

PACIFIC COMMUNITY

FIFTH PACIFIC REGIONAL ENERGY AND TRANSPORT MINISTERS MEETING

(Port Vila, Vanuatu, 8-12 May 2023)

AGENDA ITEM E8 – PLANNING FRAMEWORKS AND TOOLS TO SUPPORT REGIONAL NET ZERO ENERGY TRANSITION

[Jointly submitted by the University of New South Wales (UNSW), University of the South Pacific (USP), and Pacific Community (SPC)]

Purpose

1. The purpose of this paper is to seek the Energy and Transport Ministers' support of the development of improved planning frameworks and tools to support regional net zero energy transition through higher penetrations of variable renewable energy (VRE) in PICT utility grids, widespread electrification of transport and other suitable sectors, and the use of renewable derived fuels for energy uses that are not amenable to electrification.

Background

2. The PICTs are highly vulnerable to the impacts of climate change, have set ambitious goals to reduce carbon emissions and, as a region, have advocated strongly for the climate change agenda on the global scene. However, renewable energy uptake remains relatively low and dependence on imported fuels high in most jurisdictions despite significant efforts and investments over the past two decades.
3. Global and regional studies on net zero energy transition highlight three key tasks for the PICTs to meet their NDCs and wider net zero objectives; first, transition their electricity sectors to 100% renewables; second, greatly expand their electricity sectors to power some major energy uses that currently aren't electrified such as road transport; and three, produce or otherwise source clean fuels for those energy uses that prove unsuited to electrification such as some domestic and international navigation and aviation.
4. Deployment of VRE presents important opportunities for PICTs, but also grid integration challenges related to renewable energy variability, geographic isolation from load centres, limited capacity and flexibility of existing power plants and grid infrastructure, and the complex systems required to operate, control and monitor the power system with new flexible resources.
5. Successful transition from fossil fuels to diversified VRE and other renewable sources will therefore require careful planning and detailed assessment of reliability, flexibility, adaptive capacity, and grid stability and investments in appropriate technology deployment. While valuable studies and projects have been undertaken for some jurisdictions, more efforts are needed to successfully transition the electricity sectors.
6. At the same time, these grids must be remodelled and greatly expanded to improve energy access and supply newly electrified loads with the zero-emission electricity as it becomes available. Widespread electrification raises both challenges and opportunities, for example, while widespread electric vehicle deployment may add considerably to demand, they also can offer flexible charging that could assist in integrating variable solar and wind.

Current status

7. There have been significant efforts and investments over the past two decades in the Pacific Islands renewable energy sector. While considerable progress has recently been achieved in some jurisdictions with major renewables and storage projects, progress has still generally been insufficient to meet national energy sector objectives, and alignment of NDC and wider aspirations, with electricity sector plans.

8. Renewable electricity uptake in PICTs has been significantly impacted by COVID-19 and consequent financial and project implementation challenges, but also broader and persistent institutional capacity challenges, around which there is lack of understanding and consensus.
9. Dig SILENT Power Factory has been recently deployed for network modelling and power system studies for eight (8) utilities in the PICTs, an important initiative funded by the World Bank. However, there are currently only limited regional efforts to support the development of, and data and capacity to use, forward-looking planning frameworks and tools, including Capacity Expansion Modelling (CEM) software, by PICT utilities and other regional stakeholders.
10. Over the past three years, UNSW, USP, SPC and other partners including Loughborough University and the Pacific Power Association (PPA), have held various regional workshops and meetings to explore opportunities for better collaboration and engagement with all regional energy sector stakeholders to in developing a research and innovation agenda for energy resilience in the PICTs. This work has highlighted the importance of improved planning tools and processes.

Issues

11. Renewable electrical energy uptake in PICT's has been low to date for many jurisdictions despite considerable investments and efforts, leaving them highly dependent on imported fossil fuels and their economic and environmental consequences.
12. Despite significant capacity building efforts including those supported by the World Bank and facilitated by PPA, grid integration of VRE is technically complex and there is still a lack of capacity and technical expertise in planning and modelling for the transition to clean and renewable energy sectors. Most of this work currently is being undertaken by consultants within project timeframes, presenting barriers to local capacity development.
13. To date, electricity sector planning efforts by PICTs utilities and governments have not given detailed consideration to the implications of widespread electrification on industry development pathways. Understanding and planning across electricity, transport and other energy using economic sectors presents new challenges and requires new approaches to long-term capacity expansion planning.

Opportunities

14. Investigate reasons for both low and successful high uptake of renewable energy to PICT utility grids through situational analysis of operational data to identify and gain better understanding of these issues, challenges, and opportunities, at a jurisdictional level, as well as common threads that might be better addressed at a regional level.
15. Determine the effectiveness of current RE deployment models to support wider electrification of transport and other current non-electricity energy uses, by consulting widely across energy sector stakeholders to incorporate a broad set of perspectives that identify existing challenges and greatest opportunities. This would necessarily include PICT utilities, universities, energy and transport sector representatives, government officials, multilateral organisations and development partners.
16. Facilitate the greater use of robust techno-economic assessment tools by decision makers, energy system planners, regulators, project developers and investors to determine how energy transition efforts can be achieved at least-cost, while maintaining energy security, resilience, and reliability.
17. Identify current approaches to planning and modelling for capacity expansion in the region, and assess the software tools currently available in the market to highlight which tools might be best suited for PICTs to undertake strategic planning and scenario modelling for increasing renewable penetrations while incorporating widespread electrification efforts.
18. Assess and establish frameworks and open-source tools that can help address the region's challenges on universal energy access, resilience, and fossil fuel dependence within and beyond

the electricity sector to include sectors including transport and residential and commercial non-electricity energy use as well as wider Power2X opportunities.

19. Collaborate with industry stakeholders and initiate dialogue on the cross-sector energy integration issues and the energy modelling tools that will support this transition
20. Expand existing capabilities across regional institutions such as SPC, PCREEE and PPA that can help meet capacity expansion modelling and power system studies requirements, as well as wider planning needs across the PICTs.

Recommendations

21. This meeting is invited to:
 - i) **endorse** the collaborative efforts by UNSW, USP, SPC, PPA and other partners to jointly undertake regional studies that build upon the existing work of partners including IRENA and the World Bank to assess the renewable energy potential of the PICTs to meet future energy demand including the provision of universal energy access, electrification of key energy uses sectors currently reliant on imported fossil fuels including road transport, and the potential for renewable hydrogen and hydrogen derivatives to supply energy uses that can't be electrified.
 - ii) **support** the development and use of enhanced planning frameworks and capacity expansion tools tailored for PICT countries given their unique challenges and opportunities in energy transition, and particularly including the ability to plan 100% renewables electricity sectors and growing cross sector linkages such as the electrification of road transport, household and commercial energy use, and Power2X options.
 - iii) **adopt** improved tools for ensuring the security and resilience of island grids with high variable renewable penetrations and appropriately facilitate more distributed microgrids as well as solar home systems for remote communities.
 - iv) **strengthen** the regional capabilities of SPC/PCREEE and PPA to support energy transition efforts across the region, building on existing efforts and including data provision and tools to assist jurisdictions in planning and execution of net zero strategies.