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International Trade

Electricity Trading

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Content

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- Incoterms
- Renewable energy

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Electricity specificities

- Non storable commodity (capacity to be stored is very limited – in batteries)
- It travels almost at the speed of light
- Instantanious balance between supply and demand
- Consumption is subject to high fluctuations (day/night, summer/winter, Week/Week end)
- Limited demand elasticity
- National monopolies
- Transmission constraints

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Legal framework

- Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC

- Regulation No 1228/2003 of the European Parliament and of the Council of 26 June 2003 on conditions for access to the network for cross-border exchanges in electricity

- The law of 29 April 1999 on the organisation of the electricity market, as amended by the law of 1 June 2005

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Objectives of the Directive 2003/54

- Directive 2003/54 aims to achieve, by July 2007 at the latest:
  - unbundling of transmission system operators (TSOs) and distribution system operators (DSOs) from the rest of the industry
  - free entry to generation
  - monitoring of supply competition
  - full market opening
  - promotion of renewable sources
  - strengthening the role of the regulator
  - a single European market

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Main objective of the Directive 2003/54: market opening

- Until recently, the electricity industry was a “restricted”, monopoly sector, but as a result of the liberalisation process which began in Europe in the 1990s, electricity can now be traded across borders in an open competitive market.

- Competitive activities include generation (power production), supply and trading, whereas network activities - ie transmission and distribution - are still by their nature regarded as natural monopolies to be operated under regulated conditions.

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Regulation 1228/2003

- This Regulation aims at setting fair rules for cross-border exchanges in electricity, thus enhancing competition within the internal electricity market.

- This involves:
  - the establishment of a compensation mechanism for cross border flows of electricity, and
  - the setting of harmonised principles on (i) cross-border transmission charges and (ii) the allocation of available capacities of interconnections between national transmission systems.

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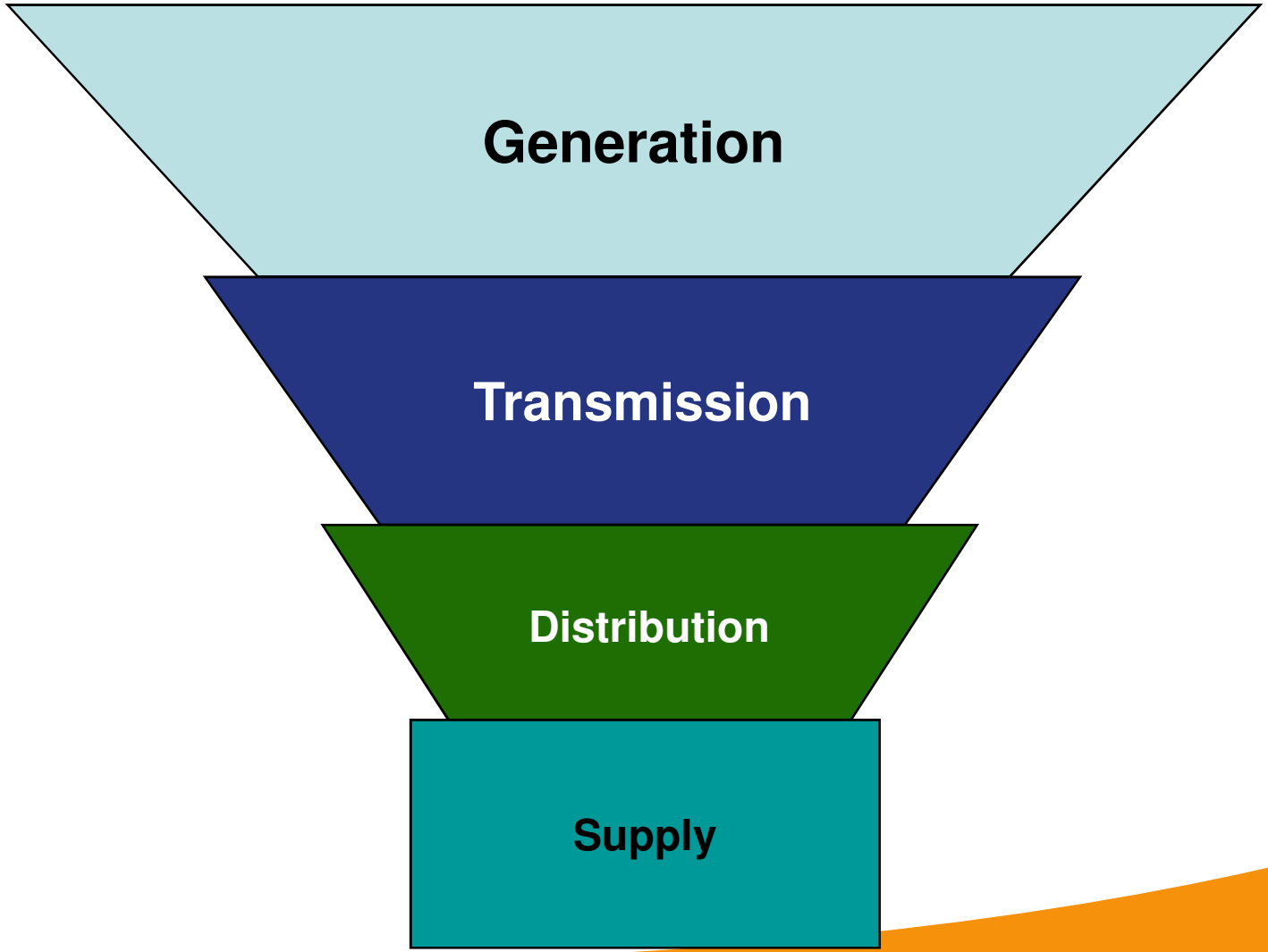
Comparison with other countries

- At present, European electricity market liberalisation represents the world's most extensive cross-jurisdiction reform of the electricity sector involving integration of distinct state-level or national electricity markets.
- In the USA, in the aftermath of the California electricity crises in 2000-01, the restructuring process has slowed down significantly and many states have put their reform plans on hold.
- Apart from a small number of leading reform countries such as Australia, New Zealand, Chile and Argentina, many other countries around the world have made only limited progress towards comprehensive energy market deregulation along the lines now being pursued by the European Union.


Generation
Transmission
Distribution
Supply

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Production (Generation)

- Each producer (small/big, private/public, Belgian/foreign) have the same access right to the transport and distribution network
- Generation Sources
  - ✓ Coal
  - ✓ Oil
  - ✓ Gas
  - ✓ Nuclear
  - ✓ Hydro
  - ✓ Wind
  - ✓ Other renewable

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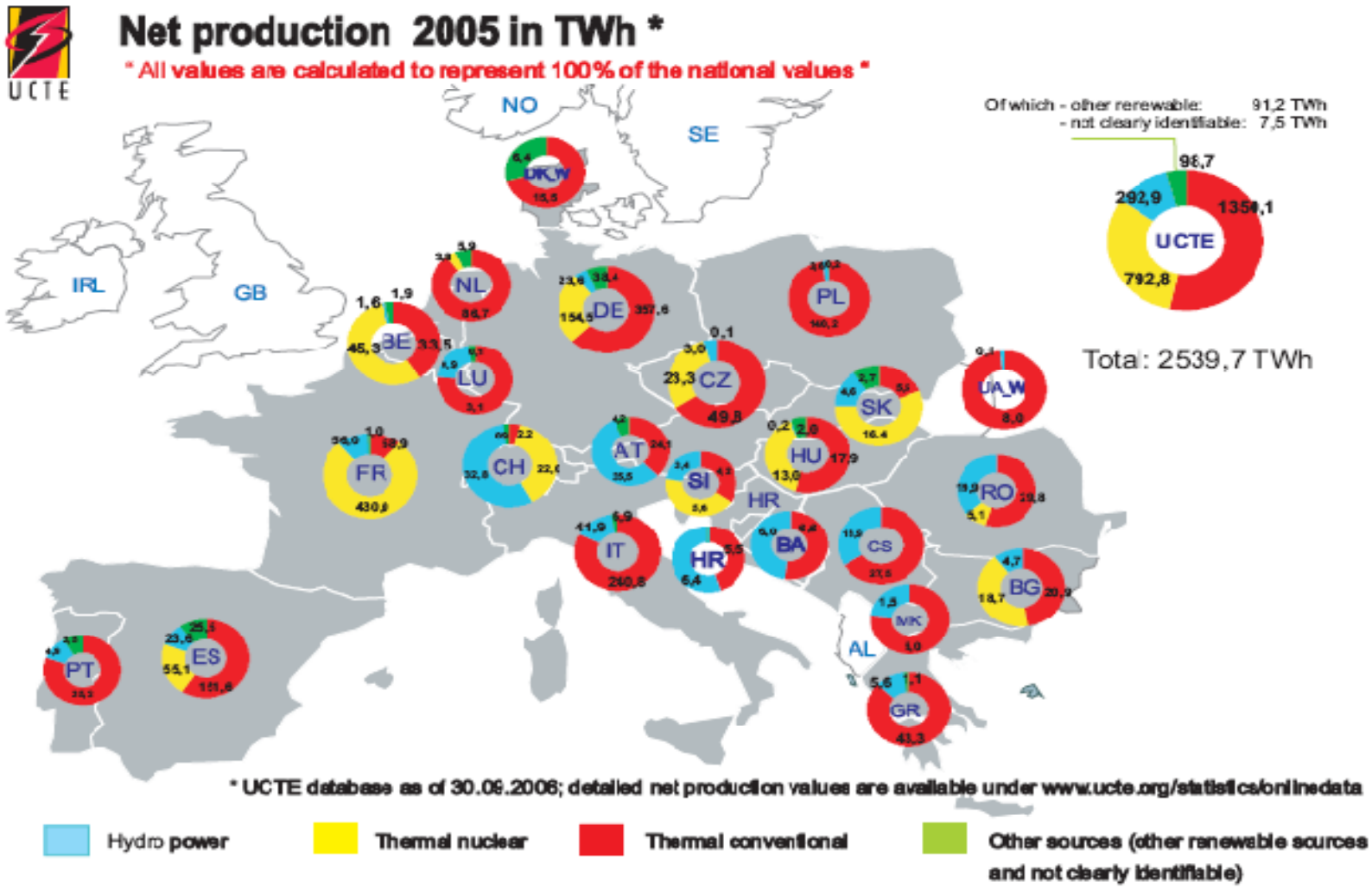
Electricity Generation in Europe



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Transmission and distribution of Belgium

- Transmission
  - » TSO (from 70 to 380 KV)
  - » The federal government allows the transmission system operator to retain a legal monopoly.
- Distribution
  - » Remain also a monopoly. DSO Regions (Wallonia, Flanders and Brussels) are responsible for the distribution and local transmission of electricity via networks with a voltage of 70 KV or less.

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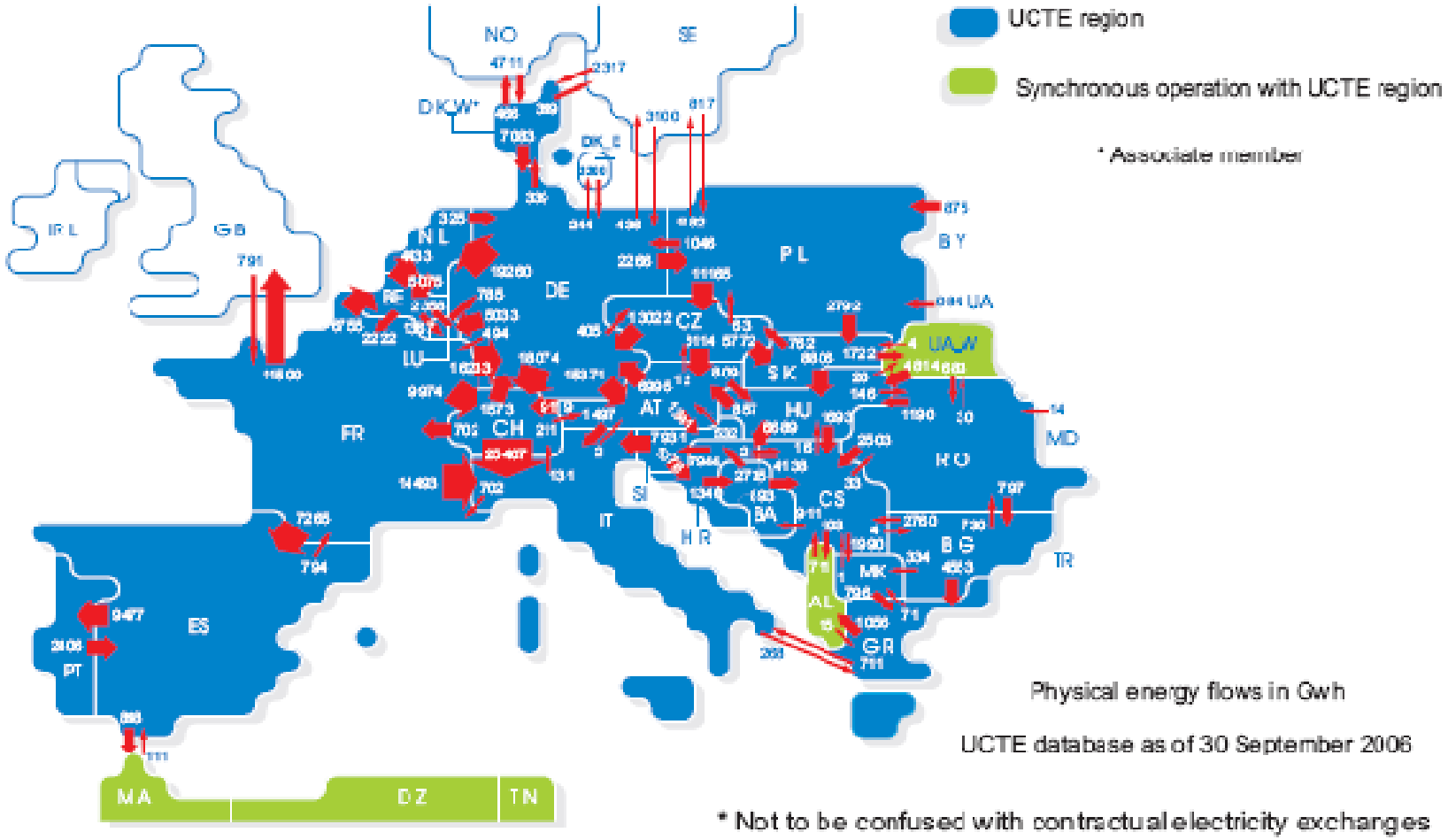
Intra Europe Electricity Transmission



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Transmission and distribution in Belgium (2)

- Distribution Grid operators
  - » Operate and maintain and develop lower voltage networks (usually 15 KV and lower)
  - » Municipalities have the legal monopoly on local distribution

- Supply
  - » Supply license
  - » 4 different supply licenses (Federal, Flanders, Wallonia, Brussels capital region)
  - » Nuon – Essent – Electrabel – EDF Belgium – SPE ....

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Regulator in Belgium: CREG

- The regulators supervise the operation of the electricity market.
- They also play a central role in:
  - issuing supply licences;
  - authorising cogeneration facilities and facilities which generate renewable power;
  - issuing and managing green power certificates.

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Horizontal & Vertical Integration

Horizontal integration:

- Effective competition requires horizontal unbundling of companies in generation and retailing to reduce market concentration.

Table 3.1 *Selected large power producers per country and their market share in 2003*

Country	Power producer	National market share	
		For the individual power producer [%]	Total for larger power producer in the country [%]
Belgium	Electrabel SA	83	83
France	Electricité de France	90	90
Germany	E.ON Energie AG	24	63
	RWE Energie AG	21	
	Vattenfal Europe AG	10	
	ENBW Energie-Versorgung Schwaben	8	
Netherlands	E.ON NL	10	74
	Electrabel NL	26	
	Essent Energy Production BV	18	
	Reliant Energy Europe	20	

Vertical integration:

- Vertical integration between generation and retail supply
- Negative and significant impact on competition

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Non tariff barriers on electricity

- Interconnection capacity constraints
- National monopolies
- Vertical and horizontal integration
- Barriers to entry : high investment cost
- High price variations across Europe

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Tariff barriers on electricity

- Commission Regulation No 1549/2006 of 17 October 2006 amending Annex I to Council Regulation No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff (Combined Nomenclature):
  - » “2716 00 00 Electrical energy : Conventional rate of duty (%): Free”

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Sovereignty Risk

✓ Each European State has its own regulator

✓ The regulators are grouped in ERGEG

✓ **Directive 2003/54/EU** concerning common rules for the internal market in electricity

✓ **Regulation 1228/2003** dealing with conditions for access to the network for cross-border exchanges in electricity.

✓ **UCTE**

Apparently NO HIGH SOUVEREIGNTY RISK

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Sovereignty Risk (cont'd)

BUT……. Let's see France..

The biggest European Player

Electricity Producer

State Owned at 87,3%

Electricity TSO

Owned by EDF

RTE set the cross border transmission capacity….

Could French Government be tempted in manipulating non-tariff barriers such as interconnection capacity ???

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Sovereignty Risk (cont'd)

The case of developing markets:

- Immature political and economic institutions
- Transmission Lines and Power Plants cannot be withdrawn
- Outright Nationalization
- Tax can change
- Repatriation of Profits

BOLIVIAN CASE

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Transportation Risk

- What's going on with cross-border interconnection ???

  Physical integration. No supra - European electricity organization
- Why prices of electricity are so different in Europe ???

  Non trade barriers – cross border capacity
- How interconnector capacity is determined ???

  TTC – TRM = Net Transfer Capacity
- Is there a solution the increase of cross-border transmission capacity???

  A costly one – HIGH INVESTMENT IN GRID HIGHWAYS

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Transportation Risk (cont'd)

SOLUTION I Increase transmission capacity

High Cost

Will take more than a decade for construction

SOLUTION II Divest power plants
Braking up generation into smaller firms

Low Cost

Will take less than a year

But…. Big lobby of EDF, Electrabel, EON, Endesa, ENEL….

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Transportation Risk (cont'd)

✓ European Blackout November 2006

Question : Is European electricity market really integrated ???

✓ Sweden and Eastern Denmark Blackout – September 2003

✓ Italy Blackout – September 2003

✓ California Blackout – May 2001

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Supply Risk

The world is changing…

- Actual European Capacity: 584 GW
- Half of this Capacity should be retired by 2030
- Expected consumption for 2030: 900 GW
- Reasons for retirement:
  - » Many European Power Plants are old and should be retired in 10 – 15 years.
  - » Environmental regulation will make many power plant to retire
  - » Liberalized Market → Higher Competition → Some plants will not be profitable
- Electricity Companies do not want to keep costly reserve capacity
- Power Plant construction time is 10 – 15 Years

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Currency Risk

Itaipu Binacional (Paraguay & Brazil) – 20 GW production

Brazil purchase electricity from Paraguay in USD

Brazil Utilities invoiced to consumers in BRL

What if BRL depreciates ??

Gestore Mercato Elettrico – Italian Electricity Exchange

Std. Currency: Euro….. But many Swiss participants

What if CHF depreciates/appreciates ???

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Payment Risk

How to reduce payment risk in Power Exchanges ?

COLLATERAL

- Cash on a pledge account
- On demand Bank Guarantee

See the Example of:

NORD POOL
NORD POOL SPOT AS
building a secure market

STANDARDIZATION ?

- The pledged account must be opened with a bank that Nord Pool Spot has approved
- Agreements and guarantees drawn up in a wording that deviates from the templates supplied by Nord Pool Spot will not be approved

HOW MUCH GUARANTEE ?

- The minimum collateral is equal to NOK/SEK/DKK 100.000,- or EUR 12.500

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Power exchanges

How many power exchanges does a deregulated market need?

Scandinavian countries started deregulation in the 1990s

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Electricity prices

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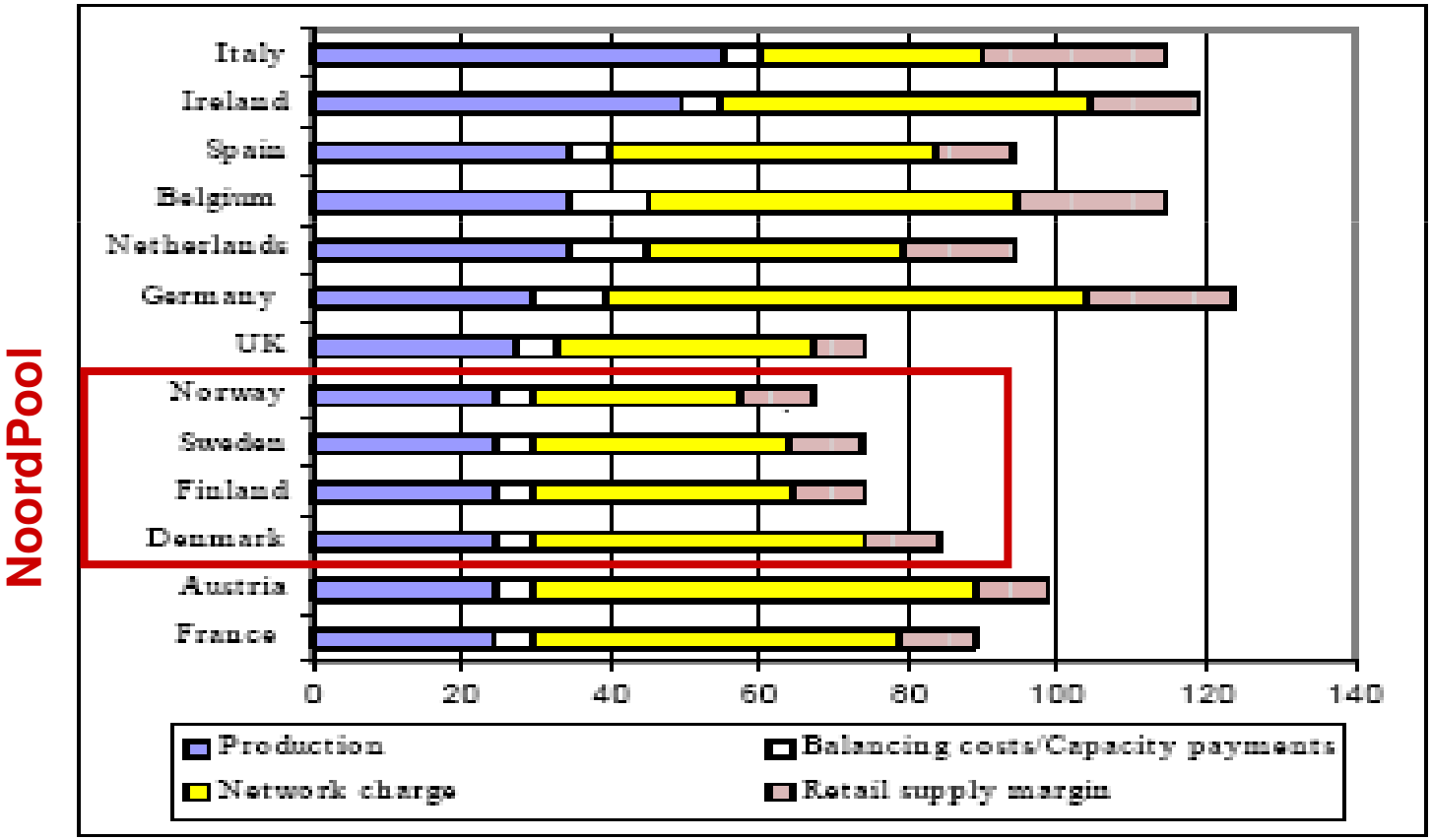
Figure 6: Estimated Breakdown of Expected Electricity Prices 2004 (50 MWh/year Customer (euro/MWh, before Taxes)

Source: European Commission (2004b)



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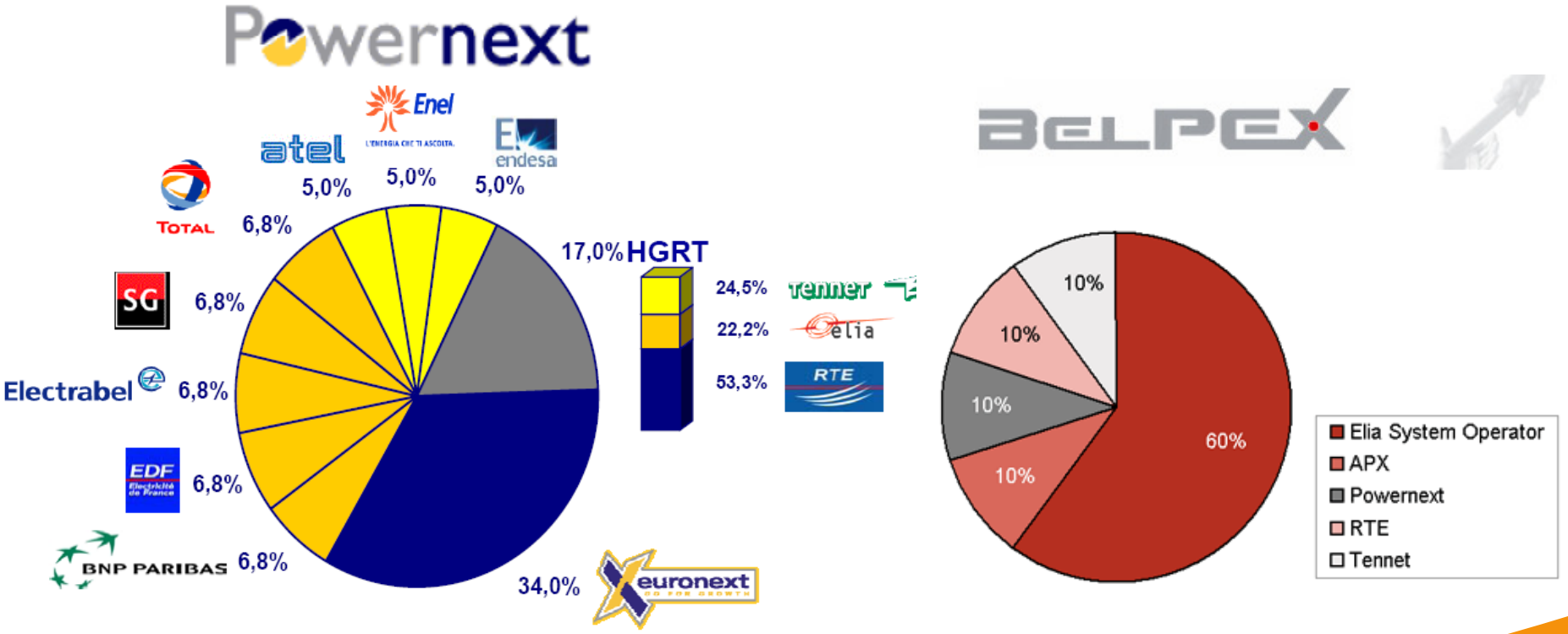
Power exchanges (cont'd)

The examples of POWERNEXT (FR) & BELPEX (BE)…

- Shareholders:



Same actors in BELPEX as in POWERNEXT ⇒ What is the purpose of BELPEX as the market is deregulated?

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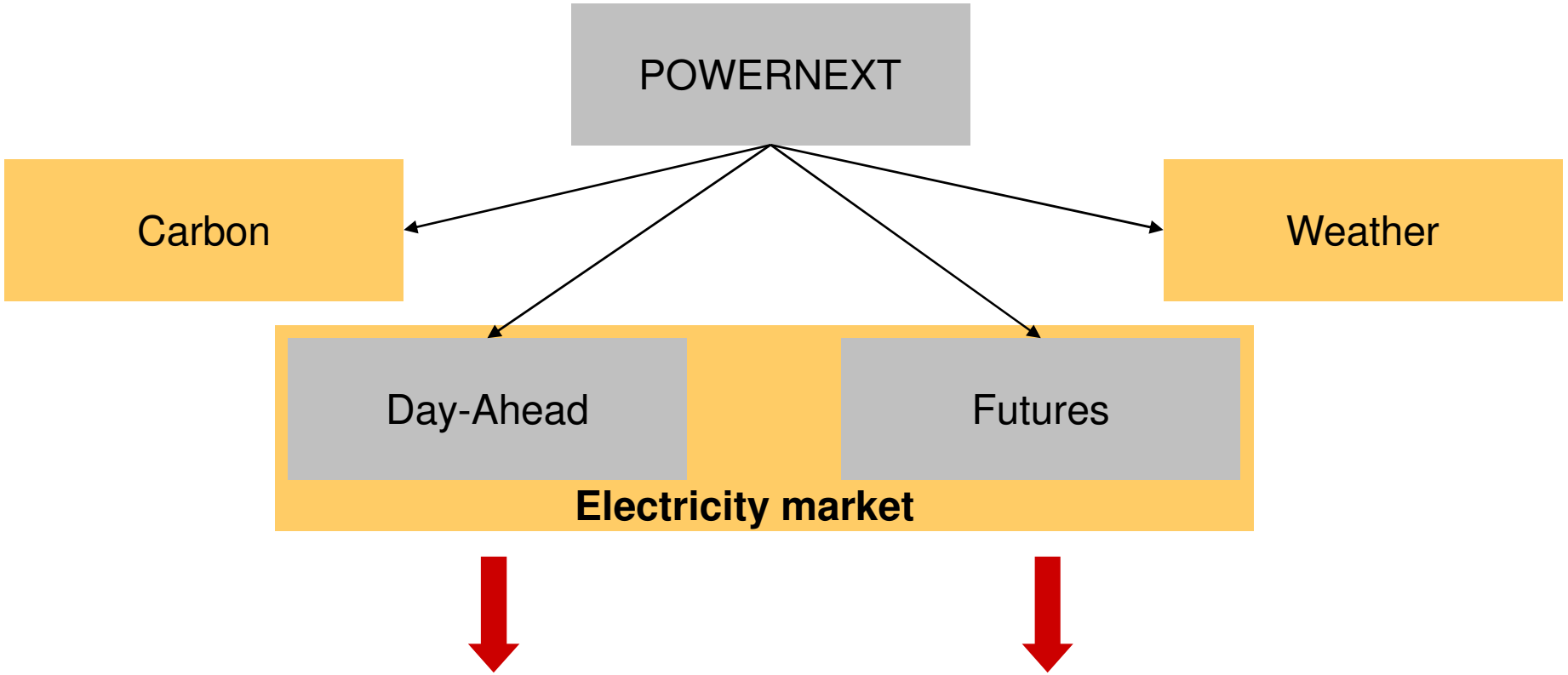
POWERNEXT: market organisation



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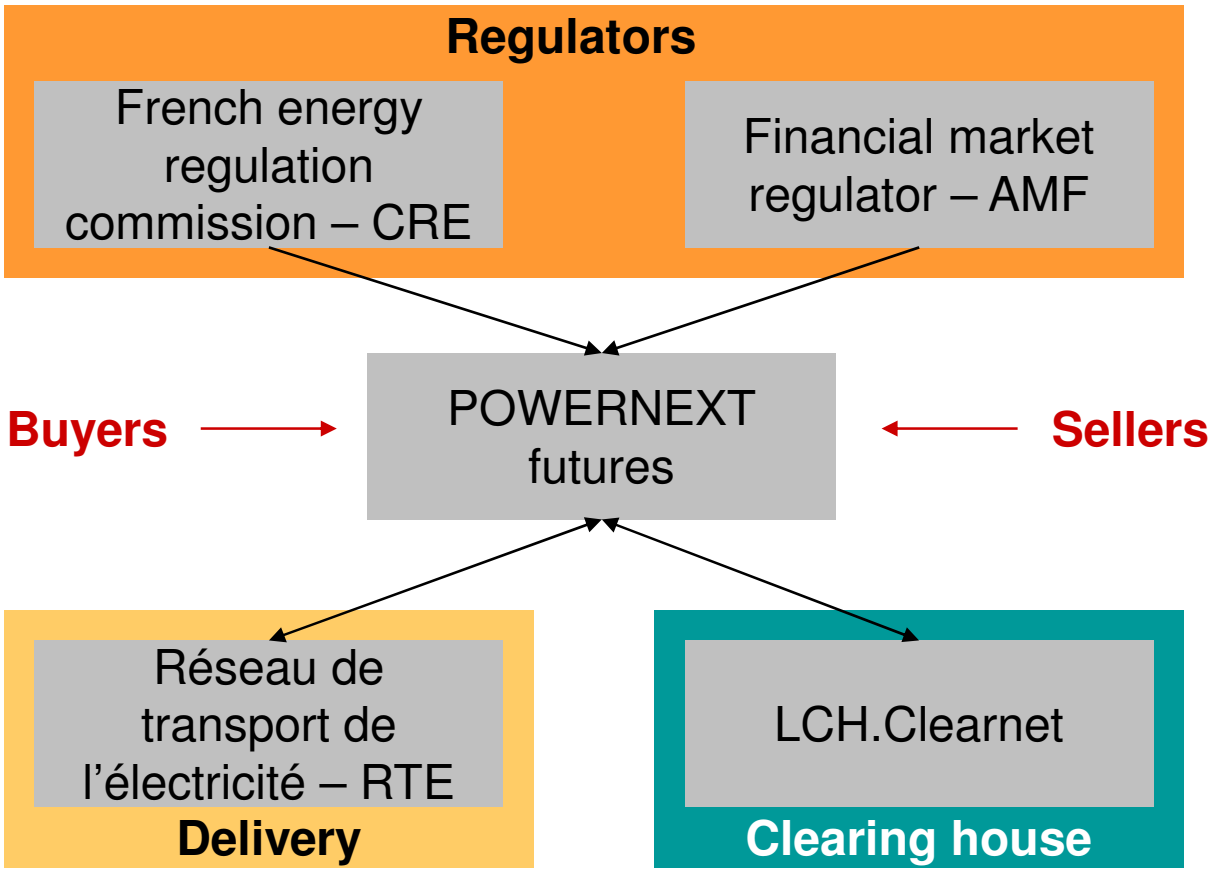
POWERNEXT Futures: market functioning

The different actors:



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Price Risk: Power derivatives

Why do power derivatives merit special attention and what is so unusual about them that we cannot use the familiar and well-developed risk management tools of the financial markets?

- Power derivatives are unique
  - » A number of power derivative products cannot be found in any other markets (e.g. volumetric options)
- The derivatives payoffs are unique
  - » Payoffs are defined by complex functions. The underlying drivers that affect power prices are:
    - ✓ Fuel prices
    - ✓ The availability of the generation units
    - ✓ Demand
    - ✓ Variable operational costs
- The price evolution process is unique

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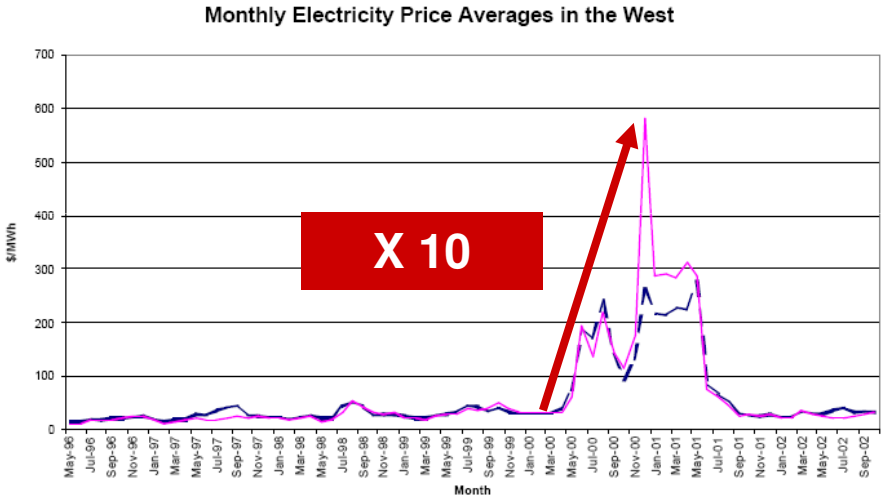
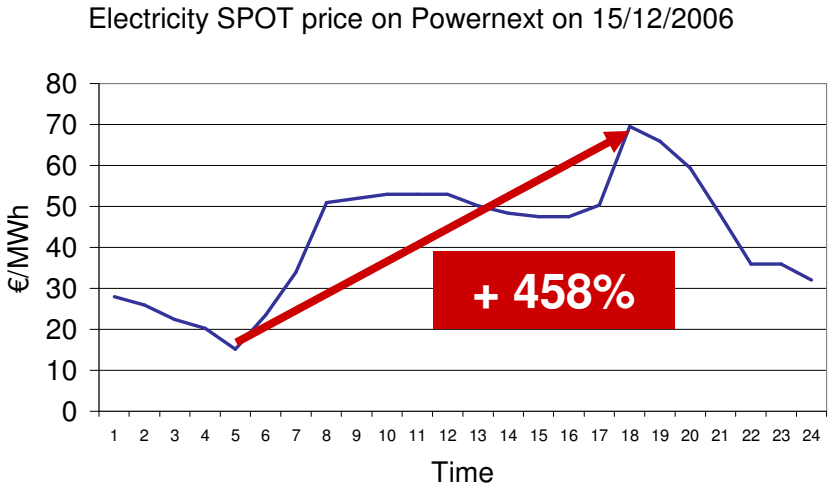
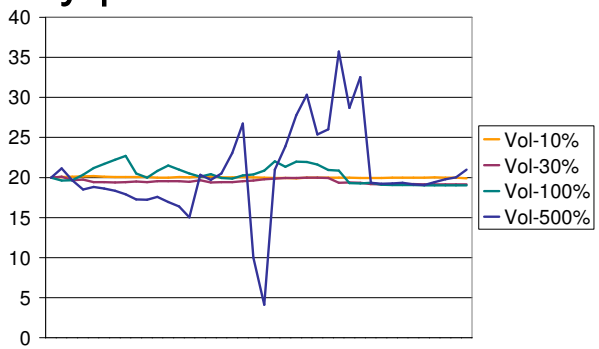
Power derivatives: Price process

- Electricity prices exhibit pervasive spikes of extraordinary magnitude, regime switching, mean reversion, etc





- Electricity prices are characterised by their extraordinarily volatility:



LIBOR rates volatility: 10%-20%

Corn price volatility: 20%-30%

Natural gas prices volatility: 50%-100%

Electricity prices volatility: 100%-500%

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Price Risk: Power derivatives

- There are standard products – futures and options – but
  - » They have unique features due to their predominantly physical nature
    - ✓ They settle differently
    - ✓ They are defined differently.
  - » The commodities underlying these products are different
    - ✓ Power delivered at any particular hour, block of hours, day, week, month, and so on, represent a different commodity because electricity cannot be stored and thus must be studied independently

e.g.

On-peak Power:	In France, power for 12h (8.00 - 20.00) a day for 5 days a week (Monday – Friday)
Off-peak Power:	Power during the low-demand periods (complementary to on-peak)
Base Power:	Power delivered 24h a day

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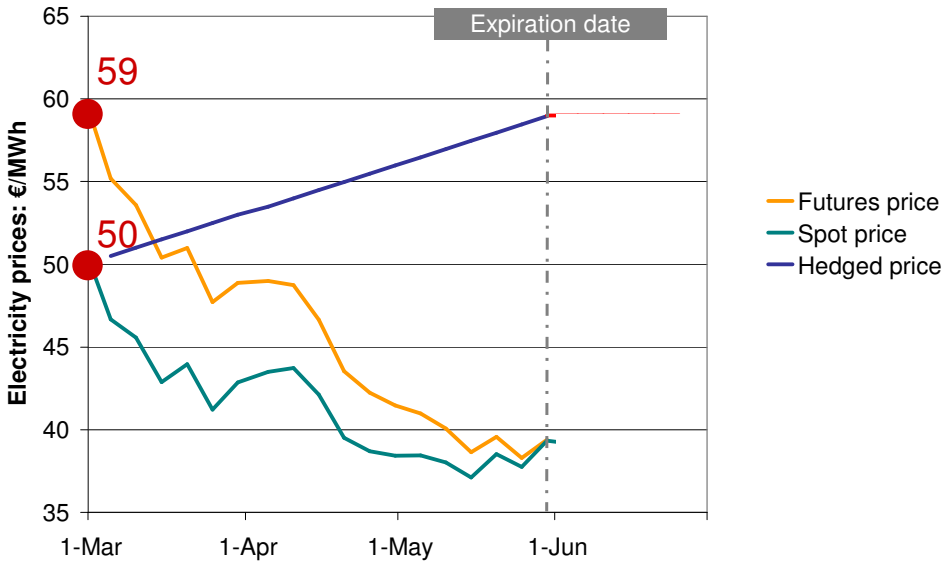
Price Risk: Futures Contract

- Futures contract specifications
  - Volume: 528 MWh
  - Electricity type: On-peak
  - Price quotation: €/MWh
  - Delivery location: French grid
  - Last trading day: The xth business day preceding the first delivery day
  - Delivery period: June 2006
  - Delivery Rate: 2 MWh during the consecutive on-peak hours of the delivery month

Futures prices stay valid during the delivery period

Same characteristics than standard futures



Short futures position bought on March 1st

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Price Risk: Options

Some examples:

- Monthly option: 50 MW | ERCOT | on-peak | June 2002 | $60 | CALL
- Quarterly option: 100 MW PJM off-peak Q3 2002 $25 CALL
- Calendar-year option: 50 MW Cinergy round-the-clock CAL2002 $35 PUT

Options are used by power marketers who need to buy spot power to fulfil their obligations to customers

To protect against price spikes of high magnitude!

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Incoterms for electricity

- Depends on the buyer/seller
- Eg buyer is household: not applicable
- Eg buyer is wholesaler buying electricity from producer (transmission is included in the price of the producer): CIP or DDP
- Eg buyer is wholesaler buying electricity and transmission: Ex Works

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Kyoto Protocol

- The Kyoto Protocol is an agreement made under the United Nations Framework Convention on Climate Change (UNFCCC). Countries that ratify this protocol commit to (i) reduce their emissions of carbon dioxide and five other greenhouse gases (methane, nitrous oxide, sulfur hexafluoride, HFCs and PFCs), or (ii) engage in emissions trading if they maintain or increase emissions of these gases.

- The Kyoto Protocol now covers more than 169 countries globally and over 61.6% of global greenhouse gas (GHG) emissions.

- Developed countries must reduce their collective emissions of greenhouses gases by 5.2% compared to the year 1990 over the 2008-2012 period.

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Electricity from renewable sources

- Directive No 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market.
- What are renewable energy sources:
  - renewable non-fossil energy sources (wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases)
  - “biomass”: the biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances), forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste.

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Objective

- Belgian indicative target: 6% by 2010 from renewable energy sources
- Global indicative target: 12% of gross national energy consumption by 2010 from renewable energy sources
- 22.1% of electricity produced from renewable energy sources in total electricity consumption by 2010 in the EU

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What is the future of renewable electricity in Europe?

- The market for renewable electricity will continue to be shaped by policies, because most technologies still depend on financial support in order to survive in a liberalised power market.

- Therefore the ambition levels of national governments and the EC will be the major determining factors for deployment of renewable electricity in the present decade and beyond.

- Of course, these ambition levels are politically determined and can be influenced by various external factors, such as the introduction of emission trade, the development of a market for biofuels and the enlargement of the EU in the next years.

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Long-term renewable electricity price expectations

- In a EU market for tradable green certificates, the certificates price directly depends on the level of the demand created in this market, in other words the ambition level of policies translated into quota.
- Taken into consideration that the quota are based on the EU targets for 2010, the market price is expected to increase rapidly in the transition period up till 2010, when the market is adjusting to the increase in demand level. In this period, Tradable Green Certificates prices are expected to be in the range of 5-6 ct/kWh. This price is additional to an average electricity commodity price of 3 ct/kWh.
- In the period beyond 2010, the level of the tradable green certificates price is directly dependent on whether new targets are agreed in the EU. If the ambition level does not further increase, and targets will only see a moderate increase in absolute terms as a result of the growth in electricity demand, the tradable green certificates price will stabilise on a lower level of 3-4 ct/kWh. Given this clear relationship and the time horizon of investors beyond 2010, it would be in the interest of further development of the market if governments would already start setting targets for 2015 or 2020.

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Trade flows of tradable green certificates

- When the market for electricity from renewable resources is opened further for international trade, some countries will be importers of renewable energy sources for electricity while others will be exporters. In this respect, the main question is which countries will open their markets and when.

- In the scenarios involving trade under harmonised quota for all EU countries, the main importers will in 2010 be Spain, Portugal and Italy, while the largest exporters will be Denmark, Germany, UK and Ireland.

- Beyond 2010, Sweden also becomes and exporting country, which is due to the growth of onshore wind.