



Bureau of
Energy Resources,
United States
Department of State



National
Association of
Regulatory
Utility
Commissioners

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**Interconnections:
Market Coupling, Regulatory and
Utility Cooperation
October 14 – 16, 2013**





What is Market Coupling?

Market Coupling European Model



Market Integration

- **Unbundle vertically integrated industry;**
- **Promote competitiveness in the generation capacity and allow free entry to new plants;**
- **Create independent TSOs; and**
- **Reduce cost of electricity and promote consumer choice and regulate CBT interconnections.**



Market Interconnection

- **Will allow optimum and efficient use of infrastructure and resources by:**
 - **Deploying resources at regional level; and**
 - **Fostering competition among suppliers and among producers.**
- **It will help lower the electricity prices.**



Market Structure

- **Energy markets;**
- **Capacity markets**
- **Congestion management;**
- **Who conducts auctions; and**
- **Who enforces the rules (in Europe Energy Regulators Group and now ACER).**



Market Drivers

- **Security (TSOs ensure a continuous match between supply and demand);**
- **Firmness (operation planning);**
- **Adequacy (new capacity to meet demand);**
- **Strategic expansion (long term availability); and**
- **Social welfare generated by CB trade (affordable electricity).**



Major Players

- **TSOs – agent to build and guarantee capacity and maximize the capacity offered;**
- **National Regulatory Authorities (NRAs – act as the principal in incentive schemes);**
- **Power Exchanges (PXs – balance supply demand); and**
- **National governments.**



Issues for Regulators!

Regulator do not know:

- **The extent to which TSOs coordinate with each other;**
- **The precision and reasons for the security margins kept by TSOs;**
- **To what extent the CB capacities are maximized; and**
- **Cost of increasing available capacity or the implication of doing so on operational security.**



Obstacles to Interconnection

- Differences in market design;
- The regulatory gap;
- The lack of human and financial resources;
- Lack of incentive regulation; and
- Lack of verifiable information.



Challenges for Regulators

- **The cost of reducing lack of information;**
- **The dynamic aspect of regulation (duration of incentive scheme);**
- **The multiplicity of the parties (mainly regulators, operators and TSOs); and**
- **The undesirable incentives that may be created to promote cross border trade (detriment to grid security).**



Ideal Incentive Scheme -1

- **Designed to maximize consumer benefit;**
- **Simple and easily understandable by all stakeholders;**
- **Objectively measurable;**
- **Controllable by TSOs;**



Ideal Incentive Scheme 2

- **Challenging and attractive for TSOs;**
- **Applicable region wise; and**
- **Compatible with other national priorities.**



Market Issues

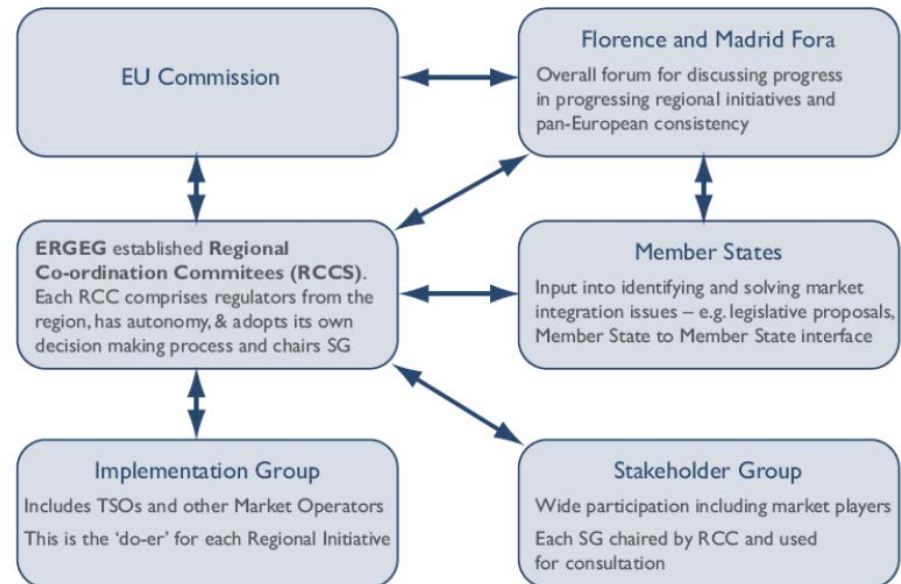
- **Market interconnection (harmonizing the rules of two or more markets);**
- **Congestion Management (when electricity is unable to flow due to physical constraints).**
- **Isolation of the supply side of the market from demand side breeds disaster (California energy crisis of 2001).**

Case Study - European Single Market

Principles

- Congestion management.
- Transparency.
- Integration of balancing markets.

Regional Initiatives *how?*



Source: EREG 2006



Congestions

Congestions occurs when the sum of demands for capacity at a specific allocation timeframe exceeds the capacity available at the interconnection.

Structural Congestions: Frequently limit the CB electricity exchange. They may involve one or more transmission lines.

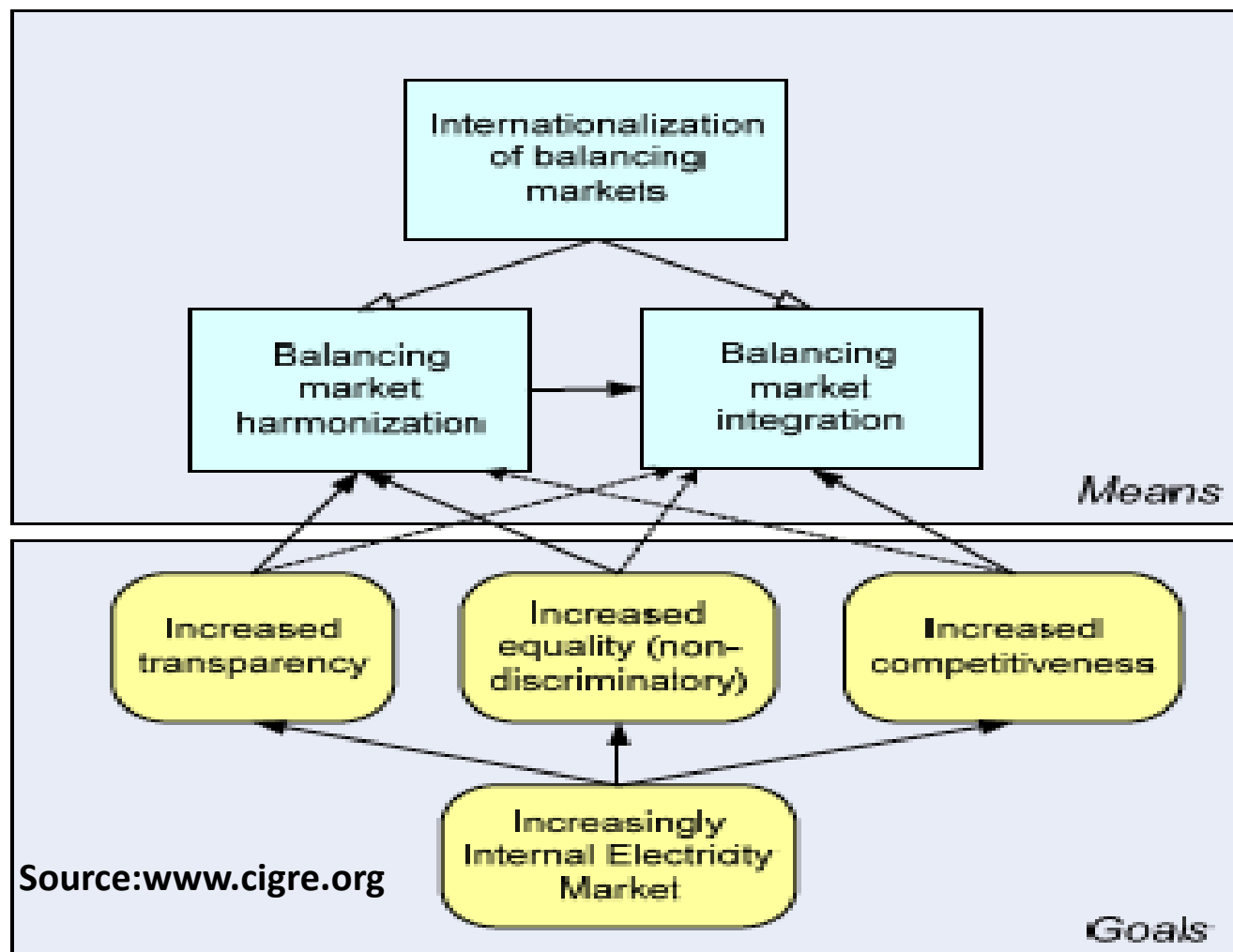
Intermittent Congestions: that may occasionally limit the CB electricity exchange.



Balancing Markets

The real time operation of a power system requires that TSOs ensure a continuous balance between supply and demand. In competitive electricity markets, TSOs can identify the need for, and procure adjustments in, generation or demand – in order to maintain balance in the power system.

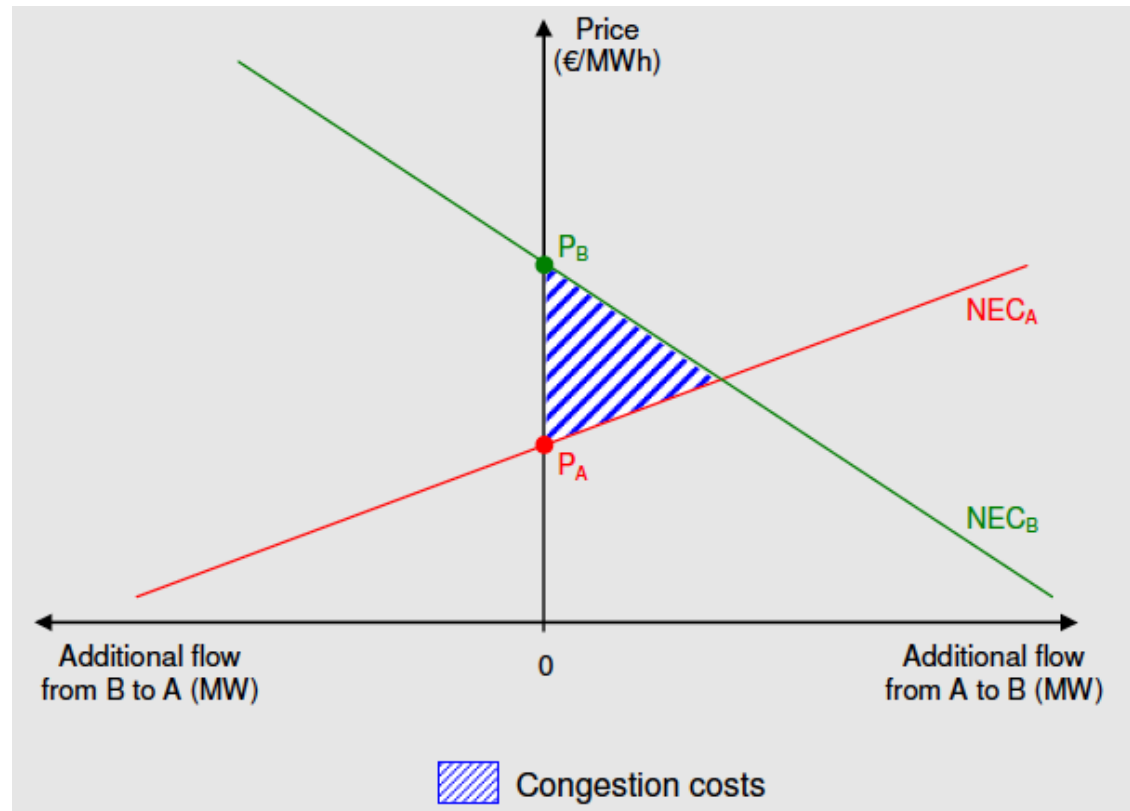
Balancing – Means and Goals



Congestions Costs

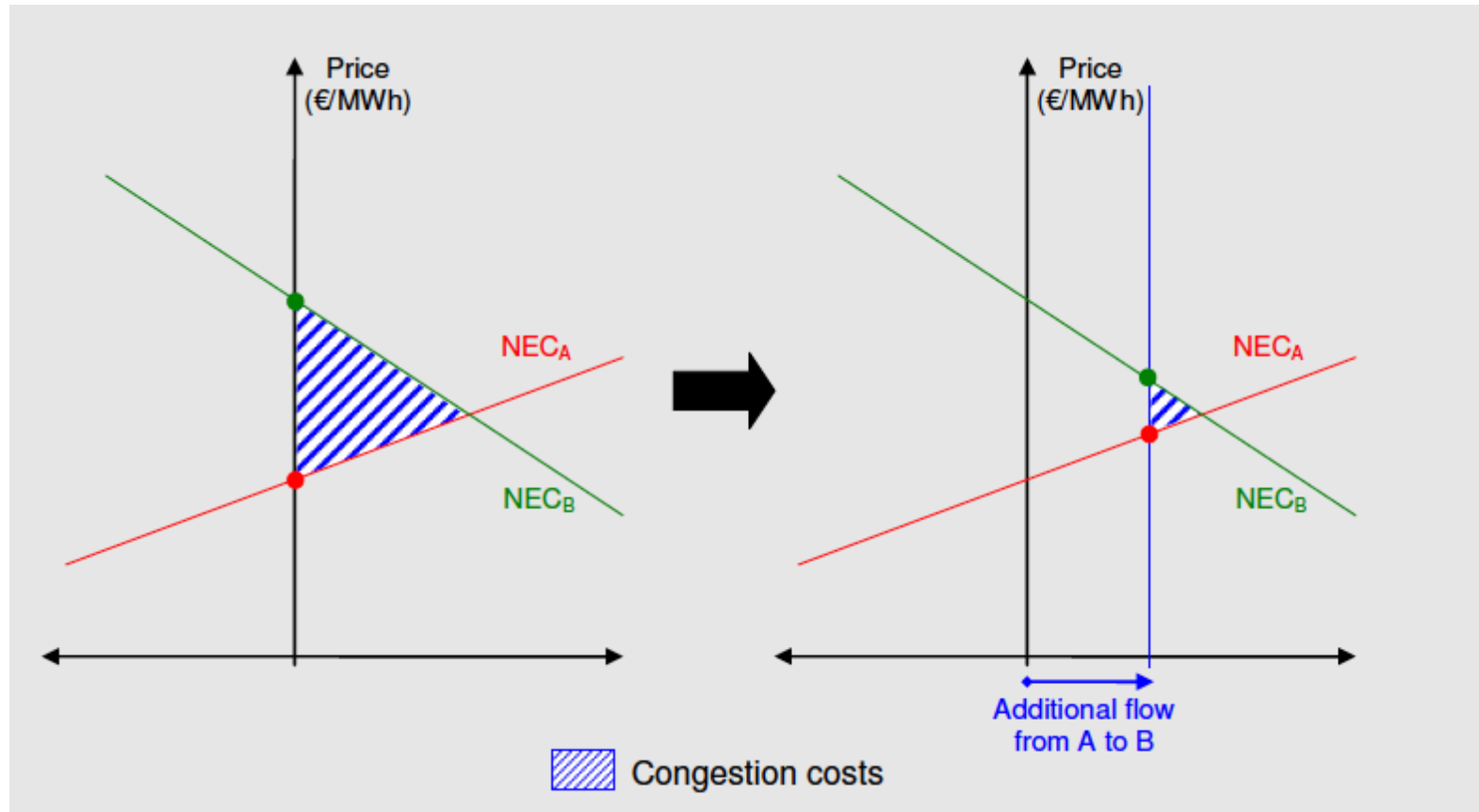
How many
hours?

At what cost?

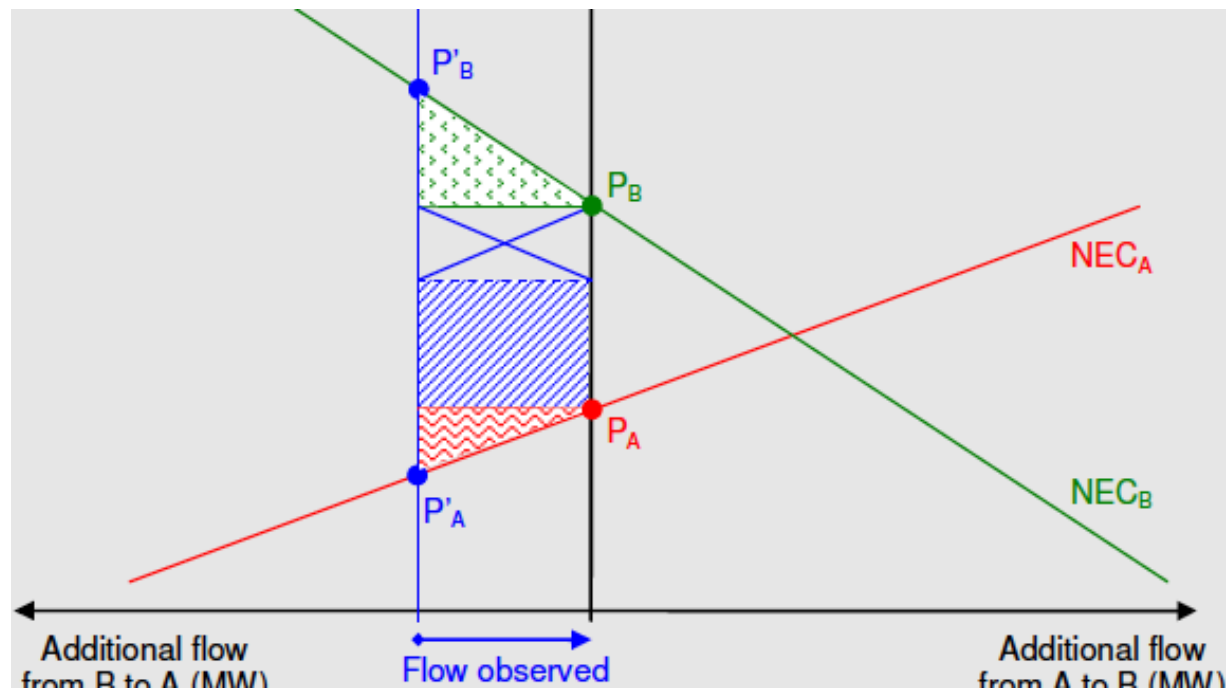


Source: ERGEG

Interconnection Benefits



Surplus Generated by Cross-border Electricity Flow



- | | |
|-------------------------|--|
| Net surplus of market A | Net surplus of market B |
| Auction revenue | Arbitrage revenue (in case of explicit auctions) |



What is Market Coupling?

Market coupling is a method to manage capacity congestion between adjacent power spot markets by optimizing the capacity allocation. It allows the matching of power exchanges' orders and implicit allocation of available cross-border capacities.



Market Coupling - Benefits

- **Optimizes the allocation process through a coordinated price formation;**
- **Uses implicit auctions where players bid for energy (not capacity) on their exchanges; and**
- **Maximizes the social welfare, avoids market splitting, and encourages investment in CB capacities.**

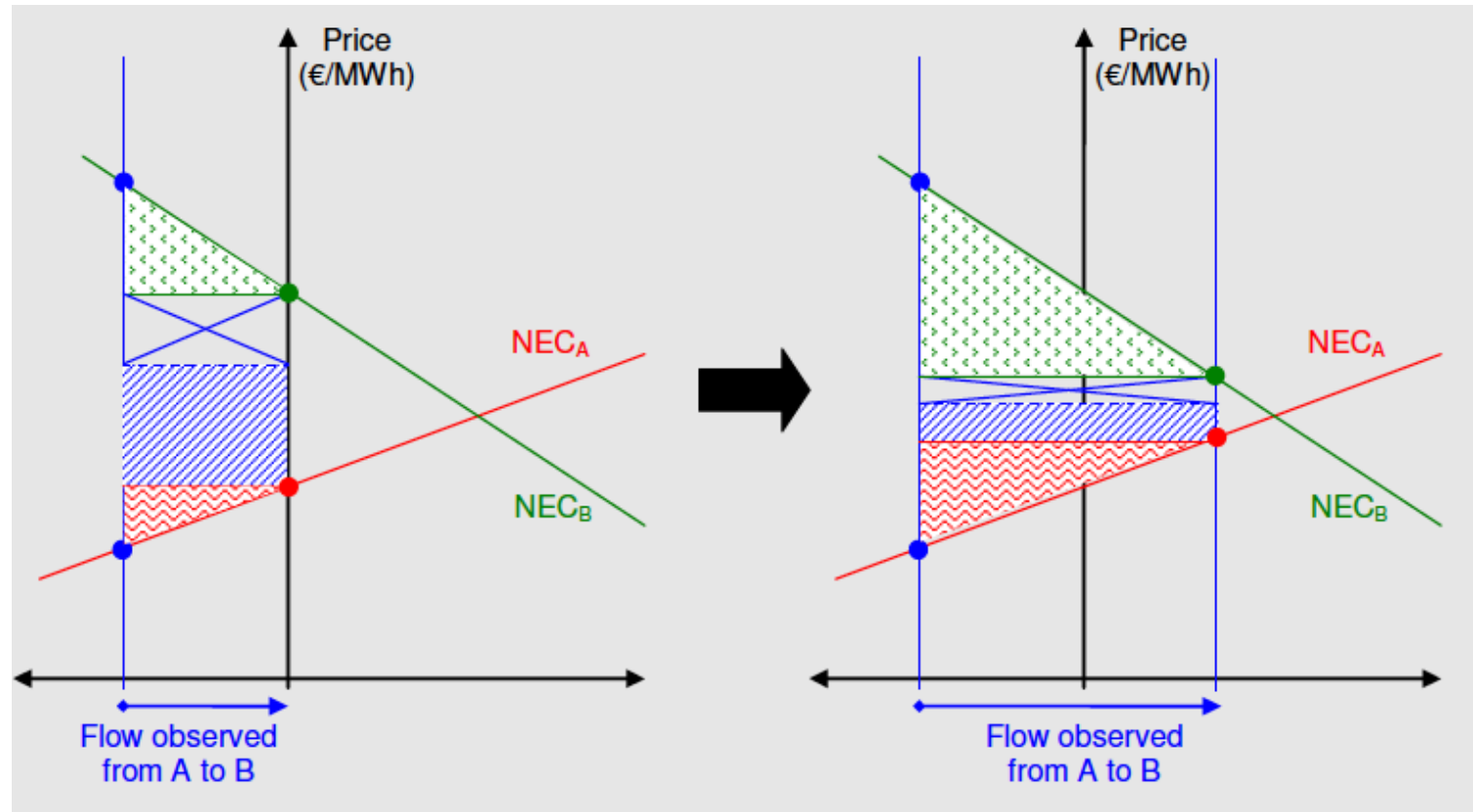
Source: EPEXNews



Prerequisites for Market Coupling

- **Market structure: A liquid organized day-ahead market;**
- **Governance: Consensus among all stakeholders (TSOs, PXs, Regulators, Politics, Market Actors) is needed. One hub can only adhere to one coupling;**
- **Harmonization of capacity calculation (firmness regimes, region-wise business process, gate closure time, schedule nomination time etc.).**

Maximizing Capacities



Net surplus of market A

Auction revenue

Net surplus of market B

Arbitrage revenue (in case of explicit auctions)

Source: ERGEG



Maximizing Cross-border Capacities

- **Determination of the total level of interconnection capacity across a particular border;**
- **Determination of a target value of the capacity to be offered; and**
- **Annual determination of whether the target value has been met by TSOs.**



Regulators must Watch for

- **Interaction with other objectives such as re-dispatching, counter-trading etc.;**
- **Incentives should not reward TSOs for poor past performance; and**
- **Coordination is needed among stakeholders when defining the targets.**



Cooperation is Necessary Condition

- **Between TSOs, DSOs and Regulators;**
- **Between NRAs;**
- **Between PXs. Regulators and NRAs;**
- **Between Governments and Regulators; and**
- **Utilities and Regulators.**



Thank you!

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Europe – Fuel Supply Mix

Table 1 - Fuel mix electricity generation (GWh and %) year 2009

Production from:	Austria		Germany		Italy		France	
Coal and peat	5032	7.294%	257137	43.401%	43416	14.836%	28708	5.295%
	1137	1.648%	9639	1.627%	25946	8.866%	6170	1.138%
	12338	17.884%	78884	13.315%	147269	50.324%	21013	3.876%
Nuclear fuels	4003	5.802%	25928	4.376%	6015	2.055%	2125	0.392%
Hydroelectric	796	1.154%	9634	1.626%	3388	1.158%	3960	0.730%
Renewable			134932	22.775%			409737	75.572%
Other*	43662	63.288%	24710	4.171%	53443	18.262%	61912	11.419%
Thermal	2	0.003%	19	0.003%	5342	1.825%		
Solar PV	35	0.051%	6579	1.110%	676	0.231%	171	0.032%
Solar thermal								
Wind	1967	2.851%	38639	6.522%	6543	2.236%	7891	1.455%
Geothermal							497	0.092%
Other sources	17	0.025%	6363	1.074%	603	0.206%		
Total Production	68989		592464		292641		542184	

Source: International Energy Agency.