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When the Wind Blows Over Europe – European Experiences with RES

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Europe in its 20s

20⁵ means:

- **20% share of renewables in primary energy consumption (and 10% biofuels)**
- **20% increase of energy efficiency**
- **20% reduction of CO₂ (compared to 1990): -50-80% by 2050**
 - **Current mindset: 450 ppm CO₂e, ~ 400 ppm CO₂**

...by 2020

Agenda

1. **Support Systems**
2. **Country Experiences**
3. **Conclusion**

Instruments

- **EU: 70s and 80s focused on support of research and development**
- **Since 90s focus on implementation:**
 - Mainly two different support mechanisms:
 - Quotas and tradable green certificates: apply market mechanisms, higher investment risk, potential lower learning effects for high cost RES
 - Feed-In tariffs: allow a differentiated treatment of RES, more costly, low investment risk
 - Others play only a minor or supporting role (e.g. tax subsidies, tendering systems)
- **Interaction with other environmental policies:**
 - Emission trading system (ETS)
 - Energy Efficiency mechanisms (White certificates)

Overview of Instruments: Quotas or Tariffs, and supporting instruments

Country	Support Policies	Share in electricity generation excluding hydro in 2005
Austria	Feed-in tariffs, tax exemptions, investment incentives	5.1 %
Belgium	Obligatory targets and fallback prices, TGC, investment support	2.7 %
Czech Republic	Feed-in tariffs or Green Bonuses, investment support, biofuel quota	0.9 %
Denmark	Tendering system for offshore, environmental premium, subsidies, feed-in tariffs,	29.2 %
Finland	Tax subsidies, investment subsidies, grid access guarantee, feed-in tariffs, biofuel quota	13.8 %
France	Feed-in tariffs, tendering system, tax credits, investment subsidies, biofuel quota	1.1 %
Germany	Feed-in tariffs, subsidized loans, biofuel quota	7.3 %
Hungary	Feed-in tariffs, TGC planned, tax subsidies	4.8 %
Italy	Grid access guarantee, obligatory targets, TGC, feed-in tariffs, tax exemptions	4.6 %
Netherlands	Premium Tariffs with TGC, tax exemption and boni, biofuel quota, investment subsidies	8.8 %
Poland	TGC, obligatory targets, tax exemption	1.3 %
Portugal	Feed-in tariffs, tendering system till 2006, investment subsidies, tax reductions	8.2 %
Slovak Republic	Guarantees of origin, tax exemption, feed-in tariffs, investment subsidies	0.0 %
Sweden	Obligatory targets, TGC, premium tariff, biofuel quota, tax exemption	5.8 %
Spain	Feed-in tariff or premium, subsidized loans, tax exemption	8.3 %
United Kingdom	Obligatory targets, TGC, tax exemption, grant schemes, , biofuel quota	3.1 %

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UK Quota and TGC

Since 1990s a support systems for RES:

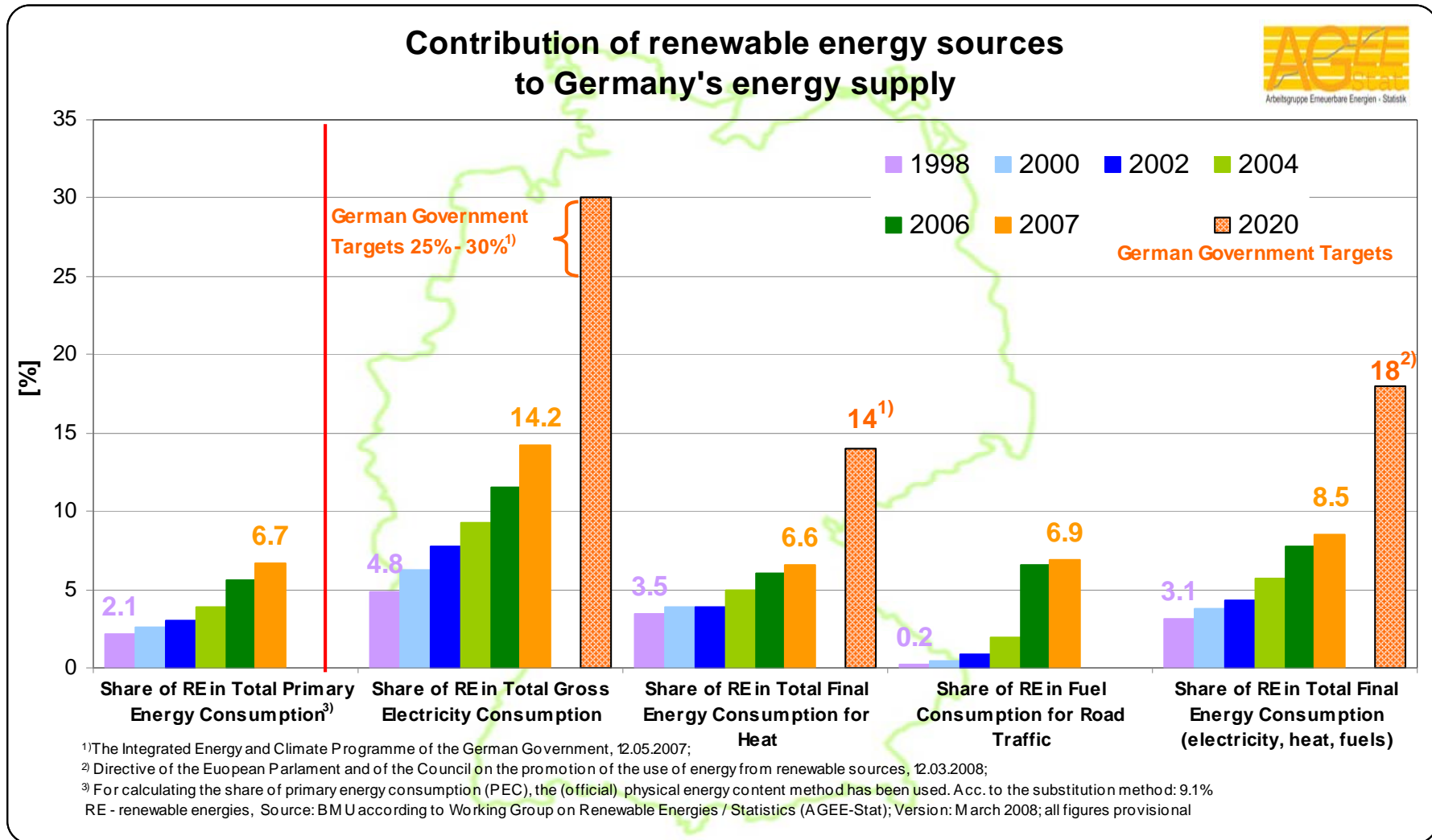
- 1990-1998: Non Fossil Fuel Obligations (NFFO)
- 1998 onward: Renewable Obligation Certificates

Achievements rather small:

- Capacity increase from 10 MW wind in 1990 to 2400 MW in 2007
- Target of 1500 MW in 2000 not achieved, very unlikely to achieve 2010 goals
- High price decrease in the beginning, due to experimental stadium in early 90s
- Mainly onshore wind energy has been utilized

→ Government is now supporting offshore projects

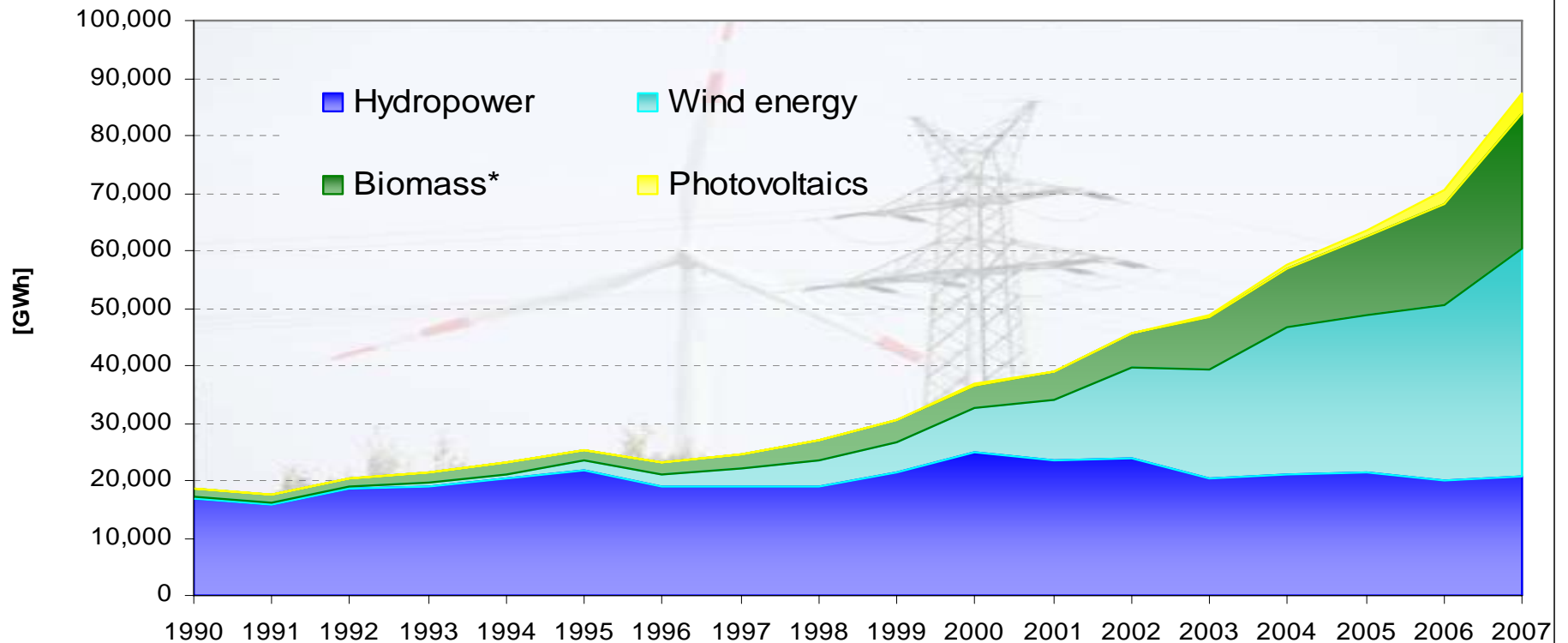
Germany Steep Increase of RES



Germany Feed-In Tariffs

German feed-in system inefficient but effective?

Contribution of renewable energy sourced electricity generation
in Germany 1990 - 2007



* solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas;
Electricity from geothermal energy is not presented due to the low volumes of electricity
Source: Source: BMU according to Working Group on Renewable Energies / Statistics (AGEE-Stat)

Germany Feed-In Tariffs

Since 1990s a support systems for RES:

- 1991 - 2000: Stromeinspeisegesetz (feed in law)
- 200 onward: EEG (Renewable Energy Law) with FIT, recently price adjustments for offshore wind and solar

Achievements rather big:

- Capacity increase from 48 MW wind in 1990 to 22+ GW in 2008
- Target of 12.5% share of RES in electricity in 2010 is realistic
- All supported energy sources have experienced capacity increases

→ FIT is now seen as a successful policy (not only by the government)

Spain Feed-In Tariffs or Premium

Since 1998 a support systems for RES:

- introduced in 1998, adjusted in 2004 and 2007
- 2 options: fixed feed-in or premium on market price

Comparison with Germany:

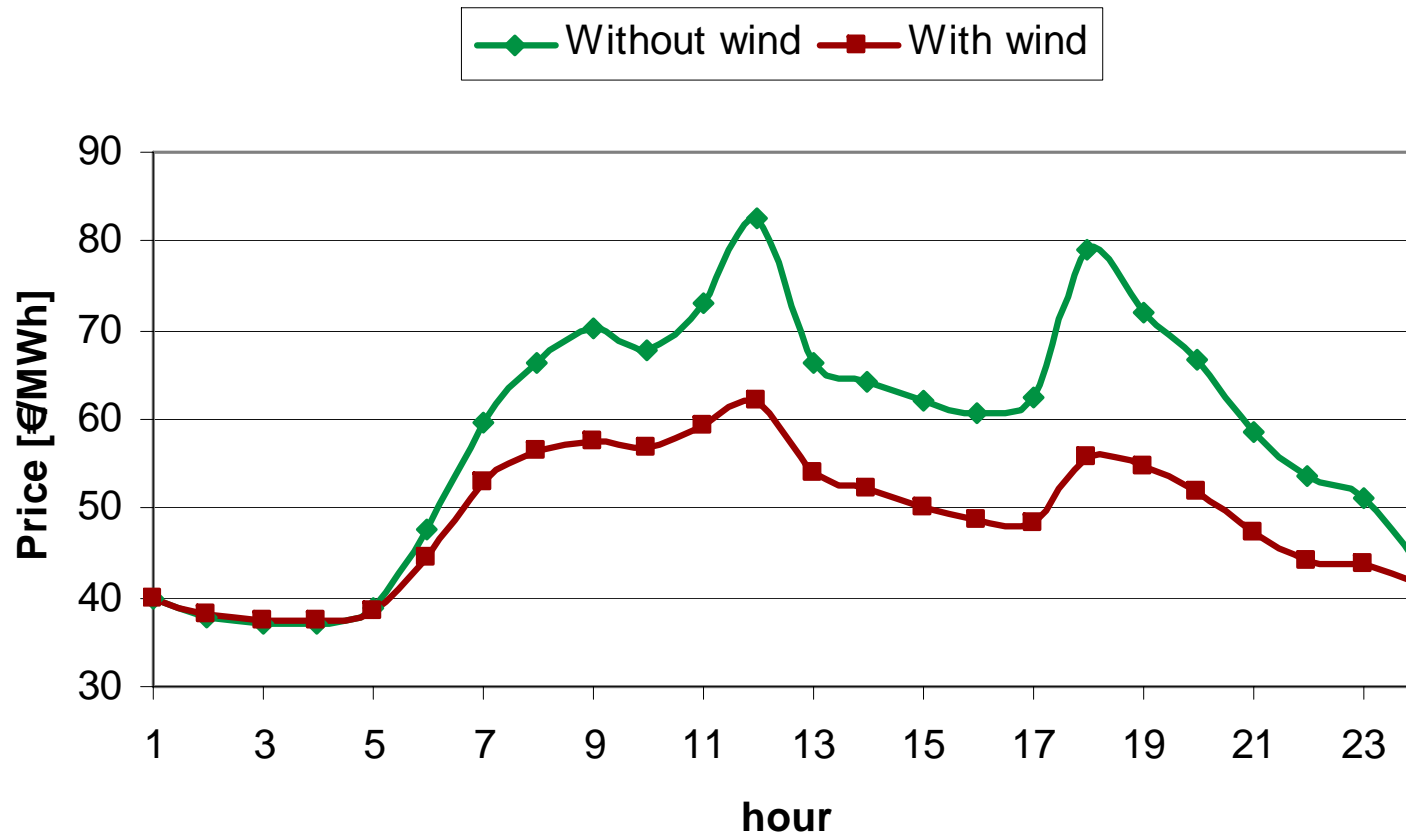
- RES operators can choose and switch each year between the 2 options
- Premium is preferred option
- Incumbents also involved in wind park investments
- Balancing more transparent, integration into load profile more precise

→ Seen as a successful policy (capacity increase from 839 MW wind in 1998 to 15+ GW in 2007)

Critical Issues

- **Cost allocation**
- **Network integration and network management**
- **Upstream competition**
- **Industrial policy (Germany, Spain)**

Further considerations: Impact of RES on market prices (exp. Wind in Germany)

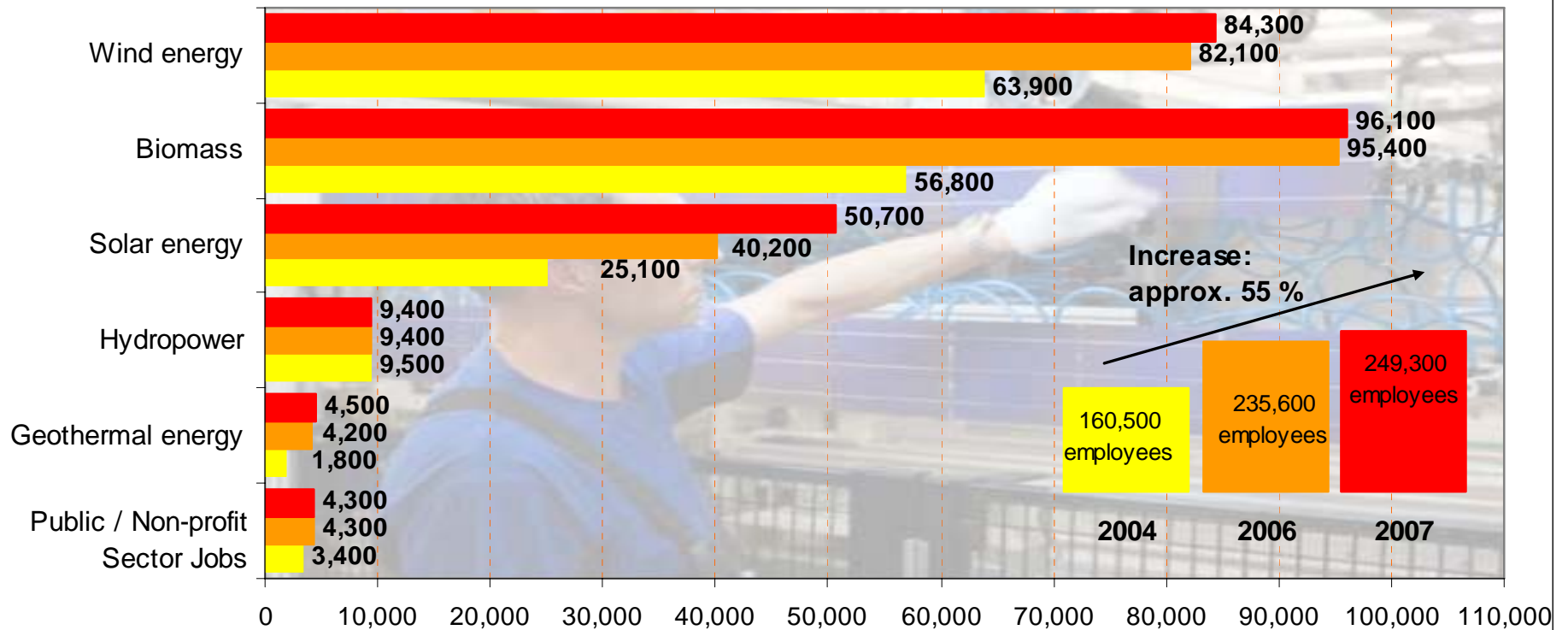


Given the installed conventional generation capacity large scale wind energy leads to price reductions

For Germany a consumer net benefit of 3 €/MWh is observed

RES as industry policy:

Employees in the German renewable energy sector
2004, 2006 and 2007



Source: BMU Projekt "Kurz- und langfristige Auswirkungen des Ausbaus der erneuerbaren Energien auf den deutschen Arbeitsmarkt", interim report March 2008

Europe

Uncertainty about which method to apply in a single EU market

Generally in favor of market based mechanisms (TGC), however a rapid implementation is unlikely giving the variety of national policies

Discussion about Quotas and Feed-In-Tariffs:

- Experiences show a disadvantage of quotas in fulfilling the projected targets and significantly increase RES utilization
- The proposed cost benefit of quotas also seems not to hold (€ct/kWh for wind):

FIT		Quota/Trade	
Netherlands	9.2	UK	9.6
Germany	6.6-8.8	Italy	13.0
France	8.4		
Portugal	8.1		
Austria	7.8		
Spain	6.4		
Greece	6.4		

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Conclusion

Europe is yet to decide how to proceed with its RES in the future:

- up to now mainly national policies
- coexistence of different systems in the coming years is likely

Experiences with FIT:

- Effective to achieve projected RES targets
- Provide investment security and increase the share of independent power producers
- Utilize learning effects and increase competition on the production markets (e.g. wind turbines)

→ FIT seems to be provide a better way (in the interim) to bring RES to the market



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**Thank you very much
for your attention!**

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Backup

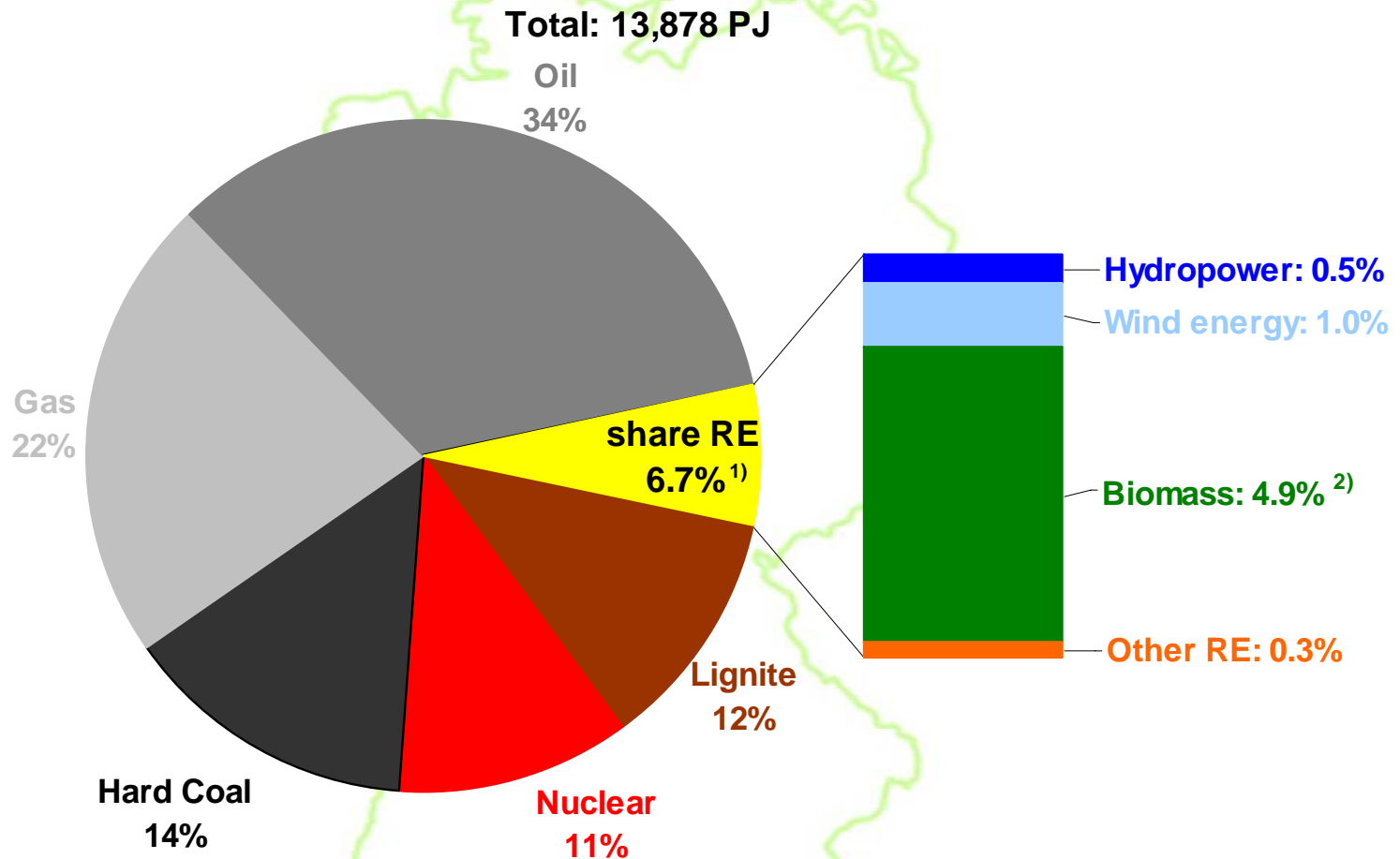
Poland

Key: Long-term contracts with utilities are possible (12 years)

- Feed-in quota for electricity sold by utilities required from renewables: 7.5% of in 2010; increase to 10,4% in 2014
- Certificate price = 360 PZI
./.. „black power“ tariff (i.e. yearly average, ~3 €/kW (128 PZI) as of 07/2008)
- Serious fine: 7 €/kWh (248 PKZ/MWh), indexed to inflation
- 1 certificate per kWh
- Disadvantage: no distinction b/w renewables → only after saturation of cheapest technology (onshore wind), the second cheapest technology will be installed

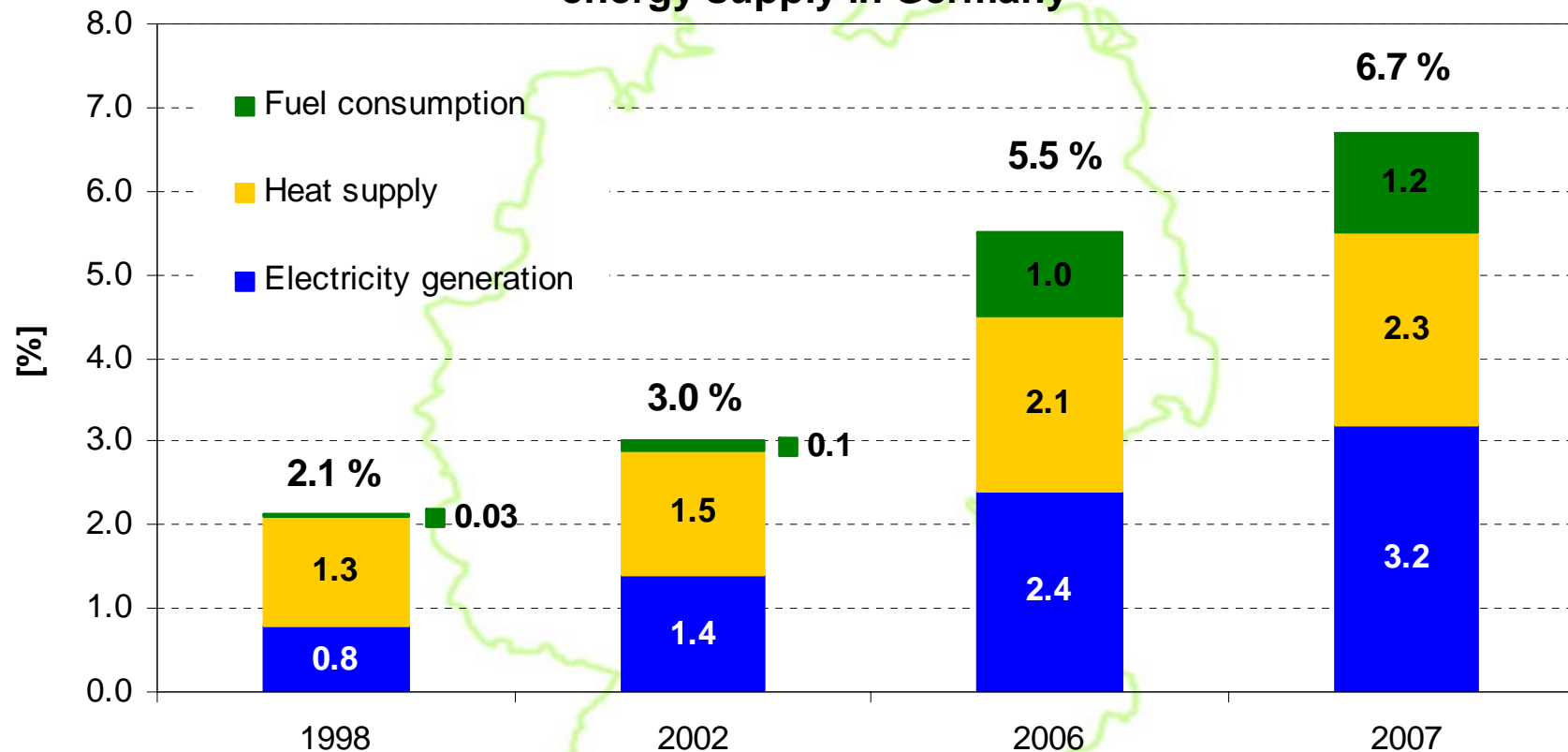
→ 16 GW (onshore) wind currently planned

Primary energy consumption in Germany in 2007



¹⁾ Acc. to the substitution method: Renewable Energies Accounted for 9.1% of Primary Energy Consumption ; ²⁾ solid, liquid, gaseous biomass, biogenic share of waste, landfill and sewage gas; RE - renewable energies; Version: March 2008; all figures provisional Source: BMU according to Working Group on Renewable Energies / Statistics (AGEE-Stat); using data from Working Group on Energy Balances (AGEB); physical energy content method.

Renewable energy sources as a share of energy supply in Germany



provisional figures, Version: March 2008

Share of primary energy consumption (PEC) calculated according to the efficiency method; acc. to the substitution method: 9.1%

Sources: Source: BMU according to Working Group on Renewable Energies / Statistics (AGEE-Stat)

The Amendment of the Law on Renewable Energies (EEG, July 4, 2008)

	„Old version“ (2004)	Amendment
Onshore wind	8 c/kWh Reduction: -2%/a	9.2 c/kWh, for at least 5 years Reduction: -1%/a (after 2010) Re-Powering: bonus of 0.5-0. c/kWh Overall collar: 5,02 c/kWh
Offshore wind	10-12 c/kWh	13 c/kWh, + „sprinter bonus“ of 2 c/kWh until 2015 Reduction (after 2015): 5% Overall collar: 3.5 c/kWh
General provisions		Bonus for „system services“ of 0.5-0.7 c/kWh

- + The TSO has to pay financial compensation for refused amounts of energy within the feed in management; wind turbines have priority feed in
- + TSOs are obliged to enlarge and optimize existing electricity networks to integrate wind and other renewables.
- → Broad political consensus: 432/530 supporting votes