Formulating a Geothermal Energy Policy, Legal and Regulatory Framework for Uganda

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Carbon Counts
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Background

• Uganda does not have any policy or law dedicated to geothermal energy:
  – Energy Policy / Renewable Policy limited consideration (REFiT of US$7.7/kWh)
  – Mining Law (2003) presents some issues

• Current framework inadequate for promoting investment and efficiently managing resources

• New Policy & Legal Framework could help address many issues and barriers

• TA request sent to UN Climate Technology Centre and Network (CTCN) in early 2015. Project team mobilised in late 2015
Project Team

**Team Lead:** expertise in energy & climate policy, including regulation of subsurface exploration & development, including in Africa

**Energy economists:** expertise in energy finance and electricity trading arrangements, including geothermal energy in Africa

**Stakeholder engagement:** experts in supporting investment and development in the utility sector in Uganda

**Lawyer:** experts in Ugandan utility law and regulation

**Lawyer:** experts in international energy law and regulation
Project Methodology

Activity 1
Geothermal Energy Policy Formulation

- Sub-activity 1.1
  Issue/challenge identification

- Sub-activity 1.2
  Stakeholder analysis & engagement

  - Sub-task 1.2.1
    Analysis and engagement plan

  - Sub-task 1.2.1
    Stakeholder engagement

- Sub-activity 1.3
  Draft Geothermal Energy Policy

Activity 2
Draft Geothermal Energy Law

Activity 3
Draft Supporting Laws and Regulations
ACTIVITY 1.1 – BACKGROUND ANALYSIS
The opportunity: free renewable energy
The challenge: risks & cost

- Significant cost involved in reducing the risks and increasing bankability
- Drill success rate 1 in 3
- Only 2 wells drilled in Western EARS (Kirisimbi, Rwanda) were dry

### Cost Breakdown

<table>
<thead>
<tr>
<th></th>
<th>Pre-survey (US$ M)</th>
<th>Explor</th>
<th>Test drill</th>
<th>Plan</th>
<th>F/dev</th>
<th>Steam field</th>
<th>Power plant</th>
<th>O&amp;M</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (Low)</td>
<td>0.5</td>
<td>1</td>
<td></td>
<td>11</td>
<td>5</td>
<td>45</td>
<td>10</td>
<td>65</td>
<td>142</td>
</tr>
<tr>
<td>Medium</td>
<td>1</td>
<td>2.5</td>
<td>18</td>
<td>7</td>
<td>70</td>
<td>16</td>
<td>75</td>
<td>5</td>
<td>196</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>4</td>
<td>30</td>
<td>10</td>
<td>95</td>
<td>22</td>
<td>95</td>
<td>8</td>
<td>274</td>
</tr>
</tbody>
</table>

Significant cost in project development
Lower risk profile since steam resource proven
But not impossible....

GOOD POLICY AND RIGHT ENABLING ENVIRONMENT ARE KEY
First of a kind geothermal projects

PUBLIC SECTOR & DONORS KEY TO FOAK GREENFIELD DEPLOYMENT

**Cerro Prieto, 1973, 75 MW**
- CFE (State Electric Utility) led and financed project
- Built on earlier efforts of CEG (Geothermal Energy Commission)

**Ahuachapan, 1976, 61 MW**
- CEL (Comision Ejecutiva Hidroelectrica) El Salvador state utility led
- UNDP funded field exploration, World Bank funded power plant

**Miravalles, 1994, 60 MW**
- Instituto Costarricense de Electricidad (ICE) led and funded project

**Olkaria I, 1980-81, 30 MW**
- KPC (KenGen predecessor) led project
- Funded by World Bank grant and EIB loan

**Aluto-Langano, 1999, 7.3 MW**
- Ethiopia Electric Power Corporation (EEPCO) led and funded project

**Kizilidere, 1984, 20 MW**
- Mineral Research & Exploration Co. (parastatal) led
- Funded by State Electric Co.

**Tiwi, 1979-80, 230 MW**
- UNOCAL /PGI led
- Public & Private finance, incl. state utility NAPOCOR
- PNOC-EDC formed 1976 to reduce costs

**Kamojang, 1978-83, 30 MW**
- Dutch (1920s), then NZ govt with local partner led
- Funded by Pertamina (NOC)

**Wairakai, 1958-63, 193 MW**
- NZ Govt & UK Atomic Energy Authority led
- Public financed
Examples of private sector activity

RECORD OF PRIVATE DEVELOPMENT OF GREENFIELD PROJECTS IS POOR

**Honduras, 1994, 0 MW**
- Plantares field acquired in 2013 by ORMAT
- 35MW plant commenced production in 2016 for state power company

**Nicaragua, 2002, 72 MW (expansion of existing)**
- 3 fields extensively explored by various entities, but no new power plants built (or close to being built)

**Chile, 2000, 0 MW**
- 76 Exploration licenses (2012)
- 6 Exploitation licenses (2012)
- 48 MW plant at Cerro Pablellon announced in 2015 by LaGeo

**Uganda, 2010, 0 MW**
- 14 exploration licenses issued
- PPA signed with AAE Systems for Katwe in 2013. Promised 100-200 MW plant at US$1.2bn
- Limited activity since

**Ethiopia, 2013, 0 MW**
- Reykavik Geothermal signed PPA with EEPCO in 2015 for Corbetti field for 1000 MW
- Promise US$4bn investment
- Trying to renegotiate PPA
- Cluff Geothermal trying to develop Fantale field

**Philippines, 2008, 20 MW + (repowering of existing)**
- 43 contracts in place – only 2 new exploration contracts
- Maibarara started 2014

**Indonesia, 2003, 67.5 MW (expansion of existing)**
- >65 geothermal working areas tendered
- Only major plan is 330 MW plant at Sarulla (almost 30 years in planning)

**Kenya, 1982, 48 MW**
- Law passed 1982
- Only private plant is ORMAT at Olkaria III in 2000(3 wells donated by KenGen)
- Various under development

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## Project structuring

<table>
<thead>
<tr>
<th>Year</th>
<th>Phase</th>
<th>Activity</th>
<th>Lead entity</th>
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</thead>
<tbody>
<tr>
<td>1-2</td>
<td>1</td>
<td>Preliminary survey</td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>2</td>
<td>Exploration</td>
<td></td>
</tr>
<tr>
<td>3-5</td>
<td>3</td>
<td>Test drilling</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>Review/planning</td>
<td></td>
</tr>
<tr>
<td>6-8</td>
<td>5</td>
<td>Field (steamfield) development</td>
<td></td>
</tr>
<tr>
<td>8-10</td>
<td>6</td>
<td>Power plant construction</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td>Start-up and Commissioning</td>
<td></td>
</tr>
<tr>
<td>10+</td>
<td>8</td>
<td>Operation &amp; Maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power plant</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steamfield</td>
<td></td>
</tr>
</tbody>
</table>

### Example countries

- C. Rica
- Kenya
- Kenya (alt)
- Indonesia
- USA
- Chile, Italy
- El Salvador
- Philippines
- Turkey
- Nicaragua
- Mexico
- N. Zealand
- Philippines
A word of caution

“There is little appetite from the private sector to fund projects where the nature and extent of the resource are unknown. The private sector only financed all stages of the project in 7.5% of the utility-scale projects in our database. 58.5% of projects had the costs entirely borne by the public sector, while 34% projects had the private sector bear costs at later stages in the development chain once the resource had been proved.”

and that:

“private financiers are not willing to provide financing until all or at least 70% of the MW capacity has been drilled”

Source: Micale et. al. (2014). Report for Climate Investment Funds (CIF)
Two main drivers apparent for geothermal globally:

1. **Necessity.** Lack of other obvious sources of energy, and an over-reliance on variable hydro-power, have given rise to the importance of geothermal energy for baseload generation (e.g. in NZ, Kenya, C. America) ➔
   - Significant government efforts to get the industry off-the-ground;

2. **Opportunity.** The quality of the resource has tended to be manifest using information acquired as from other activities e.g. exploration (such as in Philippines and Indonesia, where NOCs and IOCs have led).
   - Interest emerged in response to the clear opportunity presented.

In reality, often a mixture of the two, but useful to note
Geothermal policy globally (2)

- Nearly every first-of-a-kind (FOAK) geothermal project around the world has been publically-led and funded
- Risks too high for private financing
- But, policies tend to be evolutionary:

  - Public-sector (and dev partners) leads efforts for FOAK
  - Move towards PPP models for other greenfield development
  - Opening up brownfield production to 100% private sector led development

Time/Experience
Kenya GDC vision

Menengai Phase I

Menengai Phase II
Silali Phase I

Olkaria Phase VI+
Menengai Phase III+
Silali Phase II+
Policy situation in Uganda today

- No policy supporting geothermal energy development
- GOU is passive, relying on the organic evolution of the industry based on 100% private sector led investment, incentivised by geothermal REFiT
- Concessions are held by passive speculators
  - Poorly capitalised
  - Lacking technical competencies needed to develop such complex and long-term projects
- GRD mandate is unclear:
  - Research and data management unit?
  - Centralised point of contact for coordination of private sector-led development? or
  - Empowered to take projects forward itself?
Choices for Uganda today

1. The *opportunistic* approach. Carrying on with the current strategy of *private sector led* development. Possibly enhance the enabling environment for *private sector led* development:
   - A revised Concession allocation process, greater role of government in compiling resource information, better safeguards against passive speculation etc;
   - Clearer rights over tenure and land access, perhaps with government guarantees over supporting permits;
   - A new set of enhanced incentives for geothermal energy (e.g. enhanced tax breaks etc.).

2. The *necessity* approach. Creating enhanced *public sector led* arrangements, e.g., through GRD or a parastatal company approach similar to Kenya or Tanzania. Take either fully-public or PPP approach to development of steamfield and power plants
## Summary of options

<table>
<thead>
<tr>
<th>Description</th>
<th>Pro's</th>
<th>Con's</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A.</strong> Carry on with business as usual, relying on the private sector to</td>
<td>Limited exposure of GOU to full project costs and risks.</td>
<td>Experiences to date in Uganda, as well as examples of successful</td>
</tr>
<tr>
<td>develop the resource</td>
<td></td>
<td>deployment around the world, suggest low chance of projects being</td>
</tr>
<tr>
<td></td>
<td></td>
<td>built. High LCOE.</td>
</tr>
<tr>
<td><strong>B.</strong> As Option A, but increase GOU-led resource exploration with a view</td>
<td>Could accelerate deployment compared to Option A</td>
<td>Higher cost than Option A.</td>
</tr>
<tr>
<td>to bringing in private sector to develop when more resource certainty is</td>
<td>Exposure of GOU to full project costs is still limited.</td>
<td>Limited control over rate and scale of development – uncertain if</td>
</tr>
<tr>
<td>achieved</td>
<td></td>
<td>private sector will respond effectively to the incentive provided.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potentially high LCOE.</td>
</tr>
<tr>
<td><strong>C.</strong> As Option B, but also provide new set of enhanced incentives for</td>
<td>Could accelerate deployment compared to Options A and B</td>
<td>Potentially high cost to GOU.</td>
</tr>
<tr>
<td>private sector to develop geothermal energy</td>
<td>Lower LCOEs than Option A or B</td>
<td>Limited control over rate and scale of development – uncertain if</td>
</tr>
<tr>
<td></td>
<td>Exposure of GOU to full project costs is still limited</td>
<td>private sector will respond effectively to the incentive provided.</td>
</tr>
<tr>
<td><strong>D.</strong> GOU leads on project development, through either:</td>
<td>Greater control over rate and scale of development.</td>
<td>GOU takes on significant debt.</td>
</tr>
<tr>
<td>- GRD</td>
<td>Able to access to donor grants and concessional loans.</td>
<td>GOU needs to provide core funding to responsible agency.</td>
</tr>
<tr>
<td>- New parastatal agency (“UGDC”)</td>
<td>Lower LCOEs than Option A, B or C</td>
<td>Full exposure to project costs and risks.</td>
</tr>
<tr>
<td>- An existing parastatal agency (e.g. UEGCL; NOC)</td>
<td>Private sector could lead on power plant development as PPP approach.</td>
<td></td>
</tr>
<tr>
<td>Include PPP approaches.</td>
<td></td>
<td></td>
</tr>
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</table>
Background briefing materials

Geothermal development risks: Uganda

- Significant opportunity for increasing base load capacity
- Drill success is possible, but investment required
- Only 2 wells drilled in Western EARS (Kenya, Tanzania, Uganda, Rwanda) were drilled
- Significant geothermal potential in the East African Rift Valley
- Significant IP in Uganda

Geothermal development risks: Indonesia

- Significant IP
- 3 active fields
- 3 exploration licenses
- 5 active fields
- 5 exploration licenses
- 4 active fields
- 4 exploration licenses
- 100-200 MW point of 231 MW
- NO activity since 1928
- Various undeveloped potential

Formulation of Geothermal Energy Policy, Legal and Regulatory Framework in Uganda

CTCN Request: 2015-022/USA

GEOTHERMAL POLICY & REGULATION ANALYSIS REPORT

Oyler Coats: Company Name
23 June 2016

Prepared by:
Paul Inder, Gregory Gaskin (Carbon Counts), Mike Land and Paul Leamon (IQA)

Norton Rose Fulbright

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ACTIVITY 1.2 – STAKEHOLDER ENGAGEMENT
Stakeholder Meetings
Key Findings

• Need to better understand geothermal resource potential in Uganda and accelerate development. The government needs to take a lead. New dedicated policy is warranted.
• The mandate of the Geothermal Resources Department needs clarifying;
• Development partners reiterated number of programs to support to develop geothermal development. New policy will help in making progress;
• Private sector has a role to play. Need to promote new means of cooperation between government and the private sector;
• Local communities are supportive of geothermal development, but there is a need to ensure it’s sympathetic of local activities
• Direct uses of geothermal heat as a catalyst for local industrial development must be in policy.
• Need to better coordinate academic research and educational aspects of geothermal energy.
PRETTY MUCH UNANIMOUS AGREEMENT AMONGST ALL STAKHOLDERS THAT ALL APPROACHES ARE NEEDED TODAY AND IN THE FUTURE - are some nuances to this
ACTIVITY 1.3 – POLICY DEVELOPMENT
Purpose of the Geothermal Policy

• The new, dedicated, geothermal policy will help to give clearer direction as to:
  – how geothermal energy projects should be developed
  – by whom
  – over what time frame
  – using which sources of finance and support mechanisms

• Defines the objectives and ambitions of government in pursuing geothermal technology, thus setting target in terms of the urgency. Firm commitments included regarding resource development activities

• Raises awareness about the technology, the benefits and risks, and providing assurances to local communities about the safety of developments;
Policy outline

Foreword & Executive Summary
1. Introduction
2. Policy Context
3. Geothermal Resources Status
4. Issues and Challenges for Geothermal Resource Development
5. Geothermal Policy Framework
6. Implementation Framework
5. Policy Framework - GOAL

“To accelerate development of Uganda’s geothermal energy resources in order to realise its benefits for all”

To be achieved by fostering and establishing a safe, secure, socially and environmentally responsible geothermal industry through increased investment that:

— enhances understanding of the resource;
— reduces risk and increases bankability of projects; and
— ultimately, unlocks and accelerates the potential of the technology so that it makes a substantial contribution to Uganda’s mix of renewable energy supply over the medium- to long-term”
5. Policy Framework - OBJECTIVES

1. To accelerate progress in geothermal resource exploration and exploitation
2. To optimise geothermal resource exploration and exploitation activities
3. To establish an effective and transparent regulatory regime for geothermal resource management
4. To ensure safe and environmentally-sound development of geothermal energy
5. To promote a sustainable geothermal industry for the future
ACTIVITY 2 – LEGAL FRAMEWORK
Example dedicated geothermal laws

**Turkey**
- 2007 Law No. 5686 of 2007 on Geothermal Resources and Mineral Waters
- 2007 Regulation No. 26727 of 2007 on Geothermal Resources and Mineral Water Law Implementation

**Mexico**
- 2014 Geothermal Energy Act and Regulations

**Nicaragua**
- 2002 Law 443 on Exploration and Exploitation of Geothermal Resources
- 2010 Decree 45-2010, Implements Regulation of Law 443

**Philippines**
- 1978 Presidential Decree 1442 (Geothermal Service Contract Law)
- 2000 Republic Act 9513 (Renewable Energy Act)

**Indonesia**
- 2014, Geothermal Energy Law 21-2014 (new)

**Chile**

**Kenya**
- 1982, Geothermal Resources Act, 1982 + amendments
- 1990 Geothermal Resources Regulations

**Detailed review carried out and norms & standards adopted where relevant**
Act outline

I. Preliminary
II. Institutional Arrangements
III. Licensing
IV. Cessation of Geothermal Activities
V. State Participation and National Content
VI. Use of License as a Security
VII. Restrictions and Surface Rights
VIII. Health and Safety
IX. Liability for Damage Due to Pollution
X. Information and Documentation
XI. Payments and Royalties
XII. Offences
XIII. Miscellaneous
XIV. Transitional Arrangements
Main features

• Clarifies tenure of geothermal resources
  – Vests ownership in the state and citizens
• Defines role and powers of Minister & Commissioner
• Declaration of Geothermal Resource Areas
  – Unitisation method. Allows for competitive tendering
• Geothermal Resource Agreements to facilitate PPP
• Three part Licensing system:
  – Reconnaissance – small scale surveys
  – Exploration – extensive surveys, test drilling
  – Production (exploitation) – produce & use/sell steam

Deters speculation:
  – Time limits reduced
  – Financial instruments (bond/guarantees required)
  – Renew/bond release only on measurable progress of work
More info here:

Thank you

Paul Zakkour
Carbon Counts

www.carbon-counts.com/uganda-geothermal