Collaboration on Energy and Environmental Markets

UNSW SYDNEY

Planning Frameworks and Capacity Expansion Modelling Tools for Pacific Vanuatu's National Energy Road Map (NERM 2016-2030)

25-28 SEPTEMBER, SAIPAN, NMI

Janendra Prasad Jay.prasad@unsw.edu.au

Researcher PhD Candidate

School of Photovoltaic and Renewable Energy Engineering
Faculty of Engineering, UNSW

Pacific Community
Communauté du Pacifique

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

PPA
PACIFIC POWER ASSOCIATION

USP
THE UNIVERSITY OF THE SOUTH PACIFIC

Our Experience and Expertise in Energy Transition Planning

Iain MacGill

Expertise Areas:

- Energy Sector Planning
- Renewable Energy Integration
- Policy and regulatory frameworks
- Open-source data and tools

Qualifications:

- Ph.D., Electrical Engineering (Energy Systems), UNSW Sydney
- M.Eng.Sc. (Research), Biomedical Engineering, University of Melbourne
- B.Eng. (Electrical Engineering), University of Melbourne

Position: Professor and Planning Framework Lead

Iain MacGill is a Professor in the School of Electrical Engineering and Telecommunications at UNSW Australia, and Joint Director (Engineering) for the University's Collaboration on Energy and Environmental Markets (CEEM). He is also the theme lead on techno-economic analysis and business models for the ARC Industrial Transformation Training Centre for the Global Hydrogen Economy. Iain's teaching and research interests at UNSW include electricity industry restructuring and the Australian National Electricity market, clean energy technology assessment, renewable energy integration, electrification, renewable hydrogen, and energy and climate policy. He has research collaborations with governments and industry in Australia and internationally, supported by funding from organisations including ARENA, CSIRO, RACE CRC, the Australian Research Council, CSIRO and the Australian and NSW State Governments.
CEEM itself undertakes interdisciplinary research in the monitoring, analysis and design of energy markets and associated regulatory and policy frameworks. The collaboration has formal objectives of regulatory, market and policy impact, through relevant research and stakeholder engagement including participation in government and other agency policy development processes. Iain lead's CEEM's clean energy transition theme, focused on the challenges and opportunities of net zero energy sector transition, with a focus on planning frameworks and tools.
Over the past two decades Iain has collaborated with researchers across the Asia-Pacific including East Timor, Indonesia, the Philippines, Tonga, Fiji, the Solomon Islands and PNG. This has included collaborations with the University of the South Pacific and the University of PNG.

Relevant selected project experience

Implementation of energy projects in FM and Fiji: A project funded by the Pacific Community (SPC) to support a range of energy planning challenges in FM and Fiji (**more details Janendra**, 2021-2022

Renewable energy assessments in the Pacific to support clean maritime fuels: Confidential project for an international NGO client, 2022-23

Least-cost pathways to achieve 100% electricity access in PNG from Renewable Resources, CSIRO PhD scholarship to support collaboration between UNSW and the University of PNG, 2020-2023

Sustainable energy capacity development with University of the South Pacific, UNSW Institute for Global Development (IGD) seed grant, 2018-2021

Mission Innovation Challenge – Off-grid access to electricity, funded by the Australian Renewable Energy Agency International Engagement Program, 2018-2022.

Energy Data for Smart Decision Making , Department of industry, innovation and scheince, smart cities and suburts shared grant, 2018-2020

Anna Bruce

Expertise Areas:

- Analysis and modelling of renewable and distributed energy systems
- Energy transition modelling
- Integration of renewable energy and distributed energy
- Energy access in developing countries
- Energy policy and regulation

Qualifications:

- 2008 Ph.D., Photovoltaic Engineering, UNSW Sydney
- 1997 B.Eng (Hons) (Electrical Engineering), University of NSW

Position: Associate Professor

Dr Anna Bruce is an Associate Professor in the School of Photovoltaic and Renewable Energy Engineering and Research Coordinator (Engineering) at the Collaboration on Energy and Environmental Markets at UNSW Sydney, Australia. She leads CEEM's research theme in Distributed energy systems, including 'smart grids' and 'smart' homes, distributed generation and demand-side participation. Her research focuses on modelling, analysis and integration of renewable energy and distributed energy resources into electricity industries; energy access in developing countries; and energy policy and regulation. Anna contributes to the IEA's PV Power Systems programmes and leads the APVI's Solar Mapping project.

Relevant selected project experience

Mission Innovation Challenge - Off-Grid Access to Electricity, ARENA 2018-2021 $225,000

Upgrade to the SunSPOT Tool, Department of Clinate Change, Energy, Environment and Water 2021-2023, $860,000

Energy Sustainability through Knowledge and Information Exchange and Sharing, Resilience NSW / Bushfire Community Recovery and Resilience Fund 2022-2023, $299,990

24/7 Renewables: Solutions for Matching, Tracking and Enhancing Corporate Renewables Purchasing, Race for 2030 CRC 2022-2024 $430,000

Curtailment and Network Voltage Analysis Study (CANVAS), CRC Race for 2030, 2021 $100,000

Smart Energy Asset Management Intelligence (SEAMI), National Smart Sensing Network 2022-2023 $200,000

ARC Research Hub for Integrated Energy Storage, Australian Research Council 2020-2023 $3,058,151

Curtailment and Network Voltage Analysis Study (CANVAS), CRC Race for 2030, 2021 $100,000

Energy Data Platform (EDP), ACAP Infrastructure Fund, ARENA 2022-2023

IEA PV Power Systems Technical Collaborative Programme, Increasing the uptake of solar PV through the delivery of quality research, data and information, ARENA 2019-2022 $144,000

Lease-Cost Pathways to Achieve 100% Electricity Access in Papua New Guinea from Renewable Resources, CSIRO $45,400

Integrated Smart Home Energy Management, Control and Data Visibility, CRC-P, 2018–2020 $1,082,779

Energy Data for Smart Decision Making, Smart Cities and Suburbs Program, 2018–2020 $292,000

Energy for Sustainable Livelihoods in Pacific Islands, Australian Government New Colombo Plan Mobility, 2019

Sustainable energy capacity development for the South Pacific, UNSW Institute for Global Development, 2018-2019

Our Experience and Expertise in Energy Transition Planning

Janendra Prasad

Expertise Areas:

- Strategic Planning
- Design + Operation of Electrical Grids
- Smart Grids + Network Technology Application
- Leadership + Capacity Development
- Power Generation + Control Room Operations

Qualifications & Affiliations:

- MBA Technology Management APESMA/La Trobe University
- Grad. Cert. in Electricity Supply Engineering QUT
- BE (Electrical and Electronics) University of Canterbury, NZ
- Diploma of Contract Mngt. Sydney Institute, TAFE NSW
- MIEAust, CPEng, NPER, RPEQ

Jay is a Chartered Professional Electrical Engineer with proven leadership skills and 25 years' experience leading the delivery of innovative, cost-effective and safe engineering solutions for electrical infrastructure across Australian and Pacific Island utilities. He is a trusted and respected Board-level and client-facing advisor with a high degree of professional credibility, adds value with a business partner and consultancy approach, top tier techno-commercial skills, leadership and capacity building experience. Highly networked with well-established industry contacts and ties to regional multilateral agencies. Jay is passionate about renewable energy, has a very pragmatic approach to solve real world problems, and his research interest is in integration and optimisation of high penetration of renewable energy and sustainable energy solutions.

Relevant selected project experience

Implementation of **Sustainable Energy Project** for the FSM, a project funded by the SPC to support a range of energy planning challenges including energy system and energy demand assessment, renewable energy standards for the power sector, energy performance standards for vehicles and development of training framework to upskill Renewable Energy sector personnel.

Energy Security and Resilience Pacific regional workshop with themes including **RE Integration**, **Sustainable Electric Power** Development, Off Grid Access, Low Carbon Land Transport, Energy Sector Finance, Capacity Development, Electricity Markets & Restructuring.

Facilitated Utility Board Directors workshop for **Pacific Power Association** 30th Annual Conference, Brisbane, November 2022.

Co-Author and Presentation of Paper E8 – **planning frameworks and tools to support regional net zero energy transition** at the Fifth Pacific Regional Energy And Transport Ministers Meeting (PRETMM) Port Vila, Vanuatu, 8-12 May 2023.

Manager Electrical Engineering, Solomon Power 2015-2019. **Senior leadership, technical and capacity building** role to Solomon Power, leasing team of engineers, technicians, and electricians while providing stewardship for generation electrical, transmission, substation, and distribution assets. Assumed accountability for the **network-wide SCADA strategy and roadmap development.** Provided technical expertise for **Renewable Energy development** including conversion of diesel power stations to grid connected solar hybrid schemes.

Essential Energy, Various Roles. Secondary Systems Development Manager: Managed the company's secondary system and related assets while providing expert input into **relevant asset maintenance and renewal planning**. Developed the **network technology plan and implemented strategies** for network technology implementation. Principal Engineer – Asset Performance: Provided specialized engineering services in **identification, development, design, and implementation of key strategic initiatives for the energy network**. Development Manager – Intelligent Networks: Provided **strategic research and development of plausible smart grid strategies** and the **development of concept models addressing enhancements of grid infrastructure**. Chair for Network New South Wales (NNSW) Technology Alignment Working Group. Network Operations Coordinator: Management of Port Macquarie Control room operations, provided quality leadership, management, and technical expertise in **network operational and customer response.** Responsible for all staff including Senior Network Operators, Dispatch, and Network Operations Technical Officers. Developed a comprehensive **risk-based training needs analysis (RBTA) framework to deliver a consistent and structured training program** for network operations staff. Senior Protection Engineer: **Development and implementation of business strategies plans and budgets** to ensure that protection coordination activities achieve optimum asset protection and meet ongoing operational and customer service delivery requirements.

Academic: **Parttime lecturer at University of South Pacific** teaching Bachelor of Technology (Electrical Engineering) Courses 1998-2000, Casual Academic at UNSW teaching SOLA9104 Hybrid **Renewable Energy Systems** in 2021and 2022.

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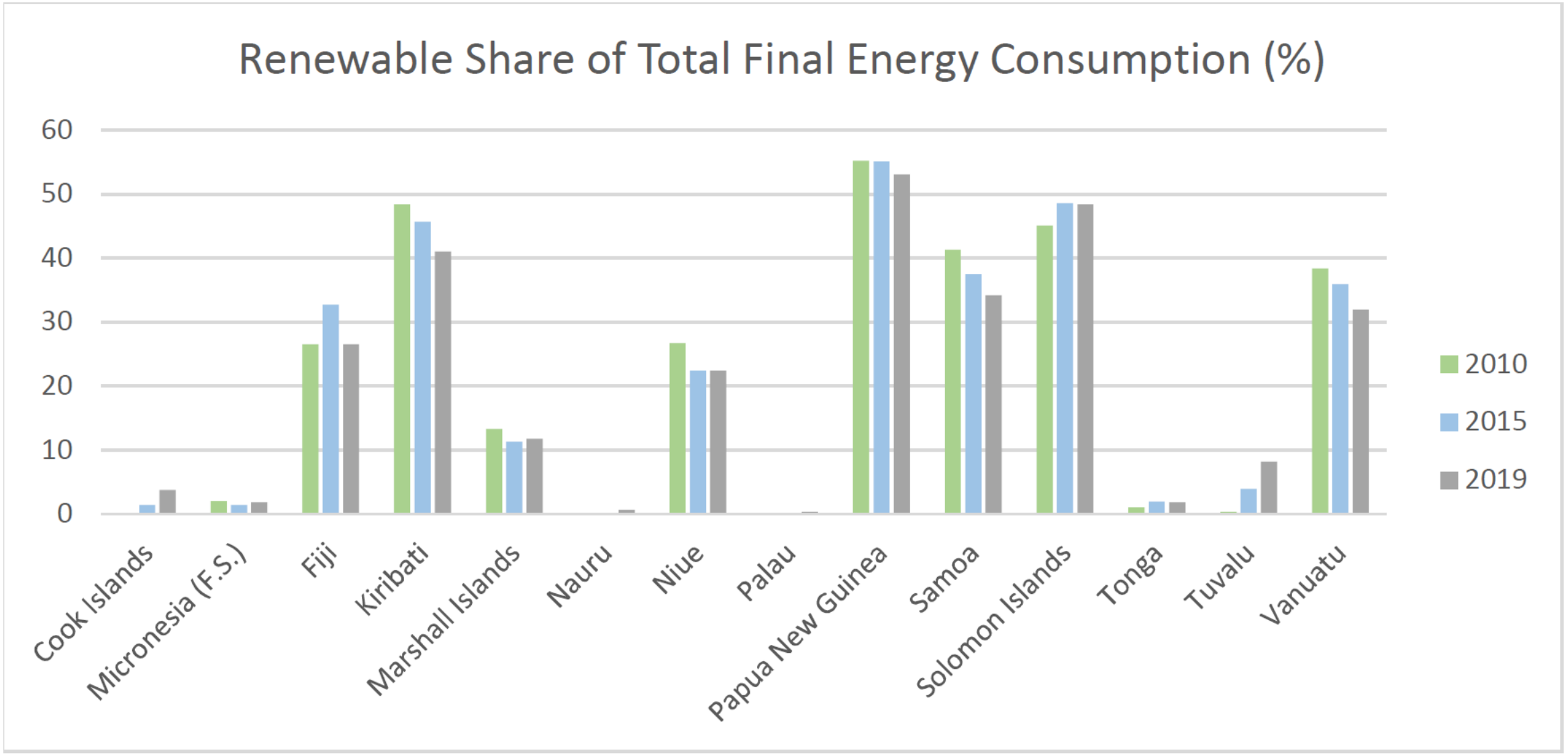
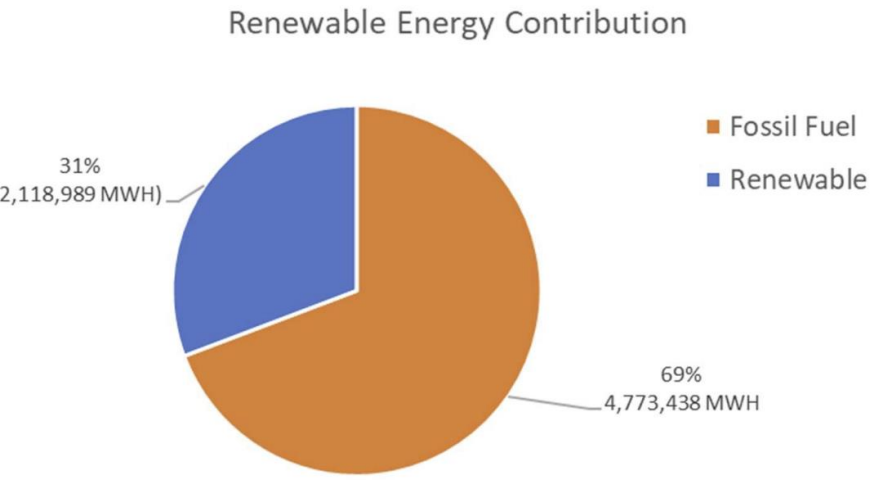
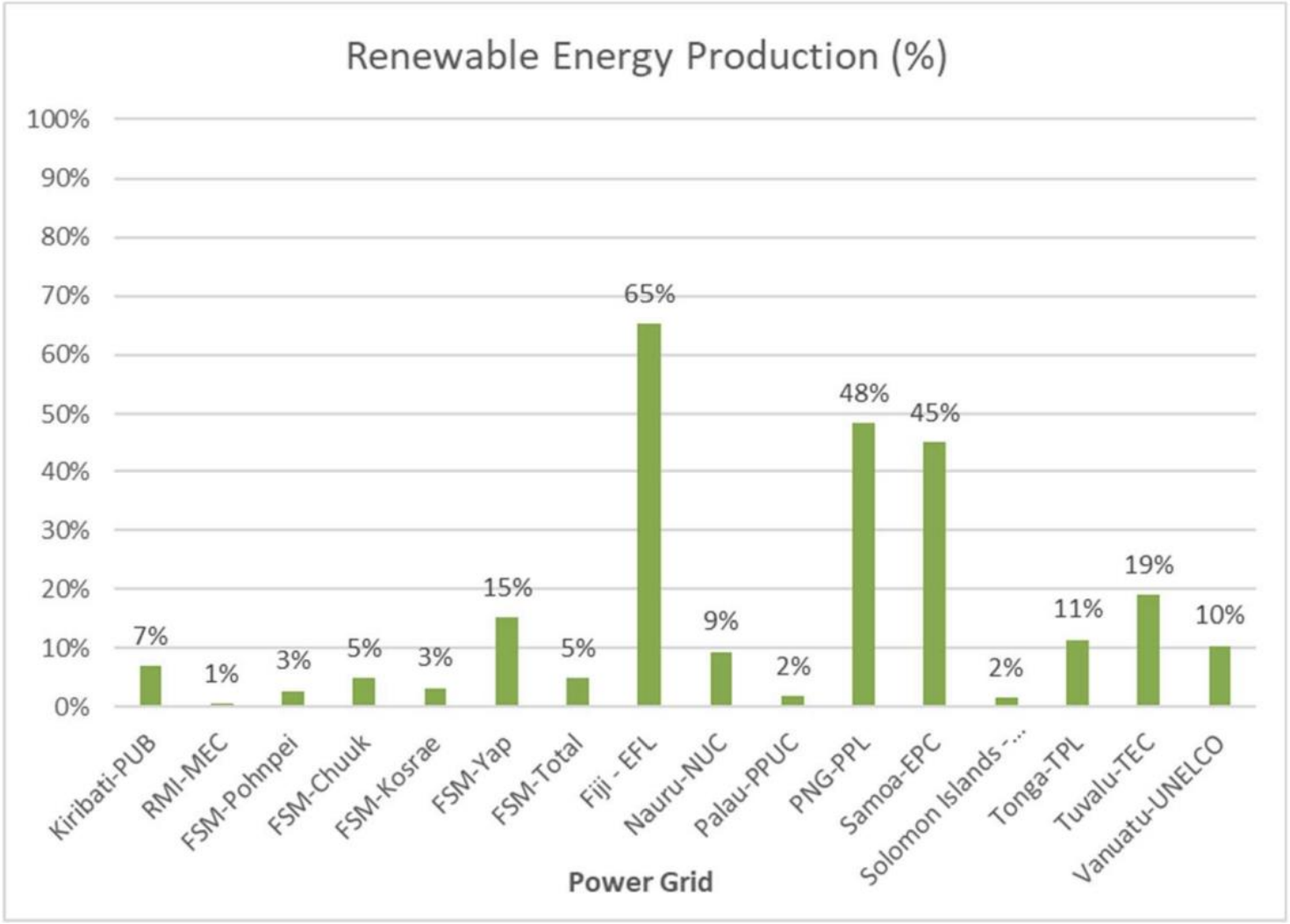
2 Renewable Energy Share of Total Energy Consumption- PICT



Source: SPC, 2023

Renewable Energy Production (%) in Pacific Region





Source: PPA Benchmarking report 2023

Vanuatu NERM 2016-2030

			NERM Baseline			2015	2020	2020	2030
			2010	2011	2012	Target	Check Sour	NERM	Target
Accessible Energy	**3.1**	Increasing electricity access in and near concession areas			59%	69%	75%	90%	100%
						62%	71%	71%	56%
	3.2	Increasing electricity access in off-grid access			<10%	55%	60%	100%	100%
						9%	61%	61%	
	3.3	Increasing electricity access by public institutions (on and		48%		90%	80%	100%	100%
						54		63	
Affordable energy	**3.4**	Increasing diesel generation efficiency	0%			10%	20%	20%	20%
						2%		5%	
	3.5	Reducing the cost of distributing petroleum products				5%	10%	10%	15%
						Insufficient	Insuffcient	Insuffcient Data	
Secure and reliable energy		Achieve a greater diversity of energy sources							
Sustainable energy	**3.6**	Generating electricity from renewable energy sources			19%	40%	65%	65%	100%
						29%		40%	

Source: NERM 2016-2030

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Energy Sector Planning Challenges for the Pacific Islands

1. Ambitious electrification, renewable energy, and emission abatement targets
2. Understanding the least-cost path to achieving these targets
3. Geographic isolation, smaller isolated communities
4. Small economies of scale, logistical challenges and high cost of business
5. Limited Technical expertise
6. High fossil fuel prices, high electricity tariffs, low energy access
7. RE resource availability, complex land ownership issues

(Maloney et al., 2020)

E8: Planning Framework and Tools to Support Regional Net Zero Energy Transition

SPC/ 2023 Energy & Transport Ministers Meeting

Agenda Item E8
Original: English

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)]

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:

- transition their electricity sectors to 100% renewables
- greatly expand their electricity sectors to power some major energy uses that currently aren't electrified such as road transport
- produce or otherwise source clean fuels for those energy uses that prove unsuited to electrification such as some domestic and international navigation and aviation.

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Progress so far-Regional Partnership

UNSW Collaboration with SPC, USP

March 2022: MoU UNSW-PPA MoU, Affiliate Membership

November 2022: 29th Annual Conference – Brisbane

- Facilitated Utility Board Members Workshop
- Presentation on Issues and Challenges with High Penetration and Integration of VRE to the Grid

May 2023: 5th Pacific Regional Energy and Transport Ministers Meeting

- Planning Frameworks and Capacity Expansion Modelling Tools for Net Zero Energy Transition for the Pacific Island Countries
- Hydrogen Strategy for the Pacific Islands
- The recommendations were unanimously adopted as resolutions in the Port Vila outcome statement

July 2023: UNSW PPA subcontract under DCCEEW project, as Regional Partner for the deployment of regional initiatives in terms of Planning Frameworks, Energy Transition Models, Capacity Expansion Models, Training Needs Assessment and Capacity Development

July 2023: Vanuatu Stakeholder Consultation

September 2023: Workshop in Fiji, Vanuatu Stakeholder Consultation

September 2023: 30th Annual Conference – Saipan

- Facilitation of Utility Board Members Workshop
- Presentation on Planning Frameworks and Modelling Tools for Net Zero Energy Transition
- Presentation to Engineers Workshop on High Penetration and Integration of Variable Renewable Energy to the Grid

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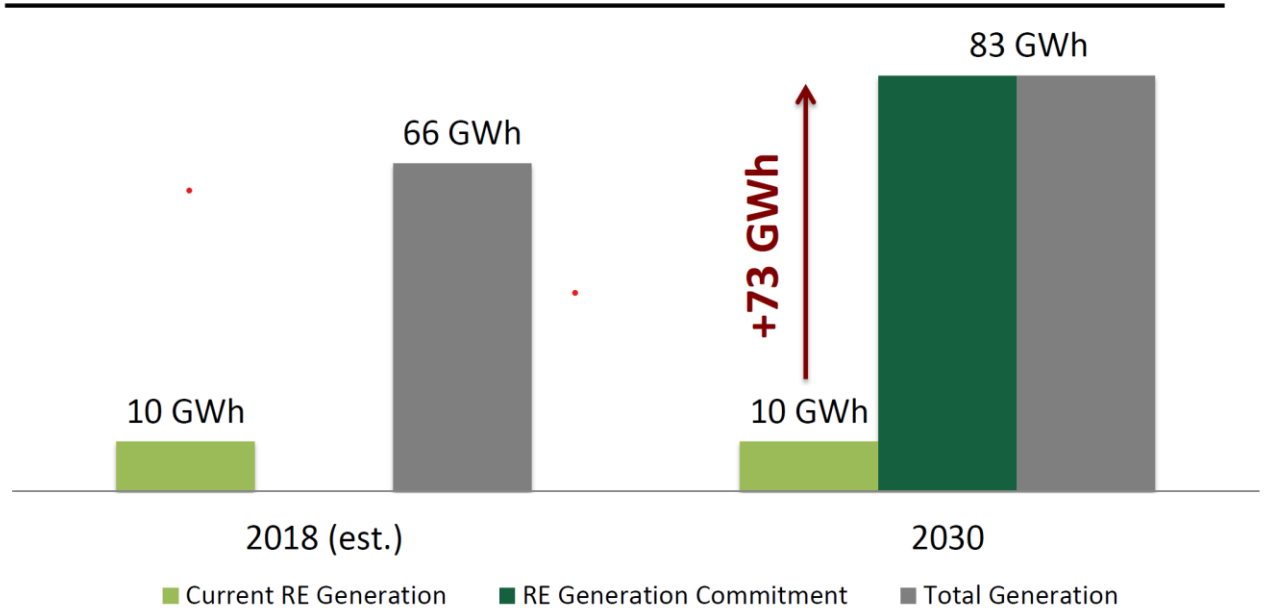
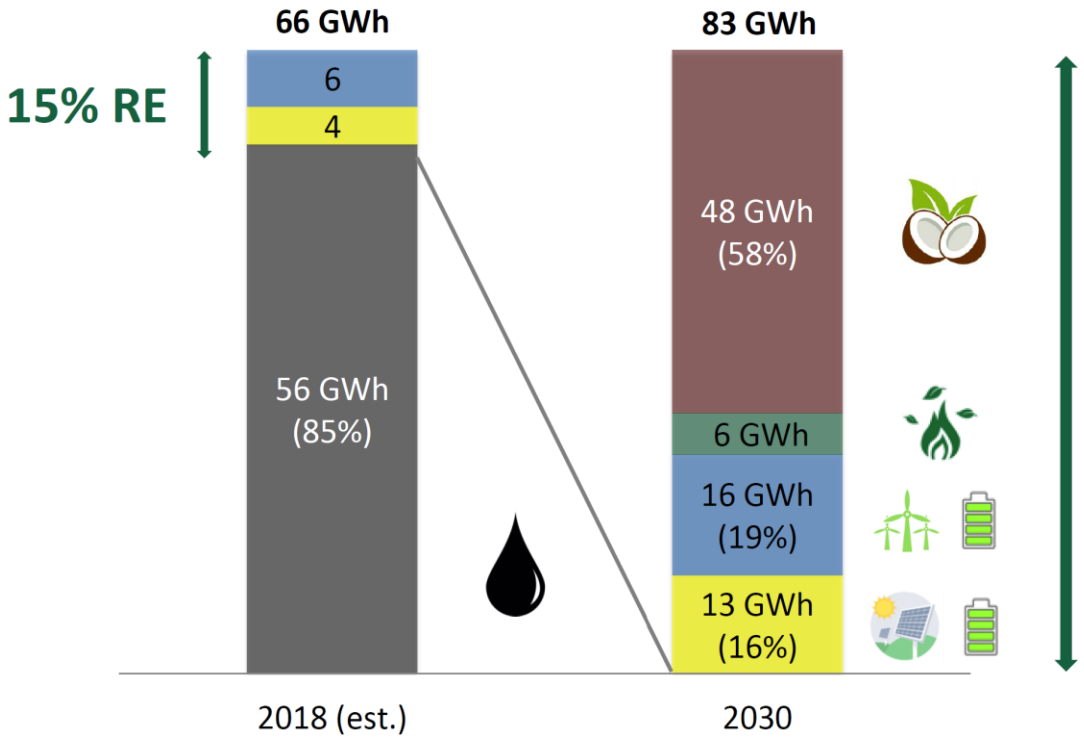
Efate 2018-2030





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

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E8: Planning Framework and Tools to Support Regional Net Zero Energy Transition

Issues

Renewable electrical energy uptake in PICT's has been low to date for many jurisdictions despite considerable investments and efforts

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.

Much of present planning work undertaken by consultants presenting barriers to knowledge transfer and local capacity development.

Electricity sector planning efforts by PICTs utilities and governments have not given detailed consideration to the implications of widespread electrification on cross-sector development pathways.

Understanding and planning across electricity, transport and other energy using economic sectors presents new challenges and **requires new approaches to long-term planning in terms of data, tools and overall frameworks.**

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E8: Planning Framework and Tools to Support Regional Net Zero Energy Transition

SPC/ 2023 Energy & Transport Ministers Meeting

Agenda Item E8
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PACIFIC COMMUNITY

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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)]

- Most of planning work currently undertaken by consultants presenting barriers to knowledge transfer and local capacity development.
- 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.

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

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.

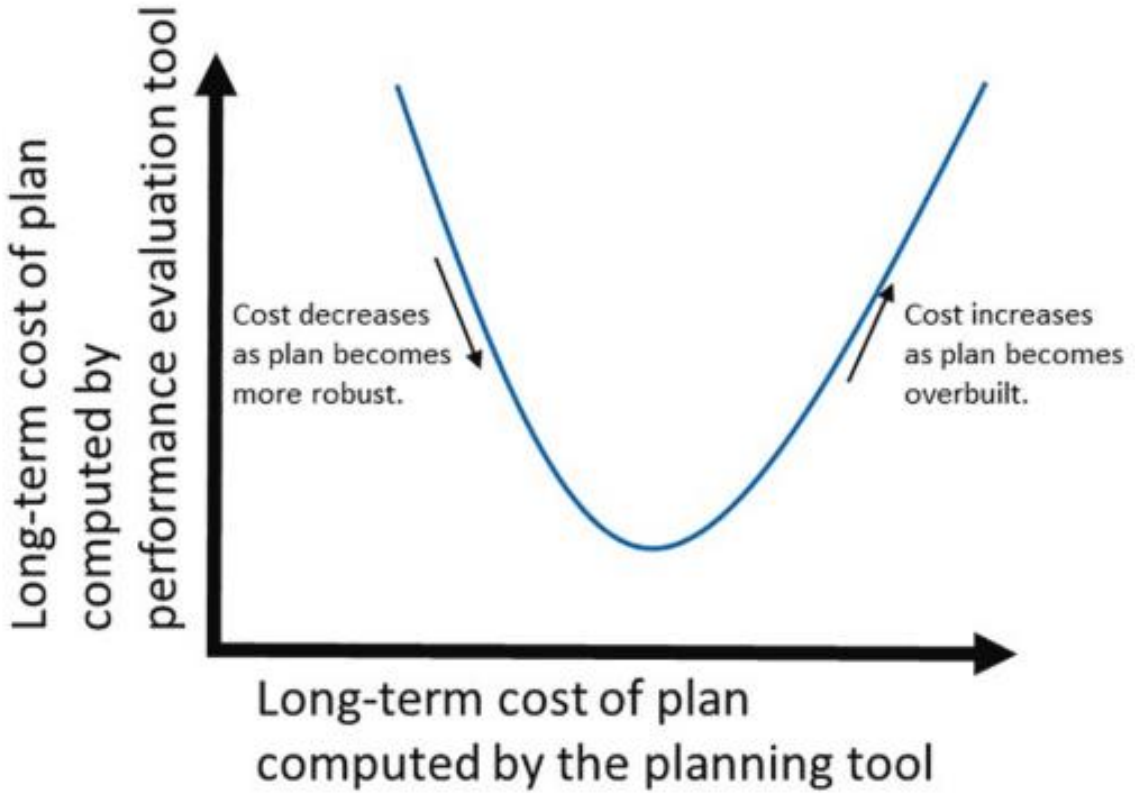
Current Approaches to Energy Planning in the Pacific Islands

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

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



Energy Modelling Principles

Energy Supply Chain

Resources → **Conversion** → **Delivery** → **Consumption**

Accurately represent future scenarios

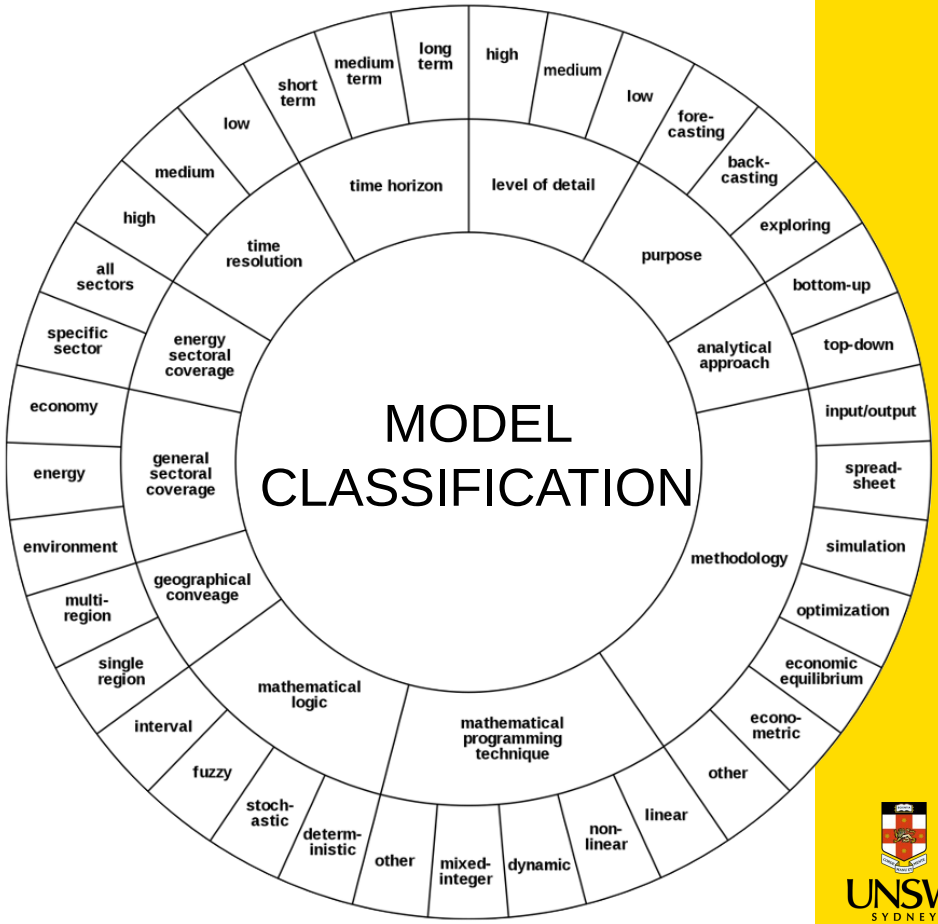
Provide flexible options to forecast demand and the uptake of specific technologies

Assist with energy planning & policy making

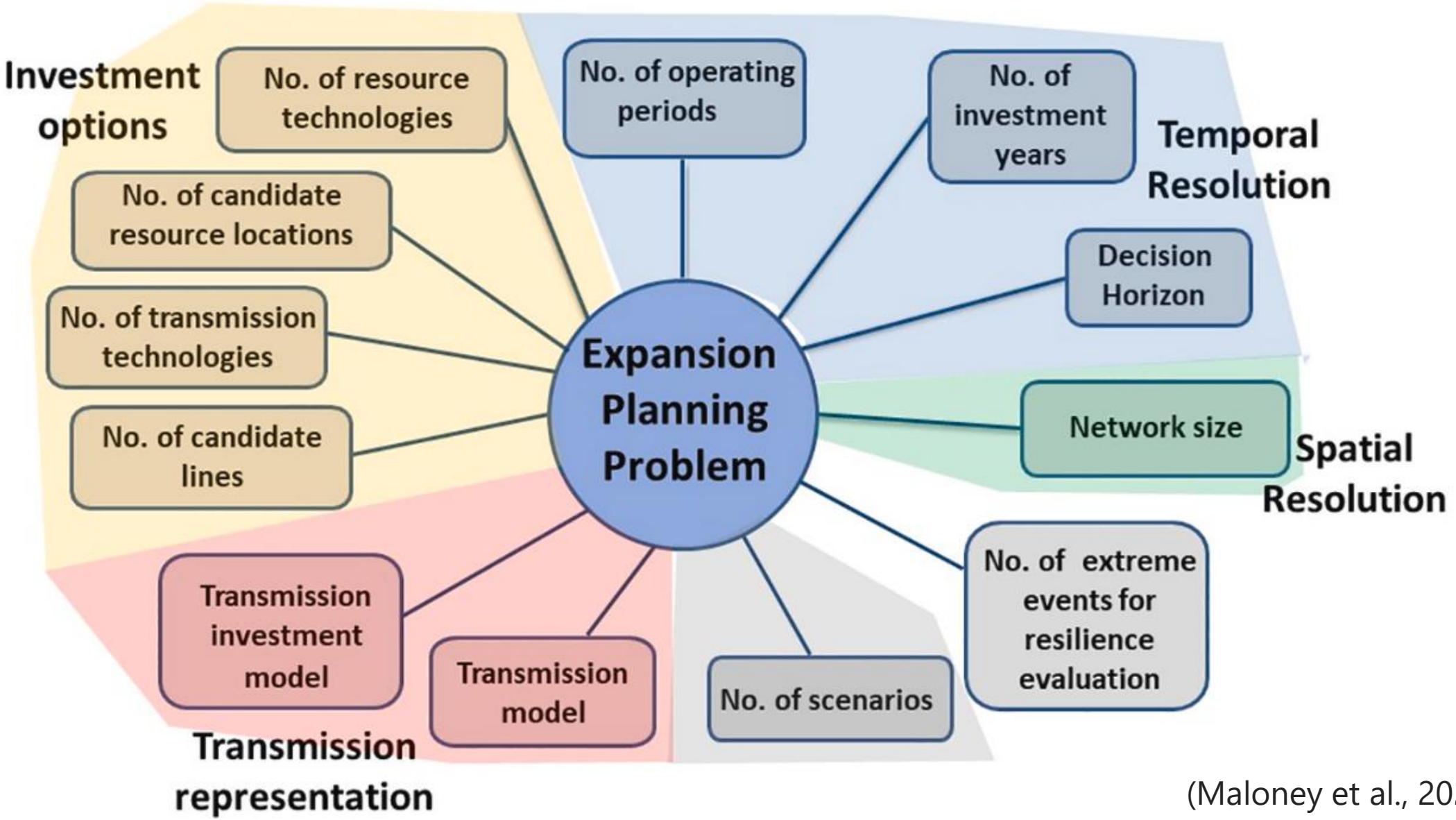
Assess the outcomes of specific technologies and trends to make better decisions regarding capacity and policy mechanisms

Track progress against strategic targets

Determine how likely an energy system is to meet current targets relating to specific technologies and emissions



3 Capacity Expansion Planning Problem



(Maloney et al., 2020)

Investment Decision Criteria

When you have various RE sources, there are so many different combinations possible. So how do you determine which combination will give you?

Q1	Lowest Levelised Cost of Electricity (LCOE)
Q2	Best technical performance (in terms of stability, reliability of power system)?
Q3	Least impact on the climate/environment, climate friendly?
Q4	For which of these systems, does your country/utility have the capacity/technical expertise to plan/design/install/operate/maintain?
Q5	The Best System that is capable to meet your current need and future needs?

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Capacity Planning Tools- Categories

Pre-feasibility: Rough sizing, comprehensive financial analysis, e.g. RETScreen

Sizing: Determination of optimal size of each component of the system and provide detailed information about energy flows among various components, e.g. Homer

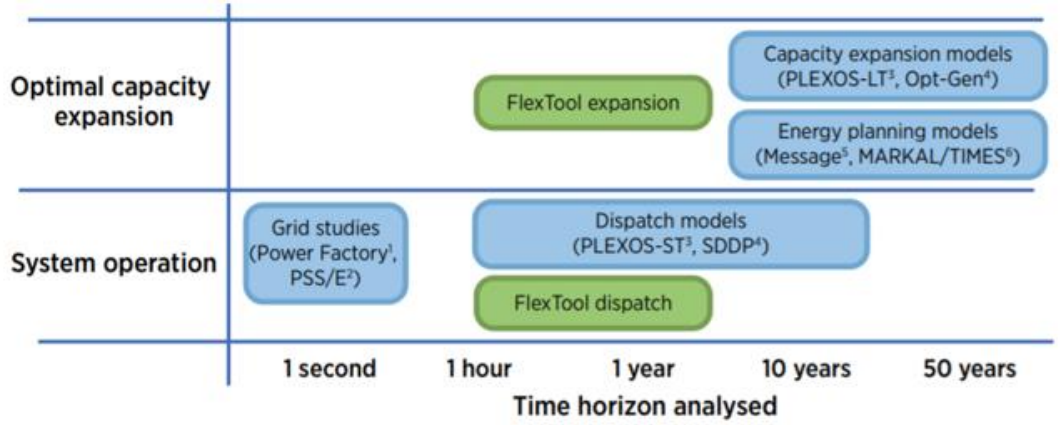
Simulation: Specific details of each component, Grid Studies, e.g. Dig SILENT Power factory, PSSE

Open Architecture Research tools

(Turcotte & Ross, 2001)

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	



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)

6.4 Available Tools in the Market

OSeMOSYS
Open Source Energy Modelling System

IRENA FlexTool

ENERGY TRANSITION MODEL
Independent, Comprehensive and Fact-based

openCEM

HOMER Energy by UL

WASP
Wien Automatic System Planning Package

LACK OF INTEGRATION WITH PICT ENERGY SYSTEMS

- Lack of energy data for the Pacific
- Modelling options may not reflect specific needs and energy challenges of the Pacific Island

USER ACCESSIBILITY & OPERABILITY ISSUES

- Unstructured and complicated user inputs for particular assessments
- Requires specific training to operate software
- Lack of adaptable dashboards

SPECIFICITY

- Selective outputs limit applicability of tool

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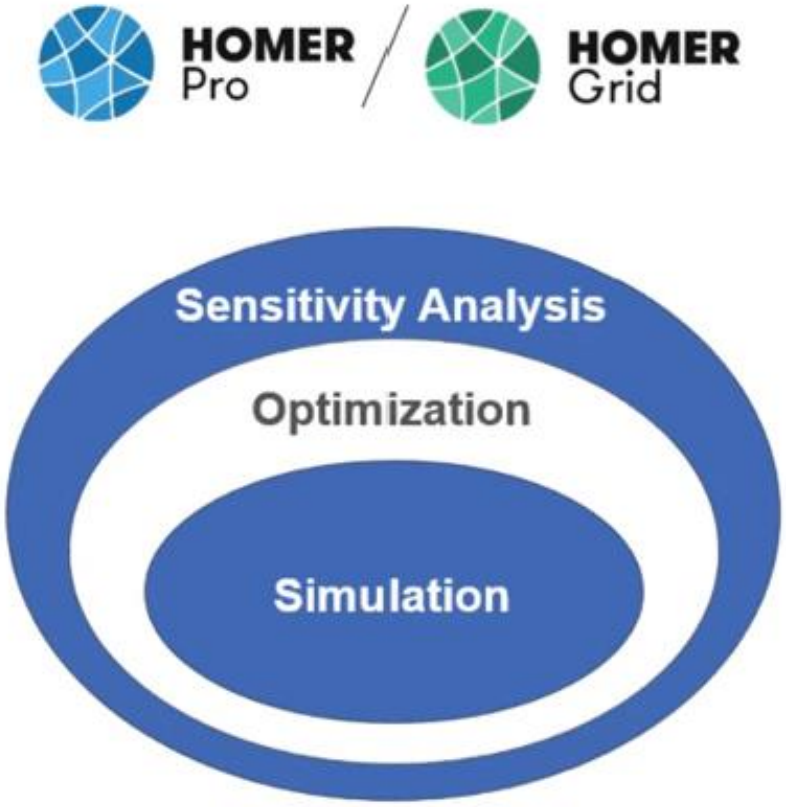
HOMER Pro and HOMER Grid

Projects Inputs

- Economics
- Load Profile
- Site Specific Renewable Resources
- System Components



Outputs

- Economics & Engineering
- System Sizing
- Performance Details
- Financials
- Graphs and Reports

PLEXOS

PLEXOS is a unified energy optimization platform.

Powerful simulation engine analyzes zonal and nodal energy models ranging from long-term investment planning to medium-term operational planning and down to short-term, hourly, and intra-hourly market simulations.

PLEXOS is a powerful simulation engine that provides analytics and decision-support to modelers, generators, and market analysts.

PLEXOS offers both flexible and precise simulations across several markets—electric, water, gas and renewable energy.

Strengths

- Run real-world studies for greater accuracy
- Analyze hundreds of scenarios for richer insights
- Co-optimize electricity, water and gas systems
- Simulate competitive behaviors
- Calibrate your simulations to maximize accuracy versus speed
- Demonstrate auditable results
- Complete control of constraints in your modeling

Commercially Available | Cost Prohibitive for the Smaller Utilities | Regional Approach May work

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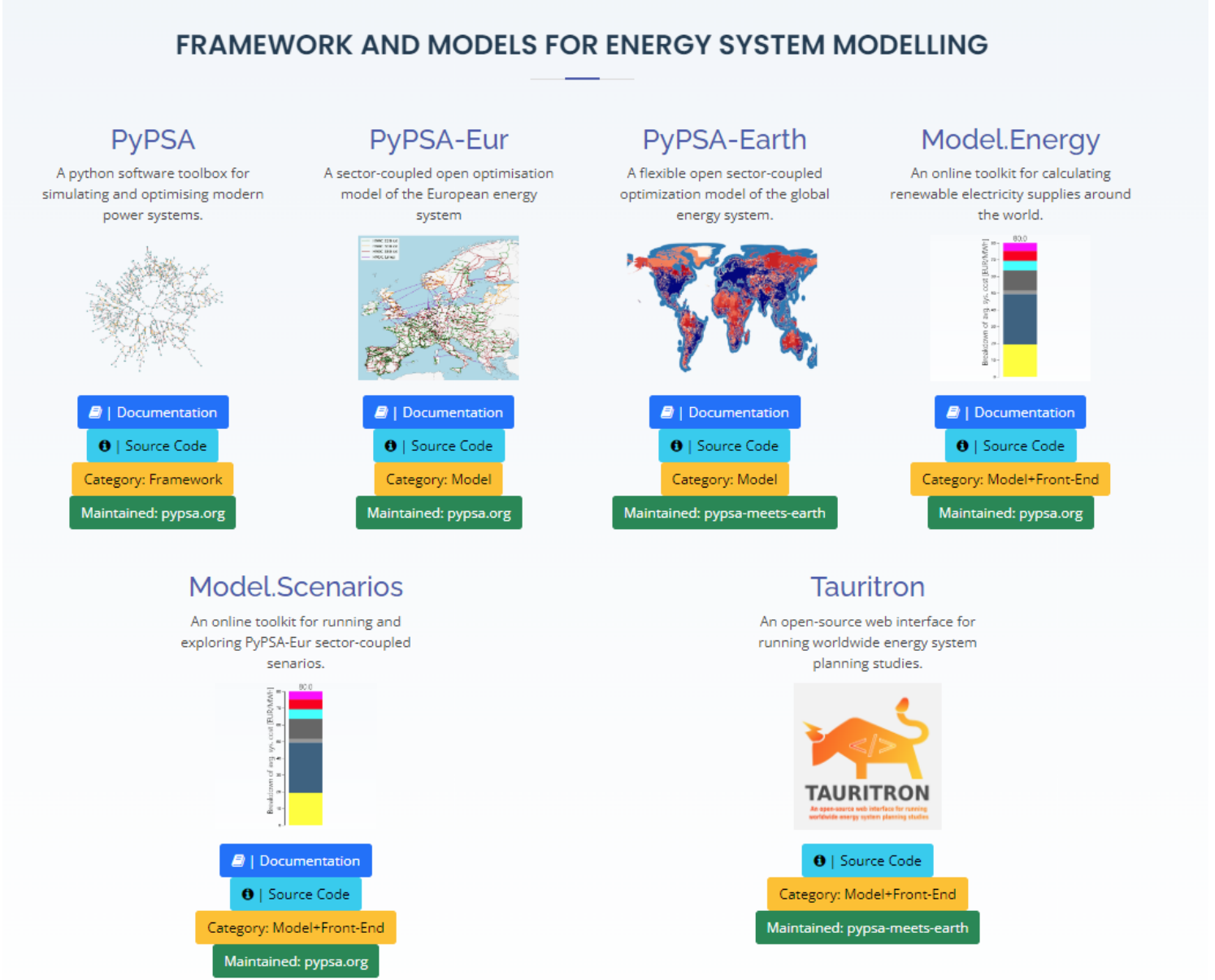
PyPSA

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



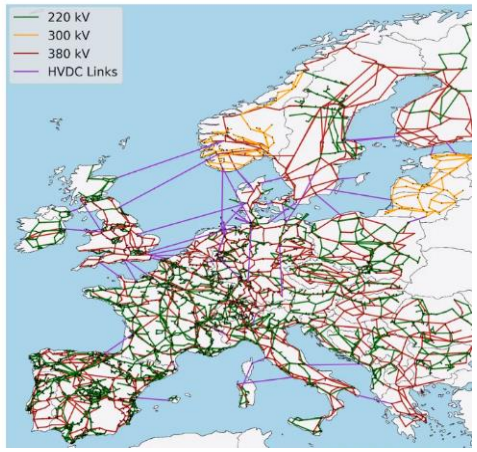
PyPSA

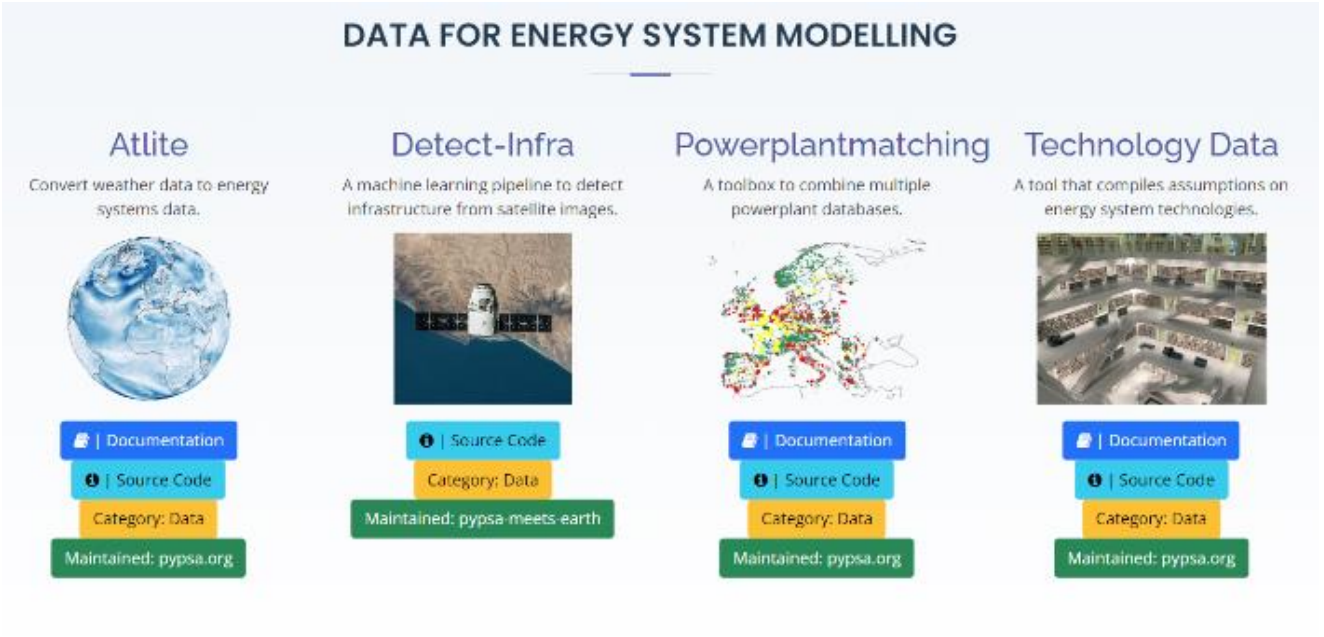
European network with

- 5,000 buses
- 9,600 (aggregated) generators
- 6,000 AC lines (>220 kV)
- 60 HVDC links

Each node has

- a load time series,
- an availability time series and potential for each carrier (solar, onshore / offshore wind),
- hydrogen storage and batteries.





Modelling framework with high degree of flexibility and customization options.

Enables advanced mathematical modelling and simulation of power generation, transmission, and storage systems.

Offers flexibility in defining and customizing power system components.

Continuous improvement, upgrades and new developments, such as PyPSA Earth.

Active and growing Community of Users.

Free technical support and resources available, training and tutorial videos on the development and use of the PyPSA tool

Prepare the PyPSA Network

Simplify the PyPSA Network

Solve the Optimisation Problem

Summarise the Results

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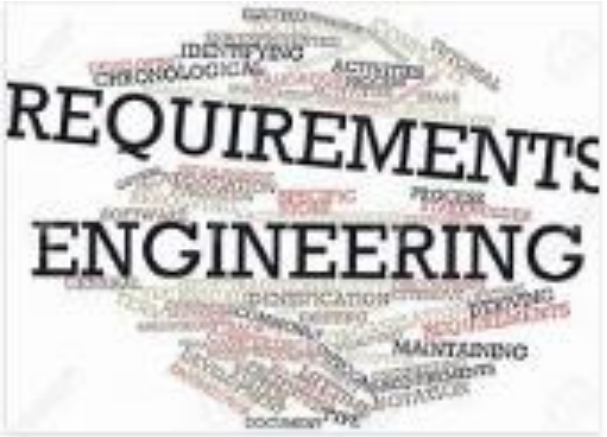
Energy Planning Framework for Vanuatu and the Pacific



An Energy Transition Planning Framework specifically tailored for Pacific Island Countries, to include

- Region and country specific yearly cost projections for a diverse range of generation and storage technologies
- Include country specific geographic distribution of energy demand
- Explore the implications of changes in policy (including EV, Maritime policy etc)
- Encompasses suite of tools for Capacity Expansion Modelling, Technoeconomic Assessment, Cross Sector Integration etc
- Credible data for system performance and economic modelling, online database including country specific demand forecasts, resource traces, technology costs, and fuel costs.
- Scenario simulations and sensitivities for major projects, policy and emissions trajectories
- Assist in transition from fossil fuels to diversified RE sources and cross sector energy transition

Energy Planning Framework

that delivers tangible outcomes

Discussion Points- Details

Targets

- What are the current targets for your utility?
- Do you think the goals are achievable?
- If not, what are barriers to achieving the targets?

Planning

- What is the current planning process at your utility?
- Is the planning process adequate to achieve the targets?
- What improvements do you suggest?

Capacity

- Does your utility have adequate capacity for planning needs?
- Have you identified the Gaps in Capacity? Where do you need most efforts?

Decision Making

- Do you have all the information you need for decision making?
- What additional information would you like?

Possible insights for the region on energy planning

We need planning, not plans

- with all that means for funding programs not just projects, and building regional capacity for ongoing planning
- Regional models but jurisdictional solutions – best practice models

Where we are now?

- Information for situational awareness – widest set of stakeholders, vulnerabilities and capabilities. This has to be ongoing
- Current trajectories – no facts about the future but better and worse processes for exploring it in a useful way, growing range of tools for risk assessments, scenario analysis

Where do want to go? Vision and goals

- Energy access remains the key objective for many PICTs
- Goals on how you do it (principles) as well as outcomes – *community oriented following subsidiarity (go as local as you can while consistent with resolution*
- Integration with water, health, telecommunications and other key infrastructure goals

How do we get there?

- Inclusive planning processes – whole of government and beyond, private sector, community – integrated with other key infrastructure, emergency response planning
- Integrated across supply and demand, grid vs mini-grid vs stand-alone solutions
- Appropriate autonomy and accountability for decision makers
- Strategy to initiatives to programs to projects
- Ongoing review processes – for situation, goals and principles, actions

Work Stream 1 Scope:

- 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 and pre-feasibility assessments
- Undertake Training Needs Assessment and develop training framework(s) that outline technical competencies required to deliver Renewable Energy implementation plans
- Deliver regional workshop(s) to share learnings and develop outline for a regional roll out
- Undertake surveys and semi-structured interviews with other Pacific Island Countries and Territories, where possible, to inform potential regional roll out.
- Presentation materials for COP28 and AusIREC

Scoping study and desktop review of existing national plans

Carrying out country specific desktop assessment of the energy sector followed by field visits to both countries Vanuatu

Desktop Review will include review previous planning reports such as National Energy Policy, National Energy Road map, Renewable Implementation Plan, Existing Planning Framework, Grid Code and Grid Integration Studies (if any), Assess RE resource capacity/constraints, PPA and Concessional Agreements, Pipeline of current and future projects, etc. Prepare workshop agenda and outline project methodology.

The field work will include country visits, site visits to the utilities and major electrical infrastructure, data collection and validation of previous reports.

Deliverables:

- Statement of Requirements (SoR) for Vanuatu
- Project Approach and Methodology Document
- Workshop with in-country energy sector stakeholders

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Analysis of barriers to renewable energy integration though stakeholder engagement and consultation in-country

This task will commence with Stakeholder engagement workshop attended by relevant Energy Sector Stakeholders (including but not limited to Department of Climate Change, Department of Energy, Regulators, Utilities Personnel, Development Partners, Implementing Agencies,)

Assessment of enabling policies, regulations and gaps

Assessment of financing mechanisms

An assessment and stocktake of previous projects assessment and achievement of objectives

Design survey methodology (for online survey and semi- structured interview questionnaires) and undertake semi-structured interviews with stake holders.

Analysis of barriers to renewable energy uptake and integration

Deliverables:

- Situational Analysis Report for Renewable Energy Sector for Vanuatu

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Develop context-specific energy transition models

This task will undertake preliminary development of country specific Energy Transition Models mapping energy resources incorporating solar, wind, hydro potential, geothermal, biomass and biofuel resources to sectoral energy uses

Deployment of context specific preliminary Capacity Expansion Models including technology assessments for existing and potential renewable energy sources, capital and ongoing costs, grid augmentation works and system operation and maintenance costs which provides users flexibility to run scenario modelling for decision support.

Run various scenarios modelling and least LCOE and Optimisation models and correlate with National Energy Policies and Roadmaps.

Hold end-user knowledge sharing workshops.

Deliverables:

- Preliminary Country Specific Energy Transition Model (ETM)
- Preliminary Country Specific Capacity Expansion Models (CEM)
- End-User Workshops

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Where necessary, undertake grid integration studies and pre-feasibility assessments

Assess Grid Code requirements and suitability of current arrangements

Undertake Grid Integration Studies for the major grids in the country (if required)

Determination and review of potential grid connection points according to the grid code

Design and dimensioning of internal topologies of RE Sources, Determination of requirement for generation plants

Assessment of Grid Infrastructure upgrades, Network stabilisation with RE, Communication and SCADA requirements for future integrated grid.

Outline RE Implementation Plans in alignment with NERM and policy objectives

Deliverables:

- Grid Code Insights
- Grid Integration Studies

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Undertake Training Needs Assessment and develop training framework(s) that outline technical competencies required to deliver Renewable Energy implementation plans

Engage with in-country Education Sector/Tertiary Training Institutes and Energy Representatives

Undertake Training Needs Assessment to identify current gaps in the technical capacity requirements

Develop training framework(s) concept that outlines technical competencies required to deliver renewable energy sector implementation plans.

Deliverables:

- Training Needs Assessments for Renewable Energy Sector
- Renewable Sector Training Framework

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Presentation materials

- Prepare and provide presentation materials for COP 28 and Australia International Renewable Energy Conference (AusIREC) based on knowledge, analysis, models and contents developed as part of this project.

Deliverables:
- Presentation materials for COP 28
- Presentation materials for AusIREC

Deliver regional workshop(s) to share learnings and develop outline for a regional roll out

Propose to establish a **Steering Committee/Working Group with UNSW/DCCEEW/SPC/USP/PPA/PCREE** to ensure the project objectives align with the 5th PRETMM Ministerial Resolution for Paper E8, viz: "… *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 …* "

Engage with all key regional stakeholders and **deliver a regional workshop** based-on Vanuatu and Solomon Island Case Studies, including agenda items: knowledge sharing, planning frameworks, energy transition and capacity expansion modelling, grid integration studies, incorporating modelling outputs in national energy plan, training needs analysis and training framework outline capacity development.

Compiling key findings and develop Planning Framework

Deliverables:

- Terms of Reference (ToR) for Steering Committee/Working Group
- Regional Knowledge Sharing Workshop
- Planning Framework and Outline Strategy for Region Wide Deployment

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Regional Capacity Building in Energy Transition Planning

Ashneel Deo

Position: Engineer/Project Officer

Expertise Areas:

- Renewable and Sustainable Energy Solutions
- Feasibility Studies
- Project Management
- Advanced software skills
- Teamwork and problem solving

Qualifications:

- M.Sc. (Renewable Energy), Candidate
- Diploma in Project Management
- BE Mechanical Engineering
- Diploma in Mechanical Plant Engineering

Ashneel is a highly skilled technical officer with a background in Mechanical Engineering and a strong passion for Renewable Energy and sustainability. Currently, he is pursuing a Master of Science in Renewable Energy Management, complementing his qualifications, which include a Diploma in Project Management, a Bachelor of Engineering in Mechanical, and a diploma in Mechanical and Plant Engineering.

Ashneel's professional experience includes working at the University of the South Pacific in the Engineering Department, Flour mills of Fiji and Coco-cola Amatil Fiji Limited where he was involved in various aspects of engineering, particularly in the field of Renewable Energy. He has successfully conducted numerous feasibility studies for renewable energy projects and possess proficiency in using software tools such as AutoCAD, SolidWorks, R, Rtscreen, and PVsystm to analyze, design, and optimize renewable energy systems.

In addition to his practical experience, he has also contributed to the field by publishing journal articles and conference papers related to renewable energy in the Pacific region. Ashneel's strengths include effective teamwork, the ability to perform under pressure, strong leadership skills, and exceptional analytical and problem-solving abilities.

Relevant selected project experience

A

Position: Senior Project Officer Vanuatu

Expertise Areas:

- **Sustainable Energy Solutions**
- **Energy Planning and Stakeholder Engagement**
- **Project Management**

Qualifications & Affiliations:

- **BE Electrical and Electronic Engineering**

Andrea is a recent graduate in Electrical and Electronic Engineering. She possesses a solid foundation in sustainable energy and a strong commitment to fostering diversity within the engineering industry.

Andrea's Journey into the realm of electrical engineering has been defined by active participation in impactful projects under the Department of Energy in Vanuatu. As an Administrative Assistant for the Assistant for the World Bank-funded Vanuatu Rural Electrification Project (VREP II), she ensured solar product compliance with environmental regulations by liaising with vendors and validating product details with customers, contributing to rural electrification.

In her capacity as an Electrical engineer for the Barrier Removal for Achieving the National Energy Road Map Target of Vanuatu (BRANTV) Project, she conducted hydro feasibility studies across multiple sites and acquired solar project quotations, supporting Vanuatu's energy goals.

Currently, she works as a Senior Project Officer for the Planning Framework and Capacity Expansion Modeling Project for Vanuatu, and her responsibilities encompass close collaboration with project managers, gathering data on energy projects, consulting with utilities, and facilitating progress meetings.

These early career experiences have solidified her profound passion for energy engineering and her dedication to advancing sustainable energy solutions and contributing to the energy sector's growth while actively supporting Vanuatu's sustainable energy goals.

As a woman in engineering, she is committed to driving innovation, challenging stereotypes, and paving the way for a more inclusive future in the engineering sector.

Vacant

Position: Senior Project Officer Solomon Islands

Expertise Areas:

Qualifications & Affiliations:

UNSW SYDNEY