AN OVERVIEW OF THE GEOTHERMAL POTENTIAL OF PAPUA NEW GUINEA

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INTRODUCTION

- **PNG Energy Statistics**
  - Installed Capacity ~ 700 MW (2010)
  - Power generation ~ 3333 M kWh (2010)
  - Power consumption ~ 3100 M kWh (2010)
  - Power sources:
    - Fossil fuel ~ 49.6%
    - Hydro ~ 42.1%
    - Geothermal ~ 8.3%

- **PNG Current status**
  - 2003 – 26 MW commissioned – Lihir Island
  - 2005 – upgraded to 56 MW
INTRODUCTION

What is PNG’s geothermal potential?

- 1970s
  - Early exploration

- 2009, 2011
  - GNS Science (NZ) conducts study on Pacific Island States, incl. PNG, geothermal potential. Identified PNG, Fiji to have potential for geothermal utilisation.

- 2010
  - Renewed interest in geothermal resource mapping (Kairiru Island, Wau Bulolo areas)
What is PNG’s potential?
- Large geothermal power projects (>100 MW) are economical in active or recently active volcanoes
- There is a simple linear relationship between number of active volcanoes and generating power potential
- On the average each active volcano can sustain 158 MW electric
- With >60 active volcanoes PNG’s total generating potential can easily exceed 9000 MW, ranking within the top 5 geothermal producers in the world!

INTRODUCTION

- **2012**
  - MRA secures World Bank funding for geothermal desk-top study
  - MRA staff attend training in NZ and Iceland. So far PNG trained 5 (4 MRA, 1 CEPA)
  - West New Britain and Milne Bay Provinces selected for WB-funded sampling program, based primarily for their economic potential
  - Sampling program commences in West New Britain

Sample preparation training
Awareness in WNB
Sampling in WNB
STUDY AREA 1 - WEST NEW BRITAIN

- 2011 Population ~242,678
- Total land area: ~21000 sq.km
- Economy base: Oil palm, logging, potential for mining
- Energy sources: Hydro (2.3MW), fossil fuel, bio-fuel (1.5MW), solar (rural village-based)
- Demand exceeding 5MW
Finally Barefoot colleg founder Bunker Roy and his advisor Ms.Meagan arrived to WNB this morning, visited Aka village in Kandrian Island and Vituhu in Vit and tomorrow they will visit Tarobi yo select two grand mot from each village to travel to India to attend 6 months training to becom solat engineer. I am grateful that Indian Govt will sponsor for my 6 moth to travel to india and attend training, cloths, allowance all paid for. I am amazed with Mr.Bunker and Ms.Meagan's selection procesd. Thq qualification is 35 to 45 yrs old grandmother or single mother, illiterate, and tge least expected in the community got selected and anonymously accepted by the whole community. Some places, husbands are the problem, do not want to allow tgeir wives to travel out. The psycology behind empowering grand mothers are if we train a yiuung man, immedi after training he or she will look for a shop in Port Moresby or Kimbe to they won’t stay in the village but the grandmothr will certainly come bac her village and help solar electrify her whole village and also train the yt ones. More than 10 countries will attend training and total capacity is to train a mixture of 40 members coming from all over the world and our mothers will get a wider exposure. For whole PNG Even whole pacific)t have only allocated 8 seats and 6 are selected from WNB and the otger mothers will come from Highlands region through Mr.Anthony Smare, so 8 mothers should travel to India by March and return ad solar engineers in
GEOTHERMAL OCCURRENCES

- Two main geothermal fields: Talasea & Hoskins
- 35 thermal sites were visited and sampled for water, gas and rocks
- Occurrences characterised by hot springs, mud pools, mud geysers, geysers, fumaroles, hot and altered ground.
- Connectable to main grid
• Confined within the Quaternary Kimbe Volcanics
• Controlled by deep-seated N-S structures
• low pH – near neutral waters
Temp. 60 - >100 C
ANALYTICAL RESULTS

- Analytical testing conducted at GNS Science laboratory
- Geothermal water classification using Cl-SO4-HCO3 ternary plot

- Magouru, Rabili, Sakalu
  - Talasea station – Mature Waters

- Taliau, Magilae, Matagele
  - Wudi, Wavua 1 – Volcanic Waters

- Lake Dakataua, Rongo
  - Immature waters
ANALYTICAL RESULTS

Geothermometry using Na-K-Mg geothermometers

Conditions:
- Applied on fully equilibrated geothermal waters
- Must be applied to matured waters with high Cl and low SO4
- Rabili, Talasea Station, Bakama, and Magouru qualify

Temperatures using geothermometry range:
- 240°C (Bakama)
- 300-320°C (Rabili, Talasea Station, and Magouru)
STUDY AREA2 – MILNE BAY

- Population: ~209,054
- Total land area: ~14,000 sq.km
- Economic base: Oil palm, tourism, mining
- Power source: Fossil fuel
- Totally dependent on fossil fuel
STUDY AREA 2 – MILNE BAY
GEOTHERMAL OCCURRENCES

- Two main geothermal fields: Deidei & Iamalele
- 6 Features were sampled at the site
- Occurrences are characterised by geysers, mud pools and hot streams
- Isolated from the main town
STUDY AREA2 – MILNE BAY

- Hosted within two different volcanic Sequences:
  - Deidei – Pleistocene to Holocene Sebuia Volcanics
  - Iamalele – Pliocene to Pleistocene Kukuia Volcanics
- Acidic to near neutral pH waters
- Temp – range 75 – 103°C
- Controlled by NE faults
• Results – water types

- Yaiyaiboalana (YY) and Seuseulina (SS) plot on Mature waters
- Munamelala (Mn) 1 & 2 plot on steam-heated Volcanic waters
Given that only Seuseulina and Yaiyaiboana have matured water, geothermometry indicates ~280 reservoir temperatures.
RESULTS

- **West New Britain:**
  - Localities Talasea station, Rabili, Magouru and Bakama are mature geothermal waters with geothermometry temperature exceeding 300 – 320 degrees C
  - Waters are neutral

- **Milne Bay:**
  - Seuseulina and Yaiyaibola are mature geothermal waters with geothermometric temperatures up to 280 degrees C
  - Waters are near neutral
CONCLUSIONS

- Potentially 9000 MW
- Using World Bank funding, geochemistry of two sampled geothermal fields indicate high temperature geothermal reservoirs, \( \sim 300^\circ C \)
- We believe PNG has the potential to develop and utilise its geothermal resource
- Need to conduct deeper geophysics to define reservoir size
THE ROAD AHEAD

- We plan to carry out further exploration on the two geothermal fields – need funding for geophysics (Resistivity or MT) and then drilling
- Plan for development of a power plant – IPP, BOT?
- Time-scale ~ within the next 5 years (I said that 3 years ago!).
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