Hydropower Development in Africa

Problems and Prospects

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Outline

- Overview of African Power Sector
- Current status of hydropower in Africa
- Potential contribution of hydropower
- Development of hydro projects
- Environmental and social concerns
- Financing Hydro Projects
- Action Plan to meet NEPAD initiative
Introduction

- Focus of NEPAD on Energy
- Wood, peat & animal waste - today’s main energy sources in Africa
- Role of modern energy in alleviating poverty in Africa
- Potential for Hydropower energy for development
Overview of Power Sector

- Today only 10% of Africans have access to electricity
- Uneven distribution of electricity with concentration in a few countries
- 82% of electricity generation in Northern & Southern regions
Overview of Power Sector

- Lowest Annual Per capita consumption in the world (450 kWh)
- Moves to increase and redistribute access through formation of power pools.
## Current Status of Hydropower

<table>
<thead>
<tr>
<th>Gross Theoretical Hydropower Potential (GWh/year)</th>
<th>Technically feasible Hydropower Potential (GWh/year)</th>
<th>Economically feasible Hydropower Potential (GWh/year)</th>
<th>Installed hydro capacity (MW)</th>
<th>Production from hydro plants (GWh/Year)</th>
<th>Hydro capacity under construction (MW)</th>
<th>Planned hydro capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,000,000</td>
<td>1,750,000</td>
<td>1,000,000</td>
<td>20,300</td>
<td>76,000</td>
<td>&gt;2,403</td>
<td>&gt;60,000</td>
</tr>
</tbody>
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Current Status of Hydropower

- Distribution
  - North Africa - 23%
  - West Africa - 25%
  - South/Central/Eastern Africa - 51%
Current Status of Hydropower

- Hydro-projects built to provide basis for industrialisation and social and economic development

Benefits include:
- Water Supply
- Irrigation
- Navigation
- Fisheries
- Tourism
Current Status of Hydropower

Contribution of Hydro to Africa's Primary Energy Needs - 2002

- Oil: 41%
- Coal: 7%
- Natural Gas: 19%
- Hydro: 32%
- Nuclear: 1%
- Oil: 41%
Potential Contribution of Hydro

Classification of Hydropower Plants

- Large 500 MW
- Medium 10 MW
- Small 500 kW
- Mini 10 kW
- Micro
- Pico
Potential Contribution of Hydro

- Feasible potential of 1,750,000 GWh/year
- Only 4.3% exploited
- Rapid exploitation hampered by low demand and dispersed population
- Opportunities of small hydro in matching supply with demand
Potential Contribution of Hydro

Small hydro

Advantages include:

- Competition in supplying Africa’s mainly rural populations.
- Low capital requirements
- Modular, sized to meet demand
- Unexploited potential
Potential Contribution of Hydro

Small Hydro

- Development hampered by preference for large projects.
- Investment concentrated mainly on large dams because
  - Easier to finance
  - Lower unit cost of generation
Potential Contribution of Hydro

Large Hydropower

- Large undeveloped capacity (e.g. INGA)
- Potential for development as regional projects to service and expand market
- NEPAD to facilitate the formation and expansion of interconnected systems and power pools
Development of Hydropower

- Focus on development as regional projects
- Development of regional transmission infrastructure for power evacuation and market creation
Development of Hydropower

Proposed regional hydro projects:
- INGA in DR Congo
- Kafue Gorge Lower in Zambia
- Cabora Bassa in Mozambique
- Maguga in Swaziland
- Bui in Ghana
- Bujagali in Uganda
Development of Hydropower

Proposed Regional Transmission Projects

- Upgrade of Zambia - DR Congo - S. Africa Interconnection
- Zambia-Tanzania Interconnection
- Namibia-Botswana Interconnection
- W. Africa Grid Network and Power Pool
Development of Hydropower

- Phased development of transmission to lead to Africa-wide interconnected network
- Role of NEPAD in encouraging regional trade in electricity
Social & Environmental Issues

Mitigation Of Environmental Impacts

- Environmental and social Impact of Dams
- Need for pre planning and continuous assessment
- Post Implementation Monitoring
- Resettlement
- Afforestation
- Power costs and prices to fully reflect environmental and social costs
- Those who sacrifice need to be compensated
Financing Hydropower

- Traditionally been public financed
- Today, there is shortage of public finance
- Need to attract private sector financing
- Mitigation of risks perceived by investors
- Other risks:
  - Hydrological uncertainties
  - high Upfront Capital Investments
  - Cost overruns and time slippage
  - negative public perception
Action Plan to achieve NEPAD Initiative

Short Term
To reduce costs, extend access and ensure supply available on sustainable basis, NEPAD should help utilities and RECs to:

- Develop proper policy framework, pricing and tariff environment
- Improve managerial and technical capabilities
- Improve existing hydro plant capacity
- Advance development of regional projects
Action Plan to achieve NEPAD Initiative

Medium to Long term
- Implement identified projects
- Build capacity for medium and small hydro
Conclusions

Major problems facing hydro power development include:

- High up-front investment requirements
- High risks (technical, economic, commercial, environmental and social)

Low access of population to electricity creates opportunities for hydropower development
Conclusion

Strategies

- Rehabilitation and operational improvement of existing hydro plants
- Collaboration of NEPAD and Regional Economic Commissions