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Scaling up Geothermal Power

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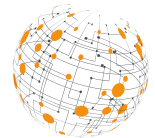
San Salvador, El Salvador | 29 September - 1 October 2022

Geothermal power

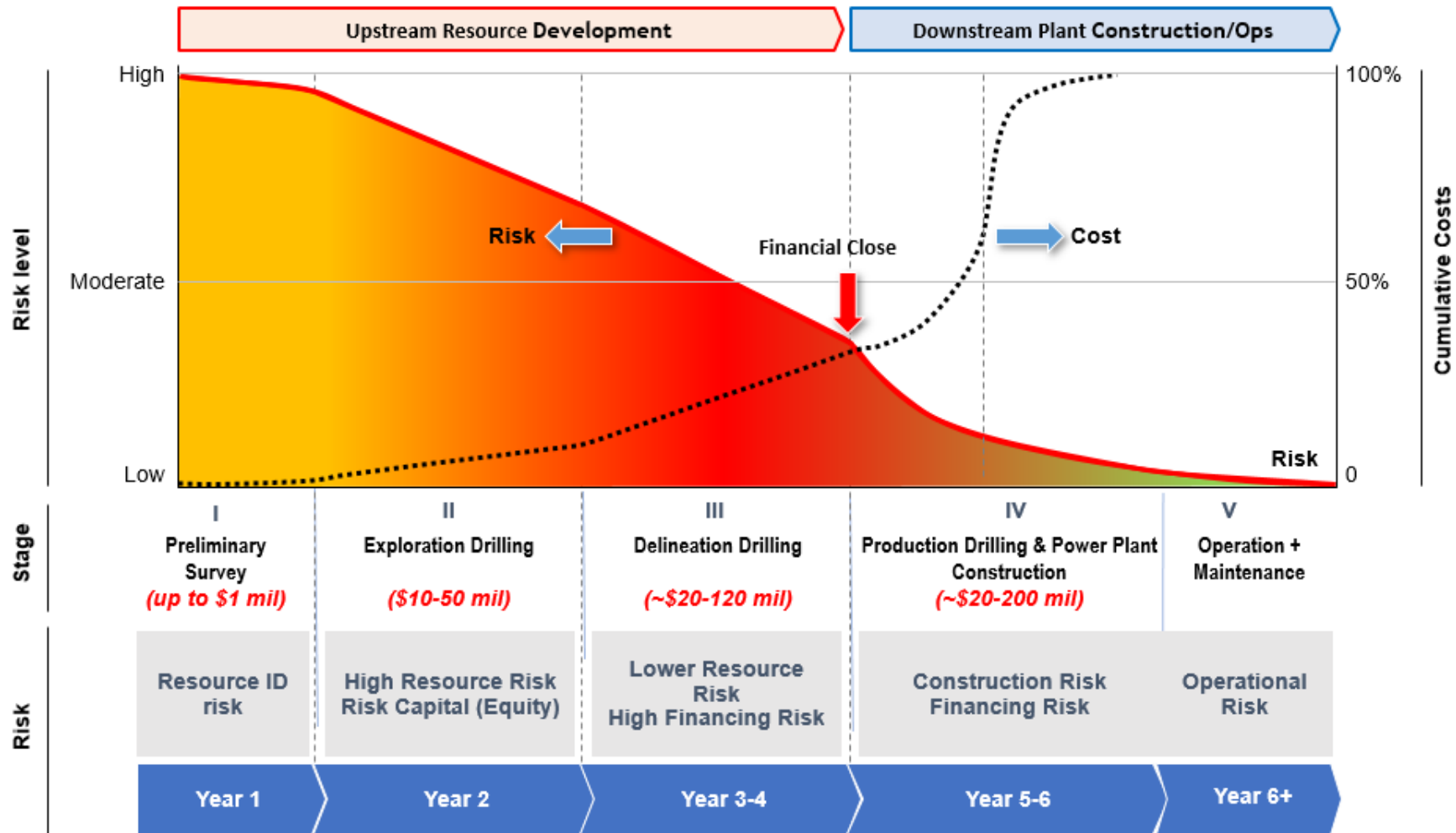
- **Can play significant role for multiple countries**
- **This includes countries like: Indonesia, Kenya, Ethiopia, Dominica, St. Lucia**
- **Limited progress has been observed for the last years in respect to installed power**



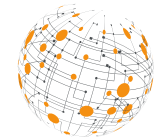
Picture: Sarulla, Indonesia



Geothermal development stages, risk and cost



Risk is reduced significantly after exploration drilling



Enabling environment

- **Legal framework**
 - Definition of geothermal resource
 - Ownership and protection
 - Institutional framework
 - Legal aspects of industrial parks
- **Government policies**
 - Enabling environment for investment
 - Financial incentives and support mechanism



Picture: ©Mannvit, Nesjavellir



Enabling environment

- **Geothermal knowledge**
 - Country's geothermal resources
 - Resource management
- **Social acceptance**
 - Changes to the environment and health
 - Stake-holders
 - Education
 - Gender Equality



Picture: ©Hinrik Bjarnason, Friðheimar



Geothermal energy

- **Geothermal energy is more than just electricity**
- **It can contribute to decarbonization of the heat market**
- **Geothermal energy can be harness as**
 - Electrical generation
 - Co generation of electricity and heat (including minerals and gas)
 - Direct use
- **Technologies to harness electricity**
 - Binary
 - Flash
 - Enhanced geothermal system (in “R&D” stage)
 - USA DOE announced its goal to lower cost by 90 percent by 2035
 - Geothermal deep drilling (in R&D stage)
- **Technologies to harness heat (stand a lone)**
 - Heat central
 - Heat pumps
 - Enhanced geothermal system (R&D stage)



Government Project preparation and implementation (SRMI* approach)

- **Planning**

- Identification of resource
- Legal and regulatory framework
- Demand current and future
- Least cost plans
 - Electricity
 - Direct use
 - Distribution e.g. grid

- **Strategy**

- Public parties roles and responsibilities
- Socio economic benefits
- Development targets and timeline
- Development schemes

- **Implementation**

- Public party preparation of early phase(s) of program
- Public investments if any for the projects
- Risk mitigation instruments
- Contractual agreements

*SRMI=Sustainable Risk Mitigation Facility



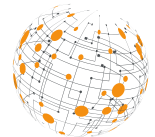
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Why geothermal energy

- **High-capacity factor**
- **Can regulate fluctuations in the grid**
- **Geothermal direct use**
- **Low footprint**
- **Long lifetime**
- **Industrial park (cascaded/integrated production)**



Picture: ©Lydur Skulason, Olkaria, Kenya

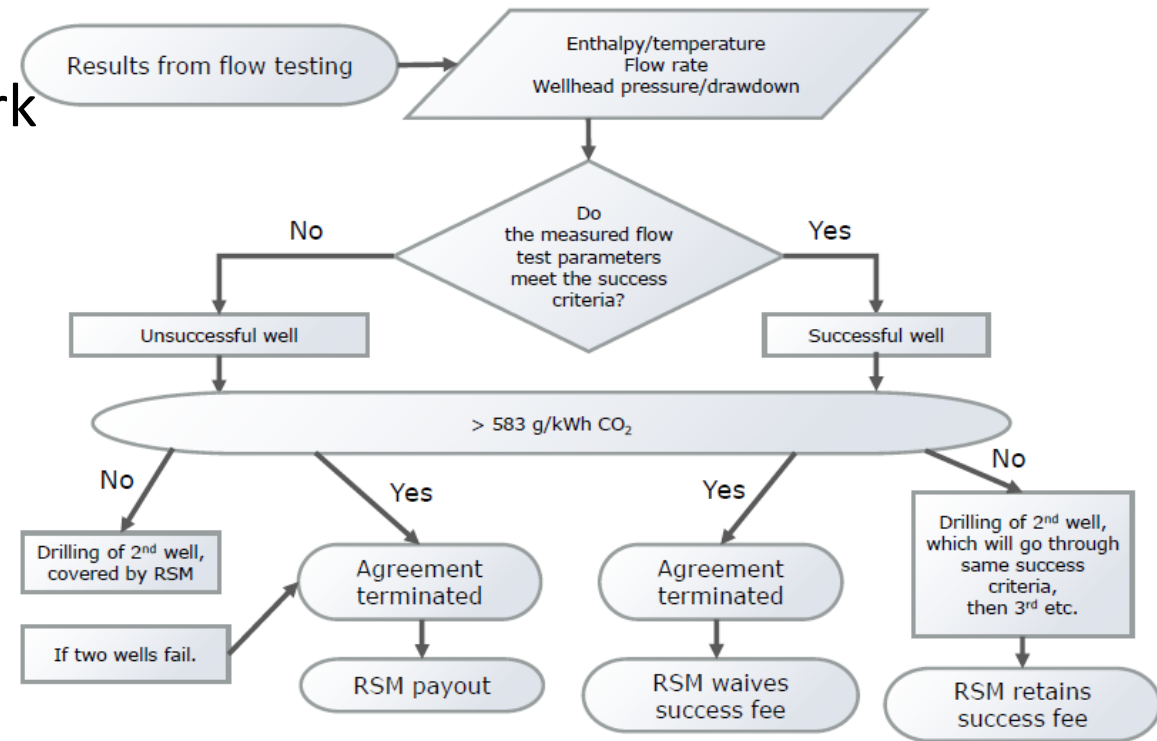


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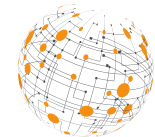
Türkiye – geothermal programs

- **Public support from 2007**
 - exploration drilling
 - Simple legal and regulatory framework
 - Favorable feed in tariff
- **First project approved in 2016**
 - Loan \$250 mUSD
 - 241 MW installed electricity
- **Included Risk Sharing Mechanism (RSM)**
 - CTF grant \$39.8 mUSD
 - Projects:
 - 12 project focus on electrical generation,
 - 3 projects focus on co generation and
 - 4 on direct use.

Determination of Success/Failure



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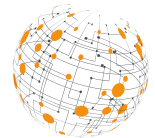
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Türkyie - Risk Sharing Mechanism

- **Second project approved in December 2021**
 - \$300 mUSD lending of which minimum \$30 mUSD is earmarked for direct use projects
 - Expected to result in 383 MW installed capacity and 30MWt.
 - Expected to leverage \$550 mUSD of private financing



Picture: ©World Bank, Geothermal Power Plant, Türkyie



Türkyie Climate Smart and Competitive Agricultural Growth Project (TUCSAP)

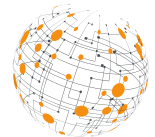
- **Finance:**

- ~340 mUSD IBRD loan approved on March 30th 2022
- Of which, 30 mUSD for a pilot project in utilizing geothermal for horculture
- Targeted mobilization of private sector financing: 100 mUSD for geothermally heated green houses

- **Implementation will include drilling and needed infrastructure**

- **Economic and social**

- In 2020 it is estimated that 40% of the agricultural workforce in Turkey were women





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Muchas Gracias!



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International Renewable Energy Agency