



**Risk management and risk covering systems
for geothermal projects**

Singapore, 3 November 2010

**Attorneys
Auditors
Tax Consultants
Business Consultants**

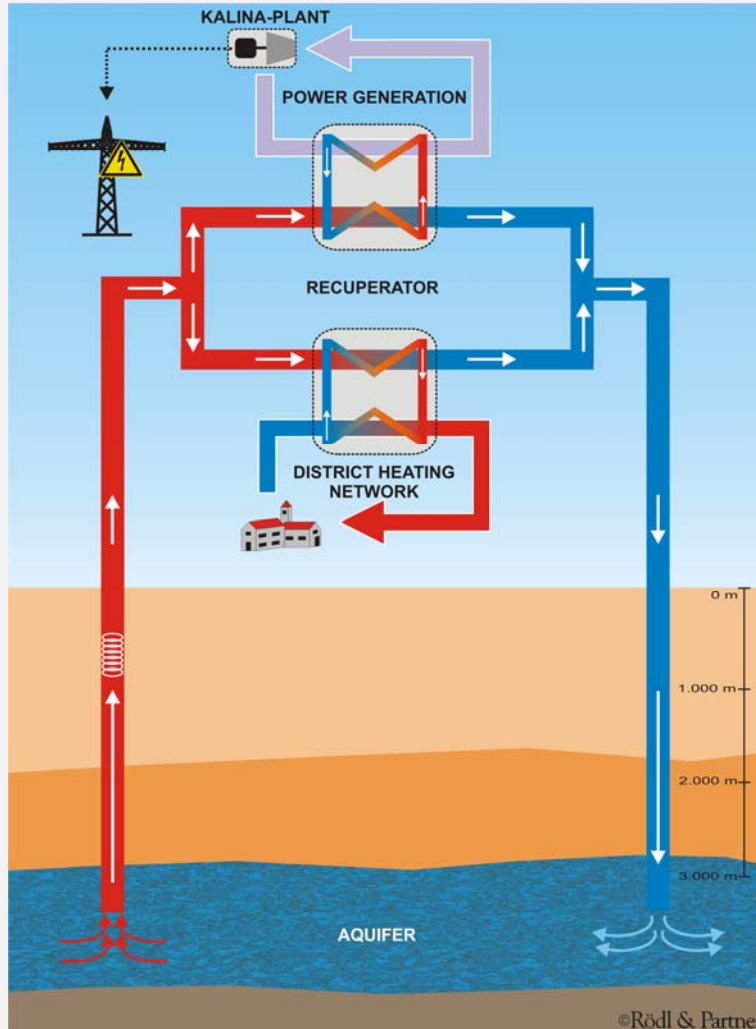
Rödl & Partner

We are one of the few professional service firms which has succeeded by its own efforts alone to become one of the leading service firms in the world.



Geothermal Projects

Overview project concept Unterhaching

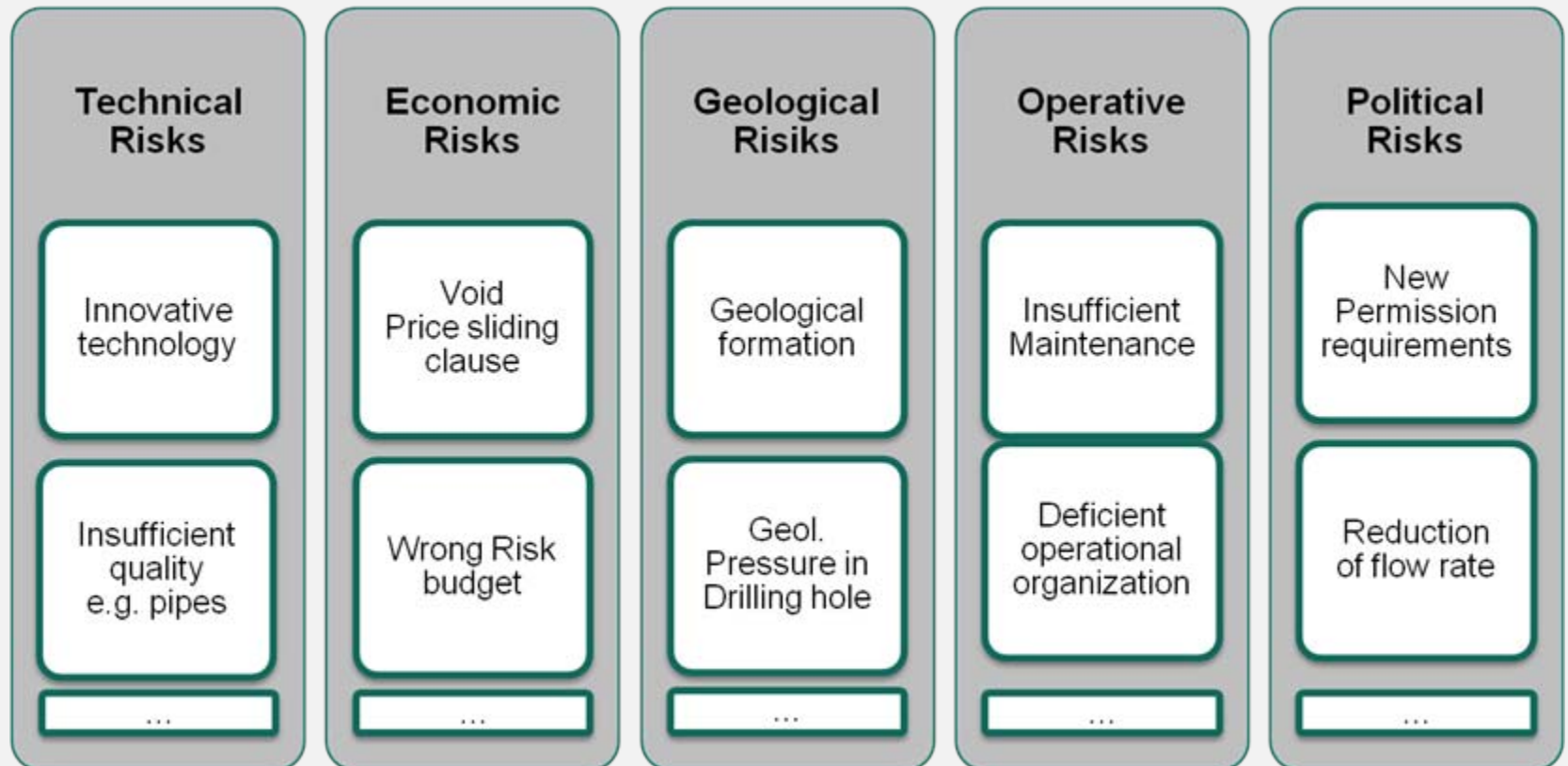


- Production well
- Reinjection well
- Pumps
- Heat exchanger
- Thermal water pipeline
- Power generation plant
- District heating network

Geothermal Projects

Overview risks

Risk categories of a geothermal project



Risk Fund System

Basic idea of an insurance for the geological risk

High investment costs + High risk in exploration phase

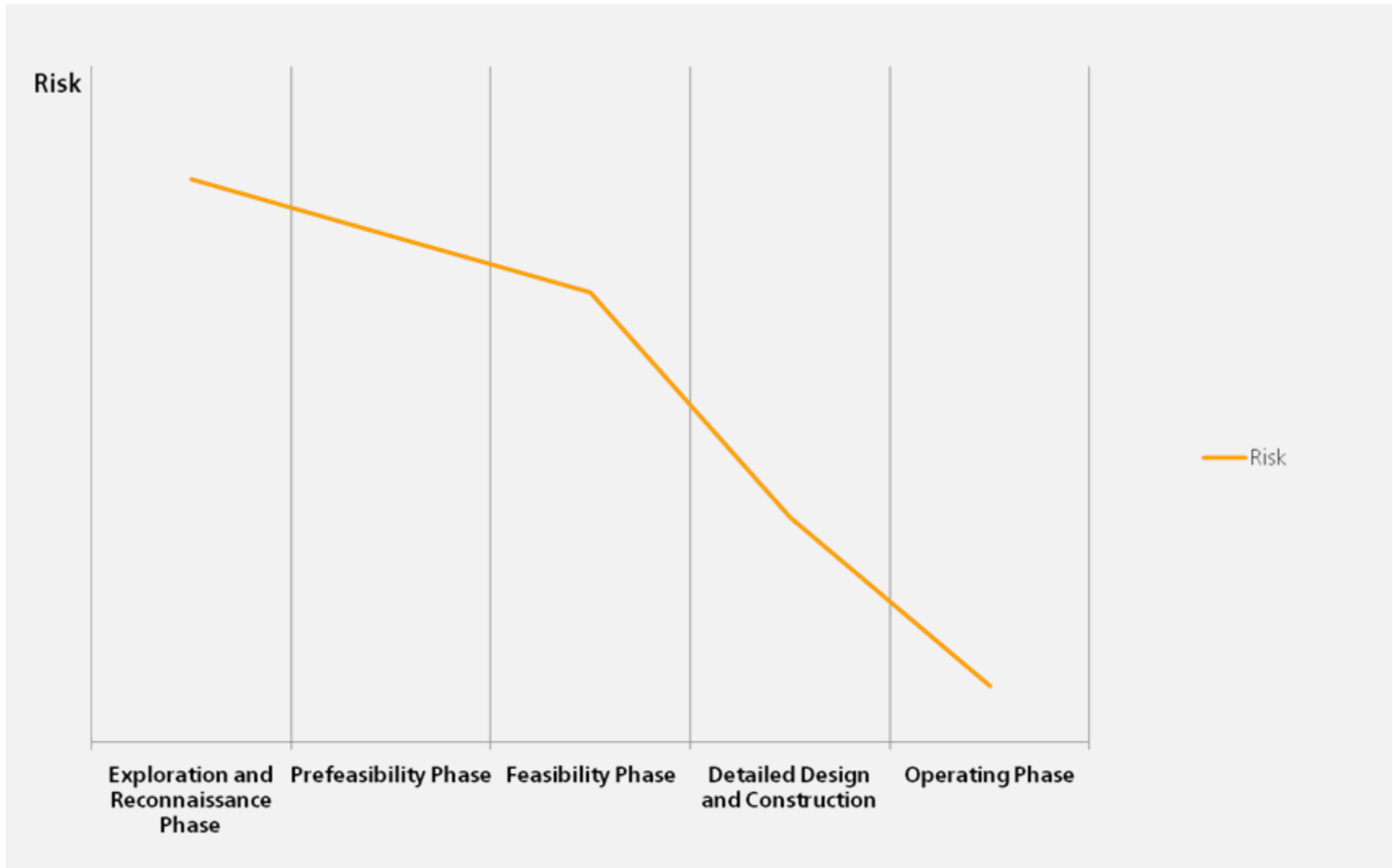
= Barriers to invest in geothermal energy



Risk mitigation by insurance for geological risk

Risk Fund System

Risk in exploration phases



Risk Mitigation Scheme Germany

Geological risk mitigation insurance

→ Rödl & Partner developed the first private commercial solution for the insurance of the geological risk which became the prototype for the KfW-Program:

Subject of support	Drilling costs for hydrothermal deep <u>drillings</u> , i.e. no single drillings are subsidized
Support	<ul style="list-style-type: none"> – Exemption from amortization in case of „Non-success“ which is individually defined for each project – Alternative refunding of stimulation measures which are actually paid and agreed with the KfW
Maximum contribution	Generally not more than 16,000,000 € for each deep geothermal project
Financing contingent	Up to 80 % of eligible drilling costs
Conditions	<ul style="list-style-type: none"> - Increased and project-dependent Disagio - Increased and project-dependent interest rate until geological success is determined - 65.000 € audit fee - 45.000 € acceptance fee

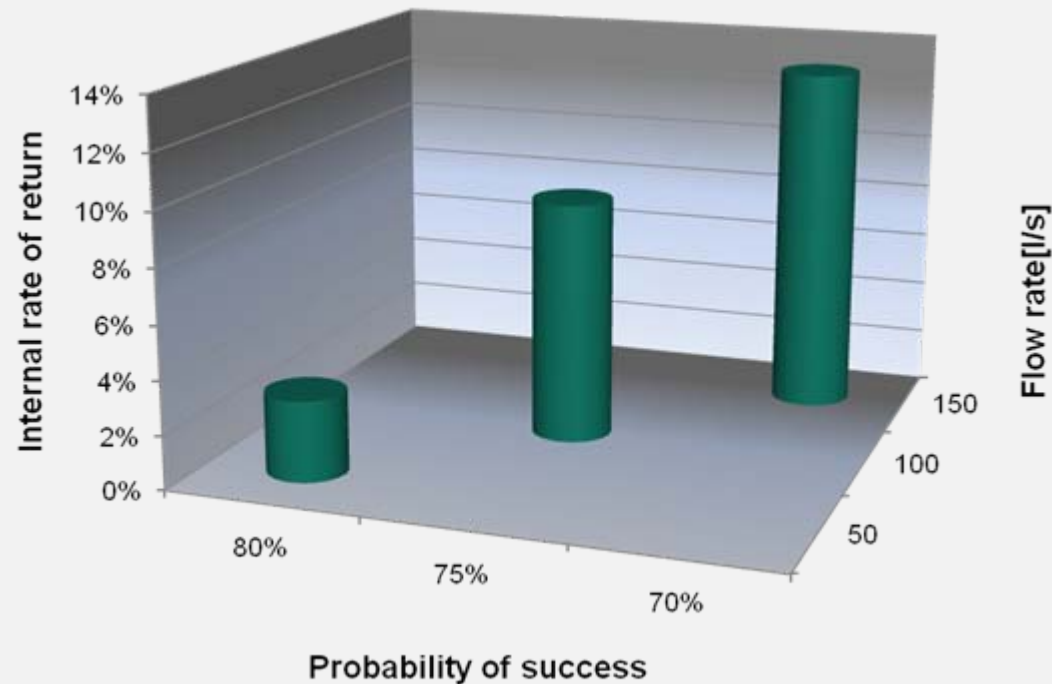
Risk Mitigation Scheme Germany

Geological risk mitigation insurance

Preconditions

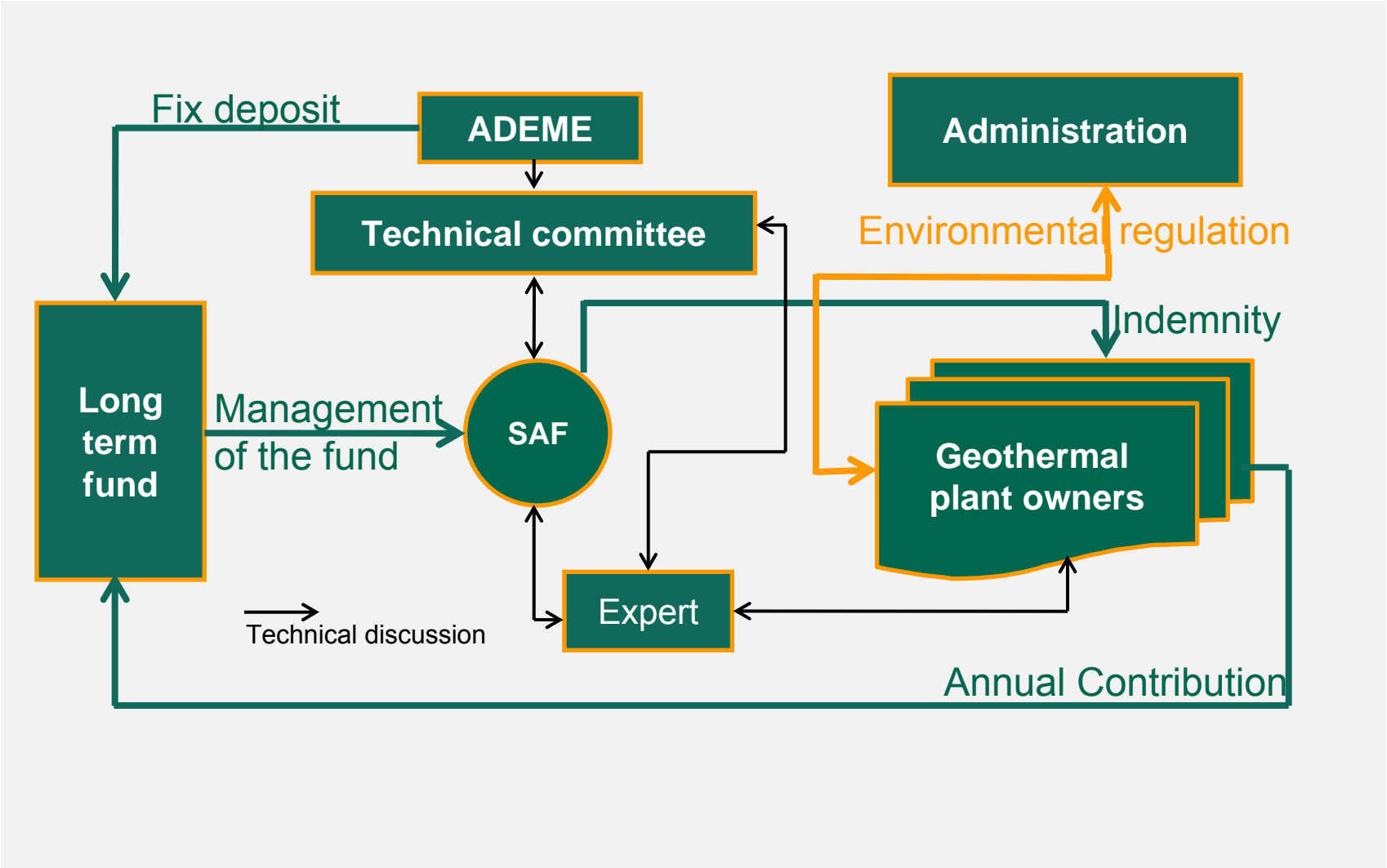
Technical and commercial feasibility:

- Geological and geophysical studies
- Abstract of technical and geological findings in a project study
- Determination of success parameters
- Inquiry concerning economical and financial capacity



Risk Mitigation Scheme France

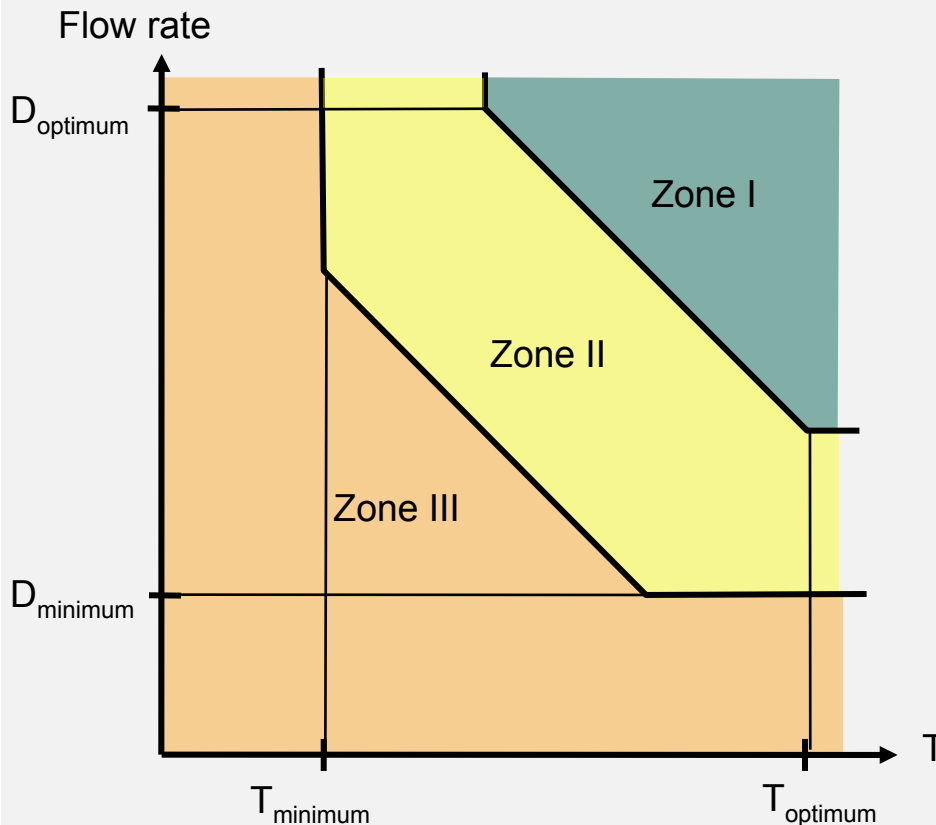
Management of the fund



Risk Mitigation Scheme France

Short-term risk mitigation

Success-Failure Curve



Zone I – Success

- Temperature and flow rate \geq Boundary to the optimum zone
- No compensation payment

Zone II – Partial success

- Temperature and flow rate \geq Threshold of minimal cost-effectiveness
- Refunding of the balance to the agreed IRR

Zone III – No Success

- Temperature und flow rate \leq Threshold of minimal cost-effectiveness
- Complete compensation payment

Risk Mitigation Scheme France

Risk mitigation*

	Short-term risk mitigation	Long-term risk mitigation
Subject of support	<ul style="list-style-type: none"> ▪ Risk of geological success of the first drilling (thermal capacity) ▪ Up to 90 % of costs (incl. tax) for the first drilling minus possible grants <ul style="list-style-type: none"> • 65 % from the fund • Additional 25 % in several regions ▪ Unexpected increase of costs ▪ Maximum 3 Mio. € per drilling 	<ul style="list-style-type: none"> ▪ Reduction of temperature ▪ Reduction of flow rate ▪ Corrosion ▪ Deposits in the borehole ▪ Compensation payment depends on consequences of loss ▪ Maximum 1.25 Mio. €
Costs	<ul style="list-style-type: none"> ▪ 3.5 % of the maximum insured capital in the region Ile de France ▪ Otherwise 5 % of the maximum insured capital 	<ul style="list-style-type: none"> ▪ Annual fee of 12,500 €

* Financed by:

- ADEME (public authority)
- Investors
- Financial products

Risk Mitigation Schemes

Risk evaluation

- European schemes based on probability of success (POS)

➔ **Determination of POS by experts required**

- In high-enthalpy green field geothermal work areas POS **cannot** be estimated in advance

➔ **Basis for insurance solution is not given**

BUT ➔ **Project proceeding is directly connected to explorational success!**

Risk Fund System Indonesia

Important aspect

If a world-wide market for geothermal projects is considered, a **risk mitigation instrument** will definitely help Indonesia to attract Independent Power Producers and, consequently, foreign capital.

But it has to be emphasized that the question of **power purchase agreement, legal security** and **financing** are more important framework conditions.

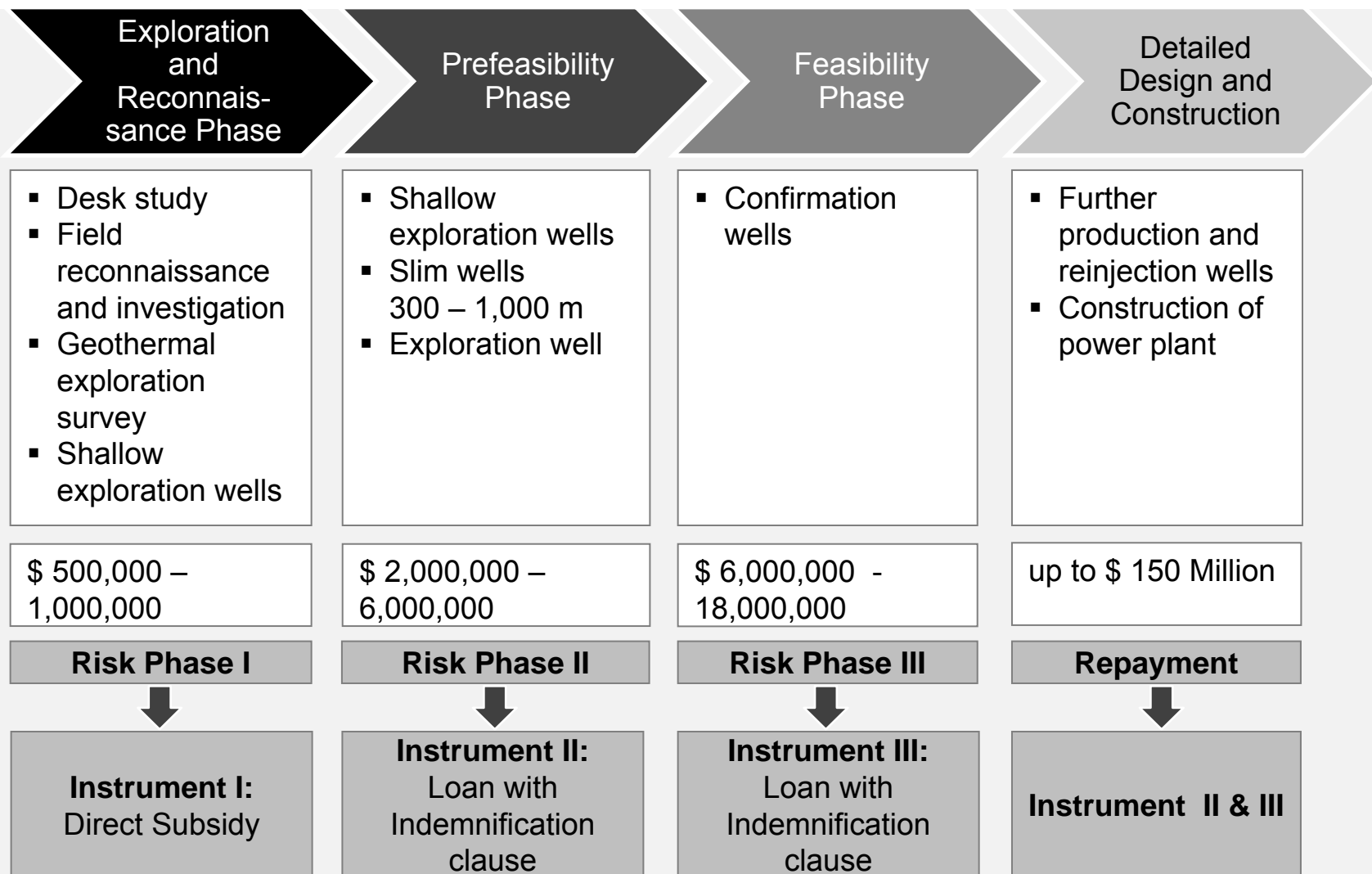
A **Risk mitigation scheme** has consequently be considered as a further market **incentive instrument** to ease the attraction of foreign capital to a particular market.

Developed Risk Fund Model

- Risk Fund for exploration phase
- Revolving effect from successful projects

Risk Fund System Indonesia

Project phases, risk phases, instruments



Contact



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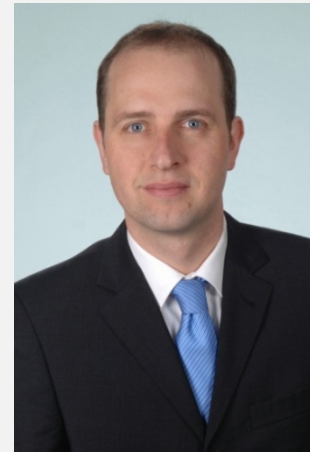
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