

MINISTRY OF ENERGY AND NATURAL RESOURCES
OF TURKEY

**GEOHERMAL DEVELOPMENT
PROJECT**

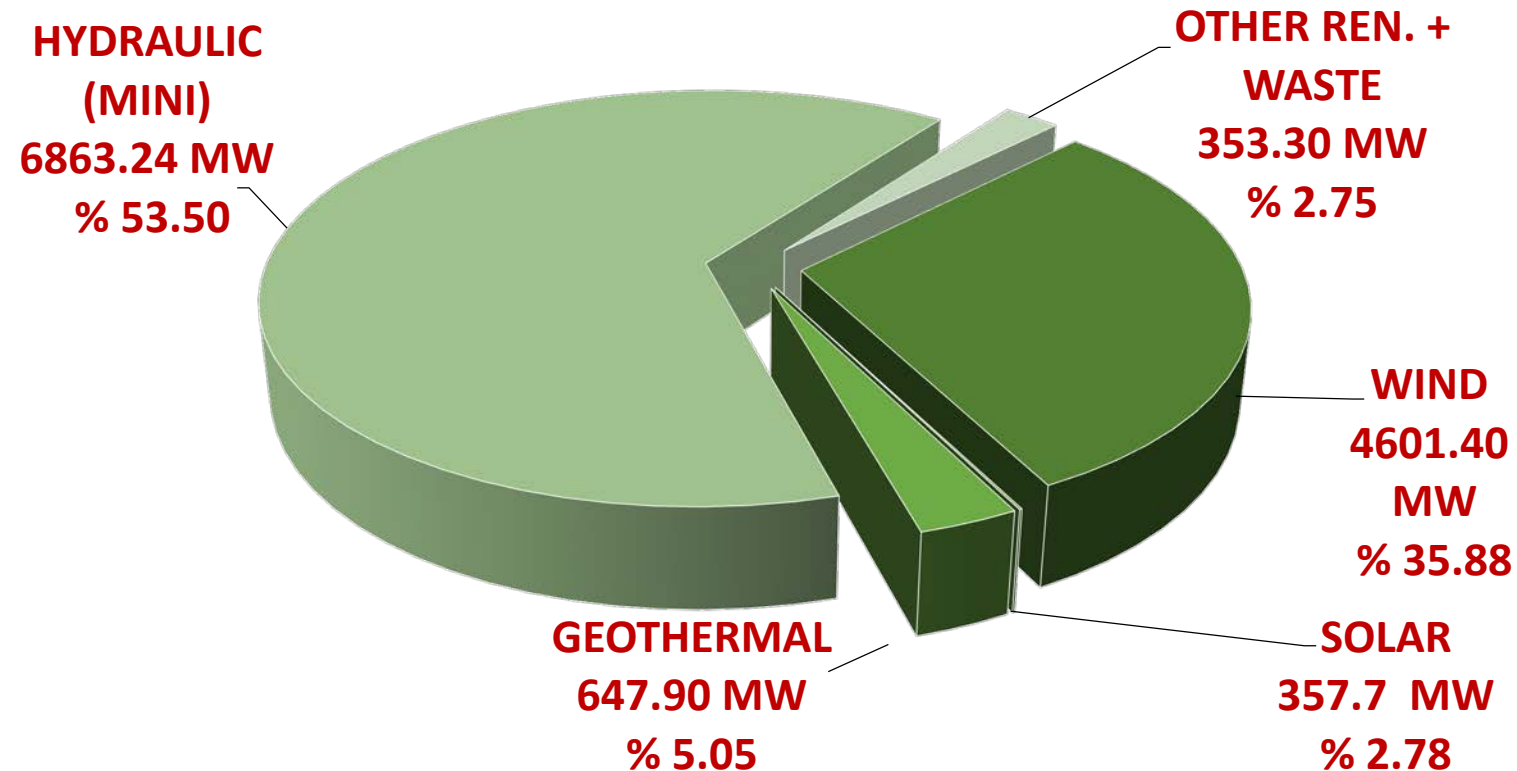
Global Geothermal Development Plan Third Roundtable

April 25-26, 2016

Reykjavik, Iceland

Geothermal Energy in Turkey

- Total installed capacity: 74,000 MW
- Renewable energy installed capacity: 17% (12,820 MW)



April, 2016

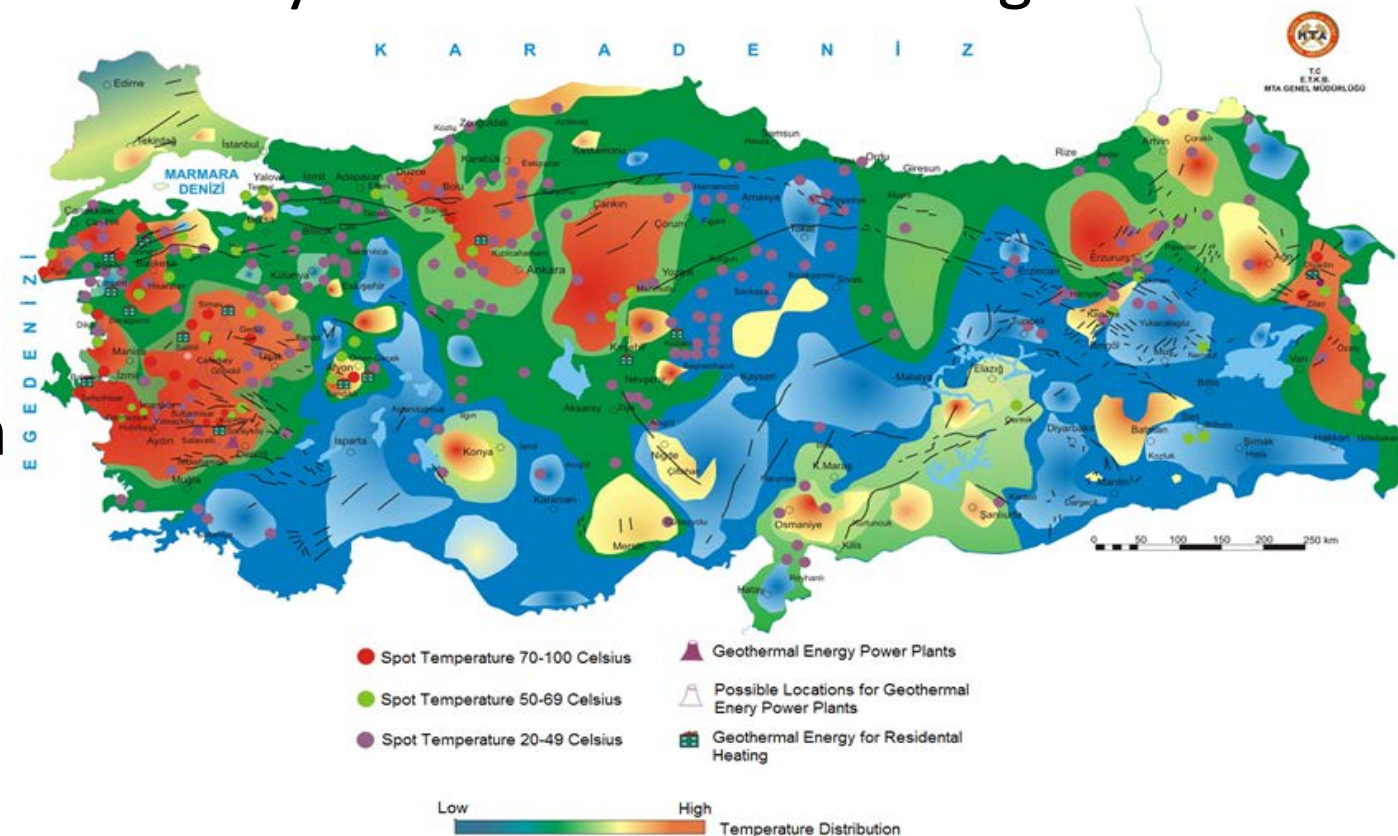
Geothermal Energy in Turkey*

THEORETICAL GEOTHERMAL HEAT POTENTIAL	31,500	MWt
THEORETICAL ELECTRICITY POTENTIAL	2,000	MWe
APPARENT HEAT CAPACITY	14,000	MWt
Current situation:		
EXPLORED FIELDS	230	Nbr
SUITABLE FOR ELECTRICITY FIELDS	25	Nbr
DWELLING HEATING	114,567	Residence Eq.
GREENHOUSE HEATING	3,931	Decares
THERMAL FACILITY	350	Nbr

*As of April 2016

Geothermal Energy in Turkey

- 78 % of geothermal potential is in Western Anatolia
- 55 % of the geothermal areas in Turkey are suitable for heating practices
- ~115,000 households in 21 districts heated with geothermal energy
- 648 MWe is under operation as of April, 2016
- Totally 39 projects of 629 MWe capacity are licensed



Geothermal Power Plants in Turkey

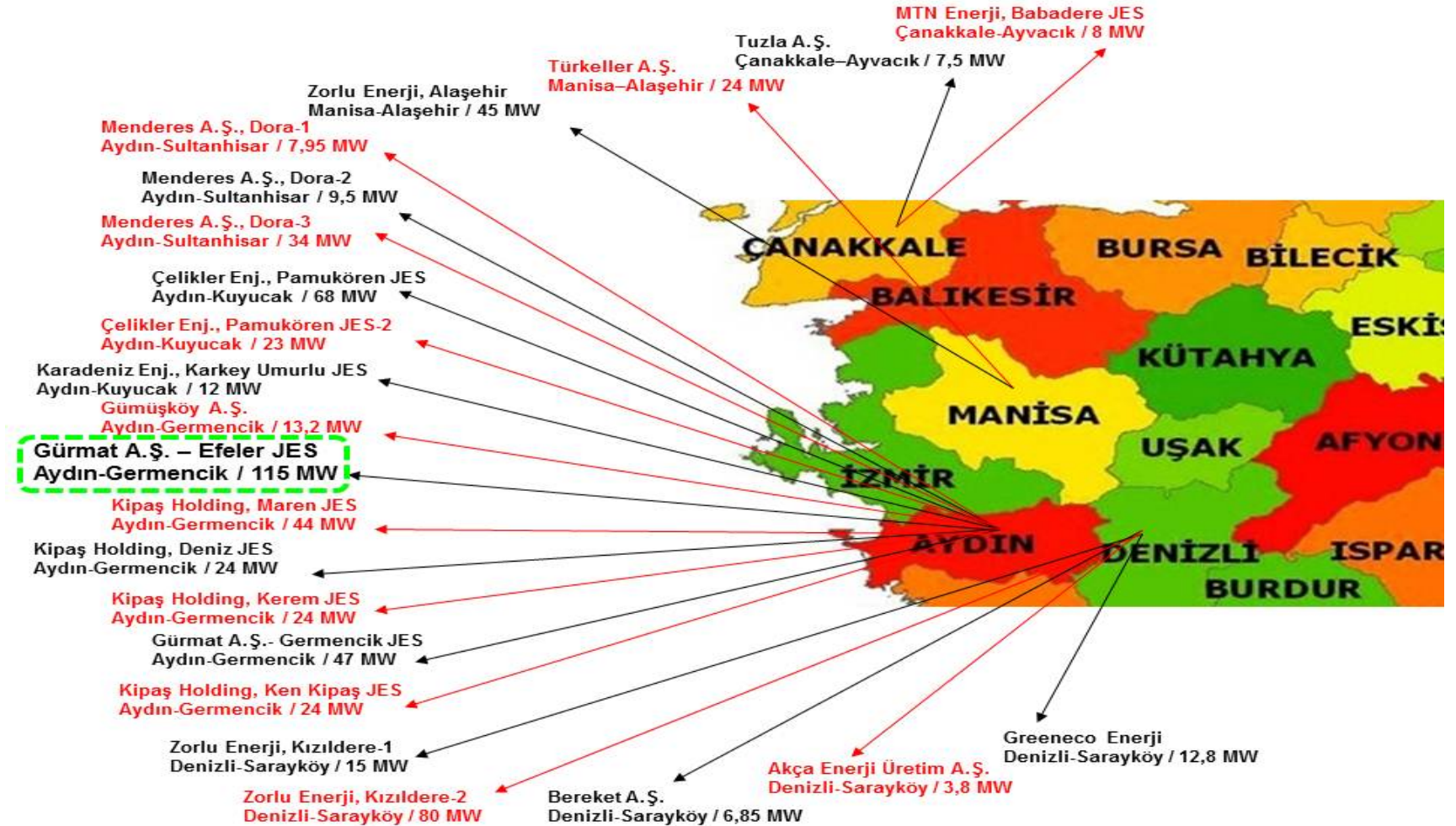
Çanakkale: 2

Manisa: 2

Denizli: 5

Aydın: 13

Total: 22



TARGETS FOR 2023



34,000 MW of hydro power plants



20,000 MW of wind power plants



5,000 MW of solar power plants



1,000 MWe for geothermal energy



1,000 MWe for biomass energy

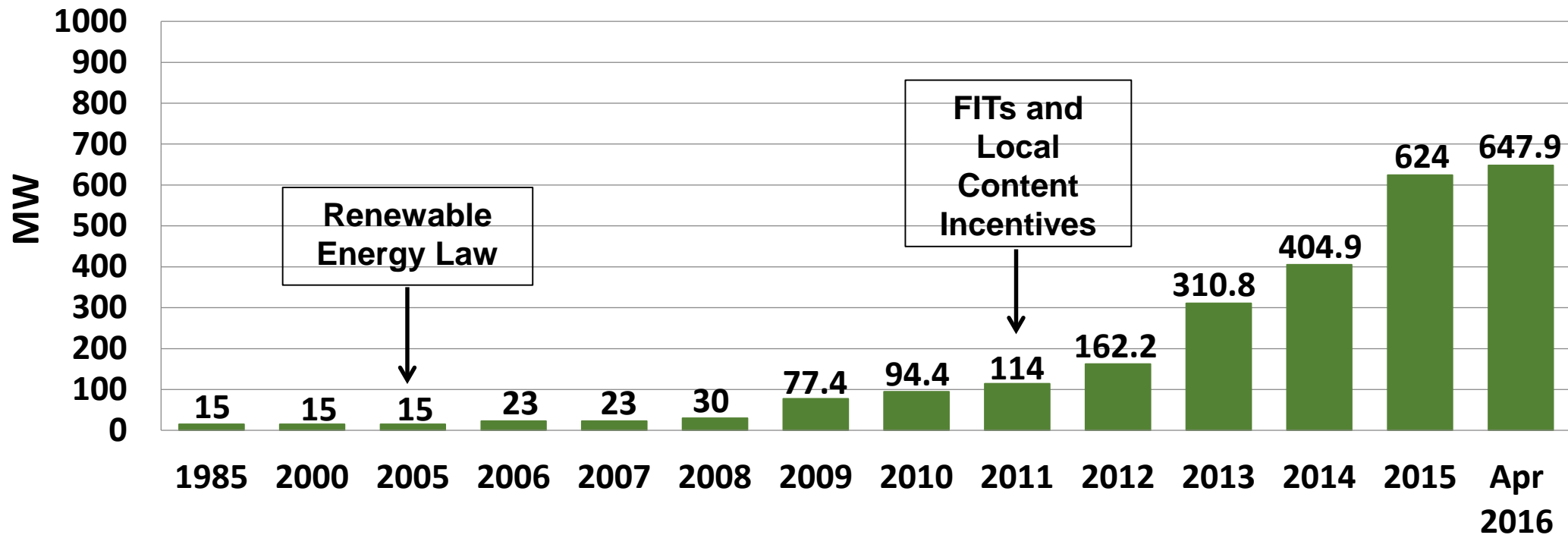
Incentives for Geothermal Energy

- Feed-in-tariff : Purchase guarantee at 10.5 US Dollar cent/kWh
 - Facilities in operation before December 31, 2020.
 - For a maximum term of 10 years from its operation date.

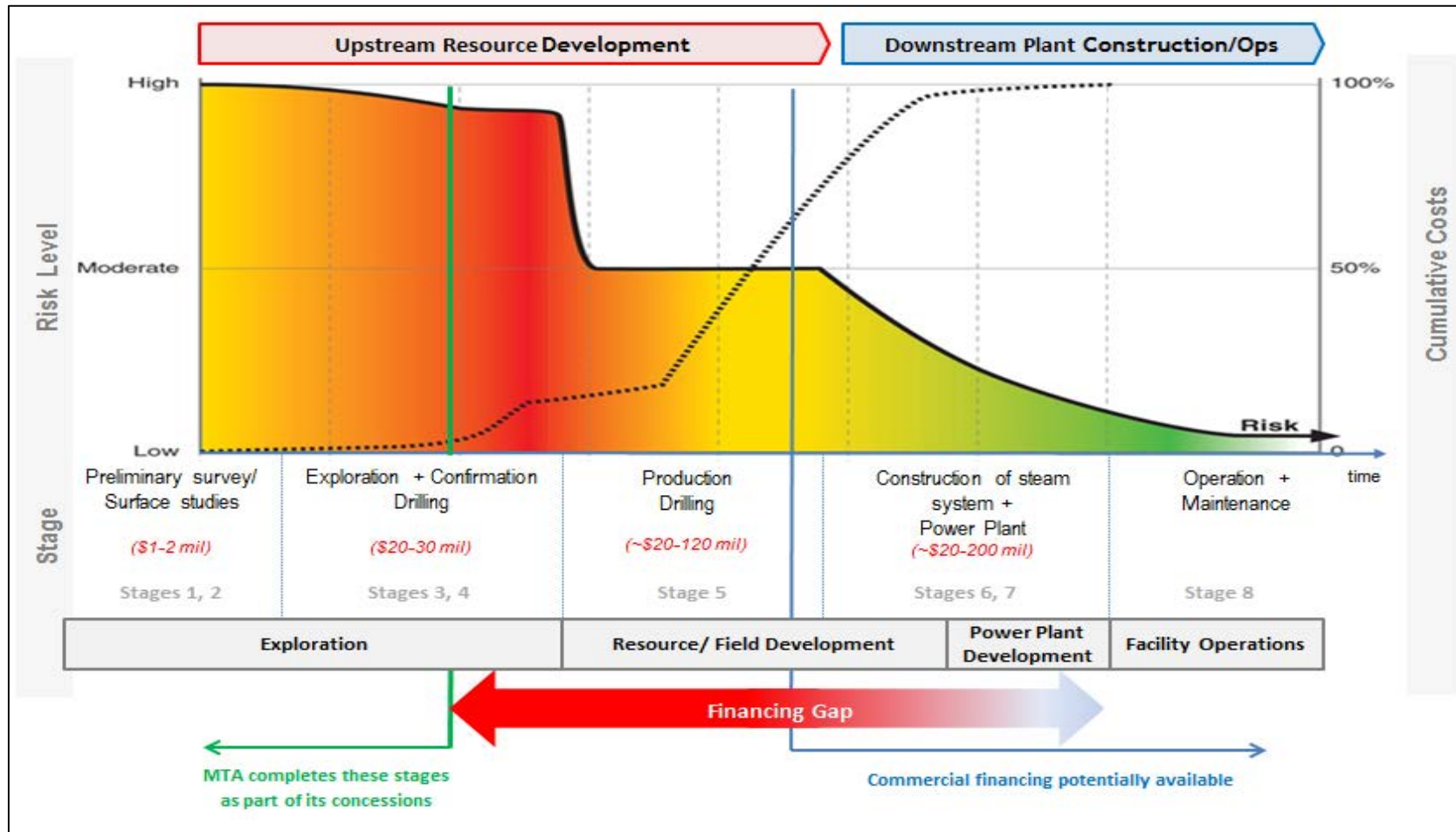
- Local content incentive
 - Facilities in operation before December 31, 2020.
 - For a maximum term of 5 years from its operation date.

Type of Renewable Energy Facility	Prices Applicable (US Dollar cent/kWh)
a. Hydroelectric production facility	7,3
b. Wind power based production facility	7,3
c. Geothermal power based production facility	10,5
d. Biomass based production facility (including landfill gas)	13,3
e. Solar power based production facility	13,3

Installed Capacity of Geothermal Power Plants by Years in Turkey



Risk and bankability profile of a geothermal power project



Project Objective

- *To scale up private sector investment in geothermal energy development in Turkey*
 - by reducing the risks in the early exploratory phases
 - by providing access to long-term financing to develop geothermal resources
- Component I → Risk Sharing Mechanism for Resource Validation
- Component II → Loan Facility for Resource Development

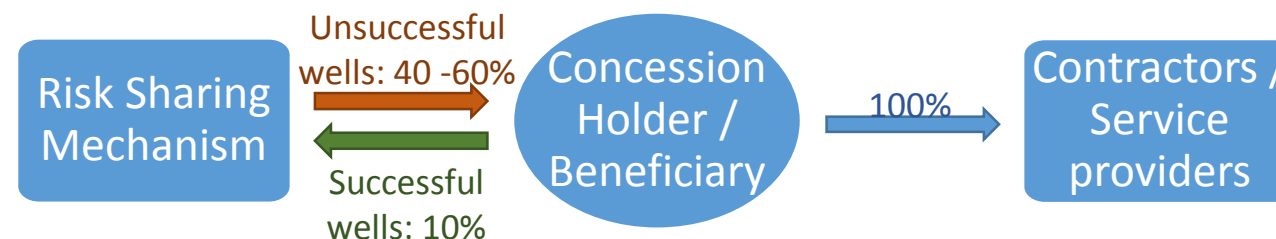


Components of GDP

- Component I → Risk Sharing Mechanism for Resource Validation
 - Stages: Exploration and confirmation drilling (Resource validation)
 - USD 38 million CTF contingency recovery grant + USD 1.8 million technical assistance grant
 - RSM under MENR
- Component II → Loan Facility for Resource Development
 - Stages: Resource development (capacity/production drilling) and power plant development
 - USD 250 million IBRD loan
 - FIs: Development Bank of Turkey (TKB)+ Industrial Development Bank of Turkey (TSKB)

Component I: RSM

- Sharing the risk of failing in exploratory and confirmation drilling among RSM administration and the developer
 - Screening applications based on a pre-defined set of technical, financial and corporate eligibility criteria
 - Pre-established well testing methodology to decide between success and failure
 - Failure → RSM covers 60% (or 40% depending on the location) of drilling expenditures
 - Success → Beneficiary puts 10% of expenditures in RSM



RSM Main Terms

- Developers apply for RSM coverage on a competitive basis
- Coverage provided for a program of 3 to 5 exploration wells per project
- Different well types eligible for coverage
 - Two phase wells for power production
 - Liquid wells for direct use
 - Slim wells for reservoir temperature verification
- Maximum payment from RSM → 4 million USD per drilling program
- RSM program terminates after two unsuccessful wells

RSM Application

- Extensive information to support application, including
 - Proof of permits
 - Results of surface exploration and conceptual model
 - Drilling plan and cost estimate
 - Business plan for the geothermal project
 - Proof of financial and technical capacity
 - Proposed success/failure criteria for exploration wells
- Successful applicants invited to negotiate success/failure criteria
 - Thermal output at minimum well head pressure (two phase wells)
 - Thermal output at minimum temperature and maximum drawdown (liquid wells)
 - Minimum temperature at specific depth (slim holes)

Component I: RSM

- Technical assistance to GDRE (short trainings and consultancy support)
 - Capacity building to successfully implement the RSM component
 - RSM Consultant
 - To provide financial and geothermal expertise
 - To design RSM in detail
 - To prepare the required draft legal documents (beneficiary agreements, forms and websites)
 - Responsible for implementation on a day to day basis
 - To prepare GDRE team take over the management of RSM

RSM: Expected impacts

- 20 geothermal exploration drilling projects supported
- 70 wells drilled
- Total Beneficiary investment: 202 million USD
- Total Project investment: 240 million USD



Turgut ÖLEMEZ
DG Renewable Energy
tolemez@yegm.gov.tr

Saniye KESER
DG Foreign Relations and EU
skeser@enerji.gov.tr