

# Regulatory incentives for efficient integration of renewable electricity into electricity grids – comparison of European practice

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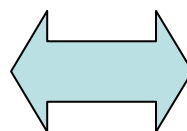
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## Overview

1. Motivation
2. European Energy Policy: RES-E System Integration
3. (omitted)
4. Methodology
5. Results
6. Conclusions

## Consistency of European RES-E policy

**National** (Internationally binding) **targets** for increasing the **share** of **Renewables** in the **electricity** sector



**Design** of regulatory framework, **Access to grid infrastructure**, **market rules**



support schemes

**Consistent framework for reaching targets?**

## Availability of European „Best practice“

Are there „best practice“ frameworks in place for incentivising long term cost efficient system-integration of RES-E in grid regulation and market rules?

## European Renewable Energy Policy

- Internal (competitive) Electricity Market (Unbundling)
- 21 % Electricity from Renewables by 2010
- 20% - Renewable Energy by 2020

## System integration

### Grid connection:

- non-discriminatory (positive discrimination for RES-e)
- disaggregated transparent statement of costs
- socialising corresponding costs?
- tendering of connection work?

### Use of System:

- no disadvantages for decentralised generation
- locational signals

### System operation:

- priority feed-in for RES-E

### Grid regulation:

- Unbundling – no suggestions on regulatory mechanism

## Comparing different aspects of grid integration in AT vs UK

- grid connection
- grid reinforcement
- Use of system charges
- setting locational signals for grid connection

### UK:

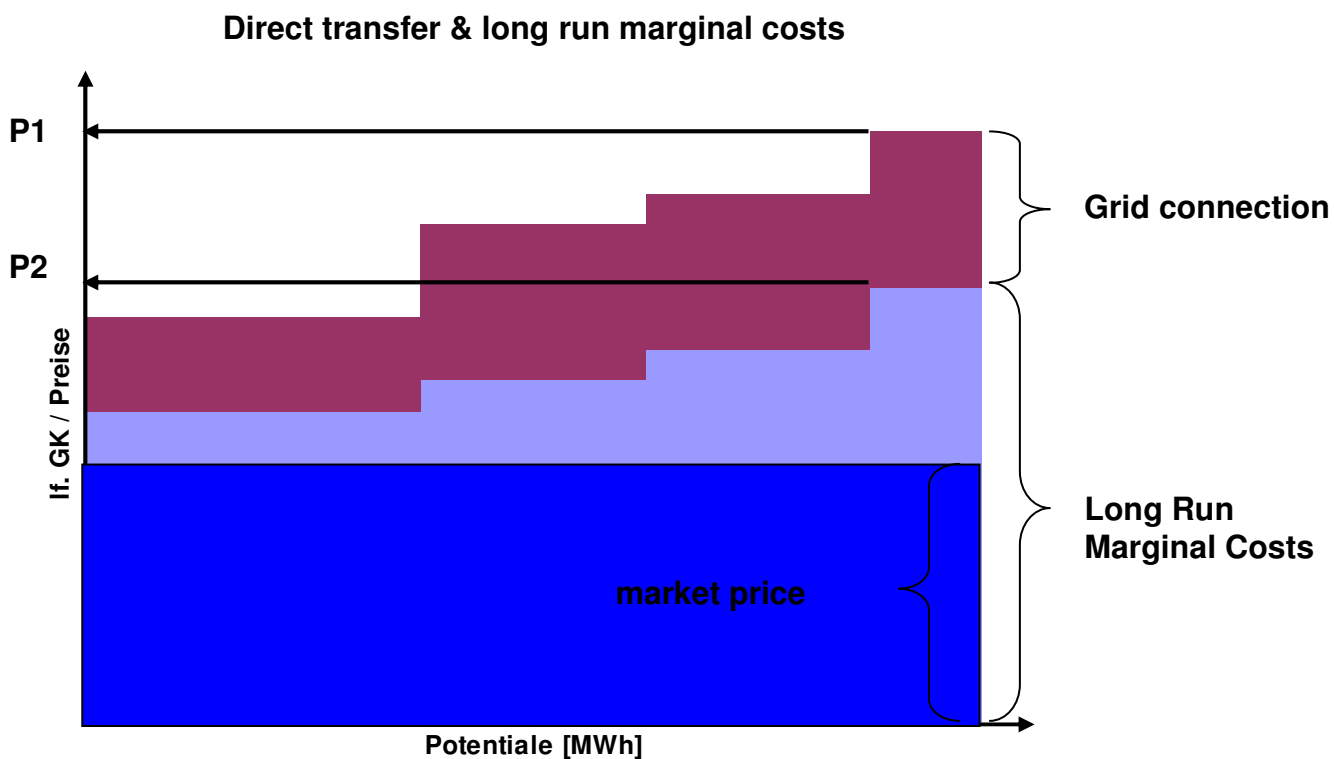
#### „Role model“:

- Liberalisation
- Deregulation
- Monopoly regulation

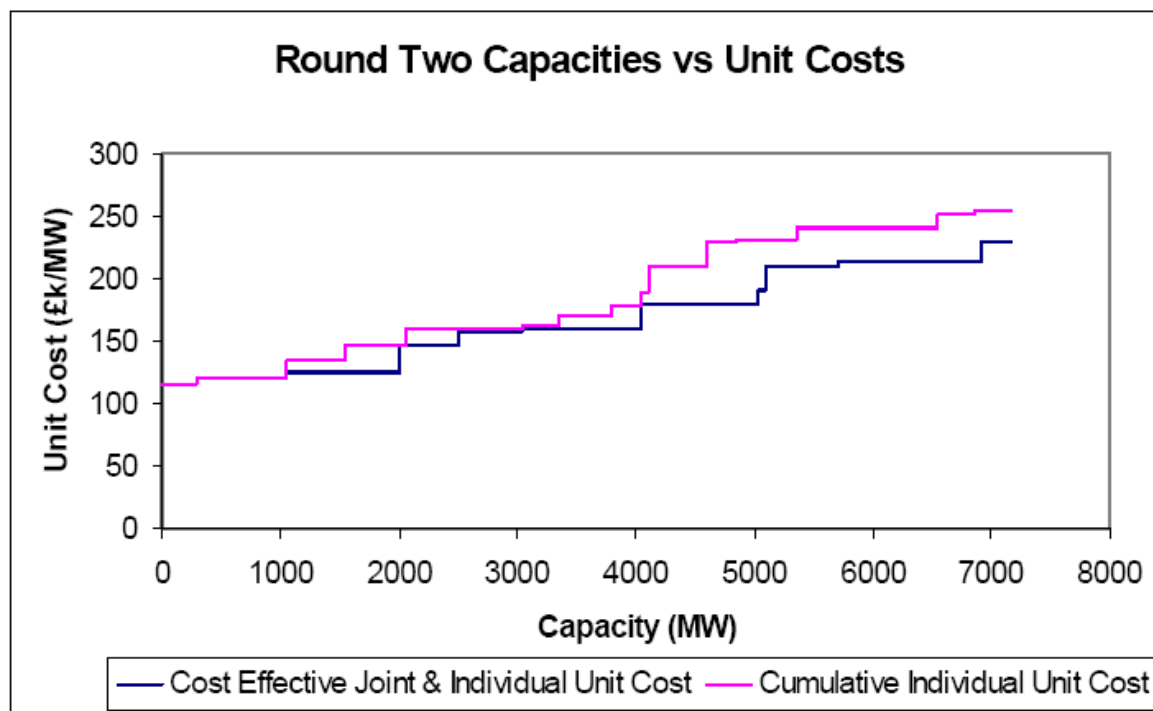
### Austria:

- change from cost based to incentive – regulation 2006

## Dependency of direct transfers from allocation of integration costs



## Incorporating Natural Monopoly Character of Grids: Subadditivity in the case of Offshore Connection



Case Study results (Econnect) show relevance of applied modeling methodology:

Cost efficient grid Connection of Offshore Capacities leads to

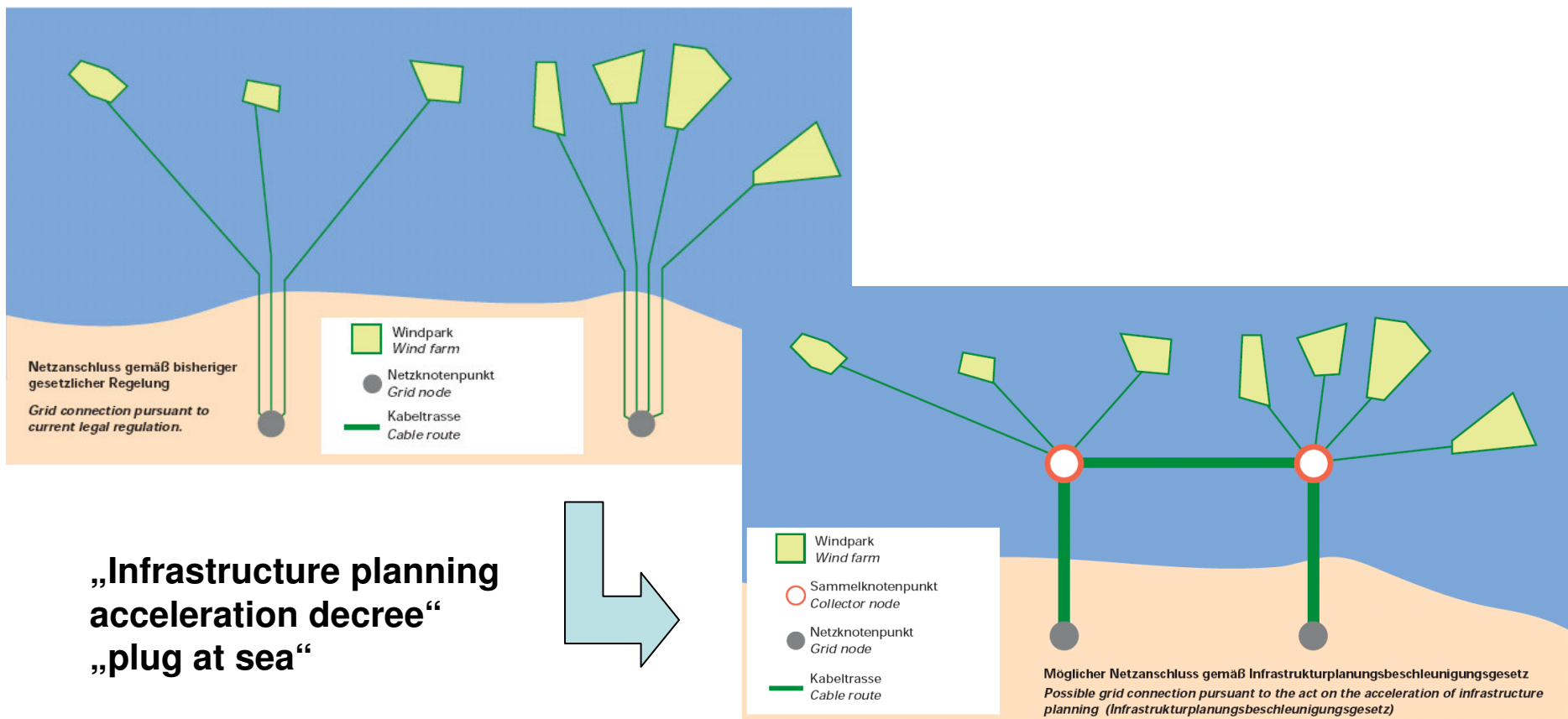
→ lower unit costs

→ different ranking (economic efficiency of projects)

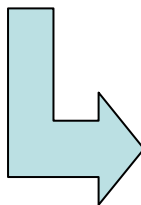
Comparison of the unit costs for the cost effective joint solutions plus remaining individual solutions versus the unit costs for strictly individual solutions for UK Round Two Wind farm capacity. Source: Econnect (2005)

$$C_{Transmission,common} + \sum_{i=1}^n C_i < \sum_{i=1}^n C_{Transmission,i}$$

## Grid connection of Offshore-Windfarms - Subadditivity of cost function II



„Infrastructure planning acceleration decree“  
„plug at sea“

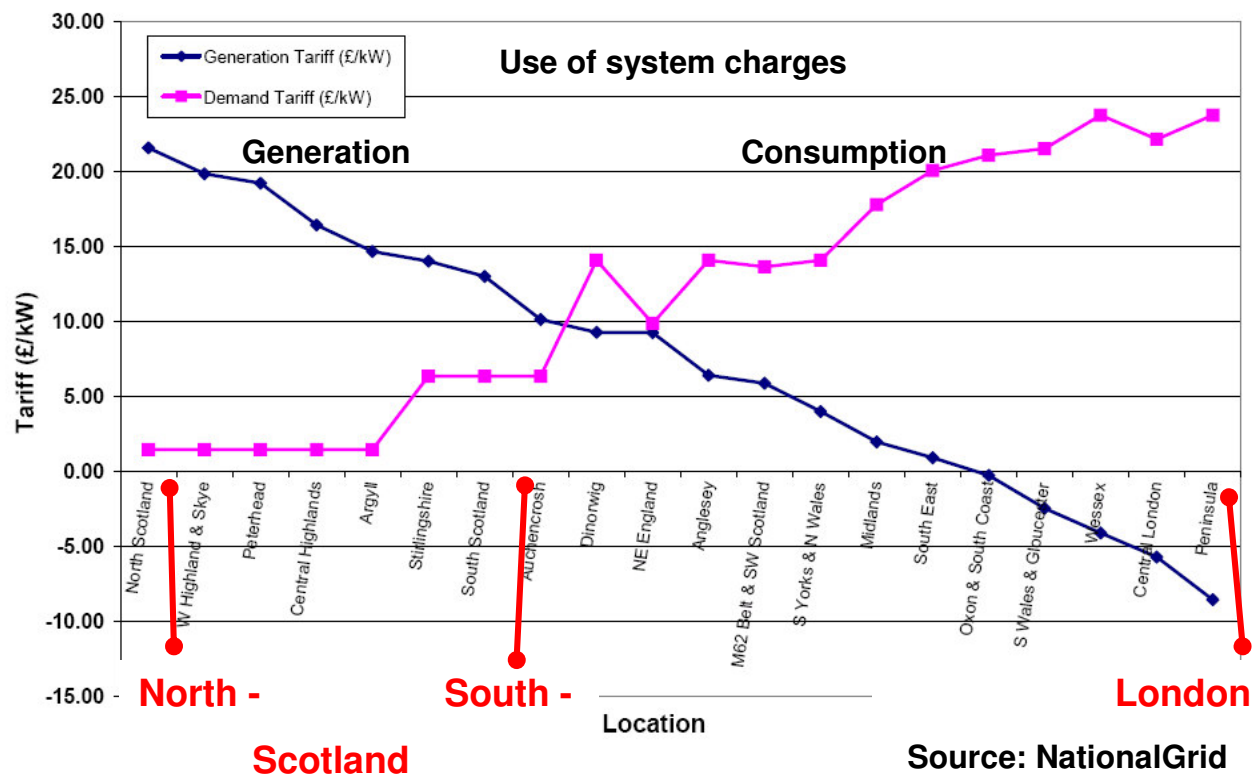


**Grid connection Offshore Germany**

Source: BMU

## Locational signals for Use of System

### Capacity related charges for UoS in UK Transmission Grid



Load centres:

→ high consumer tariffs

→ low generation tariffs (G-charges)

## Regulatory mechanisms – „Cost-Plus“, „Rate of Return Regulation“

Cost-plus-Regulation:

$$P_t = \frac{TC_t}{X_t}$$

Rate of Return Regulation:

$$P_t = \frac{OC_t + RAV * ROR}{X_t}$$

no incentive for productive efficiency, tendency of over-capitalisation  
(*gold plating*)

profit maximisation is achieved via shifting operational costs to capital costs (no a priori disadvantage for RES-E integration)

## Regulatory mechanisms – „Incentive Regulation“

Price Cap Regulation:

$$P_t = P_{t-1} * (1 + (R)PI - X)$$

Revenue Cap Regulation:

$$R_t = R_{t-1} * (1 + (R)PI - X)$$

Profit maximisation possible only via cost reductions

→ no incentive for grid operator for additional connections due to extra costs

Revenue cap limits volume risk

(= Incentive for efficiency measures)

## Grid connection

### Austria:

Grid reinforcement costs attributed to generators

Charging of deep integration costs based on technical opinion  
regional differentiation

### UK:

#### *Distributed Generation Incentive*

→ Pass through of 80% of grid connection costs (<132 kV)  
(15 years, 7% interest, + 2 €/kW/a)

#### *Registered Power Zone, Innovation Funding Incentive*

→ locational signal ( + add. 2 €/kW/a)  
→ 5% of revenue for R&D

#### *Offshore Price Control*

→ tendering of planning, construction, financing and operation of  
Offshore – Wind connection  
→ + 1% interest on asset value (RAV)

## Regulierungsmechanismen

### Austria:

price cap regulation

**no** cost pass-through of RES-E integration investments

### UK:

Price cap regulation (→ Revenue caps)

+ **pass through** of RES-E integration investments

### Adjustment of regulatory mechanisms:

Translating RES-E integration costs

into grid tariffs (socialisation), + locational signals

$$R_t = R_{t-1} * (1 + (R)PI - X) + \sum_i (\Delta C_{EE,i} * \Delta kW_{EE,i})$$

## Grid connection

- coordinated planning procedure
- priority deployment areas
- provision of connections and socialisation of grid reinforcement costs

## Grid reinforcement

- plant specific costs allocation impossible/non-transparent
- pass through into tariffs

## Regulatory mechanisms

- Incentive regulation does not incentivise further RES-E deployment from the start, but has to be adjusted
- Internalisation of grid connection and reinforcement costs supports cost efficient long term solutions

*Thank you for your  
attention!*



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