KENYA'S LEGAL AND INSTITUTIONAL CHALLENGES IN THE FUTURE DEPLOYMENT OF SMALL MODULAR REACTORS.

PRESENTED BY
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KENYA NUCLEAR ELECTRICITY BOARD

INPRO DIALOGUE FORUM ON LEGAL AND INSTITUTIONAL ISSUES IN THE GLOBAL DEPLOYMENT OF SMR
Nuclear to Power Vision 2030

Kenya Vision 2030
A globally competitive and prosperous nation with a high quality of life by 2030

Economic
To maintain a sustained economic growth of 10% p.a. over the next 25 years

Social
A just and cohesive society enjoying equitable social development in a clean and secure environment

Political
An issue-based, people-centered, result-oriented, and accountable democratic political system

Key Enabler:
A vibrant energy sector that meets electricity required to drive flagship projects and programmes
Kenya’s Energy Sector Institutional Framework

Ministry of Energy & Petroleum (MoEP)

- Generation function
  - KenGen (~80% Inst. Cap.)
  - IPPs (~20% Inst. Cap.)
  - Imports (<1%)

- Transmission and Distribution function - KETRACO & KPLC

- KenGen
  - Hydro (820.7 MW)
  - Thermal (633 MW)
  - Wind (25.5 MW)
  - Geothermal (588 MW)

- EPP (30 MW)

- IPPs
  - Geothermal (~50 MW)
  - Other IPPs expected

70% GoK & 30% Public

Energy Regulatory Commission (ERC) (regulating energy sector)

Rural Electrification Authority (REA)

Other IPPs expected
# Current Electricity Installed in Kenya

<table>
<thead>
<tr>
<th></th>
<th>Installed MW</th>
<th>Effective* MW</th>
<th>% (effective)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>820.7</td>
<td>797.6</td>
<td>37.2%</td>
</tr>
<tr>
<td>Geothermal</td>
<td>588.0</td>
<td>579.9</td>
<td>27.0%</td>
</tr>
<tr>
<td>Thermal (MSD)</td>
<td>633.0</td>
<td>614.5</td>
<td>28.6%</td>
</tr>
<tr>
<td>Temporary Thermal (HSD)</td>
<td>30.0</td>
<td>30.0</td>
<td>1.4%</td>
</tr>
<tr>
<td>Thermal (GT)</td>
<td>60.0</td>
<td>54.0</td>
<td>2.5%</td>
</tr>
<tr>
<td>Wind</td>
<td>25.5</td>
<td>25.5</td>
<td>1.2%</td>
</tr>
<tr>
<td>Cogeneration</td>
<td>26</td>
<td>21.5</td>
<td>1.0%</td>
</tr>
<tr>
<td><strong>Interconnected System</strong></td>
<td><strong>2,183</strong></td>
<td><strong>2,123</strong></td>
<td><strong>98.9%</strong></td>
</tr>
<tr>
<td>Off grid thermal</td>
<td>26.8</td>
<td>23.1</td>
<td>1.1%</td>
</tr>
<tr>
<td>Off grid wind</td>
<td>0.660</td>
<td>0.610</td>
<td>0.028%</td>
</tr>
<tr>
<td>Off grid solar</td>
<td>0.550</td>
<td>0.212</td>
<td>0.010%</td>
</tr>
<tr>
<td><strong>Imports</strong></td>
<td><strong>0.000</strong></td>
<td><strong>0.000</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Total Capacity MW</strong></td>
<td><strong>2,211</strong></td>
<td><strong>2,147</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>
Peak Power Demand Projection for Kenya (MW)

- Peak: 16,905MW
- Installed Capacity: 21,620MW

Source: Least Cost Power Development Plan 2011/2031
Projected Energy Mix

- Wind
- Hydro
- Coal
- Geot
- GT-NG
- GT-KERO
- Cogn
- Import
- MSD
- Nucl
Key Issues of Power Generation In Kenya

- Over the years, there has been over dependence in one source – Hydro power
- Inadequate research data on other energy sources like wind, solar, geothermal, coal and others.
- Low knowledge base on Nuclear power generation amongst the population.
- Lack of experience and expertise in nuclear power technologies to self start and regulate.
1. The National Economic and Social Council (NESC), recommended in April 2010 adoption of nuclear power programme as a national priority.

2. Nuclear power incorporated in the country’s energy blueprint

3. A NEPIO, NEPC was established in 2010 and elevated to a Board, KNEB, 2012

4. KNEB carried out PFS and other preliminary technical studies

Mandate of the Board is to oversee the implementation of nuclear power programme in Kenya
MILESTONES APPROACH

Phase 1
- MILESTONE 1: Ready to make a knowledgeable commitment to a nuclear programme
- Conclusions before a decision to launch a nuclear power programme is taken

Phase 2
- MILESTONE 2: Ready to invite bids for the first nuclear power plant
- Preparatory work for the construction of a nuclear power plant after a policy decision has been taken

Phase 3
- MILESTONE 3: Ready to commission and operate the first nuclear power plant
- Activities to implement a first nuclear power plant

Operation of the First Nuclear Power Plant

10 – 15 years

We are here
Why consider SMR in Kenya

- Relatively small national grid - Requires time and money to upgrade
- Uneven population distribution
- Low industrialization
- Multiple usage (Desalination and power generation)
- Multi module approach of the reactors
- Poor infrastructure in many parts of the country
- Energy security for the country
Challenges of Deploying SMR in Kenya

- Weak institutional arrangement required for the deployment
- Lack of adequate human resource capacity with knowledge and skills
- Lack of enough and appropriate information on SMR
- Slow legislative process and fear of political backlash
- Training institutions are not prepared in terms of the appropriate curriculum
- General apathy amongst the population
- Risk of adoption of a First of a Kind (FOAK) SMR
- No benchmarking member state for comparing their deployment and adoption of SMR
Key Achievements

- Prefeasibility Study (PFS) and Report done that covers all the 19 Infrastructure issues with clear road map
- The strategic plan outlines outlining all key stakeholder organizations and their roles in implementation of a NPP and commitments required from Government and other agencies
- Human Capacity Building and Public Advocacy is on going
The Energy bill has been passed by both parliament and now waiting for President’s signing (accent).

The nuclear bill is with the cabinet
# ESTABLISHMENT OF NUCLEAR POWER PROGRAMME INSTITUTIONS

<table>
<thead>
<tr>
<th>Institutions</th>
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</thead>
<tbody>
<tr>
<td>1. Regulatory body</td>
</tr>
<tr>
<td>2. Owner/operator</td>
</tr>
<tr>
<td>3. Research &amp; Development Institution (Technical Support Organization)</td>
</tr>
<tr>
<td>4. Radioactive waste management institution</td>
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</table>
CONCLUSION

- Government support and commitment to nuclear power programme has been consistent however there is still a lot of work to be done to realize the objective.
- The need to establish a nuclear regulator
- SMR will still remain a viable option in Kenya’s NPP, and the need to monitor development status of SMR technology
- Development of national technical requirements and criteria for SMR technology is the next step