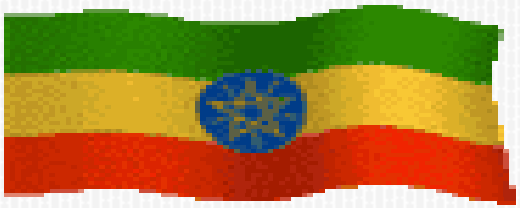


Ministry of Water Irrigation and Energy
Federal Democratic Republic of Ethiopia

HIGHLIGHTS OF THE ETHIOPIAN GEOTHERMAL SECTOR

Global Geothermal Alliance

Stakeholders Meeting

Nairobi, June 2015

ETHIOPIA

- Country in the horn of Africa
- Total area - 1.13 million square km
- 90 million inhabitants
- Population growth rate – 2.3% per year
- Average annual GDP growth rate ~ 11 %

ENERGY RESOURCES

- Hydropower potential 45,000 MW
- Geothermal potential 4,200 MW – 11,000 MW
- Solar energy potential 5.5 kWh /sq. m/day – annual average daily irradiation
- Average wind speed > 7 meter/second at 50 m above ground level – 1,350 GW
- Wood – 1,120 million tonnes (annually exploitable)
- Agro-waste – 15 to 20 million tonnes (annually exploitable)
- Natural gas - 4 TCF (113 billion m^3)
- Coal > 300 million tonnes.
- Oil shale – 253 million tonnes

ELECTRICITY STATUS

- Electricity grid geographic coverage – 55%
  - Connectivity ~ 25%
  - Per capita electricity consumption < 100 kWh/yr
- Generation capacity in the grid – 2,414 MW
  - Hydro – 1,940 MW
  - Wind – 324 MW
  - Geothermal ~ 7 MW
  - Diesel – 143 MW
- From 2002 to 2006, average annual electricity demand grew by 13%.
- Current demand growth rate > 20%

INSTITUTIONS

- Ministry of Water Irrigation and Energy - plans, leads, coordinates and monitors overall energy development
- Energy institutions affiliated to MoWIE
  - Ethiopian Electric Power– generation, transmission,
  - Ethiopian Electric Utility – distribution, sales
  - Ethiopian Energy Authority– regulatory body for electricity and energy efficiency
- Various federal ministries and agencies
  - Ministry of Mines
  - Geological Survey of Ethiopia
  - Ethiopian Petroleum Supply Enterprise
  - Ethiopian Petroleum Development Enterprise
- Energy bureaus in local regions

ENERGY POLICY FRAMEWORK

- Gives high priority to hydropower development, which is considered as the backbone of the country's energy sector development
- Wind, geothermal and solar
- Exploration for hydrocarbon fuels
- Bio-fuels for transport and household use
- The supply of various household fuels
- Energy efficiency and conservation
- Environmental sustainability
- Capacity building

CLIMATE RESILIENT GREEN ECONOMY STRATEGY

- The main objective is to improve the living condition of the population by reaching a middle income country status by 2025 based on a carbon-neutral growth pathway
- Guide the country against adverse effects of climate change
- Maximize the utilization of the country's hydro, wind, solar and geothermal resources, develop fuel efficient stoves, reduce the role of hydrocarbon fuels in industry and transport

GEOTHERMAL HISTORICAL BACKGROUND

- Geothermal development begun in the early seventies and continued during the eighties and nineties - surface investigations, temperature gradient wells and test drilling in selected sites were conducted.
- The first pilot plant was established at Aluto Langano in 1998 (7.2 MW).
- Expansion of the Aluto Langano site begun in 2010.
- Corbetti, Tulu Moye and Abaya sites were licensed for exploration by a private firm

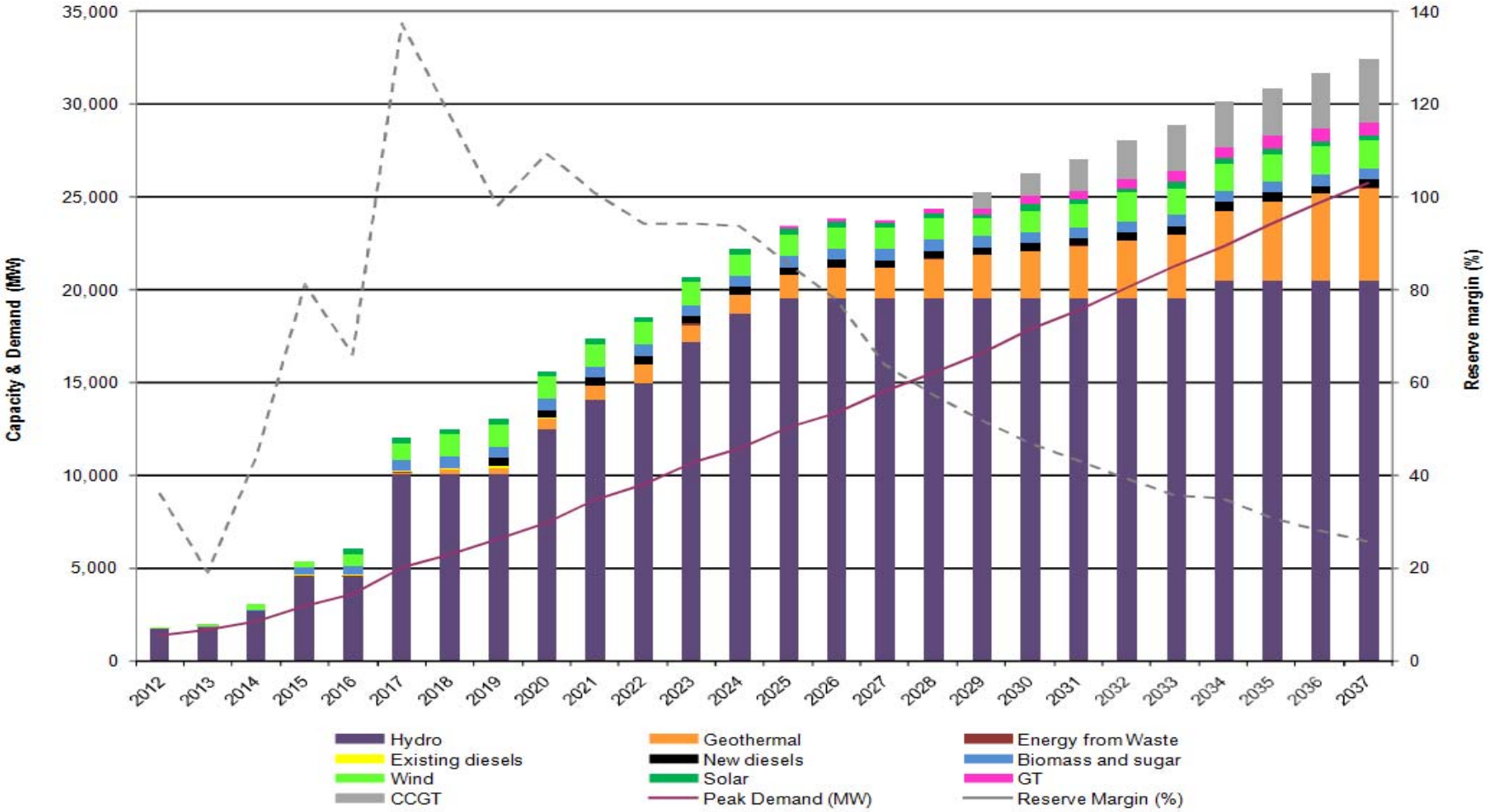
GEOTHERMAL CURRENT DEVELOPMENTS

- Geothermal projects
  - Aluto Langano geothermal expansion – 70 MW (2018)
    - GoE, GoJ, WB, SREP, ICEIDA
  - Tendaho Alalobeda 1st phase – 25 MW (2017)
    - GoE, WB, ICEIDA
  - Tendaho Dubti shallow reservoir – 12 MW (2018)
    - GoE, AFD, EU ITF
  - Corbetti Geothermal Power 1st phase – 500 MW (2018)
    - HoTPPA signed with Reykjavik Geothermal
    - Detailed PPA negotiations ongoing
    - Candidate under Power Africa initiative (USA)
- JICA, USAID/Power Africa, UNEP ARGeo, GRMF

Geothermal Resource Assessment

Site No.		Occurrence Probability 80%	Most likely (mode)	Occurrence Probability 20%
19	Corbetti	480	960	2400
16	Abaya	390	790	1900
13	Tulu Moye	202	390	1100
18	Boseti	160	320	800
21	Tendaho-1	140	290	660
4	Damali	120	230	760
7	Meteka	61	130	290
2	Tendaho-3	64	120	320
17	Fantale	64	120	320
14	Alhto-2	58	110	290
22	Tendaho-2	47	100	230
3	Boina	56	100	350
20	Alhto-1	49	91	180
7-1	Meteka-Amoissa	28	89	150
9	Dofan	41	86	200
7-2	Meteka-Ayehu	47	53	250
15	Alhto-3	23	50	110
1	Dallol	23	44	120
12	Gedemsa	20	37	100
11	Nazreth	17	33	100
23	Butajira	6	16	30
10	Kone	7	14	42
6	Danab	6	11	30
5	Teo	4	9	23
8	Arabi	4	7	36
	total	2114	4200	10791

ELECTRICITY GENERATION CAPACITY DEVELOPMENT UP TO 2037



Power System Expansion Plan 2014

GEOTHERMAL TARGETS

- After hydropower geothermal is the next optimum resource to develop
- Geothermal in the long term power development
  - 2,500 MW by 2030
  - 5,000 MW by 2037
- By 2037 - 30% of energy generated in the grid
  - Around 40,000 GWh
  - Capital cost 4,000,000 $/MW
  - 20 billion $ in 25 years

CHALLENGES AND OPPORTUNITIES

- Challenges and weaknesses
  - Large financial requirement
  - Resource and other risks
  - Long gestation period
  - Lack of institutional capacity
  - Shortage of professional skills (scientific, technical, commercial, legal)
  - Sub optimal legal and regulatory framework (upstream mineral – downstream energy/power)
- Opportunities and strengths
  - Large resource (considerable detailed investigations and test drillings done/ongoing)
  - Strong policy commitment (cost competitive, base load, renewable, heat as well as electricity, indigenous, energy security and climate resilience)
  - Open for private sector development

NEW GEOTHERMAL DEVELOPMENT FRAMEWORK

- Comprehensive review of the geothermal sector and design of strategy for development conducted
- Preparation of new geothermal legal and regulatory framework and institutional design underway (expected end of 2015)
  - Roles of existing and newly proposed public institutions
  - Models for private sector engagement


THANK YOU