Hydropower Projects

Opportunities to Meet PNG's Energy Demand

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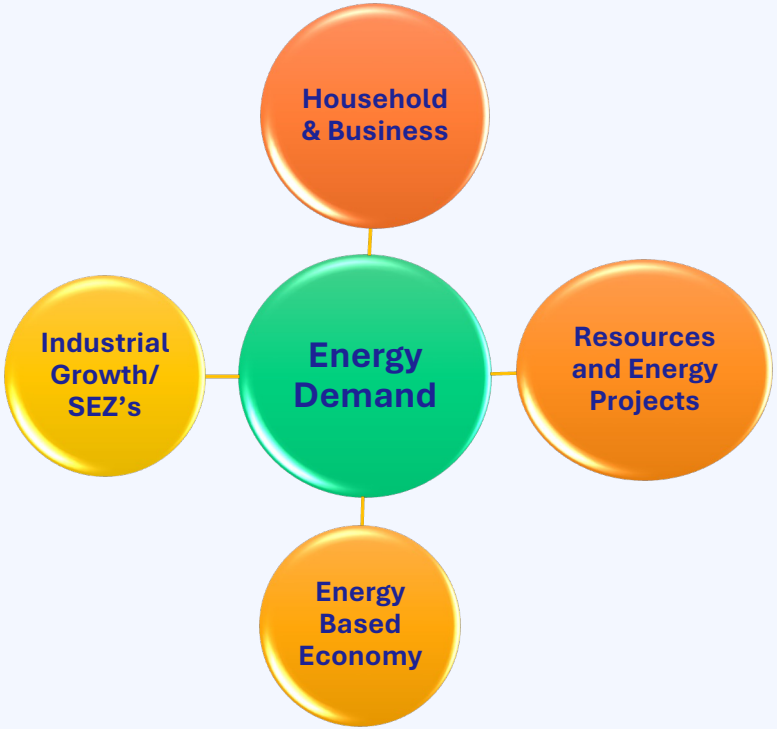
Acknowledgement

- PNG Power Limited
- PNG Forest Products
- PNG Hydro Development Ltd. (Edevu HPP)
- Finschhafen DDA
- AG Energy Limited

SMEC

- One of the leading global engineering consulting firms in Infrastructure + Energy Sector
- Globally ranks among top 5 Consulting Firms in Hydropower Sector
- Strong presence in PNG since 1976
- Has been involved in almost all hydro project studies (at different levels) in PNG

Energy Demand



Current

- Reliable, **clean** and **cheaper energy** for household, **business** and **industries**
- Resources and energy projects that are ready to kick off and starting extensions
- Energy **transition**

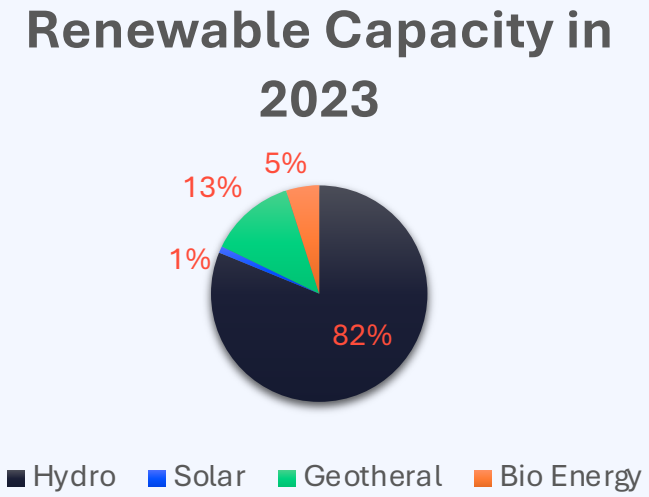
Future

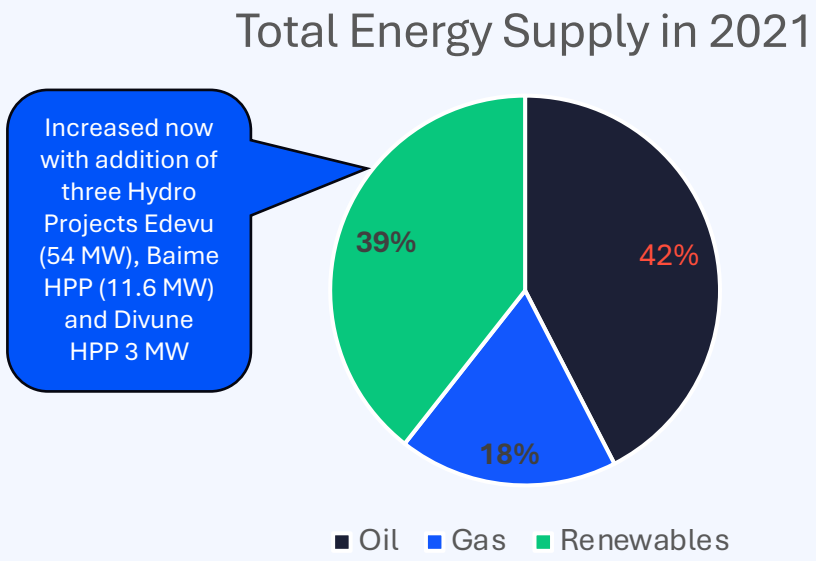
- **From 12.5 % to 70%** electrification
- Mining and energy projects in pipeline and other potential projects
- SEZ's and Industries
- Electric Vehicles
- Export Oriented Hydrogen Generation

Are We Ready with Plans?

- How to meet?
- Plan for Renewable Energy?
- **Can PNG do it with Hydro projects ?**
- Policies, incentives and funding model? **model?**

PNG's Electricity Generation-Status





Source: IRENA [Papua New Guinea_Oceania_RE_SP.pdf]

Why Hydropower?

Lower Baiune 3.5 MW in PNG has been running since 1935 (with a small break between 1942 and 1947).

Hey PNG,

You don't need to think twice to develop more hydro projects. Look at me, I am serving for almost **90** years now.

I am getting old now. I need more offspring now. PNG needs electrified by clean green hydros like me. It's time to increase hydro by many folds.

Ramu 1 (75 MW) commissioned in 1976

Approx. 250 MW out of 330 MW hydro projects were built in the 90's. Let's explore the benefit they provided to make a decision to bring more hydros for future generations.

MTDP IV Targets 700 MW Hydropower by 2027

Why Hydropower?

What if there were no hydro projects operating in PNG?

- If no hydropower plants were built in 1990s and we were to supply the same amount of energy from diesel plant – annual spending of approx. PGK 1.3-1.5 billion
- Or annual spending of PGK 2-2.5 billion if there were no new hydro projects added after 2010 in addition to the existing old hydros
- This equates to **almost 10% of PNG's budget**
- **0.75 – 1 million metric ton of additional CO_2 emissions per year.**

Let's look for 2050 and be prepared for Sustainable Hydro Energy

Hydropower Potential

World Bank (1994 study) estimates

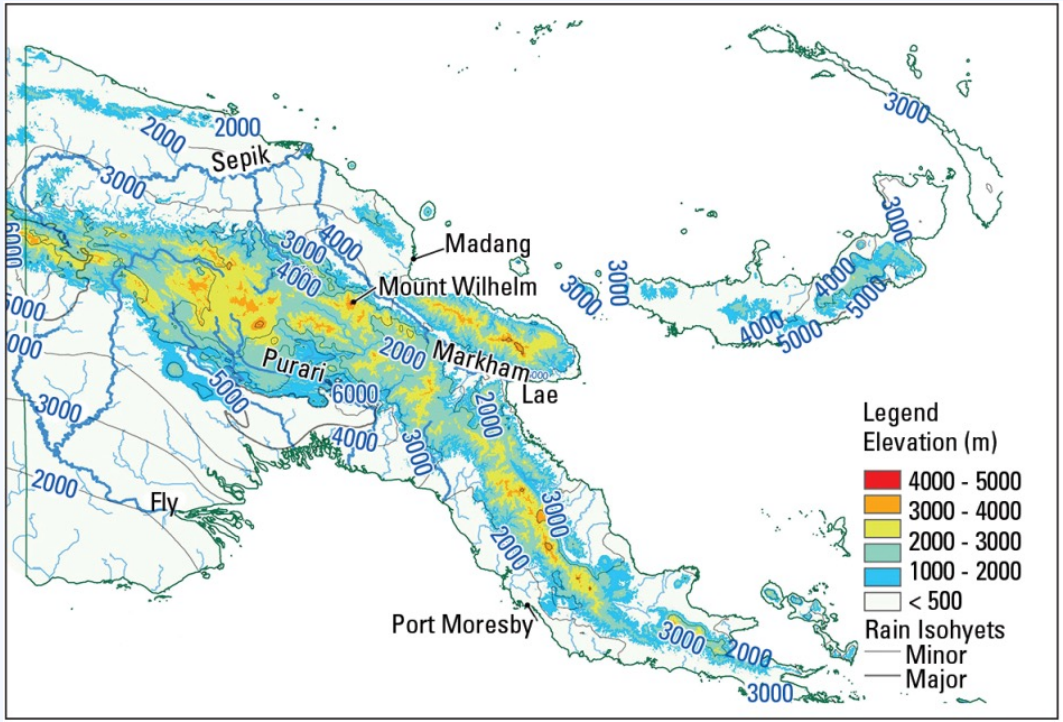
- Gross potential - 20,000 MW of large-scale hydro (excluding micro, mini rural hydros)
- Technically feasible – 14,000 MW
- PNG has one of the highest hydropower potential per person in the world

REALITY

- Total hydro generation to date is <2% of hydro potential
- However, it represents 39% of the total installed capacity.
- Substantial contribution of hydro in the overall generation mix
- BUT one of the lowest per capita energy consumptions in the world – 450kWh (PNG) which is 20 times lower than Australia (9300kWh)

Why Hydropower?

Power = Flow × Head (fall) × Coefficients



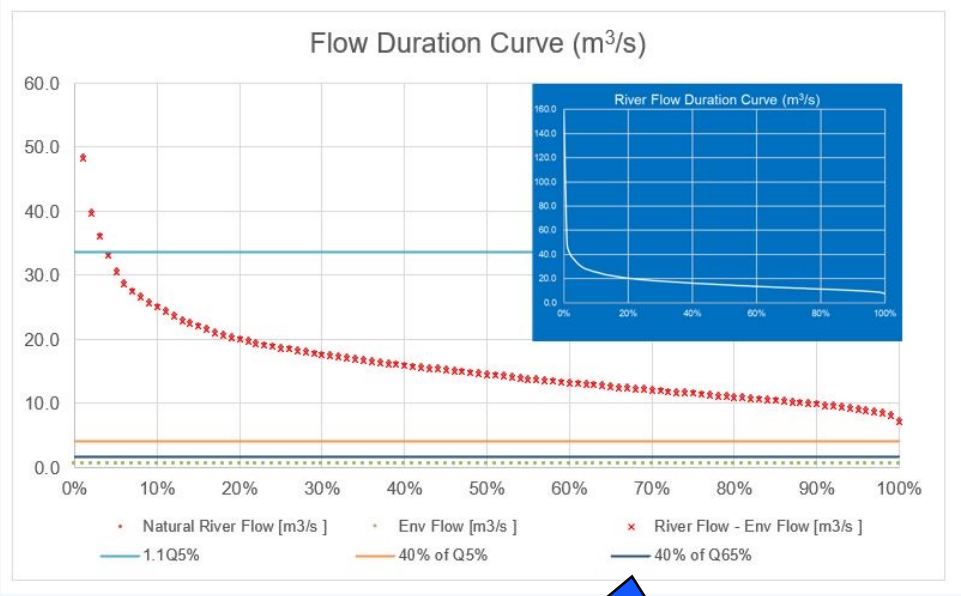
Please utilise us to generate more clean energy to boost PNG economy

Somewhere in Eastern Highland

Burum River , Finschhafen, Morobe

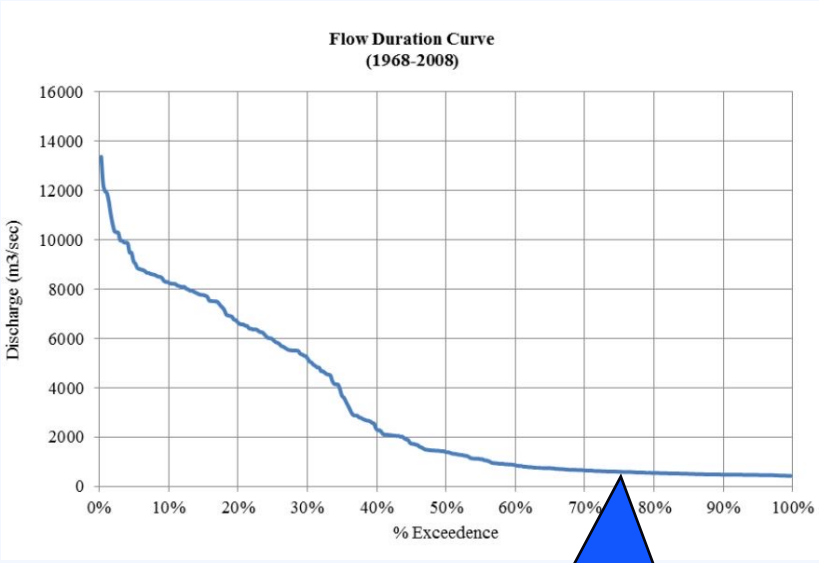
Images: SMEC

Why Hydropower?



Burum II Hydropower Project
Finschhafen, Morobe

PNG: River Base Flow in PNG is far better because of Tropical Monsoon climate. Best for Hydro Projects **(Nature's blessing)**



https://www.researchgate.net/figure/Flow-duration-curve-of-Koshi-River-at-Chatara

Nepal: although the base flow is less attractive when compared to PNG, 95% of Nepal's energy comes from hydro. Now exporting power to India and Bangladesh.

Why Hydropower?

Why Transition from Non-Renewables to Hydropower?

- Cheaper, in-country resource, reduced financial burdens to government and private sectors.
- Mining and Energy Projects - energy transition, global need to reduce carbon footprint
- Limit global warning to below **2 degree Celsius**. PNG is one of the signatories of COP21 Paris Agreement
- SEZ's- Industrial products need to be competitive in the market. Hydropower can help reduce production costs

Energy Security is a Global Priority

PPL's Pauanda HPP Commissioned in 1983.

Why Hydropower?

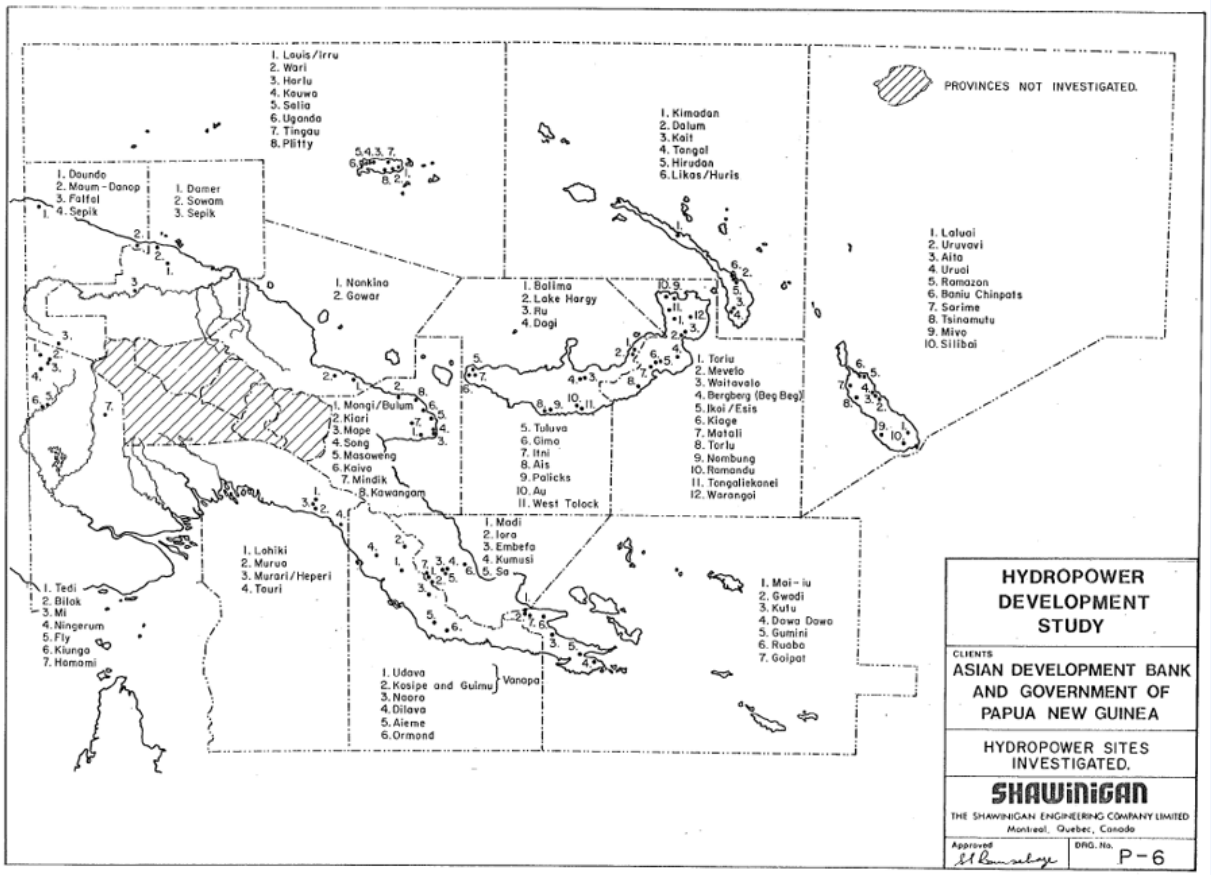
Hydropower stands at the TOP among other renewables in PNG!

- Require to explore all renewable energy options but hydro will still be the frontrunner in PNG
- Majority of PNG receives rainfall throughout the year

Solar	Relies on shining sun, intensity and duration (Capacity Factor around 15%)
Wind	Relies on wind velocity, direction and duration
Geothermal	Potential reserve, loan centers
LNG	Potential reserve, loan centers and alternative sale
Biomass	?
Ocean Energy	?
Hydropower	Scalable, dispatchable, abundant resources, wasted energy if not used, reliable, affordable and sustainable

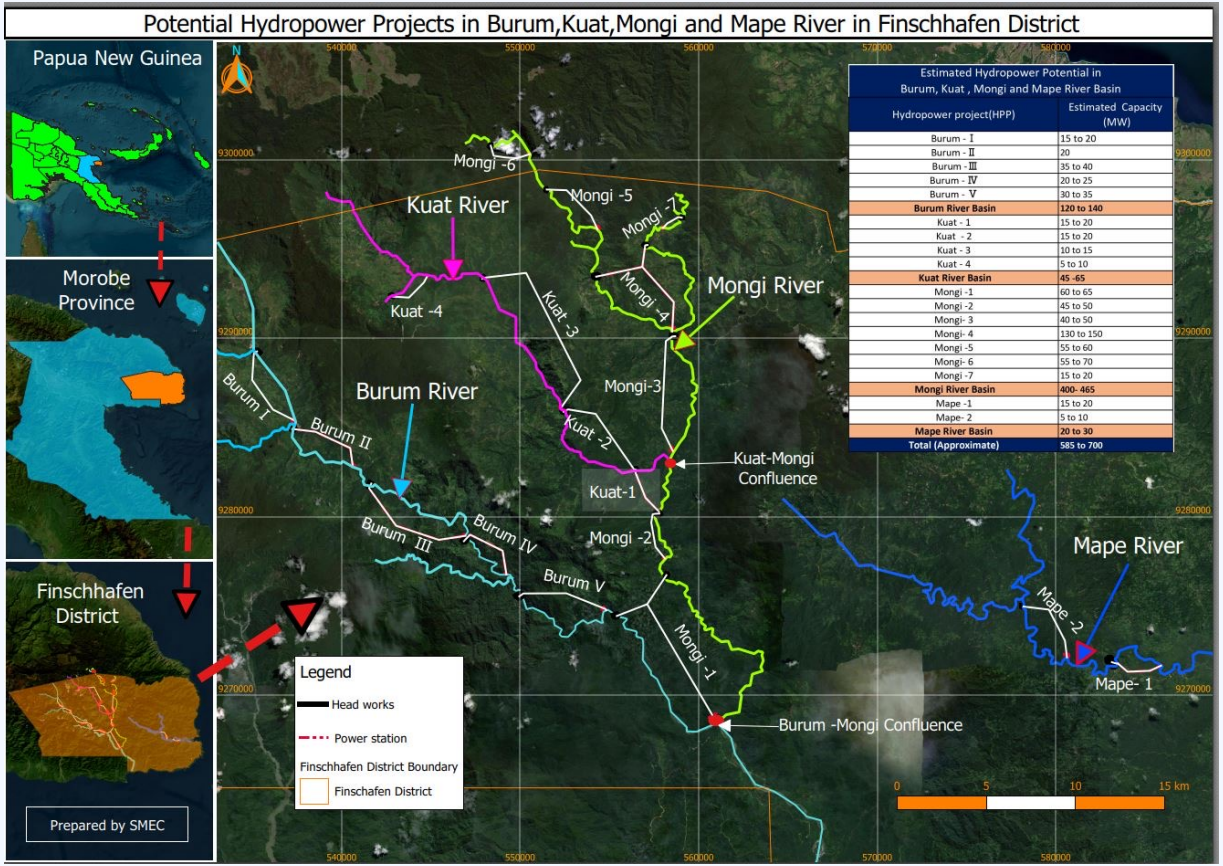
Upper Baiune Hydro , PNGFP (around 90% Capacity Factor). 60%-90% CF in Hydro Projects studied by SMEC in PNG.

Hydropower Potential in PNG?



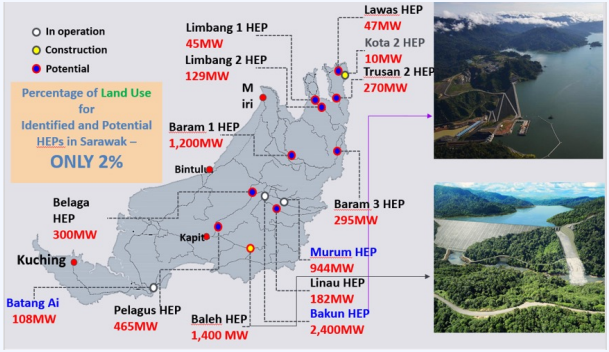
- 93 projects from 14 provinces mainly on coastal
- SMEC did another study in 1986
- PNG must start energy mapping of all river basins throughout the nation to assess Hydropower potential
- SMEC has completed energy mapping of Finschhafen district (500-700 MW)
- SMEC has identified 50+ projects in last 15 years from prefeasibility to feasibility level study.

Finschhafen Energy Mapping

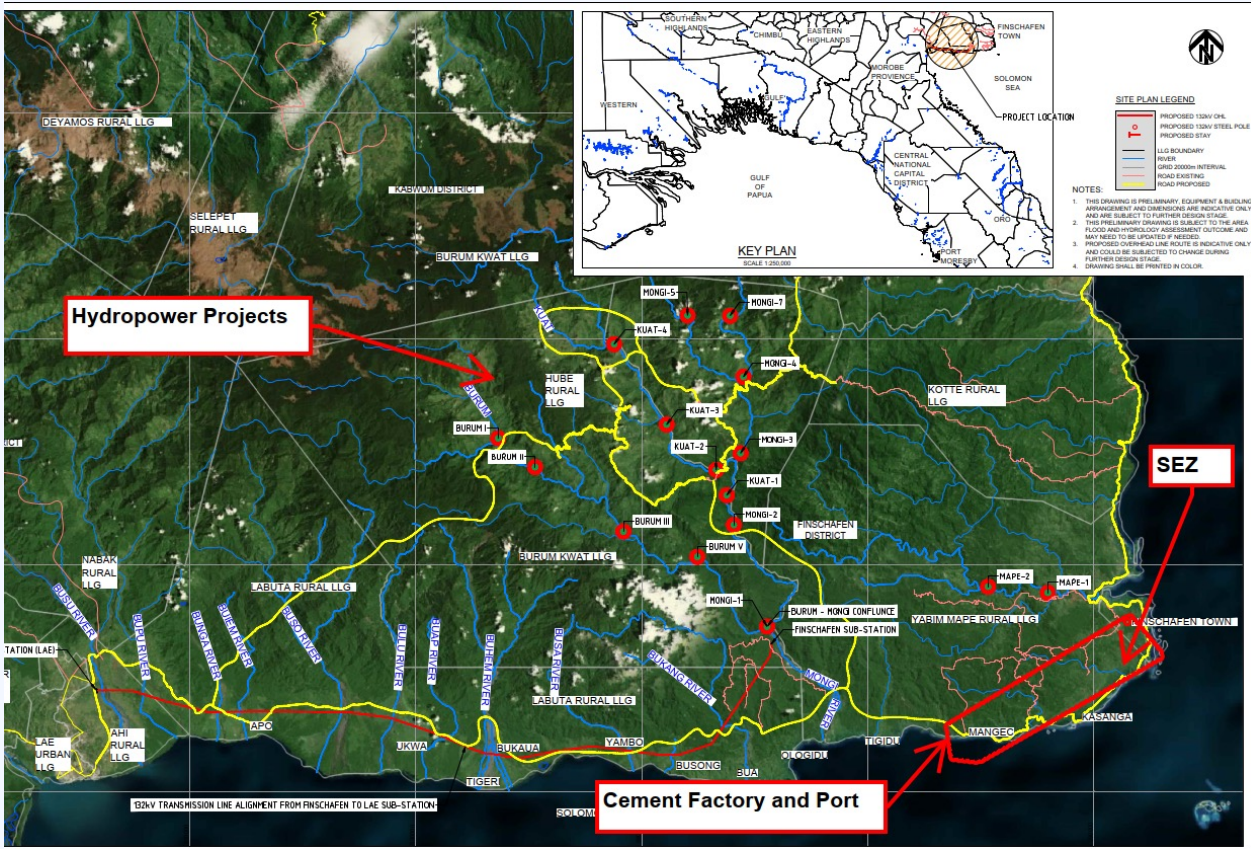


- 500 MW -700 MW Run of the River type Projects
- Projects less than 10 MW not considered
- Burum III and IV are now combined as a single project.
- Potential to supply to Lae to connect to Ramu Grid.
- This generation hub can meet supplies to Wafi Golpu and similar nearby mines.
- Power source for proposed SEZ's within the district and or industrial hydrogen generations

Mini Sarawak Model in PNG- Finschhafen?

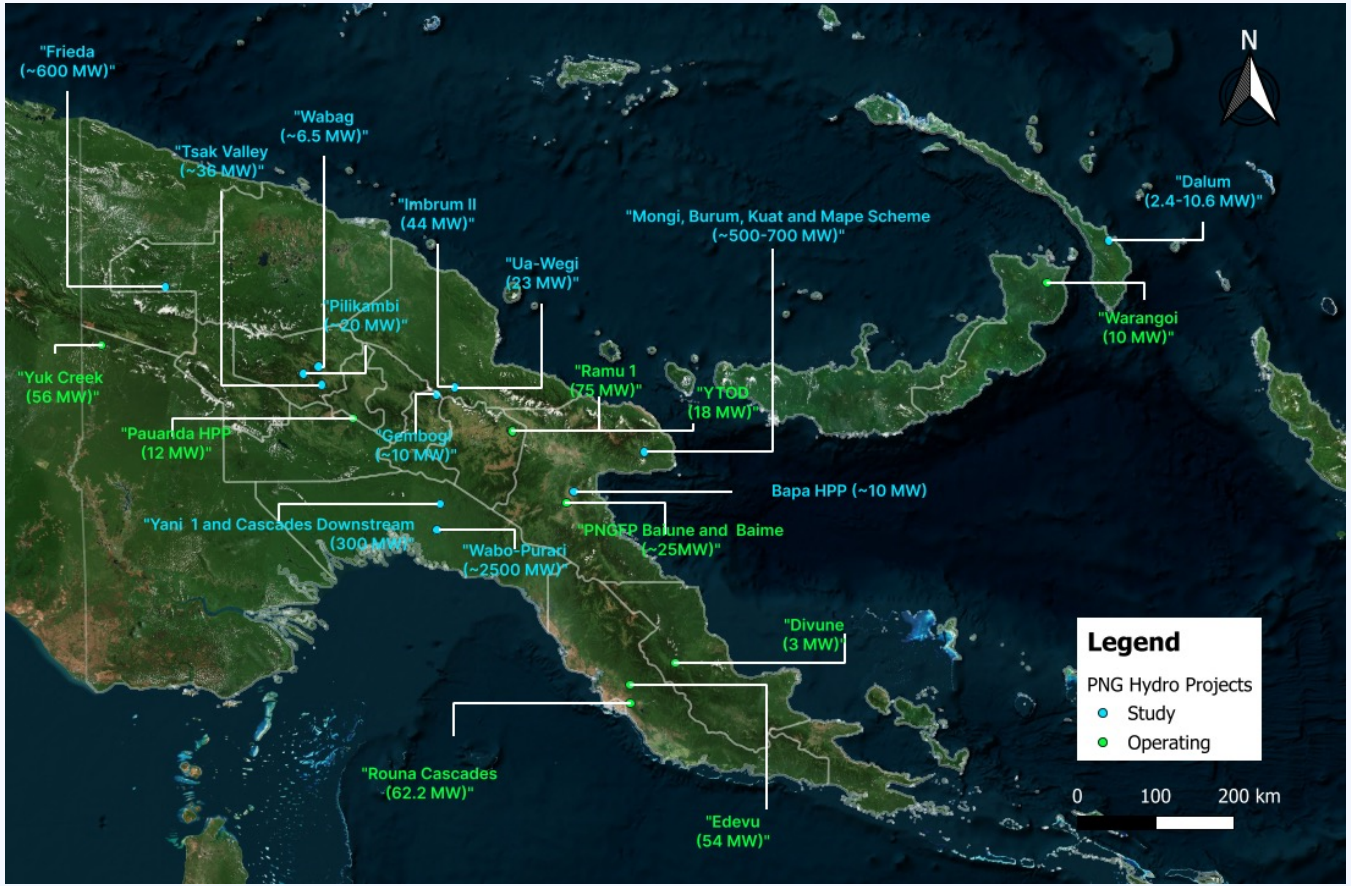


Aerial view of Samalaju Industrial ParkSource: Recoda



Hydropower Projects in PNG

(Known to SMEC from its involvement at various stages in the past and present)

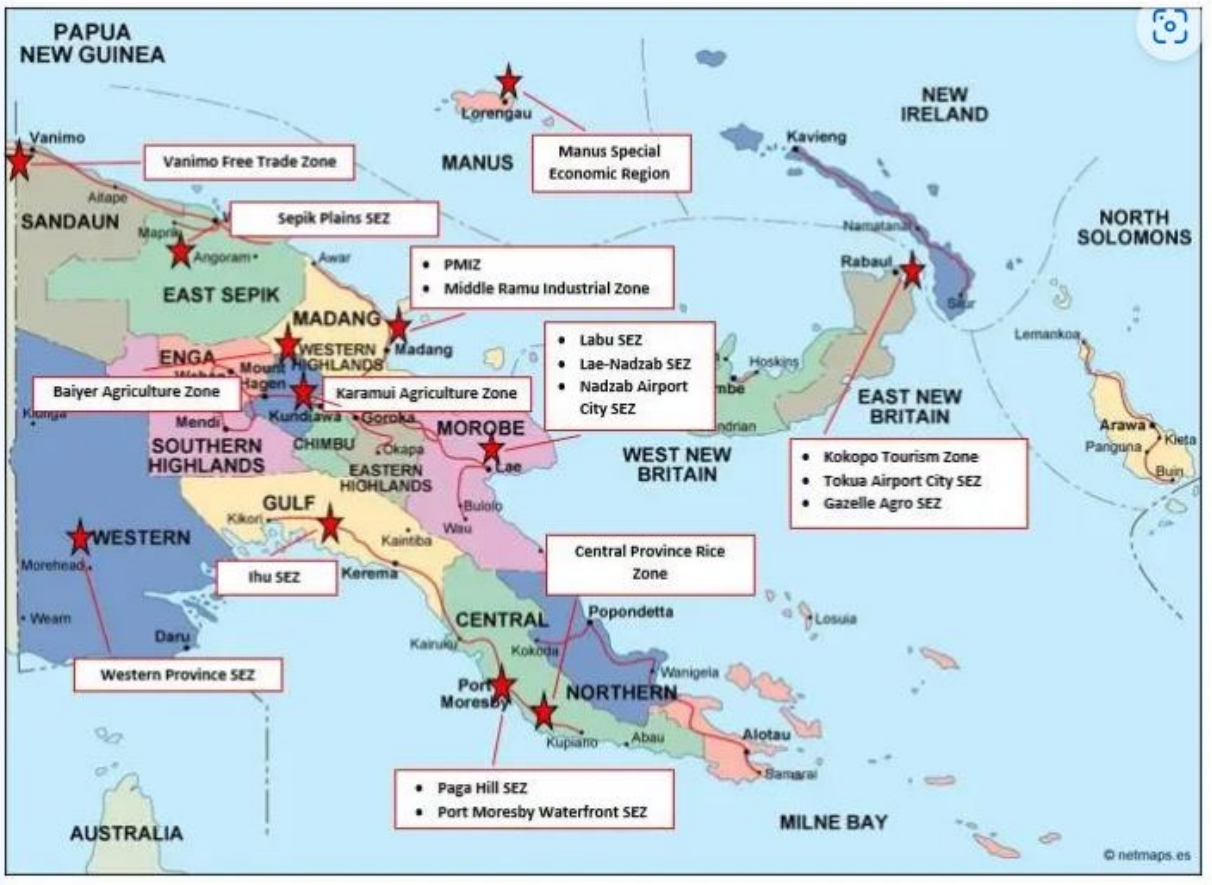


Major Load Center (Resources and Energy)

//PNG Business News, 2023

Need of Energy Transition

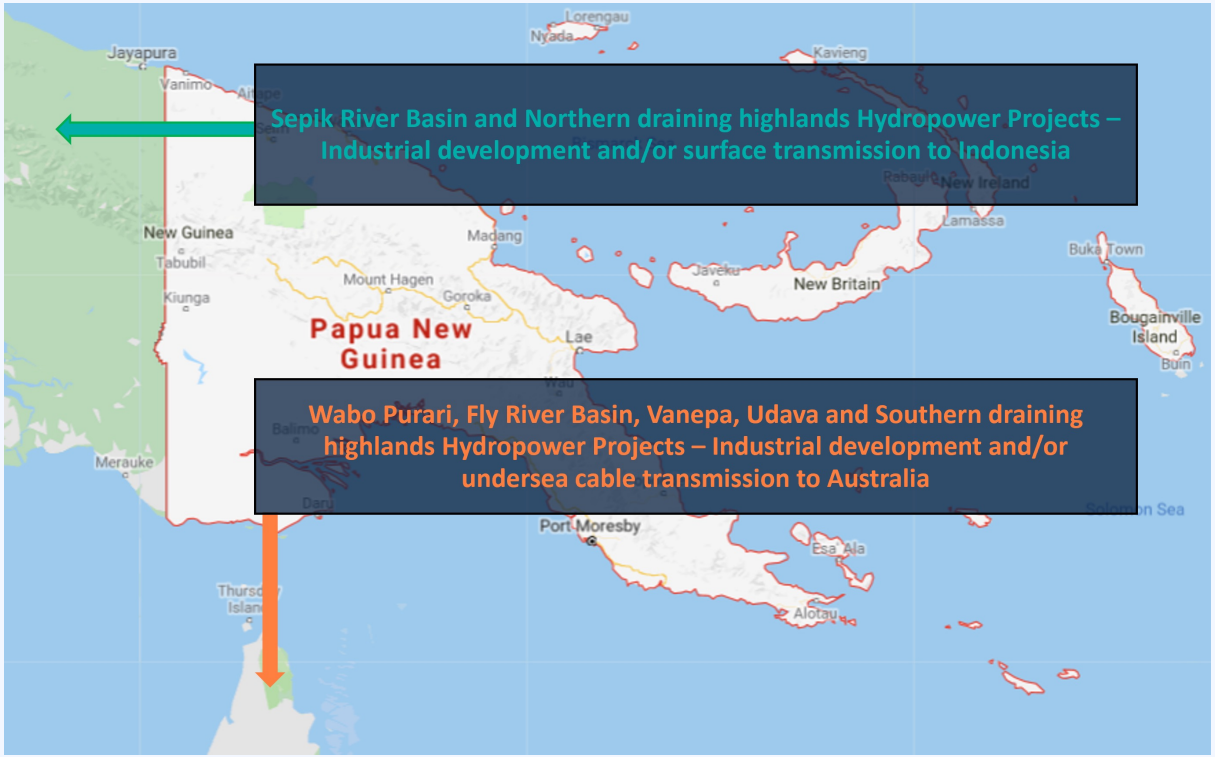
Demand of Proposed SEZ's



- 22+ SEZ's
- Power Demand?
- Power Source?
- Sustainable Power?
- Effect of Energy price on production cost?
- Market completive product

https://miti-gov-pg.site/sez-projects/

Long Term Plan for Hydro



Hydro Development - Policies and Funding Models

Policies:

Clear and Investment friendly Government Policies and Frameworks are required including the following:

- National Water Resources Act
- Benefit Sharing Act/Third Party Access
- Public Private Partnership (PPP) Act
- IPP – Project Concession Period (tariff structure)

Incentives:

- Tax Exemption on construction products and Equipment for renewable energy

Funding Models:

- Equity (30% ??) + Loan (70% ??) - Banks are welcoming the investment in renewables
- Pay back period- 5-8 years?
- FDI/ IPPs
- Government Budget
- Royalties from Energy and Resources projects

Conclusion

PNG – It's time for Hydropower Projects

Abundant Hydropower Resources

- Leverages PNG's mountainous terrain and vast hydrological potential
- Requires a comprehensive nation-wide energy mapping to locate potential hydropower sites and priorities project developments near the main load centres

Energy Demand

- Power consumption in PNG has been increasing by about 10%-15% (??) annually
- Supports population growth, industrialization, and urbanization.

Energy Security

- Reduces reliance on costly and polluting fossil fuels.

Climate Change

- Hydropower is a renewable, non-polluting energy source
- Cuts carbon emissions and aligns with PNG's vision of a decarbonized power supply by 2050.

Socio-Economic Development

- Hydropower projects create employment opportunities during construction and operation and Improves rural infrastructures such as roads, schools and health facilities.
- Provides electricity access to remote communities, improving living standards.
- Positions PNG as a regional energy exporter.

Cleaner Future

- Facilitates a transition to sustainable, inclusive energy systems, supports green hydrogen generation

SMEC’s Efforts to Develop PNG’s Hydropower

Thank you!