



Highlights of Hydropower and Geothermal Energy Development

The 8th climate change and Development in Africa conference

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Energy Policy, Strategy and Information Directorate, MoWIE

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1. Energy Resources

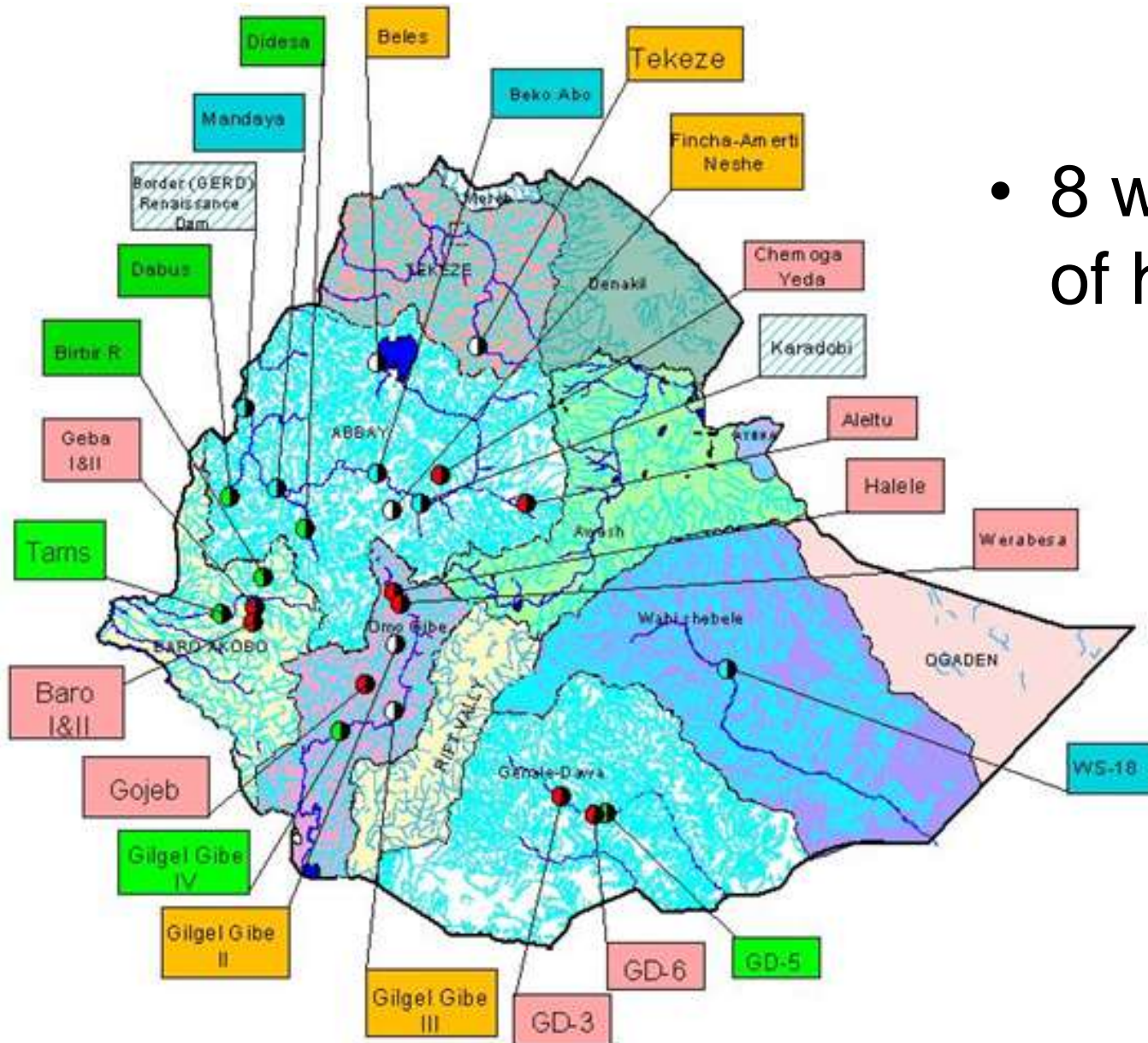
Hydropower	~ 48,030 MW
Geothermal	~ 10,000 MW
Solar	Average daily irradiation of ~ 5.75 kWh /sq. m.day or 2100 kWh /sq. m.year
Wind	> 1,000 GW with average wind speed of 7 meter/second and greater at 50 m above ground level
Wood	~ 1,100 million tones (annually sustainably exploitable)
Agricultural waste	~ 15 - 20 million tones (annually sustainably exploitable)
Natural gas (proven reserve)	~ 230 billion m ³ → 454.8 Billion m ³
Coal (proven reserve)	> 300 million tonnes
Oil shale (proven reserve)	~ 250 million tonnes

2. Hydropower Resource and Development Status

Hydropower Resource

No.	River Basin	Technical exploitable potential (MW)	Economic exploitable potential (MW)	Developed capacity (MW)
1	Abbay	23,868	11,459	7,315
2	Omo Gibe	7,960	5,226	4,634
3	BaroAkobo	7,744	2,988	0
4	Genela Dawa	3,246	881	254
5	Tekeze	2,377	750	300
6	Awash	689	127	107
7	WabiShebele	1,936	243	153
8	Rift Valley	209	0	0
		48,030	21,674	12,763

Hydropower Resource Map



- 8 wet river basins, 48,030 MW of hydropower potential

Energy Resources

Among the hydropower potential sites that are classified as technical exploitable potential, there are

- 24 large potential sites with a total installed capacity of 23,502MW,
- 259 medium potential sites with a total installed capacity of 21,693MW,
- 218 small potential sites with a total installed capacity of 2,835MW;

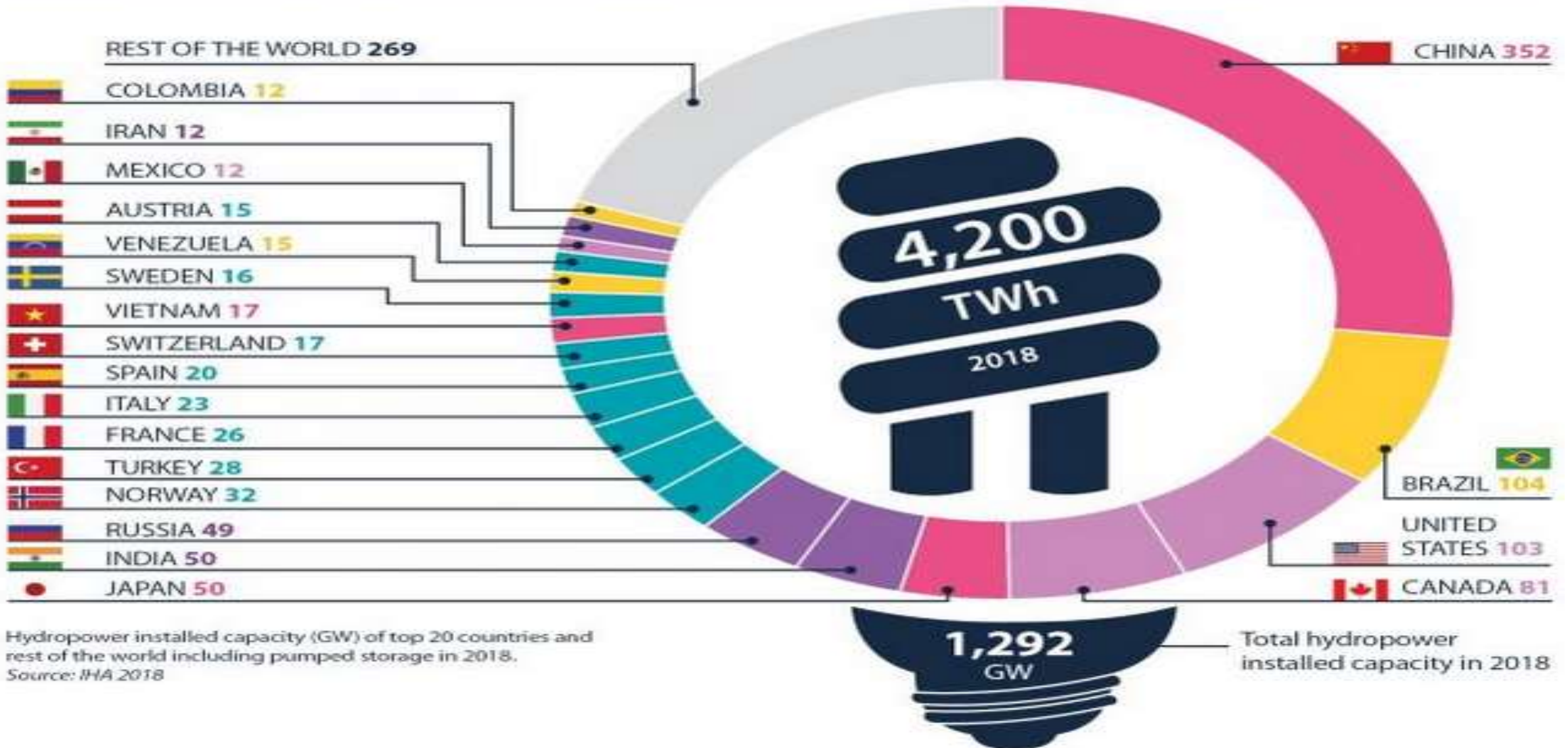
which constitutes the total technical exploitable hydropower potential to be 48,030MW.

Power Generation Facilities

- ✓ There are 22 power Plants in the system with a total of 4,260.6MW of which;
 - 14 of them are Hydropower plants with a total installed capacity of 3817.3MW ~89.6%
 - 3 of them are Wind Power Plants with a total installed capacity of 324MW ~ 7.6%
 - 1 one them is WtE Power Plant with an installed capacity of 25MW ~0.6%
 - 1 of them is Geothermal Power Plant with an installed capacity of 7.3MW ~0.2% and
 - 3 of them are Diesel Power Plants with a total installed capacity of 87MW ~2.0%
- ✓ Three (3) Hydropower plants under construction with a total capacity of 8, 864MW installed capacity; of which:-
 - 6,540 MW is GERD with average energy of 15,177 GWh
 - 254 MW Genale Dawa III with average energy of 1200KWh and
 - 2,160 MW Koysha average energy 6,460GWh

2019 Hydropower Status Report

HYDROPOWER INSTALLED CAPACITY WORLDWIDE



Planned Hydro power plants projects

✓Planned Plants (2030) :-

- 6 Hydropower plants =2,228MW

No.	Name of Plant	Capacity (MW)	Energy (GWh)
1	Chemoga-Yeda	280	1089
2	Halele-Werabesa	422	2029
3	Genale Dawa-5	100	750
4	Genale Dawa-6	256	1542
5	Dabus	798	3433
6	Geba	372	1749

3. Geothermal Resource and Development status

Geothermal Resource

According to the Geothermal Development Master plan Assessment result indicates that:-

- The value at occurrence probability 20% is around 11,000 MW
- The most likely value is around 4,200 MW,
- The value at occurrence probability 80% is 2,117 MW

Site No	Occurrence probability (80%)	Most likely	Occurrence probability (20%)
Corbetti	480	960	2400
Abaya	390	790	1900
Tullu moye	202	390	1100
Boseti	160	320	800
Tendaho-1	140	290	660
Damali	120	230	760
Meteka	61	130	290
Tendaho-3	64	120	320
Fantale	64	120	320
Aluto-2	58	110	290
Tendaho-2	47	100	230
Bonia	56	100	350
Aluto-1	49	91	180
Meteka-Amoissa	28	89	150
Dofan	41	86	200
Meteka-Ayelu	47	53	250
Aluto-3	23	50	110
Dallol	23	44	120
Gedemsa	20	37	100
Nazreth	17	33	100
Butajira	6	16	30
Kone	7	14	42
Danab	6	11	30
Teo	4	9	23
Arabi	4	7	36
Total (MW)	2117	4200	10,791

Geothermal Energy Resource Map



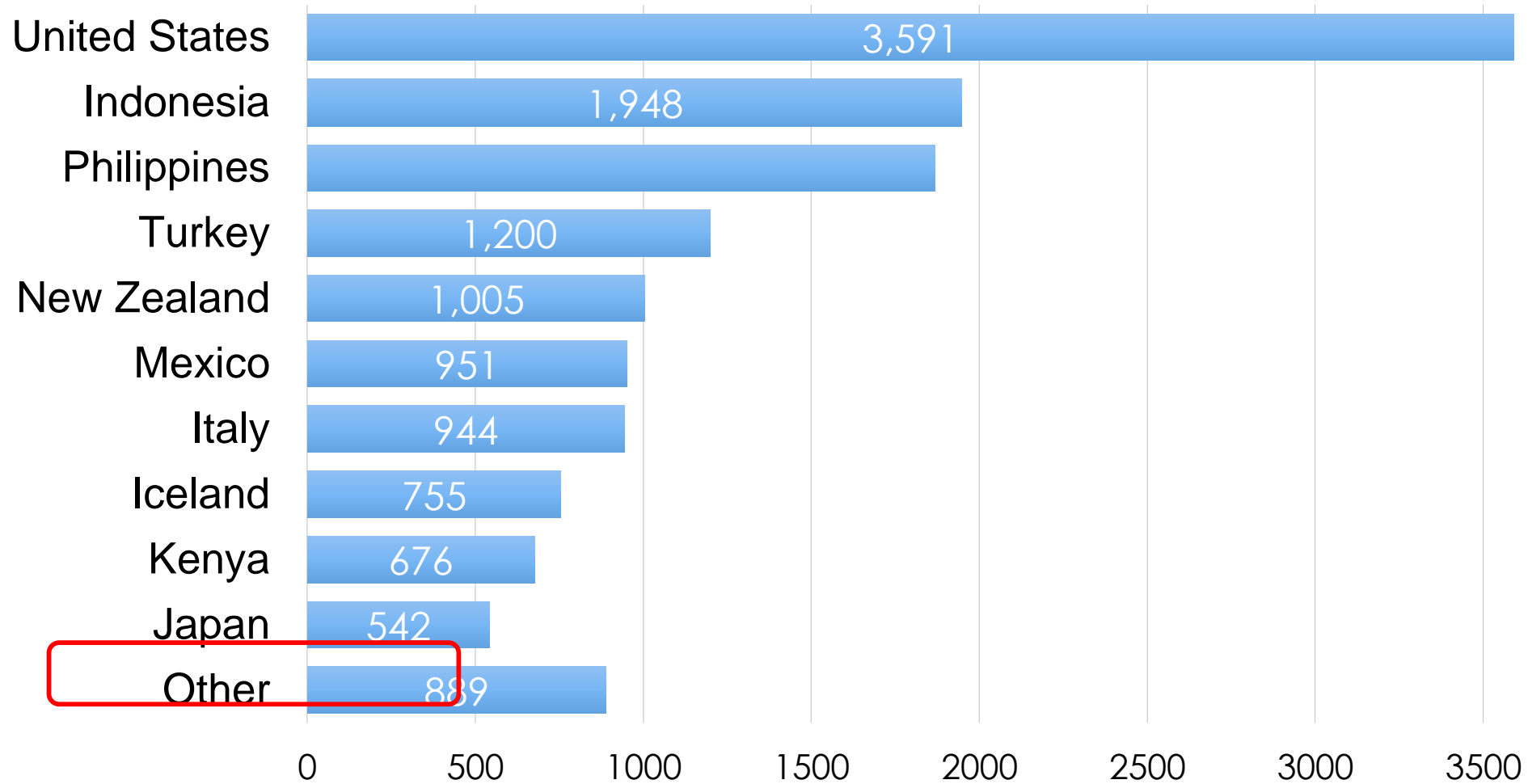
- 25 prospect sites identified with total potential of over 10,000 MW
- A larger number of areas have potential for medium to low temperature resources throughout the Ethiopian Rift System

Power facility from generation from Geothermal

- Drilling commenced in 1981 where a total of eight deep exploration wells were drilled.
- The 7.2 MWe Geothermal power plant was commissioned in 1998.
- The plant had intermittent operation between 1998 and 2014 with challenges of maintenance



Total Installed capacity (MW) as of Sept. 2018 Total 14,369 Mwe



ThinkGeoEnergy, Sept 2018

24 countries use geothermal for power generation 14.4 GW (2018) and about 83 countries for direct uses

Exploration and development activities underway

Aluto Lugano

- To build 70 MW Geothermal power plant it is planned drill 22 wells.
- A 5MW Geothermal wellhead power plant is planned to be operational May 2021.

Tendaho-Dubti

- Preparation works are in progress to drill 6 shallow production wells to develop 10-20 MW Geothermal power.

Tendaho- Alalobad

- Drilling 4 exploration wells in Alalobad is in the process

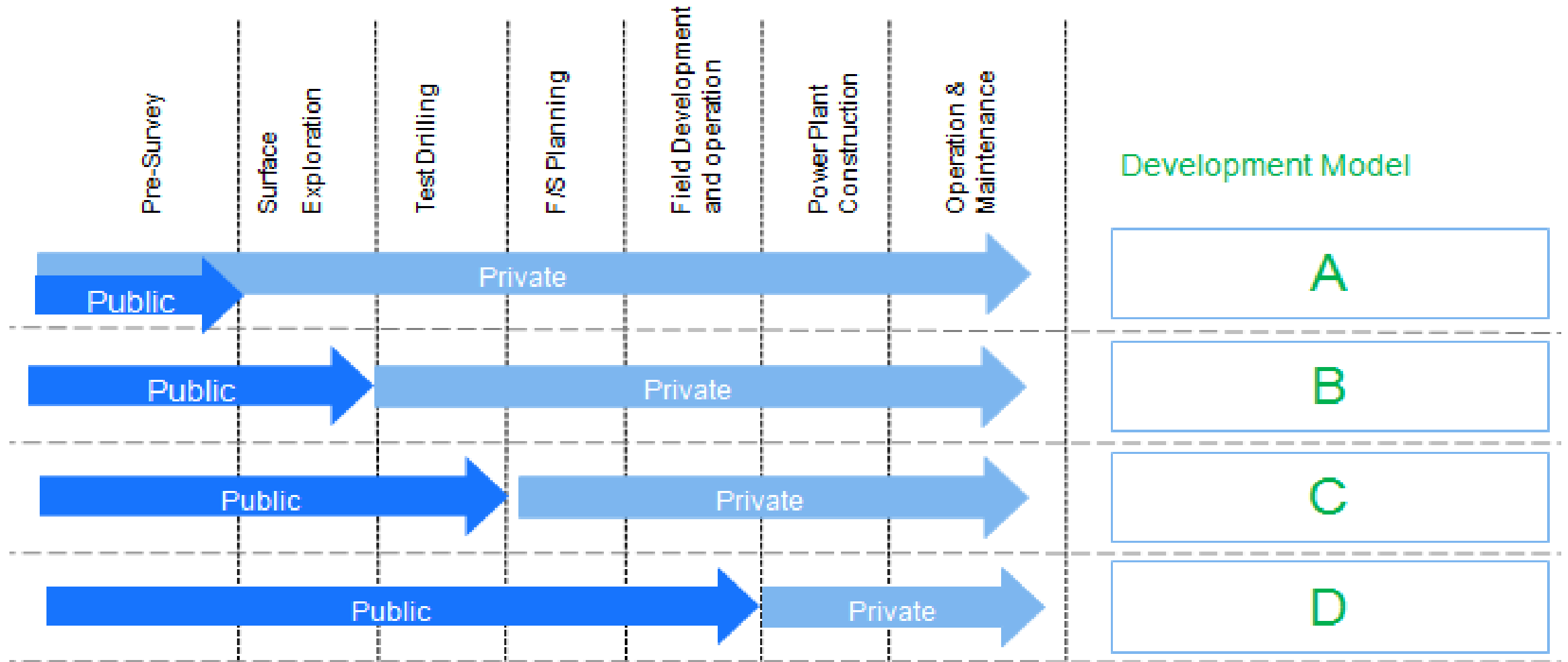
Planned Geothermal Projects

✓ Planned (2030): 7 Plants:-

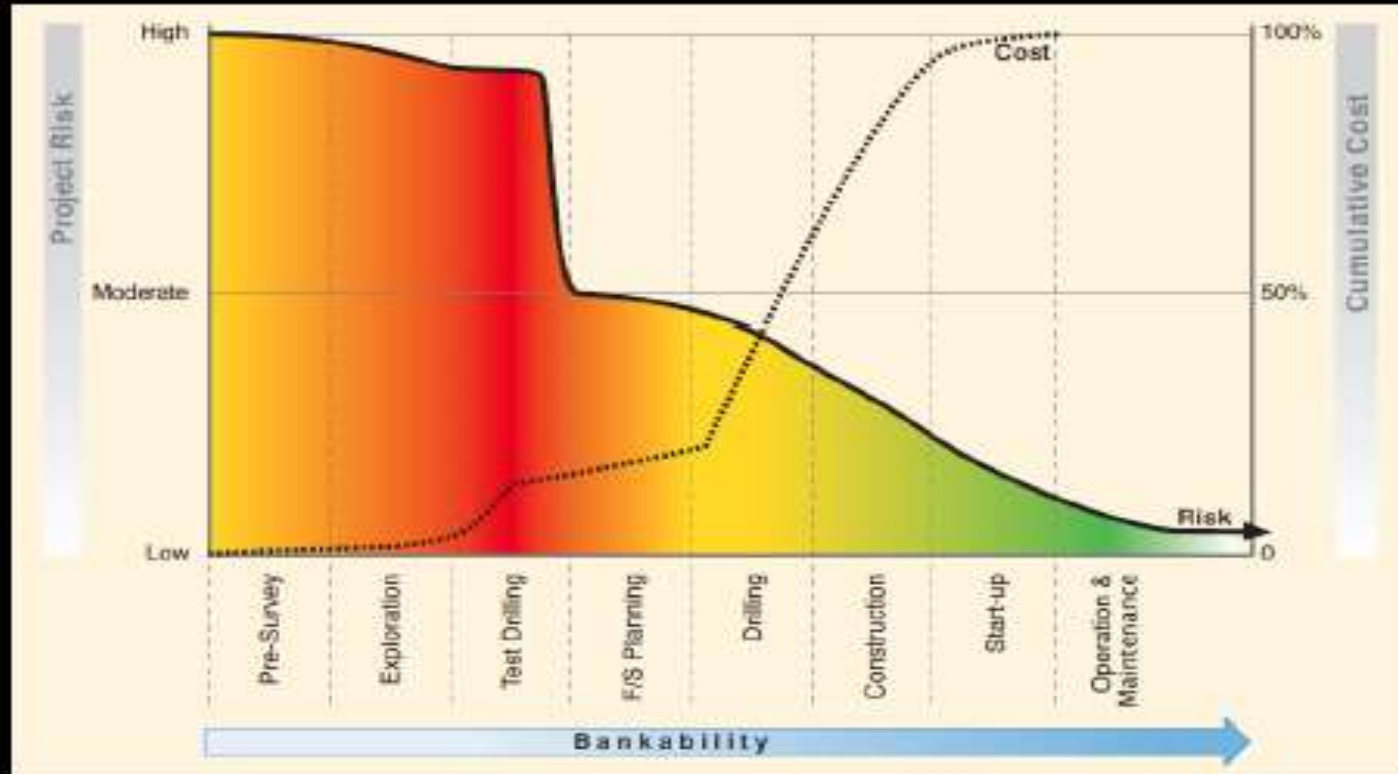
- 7 Geothermal=1,640MW with energy generation of 6,480GWh

No.	Name of Plant	Capacity(MW)	Energy(GWh)	Status
1	Korbeti	520	2080	Financial Closure
2	Tulu Moye	520	2000	Financial Closure
3	Shashemene	100	745	PPA Negotiation
4	Dofan	100	745	PPA Negotiation
5	Boku	100	745	PPA Negotiation
6	Dugna Fango	150	1117	PPA Negotiation
7	Fentale	150	1117	PPA Negotiation

Private sector participation



Geothermal power projects can be divided into distinct phases before power generation commences

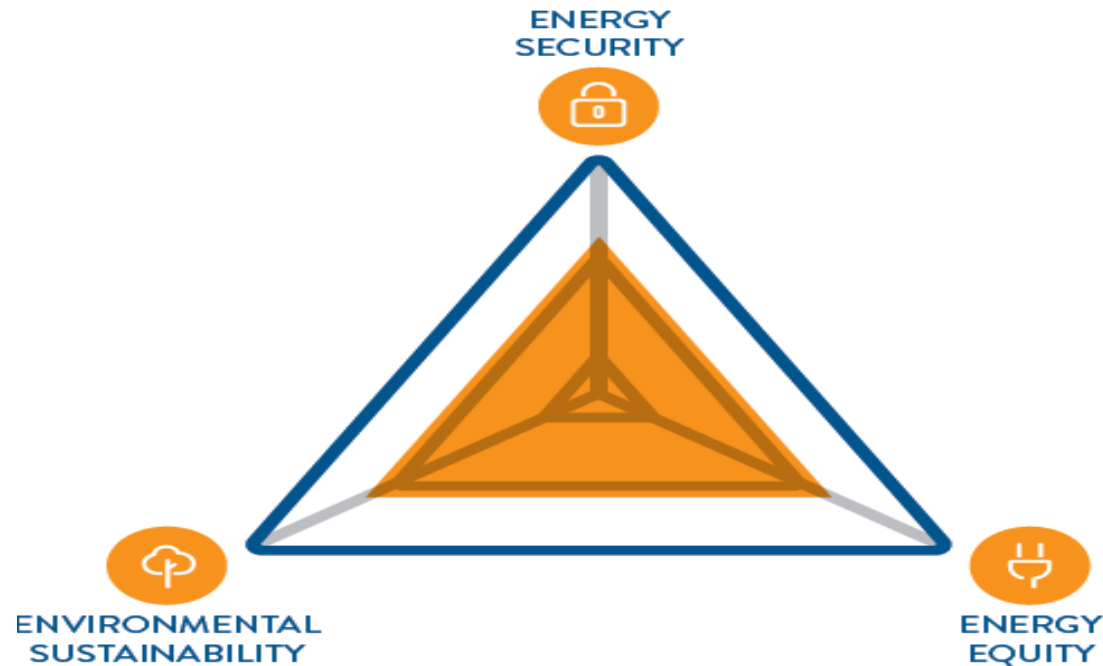


Resource risk is high until successful wells are drilled!

- Preliminary surveys (recon);
- Exploration (surface methods, TGH);
- Test drilling (slimholes, deep wells);
- Project review and planning (appraisal drilling, feasibility study);
- Field development and production drilling;
- Plant and facility construction; and
- Plant start-up and commissioning

4. Energy Trilemma Index Rank of Ethiopia

- Energy Trilemma Index ranks countries' energy performance on three dimensions: Energy Security, Energy Equity, and Environmental Sustainability
- Robust energy systems are secure, equitable and environmentally sustainable



TOP 10 OVERALL RESULTS

1. Denmark
2. Switzerland
3. Sweden
4. Netherlands
5. United Kingdom
6. Slovenia
7. Germany
8. New Zealand
9. Norway
10. France

EUROPE



LATIN AMERICA AND CARIBBEAN



NORTH AMERICA



MIDDLE EAST, GULF STATES AND NORTH AFRICA



SUB-SAHARAN AFRICA



ETHIOPIA

TRILEMMA INDEX RANKINGS AND BALANCE SCORE

RANK

110

SCORE

DDC



	2016	2017	2018	Trend	Score
Overall rank and balance score	118	116	110	▶	DDC
Energy performance					
🔒 Energy security	102	110	108	▶	D
🔌 Energy equity	117	111	108	▶	D
🌿 Environmental sustainability	90	91	73	▶	C
Contextual performance	111	110	113	▶	

5. Conclusion

- Hydropower will continue to be the dominate source of electricity production.
- Government commitment, proper Institutional setup and capacity buildings are the major corner stones for successful development of geothermal energy in the country.
- Energy leaders the country should strongly perform in the area of Energy Security and Energy equity to build Sustainable Energy System.

Thank you