

# European experience with deploying large scale RES in the electricity sector

Leonardo Meeus & Marcelo Saguan

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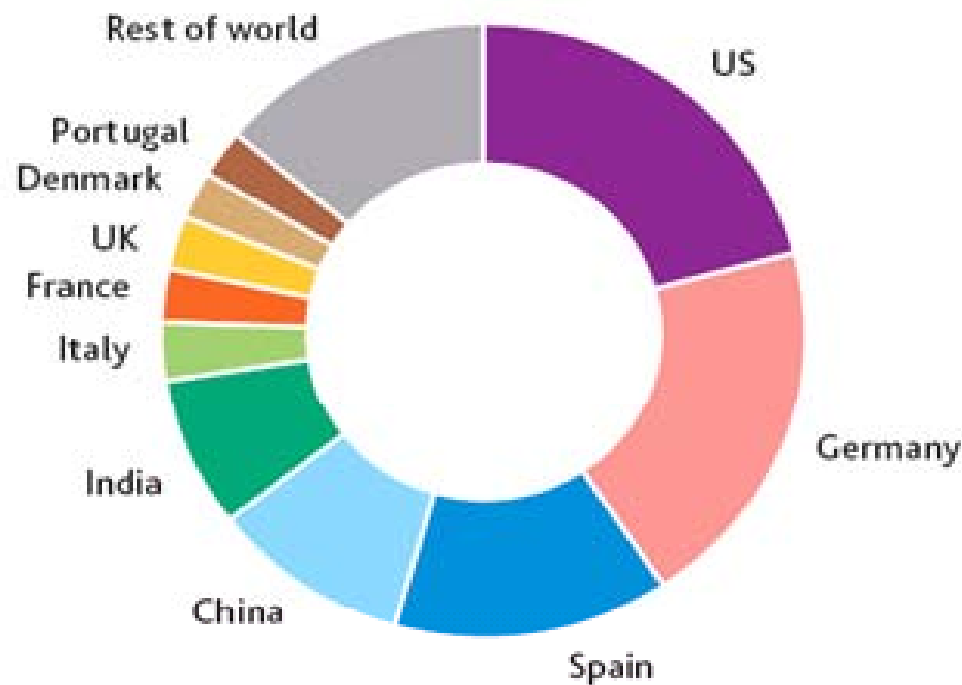
## Overview

1. **European experience: relevant, rich, matured and well-documented**
2. Support Schemes: the controversy and reconciliation
3. What is currently discussed

**European experience:**  
***relevant because a leader in large scale  
RES deployment***

- E.g. most capacity installed in wind power:

TOP 10 TOTAL INSTALLED CAPACITY 2008

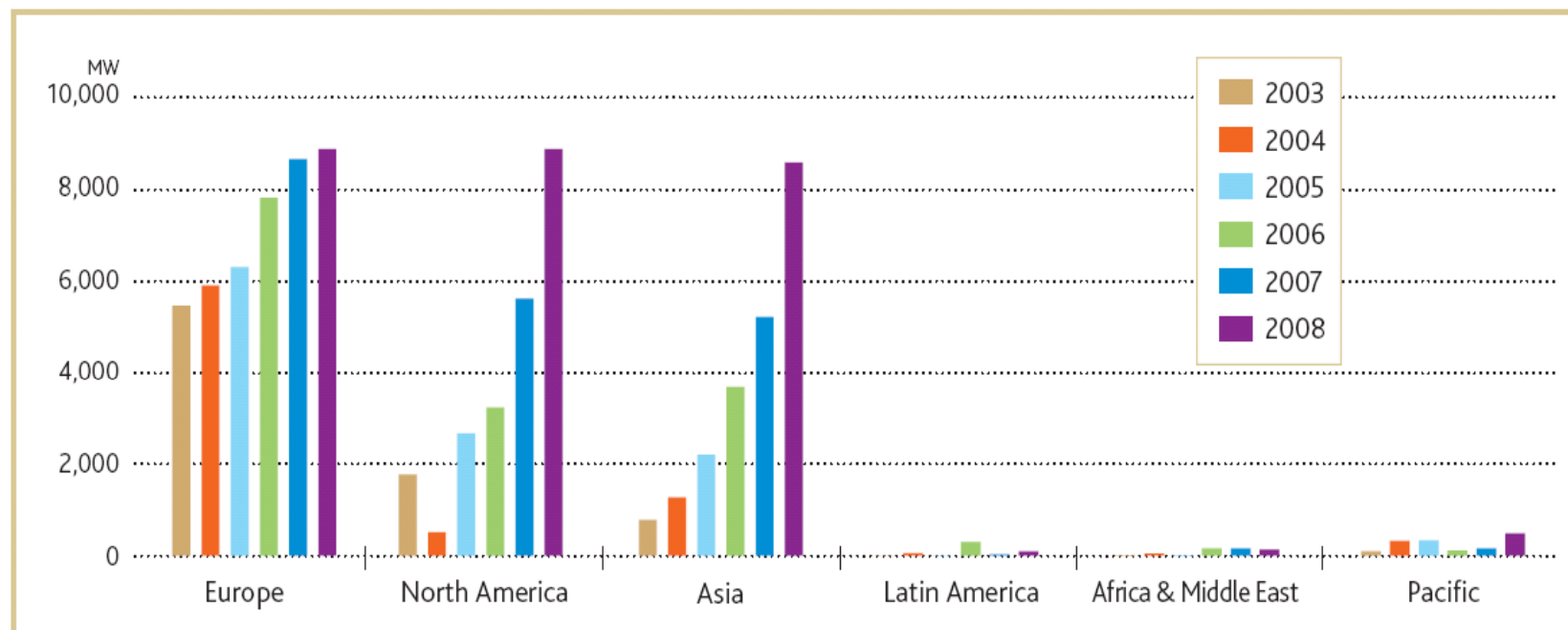


Source: Global wind report, GWEC

**European experience:**  
**relevant because a leader in large scale**  
***RES deployment***

- ... but US and Asia (China and India) are catching up

ANNUAL INSTALLED CAPACITY BY REGION 2003-2008

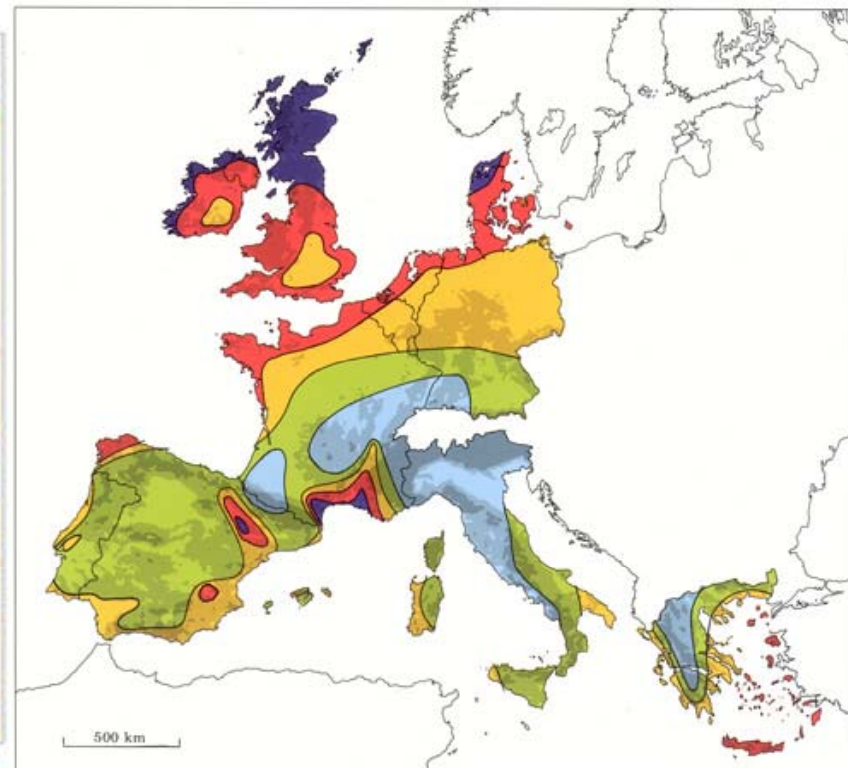
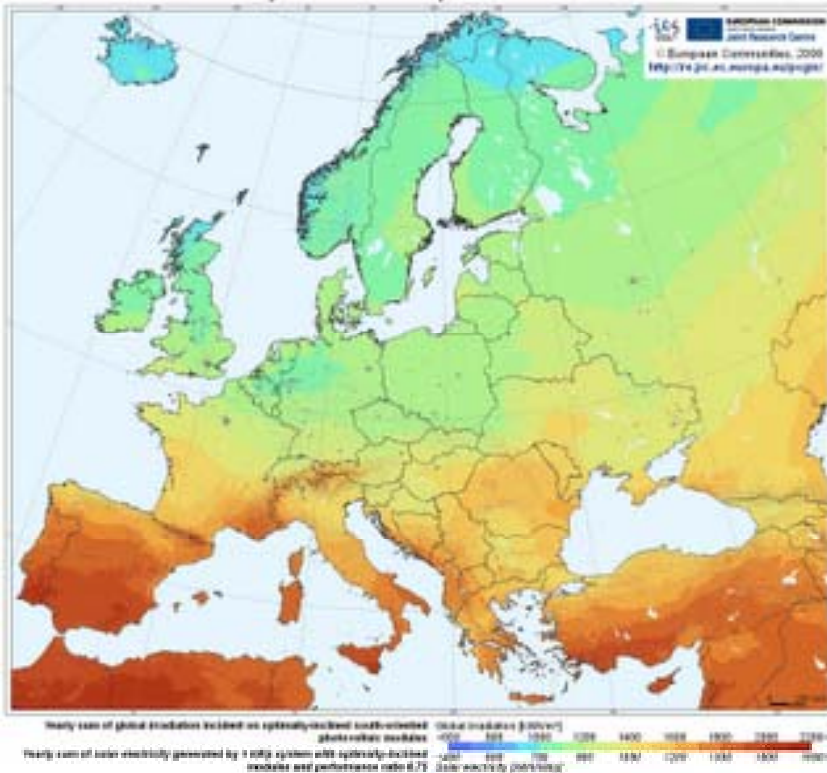


Source: Global wind report, GWEC

# European experience: *rich because of country diversity*

- Diversity in RES potential

Photovoltaic Solar Electricity Potential in European Countries

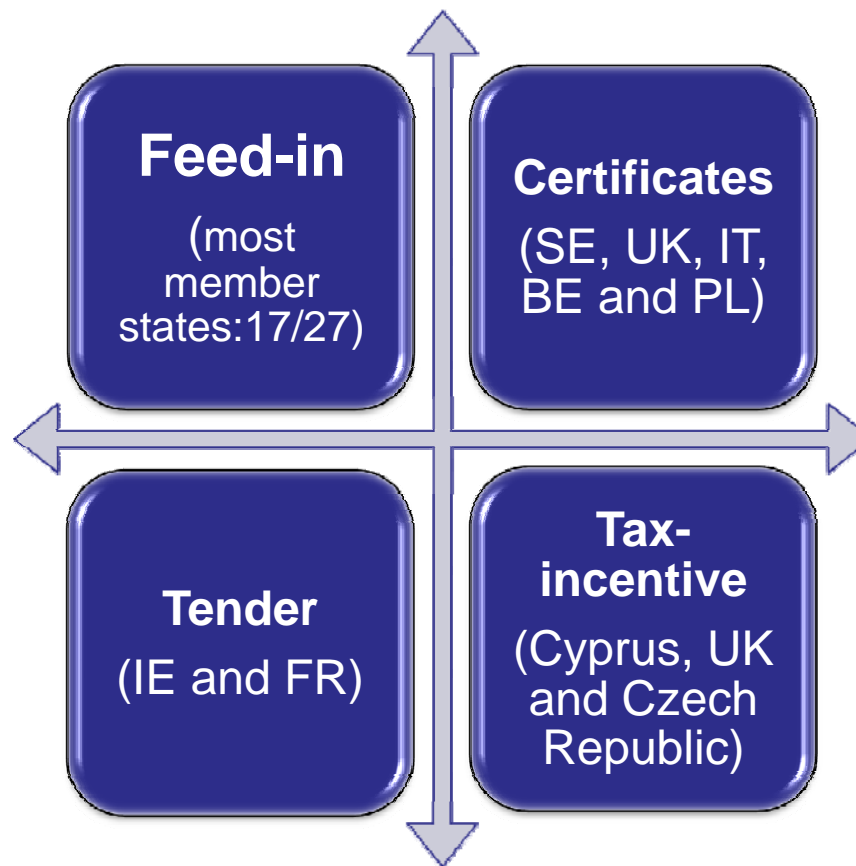


Wind resources<sup>1</sup> at 50 metres above ground level for five different topographic conditions

Sheltered terrain <sup>2</sup>		Open plain <sup>3</sup>		At a sea coast <sup>4</sup>		Open sea <sup>5</sup>		Hills and ridges <sup>6</sup>	
m s <sup>-1</sup>	Wm <sup>-2</sup>	m s <sup>-1</sup>	Wm <sup>-2</sup>	m s <sup>-1</sup>	Wm <sup>-2</sup>	m s <sup>-1</sup>	Wm <sup>-2</sup>	m s <sup>-1</sup>	Wm <sup>-2</sup>
> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
5.0-6.0	150-250	6.5-7.5	300-500	7.0-8.5	400-700	8.0-9.0	600-800	10.0-11.5	1200-1800
4.5-5.0	100-150	5.5-6.5	200-300	6.0-7.0	250-400	7.0-8.0	400-600	8.5-10.0	700-1200
3.5-4.5	50-100	4.5-5.5	100-200	5.0-6.0	150-250	5.5-7.0	200-400	7.0- 8.5	400- 700
< 3.5	< 50	< 4.5	< 100	< 5.0	< 150	< 5.5	< 200	< 7.0	< 400

## European experience: *rich because of country diversity*

- Diversity in RES support schemes, e.g. 2005:



Source: Leo, based on COM 05

## European experience: *rich because of country diversity*

- Feed-in
  - Electricity companies pay to the renewable producers, usually distributors, who then charge it to consumers as a premium per kWh
  - RES producers get per kWh produced a specific price or a specific environmental bonus on top of the normal electricity price set for several years
- Green certificates
  - Electricity companies, suppliers or producers, are obliged to purchase a certain amount of certificates per kWh produced or sold, if not they pay a fine
  - RES producers sell their kWh produced at conventional prices, and get an additional income for selling certificates they get per kWh produced

Source: COM 05

## European experience: *rich because of country diversity*

- Tender
  - The state charges a specific levy to consumers to pay the renewable producers
  - RES producers get per kWh produced the price determined by the tender for several years
- Tax incentive
  - In most cases this is an additional policy tool

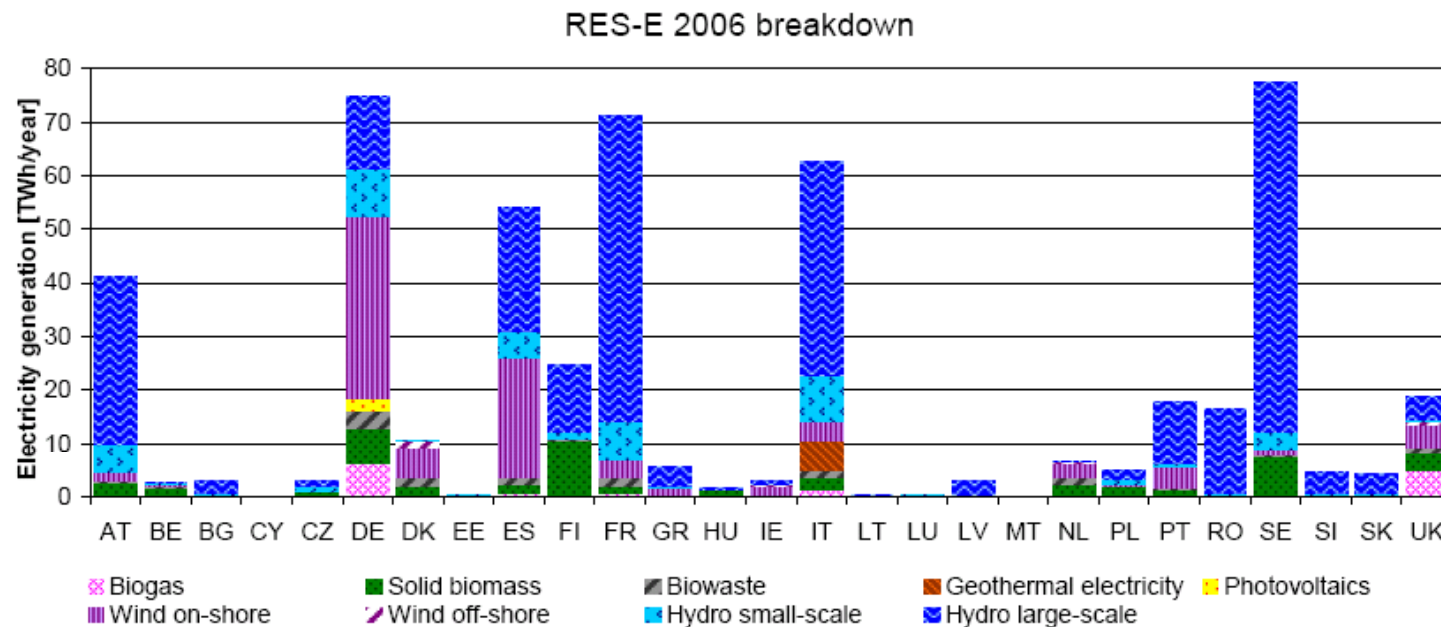
Source: COM 05



## European experience: *rich because of country diversity*

- Diversity in RES technologies deployed

Renewable electricity generation in European Union in 2006.



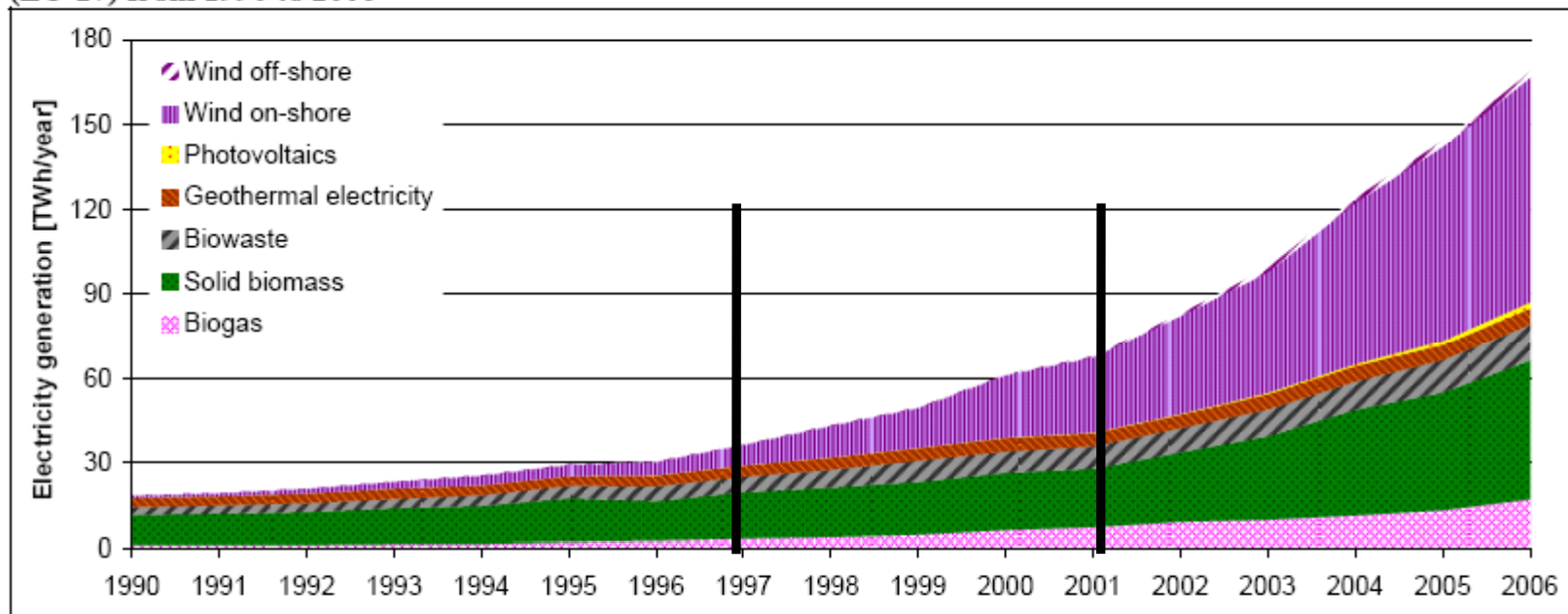
Source: Eurostat/Fraunhofer ISI: Electricity from renewable energy sources 2006 breakdown of normalised renewable electricity in 2006

Source: COM 09

## European experience: *matured over more than a decade*

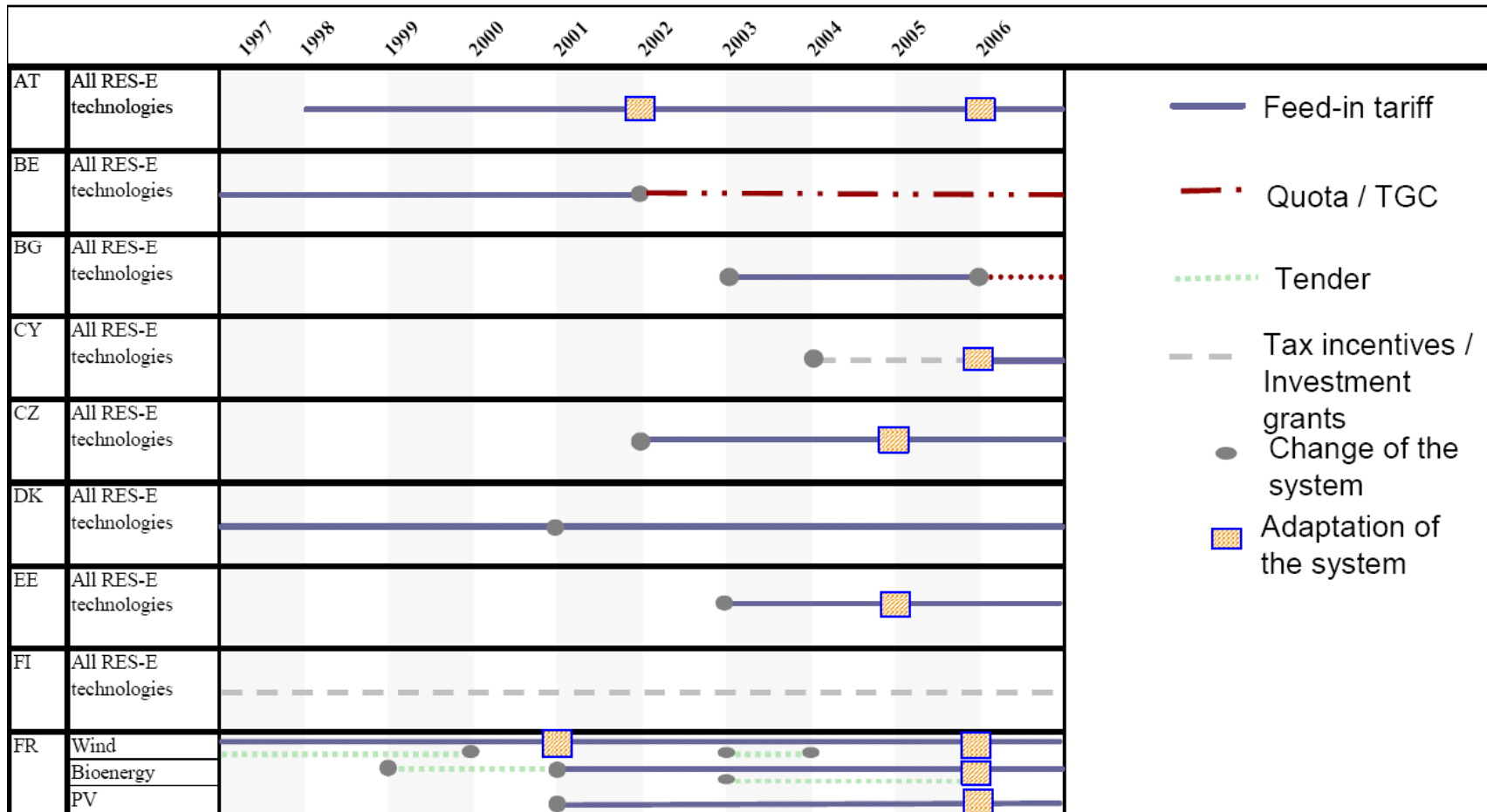
- 1997 (white paper), 2001 (first Directive), and 2009 (second Directive) as historical milestones

Figure 3: Historical development of electricity generation from 'new' renewable electricity in the European Union (EU-27) from 1990 to 2006



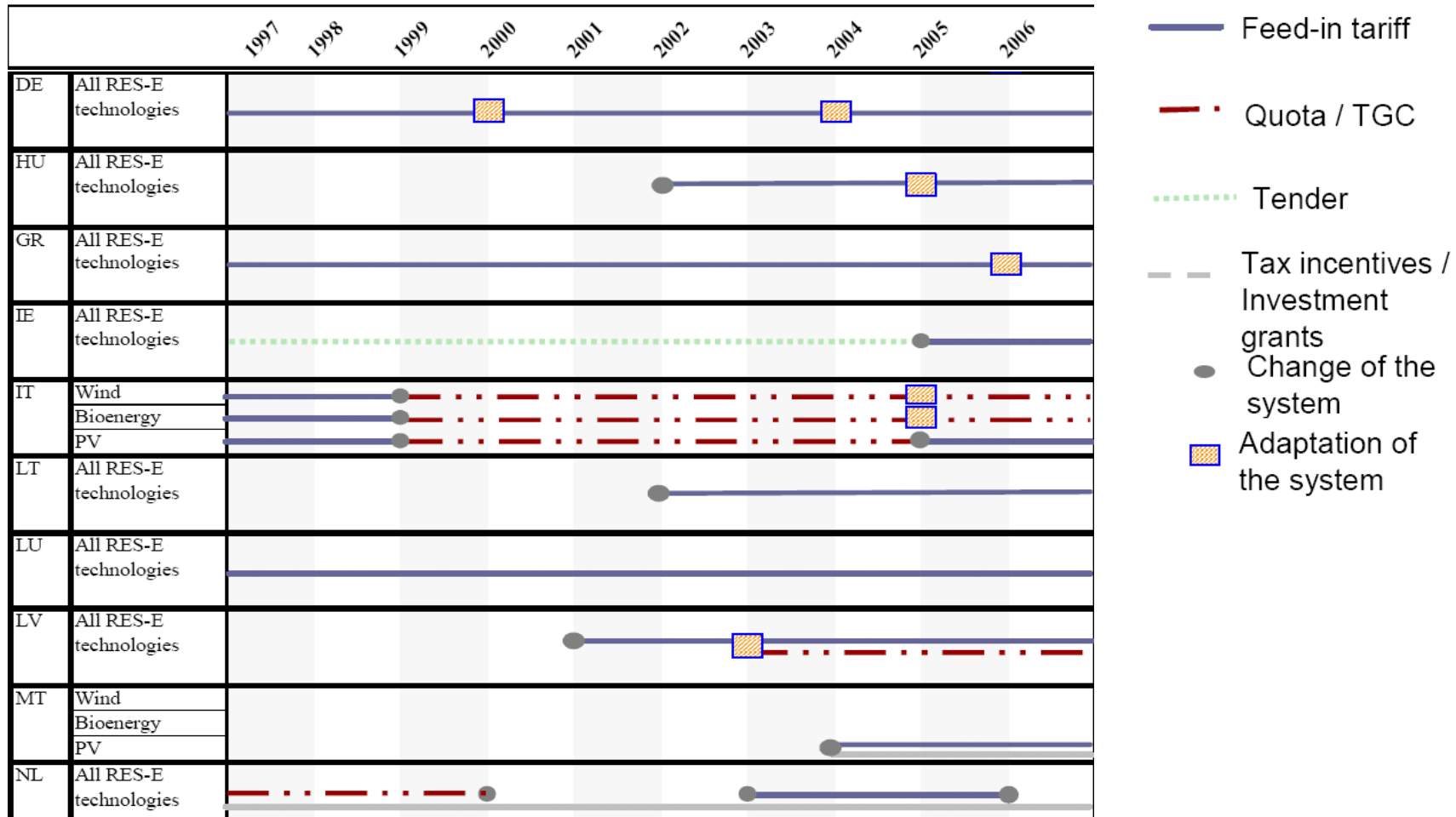
Source: COM 08

## European experience: *matured with many adaptations*



Source: COM 08

## European experience: *matured with many adaptations*



Source: COM 08

## European experience: *well-documented*, see documents from the *European Commission*

- COM (1997) 599:
  - “White paper: energy for the future: RES”
- COM (2005) 627:
  - “The support of electricity from RES”
- COM (2006) 848:
  - “Renewable Energy Roadmap”
- COM (2008) 19:
  - “The support of electricity from RES”
- COM (2009) 192:
  - “The Renewable Energy Progress Report”

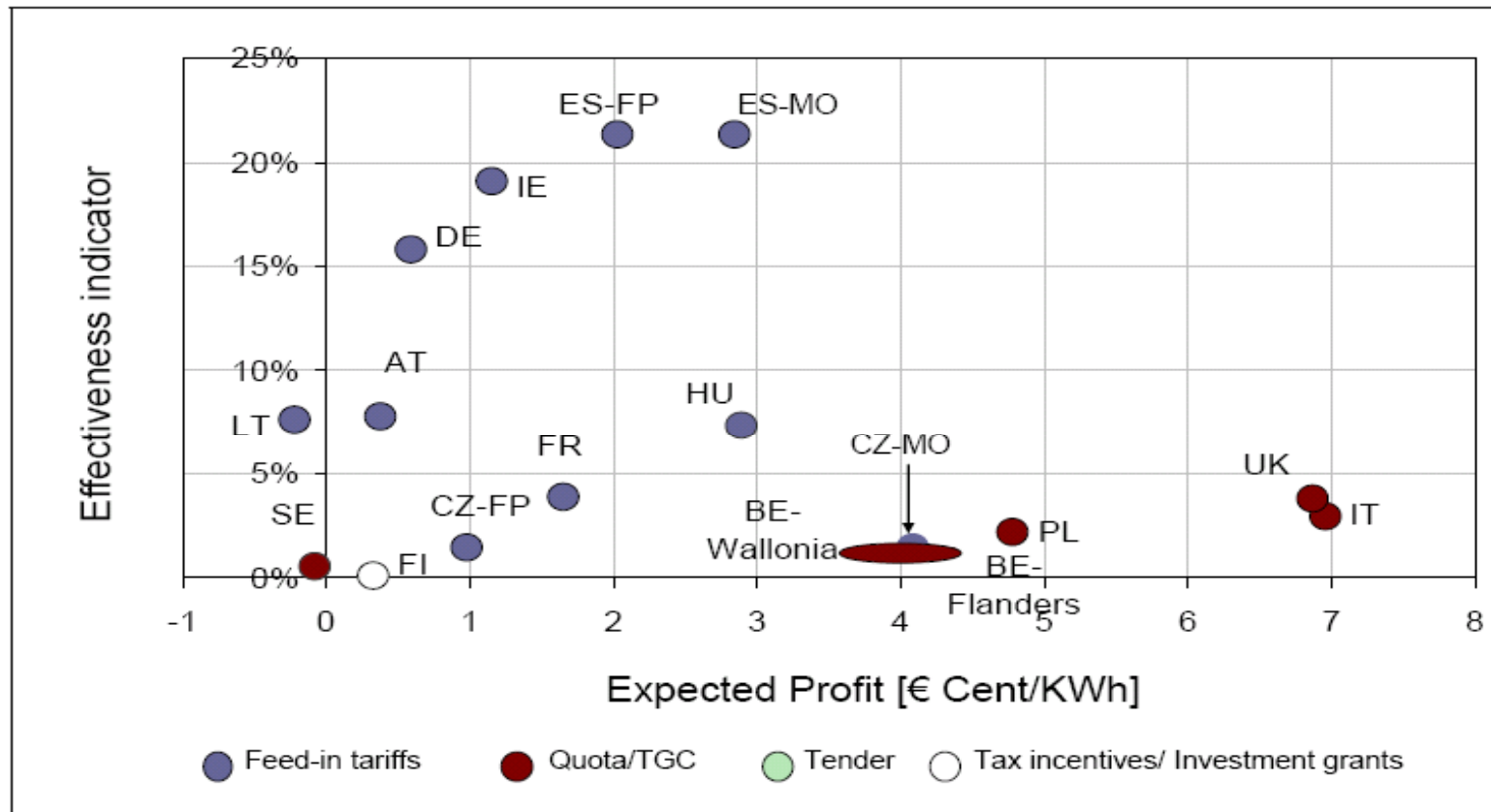


## Overview

1. European experience: relevant, rich, matured and well-documented
2. **Support Schemes: the controversy and reconciliation**
3. What is currently discussed

# Support Schemes: *the controversy*

Figure 1: Historically observed efficiency of support for onshore wind: Effectiveness indicator compared to the expected profit for the year 2006



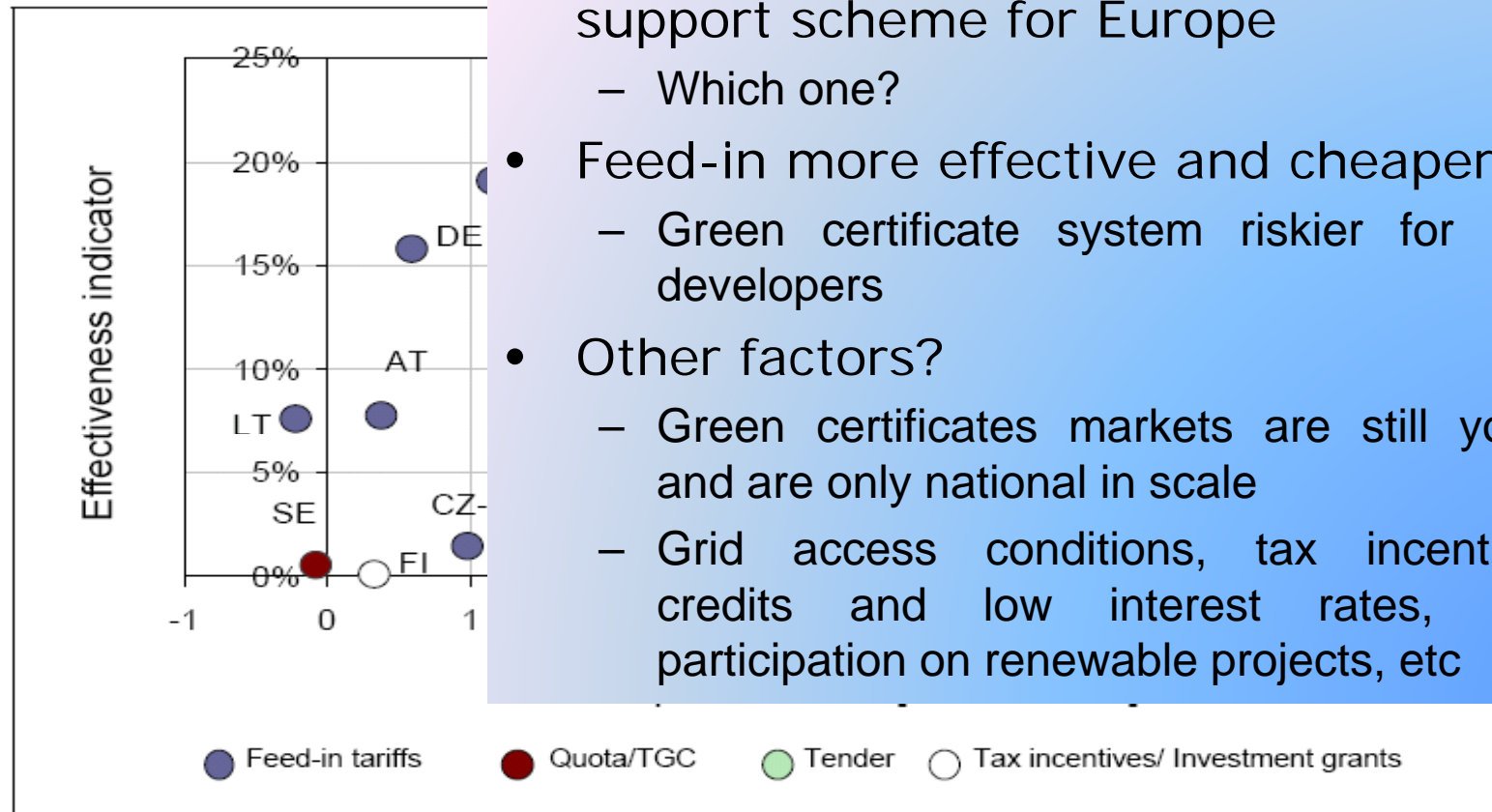
Source: OPTRES, 2007

Source: COM 08



# Support Schemes: *the controversy*

Figure 1: Historically observed effectiveness of support schemes relative to the expected profit for the year



Source: OPTRES, 2007

- Should there be one harmonized support scheme for Europe
  - Which one?
- Feed-in more effective and cheaper?
  - Green certificate system riskier for RES developers
- Other factors?
  - Green certificates markets are still young and are only national in scale
  - Grid access conditions, tax incentives, credits and low interest rates, local participation on renewable projects, etc








Source: COM 08



## Support Schemes: *reconciliation by 2009*

- Feed-in versus certificates: what really matters is how it is implemented

Table 1: Long term stability of Member States' support schemes.

	Long term stability	
<b>Latvia</b>	Set prices (feed-in) for electricity from renewable energy sources (apart from hydro over 5 MW, geothermal and photovoltaic), guaranteed for 10 years or until target levels for each type renewable energy source are met (target levels are set by the Government annually). Wind over 0.25 MW has to compete via tenders.	
<b>The Netherlands</b>	Fixed prices for 10 years in principle but this time period can be shortened or lengthened depending on the type of renewable energy source. The Minister for Economic Affairs sets the budget for subsidies annually <sup>9</sup> .	
<b>Luxembourg</b>	Feed-in tariff for 15-20 years. However, legal uncertainty about state aid matters (recently resolved) resulted in little new deployment of renewable electricity.	
<b>Romania</b>	Annual obligatory quotas until 2012.	
<b>Key</b>	 <i>Stable support scheme</i>  <i>Some aspects of the support scheme weaken the stability of the scheme</i>  <i>Considerable uncertainty undermines the stability of the scheme.</i>	

Source: COM 09

## Support Schemes: *reconciliation by 2009*

- “majority of Member States have opted for feed-in tariff regimes, whereas a handful for quota regimes”
- “since 2005, 10 countries have adapted their support schemes”
- “introduction of one harmonized system would create a lot of uncertainty and disruption in the market for renewables, as it would abolish well-established national support schemes.”
- “National support schemes are often designed so that they also promote regional development, for example the promotion of biowaste energy as part of a national waste strategy. Harmonization might oblige Member States to find other ways to promote regional development.”
- “The analysis further suggests that a **high priority should be given to removing administrative barriers and improving grid access** for renewable energy producers.”

Source: COM 08

## Overview

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## What is currently discussed *balancing, planning, and grid access*

- Balancing: charge deviations from predicted production, whatever the origin, including wind (e.g. Denmark, UK and Spain)
- Pre-planning: local authorities assign locations for renewable technologies (Germany and Denmark)
- Grid access: EU started to **support studies** on grid adaptation and optimization for the integration of RES-E projects.

# What is currently discussed *cooperation in grid development and operation*

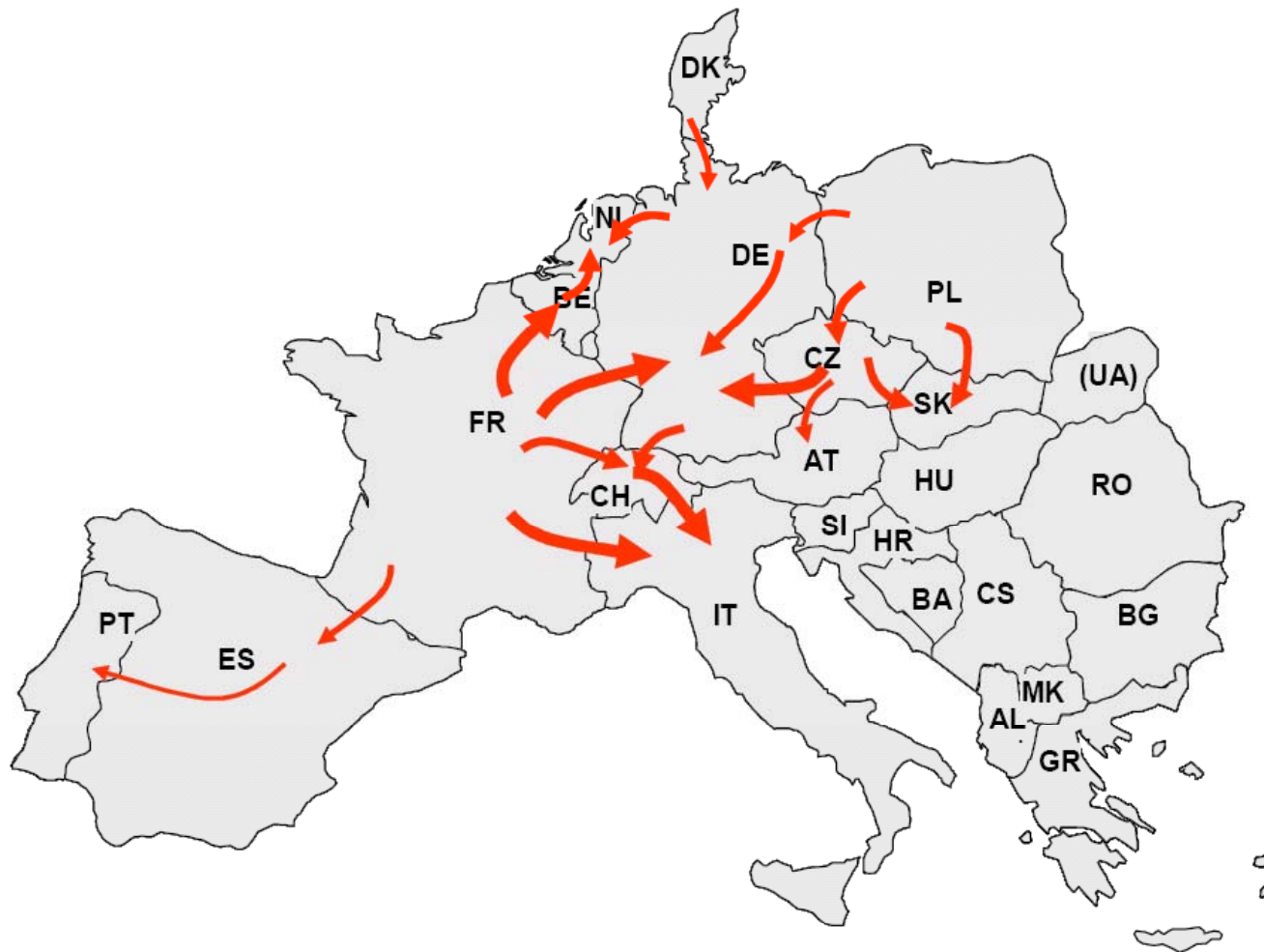


Figure 23: Main corridors of electrical power transmission in the Base Case

Source: EWIS study, 2008 scenario

# What is currently discussed *cooperation in grid development and operation*

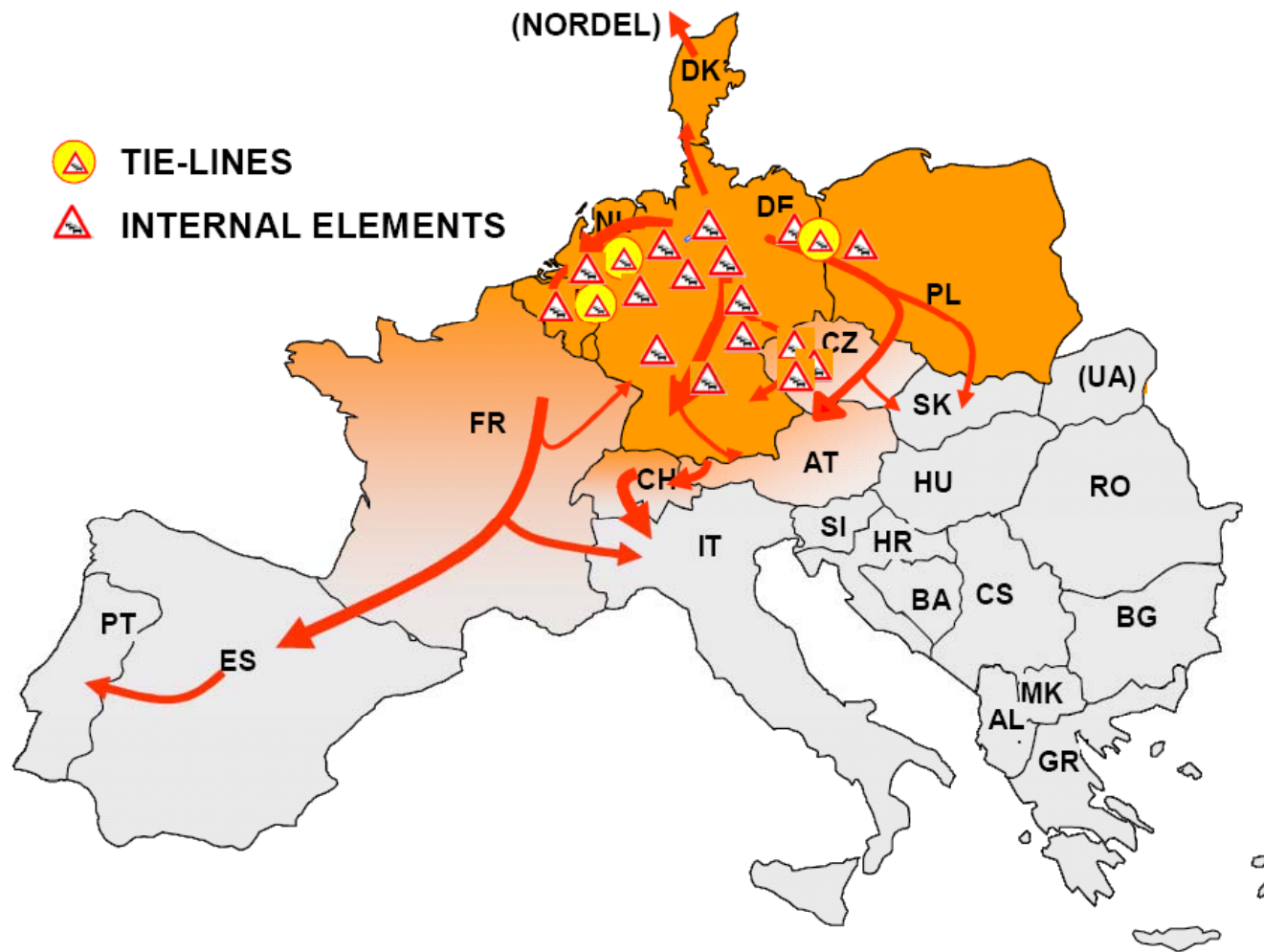
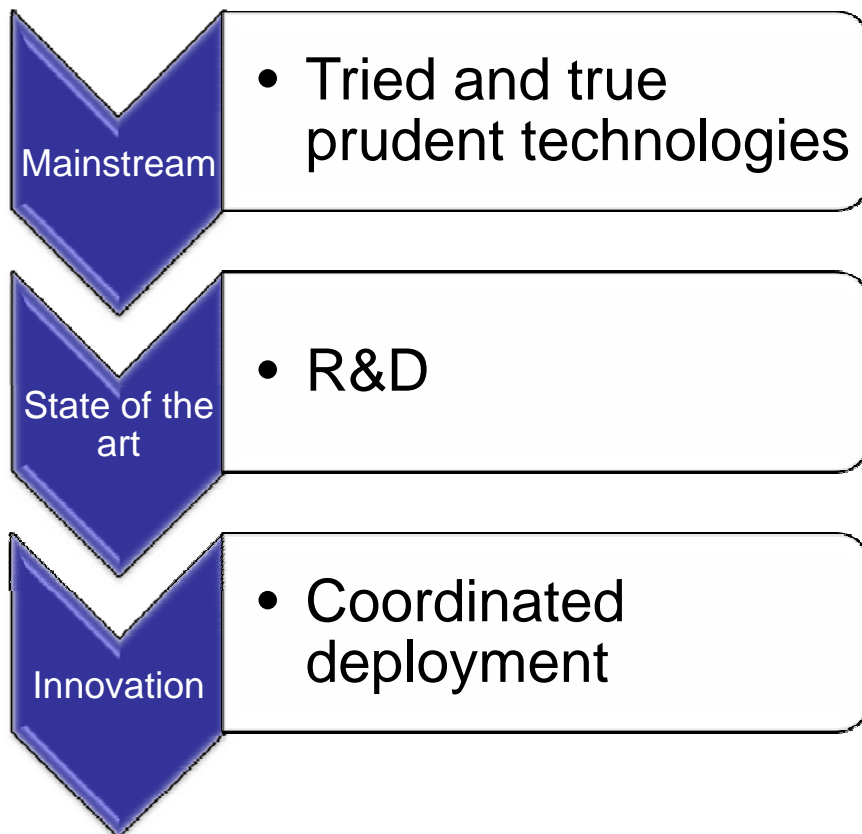


Figure 26: Detected bottlenecks during N-1 conditions of UCTE Scenario North

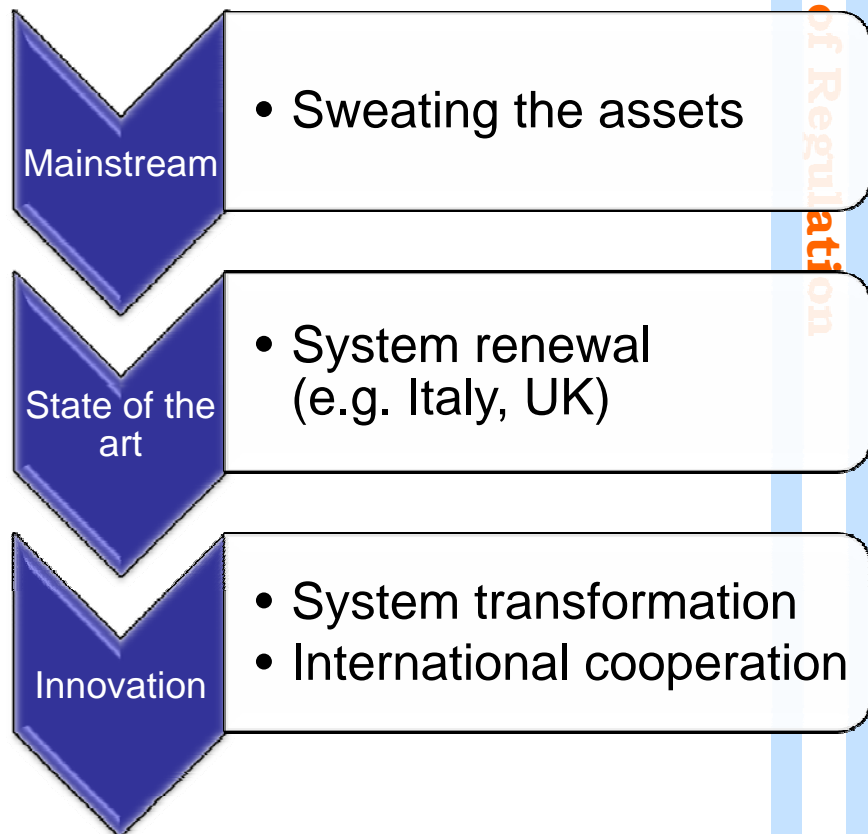
Source: EWIS study, 2008 scenario

# What is currently discussed *innovation in grids and grid regulation*

## Grid operation & investment



## Regulatory incentives



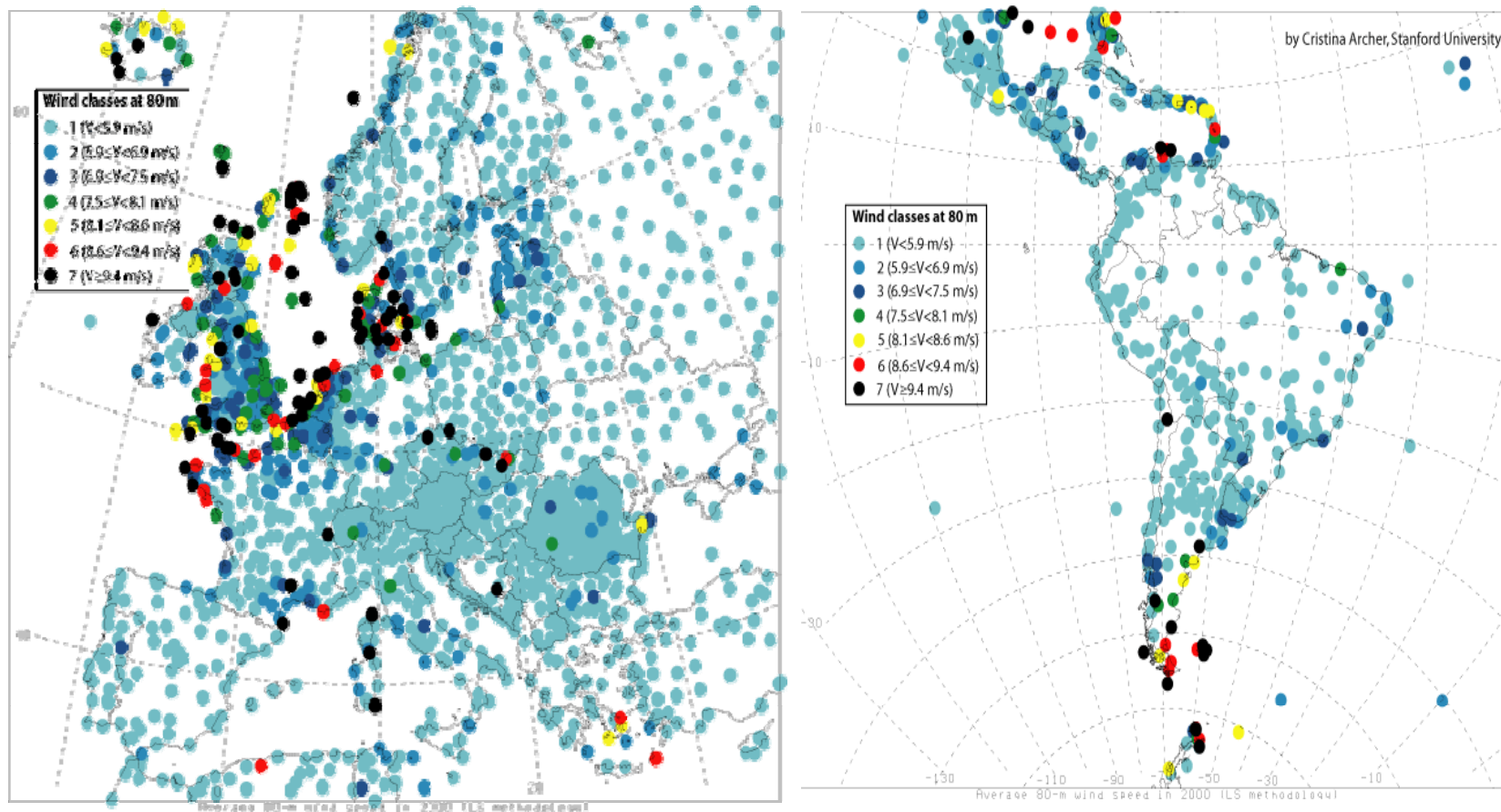
Source: Meeus & Sagan, European Electricity Grid Initiative: a step forward on the innovation path?



## Conclusion 1/3

### *when making use of your potential...*

- Wind potential in Europe and Latin America



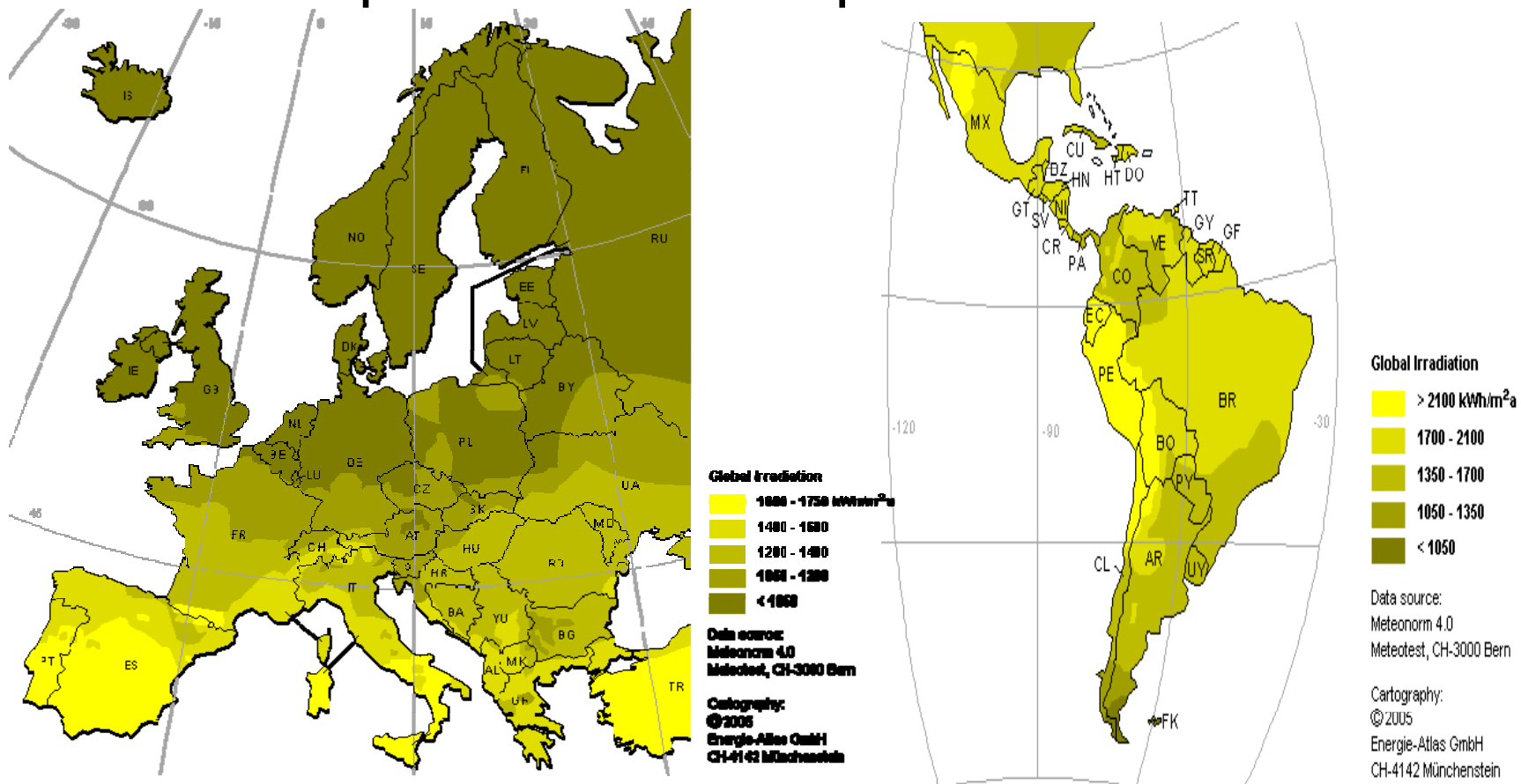
Source: <http://www.geni.org>



## Conclusion 2/3

*...when making use of your potential...*

- Solar potential in Europe and Latin America



Source: <http://www.geni.org>

## Conclusion 3/3

### *...you could consider lessons learned from European experience*

- Both feed-in and certificates can work and not work, the devil is in the details of the implementation
- Support schemes will need to be adapted, optimizing their implementation
- Support schemes will tend to be national, but grid cooperation will be necessary in interconnected systems
- Disclaimer: of course institutional difference have to be taken into account when when considering experience from Europe for Latin America

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- Scientific coordinator of the Florence School of Regulation at the European University Institute.
- Before arriving in Florence, he coordinated the European Energy Institute, a Leuven based think tank. He holds a PhD in electrical engineering and a master degree in commercial engineering, both from the University of Leuven (K.U.Leuven), where he is an associated professor.
- He advised the European Commission (DG TREN) on the design of intra-day and balancing markets for electricity in 2008-09; an Irish merchant interconnector developer (IMERA) on European and regulatory affairs in 2007-09; the Dutch Power Exchange (APX), the Belgian TSO (Elia), and Power Exchange (Belpex) on the creation of a regional electricity market including France, Belgium and the Netherlands up to its implementation in 2006-07.

## *Dr. Marcelo Saguean*

- Consultant in energy economics at Microecomix.
- He was previously Jean Monnet Fellow at the RSCAS in the Loyola de Palacio Energy Policy Programme.
- His areas of expertise and main research interests are energy policy, electricity market design, power systems modeling, network regulation and renewable energies integration in competitive markets.
- He had a post-doc position within the GRJM electricity research group at University of Paris 11. He holds a PhD in economics (2007) from the University of Paris 11 and the Ecole Supérieure d'Electricité (Supelec) and a Master degree in industrial engineering from ENIM (Metz) and from University of Cuyo, Argentina (2001).