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Institut für Energetik und Umwelt

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**Forschung, Entwicklung,
Dienstleistung für**

- **Energie**
- **Wasser**
- **Umwelt**

Policies and strategies for the development of geothermal energy in Europe

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Agenda

- ◇ Introduction
- ◇ Political goals
- ◇ Measures for the promotion of renewable energy
 - R, D & D activities
 - Market introduction measures
 - Supporting measures
- ◇ Strategies
- ◇ Conclusions



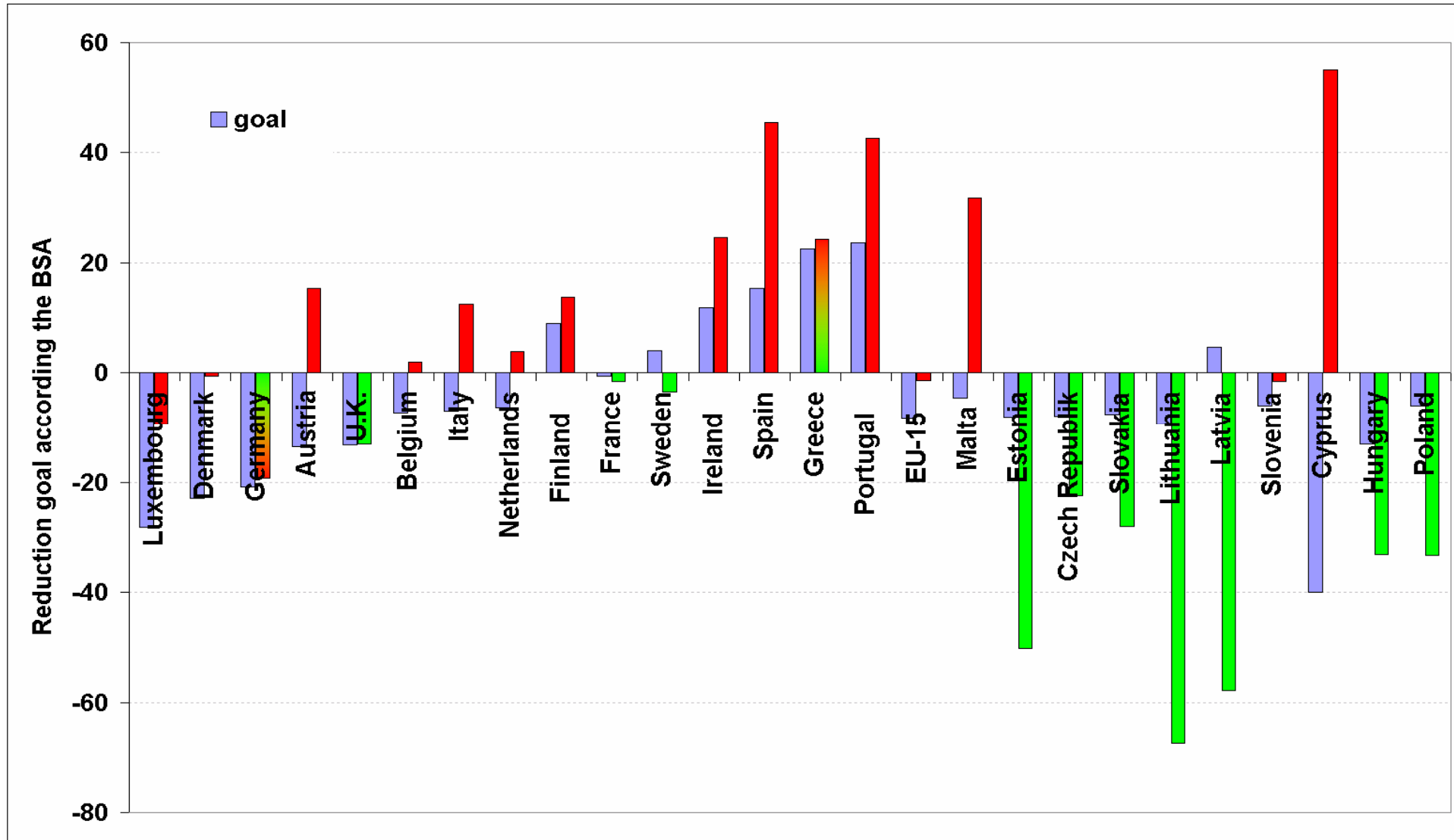
Introduction

- ❖ The energy based environmental effects on our natural environment become more and more obvious. With an increasing necessity the influence of our energy system on selected global and local environmental effects have to be reduced. One political measure is the so called Burden Sharing Agreement.
- ❖ To achieve these greenhouse gas reduction aims a broad variety of different measures on the demand as well as on the supply side have been put into force.
- ❖ One measure is an increased use of renewable sources of energy. According to the White Paper of the EC renewable energies ought to contribute to a much greater degree to cover the given energy demand in Europe. Ambitious goals have been defined.



Political goals

- Greenhouse Gas Reduction Goals -





Political goals

- Goals for increased use of renewables -

- ◇ White Book:
 - Renewable energy with 12 % contribution in 2010 to cover the overall energy consumption

- ◇ Green Electricity Directive (2001/77/EC):
 - Renewable energies with 22 % contribution in 2010 to cover the given electricity demand

- ◇ Biofuel Directive (2003/30/EC):
 - Biofuels with 5,75 % contribution in 2010 to cover the given energy demand for transportation purpose



Introduction

- ◆ These or similar goals have also been adopted by most EU-countries on the national level. Additionally such targets have been agreed in some countries outside the EU.
- ◆ By analysing these political goals one will find that all options to use renewable energies for heat, electricity or mobility should be used to a much higher degree. Often a clear focus is put on biomass. But also geothermal energy should contribute in some countries substantially to cover the given energy demand in the future.
- ◆ To achieve these goals a broad variety of measures have been put into force within the last couple of years by the European Commission as well as various governments on the national level. This is also true for geothermal energy.



Measures for the promotion of renewable energy

R, D & D

- ◇ Basic research
- ◇ Applied research
- ◇ Pilot plants
- ◇ Demonstration projects

Market Introduction

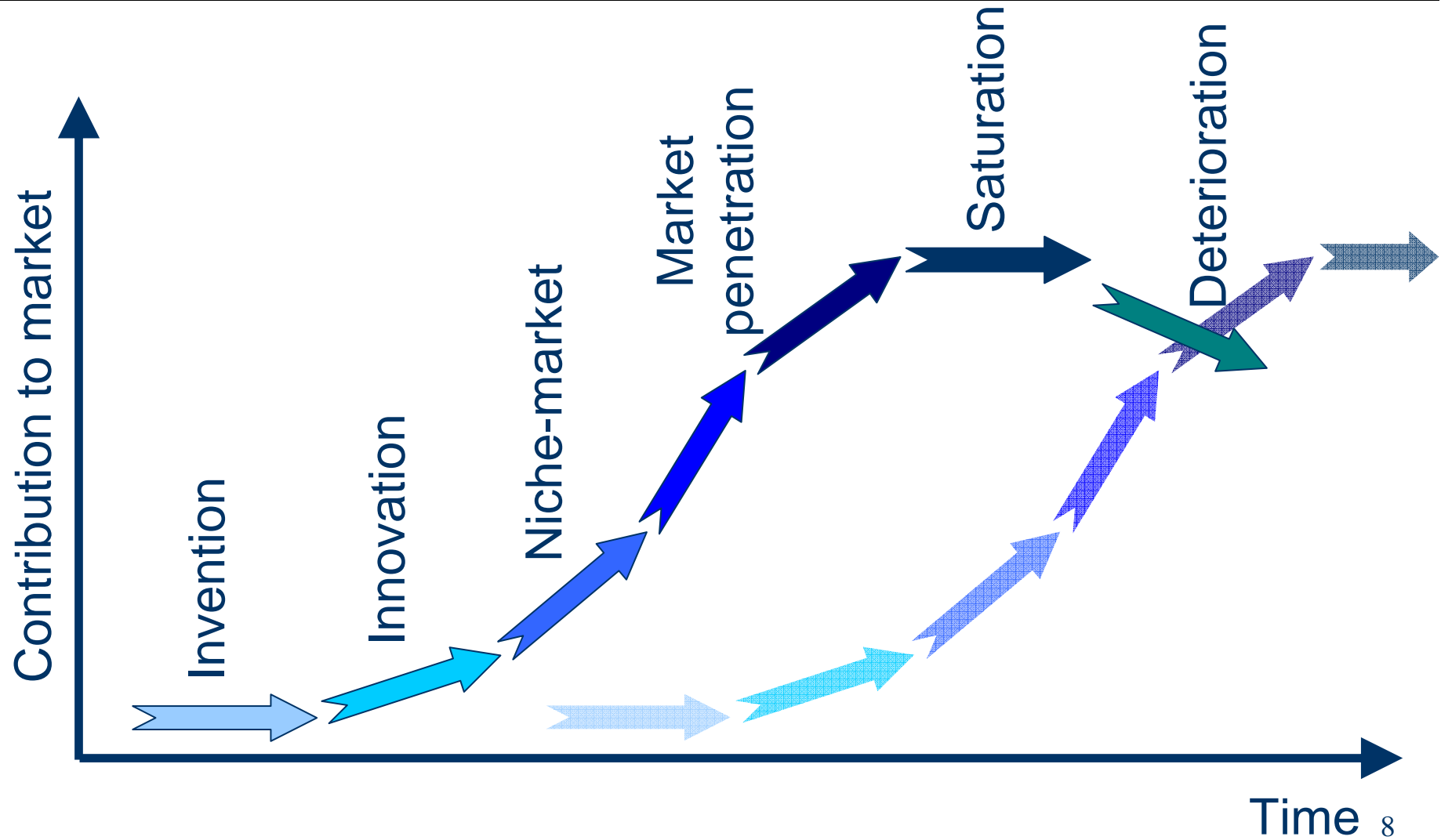
- ◇ Investment subsidies
- ◇ Credits with special conditions
- ◇ Feed-in tariffs, quota-model, “green” certificates
- ◇ Simplified permission procedure
- ◇ Reduction of (economic) risks

Supporting Measures

- ◇ Education & information activities
- ◇ Improvement of acceptance
- ◇ Feasibility studies
- ◇ Potential analysis
- ◇ Socio-economic analysis
- ◇ Risk analysis

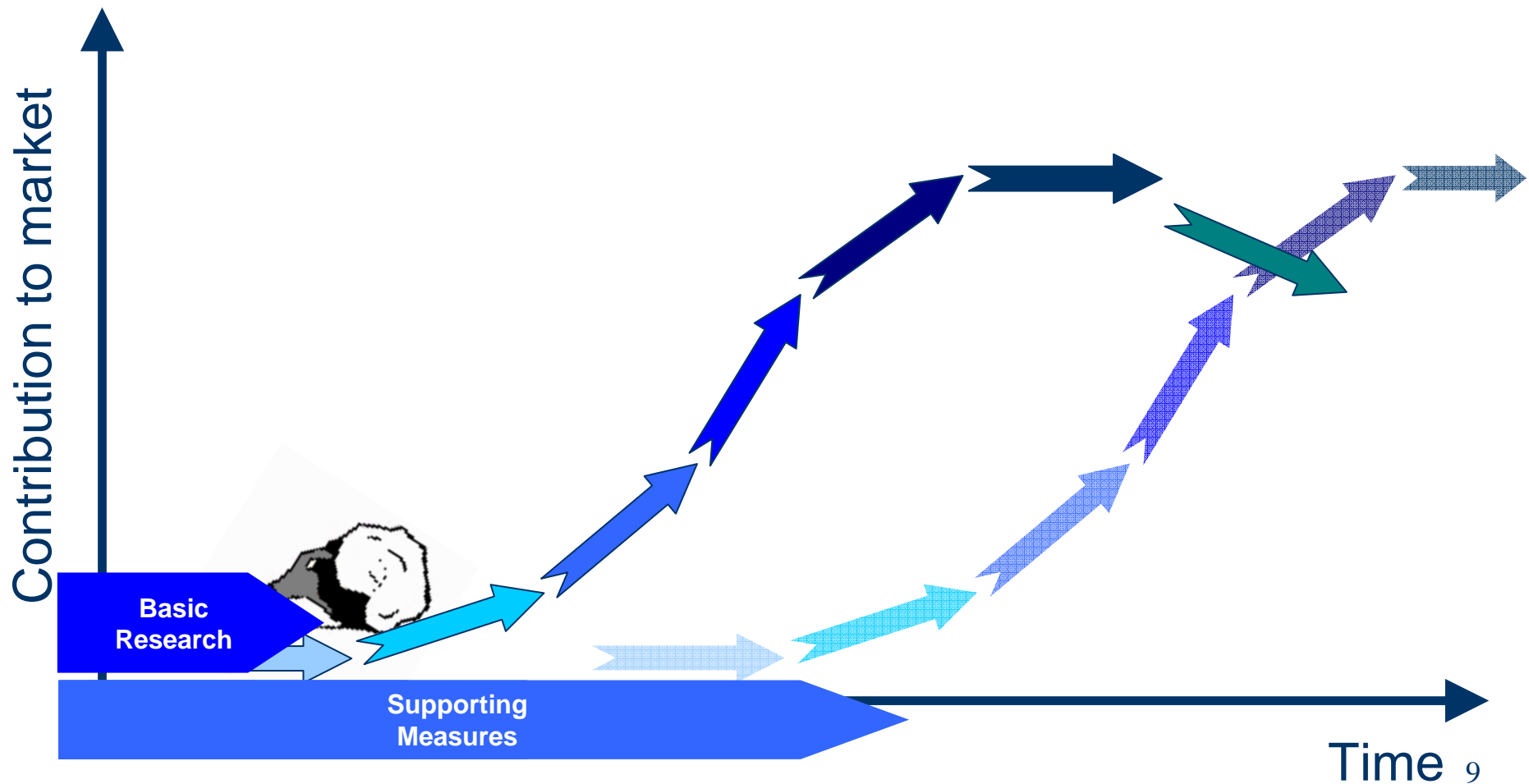


Life cycle of a technology



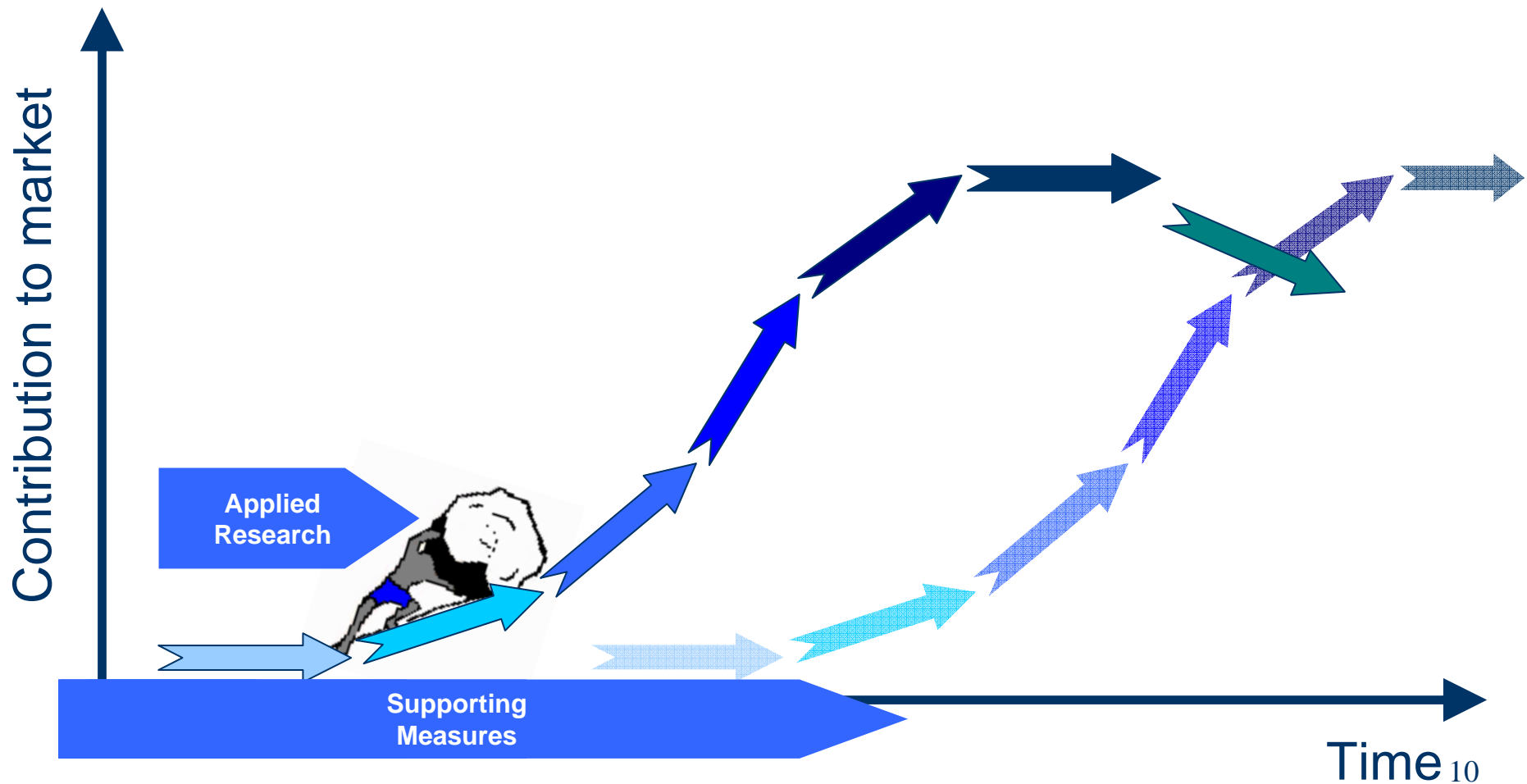


Measures for the promotion of renewable energy I



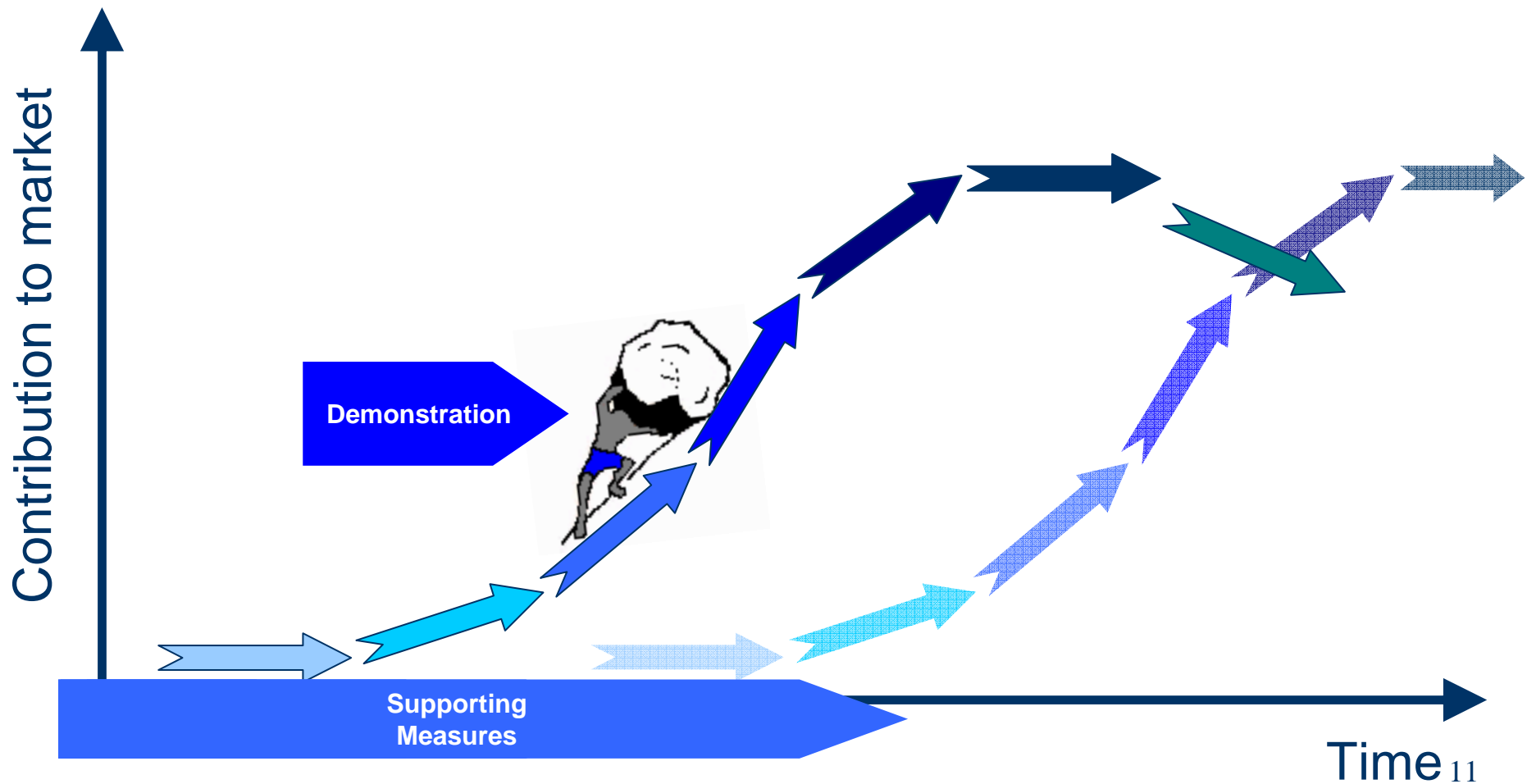


Measures for the promotion of renewable energy II



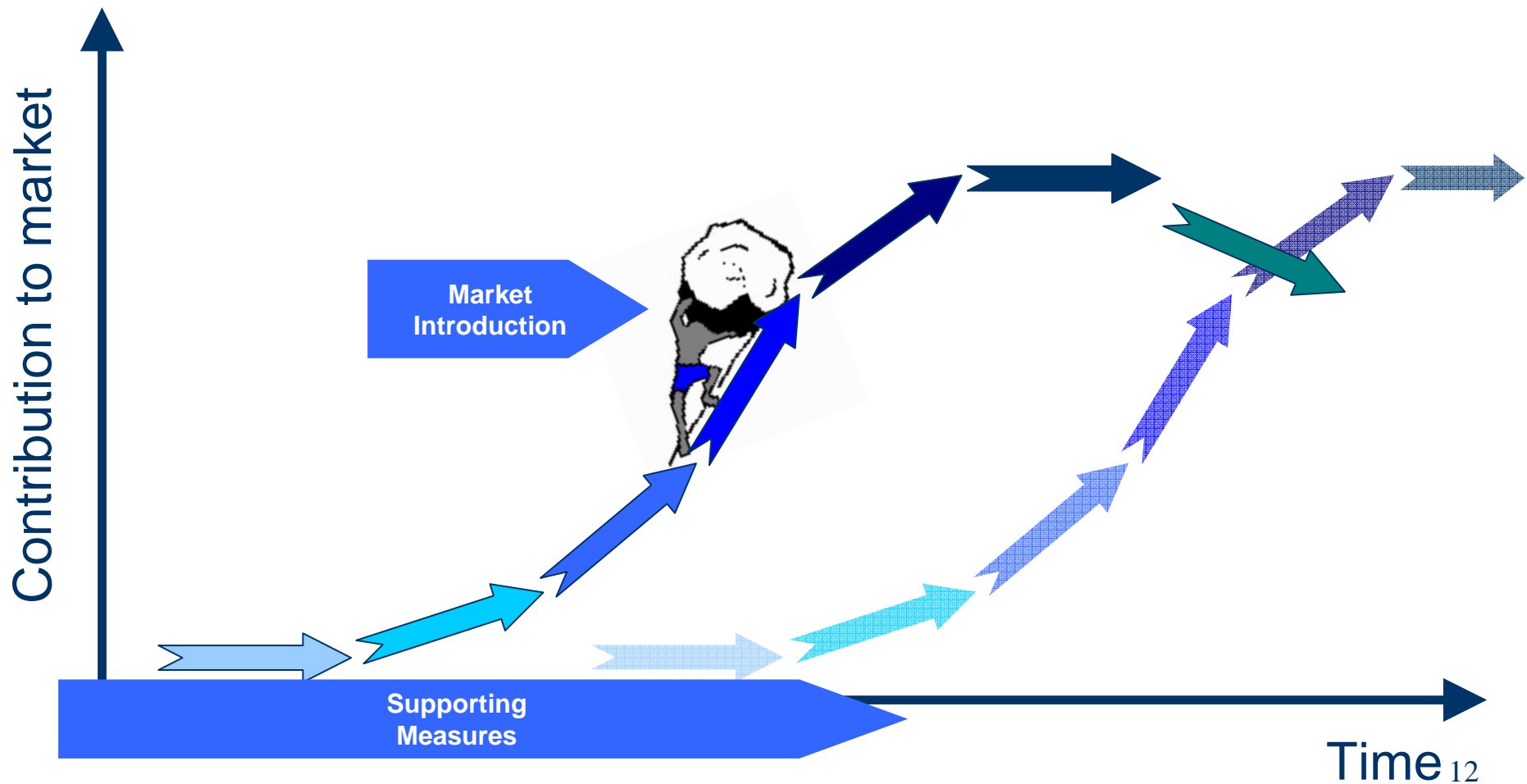


Measures for the promotion of renewable energy III



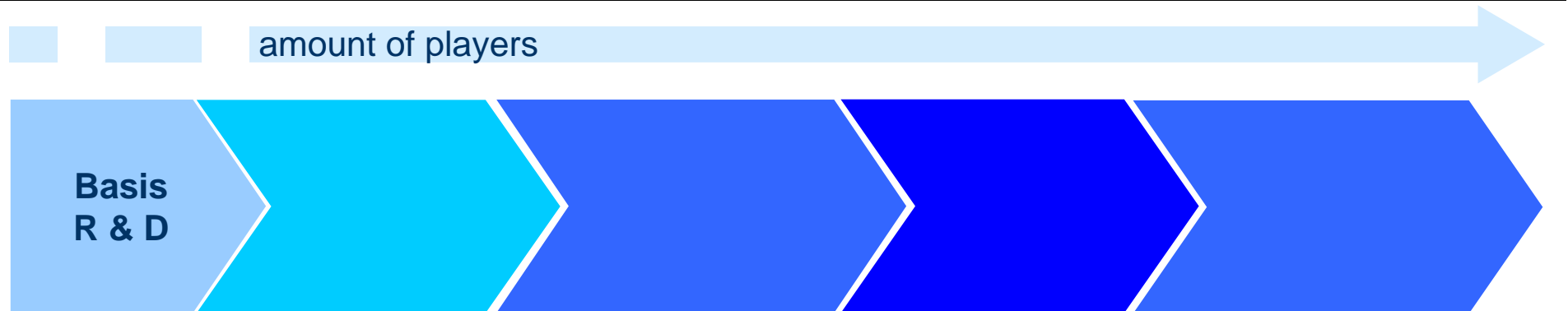


Measures for the promotion of renewable energy IV





Activities for the promotion of geothermal energy

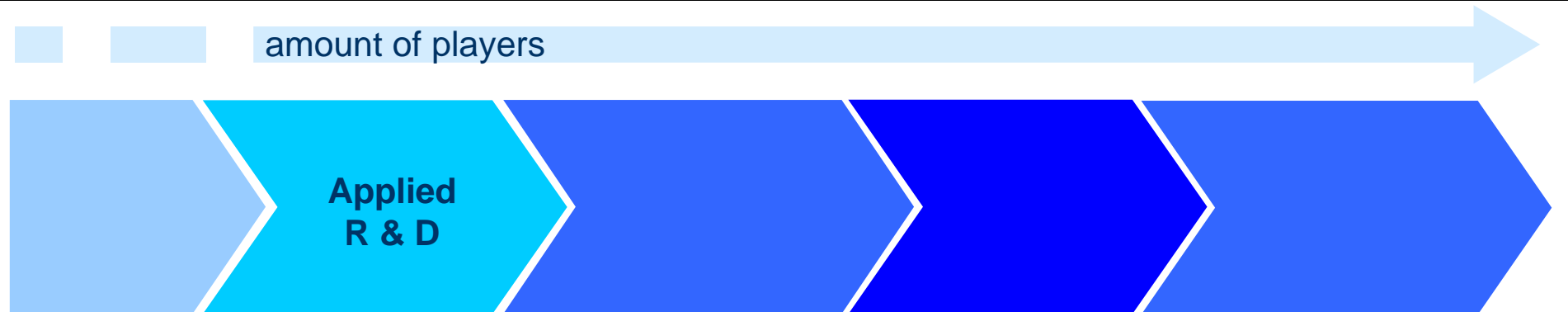


- ◇ **Basic analysis in fracturing**
- ◇ **Investigation in rock mechanics**
- ◇ **Basics of 3D-seismic**
- ◇ **Thermodynamic basics of heat transfer**
- ◇ **Thermodynamic analysis of cycles**
- ◇ ...

- ◇ **I-GET, EU**
- ◇ **Soultz, F**
- ◇ **Project Bad Urach, D**
- ◇ ...



Measures for the promotion of geothermal energy

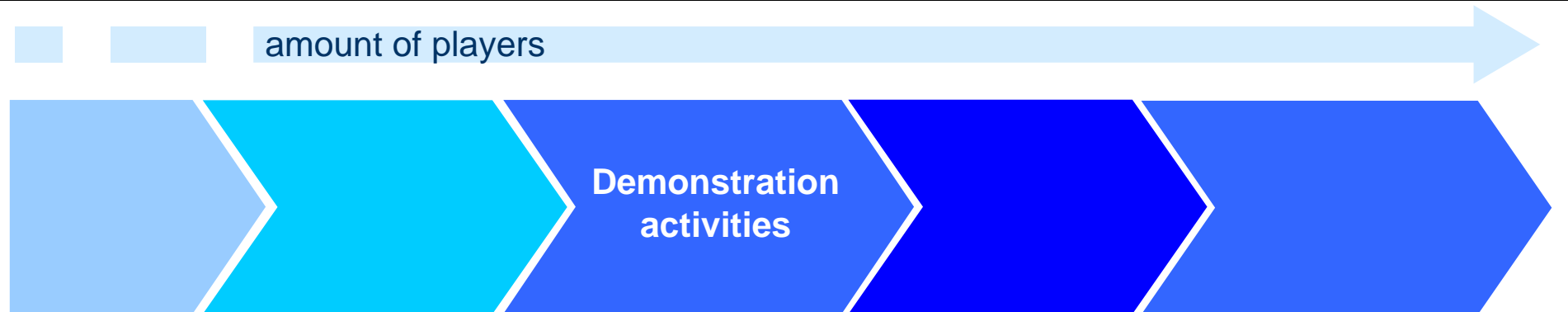


- ◇ **Fracturing tests**
- ◇ **Development/Improvement of measurement technique**
- ◇ **New drilling turbines**
- ◇ **New drilling fluids**
- ◇ **Corrosion tests**
- ◇ ...

- ◇ **Soultz, F**
- ◇ **Groß Schönebeck, D**
- ◇ **Neustadt-Glewe, D**
- ◇ ...



Measures for the promotion of geothermal energy

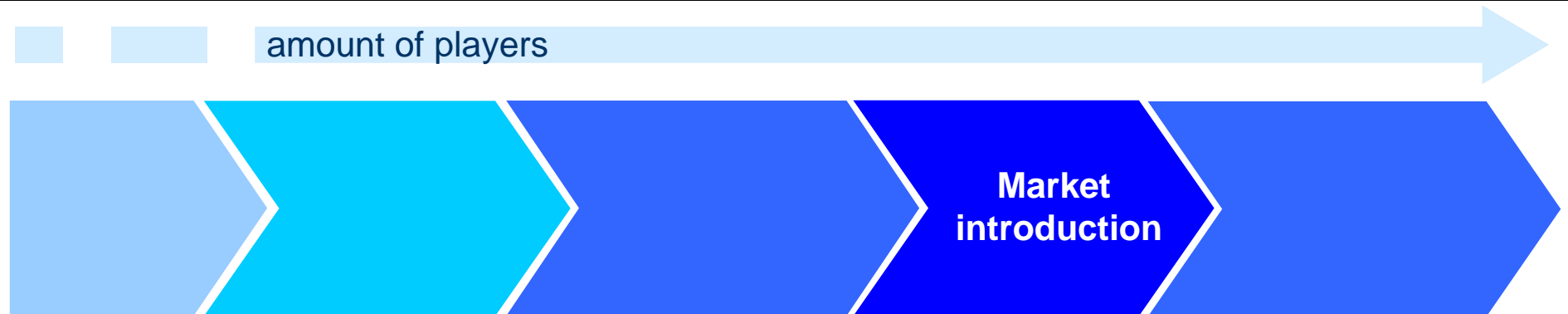


- ◇ Demonstration of a new bit
- ◇ Demonstration of a new drilling rig
- ◇ Demonstration of a Kalina cycle
- ◇ Demonstration of a geothermal CHP-plant
- ◇ Transformation of a geothermal heating plant into a geothermal CHP plant
- ◇ ...

- ◇ Altheim, A
- ◇ Unterhaching, D
- ◇ DHM, CH
- ◇ Electricity generation in Soultz, F
- ◇ ...



Measures for the promotion of geothermal energy

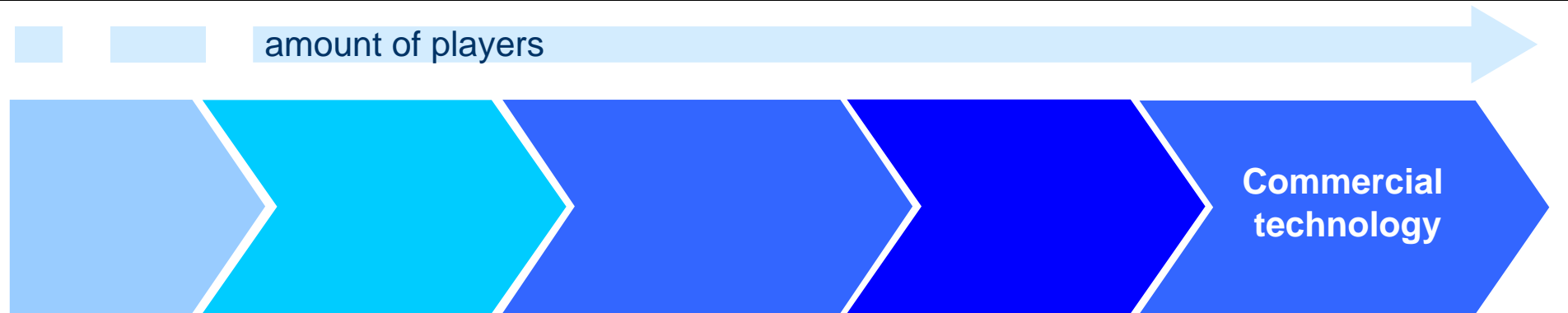


- ◇ Feed-in tariffs
- ◇ “Green” certificates
- ◇ Defined “green” electricity quotas
- ◇ Credits with special conditions
- ◇ Simplified permission procedure
- ◇ Reduction of (economic) risks
- ◇ Priority for “green” heat & electricity by public bodies
- ◇ ...

- ◇ KfW-Programm, D
- ◇ Feed-in Law, Spain
- ◇ ...

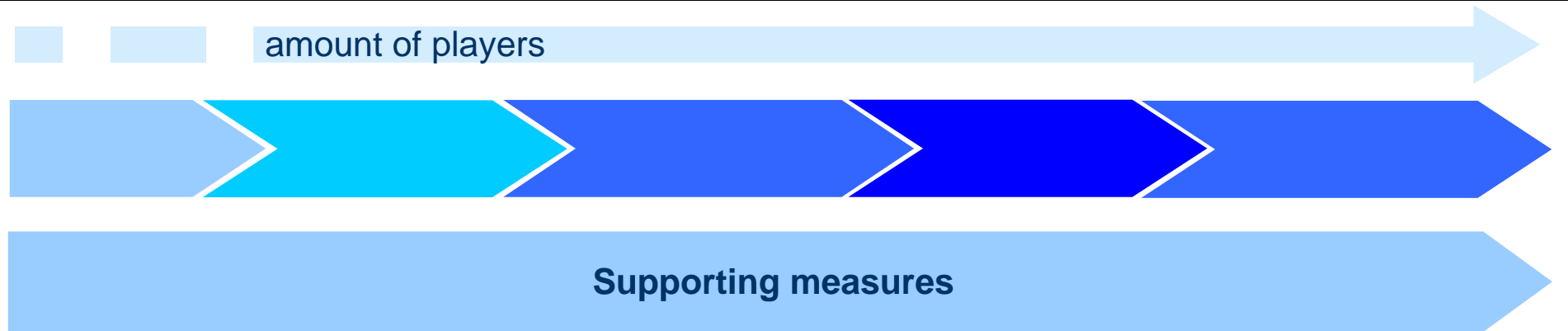


Measures for the promotion of geothermal energy





Measures for the promotion of geothermal energy



- ◆ **Education & information activities (new (multinational) courses at University)**
- ◆ **Improvement of acceptance (meetings, conferences)**
- ◆ **Potential analysis on the demand and supply side**
- ◆ **Socio-economic analysis under varying frame conditions**
- ◆ **Risk analysis (technical, economic, environmental, social)**
- ◆ ...

- ◆ **Accompanying research (Altener), EU**
- ◆ **Advisory board of the Federal Ministry for the Environment, D**
- ◆ **Public relations, EU**
- ◆ ...



EU-wide Feed-in tariffs for geothermal energy



Austria: 7,00 ct/kWh



Germany: up to 15,00 ct/kWh



Belgium: 2,50 ct/kWh



Greece: 7,31 ct/kWh



Czech Republic: 15,56 ct/kWh



Slovakia: 9,04 ct/kWh



Estonia: 5,10 ct/kWh



Slovenia: 5,85 + 2,52 ct/kWh



France: 7,62 ct/kWh (overseas: 7,93)



Spain: 6,49 + 2,94 ct/kWh



Strategies

- General -

-
- ◇ The different measures can be combined within overall implementation strategies. Only if this is realised focused on the national preconditions a technological development and a following successful market introduction is likely.
 - ◇ Therefore different countries have implemented different strategies to promote the production of electricity from geothermal energy. Often they are closely linked with the activities realised for other renewables as well as the actions carried out on the EU level.
 - ◇ Sometimes these strategies are dominated by one measure which pushes this option (like the feed-in law in Germany).
 - ◇ Additionally these different strategies should be not static. They have to be adjusted according to the technological improvement resp. the progress in market introduction.



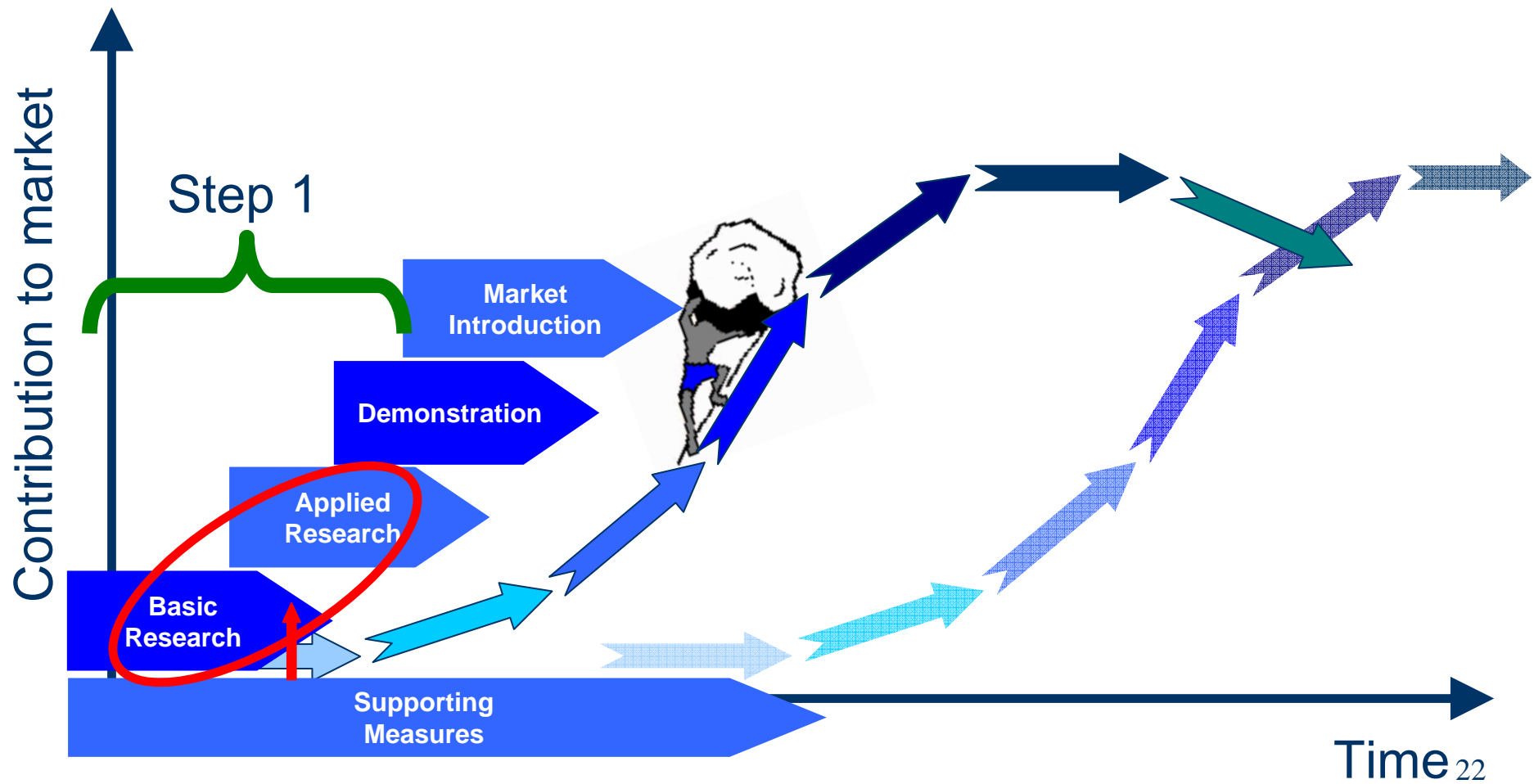
Strategies

- Demands -

-
- ◇ Definition of specific political goals.
 - ◇ Basic research activities should be closely linked with applied research.
 - ◇ Applied research will not be successful on the long term if no pilot plants and/or demonstration activities under realistic circumstances are carried out.
 - ◇ One will find no investors for demonstration activities if there are no realistic chances on a certain market penetration on the short to medium term (e.g. market introduction measures like the feed-in law).
 - ◇ A new technology often does not fit with the existing legislation (e.g. adaption of the permission procedures).
 - ◇ A new energy technology will only be successful if the people know the technology (acceptance; i.e. supporting measures).

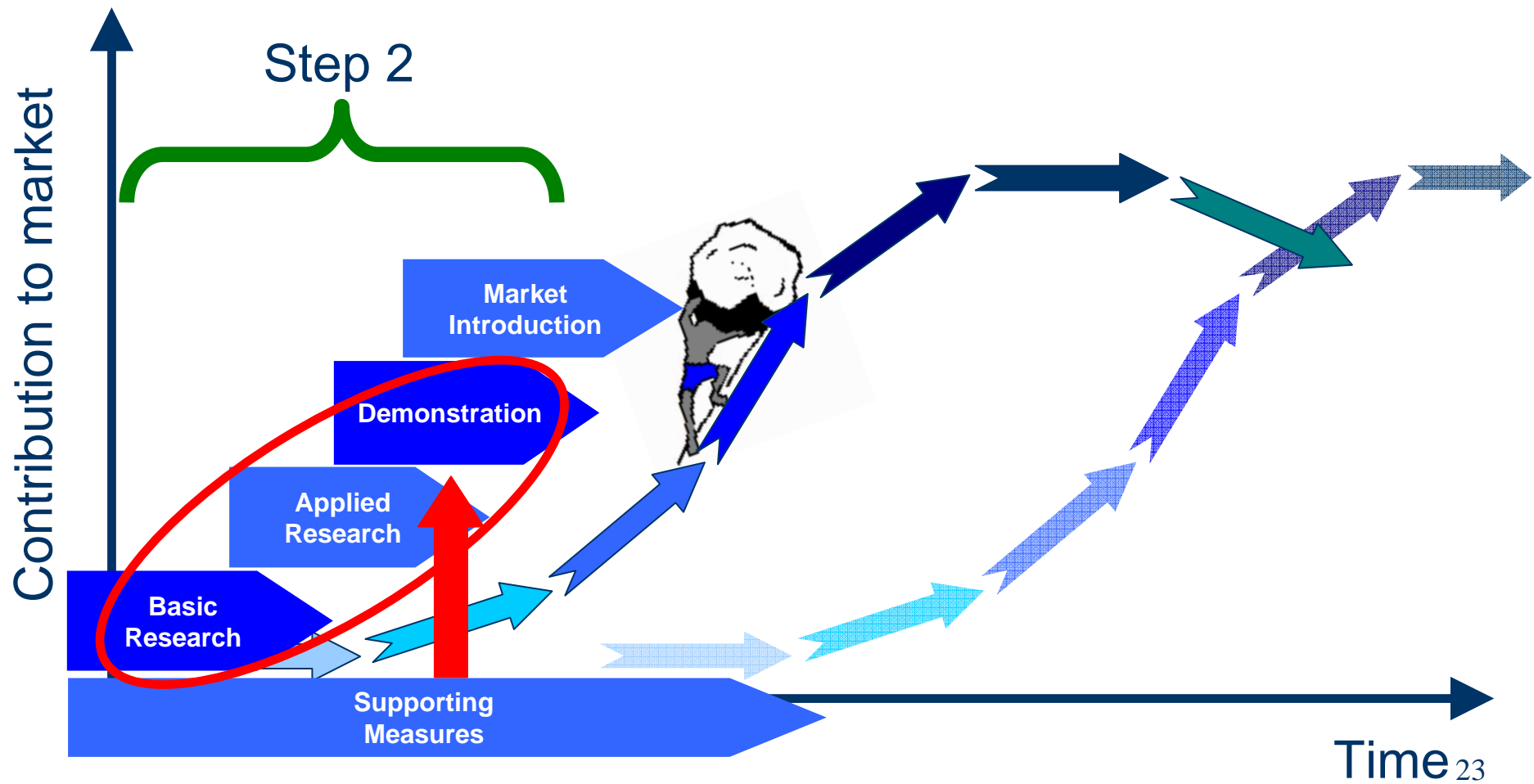


Strategies - Development I -



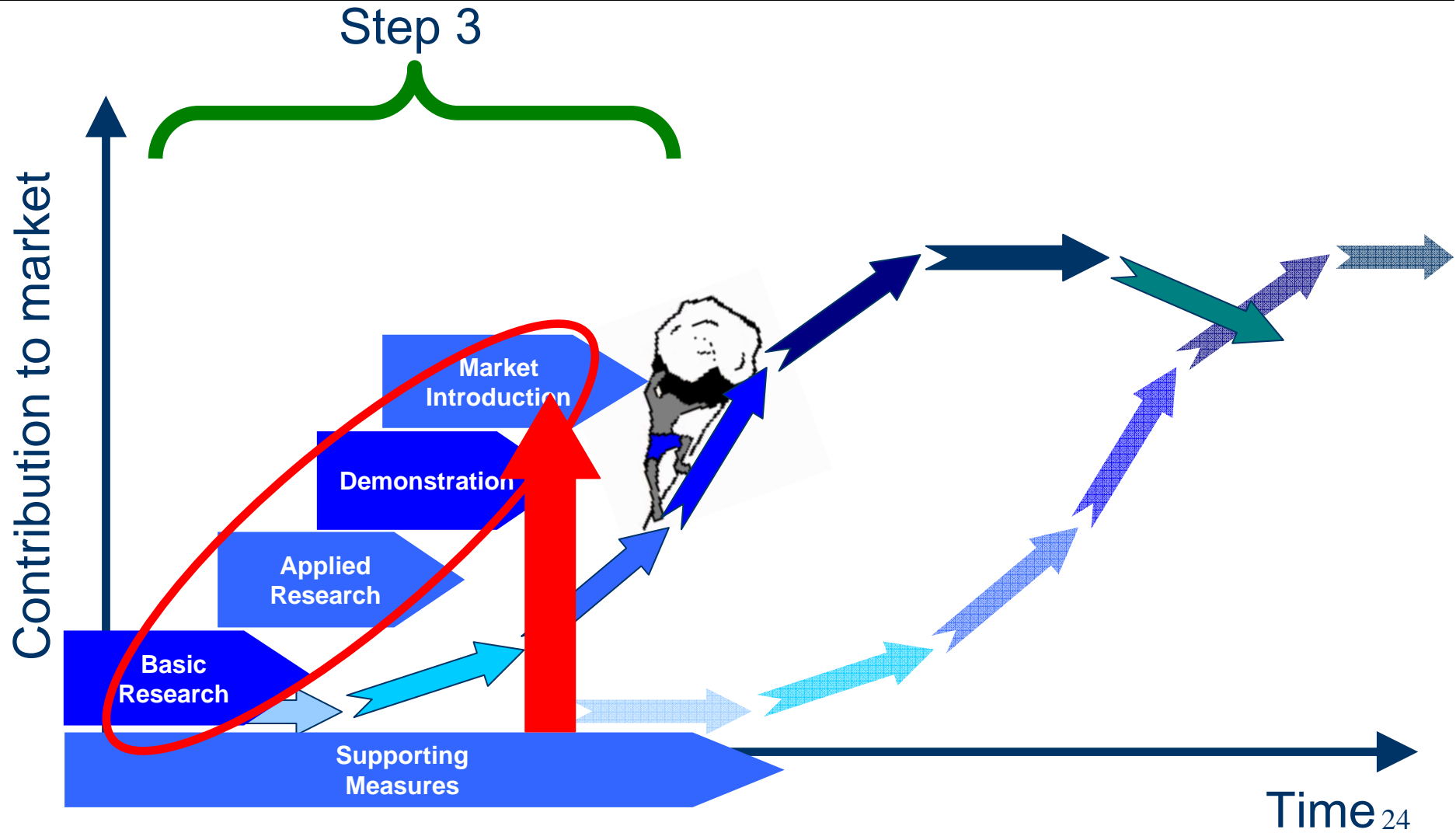


Strategies - Development II -



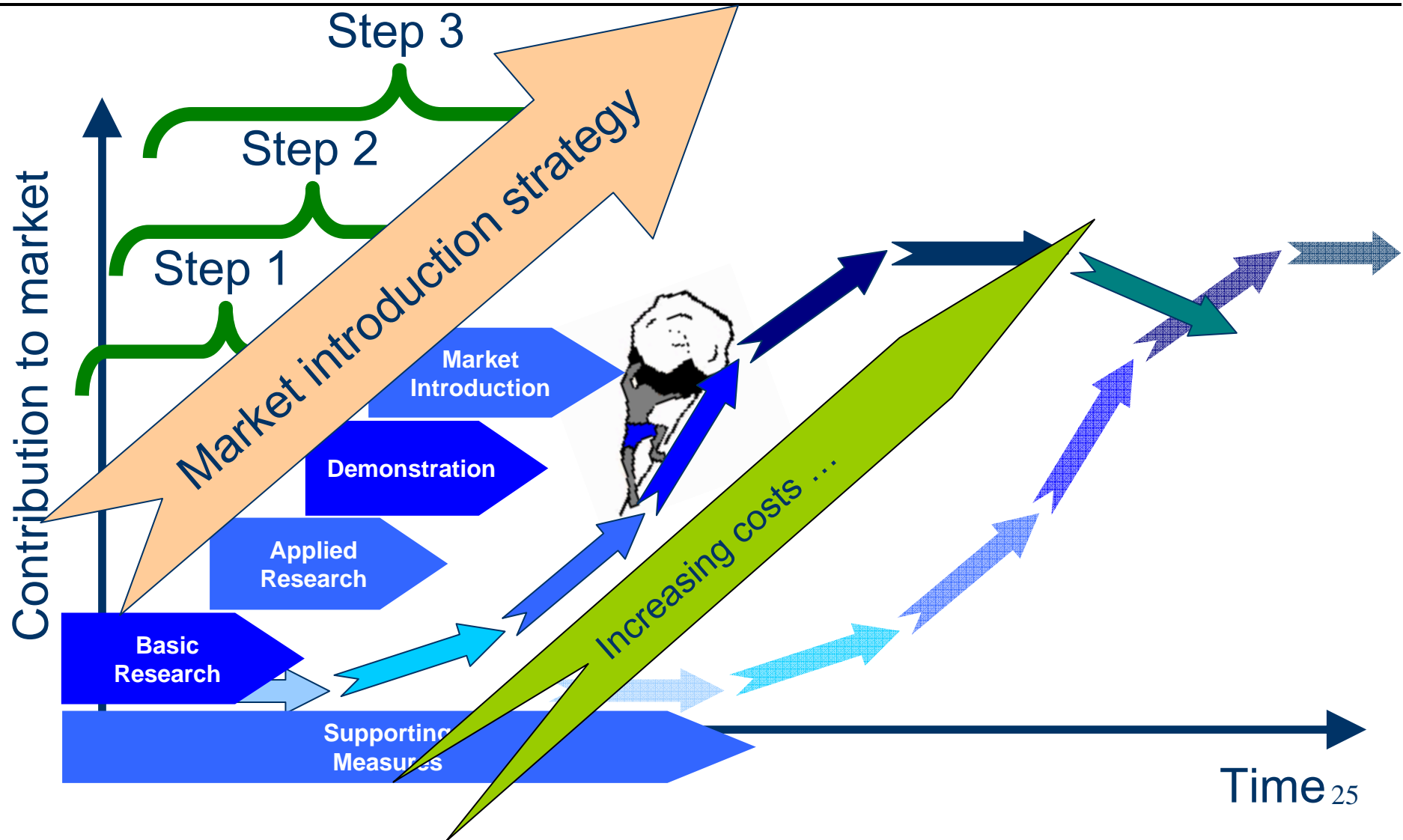


Strategies - Development III -





Strategies - Development IV -





Conclusions

- ◇ To bring the geothermal power production from low-enthalpy sources to the market a wide variety of political measures have been developed in recent years.
- ◇ These measures can be implemented mostly independently from each other. But in most cases they are only successful if they are linked within overall market introduction strategies.
- ◇ Often such overall strategies get stucked at the beginning due to a lack of R&D – even when with a feed-in law a very strong instrument for market introduction has been implemented.
- ◇ Therefore it must be the goal for the years to come to integrate various political measures within further developed national and even European wide implementation strategies.
- ◇ If this will be successful electricity from geothermal energy can contribute substantially within the national and thus also the European energy system.



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Thank you very much for your attention.

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