Belize*, US Energy Information Administration, 2019. https://www.eia.gov/international/overview/country/BLZ.
[104] *2020 Annual Energy Report*, Belize Energy Unit, 2020. https://energy.gov.bz/2020-annual-energy-report/.

The energy supply in Belize is a mix of fossil fuels and renewable energy. As reported in Energy Statistics Belize, renewable energy accounts for roughly 40%, a very high portion of total energy supply in Belize.[105] In 2018, total energy imports were 9,529 TJ, internal energy production included 6,218 TJ of indigenous renewable energy and 1,786 TJ of indigenous fossil fuels, and Belize exported 1,236 TJ of its indigenous fossil fuels. Among its renewable energy sources, Belize mostly produces biomass and hydropower, followed by solar. Belize's transportation sector consumes the most energy, followed by industry, residential, and commercial services.

Table 13. Key statistics on Belize's population and economy.

Population and Economy	
Population Size	430,000[106]
Total Area Size	22,970 sq km[107]
Nominal GDP	US$2.5 billion[108]
Share of GDP on Imports	58%[109]
Share of GDP on Fuel Imports	1.5%[110]
GDP Per Capita	$57,540.19[111]
Urban Population Percentage	44.7%[112]

As Belize is only partially reliant on imported fossil fuels, it is less vulnerable to oil price fluctuation than other CARICOM countries and Caribbean islands.[113]

Table 14. Key statistics on Belize's electricity sector.

Electricity Sector Overview[114]	
Total Installed Capacity	119.98 MW
Peak Demand (2018)	104.2 MW
Electricity Generation Mix in 2020[115]	1.5% Diesel, 2% Fuel Oils, 38% Hydropower, 13% Biomass, 0.1% Solar, 42% imports
Electricity Access	92%
Average Electricity Rates (USD/kWh)	Residential: $0.20, Large Commercial: $0.20, Industrial: $0.13

The country's latest energy policy framework, *Belize National Energy Policy*, was endorsed by the Government of Belize and officially released in 2012 and includes sustainable transportation goals and details renewable energy and clean transportation options. This policy has five strategic pillars including energy efficiency, renewable energy, clean production, governance, and infrastructure. The *2015 National Sustainable Energy Strategy and Action Plan* builds upon the *Belize National Energy Policy* and identifies energy

[105] *Energy Consumption in Belize*, World Data Info, 2019. https://www.worlddata.info/america/belize/energy-consumption.php.
[106] *Belize Statistics*, Britannica, 2021. https://www.britannica.com/place/Belize.
[107] Energy Statistics Belize, Geon Hanson, 2019, https://www.irena.org/-/media/Images/IRENA/Agency/Data-Statistics/Caribbean-Renewable-Energy-Statistics-Training/Country-Presentations/Belize.pdf?la=en&hash=2AF4DA3A793F560DDF472A35502599BA917C0F4E
[108] *Belize: Economy*, GlobalEDGE, 2020. https://globaledge.msu.edu/countries/belize/economy.
[109] *Belize Energy Snapshot*, Energy Transitions Initiative, US Department of Energy, 2020.
[110] Ibid.
[111] *GDP Activity 1992-2020*, Statistical Institute of Belize, 2021. http://sib.org.bz/statistics/gross-domestic-product/
[112] *Energy Statistics Belize*, Geon Hanson, 2019.
[113] *Belize Energy Snapshot, Energy Transition Initiative*, National Renewable Energy Laboratory, 2020. https://www.osti.gov/biblio/1659781.
[114] *Belize Energy Snapshot, Energy Transition Initiative*, National Renewable Energy Laboratory, 2020. https://www.osti.gov/biblio/1659781.
[115] *2020 Annual Energy Report*, Belize Energy Unit, 2020. https://energy.gov.bz/2020-annual-energy-report/.

efficiency measures and programs, renewable energy technologies, and audit actions to improve the country's energy system.

Belize has set clear renewable energy, energy efficiency, and transportation sustainability targets. As reported by the UNFCCC, Belize aims to achieve a 75% renewable energy mix by 2030, with other goals of increasing total installed hydropower and supplying more electricity from municipal solid waste.[116] The Government of Belize has put into place tax reductions or exemptions for renewable energy and has also proposed rebates and interconnection standards for renewable energy. Belize's ministries have established energy efficiency standards, restrictions on incandescent bulbs, appliance labeling standards, minimum energy performance standards, building codes, and energy efficiency loan programs to encourage energy efficiency.

Table 15. Key statistics on Belize's transportation sector.

Transportation Sector	
Transport Sector as Share of Energy End Uses (2010)	46.8%[117]
Total Vehicles Registered (2008)	57,000[118]
Public Service Vehicles as Share of Total Vehicles	Unknown
Average Kilometers Per Day Driven by Car Owners	Unknown

The Belize Electricity Limited (BEL) is the primary entity responsible for purchasing, transmitting, and distributing electricity in Belize. The utility has implemented some sustainability initiatives, including the adoption of two electric vehicles into its fleet. Belize's utility rates are also lower than most other Caribbean countries, in large part due to existing renewable energy projects (predominantly hydropower).[119] BEL purchases about 71% of its electricity from five domestic independent power producers. To meet peak demand, BEL also generates electricity from gas turbine and diesel fired generators that it owns.[120]

Context – Transportation Landscape

Existing Transportation Network and Trends

Belize has 1,594 miles of roads, 303 of which are paved.[121] There are four main highways, with two border crossings into Mexico and Guatemala, but some roads, including major highway sections, are vulnerable to damage or closure from heavy rain. The road network links Belmopan and Belize City to all primary towns and villages in the country, and there is regular bus service to and from all major towns. Belize has 10 ports, the largest in Belize City.[122] There is one international airport and several smaller regional airports in Belize.

---

[116] Belize's Updated Nationally Determined Contribution, UNFCCC, 2021. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjwxpuxlYf1AhXemHIEHczKBiAQFnoECAwQAw&url=https%3A%2F%2Fwww4.unfccc.int%2Fsites%2Fndcstaging%2FPublishedDocuments%2FBelize%2520First%2FBelize%2520Updated%2520NDC.pdf&usg=AOvVaw019qG6vfxD-qQ87dpd1GCo.

[117] *Belize's First Comprehensive National Transportation Master Plan*, Government of Belize, 2018. https://edc.gov.bz/governmentpolicies/projects/cntmp/.

[118] Ibid.

[119] *Belize Energy Snapshot*, Energy Transitions Initiative, US Department of Energy, 2015.

[120] Ibid.

[121] Belize - Infrastructure, power, and communications, Nations Encyclopedia, n.d. https://www.nationsencyclopedia.com/economies/Americas/Belize-INFRASTRUCTURE-POWER-AND-COMMUNICATIONS.html.

[122] Ibid.

Vehicle Use in Belize

Belize's road transportation sector is reliant on petroleum fuel, with almost all vehicles using gasoline or diesel. In 2010, the transportation sector was responsible for 46% of total secondary energy consumption in the country.[123] The overwhelming majority of Belize's vehicle stock consists of used vehicles, and most are imported from the United States, according to a study on vehicle registrations from 2013 to 2016.[124] Approximately five electric vehicles are on the road in Belize.[125]

According to the *Energy Snapshot*, published by the U.S. Department of Energy in 2020, Belize has a goal of reducing conventional transportation fuel use in the country by 20% by 2030.[126]

The Government of Belize's report, *Cleaner and More Efficient Fuels and Vehicles in Belize*, published in 2016, established a baseline for the fuel economy of light duty vehicles.[127] This report examines fuel consumption and its relationship to greenhouse gas emissions and also includes a vehicle inventory and a baseline fuel economy estimate for light duty vehicles that entered Belize between 2013 and 2016. The study found that the mean fuel economy of newly registered light-duty vehicles in Belize in 2016 was 13,98 Lge/100km. The study found that between 2013 and 2016, 32,207 light duty vehicles were registered over those four years. The study also found that, during that period, the average CO_2 emissions per year for emissions of the new vehicle registrations (in grams per kilometer) ranged between 323 g CO_2/km to 330 g CO_2/km. The study highlights actions for consideration, such as reducing heavy-duty vehicle emissions by limiting the age of the vehicles being imported to the country; ensuring energy efficiency in light-duty vehicles through eco labelling, regulatory standards and taxes on new and used vehicles based on fuel consumption; and encouraging electric vehicles and biofuel vehicles.

In 2018, the government published *Belize's First Comprehensive National Transportation Master Plan*, which outlines ways the country can improve efficiency, resilience, and climate preparedness in the future.[128] The plan specifically proposes that the Government of Belize develop a policy for introducing electric vehicles. The plan also notes that introducing electric vehicles would help reduce Belize's greenhouse gas emissions and notes the environmental usefulness of introducing electric buses to the country as a pilot as well. Another potential policy to promote electric vehicles, discussed in the plan, is an economic incentive to cover the cost of electric vehicle technology in the initial years of an electric vehicle program.

Electric Vehicle and Charger Use in Belize

There are approximately five registered electric vehicles in Belize, though the Ministry of Public Utilities, Energy and Logistics indicated it is possible there may be more electric

---

[123] *Cleaner and More Efficient Fuels and Vehicles in Belize*, UN Environment and Ministry of Energy, Science, Technology and Public Utilities, Belize, 2016.
[124] Ibid.
[125] Geon Hanson, Personal Contact, December 2021. Mr. Hanson noted that there may be some data lapses at the agency that tracks vehicle ownership, which could mean actual hybrid electric or battery electric vehicle ownership is higher than recorded.
[126] *Belize Energy Snapshot*, Energy Transitions Initiative, U.S. Department of Energy, 2020.
[127] *Cleaner and More Efficient Fuels and Vehicles in Belize*, UN Environment and Ministry of Energy, Science, Technology and Public Utilities, Belize, 2016.
[128] *Belize's First Comprehensive National Transportation Master Plan*, Government of Belize, 2018. https://edc.gov.bz/governmentpolicies/projects/cntmp/.

vehicles that are not captured in any national tracking system.[129] The ministry also said one vehicle distributor in Belize is offering a heavy-duty electric truck model.

Belize's utility, BEL, has played a significant role in promoting sustainable transport. It is deploying two fully electric vehicles in its fleet and procuring three DC fast charger stations and eight Level 2 charging stations.[130] The stations are projected to be installed in early 2022. The chargers will be distributed in the major municipalities around the country.

There is also one restricted access Tesla charging station already in operation (as of 2021) located at the Belize Boutique Resort and Spa.

Belize does not yet have an electric vehicle policy or roadmap nor a regulatory framework for electric vehicles.

The government is working with the European Development Fund to pilot three electric buses for inter- and intraurban transit beginning in 2022 along the George Price Highway (intercity: busiest highway route in Belize) and two electric buses for Belize City (intraurban). This pilot aims to demonstrate conditions for electric vehicle readiness for a national e-mobility transition and to inform sector growth and planning.

Other electric mobility plans by the Ministry of Public Utilities, Energy and Logistics in Belize include an e-mobility policy framework to encourage low carbon transport and international investments as well as support for a national electric transport policy. The e-mobility policy framework will examine electric vehicle and regulatory policy options while monitoring the electric bus pilot for practices that work well. This framework will also examine enabling investment options for upscaling e-mobility beyond the e-bus pilot. The ministry is emphasizing public-private partnerships and coordination among bus operators, investors, and other private-sector stakeholders to transition to more electric vehicle bus operation.

Policies, Measures, and Actions Implemented to Advance Transport Electrification in Belize

Policies, Measures, and Actions on Electric Vehicle Adoption

Belize's government and private partners have already taken several actions or measures to promote vehicle electrification, such as those listed in Table 16.

Table 16. Existing Policies, Measures, and Actions in Belize to Encourage Vehicle Electrification.

Policy, Measure, or Action Type	Year Initiated	Key Stakeholder(s)	Short Description
Electric vehicle policy plan	2018	Government of Belize	Electric vehicles are mentioned in the *Comprehensive National Transportation Master Plan*, which aims to contribute to achieving Belize's goals of reducing greenhouse gas emissions. The plan suggests electric bus and electric vehicle economic incentives as early actions.
Private sector electric vehicle pilot	2021	BEL	Belize's utility, BEL, incorporated two electric vehicles into its fleet. BEL also plans to contribute two electric motorcycles, one to the Belize City

[129] Geon Hanson, Personal Contact, December 2021
[130] Note: These were estimates of what is planned as of December 2021 but are subject to change at the implementation stage.

Policy, Measure, or Action Type	Year Initiated	Key Stakeholder(s)	Short Description
			Council and the other to an unidentified private organization, to encourage e-mobility.[131]
Creating a utility-driven electric vehicle charging infrastructure network	2021	BEL	BEL is rolling out a public electric vehicle charging network, installing three DC fast chargers and eight Level 2 chargers over the next few years.
Discussions for potential e-mobility policy framework and national electric transport policy	Discussions began in 2021	Ministry of Public Utilities, Energy and Logistics in Government of Belize	The Government of Belize is exploring the feasibility and potential of establishing both an electric mobility policy framework and e-mobility policy that could include economic and policy incentives. These discussions are in the early stages, as of December 2021.
Electric bus deployment target	2021	Government of Belize	The Government of Belize, in its updated Nationally Determined Contribution for 2021, describes a target to improve efficiency in the public transit system through the deployment of 77 hybrid and electric buses by 2030 (17 by 2025).[132]
Electric vehicle policy goals	2021	Government of Belize	The Government of Belize, in its updated Nationally Determined Contribution for 2021, explains its transportation target to facilitate adoption of electric vehicles in the passenger fleet by conducting a feasibility study of electric vehicle penetration, including assessing potential incentives and investing in electric vehicle charging infrastructure. This target also identifies transit fleets as a potential avenue for vehicle electrification.[133]
Public sector electric vehicle pilot	Beginning 2022	Government of Belize, the European Development Fund	Piloting five electric buses for inter- and intracity travel: 3 for intercity and 2 for intraurban (Belize City).

Barriers to Electric Vehicle Adoption and Electric Vehicle Market Needs

In an interview, an in-country expert highlighted several barriers to electric vehicle adoption.[134] The high upfront costs of electric vehicles are a challenge for households, businesses and government fleets. Greater external investment by donor banks is needed for electric bus and electric vehicle incentive programs as well as for charging infrastructure. Electric vehicles also carry a perceived risk of technological reliability and refueling availability. Basic data, such as the impact of temperature and humidity on battery life and performance, are also missing in the Belize context. Lastly, the Belize workforce lacks the necessary operational and maintenance capabilities for electric vehicles and chargers to ensure development of the electric vehicle market and mainstreaming of EV technology in Belize.

[131] "Electric Buses Coming to Belize City and Out West," Great Belize Television, November 2021. https://edition.channel5belize.com/archives/226152.
[132] *BELIZE Updated Nationally Determined Contribution,* IRENA, FAO, UNFCCC RCCMRVH, Vivid Economics, and Lucid Solutions, 2021. https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Belize%20First/Belize%20Updated%20NDC.pdf.
[133] Ibid.
[134] Geon Hanson, Personal Contact, December 2021.

Potential Regional Electric Vehicle Strategy (REVS) Measures

Potential Electric Vehicle Adoption Policies and Strategies

The measures in Table 17Table 28 could be next steps for vehicle electrification in Belize. Several build upon previous actions in Belize, while others may be considered as potential next steps. These measures were included given the preliminary stage of vehicle electrification in Belize as well as key country context.

Table 17. Potential Measures, Actions, and Policies to Encourage Electric Vehicle Adoption in Belize.

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
Develop an electric vehicle awareness campaign	Capacity Development & Awareness	Early Action	Begin an awareness campaign on vehicle electrification through promotional activities, fact sheets, ride-and-drive events, work groups, and development of "Electric Vehicle Clubs."
Develop electric vehicle training curriculum	Capacity Development & Awareness	Early Action	Develop and implement appropriate curricula to meet the need for electric vehicle-related workers, including drivers, mechanics, electricians, first-responders, among others.[135] This action could be government-led (e.g., by the Ministry of Education or the Ministry of Public Utilities, Energy and Logistics) or led by the private sector. These groups could work with academia to design curricula and incorporate any changes necessary as technology and information change.
Develop an electric vehicle roadmap	Capacity Development and Awareness	Early Action	Create a public-facing roadmap that describes milestones, responsibilities and strategies for bolstering EV adoption.
Electrify government fleet vehicles	Policy and Regulation	Early Action	Revise requirements around government fleet procurement of EVs (such as having 25% EVs by 2025) and implement pilot projects for electrification of government fleets. To facilitate this action, procedures and frameworks could be developed to guide procurement of government vehicles by technology or efficiency.
Electrify public transit buses	Policy and Regulation	Early Action	Build on the country's existing pilot to transition public transit buses to electric, improving public health outcomes and awareness.
Provide electric vehicle rebates	Policy and Regulation	Early Action	Private sector partners (e.g., vehicle dealerships) could incentivize car buyers toward EV adoption through rebates at the time of vehicle purchase.
Reduce import taxes on electric vehicles	Policy and Regulation	Early Action	Incentivize electric vehicle imports through reduced import tariffs. The government and academia could also study the financial impact of electric vehicles regarding the government's fossil-fuel taxes and import duties.
Streamline permitting for charging infrastructure	Policy and Regulation	Early Action	Update the permitting process for EV charging stations to ensure fast-tracking (compared to other permits). Instructions for installing electric vehicle charging infrastructure and associated permitting requirements could be made public on jurisdiction websites if permits are required for charging infrastructure installations.

[135] This action may be lower priority than some of the other actions listed in the table.

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
Auto dealership incentive	Policy and Regulation	Early Action	The private sector (e.g., banks or electric vehicle manufacturers) could provide small cash incentive for sales staff at auto dealerships to sell electric vehicles.
Private sector/shuttle bus electrification pilot	Policy and Regulation	Early Action	Private sector actors could replace a small number (e.g., 3 to 5) of their fleet vehicles. Actors could include hotels, airports, and/or ports that replace existing shuttle buses with electric buses. Monitor challenges and benefits during the deployment.
Conduct an electric or hybrid electric ferry feasibility study	Finance, Market Development, and Innovation	Medium Term	As Belize has numerous small islands and coastline accessible to residents and tourists, there is an opportunity to electrify maritime transport. Conduct a feasibility study of electric or hybrid-electric ferry integration to examine the impacts of ferry electrification on ferry operations, economics, and port electricity infrastructure.
Pilot electrification of taxis	Policy and Regulation	Medium Term	Replace a small number (e.g., 10 to 25) taxis with electric taxis. Monitor challenges and benefits during the deployment. This action would be led by the private sector (e.g., taxi or ridesharing companies).
Zoning, building codes, and parking reforms	Policy and Regulation	Medium Term	Incentivize private EV adoption through new zoning, building codes, and parking requirements that align with best practices.
Promote electric medium- and heavy-duty work trucks and freight delivery trucks	Policy and Regulation	Long Term	Develop policies for transitioning to electric medium- and heavy-duty work trucks and freight delivery trucks. In coming years, these vehicles are expected to reach cost parity with internal combustion engine vehicles.[136]

[136] McKinsey. "New reality: electric trucks and their implications on energy demand." 2017. https://www.mckinseyenergyinsights.com/insights/new-reality-electric-trucks-and-their-implications-on-energy-demand/

APPENDIX D: JAMAICA APPLICATION EXAMPLE

Overview

Table 18. Key statistics on Jamaica's transportation sector.

Key Transport Electrification Statistics	
Total Electric Vehicles on the Road (2022)	150[137]
Electric Vehicles as Share of Total Registered Vehicles (2019)	<1%[138]
Electric Vehicles as Share of New Car Sales (2018)	<1%[139]
Charging Points	25[140]

Jamaica is the second most populated island of CARICOM member states[141] and has one of the largest and quickest growing car markets in the Caribbean.[142] Jamaica currently has 150 electric vehicles adopted as of March 2022,[143] which is equivalent to less than 1% of the vehicle market share.[144] Currently there are 25 charging points as of March 2022.[145] Additionally, Jamaica Public Service Company (JPS Co.), the sole utility for the country, is currently working on an initiative to commission and install 10 additional public electric vehicle charging stations across the island.[146] The Government of Jamaica is actively pursuing new policies and programs to incentivize electric vehicle adoption, such as a 2021 statement by the Minister of Science, Energy and Technology noting a goal of a 10% electric vehicle use in 2030.[147]

This application example presents the current economic, energy, transportation, and vehicle electrification landscape in the country and identifies potential avenues for in-country stakeholders to further promote transportation electrification. Table 18, Table 19, and Table 20 all summarize key statistics on the transportation and electricity sectors for Jamaica.

Context: Jamaica's Economic and Energy Landscape

Economy

Jamaica is an upper-middle-income country, as classified by development indices. In 2009, the country established a long-term economic development plan, known as the *Vision 2030*

[137] REVS Steering Committee, Personal contact, March 2022.
[138] *Electrified Islands: The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[139] Deduced based on share of vehicles in country.
[140] REVS Steering Committee, Personal contact, March 2022.
[141] World Population Review, 2021. CARICOM Countries (worldpopulationreview.com).
[142] *Number of new vehicles registered or sold in selected countries in the Caribbean in 2019 (in 1,000s),* Statistica, 2019. https://www.statista.com/statistics/892271/caribbean-new-vehicle-sales-registration-number/.
[143] REVS Steering Committee, Personal contact, March 2022.
[144] *Electrified Islands: The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[145] Ibid.
[146] *First Public Electric Vehicle Charging Station to be Ready for New Year's Celebration – Gas Station Operators Get Onboard*, Jamaica Public Service Company, 2020. https://www.jpsco.com/first-public-electric-vehicle-charging-station-to-be-ready-for-new-years-celebration-gas-station-operators-get-onboard/.
[147] *Stakeholders Consultation Document: Proposals for a Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf.

Transport Sector Plan, with goals to achieve the status of being considered "developed."[148] However, Jamaica continues to experience economic difficulties including low growth, high public debt, and exposure to external shocks.[149] To combat these difficulties, in 2013 the country

launched an economic reform program aimed at stabilizing the economy, reducing debt, and encouraging growth. In 2018 and 2019, public debt fell below 100% of the gross domestic product (GDP) and continues to decline.[150] Additionally, the rate of unemployment fell to 7.2% by 2019.[151] The World Bank expects the country's poverty rate to decline due to reform programs, rising per-capita GDP, lower unemployment, and more social safety nets.[152]

Energy

Like many Caribbean island nations, Jamaica is heavily reliant on fossil fuels for its energy supply. The country's electricity production is comprised of 89% fossil fuels (such as petroleum and liquid natural gas), 6.5% wind, 3.5% hydropower, and 1% solar.[153] This means that about 11% of electricity production is generated from renewable energy. Jamaica has 1,071 MW of installed electricity capacity.[154] The country's renewable energy share is among the highest in the Caribbean. Additionally, the country has the largest wind energy facility in the Caribbean: the 62.7 MW Wigton Windfarm.[155]

Table 19. Key statistics on Jamaica's population and economy.

Population and Economy	
Population Size	2.97 million[1]
Total Area Size	11,000 sq km
Nominal GDP	US$25.13 billion
Share of GDP on Imports	9%
Share of GDP on Fuel Imports	3%
GDP Per Capita	US$9,000
Urban Population Percentage	52%

Jamaica's Prime Minister has set goals toward integrating more renewable energy into its energy mix, directing the government to aim for 50% of electricity generation to be sourced from renewable energy by 2030.[156] Also, in its *National Energy Policy 2009–2030* (NEP), the Government of Jamaica identified reducing energy dependence on imported fuel as an energy priority.[157] The NEP also identified the country's vulnerability to oil price volatility and supply disruption as an energy security threat.[158] An additional difficulty for the country's energy industry is the routine system losses of electricity due to inefficient transmission and distribution and energy theft, which consume 26% of

the electricity produced in the country[159] (compared to just 5% in the United States).[160] The NEP is setting Jamaica on a path to address energy security risks and integrate more renewable energy as fuel sources.

Jamaica's Transportation Landscape

Existing Transportation Network and Trends

Table 20. Key statistics on Jamaica's electricity and transportation sectors.

Electricity Sector Overview[161]	
Total Installed Capacity	1,071 MW
Peak Demand (2018)	655 MW

Electricity Generation Mix	Oil and diesel: 89% Renewables: 11%
Electricity Access	97%
Average Electricity Rates (USD/kWh)	Residential: $0.28 Commercial: $0.21 Industrial: $0.20
Transportation Sector	
Transport Sector as Share of Energy End Uses (2018)	~32%[162]
Total Vehicles Registered (2003–2016)	3,304,559 between 2003 and 2016[163]
Public Service Vehicles as Share of Total Vehicles	Unknown
Average Kilometers Per Day Driven by Car Owners	Unknown

Jamaica's transportation infrastructure consists of a road network that covers the entire island, six airports plus an air traffic control system, nine water ports, a rail track system, and six private mining railway lines.[164] Jamaica's road network is extensive, at over 15,300 kilometers.[165] There is one four-lane, controlled-access tolled highway, known as Highway 2000, with both an east-west link and a north-south link.[166] There is also a Northern Coastal Highway Improvement Project roadway connecting the west and east sides of the island.[167]

The country's Ministry of Transport and Mining is responsible for overseeing the transportation sector with assistance from other agencies such as the National Works Agency, the Transport Authority, and the Island Traffic Authority.[168] Jamaica has a National Transport Policy, adopted in 2007, which integrates policy themes such as environmental

[148] *Vision 2030 Jamaica: National Development Plan*, Planning Institute of Jamaica, 2019. https://sustainabledevelopment.un.org/content/documents/1501jamaica.pdf.
[149] *The World Bank in Jamaica: Overview*, The World Bank, 2020. https://www.worldbank.org/en/country/jamaica/overview.
[150] Ibid.
[151] Ibid.
[152] Ibid.
[153] Ibid.
[154] Ibid.
[155] *Electrified Islands: The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[156] https://solarheadofstate.org/press-releases/2018/jamaicasolar as cited in *Jamaica Energy Snapshot, Energy Transition Initiative*, National Renewable Energy Laboratory, 2020. https://www.energy.gov/sites/prod/files/2020/09/f79/ETI-Energy-Snapshot-Jamaica_FY20.pdf.
[157] *Jamaica's National Energy Policy: 2009-2030*, The Ministry of Energy and Mining, 2009. https://www.mset. gov.jm/wp-content/uploads/2019/07/National-Energy-Policy_0.pdf.
[158] *Development of Renewable Energy in Jamaica: A Regulatory Perspective*, Francis, C., Office of Utilities Regulation, February 2018. https://www.our.org.jm/ourweb/sites/default/files/documents/sector_documents/presentation_4a_-_development_of_re_market_in_jamaica_c_francis_2018_feb_7.pdf.
[159] *The World Bank in Jamaica: Overview,* The World Bank, 2020. https://www.worldbank.org/en/country/jamaica/overview.
[160] *Frequently Asked Questions*, Energy Information Administration, 2021. https://www.eia.gov/tools/faqs/faq.php?id=105&t=3
[161] *Jamaica Energy Snapshot, Energy Transition Initiative*, National Renewable Energy Laboratory, 2020. https://www.energy.gov/sites/prod/files/2020/09/f79/ETI-Energy-Snapshot-Jamaica_FY20.pdf.
[162] *2017 Energy Report Card Jamaica*, Europa, 2018. https://europa.eu/capacity4dev/file/88809/download?token=9l2UjQvP.
[163] Ibid.
[164] *National Transport Policy*, Government of Jamaica Ministry of Transport and Works, 2007. http://www.oas.org/en/sedi/dsd/Biodiversity/Sustainable_Cities/Sustainable_Communities/Events/SC%20Course%20Jamaica%202016/Module%20III/National%20Transport%20Policy-%20Jamaica.pdf.
[165] Ibid.
[166] *Pathways to climate change mitigation and stable energy by 100% renewable for a small island: Jamaica as an example*, Chen et al., Renewable and Sustainable Energy Reviews, 2020. https://www.sciencedirect.com/science/article/abs/pii/S1364032119308767.
[167] Ibid.
[168] *Stakeholders Consultation Document: Proposals for a Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf.

protection, cost recovery of services, economic growth, private-sector participation, energy efficiency, and equal access to transportation services.[169] The country's transportation system faces some fundamental difficulties such as a lack of adequate investment for infrastructure due to limited public resources, the need for more institutional reforms, lack of data tracking, and limited capacity of the public sector to manage resources, enforce regulations, and effectively guide transportation system development.[170]

Jamaica has turned towards alternative fuel use in recent years. Compressed natural gas and liquefied petroleum gas have been used as cleaner transportation fuel alternatives. There are currently 5 compressed natural gas buses in operation. There are also some cases of liquefied petroleum gas being used for passenger cars.[171]

Jamaica has experienced rapid population growth and urbanization over the last several decades. This migration, coupled with inconsistent land use planning and lack of enforcing existing regulations, has resulted in communities being developed in high-risk areas that are prone to landslides and flooding, threatening community safety and infrastructure.[172] Additionally, climate change considerations in national transportation planning, including the country's *Vision 2030 Transport Sector Plan*, have been limited with respect to evaluating disaster risk and resilient design.[173] Thus, there remains a strong need for the country to prioritize transportation network resilience and consider sustainable solutions, which could include vehicle electrification.

Vehicle Use in Jamaica

Jamaica's road transportation sector is predominantly comprised of vehicles that rely on petroleum fuel, with most using gasoline or diesel.[174] The vast majority of on-road vehicles in the country are imported, with nearly 70% of imported vehicles being small cars (Figure 6). A significant portion of these vehicles are used.[175] Jamaica has one of the region's largest car markets, which is growing quickly, with over 514,000 vehicles registered in the

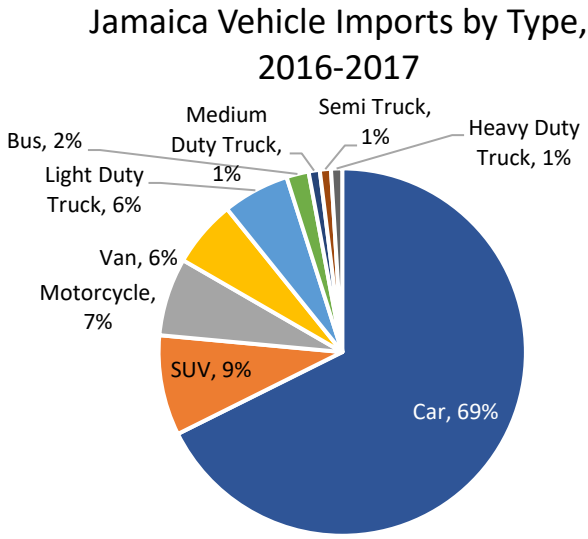


Figure 6. Vehicle Imports by Type in Jamaica, 2016-2017. Source: Jamaica Transportation Greenhouse Gas Reduction Plan, U.S. National Renewable Energy Laboratory, 2019.

[169] Ibid.
[170] Ibid.
[171] Curtis Boodoo, Personal Contact, October 2021.
[172] *Vulnerability Assessment of Jamaica's Transport Sector*, United States Agency for International Development, 2018. https://www.climatelinks.org/sites/default/files/asset/document/20180328_USAID-ATLAS_Vulnerability-Assessment-of-Jamaica-Transport-Sector_final.pdf.
[173] Ibid.
[174] *Jamaica Transportation Greenhouse Gas Reduction Plan*, U.S. National Renewable Energy Laboratory, 2019. https://www.nrel.gov/docs/fy19osti/73380.pdf.
[175] Interview with Jamaica Public Service Company, July 2021.

country in 2016.[176] In a 2019 study, the U.S. National Renewable Energy Laboratory (NREL) developed a database of vehicle imports in Jamaica for 2016-2017, and noted the inclusion of 1,309 hybrid electric vehicles and 44 all-electric vehicles in the overall number of vehicles on the road.[177] Most other sources, however, estimate the number of all-electric vehicles to be much lower, closer to between 150.[178]

NREL also determined that the average age for vehicles imported to Jamaica is 3.6 years.[179] In the same study, NREL extrapolated vehicle kilometers traveled (VKT) in Jamaica based on the country's fuel consumption and using data from similar countries,[180] determining that light-duty vehicles' VKT per capita is about 2,887, while medium-duty vehicles' and heavy-duty vehicles' VKT per capita is 471.[181]

Electric Vehicle Charging Infrastructure in Jamaica

As mentioned above, JPS Co. plans to install 10 electric vehicle chargers in Jamaica. The company anticipates that at least six of those stations will be built by the end of 2021 in the cities of Kingston, Montego Bay, and other urban areas.[182] At least five of the 10 charging stations will be located at gas stations owned by Total Jamaica or Boots Gas Station.[183] Three of the chargers JPS Co. installs will be DC fast chargers, while seven will be Level 2 chargers.[184] A privately owned AC Marriott hotel in Kingston reportedly has installed three electric vehicle chargers and offers use of them at no cost to electric vehicle owners.[185]

Policies, Measures, and Actions Implemented to Advance Transport Electrification in Jamaica

Policies, Measures, and Actions on Electric Vehicle Adoption

Jamaica's government and private partners have already taken several actions or measures to promote vehicle electrification, such as those listed in Table 21.

---

[176] *Electrified Islands: The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[177] *Jamaica Transportation Greenhouse Gas Reduction Plan*, U.S. National Renewable Energy Laboratory, 2019. https://www.nrel.gov/docs/fy19osti/73380.pdf
[178] REVS Steering Committee, Personal contact, March 2022.
[179] *Electrified Islands: The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[180] Ibid.
[181] Ibid.
[182] *First Public Electric Vehicle Charging Station Opened – Signals Start of Transportation Revolution for Jamaica*, Jamaica Public Service Company, 2021. https://www.jpsco.com/first-public-electric-vehicle-charging-station-opened-signals-start-of-transportation-revolution-for-jamaica/.
[183] *First Public Electric Vehicle Charging Station to be Ready for New Year's Celebration – Gas Station Operators Get Onboard*, Jamaica Public Service Company, 2020. https://www.jpsco.com/first-public-electric-vehicle-charging-station-to-be-ready-for-new-years-celebration-gas-station-operators-get-onboard/.
[184] Interview, Jamaica Public Service Company, July 2021.
[185] *Stakeholders Consultation Document: Proposals for A Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf

Table 21. Policies, Measures, and Actions in Jamaica to Encourage Vehicle Electrification.

Policy, Measure, or Action Type	Year Initiated	Key Stakeholder(s)	Short Description
Created imported energy reduction target	2009	Government of Jamaica	The Government of Jamaica noted in its *2009–2030 National Energy Policy* a desire to reduce reliance on imported fuel as an energy source. This was stated as an energy policy priority.[186]
Implemented carbon-based fuel taxes	2017	Government of Jamaica	The Government of Jamaica incentivized drivers to reduce their greenhouse gas emissions through a fuel tax.[187]
Drafted electric vehicle policy	Announced 2019	Jamaica Information Service	In February 2019, the Government of Jamaica announced that it would draft an electric vehicle policy,[188] intended to be comprehensive (currently being developed in consultation with private and public agency partners).[189] This policy will provide direction on electric vehicle imports.[190]
Raised age limit for imported vehicles	2019	Government of Jamaica	Serving as a disincentive for electric vehicle purchases, the Government of Jamaica increased the age limit for imported vehicles from five years to six years. This creates more influx of older, cheaper, pre-owned internal combustion engine vehicles that are more attractive in a mass market.[191] This discourages electric vehicle purchases.
Introduced electricity tariffs	2019	JPS Co.	JPS Co. began exploring the option of electricity tariffs.[192]
Creating a utility-driven electric vehicle charging infrastructure network	2019	JPS Co.	JPS Co. is aiming to create an initial public charging network across the island to provide charging opportunities for existing electric vehicle users and to encourage more non-electric vehicle drivers to consider driving electric.[193] Deployed 3 chargers in operation and aiming for a network of 10 chargers.
Offered pilot for electric vehicles to be integrated into Government fleet	2021	Inter-American Development Bank (IDB) and Government of Jamaica	The Government of Jamaica began working with the IDB to pilot an electric vehicle program funded by the Global Environment Facility to integrate electric vehicles into a government fleet, possibly with electric buses.[194] This pilot could inform the Government on costs and benefits associated with electric vehicles, as well as on any fiscal incentives that could prove influential.
Created electric vehicle target	Current as of 2021	Ministry of Science, Energy and Technology	The Ministry targeted 10% electric vehicle uptake as a share of the transport mix in 2030.[195]

[186] THE NATIONAL ENERGY POLICY 2009 – 2030 (jis.gov.jm).
[187] *Revenue Measures for Fiscal Year 2017/18*, Jamaica Ministry of Finance and the Public Service, 2017. http://go-jamaica.com/revenuemeasures/
[188] *Stakeholders Consultation Document: Proposals for A Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf
[189] *Government to develop comprehensive electric car import policy*, The Gleaner, May 2021. https://jamaica-gleaner.com/article/news/20210511/government-develop-comprehensive-electric-car-import-policy.
[190] Ibid.
[191] *ELECTRIFIED ISLANDS The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[192] Ibid.
[193] *Webinar, CREF,* Dionne Nugent, JPS Co., October 2021, Replays - Caribbean Renewable Energy Forum (newenergyevents.com).
[194] *ELECTRIFIED ISLANDS The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[195] https://www.jamaicaobserver.com/the-agenda/is-jamaica-s-entry-into-the-electric-vehicle-market-a-good-idea-_225235.

Policy, Measure, or Action Type	Year Initiated	Key Stakeholder(s)	Short Description
Established electric mobility working group	Current as of 2021	IDB, Government of Jamaica, and other stakeholders	The IDB and Government of Jamaica established a strategic framework to develop a working group, known as the EV Council, to advise on national electric vehicle incentives, standards, regulations, adoption policies, and targets.[196]
Reduced special consumption tax	Current as of 2021	Government of Jamaica	The Government of Jamaica set the special consumption tax to 0% for highly efficient hybrids, electric vehicles, and motorcycles (while increasing the tax rate for vehicles with larger engines).[197] Note that the general consumption tax is the same for all vehicles: 16.5% if imported by an individual and 21.5% if imported by a dealer.[198]
Private Sector Electric Bus Pilot	Current as of 2021	UNDP and UWI Mona Campus	An electric bus pilot is being let by the UWI Mona Campus.
Public Sector Electric Bus Pilot	Current as of 2021	JUTC, Government of Jamaica	There is also an electric bus pilot being led by the JUTC study. There is an ongoing comparative analysis comparing liquefied natural gas, diesel, and electric buses and the government's appraisal branch is seeking final approval to implement an electric bus project. The branch is currently writing a business case for e-buses.
Added import duty on electric vehicles	Current as of 2021	Government of Jamaica	The Government of Jamaica added an import duty of 30% on electric vehicles to disincentivize electric vehicle purchases.[199]
Integrated electric vehicles into utility fleet	Current as of 2021	JPS Co.	JPS Co. examined the feasibility of integrating electric vehicles into the company's vehicle fleet in increments, performing electric vehicle forecasts out to 2030.[200] JPS Co. is aiming to incorporate three electric vehicles into its utility fleet.
Added time-of-use rates	Current as of 2021	JPS Co.	JPS Co. is offering special time-of-use rates for electric vehicle charging.[201]
Trained mechanics in electric vehicle technology	Current as of 2021	JPS Co.	JPS Co. is working to connect with a national training institution to ensure that mechanics and first responders are trained in electric vehicle technology.[202]
Engaging in gender equity initiative	Current as of 2021	JPS Co.	JPS Co. is engaged in an initiative to ensure gender equity, where women are represented in electric vehicle planning at all stages of the planning process.[203] Held a women's forum on electric vehicles.
Approving electric vehicle rate	Current as of 2021	Office of Utilities Regulation	The Office of Utilities Regulation has provided approval in its 2019–2024 Tariff review to establish electric vehicle charging rates based on the time-of-use rate format, set at 5% more than the residential time-of-use rate charges.[204] The Office of Utilities Regulation issued a consultation document in 2021, *Proposals for a Regulator Framework to Facilitate*

[196] *ELECTRIFIED ISLANDS The Road to E-Mobility in the Caribbean*, Viscidi et al., 2020. https://www.thedialogue.org/wp-content/uploads/2020/02/Electrified-Islands-Final.pdf.
[197] *Jamaica Transportation Greenhouse Gas Reduction Plan*, US National Renewable Energy Laboratory, 2019. https://www.nrel.gov/docs/fy19osti/73380.pdf
[198] Ibid.
[199] Ibid.
[200] *Stakeholders Consultation Document: Proposals for A Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf
[201] Ibid.
[202] Ibid.
[203] Interview, Jamaica Public Service Company, July 2021.
[204] OUR Document JPS 2019-2024 Tariff Review Determination Notice, December 2020, as cited in *Stakeholders Consultation Document: Proposals for a Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf.

Policy, Measure, or Action Type	Year Initiated	Key Stakeholder(s)	Short Description
			the Penetration of EVs in Jamaica, which described grid impacts.[205]

The Government of Jamaica has only begun taking action to advance vehicle electrification within the past five years. Early actions by both the Government and stakeholders have been to integrate limited numbers of electric vehicles into existing fleets, set targets for vehicle adoption, and establish policies for imported electric vehicles. Additionally, the Government is in consultation with external partners to plan for electric vehicle policies. For example, JPS Co., IDB, and other stakeholders are participating in an electric mobility working group to advise on a comprehensive electric vehicle policy, which is currently being developed as of 2021. Given that there are about 20 electric vehicles (presumably a mix of personal vehicles, fleet vehicles, and Government vehicles) currently being deployed in Jamaica, existing incentives may have already encouraged electric vehicle adoption.

In addition to the actions listed in the table, other actions have been taken in the country. For example, Jamaica's Minister of Science, Energy and Technology has targeted electric mobility as a priority area that can help advance several energy and transportation policy goals.[206] To inform the Government's anticipated electric vehicle policy, the Government of Jamaica is finalizing a strategic framework for electric mobility, with assistance from the IDB. The IDB is also providing financial assistance to Jamaica for building out an electric vehicle ecosystem and growing human capacity in this space. In recent years there have been other vehicle electrification studies underway to advise the Government of Jamaica on potential avenues for promoting and incentivizing electric vehicles.[207]

Barriers to Electric Vehicle Adoption

Jamaica is in a very early stage of vehicle electrification, having recently adopted initial measures to promote vehicle electrification and with approximately 20 electric vehicles on the road. Several barriers have been identified that are relevant to consider as Jamaica plans further measures and actions to increase vehicle electrification. It is important to note that the authors documented most of these barriers during consultations with JPS Co. in July 2021 and through internet research cited in footnotes.

The high upfront purchase cost for an electric vehicle is a key barrier to adoption, even for used electric vehicles that enter the market. The high prices for electric vehicles make them less cost-competitive to car buyers relative to vehicles with internal combustion engines. One estimate suggests that electric vehicles have about a 30% higher acquisition cost than internal combustion engine vehicles.[208] Jamaica, like many CARICOM member states, has a significant portion of used vehicles imported and sold within its vehicle market due to their affordability. Used electric vehicles are still typically sold at a

[205] *Webinar, CREF,* Dionne Nugent, JPS Co., October 2021, Replays - Caribbean Renewable Energy Forum (newenergyevents.com).
[206] *Jamaica Transportation Greenhouse Gas Reduction Plan*, US National Renewable Energy Laboratory, 2019. https://www.nrel.gov/docs/fy19osti/73380.pdf
[207] *Stakeholders Consultation Document: Proposals for A Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf
[208] *Jamaica's entry into the electric vehicle market a good idea?* Jamaica Observer, .July 2021. Is Jamaica's entry into the electric vehicle market a good idea? (jamaicaobserver.com).

higher price point than used internal combustion engine vehicles. This high upfront cost for electric vehicles is also a barrier for bus and taxi companies that might otherwise consider electric vehicle options for their fleets.[209]

The lack of publicly available electric vehicle charging infrastructure is another challenge. As of 2020, Jamaica had only one public charging port, which both limits opportunities for the public to become aware of electric vehicles and presents a challenge to existing users of electric vehicles who may not have enough options for refueling. However, JPS Co. is making efforts to install more charging stations throughout the country (as described above). JPS Co. noted that it can be also difficult to integrate electric vehicle charging station infrastructure into a potential site host's business model when certain companies are hesitant. These entities vary in their willingness to serve as electric vehicle infrastructure site hosts, making it challenging to secure locations for charging infrastructure.

The lack of public awareness of electric vehicles and car dealerships is also an impediment to encouraging electric vehicle adoption. Jamaica's Office of Utilities Regulation's electric vehicle working group conducted a survey indicating that consumers in Jamaica are generally unaware of the technology and the benefits of owning electric vehicles.[210] With the installation of more public charging infrastructure, there will potentially be more demand for both electric vehicles and mechanics who are trained in working with electric vehicle technologies. Training more mechanics in electric vehicle technology would be a useful way for Jamaica to scale up its electric vehicle market and improve awareness.

Electricity theft is a significant problem in Jamaica. This theft is manifested in broad system losses and is also a large risk to the electricity sector.[211] If electric vehicles become more widely adopted in Jamaica, this may present opportunities for certain consumers to illegally steal electricity for electric vehicle charging.

The COVID-19 pandemic has also presented challenges to electric vehicle adoption.[212] These challenges include difficulty with integrating a charging infrastructure, ensuring that the right hardware and software is integrated, and the COVID-19 travel restrictions that have presented challenges for commissioning charging stations. These challenges include a limited ability for individuals to travel across borders to promote business or move material, labor shortages, and supply chain issues. The economic challenges spurred by COVID-19 have also prompted the Government of Jamaica to prioritize other issues over electric mobility, though the Government will adopt an electric mobility strategy in 2021, which could help provide momentum for more electric vehicle incentives.

---

[209] *Stakeholders Consultation Document: Proposals for A Regulatory Framework to Facilitate the Penetration of Electric Vehicles in Jamaica*, Office of Utilities Regulation, 2021. OURs-EV-Stakeholders-Consultation-Document-2021-May-12.pdf

[210] *Is Jamaica's entry into the electric vehicle market a good idea?,* Jamaica Observer, July 2021.Is Jamaica's entry into the electric vehicle market a good idea? (jamaicaobserver.com).

[211] Ibid.

[212] Barriers related to the COVID-19 pandemic were discussed in consultation with JPS Co. in July 2021.

Potential Regional Electric Vehicle Strategy (REVS) Measures

Potential Electric Vehicle Adoption Policies and Strategies

The measures in Table 22 may be considered as potential next steps for the country. A few of these actions may build upon previous actions, while others may be considered because Jamaica is in the preliminary stages of electric vehicle rollout and these actions could be reasonable early steps.

Table 22. Potential Measures, Actions, and Policies to Encourage Electric Vehicle Adoption in Jamaica.

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
Further expand existing electric vehicle awareness campaign	Capacity Development & Awareness	Early Action	Advance awareness on vehicle electrification through promotional activities, fact sheets, ride-and-drive events, work groups, and the development of "Electric Vehicle Clubs."
Continue to develop electric vehicle training curricula for drivers, mechanics, and electricians	Capacity Development & Awareness	Early Action	Develop and implement appropriate curricula to meet the need for electric vehicle-related technicians.
Develop an electric vehicle roadmap	Capacity Development and Awareness	Early Action	Create a public-facing roadmap that outlines milestones, responsibilities, and strategies for bolstering EV adoption, building upon Jamaica's electric vehicle policy.
Electrify government fleet vehicles	Policy and Regulation	Early Action	Revise requirements around Government fleet procurement of EVs (such as having 25% EVs by 2025) and implement pilot projects for electrification of government fleets.
Electrify public transit buses	Policy and Regulation	Early Action	Transition public transit buses to electric, improving public health outcomes and awareness.
Provide electric vehicle rebates	Policy and Regulation	Early Action	Incentivize car buyers toward EV adoption through rebates at the time of vehicle purchase.
Reduce import taxes on electric vehicles	Policy and Regulation	Early Action	Incentivize electric vehicle imports through reduced import tariffs.
Streamline permitting for charging infrastructure	Policy and Regulation	Early Action	Update the permitting process for EV charging stations to ensure fast-tracking (compared to other permits). Instructions for installing electric vehicle charging infrastructure and associated permitting requirements could be made public on jurisdiction websites if permits are required for charging infrastructure installations.
Auto dealership incentive	Policy and Regulation	Early Action	Provide small cash incentive for sales staff at auto dealerships to sell electric vehicles.
Private sector/shuttle bus electrification pilot	Policy and Regulation	Early Action	Replace a small number (e.g., 3 to 5) of hotel, airport and/or port shuttle buses with electric buses. Monitor challenges and benefits during the deployment.
Provide rebates for low-income drivers	Policy and Regulation	Medium Term	Create an equity-driven rebate program aimed at low- and moderate-income households to help reduce free ridership and improve the cost-effectiveness of EVs. These could be particularly useful for taxi drivers or delivery service drivers. This could also apply to alternative forms of electric transport, such as offering rebates for e-bikes.

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
			Provide point-of-sale rebates to vehicle buyers who meet certain eligibility criteria (e.g., income under $50K per year, vehicle upfront cost under $40K, etc.).
Taxi electrification pilot	Policy and Regulation	Medium Term	Replace a small number (e.g., 10 to 25) taxis with electric taxis. Monitor challenges and benefits during the deployment.
Promote electric medium- and heavy-duty work trucks and freight delivery trucks	Policy and Regulation	Long Term	Develop policies for transitioning to electric medium- and heavy-duty work trucks and freight delivery trucks. In coming years, these vehicles are expected to reach cost parity with internal combustion engine vehicles.[213]
Zoning, building codes, and parking reforms	Policy and Regulation	Long Term	Incentivize private EV adoption through new zoning, building codes, and parking requirements that align with best practices.
Government fleet rental pilot	Policy and Regulation	Long Term	Allow tourists to rent government EVs on weekends and holidays, thus ensuring high vehicle utilization and low total costs.

The Government of Jamaica has set a limited number of softer targets to pursue electric mobility. Many of some of the actions in Table 28 can help the Government to either incentivize electric vehicles and charging infrastructure purchases or encourage more adoption through their own fleet conversions. The Government can build on its existing electric mobility goals by setting binding achievable electric vehicle deployment targets. A clear early step for the country would be to identify some near-term, achievable actions to promote electric vehicles, perhaps by developing an electric vehicle roadmap.

Additionally, one mechanism to minimize the impacts of increased electric vehicle charging on the electric grid is to develop a strategy to manage charging behavior. Action before electric vehicles are more widely adopted is necessary to mitigate undesired impacts on the electric grid. Relatedly Jamaica's utility emphasized in an interview that adjusting the zoning laws to encourage more multifamily unit dwellings to offer electric vehicle charging stations could be beneficial for vehicle electrification. Putting electric vehicle charging station standards in place could also help to ensure consistency in the types of charging ports being installed. To incentivize electric vehicle charging infrastructure and encourage innovative business models, it would also be helpful for electricity regulators to more closely regulate the charging infrastructure and define the roles of utilities and others in the charging infrastructure value chain.[214]

[213] McKinsey (2017) New reality: electric trucks and their implications on energy demand. https://www.mckinseyenergyinsights.com/insights/new-reality-electric-trucks-and-their-implications-on-energy-demand/
[214] Ibid.

This page is intentionally left blank.

APPENDIX E: MONTSERRAT APPLICATION EXAMPLE

Overview

Table 23. Key statistics on Montserrat's transportation sector.

Key Transport Electrification Statistics	
Total Electric Vehicles on the Road	~5[215]
Electric Vehicles as Share of Total Registered Vehicles (2019)	<1%
Electric Vehicles as Share of New Car Sales	<1%
Charging Points	2

Montserrat is a small island country in the Caribbean, with a population of just under 5,000 people, the lowest population among the REVS application examples. Montserrat is in an early stage of vehicle electrification, with an estimate of only five electric vehicles in use and two public Level 2 charging stations available. Four of the electric vehicles are privately owned, while one is owned by a government agency.[216] Montserrat's government is beginning to plan for electric vehicles and already offers some incentives and pilot programs.

This application example of transport electrification efforts in Montserrat presents an overview of key country context; details of policies, measures, and actions on transport electrification in the country; and input on potential future actions to encourage vehicle electrification. Table 23, Table 24, Table 25, and Table 26 summarize key statistics on Montserrat's transportation and energy landscape.

Context – Economy and Energy

Table 24. Key statistics on Montserrat's population and economy.

Population & Economy[217]	
Population Size	4,649
Total Area Size	102 Sq. Km
Total GDP	$167.4 million
Share of GDP on Fuel Imports	2.4%
GDP Per Capita	$34,000
Urban Population Percentage	9.2%

Economy

Montserrat is one of the smaller island nations in the Caribbean region, with a total area of 102 square kilometers and a population of 4,649, less than 10 percent of whom live in an urban area.[218] Historically, Montserrat had an economy built around the island's sugar plantations, which were converted to small farm shares in the mid-nineteenth century.

Two-thirds of Montserrat's population, or roughly 8,000 people, fled abroad during a devastating volcanic eruption in 1995, after which the country's original capital, Plymouth, was abandoned in 1997 and the de facto capital became Brades Estate where interim

[215] Kenrick Burke, Personal Contact, December 2021.
[216] Ibid.
[217] Montserrat Factsheet, CIA, World Factbook, 2021. https://www.cia.gov/the-world-factbook/static/7961f325d864df2d18fcd1b6fc075ea2/MH-summary.pdf.
[218] *Montserrat Historical Population Profile – Census 1881 – 2018*. https://statistics.gov.ms/subjects/social-and-demographic-statistics/population-and-demography/montserrat-historical-population-profile-census-1881-2018/

government buildings have been constructed, with the southern half of Montserrat uninhabitable due to volcanic activity.[219] Prior to the eruption, Montserrat was classified as a higher income country by the CIA World Factbook until much of the country's infrastructure and economy was destroyed.[220]

Montserrat's leading industries are tourism, rum, textiles, agriculture, and building electronic appliances. The primary exports are sand and related byproducts.[221] As of September 2020, 2,727 people in Montserrat participated in the labor force, with the top five occupations including service and sales (23%), technicians and associate professionals (16%), and elementary occupations (14%).[222]

Table 25. Key statistics on Montserrat's electricity sector.

Electricity Sector Overview[223]	
Total Installed Capacity	7.3 MW
RE Installed Capacity Share	3.5%
Peak Demand (2018)	2.1 MW
Electricity Generation Mix	96.5% Fuel Oil
Electricity Access	100%
Average Electricity Rates (USD/kWh)	Residential: $0.50 Commercial: $0.52 Industrial: $0.51

Energy

The Montserrat Utilities Limited (MUL) is Montserrat's sole electric utility. At approximately $USD 0.50 per kilowatt-hour, electricity prices in Montserrat are higher than the average in the Caribbean. Its energy supply is also predominantly sourced from heavy fuel oil.[224] For example, in Montserrat the share of renewable energy in the energy supply mix is 3%, with the remainder supplied by fossil fuels (largely heavy fuel oil).[225]

In 2016, Montserrat set a goal of achieving a 100% renewable energy generation capacity by 2020. Notably, the country has one of the region's highest per-capita levels of greenhouse gas emissions due to its reliance on temporary, inefficient diesel generators.[226]

Incorporating more renewable sources, such as solar and wind, into its energy supply can help Montserrat reduce its carbon footprint. Montserrat also has significant potential capacity for geothermal energy production, with some sources citing an estimated 60 MW of usable capacity and others citing an estimated 940 MW of potential capacity for geothermal.[227] Montserrat currently has 1 MW of installed solar capacity.[228] The government has also proposed a 100% CO_2 emissions reduction target for the power sector by 2027 against 2012 business-as-usual levels.[229]

---

[219] Ibid.
[220] *Montserrat*, CIA World Factbook, 2021. https://www.cia.gov/the-world-factbook/countries/montserrat/.
[221] *Statistics Compendium 2016 – 2019*. Statistics Department Montserrat. 2021. https://statistics.gov.ms/wp-content/uploads/2021/08/Statistics-Conpendium.pdf
[222] *Statistics Department Releases Infographic on Labour Force Survey Main Indicators*. Government of Montserrat. 2021. https://www.gov.ms/2021/05/03/statistics-department-releases-infographic-on-labour-force-survey-main-indicators/
[223] *ETI Energy Snapshot - Montserrat,* National Renewable Energy Laboratory. June 2020. https://www.energy.gov/sites/default/files/2020/09/f79/ETI-Energy-Snapshot-Montserrat_FY20.pdf
[224] *The Power to Change, The Montserrat Energy Policy 2016 – 2030*, Ministry of Communications, Works, Energy & Labour, 2016. https://www.gov.ms/government/ministries/ministry-of-finance-economic-management/policy-register/.
[225] *Renewable Islands Index and Marketplace*, Caribbean Renewable Energy Forum, Castalia, 2020. https://castalia-advisors.com/cref-2020/.
[226] C-SERMS Baseline Report and Assessment, GIZ, 2015. https://c-serms.org/wp-content/uploads/2018/04/C-SERMS_Baseline_10.29.2015.pdf.
[227] *Planning 100% Renewable Energy Islands – The Case of the Caribbean Island of Montserrat*, CIRED, 2017. http://cired.net/publications/cired2017/pdfs/cired2017_0728_final.pdf.
[228] *Islands Energy Program Statement of Qualifications*, Rocky Mountain Institute, 2019. https://rmi.org/wp-content/uploads/2019/05/rmi-islands-energy-statement-qualifications-2019.pdf.
[229] C-SERMS Baseline Report and Assessment, GIZ, 2015. https://c-serms.org/wp-content/uploads/2018/04/C-SERMS_Baseline_10.29.2015.pdf.

Context – Transportation

Table 26. Key statistics on Montserrat's transportation sector.

Transportation Sector[230]	
Transport Sector as Share of Energy End Uses	51%
Total Vehicles Registered (2019)	3,141[231]
Public Service Vehicles as Share of Total Vehicles	Unknown
Average km-per-day Driven by Car Owners	Unknown

Existing Transportation Network and Trends

The Public Works Department constructs and maintains the public road and drainage networks in Montserrat. Prior to the 1996 volcanic eruption, which devastated a significant part of the country, Montserrat's road network was 269 kilometers. There are considerably fewer usable roads since the eruption, as many were destroyed.[232] Montserrat has one airport and two major seaports, Little Bay and Plymouth.[233]

In its Energy Policy 2016-2030, the Government of Montserrat identified policy opportunities and strategies to integrate sustainability into the transportation system. Some policies include improving public transport through public-private partnerships and increased cost-effectiveness, developing emissions standards for vehicles imported to the island, implementing tariffs for fuel efficient vehicles, facilitating public awareness campaigns and stakeholder dialogues, and assessing the potential to power ferries using renewable energy.[234]

Vehicle Use in Montserrat

The transportation sector in Montserrat accounts for roughly 51 percent of fossil fuel imports, with ground transportation uses accounting for 44 percent.[235] Over 90 percent of the government's vehicles are over five years old, and therefore present an opportunity for the Government of Montserrat to consider converting its fleet to electric, as has been done with one vehicle as a pilot.[236]

A significant portion of Monserrat's vehicle supply is received by individual vehicle importer firms that then sell the vehicles on the island, and some vehicles are also sold through car dealerships such as Toyota or Nissan that have business locations on the island. [237]

Electric Vehicle Use in Montserrat

There are two public electric vehicle charging stations in Montserrat and five recorded electric vehicles in use, one of which is government-owned. The government is drafting an

[230] *ETI Energy Snapshot - Montserrat,* National Renewable Energy Laboratory. June 2020. https://www.energy.gov/sites/default/files/2020/09/f79/ETI-Energy-Snapshot-Montserrat_FY20.pdf.
[231] *Transport, Storage, and Communication*, Statistics Department Montserrat, 2019. https://statistics.gov.ms/subjects/economic-statistics/transport-storage-and-communication/.
[232] *Montserrat*, Dickinson College, 2005. https://mosaics.dickinson.edu/montserrat2005/sociology-of-disasters/infrastructure-and-transportation-on-montserrat/infrastructure/.
[233] *Montserrat*, CIA World Factbook, https://www.cia.gov/the-world-factbook/countries/montserrat/.
[234] *THE MONTSERRAT ENERGY POLICY 2016 – 2030, 2016*, Government of Montserrat, 2016. https://www.gov.ms/wp-content/uploads/2020/07/The-Power-to-Change-MNEP-Cabinet-Approved.pdf.
[235] *Did You Know That 100% Electric Cars Are Exempted From Customs & Consumption Tax in Montserrat?*, 664 Connect, https://www.664connect.com/did-you-know-that-100-electric-cars-are-exempted-from-customs-consumption-tax-in-montserrat/
[236] *Audit Report Recommends Government of Montserrat Speeds Up Shift to Electric Vehicles*, Discover Monserrat, 2020 https://discovermni.com/2020/10/30/audit-report-recommends-government-of-montserrat-speeds-up-shift-to-electric-vehicles/.
[237] Kenrick Burke, Personal Contact, December 2021.

e-mobility policy and exploring options for electrifying more of its fleet as well as encouraging the public to adopt electric vehicles through new tax and fee incentives.[238] The government has distributed surveys to assess public opinion towards electric vehicles, and initial results are relatively positive. There is also a pilot project inviting civil servants to test drive the government's electric vehicle.[239]

Policies, Measures, and Actions Implemented to Advance Transport Electrification in Montserrat

The Government of Montserrat is in the early stages of implementing actions to advance electrification of vehicles on the island. In its Energy Policy 2016-2030, the government supports the use of electric vehicles and hybrid electric vehicles as well as advanced electrification technologies. The government has also purchased an electric vehicle for a government fleet trial program and offers tax and import duty reduction incentives to the public for electric vehicle and charging infrastructure imports. Recently, the government conducted a survey to assess the public's views on vehicle electrification, public energy consumption, and the government efforts to improve the efficiency of the transportation sector.

In 2019, the Government of Montserrat updated its new National Energy Policy to include offering electric vehicle and hybrid electric vehicle incentives, such as a reduction in customs duties and consumption taxes on electric vehicles and charging infrastructure.[240]

Table 27 provides an overview of transport electrification policies, measures and actions that have been implemented within the past decade in Montserrat.

Table 27. Existing Transport Electrification Policies, Measures and Actions Implemented in Montserrat.

Policy, Measure or Action Type	Year Initiated/ Timeframe	Key Stakeholders	Short Description
Electric Vehicle Deployment Targets	2016	Ministry of Communications, Works, Energy & Labour	The ministry presented transportation sustainability and vehicle electrification goals in the Montserrat Energy Policy 2016-2030.
Government Fleet Electrification	2019	Government of Montserrat	The government is piloting electric vehicles in a trial program. It has purchased one electric vehicle for the government fleet to assess its utility and performance and to determine whether to convert more fleet vehicles to electric.
Electric Vehicle Charging Station Deployment	2019	Public Works Department, Ministry of Works	The department has installed two public electric vehicle charging stations, one at the Public Works shop and one at the Ministry of Works in Montserrat.
Import Tax Reduction on Electric	2019	Ministry of Finance	The ministry offers a tax exemption, which is up for renewal, on electric vehicles for a five-year trial and hybrid electric vehicles for a two-year trial. For fully electric vehicles (duty is 35% and consumption tax is

[238] Ibid.
[239] *THE MONTSERRAT ENERGY POLICY 2016 – 2030, 2016*, Government of Montserrat, 2016. https://www.gov.ms/wp-content/uploads/2020/07/The-Power-to-Change-MNEP-Cabinet-Approved.pdf.
[240] Did You Know That 100% Electric Cars Are Exempted from Customs & Consumption Tax in Montserrat?, Bass, V., 2021. https://www.664connect.com/did-you-know-that-100-electric-cars-are-exempted-from-customs-consumption-tax-in-montserrat/.

Policy, Measure or Action Type	Year Initiated/ Timeframe	Key Stakeholders	Short Description
Vehicles and Chargers			15%), for plug-in hybrids and regular hybrids (duty is 20% and consumption tax is 15%).
Feasibility Study for Government Fleet Conversion	Ongoing	Government of Montserrat	The government has analyzed the cost-effectiveness of purchasing an electric vehicle compared to an internal combustion engine vehicle.
Public Electric Vehicle Awareness Campaign	Ongoing	Government of Montserrat, Public Stakeholders	The government facilitates public awareness campaigns to promote efficient transportation and has conducted stakeholder outreach through public surveys to assess public opinion on electric vehicles.
Electric or Hybrid Ferry Feasibility Study and Deployment	Ongoing	Government of Montserrat	The government is investigating the potential for using renewable energy in the ferry system in Montserrat.
Electric Mobility Policy	2021	Government of Montserrat	The government began drafting a five-year e-mobility policy in 2021 to kickstart adoption of electric vehicles in Montserrat. The draft policy, pending cabinet approval, states goals of increased electric vehicle registrations, sets import and other fee and tax exemptions for electric vehicles, encourages battery recycling and technology training programs, and expresses intent to convert existing fleets to electric. This policy is not yet finalized.
Identified electric vehicle deployment targets	2021	Government of Montserrat	In its strategic plan, which is not yet public as of December 2021, Montserrat's government identified a target percentage of new vehicles that should be electric vehicles or hybrids within three years.

Potential Vehicle Electrification Measures

Potential Electric Vehicle Adoption Policies and Strategies

Table 28 lists possible next steps for vehicle electrification in Montserrat. Several build upon previous steps. The measures were selected given the preliminary stage of vehicle electrification in Montserrat as well as by the key country context.

Table 28. Potential Policies, Measures and Actions to Encourage Electric Vehicle Adoption in Montserrat.

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
Set electric vehicle deployment targets	Policy and Regulation	Early Action	Develop aspirational but achievable targets for EV adoption (by 2025, 2030, etc.)
Develop an electric vehicle awareness campaign	Capacity Development & Awareness	Early Action	Begin awareness campaign on vehicle electrification through promotional activities, fact sheets, ride-and-drive events, work groups, and development of "Electric Vehicle Clubs."
Develop electric vehicle roadmap	Capacity Development & Awareness	Early Action	Create a public-facing roadmap that outlines milestones, responsibilities, and strategies for bolstering EV adoption.

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
Develop electric vehicle training curriculum	Capacity Development & Awareness	Early Action	Study future need for EV-related training for drivers, mechanics, emergency responders, and electricians and establish appropriate curriculum to ensure a trained workforce.
EV-Ready building codes	Policy and Regulation	Early Action	Require new development to have a certain fraction of parking spots as “EV-Ready,” including sufficient electrical capacity and a dedicated brand circuit.
Streamline permitting for charging infrastructure	Policy and Regulation	Early Action	Update the permitting process for EV charging stations to ensure fast-tracking (compared to other permits).
Develop uniform signage requirements for electric vehicles	Capacity Development & Awareness	Early Action	Ensure standardization of signage for EV parking and charging to help build awareness and confidence.
Private sector/shuttle bus electrification pilot	Policy and Regulation	Early Action	Private sector actors could replace a small number (e.g., 3 to 5) of their fleet vehicles. Actors can include hotels, airports, and/or ports to replace existing shuttle buses with electric buses. Monitor challenges and benefits during the deployment.
Pilot electrification of taxis	Policy and Regulation	Medium Term	Replace a small number (e.g., 10 to 25) taxis with electric taxis. Monitor challenges and benefits during the deployment. This action would be led by the private sector (e.g., by taxi or ridesharing companies).
Electrify government fleet vehicles	Policy and Regulation	Early Action	Revise requirements around government fleet procurement of EVs (such as having 25% EVs by 2025) and implement pilot projects for electrification of government fleets.
Electrify public transit buses	Policy and Regulation	Early Action	Transition public transit bus fleets to electric, which could improve public health outcomes and awareness.
Develop partnerships with automakers	Technology and Infrastructure	Medium Term	Create unique and innovative partnerships with automakers that focus on bringing greater EV volumes and model availability to the CARICOM member states.
Develop e-school bus pilot project	Policy and Regulation	Medium Term	Replace diesel buses with electric school buses to help lower emissions and improve health outcomes.
Develop electric ferry program	Finance, Market Development and Innovation	Medium/ Long Term	Create a program to electrify ferries, either with new acquisitions or conversion of existing ferries (pending resumption of the ferry lines, which were closed in 2020 due to COVID-19).

The Government of Montserrat may consider advancing vehicle electrification efforts on the island by investing in the steps listed in Table 28. Taking these steps would equip the public and other key stakeholders with a better understanding of electric vehicle technology and the benefits of driving electric and would also incentivize electric vehicle purchases and help reduce the cost burden.

Electrification of government or private fleets is a critical early action, by deploying a larger number of electric vehicles in a shorter period of time while also building awareness among the broader public on electric vehicles.

APPENDIX F: SAINT LUCIA APPLICATION EXAMPLE

Overview

Table 29. Key statistics on Saint Lucia's transportation sector.

Key Transport Electrification Statistics	
Total Electric Vehicles on the Road	<50[241]
Electric Vehicles as Share of Total Registered Vehicles (2019)	<1%
Electric Vehicles as Share of New Car Sales	<1%
Charging Points	5

This application example summarizes the state of transport electrification in Saint Lucia by providing an overview of key context; describing policies, measures, and actions on transport electrification in the country; and examining potential future actions to encourage vehicle electrification. Table 29, Table 30, and Table 31 summarize key statistics on the transportation, economic, and electricity sectors in Saint Lucia.

Context: Saint Lucia's Economic and Energy Landscape

Table 30. Key statistics on Saint Lucia's population and economy.

Population & Economy[242]	
Population Size	183,627[243]
Total Area Size	620 Sq. Km
Total GDP	$1.92 Billion
Share of GDP on Fuel Imports	4.9%
Gross National Income (GNI) Per Capita	$9,560
Urban Population Percentage	18.8%

Economy

As one of the smaller CARICOM Member States and island nations in the Caribbean, Saint Lucia, a volcanic island of 238 square miles and a population of 183,627, is known for its tropical ecology and Piton mountains.[244]

The island's key economic sectors are tourism, commercial, industrial, and agricultural development.[245] Roughly 300,000 tourists visited the island each year before the COVID-19 pandemic.[246] Many urban dwellers reside in coastal towns and cities, while the rural population live mostly in villages in the flatter parts of the country.[247] As an island nation, Saint Lucia is prone to risks from the impacts of climate change, such as from tropical storms, coastal storm surge and flooding, and landslides. The United Nations classifies Saint Lucia as a small island developing state (SIDS) that is disproportionately vulnerable to external economic shocks and extreme climate events.[248] According to the International Panel on Climate Change, Saint Lucia is expected to have an average temperature increase of 4 degrees Celsius by 2100 relative to

[241] Kurt Inglis, Ministry of Infrastructure, Ports, Transport, Physical Development and Urban Renewal, Personal Contact, October 2021.
[242] *St. Lucia Energy Snapshot,* Energy Transitions Initiative, US Department of Energy, 2020. https://www.energy.gov/sites/prod/files/2020/09/f79/ETI-Energy-Snapshot-St-Lucia_FY20.pdf
[243] *Saint Lucia*, The United Nations, 2021. Saint Lucia | United Nations in Barbados and the Eastern Caribbean.
[244] Ibid.
[245] *Saint Lucia*, World Bank Group, 2021. https://climateknowledgeportal.worldbank.org/country/st-lucia#
[246] 2016 World Bank Data as cited in *Developing the Saint Lucia Energy Roadmap, Rocky Mountain Institute*, 2016. https://rmi.org/wp-content/uploads/2017/03/Islands_Saint_lucia_Energy_Roadmap_Report_2016.pdf
[247] *Saint Lucia*, World Bank Group, 2021. https://climateknowledgeportal.worldbank.org/country/st-lucia#
[248] *SAINT LUCIA'S UPDATED NATIONALLY DETERMINED CONTRIBUTION communicated to the UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE,* United Nations, January 2021. https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Saint%20Lucia%20First/Saint%20Lucia%20First%20NDC%20(Updated%20submission).pdf

its 1986-2005 climate in its worst case climate change scenarios.[249] The country also faces a high debt-to-GDP ratio as well as significant fiscal and capacity constraints.[250] Saint Lucia has an average GDP per capita of $7,762 USD.[251]

Saint Lucia has set an energy sector greenhouse gas emissions reductions target in its updated Nationally Determined Contributions (NDC) to reduce emissions by 7% in the energy sector (specifically transportation and electricity generation) relative to 2010 levels by 2030.[252]

Energy

Saint Lucia's residents and businesses rely primarily on imported diesel for electricity, and the country's refined petroleum imports are among the highest as a share of GDP compared to other CARICOM Member States.[253] Electricity costs in Saint Lucia are also susceptible to fluctuation due to volatile global oil markets.[254] Most of the country's oil imports are from Brazil and Trinidad and Tobago.[255]

Saint Lucia Electricity Services Limited (LUCELEC) is the sole electricity provider in Saint Lucia, supplying 67,000 customers and more than 300,000 tourists per year with power.[256] The country's power generation is highly efficient, with a reliable electric grid, due to joint efforts between LUCELEC and the Government of Saint Lucia. As reported in the *Developing the Saint Lucia Energy Roadmap,* both entities have identified the need to improve the electricity sector's resilience and cost-effectiveness by powering the electricity grid with indigenous energy sources. Together, they have agreed to a long-term plan to invest in renewable energy to improve sustainability, reliability, cost-effectiveness, and equitable electricity service. This agreement prompted the issuance of the National Energy Transition Strategy (NETS) to purposefully plan the future of the energy system and guide the transition to a more diversified energy portfolio. The NETS identifies near- and medium-term planning options, such as energy efficiency and renewable energy programs and financial structures, to help Saint Lucia's energy transition to more renewable energy.

Increased renewable energy investments can help Saint Lucia diversify its power supply mix and provide consumers with low-cost and more stable power supply. In 2016, the Government of Saint Lucia passed regulatory reforms to enable the National Utilities Regulatory Commission (NURC), the national electricity and water regulator, to promote economic efficiency of the energy sector by encouraging cost-effective energy investments that benefit both investors and consumers. The government has since drafted an Electricity Supply Services bill and an Energy Efficiency bill to improve energy efficiency and system reliability.[257] Saint Lucia's NDC target for the United Nations Framework Convention on Climate Change (UNFCCC) is 35% renewable energy penetration in the national energy mix by 2025.[258] Saint Lucia also incentivizes energy sustainability through energy awareness weeks.[259]

Table 31. Key statistics on Saint Lucia's electricity and transportation sectors.

Electricity Sector Overview[260]	
Total Installed Capacity	88.4 MW

[249] RCP 8.5 Scenario as shown in the World Bank Climate Change Portal, https://climateknowledgeportal.worldbank.org/country/st-lucia/climate-data-projections
[250] Ibid.
[260] *ETI Energy Snapshot - Saint Lucia,* National Renewable Energy Laboratory. June 2020. https://www.energy.gov/sites/prod/files/2020/09/f79/ETI-Energy-Snapshot-St-Lucia_FY20.pdf

RE Installed Capacity Share	4%
Peak Demand (2018)	60.6 MW
Electricity Generation Mix	99% Diesel, 1% Solar
Electricity Access	99%
Average Electricity Rates (USD/kWh)	Residential: $0.28 Commercial: $0.32-0.34 Industrial: $0.34
Transportation Sector	
Transport Sector as Share of Energy End Uses	~60%
Total Vehicles Registered (2010)	56,600[261]
Public Service Vehicles as Share of Total Vehicles	Unknown
Average km-per-day Driven by Car Owners	Unknown

Saint Lucia's Transportation Landscape

The government directed in its Sustainable Energy Plan of 2001 to explore the introduction of alternative fuel vehicle fleets.[262] With the help of Rocky Mountain Institute, the Government of Saint Lucia identified 131 vehicles in its vehicle fleet that could be replaced with electric vehicles (based on assessments of each vehicle's age, type, and amount of use).[263] The country has also proposed some pollution mitigation actions through its 2010 National Energy Policy to address vehicle emissions, such as taxing motor vehicles and ensuring better vehicle maintenance to improve the transportation sector's energy efficiency.[264]

Saint Lucia's transport sector is just over 60% of the total energy consumption in the country, and the vast majority of the approximately 2,000 new vehicles registered in Saint Lucia annually are conventional internal-combustion-engine vehicles.[265] There has been a net increase in the number of registered vehicles in Saint Lucia over time; however, the country does not maintain accurate official databases that track the number of vehicles on its roads and therefore the exact number is unavailable.[266]

[252] *SAINT LUCIA'S UPDATED NATIONALLY DETERMINED CONTRIBUTION communicated to the UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE,* United Nations, January 2021. https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Saint%20Lucia%20First/Saint%20Lucia%20First%20NDC%20(Updated%20submission).pdf

[253] 2016 World Bank Data as cited in *Developing the Saint Lucia Energy Roadmap, Rocky Mountain Institute*, 2016. https://rmi.org/wp-content/uploads/2017/03/Islands_Saint_lucia_Energy_Roadmap_Report_2016.pdf

[254] Ibid.

[255] *ETI Energy Snapshot - Saint Lucia,* National Renewable Energy Laboratory. June 2020. https://www.energy.gov/sites/prod/files/2020/09/f79/ETI-Energy-Snapshot-St-Lucia_FY20.pdf.

[256] 2016 World Bank Data as cited in *Developing the Saint Lucia Energy Roadmap, Rocky Mountain Institute*, 2016. https://rmi.org/wp-content/uploads/2017/03/Islands_Saint_lucia_Energy_Roadmap_Report_2016.pdf

[257] *Developing the Saint Lucia Energy Roadmap, Rocky Mountain Institute*, 2016. https://rmi.org/wp-content/uploads/2017/03/Islands_Saint_lucia_Energy_Roadmap_Report_2016.pdf

[258] *Construction Of Saint Lucia's First Solar Car Port Facility Begins,* Saint Lucia Times, 2019. https://stluciatimes.com/construction-of-saint-lucias-first-solar-car-port-facility-begins/.

[259] Enhancing energy efficiency in national transportation systems *A readiness analysis for Saint Lucia,* ECLAC/GIZ, 2017. https://www.cepal.org/sites/default/files/project/files/enhancing_energy_efficiency_in_national_transportation_systems.pdf

[260] *ETI Energy Snapshot - Saint Lucia,* National Renewable Energy Laboratory. June 2020. https://www.energy.gov/sites/prod/files/2020/09/f79/ETI-Energy-Snapshot-St-Lucia_FY20.pdf

[261] *Saint Lucia*, World Health Organization, 2010. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjA29Sr-sXzAhUV654KHW41A4kQFnoECBsQAQ&url=https%3A%2F%2Fwww.who.int%2Fviolence_injury_prevention%2Froad_safety_status%2F2013%2Fcountry_profiles%2Fsaint_lucia.pdf&usg=AOvVaw3eA5OSmhboqVwUtFWKUgUD

[262] Ibid.

[263] Kurt Inglis, Ministry of Infrastructure, Ports, Transport, Physical Development and Urban Renewal, Personal Contact, October 2021.

[264] Enhancing energy efficiency in national transportation systems *A readiness analysis for Saint Lucia,* ECLAC/GIZ, 2017. https://www.cepal.org/sites/default/files/project/files/enhancing_energy_efficiency_in_national_transportation_systems.pdf

[265] *Request For Proposals For: Supply of Full Electric Vehicles Tender on Goods and Services*. Government Of Saint Lucia Ministry of Education, Innovation, Gender Relations and Sustainable Development Department of Sustainable Development. 2017.

[266] *ETI Energy Snapshot - Saint Lucia,* National Renewable Energy Laboratory. June 2020. https://www.energy.gov/sites/prod/files/2020/09/f79/ETI-Energy-Snapshot-St-Lucia_FY20.pdf

Policies, Measures, and Actions Implemented to Advance Transport Electrification in Saint Lucia

The Government of Saint Lucia has established a small number of transport electrification policies and initiatives. Sustainable transport is one of Saint Lucia's greenhouse gas emission reduction targets in its First NDC submission UNFCCC in 2015.

In 2017, Saint Lucia assessed the feasibility of incorporating electric vehicles into its government fleet and evaluated potential cost savings that could be made through fuel and maintenance cost reductions.[267] The government procured three new electric vehicles: two five-door passenger vehicles and one light goods vehicle. The country has at least one solar carport charging station for these vehicles, built in 2019.[268] This solar photovoltaic carport system was built at the Department of Infrastructure Ports and Energy parking lot in Union Castries and was financed by the Italian Government.[269] The solar powered charging facility consists of two charging pedestals, capable of charging four vehicles at once.[270] Along with this solar charging facility, Saint Lucia's government has also made an effort to expand solar photovoltaic systems across the country on school roofs, community centers, and the Owen King European Union Hospital on the Millennium Highway.[271] One public Level 2 charging station with two charging connectors is located at a police station in Vieux Fort, Santa Lucía.[272]

Figure 7. An electric car charger installed by the country's utility at a map in Saint Lucia

LUCELEC has also built an electric car charging station at the JQ Mall in Rodney Bay for a corporate diversification project (Figure 7).[273] This charging station is the first of five planned stations that LUCELEC is deploying around the island, and the company has also already incorporated two electric vehicles in its fleet.[274]

The Government of Saint Lucia incentivizes electric vehicle adoption through a system of monetary incentives. As of 2021, Saint Lucia's import duties are 5% on electric vehicles compared to 35% for internal combustion engine vehicles. The government also

[267] *Request For Proposals For: Supply of Full Electric Vehicles Tender on Goods and Services*. Government Of Saint Lucia Ministry of Education, Innovation, Gender Relations and Sustainable Development Department of Sustainable Development. 2017.
[268] Ibid.
[269] *Construction of Saint Lucia's First Solar Car Port Facility Begins,* Saint Lucia Times, 2019. https://stluciatimes.com/construction-of-saint-lucias-first-solar-car-port-facility-begins/.
[270] *Charging station on Vieux Fort (Saint Lucia*), Electromaps, 2021. https://www.electromaps.com/en/charging-stations/saint-lucia/vieux-fort
[271] *No Duty on Electric Vehicles*, Saint Lucia Loop, 2017. https://stlucia.loopnews.com/content/government-no-duty-electric-vehicles
[272] *Charging station on Vieux Fort (Saint Lucia*), Electromaps, 2021. https://www.electromaps.com/en/charging-stations/saint-lucia/vieux-fort
[273] *LUCELEC Introduces Electric Car Charging Station*, LUCELEC, 2014. https://www.lucelec.com/node?page=48
[274] *2018 Annual Report Transforming the Electricity Sector*, LUCELEC. 2018. https://www.lucelec.com/sites/default/files/annual-reports/LUCELEC-2018-Annual-Report-Web.pdf

charges an excise tax that varies depending on engine size for internal combustion engine vehicles but is at zero percent for electric vehicles; the government charges a value-added tax of 12% for all vehicles and a service charge of 6% for all vehicles.[275] Though not an electric vehicle policy, the Vehicle Management Policy of 2016 was issued to improve effectiveness and efficiency in vehicle use, reduce operational costs, and ensure proper use of government vehicles.[276]

In 2018, the country's Renewable Energy Division of the Ministry of Infrastructure, Ports, Transport, Physical Development and Urban Renewal prepared a Government Fleet Transition Strategy to analyze the current government vehicle fleet, assess the current cost of purchasing and maintenance of the fleet, and identify vehicles needing near-term replacement that could be with low-carbon emission vehicle alternatives. This report also identifies how transitioning a government fleet to more sustainable fuels would help Saint Lucia achieve its international climate change targets.[277]

Saint Lucia is also working on two projects to accelerate electric mobility, both set to begin in 2021, in partnership with international agencies and described in the *Making Way for Electric Mobility in Saint Lucia* report.[278] The first is with the United Nations Environment Programme and will be implemented over a three-year period to create an enabling environment for the shift to electric transport in the country through interventions such as creating a sustainable transport policy, a national low-carbon strategy, and a national coordinating mechanism. The project will help Saint Lucia incorporate 10 electric vehicles into the government fleet, increase the number of publicly available chargers, and build national capacity for mechanics, drivers, and emergency responders. Part of this project will be to develop a plan for the sustainable and clean disposal of electric vehicles.

The second project is for the German International Climate Initiative led by GIZ and will take place over five years. Saint Lucia is among six participating countries and is one of three "demonstration countries" along with Guyana and Jamaica. Saint Lucia is demonstrating the use of electric cars. This project will finance the purchase of electric vehicles to replace existing end-of-use government fleet vehicles and charging stations. The project will also develop a partnership directly with local colleges like the University of the West Indies to offer vocational courses on electric mobility. The country is interested in identifying safe approaches to dispose of lithium-ion electric vehicle batteries.

According to the ministry, there has also been interest among bus operators to electrify some of the bus fleet once there are more available and affordable e-bus options.[279]

Table 32 provides an overview of transport electrification policies, measures and actions that have been implemented within the past decade in Saint Lucia.

[275] Kurt Inglis, Ministry of Infrastructure, Ports, Transport, Physical Development and Urban Renewal, Personal Contact, October 2021.
[276] *Enhancing energy efficiency in national transportation systems: A readiness analysis for Saint Lucia*, United Nations. 2017. https://www.cepal.org/sites/default/files/project/files/enhancing_energy_efficiency_in_national_transportation_systems.pdf
[277] *Making Way for Electric Mobility in Saint Lucia*, Caribbean NDCFI, 2020. https://ndcfi.oecs.org/making-way-for-ev-slu/.
[278] Ibid.
[279] Kurt Inglis, Ministry of Infrastructure, Ports, Transport, Physical Development and Urban Renewal, Personal Contact, October 2021.

Table 32. Transport Electrification Policies, Measures and Actions Implemented in Saint Lucia.

Policy, Measure or Action Type	Year Initiated/ Timeframe	Key Stakeholders	Short Description
Sustainable Energy Plan of 2001	2001	Government of Saint Lucia	The Sustainable Energy Plan, written in 2001, directed the exploration of the introduction of alternative fuel vehicle fleets.
2010 National Energy Policy	2010	Government of Saint Lucia	National Energy Policy included vehicle management policies that include taxing motor vehicles and ensuring improved vehicle maintenance to improve the transportation sector's energy efficiency; using taxes to incentivize the purchase of more energy-economical vehicles; requiring vehicle inspections and regular maintenance; training automotive mechanics and driving instructors with on energy efficiency and conservation; integrating energy and environmental strategies into urban planning; improving traffic management through computer-controlled traffic lights and other measures; and improving energy efficiency overall in national transportation.
Electric Utility Electric Vehicle Programs	2014	LUCELEC	LUCELEC has built an electric car charging station at the JQ Mall in Rodney Bay for a corporate diversification project. The utility plans to build five more charging stations.
Sustainable Transport Deployment Target	2015	The Government of Saint Lucia	Sustainable transport is one of Saint Lucia's greenhouse gas emission reduction targets in its UNFCCC NDC.
Import Tax Reduction on Electric Vehicles and Chargers	2016	Government of Saint Lucia	In 2016, the government lowered import duties on electric and hybrid electric vehicles.
Electric Vehicle Feasibility Study	2017	Renewable Energy Division of the Ministry of Infrastructure, Ports, Transport, Physical Development and Urban Renewal	In 2017, Saint Lucia began assessing the feasibility of incorporating electric vehicles into its government fleet and evaluated potential cost savings that could be made through fuel and maintenance cost reductions. The ministry prepared a Government Fleet Transition Strategy that included findings of these assessments.
Government Fleet Electrification	2017	Government of Saint Lucia	The government procured three new electric vehicles: two five-door passenger vehicles and one light goods vehicle.
Public Electric Vehicle Awareness Campaign	2017, 2018	Government of Saint Lucia, the Public	The government held two electric vehicle test drive events that were useful in raising public awareness. One event was held at a government office while the other was located in a downtown area.
Electric Vehicle Curriculum	2017	Government of Saint Lucia, Vehicle Maintenance Technicians	The government offered training for technicians in electric vehicle and hybrid maintenance. The program trained 15 technicians and connected technicians with all local vehicle dealerships.
Assistance for Auto Dealers to Sell Electric Vehicles	2018	Government of Saint Lucia, Vehicle Dealerships	Connected local dealerships with trained technicians. Each local vehicle dealership has at least one trained person in hybrid and electric vehicle technologies. The government provides direct help with electric vehicle questionnaires for dealership suppliers. The government of Saint Lucia has provided details for at least three questionnaires with electricity standards in the country, electric battery availability and battery disposal information.
Government Sponsored Solar Carport Charging Station	2019	Department of Infrastructure Ports and Energy	The solar powered charging facility is located at the Department of Infrastructure Ports and Energy and consists of two charging stations, capable of charging four vehicles at once. The government-owned charging stations do not require a fee, but they do require government permission for use.

Policy, Measure or Action Type	Year Initiated/ Timeframe	Key Stakeholders	Short Description
Financing Assistance	2021	A local bank in Saint Lucia	A local bank offers 100% financing options for private customers interested in purchasing hybrid electric vehicles. Duty concessions offer assistance because in most cases this reduces vehicle cost in the tens of thousands of dollars range and is reviewed on an individual buyer basis.
Enabling Environment for Electric Transport	2021	Government of Saint Lucia and United Nations Environment Programme	The government is making a series of interventions over three years that include creating a sustainable transport policy, national low-carbon strategy, and national coordinating mechanism. Also includes procuring 10 electric vehicles for the government fleet and planning for sustainable and clean disposal of electric vehicles.
Electric Vehicle Curriculum	2021	Government of Saint Lucia, GIZ, German International Climate Initiative	Five-year project to demonstrate the use of electric cars to integrate electric vehicles into the government fleet, raise awareness, and work with local universities to offer courses in electric mobility.
Assessing Potential Electric Vehicle Incentive Program	2021	Government of Saint Lucia	The government is exploring options for financial incentives for electric vehicles, such as taxing imports of internal combustion engine cars and reducing the cost of energy through renewable sources.

Barriers to Electric Vehicle Adoption

Saint Lucia has implemented some early actions to advance vehicle electrification but still faces barriers to widespread electric vehicle adoption. These barriers were described during an October 2021 interview with Kurt Inglis from the Ministry of Infrastructure, Ports, Transport, Physical Development and Urban Renewal.

Frequent changes in government leadership. Every five years, there is a change in Saint Lucia's leadership. Frequent changes in leadership make it difficult for policy continuity across administrations and presents a political barrier not only for achieving progress in electric vehicles but also in other areas of sustainability. There is also a lack of clear directive or push from the highest levels of government to pursue electric mobility solutions.

Negative perceptions of electric vehicles amongst the public. The public generally are not as aware of the benefits of electric vehicles and consider them to be less than ideal for driving in mountainous terrain.

Lack of financing options. Limited financing options constrain the ability of consumers to adopt electric vehicles. There is a greater need for banks, insurance companies, and other private entities to offer financing schemes to purchase electric vehicle and charging infrastructure.

Lack of availability or affordability of electric vehicles. There are very few options for consumers to purchase an electric vehicle in Saint Lucia from a local dealership. The high upfront cost of electric vehicles is also a deterrent for consumers who are considering purchasing an electric vehicle.

Potential Vehicle Electrification Measures

Potential Electric Vehicle Adoption Policies and Strategies

The measures in Table 33 could be next steps for the Saint Lucia. A few may build upon previous actions, while others may be considered because Saint Lucia is in the preliminary stages of electric vehicle rollout and these actions could be reasonable early steps.

Table 33. Potential Measures, Actions, and Policies to Encourage Electric Vehicle Adoption in Saint Lucia.

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
Continue to develop an electric vehicle roadmap	Policy and Regulation	Early Action	Create a public-facing roadmap that outlines milestones, responsibilities, and strategies for bolstering electric vehicle adoption. This is an existing effort through the GEF 7 E-mobility project.
Set electric vehicle deployment targets	Policy and Regulation	Early Action	Develop aspirational but achievable targets for electric vehicle adoption (by 2025, 2030, etc.).
Further expand existing public electric vehicle awareness campaign	Capacity Development & Awareness	Early Action	Advance awareness on vehicle electrification through promotional activities, fact sheets, ride-and-drive events, work groups, and the development of "Electric Vehicle Clubs."
Continue to electrify government fleet vehicles	Policy and Regulation	Early Action	Implement and expand pilot projects for electrification of government fleets.
Develop electric vehicle training curricula for drivers, mechanics, and electricians	Capacity Development & Awareness	Early Action	Develop and implement appropriate curricula to meet the need for electric vehicle-related technicians.
Provide incentives for auto dealers to sell electric vehicles	Policy and Regulation	Early Action	Provide small incentive to dealerships to encourage them to sell more electric vehicles (such as providing a small cash incentive to the salesman). This action would benefit from collaboration with dealerships to assess whether they would be inclined to sell electric vehicles with these incentives.
Electrify public transit buses	Policy and Regulation	Early Action	Transition public transit buses to electric, improving public health outcomes and awareness.
Implement e-school bus pilot project	Policy and Regulation	Early Action	Replace a select number of diesel-powered school buses with electric school buses.
Develop EV-Ready building codes	Policy and Regulation	Early Action	Require new development to designate a certain fraction of parking spots as "EV-Ready," including sufficient electrical capacity and a dedicated brand circuit. The building and electrical codes should cover the charging component.
Provide electric vehicle rebates	Policy and Regulation	Early Action	Incentivize car buyers to adopt electric vehicle through rebates at the time of vehicle purchase.
Streamline permitting for charging infrastructure	Policy and Regulation	Early Action	Update the permitting process for electric vehicle charging stations to ensure fast-tracking (in comparison to other permits).
Develop uniform signage requirements for electric vehicles	Capacity Development & Awareness	Early Action	Develop and implement standard signage for electric vehicle parking and charging to help build awareness and confidence.
Implement private sector/ shuttle bus electrification pilot	Policy and Regulation	Medium Term	Replace an initial small number (e.g., 3 to 5) of hotel, airport, and/or port shuttle buses with electric buses. Monitor challenges and benefits during the deployment.
Provide rebates for low-income drivers	Policy and Regulation	Medium Term	Create an equity-driven rebate program aimed at low- and moderate-income households to help reduce freeridership and improve the cost-effectiveness of EVs. Such rebates could be particularly useful for taxi drivers or delivery service drivers. This action could also apply to alternative forms of electric transport, such as offering rebates for e-bikes. Provide point-of-sale rebates to vehicle buyers who meet certain eligibility criteria (e.g.,

Policy, Measure, or Action Type	Policy Area	Time Frame	Short Description
			income under $50,000 per year, vehicle upfront cost under $40,000).
Develop partnerships with automakers	Technology and Infrastructure	Medium Term	Create unique and innovative partnerships with automakers that focus on bringing greater volume of electric vehicles and model availability to CARICOM member states.
Taxi electrification pilot	Policy and Regulation	Medium Term	Replace a small number (e.g., 10 to 25) taxis with electric taxis. Monitor challenges and benefits during the deployment.
Promote electric medium- and heavy-duty work trucks and freight delivery trucks	Policy and Regulation	Long Term	Develop policies for transitioning to electric medium- and heavy-duty work trucks and freight delivery trucks. In coming years, these vehicles are expected to reach cost parity with internal combustion engine vehicles.[280]
Institute zoning, building codes, and parking reforms	Policy and Regulation	Long Term	Incentivize private electric vehicle adoption through new zoning, building codes, and parking requirements that align with best practices.
Implement government fleet rental pilot	Policy and Regulation	Long Term	Allow tourists to rent government EVs on weekends and holidays, thus ensuring high vehicle use and low total costs.

The Government of Saint Lucia has set a limited number of softer targets to pursue electric mobility. Some of the actions in Table 33 can help the government firm commitments and pursue actionable steps. The government can build upon electric mobility goals by setting ambitious but achievable electric vehicle and charging network deployment targets in tandem with development of an electric vehicle roadmap. There is also substantial opportunity for the government to further incorporate electric vehicles in government or public transit fleets. Electrifying (and improving) public transit options may contribute to reducing the number of vehicles on the road.

Saint Lucia may benefit from further exploration of incentives or pilot projects to encourage taxi companies and other fleet owners to electrify their vehicles. Electrifying fleets (e.g., taxis, rental cars, among others) is a means to quickly electrify a larger number of vehicles and to improve public awareness on the utility of electric vehicles. These vehicles can also be subsequently sold as used vehicles to private consumers who otherwise might not be able to afford electric vehicles. These sales could assist with supply chain issues and reduce the cost of an electric vehicle to private consumers. Saint Lucia already offers tourism-related incentives that could assist rental car or taxi companies with their electric vehicle purchases.

[280] McKinsey. “New reality: electric trucks and their implications on energy demand.” 2017. https://www.mckinseyenergyinsights.com/insights/new-reality-electric-trucks-and-their-implications-on-energy-demand/