



INTERNATIONAL ENERGY AGENCY

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European Renewable Energy Trends & Challenges

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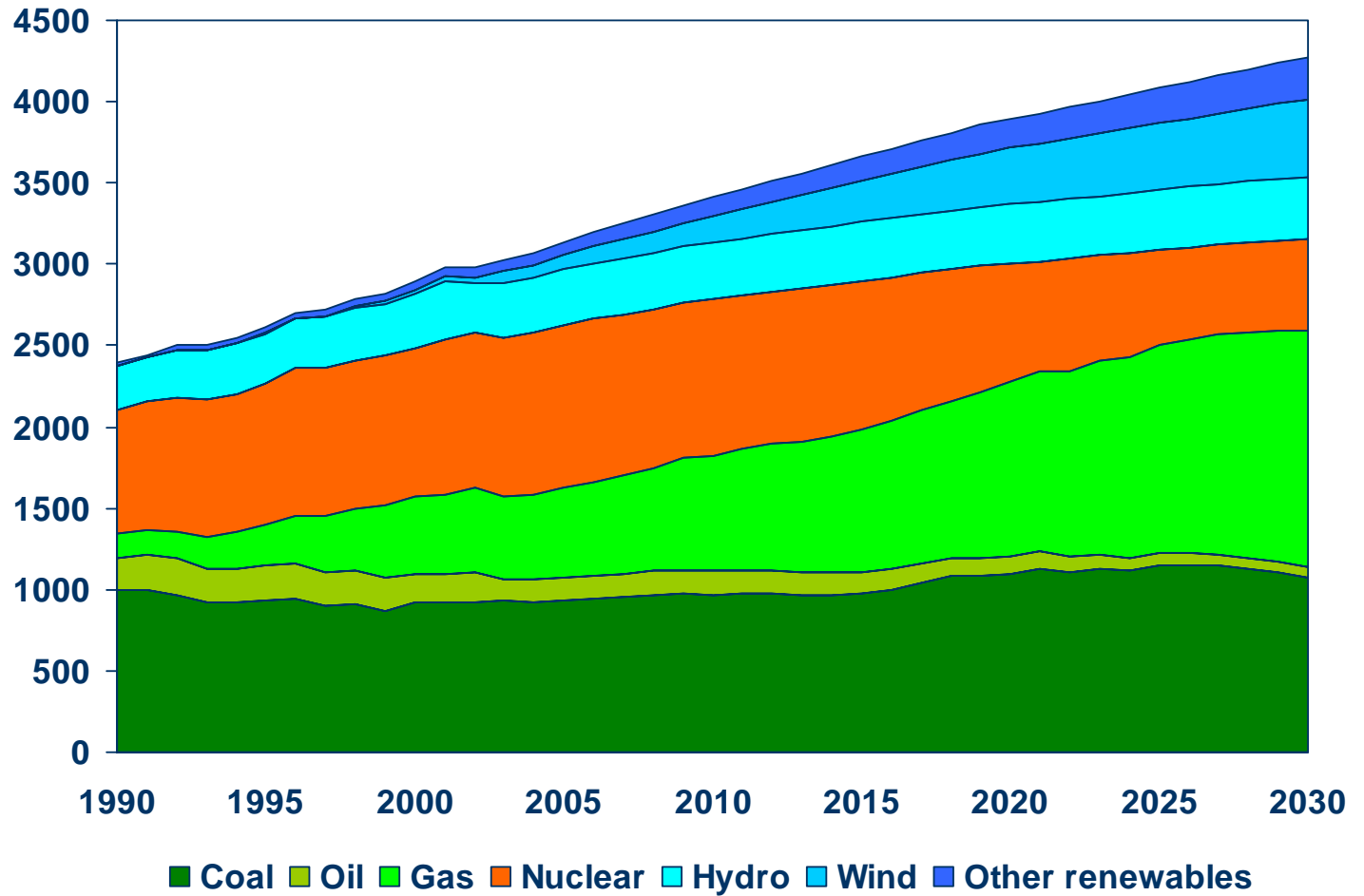
Chairman RE Working Party

Thanks to Arnulf Jäger-Waldau

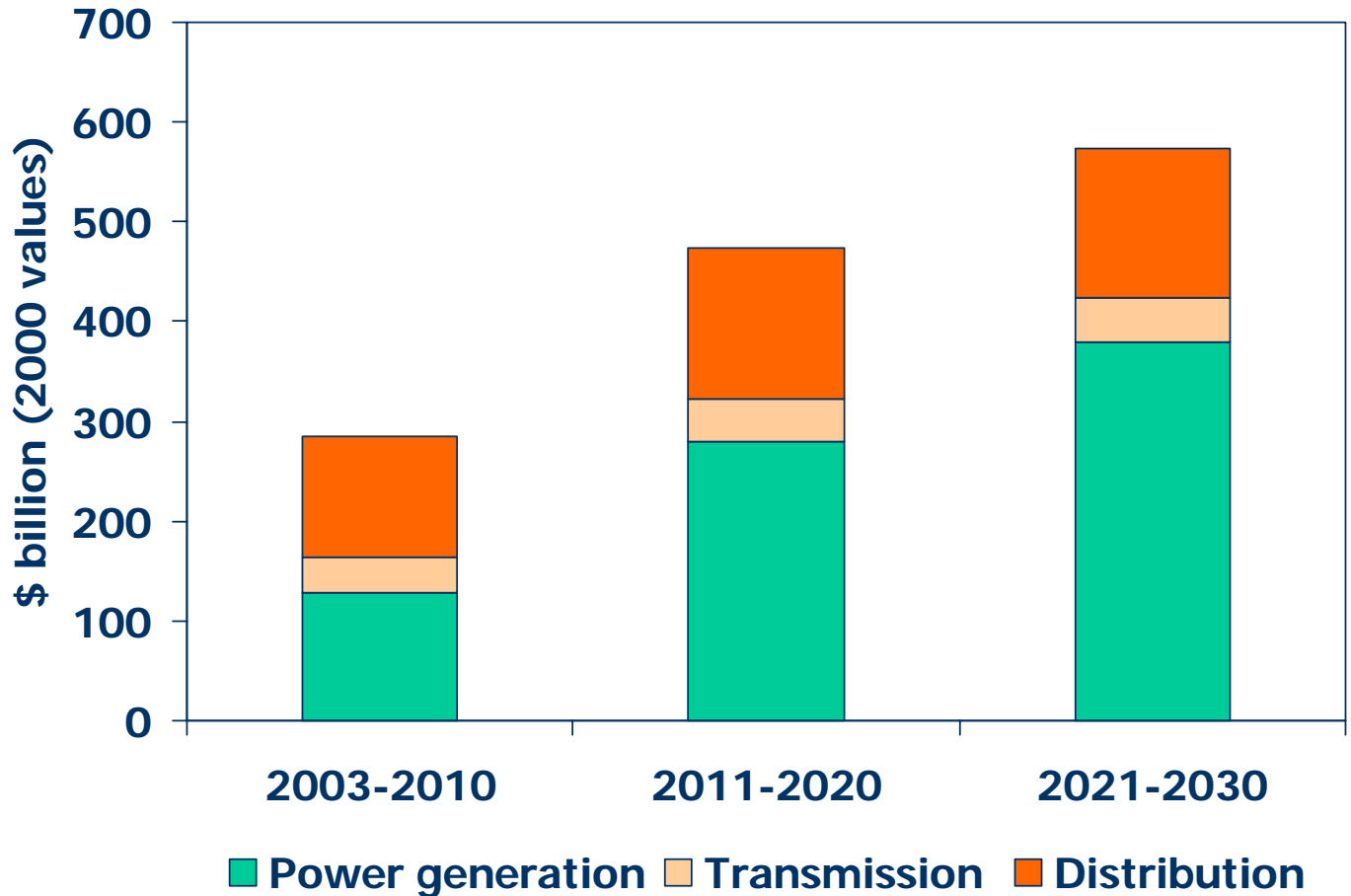


**Energy Trends &
Strategic Challenges
Reference Scenario**

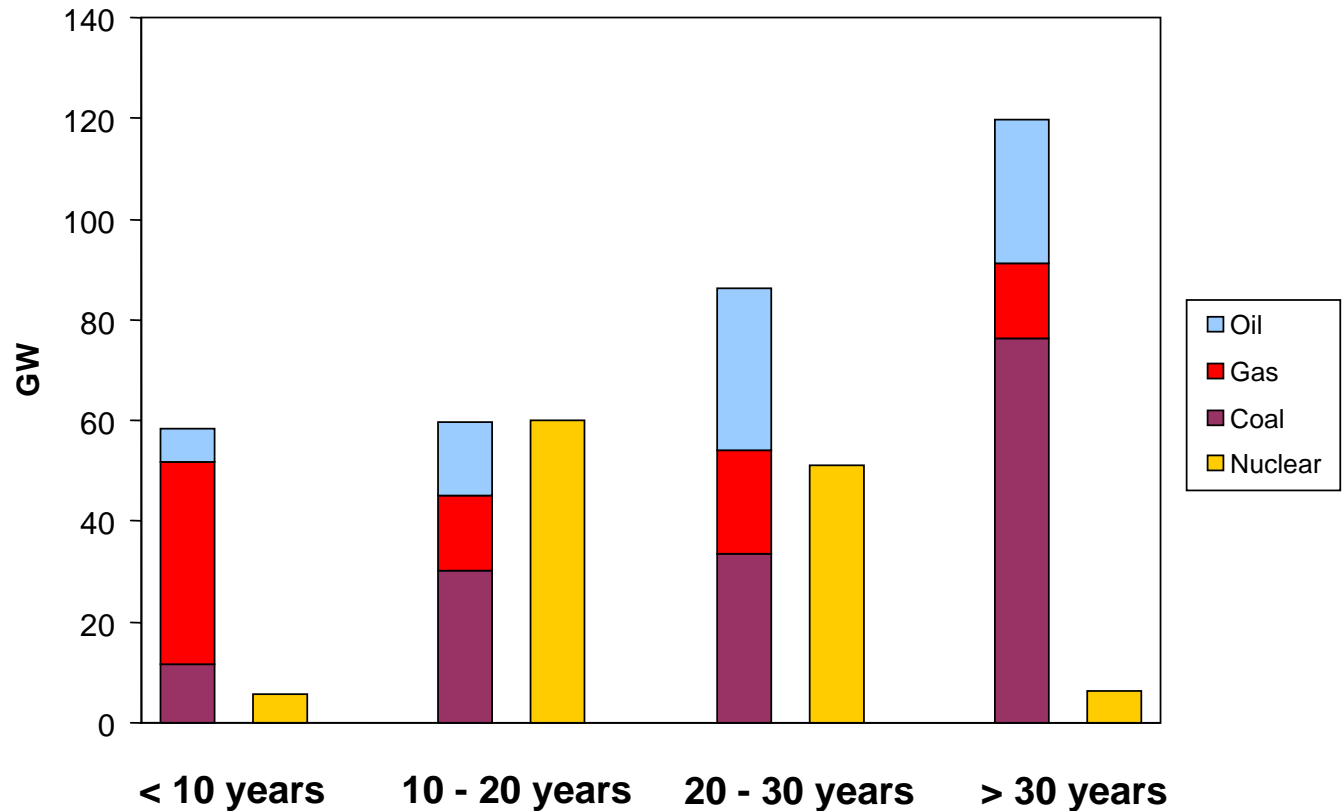
EU-25 Electricity Generation, 1990-2030



EU Electricity Sector Investment

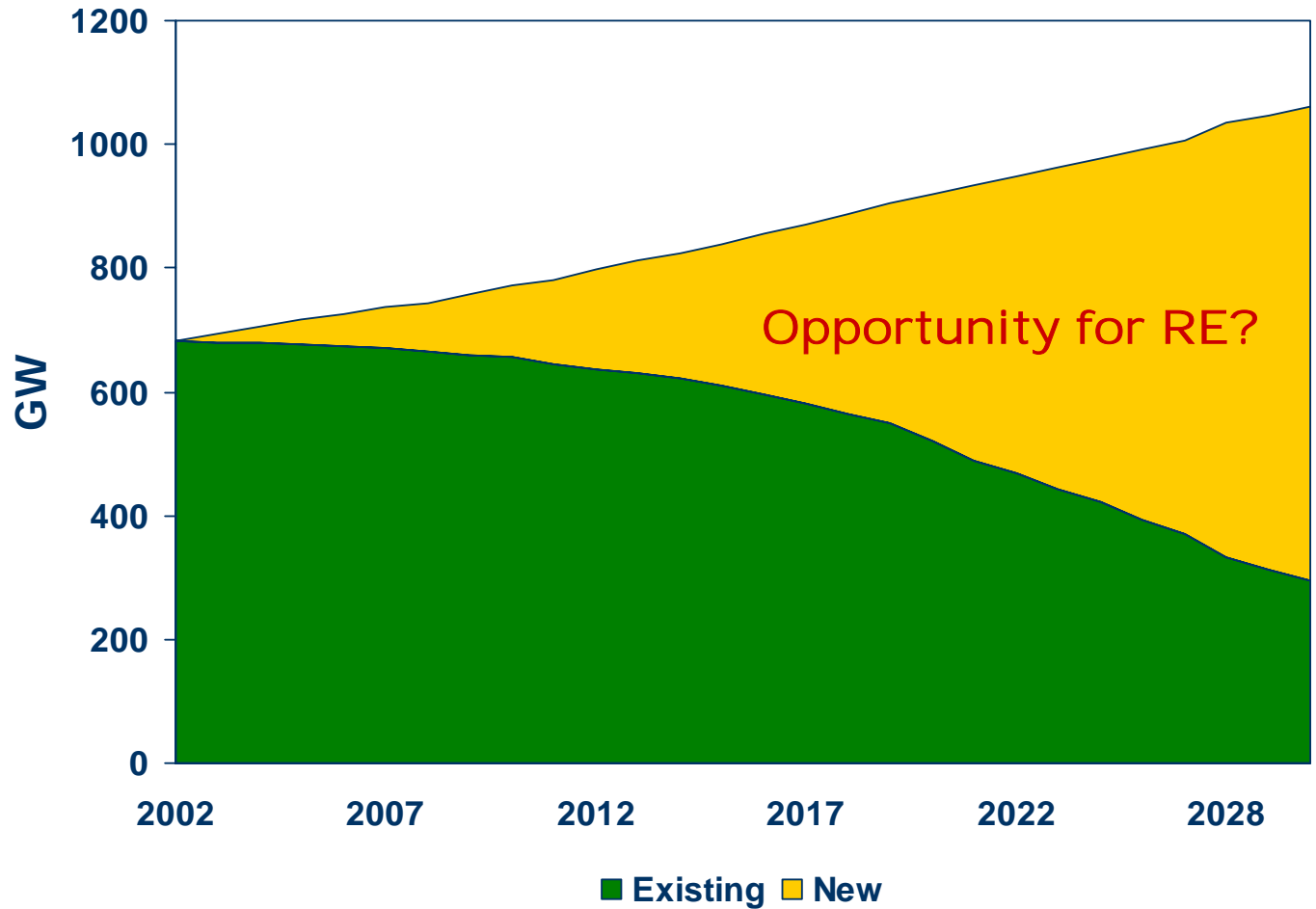


Age of Installed Capacity in Europe

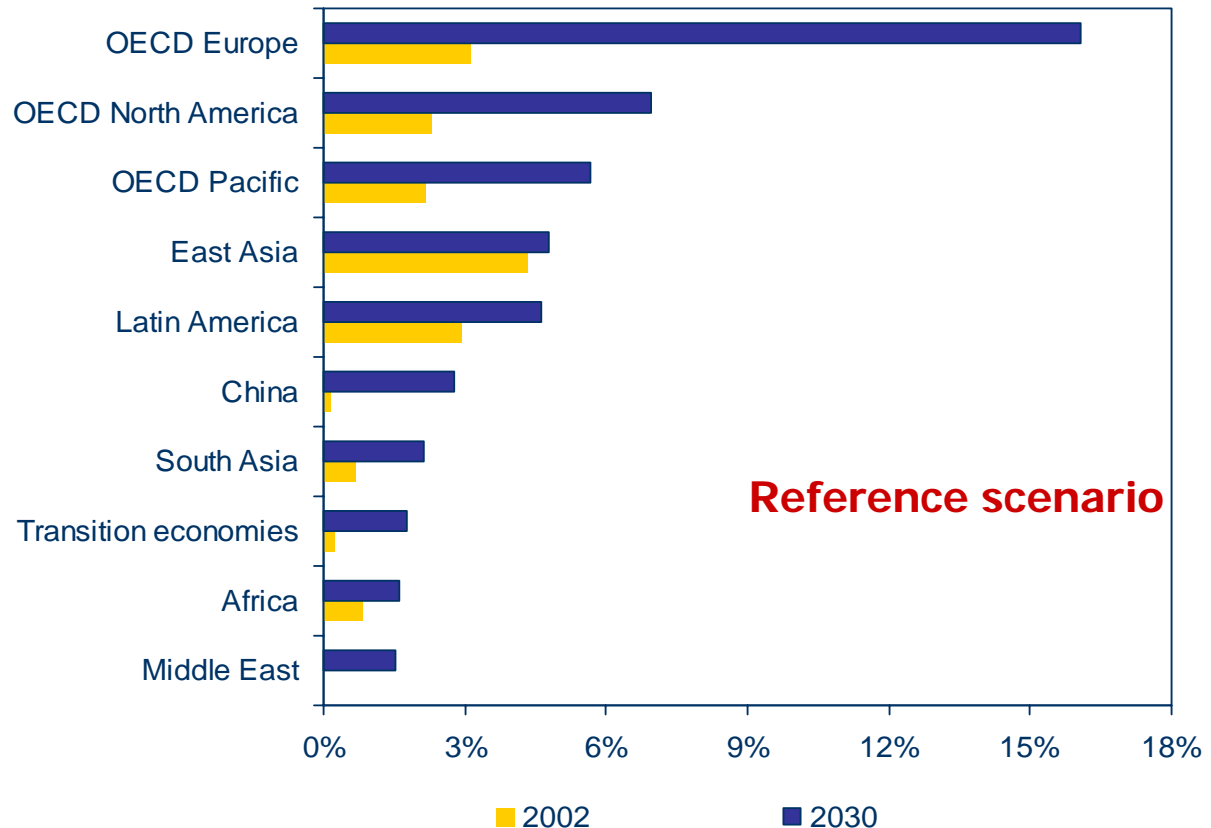


Europe's power plants are ageing: more than half the current capacity could be retired by 2030

EU-25 Capacity Increases, 2003-2030



Outlook for Share of Non-Hydro Renewables in Power Generation



.. but their share will increase substantially through 2030, especially in OECD Europe

World Alternative Policy Scenario

Key Policies in Alternative Scenario for European Union

Power generation

- Renewable energy directive
- CHP directive

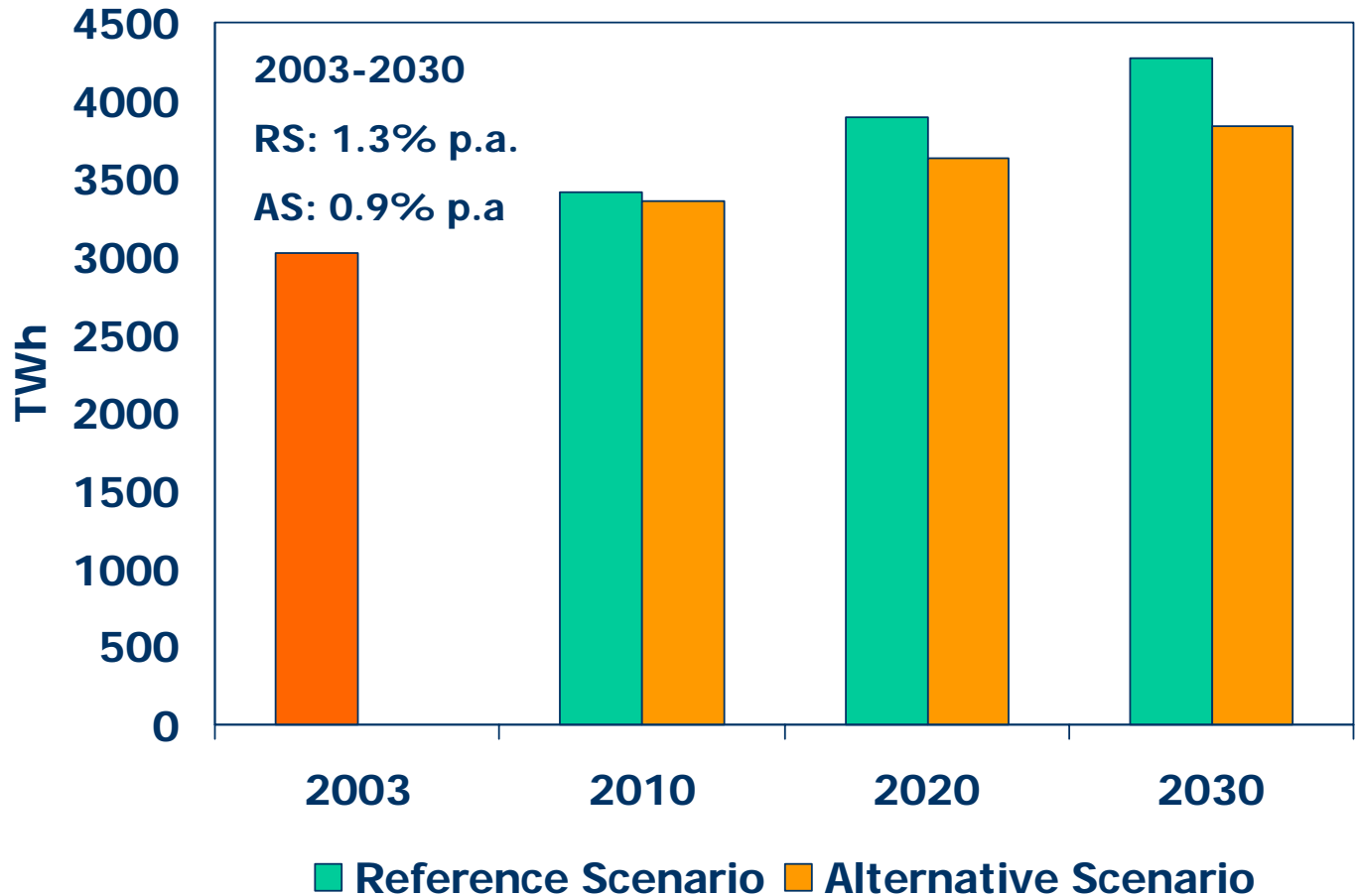
● **Transport sector**

- Prolongation and tightening of Voluntary Agreement with car manufacturers
- Biofuels target

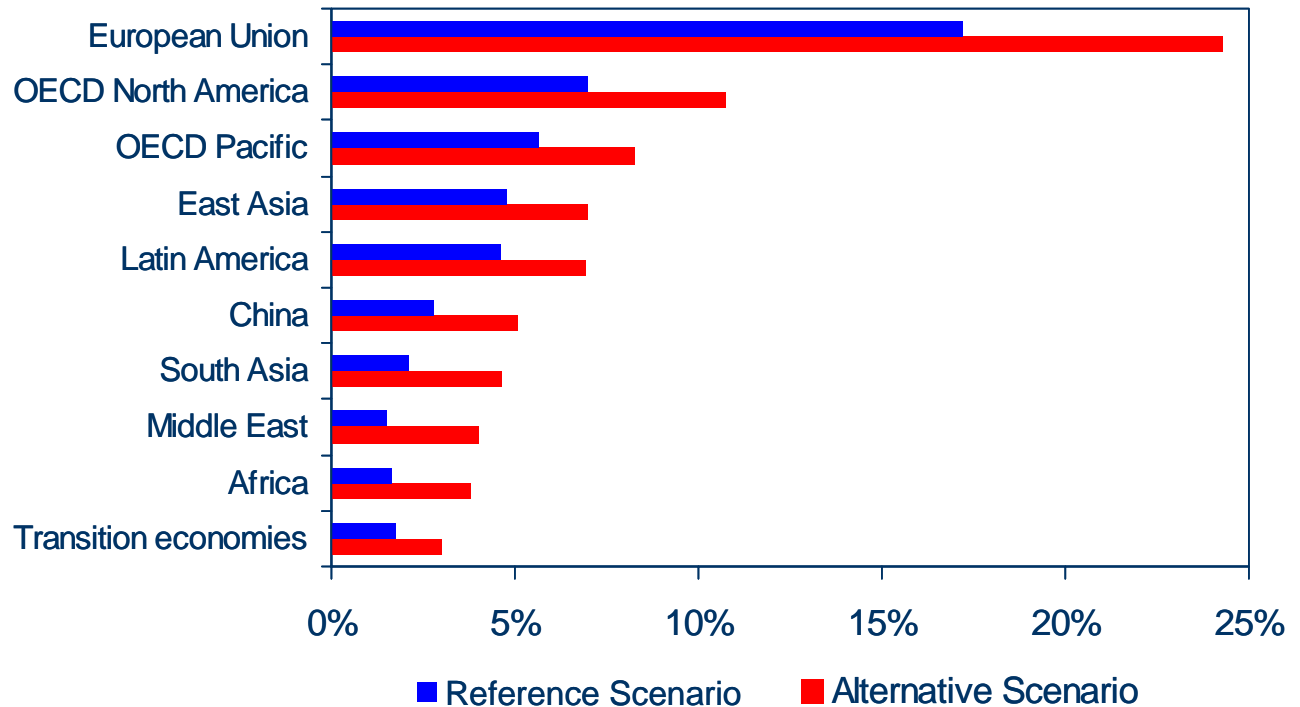
Residential and commercial sectors

- Energy performance in buildings directive
- Energy labelling

EU Electricity Generation Scenarios

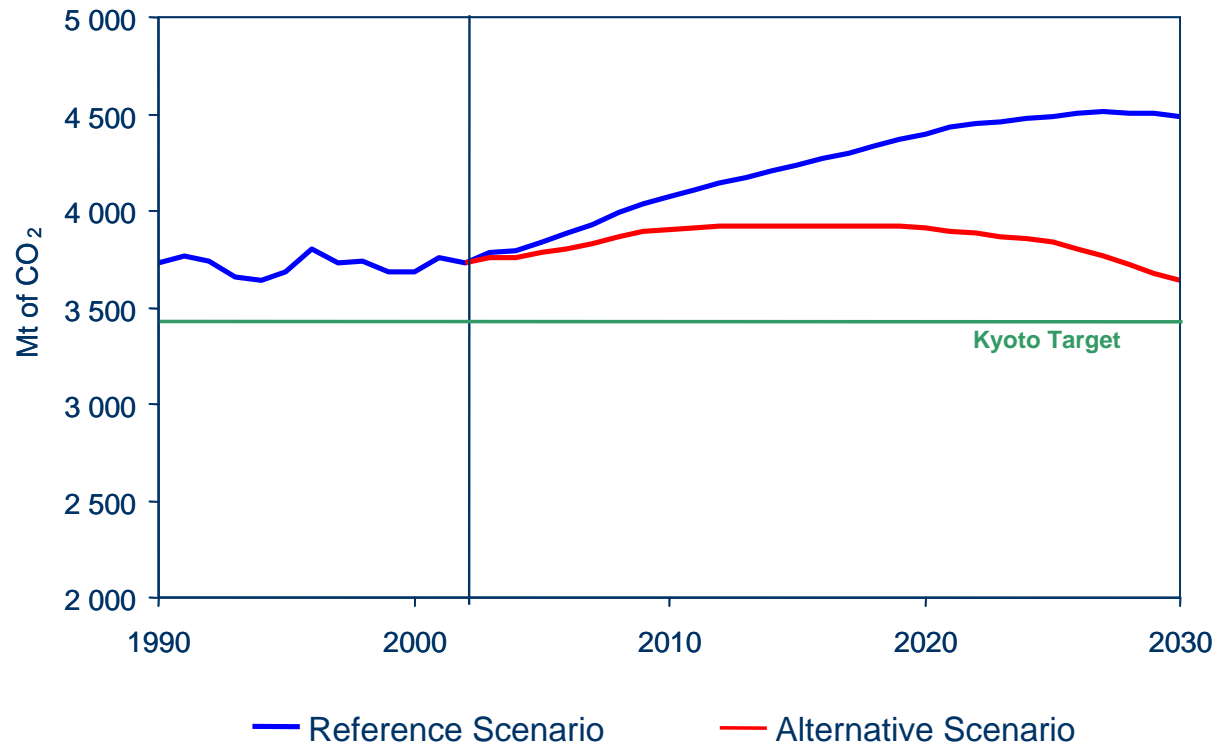


Share of Non-Hydro Renewables in Electricity Generation, 2030



New policies would boost the share of non-hydro-renewables in EU power generation – already the highest in the world

EU CO₂ Emissions in the Reference & Alternative Scenarios



With new policies, EU CO₂ emissions stabilise by 2010 and fall after 2020

Links between EU Policy and Industry in the field of RE Technology

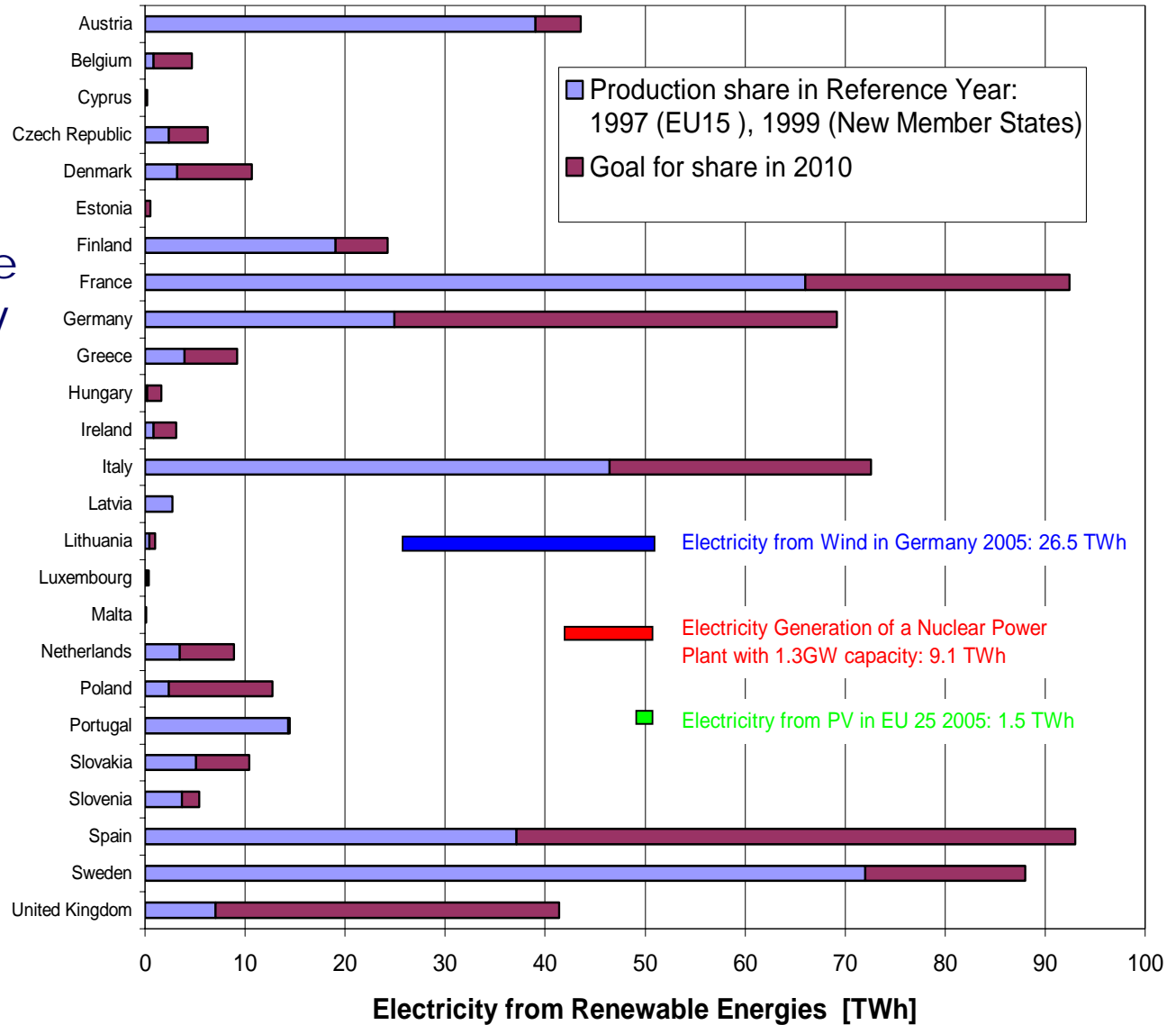
Political Situation in Europe

- European Commission has the task and the mandate to **continuously monitor** and evaluate the progress achieved in implementing Renewable Energies and Energy End-Use Efficiency.
- Larger frame is:
European energy strategy and policy with the twin objectives of **sustainability** (incl. environmental aspects) and **security of energy supply**.

Important Directives

- **Renewable Electricity Directive:**
Indicative renewable energy and energy efficiency targets for each of the 25 Member States.
- **Biofuel Directive**
Target: 5.75% in 2010
- **Directive on the Energy Performance of Buildings**
- on site renewable energy production is taken into account
- **Renewable Heat Directive** (under consideration)

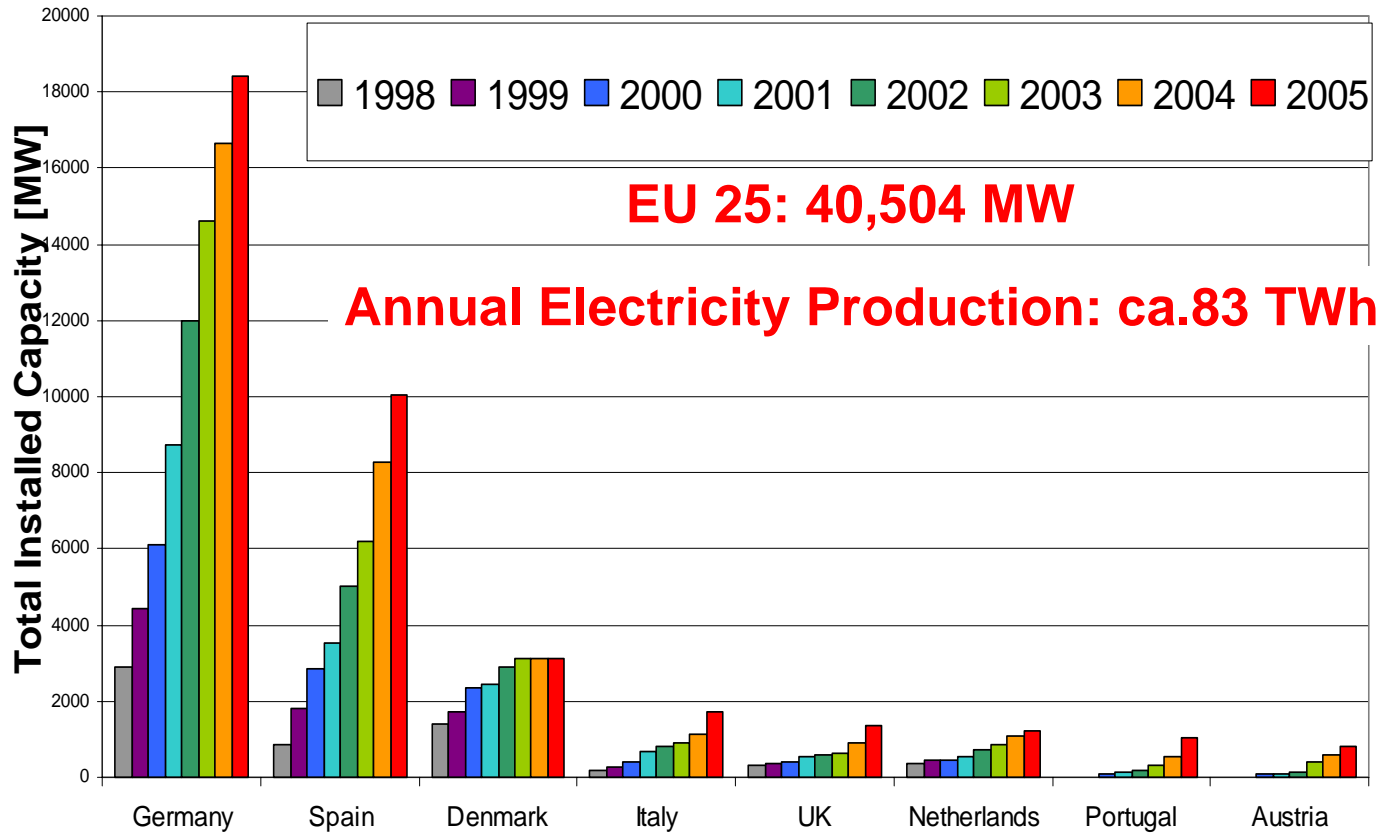
Renewable Electricity Targets



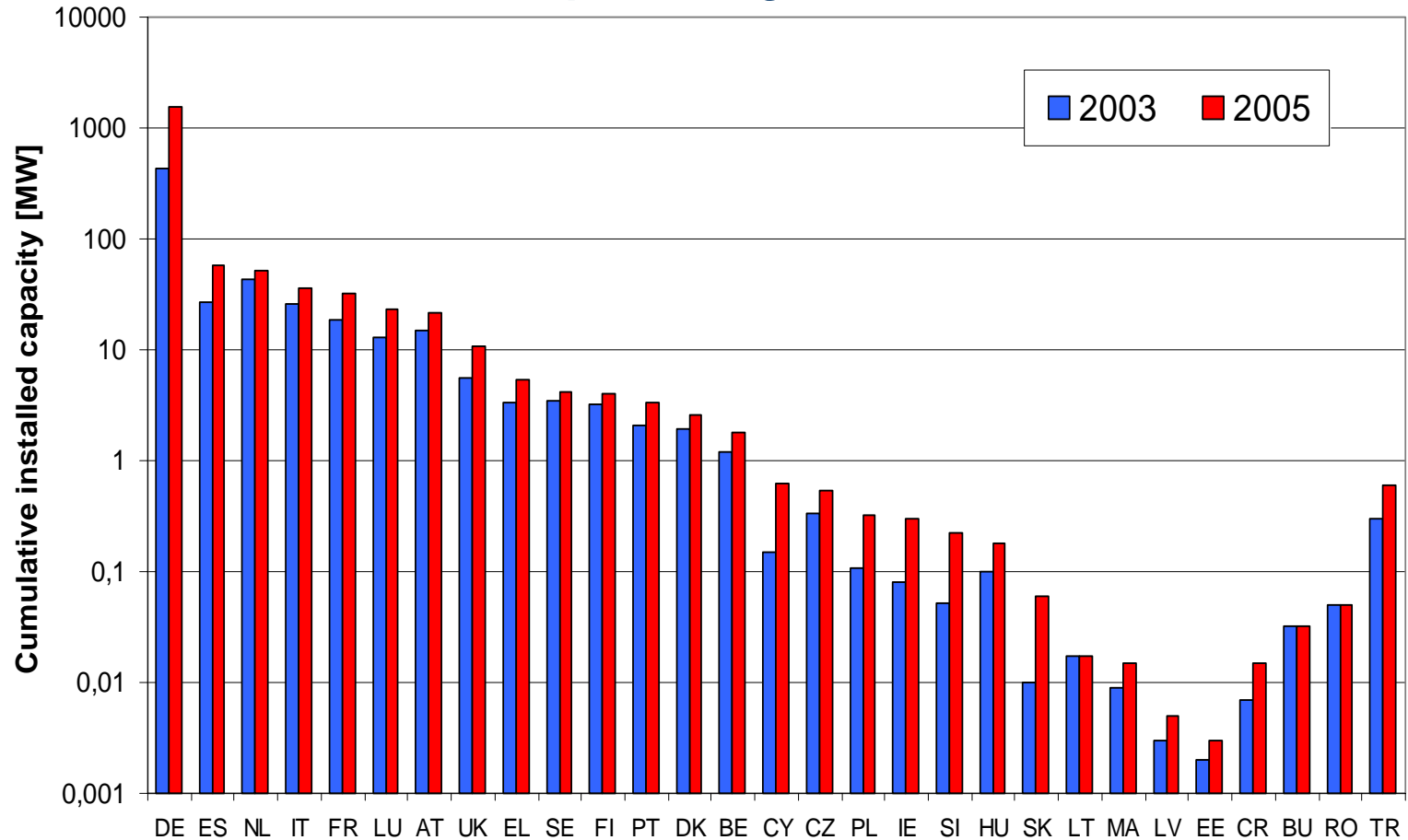
Support Situation in Europe

- **R&D Support** for Renewable Energies **Industry** on Member States and European Union level
- Almost all European Union Member States have **support mechanisms for Renewable Energies** ranging from certificates to feed-in tariffs and tax-incentives as well as direct subsidies
- **No industry policy** for Renewable Energies

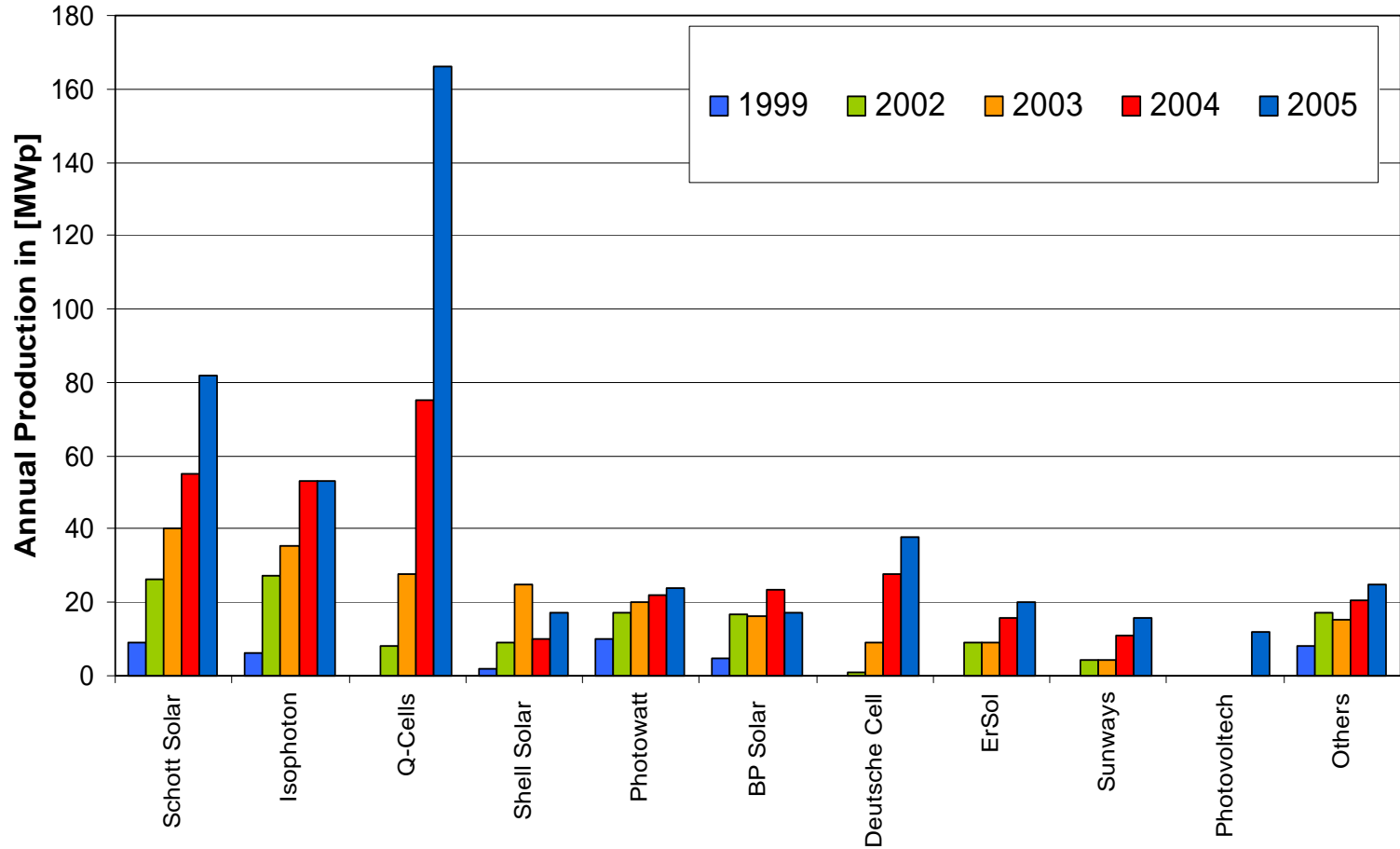
Wind Energy Growth in EU Top 8



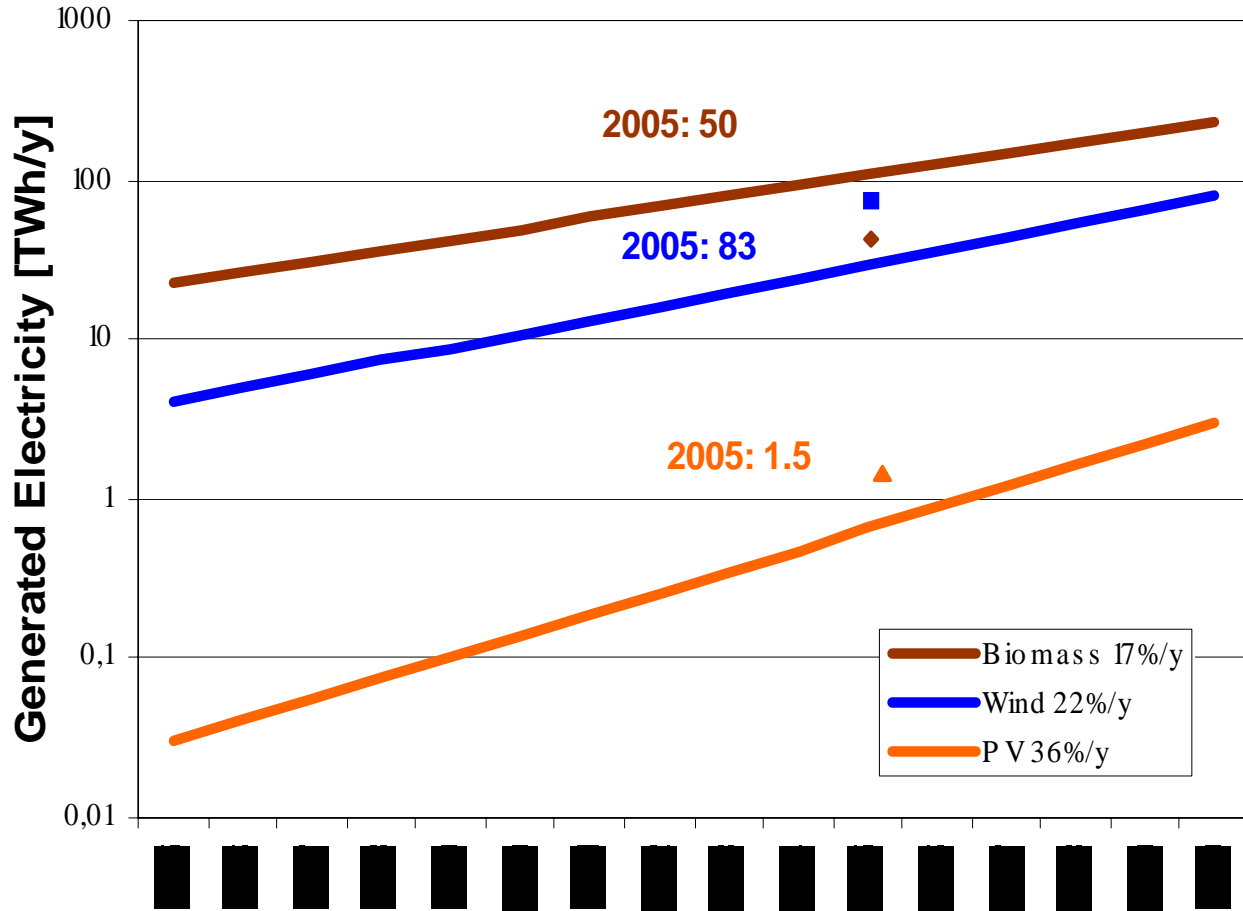
Cumulative installed pv grid connected capacity within EU-25 + CCs



European PV Production Growth



The Way to Reach the White Book Targets



Conclusions

- ☹ **No Industry Policy for Renewable Energies**
- ☹ Electricity production from **Biomass not on track**
 - Growth rates during the last years 8-9% instead of 17%
 - » Biomass action Plan

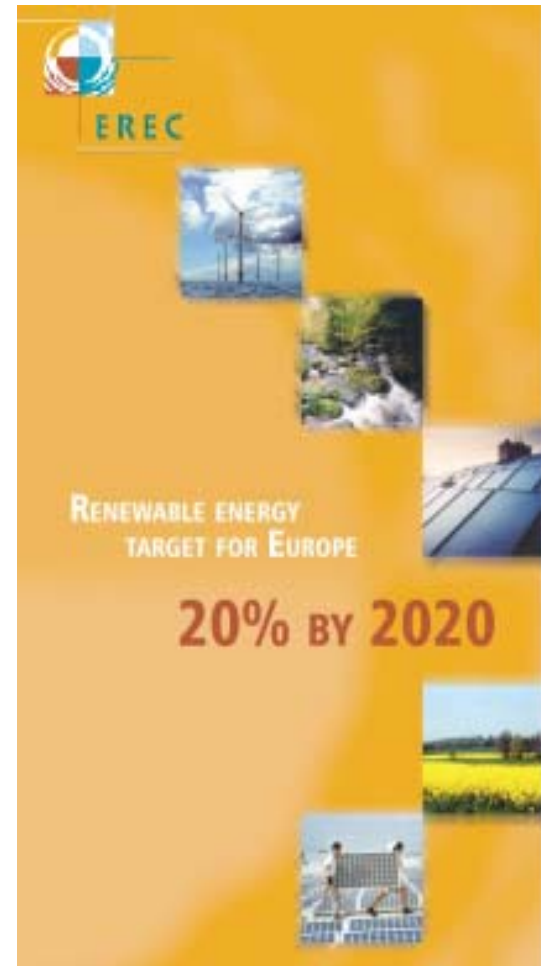
- ☹ Geothermal - only Italy

- 😊 **Support measures for Renewable Energies common**
- 😊 **Wind and Photovoltaics on track**
- 😊 Wind will probably provide most of the Renewable Electricity part in 2010 (est. 200 TWh)

Europe has a need to develop a common strategy how to implement Renewable Energies in order to meet the 2010 targets!

Scenarios by RE trade association

**20 %
by 2020
in Europe**



20 % target by 2020



- A contribution of RES to total inland consumption of 20 % by 2020 is possible
- The contribution of RES to electricity production to be more than 33 % in 2020
- The contribution of RES to heat production to be 25 % in 2020.

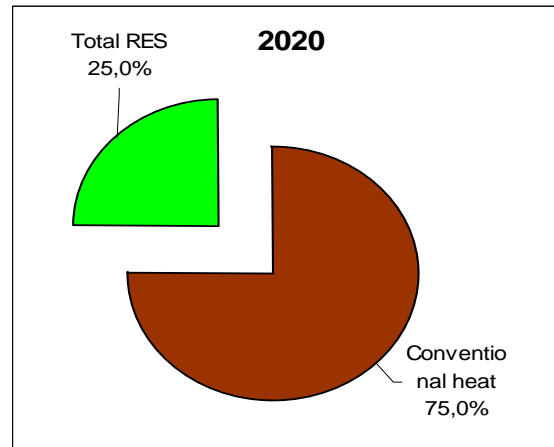
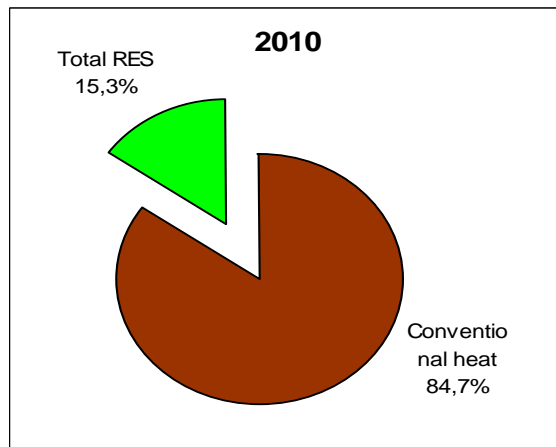
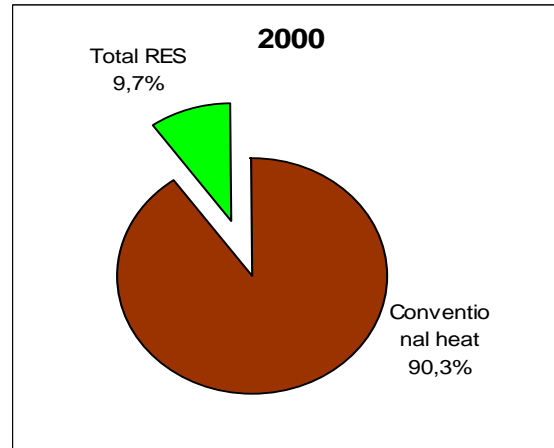
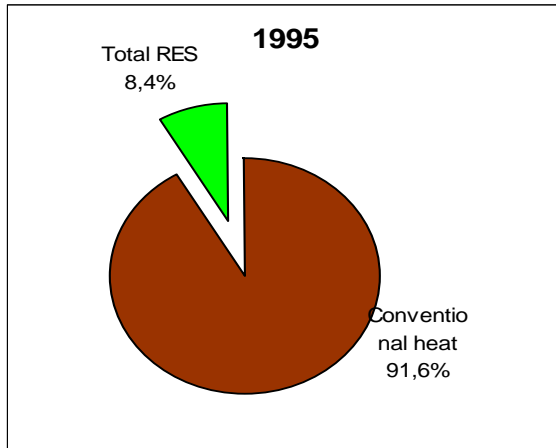
Contribution of RES to Total Inland Consumption Eurostat Convention (Mtoe)

	2000		TARGETS 2010		TARGETS 2020	
TYPE OF ENERGY	Eurostat Convention	% of total	Eurostat Convention	% of total	Eurostat Convention	% of total
Total Gross Inland Consumption	1,455		1,576 (trends to 2030)		1,576	
1. Wind	1.92	0.13	14.4	0.91	38	2.4
2. Hydro	27.6	1.9	30.6	1.94	33	2.1
3. Photovoltaics	0.01		0.3	0.02	3.6	0.2
4. Biomass	54.5	3.73	125.5	7.96	205	13.0
5. Geothermal	3.32	0.22	6.2	0.4	12.4	0.8
6. STC	0.38	0.02	3	0.2	24	1.5
Total Renewable Energies	87.8	6.0	180	11.5	316	20.0

Contribution of Renewables to Electricity Production (1995-2020)

	1995 Eurostat TWh	2000 Eurostat TWh	2010 Projections TWh	2020 Projections TWh
Wind	4	22.4	168	444
PV	0.03	0.1	3.6	42
Biomass	22.5	39.2	141	282
Hydro	290.2	321.5	355.4	384
Geothermal	3.5	4.8	7	14
TOTAL RES	320.2	388	675	1166
Total Electricity	2308.3	2574	3027	3450
Share of RES	13.9%	15.1%	22.3%	33.8%

Contribution of Renewable Energy to Heat Production (1995-2020)



The Benefits

Total RES investment (2001 – 2020)

	2001-2010 Billion Euro	2011-2020 Billion Euro	2001-2020 Billion Euro
Wind	55	101	156
PV	10	66	76
Biomass	44	45	89
Hydro	11	9	20
Geothermal	4	7	11
Solar thermal	16	75	91
TOTAL RES	140	303	443

Annual CO₂ Emission Reductions from 2001 due to RES Penetration

	2010 Mt/year	2020 Mt/year
Wind	99	236
PV	2.2	24
Biomass	176	326
Hydro	23	35
Geothermal	5.8	15
Solar thermal	14	92
TOTAL RES	320	728
% of total EU15 CO₂ emissions in 2000	9.6%	21.9%

Cumulative Avoided Fuel Costs in the EU-15 (2001 – 2020)

	2001-2010 Billion Euro	2001-2020 Billion Euro
Wind	12.9	63
PV	0.2	4.3
Biomass	-	-
Hydro	3.1	11.5
Geothermal	1.5	7.3
Solar thermal	2.3	29.7
TOTAL RES	20.0	115.8

RES – Full Time Employment Growth (2001 – 2020)

	2010 Jobs (FTE)	2020 Jobs (FTE)
Wind	184,000	318,000
PV	30,000	245,000
Biomass	338,000	528,000
Biofuels	424,000	614,000
Small Hydro	15,000	28,000
Geothermal	6,000	10,000
Solar thermal	70,000	280,000
TOTAL RES	1,067,000	2,023,000