

Geothermal Development Associates

Company Description and Export Issues

US Export Import Bank

Sub Saharan Africa Advisory Committee Meeting

April 21, 2010

Geothermal Power

Geo=Earth Thermal=Heat



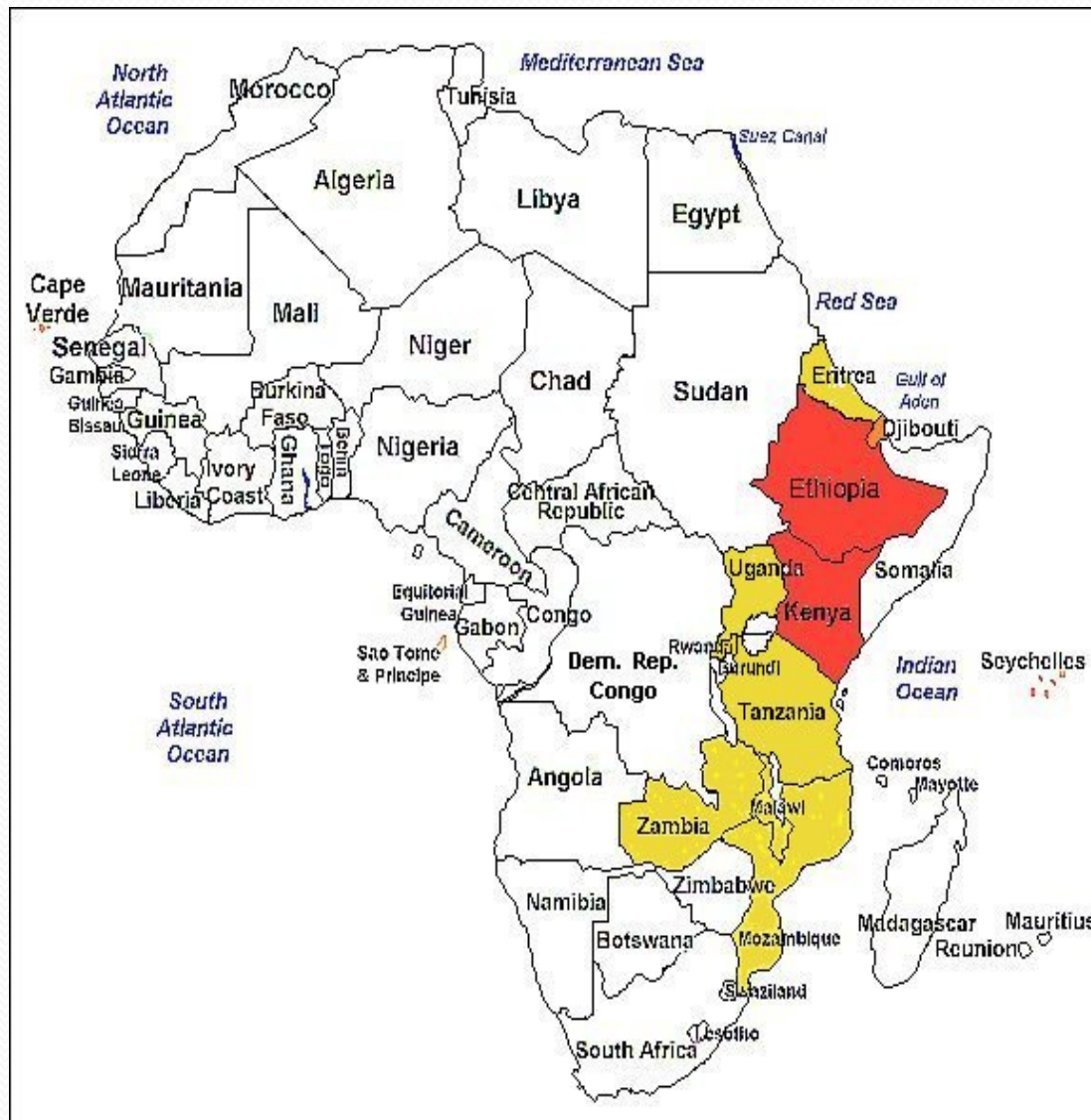
Electric power generated by converting hot water or steam from beneath the earth's surface into electricity



Countries Generating Electricity With Geothermal Resources

Australia	Indonesia	Portugal (Azores)
China	Italy	Russia
Costa Rica	Japan	Taiwan
El Salvador	Kenya	Thailand
Ethiopia	Mexico	Tibet
France (Guadeloupe)		New Zealand
Turkey	Guatemala	Nicaragua
United States	Iceland	Philippines
Papua New Guinea		

African Countries Using or Having Researched Geothermal Resources



- **Djibouti***
- **Eritrea***
- **Ethiopia***
- **Kenya***
- **Malawi**
- **Mozambique**
- **Rwanda***
- **Tanzania***
- **Uganda***
- **Zambia**
- **Comoros***

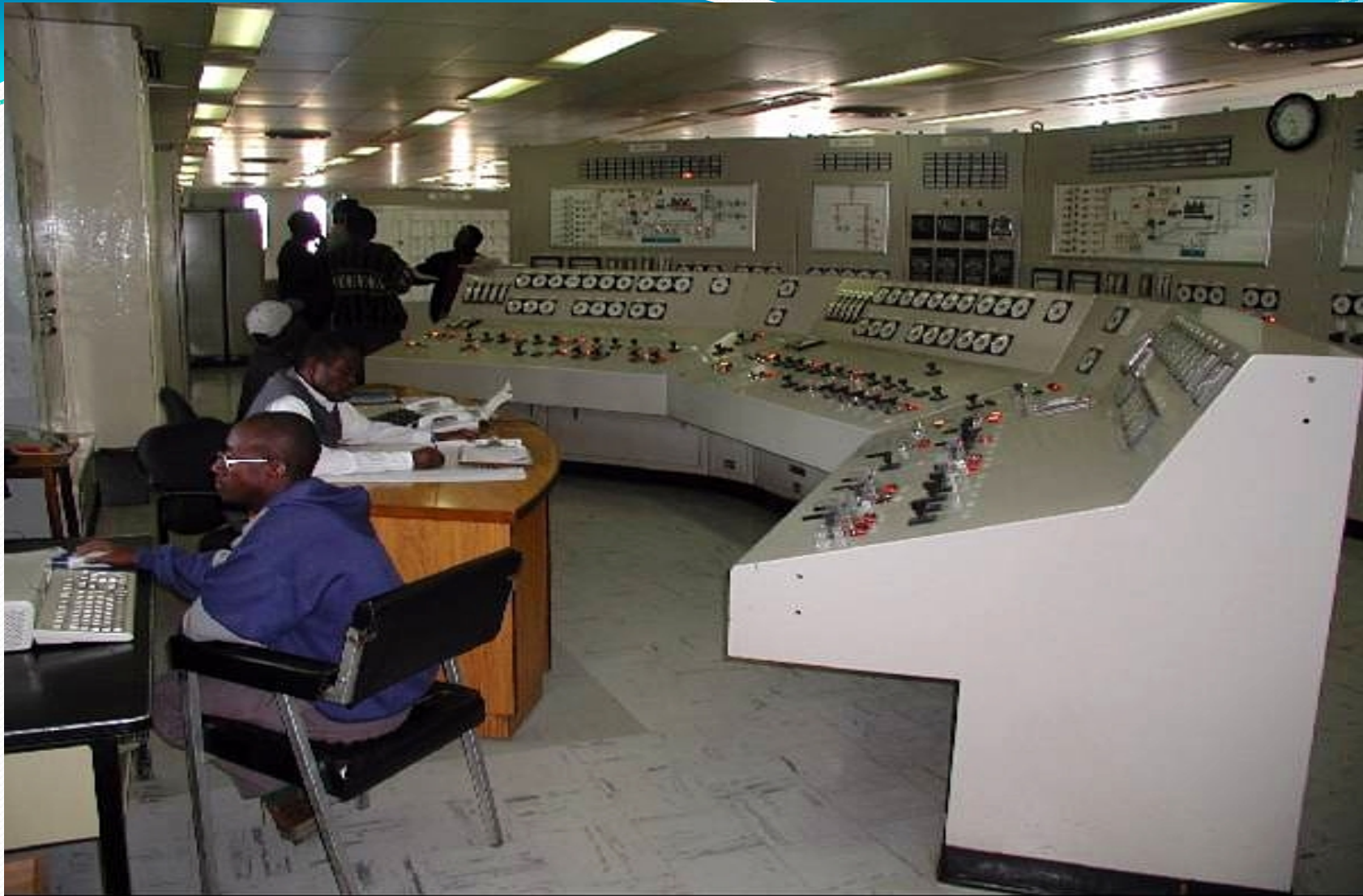
- * GDA exploration visits
- **Geo plants installed**

Olkaria I - First 45 MW Geothermal Plant, Kenya, 1981-85
Present Country Capacity 163 MW





Entrance to Olkaria I Geothermal Plant



Control Room at Olkaria I Geothermal Plant

GDA HISTORY

- 1978 – Incorporated in Nevada, USA, by G. Martin Booth III (MS geologist) and David L. Mendive, (PE, MS electrical engineer) to provide geotechnical and engineering to geothermal industry
- Privately owned & operated US company
- 1985 – as developer, brought initial Steamboat 5.0 MW binary power plant online, south Reno
- 1986 – began transition from consulting services to equipment supply, including detailed plant design, project management



GDA Staff & Facilities

- 13 geoscientists, engineers and administrators with experience in all aspects of geothermal project planning, implementation and management – both in the US and overseas
- Maintains a field office at the national power company in Addis Ababa, Ethiopia, staffed by a New Zealand-trained Ethiopian reservoir engineer
- New (Sept. 2009) GDA offices and workshop facility, east Reno, includes 6,000 ft² office space, 11,000 ft² workshop space
- Passive lighting and geothermal heat pump system create model energy-efficient installation

New GDA Office/Workshop Facility





GDA Value-Added

- Resource and Power Plant Consulting
- Resource Development
- Power Plant Design & Supply

GDA Expertise

Resource and Power Plant Consulting

- **Project Feasibility**

Analyze and evaluate geo resources to determine power potential and recommend optimal power plant type, design

- **Economic Evaluation**

Develop financial models for optimal resource development & plant design to maximize commercial viability

- **Permitting**

Extensive experience with total project permitting at federal, state and local levels

Resource Development

- **Land/Lease Acquisition**

Assist assessment,
acquisition

- **Exploration**

Plan, supervise,
assess geological,
geochemical, geophysical, hydrologic surveys

- **Drilling Operations**

Design, supervise temperature gradient, exploration,
production and injection wells

- **Reservoir Engineering**

Well test planning, supervision and data interpretation



Power Plant Design & Supply

- **Power Plant Design**
Custom-designed 2-20 MW to make optimal use of the geothermal resource
- **Manufacturing**
Turbine auxiliary systems including lube oil, hydraulics, electrical controls
- **Power Plant Packaging & Supply**
Package turbine generator sets with associated components into easily installed modules
- **Installation and Commissioning Support**
Detailed installation procedures and on-site support to ensure proper installation and commissioning
- **Operator Training**
In proper operation, monitoring, and maintenance of the plant



Selected GDA Power Plant Projects

- Power project development: pioneered first Steamboat Springs 5 MW pilot power plant (1985)
- Recently awarded international contracts for geothermal power projects in:
 - Papua New Guinea - units of 6, 30 & 20 MW supplied 2001-07
 - Ethiopia - repair of existing 8.5 MW Ormat installation 2006-09
 - Kenya - 2 MW supplied to Oserian 2007; 2.5 MW being built for KenGen
 - Indonesia – contract for 2 x 2.5 MW units for PLN/ADB being finalized

Lihir 6 MW Geothermal Steam Power Plant Lihir Island, Papua New Guinea (2002)

- Design and supply of all major components, including the turbine generator set, prefabricated control building and auxiliary equipment
- Delivered to port in 7 months
- Simple non-condensing design allowed client to easily move unit to a new location



**Lihir 50 MW
Geothermal Steam
Power Plant
Lihir Island, Papua New
Guinea (2006)**

- Designed as a 30 MW plant in 2003, with 20 MW extension in 2005
- Design and supply of all major components and manufacture of auxiliary systems including lube oil, hydraulics, electrical controls
- Supervised construction and commissioning of both original plant and extension



Aluto Langano Geothermal Power Plant Rehabilitation

Aluto Langano, Ethiopia
(2006 – 2009)

- Ormat plant commissioned 1998; shut down 2002
- GDA began rehabilitation early 2006 including problem assessment, testing and repair of both plant and well field
- Trained EEPCo personnel in U.S., Kenya and on site
- Re-commissioned first unit June 2007
- Second unit refurbished, re-commissioned July 2009



Oserian 2 MW Geothermal Power Plant Lake Naivasha, Kenya (2007)

- Design and supply/manufacture of complete power generation unit (turbine generator set, gearbox, oil lubrication system, electrical controls)
- Time from contract signature to shipment was 10 months
- Provided supervision during construction, commissioning



Geothermal Development Int'l

- Established early 2009 as wholly-owned international development and finance arm of GDA
- Objectives: using public / private JV financing, develop, generate and sell power to local offtaker(s) on commercial basis
- Work with local partners to assist feasibility studies, concessions, permitting, financing and project management
- Initial targets: Kenya, Rwanda, Ethiopia due good geo resources, need for add'l power, private incentives
- Efforts underway to verify/negotiate feedin tariffs, obtain concessions in target countries

Issues, Needs of Small Renewable Energy Companies to Compete Internationally

1. Competition from New Zealand, Japan, Philippines, Iceland, France, Germany, China
2. To expand, US renewable companies need add'l working capital, financing for bid, advance payment & performance bonds despite small company size, limited balance sheet
3. Seed capital provided by other gov'ts on behalf of their companies for initial geothermal reconnaissance (i.e. \$650K from Japan for WestJec in Ethiopia, \$350K from Germany in Rwanda) is severe impediment to small companies. Hopeful US TDA will assist



Issues / Needs

4. US companies need subsidized, concessionary financing to match French, Italian, Chinese
5. 18 year ExIm financing attractive for renewables, however exposure fee often prohibitive (27.48% for Kenya)
6. Significant geo export opportunities in Ethiopia that require LT financing. Presently only ST financing available



Going Forward

- ExIm's new SME Supply Chain Financing promising. Need learn more about it
- GDA welcomes the NEI, related interagency collaboration. Need to learn more about it
- Thanks to ExIm's Rick Angiouni, Ben Todd for advice, guidance, perseverance on recent efforts to develop new Africa transactions
- Also US Embassy Nairobi/SCO Jim Sullivan
- GDA hopes design, build, supply many geothermal power plants to international clients from new Reno production facility

Geothermal Development Associates

THANKS FOR YOUR INTEREST

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