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Collaboration on Energy and Environmental Markets

Capacity Expansion Modelling to Support Vanuatu's National Energy Roadmap (NERM 2016-2030)

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Scope

- Undertake scoping study and desktop review of existing national plans
- Analysis of barriers to renewable energy integration though stakeholder engagement and consultation in-country
- Develop context-specific energy transition models
- Where necessary, undertake grid integration studies
- Capacity Development Framework
- Deliver regional workshop(s) to share learnings and develop outline for a regional roll out

Project Consortia

Pacific Community
Communauté du Pacifique

Australian Government
Department of Climate Change, Energy, the Environment and Water

DEPARTMENT OF ENERGY

PPA
PACIFIC POWER ASSOCIATION

USP
THE UNIVERSITY OF THE SOUTH PACIFIC

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Motivation

Current Approaches to Energy Planning in the Pacific Islands

- Based on static reports
- Don't allow stakeholders to update or test new scenarios
- Based on analysis that lacks transparency
- May not be technology agnostic

Successful transition from fossil fuels to diversified renewable sources will require careful planning and detailed assessment

Resolution for Paper E8:

… to develop and use enhanced and tailored energy planning frameworks and capacity expansion tools for net zero outcomes, with a focus on future demand assessments,

… transitioning fossil fuel dependent sectors,

…meeting 100% renewable targets,

… securing island grids with high variable renewable penetrations,

…jurisdictional planning"

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.

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Motivation

FESRIP

Framework for Energy Security and Resilience in the Pacific (FESRIP): 2021-2030

Volume 1: The Framework

Final Report

Priority A: Energy Policy, Planning and Capacity Development	
1. Development and implementation of robust national energy policies, plans and legislation	SPC, lead; PPA for power sector
2. Capacity development in the energy sector	USP, lead in cooperation with the other CROP agencies
3. Database development with energy resilience/security indicators	SPC and PPA, co-leads
4. Rectifying gender imbalance in the energy sector	SPC, lead
5. Non-commercial household energy	SPC, lead in cooperation with USP

PRETMM

Pacific Community
Communauté du Pacifique

FIFTH PACIFIC REGIONAL ENERGY AND TRANSPORT MINISTERS' MEETING

Warwick Hotel, Port Vila, Vanuatu, 08 – 12 May 2023

"Accelerating decarbonisation in the Blue Pacific".

EFATE OUTCOME STATEMENT

Port Vila, Vanuatu, 11-12 May 2023

Capacity building and planning

28. **Call on** PICTs and partners to prioritize capacity building and training in the areas of public-private partnerships, energy efficiency, data management, through accredited training in sustainable energy, south-south cooperation, and other modalities.

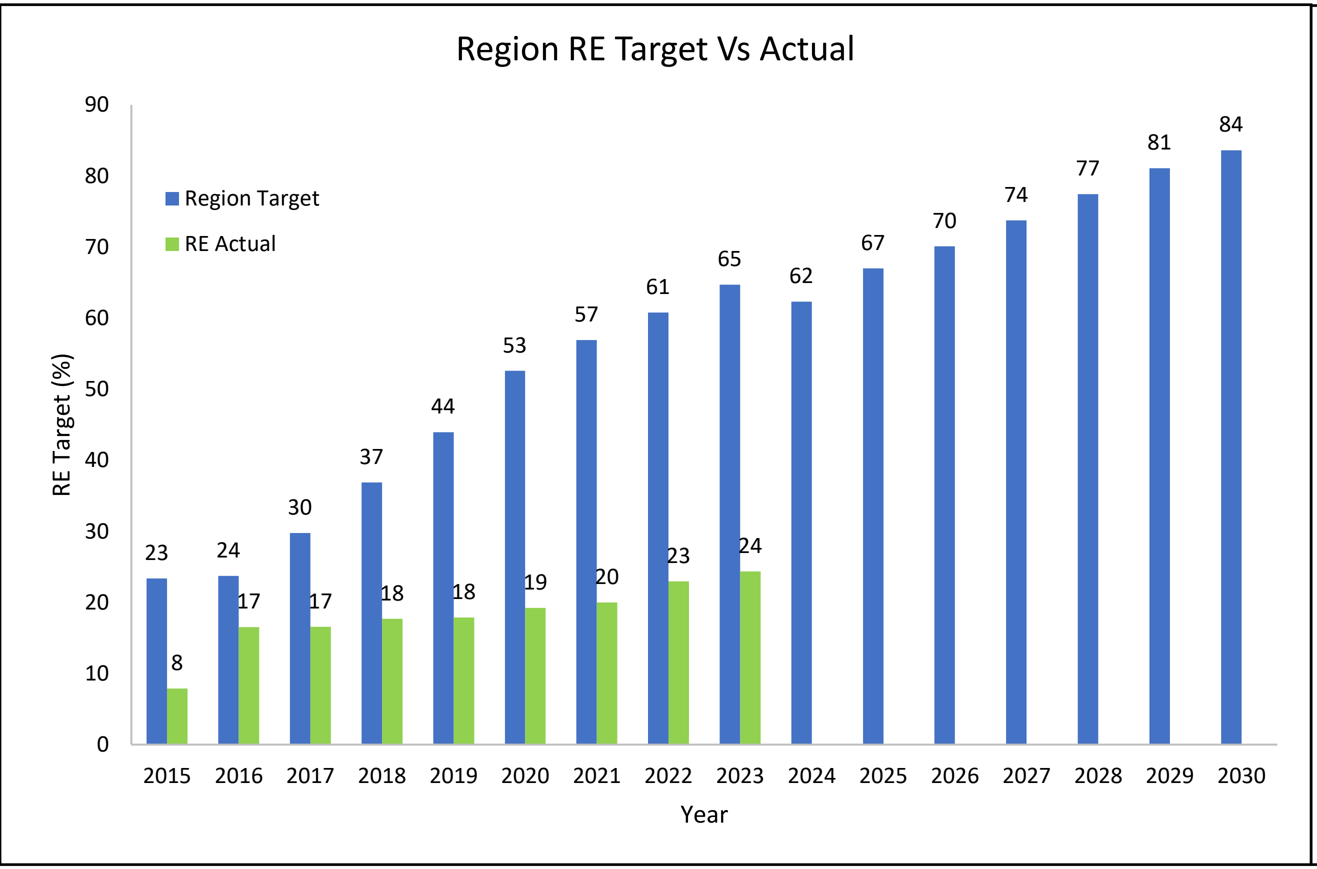
29. **Call on** PICTs, SPC, PCREEE, PPA and other partners to develop and use enhanced and tailored energy planning frameworks and capacity expansion tools for net zero outcomes, with a focus on future demand assessments, universal energy access, transitioning fossil fuel dependent sectors, hydrogen energy sources, meeting 100% renewable targets, electrifying road transport/household/commercial uses, securing island grids with high variable renewable penetrations, expanding distributed microgrids, jurisdictional planning and expanding solar home systems for remote communities.

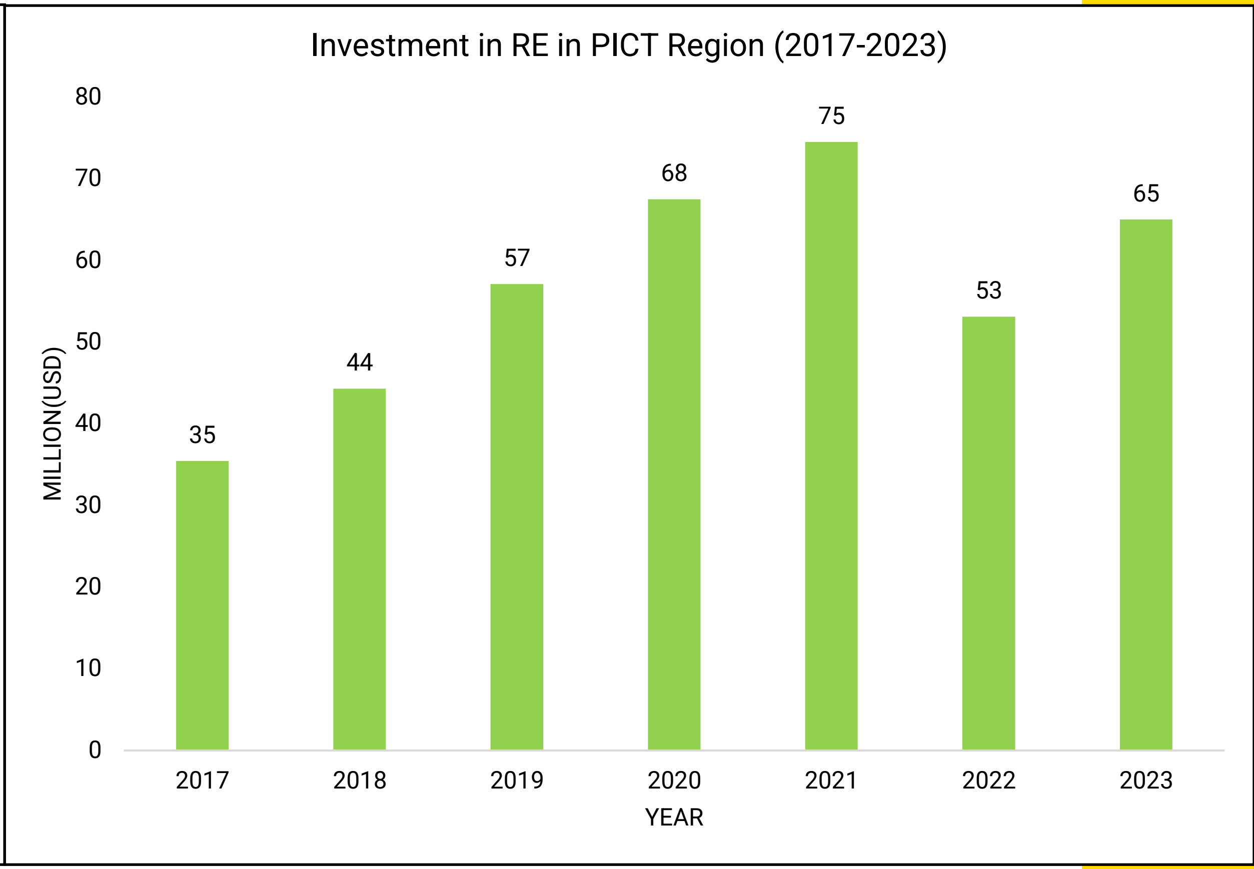
Nationally Determined Contributions (NDC) Targets in PICTs

PICT	NDC Targets
Cook Islands	Reduce emissions from electricity generation by a further 43%, totaling an 81% emissions reduction by 2030 (relative to 2006)- conditional
Fiji	30% reduction in GHG emissions (20% from RE in electricity conditional). 10 % Energy Efficiency
FSM	35 % reduction in GHG (conditional). 28% reduction by 2025 - baseline 2006
Kiribati	Reduce emissions by 35,880tCO2e annually by 2025 and by 38,420tCO2e annually by 2030 (conditional)
Marshall Islands	Reduce GHG emissions to at least 32% below 2010 levels by 2025 and further to at least 45% below 2010 levels by 2030. (conditional)
Nauru	100% RE on grid by 2050 (61% conditional)
Niue	80% RE in electricity generation by 2025- 69% conditional
Palau	45% RE, 35% energy efficiency by 2025, 22% energy sector emissions reductions below 2005 levels by 2025- 95% conditional
PNG	78% of electricity from renewable energy sources by 2030 - 100% conditional
Samoa	100% Electricity from RE by 2025 (conditional) (26% reduction by 2030 overall)
Solomon Islands	27% reduction in GHG emissions by 2025 and 45% reduction in GHG emissions by 2030 (conditional)
Tonga	13% reduction in GHG emission by 2030 compared to 2006 through a transition to 70% RE electricity as well as energy efficiency measures (100% conditional)
Tuvalu	100% RE electricity by 2030
Vanuatu	100% renewable energy in the electricity sector by 2030 (conditional)

Renewable Energy Trends- Pacific Islands

SDG Target 7.2: RE as a Percentage of Total Energy (Electricity)





- **Pacific Islands countries have set quite aggressive targets to reduce their carbon emissions.**
- **Heavy reliance on fossil fuels, which make up to one-third of their total import costs.**
- **RE uptake in the Pacific Island Countries and Territories (PICTs) has been far less than required to meet their national energy sector objectives.**
- **Considerable investments in RE in Pacific Islands over the past two decades**

Vanuatu- Sector Context

80 Islands, 65 Inhabited

Population: 326,740

Installed Capacity: 32MW

Peak Demand: 14.2 MW

Annual Electricity: 79 GWh

Access to Electricity:

Rural: 60.73%; Urban: 97.01%; Total-70.04%

RE (Electricity) Composition: 26%

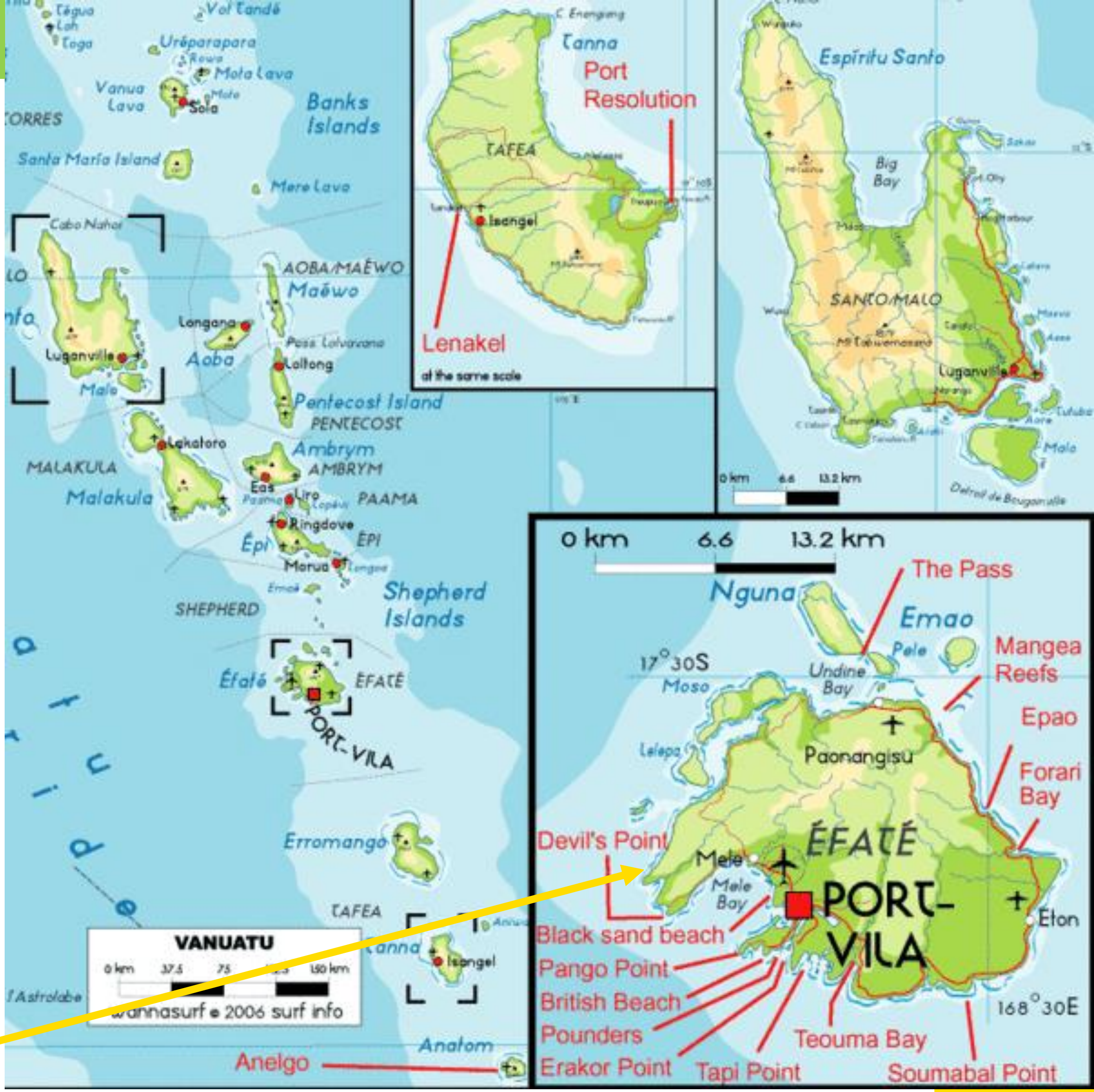
Efate Grid

Customers: 16 000

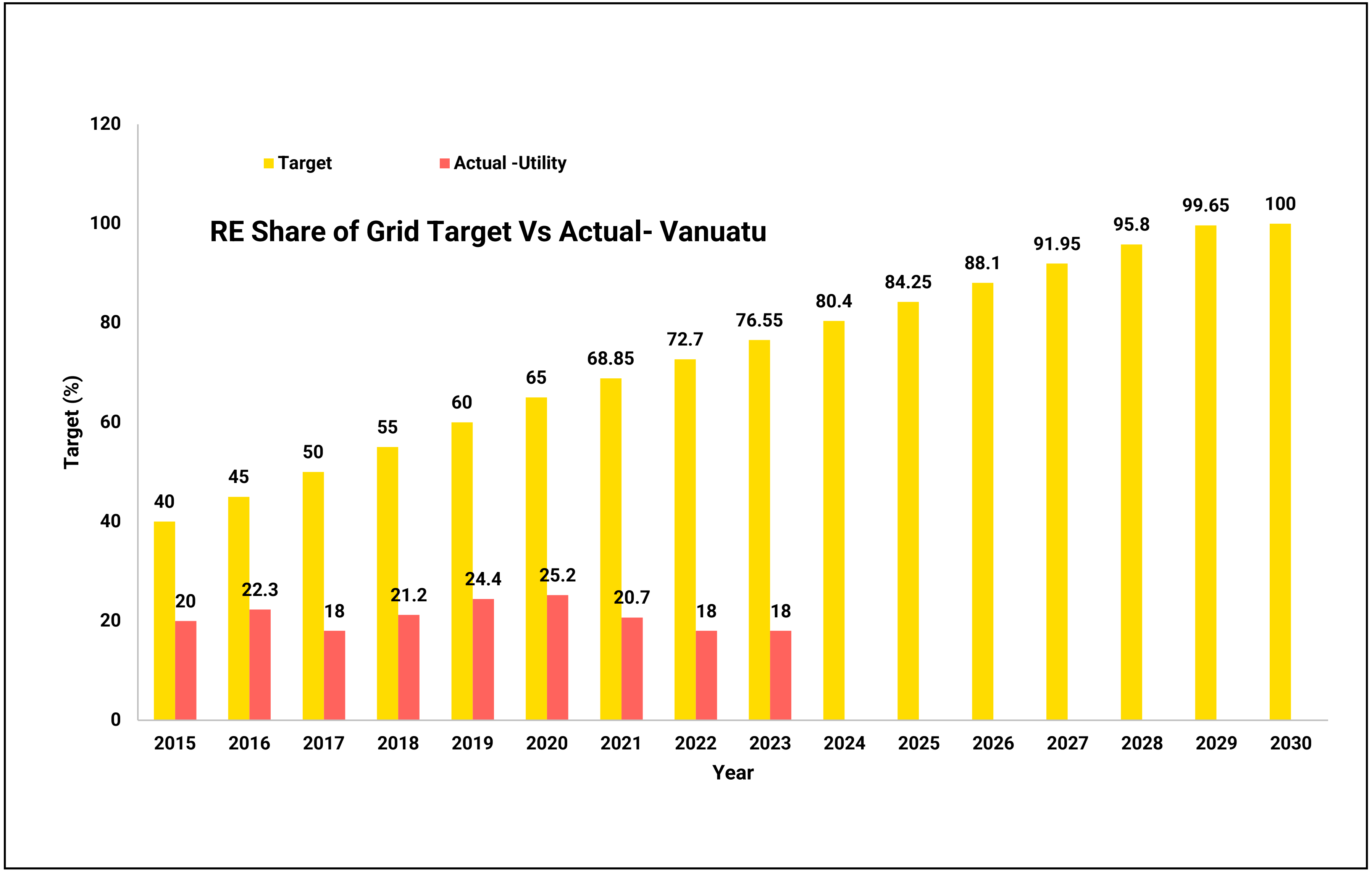
Peak Electricity Demand: 12.5 MW

Annual Generation: 66 GWh

Tariff: 68Vt/kWh (USD $0.56/kWh)



Renewable Energy Trend- Vanuatu



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Stakeholder Engagement: Inception Workshop, July Port Vila

Transparency versus ‘black boxes’ – supporting verification, impact of assumptions, sensitivity analysis

Wider stakeholder engagement by reducing costs for participation

Opportunity to explore wider scenarios

Energy Sector Stakeholders
Government
Department of Climate Change
3 utilities (UNELCO, VUI, VanPAWA)
Department of Energy
Utilities Regulatory Authority (URA)
Development partners- DCCEEW, DFAT
CROP Agencies SPC
Implementing agencies, GGGI
Tertiary institutes- UNU, VIT, VQF.
Consultants

Is $$’s the issue?

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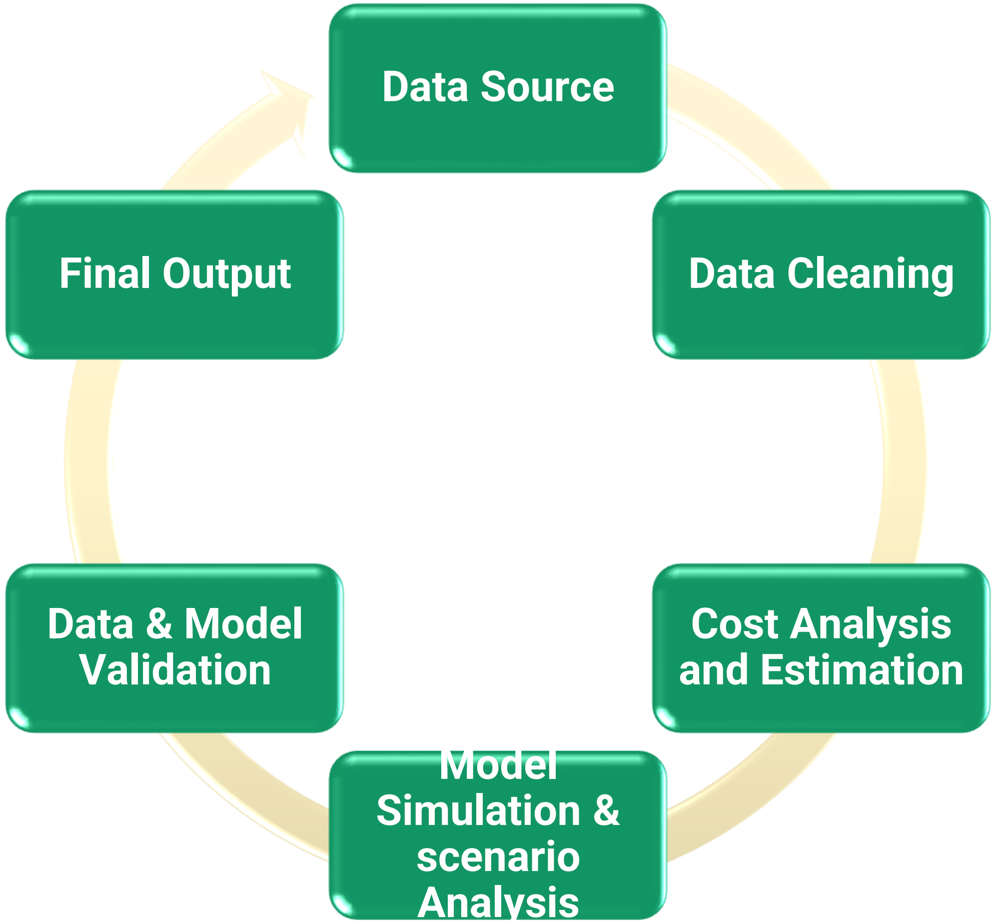
Data collection process

Energy Stakeholder Lists

- Utilities
- URA
- Department of Energy
- Department of Customs
- Pacific Energy
- Statistics office
- Development Partners
- Institutions (University of the South Pacific, Vanuatu Institute of Technology, Pacific Vocational Training Center)



List of Data Requested

- Historical Load profiles
- Financial Data
- Transmission Line Data
- Turbine Information Data and Costs
- Renewable Energy Potentials Information
- Feasibility Study Reports of the Potential RE Projects
- Policy and Regulatory Framework

Data for Planning and Modelling

To submit this work book:

1.	The blue fields with *italiziced red labels* are the minimum required data to model your solar PV in HOMER. However, we recommend that you provide as much of the
2.	Please attach this workbook in an e-mail addressed to steffi.klawiter@ul.com
3.	Partners: please include an image of the product, a company logo, and sales contact info.

Contact		Please enter the primary point of contact for HOMER here. This data is for administrative purposes and will not
	Name	
	Email	
	Company	
	Position/Title	
	Work phone or Cell phone	

PV performance data	
	PV panel Name
	Manufacturer
	Website
	Notes
	Weight
	Footprint
	Electrical Bus (AC or DC)
	Lifetime
	Temperature effects on power (%
	Nominal operatin cell temperatur
	Efficiency at STC
	Enter Efficiency Table of a Dedicat
	Input Percentage (%)

Cost info		
	Capital cost of 1kW solar panels i	
	Replacement costs for 1kW solar	
	O&M annually for 1kW solar PV	
	Nominal power (kW) of 1 module	kW

1. Project and Component Questionnaire
2. Interval Data
3. Solar PV Data
4. Inverter Data
5. Energy Storage
6. Wind Turbines
7. Diesel Generator
8. CNO Generator
9. Geothermal

CEM tools are used to simulate different renewable energy technologies to predict the future based on the current data input.

Inaccurate data can lead to flawed predictions, which can result in poor decision-making regarding investment in energy infrastructure.

Use of structured data templates, help identify help identify the data gaps

Data validation is essential for ensuring the reliability, accuracy, and credibility of Capacity Expansion Models.

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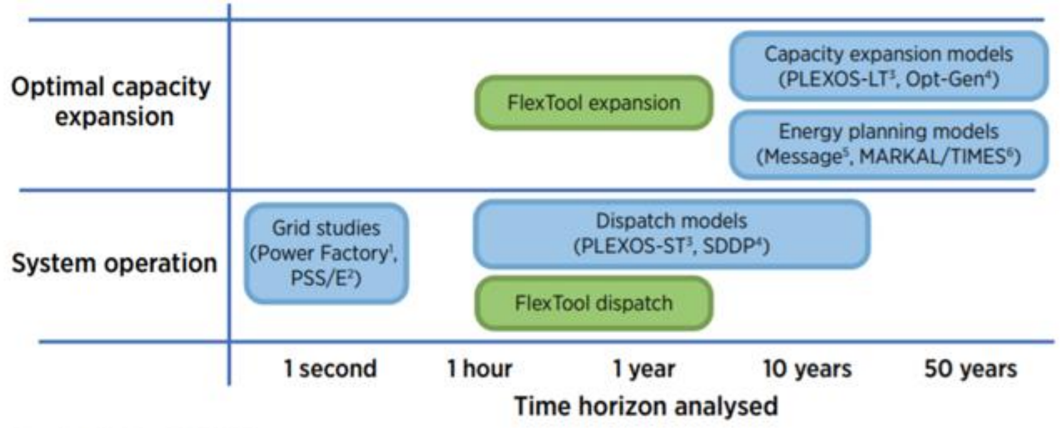
Major types of energy models and their dimensions

Type	Time frame and resolution	Size	Network detail	Energy system integration	Example tools[1]
Short-term stability studies	Very short, high resolution	Local to multi-regional	Detailed transmission / distribution	No	PSS®E, OpenDSS
Unit-commitment and economic dispatch (UC-ED)	Medium length (months to years) and resolution (e.g. hour)	Regional to multi-regional	Typically low to medium detail	Possible	PLEXOS®, OSeMOSYS, TIMES, Balmorel
Capacity expansion and planning	Long (years to decades)	Regional to multi-regional	Medium to high detail	Possible	PLEXOS®, GE MAPS, OSeMOSYS, TIMES, Balmorel, OptGen, ReEDS
Household demand modelling	Short-medium (days to months)	Very small (e.g. single household or mini/microgrid)	None to moderate	Possible, e.g. household electricity and gas	

Open-source energy modelling, simulation, optimisation tools to help

- Stakeholders engage
- Explore multiple possible energy transition pathways
- Continue to evolve plans as circumstances change
- Ensure tools being used are 'fit for purpose



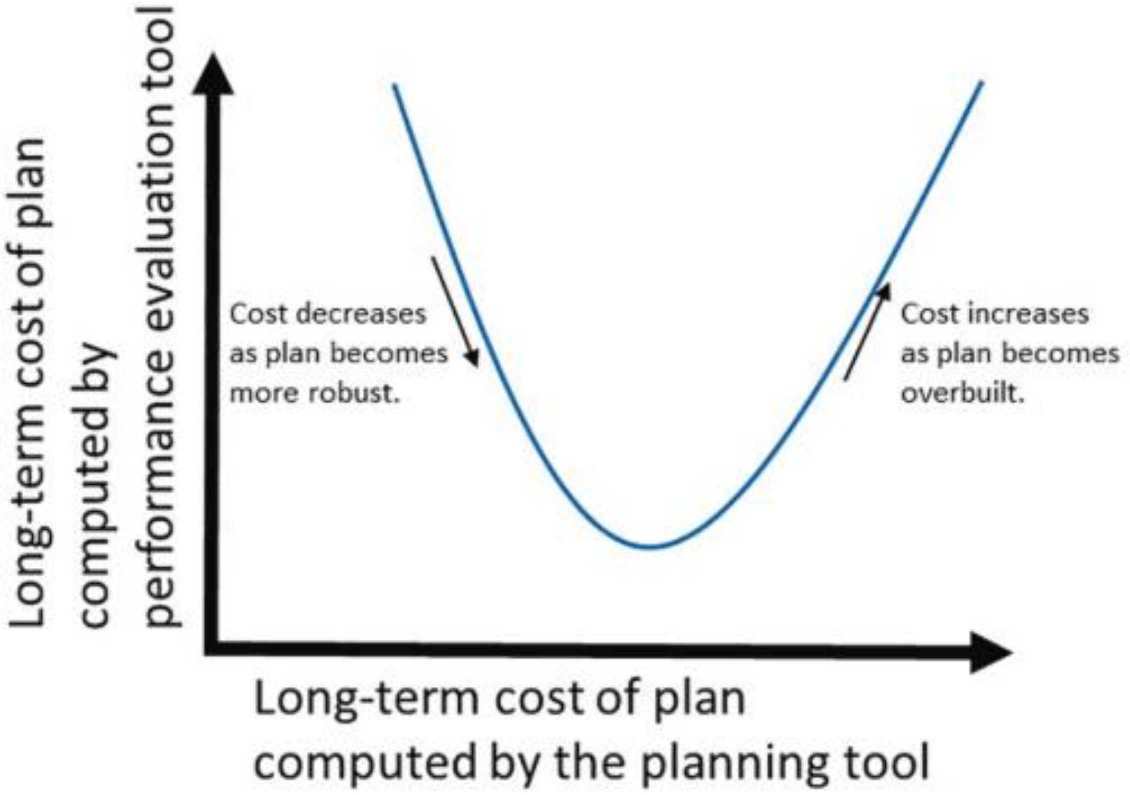
1 Owned by DIgSILENT GmbH
2 Owned by Siemens PTI
3 Owned by Drayton Analytics Pty. Ltd and Energy Exemplar Pty. Ltd.
4 Owned by PSR
5 Owned by the International Institute for Applied System Analysis (IIASA)
6 Owned by the Inernational Energy Agency (IEA)

(Hungerford, 2019)

An Ideal Electricity Planning Process

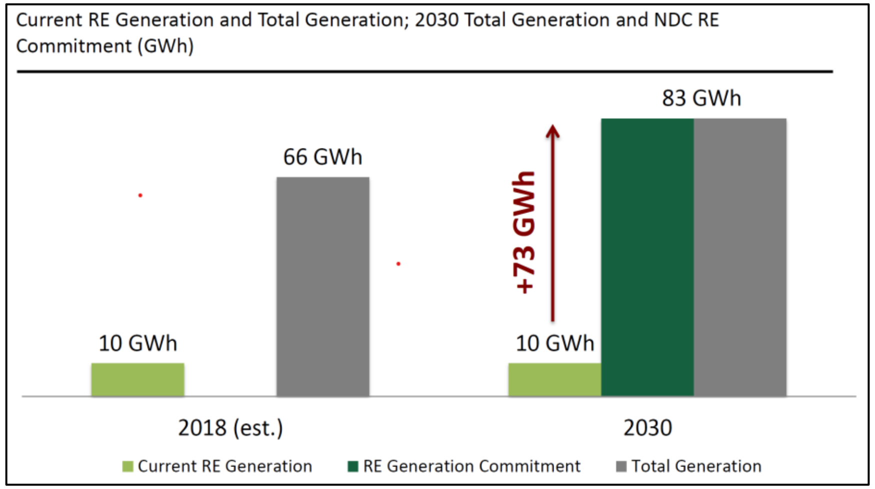
1. Economic policy and outlook for Pacific Island Nations
2. **Long term electricity sector planning**
3. Individual project procurement, construction, commissioning, and connection
4. Power system operation and delivery to consumers

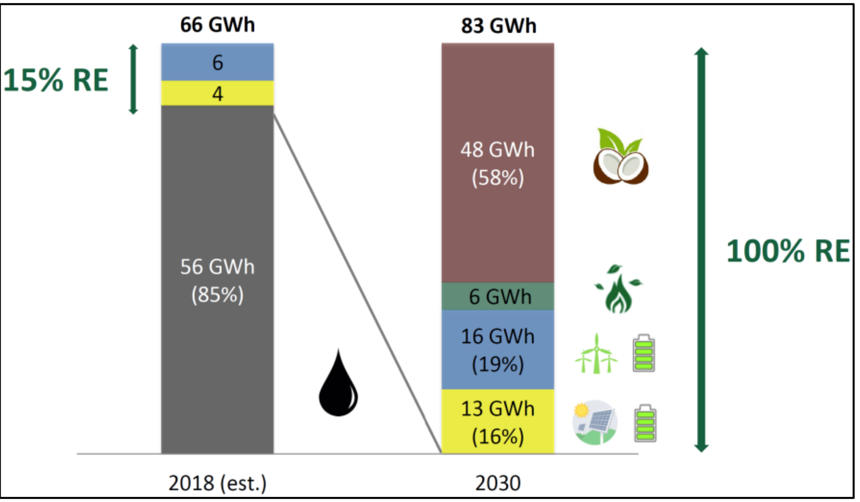
Adoption of uniform Planning and Modelling Tools for Pacific Island Nations would support an integrated, engaged and transparent electricity sector planning process



Vanuatu Desktop Study

- **Updated Vanuatu National Energy Road Map 2016-2030**
- VISIP 2015-2024 Report
- **UNELCO Efate Energy Road Map 2018-2030**
- Vanuatu NDC Implementation Roadmap 2019
- Vanuatu National Sustainable Development Plan (2016-2030)
- Vanuatu Climate Change Disaster Risk Reduction Policy 2016-2030
- Renewables Readiness Assessment_ Vanuatu 2015
- IRENA_grid_study_Vanuatu_2020
- **UNELCO Annual Reports**
- etc

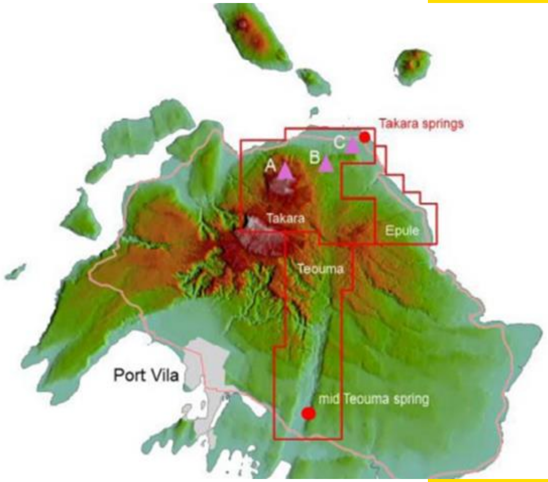




Source: **Efate Energy Road Map 2018-2030** Pathway to Achieving the Renewable Energy Commitments and Other Wider Sustainable Development Goals for Vanuatu NERM 2016-2030

Scenario Development- Renewable Energy Pathways

Technology	Description	Rating (MW/MWh)	S1 2024	S2 2027	S3 2030	S4 2030	S5 2030
Diesel	7MW Diesel Port Vila	8.8	☑	☑			
	3MW Diesel Agape	3.8	☑	☑			
	Minimum Diesel				☑		
Wind	3.5MW Wind Kawene	3.5	☑	☑	☑	☑	☑
	Additional Wind-Optimised			☑	☑	☑	☑
Solar	Existing Solar Kawene	2.4	☑	☑	☑	☑	☑
	RESSET: 5MW Solar- Kawene	5		☑	☑	☑	☑
	Distributed 1.5MW Rooftop PV	1.5		☑	☑	☑	☑
	Distributed 1.5MW Rooftop PV	1.5			☑	☑	☑
	Additional Solar-Optimised			☑	☑	☑	☑
BESS	RESSET BESS Agape	11.5/6.65		☑	☑	☑	☑
	Additional BESS-Optimised			☑	☑	☑	☑
CNO	0.8MW CNO	0.8		☑	☑	☑	☑
	7.2MW CNO	7.2				☑	
	Additional CNO Optimised						☑
Geothermal	4MW Geothermal- Takara	4					☑



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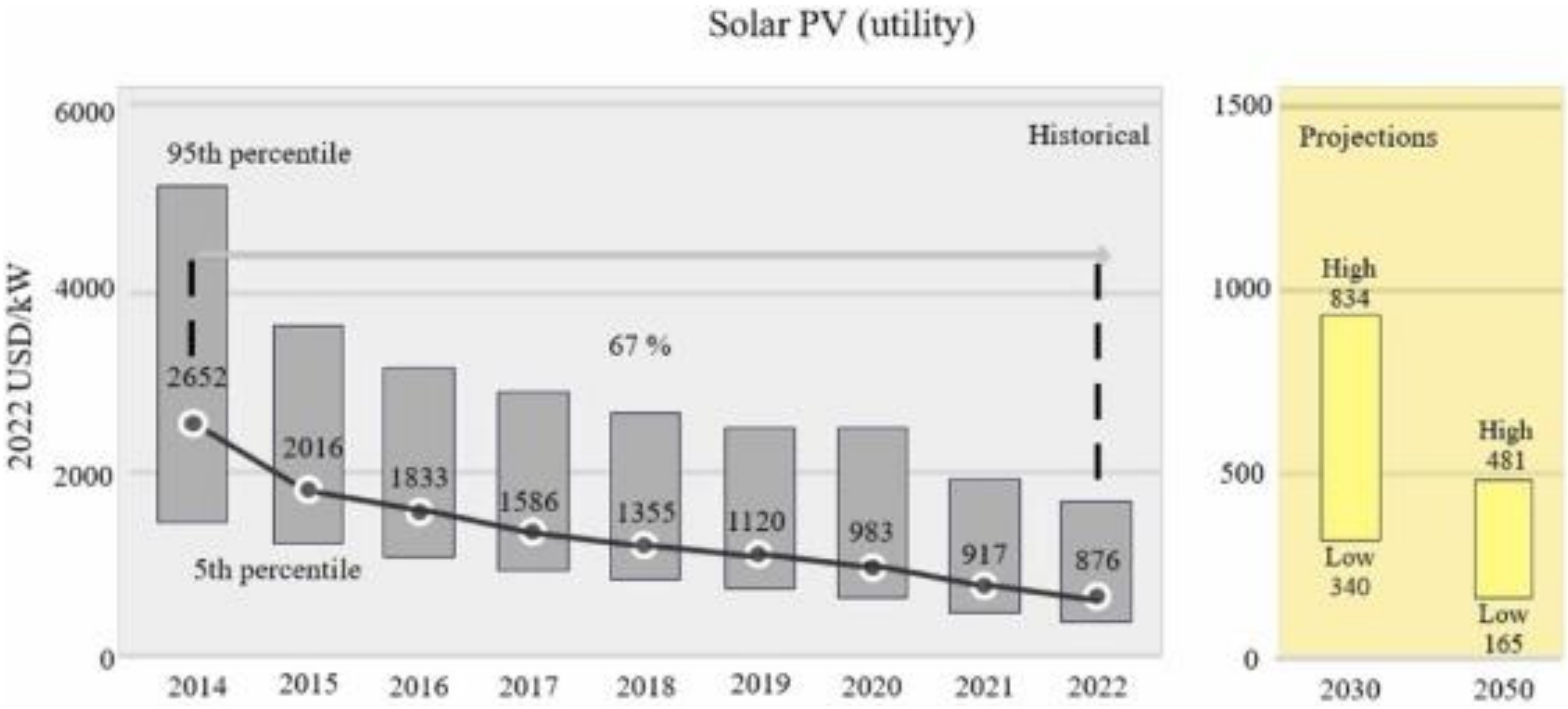
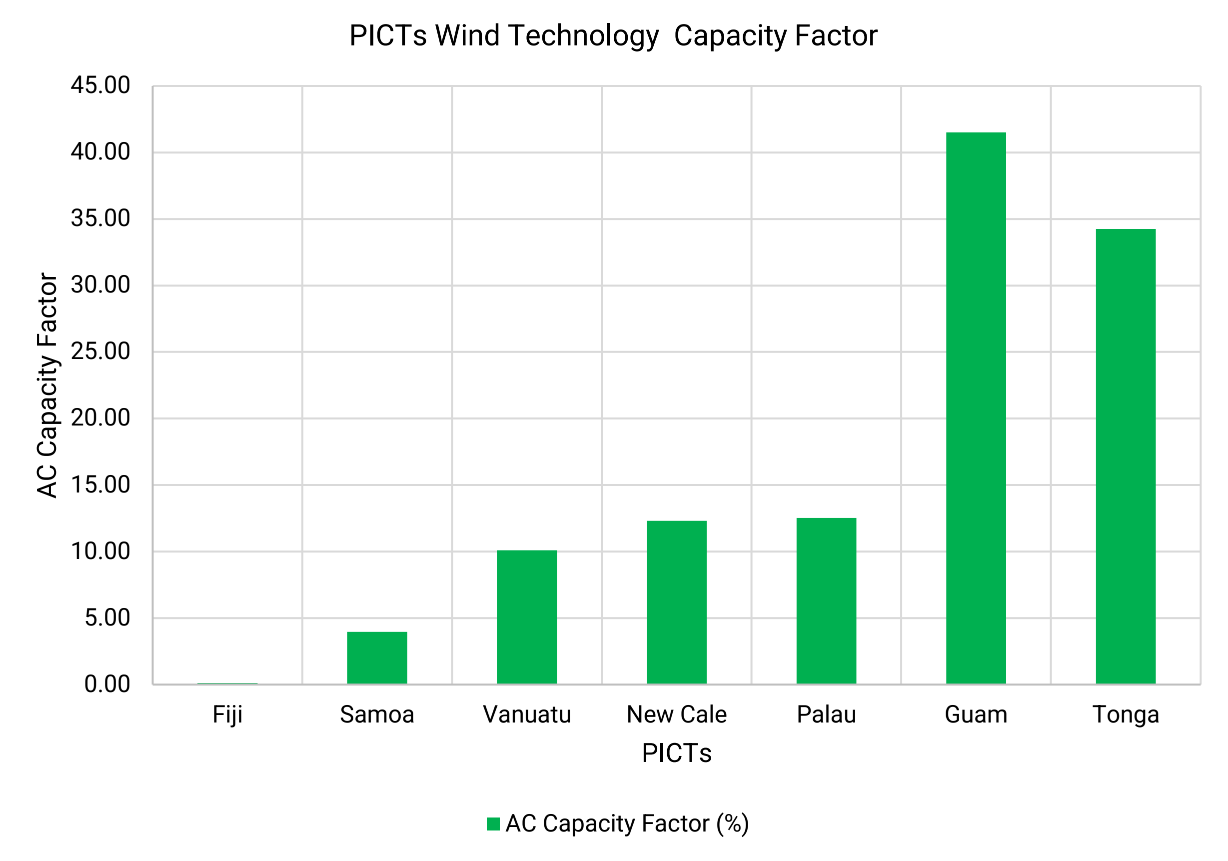
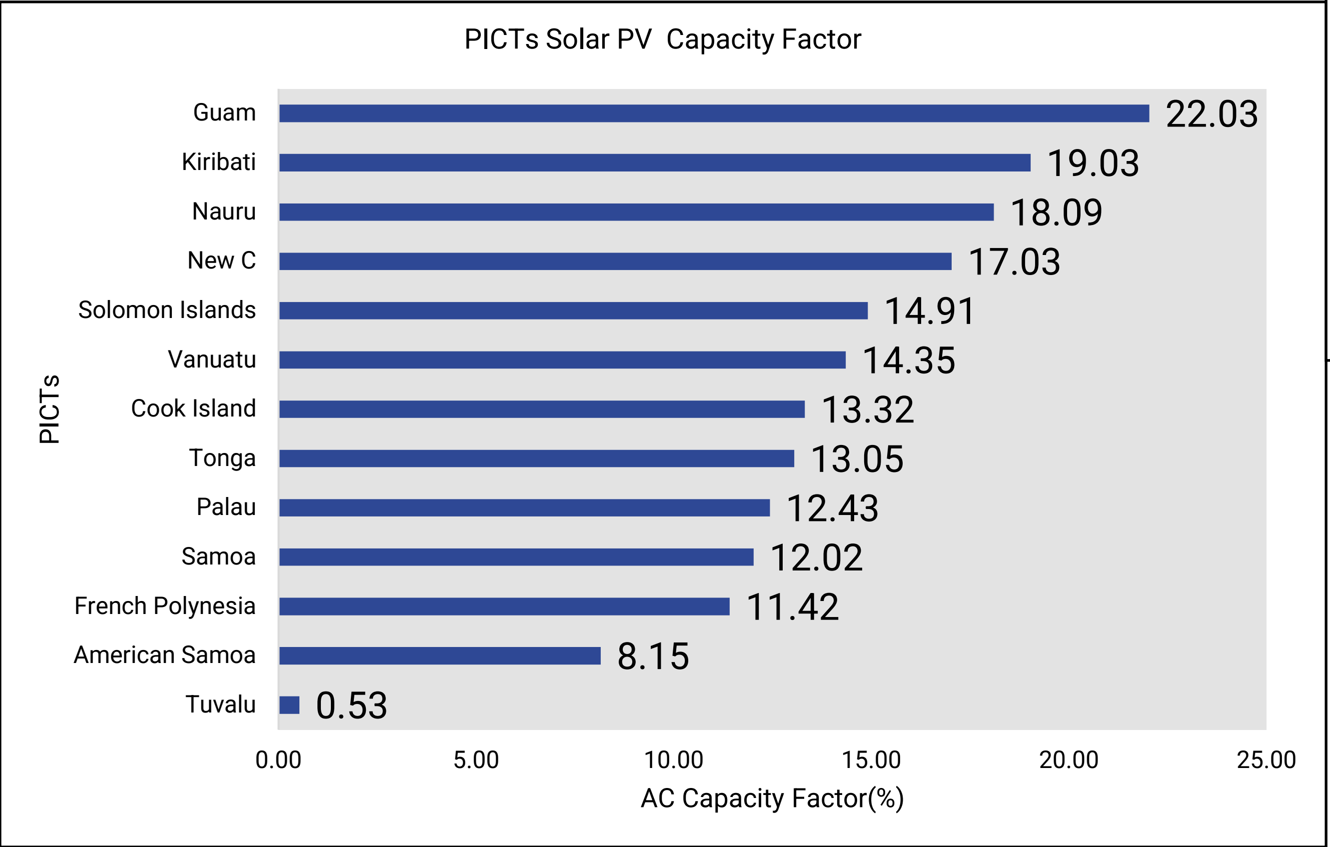
Solar PV Weighted Average Costs



Global weighted-average total installed cost of solar PV projects since 2014, followed by 2050 (IRENA 2019, IRENA 2022)

Solar PV & Wind Energy Capacity Factors in PICTs





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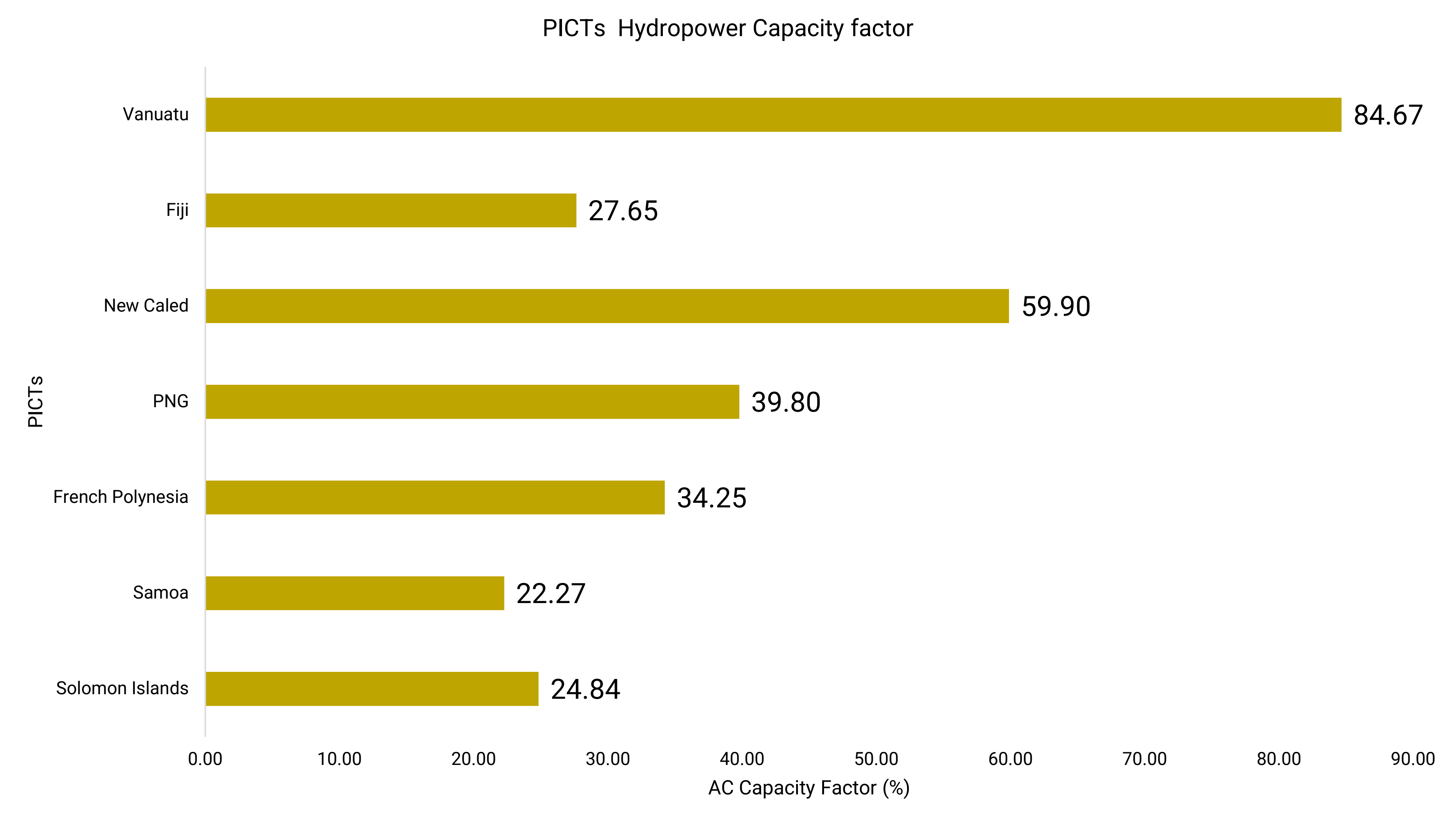
Hydropower Plant Capacity Factors in PICTs



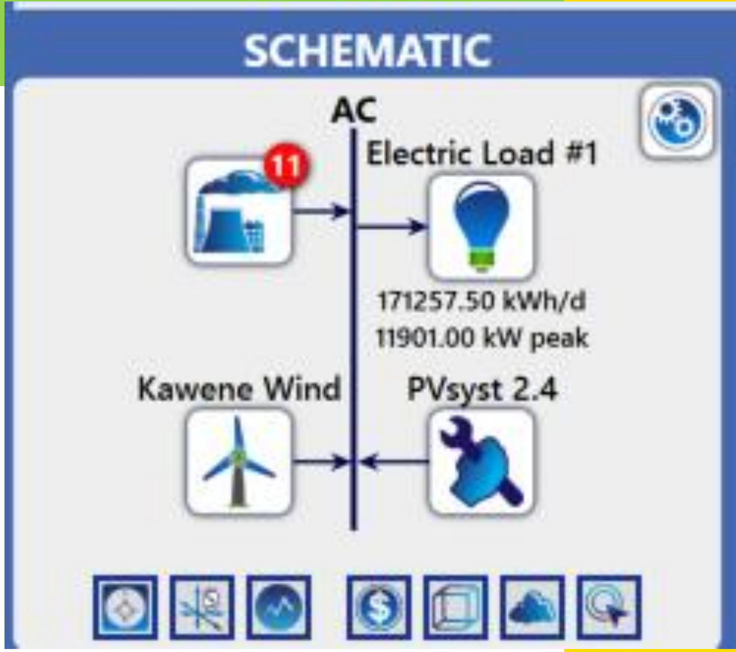
Opportunities

Improve O&M for all RE Technologies

Better data to support decision making

Include these parameters in the PPA Benchmarking Portal

Design system architecture and specify components



- ✓ **Define the system topology** and select the desired equipment for your specific application.
- ✓ The entire Efate grid entire remote island system with multiple generators, technologies and loads was modelled in Homer which is quite **complex for what HOMER is generally used for.**
- ✓ **Choose the desired system architecture generators**, multiple generators, PV, wind, storage, and even grid connections.
- ✓ BASE CASE: Existing Generation Assets

  Thermal Generation: There are 3 Cummins generators, each with a capacity of 1258kW, located at Tagape. Additionally, there is 1 containerised genset and 7

  Cummins generators, each with a capacity of 1258kW, at Port Vila.

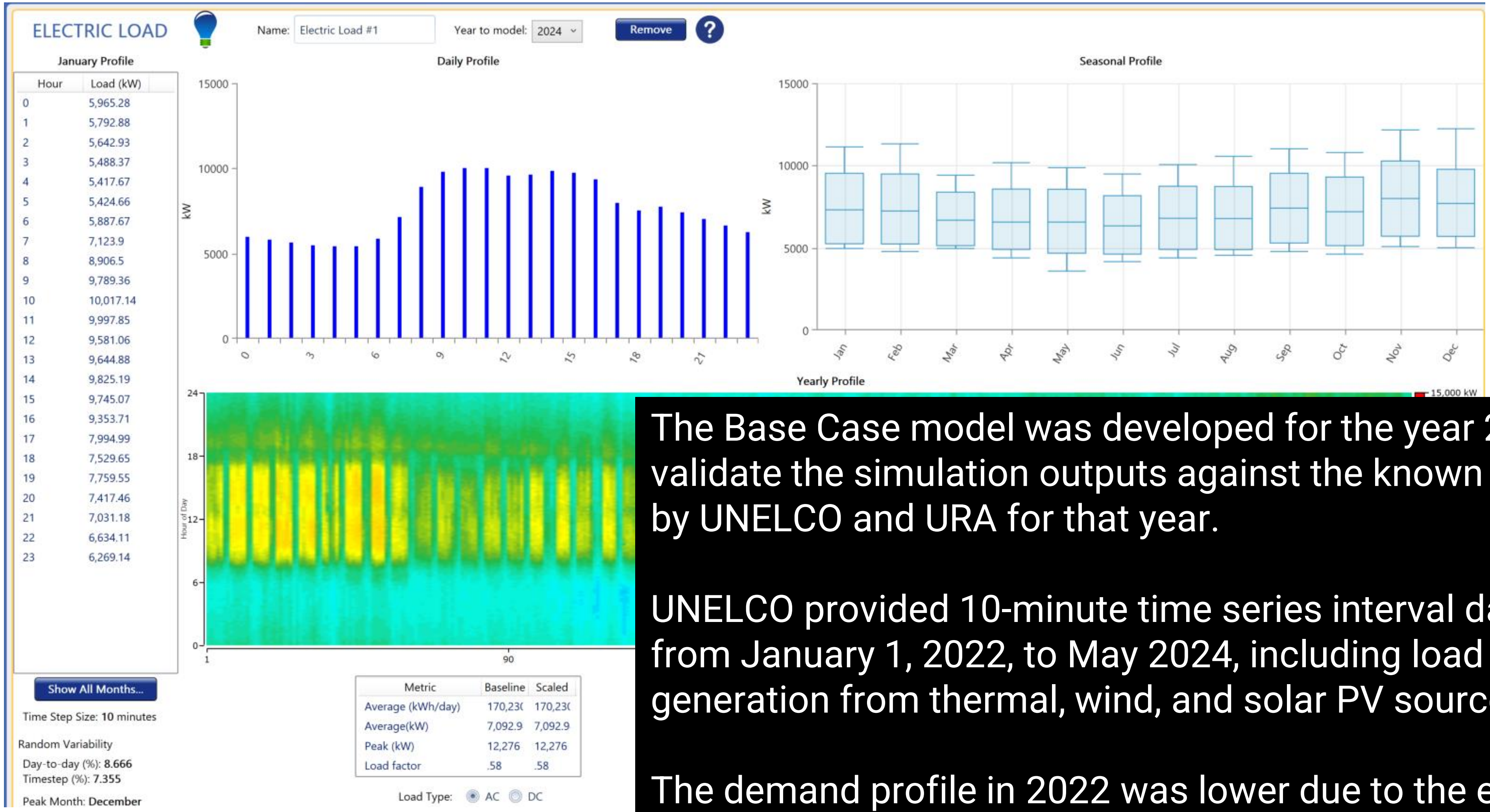
  Solar PV: All the existing Solar PV Plants were combined, and the production data from these plants was imported as PvSyst.

  Wind: There are 9 wind turbines with a capacity of 275 kW each, located in Kawene. The output of these turbines was derated to match the actual output.

Existing Solar PV Plant	Rating (MW)
Kawene	**1.095**
Undine Bay	**0.51**
Tagape	**0.08**
Meteo	**0.123**
Solar Parliament	**0.615**
2022 UNELCO Data	**2.423**

- ✓ **Set up the system controller**:
  - ✓ **Select from pre-defined dispatch strategies** or **define your own** strategy and control algorithms using C++ or MATLAB

Define the Load



The Base Case model was developed for the year 2023, serves to validate the simulation outputs against the known parameters provided by UNELCO and URA for that year.

UNELCO provided 10-minute time series interval data for the period from January 1, 2022, to May 2024, including load demand and generation from thermal, wind, and solar PV sources.

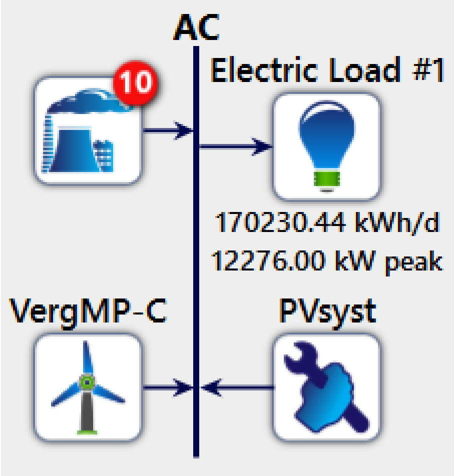
The demand profile in 2022 was lower due to the effects of COVID. In 2023, there were gaps in the data caused by two cyclones in March and several other data gaps.

To obtain a better load profile and generation profiles, the data from both 2022 and 2023 were combined.

Results: Base Case_ Scenario 1 2023

Variances

1. Actual fuel consumption slightly higher, possibly due to lower actual PV output and due to spinning reserve requirements
2. Actual PV output was lower due to 2 cyclones in March 2023, however, expect the existing PV output to be somewhat higher in future years.
3. Overall, the Base Case is Satisfactory



Parameters	Units	UNELCO/UI	Base Case	Variances (Actual/M	Column
Total Load			62,053,633		Notes
Total Generation	kWh/yr.	62,724,806	62,057,725	1.06%	
Thermal Generation					
Capacity	KW	13,838	13,838	0.0%	
Operational Life	Years	6.9	6.9	0.0%	
Capital Cost	USD$/ Gense	7,950,964	8,030,704	1.0%	
Fuel Consumption	L	14,265,770	13,823,681	-3.1%	1
Generator Fuel Price	USD $/L	1.27	1.27		
Maintenance Cost	USD $/Y	457622	0		
Electricity Produced	KWh/yr	57,490,000	56,227,836	-2.2%	
Wind					
Quantity		9	6		
Wind Turbine Total Productio	kWh	2,755,583	2,771,488	0.6%	
Capital Cost	Million($)	11.34	11.3	-0.4%	
Wind Turbine Life Time	Years	10	10		
Capacity	KW	3,300	1,650	Derated	
Maintenance Cost	USD $/Y	$ 6,356	$ 6,354		
Solar					
Capacity Factor	%		15		
Total Energy Production	kWh/Year	2,479,223	3,058,401	23.4%	2
Maximum Output	kW		1,841		
Hours of Operation	hrs/yr.		5,783		
levelized Cost	$/kWh		0.267		
LCOE			0.354		
Total Generation	**kWh/yr.**	**62,724,806**	**62,057,725**	**-1.1%**	

Summary | Tables | Graphs

Compare Economi

Export... | Export Details...

Optimization Results

Double click on a system to see its Simulation Details.

Architecture			Cost				System	
VergMP-C	PVsyst	Gen1258 (kW)	NPC ($)	LCOE ($/kWh)	Operating cost ($/yr)	CAPEX ($)	Ren Frac (%)	Total Fuel (L/yr)
12	2.40	1,258	$197M	$0.275	$15.1M	$21.7M	26.2	11,331,993
12	2.40	1,258	$206M	$0.286	$15.8M	$22.4M	25.2	11,722,340

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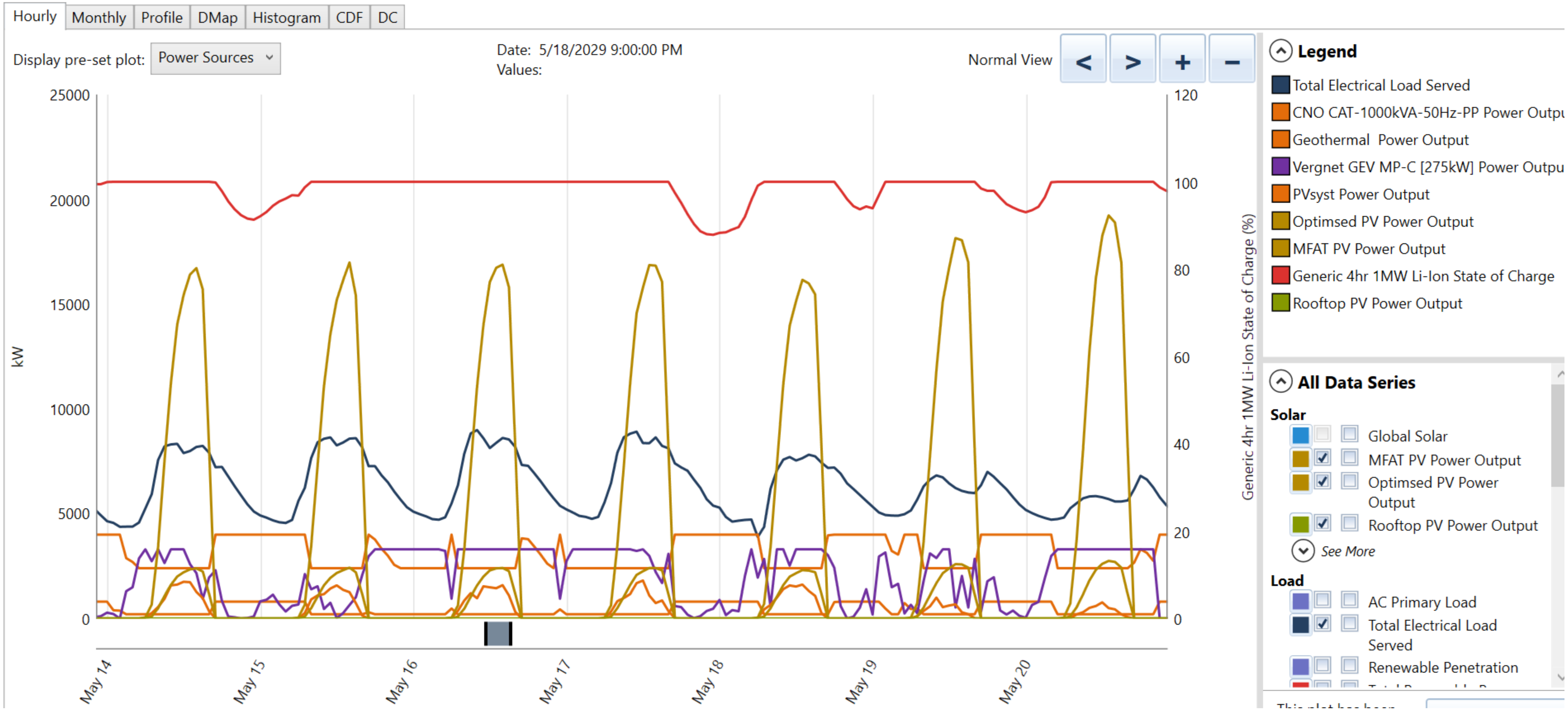
Results in HOMER

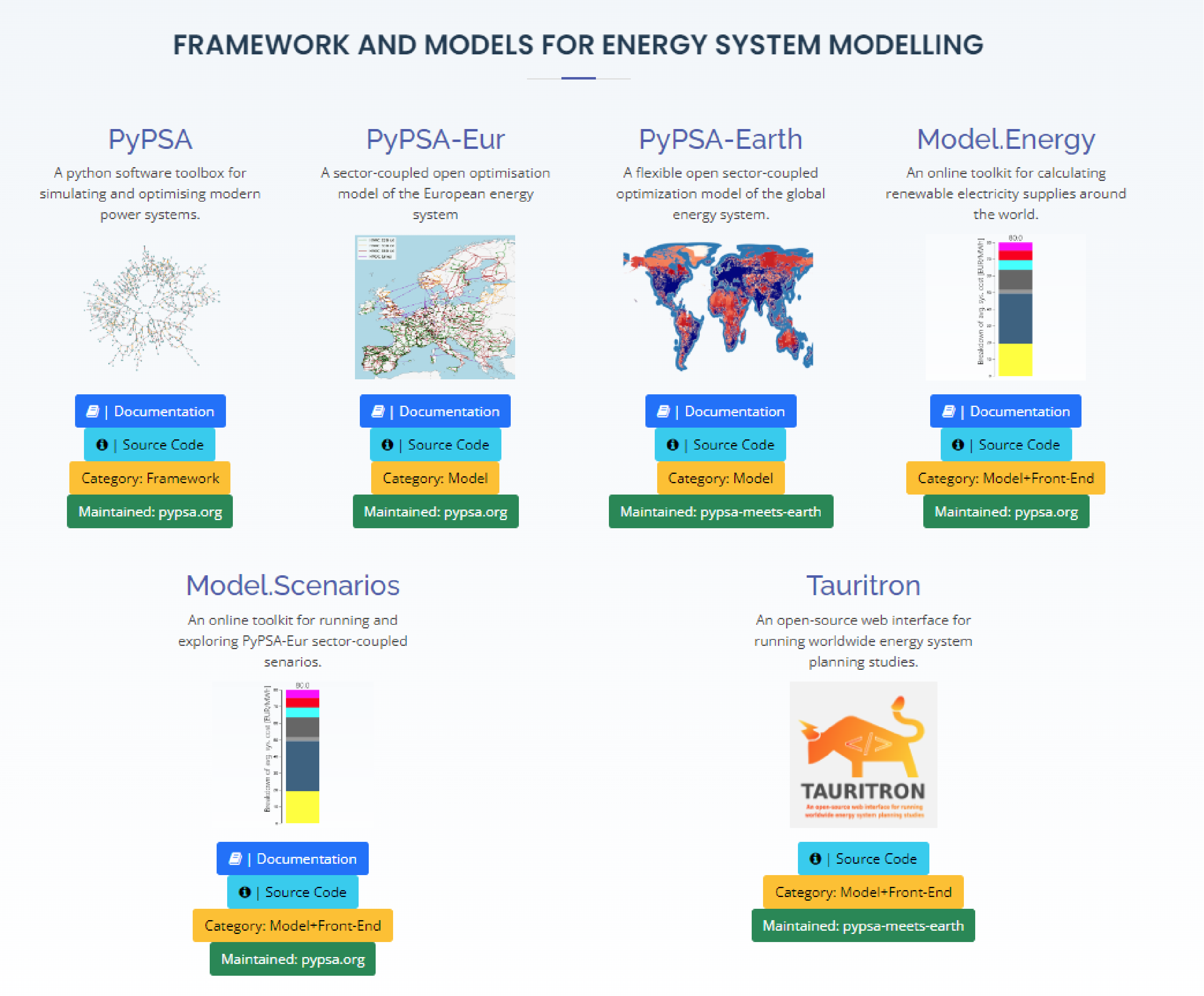


PyPSA

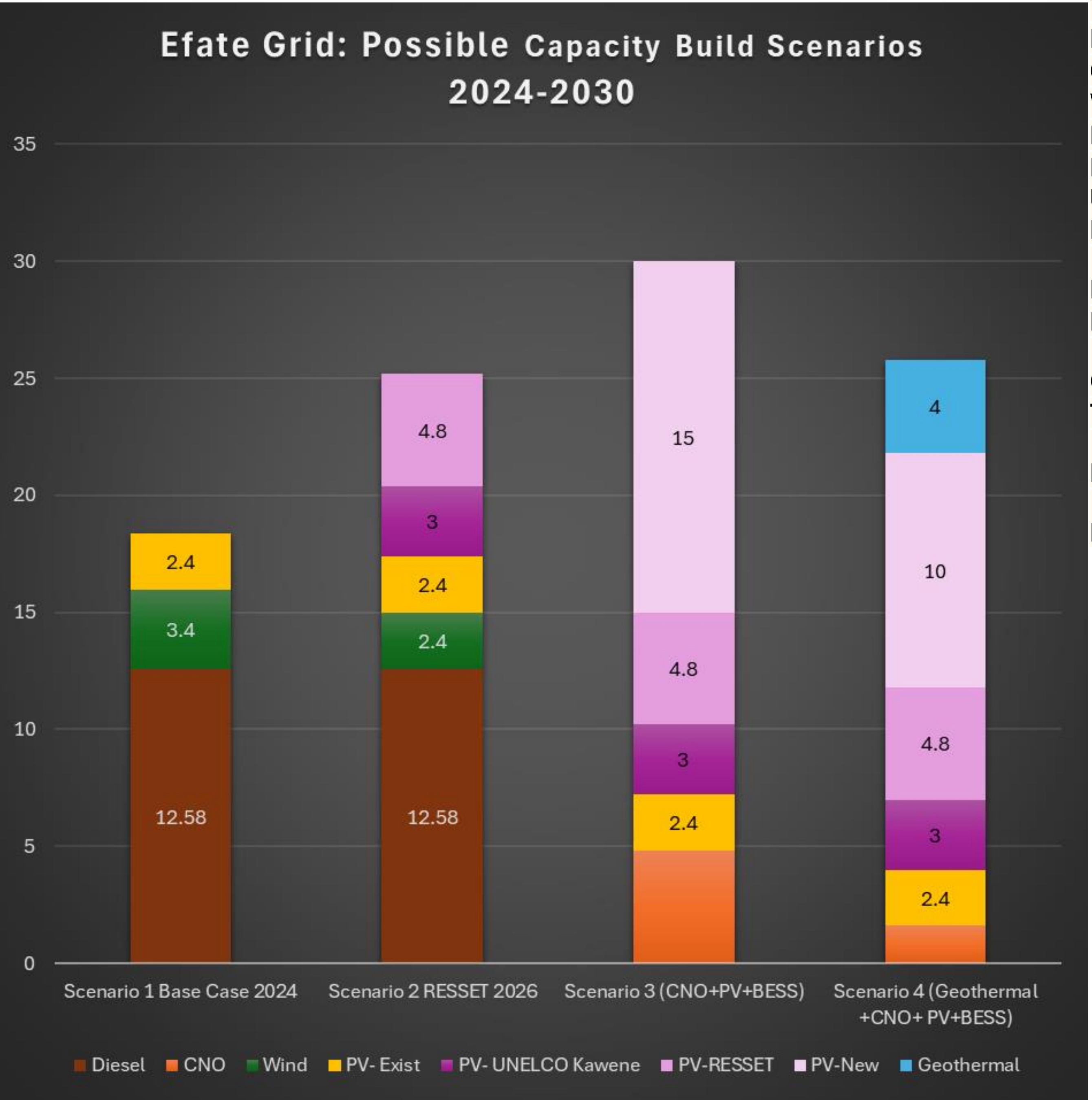
PyPSA- Python for Power System Analysis

PyPSA is an open-source Python library for power system analysis and optimization.

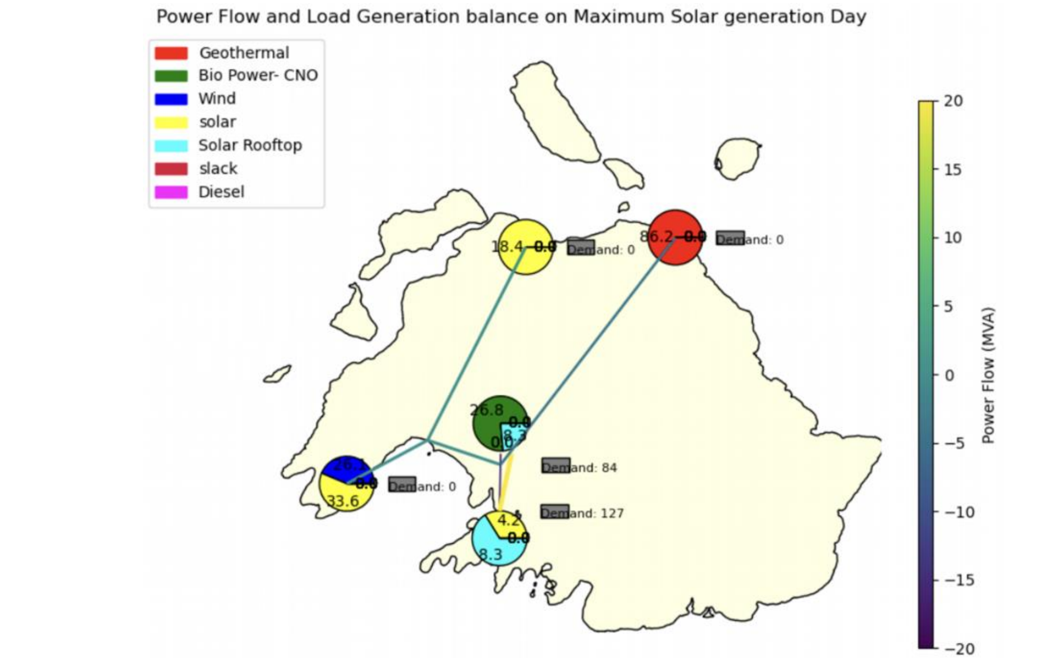
- ✓ focuses on modelling and simulating power generation, transmission, and storage systems
- ✓ allows users to analyse and optimize the dispatch of generation resources, evaluate different investment options, and simulate the integration of renewable energy sources.
- ✓ supports the incorporation of various constraints, including transmission capacity, renewable energy curtailment, and storage operation limits



Possible Pathways

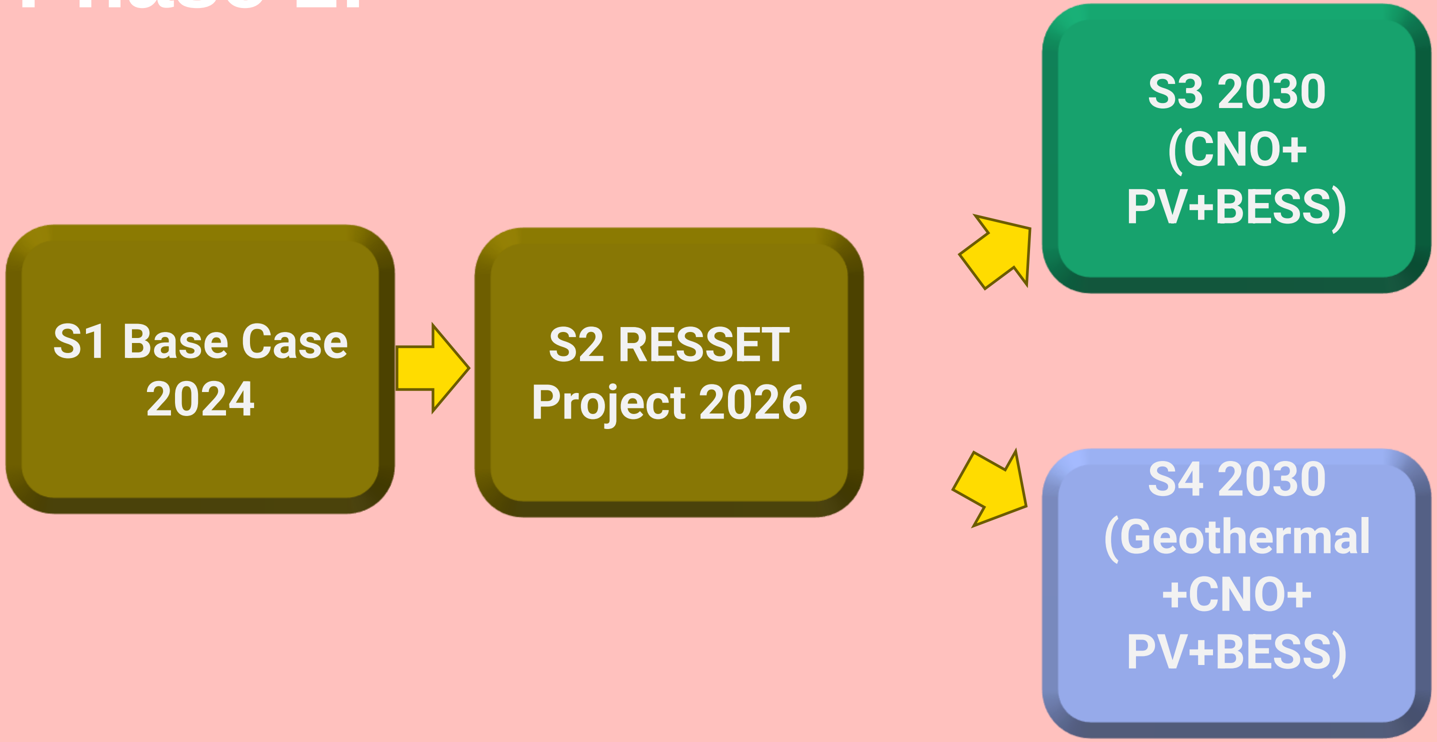


Technology	Scenario 1 Base Case 2024	Scenario 2 RESSET 2026	Scenario 3 (CNO+PV+BESS)	Scenario 4 (Geothermal +CNO+ PV+BESS)
Diesel	12.58	12.58		
CNO	0		4.8	1.6
Wind	3.4	2.4		
PV- Exist	2.4	2.4	2.4	2.4
PV- UNELCO Kawene		3	3	3
PV-RESSET		4.8	4.8	4.8
PV-New			15	10
Geothermal				4
Total	18.38	22.78	30	25.8
BESS (MW)				
BESS (MWh)		4	14	2



Pathways for 100% Pathways

Phase 1:



1. Data collection & hosting– improved weather data, electricity network, load demand data
2. Enhancement of tools developed for capacity expansion modelling and wider energy sector transition scenarios
3. Further investigations for rooftop PV (separate study)
4. Explore role of EV and its impact on grid

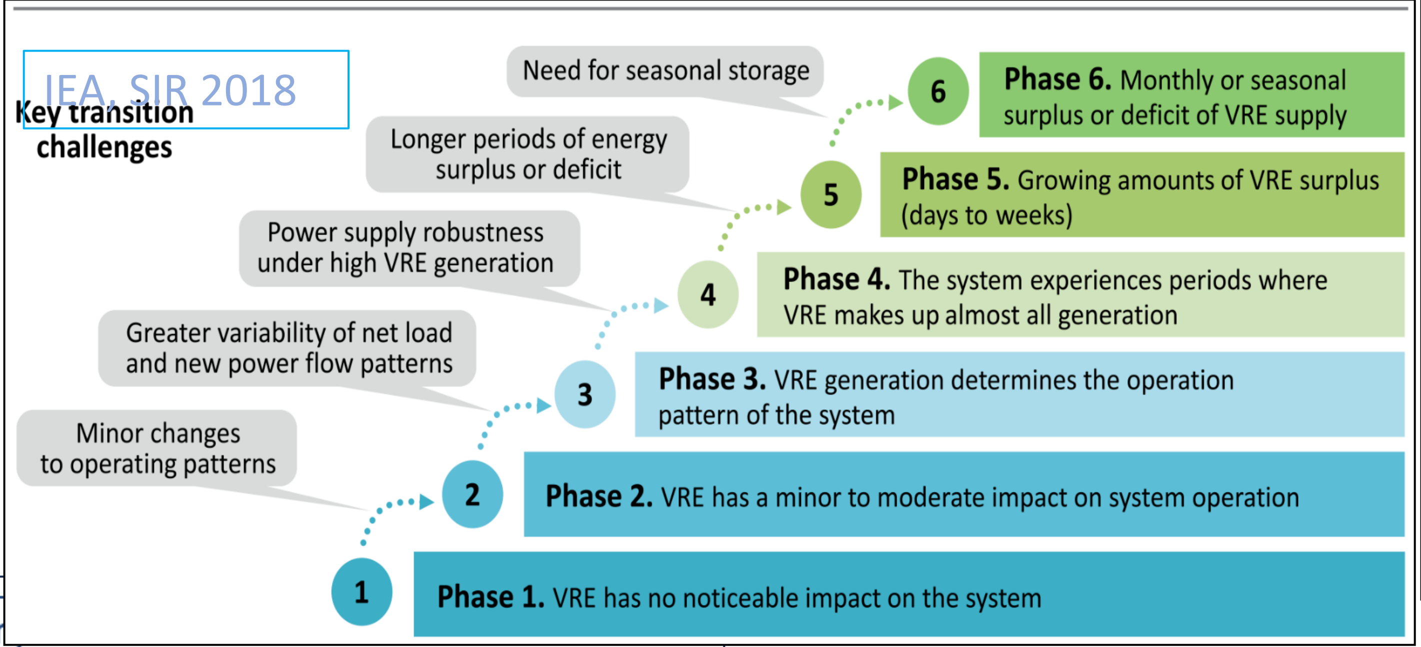
Phase 2:

5. **S3: Testing of the feasibility of CNO given current uncertainties**
6. **S4: Undertake Feasibility studies for geothermal opportunities**
7. **S3, S4: Undertake Feasibility studies for potential sites for PV deployments**
8. **S3, S4: Undertake due-diligence for the wind farm and assessment of wind technology potential future role**

Incorporate Recommendations from Phase 1 into DoE's2025 – Strategic Plan

Funding and Donor Coordination

International perspectives on variable RE integration

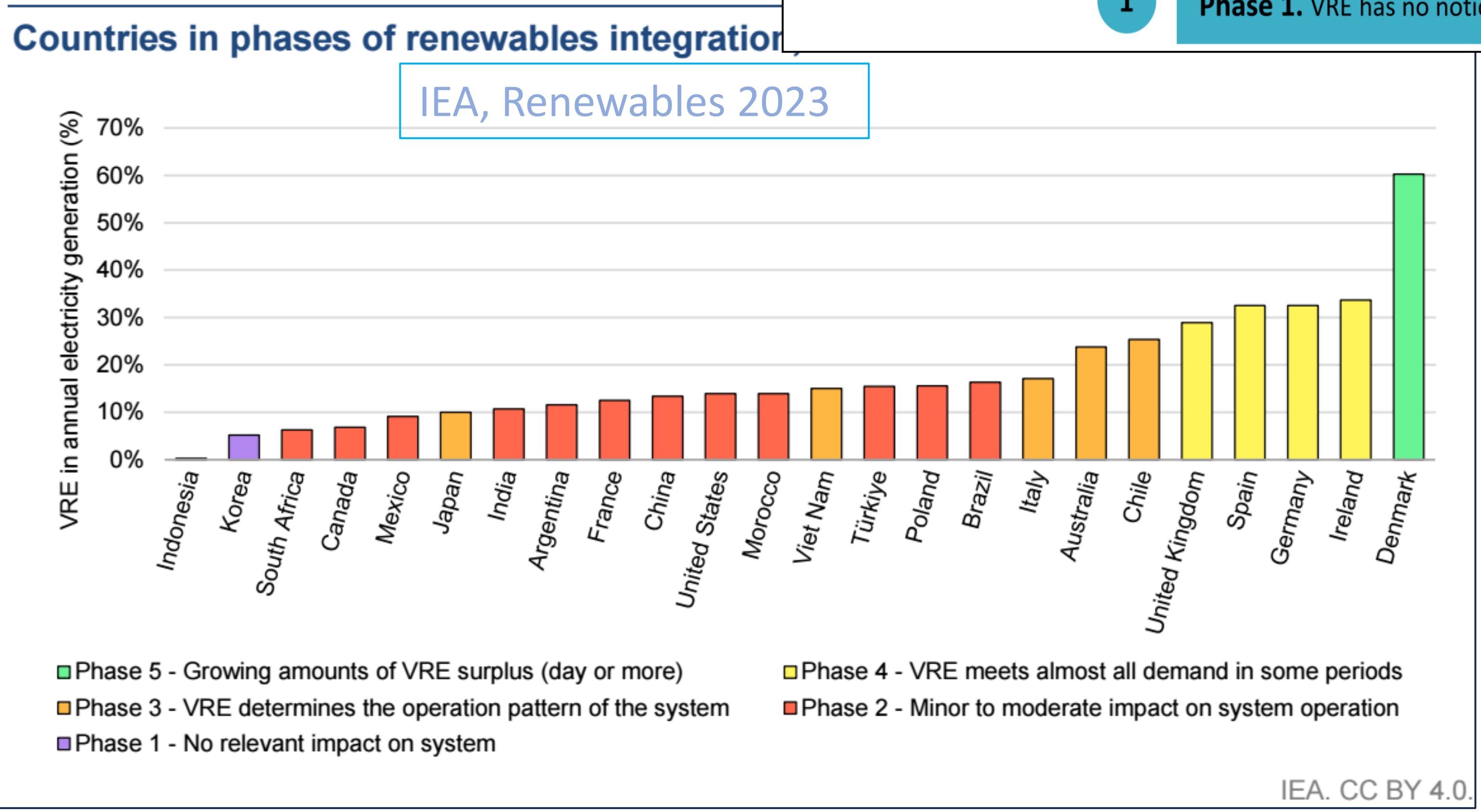


Phase 4
Require advanced technologies to ensure reliability

Phase 3
Flexibility investments

Phase 2
Draw on existing flexibility in the system

Phase 1
No relevant impact on system integration



Assessing jurisdictional integration challenges complex:

- Transmission inter-connections
- Mix of VRE – wind/solar
- Mix of other generation and flexibility options
- Market arrangements

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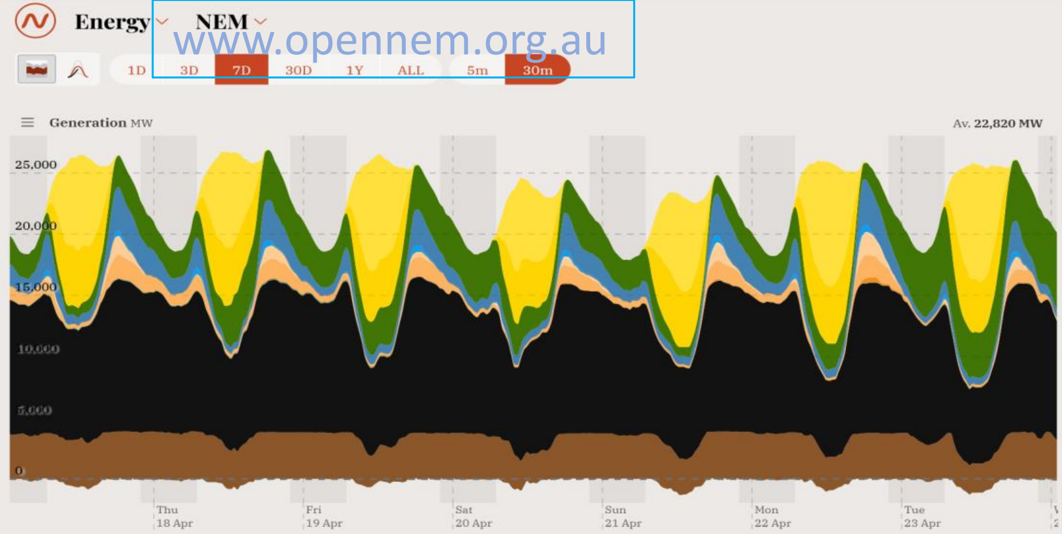
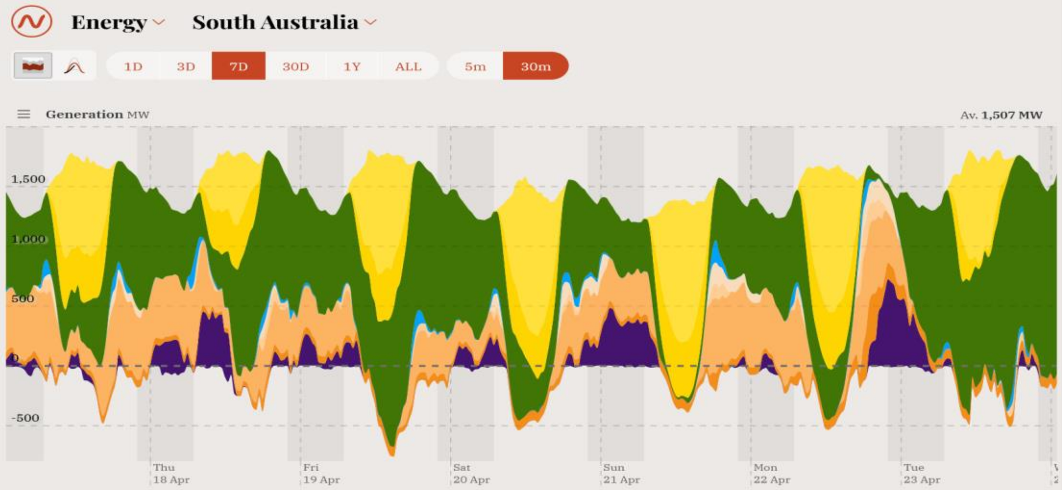
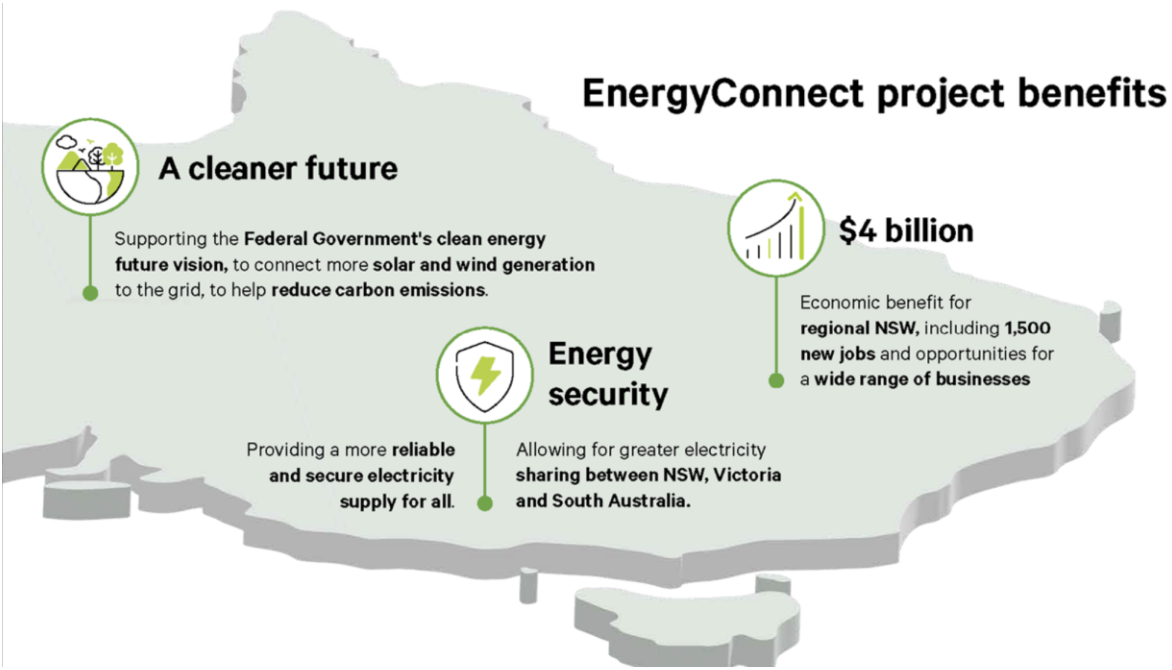
Infrastructure Readiness

- **National Electricity Market (NEM) 33% VRE (wind + solar)**
- **South Australia 75% VRE - a typical week**
    - Role of BESS
    - Interconnector







EnergyConnect is Australia's largest energy transmission project. It involves building a new 900km transmission line to connect the energy grids in New South Wales (NSW), Victoria (VIC) and South Australia (SA). This will help improve reliability and security of electricity supply and allow for future connections from renewable energy sources.

IRENA
International Renewable Energy Agency

TRANSFORMING SMALL-ISLAND POWER SYSTEMS

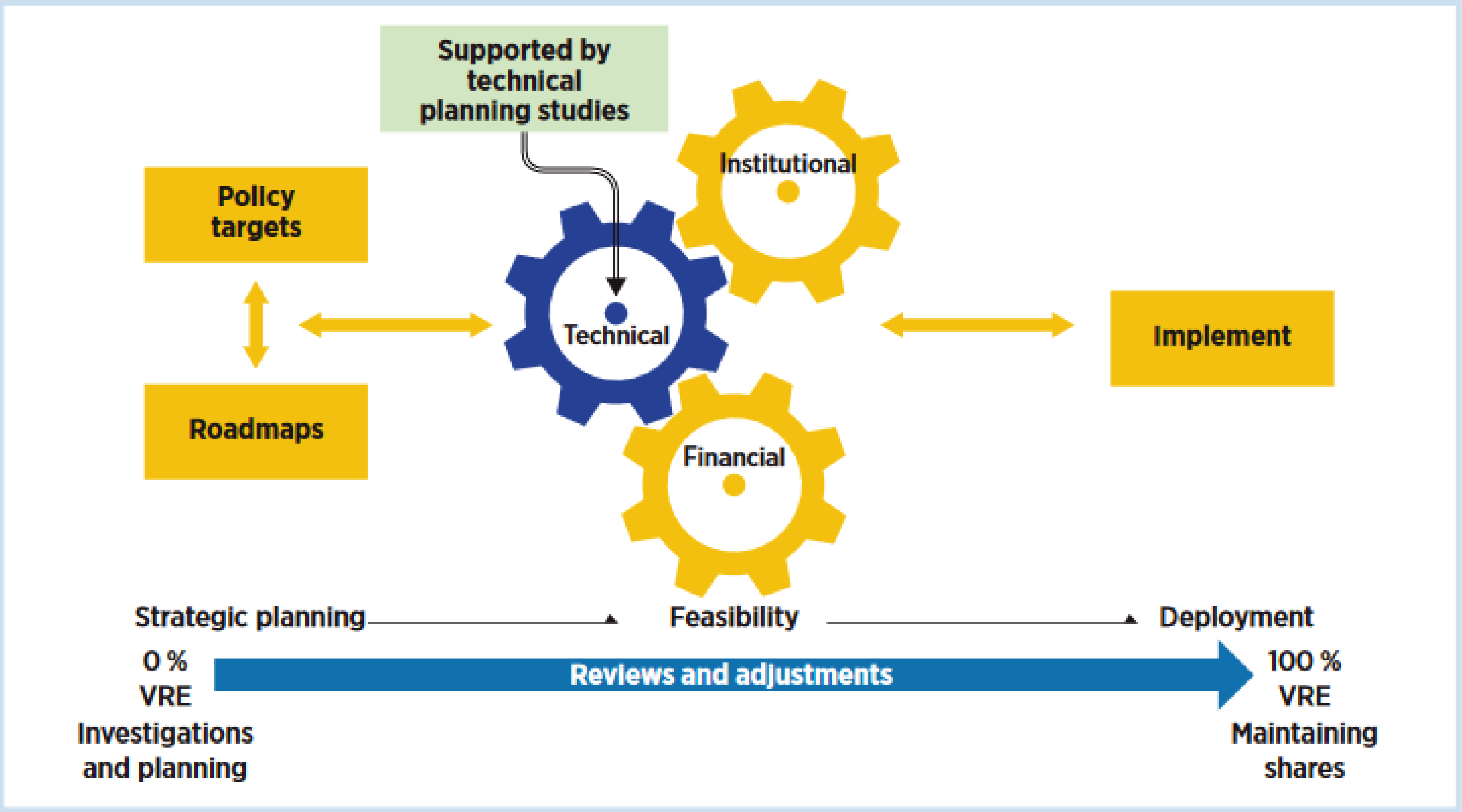
TECHNICAL PLANNING STUDIES FOR THE INTEGRATION OF VARIABLE RENEWABLES

Collaboration on Energy and Environmental Markets

Table ES1: Mapping of power system characteristics with technical challenges of VRE integration

	Integration challenge					
System characteristic	Generation adequacy	Intraday flexibility	Stability	Static thermal/ voltage grid limits	Short circuits and protections	Power quality
Flexibility of existing and future power generation fleet						
Demand and load profile						

Figure ES1: The role of technical planning studies in the transformation of SIDS power systems

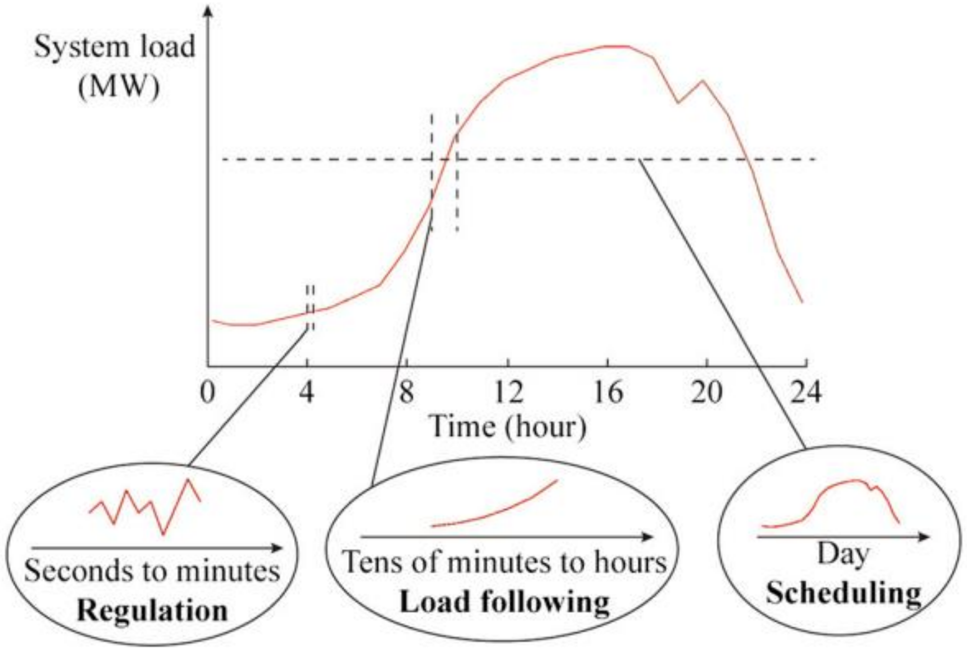


…upport VRE integration

…horizon	Parts of the power system represented		
Operational planning (day to week ahead)	Load and generation	Transmission	Distribution
			(UFLS & UVLS)

Almost always applicable | Applicable in specific situations | Almost never applicable

Grid Studies



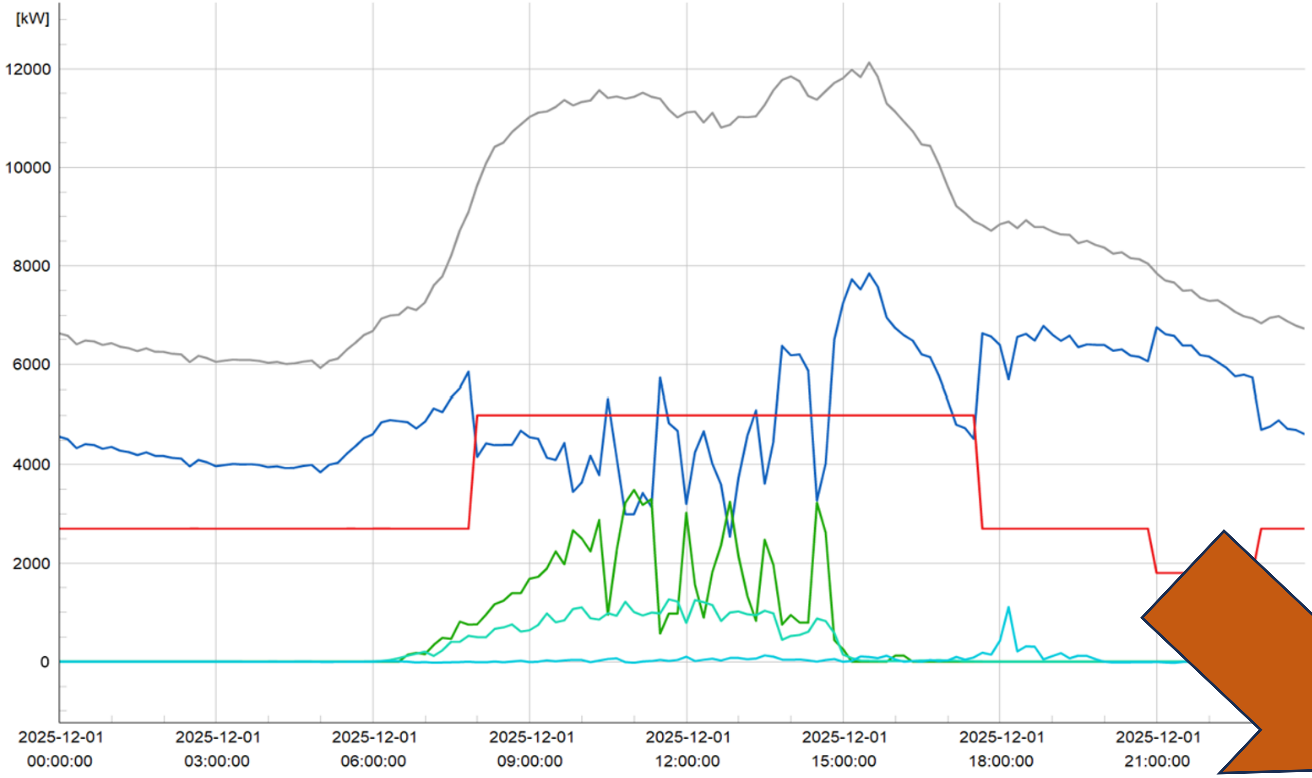
Provide recommendations on strategic reinforcements and other methods of increasing VRE penetration.

Assess the operational and stability characteristics of the existing networks

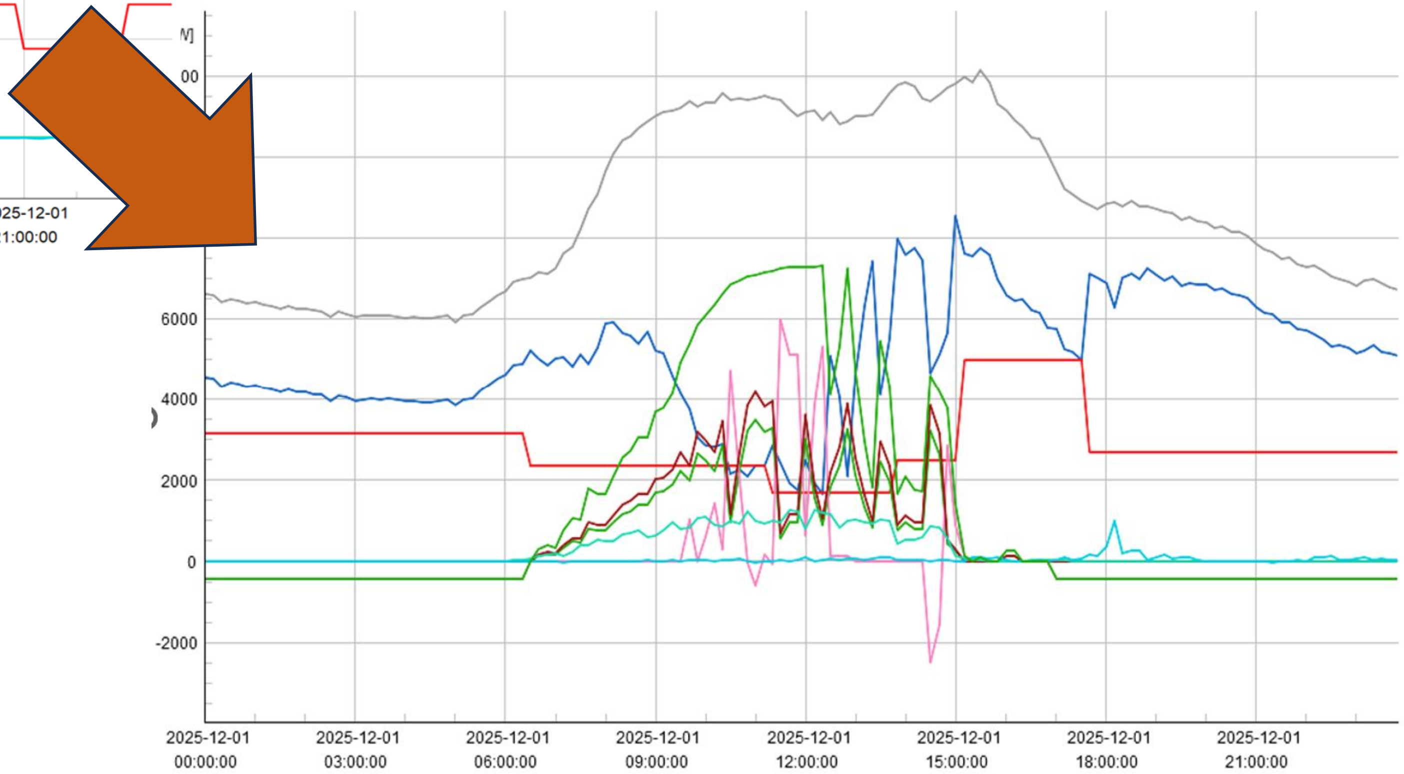
Identify operational limitations and optimal range of power generation mix between existing and new generation to prevent adverse impacts

Assess and understand the capability of each of the studied networks to accommodate more VRE

The Dispatch Challenge

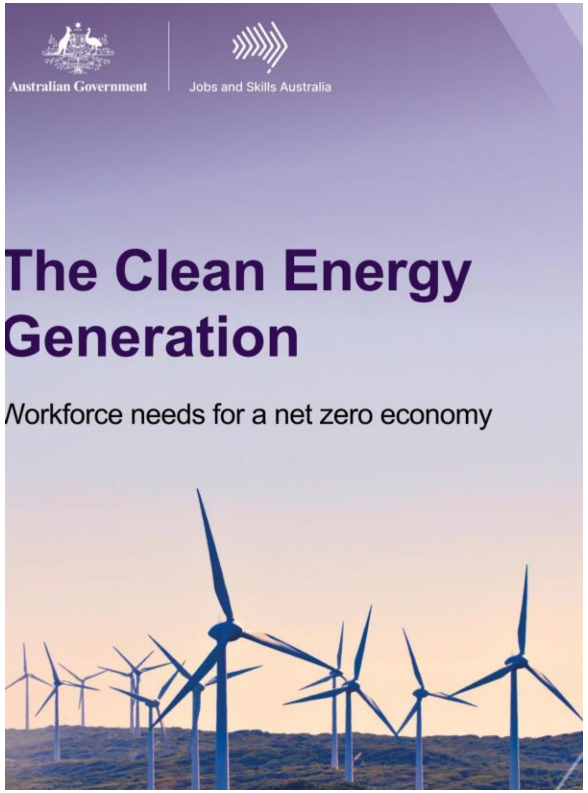


- **Role SCADA Systems**
- **Integration of VRE**
- **Distributed Energy Resources (DER)**
- **Advanced Dispatch Algorithm**



Key needs

- **While there are many occupations of the clean energy workforce, most of the critical are found within trades, technical occupations and engineering professionals, where training times and licensing and accreditation requirements impose barriers to entry.**
- **This study identified 38 occupations that are critical.**



Technicians and Trades Workers

- Architectural, Building and Surveying Technicians
- Civil Engineering Draftspersons and Technicians
- Electrical Engineering Draftspersons and Technicians
- Other Building and Engineering Technicians
- Automotive Electricians
- Motor Mechanics
- Aircraft Maintenance Engineers
- Metal Fitters and Machinists
- Structural Steel and Welding Trades Workers
- Plumbers
- Electricians
- Airconditioning and Refrigeration Mechanics
- Electrical Distribution Trades Workers
- Chemical, Gas, Petroleum and Power Generation Plant Operators
- Telecommunications Trades Workers
- Electronics Trades Workers

Managers

- Policy and Planning Managers
- Research and Development Managers
- Construction Managers
- Engineering Managers
- Production Managers

Professionals

- Marine Transport Professionals
- Architects and Landscape Architects
- Urban and Regional Planners
- Chemical and Materials Engineers
- Civil Engineering Professionals
- Electrical Engineers
- Industrial, Mechanical and Production Engineers
- Mining Engineers
- Other Engineering Professionals
- Agricultural and Forestry Scientists
- Chemists, and Food and Wine Scientists
- Environmental Scientists
- Geologists, Geophysicists and Hydrogeologists
- University Lecturers and Tutors
- Vocational Education Teachers
- Occupation and Environmental Health Professionals

Labourers

- Structural Steel Construction Workers

Capacity Development Framework

Planning Framework and Capacity Expansion Modelling Tools for Vanuatu's Energy Transition

Deliverable 3

Capacity Development Framework for RE Sector Transition

Janendra Prasad[1,2], Anna Bruce[1,2], Iain MacGill[1] Ashneel Prasad

[1] Centre for Energy and Environmental Markets, UNSW Sydney
[2] School of Photovoltaic and Renewable Energy Engineering, UNSW Sydney

The Pacific Islands region will require

- **customized approach and sufficient technical expertise**
- **effective coordination among all stakeholders**
- **adoption of appropriate tools and the identification of the most sustainable pathways**
- **implement the necessary pipeline of projects**

In order to achieve the objectives of their national energy roadmap.

TNA: Capacity Gaps
Capacity Gaps and Technical Expertise
Barriers to Knowledge Transfer
Cross-Sector Development Pathways
Migration of Skilled Workforce

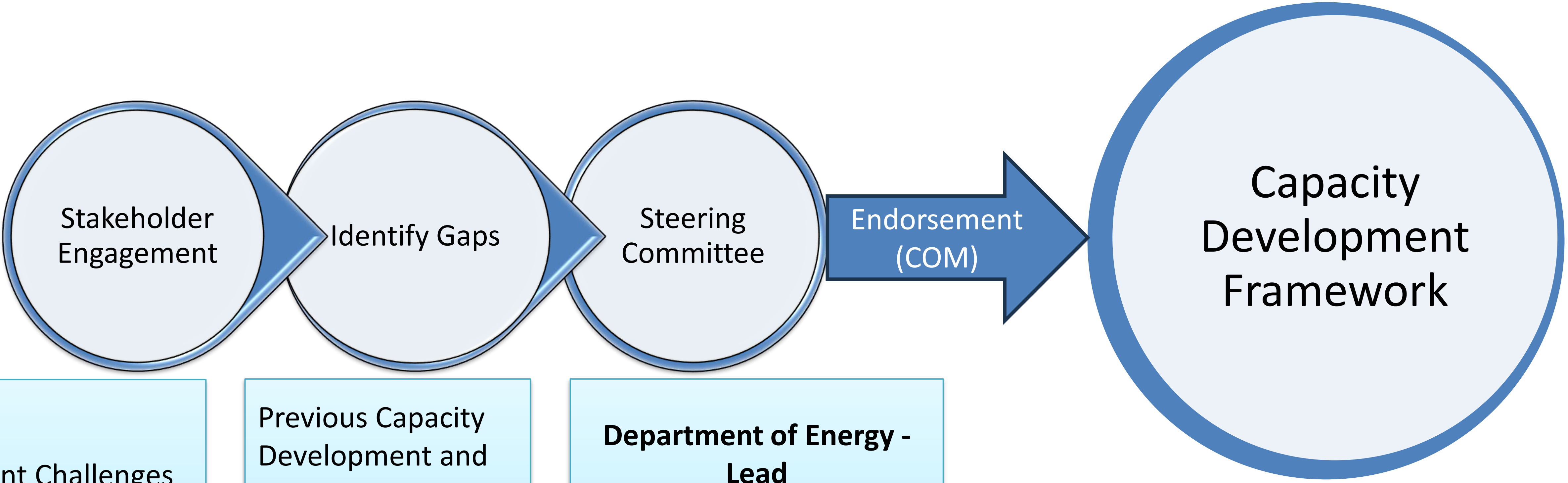
Future Training Needs

1. Diversified/Integrated Energy Mix
2. Hydropower
3. Solar PV, Rooftop PV, Agro PV
4. Wind
5. Battery Energy Storage Systems (BESS)
6. Crude Coconut Oil (CNO)
7. Electric Vehicles (EV)
8. SCADA Systems

Local Training Institutions

1. The University of the south Pacific (USP)
2. Vanuatu Qualifications Authority (VQA)
3. National University of Vanuatu (NUV)
4. Vanuatu Institute of Technology (VIT)
5. Vanuatu Regional Energy Training Institute (VRETI)
6. Tanna Renewable Energy Learning Centre

CAPACITY DEVELOPMENT FRAMEWORK



Current Challenges and barriers

Gap in the country- current and Future countries technology mix

Previous Capacity Development and Training Frameworks

Existing courses offered in the local & Regional Universities

Department of Energy - Lead
Local Institutions- VIT, NUV, USP, PVTC
Ministry of Education
Scholarship Unit, VQA
Utilities,
Chamber of Commerce,
Donor Rep

Training needs of Assessment
Industry Engagement, Workforce Planning
Competency Based Training
Monitoring and Evaluation of Market demand
Coordinated Efforts

Capacity Development Framework: Key Takeaways

Training Needs Analysis (TNA)

Workforce Planning

Competency Based Training

Assessments & Accreditations (Executive, Techno Economic Assessment, Engineering, Project Managers, Trade Level

Coordinated Efforts

Across all stakeholders, Industry Engagement

Regional role of PPA, SPC, etc. to help jurisdictions

Monitoring and Evaluation

Continuing Professional Development

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Pilot Project Outcomes to Vanuatu's NERM

Achieving Vanuatu's growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an educated, healthy, and wealthy nation.

- National Energy Road Map (2016-2030)

MANY PARTNERS, ONE TEAM, ONE PLAN

All stakeholders	working together	to achieve the <u>**vision**</u> stated in the NERM

national, regional and international stakeholders contributing to the operation, transition and future of the <u>energy sector</u>

exchange information, share data (where appropriate), coordinate activities with awareness of the wider <u>energy ecosystem</u>

better sequenced investment, productive partnerships and sustained impact led by the <u>people of Vanuatu</u>

We set clear direction on appropriate energy transition pathways

our actions

ENERGY TRANSITION and CAPACITY EXPANSION MODELLING

The NERM is not one single plan to detail the course of action over 15 years, we revisit these plans and adapt our actions to support the evolution of a modern, clean energy system

The DoE will use tools to make informed, transparent decisions that channel investment toward a common goal, signalling where priority support is needed

PRIORITY: SUPPORT FOR ADDITIONAL FEASABILITY TO REFINE OPTIONS

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our actions

We increase impact through collective action & systems thinking

FROM MODELLING TO MAPPING THE ENERGY SYSTEM

The DOE will provide guidance for development partners to better support NERM objectives and nest their activities across a broader system and enabling environment

The DoE encourages data-sharing to expedite feasibility studies, avoid duplication reduce costs, and drive progress beyond the life of any one project.

PRIORITY: DATABASE OF PROPOSED ACTIVITIES TO ASSESS IMPACT AND ALIGNMENT WITH SET DIRECTION

Thank you
Malo!

Questions?

Reach out to provide feedback

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