

# University of Pennsylvania – ENVS 630

## EU Renewables Policy 2008

March 6, 2008



### Agenda/Contents

- Introduction
- EU energy policy
- RES – energy sources for the future
- EU renewables policy
- Policy instruments
- National implementation
- Conclusion and outlook
- Q&A session

## Section one

### Introduction

EU energy policy

RES – energy sources for the future

EU renewables policy

Policy instruments

National implementation

Conclusion and outlook

Q&A session

Introduction

### Introduction

→ Who is talking to you today?

→ **Learning objectives:**

- Is there **a European** RES policy?
- If so, what does it look like?

→ Questions anytime...

## Section two

Introduction ✓

### **EU energy policy**

RES – energy sources for the future

EU renewables policy

Policy instruments

National implementation

Conclusion and outlook

Q&A session

EU energy policy

### Some necessary remarks on how EU (energy) policy works (1)

#### **The European Union (EU):**

- founded in the 1950s by FR, IT, DE and BENELUX countries
- federation of 27 nation states
- Population (2007): 455 million
- GDP (2007): \$16.6 trillion

#### **Primary legislative acts:**

- (1) regulation = directly enforceable
- (2) directive = transposition required



Fig. 1: The European Union in 2007 (picture © ECB)

## Some necessary remarks on how EU (energy) policy works (2)

### EU energy policy:

- energy policy is shared between EU and national governments
- traditionally no role for EU in energy policy but EU is increasingly assertive in shaping energy policy, primary levers:
  - competition policy
  - environmental protection
  - security of energy supply

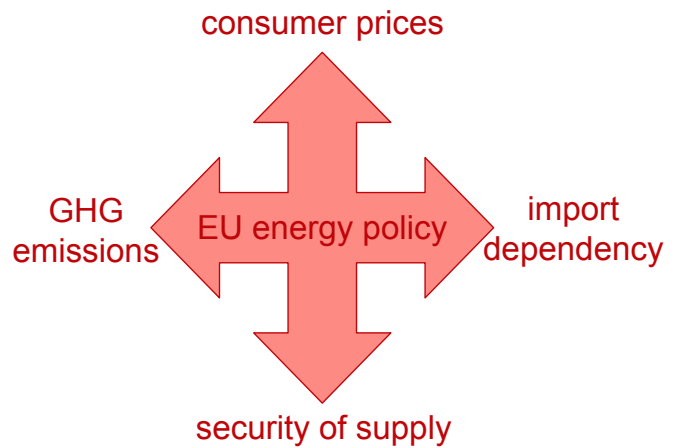


Fig. 2: Key challenges for European energy policy

## Section three

- Introduction ✓
- EU energy policy ✓
- RES – energy sources for the future**
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# Renewable energy sources (RES) – one solution to Europe’s (& the world’s) energy problems (1)

## Definition of renewable energy sources<sup>1</sup>:

“Renewable energy sources shall mean **renewable, non-fossil** energy sources [such as] wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.”

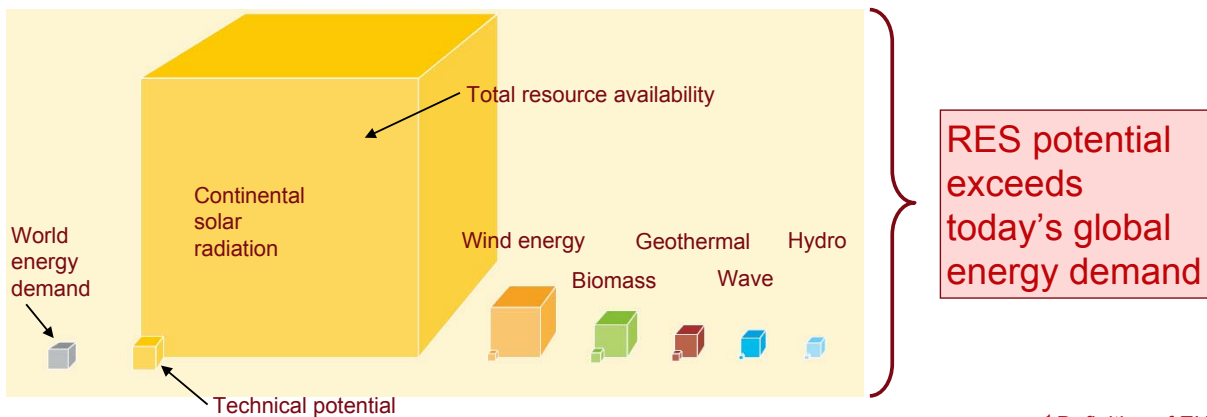


Fig. 3: World energy demand and RES potential (source: BMU 2007)

<sup>1</sup> Definition of EU Directive 2001/77/EC

# Renewable energy sources (RES) – one solution to Europe’s (& the world’s) energy problems (2)

## New uses for RES:

- electricity generation
- transport fuels

## Why use RES?

- decreasing marginal costs
- indigenous resources
- stabilizing portfolio effect
- low environmental impact

→ From now on focus on RES-E!

RES \ Use	Electricity	Heating / Cooling	Transport fuels
Wind	✓		
Solar	✓	✓	
Geothermal	✓	✓	
Wave	✓		
Tidal	✓		
Hydro	✓		
Biomass	✓	✓	✓
Landfill	✓	✓	
Sewage	✓		
Biogas	✓	✓	

Tab. 1: Primary uses of various RES



## Section four

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### EU renewables policy

## Supporting renewables – the case for policy intervention (1)

### Why support RES at all?

- market alone will not deliver socially desirable outcome
- several **market failures** lead to under-provision of RES-E:
  - **external costs** of conventional energy sources
  - underinvestment in **technological progress / innovation**
  - other **market failures** (“leveling the playing field”)

	CO2 (g/kWh)	SO2 (g/kWh)	NOx (g/kWh)
Hydro (small-scale)	9	0.03	0.07
Wind	7 – 9	0.02 – 0.09	0.02 – 0.06
Photovoltaic	98 – 167	0.20 – 0.34	0.18 – 0.30
Coal (best practice)	955	11.8	4.3
Oil (best practice)	818	14.2	4.0
Gas (combined cycle)	430	-	0.5

Tab. 2: Life-cycle emissions (source: IEA 2002)

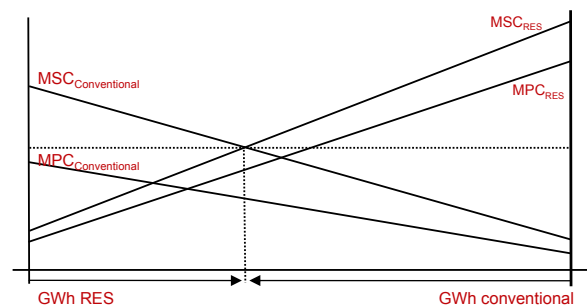


Fig. 4: Economic efficiency in electricity markets

## Supporting renewables – the case for policy intervention (2)

### RES-E policy framework of the EU:

- **Directive 2001/77/EC** “on the promotion of electricity produced from RES” adopted by EU institutions on 09/27/01
- preceded by over five years of discussions & especially:
  - **White Paper on RES** (1997)
  - **Green Paper on security of energy supply** (2001)
- plethora of **justifications** given by EU for policy intervention:
  - reducing **import dependency** / increasing **security of supply**
  - **environmental protection** / **sustainable development**
  - contribution to **job creation**, especially in **SME**
  - facilitation of **regional development**, greater **social cohesion**
  - opening up **business opportunities** to European industry
  - **public support** of RES

## Supporting renewables – the case for policy intervention (3)

### Aims of Directive 2001/77/EC:

- **double share of RES** in total energy consumption from 6% (1997) to 12% by 2010
- **increase RES-E** from **13.9%** (1997) to **22.1%** by 2010 across EU15
- sets **indicative (!) targets** for individual member states, leaving the detailed implementation to member states
- includes provisions on **monitoring, reporting and revision**

	RES-E TWh 1997	RES-E % 1997	RES-E % 2010
Austria	39.05	70.0	78.1
Belgium	0.86	1.1	6.0
Denmark	3.21	8.7	29.0
Finland	19.03	24.7	31.5
France	66.00	15.0	21.0
Germany	24.91	4.5	12.5
Greece	3.94	8.6	20.1
Ireland	0.84	3.6	13.2
Italy	46.46	16.0	25.0
Luxembourg	0.14	2.1	5.7
Netherlands	3.45	3.5	9.0
Portugal	14.30	38.5	39.0
Spain	37.15	19.9	29.4
Sweden	72.03	49.1	60.0
United Kingdom	7.04	1.7	10.0
European Union	338.41	13.9%	22.1%

Tab. 3: Indicative targets for RES-E by 2010

## Section five

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### Policy instruments

#### Policy instruments for the support of RES-E (1)

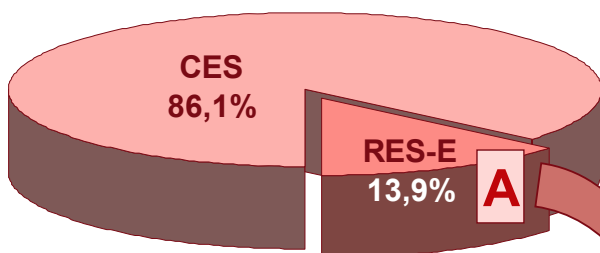


Fig. 5: Shares in EU electricity market (1997)

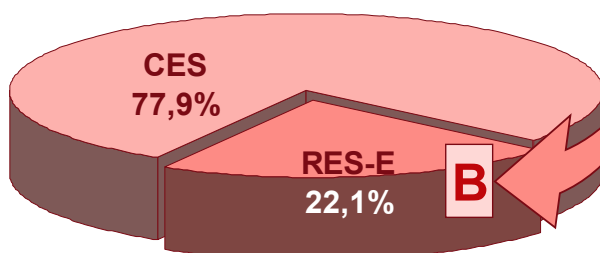


Fig. 6: Shares in EU electricity market (2010)

#### How to get from A to B:

- change **legal frameworks**
- ensure fair **market access**
- establish **economic incentives**

#### 1. Legal framework for RES:

- laws and rules needed for development of RES-E market
- permitting of projects most critical

#### 2. Market access:

- feed-in priority
- grid extensions
- grid management

## Policy instruments for the support of RES-E (2)

### 3. Economic incentives for RES-E: (b) Supply side (price-based) instruments:

#### (a) Demand side (quantity-based) instruments:

- tender systems
- TGC / RPS schemes

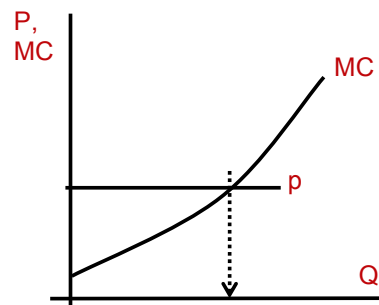
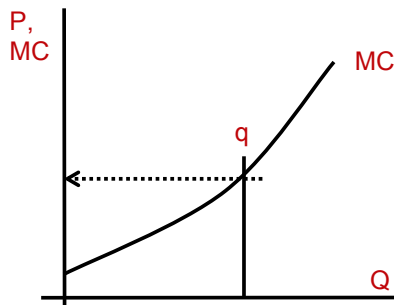


Fig. 7: Price vs. quantity instruments to promote RES-E

## Policy instruments for the support of RES-E (3)

### Policy implementation in EU member states:

- most EU countries have adopted mix of policies
- **feed-in tariffs** dominant in big markets: DK, DE, FR, ES, PT, GR
- **quota systems** only in UK, IT
- **fiscal incentives, tenders, etc.** as addition to REFIT / TGC

→ many countries have experimented with different instruments during past years

→ **most countries use REFIT!**

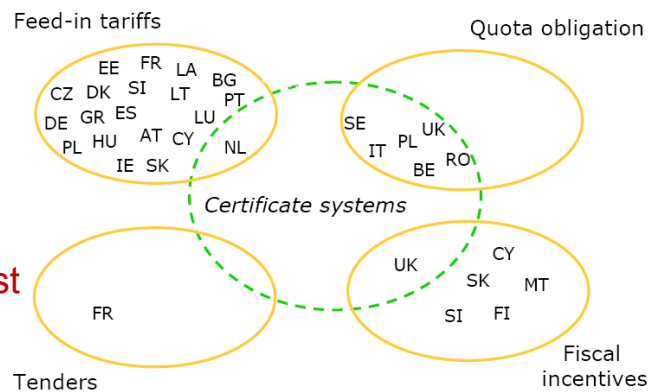


Fig. 8: Policy mix in EU member states (OPTRES 2006)

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### National implementation

#### National implementation (1): Germany RES policy

##### Policy mix for RES-E:

- Feed-in law for RES-E (StrEG) from 1991 modified to **Renewable Energy Sources Act** (EEG) in 2000:
  - priority grid access for RES-E
  - feed-in tariffs guaranteed for 20 years and differentiated by technology
  - grid upgrades paid for by grid operators
  - tariff degression to avoid windfall profits / trigger innovation (R&D)

- **Tax credits** for investments in RES generation facilities (discontinued 2005)
- **Streamlined licensing** procedures (“one-stop-shop”)

RES technology	Feed-in tariff €ct / kWh	Annual tariff reduction
SHP (<500 kW)	9.67	0.0%
Biomass (<500 kW)	≥ 9.90	1.5%
Geothermal (<20 MW)	8.95	1.0% (from 2010)
Onshore wind	8.70	2.0%
Photovoltaic	45.70	5.0%

Tab. 4: REFITs for various technologies (2004 rates, simplified representation)

## National implementation (2): British RES policy

### Policy mix for RES-E:

- **Non-fossil Fuel Obligation (NFFO)** from 1990 until 2002 (tender rounds and price premium)
- Complete overhaul in 2002 leading to **Renewables Obligation (RO)**:
  - suppliers required to include increasing RES-E share
  - RO target met either through RES-E generation or buying of RO certificates (ROC)
  - “technology blind” scheme
  - buy-out price set at £30 / ROC

- **Capital grants** for investments in offshore wind and energy crops
- Exemption from **Climate Change Levy (CCL)**
- **Streamlined licensing** procedures still in the making

Obligation period	Percentage of total supplies	Obligation period	Percentage of total supplies
2002/2003	3.0	2007/2008	7.9
2003/2004	4.3	2008/2009	9.1
2004/2005	4.9	2009/2010	9.7
2005/2006	5.5	2010/2011	10.4
2006/2007	6.7	2015/2016	15.4

Tab. 5: Renewables Obligation amounts (ROO 2002)

## National implementation (3): Results in Germany & UK

### Lessons learnt from DE & UK:

- **rapid expansion** of RES in Germany, slow uptake in UK
- **growing renewables industry** in Germany (e.g. wind, solar PV)
- **lower tariffs** (per kWh) in Germany than UK
- **greater diversity** in RES technologies in Germany than UK
- **many SME actors** in Germany, oligopolistic market structure in UK sustained



Fig. 9: Installed wind capacity in MW (EWEA 2007)

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### Conclusion and outlook

## Results across the EU – Mission accomplished?

### Are EU / national policies working? Key lesson from market leaders:

- **wind** is growing with 26% p.a.
- **PV** is growing with 80% p.a.
- **other RES:** 2 – 16% p.a.
- **3L in framework:** long, loud & legal

→ RES-E share increased (only) 0.5 percentage points b/w 1997 and 2005

- very **mixed results** across EU countries
- still long way to go for EU to achieve 22% mid-term (2010) target
- targets even more difficult to achieve for EU27 as a whole (CEE states)

	RES-E % 1997	RES-E % 2005	RES-E % 2010
Austria	70.0	57.8	78.1
Belgium	1.1	2.8	6.0
Denmark	8.7	28.2	29.0
Finland	24.7	26.9	31.5
France	15.0	11.2	21.0
Germany	4.5	10.3	12.5
Greece	8.6	10.0	20.1
Ireland	3.6	6.8	13.2
Italy	16.0	14.1	25.0
Luxembourg	2.1	3.2	5.7
Netherlands	3.5	6.3	9.0
Portugal	38.5	16.0	39.0
Spain	19.9	15.2	29.4
Sweden	49.1	54.3	60.0
United Kingdom	1.7	4.3	10.0
<b>EU 15</b>	<b>13.9%</b>	<b>14.4%</b>	<b>22.1%</b>
<b>TPES (EU 15)</b>	<b>5.5%</b>	<b>6.7%</b>	<b>12.0%</b>

Fig. 10: RES-E share in 2005 (BMU 2007)

## Future EU renewables policy: “20/20/10 by 2020”

### Policy package of January 23, 2008

→ stated aim of “making the EU the world’s first **low carbon economy**”:

- **20% less CO<sub>2</sub>** emissions by 2020\*
- **20% RES share** in TPES by 2020
- **10% biofuels** share by 2020

### Policy instruments:

- strengthening of **EU ETS**
- strengthening of **RES policies** (RES-E, heating, cooling)
- mandatory blending with **biofuels**

### New renewables legislation:

- **binding targets** for RES share in TPES for each country
- **national action plans** for policies and sector targets (electricity, heating, fuels) by March 2010
- stricter **enforcement**
- trading of **guarantees of origin** (GO)  
→ new directive as “*temporary*” measure only (i.e. until EU ETS fully implemented)

\* 30% if other countries commit to meaningful post-Kyoto agreement

## Section eight

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## Wrap up / Q&A session

### → Learning objectives:

- Is there a European RES policy?
- If so, what does it look like?

# Any questions?



Contact details and further reading

## Contact details and further reading

### → Contact details:

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### → Further reading:

- **European Union** website on renewable energy policy: <http://europa.eu.int/comm/energy/res/>, including “The support for electricity from renewable energy sources - Impact Assessment” (SEC(2005) 1571) and following studies & legislative proposals
- **Menanteau, P.**, et al. (2003): “Prices vs. quantities: choosing policies for promoting the development of renewable energy”, *Energy Policy* 31, 799-812
- **Ondraczek, J.** (2004): “Implementation of EU Directive 2001/77/EC (...) in Germany and the UK: Lessons learnt and the way forward”, available from the author