

Pacific Island Countries (PICs) E-mobility/BESS

Inchul Hwang

Senior Energy Specialist

World Bank

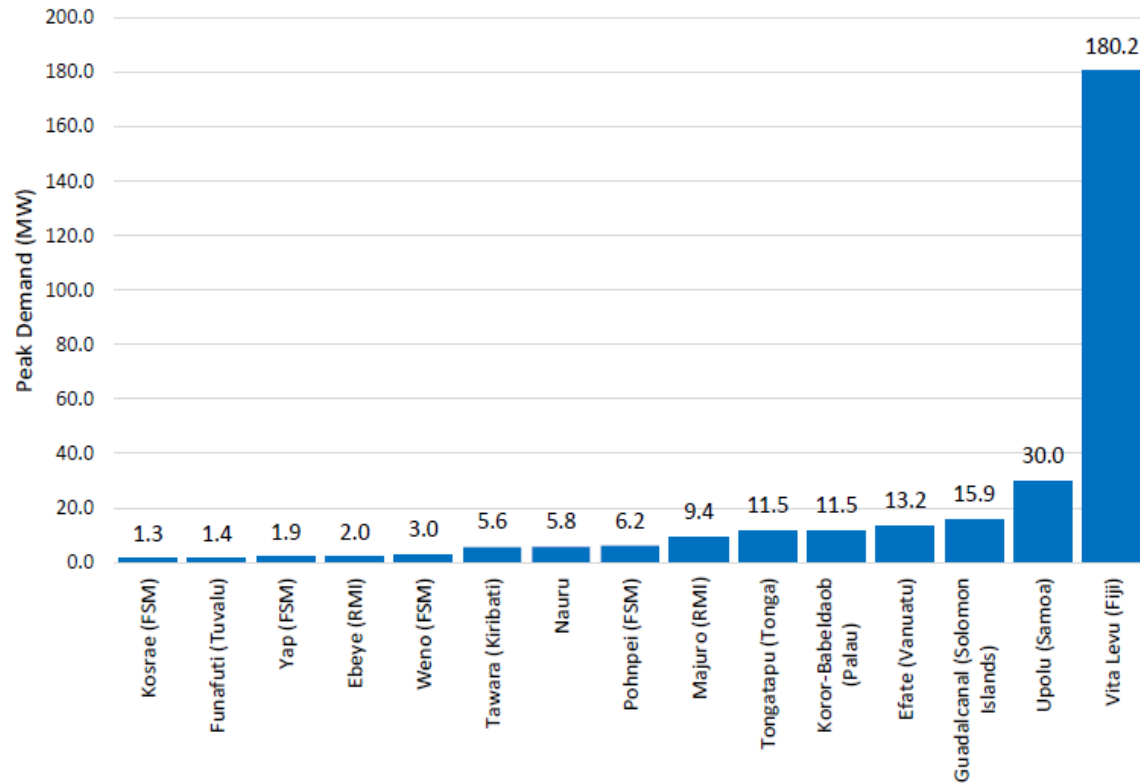
KGID
CAIRO

PICs Challenges in the Energy Sector

- PICs: 11 countries and other territories with total population of 2.3 million
- Heavily dependent on imported **fossil fuel (diesel)** for energy generation and transportation, leading to **high electricity tariff**
- Small islands – low demand, leading to **small market**
- Weak institutional capacity – small private sector, weak financial sector



PIC Grid Systems: Low Demand + High Tariff



Country	2021 Rank ¹	2021 Cents/kwh ¹	2020 RE % ²
Fiji	114	14.4	64.2
Nauru	179	22.8	7.7
Palau	195	27.0	2.0
Tuvalu	196	27.1	15.7
Samoa	201	28.2	44.4
Kiribati	204	28.5	6.8
Marshall Islands	216	34.6	0.6
Tonga	218	35.4	13.7
FSM	226	48.4	6.5
Vanuatu	228	59.1	14.7
Solomon Islands	230	69.2	1.7

1: Cable.co.uk surveyed electricity rates (in \$/KWh) in 230 countries –

see: <https://www.cable.co.uk/energy/worldwide-pricing>

2: Response to the Pacific Power Association (PPA) Survey

KGTF ASA: BESS Development Roadmap

- BESS is one of several green technologies optimal for PICs as it offers them the opportunity to reap maximum benefits from their planned upgrades to the electric grid and RE installations.
- Focused on FSM, RMI, Tuvalu. Results from Jeju analysis indicate that, in the case of small islands, **BESS works best** with **wind** in the **main grid**, whereas it works best with **solar PV** in the **microgrid**.
- BESS integration options for each country (and region), proposed in existing studies, are listed in the table below:

Standard RE models	Proposed option	Utilities
Solar PV + BESS	▪ FSM: Chuuk	▪ CPUC
Solar PV + Diesel ^R + BESS	▪ FSM: Kosrae	▪ KUA
	▪ FSM: Pohnpei	▪ PUC
	▪ FSM: Yap	▪ YSPSC
	▪ RMI: Majuro pathway 2*	▪ MEC
	▪ TUV: Funafuti	▪ TEC
Solar PV + Wind + BESS	▪ RMI: Majuro pathway 1*	▪ MEC
Solar PV + Wind + Diesel ^R + BESS	▪ RMI: Ebeye	▪ KAJUR

^R Diesel generators as backup




* Majuro, RMI, has two pathways identified in existing roadmaps (RMI. (2018).) - the first one incorporates wind while the second does not

PPIAF ASA: BESS PPP Structures by Grid

	VRE + BESS IPP	Standalone BESS IPP	BESS Lease/Rental	Mini Grid Concession	C&I Customer-Sited BESS
Federated States of Micronesia			All four main grids as well as outer islands in Pohnpei	Outer islands in Chuuk, Kosrae, and Yap	All four main grids
Republic of Marshall Islands	Both main grids		Both main grids	Outer islands in Majuro	
Tuvalu			Funafuti	Outer islands	
Fiji	Viti Levu and Vanua Levu (Lavasa)	Viti Levu	All systems		Viti Levu and Vanua Levu (Lavasa)
Kiribati			Tarawa		
Nauru			Nauru		
Palau	Babeldaob	Babeldaob			
Samoa	Upolu	Upolu	Upolu		
Solomon Islands	Guadalcanal		Guadalcanal	Other islands	
Tonga		Tongatapu	Tongatapu	Other islands	
Vanuatu			Efate and Espiritu Santu	Other islands	Efate
Template Projects					
Smaller Systems	Vital Group quasi-IPP in FSM	Not recommended	N/A	Iririki Resort and Spa solar mini grid in Vanuatu	Vital Group's hybrid system at its fuel terminal in FSM
Larger Systems	IPP projects in Palau or Fiji with government guarantee		N/A	UNELCO and VUI concessions in Vanuatu	Fiji biomass IPPs exporting surplus power to the grid

KGTF ASA: PICs E-mobility Roadmap

- Viability of EVs under 2030 Favourable Scenario:
 - Grouped PICs by size/economy with 4 representative countries
 - As costs come down, EVs will become **viable** in the PICs if countries **increase solar generation** and encourage **daytime charging**, except for when the usage is low
 - This also depends on countries implementing incentives to encourage daytime charging (to benefit from cheap and clean solar energy)

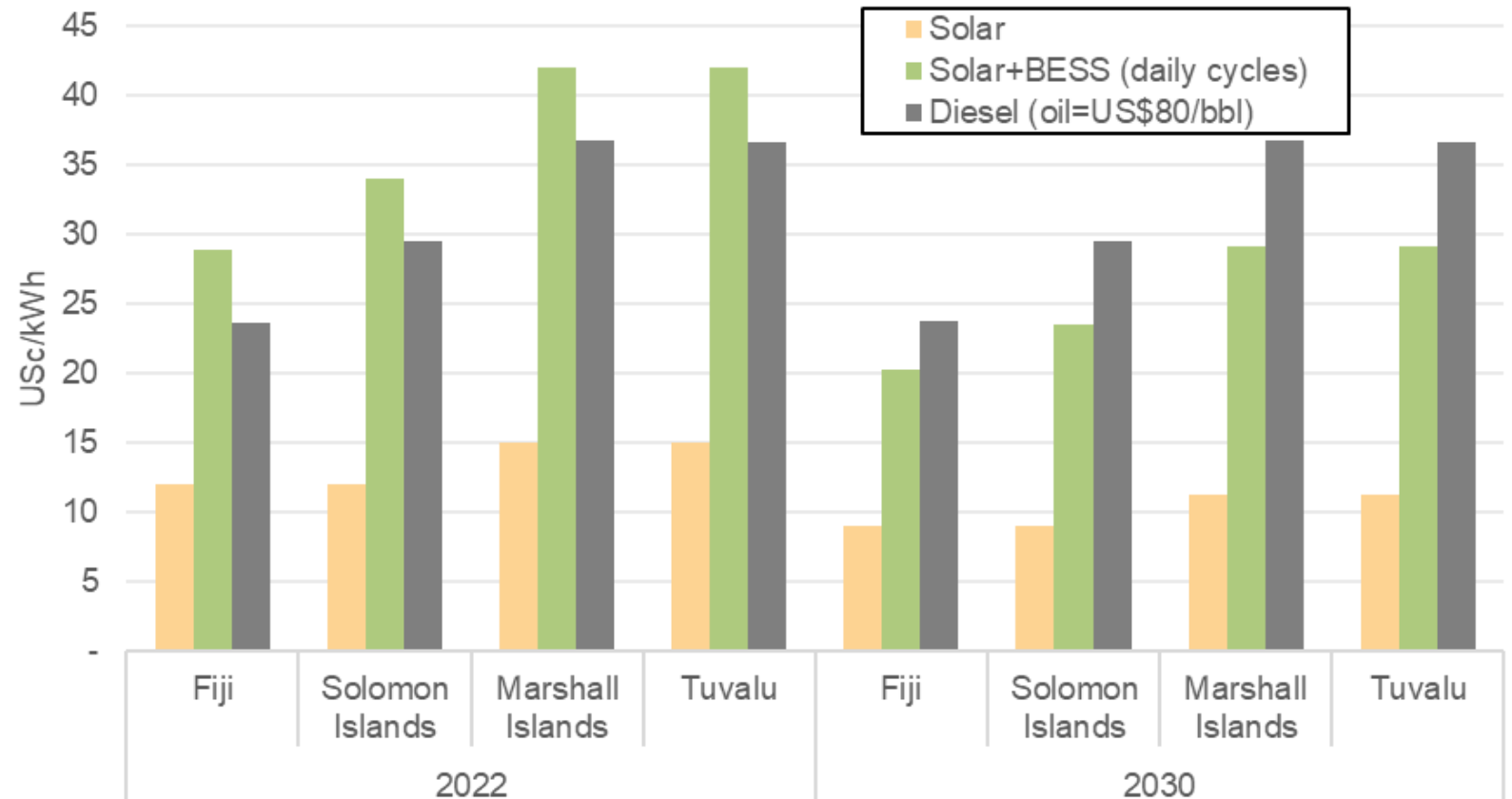
Modes	Use case	Fiji	Solomon Islands	RMI	Tuvalu
E-cars 	Low	✗	✗	✗	✗
	Medium	✓	✓	✓	✗
	High	✓	✓	✓	✗
E-motorbikes 	Low	✗	✗	✗	✗
	Medium	✓	?	?	✗
E-vans 	Medium	✗	✗	✗	✗
	High	✓	✗	✓	✗

Legend	
✓	Economically viable
?	Marginal/potentially economically viable

Conclusion

- There is a synergy between E-mobility and BESS.
- The most efficient way to meet EV demand will be through solar + BESS and daytime charging

Assumed levelised costs of different generation types



Thank you

KGID
CAIRO