



# Rules and mechanisms for integrating wind power in electricity markets

14-15 October, 2009 - 8th International Workshop on Large-Scale Integration of Wind Power into Power Systems  
Bremen, Germany



- Founded in 1989
- HQ in Edinburgh
- Offices in
  - London
  - Abu Dhabi
  - Melbourne
  - Shanghai
- Member of the Dar Group

**Market Analysis**

**Renewables**

**Regulation**

**Market Entry**

**Restructuring**

**Carbon Management**

**Market Modelling**

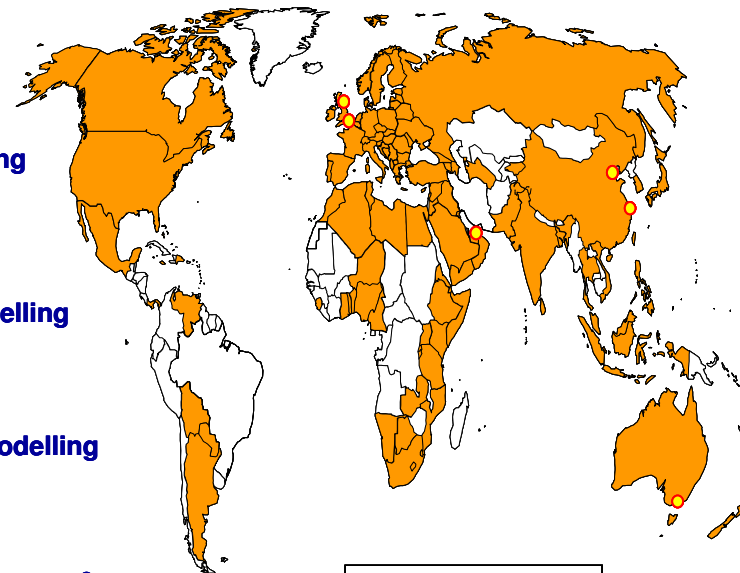
**Risk Management**

**Financial Modelling**

**Tariffs**

**Training Courses & Conferences**

**Privatisation**



● Office locations  
● Country coverage

## RET D Objective

Promote the benefits of renewable energy, within energy and climate change policy, to enable an increased rate of renewable energy technology deployment by:

- Empowering policy makers and energy market actors through provision of information, tools and resources
- Facilitating and fostering the co-operation between private and public stakeholders
- Involving more stakeholders in the deployment of renewable energy technologies

## Member Countries

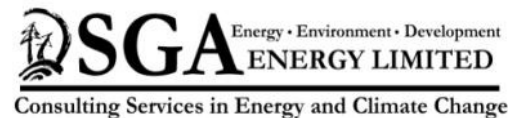
- Canada
- Denmark
- France
- Germany
- Italy
- Ireland
- Japan
- Netherlands
- Norway
- United Kingdom

## For IEA RETD

Electricity market products and services for integration of variable electricity generation

- Market design
- Cross border trading mechanisms
- Grid planning processes

By...



## Challenges integrating wind

### Dispatch

- Down, not up
- Can exhibit extreme ramp up or down rates
- Requirement for additional ancillary services
- Greater exposure to short term markets and balancing prices

### Small Size

- Onerous fixed costs (trading, reporting & regulation) due to typical small scale

### Lower Load Factors

- Proportionality of capacity related costs?

### Higher Costs

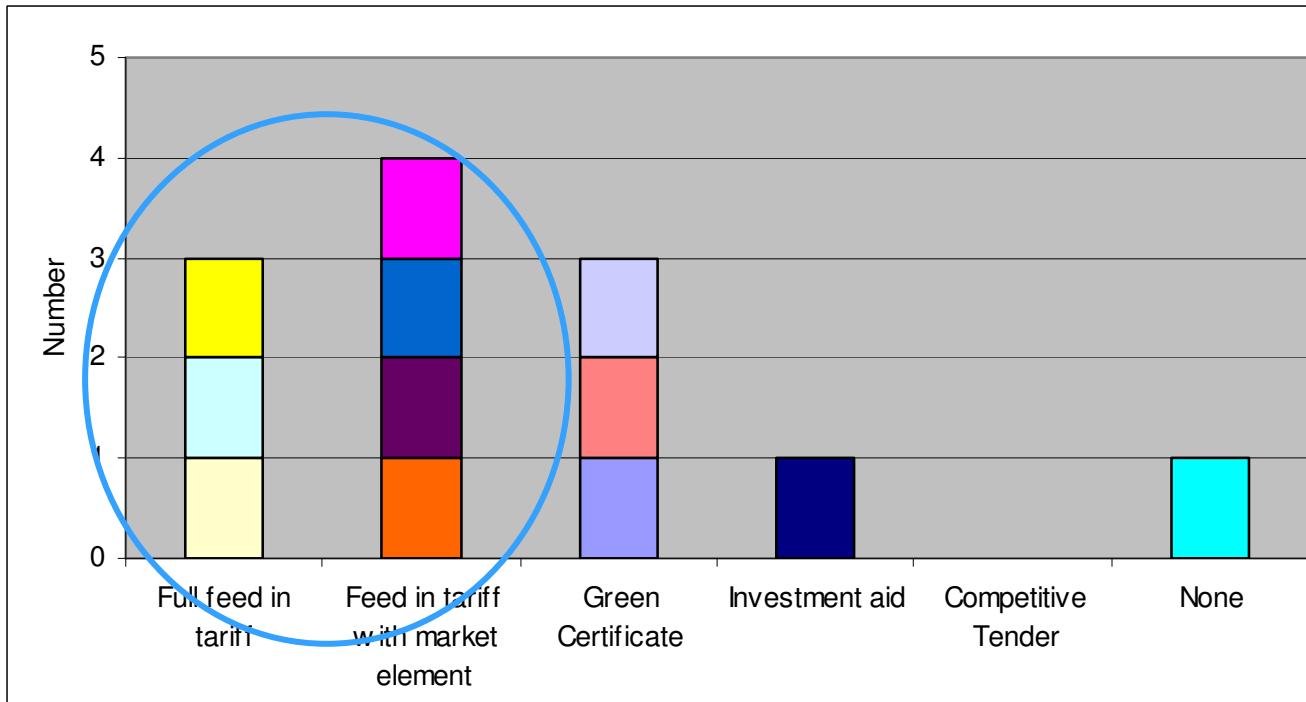
- Higher cost of some renewable generation than conventional generation
- Requires special treatment and subsidies



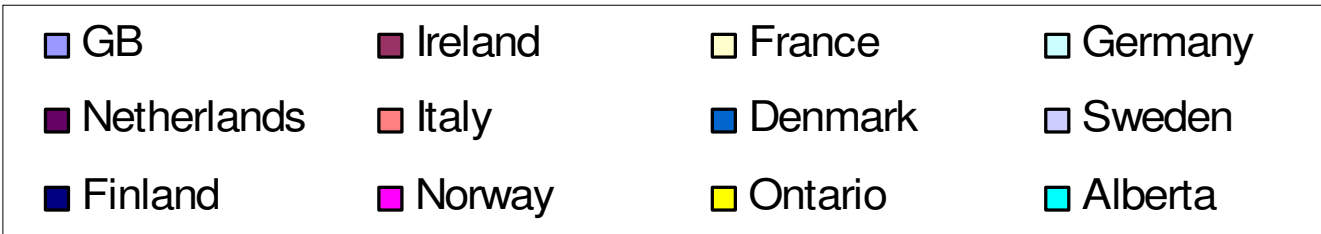
## The jurisdictions considered were:

- |                 |           |  |
|-----------------|-----------|--|
| ■ Great Britain | ■ Finland | } Nordic Market<br>"Nordpool"  |
| ■ Ireland       | ■ Norway  |  |
| ■ Italy         | ■ Denmark |  |
| ■ France        | ■ Sweden  |  |
| ■ Germany       | ■ Ontario | } Two Canadian jurisdictions with fully or partially open electricity markets and developed renewables |
| ■ Netherlands   | ■ Alberta |  |

## Support Schemes



**Feed in tariff most common**



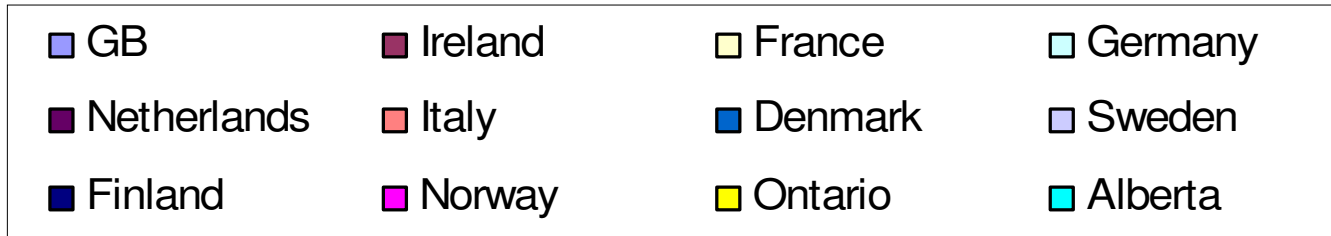
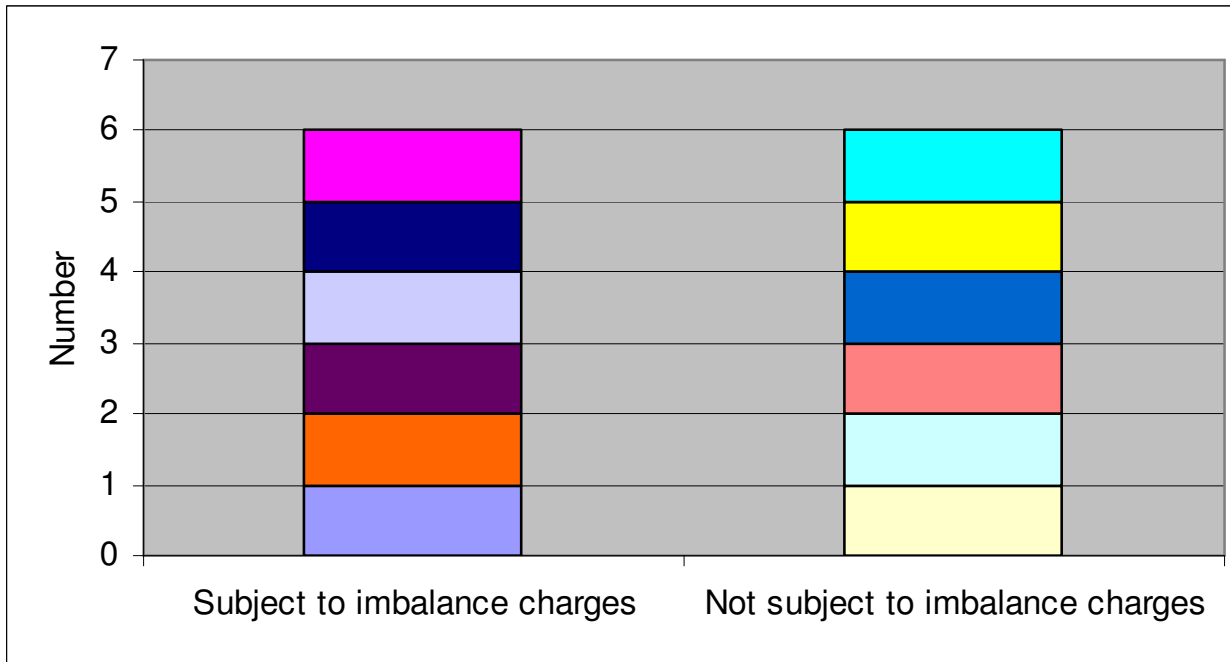
## The type of support mechanism can determine the degree of insulation from market risk.

- Feed in Tariffs & Competitive Tender *Complete isolation from market risk*
- Investment Aid & Market-linked/“Top-Up” *Reduced market risk*
- Tradable Green Certificates *Additional income stream, but additional market risk*

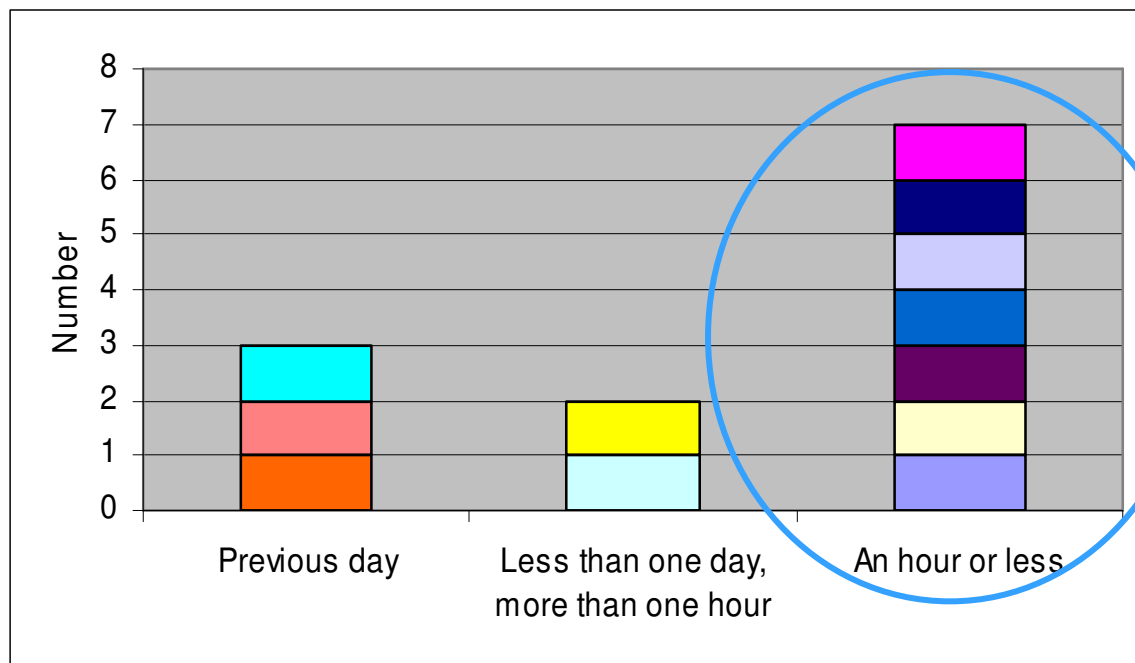
### Market Risk

Renewables support can isolate renewables from market arrangements.  
→ Renewables not fully integrated in most markets.

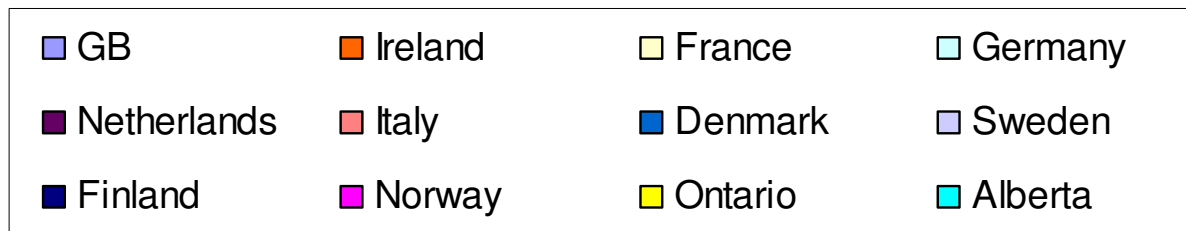
## Whether renewables has to meet (at least part of) balancing costs



## Gate Closure



**Normally an hour (or less) where renewables has to balance itself**



### Traded market is needed to balance ahead of gate closure

- **Less** trading on spot market due to:
  - Vertical integration
    - GB, France and the Netherlands
  - High costs/ credit cover for small renewable generators → more opt for long term bilateral contracts
    - GB and Netherlands
- **More** trading on spot market due to:
  - Cross border trading and strong intraday or day-ahead auctions
    - Nordic Countries, the Netherlands and Germany
  - Opportunity to pay per MWh traded → not penalised for small generation
    - Nordic market

### After gate closure, producers may be subject to imbalance charges.

- Imbalance prices are an incentive for balancing parties to manage their own position
- **Dual imbalance charges** operate on most markets
  - Higher price for buying from the market than selling surplus
  - Encourages under-notification of generation
  - Often do not reflect actual system costs
  - Can be volatile
- Only Germany and Norway have a **single imbalance price**

## Targeting balancing costs

- Moving to a shorter gate closure/notification period will target balancing costs more on participants and place less responsibility on the system operator.
  - Not necessarily more efficient than SO balancing – depends how costs are subsequently targeted.
  - Will only incentivise economic balancing where there are short term liquid markets
- Where balancing is done at portfolio level, companies can use their own plant to balance
  - Puts independents and generators with more short term uncertainty at a disadvantage, since markets may not provide efficient balancing options.

## Wider Market Impacts

- Isolating renewables from the traded market does not necessarily isolate their impact
- During normal operation, not clear if impacts on overall spot price
- Extreme of wind power can affect spot and pool markets
  - Low spot prices observed with extremely high wind generation
  - High spot prices observed with very low wind generation



# Two approaches to promoting wind generation

## Maximal Integration

- Market integration, adapting existing market mechanisms to accommodate variable generation in a cost effective way without special treatment
  - Trading close to real time – reduce exposure to market imbalance costs
  - Volatile/ penal balancing costs place wind at a disadvantage



## Maximal Deployment

- Accept that integration is not the most pragmatic option and provide “special conditions” for variable renewables
  - Isolate renewables from market risk and/or balancing risk



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