

# AN OVERVIEW OF GEOHERMAL RESOURCES DEVELOPMENT IN KENYA

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# Introduction

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Location: Eastern part of Africa



Area: 582,646 Km<sup>2</sup>



Population: 38.6 million



Economy: Agriculture, Tourism, Services, Manufacturing, Mining






Energy: Imports petroleum, electricity supply inadequate (~23% of households connected)

# Introduction (cont)

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-  Economic Growth Rate: 5.4 %
-  Electricity Installed Capacity:  
1,664MW
-  Effective Power Generation Capacity:
  - Hydro - 46%
  - Thermal - 37%
  - Geothermal - 15%**
  - Cogeneration - 1.6%
  - Wind - 0.3 %

# Geothermal Resources Potential

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- The geothermal resources potential is currently estimated at 10,000 MW, of which only 241 MW is connected to the national grid.
- Another 332 MW is expected to come on stream by December 2014.
- Development of geothermal energy is being carried out by Geothermal Development Company (GDC), Kenya Electricity Generating Company (KenGen) and OrPower4 (an IPP).

# Geothermal Prospective Fields



The geothermal prospective sites identified in Kenya are:

- ✓ Barrier(open)
- ✓ Namarunu(open)
- ✓ Emuruangogolak(open)
- ✓ Silali(open)
- ✓ Paka(open)
- ✓ Korosi(open)
- ✓ Lake Baringo(open)
- ✓ Arus-Bogoria(open)
- ✓ Menengai(Licensed)
- ✓ Badlands(open)
- ✓ Eburru(Licensed)
- ✓ Olkaria(Licensed)
- ✓ Longonot(Licensed)
- ✓ Akiira-Mt. Margaret(Licensed)
- ✓ Suswa(Licensed)
- ✓ Lake Magadi(open)
- ✓ Homa Hills(open)

# Status of Geothermal Development

Field	Estimated potential (MW)	Reconnaissance	Surface Exploration	Detailed Surface Exploration	Exploration Drilling	Production Drilling
Menengai	1600	Done	Done	Done	On-going	On-going
Olkaria	1000	Done	Done	Done	Done	On-going
Korosi	450	Done	Done	On-going		
Paka	500	Done	Done	On-going		
Silali	1300	Done	Done	On-going		
Emuruangog -alak	650	Done				
Arus	200	Done	Done	On-going		
Bogoria	200	Done	Done	On-going		
Barrier	450	Done	On-going			
Eburru	50	Done	Done	Done	Done	
Suswa	600	Done	Done	Done		
Longonot	700	Done	Done	Done		
Namarunu	400	Done				
Total	7600					

# Geothermal History

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- Geothermal exploration in Kenya started with the drilling of two wells at Olkaria to a depth of ~950 metres. The wells never discharged and were later abandoned (1956-59).
- GoK and UNDP entered into an agreement to extensively undertake geothermal resource assessment (1967-70).
- A GoK decision was taken to concentrate geothermal development at Olkaria in an area of 80km<sup>2</sup>. Six wells were drilled with positive results (1971-76).

# Geothermal History (Cont)

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- With financing mainly from World Bank, drilling was accelerated and about 23 wells were drilled, 45 MW (Olkaria I) was commissioned in 1981 (1977-85).
- Drilling continued in Olkaria II steam field where ~ 30 wells were completed by 1992.
- From 1992, financiers pulled out due to the prevailing political climate and no major works were undertaken until 1999. However, a concession was given to OrPower4 (an IPP) for Olkaria III field in 1998.



# Geothermal History (Cont)

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- In 1999, exploratory wells were drilled in Olkaria IV field.
- Production drilling was carried out in Olkaria II between 1986 and 1993. However, construction of the 70 MW plant began in 2000 when funds became available and commissioning was in November 2003.
- Through GoK funding, six appraisal wells were then drilled over an 8 km<sup>2</sup> field with steam output equivalent to between 4 MW and 5 MW per well in 2006.

# Current Status

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- Drilling of twenty production wells, with an average output of 7 MW per well, commenced in July 2008 in Olkaria IV.
- Construction of Olkaria I (units IV and V) and IV (units I and II) 280 MW to be commissioned in 2014.
- Procurement of a contractor for Olkaria I 70 MW unit VI in progress.
- Drilling is on-going for 400 MW in Phase I of the 1600 MW Menengai field.
- Tendering for supply and installation of 3 modular power plants of 30 MW each has been done by GDC as part of Menengai Phase I.

# Current Status (Cont)

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- In the 3<sup>rd</sup> phase of development, OrPower4 in 2009 commissioned an additional 35 MW, raising its capacity to 48 MW.
- OrPower4 is undertaking drilling to develop a further 52 MW, raising its total generation capacity to 100 MW by 2014.
- A 2.4 MW wellhead generator has been successfully installed by KenGen at the Eburru field. Further development of the field is expected to upscale capacity to 40 MW.

# Upcoming Projects

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- Funding for 140 MW Olkaria V plant has been promised by JICA. 63 MW of steam has been confirmed. Drilling is on-going for the remainder.
- KenGen plans to scale up wellhead generation from the current 5 MW to 75 MW at Olkaria by November 2014.
- 140 MW Olkaria VI plant will be developed under a PPP arrangement with KenGen.
- AGIL and MPGL (IPPs), licensed to develop Longonot and Akiira-Mt. Margaret respectively, are expected to generate 70 MW each by 2016.

# In Conclusion

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- Geothermal development is a flagship project of Kenya's Vision 2030 (a long term blueprint for economic development).
- Geothermal is earmarked to provide 5, 000 MW of base load power for a projected demand of 15, 000 MW by the year 2030 at a cost of US\$ 20 Billion.
- Intensive exploration activities are ongoing in the Central and Northern sections of the Kenyan Rift.

# In Conclusion (Cont)

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- The ongoing exploration activities involve:
  - Detailed surface studies
  - Drilling of exploratory and appraisal wells; and
  - Well testing



Plate 1: A drilling rig on site at the Menengai geothermal field

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Plate 2: A discharging well at the 1600 MW Menengai geothermal field





Plate 3: Reservoir engineers undertaking well head testing at Menengai Well No. 1

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Plate 3: An artist's impression of Olkaria IV geothermal power plant

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18



Plate 4: The 2.4 MW wellhead generator at the Eburru geothermal field

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*Ahsanteni Sana*  
Thank you