Innovations in energy efficiency and renewable energies:

funding instruments and support structures, examples from Germany

Florian Mörger, June 2nd 2015, Tbilisi

TÜV NORD GROUP

Structure

- ee energy engineers GmbH – Who we are
- Background – German Energy Transition
- Innovation development – Financing instruments
- Innovation implementation – Support structures
- Lessons learned

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ee energy engineers – Parent company

TÜV NORD GROUP
Excellence for your Business

Brands	TÜV NORD	DMT TÜV NORD GROUP	ALTER TECHNOLOGY Member of TÜV NORD
Business units	➢ Industry services ➢ Mobility ➢ Capacity building	➢ Natural resources	➢ Aerospace
Services	➢ Certification ➢ Testing ➢ Inspections ➢ Complex safety solutions	➢ Engineering ➢ Consulting ➢ Inspection	➢ Procurement ➢ Inspection ➢ Certification
Key facts	Annual turnover: > 1 billion € Employees: > 10,000 Subsidiaries: in more than 80 countries		

the future of energy

ee energy engineers – Parent company

TÜV NORD GROUP
Excellence for your Business

ee energy engineers **Member of** TÜV NORD

Services	Public contractors
➢ Strategy consulting ➢ Technology consulting ➢ Project management ➢ Capacity building	➢ European Union ➢ German federal government ➢ German state governments ➢ Municipalities
Tasks within the TÜV NORD GROUP	**Private contractors**
➢ Innovation scout/incubator ➢ In-house consultant	➢ Utilities ➢ SMEs

Key facts

- Year of foundation: 1996
- Employees: 65
- Turnover 2013: 6.7 million €
- Main topics: renewable energies (RE) and energy efficiency (EE)

the future of energy

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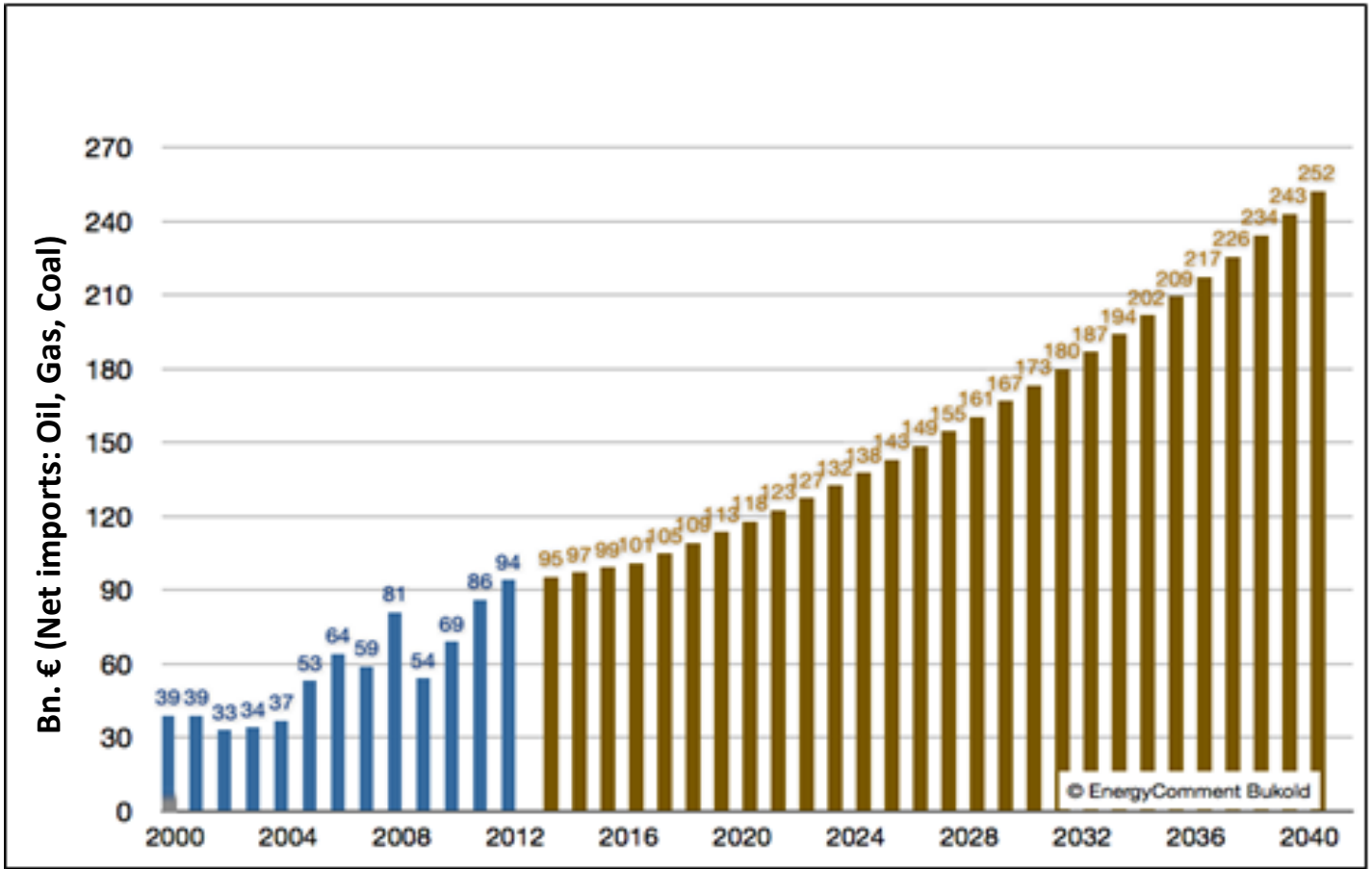
Fossil energy imports in Germany

Cost scenario from today until 2040



Source: Energy Comment

Political targets

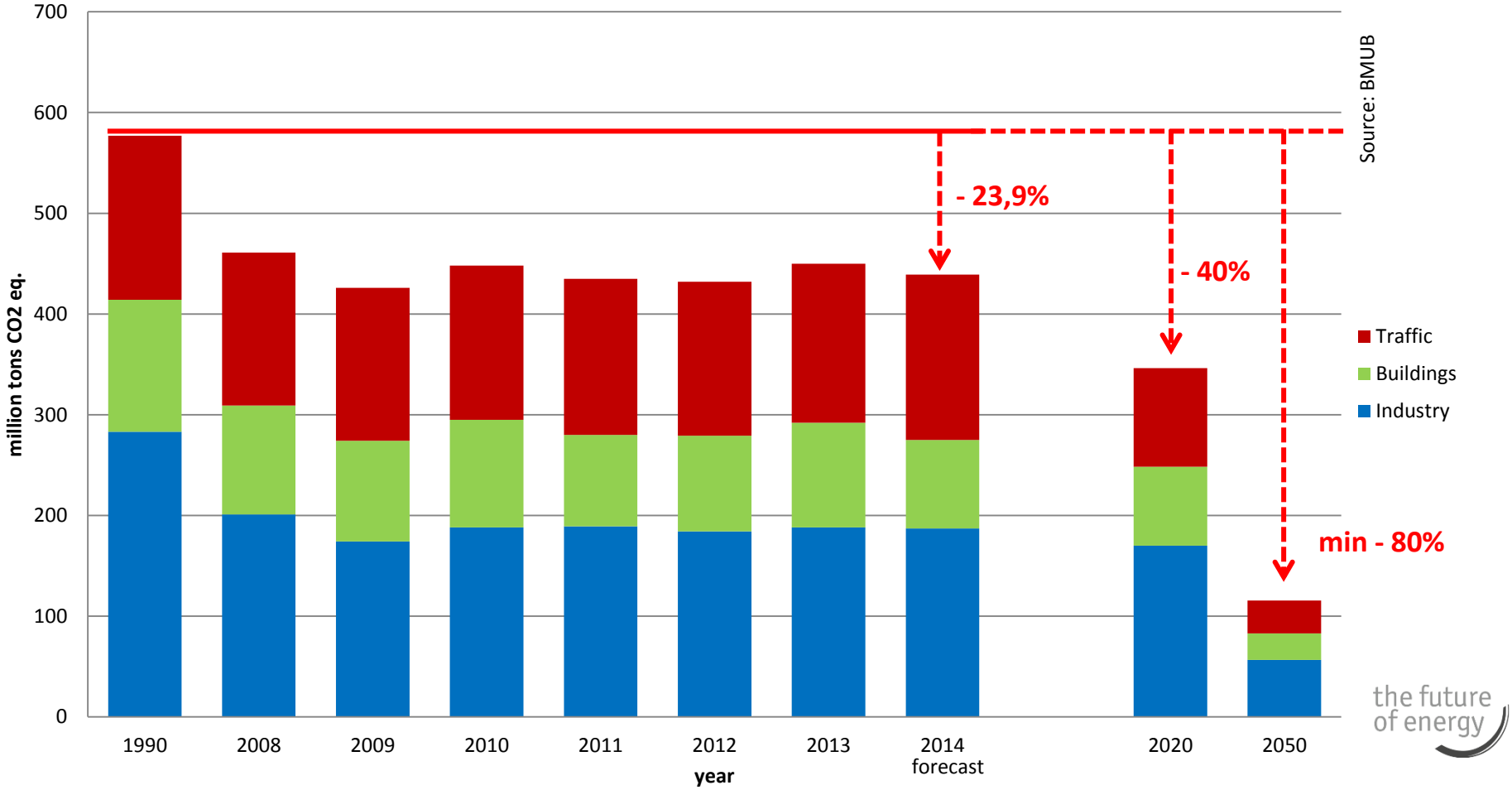
The way towards 2050

Year	GHG	Renewable Energies		Energy Efficiency			
	GHG (cp. 1990)	Energy	Electricity	Energy (cp. 2008)	Electricity (cp. 2008)	Buildings (cp. 2008)	Transport (cp. 2005)
2020	- 40%	18%	35%	- 20%	- 10%	- 20%	- 10%
2030	- 55%	30%	50%				
2040	- 70%	45%	65%				
2050	- 80-95%	60%	80%	- 50%	- 25%	- 80%	- 40%

Source: BMU

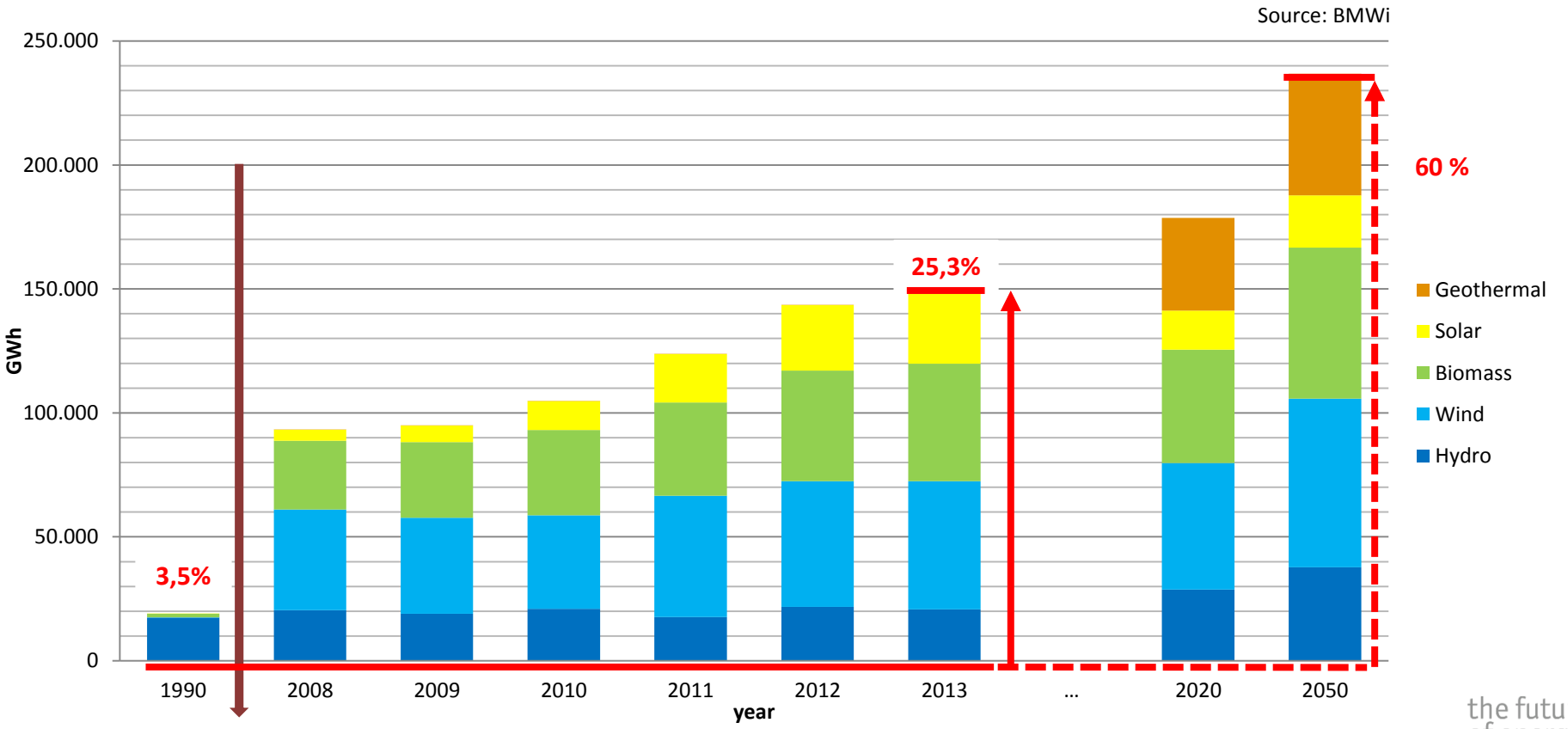
GHG reduction

Current results (2013)



Renewable energies

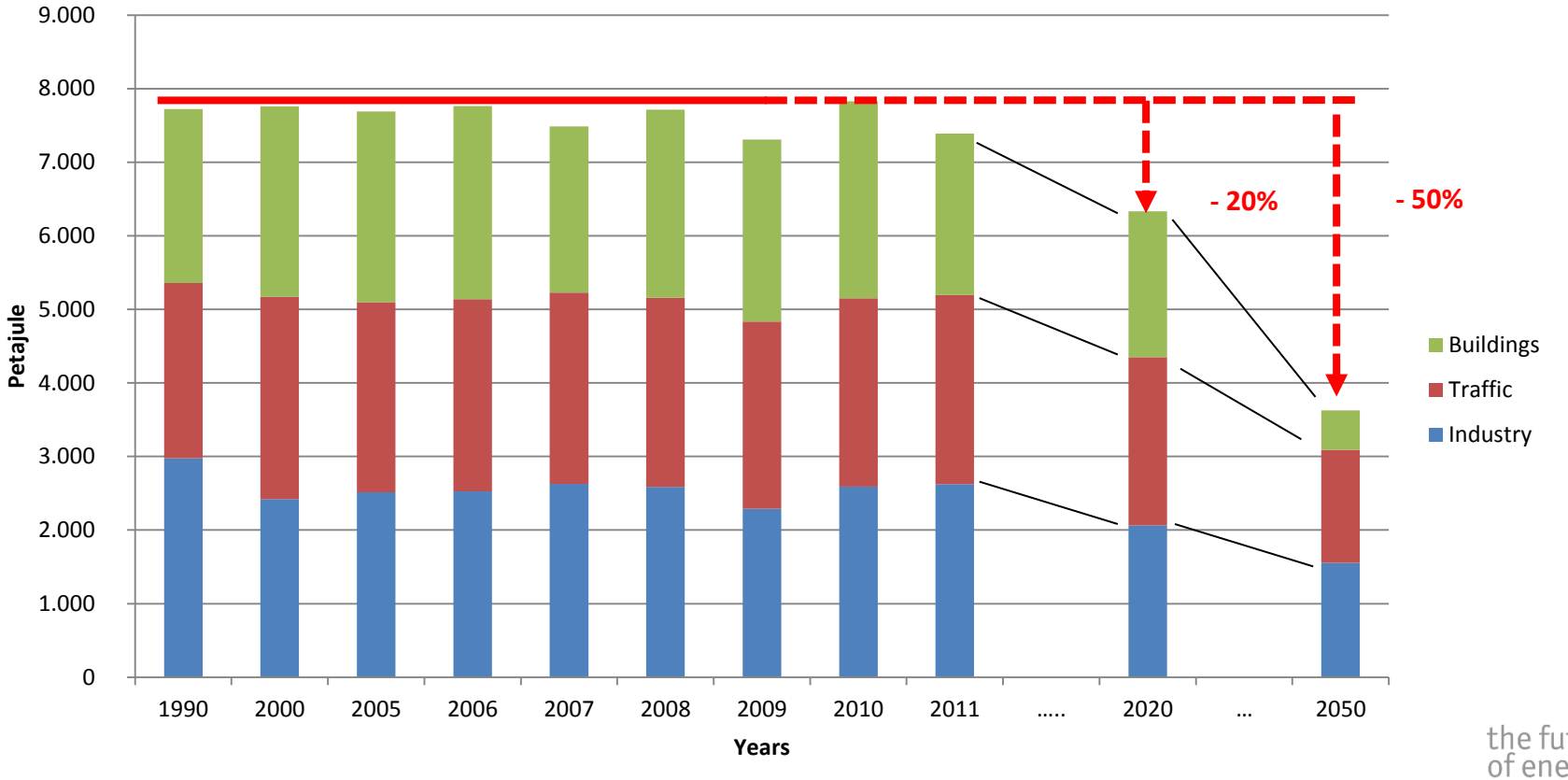
Current results (2013)



EEG in force since 1. April 2000

Energy efficiency

Current results (2011)



Interim conclusion

Status regarding GHG / RE / EE

- Developments in Germany in terms of GHG-reduction, expansion of RE and EE positive, but **under current circumstances,** the first **milestones in 2020 will be missed**

Turnaround possible by:

- Developing new and innovative technology solutions **(Research and development)**
- Support involved stakeholders during technology implementation **(Support structures)**

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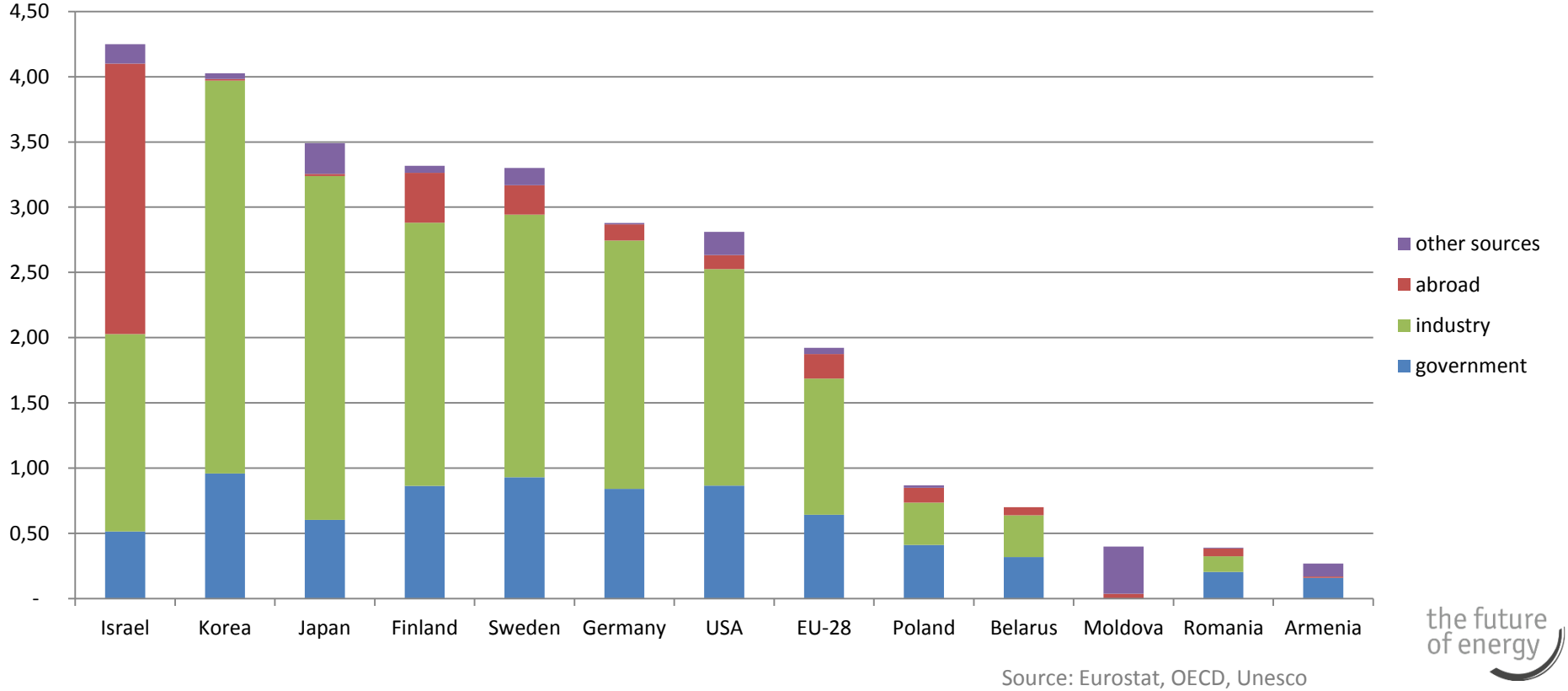
Financing of innovations

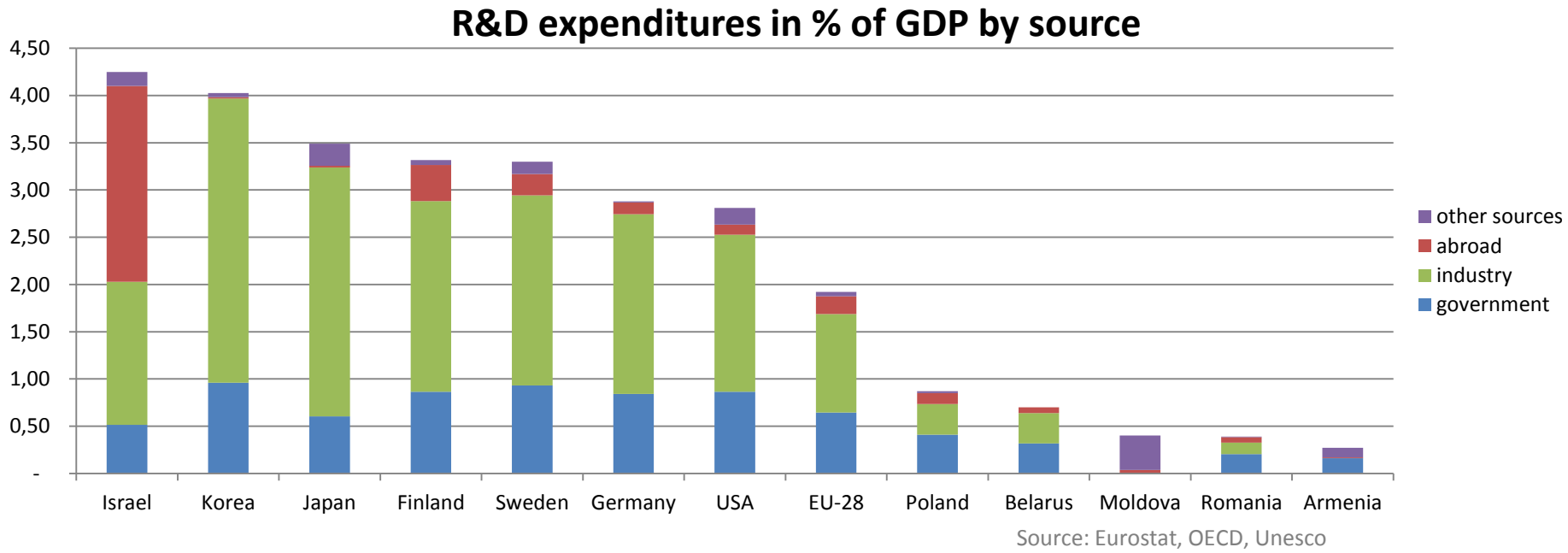
Expenditures on research in various countries



Source: Eurostat, OECD, Unesco

Financing of innovations

Expenditures on research in various countries

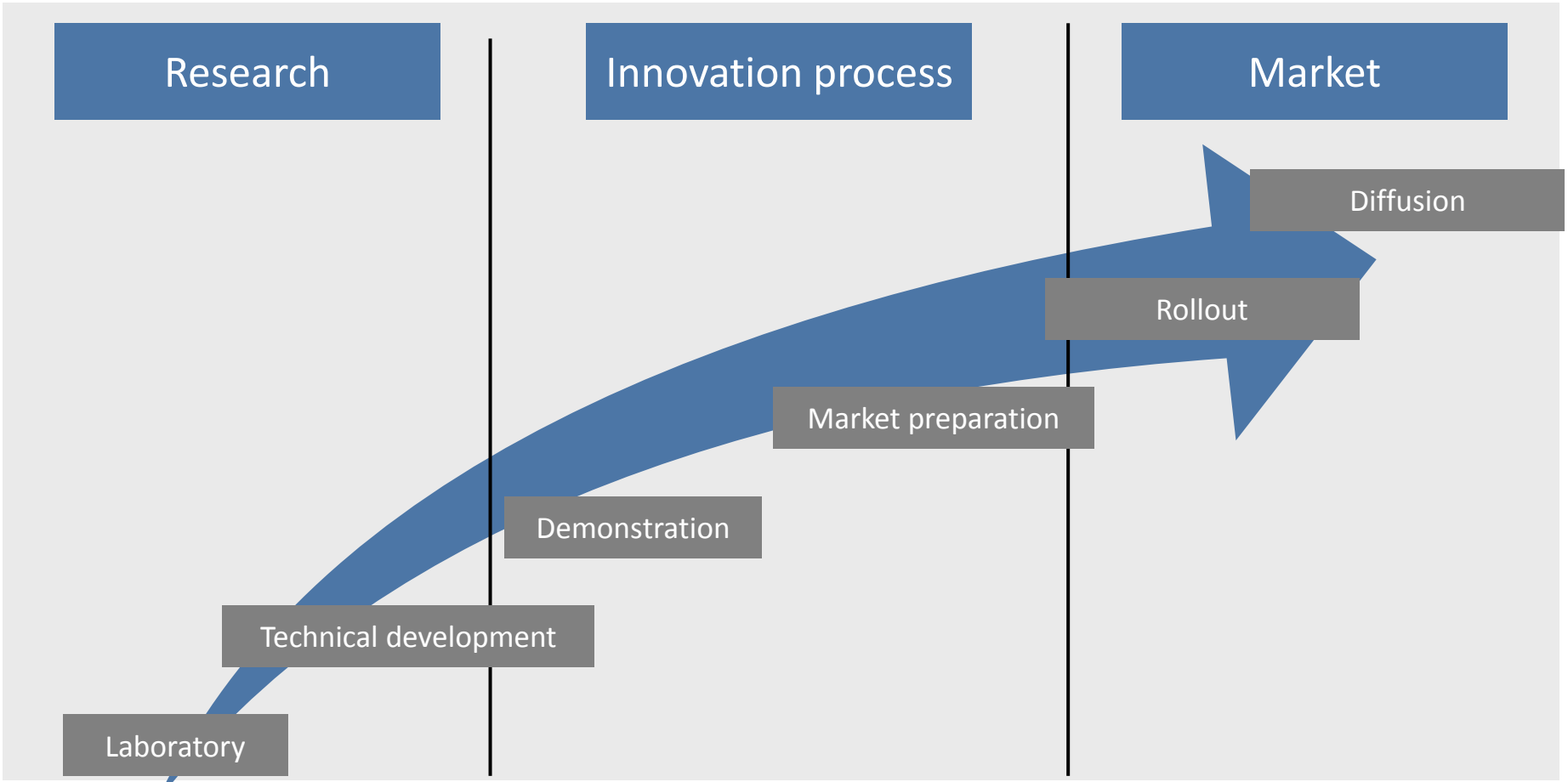


Source: Eurostat, OECD, Unesco

But: R&D investments are concentrated in large companies and in a few sectors like automotive and chemical/pharmaceutical industry **(Need to focus public R&D funding on SMEs and alternative sectors)**

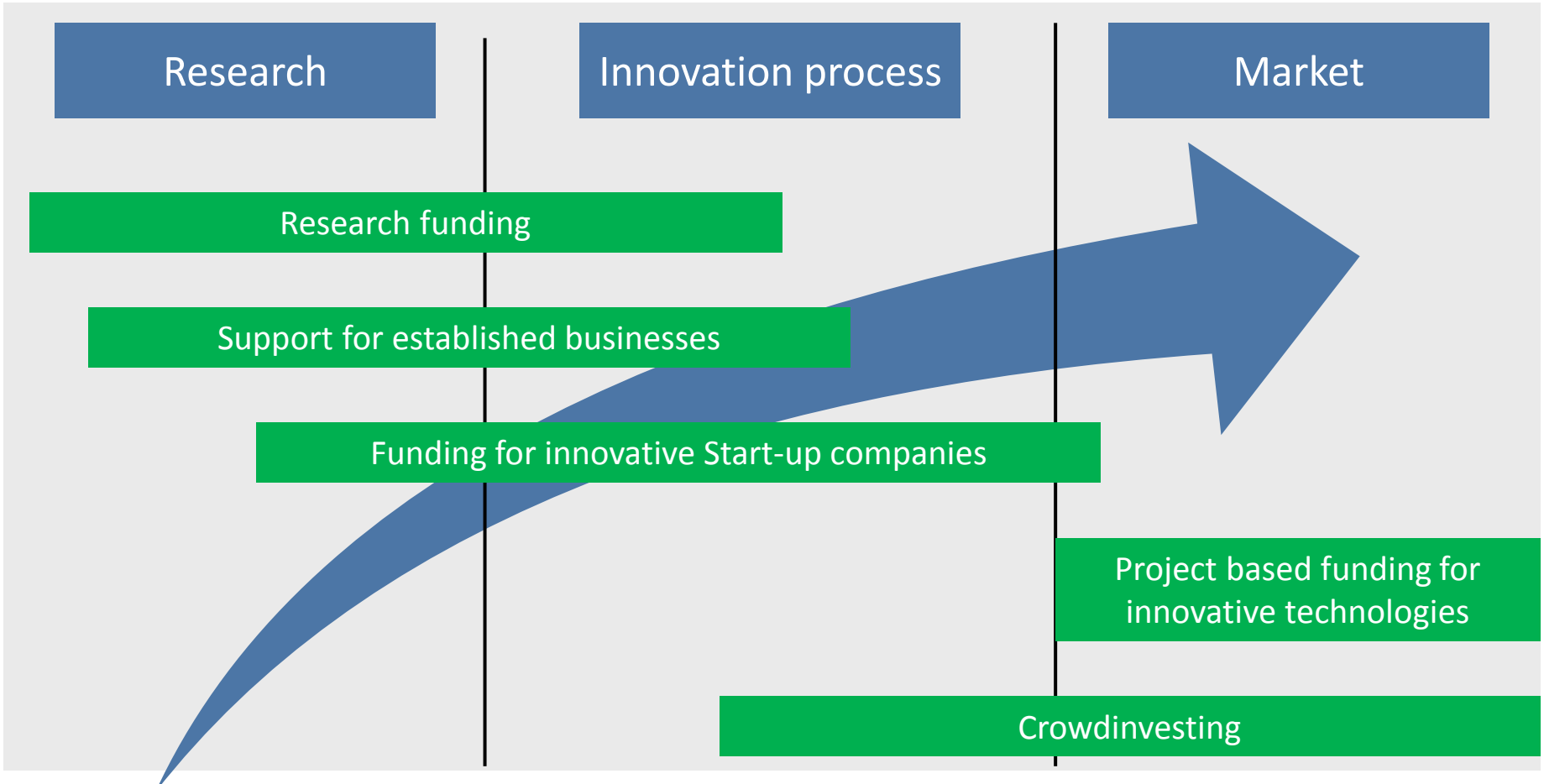
Technology development

Stages of the Innovation path



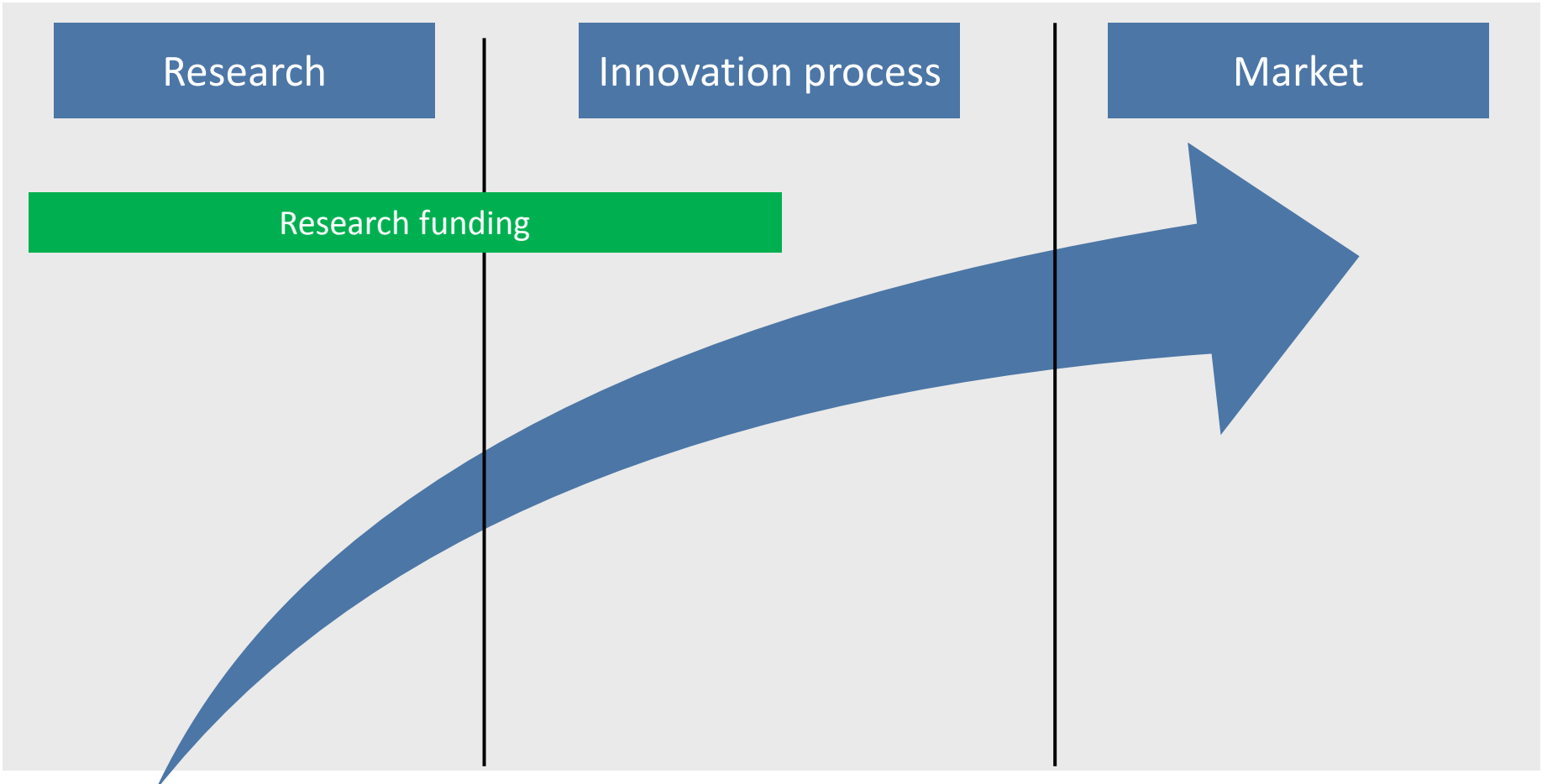
Technology development

Financial instruments along the innovation path



Technology development

Financial instruments along the innovation path



Research funding for RES/EE

The basis for effective innovation policy

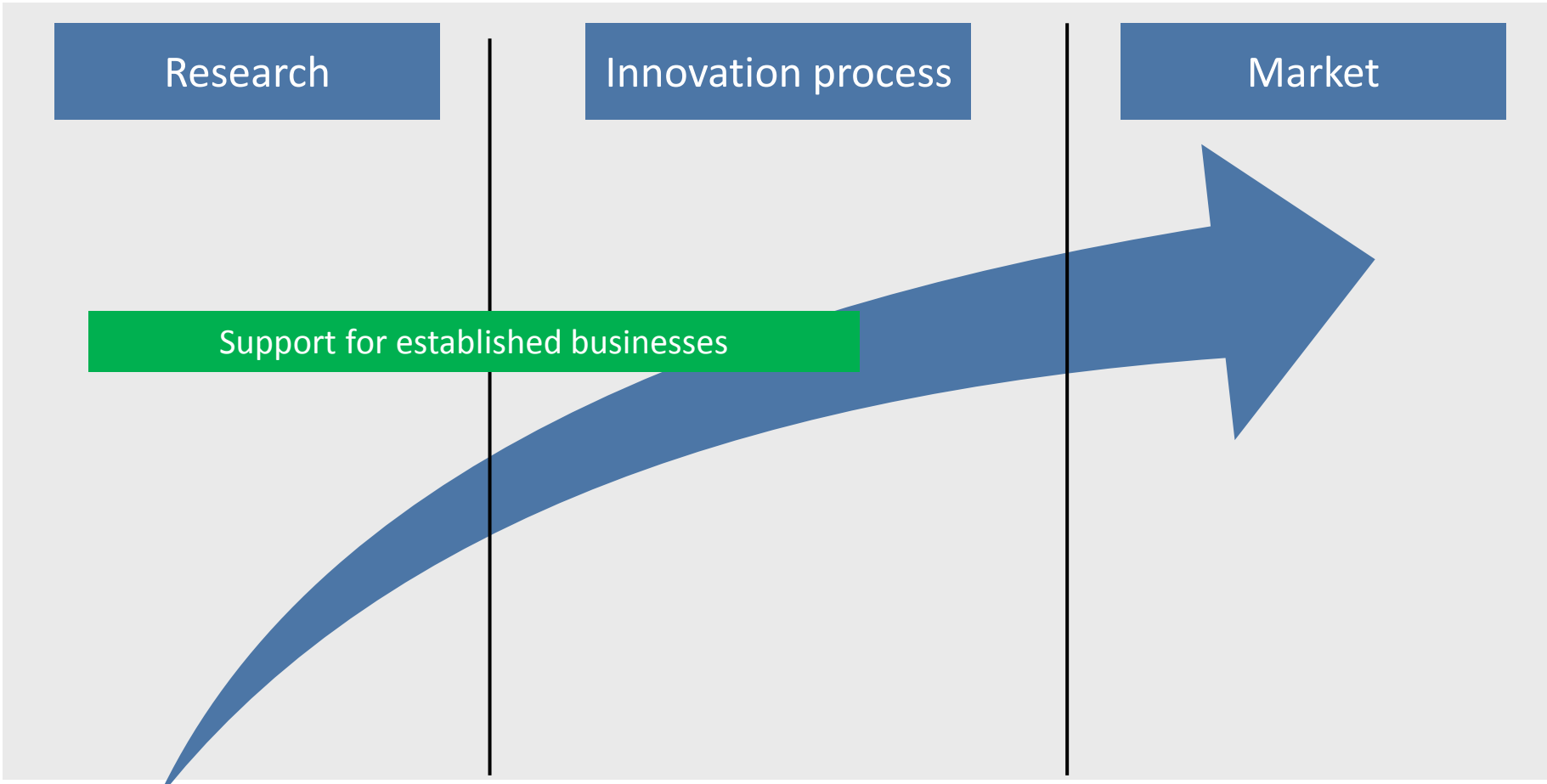
- There are 3 main sources of **public sector research funding** in Germany:

EU	Federal Government	Federal States (16)
Under the 7th Framework Research Program **(2007-2013) 282 m. € of grants for energy research** were approved for Germany (the highest amount in EU)	**Annual research funding** for RES/EE increased from 200 m. € in 2006 to **600 m € in 2013**	In total **250 m. € funding for energy research per year** (mainly RES/EE)

- There is no data on private investments in R&D with regard to RES/EE
- If we assume 50% funding and 50% private investments we have roughly R&D investments in RES/EE in Germany of **1.8 bn € / year**

Technology development

Financial instruments along the innovation path



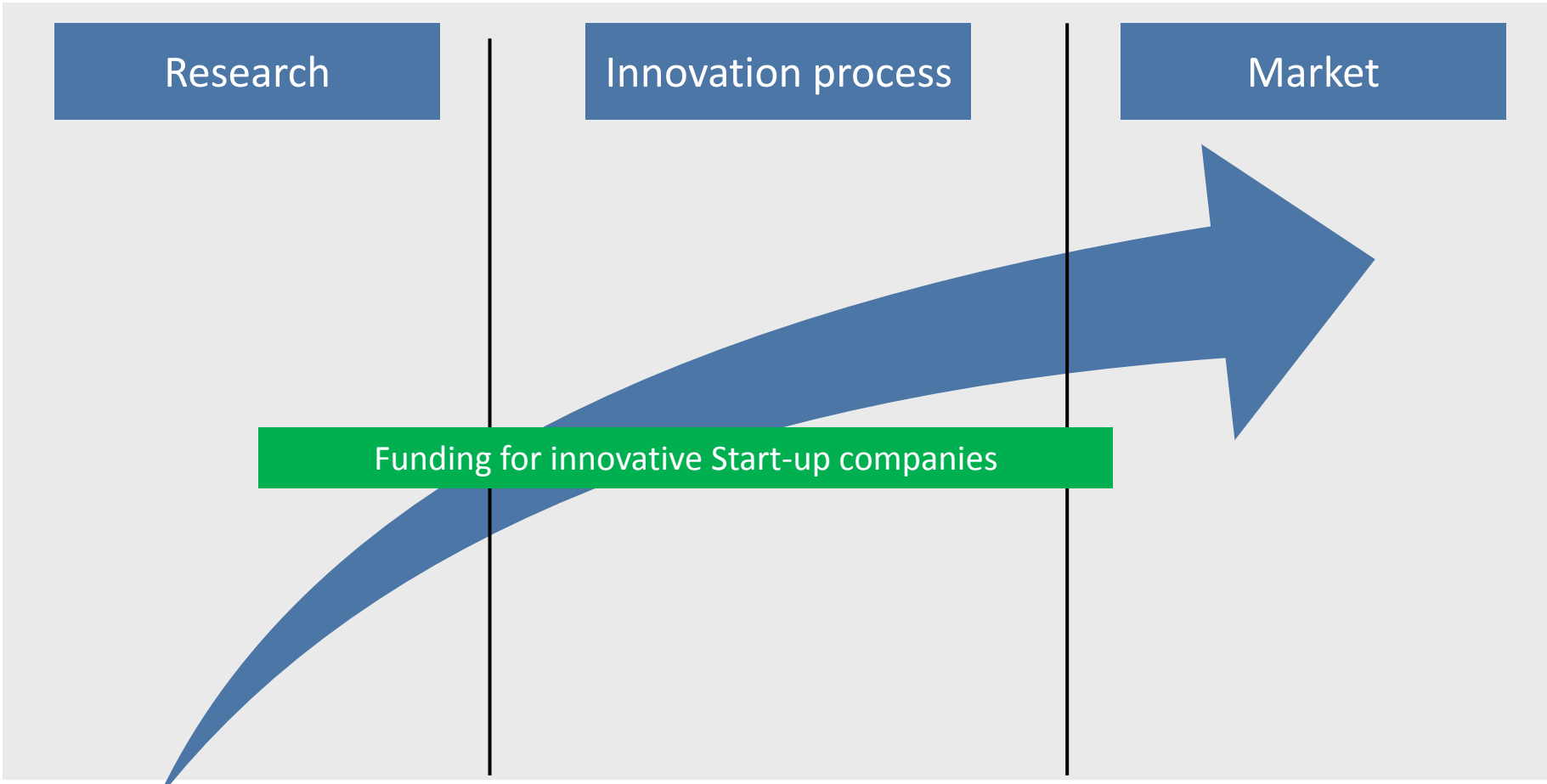
Funding for established businesses

ERP innovation program (EU Recovery Program)

Source of capital	Federal Government (ERP fund)
Target group	companies up to 500 m € revenue
What is supported?	R&D projects, market launch projects (only SME)
Technology	Open to all technologies
Type of support	**Loans, up to 60% subordinated loan**
Amount of support per project	Up to 100% of project costs, max. 5 m €
Amount of support in total	814 m € (2013)
Eligibility criteria	**Innovative for the applying company**

Technology development

Financial instruments along the innovation path



Funding for innovative start-up companies

Entrepreneurship in Germany - Overview

11 % of the German workforce is self-employed

350,000 new companies founded every year

18 % come with market innovations

14,000 new companies in the high-tech sector every year

Funding for innovative start-up companies

The high-tech founder fund

Source of capital	PPP (Federal Government, KfW Bank, 18 major German companies)
Target group	High-tech start-up companies
What is supported?	**Commercialization of high-tech inventions**
Technology	Open to all high-tech start-up companies
Type of support	**Venture capital (VC), subordinated loan, shareholding to attract other VC investors, coaching and networking**
Amount of subsidy per project	15% shares of the company + subordinated loan (interest rate 10%), in total max. 0.5 m €
Amount of subsidy in total	573 m € invested capital to date (Currently 19 clean-tech investments) (Founded in 2005)
Eligibility criteria	Technological innovation, significant growth potential …to be described in a business plan

Funding for innovative start-up companies

Exist – University-Based Business Start-Ups

- EXIST is part of Germany's high-tech strategy (Governmental funds)

It is aimed at:

- improving the entrepreneurial environment at universities and research institutions
- increasing the number of technology and knowledge based business start-ups

Funding for innovative start-up companies

Exist – University-Based Business Start-Ups

EXIST Business Start-Up Grant:

- Supports scientists, graduates and students in the preparation of their business start-up
- Scholarship of max. 3000 € /month for one year, for equipment 10.000 € for solo and 30000 € for team start-up´s, 5,000 € for coaching

EXIST Transfer of Research:

- Focused on high-tech business start-ups
- In a first phase the feasibility proofing of the idea, prototype and business plan development is supported
- 4 jobs + operating costs of 250,000 € (materials + equipment)
- In a second phase the commencement of business is supported

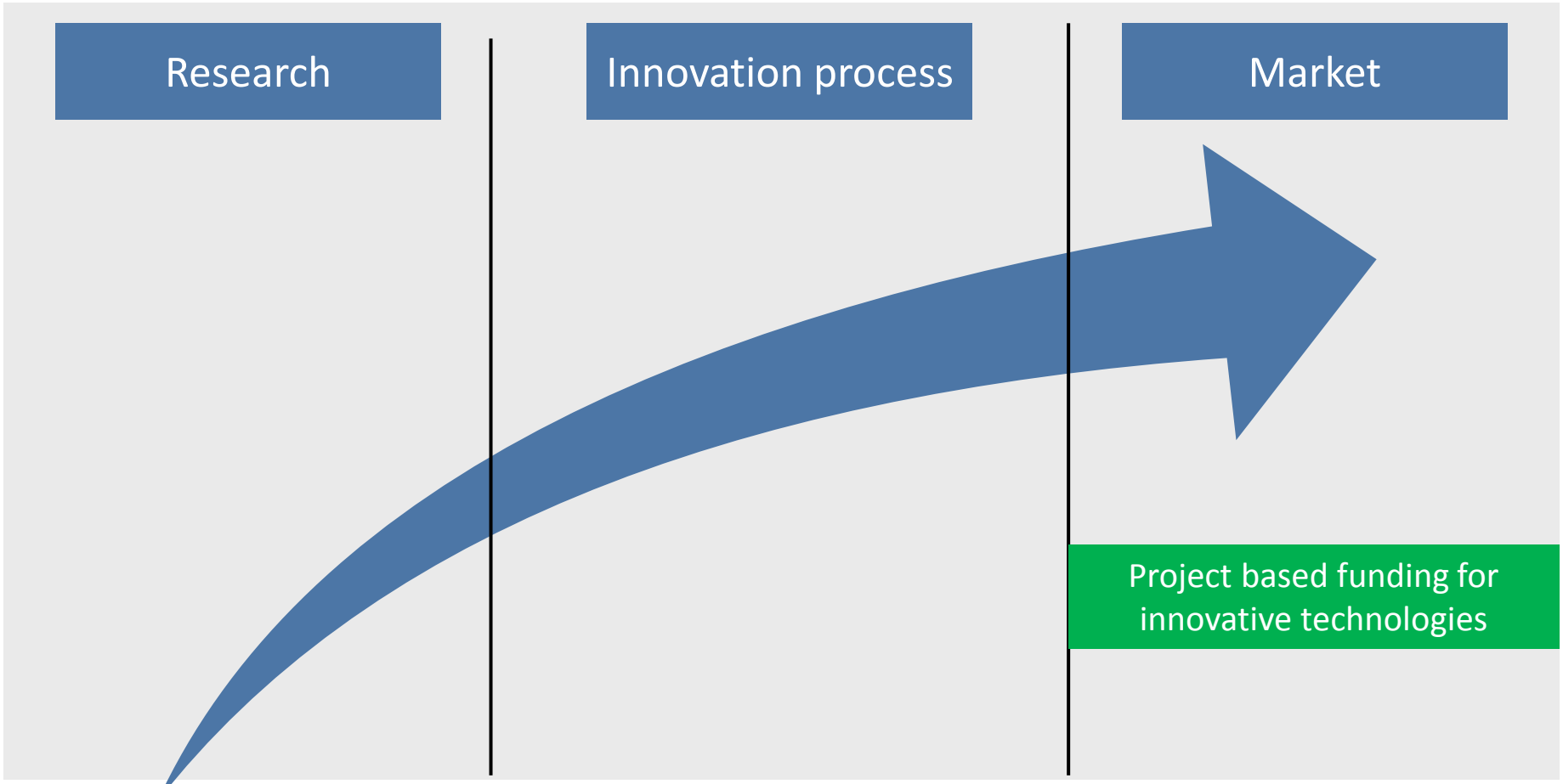
Funding for innovative start-up companies

Climate-KIC Germany

Source of capital	PPP: European Institute on Innovation and Technology (EIT), universities, research institutions and companies
Target group	Development of start-up companies with focus on mitigation or adaption to climate change (not limited to technological start-ups)
What is supported?	
Technology	
Type of support	**Climate KIC Accelerator:** **4 stage coaching and development process** **(offices, coaching, networking, scholarship)**
Amount of subsidy per project	Scholarship: 1,400 € per person and month (9-18 month)
Amount of subsidy in total	Currently 23 investments
Eligibility criteria	• high potential ventures in terms of both climate impact and commercial viability and be related to new technology • at least two persons

Technology development

Financial instruments along the innovation path



Project based funding for innovative technologies

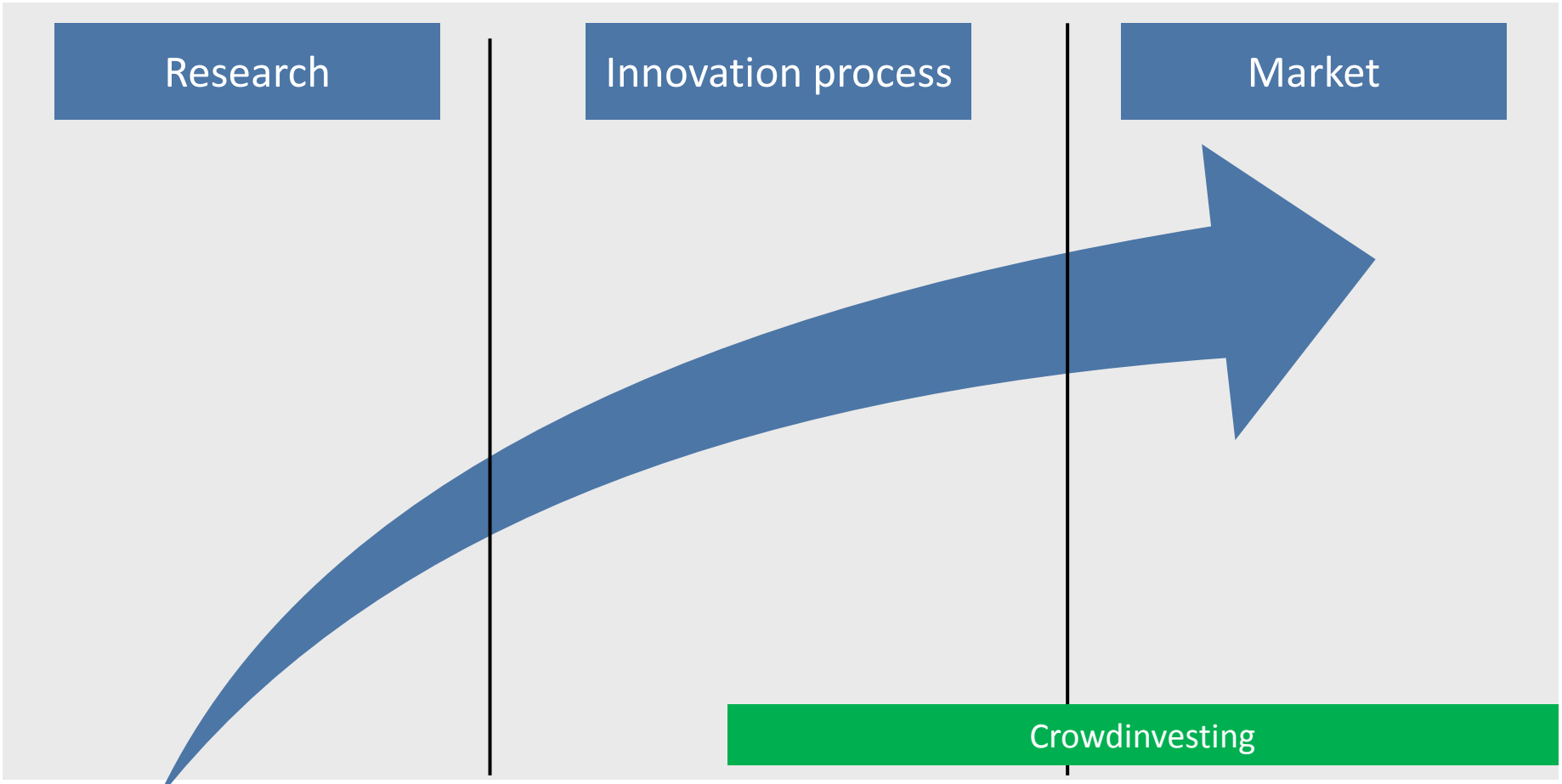
German Renewable Energy Law (EEG)

1. Safety of investment by **guaranteed feed-in tariffs** over 20 years and **obligation** of grid operator **to connect**
2. Incentives for innovation by declining remuneration

   Current feed-in-tariff:
   - Wind: 8.9 ct €/kWh (Offshore: 15.4 ct €/kWh)
   - PV: 8,61-12.42 ct €/kWh (depending on size)
   - Biogas: 5,85-13,66 ct/kWh (depending on size)
3. No liability for State treasury by a pay-as-you-go-system (EEG-Umlage)
   - Higher prices for end users (+ 67% since 2003)
   - Exceptions for energy intensive industries

Technology development

Financial instruments along the innovation path

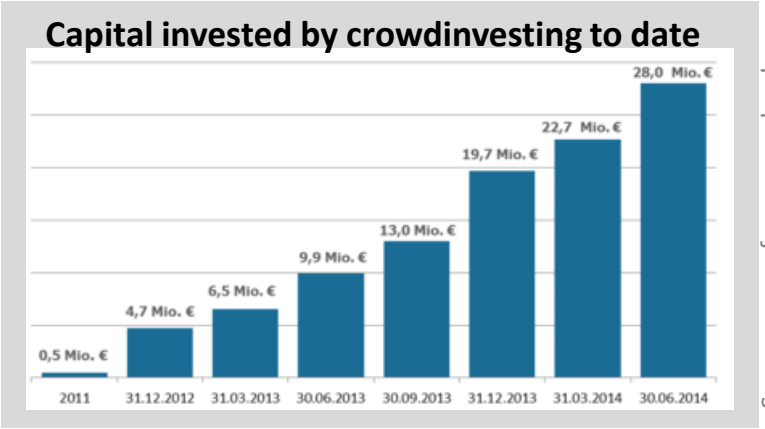


Crowdinvesting

A promising way to finance innovations without state aid

- Crowdfunding means funding a project by raising monetary contributions from a large number of people, typically via the internet
- Crowdinvesting is crowdfunding with the intention to make a profit
- Typical investments for crowdinvesting are **technology start-up companies or RES/EE projects**
- Way to get funding for innovations in RES/EE via the market
- Crowdinvesting in Germany is new but growing:

  (23 m. € invested in 18 months)



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Innovation implementation – Support structures

Example from North Rhine-Westphalia (NRW)

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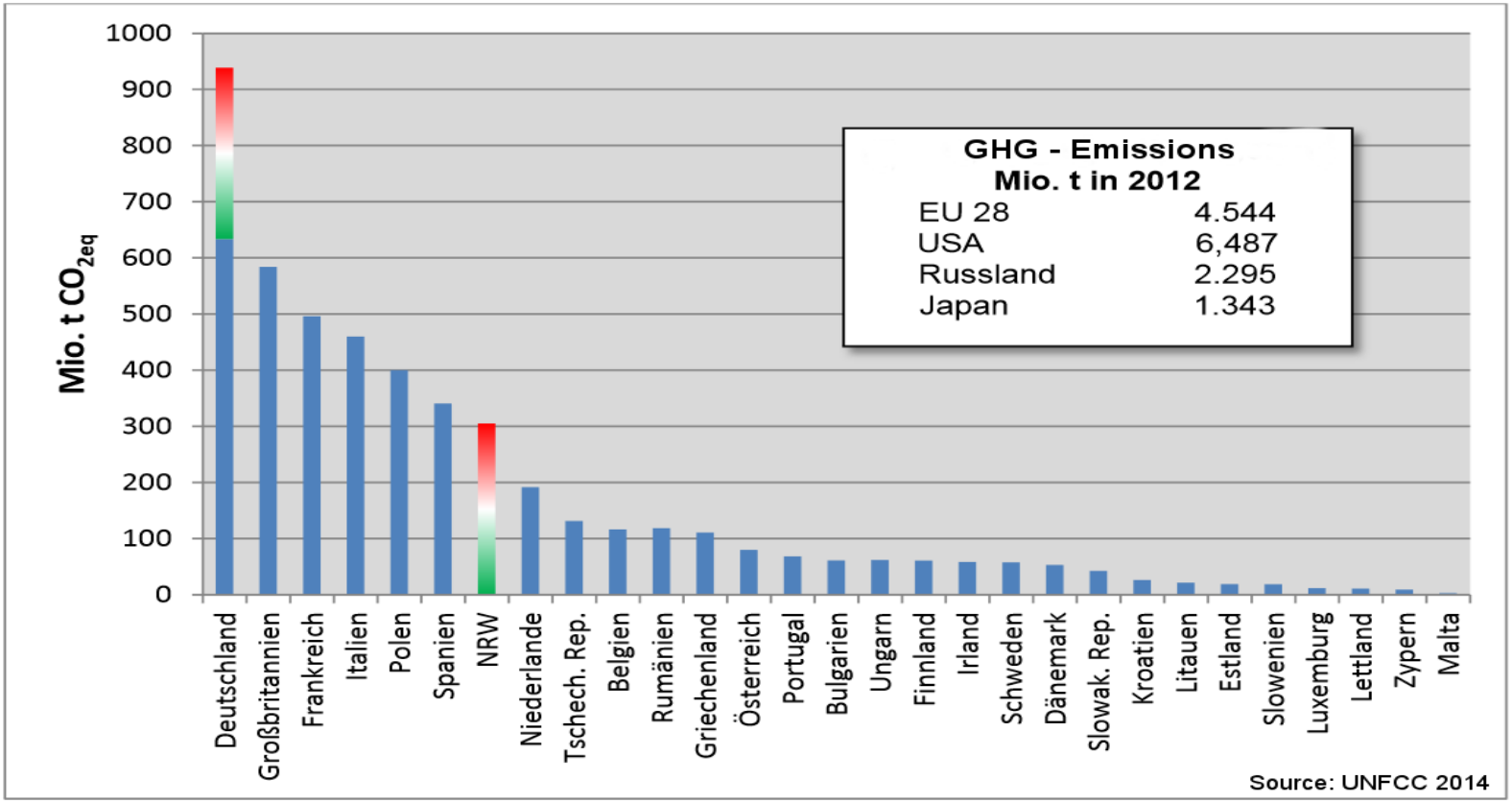
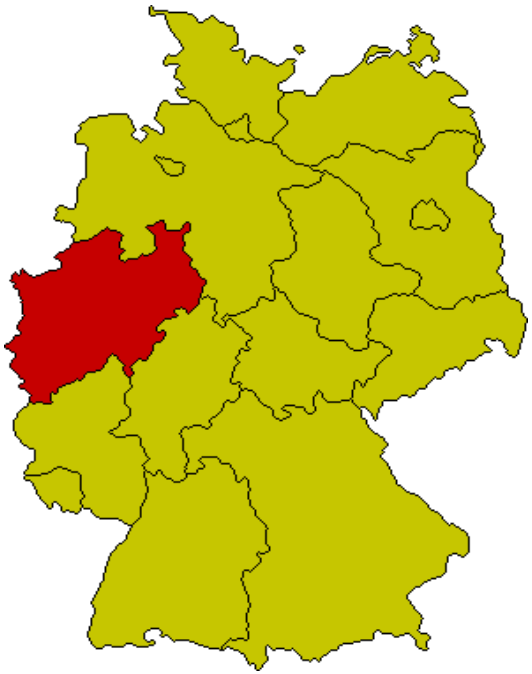
Total GHG Emissions of NRW compared to Europe



Innovation implementation – Support structures

NRW – Europe's center of energy



- 18 million inhabitants, GDP 600 bn. € /year
- 23% of German electricity consumption
- 30% of German electricity production (186 TWh)
- 45,000 MW power generation capacity installed
- No nuclear energy
- 10% of electricity from RES
- 240,000 employees in energy sector (of whom 28,000 work with RES)

First state in Germany with climate protection law in place

EnergyAgency.NRW

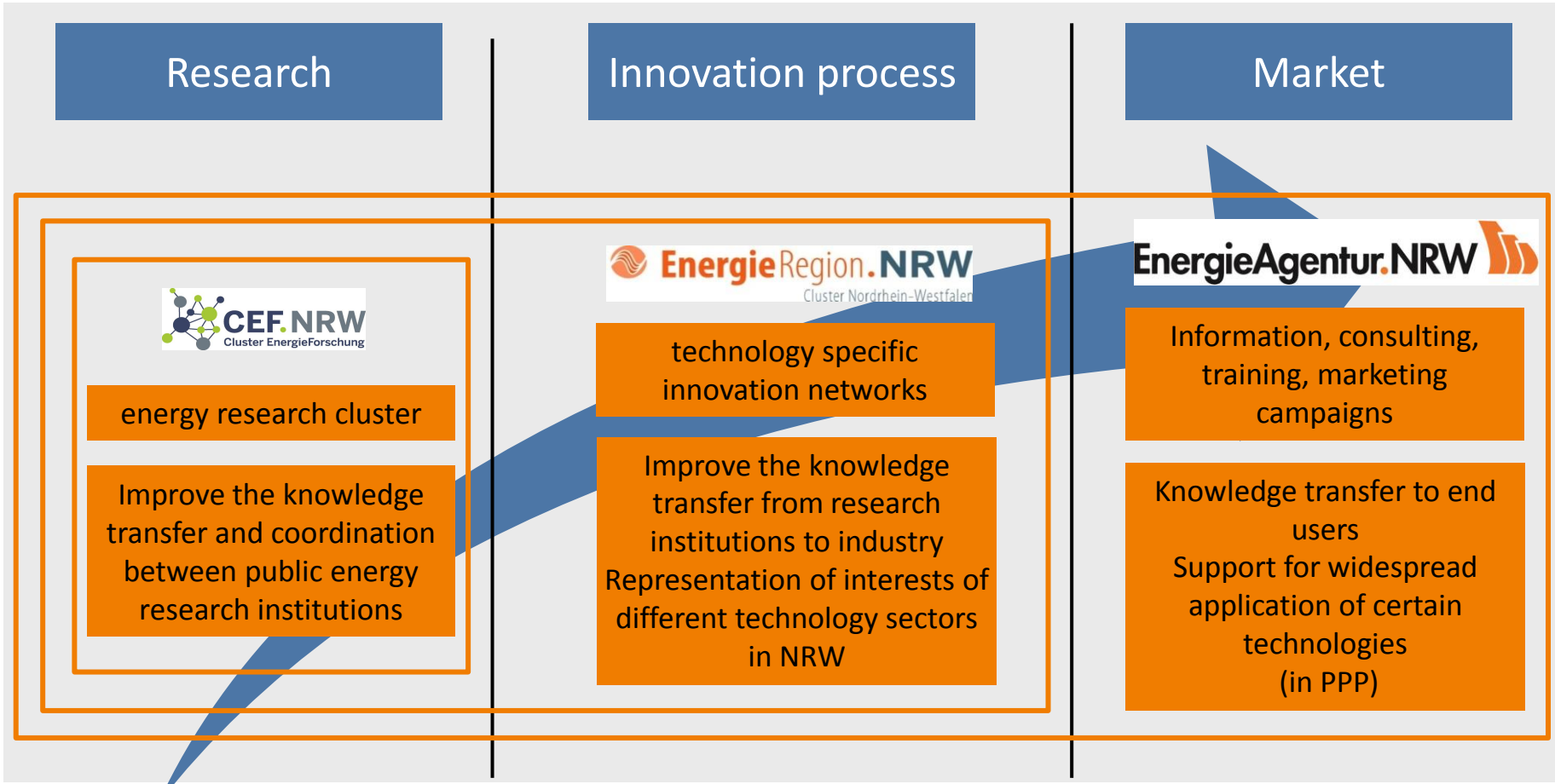
Platform to facilitate NRW's climate protection

EnergieAgentur.NRW
klimaschutz made in nrw

- NRW's **independent and non-commercial platform** for all energy-related matters
- Main instrument of the Government of NRW to **implement** its **energy and climate protection** policy
- **Fully financed** by NRW's State Government: € 17 MM/year
- Managed by ee energy engineers GmbH & partner: **120 employees**

EnergyAgency.NRW

Instruments to support the innovation path



EnergyAgency.NRW

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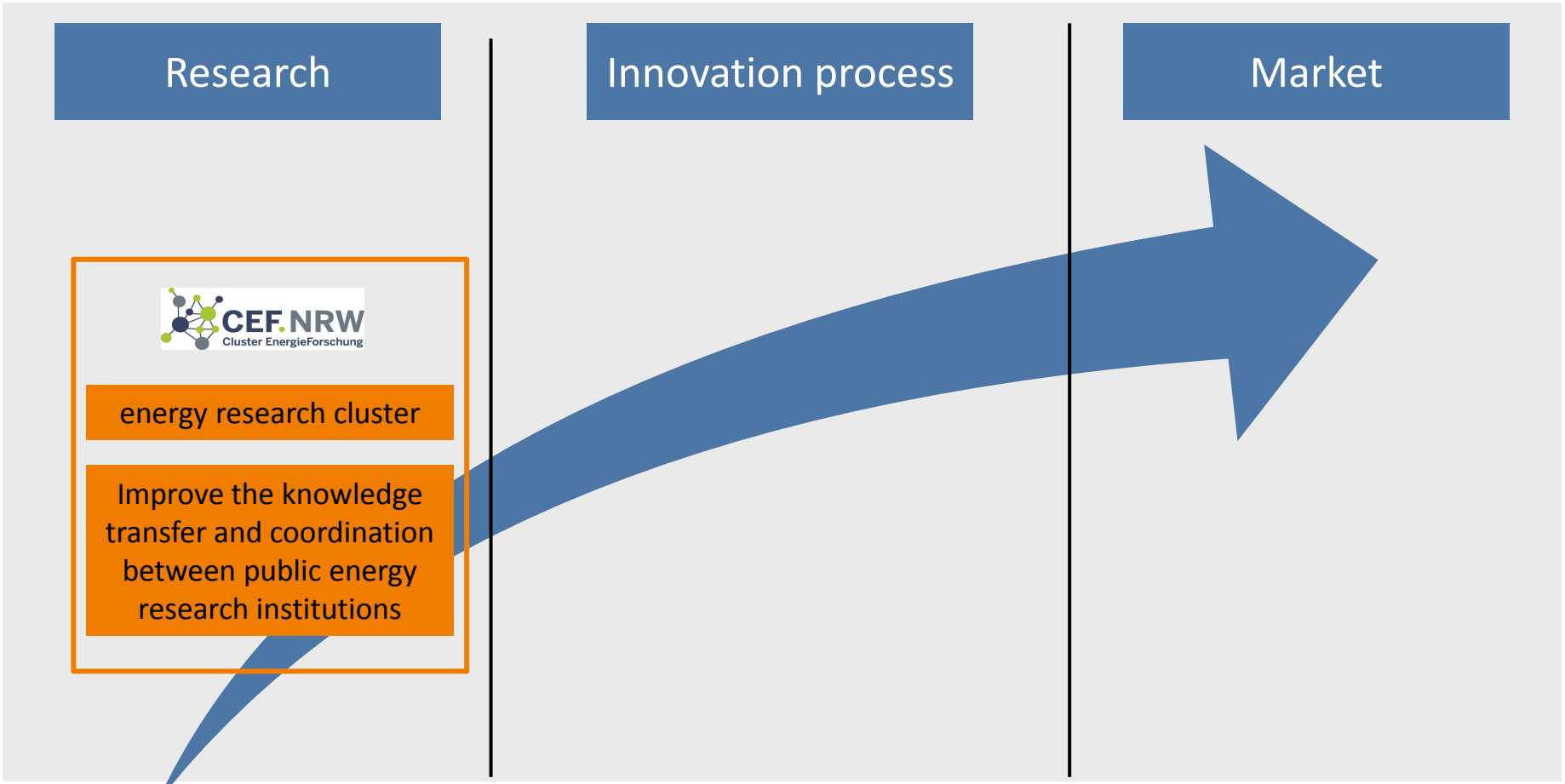


Cluster EnergyResearch.NRW

Support for research activities

CEF.NRW
Cluster EnergieForschung

Topics:

- Central Energy Conversion (including Solar Power Plants)
- Decentralized Energy Conversion (PV, FC, H2, Energy grids/storage)
- Biological Production of Energy Carriers
- Socio – Economic Research

Cluster EnergyResearch.NRW

Support for research activities

CEF.NRW
Cluster EnergieForschung

Aims & actions:

- To support the energy industry and international cooperation in R&D
- To strengthen the structures in NRW and increase the visibility (i.e. organization of workshops, conferences etc.)
- To foster Cross – Innovation (Innovation by cooperation across subject specific borders, i.e. materials and energy)

Cluster EnergyResearch.NRW

Project example

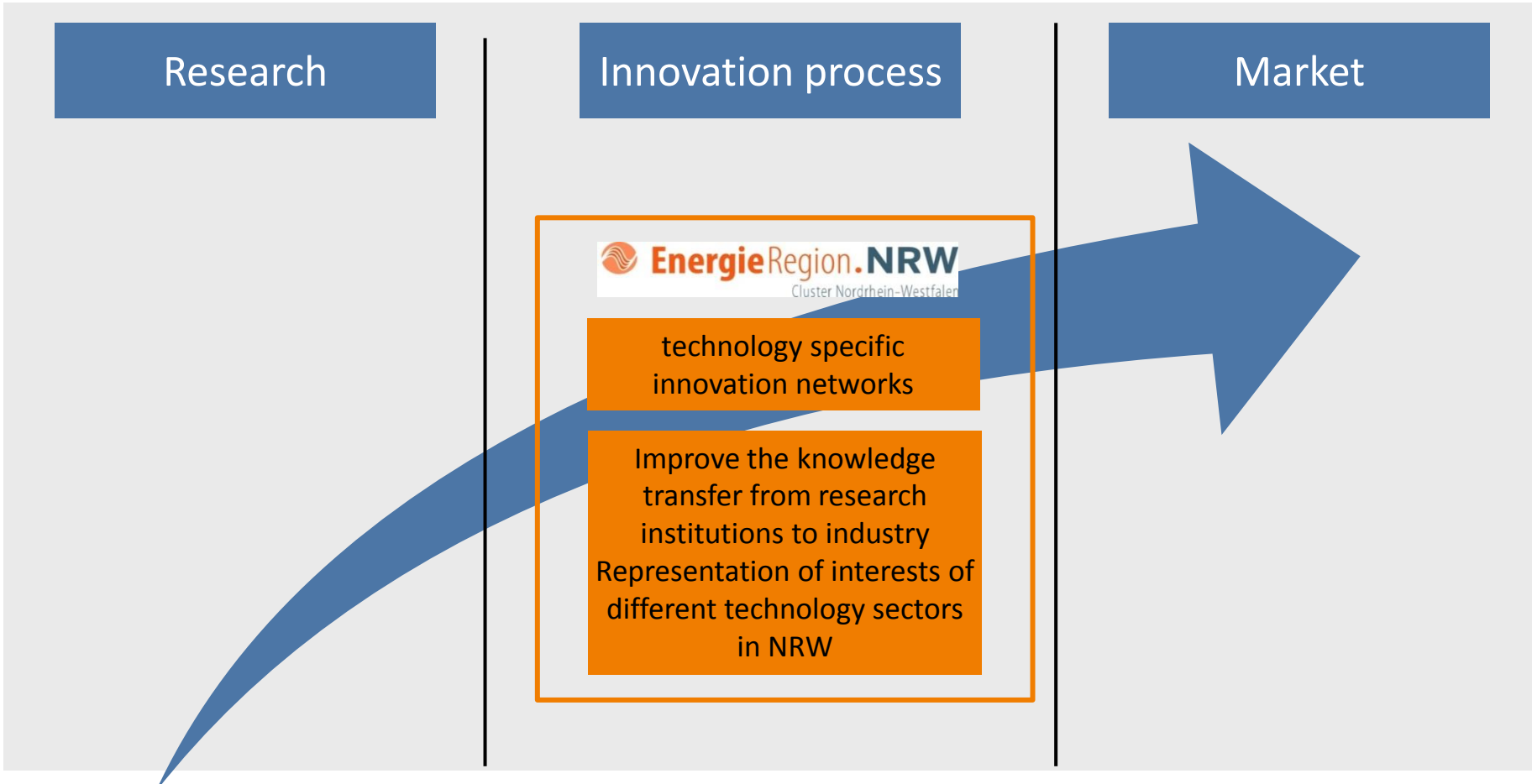
Adapted laser processes for silicon solar cells (ALPS):

- Development of shaped Laser profiles for solar cell production technology
- **Aim:** Reduction of process costs

Fraunhofer Institut Solare Energiesysteme

EnergyAgency.NRW

Instruments to support the innovation path



Cluster EnergyRegion.NRW

Support for demonstration and market preparation

EnergieRegion.NRW
Cluster Nordrhein-Westfalen

Topics:

- Wind Power
- Biomass
- Photovoltaics
- Geothermal Energy
- Fuel Cells and Hydrogen
- Energy-efficient and Solar Construction
- Fuels and Engines of the Future
- Power Plant Technologies

Cluster EnergyRegion.NRW

Support for demonstration and market preparation

EnergieRegion.NRW
Cluster Nordrhein-Westfalen

Aims and actions

- To connect the stakeholders along the value chain
  (networking among businesses, organizations, scientists and politicians)
- To initiate and accompany technology oriented demonstration projects
- To benchmark NRW's competitiveness with selected regions worldwide

Cluster EnergyRegion.NRW
Project example

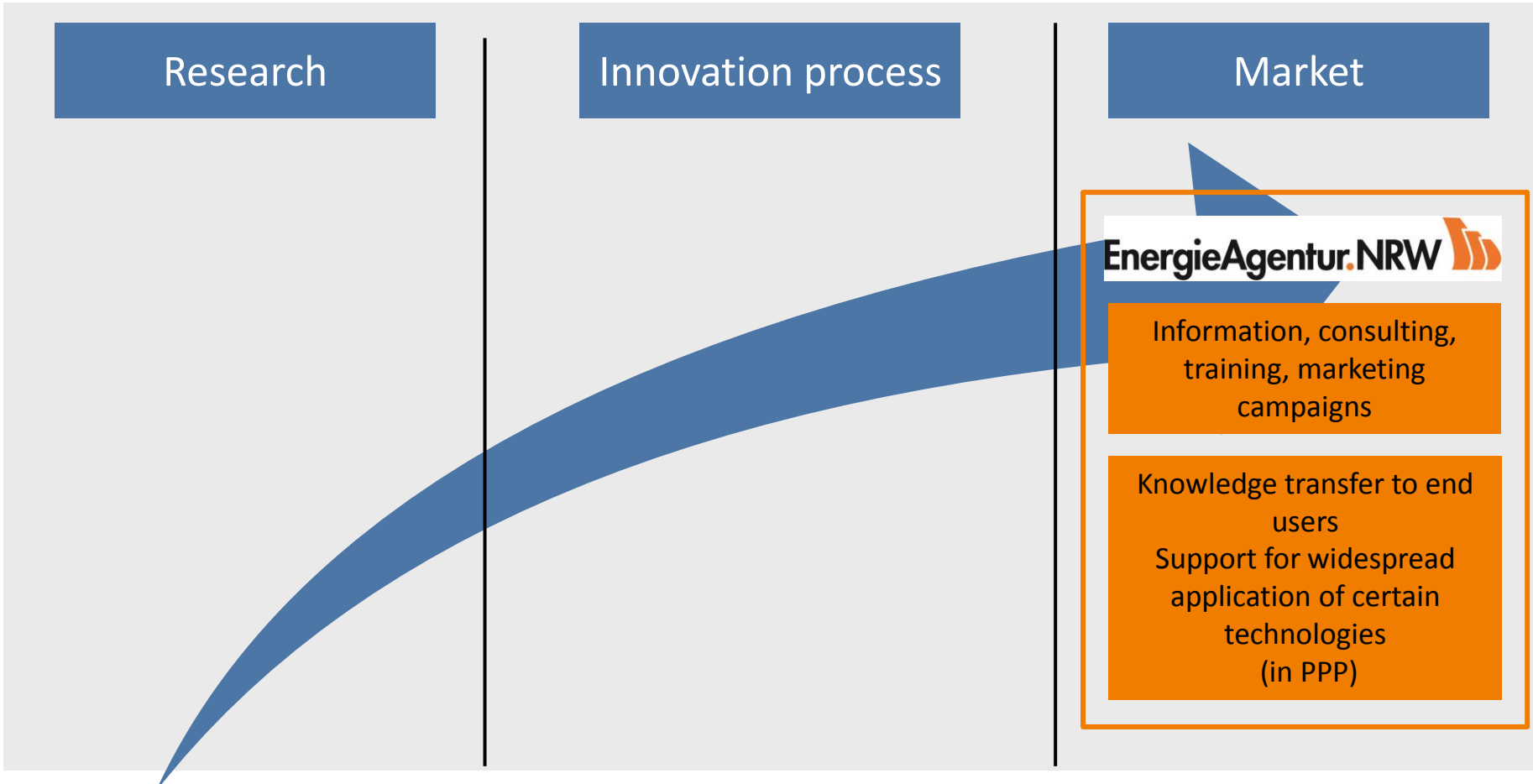
Model Region Rhine-Ruhr: Facts & Figures

- Phase I (2009-2011)
  - 8 Projects
  - 200 Vehicles, 530 recharging points
  - Total budgets: 43 Mio. €,
    subsidies (Gov): 21 Mio.€

- Phase II (2012-2015)
  - 13 Projects: terms to the end of 2017
  - Total budget: 48 Mio. €,
    subsidies (Gov): ca. 31 Mio. €
  - Ca. 660 Vehicles projected, realized: 440
  - 400 new recharging points projected, realized: ca. 350

EnergyAgency.NRW

Instruments to support the innovation path



EnergyAgency.NRW

Support of market penetration

- **3,300** companies and institutions are **partner of the EnergyAgency.NRW**
- **76 %** of the companies are **SMEs**
- **64** universities, **107** institutions and **94** associations
- **5,200** individuals **actively involved** in working groups and networks
- **32,000 individuals** are **regularly informed** regarding the EA's activities

EnergyAgency.NRW

Support of market penetration

Tasks

- Information / communication
- Motivation / awareness creation
- Advise
- Capacity building

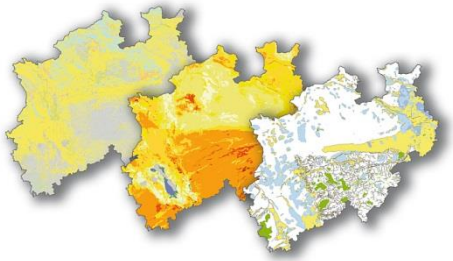
Standard services

- Advisory services
- Public relations, information and awareness campaigns
- Education and training

Additional services

- R&D support
- Project work (initiation, management)
- Financial advise, funding

EnergyAgency.NRW
Project example



Heat Pump market place:

- Co-financed by state and >100 private sector partners Instruments:
  - market brochure, planning guide, annual heat pump weeks
  - road shows, media relations, presentations and retail trade fairs
- **Aim:** Increase knowledge of the innovative technology of heat pumps in NRW

EnergyAgency.NRW

Project example

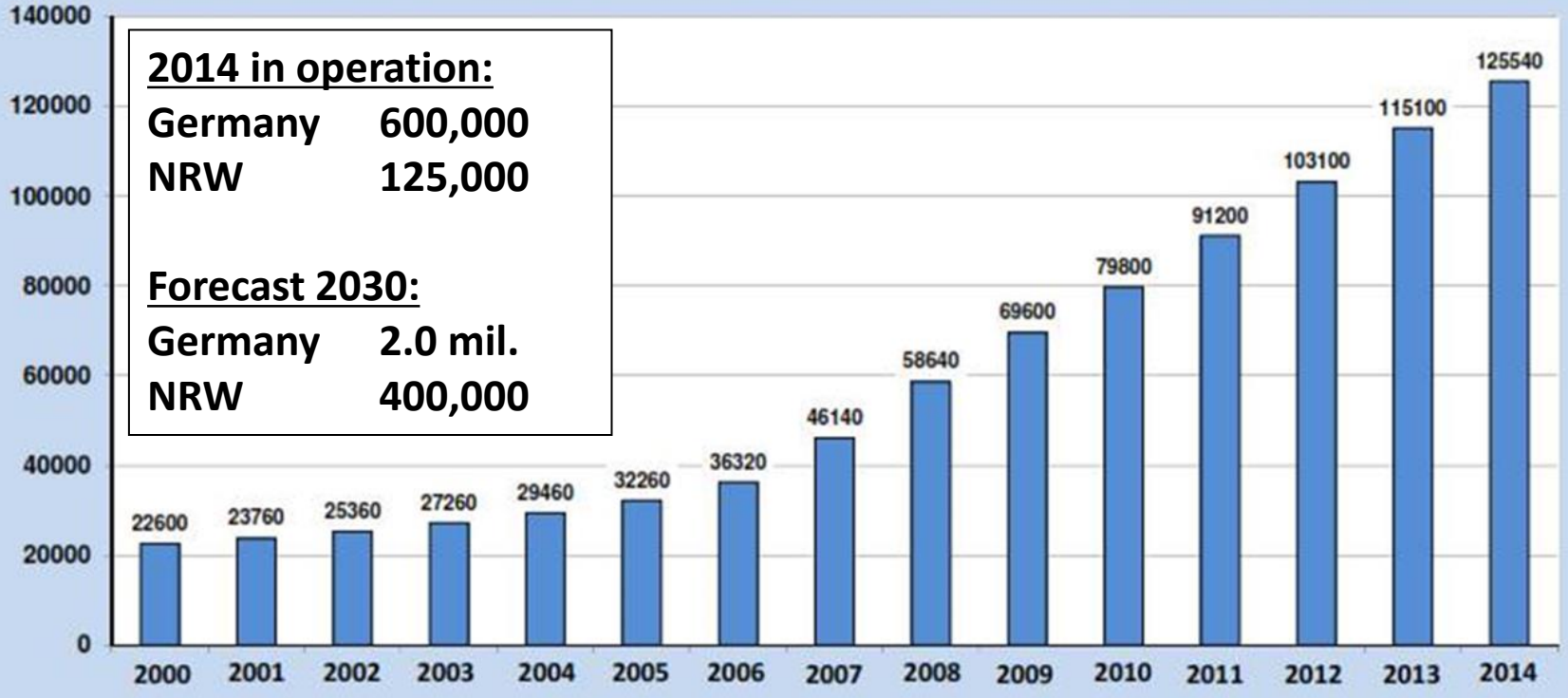
Sales figures: heat pumps in NRW 2014

2014 in operation:

Germany	600,000
NRW	125,000

Forecast 2030:

Germany	2.0 mil.
NRW	400,000



Source: BWP e.V., Stand:2015

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Lessons learned – Financing instruments

- There is **not a "one fits it all"-financing instrument** to come from ideas to innovative technologies in RES/EE
- Germany applies a combination of:
  - Mainly **technology open** funding instruments
  - **Niche programs** especially for green innovations
  - **Different types of funding** (grant, loan, coaching)
  - **Funding for different stages** in the innovation process (R&D, start-up, dissemination)
- Tries to **avoid pitfalls** in terms of over funding of single technologies

Lessons learned – Support structures

- **EA.NRW's** approach to facilitates the technology transfer from academia to market in a very broad sense is **very successful (>40,000 energy related projects** where initiated and supported since 1990)
- EA.NRW's status a as non-commercial platform for all energy-related topics **(independency)** is really important for the trustworthiness
- The contracting authority (Ministry for climate protection NRW) recognized the importance of EA.NRW and **extended the contract for 6 more years** (until 2020)

Thank you!

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