The Abdus Salam
International Centre for Theoretical Physics

United Nations
Educational, Scientific
and Cultural Organization

International Atomic
Energy Agency

ICTP Experts Meeting on "Science & Renewable Energy"
January 15 - 18, 2007

Venue: ICTP Adriatico Guest House - Lundqvist Lecture Hall

310/1905

"Renewable Energy in Germany: Policies & Support Mechanisms"

R. Hinrichs-Rahlwes
German Renewable Energy Foundation
Berlin, Germany

Renewable Energy in Germany

- Policies and Support Mechanisms -

ICTP/WREN Expert Meeting, Trieste, January 15 – 19, 2007

Rainer Hinrichs-Rahlwes

Advisor European and International Affairs

German Renewable Energy Federation (BEE e.V)

German Renewable Energy Federation

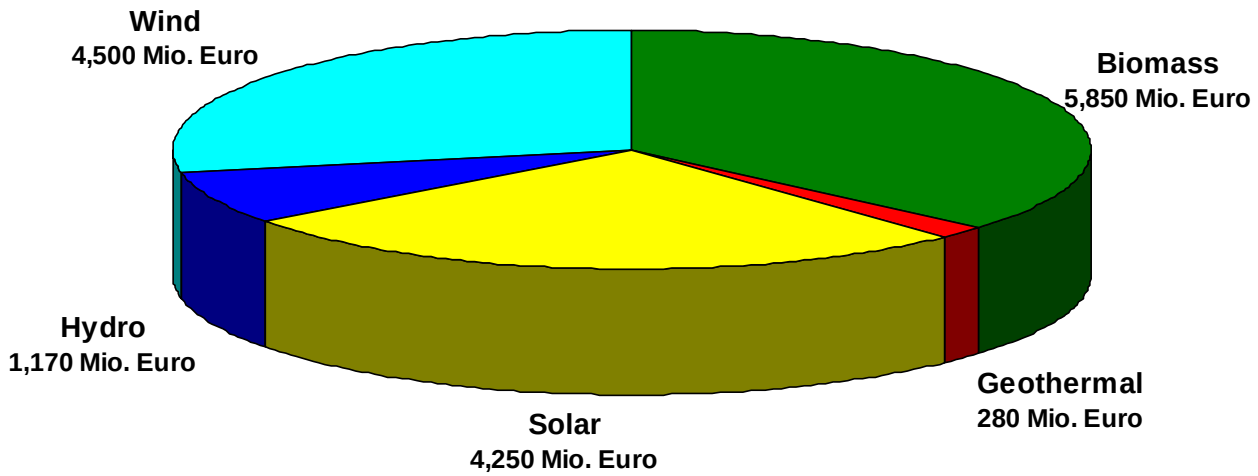
- **Umbrella organisation** of RES-associations **since 1991**
- **Task and mission:** Political consulting
  → stable and reliable framework conditions for RES
- **21 Member associations:**
  hydro, wind, solar, biomass, and geothermal energy
- **Representing**
  > 30,000 members, including > **5,000 enterprises**.
- **Parliamentary board:**
  all Bundestag-Parties represented → link to politics.

Structure

1. Overview
2. Electricity: RES-E
3. Heating and Cooling: RES-H
4. Road Transport: RES-T
5. Industry's Vision for 2020 - Part I: Market Development in Germany
6. Industry's Vision for 2020 - Part II: From Internal to External Markets
7. Challenges and Perspectives

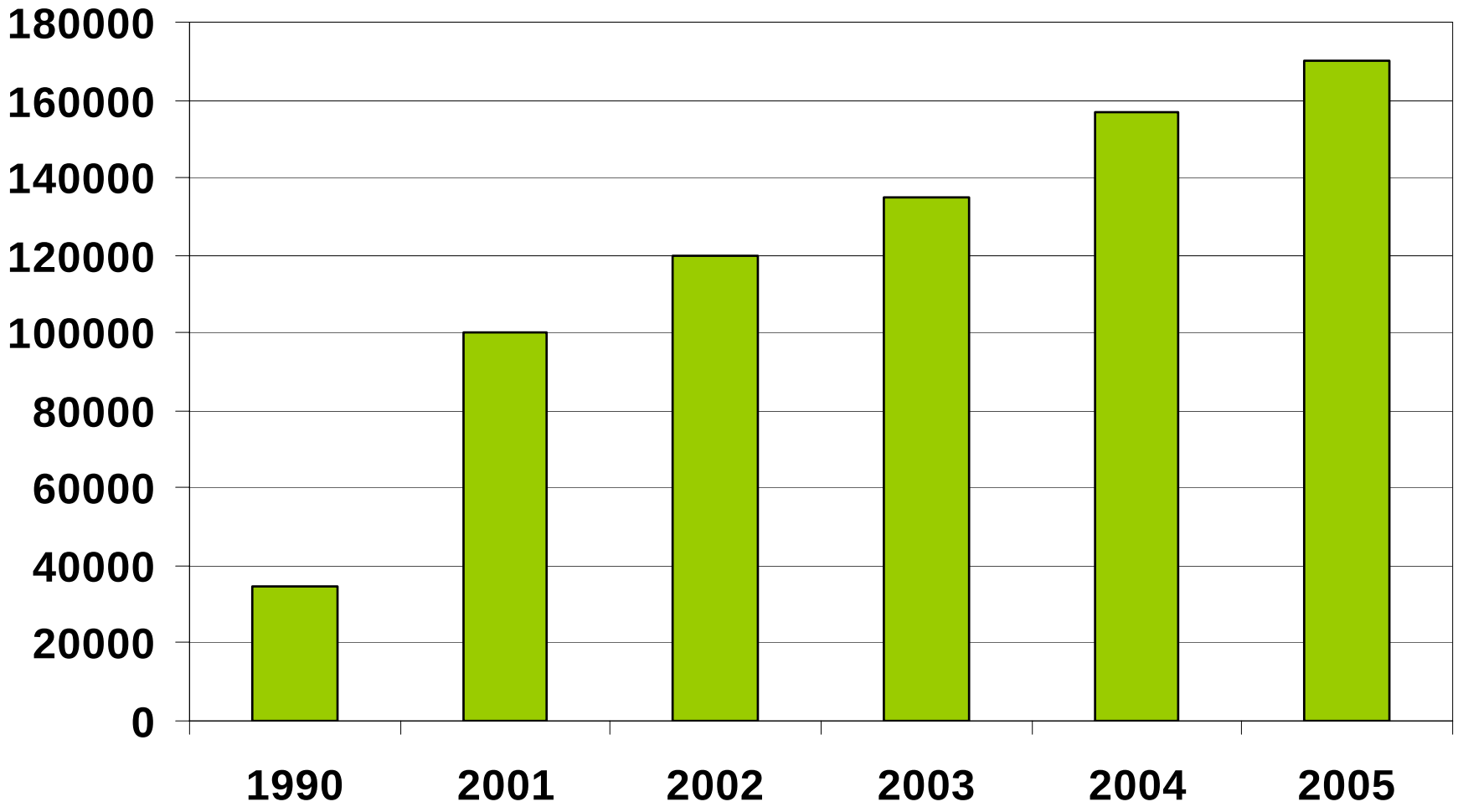
Turnover of the German RE-Industry (2005)

Total: 16,1 bn. €

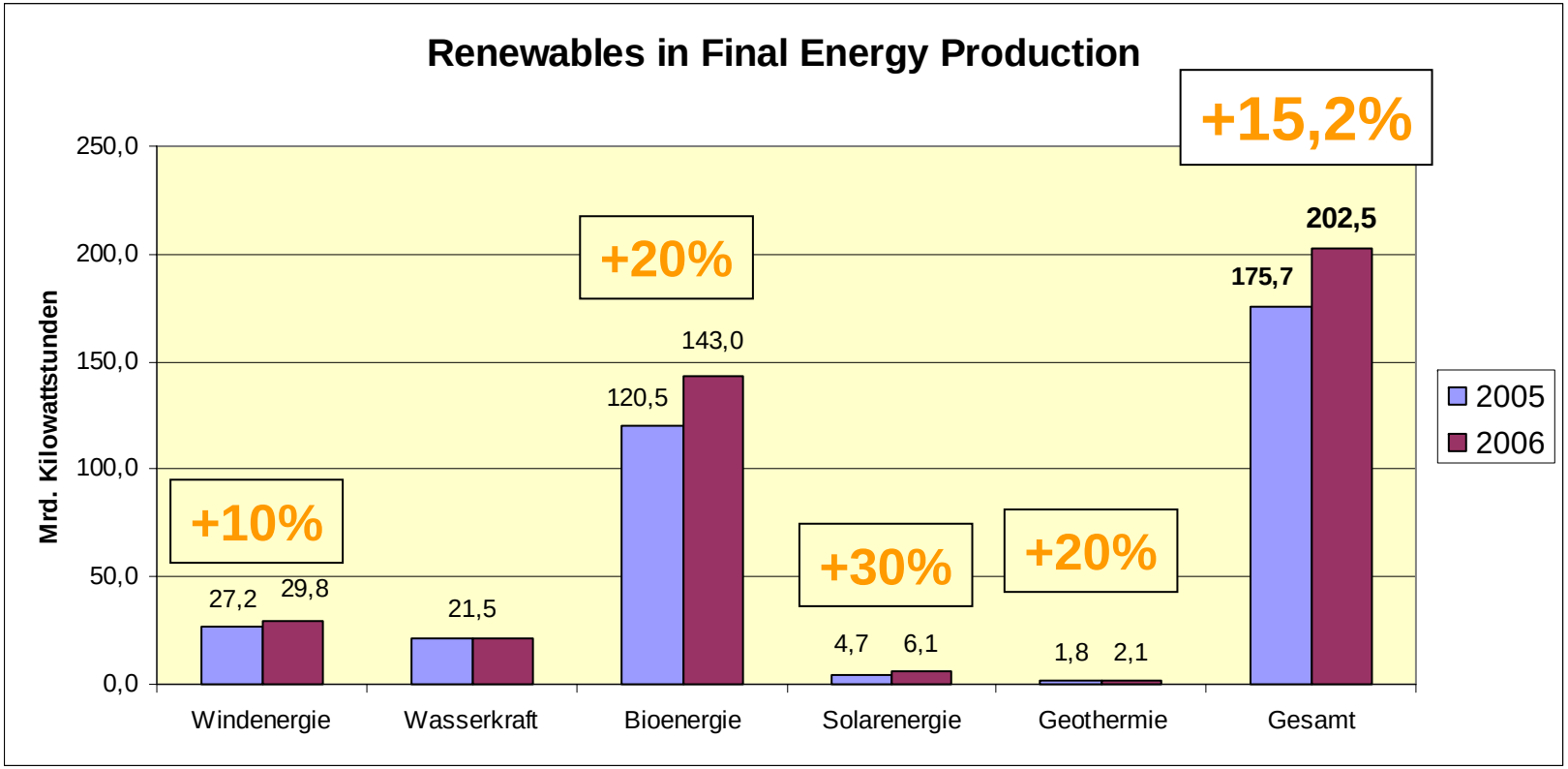


Source: ZSW Jahrbuch Erneuerbare Energien

Jobs in the RE-Sector: 170 000 in 2005



RES in Final Energy Consumption 2005 / 2006



RES in Final Energy Consumption in Germany 2006 : 7.7% (2005: 6.8%)

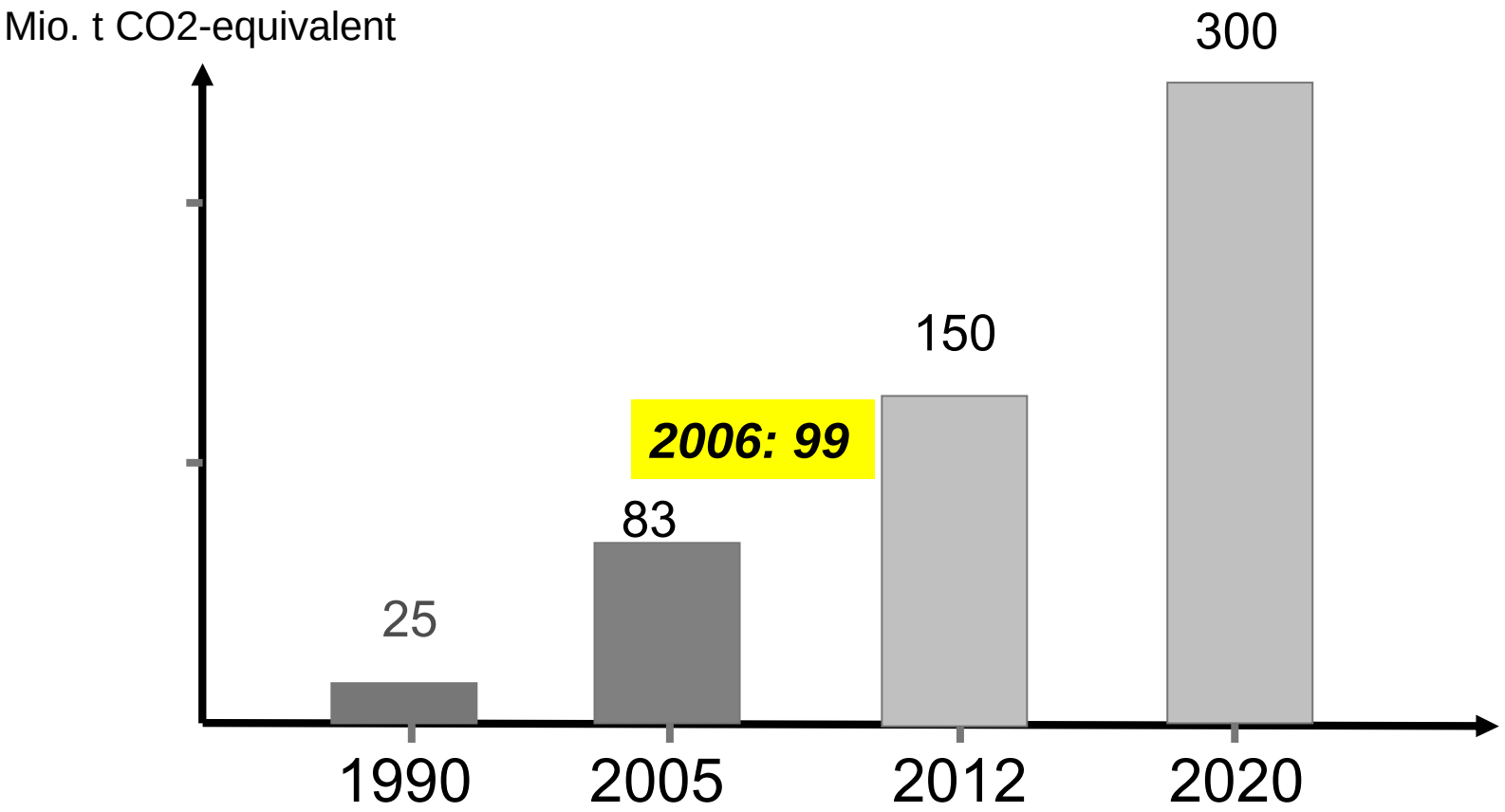
Quelle: BEE auf Basis Branchenverbände, BMU, ISET, VDN, Uni Hamburg, IE; Wachstumsraten gerundet

Germany Among The Top countries

Top Five Countries	#1	#2	#3	#4	#5
Annual amounts or capacity additions in 2005					
Annual investment	Germany/China (equal)		United States	Japan	Spain
Wind power	United States	Germany	Spain	India	China
Solar PV (grid-connected)	Germany	Japan	United States	Spain	France
Solar hot water	China	Turkey	Germany	India	Austria/Greece/ Japan/Australia
Ethanol production	Brazil/United States		China	Spain/India	
Biodiesel production	Germany	France	Italy	United States	Czech Republic
Existing capacity as of 2005					
Renewables power capacity (excl. large hydro)	China	Germany	United States	Spain	India
Large hydro	United States	China	Brazil	Canada	Japan/Russia
Small hydro	China	Japan	United States	Italy	Brazil
Wind power	Germany	Spain	United States	India	Denmark
Biomass power	United States	Brazil	Philippines	Germany/Sweden/Finland	
Geothermal power	United States	Philippines	Mexico	Indonesia/Italy	
Solar PV (grid-connected)	Germany	Japan	United States	Spain	Netherlands
Solar hot water	China	Turkey	Japan	Germany	Israel

Source: REN21: Global Status Report Update 2006

RE reduce CO2-Emissions



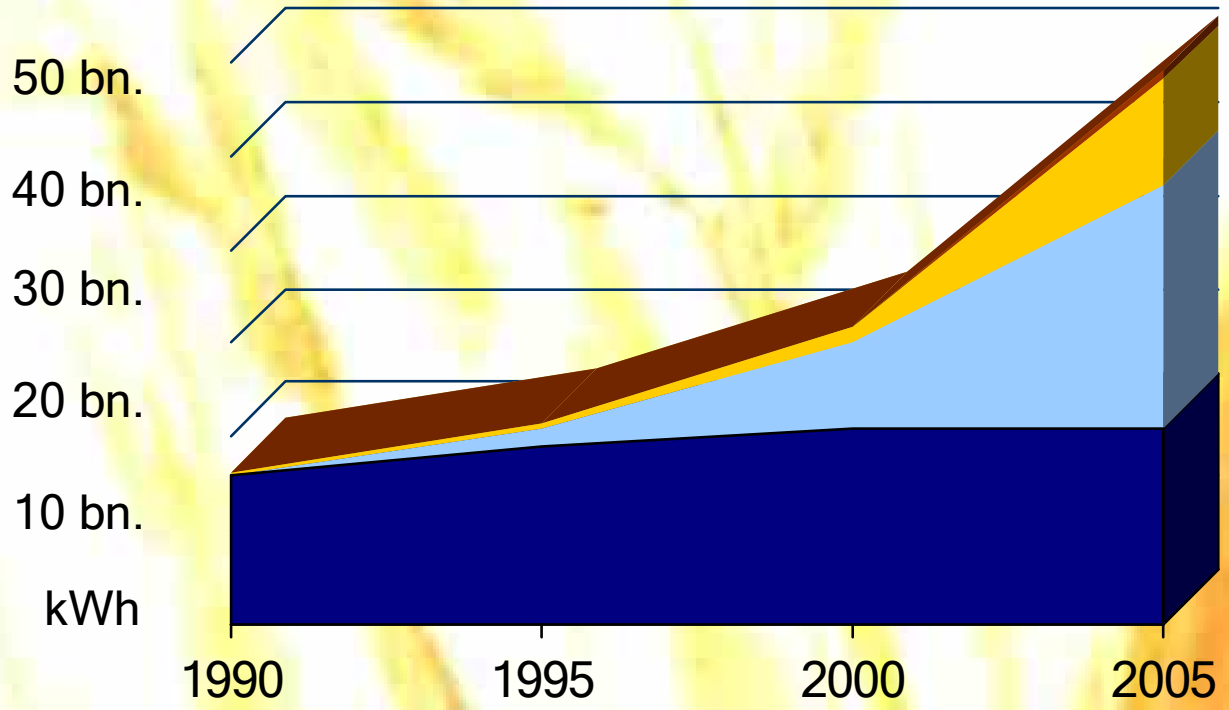
RE promotion: The German Policy Mix

Electricity Sector	Renewable Energy Law – **EEG** - : - Priority for RE - Fixed feed-in tariffs, guaranteed for 20 years - High efficiency
Heating *and* *Electricity* Sector	Market Incentive Programme – MAP -: - Financed through ecological tax reform - supports heating *and/or electricity* from RES - Until 2006: More than 600,000 solar collectors and small biomass installations were supported - supplementary loans for larger plants
Fuel sector	- tax exemption from 1992 (biodiesel)/2004 (all biofuels) - since August 2006: partial taxation - quota system from 2007

Structure

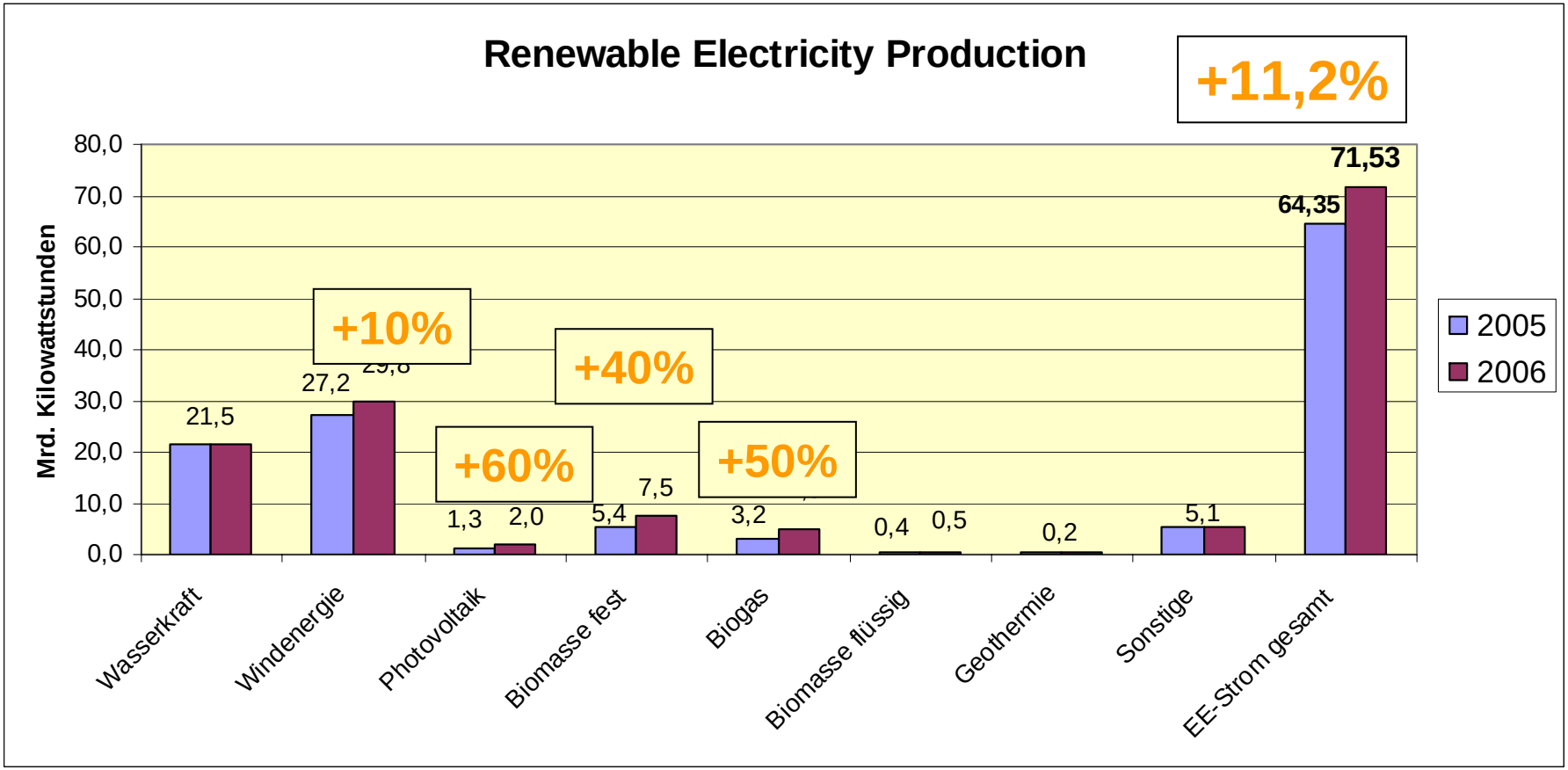
1. Overview
2. Electricity: RES-E
3. Heating and Cooling: RES-H
4. Road Transport: RES-T
5. Industry's Vision for 2020 - Part I: Market Development in Germany
6. Industry's Vision for 2020 - Part II: From Internal to External Markets
7. Challenges and Perspectives

Renewable Electricity Production in Germany



- Increase of renewable electricity production from 2.7 % (1990) to >10 % (2005)

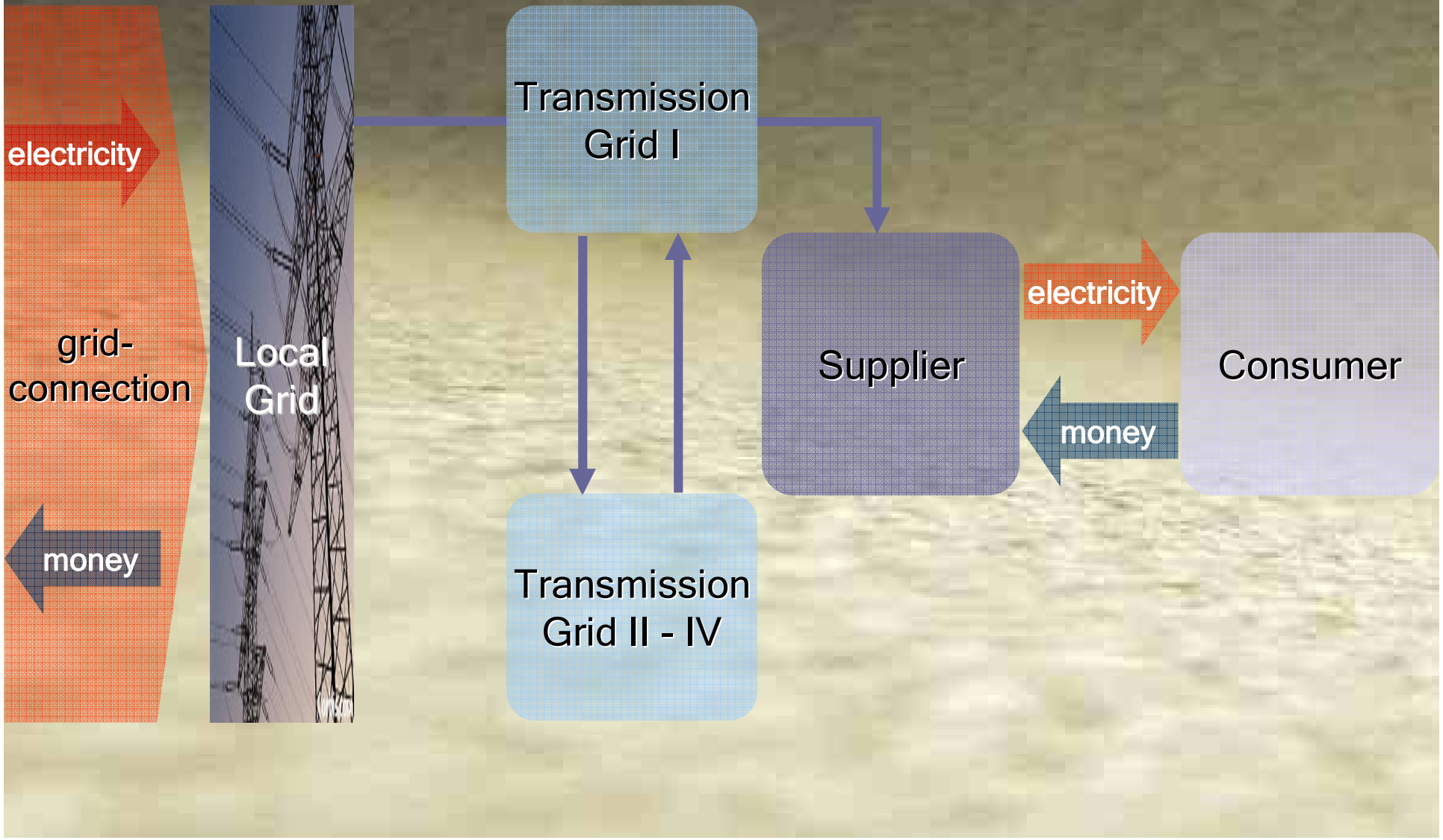
RES-E 2005 / 2006



RES-E share in Germany 2006: 11.6% (2005: 10,2%)

Sources: BEE auf Basis Branchenverbände, BMU, ISET, VDN, IE; Wachstumsraten gerundet

How the EEG works



Renewable Energy Law (EEG) – Feed-in Tariffs

	Feed-in Tariffs in ct (EUR) per kWh 2006	Annual Degression in %	Years
Hydro large (only for additional electricity after modernisation)	3.62 - 7.51	1.0	15
small	6.65 - 9.67	none	30
Biomass / Biogas	8.15 – 17.16	1.5	20
Geothermal	7.16 – 15.00	1.0 (starting 2010)	20
Wind onshore	5.28 – 8.36	2.0	20
offshore	6.19 – 9.10	2.0	20
Photovoltaic	40.60 – 56.80	5.0 Stand-alone: 6.5	20

Renewable Energy Law (EEG) 2006 – Hydropower

		Feed-in Tariff in ct (EUR)	Annual Degression	Years
Hydro	small	6.65 - 9.67	none	30
	large	3.62 - 7.51	1%	15

Small Hydro (< 5 MW):

< 500 kW only at existing dams (or if approved until end of 2007)

Large Hydro (5 – 150 MW)

- Only if modernised until end of 2012
- Only for newly installed capacity

Renewable Energy Law (EEG) 2006 – Bio-Energy

	Feed-in Tariffs in ct (EUR)	Annual Degression	Years
Biomass/ Biogas	8.16 - 17.16	1.5 %	20

- Higher fees for small plants (< 150 kW)
- Bonus for energy crops (6 ct < 500 kW, 4 ct < 5 MW)
- Bonus for cogeneration (2 ct)
- Bonus for innovative technologies (2 ct)

Renewable Energy Law (EEG) 2006 – Geothermal Energy

	Feed-in Tariffs in ct (EUR)	Annual Degression	Years
Geothermal	7.16 - 15.00	1 % (starting 2010)	20

- < 5 MW: 15 ct
- 5 - 10 MW: 14 ct
- 10 - 20 MW: 8.95 ct
- >20 MW: 7.16 ct

Renewable Energy Law (EEG) 2006 – Photovoltaics

	Feed-in Tariffs in ct (EUR)	Annual Degression	Years
Photovoltaics	40.60 – 56.80	5 % (stand-alone: 6.5)	20

- **Roof-top:**

  < 30 kW: 51.8 ct
  > 30 kW: 49.28 ct
  >100 kW: 48.74 ct

- **Integrated in buildings:**

  < 30 kW: 56.8 ct
  > 30 kW: 54.28 ct
  >100 kW: 53.74 ct

- **Free Standing:** 40.6 ct

Renewable Energy Law (EEG) 2006 – Windpower

	Feed-in Tariffs in ct (EUR)	Annual Degression	Years
Wind Energy onshore	5.28 – 8.36	2 %	20
Wind Energy offshore	6.19 – 9.10	2 % (starting 2008)	20

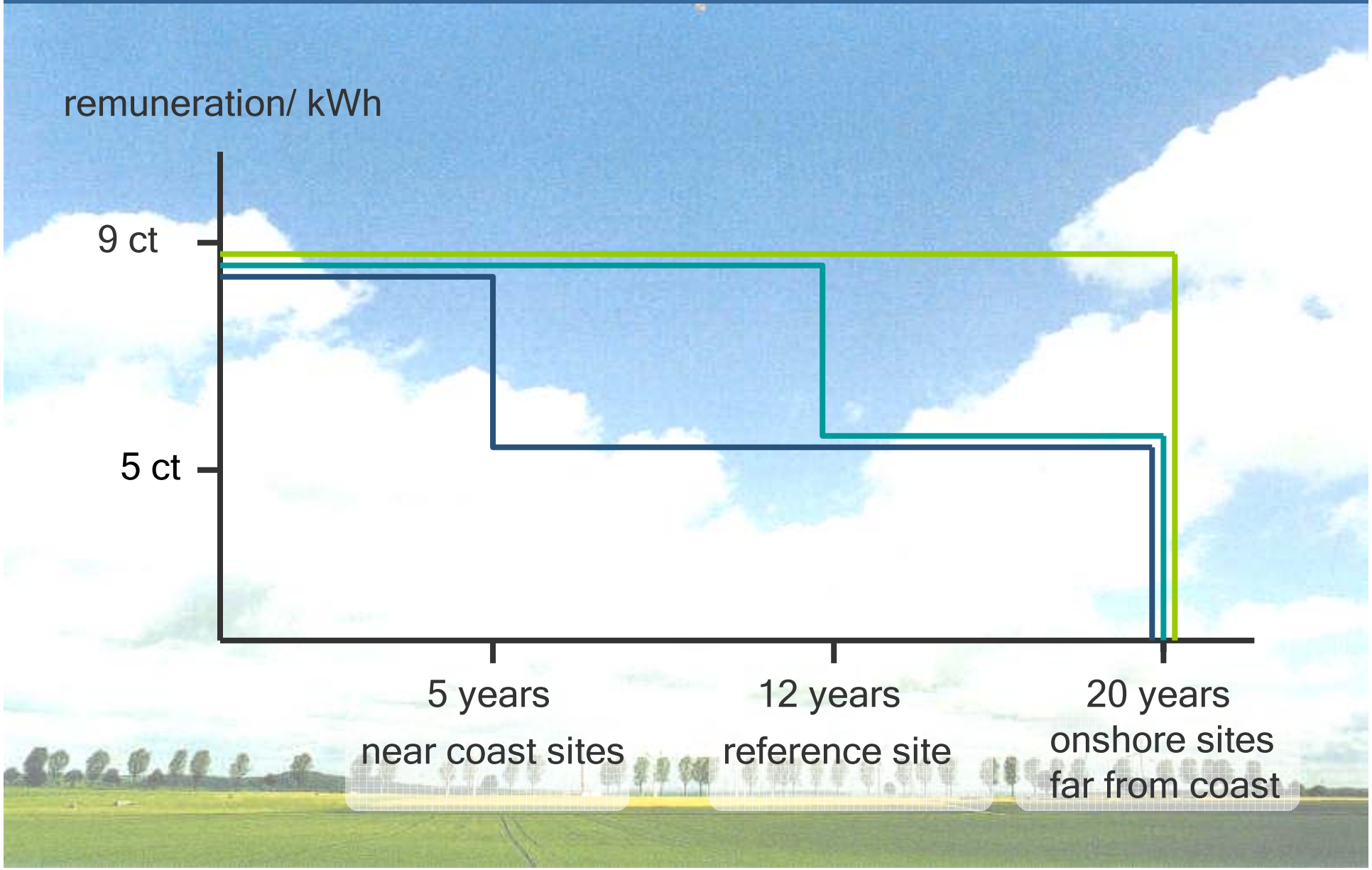
Onshore:

- higher starting-fee for 5 years or more (depending on site-quality)
- Basic fee for rest of 20-year-period
- must deliver 60% of a typical reference-site production
- incentives for repowering

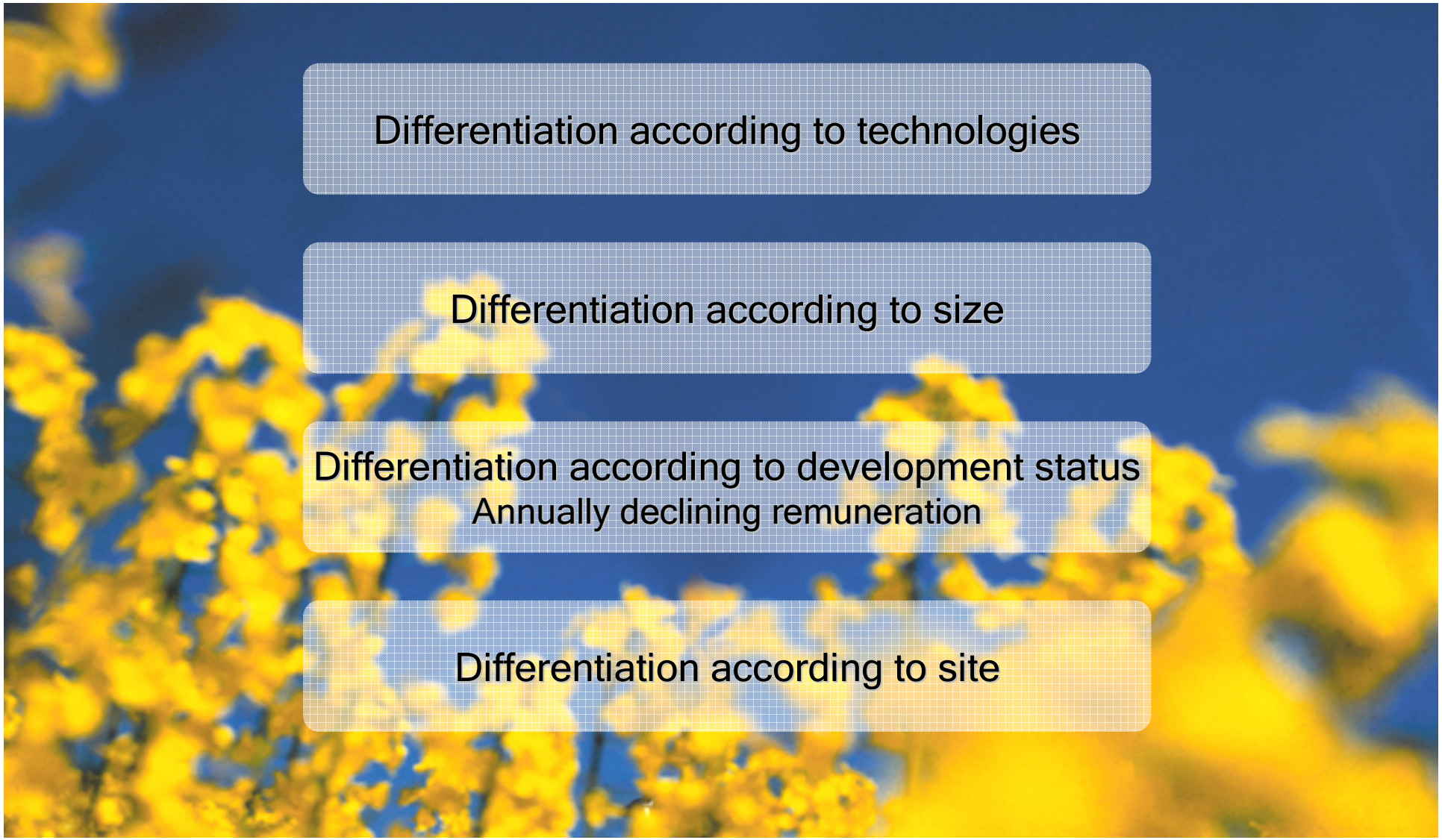
Offshore:

- starting-fee for 12 years, basic fee for 8 years
- starting-fee extended for sites in deeper water or further from coastline

Steps According to Reference Revenue Model



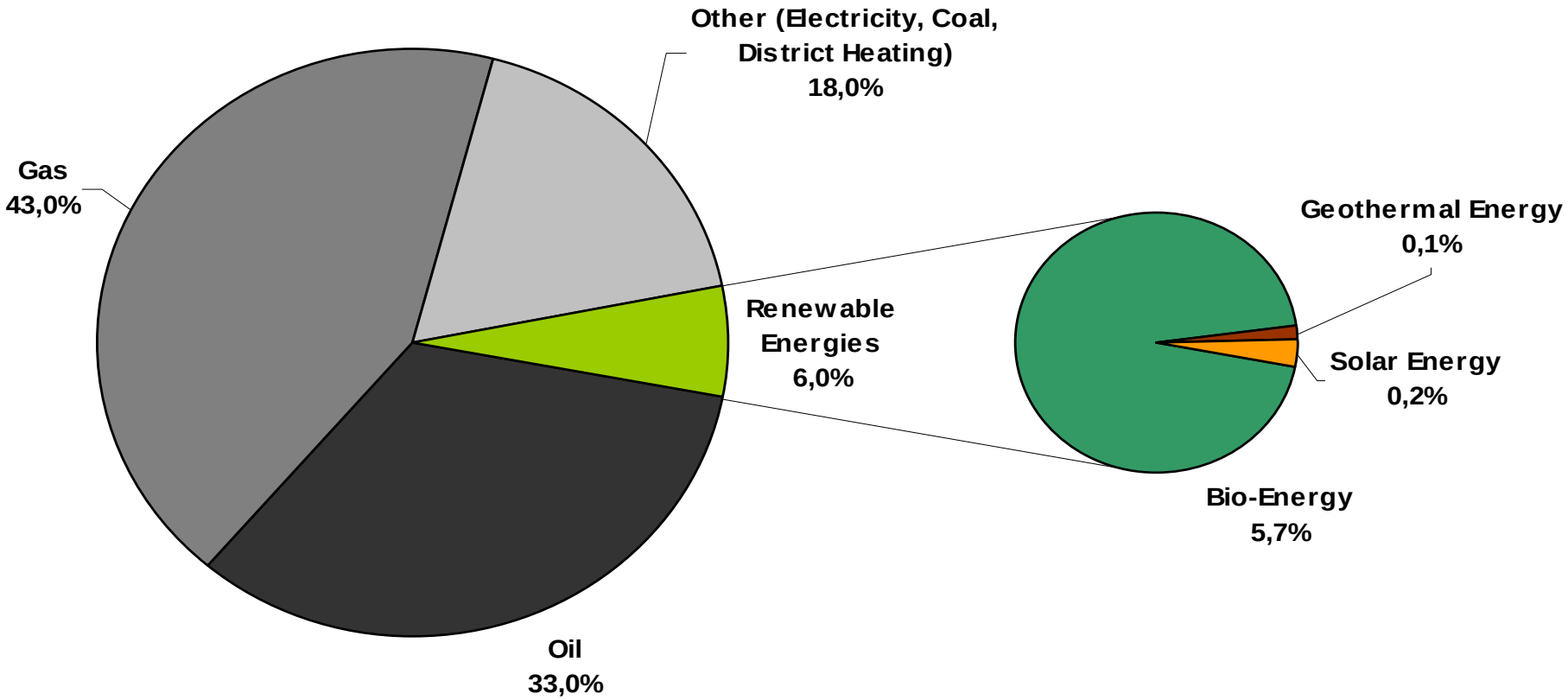
EEG – Cost Efficiency



Structure

1. Overview
2. Electricity: RES-E
3. Heating and Cooling: RES-H
4. Road Transport: RES-T
5. Industry's Vision for 2020 - Part I: Market Development in Germany
6. Industry's Vision for 2020 - Part II: From Internal to External Markets
7. Challenges and Perspectives

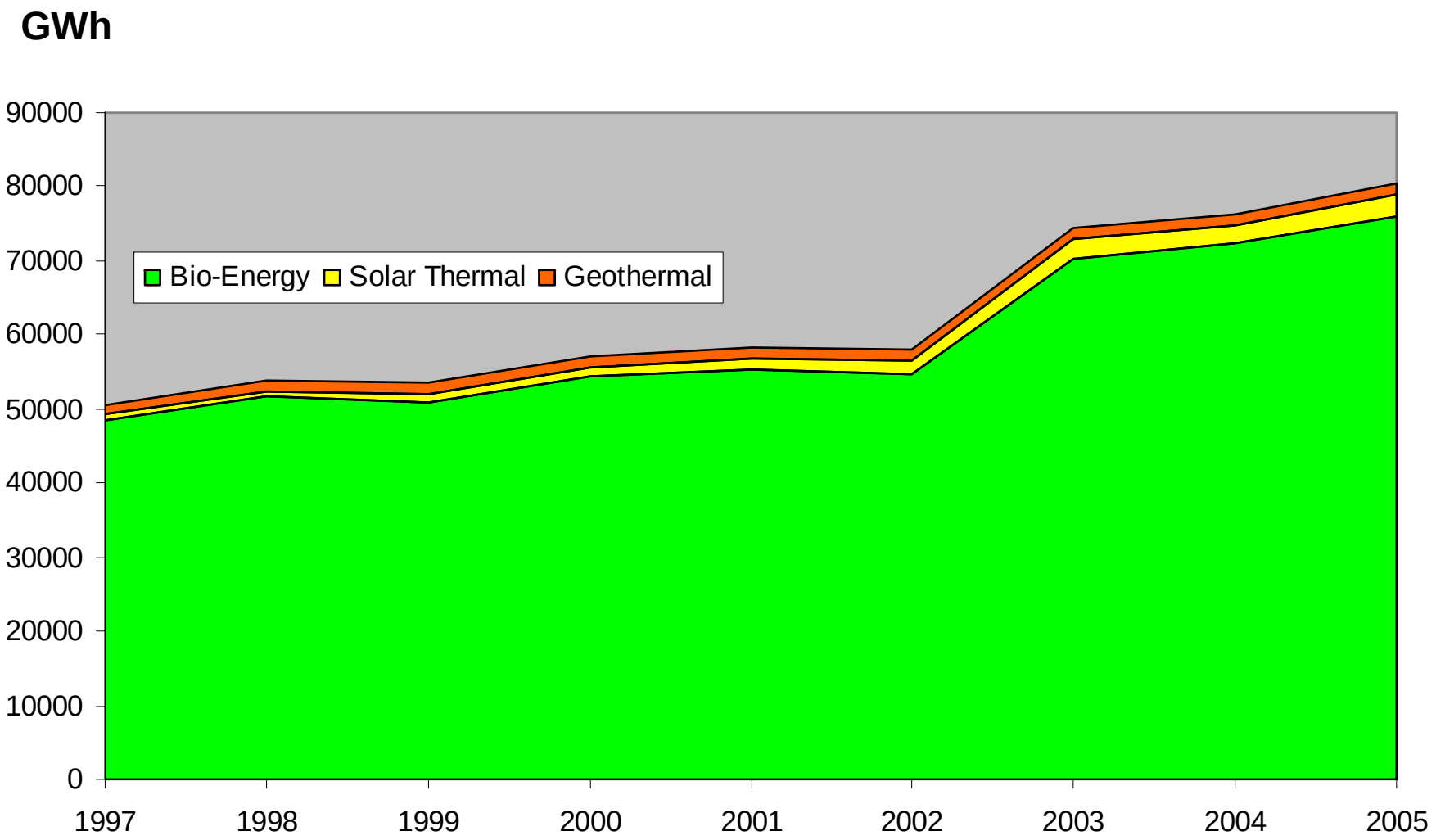
Renewable Energy in Heating 2005



Total: 1.519 TWh Heat-Production in 2005

Quelle: AGEE-Stat, AG Energiebilanzen

Development of Renewable Energy in Heating



Support for RES-H

Market Incentive Programme (MAP) 174 mio € (2006) 213 mio € (2007) Support guidelines and tariffs adjusted in January 2007	• Financed through ecological tax reform • Support for heating (and/or electricity) from RES • Supplementary loans for larger plants • Solar Collectors - for water or process heating: 2006: 54.60 €/m² (2007: 40 €) - for combined systems: 70.20 €/m² - >200 m²: 48 €/m² • Biomass - Automatic kettles < 30 kW: 38.40 €/kW (minimum: 1,088 €) [no longer eligible after adjustment in 2007] - Automatic kettles < 100 kW: 24 €/kW (minimum: 1,000 €) - Manual kettles >30 kW: 26 €/kW (minimum 780 €) (as of February 2006) • Cheap loans for - biomass heating and combined cycle plants - deep geothermal heating

MAP – some figures 1999 - 2006

- Investment Support for 605,000 projects
  - Solar collectors: 563 mio. €
  - Biomass installations: 157 mio. €

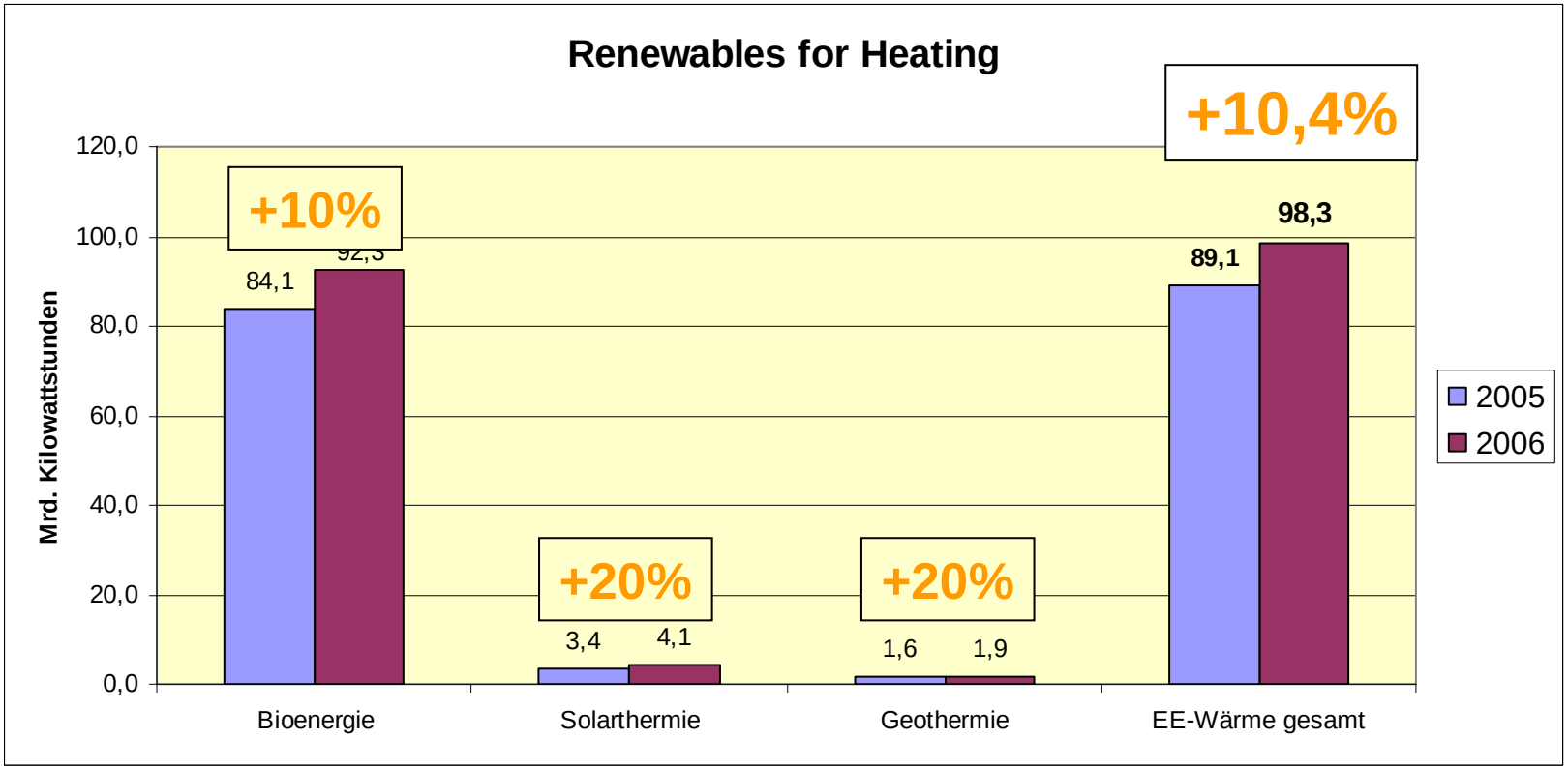
  – **Investment Support: 720 mio €**
  – **Investment Volume: 5.2 bn €**

- Loans at low interest rates: 3,000 projects
  - Biogas: 560 mio. € (1,300 projects)
  - Biomass + comb.cycl: 226 mio. € (1,400 projects)
  - Geothermal: 23 mio. € (9 projects)

  – **Volume of loans: 820 mio. €**

Source: Information from the German Ministry for the Environment, Nature Conservation and Nuclear Safety

RES-H 2005 / 2006



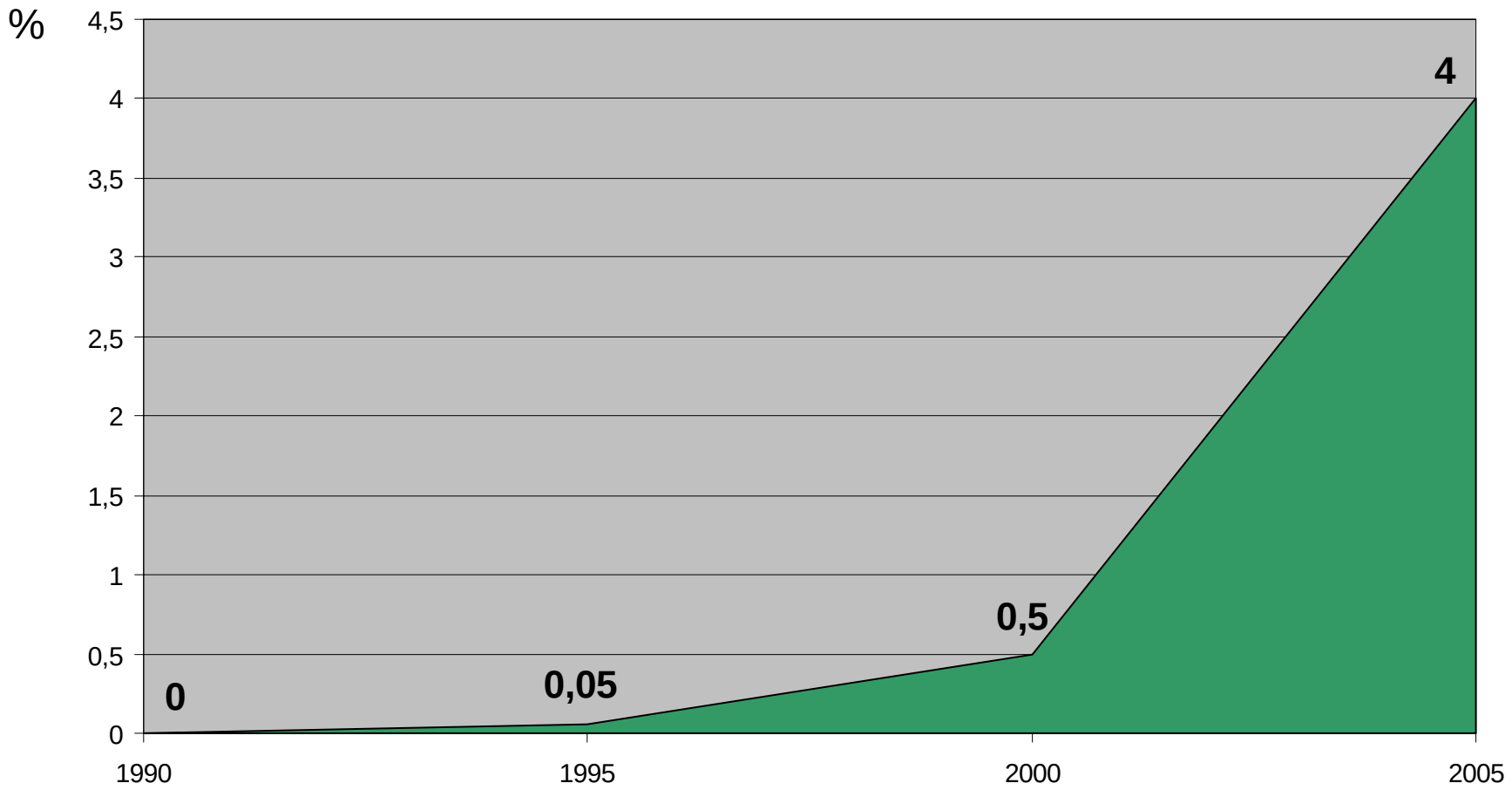
RES-H share in Germany 2006: 6.2% (2005: 5.9%)

Quelle: BEE auf Basis Branchenverbände, BMU, Uni Hamburg, IE; Wachstumsraten gerundet

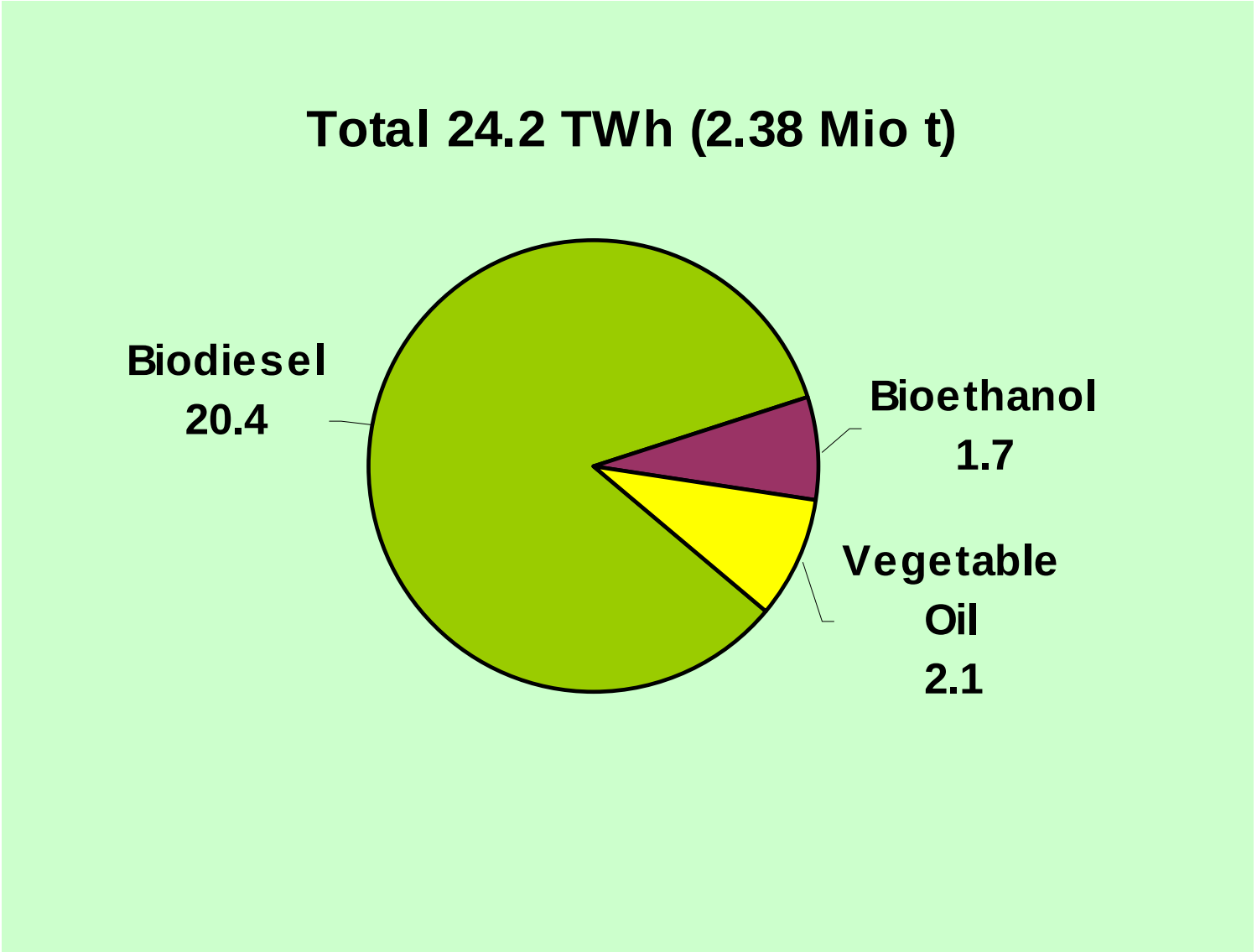
Structure

1. Overview
2. Electricity: RES-E
3. Heating and Cooling: RES-H
4. **Road Transport: RES-T**
5. Industry's Vision for 2020 - Part I: Market Development in Germany
6. Industry's Vision for 2020 - Part II: From Internal to External Markets
7. Challenges and Perspectives

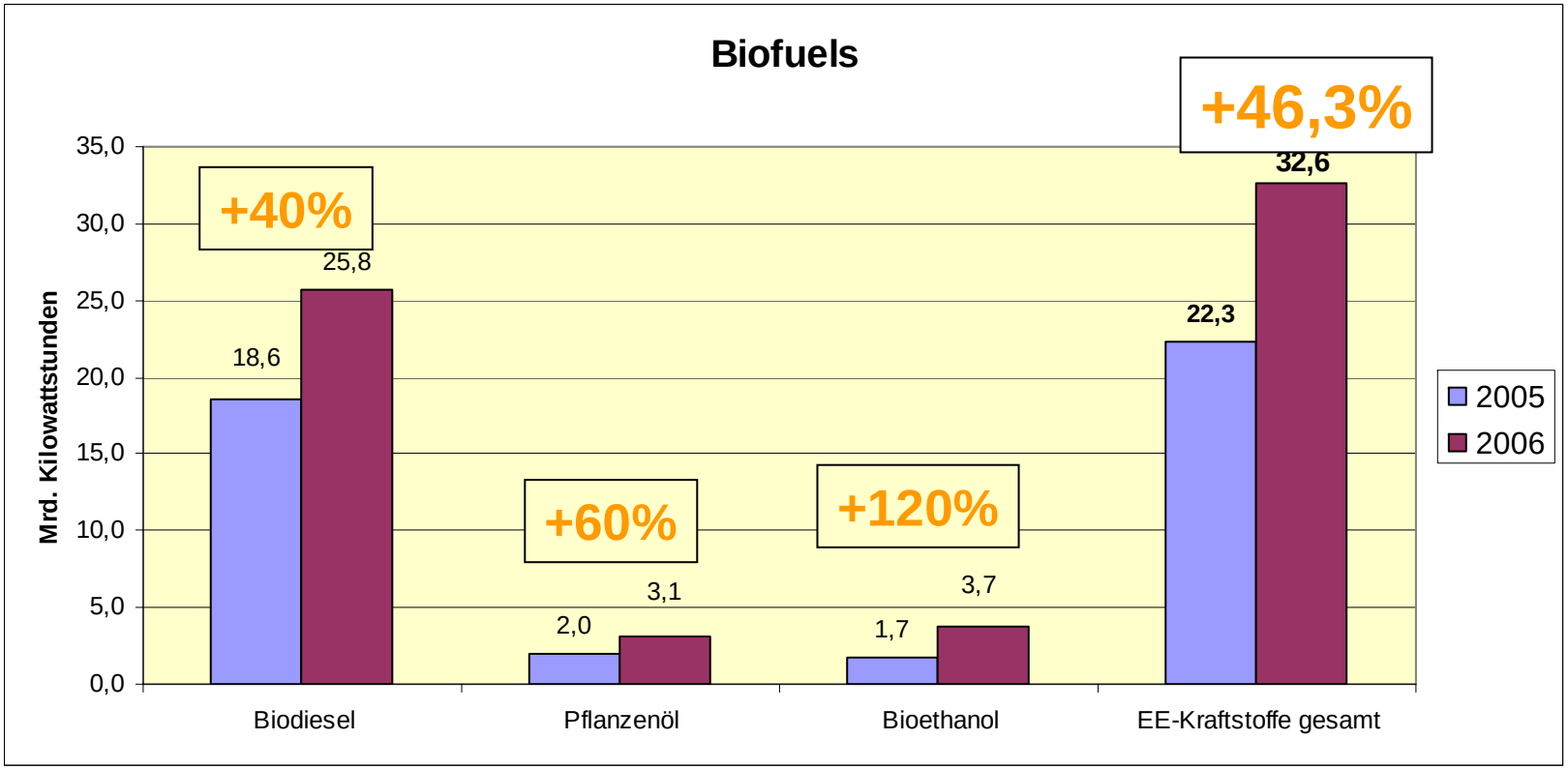
Share of Biofuels in German Road Transport: 4% in 2005



Biofuels in German Road Transport (2005)



RES-T 2005 / 2006



Share of RES-T in Germany 2006: 5.4%

Quellen: BEE, BBE, BMU; Wachstumsraten gerundet

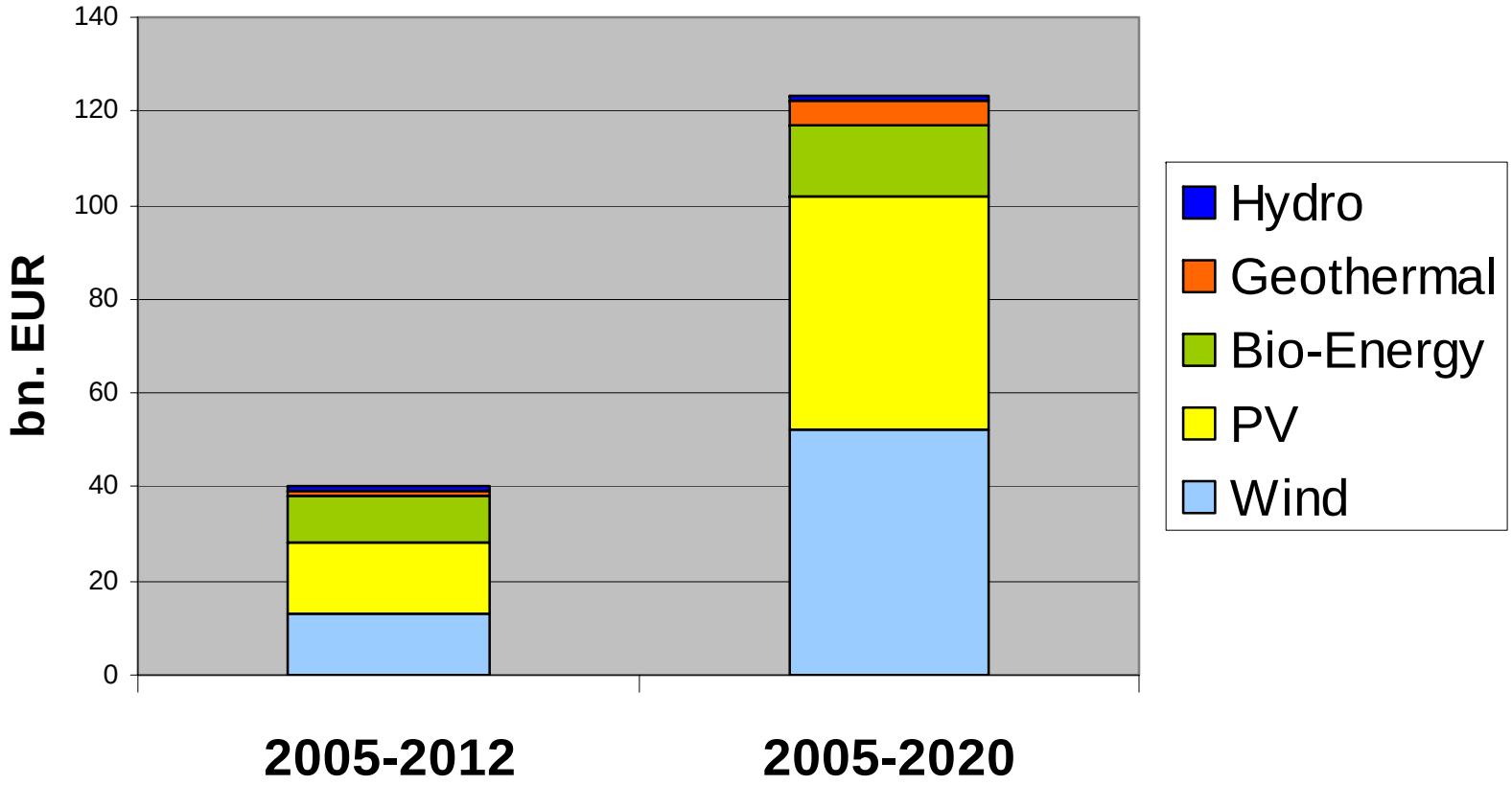
Support for RES-T

tax exemption	from 1992 for biodiesel from 2004 for all biofuels since August 2006: partial taxation – increasing until 2012 (9 / 45 ct for biodiesel, 10 / 45 ct for vegetable oil – starting 2008)
quota system / blending obligation	Ethanol: → 2007: 2% → 2010: 3% Biodiesel: → 2007: 4.4% Biofuels total: → 2009: 5.7 % → 2010: 10%

Structure

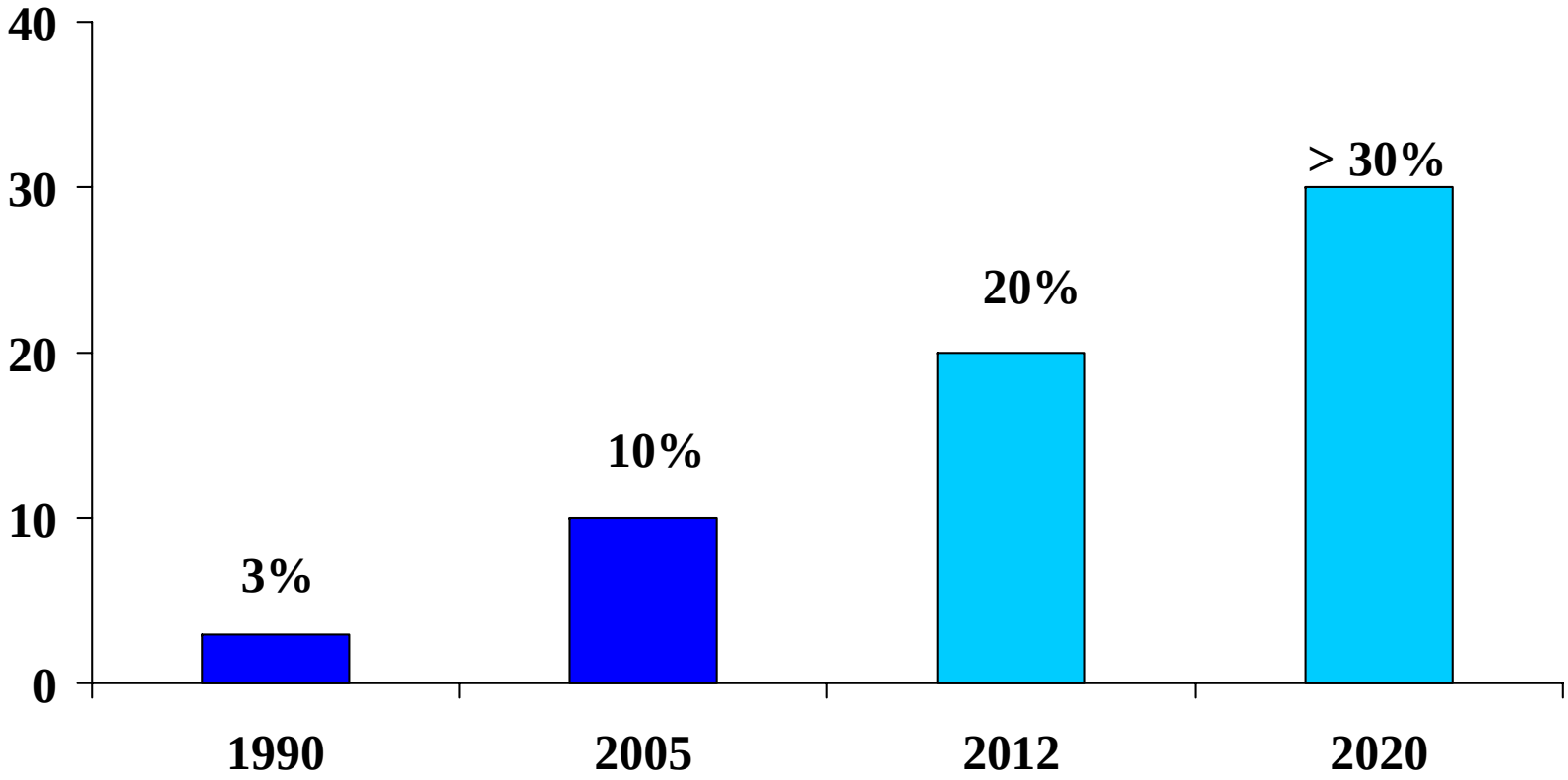
1. Overview
2. Electricity: RES-E
3. Heating and Cooling: RES-H
4. Road Transport: RES-T
5. **Industry's Vision for 2020**
   - Part I: Market Development in Germany
6. Industry's Vision for 2020
   - Part II: From Internal to External Markets
7. Challenges and Perspectives

Investments in Renewable Power Production Capacities until 2020

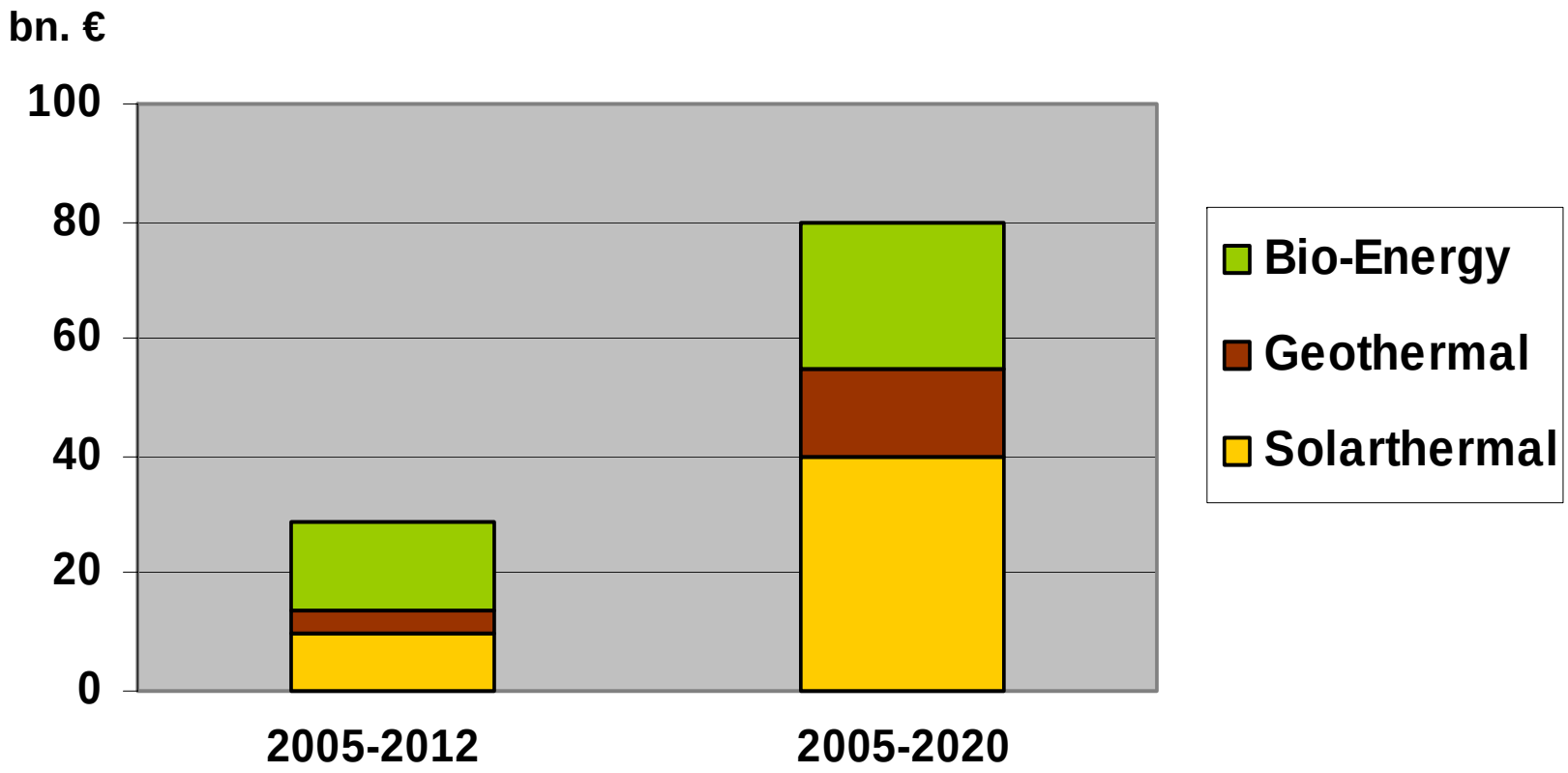


Source: BEE

RE-Share in Power Generation

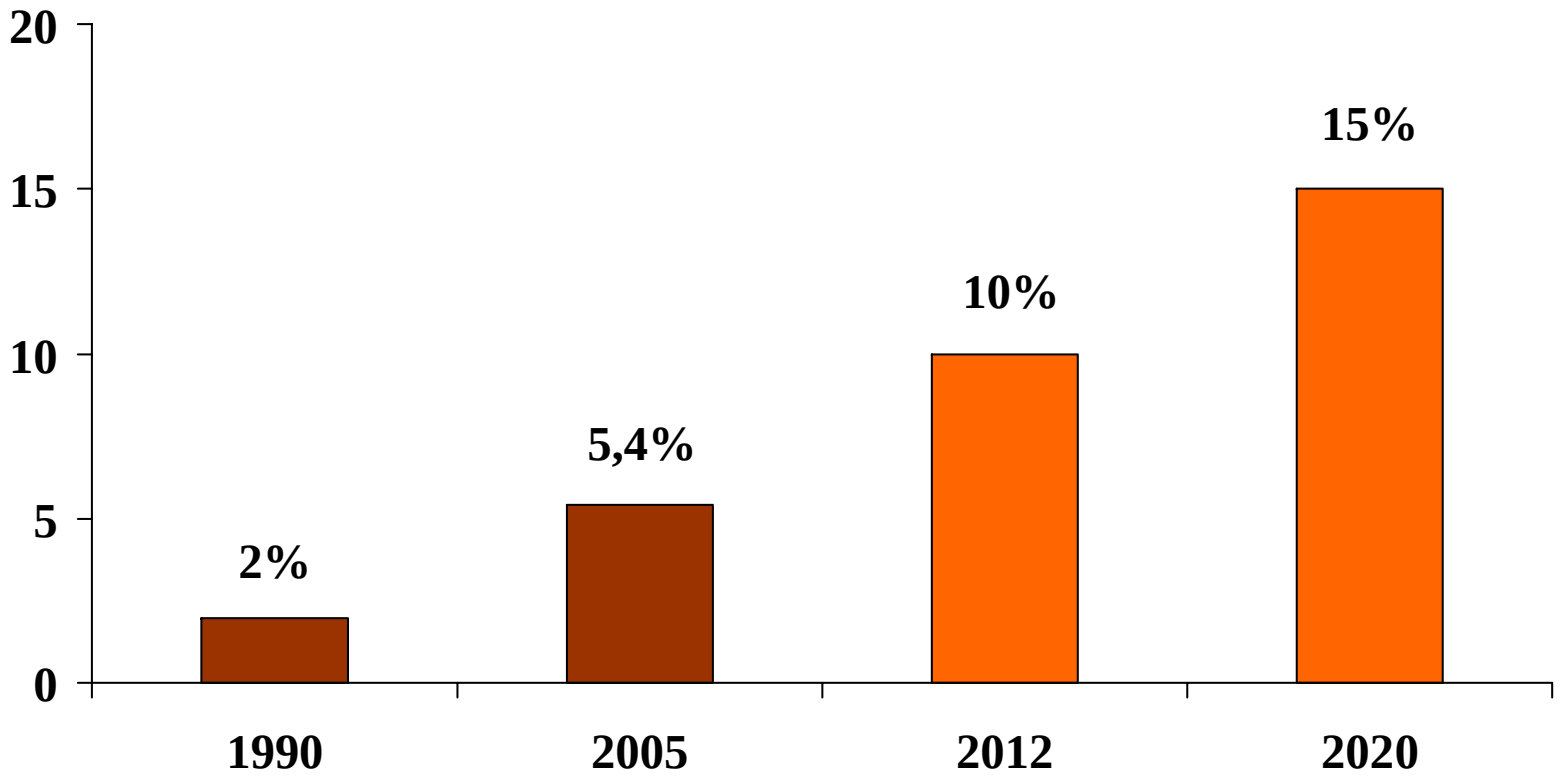


Investments in RE for Heating and Cooling

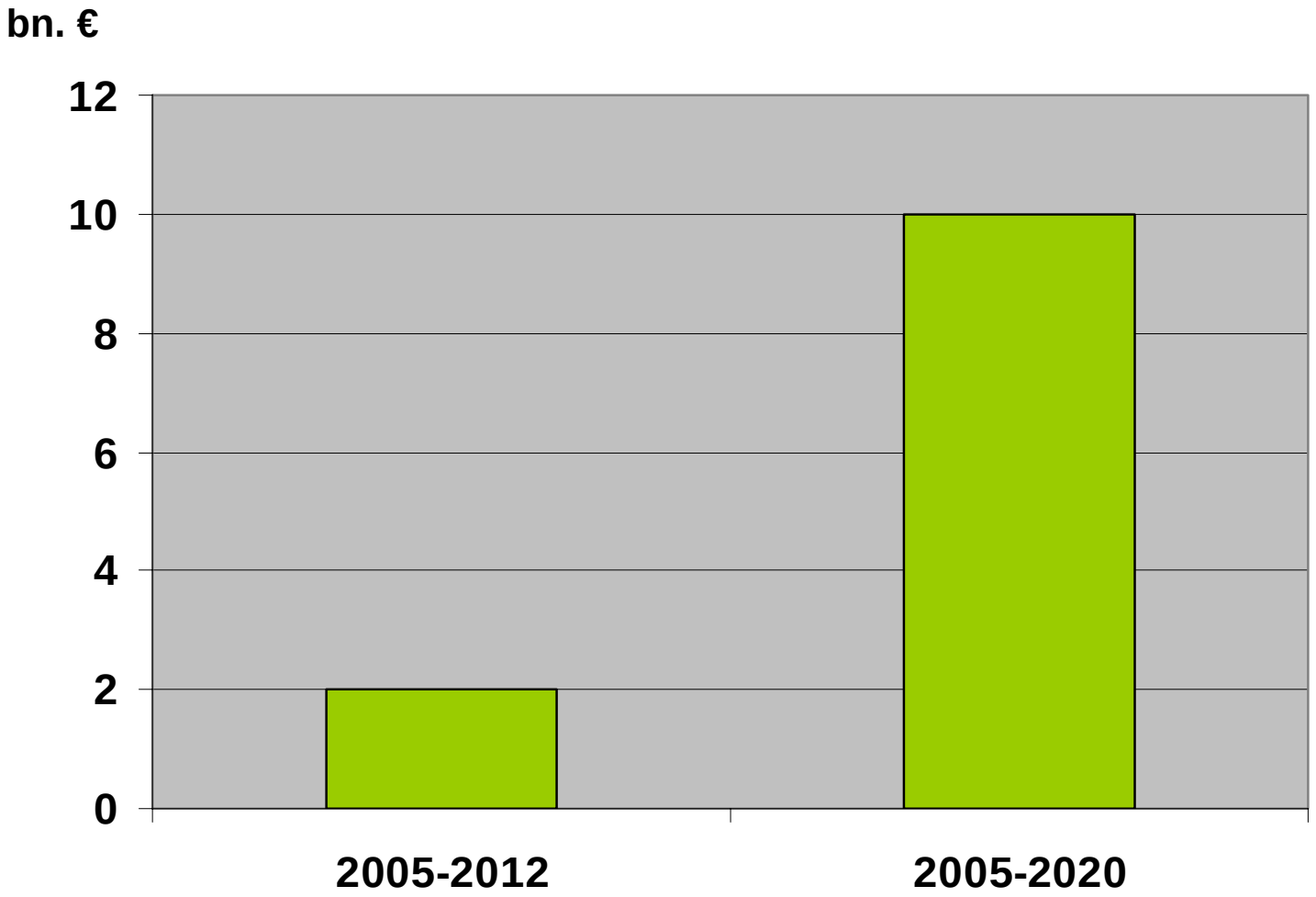


Quellen: BEE, EREC

RE-Share in Heating and Cooling

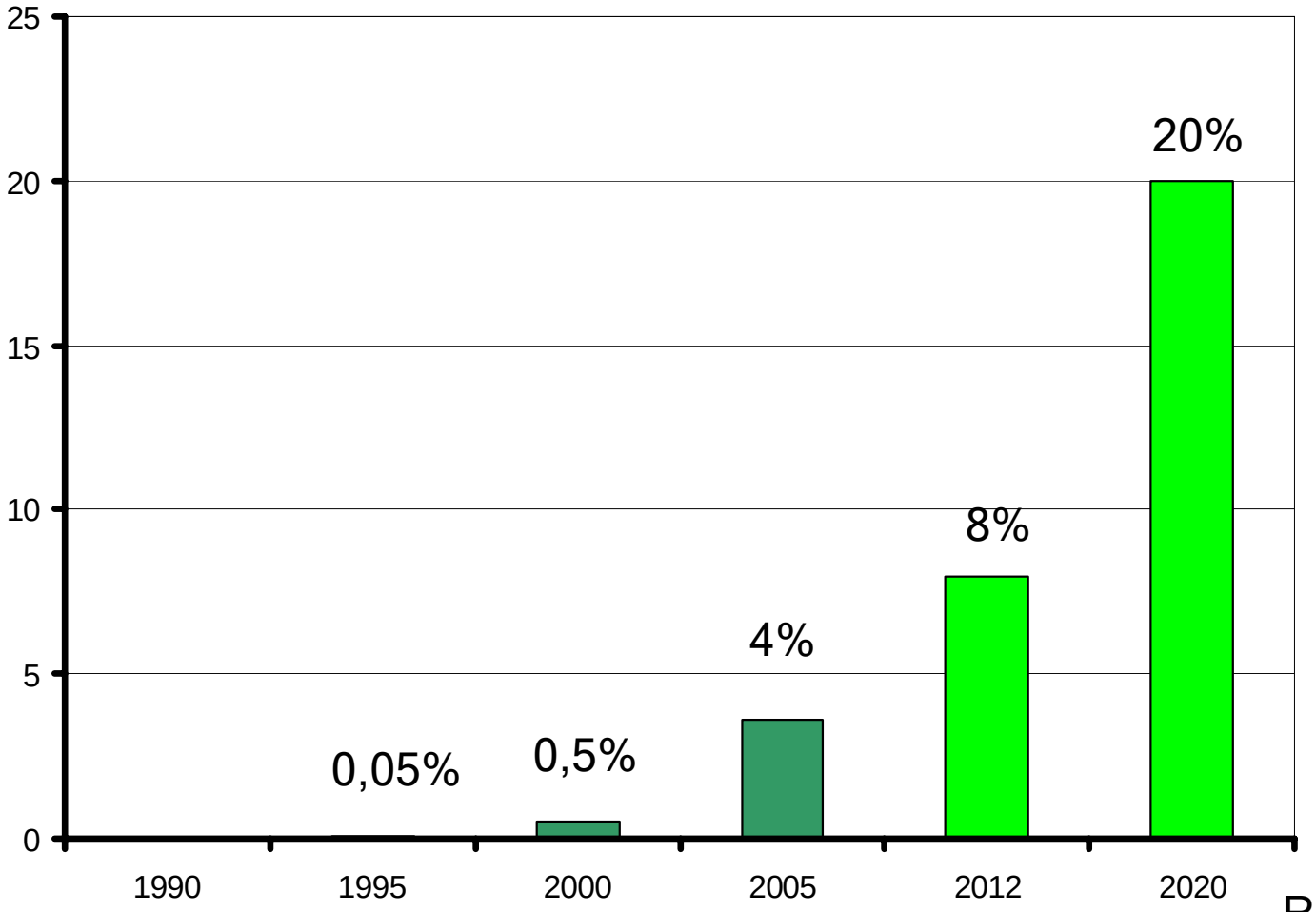


Investments in Biofuels in Germany



RE-share in German Fuel Consumption

(mainly based on domestic production capacities)



Road Transport only

Structure

1. Overview
2. Electricity: RES-E
3. Heating and Cooling: RES-H
4. Road Transport: RES-T
5. Industry's Vision for 2020
   - Part I: Market Development in Germany
6. **Industry's Vision for 2020**
   - Part II: From Internal to External Markets
7. Challenges and Perspectives

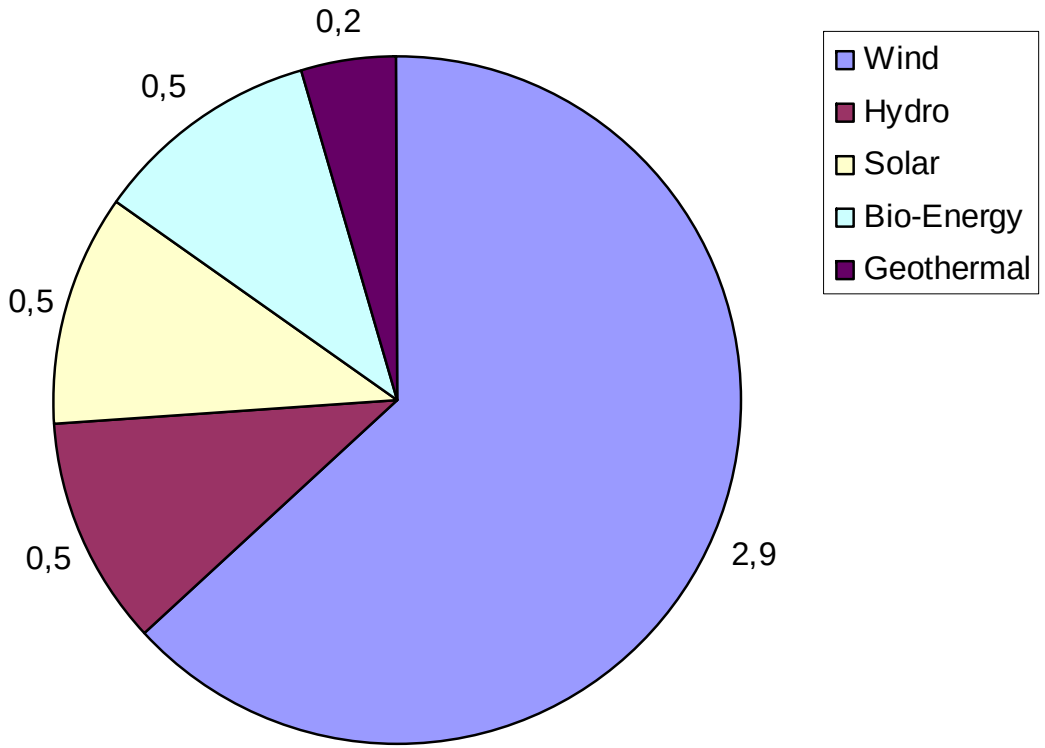
Exports will increase

In the renewable power generation sector **Germany‘s world-market share will decline** from 15% in 2005 to 2% in 2030

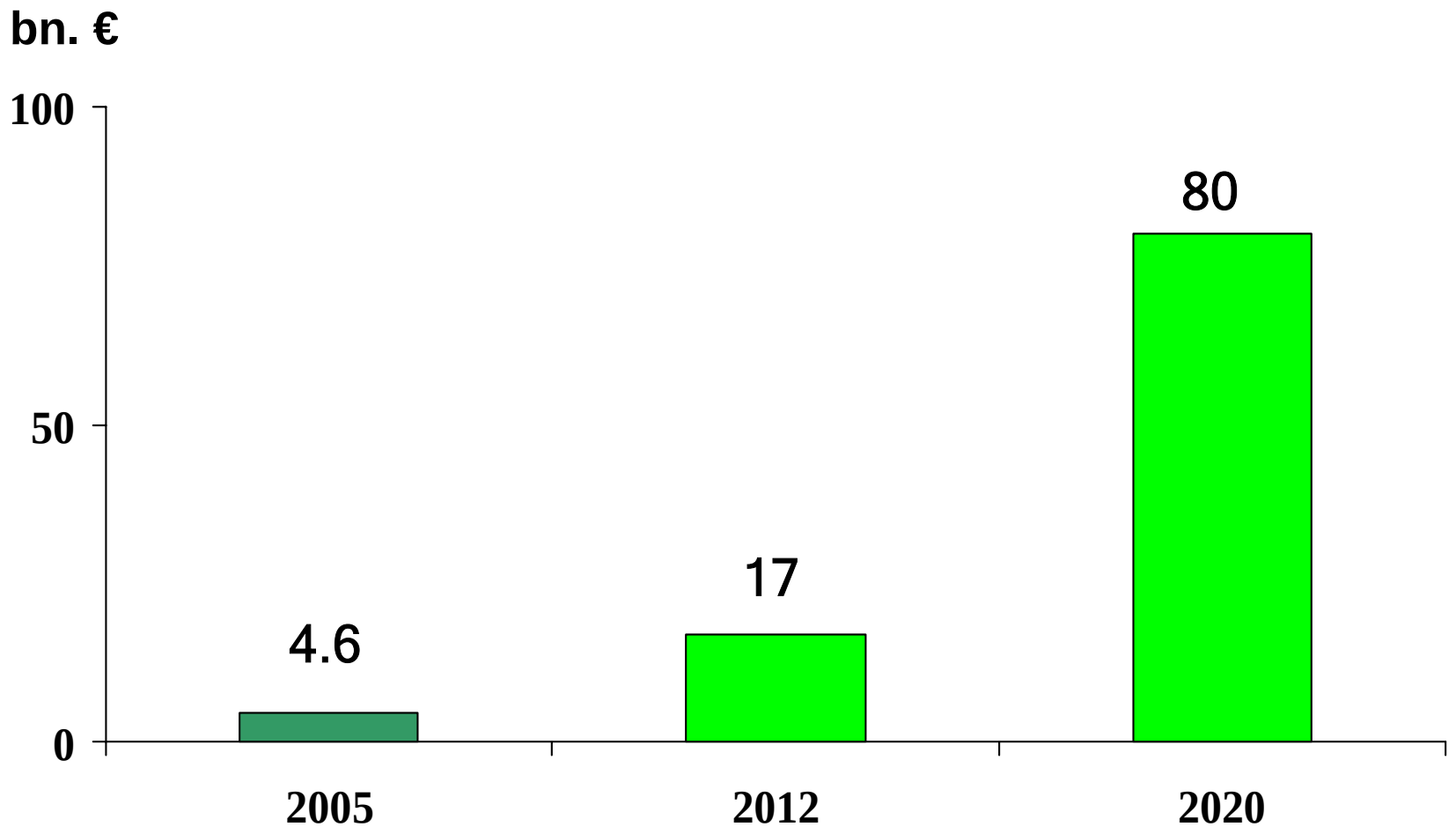
Growing world market will result in **increasing exports of technologies and services** from Germany

Source: AGEE-Stat presentation, January 2006 (Working Group on Renewable Energy Statistics)

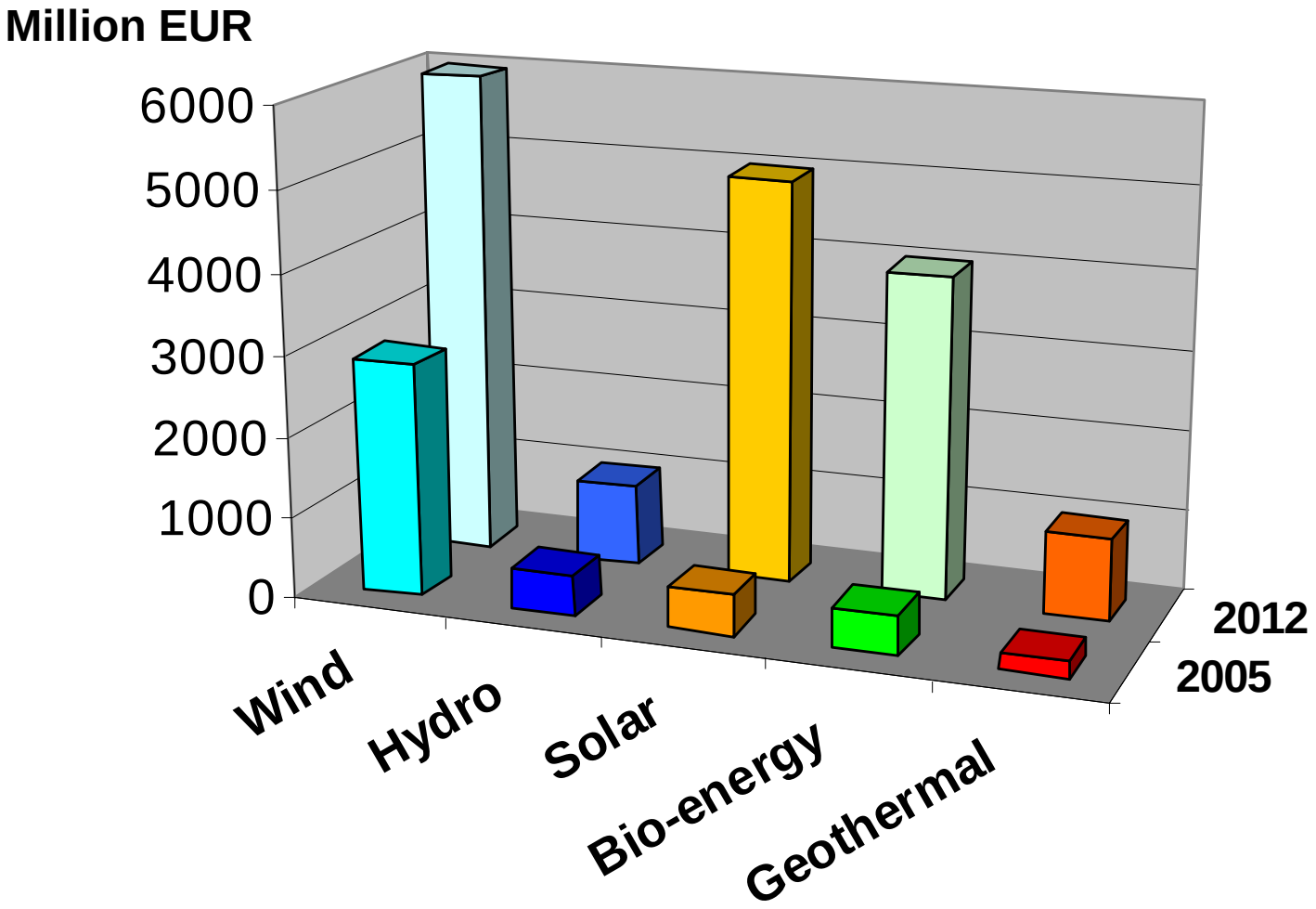
Exports from German RE-Industry in Billion EUR (2005)



Exports from German RE-Industry

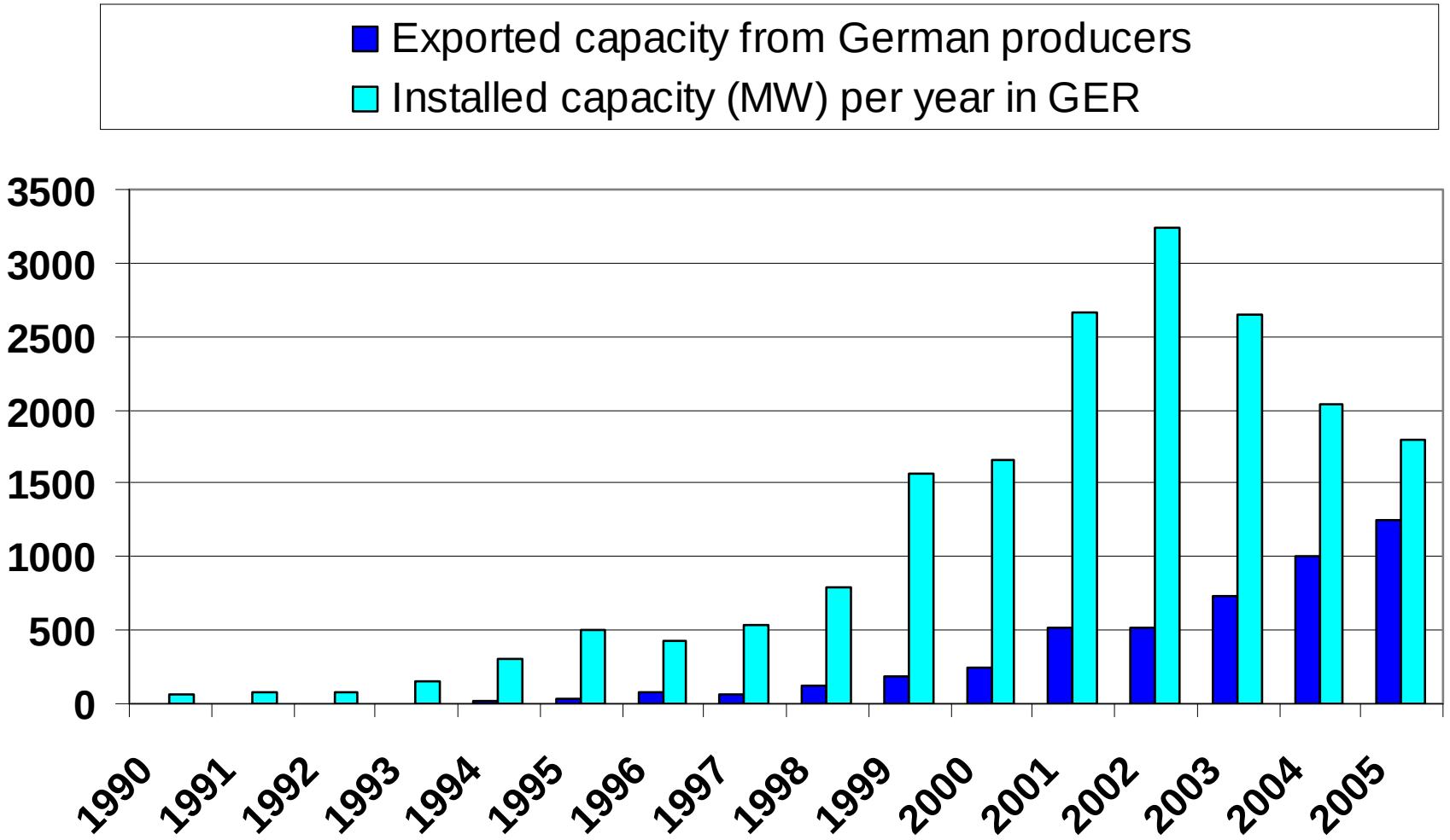


RE Industry: Volume of Exports



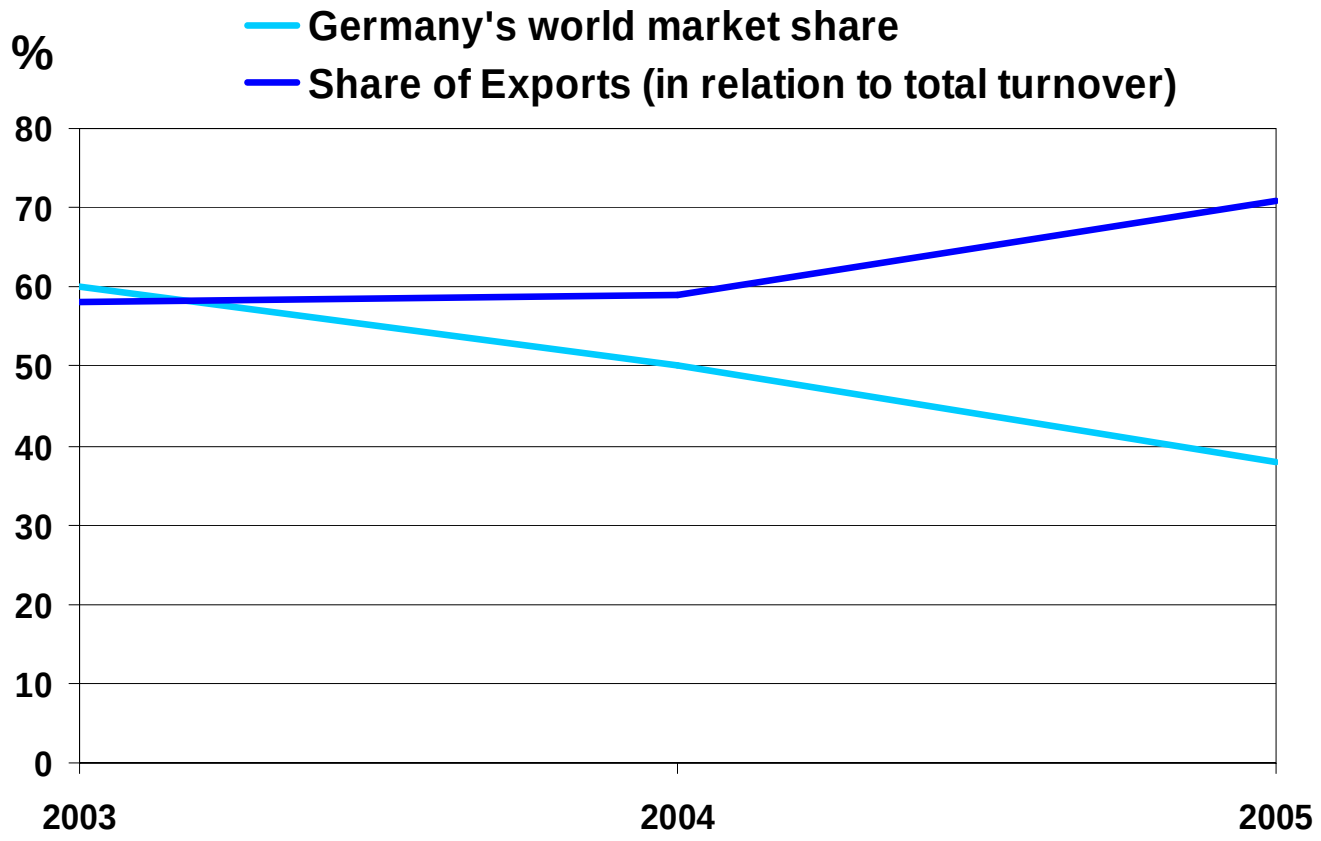
Source: SOKO-Bielefeld Company Survey (03/2006)

Wind industry: Exports 1990-2005



Windpower: Exports and World Market Share

Germany‘s world market share declines, but world market volume doubles every 3 years!



Volume of exports

2005: 2.9 bn €

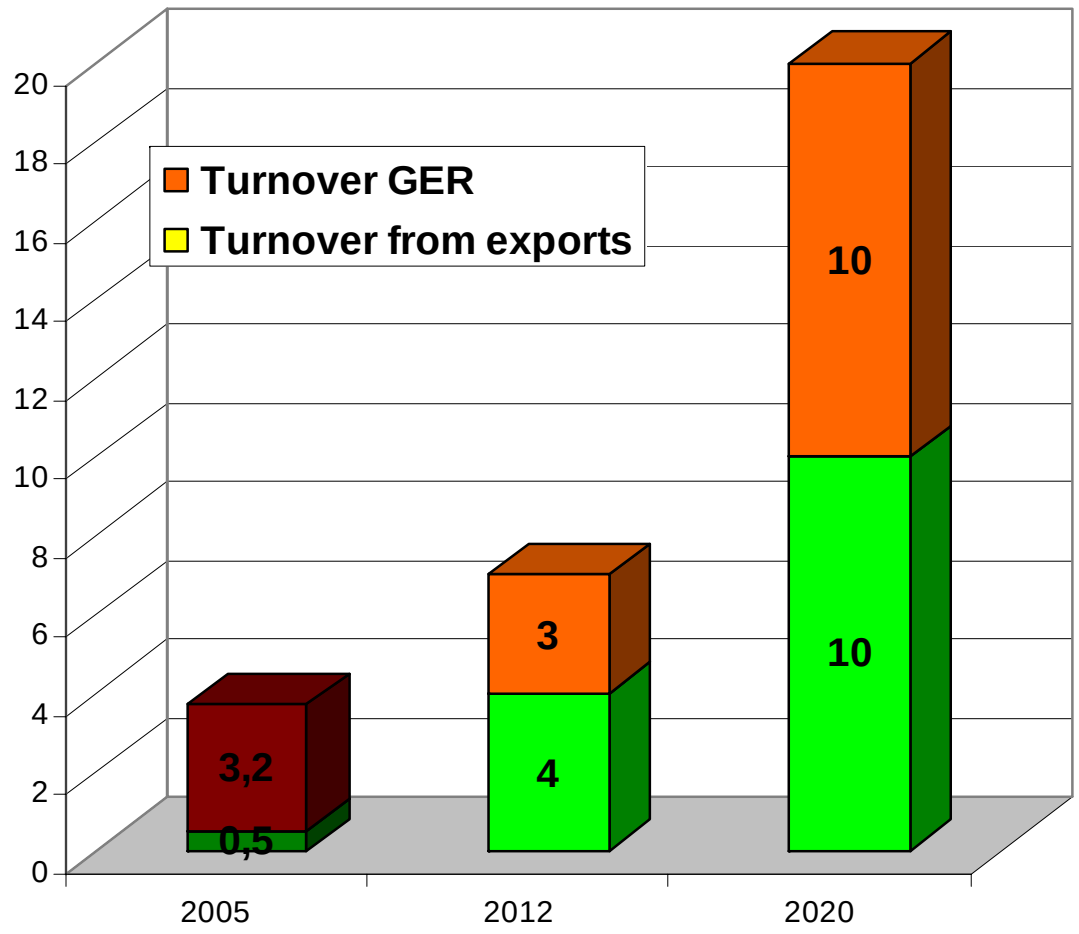
2012: 6.0 bn. €

Source: DEWI, BWE

Biogas: Turnover and Exports

Source: FV Biogas

Solar

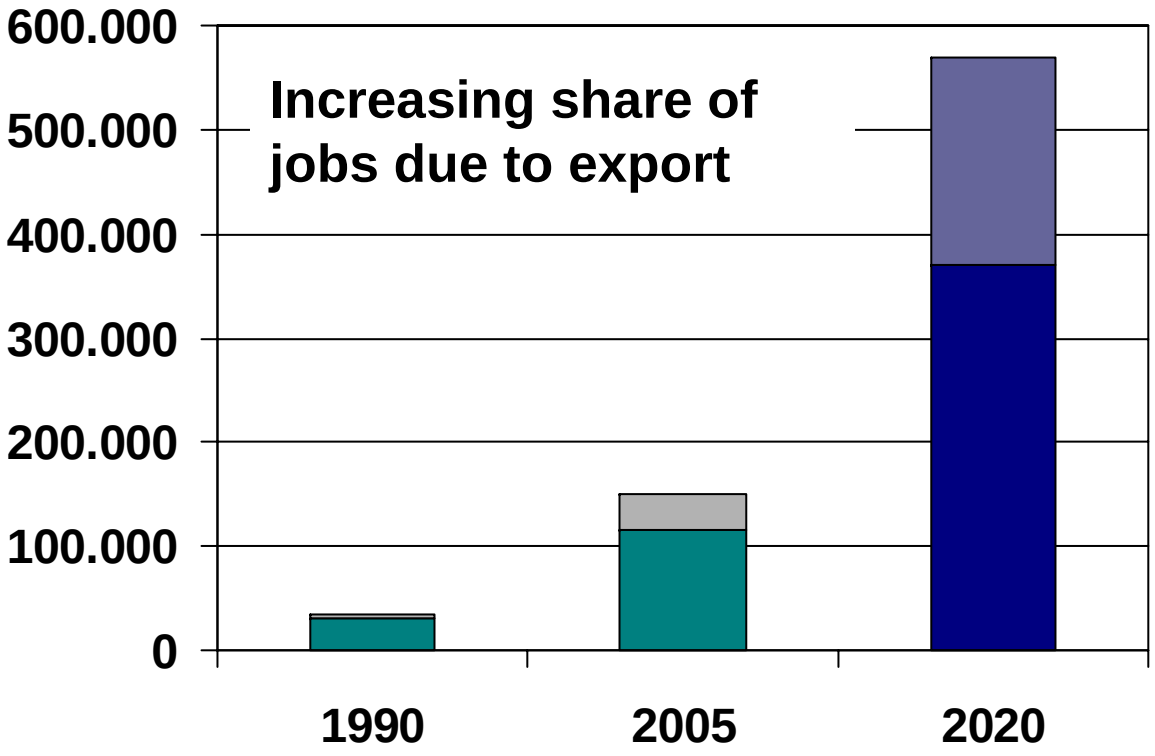


World-market growth 25% in 2006

German production will grow twice as fast as in competitors‘ markets

On new markets, German companies benefit from first-mover-advantage (GR, F, I, E now have feed-in-tariffs for PV)

Effects on the Job Market



Structure

1. Overview
2. Electricity: RES-E
3. Heating and Cooling: RES-H
4. Road Transport: RES-T
5. Industry's Vision for 2020 - Part I: Market Development in Germany
6. Industry's Vision for 2020 - Part II: From Internal to External Markets
7. Challenges and Perspectives

Major Reasons for German Success

Strong Commitment of Parliament and Government to create a system that delivers

High public awareness about benefits of RES

- **Ambitious targets and policies:**
  RES-E: 12.5 % (2010) – 20% (2020)
  RES-PE: 10 % (2010) …. 50% (2050)

- **New and innovative players on the energy market**
  → 85 % SME in RES

Development on a solid basis

→ Simple truth:
Investment security is crucial - especially for new market players.

→ Simple instruments:
Ambitious targets together with a differentiated and cost efficient support system have established stable and **reliable framework conditions**, especially in RES-E.

EEG: FIT for RES-E - to be continued …

A unique success story

☺ **Electricity Sector:**
Priority Grid Access, feed-in tariffs (FIT) differentiated by technology, size and site.

→ **Priority Access** enables new market players to enter the market dominated by incumbent.

→ **Technology-differentiation** fosters development of different technologies - not only the currently cheapest solution (as in most quota-systems).

→ **Economies of Scale** to reduce costs

On the right track in RES-H and RES-T?

Growth of RES-H and RES-T
still to be increased and stabilized

→ **RES-H**: successful Market Incentive Programme (MAP)

💣 **Risk** of stop-and-go: programme depending on government funding

☹ Legislation needed for long-term stability

→ **RES-T**: tax incentives produced rapid increase
→ change to blending obligation in 2007

☹ Taxation for biofuels and change of support system
→ **risks** for new market players and for market growth

EU-Legislation and Policies

"**Energy Package**" presented on **January 10, 2007**:
Strategic Energy Review: "An Energy Policy for Europe"

Main Elements:

- Renewable Energy Road Map
- Biofuels Progress Report
- Report on Progress in Renewable Electricity
- Sustainable Power Generation from Fossil Fuels
- Draft Nuclear Illustrative Programme
- Towards a European Strategic Energy Technology Plan
- Priority Interconnection Plan
- Prospects for the Internal Gas and Electricity Market

EU Energy Package (1)

→ **Ambitious language**:
Aims at sustainability, security of supply, competitiveness, ambitious climate protection targets and strong wording for renewable energies.

→ **Ambiguous policies**:
20% (30%) **GHG-reduction** until 2020 to be reached by 20% improvement of **energy efficiency**, "**clean fossils**" and ambitious **ETS**, 20% **RES** and continued support for **nuclear** fusion and fission.

→ Foster **competition** by stronger unbundling and/or regulator.

→ **Foreign energy relations** with most major players are focused on fossils and nuclear. Only for Africa, RES are suggested to become a focus.

EU Energy Package (2)

→ **Insufficient RES targets and policies**:

For **2020** an overall RES share of **20%** and of 10% in biofuels are proposed.

There are **no sectoral targets** for RES-E and RES-H. RES-H directive is postponed.

→ Follow-up legislation envisaged for national overall and sectoral RES-targets.

→ Revision and in-depth assessment of support schemes for RES-E envisaged for end of 2007.

Some Conclusions

- **Avoid stop-and-go programmes and repeated change of support systems**
- **Create and maintain a reliable framework for long term investment security based on**

Strong political commitment

Ambitious targets

Differentiated support systems which really deliver

contact

Rainer Hinrichs-Rahlwes
Käthe-Niederkirchner-Str. 13
D-10407 Berlin

fon +49 30 42084094
fax +49 30 42084096

mailto: rainer.hinrichs@bee-ev.de

or

BEE - Bundesverband Erneuerbare Energie e.V.
Teichweg 6
D-33100 Paderborn

fon +49 5252 939800
fax +49 5252 52945

mailto: info@bee-ev.de