PCREEE
Pacific Centre for Renewable Energy and Energy Efficiency

Pacific Community
Communauté du Pacifique

Regional Program to Promote Electric Vehicle Markets in Pacific Island Countries and Territories (PICTs)

Prepared as follow-up to the decisions of the Fourth Pacific Regional Energy and Transport Ministers' Meeting, held from 18 to 20 September 2019, in Apia, Samoa

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Pacific Community
Communauté du Pacifique

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

GN SEC Global Network Regional Sustainable Energy Centres

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Abbreviations and Acronyms

A*x*	Policy Activity *x*
BAU	Business as Usual
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
e-	Electric (e.g., e-bus)
EE	Energy Efficiency
EV	Electric vehicle
FAESP	Framework for Action on Energy Security in the Pacific
FATS	Framework for Action on Transport Services
FRDP	Framework for Resilient Development in the Pacific
FTE	Full-Time-Equivalent
GGGI	Global Green Growth Institute
GHG	Greenhouse gas or greenhouse gases
GN-SEC	Global Network of Regional Sustainable Energy Centres
kW	Kilowatt
kWh	Kilowatt-hour
NDC	Nationally Determined Contribution
PCREEE	Pacific Centre for Renewable Energy and Energy Efficiency
PEAG	Pacific Energy Advisory Group
PICT	Pacific Island Countries and Territories
PRIF	Pacific Region Infrastructure Facility
PV	Photovoltaic
RE	Renewable Energy
RMI	Republic of the Marshal Islands
SIDS	Small Island Developing States
SPC	Pacific Community
TA	Technical Assistance projects
TOR	Terms of Reference
TOU	Time of use (metering)
UNIDO	United Nation Industrial Development Organization
UNDP	United Nations Development Programme
V2H	Vehicle-to-home
V2G	Vehicle-to-grid

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1 Introduction

As small and remote economies, Pacific Island Countries and Territories (PICTs) share many similar challenges and opportunities. They have limited natural resources. Their economies lack diversification and they suffer disproportionately from large distances to major markets. The dependency on imported fossil fuels contributes to their difficult fiscal situation and leads to high energy costs for households and key island industries. Following the diesel track implies less jobs, less opportunities for the youth and less resources to adapt to climate change.

To reap the opportunities of the "green" and "blue" economy, a rapid transformation towards renewable energy and energy efficiency is required. Most PICTs have adopted ambitious renewable energy targets and have started to implement renewable energy and energy efficiency policies, regulations, standards and incentive schemes. The sector is increasingly attracting project finance and foreign direct investment. However, the nexus area of integrated e-mobility and targeted increasingly renewable energy-based island power systems, has not had much attention.

Therefore, the Fourth Pacific Regional Energy and Transport Ministers' Meeting, held from 18 to 20 September 2019, in Apia, Samoa, requested the Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE)[1] and the United Nations Industrial Development Organization (UNIDO) to assist Pacific Island Countries and Territories (PICT) in the development of a regional electric mobility (e-mobility) policy document and a regional e-mobility program[2].

The EV efforts contribute to the 100% renewable energy vision of the region and extend the "climate leadership" of PICTs also to the transport sector. The e-mobility efforts could also help address the nexus between regional policies, namely the upcoming 2020-2030 regional energy framework, the Framework of Action on Transport Services (FATS) and Framework for Resilient Development in the Pacific (FRDP).

The Ministers also called for SIDS-SIDS cooperation on EV issues and solution under the umbrella of the Global Network of Regional Sustainable Energy Centres (GN-SEC[3]) some members of whom are also working on similar initiatives,[4] and SIDS DOCK.

With the program, PICTs will also contribute to global EV initiatives operating under the Paris Declaration on Electric Mobility and Climate Change. For example, the Clean Energy Ministerial's Electric Vehicles Initiative (EVI) supported by Canada, China, Finland, France, India, Japan, Mexico, Netherlands, Norway and Sweden aims to reach a 30% sales share for EVs by 2030. This EV30@30 campaign sets ambitious targets for electric vehicle (EV) sales that, combined with decarbonisation of the power sector, will move the world towards meeting our shared climate goals.

This draft project document describes the main pillars and results framework of the envisaged *Regional Program to Promote E-Mobility Markets in PICTs* (the output for the third and final stage of this project). The document is based on the Technical Report *"Options for Integrated Electric Mobility and Renewable Power Markets in the Pacific Island Countries and Territories (PICTs)*" (the Stage 1 output for the project), and the *Regional Policy Document on E-Mobility for Pacific Island Countries and Territories (PICTs*) (the Stage 2 output for the project).

[1] www.pcreee.org

[2] Specifically, the Energy Ministers:

- Requested SPC/PCREEE, UNIDO and SIDS DOCK to develop a regional policy document outlining the short-term and long-term vision of PICTs with regard to integrated e-mobility and renewable energy power markets. It will propose regional e-mobility targets for the PICTs region by 2030 and 2050 and include a regional implementation framework with concrete priority actions. (E11 (iv) of the Resolution of Ministers, Apia, Samoa, 19 September 2019);
- Requested SPC/PCREEE, UNIDO and SIDS DOCK to develop a regional e-mobility program. The program will address existing barriers by promoting regional interventions in the areas of policy and regulation, knowledge management, qualification/certification, as well as the promotion of investment, entrepreneurship and innovation, and to promote SIDS-SIDS cooperation and exchange on integrated e-mobility and renewable energy power systems under the umbrella of the Global Network of Regional Sustainable Energy Centres (GN-SEC). (E11 (iv) of the Resolution of Ministers, Apia, Samoa, 19 September 2019).

[3] www.gn-sec.net

[4] For example, the Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) is working on the Caribbean Community (CARICOM) Electric Vehicle Strategy Framework.

2 Structure

The project document is structured as follows:

- Section 3 recaps the findings of technical report and policy document; it also provides an overview on the proposed policy actions to address the identified EV barriers in PICTs;
- Section 4 describes the context in which the proposed Regional EV Program must work;
- Section 5 develops a working structure for the Regional EV Program, introducing and describing the various elements that make it up, then develops and presents a results framework for the Regional EV Program;
- Section 6 draws up the conclusions;
- Appendix A provides a detailed list of the policy actions developed in Stage 2 of the project work; and
- Appendices B and C set out the results framework of the EV program in far more detail.

3 Identified E-Mobility Options and Policy Actions

In the first stage of the project, a technical report to inform PICTs decision-makers on e-mobility options and their potential to benefit renewable energy-based power systems of PICTs, was prepared. The report provided a "realistic view" of opportunities, barriers, as well as potential risks, benefits and limitations. It provided an overview on the suitability, feasibility and economic viability of various types of EVs, from push e-scooters to heavy trucks, when considered in the PICT environment. The report found potential for most forms of EVs.

Consideration was also given to charging EVs and, rather than simply treating them as a demand on the local grid, the possibilities for integrating them with the supply of electricity by using the capacity of their batteries to support supply were explored. This work found that the capability for in-service EVs to support the grid was emerging and this capability was expected to grow, but that there are cheaper and more convenient options to achieve the same effect. However, significant benefit is expected from managing the charging of EVs in coordination with the supply of electricity, rather than EV charging presenting itself as an uncontrolled demand.

Based on the technical findings, a regional PICTs vision on EVs was prepared in the form of a policy document. The policy document identified the main barriers for the uptake of EVs in PICTs and drew up a thirty-eight (38) concrete policy actions to address them.

The policy actions stretch across the four broad themes: "Central Policy and Administration", "Standards and Guidelines", "Awareness and Promotion", and "Demonstration and Upscale" (noting that these themes broaden the scope from the four areas that the Energy and Transport Minister's requested consideration of, aimed at providing a more comprehensive overview of the policy requirements for the EV sector). These policy actions aim to prepare PICTs for their respective EV futures and to lead them through those futures.

A harmonized regional approach can help to address some of the existing barriers more effectively and at lower cost. It can promote equal progress and standards between PICTs and create the needed economies of scale to influence international vehicle supply chains and investments in charging infrastructure and e-mobility based business models.[5] Regional actions can complement and accelerate national efforts in line with the principle of subsidiarity.

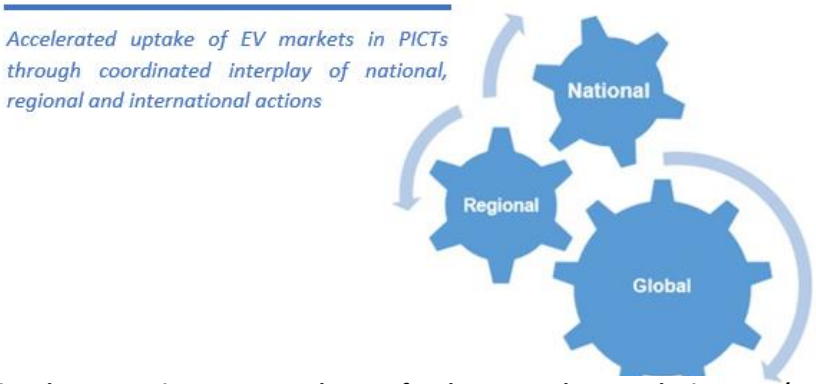

Figure 1: Regional Cooperation as an Accelerator for the EV Market Uptake in PICTs (GN-SEC/UNIDO)

[5] See also GN-SEC theory of change for regional sustainable energy acceleration at: www.gn-sec.net

These policy actions are the recommended, or target, actions to be managed as part of the proposed regional EV program – essentially, they *are* the Regional EV Program. In recognition of their significance, these policy actions have been summarised and presented in Table 1 below. A detailed list is provided in Appendix A.

Summary of Target Actions of the Regional EV Program
Central Policy and Administration:
1. Develop high-level targets and mandates concerning EV uptake. 2. Form a staffed and funded Regional EV Hub with regional representatives responsible for coordinating national programs and collecting and sharing information and international links including those related to SIDS-SIDS cooperation. 3. Support PICTs in developing and implementing EV roadmaps. 4. As appropriate, set tax levels or other to encourage the importation of desired goods. 5. Develop and set minimum specifications for imports. 6. Develop and deploy a monitoring and evaluation system. 7. As appropriate, introduce/amend the regulatory framework to provide for EVs, their charging, and other associated activities. 8. Maintain a watching brief on global EV-related developments.
Standards and Guidelines:
1. Develop and set minimum standards for vehicles at time of entry and at time of in-service fitness testing. 2. Ensure appropriate standards are in place for the retirement of EVs. 3. Set guidelines for charging, including the specification of charging connectors. 4. Require new buildings to be "EV-ready". 5. Develop guidelines for the use of V2H and on-site managed charging. 6. Develop (at least voluntary) standards for low-voltage vehicles, the charging of them, and the use of "mobility batteries" for local power supply circuits. 7. Develop and introduce technical courses. 8. Develop guidelines for the use of new e-mobility options targeting safety. 9. Provide buyer and user guides on low-voltage e-mobility options.
Awareness and Promotion:
1. Undertake social marketing research. 2. Develop and deliver an awareness, information and promotion campaign supporting the uptake of EVs. 3. Develop, publish and promote guidelines on: a. EV purchase (micro-e-mobility through 4-wheelers); b. Charging (micro-e-mobility through 4-wheelers); c. Servicing and Support (micro-e-mobility through 4-wheelers). 4. Collate and distribute global and PICT EV information. 5. Ensure that first responders are aware of correct procedures.
Demonstration and Upscale:
1. Demonstrate government leadership through purchase of appropriate EVs. 2. Consider supporting electric bus demonstrations. Consider supporting the demonstration of other non-passenger car EV projects if there is a good case for them. 3. Consider methods to share heavy EV technical support capability across fleets and PICTs. 4. Consider opportunities for the electrification of small marine vessels. 5. Facilitate or co-invest in public charging infrastructure. 6. Provide facilities in support of micro- through large e-mobility options, beginning with facilities at public offices. 7. Support inspection of charging cables, particularly those supplied with used imports. 8. Support inspection of existing electricity supply circuits that will be used for EV charging. 9. Support the demonstration of V2H and on-site managed charging. Show leadership by deploying these options for some government vehicles. 10. Develop EV service industry and encourage retention of capability and capacity. 11. Develop and introduce a system that encourages the industry to adopt quality product and provide quality services. 12. (Support the introduction of Time of Use (TOU) electricity pricing).

Table 1: Target Actions of the Regional EV Program

Note that the reference to TOU electricity pricing (last row of Table 1) has been placed in parentheses. As it stands, the introduction of EVs is not the main reason to adopt TOU pricing: there are other, more compelling reasons for the introduction of TOU pricing and therefore, in our opinion, the EV Program should not lead the take-up of TOU systems.

The portfolio of action is fully in line with the PCREEE focus on promoting inclusive and integrated markets for sustainable energy products and services in PICTs, by addressing the demand-side (consumer) and supply side (technology/service providers) barriers equally through regional tools and methodologies.

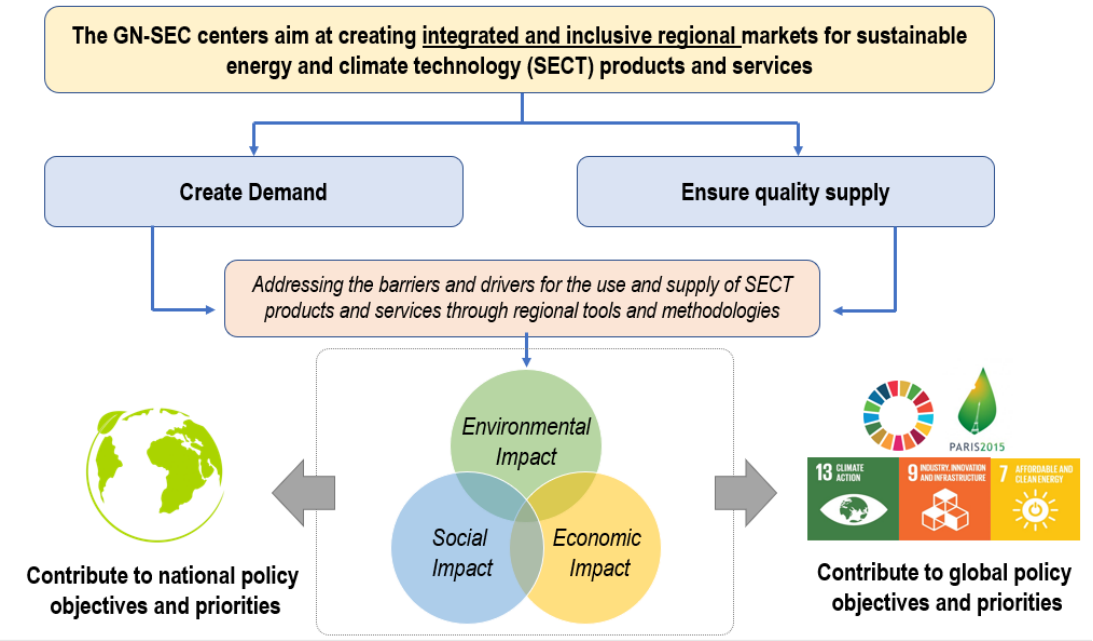

Figure 2: PCREEE/GN-SEC Theory of Change[6]

Through regional activities and spill-over effects, PCREEE aims to introduce RE&EE innovations into the PICTs market. Once demonstrated and tested, PCREEE will facilitate their commercialisation, replication and industrial scale-up.

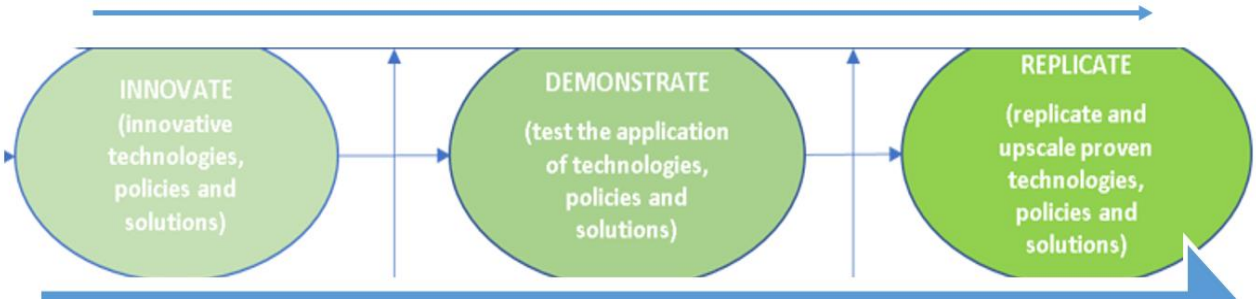

Figure 3: PCREEE/GN-SEC Regional Market Development Approach for EVs

[6] See GN-SEC approach at www.gn-sec.net

4 Context for the Working Environment of the Regional EV Program

The earlier work identified some important context in which the proposed Regional EV Program must work. This context is as follows:

- Electric vehicle-related technology is rapidly evolving, providing many new opportunities. Related to this:
  - Pacific organisations working in this space will need to remain nimble to make the most of the new technology as it comes available. Projects may also require re-evaluation as circumstances change;
  - Care must be taken to avoid adopting technology that is not sufficiently mature for purposes of the particular PICT market (as early adoption might lead to setbacks);
  - Use of partnerships with overseas groups might best provide knowledge on and access to the latest developments.
- PICTs are highly diverse in many respects, quite apart from their differing physical and human geography — their urbanisation, their relative wealth, the quality and extent of their roading networks, their transport demands and existing vehicle fleets, their electricity infrastructure and markets for electricity and fuel (requiring flexibility in how the Regional EV Program applies to individual PICTs).
- There is currently little EV-related capability and capacity within PICTs. In their initial years, PICTs will be highly dependent upon international support whilst they develop their own capability. This upskilling would be more efficiently provided by rolling out similar programs across all PICTs so that the region can grow and each party can learn from the experiences of others as part of a single ecosystem, rather than allow some to be left behind. PICTs can also learn from some initial experiences with EVs in other SIDS, particularly in the Caribbean. This can be facilitated through the GN-SEC and SIDS DOCK.
- PICTs are better positioned to be followers of "global" EV technology and, in many circumstances, should be able to adapt guidelines and standards already in place in other countries, limiting any new work or novel systems that may otherwise require to be developed. As examples, the New Zealand Government's Energy Efficiency and Conservation Authority has published guidance on purchasing EVs[7] through to charging them[8], and the International Council on Clean Technologies (ICCT) has recently published the "Electric Vehicle Guidebook for India States"[9] all of which could be adapted into PICT-relevant information.
- But on that note, particular care is required to ensure that polices borrowed from overseas are suited to the PICT environment, and to ensure that policy is developed from evidence.
- There are some people based in the PICT region who are respected experts in their transport-related field and it would pay to encourage at least some of these to become the "Regional Experts" on EVs in their field. For example, a recognised authority on marine vessels resides in the PICTs and appears a worthy candidate to consider supporting in work to develop regional expertise on the electrification of marine vessels. Similar positions to cater for heavy-vehicle electrification, EV servicing, and others, would be beneficial to the region.
- Initiatives in PICTs appear to work best when there is local buy-in and they are supported locally, rather than being top-down driven from a regional hub. Yet a regional hub is expected to provide efficiencies through avoiding duplication of effort, providing valuable communication links between interested parties and projects, etc. (including spear-heading SIDS-SIDS cooperation initiatives). Hence a combination of PICT-based EV-related representatives and a regional hub appears sensible.
- Looking at possible hosts of the EV Program in the individual PICTs, these might be the offices of the energy or transport ministries. Many PICTs have separate energy and transport ministries. EVs and their charging straddle both portfolios and will require participation by both ministries (or other ministry if, for example, the electricity sector falls under the umbrella of another ministry). Where these are separate, good communication and coordination between them will be essential.
- Roll-out of a coordinated EV package of activities would best be supported by donor contributions, and it will be important to gain the support of potential donors from the start.

[7] https://www.eeca.govt.nz/news-and-events/media-releases/booklet-answers-common-electric-vehicle-questions/
[8] https://www.energywise.govt.nz/on-the-road/electric-vehicles/ev-charging/
[9] https://theicct.org/sites/default/files/publications/India_EV_State_Guidebook_20191007.pdf

Early involvement of organisations such as the Pacific Region Infrastructure Facility (PRIF: made up of a membership of eight donor organisations) and the Green Climate Fund (GCF) is recommended in this regard.

- There are several regional frameworks already in place across PICTs. Experience from these frameworks suggests that, in general, the anticipated high level of coordination, cooperation and collaboration hoped for from working to frameworks has not been realised.[10] Care will be required to ensure that a regional EV hub does not suffer the same fate. Care will also be required if aligning with another framework: if, for example, an existing monitoring and evaluation system was used (as is recommended), it must be ensured that any poor performance of the existing framework does not affect the performance of the EV initiatives.
- The National Determined Contributions (NDCs) do not appear to have been well developed for some PICTs, resulting in targets that are more aspirational than achievable without significant disruption and/or significant foreign aid. PICs are currently reviewing their NDCs and this provides an opportunity for the inclusion of energy efficiency in the transport sector, which may include EVs at a secondary level (i.e., NDCs may not provide EV-specific targets, but EV initiatives may have an effect on meeting the non-EV specific targets).
- It would be worthwhile to consider the many potential opportunities for women that may accrue due to the development and implementation of the proposed policy and program, including in the course of the downstream deployment tasks.

Lastly, it is worthwhile revisiting the potential high-level goals of a Regional EV Program: that is, what are the desired outcomes/what would success look like after a Regional EV Program has been in place for several years? Here are our suggested target outcomes for this:

- PICTs are best prepared for their respective EV futures, whatever those futures might be;
- The uptake of EV technology has been carried out wisely and in a fit-for-purpose manner;
- Programs have been inclusive, well-coordinated and the parties involved well-connected so that they could achieve maximum benefit from the resources that are made available to the program;
- The region develops its own, stable base of capability and capacity.

However, as pointed out in the policy document, administrative-type targets like these are hardly inspirational, nor visionary – and therefore serve little purpose in providing guidance to a wide audience towards an e-mobility future. The policy document discusses this further, and recommended the following regional e-mobility targets:

	Proposed 2030 Regional E-Mobility Targets for PICTs
1.	Ten different models of manufacturer-supported, mainstream EVs are available in the marketplace.
2.	Battery swapping for low-voltage mobility use is available on a commercial scale in the marketplace.
3.	There is good public awareness of EVs.
4.	50% of all mainstream EVs are charged through devices that are managed-charging[11] enabled.
	Proposed 2050 Regional E-Mobility Targets for PICTs
5.	Services provided by EVs are an integral and significant component of transport within the region and include single-person, electrically assisted mobility options through to electric trucks, buses and boats.
6.	90% of grid-supplied charging of mainstream EVs is provided through managed-charging systems.

Table 1: Target Actions of the Regional EV Program

[10] For example, as described in the findings of the report "In Review of the Framework for Action on Energy Security in the Pacific (FAESP): 2010 – 2020 PHASE 1: FINAL REPORT" Peter Johnston, October 2019.

[11] That is, the charging event can be managed by a remote, third party.

5 Proposed Design of the Regional EV Program

5.1 Introduction

This section provides a proposal for a Pacific Regional EV Program by:

- First describing a structure for how it is proposed that the various stakeholders connect and work together (Section 5.2);
- Describing the proposed funding mechanisms for the Regional EV Program (Section 5.3);
- Using the above as a foundation on which to launch the earlier recommended EV activities, resulting in the development of a results framework for the proposed Regional EV Program Section 5.4).

5.2 Proposed Management and Governance Structure

As previously indicated, it is important that the program implementation strategy adopts the right balance between regional coordination, local ownership, preference for national execution and openness to manifold international partnerships. Figure 1 looks at this arrangement spatially, to introduce the various stakeholders involved in this EV program landscape:

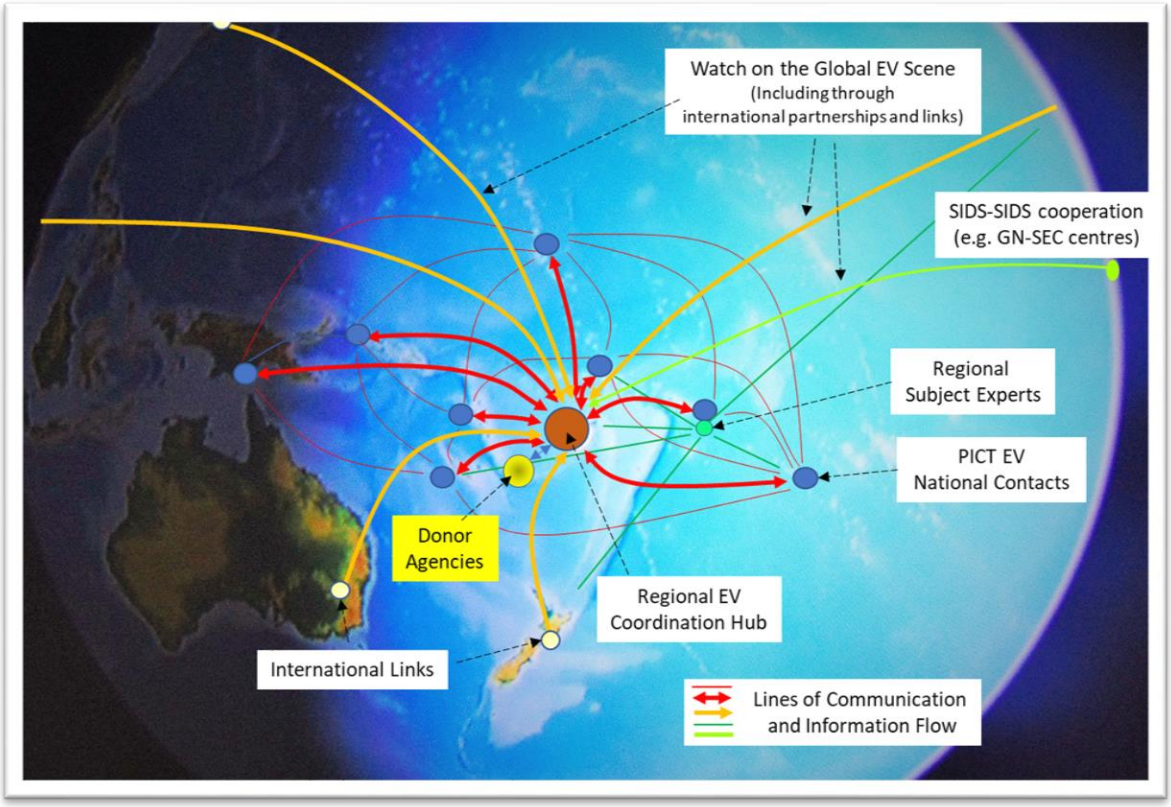

Figure 4: Spatial Schematic of Proposed Regional EV Working Group Ecosystem

At the heart of this EV Program is the "Regional EV Coordination Hub", which acts as a Pacific clearinghouse for EV issues. It employs a number of technical and administrative staff and is responsible for the execution of the day-to-day activities of the program. It oversees the smooth implementation of the annual work plans and ensures communication and coherence between the various national, regional and international execution partners. The Regional EV Coordination Hub is provided direction by the PICT Energy and Transport Ministers and also by the Pacific Energy Advisory Group (PEAG) (both Program Directors). PCREEE has offered to host the hub under the SPC framework. It is envisaged that UNIDO continues with its technical support for the hub in close coordination with other partners.

Supported by agreed policy actions, the hub provides leadership in the agenda-setting and provides an umbrella for management, guardianship (monitoring) and quality assurance over the EV activities in the Pacific. Administratively, the hub will be organised into "service desks" (the term "service desk" here referring to the person, persons or group that are the main point of contact and main administrators of a particular subject area, with "desk" inferring set up in an existing office) reflecting

the key components of the EV program (Central Policy and Administration"; "Standards and Guidelines"; "Awareness and Promotion"; and "Demonstration and Upscale").

The hub is well connected to the region through the PCREEE National Focal Institutions (NFIs), a network of "PICT EV National Contacts" and "Regional EV Subject Experts" that are based in various PICTs. It will also ensure links to various international stakeholders such as the Pacific Blue Shipping Partnership[12] and to "global EV information". SIDS-SIDS knowledge exchange on island e-mobility issues will be facilitated by PCREEE and UNIDO through the Global Network of Regional Sustainable Energy Centres (GN-SEC). Currently, CCREEE is involved the formulation of a similar EV strategic framework for the Caribbean.

The management of the hub reports to a Regional EV Working Group, comprising a number of national (PICTs EV National Contacts), regional (Regional EV Subject Experts) and international key stakeholders and core partners. The detailed composition will be defined during the establishment phase of the program. The annual work plans (including budgets) and progress reports developed by the hub are subject to the approval by the EV Working Group.

The annual work plans will include the activities of all members of the EV Working Group (incl. those not directly implemented but coordinated by the hub). Technical support is also provided to the various EV activities amongst Small Island Developing States (SIDS)[13], including cooperation activities and access to "global EV information", and that information provided through the use of Technical Assistance (TA) projects. The EV Working Group will also oversee the general performance of the hub and will provide updates to the Pacific Energy Advisory Group (PEAG) and the Pacific Ministers of Energy and Transport. Figure 2 provides a management and communications structure view of this proposed stakeholder arrangement.

[12] The PBSP is an open coalition currently comprised of eight Pacific Island countries—co-chaired by Fiji and the Marshall Islands—who have announced an ambitious commitment to accelerate development of a 100% carbon-free maritime transport sector by 2050, including a 40% reduction of greenhouse gas (GHG) emissions from shipping by 2030. In consultation with multi-lateral and bilateral development partners, the PBSP is Developing a blended finance package of at least USD$500 million for its 10-year initial work programme (2020–2030).

[13] E.g., Cooperation across Small Island Developing States (SIDS), understanding that many of them face similar barriers and are at similar or other early stages of EV deployment.

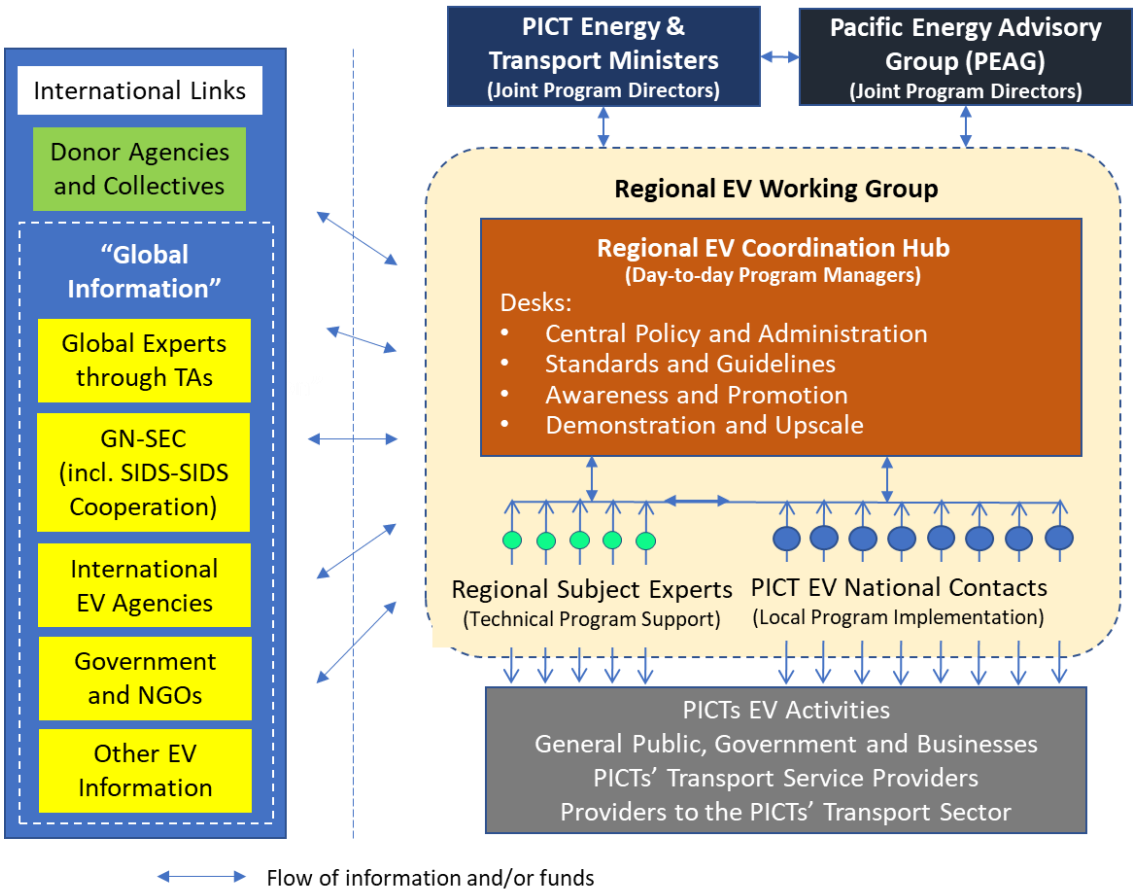

Figure 5: Proposed Management and Communications Structure of the Regional EV Program

It is proposed that technical support is provided at a regional level to the various EV activities from "Regional Subject Experts" – from people within the region who are recognised experts in certain fields and who are supported to become the Regional EV Subject Experts in their field.

The various entities working within this proposed Regional EV Program and their respective responsibilities are:

The Regional EV Coordination Hub – it is proposed that:

- The Regional EV Coordination Hub comprise four main service desks:
  - Central Policy and Administration;
  - Standards and Guidelines;
  - Awareness and Promotion; and
  - Demonstration and Upscale.
- The Regional EV Coordination Hub is responsible for:
  - Implementing the day-to-day activities and oversee the annual work plans and budget of the EV Coordination Hub;
  - Developing and maintaining the Regional EV Coordination Hub business plan;
  - Defining work targets for PICT EV National Contacts;
  - Ensuring good communication between the Regional EV Coordination Hub and the various PICT EV National Contacts, and amongst the PICT EV National Contacts themselves;
  - Providing information and resources to PICT EV National Contacts (and their respective offices);
  - Centralising the data received from monitoring and evaluation carried out by PICT EV National Contacts, their offices, or others involved in EV activities within the region;
  - Maintaining a watch on the global EV scene, including through international partnerships and links, and through Regional Subject Experts;
  - Providing quality control over information and programs;

- Disseminating information to PICT EV National Contacts, Regional Subject Experts, other regional stakeholders, and interested international partners;
- Working with donor agencies (in a transparent and coordinated manner across the donor agencies).

The Regional EV Working Group – it is proposed that:

- The Regional EV Working Group is responsible for:
  - Overseeing the performance of the hub and progress with regard to the achievement of the program objectives;
  - Providing supervision across EV activities with Regional EV Coordination Hub beginnings;
  - Communication with international development partners aim at avoiding duplication of projects and work efforts;
  - Reviewing the annual work/business plans and progress reports of the hub;
  - Suggesting concrete activities and initiatives to be implemented by the hub or individual partners of the EV Working Group;
  - Selecting and appoint external evaluators;
  - Providing updates to the PEAG and the Ministers of Energy and Transport (coordinated through the Central Policy and Administration Service Desk of the Regional Coordination Hub).

PICT EV National Contacts – it is proposed that:

- The PICT EV National Contacts are based in a suitable national government office such as a PICT's Ministry of Energy or Transport:
  - These are likely to begin as part-time positions for each PICT, integrated into the responsibility of an existing position, and it is proposed that the position is at least partly sponsored by the national government involved. However, it is expected that resources, including those related to the provision of guidelines, and awareness and promotional materials and publications, would be provided by the Regional EV Coordination Hub and any sponsorship the hub gains for this;
  - Likewise, it is expected that the PICT EV National Contacts would receive at least partial funding for communications, and travel to joint EV Working Group meetings and others from the Regional EV Coordination Hub, as sponsorship of the Regional EV Program allows. The PICT EV office would also receive Working Group funding for approved projects (such as demonstration projects), again, as sponsorship allows.
- The responsibilities of each PICT EV National Contact and their office include:
  - Oversight of local PICT EV projects, including monitoring and evaluation of local PICT EV activities;
  - Passing information between the Regional EV Coordination Hub and local PICT entities involved in the EV sector, and vice versa.
  - Providing the PICT's Centre for EV information and awareness programs.

Regional Subject Experts – it is proposed that:

- Regional Subject Experts (or suitable persons able to manage the portfolio involved) will be chosen from those that already have a good knowledge of desired subjects and will be supported to gain specific EV knowledge in their field. These may be experts employed by technical institutes, with their (part) time on the Program negotiated for and supported by a stipend or other. Through this means, it is hoped that the region will develop its own expertise in the following sectors:
  - EV charging systems and integration with the supply electricity;
  - Servicing and support of EV and EV-related technologies;
  - Heavy EVs;
  - Electrification in the marine sector;
  - Re-use and end-of-life component management;
  - Low-voltage e-mobility and power supply systems.
- The Regional Subject Experts will then be responsible for providing their expertise to PICT and regional projects and programs.

International Links – it is proposed that:

- Links are established with international organizations and international subject experts, including through partnerships with them (including SIDS-SIDS cooperation within the scope

of the Global Network of Regional Sustainable Energy Centres (GN-SEC), aimed at providing the region with ready access to leading information, expert advice and informed project stewardship.
- Links are established with donor agencies, preferably working with donor agency collectives (aimed at providing efficient organisation of donor support).

5.3 Regional EV Program Funding Mechanisms

It is proposed that the Regional EV Program is funded by various means including:

- For the Regional EV Coordination Hub and Working Group: PCREEE regional funding allocated for this purpose and provided through PCREEE/SPC. UNIDO continues to provide technical support to the Hub in close coordination with other partners;
- For the PICT EV National Contacts:
    - At least partial sponsorship of the PICT EV National Contact service desks by individual PICTs (for example, through PICTs allocating some proportion of personnel time to the EV program);
    - Travel to regional EV activities through "collective donor sponsorship" (i.e., sponsorship by international development partners provided via a coordinated, collective arrangement), where this is attained by the Regional EV Coordination Hub for this purpose;
    - Resource materials provided by the Regional EV Coordination Hub (which may in turn be provided through regional funding and/or through TA-related projects for this purpose);
- For the Regional Subject Experts:
    - An annual stipend provided through regional sponsorship from the private sector and from international development partners, and administered by SPC/PCREEE;
    - Travel to regional EV activities through collective donor sponsorship, where this is attained by the Regional EV Coordination Hub for this purpose;
    - Supplementary funding provided through TA-related projects that involve the Regional Subject Expert;
- For Technical Assistance projects: collective donor sponsorship, where this is attained by the Regional EV Coordination Hub for specific projects;
- For "contestable fund" projects (where rounds of proposals are called for from the private sector for EV projects and partial funding of the proposed projects is awarded to those projects that best meet the round's objectives (for example, one of the objectives in a round might be to provide public charging in critical areas)):
    - Private funding from the private sector party proposing the work;
    - Supplementary funding provided by collective donor sponsorship, where this is attained by the Regional EV Coordination Hub for specific contestable fund projects.
- Privately or directly donor-funded EV projects.

Before launching the program, a minimum funding based needs to be secured. In this context traditional Pacific donors and PCREEE core partners (e.g. UNIDO, Austria, Norway) could be approached.

Providing more background on the contestable fund proposal, the New Zealand Government has had good success running seven rounds of a contestable fund over four years. This mechanism has provided supplementary funding for projects that would have otherwise been unlikely to have gone ahead due to their poor financials and/or their associated risks. For New Zealand, the support of the partial sponsorship has resulted in early uptake of heavy vehicle EVs, EV taxis, new charging arrangements, and the introduction of charging infrastructure in remote but vital areas (where the frequency of use is not expected to provided commercial returns for several years).

The Regional EV Program is not fully dependent upon receiving the suggested sponsorship funding, although this would likely result in a skeleton EV program that achieves a mere shadow of the proposed target outcomes. In this light, the proposed TAs are to be considered more as target projects that proceed only if funding is secured for them. Similarly, rounds of the contestable fund would only be undertaken if sponsorship was in place, and sponsored travel to regional EV events by various EV Working Group members would only occur if sponsorship was gained for this. In this manner the Regional EV Program can begin without first securing sponsorship funding, providing certainty to begin the program.

5.4 Proposed Regional Electric Vehicle Program Results Framework

This section pulls together the findings of the technical background report, the findings of the policy action work (Stage 2 of the project), and proposed stakeholder and administrative structures (Sections 5.1 through 5.3 of this report) to develop and present a results framework for the proposed Regional EV Program. In keeping with this project's TOR requirements, this was developed for a five-year timeframe.

At a more detailed level, this results framework was developed as follows:

- The EV Program encompassed those EV-related activities to be carried out directly by the proposed Regional EV Coordination Hub and those that may be managed or directed by a particular member of the Regional EV Working Group (e.g. the latter might be a donor-sponsored Technical Assistance (TA) project (a proposed list of which is provided in Table 3));
- Further to this, the target outcomes presented were both those of the Regional EV Coordination Working Group (i.e., including those with PICT Representative involvement) and those of the Regional EV Program as a whole (i.e., those including TA projects and others);
- Timeframes for the various EV-related activities were chosen according to our assessment of the priority of the activity, which also took into consideration the maturity of the technology involved (i.e., when the technology involved was likely to become "mainstreamed", or at least required exposure in the local marketplace);
- There is an expectation that various agencies within national governments will provide some basic level of staffing assistance to the EV Program;
- An office assistant has been added to the four before mentioned service desks of Central Policy and Administration; Standards and Guidelines; Information and Awareness; and Demonstration and Upscale.

Fund Type	Activity	Amount US$	Year Deployed
TA1	Oversee PICT development of EV roadmaps and EV mandates.	$ 30,000	1
TA2	Provision of discussion document and guidelines on preferred specifications for EV-related goods and recommendations for tax/duty levels.	$ 15,000	1
TA3	Provision of V2H and on-site managed charging guidelines.	$ 5,000	3
TA4	Provision of low-voltage specification guidelines	$ 30,000	3
TA5	Develop and provide generic courses on working with high-voltage EV systems.	$ 200,000	2,3
TA6	Develop and provide generic courses on working with low-voltage EV and electricity supply systems.	$ 100,000	2,3
TA7	Development of low-voltage awareness and promotion info ration.	$ 30,000	3
TA8	Social marketing package, once per year (5 x $10,000)	$ 50,000	1,2,3,4,5
TA9	Development of EV sector awareness and promotional campaign ($40k + 4 x $20k)	$ 130,000	1,2,3,4,5
TA10	Provision of guidelines for public charging.	$ 20,000	2
Other	Contestable Fund Round 1	$ 250,000	3
Other	Contestable Fund Round 2	$ 250,000	4
	Total	$ 610,000	

Table 2: Proposed Technical Assistance Projects in Support of the EV Program

The results framework was developed in an Excel spreadsheet. Appendix B provides a cut and paste of this spreadsheet. With 38 policy actions involved, the detailed results framework is extensive and Appendix C provides a summary aimed at making it easier to look across the proposed results framework.

Listed below, and also presented in Table 4, are the resulting staffing and budget levels as taken from the results framework for both the overall proposed EV Program, and separately for the proposed Regional EV Coordination Hub. These totals are:

- A staffing level of the Regional EV Coordination Hub of averaging 3 full-time-equivalents (FTEs) over the five-year period under consideration;
- US$274,000 over the five years for the operational budget of the Regional EV Coordination Hub (i.e., an average of around US$55,000 per year), provided from regional funds;
- US$402,500 over five years to support Regional Subject Experts and to provide for a proposed annual regional EV workshop (i.e., an average of around US$80,000 per year), provided from regional funds or donor sponsorship;
- US$610,000 of Technical Assistance projects provided from donor sponsorship; and
- US$500,000 of funding for two rounds of a “contestable fund” (to be used to support private investment in numerous EV-related infrastructure and demonstration projects.

	Staffing (Full-Time-Equivalents (FTEs))						Budget			
Program Year	Mgmt Desk	STDs Guides	Info	Demo	Assist	Total FTE	Coordin' Centre	PICT/Expert Sponsorship	Supporting TAs/Other	Contestable Fund
Year 1	1.04	0.40	1.00	0.33	0.30	3.07	$ 65,000	$ 80,500	$ 105,000	$ -
Year 2	0.63	0.40	1.08	0.33	0.30	2.74	$ 62,000	$ 80,500	$ 200,000	$ -
Year 3	0.63	0.48	1.08	0.50	0.30	2.99	$ 52,000	$ 80,500	$ 245,000	$ 250,000
Year 4	0.63	0.40	1.00	0.50	0.30	2.82	$ 52,000	$ 80,500	$ 30,000	$ 250,000
Year 5	0.63	0.48	1.00	0.50	0.30	2.90	$ 43,000	$ 80,500	$ 30,000	$ -
	Total 5 years:					14.52	$ 274,000	$ 402,500	$ 610,000	$ 500,000
					total	14.52			total	$1,786,500

Table 3: Regional EV Program: Totals for the Staffing FTEs and Project Budget.

Again, it is noted that the FTE and the operational budget of the Regional EV Coordinating Centre provides the essential starting block for the proposed Regional EV Program and that there is much that is expected to be achieved through forming and operating such a centre with support from PICT EV National Contacts. Any sponsorship on top of this adds to the Regional EV Program, and the target is for an additional US$1.5m in funding over five years (i.e., an average of US$300,000 per year) which is expected to fill most of the significant gaps for the regions move to EVs.

5.5 Gender Considerations

There are many opportunities for the Regional EV Program to empower women, as can be seen from the fact that many women chair automotive companies and organisations involved in electric vehicles globally (for example, Christina Bu, Chair of the Norwegian Electric Vehicle Association (the largest EV Association in the world)). Acts such as appointing women to leadership positions break down perceived gender barriers, which is important in the Pacific context due to the important role that women often play in decision-making. This aspect should be considered when filling the Regional EV Coordination Hub and PICT Representative positions. The positions available can be part-FTEs, which will make it possible for women to take them up even if they have other responsibilities.

6 Conclusions

The Regional EV Program would be best supported by coordinated donor sponsorship of various EV sub-projects (through Technology Assistance-type projects and by other methods) (and one function of the Regional EV Coordination Hub is to arrange for the sponsorship of these sub-projects). This donor acceptance and then delivery of proposed TA activities can be thought more as a target than as a reliance on receiving sponsorship (and on the delivery of the sub-projects). Regardless, there is a need to form and operate a Regional EV Coordinating Hub to help coordinate securing the proposed TAs and other EV sub-projects, and to then ensure best use of the outcomes of concluding sub-projects.

The five-year results framework indicated that a staffing level of around 3.0 FTEs was required each year for the Regional EV Coordination Hub to deliver the recommended EV Program. On top of this, the Regional Coordinating Centre required operating capital of around US$55,000 per year (US$274,000 over five years) plus regional- or donor-sponsored contributions of around US$80,000 per year to support Regional Subject Experts and to provide for a proposed annual regional EV workshop. Significant cost-synergies can be created by linking the EV Coordination Hub to the capacities and resources of the PCREEE and the Energy Program of SPC. The PCREEE link offers opportunities to promote SIDS e-mobility on a global scale through the GN-SEC. There is also potential for extended technical and funding support from PCREEE's core partners (e.g. UNIDO, Austria, Norway) in addition to what could be mobilised through traditional and emerging Pacific donors.

It is recommended that the full Regional EV Program is additionally supported over five years with US$610,000 of Technical Assistance projects and around US$500,000 of funding for two rounds of a "contestable fund" to be used to support private investment in numerous EV-related infrastructure and demonstration projects.

Appendix A: Recommended Policy Actions of the Regional Policy for E-Mobility in PICTs

The recommended regional and national policy actions are:

Central Policy and Administration

Policy Action 1. Develop and put in place high-level targets and mandates concerning EV uptake.

Policy Action 2. Form a Regional EV Coordination Hub and Working Group comprising national, regional and international key stakeholders responsible for quality assurance, harmonisation, coordination and implementation of work packages as well as information sharing. A regional monitoring framework to track progress will be operated by the EV Regional Coordination Hub.

Policy Action 3. Support PICTs in the development and implementation of EV roadmaps and required policies and regulations in line with the regional framework;

Policy Action 4. Consider import tax relief for compliant products, if applicable. Also consider the use of minimum specifications at the time of import to avoid the proliferation of poor-quality or unsupported product.

Policy Action 5. Develop and set minimum specifications for goods, to be applied at the time of import (which may be linked to the tax levels applied). These are to include minimum standards for EVs, chargers and battery systems.

Policy Action 6. Develop and deploy a monitoring and evaluation (M&E) system in order to keep the policy aligned with changes in the political landscape, and with developments in technology. These management systems must also allow for re-evaluation and pivoting of activity direction and goals, if required to achieve the desired outcomes. Good governance is also required to instil efficient deployment and to also to prevent fraud, corruption and other damaging activities. This activity will be harmonised with regional monitoring frameworks.

Policy Action 7. As required, introduce and/or amend the regulatory framework to provide for EVs, including the registration of them for use on the roads, the charging of them, and other associated activities.

Mainstream (Passenger Car) Electric Vehicle Uptake:

Policy Action 8. Set guidelines or requirements for charging including the specification of charging connectors and public charging guidelines to facilitate interoperability of electric vehicle charging (both fast and slow) and communicate these to vehicle suppliers and potential charging providers.

Policy Action 9. Undertake social marketing research to identify existing attitudes, level of understanding and information gaps around electric vehicles.

Policy Action 10. Awareness, information and promotion campaign: based on the findings of research, develop and deploy a campaign to inform all parties who will be involved in electric vehicle uptake, from potential purchasers and users through to service providers. This campaign is to include the development of information and guidance materials and provide the opportunity for people to experience and drive electric vehicles, particularly in areas where the technology is wholly novel. The tourist sector is an obvious target for these activities. These initiatives will require at least oversight by an independent authority to provide the necessary quality and robustness to gain the trust of those receiving the information. Ultimately, the goal of this phase is the “normalisation” of electric vehicles. Among other methods, information and data will be disseminated through a PRDR-PCREEE Knowledge Hub with SIDS-SIDS cooperation on EV island issues facilitated through the GN-SEC;

Policy Action 11. Facilitate or co-invest with providers of public charging infrastructure to develop this ahead of demand from EVs. The extent to which public charging infrastructure is required, and what type of infrastructure (fast or slow) is needed will vary with the circumstances of individual PICTs. For example, where levels of solar PV uptake are high, daytime charging could be encouraged by providing slow public charging where people park during the day.

Policy Action 12. Provide leadership by purchasing appropriate electric vehicles for use in government and local government fleets.

Policy Action 13. Support the development of EV service industries and include consideration of methods to retain capability in the PICTs. Included in this, ensure that first responders are aware of correct procedures.

Policy Action 14. Support inspection of existing electrical supply circuits (for example, socket outlets that will be used at home and at work) before they are used for charging electric vehicles.

Policy Action 15. Support inspection of charging cables supplied with used EV passenger car imports to ensure they are compatible with the local electricity network (noting that in Japan, charging cables are typically designed to operate at the local residential electrical supply of 110V, whereas residential electrical supply in many PICTs operate at the higher 220-240V, and an influx of used EVs from Japan will potentially introduce chargers that are not approved for use in PICTs).

Policy Action 16. Require new buildings with parking facilities to be "EV-ready" by ensuring sufficient capacity at switchboards and easy routes for cabling.

Policy Action 17. Ensure appropriate plans are in place for the retirement of EVs and associated componentry, including maintaining a watching brief on global developments concerning tracking the ownership of propulsion batteries, their repurposing and recycling.

Low Voltage E-Mobility

Policy Action 18. Develop and introduce standardization measures, ranging from guidelines through mandatory standards, including minimum performance specifications and/or standards aimed at making e-mobility easier to access, more convenient and at lower cost; to ensure product quality and reliability; and avoid incompatibility issues leading to product failure. (The Sustainable Energy Industry Association of the Pacific Islands provides guidelines for PV use and for many other energy systems[14], and provides a good example of the sort of guidelines that could be developed for low-voltage e-mobility and electricity supply.)

Policy Action 19. Encourage the industry to provide quality, well-supported products through promotion of suppliers and product, possibly including the use of quality marks and customer feedback forums.

Policy Action 20. Develop and introduce technical courses on low-voltage technologies (these also supporting greater understanding of mainstream EV technologies).

Policy Action 21. Provide guidance and/or develop regulations to manage the maximum speed/power of low-voltage e-mobility devices that can be imported, and which types of roading/footpaths/cycleways they can operate on, to manage road safety.

Policy Action 22. Provide guidance on hiring/buying and using low-voltage e-mobility options to promote fit-for-purpose user selection and effective use of e-mobility options.

Policy Action 23. Demonstrate leadership by providing facilities where government and local government staff can park and charge their e-mobility devices, and promote these to staff. Also provide public facilities.

Other Electric Vehicle Uptake:

Policy Action 24. Support PICT-relevant, heavy electric vehicle demonstrations, but carefully consider target applications (should be scalable) and timing (a delay of 2-3 years may not have a significant effect on the five-year outcome for PICTs, but would carry far less risk and likely require less financial support).

Policy Action 25. Consider amalgamating various heavy vehicle projects or otherwise to share set-up costs.

Policy Action 26. Provide leadership by demonstrating appropriate heavy electric vehicles where government or local government operates heavy vehicles.

Policy Action 27. Work with tourism operators and national park authorities to identify opportunities to demonstrate electric marine vessels, particularly in environmentally sensitive areas, and support such demonstration projects. Also consider the (low-voltage) electrification of small fishing vessels.

[14] Sustainable Energy Industry Association of the Pacific Islands (SEIAPI) guidelines: http://www.seiapi.com/guidelines/

TOU Pricing:

Policy Action 28. Facilitate the introduction of TOU pricing, including supporting techno-economic assessments of TOU pricing use for grid supply on PICT main islands, a workshop on TOU pricing delivered by overseas- and PICT-based experts, and follow-up support to electricity supply companies that are expected to benefit from deploying TOU pricing systems.

Policy Action 29. Consider amalgamating orders for TOU equipment and services to attract more favourable responses to tenders.

Policy Action 30. For locations enabled through the deployment of TOU or smart meters, support the development and deployment of awareness campaigns to electricity consumers so that they are aware of how best to use TOU charging.

Policy Action 31. Provide guidance on monitoring customer response and use of data to manage pricing and the need for ongoing customer education.

Policy Action 32. Provide leadership through government and local government being early adopters of smart meters and time of use pricing in their facilities as this becomes available.

Low-Voltage Power Supply:

Policy Action 33. Develop guidelines for system design, component specification, installation and use of low-voltage electricity generation for various PICT scenarios.

Policy Action 34. Develop voluntary standards and support service requirements, and encourage compliance with them. Options for the latter include a compliance- and/or a customer feedback-rating system, and support and advertising provided where the equipment, supplier and/or service providers meet minimum requirements.

V2H and on-site managed charging:

Policy Action 35. Develop guidelines for the use of V2H and on-site managed charging that includes descriptions of case-study systems and the performance achieved with these (which will thus require a number of demonstration V2H and on-site managed charging projects to be undertaken). Also include the obligation that installers must meet wiring regulations and any post-works inspection requirements.

Policy Action 36. Develop voluntary standards for minimum specifications and encourage their use through advertising equipment or service providers that meet the standards and/or through use of quality marks for compliant product and service providers.

Policy Action 37. Show leadership by deploying on-site managed charging where there are government and local government fleets with electric vehicles.

V2G and grid-scale managed charging:

Policy Action 38. Maintain watching briefs on global developments concerning grid-scale managed charging and V2G technologies, with the possibility to upgrade this status should developments in these sectors reach the stage where the technologies might be applicable to the PICT environment.

Appendix B: Detailed Results Framework for Proposed Regional EV Program

Proposed Results Framework for the Progression of the Region's EV Sectors (Table 4, 1 of 3)

	Action (Regional/National)	Priority	PAs	Links	Timeframe	Stakeholders/Target Stakeholders	Target Outcomes	Budget REV-WG	Budget TA and other Donor	Budget PICT	Comments
	Central Policy and Administration										
1	Individual PICTs to set individual EV targets and mandates	3	PA1	Next step after developing EV Roadmaps.	Y1	PICT Energy & Transport Ministers, REV-WG.	EV mandates in place for at least 10 PICTs.	Project management of process, provision of road mapping/mandate guidelines and publishing of PICT mandate results: Y1 2/12FTE +US5,000.	TA1: part of US$ 30,000 package to oversee PICT development of EV roadmaps and EV mandates.	Staff contribution from Ministries of Energy and Transport.	Require a careful balance of setting mandate goals and the ability to meet them, which might best be managed by developing EV roadmaps at the same time.
2	Form a Regional EV Coordination Hub and Working Group comprising national, regional and international key stakeholders responsible for quality assurance, harmonisation, coordination and implementation of work packages as well as information sharing. A regional monitoring framework to track progress will be operated by the hub.	1	PA2	Foundation step for delivering a regional EV program.	Y1	UNIDO/PCREEE, PICT Ministers/ministries of Energy & Transport, international agencies. Ongoing operation also includes Coordination Office, PICT Representatives, Experts, International links.	Development of REV-WG business plan, approval and launch of REV-WG. Over time, the REV-WG becomes a respected entity in the Pacific EV Sector.	Y1 7/12 FTE plus ongoing operation of 6/12 FTE	As described by this spreadsheet and as refined in the REV-WG business plan.	As described by this spreadsheet and as refined in the REV-WG business plan.	Form a Regional EV Coordination Hub and Working Group comprising national, regional and international key stakeholders responsible for quality assurance, harmonisation, coordination and implementation of work packages as well as information sharing. Introduce and maintain a regional monitoring framework to track progress (operated by the hub).
3	Individual PICTs to develop EV roadmaps and targets in line with the regional framework.	2	PA3	Provides PICTs with the basis of their own, tailored EV business plans.	Y1	PCREEE, PICT Ministers of Energy & Transport, transport-sector representatives.	EV Roadmaps published for at least 10 PICTs.	Project management of process, provision of guidelines and publishing of results. Additional Y1 1/12FTE +US$5,000 to PA1 expenditure.	Part of proposed TA1 expenditure.	Staff contribution from Ministries of Energy and Transport.	Process leads into the development of EV mandates and the two actions (AP1 and AP3) can be run together.
4	As appropriate, set tax levels to encourage import of desired goods.	4	PA4	Requires the development of broad specifications for desired goods.	Y1-Y5 staged based on the ability to clearly identify preferred goods and process changes to tax schedules.	PICT Ministers of Energy, Transport, Finance, Trade, etc.	Reduction in the tax paid on EVs and EV-related goods meeting desired specifications.	Project management of the development of a discussion document and guidelines that includes supporting information for any Regulatory Impact Statement required. 2/12FTE Y1, Y2 +US$5,000.	TA2: Identification of preferred specifications for EV-related goods and recommendations for tax/duty levels for such goods, provided as discussion document and guidelines. US$15,000.	Staff contribution from various PICT ministries.	Fiji already has a tax system in place that results in less tax paid on EVs (and on Hybrid Electric Vehicles (HEVs)). At the same time, Fiji also has a maximum age restriction on vehicles entering the country, which is expected to be beneficial to the country and provides a good template for other PICTs. Hence there is already PICT experience to draw upon. Consider developing and introducing a regional best practice modality.
5	Develop and set minimum specifications for imports.	1-5	PA5	May be linked to the review of taxes and duties due on imported goods.	As approved. Target of Y2.	PICT Ministers of Energy, Transport, Finance, Trade, etc. Transport sector providers.	At least minimum voluntary specification for: chargers; new technology battery systems; mainstream and low-voltage EVs;	An enabling component of proposed Action 4.	Part of proposed TA2	Staff contribution from various PICT ministries.	The introduction of minimum specification or minimum performance specifications is encouraged for consumer protection purposes, especially considering the ease with which goods can be bought and imported from China by individuals who have little knowledge of product quality requirements. Care is also required to avoid over-specifying the requirements of goods as this may unintentionally ban new, desired technologies. Different goods would require different priorities. This would likely be best served through the development of regional minimum specifications and national governments drawing from these in line with local context.
6	Develop and deploy a monitoring and evaluation system.	2	PA6	Across all actions.	Y1-Y5	All - project practitioners are responsible for providing data, various PICT parties are the receivers .	Steady issue of EV activity "dashboard" results and use in at least annual evaluation of REV-WG projects and targets as part of BAU project management.	1/12 FTE x 5 years + electronic publishing.	Nil	Nil	There is a regional M&E system in place. The Regional EV Program shall connect to this, although the Regional EV Hub is to ensure that the M&E system remains efficient, specific and effective. A reasonable level of importance is given to M&E because of the expected value of lessons learned during various deployments.
7	As appropriate, introduce/amend the regulatory framework to provide for EVs, their charging, and other associated activities.	2	PA7	Vehicle class specifications.	Y1	PICT Governments	No regulatory barriers prevent the import or use of desirable EVs or related goods/systems.	Raise potential issue with PICTs on an as-required basis. FTE from general office budget.	Nil	Staff contribution from various PICT ministries.	REV-WG could act as a supportive watchdog, providing potential barrier checklists to PICTs.
8	Maintain a watching brief on global EV-related developments.	3	PA3 8	Across all actions.	Y1-Y5	Regional Subject Experts, Coordination Office, links with "Global Information", those who would benefit from receiving.	Pacific Region becomes well-informed on the aspects of EV that are relevant to them.	e-newsletter 1/12 FTE/y x 5 years. Support also from Regional Subject Experts (funded from general fund).	General fund suggested to be funded by collective donor sponsorship that covers staging one EV full-day workshop per year and travel for this. Contribute to writing and publishing of "Pacific EV Dashboard". Workshop event: US$4,000, part travel/accommodation US$1,500 x 20 sponsored delegates, US$5,000 invited speakers.	Staff contribution from various PICT ministries.	Suggest EV Workshop held each year on day before or after Energy & Transports Minister's meeting to update parties involved. Coordinated with other to reduce cost of travel. Monthly "Pacific-EV Dashboard" (e-newsletter providing "dashboard" listings of activities, status, findings and useful information).

Results Framework for the Progression of the Region's EV Sectors (Table 4, 2of 3)

	Action	Priority	PAs	Links	Timeframe	Stakeholders/Target Stakeholders	Target Outcomes	Budget REV-WG	Budget Donor	Budget PICT	Comments
	Standards and Guidelines:										
9	Develop and set minimum standards for (mainstream) vehicles at time of entry and at time of in-service fitness testing.	3	PA5 PA7 PA8	Vehicle standards.	Y2 introduction. Y5 move towards one standard across PICTs.	PICT Ministers of Energy, Transport, Finance. Road vehicle sector/transport sector providers.	Move towards common Pacific Island standards for mainstream vehicles.	1/12 FTE x Y1, Y2 and Y5	Part of TA2.	Staff contribution from various PICT ministries.	For some PICTs, requires wider consideration of minimum standards for vehicles in general. There are some PICT standards and many global standards that can be readily adapted for this purpose. There are various global standards already developed for low-voltage applications and PICTs stand to benefit from information on these.
10	Ensure appropriate standards are in place for the retirement of EVs.	4	PA17	Across goods PAs.	Y3, Y4, Y5	Various government ministries. Service providers.	Adoption of industry best practices as they become available. Avoidance of dumping of EV-related components.	0.5/12 FTE x 3 years.	Nil	Staff contribution from various PICT ministries.	Lower priority due to value of batteries in open market providing market with incentive for re-use.
11	Set guidelines for charging including the specification of charging connectors	1,3	PA8	All charging	Y1, Y3	Government ministries and general EV industry.	Guidelines in place for passenger cars 2020, Guidelines in place for low voltage 2022.	Under Standards and Guidelines General Budget	Nil	Staff contribution from various PICT ministries.	Where none, "borrow" voluntary guidelines from New Zealand, Australia and Japan.
12	Require new buildings to be "EV-ready".	5	PA16	Building Code.	Y4	Government ministries, building owners, building service providers.	Minimum of new government buildings pre-wired for EV charging.	Little time involved. Part of general budget.	Nil	Staff contribution from various PICT ministries.	Has the backup of post-build retrofit, but worth raising so that those in the building industry are aware of the option.
13	Develop guidelines for the use of V2H and on-site manged charging.	3	PA35 PA36	Charging options.	Y3,Y4	Private EV user groups, governments with EV fleets.	V2H demonstrated and technology accessible.	Management of projects won under an initial US$250,000/y contestable LEV fund. 2/12 FTE x Y3,Y4 and Y5.	TA3 US$5,000 for development of V2H and on-site managed charging guidelines. Plus, access to Y3 and Y4 US$250,000 contestable fund aimed at small project demonstrations.	Staff contribution from various PICT ministries.	The private sector often has the will and the need to push new technology boundaries. Setting up a contestable fund for small projects has the potential to bring about early deployment of quality projects.
14	Develop (at least voluntary) standards for low-voltage vehicles, the charging of them, and the use of "mobility batteries" for local power supply circuits.	4	PA18	Low-voltage options	Y3-Y5	Wide range of PICT inhabitants.	Standardization of charging connectors and batteries providing easy use across different platforms.	2/12 FTE Y3,Y4, Y5.	TA4: US$30,000 investigation into options and recommendations for PICTs.	Staff contribution from various PICT ministries.	Requires global market to first mature, hence holding off so that PICTs can follow rather than lead. However, this offers a possible opportunity for SIDS-SIDS led cooperation.
15	Develop and introduce technical courses.	3	PA 20	EVs	Y2	Vehicle service industry.	Increased PICT capability and capacity.	1/12 x 5 years plus additional 1/12 Y2,Y3 for managing TA	TA5: US$200,000 to develop and provide a generic course on working with high-voltage EV systems including sponsorship of service personal. TA6: US$100,000 to develop a generic course on low-voltage electricity supply and servicing low-voltage EVs.	Staff contribution from various PICT ministries.	To be providing under guidance/direction of the Regional Subject Expert.
16	Develop guidelines for the use of new e-mobility options targeting safety.	4	PA21	L-V mobility	Y3	PICT governments, users.	Road Code for low-voltage mobility in public areas.	0.5/12 x Y3, Y4 and Y5	Nil	Staff contribution from various PICT ministries.	Governments to look at adapting codes from overseas as these are developed. Delay in starting is due to waiting for market to mature globally.
17	Provide buyer and user guides on low-voltage e-mobility options.	4	PA22	L-V mobility	Y3	Users	Buyer and user guides aimed at enabling informed choices to be made aimed at avoiding low quality and poor choices.	0.5/12 FTE x 5 years plus 1/12 FTE for TA7 in Y3.	TA7: part of suite of low-voltage awareness material to be prepared by single TA. TA7: US$30,000.	Staff contribution from various PICT ministries.	To be provided under guidance/direction of the Regional Subject Expert.
	Awareness and Promotion:										
18	Undertake social marketing research.	2	PA19	EV uptake.	Y2, Y5	All potential EV users	Provide understanding of market so that market barriers can be addressed.	1/12 FTE x 5 years.	TA8: Y2 and Y5 social marketing TAs provided by regional provider. 5 x US$10,000.	Staff contribution from various PICT ministries.	Valuable to consider value of outputs provided.
19	Develop and deliver an awareness, information and promotion campaign supporting the uptake of EVs. Information to be disseminated through the PRDR-PCREEE Knowledge Hub. Work is to be supported through SIDS-SIDS cooperation through the GN-SEC.	2	PA10	EV uptake.	Y1-Y5	All potential EV users	Increased awareness of EVs (resulting in higher likelihood of uptake)	6/12 FTE + US10,000 per year resources.	TA9: provision of resources for an awareness and information campaign adapting programs from overseas and with SIDS-SIDS cooperation. US$50,000 first year + US$20,000 x 4yrs.	Staff contribution from various PICT ministries.	This is the heart of the program - requiring appropriate, robust, independent and authoritative information to be distributed to those most likely to change and those who have changed - aimed at improving the experience. Information to be disseminated through the PRDR-PCREEE Knowledge Hub. Work is to be supported through SIDS-SIDS cooperation through the GN-SEC.
	Develop, publish and promote guidelines on:										
20	a. EV purchase (micro-mobility through 4-wheelers)	2-4	PA10	EV uptake.	Y2-Y4	Potential purchasers of EVs.	Better informed purchasers increasing sales of EVs.	Part of awareness and promotion FTE.	Part of TA9.	Staff contribution from various PICT ministries.	Sub-component of information, awareness and promotion campaign
21	b. Charging (micro-mobility through 4-wheelers)	2-4	PA22	EV use.	Y2-Y4	EV users and potential purchasers of EVs.	Better informed users resulting in improved experiences.	Part of awareness and promotion FTE.	Part of TA9.	Staff contribution from various PICT ministries.	Sub-component of information, awareness and promotion campaign
22	c. Servicing and Support (micro-mobility through 4-wheelers)	2-4	PA20	EV servicing.	Y2-Y4	EV service industry.	Improvements in servicing resulting in improved EV experiences and leading to increased sales.	Part of awareness and promotion FTE.	Part of TA9.	Staff contribution from various PICT ministries.	Sub-component of information, awareness and promotion campaign
23	Collate and distribute global and PICT EV information.	1	PA6 PA38		Y1-Y5	All parties	A more informed region, with normalization of EV technologies resulting in increased uptake.	PICT information component adds a further 1/12 FTE x 5 years to Line Item 8 budget.	Nil	Nil	Information updates are important to bring about normalisation of the technologies involved.

	Results Framework for the Progression of the Region's EV Sectors (Table 4, 3 of 3)										
	Action	Priority	PAs	Links	Timeframe	Stakeholders/Target Stakeholders	Target Outcomes	Budget REV-WG	Budget Donor	Budget PICT	Comments
	Demonstration and Upscale:										
24	Demonstrate government leadership through purchase of appropriate EVs.	3	PA1 2	EV uptake.	Y3-Y5	PICT governments.	EV purchases by PICT governments.	Little time involved, as coordinator. Part of general budget.	Nil	Various - covering purchase of EVs.	
25	Consider supporting electric bus demonstrations. Consider supporting the demonstration of other non-passenger car EV projects if there is a good case for them.	4	PA2 4	Heavy EVs	+Y3	Major city public transport provider.	The demonstration of e-buses if financially attractive/meets other requirements by then.	Small time involved, as coordinator. Part of general budget.	Likely special donor project.	Staff contribution from various PICT ministries.	
26	Consider methods to share heavy EV technical support capability across fleets and PICTs.	5	PA2 5	Heavy EVs	+Y4	EV service industry.	PICTs gain regional capability to provide some levels of service support to heavy EVs.	Little time involved, as coordinator. Part of general budget.	Likely special donor project.	Staff contribution from various PICT ministries.	
27	Consider opportunities for the electrification of small marine vessels.	4	PA2 7	EV options	+Y3	Marine Sector	Demonstration of small electric vessels.	Little time involved, as coordinator. Part of general budget.	Sponsorship provided as part of contestable fund.	Staff contribution from various PICT ministries.	Under management of Regional Subject Expert.
28	Facilitate or co-invest in public charging infrastructure.	2	PA1 1	Charging options.	Y1 thru Y5	PICT ministries, owners and operators of commercial areas, electricity supply companies.	The availability of *x* public charging stations. As an interim, a model road map for introducing charging for a chosen city and guidelines used for local government to consider their own.	2 FTE x 5 years.	TA10: Development of a guideline for public charging based on a PICT example: US$20,000. Also subject to contestable fund which allows for the introduction of public charging.	Staff contribution from various PICT ministries. PICT sponsorship of chargers.	
29	Provide facilities in support of micro through large e-mobility options, beginning with facilities at public offices.	3	PA1 2 PA2 3 PA2 6	Charging options.	Y2 thru Y5	PICT ministries, owners and operators of commercial areas, electricity supply companies.	Charging facilities available for low-voltage e-mobility options.	Part of line item 31.	Part of TA10 and contestable fund.	Staff contribution from various PICT ministries. PICT sponsorship of chargers.	Have example of Indonesia's general device charging to consider.
30	Support inspection of charging cables, particularly those supplied with used imports.	3	PA1 5	Charging options.	Y2 thru Y5	Vehicle importers, PICT Ministries.	Non-compliance charging cables are removed from use and do not become available to the market.	Little time involved, as coordinator. Part of general budget.	Nil	Staff contribution from various PICT ministries.	Already a requirement for many PICTs through the wiring and electricity regulations. Requires highlighting and more specific information provided to the industry.
31	Support inspection of existing electricity supply circuits that will be used for EV charging.	2	PA1 4	Charging options.	Y2 thru Y5	Owners of EVs, electricity supply companies, PICT ministries.	EV owners have ready access to a service that checks the condition and suitability of supply circuits for EV charging.	Little time involved, as coordinator. Part of general budget plus US$5,000 to develop a checklist and procedure with electricity supply companies. Plus US$2,000 per year for resources.	Nil	Staff contribution from various PICT ministries.	Target provision by electricity supply companies at no cost as it is in their interests.
32	Support the demonstration of V2H and on-site managed charging. Show leadership by deploying these options for some government vehicles.	4	PA3 5 PA3 6 PA3 7	Charging options.	Y3 thru Y5	Owners of EVs, electricity supply companies, PICT ministries.	V2H demonstrated and technology accessible.	Part of budget provided for in Line Item 13.	Part of budget provided for in Line Item 13.	Staff contribution from various PICT ministries. Sponsorship of own V2H and other units.	Extension of Line Item 13
33	Develop EV service industry and encourage retention of capability and capacity.	2	PA1 3	Servicing. Part Line Item 15, part Line Item 24.	Y2 thru Y5	EV service industry. Charging providers	Region increases capability and capacity with respect to servicing EVs and technology related to their use.	Part of FTE provided in Line Item 15.	Part of TA5.	Staff contribution from various PICT ministries.	To be also managed by the Regional Subject Expert.
34	Develop and introduce a system that encourages the industry to adopt quality product and provide quality services.	4	PA3 3 PA3 4	EV and related services quality.	Y3 thru Y5	Consumer groups	A system is in place that allows people to identify those that provide quality services and goods.	2/12 FTE plus US$10,000 x 5 years for advertising and promotion.	Nil	Nil	May be based on social media, although this limits coverage in some circumstances.
35	(Support the introduction of TOU electricity pricing).	5	PA2 8- PA3 2		Y1-Y5	PICT ministries, EV owners, electricity supply companies.	Support is provided for the uptake of TOU electricity pricing.	Little time involved, as coordinator. Part of general budget.	Nil	Staff contribution from various PICT ministries.	EVs are not a principal driver for TOU, therefore supporting role only.

Appendix C: Mid-Level Detailed Results Framework for Proposed Regional EV Program

	Policy Actions	Year 1						Year 2					
		Mgmt Desk	STDs Guides	Info	Demo	Budget	TA	Mgmt Desk	STDs Guides	Info	Demo	Budget	TA
	Central Policy and Administration:	FTE/12	FTE/12	FTE/12	FTE/12	US$	US$	FTE/12	FTE/12	FTE/12	FTE/12	US$	US$
1	Individual PICTs to set EV mandates.	2.00				$ 5,000	$ 30,000						
2	Form and operate Regional EV Working Group.	8.00						6.00					
3	Develop EV roadmaps for PICTs.	1.00				$ 5,000							
4	Set tax levels to encourage import of desired goods.		2.00			$ 5,000	$ 15,000		2.00			$ 5,000	
5	Develop and set minimum specifications for imports.												
6	Develop and deploy a monitoring and evaluation system.	1.00						1.00					
7	Regulatory framework provides for EVs.												
8	Watching brief on global EV-related developments.			1.00						1.00			
	Standards and Guidelines:												
9	Minimum standards at EV entry and in-service.		1.00						1.00				
10	Standards in place for the retirement of EVs.												
11	Guidelines for charging/connectors.		1.00						1.00				
12	"EV-ready" new buildings.												
13	V2H and on-site manged charging guidelines.												
14	Develop guidelines/standards for low-voltage systems.												
15	Develop and introduce technical courses.			1.00						2.00			$ 150,000
16	Guidelines for safe use of new e-mobility options.												
17	Buyer/user guidelines on low-voltage e-mobility options.		0.50						0.50				
	Awareness and Promotion:												
18	Social marketing research.			1.00			$ 10,000			1.00			$ 10,000
19	EV information and promotion campaign.			6.00		$ 10,000	$ 50,000			6.00		$ 10,000	$ 20,000
23	Collate and distribute global and PICT EV information.			1.00						1.00			
	Regional and Local Government Supported:												
24	Government leadership - purchase of appropriate EVs.				0.50						0.50		
25	Support to e-bus and other projects if fitting.				0.50						0.50		
26	Consider heavy EV technical support capability.				0.50						0.50		
27	Electrification of small marine vessels.				0.50						0.50		
28	Facilitate co-investment in public charging infrastructure.				2.00						2.00		$ 20,000
29	Facilities for other EV options, particularly at public offices.												
30	Inspection of charging cables.												
31	Inspection of existing electricity supply circuits.		0.25						0.25			$ 7,000	
32	Demonstration of V2H and on-site managed charging.												
33	Development of EV service industry.												
34	Encouraging quality in the marketplace.			2.00		$ 10,000				2.00		$ 10,000	
35	(Support the introduction of TOU electricity pricing).	0.50						0.50					
	Totals (FTE/12 and US$)	12.50	4.75	12.00	4.00	$ 35,000	$ 105,000	7.50	4.75	13.00	4.00	$ 32,000	$ 200,000
	As FTEs and US$ totals	1.04	0.40	1.00	0.33			0.63	0.40	1.08	0.33		
	Totals (FTE and US$)	2.77				$ 35,000	$ 105,000	2.44				$ 32,000	$ 200,000
	General administration	0.30						0.30					
	Airfares and travel					$ 30,000						$ 30,000	
	Regional Subject Experts					$ 50,000						$ 50,000	
	Annual EV Workshop					$ 30,500						$ 30,500	
	Totals	3.07				$ 145,500	$ 105,000	2.74				$ 142,500	$ 200,000

	Policy Actions	Year 3							Year 4							Year 5					
		Mgmt Desk	STDs Guides	Info	Demo	Budget	TA	Contest Fund	Mgmt Desk	STDs Guides	Info	Demo	Budget	TA	Contest Fund	Mgmt Desk	STDs Guides	Info	Demo	Budget	TA
	Central Policy and Administration:	FTE/12	FTE/12	FTE/12	FTE/12	US$	US$	US$	FTE/12	FTE/12	FTE/12	FTE/12	US$	US$	US$	FTE/12	FTE/12	FTE/12	FTE/12	US$	US$
1	Individual PICTs to set EV mandates.																				
2	Form and operate Regional EV Working Group.	6.00							6.00							6.00					
3	Develop EV roadmaps for PICTs.																				
4	Set tax levels to encourage import of desired goods.																				
5	Develop and set minimum specifications for imports.																				
6	Develop and deploy a monitoring and evaluation system.	1.00							1.00							1.00					
7	Regulatory framework provides for EVs.																				
8	Watching brief on global EV-related developments.			1.00							1.00							1.00			
0	**Standards and Guidelines:**																				
9	Minimum standards at EV entry and in-service.																1.00				
10	Standards in place for the retirement of EVs.		0.50							0.50							0.50				
11	Guidelines for charging/connectors.		1.00							1.00							1.00				
12	"EV-ready" new buildings.																				
13	V2H and on-site manged charging guidelines.				2.00		$ 5,000					2.00							2.00		
14	Develop guidelines/standards for low-voltage systems.		2.00				$ 30,000			2.00							2.00				
15	Develop and introduce technical courses.			2.00			$ 150,000				1.00							1.00			
16	Guidelines for safe use of new e-mobility options.		0.50							0.50							0.50				
17	Buyer/user guidelines on low-voltage e-mobility options.		1.50				$ 30,000			0.50							0.50				
0	**Awareness and Promotion:**																				
18	Social marketing research.			1.00			$ 10,000				1.00			$ 10,000				1.00			$ 10,000
19	EV information and promotion campaign.			6.00		$ 10,000	$ 20,000				6.00		$ 10,000	$ 20,000				6.00		$ 10,000	$ 20,000
23	Collate and distribute global and PICT EV information.			1.00							1.00							1.00			
0	**Regional and Local Government Supported:**																				
24	Government leadership - purchase of appropriate EVs.				0.50							0.50							0.50		
25	Support to e-bus and other projects if fitting.				0.50							0.50							0.50		
26	Consider heavy EV technical support capability.				0.50							0.50							0.50		
27	Electrification of small marine vessels.				0.50							0.50							0.50		
28	Facilitate co-investment in public charging infrastructure.				2.00							2.00							2.00		
29	Facilities for other EV options, particularly at public offices.																				
30	Inspection of charging cables.																				
31	Inspection of existing electricity supply circuits.		0.25			$ 2,000				0.25			$ 2,000				0.25			$ 2,000	
32	Demonstration of V2H and on-site managed charging.																				
33	Development of EV service industry.																				
34	Encouraging quality in the marketplace.			2.00		$ 10,000					2.00		$ 10,000					2.00		$ 1,000	
35	(Support the introduction of TOU electricity pricing).	0.50							0.50							0.50					
	Totals (FTE/12 and US$)	7.50	5.75	13.00	6.00	$ 22,000	$ 245,000		7.50	4.75	12.00	6.00	$ 22,000	$ 30,000		7.50	5.75	12.00	6.00	$ 13,000	$ 30,000
	As FTEs and US$ totals	0.63	0.48	1.08	0.50				0.63	0.40	1.00	0.50				0.63	0.48	1.00	0.50		
	Totals (FTE and US$)	2.69				$ 22,000	$ 245,000	$ 250,000	2.52				$ 22,000	$ 30,000	$ 250,000	2.60				$ 13,000	$ 30,000
	0	0.30							0.30							0.30					
	Airfares and travel					$ 30,000							$ 30,000							$ 30,000	
	Regional Subject Experts					$ 50,000							$ 50,000							$ 50,000	
	Annual EV Workshop					$ 30,500							$ 30,500							$ 30,500	
	Totals	2.99				$ 132,500	$ 245,000	$ 250,000	2.82				$ 132,500	$ 30,000	$ 250,000	2.90				$ 123,500	$ 30,000