

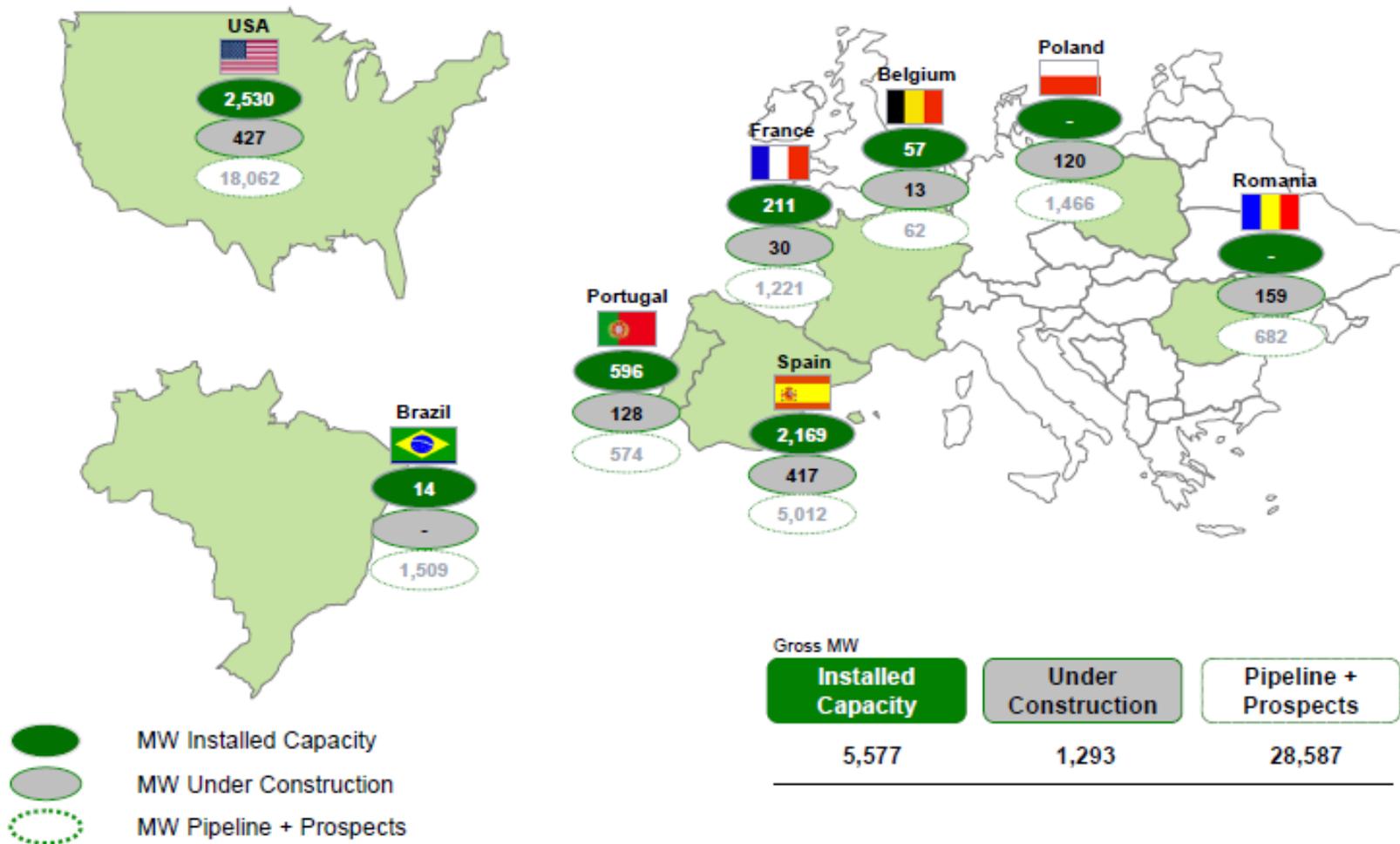
November, 26th 2009  
Budapest

## Key success factors for the development of wind energy

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EDP Renewables



# EDPR is the fourth largest wind company in the world



# EDPR is used to operate with different remunerations schemes

Country	9M09 Gross MW in operation (under constr.)	9M09 Price/MWh	Remuneration Scheme	Wind Resource
 USA	2,530 (427)	\$48 <sup>(1)</sup>	<ul style="list-style-type: none"> <li>• PPA or Merchant</li> <li>• Tax Incentives</li> </ul>	
 Spain	2,169 (417)	€86	Feed-in tariff, or market option with premium	
 Portugal	596 (128)	€99	Feed-in tariff	
 France	211 (30)	€87	Feed-in tariff, 1 year accelerated fiscal depreciation	
 Belgium	57 (13)	€112 <sup>(2)</sup>	Green Certificates, PPA	
 Brazil	14 (-)	R\$265	PPA	
 Poland	- (120)	€97 <sup>(3)</sup>	Green Certificates, PPA	
 Romania	- (159)	€133 <sup>(3)</sup>	Green Certificates, PPA	
	5,577 (1,293)			 <25%  25-30%  >30%

# Agenda

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**Designing an efficient regulatory system for wind development**

**A success case: the Portuguese way to wind energy**

**Quick overview of the Spanish, French, Belgian, Polish and Romanian support mechanisms**

# Two main issues to consider when designing a framework for wind energy

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## Policy Design (Financial Support)

- Overall system to create financial incentives for investors to participate in the development of wind energy

## Permitting processes

- Set of different steps to be fulfilled when installing new capacity
- Main ones are administrative (number of authorities involved, lead time to obtain permits, etc.) and access to grid (existing transparent rules to allocate evacuation capacity and to bear and share investment costs)

 Focus of this presentation

# There are four general policy systems to promote wind energy

## System Description

### Main Systems

#### Feed in Tariff

- Producers of green electricity receive a fixed price (normally set for a period of several years)
- A variant of the feed-in tariff scheme is the fixed premium scheme in which a premium is paid above normal electricity spot price

#### Green Certificate Systems

- Renewable energy has two revenue streams:
  - conventional power prices from the conventional market
  - Revenues from the sales of green certificate in a secondary market
- Secondary market is created when government forces a participant in the supply chain (generators, suppliers) to prove that part of its supply has GCs associated to them, thus creating demand for GCs
- Renewable energy producers supply GCs
- Price for GCs is set by market supply and demand

### Secondary Systems

#### Tendering

- The State places a series of tenders for the supply of renewable electricity:
  - Selection based on price and other quantitative criteria (scoring system)
  - Electricity supplied on a contract basis at the price resulting from the tender
  - Additional cost typically passed on to end consumer through a specific levy

#### Financial and Tax Incentives

- Reduction or exemption of electricity taxes applied to all producers
- Investment grants as a reduction of capital and/or total costs due to low interest loans

# Feed in tariffs seem the best option when considered pros and cons

## Advantages

## Disadvantages

### Feed-in Tariff

- Simple and low cost: easy to implement and supervise
- Reduces regulatory and market risk for investors and loan risk for financial companies
- A stable investment environment promotes the development of manufacturing
- Effective in promoting different technologies

- Risk over/under funding:
  - It can be partially compensated with market monitoring and adjustments
  - Need to adjust tariffs as targets are achieved or market conditions change

### Green Certificates

- In theory if working well, they lead to the best cost solution because it is a market instrument
- If it works well, targets are exactly met

- Increased risk and required return for investors, thus increasing effective costs, due to volatility & uncertainty on future prices
- Does not encourage technology diversity
- High administrative costs
- System may not create enough incentives to invest.
  - Total revenue for RES generator is the sum of pool price and GC price
  - Since companies may avoid buying the GC by paying a penalty, GC price may not rise to a level to make investment profitable

### Tax Incentives

- Easily linked with existing fiscal and financial structures

- Does not create long-term certainty of investments
- Risk of over/under funding

### Tendering

- Long term certainty about receiving support

- Bidding price can fall so low that contracts cannot be fully implemented
- It increases project preparation costs
- The stop-and-go nature does not conduct to stable conditions

# Green certificate markets are structurally unbalanced leading to a higher risk form of feed-in tariff

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## Key characteristics

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- Contrary to other markets both supply and demand are fixed and cannot be adjusted within a year
  - Demand is fixed by the government
  - Supply depends on the plants already operating for that year that typically do not change significantly compared with supply
- Since Investment process generally takes more than a year no adjustment on supply and demand is possible and market is either in deficit or in excess of Green Certificates

## Market behavior

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- If demand is larger than supply (deficit on green certificates) then price would go up to infinite or typically to a penalty price defined by the regulator which is the opportunity cost of each of the buyers
- If supply is larger than demand then price should go down to zero or a floor already defined
- The only factor that can affect this situation is the expectation of a change in supply-demand balance if green certificates are bankable

## Implications

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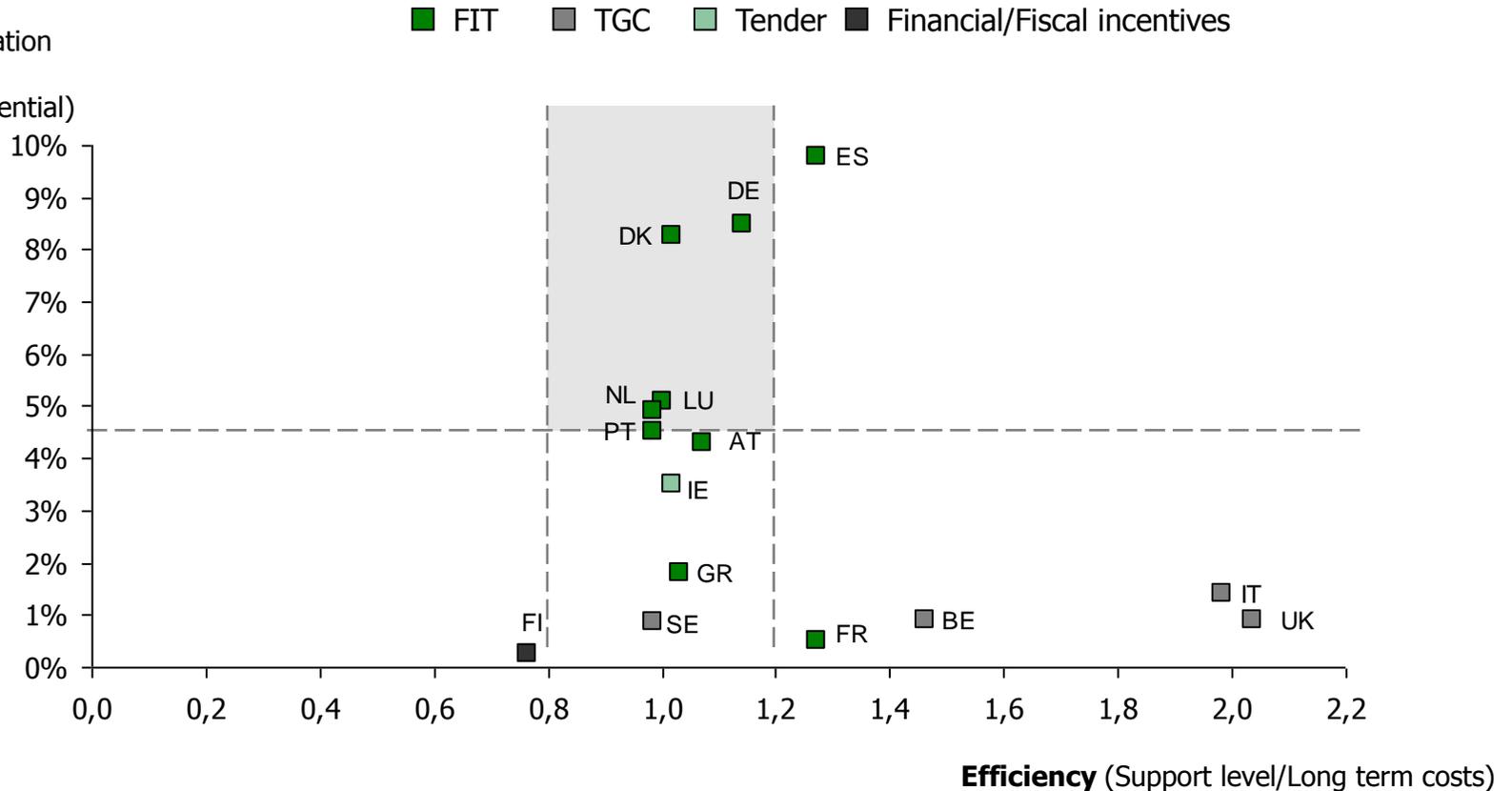
- Green certificate system ends up being a form of feed-in tariff (price is at the end set up by a regulator) but with higher medium and long term risk
- Price depends on penalty price and supply/demand balance (both subjected to regulatory changes)
- Changes on regulatory system and/or market rules affect already built farms, increasing uncertainty

# Technical comparison of supporting mechanisms suggests that feed-in tariffs achieve larger deployment at lower costs

## Effectiveness and efficiency indicators for wind electricity generation

### Effectiveness

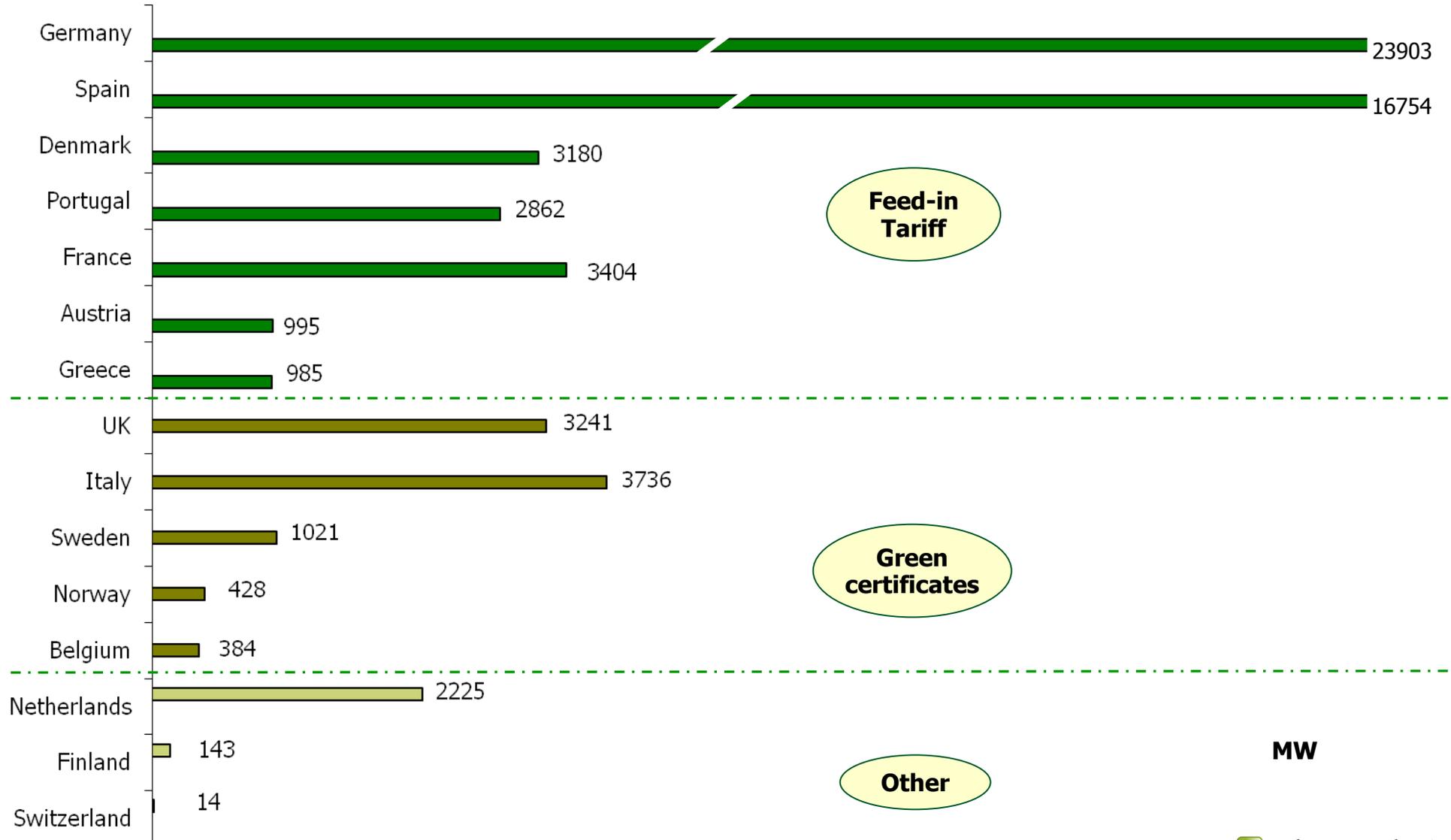
(Avg. annual generation growth 1998-2005/Additional potential)



Source: COM(2005) 627 final of 7Dec05

# For this reason, successful countries have a form of feed-in tariff

Wind capacity installed at the end of 2008 vs. implemented regulatory system



Source: EWEA

MW

**Portugal**

**Fragmentation can prevent wind development, specially for a small/not developed countries (in terms of wind energy)**

**The allocation of groups of capacity, together with the development of industrial projects can be an effective tool for those countries**

# Fragmentation can prevent wind energy development in small countries

Portugal

## Description of the past system in Portugal

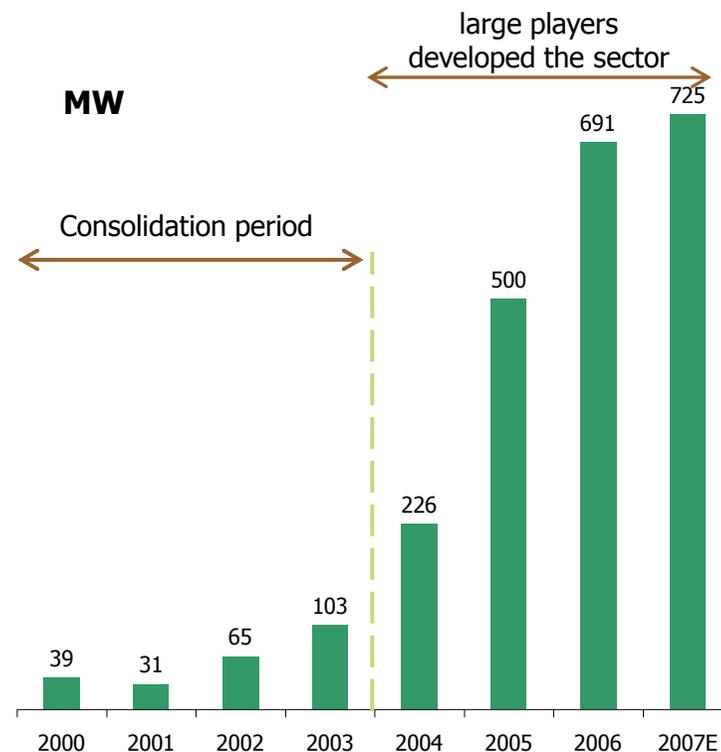
- Allocation of capacity according to requests on a pro-rata basis
  - Capacity allocated to plenty of operators
  - Financial capacity of developers not previously tested

## Implications

- Wind energy sector severely fragmented
- Plenty of projects not implemented
- System failed to add new capacity and development slowed down

- For small countries with low wind capacity development an unstructured process can slow down development
- “Not controlled” process leads to a fragmented sector with low financial capacity operators
- Growth only takes place when consolidation happens

## Evolution of yearly added wind-power capacity



# To sort this problem out Portugal decided to allocate two groups of capacity associated to an industrial project

Portugal

## Description

- Creation of two groups of capacity to be allocated
    - 1200 MW installed capacity (EDP consortium)
    - 400 MW installed capacity (GALP Consortium)
  - Allocated capacity committed operators to develop an Industrial Project
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- Faster market consolidation
  - Minimizing risk of failure on implementation
  - Guaranteed implementation and turbine concentration allowed local industrial development

## Benefits for the country

<b>Energy System</b>	<ul style="list-style-type: none"><li>• Clean energy generation</li><li>• Contribution to electricity generation</li><li>• Reduce CO<sub>2</sub> emissions</li></ul>
<b>Investment</b>	<ul style="list-style-type: none"><li>• Direct investment</li><li>• Attraction to new investors</li><li>• Creation of funds for research &amp; development</li></ul>
<b>Development of National economy</b>	<ul style="list-style-type: none"><li>• Positive effects on trade balance</li><li>• Contribution to increase the National Product</li></ul>
<b>Creation of employment</b>	<ul style="list-style-type: none"><li>• Direct employment generation</li><li>• indirect employment creation</li></ul>
<b>Regional development</b>	<ul style="list-style-type: none"><li>• Contribution to regional development</li><li>• Promotion of underprivileged areas</li><li>• Reduction of regional socio economic differences</li></ul>

# In 2004 a new framework for wind energy remuneration was developed in Spain to introduce predictability and stability

Spain

## Previous system description<sup>(1)</sup>

- Tariff defined yearly only for the next year creating lack of visibility on future revenues
- No guarantees on whether remuneration system could be changed

## New System Description

- Revenues are fixed for a 20 year period
- Tariffs for already operating farms are not revised in the event of a change in the remuneration scheme
- Increased visibility on future revenues
- System stability

Change in remuneration systems had an impact in financial parameters

Conditions	in 2003	Today
<b>DSCR min. <sup>(2)</sup></b>	<b>1,35</b>	<b>1,30-1,25</b>
<b>DSCR average <sup>(2)</sup></b>	<b>1,40</b>	<b>1,35-1,30</b>
<b>Leverage</b>	<b>80-85%</b>	<b>85-90%</b>
<b>Maximum Amortization period</b>	<b>13-15 years</b>	<b>15 -18 years</b>

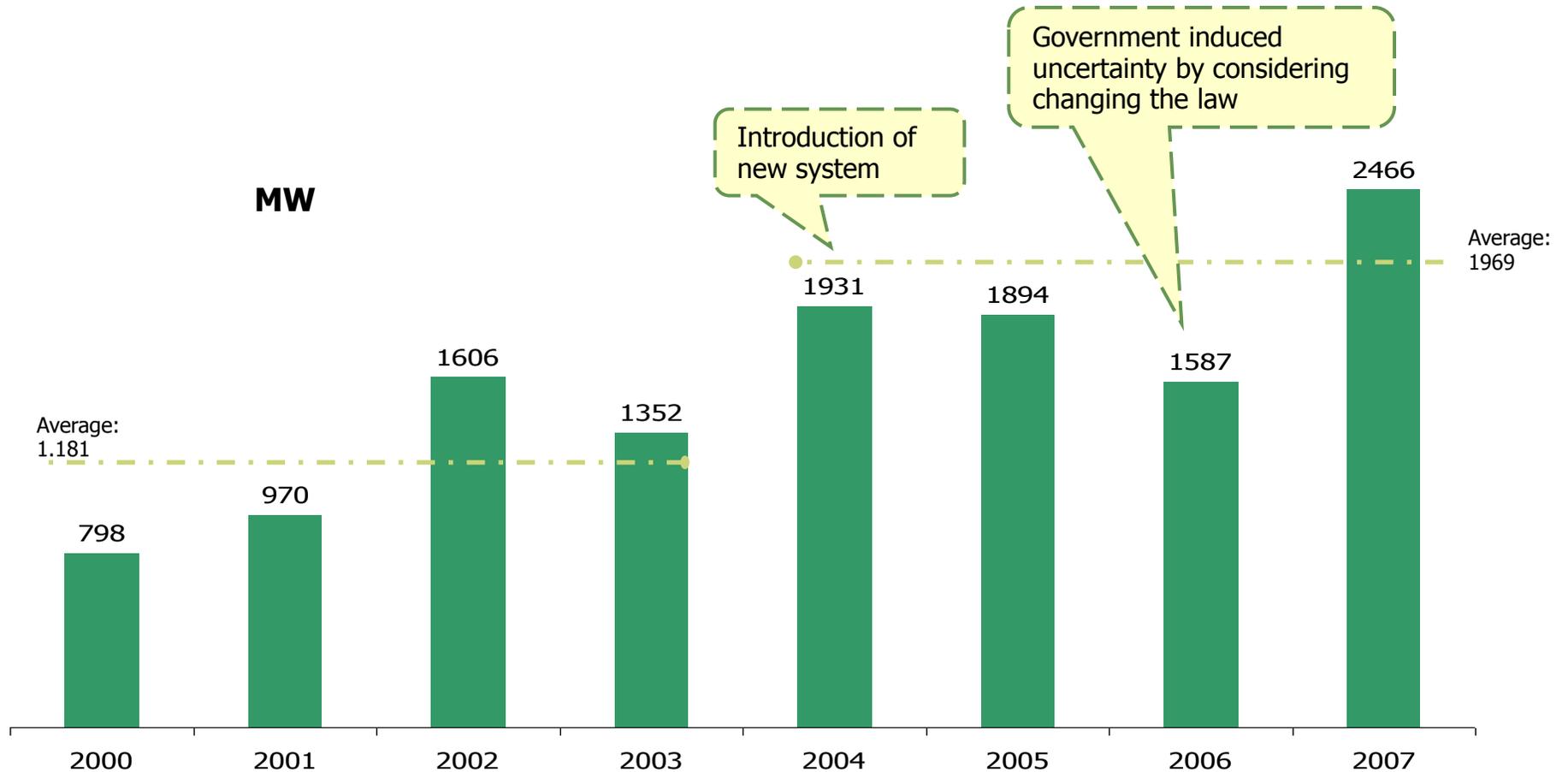
(1) 2818/98

(2) DSCR: Debt Service Coverage Ratio

# This new system had a very positive effect in the development of wind energy in Spain

Spain

## Evolution of yearly added wind-power capacity



Source: Emerging Energy; REE



## On shore feed in tariff

Annual production references (HQnet)	Feed-in tariff for the first 10 years (c€/kWh)	Feed-in tariff for the next 5 years (c€/kWh)
$h \leq 2400$ .....	8,2	8,2
$2400 < h > 2800$ .....	8,2	Linear interpolation
$h = 2800$ .....	8,2	6,8
$2800 < h > 3600$ .....	8,2	Linear interpolation
$h \geq 3600$ .....	8,2	2,8

## Offshore feed in tariff

Annual production references (HQnet)	Feed-in tariff for the first 10 years (c€/kWh)	Feed-in tariff for the next 5 years (c€/kWh)
$h \leq 2800$ .....	13	13
$2800 < h > 3200$ .....	13	Linear interpolation
$h = 3200$ .....	13	9
$3200 < h > 3900$ .....	13	Linear interpolation
$h \geq 3900$ .....	13	3



Establishment of a combined system of Green Certificates, with a floor price, to encourage the use of renewable energy: each Region and the Federal Government have organized a system of Green Certificates based on common principles.

The Green Certificate scheme is based on an innovative combination of two mechanisms. Firstly, the Regions organize Green Certificate markets and oblige electricity suppliers to deliver a certain quota of green electricity (to be adjusted every year). At the same time, the Federal Government has established a floor for green certificates in case the market should not work properly and also to grant investors a minimum return.

"Black" Energy Pricing

€/MWh

+

Green Certificates Pricing

65 100 €/MWh

# New Regulation for Green Certificates in Belgium improves significantly wind farms' remuneration

Belgium

Timeframe for renewable quota requirements

- Since the 1st of January 2008

Cap

- 100 €/MWh

Floor

- 65 €/MWh

Cap & Floor Indexation

- Yes

Number of GC per MWh produced

- The number of Green Certificates issued is equal to the CO<sub>2</sub> savings rate multiplied by the net electricity produced by the wind farm

Duration of scheme

- 15 years from the date of notification of acceptance

Penalty for non compliance

- 100 €/GC

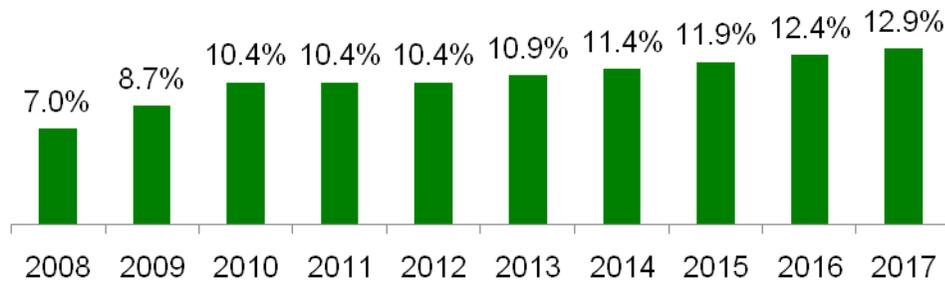
Mechanism description

- Energy distributors have to redeem a certain quota of their sales in Green Certificates each year (quotas established until 2017), or pay a penalty fee
- Penalty creates a ceiling on the Green Certificate market price and acts as a reference price
- One Green Certificate issued per MWh for all RES-E sources, with unlimited lifetime
- Market expected to be structurally short

Evolution of quotas

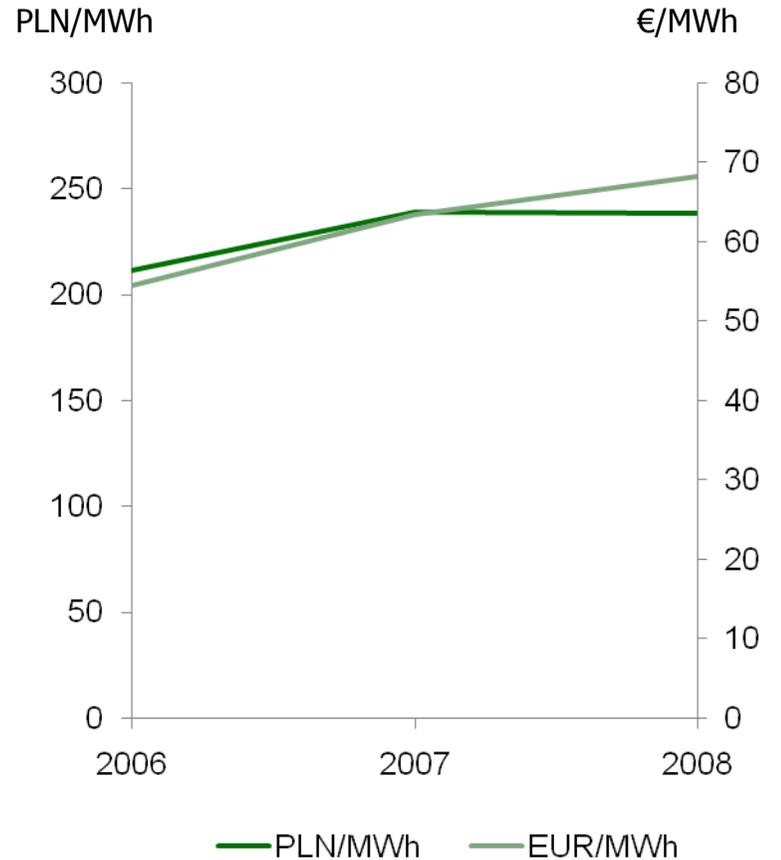
Renewable energy quotas imposed on energy distributors / final suppliers

% of electricity sales



Source: Polpx, Oanda

Evolution of historical Green Certificate Market prices



# New Regulation for Green Certificates in Romania improves significantly wind farms' remuneration

Romania

	Old regulation	New Law
Timeframe for renewable quota requirements	<ul style="list-style-type: none"> <li>● Until 2012</li> </ul>	<ul style="list-style-type: none"> <li>● Until 2020</li> </ul>
Currency	<ul style="list-style-type: none"> <li>● Green Certificates are denominated in €</li> </ul>	
Cap	<ul style="list-style-type: none"> <li>● 42 €/MWh</li> </ul>	<ul style="list-style-type: none"> <li>● 55 €/MWh</li> </ul>
Floor	<ul style="list-style-type: none"> <li>● 24 €/MWh</li> </ul>	<ul style="list-style-type: none"> <li>● 27 €/MWh</li> </ul>
Cap & Floor Indexation	<ul style="list-style-type: none"> <li>● Not indexed (no nominal growth)</li> </ul>	<ul style="list-style-type: none"> <li>● Yes</li> </ul>
Number of GC per MWh produced	<ul style="list-style-type: none"> <li>● 1 Green Certificate per MWh</li> </ul>	<ul style="list-style-type: none"> <li>● 2 GC/MWh produced until 2015</li> <li>● 1 GC/MWh afterwards</li> </ul>
Duration of scheme	<ul style="list-style-type: none"> <li>● Not defined</li> </ul>	<ul style="list-style-type: none"> <li>● 15 years since the beginning of exploitation</li> </ul>
Penalty for non compliance	<ul style="list-style-type: none"> <li>● 84 €/MWh</li> </ul>	<ul style="list-style-type: none"> <li>● 70 €/MWh</li> </ul>

GC component → ~ 110 €/MWh (expected shortage plus 2 GC/MWh)  
 Energy component → ~ 50 €/MWh  
 Total remuneration → ~ 160 €/MWh

## Key success factors for the development of wind energy

- 1 Stable and predictable regulatory frameworks are favorable to renewable energy development
- 2 If no action is taken, sector's fragmentation in small Countries might slow down development
- 3 The participation in the process of large groups/consortia can speed up the process