Opportunities for direct utilization of geothermal resources in Kenya

By

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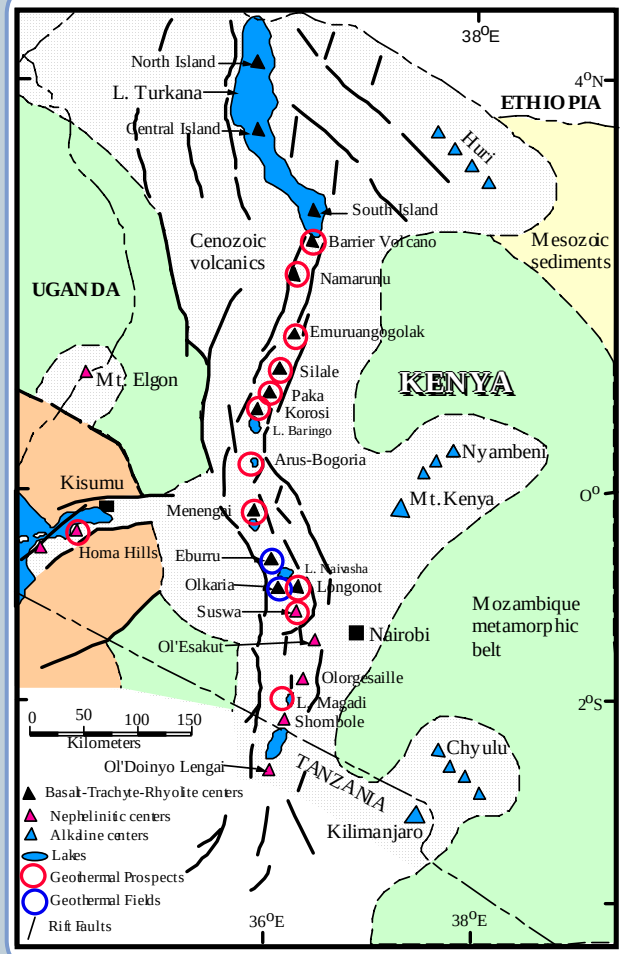
Introduction

Geothermal areas and use

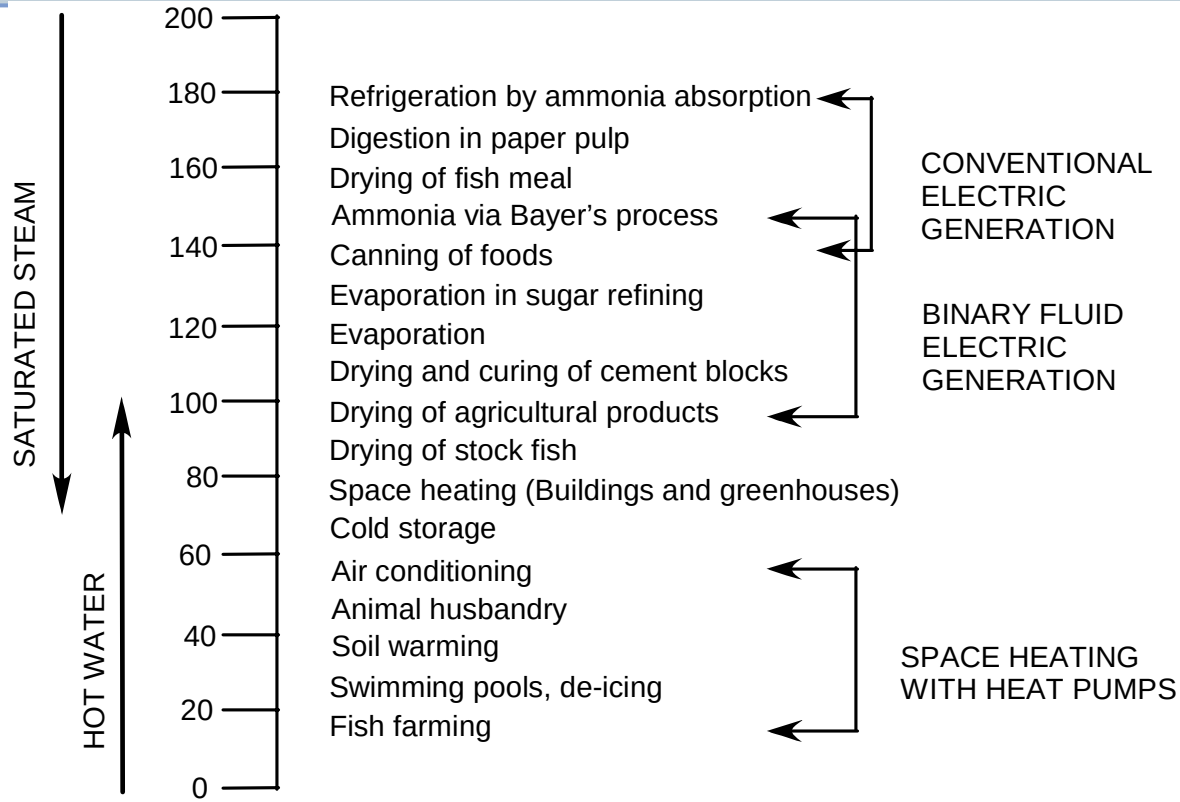


- **Kenya's geothermal potential areas occur within the Kenya Rift**
- **Utilization of geothermal energy:**
  - **Power generation: 130 MWe (99%)**
  - **Direct utilization: 1.3 MWt (1%)**
- **The country has an enormous low enthalpy resource base.**
- **A small fraction of this enormous resource has been harnessed.**

Chepkoiyo blowout well

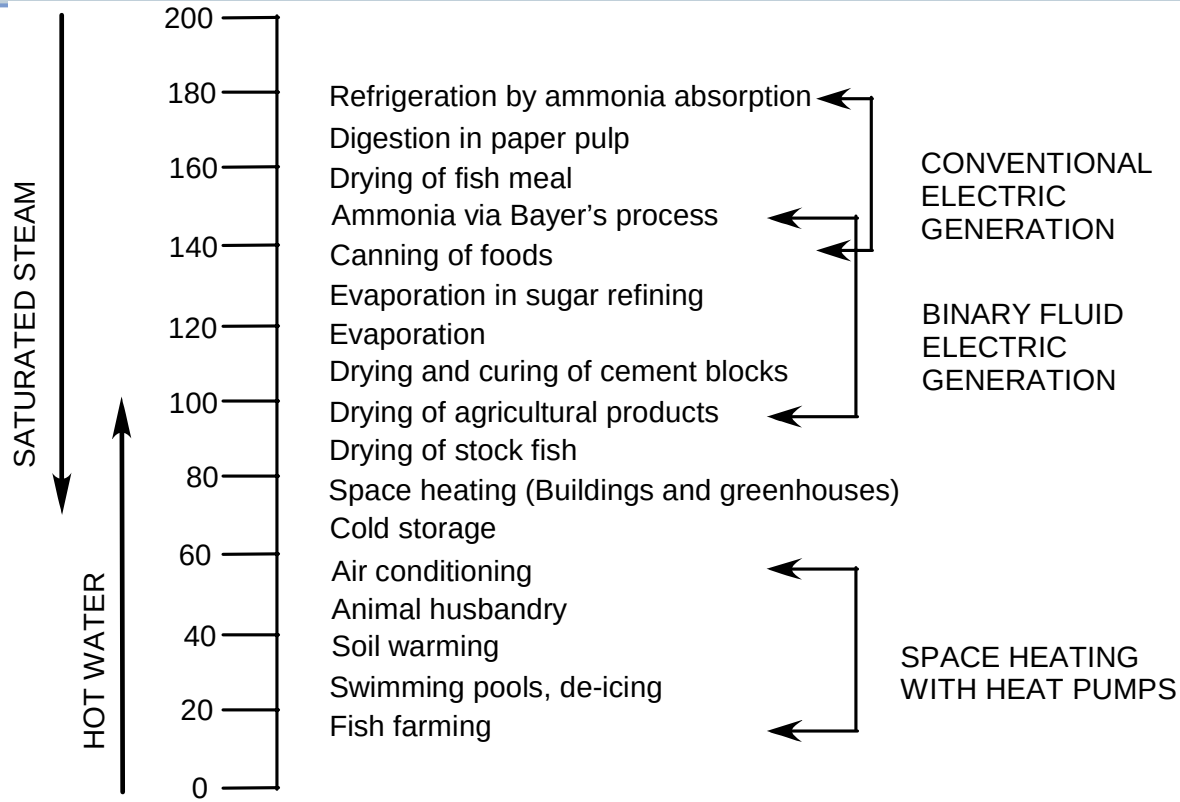
- 90 m borehole drilled for domestic water produced hot water 92°C (local BP) .
- Self discharged sprouting to a depth of 50 m.

Lindal diagram



Lindal assessed the potential use of geothermal water and steam in relation to their temperature

Lindal diagram



Thermal waters with temperatures as low as 20-30˚C constitutes a useful energy resource

Current status of direct use utilization in Kenya

Horticulture-Greenhouse heating

- Geothermal water from one of the wells leased from KenGen used to heat water by use of a heat exchanger.

Oserian greenhouse

- Hot water pipe
- CO_2 & H_2S pipe
- Benefits:

-Increased growth rate & duration.

-Not affected by diseases; little use of pesticides.

Spa pool at Lake Bogoria Hotel

Hot spring

- Hot water at 38oC from a near by hot spring used to heat the spa pool

Water harvesting

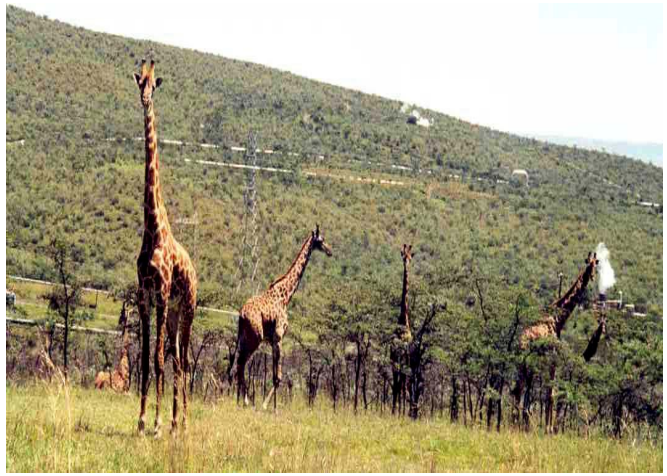
Water condensed for domestic use at Eburru

Pyrethrum drying

Pyrethrum drier at Eburru

Tourist attraction

KenGen



Kapedo Springs

Opportunities for direct use applications in Kenya

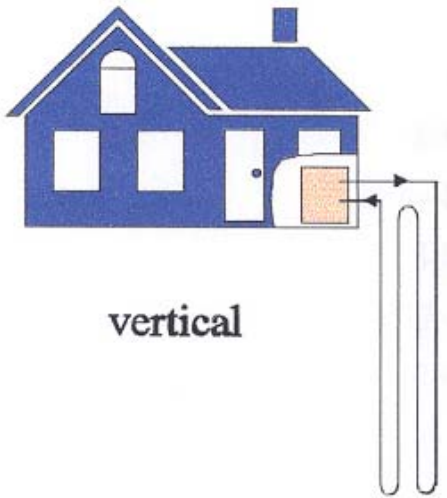
Opportunities

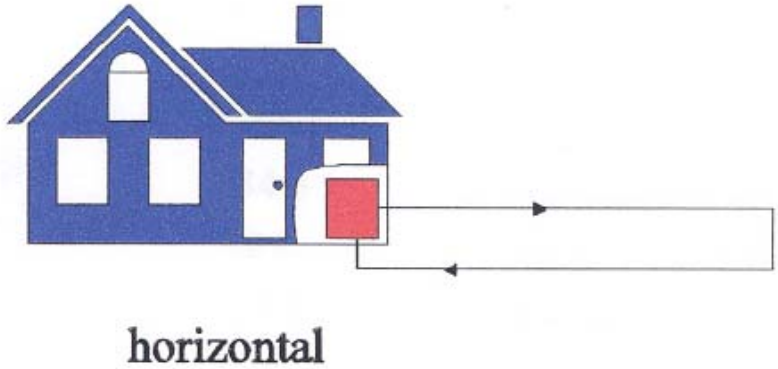
1. Swimming pools, bathing and balneology using natural springs.

2. Greenhouse heating in flowers and vegetables growing

Opportunities

3. Aquaculture. Study on effects of temperature on animal and fish growth indicate that they require certain temperature for optimum growth.
4. Residential heating or cooling by use of heat pumps





Opportunities

5. Drying of agricultural produce:
    1. Drying of pyrethrum
    2. Drying of sisal
    3. Drying of fruits and vegetables
    4. Curing and drying of tea
    5. Raw wool washing and drying

Opportunities

6. Industrial applications.
    1. Diatomite soda ash mining
    2. CO_2 mining
    3. Sugarcane industry
    4. Production of alcohol
    5. Wood industry

Barriers to development of direct use applications in Kenya

Constraints

1. Resource identification.
2. Exploration risks
3. Technological constraints
4. Commercial financing
5. Credit risk barriers and political barriers
6. Legislative framework
7. Markets

Recom. to accelerate growth

1. Funding.
2. Proper policy and legislative framework
3. Tax incentive.
4. Risk funds

Benefits to the Kenyan economy

Benefits

1. Clean indigenous source of energy.
2. Easy on land
3. Reliable-Availability high
4. Flexible-modular designs
5. Keeps dollars at home
6. Reduces deforestation
7. Helps the country grow-Rural areas

Conclusions

1. **Geothermal energy will remain one of the primary renewable clean energy sources of direct uses in Kenya**
2. **A huge potential of untapped low enthalpy energy resource is available in Kenya.**
3. **The initial high-risk investment stages of geothermal development should be borne by the Government, but the later stages to be shared between the public and the private sector.**

Conclusions

4. **Incentives like e.g tax holidays and enabling proper Legislative framework should be set to attract more private investors in the industry.**
5. **Installations of greenhouses, spas and industries utilizing geothermal in remote locations will raise the standard of living and quality of life for the local population by creating employment.**

Olkaria I Plant

KenGen

Olkaria II plant (70 MW +35 MW)

Hells Gate National park

KenGen

Thanks for your attention