

INSURANCE SCHEME FOR THE INDONESIA'S GEOTHERMAL DEVELOPMENT PROJECT

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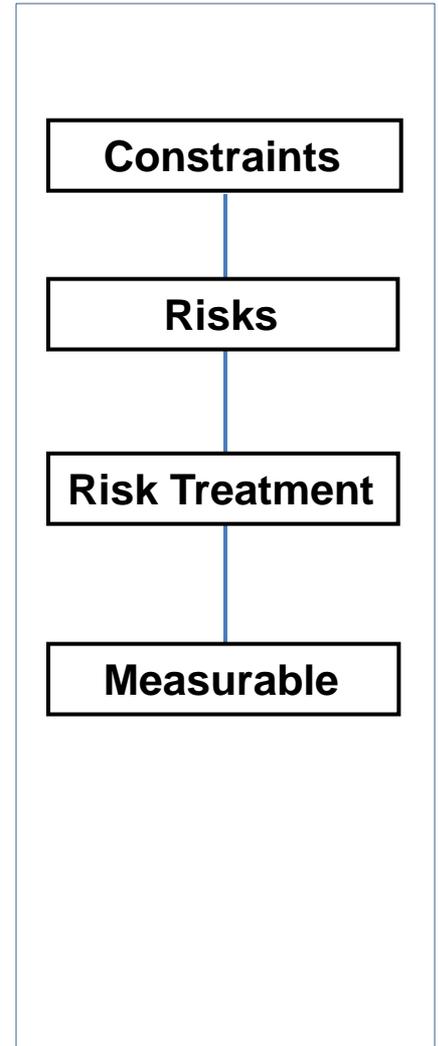
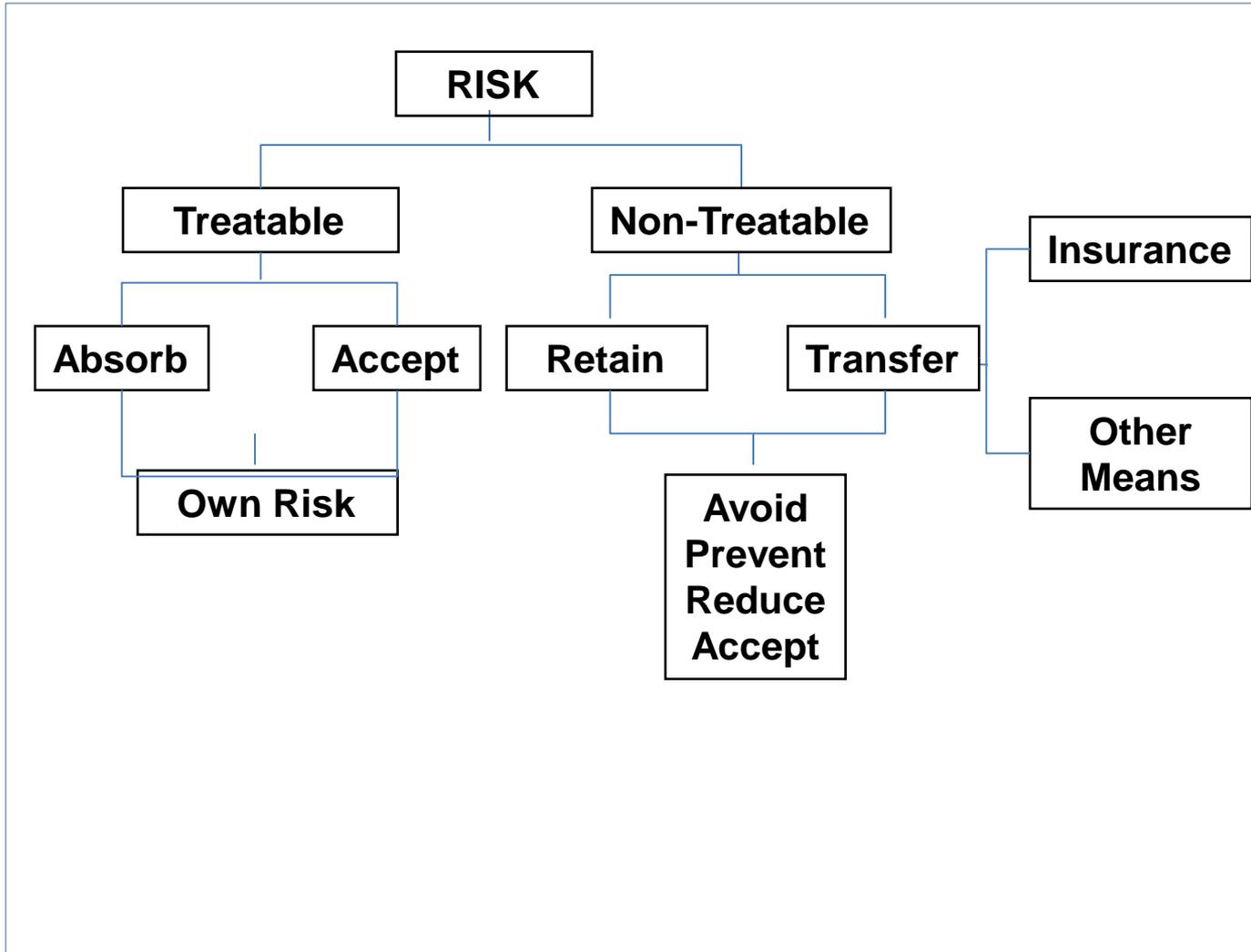
UNIQUE CHARACTERISTICS

- Investment in a geothermal power plant depends on a large number of conditions:
 - Geology
 - Investment environment
 - Political stability
 - Legal certainty
 - Power market; and
 - Infrastructure.
- Inherent risks associated with the geothermal project undertaking:
 - Exploration, not finding the economically viable temperature or flow rate in a geothermal reservoir.
 - Development and operation of geothermal resources are subject to several risk factors which vary between different geothermal systems.
 - The unexpected geology may cause problems with the drilling process.
- Specifications of a geothermal power plant differs site by site or no standardized specifications of power plants.

GEOTHERMAL PROJECT'S RISKS

Type of Risks	Phase	Probability	Consequent
Geological/Reservoir			
Identification	Exploration	Frequent	Major
Field Survey	Exploration	Frequent	Major
Drilling (exploration/delineation)	Exploration	Frequent	Major
Development Drilling	Development	Frequent	Major
Reservoir Capacity & steam quality	Development	Frequent	Major
Higher Investment Cost	All phases	Frequent	Significant
Operational:			
Blowout & re-drilling	Drilling	Rare	Major
Pollution	All phases	Occasionally	Significant
Construction Permit	Development	Probable	Major
Construction Schedule	Development	Probable	Major
Reservoir Capacity & steam quality	Operation	Occasionally	Major
Equipment Breakdown	Operation	Probable	Significant
Prop. Damage/Business Interruption	All phases	Probable	Significant
Force Majeure	All phases	Rare	Major

RISKS TREATMENT



RISKS MITIGATION SCHEME

Government Participation

- Government undertakes the initial exploratory survey (shifting IPP's participation from green fields to brown fields):
 - New Zealand: Gov conducted early exploration (1960's);
 - Philippines: SOE (Philippine National Oil Coy) conducted initial exploration (1970's);
 - Iceland: Energy Fund to promote utilization of geothermal energy;
 - Japan: NEDO carryout advanced study in certain geothermal selected areas (preliminary survey and exploratory drilling) ;
 - World Bank's Geofund

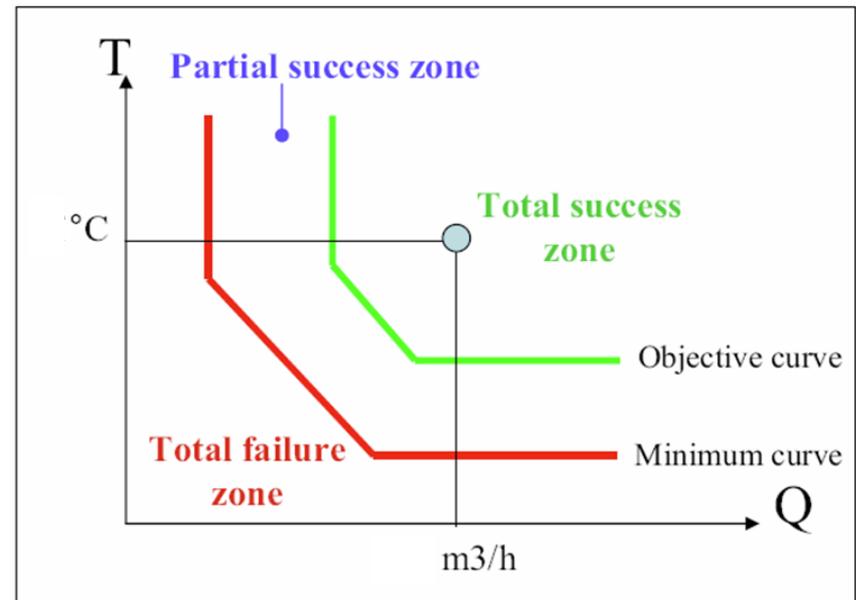
Insurance Scheme

- France (1981 & reactivated in 2006):
 - Short Term Risk: Exploration
 - Long Term Risk: Exploitation
- Germany (2009):
 - Drilling insurance facilities for drilling geothermal wells over 400 meter (Government & Private)
- Switzerland:
 - 1987-1997: risk guaranteed system (up to CHF 10 million)
 - 2006: Geothermal risk coverage (50% of subsurface costs)
- World Bank:
 - Partial; Risk Guaranteed Facilities (for Europe & Central Asia for exploration and drilling geothermal wells)

RISKS COVERAGE TO BE CONSIDERED

- Preliminary Survey
 - Not Insured
- Exploratory Drilling
 - Geological Risks:
 - Failure to find heat
 - Insufficient reserve to produce required heat or planned capacity
 - Technical Risks:
 - Problems during drilling.
 - Dangerous gas
 - Natural Disasters:
 - Volcanic eruption;
 - Other geological hazards

France's Short-Term Risk's criteria or parameter of insured or guaranteed loss



CRITERIA FOR EXPLORATORY SUCCESS

- Minimum temperature for steam power plant to run efficiently is $\pm 200^{\circ}\text{C}$;
- MW benchmark has to be determined on a case by case basis:
 - Available information on the geothermal reservoir before the drilling;
 - For example, first exploration well drilled in a geothermal system might be considered successful if it provides 3 MW of electrical power with 15 bar well head pressure.
- Fluid with pH value of less than 5 is considered corrosive and could be considered as a benchmark for fluid acidity.
- Other parameters, scaling and the presence of non-condensable gases does not impose significant constraints on geothermal development, but will impact operation and maintenance cost of geothermal project.
- Reservoir temperature and the well power output can be estimated quantitatively easily, but the chemical parameters can only be estimated qualitatively at this stage.

INSURANCE SCHEME FOR INDONESIA

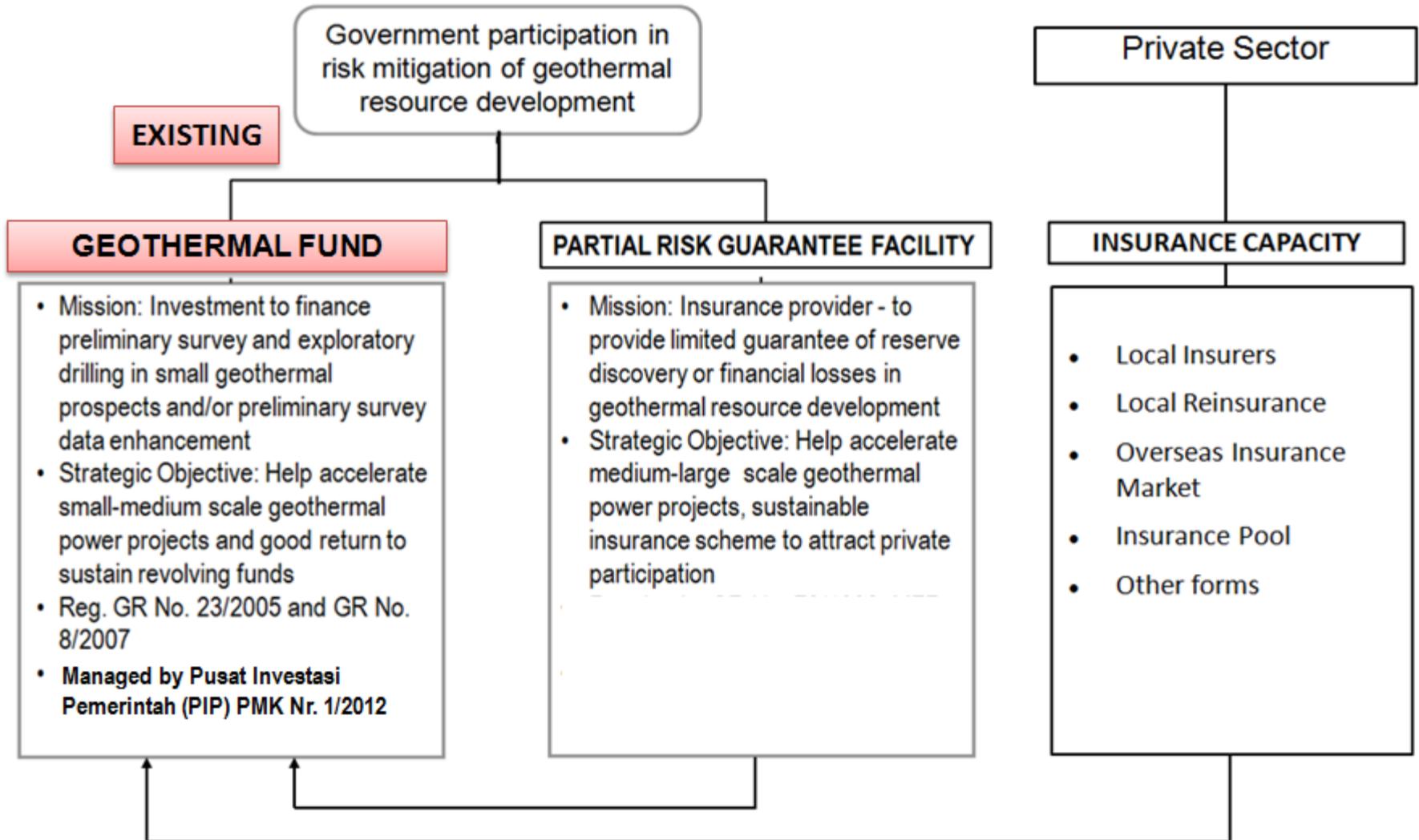
Objectives & Goals

- Development Constraints:
 - Fund is limited
 - Risks of failures
- Objectives & Goals:
 - Key driver to geothermal development in Indonesia;
 - Making the geothermal development attractive for investors and lenders;
 - Revolving & sustainable.

Types of Risks:

- Associated with operation:
 - Professional indemnity;
 - Regulatory;
 - Technical risks;
- Technical Risks:
 - Property damage;
 - Business interruption;
 - Machinery breakdown;
 - Construction risks.
- Associated with geology:
 - Exploration
 - Exploitation

GOI'S PARTICIPATION



INSURANCE SOLUTION FOR INDONESIA

WEAKNESS:

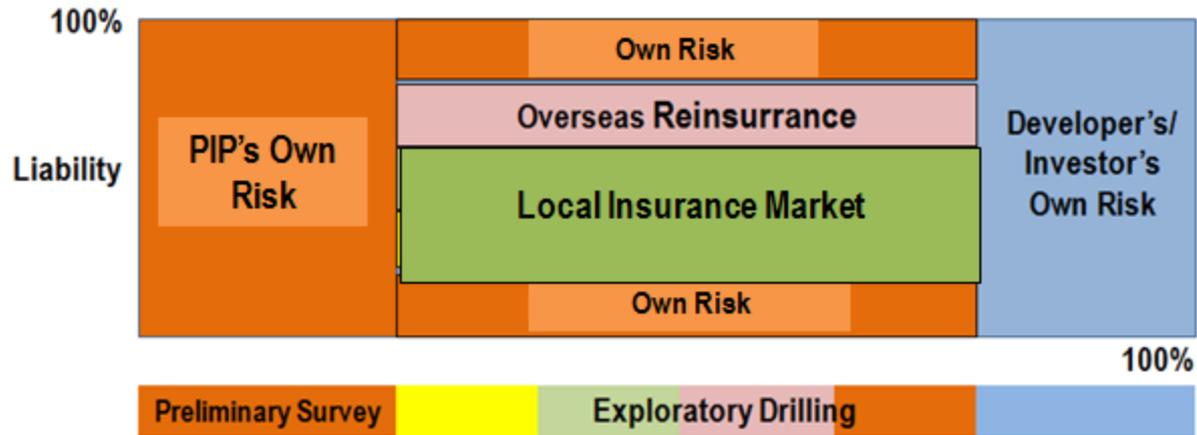
- Insurance for geothermal exploration risks still unknown in Indonesia
- Not generally known internationally
- Small population
- No sufficient statistical data
- Small paid up capital
- Geothermal exploration perceived as undesirable risks
- Technical expertise in geothermal risk is rare

STRENGTH:

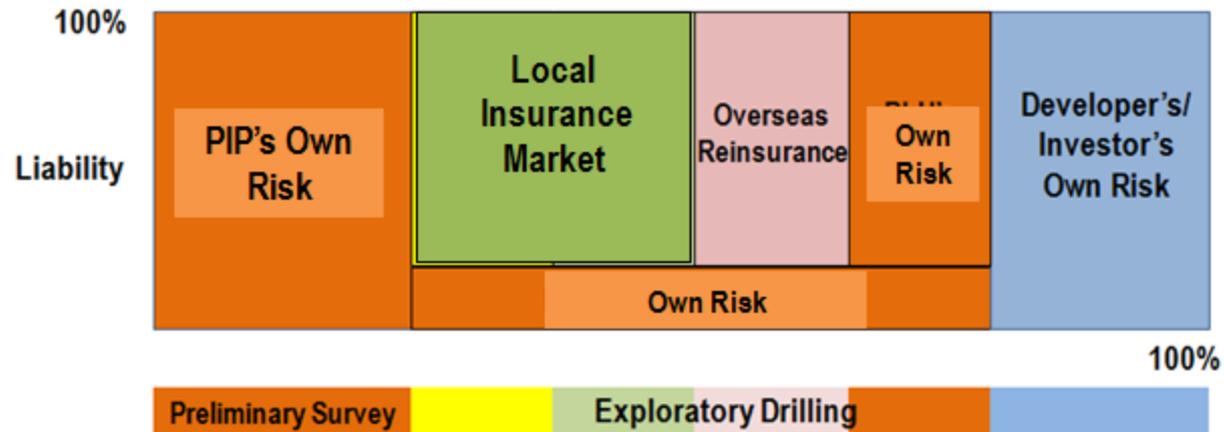
- Local insurance market has some experiences in local capacity building
- Insurance, guarantee, grant, fund for risk mitigation known as key success in geothermal development such as in France, Germany, Iceland
- Known big potential attracts insurance capacity
- Revolving Fund Scheme can act as the key driver
- Risk management application in insurance market can make undesirable risks becoming acceptable

ALTERNATIVE INSURANCE STRUCTURE

Non-Proportional Basis



Proportional Basis



CONCLUSIONS

- Geothermal resources development may be accelerated by providing exploration risk insurance, which will provide the developer with:
 - Financial security for the venture capital needed until the completion of drilling works and successful well testing.
 - Proof of risk coverage in order to facilitate acquisition of loan capital.
- Main advantage of the risk mitigation scheme through insurance:
 - It combines both project financing via a credit and the mitigation of exploration risk in one program.
 - Risk coverage consists of a loan being for-given if the project is unsuccessful.
- As insurance for geothermal development is still unknown in Indonesia's market:
 - Its introduction would require actuarial analysis to determining the insurance premium.
 - Actuarial analysis has to be based on the prudent assumption and the generally applicable insurance practice;
 - Require reliable statistical data on the probability of success of a project at a specific site in certain area.

CLOSING REMARKS

- Political risk:
 - Regulatory changes; and
 - Inconsistencies in the government's policy.
- Commonly available to foreign investors:
 - Associated with possible negative events such as expropriation of assets;
 - Changes in tax policy,;
 - Restrictions on the exchange of foreign currency, or
 - Other changes in the business climate.
- For domestic investors:
 - Regulatory and environmental and social risks;
 - Can add to the uncertainties of doing business in geothermal energy development have yet to be addressed".