



PACIFIC
PRECOP31
FIJI / TUVALU

ELECTRIFICATION OPPORTUNITY

EXTENDING THE BENEFITS OF RENEWABLE ENERGY
ACROSS THE ECONOMY



UNSW
SYDNEY



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Electrification is becoming an increasingly prominent part of global energy-transition discussions. As countries seek to strengthen energy security and affordability, improve resilience, reduce emissions and maximise the value of clean electricity investments, growing attention is being given to replacing the direct use of fossil fuels with electricity across transport, buildings and industry.¹

This growing focus is also reflected in the lead-up to COP31. The COP31 Global Climate Action Agenda includes a collective global goal to increase the share of final energy demand met by electricity from just over 20% today to 35% by 2035.²

For Pacific Island Countries, electrification represents a significant opportunity to maximise the benefits of renewable-energy investments. While many countries have made substantial progress in expanding renewable electricity generation, the direct use of fossil fuels remains widespread across transport, households, businesses and productive sectors. As a result, much of the region's renewable-energy potential has yet to be translated into broader reductions in fossil-fuel consumption, highlighting considerable scope to accelerate end-use electrification.

Keeping 1.5°C within reach: Electrification is a critical pillar of pathways consistent with limiting global warming to 1.5°C. By reducing reliance on fossil fuels across transport, buildings and other end uses, electrification can help deliver economy-wide emissions reductions. As one of the regions most vulnerable to climate impacts, the Pacific has a strong interest in global efforts to accelerate electrification.³

Energy security and economic resilience: Electrification can reduce dependence on imported petroleum, lowering exposure to international fuel-price volatility, supply disruptions and recurring foreign-exchange expenditure.

Development outcomes and energy access: Electrification can improve access to modern energy services and enable more productive uses of energy across households, businesses, health services, education, water and communications, including in remote and outer-island communities.

Electrification and renewable energy are distinct but complementary.

Renewable-energy deployment changes how electricity is produced; electrification changes how energy services are delivered. Together, they allow renewable electricity to displace fossil fuels across a wider share of the economy. Wider electrification can therefore extend the Pacific's renewable-energy ambitions beyond the power sector into transport, cooking, productive uses and essential services.¹

The opportunity will differ across the region because Pacific energy systems vary in scale, geography, electricity access, renewable resources, institutional capacity and access to technologies. The appropriate pathway will therefore depend on country-specific circumstances.



Image source: Rosie Holidays Fiji - Fiji's first electric tourist coaches.

PACIFIC ELECTRIFICATION REMAINS AT AN EARLY STAGE, CREATING SUBSTANTIAL UNTAPPED POTENTIAL

Across much of the Pacific, end-use energy demand remains heavily reliant on fossil fuels, particularly for land transport, maritime activity and other productive uses. Electricity currently plays a more limited role in many end-use sectors, despite progress in expanding renewable electricity generation.

This highlights the substantial remaining potential for electrification. Significant opportunities remain to electrify transport, cooking and productive uses, allowing a larger share of energy demand to be met by increasingly renewable domestic electricity.

Policy interest is also growing. Recent national plans, NDCs and demonstration projects increasingly reference electric mobility, cleaner maritime transport, electric cooking, energy efficiency and productive uses. These developments indicate emerging momentum, but in most cases they represent early policy and project activity rather than electrification at scale.

The central opportunity is therefore the combination of substantial remaining potential, growing policy momentum and increasingly available and affordable electric technologies. The sections that follow consider where electrification may deliver the greatest benefits and the conditions needed to support wider deployment.

ELECTRIFICATION CAN STRENGTHEN PACIFIC ENERGY SECURITY AND ECONOMIC RESILIENCE

The COP31 Presidency's collective global goal is to increase electricity's share of final energy demand to 35% by 2035. While this is not a country-specific target, it provides useful context for the scale and direction of the global shift toward electrification. Against this broader global direction, electricity currently supplies 15.7% (weighted average) of final energy consumption across the Pacific systems, ranging from 3.9% in Solomon Islands to 36.1% in New Caledonia.^{2,4}

Across the 17 Pacific countries and territories assessed, gross fossil-fuel import exposure ranges from 58.7% of total energy supply in Papua New Guinea to 134.6% in Naoero, highlighting the region's substantial exposure to imported fossil fuels and associated price and supply risks. Eight systems record values above 100%, reflecting the effects of exports, international bunkers and stock changes in national energy balances.^{4,5} This reflects the structural dependence of island economies on imported petroleum for mobility, shipping and electricity generation.

In some Pacific economies, refined-petroleum imports are equivalent to more than 10% of GDP, illustrating how fuel-price shocks can translate into broader economic exposure.^{6,7}

This dependence creates vulnerabilities that are difficult to manage domestically. Pacific countries generally have limited influence over global oil prices, international shipping costs or disruptions to major petroleum trade routes. Small market size and geographic isolation can materially increase delivered fuel costs. In Solomon Islands, commercial fuel prices are around SBD 10/litre (US\$1.20/litre) in Honiara, rising to as much as SBD 25/litre (US\$3.00/litre) in the most remote provinces. Grid-connected electricity prices in Honiara can also reach up to SBD 7.60/kWh (US\$0.91/kWh).⁸ These cost pressures can flow through to transport costs, electricity tariffs, public-service budgets and household expenditure.

Electrification creates an opportunity to reduce part of this exposure by replacing imported petroleum used directly in end-use sectors, particularly road and maritime transport, with electricity increasingly generated from local renewable resources.



Image source: Fiji Sun - solar freezers for storing fish, frozen goods and other perishable items.

Illustrative electrification pathways point to a potentially material reduction in petroleum dependence. Under a broader electrification pathway, annual net petroleum requirements could fall by around 3,300 TJ under current electricity-supply conditions, with substantially larger reductions possible as electricity supply becomes less dependent on petroleum.^{4,9} Under the broader electrification case, indicative avoided refined-petroleum import expenditure is about US\$53 million per year under current electricity-supply conditions and about US\$138 million per year under the higher-renewable sensitivity. The increase reflects the lower petroleum intensity of electricity supply in the higher-renewable case, which allows more of the petroleum displaced from end uses to translate into net avoided imports.⁶

These figures are indicative rather than forecasts and do not represent net economic benefits. Investment in vehicles, vessels, appliances, charging infrastructure, renewable generation, storage and networks would also need to be considered. However, reducing petroleum dependence is itself a central strategic benefit of electrification for Pacific economies, given their exposure to imported fuel costs, supply disruptions and foreign-exchange pressures. Electrification can therefore deliver benefits well beyond avoided fuel expenditure, including stronger energy security and economic resilience, support for climate objectives, and improved access to productive and essential energy services.

KEY ELECTRIFICATION OPPORTUNITIES

Transport represents a major electrification opportunity across much of the Pacific, but the scale and composition of that opportunity vary considerably between countries. Road transport is a particularly important source of non-electric energy demand in many systems, while domestic maritime transport is more prominent in several smaller island economies. In other countries, including Papua New Guinea, New Caledonia and Kiribati, buildings and industry account for a larger share of remaining non-electric energy demand (Figure 1).

Electrifying road vehicles can directly reduce fossil-fuel demand, while electric drivetrains are also substantially more energy efficient than internal-combustion engines and light-duty electric vehicles are increasingly commercially mature.¹⁰ Pacific deployment is already underway: Samoa had rolled out 76 electric government vehicles by the first half of 2025, supported by a central charging hub with five DC fast chargers and two AC chargers.¹¹ Other countries, including Vanuatu, have EV targets in their Nationally Determined Contributions (NDCs).¹² Public fleets, taxis, buses and other high-utilisation vehicles can be particularly attractive because higher annual utilisation allows operating-cost savings to accumulate more quickly.

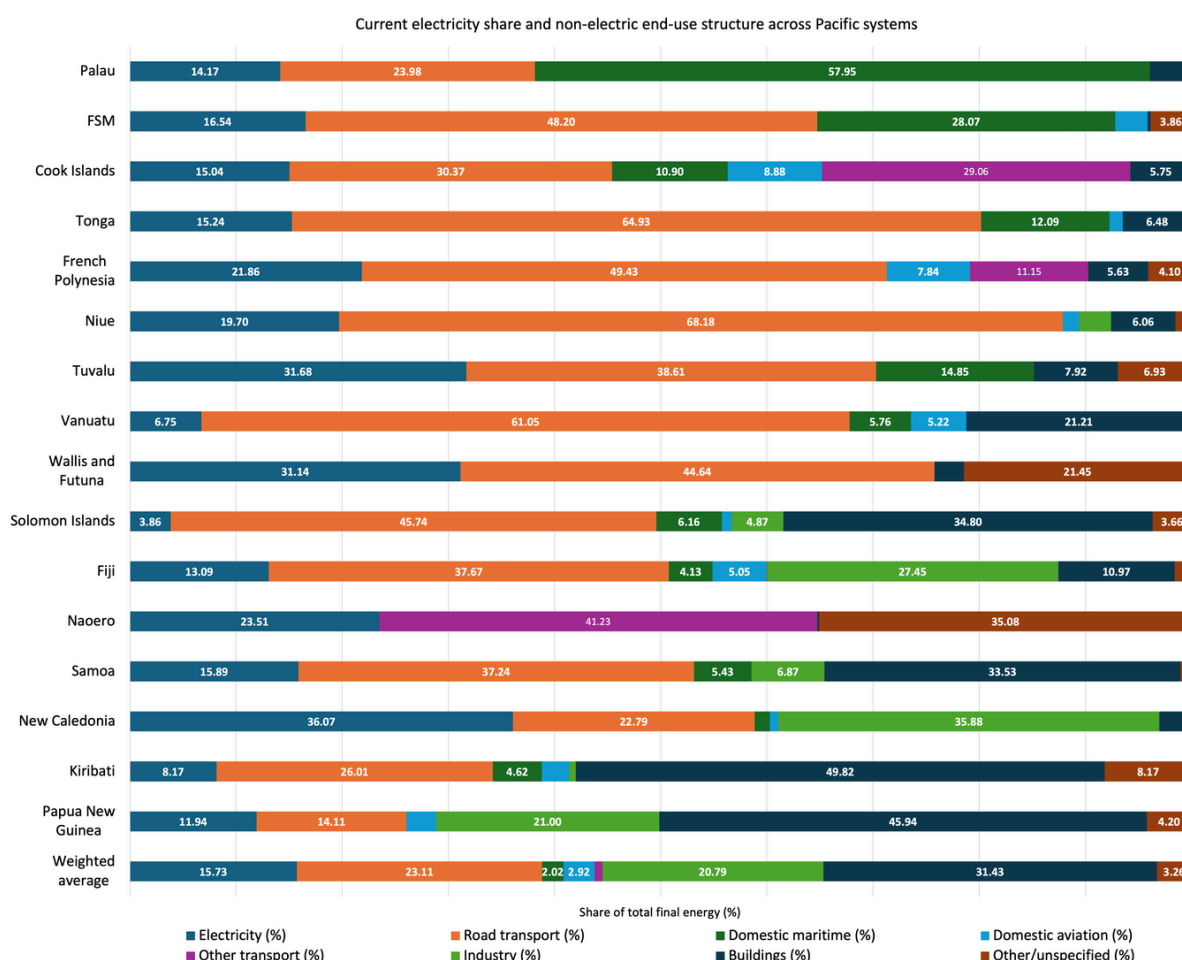


Figure 1. Electricity share and remaining non-electric final energy by end-use sector, 2023. Source: analysed using UNSD 2023 Energy Balances.⁴

Domestic maritime transport is another important electrification opportunity in parts of the Pacific, particularly in smaller island systems where inter-island travel and supply chains are central to everyday economic activity. Maritime energy use is especially prominent in countries such as Palau and the Federated States of Micronesia. In Samoa, electric vessels are being introduced for transport between Upolu, Manono and nearby communities, with the first of five electric boats entering sea trials in 2025.¹³ Short, sheltered and predictable ferry and inter-island routes may offer opportunities for battery-electric or hybrid vessels where route distance, charging access and vessel design are suitable.

Electric cooking also warrants attention, but the starting point differs substantially across the Pacific. In many countries, traditional biomass like fuelwood and coconut residues remains an important cooking fuel, particularly in rural and outer-island communities.¹⁴ LPG and kerosene are also used, while electricity access, reliability and affordability vary across the region. Electric cooking can reduce direct fossil-fuel use and reliance on combustion-based cooking where reliable and affordable electricity is available, but it will not be the appropriate near-term solution in every setting. The pathway will depend on household preferences, cooking practices, appliance costs, electricity-system capability and access to alternative clean cooking technologies.

In remote Pacific communities, the value of electrification may be measured as much in improved services as in avoided fuel use. Beyond transport and cooking, electrification can improve the quality of essential and productive services. Cold storage can reduce losses in fisheries and agriculture. Reliable electricity can support health facilities, water pumping, schools, communications and small businesses. In remote and outer-island communities, relatively modest electric loads can therefore generate benefits that are not captured fully by conventional energy or emissions metrics.





Image source: Ian Iercet / UNDP — Wintua-Lorlow solar micro-grid, Malekula Island, Vanuatu

THE SOURCE OF ELECTRICITY DETERMINES THE SCALE OF THE BENEFIT

Electrification and renewable-energy deployment are mutually reinforcing. Electrification can reduce reliance on imported petroleum by shifting transport, cooking and other energy services to electricity, while expanding renewable generation increases the energy-security and emissions benefits of that transition.

The extent of these benefits depends on how additional electricity demand is supplied. In smaller island systems, even modest levels of electrification can materially increase electricity requirements, highlighting the importance of planning generation, network and storage investments alongside growing electricity demand.

Where electricity generation remains heavily reliant on petroleum, some fuel consumption is effectively transferred from end-use sectors to the power sector. As electricity supply becomes less oil-intensive, however, the same electrification opportunities can deliver substantially greater energy security, economic and emissions benefits.¹⁵

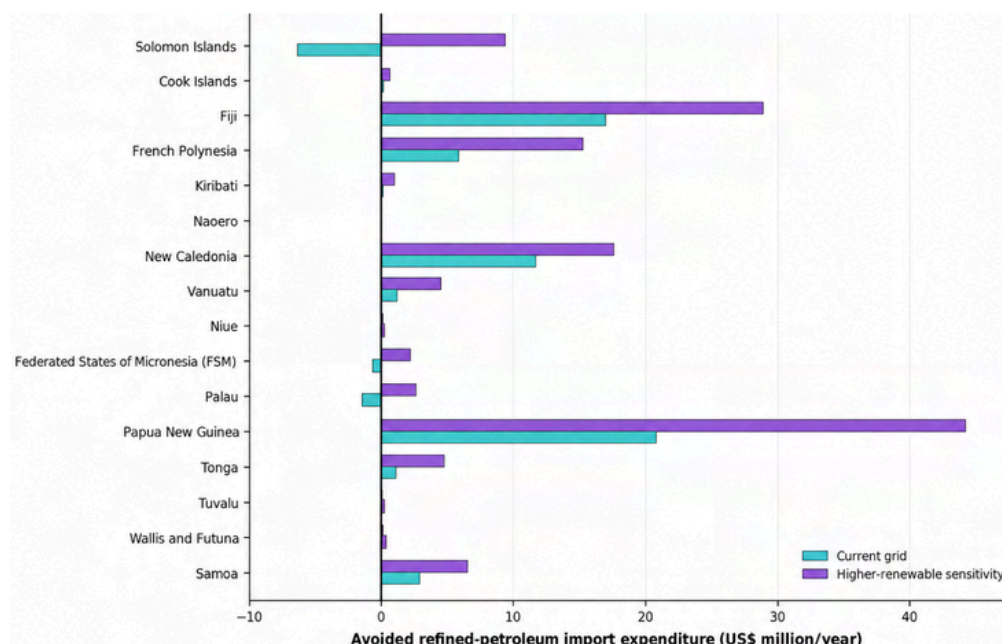


Figure 2. Indicative avoided refined-petroleum import expenditure (US\$ million/year) under current-grid and higher-renewable electricity-supply conditions for the broader electrification case. Negative values indicate a net increase in refined-petroleum import expenditure. Source: estimated using UNSD 2023 energy data and WITS / UN Comtrade HS 2710 import data.^{4,6,9}

This is not an argument for delaying electrification until electricity systems are fully renewable. Rather, it highlights the importance of planning electricity demand and supply together, particularly as the benefits of electrification increase under a higher-renewable electricity supply (Figure 2).

New electric loads can themselves become an asset for power-system planning if they are flexible.¹⁶ Vehicle charging, water pumping, refrigeration and some commercial loads can be shifted toward periods of higher renewable output, helping align electricity demand with system conditions and renewable generation.¹⁷

Storage, managed charging and appropriately designed tariffs can further reduce pressure on peak demand. Investment in networks, storage and demand flexibility will therefore be important to ensure that growing electric loads can be supplied reliably while making greater use of renewable generation.

Electrification and renewable-energy deployment are therefore most effective when they advance together. As petroleum-consuming end uses become electric and electricity supply becomes progressively less dependent on petroleum, energy-security, economic and emissions benefits can increase substantially.

PACIFIC ELECTRIFICATION PRIORITIES WILL VARY BY COUNTRY

Pacific countries differ substantially in electricity access, system size, generation mix, transport patterns, renewable-resource availability and institutional capacity. These differences will shape where electrification can deliver the greatest near-term value and what enabling conditions are required. For example, Samoa reports universal electricity access and has already begun deploying electric government vehicles and charging infrastructure,^{11,18} while Papua New Guinea continues to face much lower electricity access, with only around 20% of the population connected to the grid and less than 15% connected in rural areas.¹⁹

These differences imply different near-term priorities. In systems with high electricity access and stronger infrastructure, early opportunities may lie in public fleets, commercial vehicles and productive uses. Where access and reliability remain constrained, expanding reliable electricity services and strengthening the power system may deliver greater immediate value before larger transport loads are added.

Outer-island systems may require a different approach again. Distributed renewable generation, storage and relatively small service-led loads can often be more appropriate than large centralised infrastructure.

The implication is that Pacific electrification should be organised as a portfolio of opportunities, not as a single technology programme. Projects can be prioritised according to technology suitability, energy security value, electricity system readiness, affordability, service benefits and implementation capability.

Early projects can then be used to build the evidence required for wider deployment. Monitoring actual electricity consumption, charging patterns, operating costs, maintenance requirements, battery performance, user behaviour and service outcomes will be particularly valuable in a region where many technologies are still being deployed at relatively small scale.

IMPLEMENTATION CAPACITY MAY BE AS IMPORTANT AS TECHNOLOGY AVAILABILITY

Many of the technologies needed to advance electrification are already being deployed in Pacific countries, including electric vehicles and charging infrastructure, solar generation, battery storage and renewable-powered island systems. In Samoa, for example, EV workshops have now been established in three vocational institutions alongside a new EV mechanics training programme, reflecting the need to build local capability as deployment expands.²⁰

Implementation conditions remain a particular challenge for small and dispersed Pacific markets. Equipment supply chains can be long, specialist technical skills are limited in some systems, and retaining trained energy-sector workers can be difficult.²¹ Projects therefore need to consider maintenance arrangements, spare-parts availability, technical training and regional support alongside the technology itself.

Regional cooperation could help address some of these challenges. Common technical specifications, training programmes, procurement approaches, data standards and knowledge-sharing platforms could reduce duplication and improve access to expertise while still allowing individual governments and utilities to make technology choices suited to local conditions.

Building on existing national initiatives, there is an ongoing opportunity for a Pacific-led, regionally coordinated programme of work to identify, test and scale priority electrification opportunities. Australia, regional organisations and other development partners can support this process in response to priorities identified by Pacific governments and communities.



Image source: UNDP - official handover of EVs to the Ministry of Finance, Samoa.

Capturing the benefits of electrification will require targeted finance.

Electric technologies can involve higher upfront capital costs even where lifetime operating costs are lower. Concessional finance, guarantees, leasing structures, fleet procurement and targeted consumer support may help overcome these barriers where the underlying economics are sound. Support should, however, be linked to demonstrated barriers and system needs rather than applied uniformly across technologies.

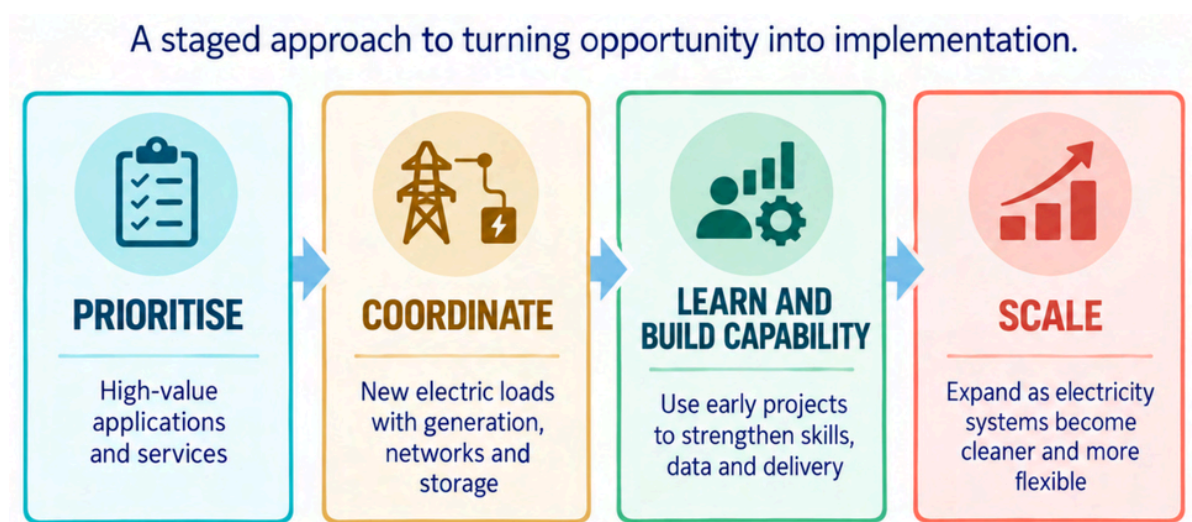
The opportunity is significant, but implementation needs to reflect local conditions. National energy balances provide a useful regional picture, yet they cannot capture every island grid, network constraint, charging profile, vessel route, technology cost or investment decision. Electricity-system impacts can also vary substantially within countries, particularly where multiple island grids operate independently.

These considerations point to the importance of moving from regional opportunity to country-specific planning. Detailed assessment of electricity demand, renewable supply, infrastructure requirements, technology costs, financing and local operating conditions will be needed as individual projects move toward investment.

ELECTRIFICATION CAN BECOME A PRACTICAL PATHWAY TO GREATER PACIFIC ENERGY RESILIENCE

The Pacific energy transition will not be delivered through electrification alone. Renewable generation, grids, storage, efficiency, access, institutional capability and finance will all remain essential. Electrification can, however, connect many of these priorities by reducing petroleum dependence, improving energy efficiency, supporting essential and productive services, and extending the benefits of renewable electricity into a wider range of end uses.

The opportunity is therefore not simply to electrify more end uses, but to do so strategically where it improves services, strengthens energy resilience and can be supported by the electricity system. A staged approach can help Pacific countries move from high-value early applications toward broader deployment as systems become cleaner, more flexible and more capable.



CONCLUSION

Electrification offers Pacific countries a practical opportunity to strengthen energy security and economic resilience, support climate objectives, improve essential and productive services, and make greater use of domestic renewable resources. Its value will depend on where it is applied, how quickly electricity systems can support new demand, and whether additional supply becomes progressively less dependent on imported petroleum.

The most effective pathway is likely to be staged rather than uniform. Early deployment can focus on applications where the service, energy security and operating benefits are clearest, while generation, networks, finance and technical capability are strengthened in parallel. This approach can help Pacific countries move from individual projects toward broader, more resilient electrification pathways.

Work is already underway to translate this regional opportunity into a more detailed evidence base. The upcoming full report will provide country-level energy-system analysis, sector-specific electrification opportunities, illustrative modelling of electricity demand, petroleum displacement and emissions impacts, and practical implications for implementation across Pacific systems. This provides a basis for identifying where more detailed country-specific technical, investment and delivery assessments may be most valuable.

The immediate opportunity is to build on existing Pacific initiatives, strengthen the evidence base and move progressively from individual projects toward coordinated country-level electrification pathways.

LOOKING AHEAD TO COP31

As global attention turns toward COP31 and electrification receives greater prominence in international energy-transition discussions, Pacific countries have an opportunity to shape electrification around their own climate, energy-security, development and resilience priorities.

Well-designed electrification also strengthens the Pacific's voice in global efforts to limit warming to 1.5°C, a threshold of direct consequence for a region facing rising seas, more severe extreme weather and growing pressure on ecosystems, livelihoods and infrastructure.³

The value of electrification will be greatest where new electric demand is aligned with local service needs, electricity-system capability and increasing renewable supply. The opportunity is not uniform across the region, but the direction is clear: targeted electrification can help reduce petroleum exposure, improve energy services and support more resilient Pacific energy systems.



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