Geothermal Exploration Strategies: Uganda’s case study.

Vincent Kato

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INTRODUCTION

- Energy security
- Economic competitiveness
- Climate change
- Alternative energy sources

Geothermal: Clean, cost effective, reliable
Alternative Energy Source
GEOTHERMAL RESOURCE POTENTIAL
SURFACE MANIFESTATIONS
GEOTHERMAL RESOURCE ASSESSMENT

- Timeline
- Breakthrough techniques
- Breakthrough Technology
- Exploration Strategy
PREVIOUS STUDIES
PREVIOUS STUDIES
EXPLORATION STRATEGY

• To minimize cost and maximize success.
• Which of the techniques used was not effective.
• Review both failed and successful techniques.
• Proved very helpful to the nascent geothermal industry in Uganda.
REGIONAL GEOLOGICAL SETTING

- Extensional Tectonics.
- Border Faults
- Seismically active (20–30km).
- Crustal extension and thinning
- High Geothermal Gradient (elevated mantle).
REGIONAL GEOLOGY

**Figure 6.5** Schematic cross-sectional diagram of horst-graben structures in an extensional environment in a continental crust. Heat rises into the faulted zone from the heated base of the continental crust. Magmatic feeders to volcanic centers cut through the crust. Fluids migrate along fault zones, descending into hot crust and heated, ascend through buoyancy along the same or other faults.
LOCAL GEOLOGY

- Surface Indicators
- Along Main border faults
- Seismically active
- Extensional driven (deep circulation type)
- Helium 3 content.
LOCAL GEOLOGY

- Extensional type of geothermal system.
- Crustal extension and thinning
- Mantle elevated
- Region of crustal high heat flow.
- Deep circulation of meteoric waters.
LOCAL GEOLOGY

- High Angle Border Faults
- Deep circulation
- High crustal heat flow
- Extensional type of geothermal systems
GEOTHERMAL PLAYS

• Early stage rifting phase.
• Main Boundary Fault.
• Extend to considerable depth.
• High heat flow
• Permeability is restricted to fault-controlled zones.
• Main bounding faults are Exploration targets
EXPLORATION TARGETS

• Main Rift bounding faults.
• Fault intersection and fault interaction zones.
• High fracture density.
• Enhanced permeability.
EXPLORATION TARGETS
TYPE OF EXPLORATION METHOD

- Fault-bounded extensional systems tend to be relatively deep.
- Deep penetrating measurements to detect deep permeability.
- MT (Magneto-telluric) survey
- TDEM Static correction.
PANYIMUR GEOTHERMAL RESOURCE AREA
KATWE GEOTHERMAL RESOURCE AREA
EXPLORATION STRATEGY

Main Bounding Fault
✓ MT/TDEM
✓ Soil Gas and Gas flux
✓ Reflection–seismic survey
✓ Gravity survey
✓ Magnetic survey
✓ Data integration

Geothermal Geological Conceptual Model
CONCLUSION

• Without a good understanding of the geology of a prospect area, exploration is merely guesswork.
• Extensional systems associated with regions of high heat flow and recent faulting in areas of thinned crust and extended crust.
• Fault-controlled deep circulation systems.
• Exploration strategy reduces the cost and risk of geothermal exploration.
• Guide exploration in new systems and expand existing ones.
THANK YOU