Risks and Risk Management for competitive Electricity Markets
Report from CIGRE TF C5-2.02

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Summary

CIGRE Study committee C5 established a Task Force called Risk Management for World Markets in 2003. This paper presents the work of the Task Force and in addition focuses on Congestion Management as an element in a Risk Management Strategy. The paper is based on results from a survey on risk management.

Congestions and outages are major uncertainties for the electric power industry together uncertainties related to the competitive electricity market. Risk management organisation and methods seems to focus on production and trading. The use of financial instruments is an element in a risk management strategy which includes congestion risks.

Major uncertainties in the short and long term besides market price are regulatory risks. A challenge for the total risk management of the electricity business will be to include the handling of risks related to the regulated business.

Keywords: Risk Management, Market solutions, Congestion Risks, Organisation and Ownership, Market Power

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1. Electricity as a Risky Commodity

The Task Force (TF) is an initiative of Working Group C5-2 "Markets" within the Study Committee C5. Study Committee C5 "Electricity markets and Regulation" was established in 2003.

The scope of the Task Force is to explore risks and risk management methods for market players in competitive electricity markets and include risks related to:

- Type of contract portfolio for Market participants
- Legal documents and Directives from a Regulator
- Ownership of and Contracts with Market institutions
- Market imperfection

This paper summarizes the responses to a questionnaire that was sent to different companies' world wide. We received 37 answers to the questionnaire from 18 different countries described below: Country name(market abbreviation, number of received answers from country): Argentine(AR,4), Australia(AU,7), Brazil(BR,5), China(CN1), Ireland(IR,1), Japan(JP,1), Holland(NE,1), Denmark(NP-NordPool,1) Finland(NP,2), Sweden(NP,1), Norway(NP,2), Peru(PE,1), Poland(PO,1), Portugal(ES-Spanish market,2), Spain(ES,3), UK(UK,1), USA(US,2), Czech Republic(CZ,1).

2. Major uncertainties in the electricity market

The following list includes some major uncertainties in the short-run (less than 2 years ahead) and in the long-run (more than 2 years ahead) for the electric power industry.

As can be seen market price and regulatory risks are the two most important uncertainties both in the short and in the long run. Handling of congestion and the responsibility for outages are uncertainties are linked to regulation and to ownership positions.

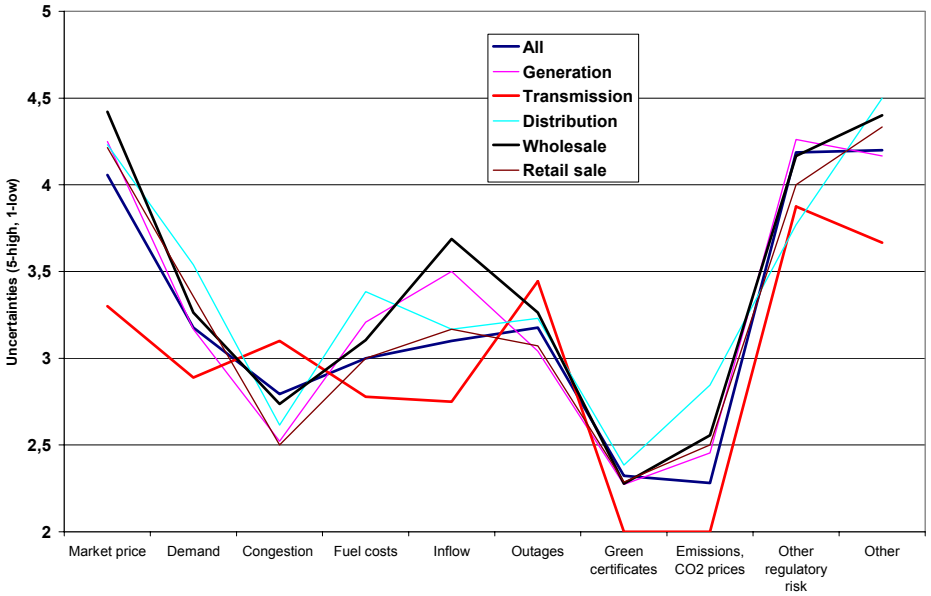

Figure 1 Major uncertainties in the short run (less than two years ahead).

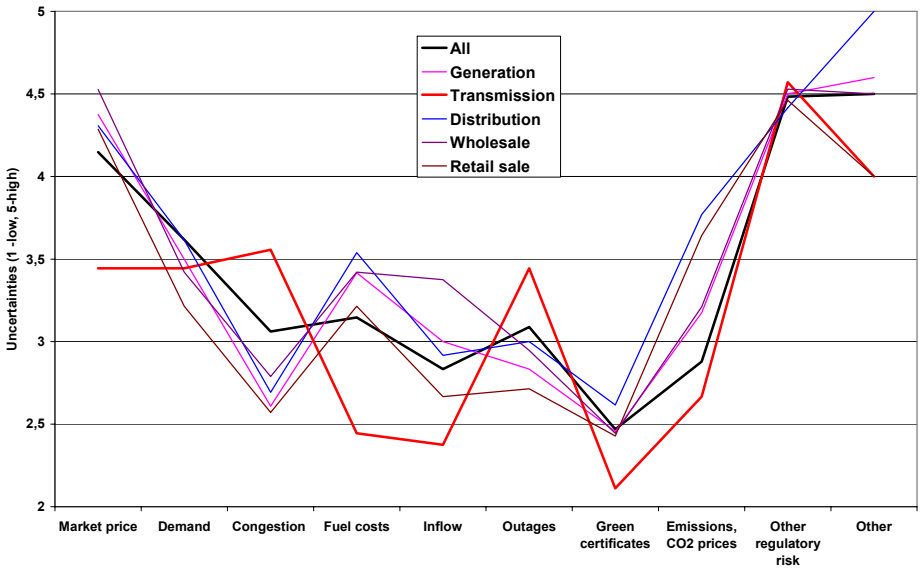

Figure 2 Major uncertainties in the long run (less than two years ahead).

The figure 3 shows very little difference in the evaluation of uncertainties for different types of owners. Only one out of 37 of the companies that has responded to the survey can be characterised as a new player in the market with a sole activity in retail business.

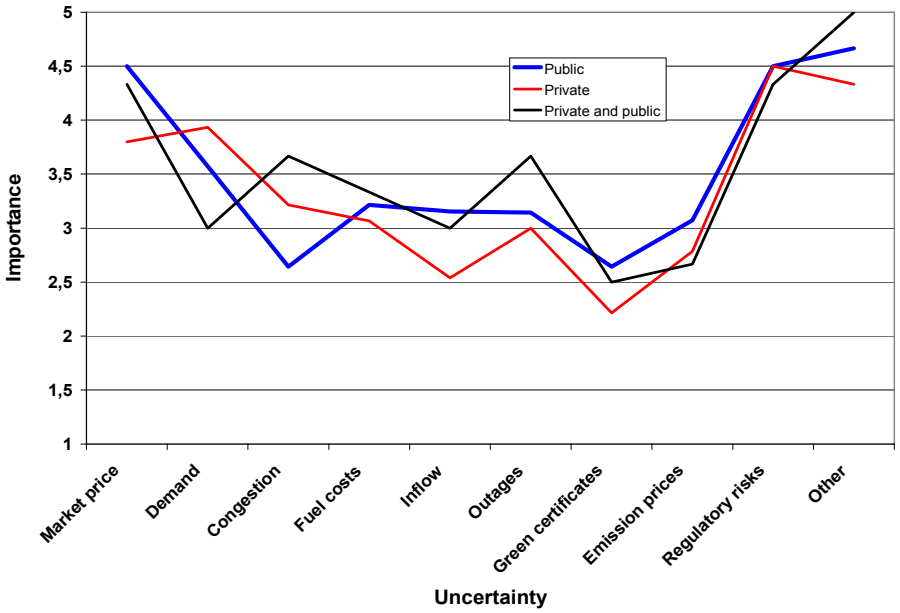

Figure 3 Importance of long-term uncertainties and ownership. All types of public utilities are lumped into one group.

3. Company and Market information

Table I Company activities

Activities	Generation	Transmission	Distribution	Wholesale trading	Retail sales
Number of companies	25	10	14	20	14
Percentage	65.6	27.0	37.8	54.1	37.8

Most of the companies are involved in several activities. There are four pure generation companies; two from Brazil and two from Argentine. There are six pure transmission companies one each from Ireland, Peru, Argentine and the UK and two from the Spanish/Portuguese market. There are two pure distributors one from Argentine and one from the NordPool area. One of the companies from the US is only involved in retail sales.

Table II Company ownership

Ownership	Public (State)	Public (County	Public (Municipal)	Private	Private and public
Number of companies	10	3	4	14	4
Percentage	27.0	8.1	10.8	40.5	10.8
Markets	AU(3), BR(2), IR, CN, NP(2), CZ	AU, BR, NL	NL, NP(3)	AR(4), AU(4), BR(2), JP, NP, PE, ES, UK	ES(4)

Table III The basic organisational model established for system operation in the market.

Basic organisational model	Independent System Operator (ISO)	Transmission System Operator (TSO)	Regional Transmission Organisation (RTO)
Number of answers	8	19	5
Markets	AR, AU(4),BR(3)	AR(4), BR(2), NL, NP(4), PO, ES-PO(5), CZ, UK	AU, CN, IR, US(2)

Different companies in the same market sometimes give different answers. We have not analysed the reason behind this. It may be that questions have not been formulated clear enough. The bracket behind the market abbreviation says how many responses from a given market, e.g. BR(2) means that two of the companies from Brazil has responded as indicated. No bracket means that only one company from the given market has responded as indicated.

Table IV Products traded at the Market Operation (MO) organisation

Type of product	Number of companies	Percentage	Markets
Real-time physical contracts for balancing power	17	45.9	AR,AU, CN,IR, NP(5), PE, PO, ES(2), CZ, UK, US(2)
Day-ahead (spot) physical contracts	20	54.1	AR, BR, CN, JP,NL, NP(6), PO, ES(5), CZ, UK, US
Physical futures contracts	5	13.5	AR, CN, NP, PO, UK
Financial futures contracts	9	24.3	AR, AU, BR, NP(5), UK
Physical forward contracts	4	10.8	AU, JP, NP, UK
Financial forward contracts	11	29.7	AR(3), AU, NP(5), UK
Options	8	21.6	AU, BR, NP(5), UK
Contracts for Difference (CfDs)	9	24.3	AU, BR(2), NP(5), UK
Financial Transmission Rights (FTRs)	3	8.1	US(2), AU

There brokers in all countries except for China Peru, Portugal and the Czech Republic

3. Risk management organisation and products traded

Table V Organisation of risk management within the company

	Number of answers	Percentage
Separate organisational unit for risk management	12	32.4
Risk management is integrated with production planning	10	27.0
Risk management is integrated with trading	17	45.9

Typical risk management organisations are linked to production and trading.

Table VI Products that are traded bilaterally.

Type of product	Number of companies	Percentage	Markets
Physical futures contracts	7	18.9	AR, BR, NL, NP, PO, UK, US
Financial futures contracts	15	40.5	AR, AU(5), BR(2), NP(4), UK, US (2)
Physical forward contracts	12	32.4	BR(2), IR, JP,NL, NP(3), PO, ES, CZ, UK
Financial forward contracts	21	56.8	AR(2), AU(6), BR(3), NP(6), ES, UK, US(2)
Options	21	56.8	AU(7), BR(3), NL, NP(5), ES(3), CZ, UK

Contracts for Difference (CfDs)	20	54.1	AU(7), BR, NP(5), PO, ES(3), UK, US(2)
Financial Transmission Rights (FTRs)	2	5.4	AU(2)

48 % of the answers report that there are no third parties clearing of the bilateral contracts.

The survey shows a variety of different bilateral products for risk management. No overall standardisation of type of contracts between the different market organisations worldwide. Financial contracts and options are important tools in risk management. The use of financial transmission rights is very small which indicates that it is more common to use other financial contracts in the management of congestion risks

4. Risk management and the use of analytical methods

The survey gives an overview of the types of risk management software used by the companies. 70 % of the companies use in house models, 60 % use optimisation models, 49 % use spreadsheet applications and 49 % use commercial available models. Although risk management is a very important and a general issue for a market participant in the electricity market, the use of commercial available models is rather low.

The survey also shows a variety of different analytical methods for risk management. No overall standardisation of type of methods between the different market organisations worldwide.

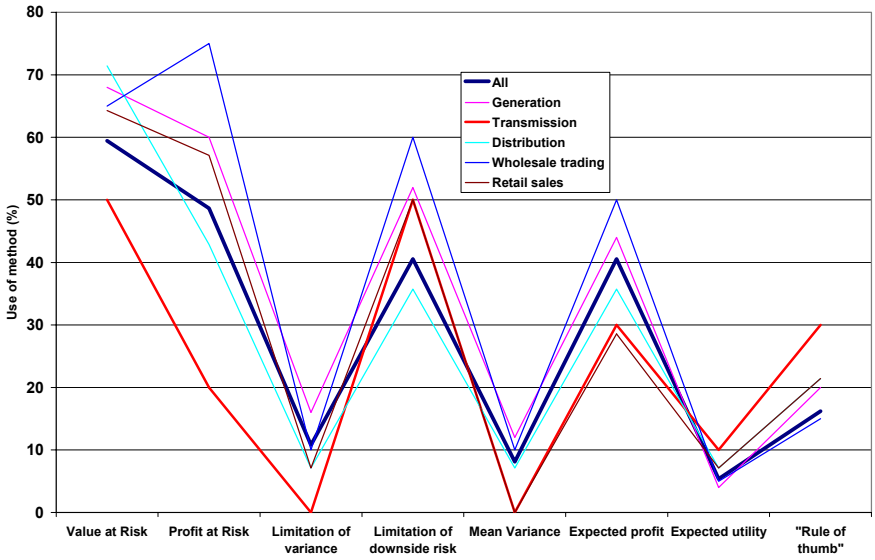

Figure 3 Analytical methods applied for hedging for different types of companies

The results of the survey on applications and the use of analytical methods confirms that the electricity market is still in a transition phase regarding risk management.

5. Risks in Legal documents from Regulator

The survey asked if there is a clear definition of mandate, role and obligations from the Regulator in legal documents (licenses, concessions, directives) for the System Operation, Grid Operation, Market Operation and Market Participants?

Table VII Definition of mandate, role, obligations for basic functions from the regulator in legal documents.

	1 –not clear	2	3	4	5 –clear
The System Operation (SO)	0	1	2	12	20
Categorized on markets		US	AR,ES	AR, AU(3), BR(3), NP(2), PE, ES(2)	AR(2), AU(4), BR(2),CN,IR,JP,NL,NP(3), PO, ES(2), CZ, US
The Grid Operation and Development (GO)	0	1	6	8	20
Categorized on markets		US	AU(2),CN, PE, ES(2)	AR(2),AU(2), BR(2),NP(2)	AR(2), AU(3), BR(2), IR,JP, NL, NP(3), PO, ES(3), CZ, UK, US
The Market Operation (MO)	2	0	2	10	22
Categorized on markets	AR JP		BR, ES	AR, AU(2), BR(2), CN, NP(2), PE, ES	AR(2), AU(4), BR(2),IR, NL, NP(4), PO, ES(3) CZ, UK, US(2)
The Market Participants	1	3	2	11	22
Categorized on markets	JP	AR,BR, PO	ES(2)	AR, AU(3), BR(2),CN, NL, NP(2), ES(1)	AR(2), AU(4),BR(2), IR, NP(3), PE,ES(2), CZ, UK, US(2)

Table VII shows the number of answers categorized from not clear (1) to clear (5) and also which market the different responses where from. For example, in the last column with heading ‘5-clear’ two responses from Argentine (AR(2)) said that there was a clear mandate for System Operation.

Table VII also indicates that an unclear definition of mandate, role and obligations for the basic market functions can be an element in the understanding that regulation is a major uncertainty for the electric power industry.

6. Exercise of Market Power as a Problem

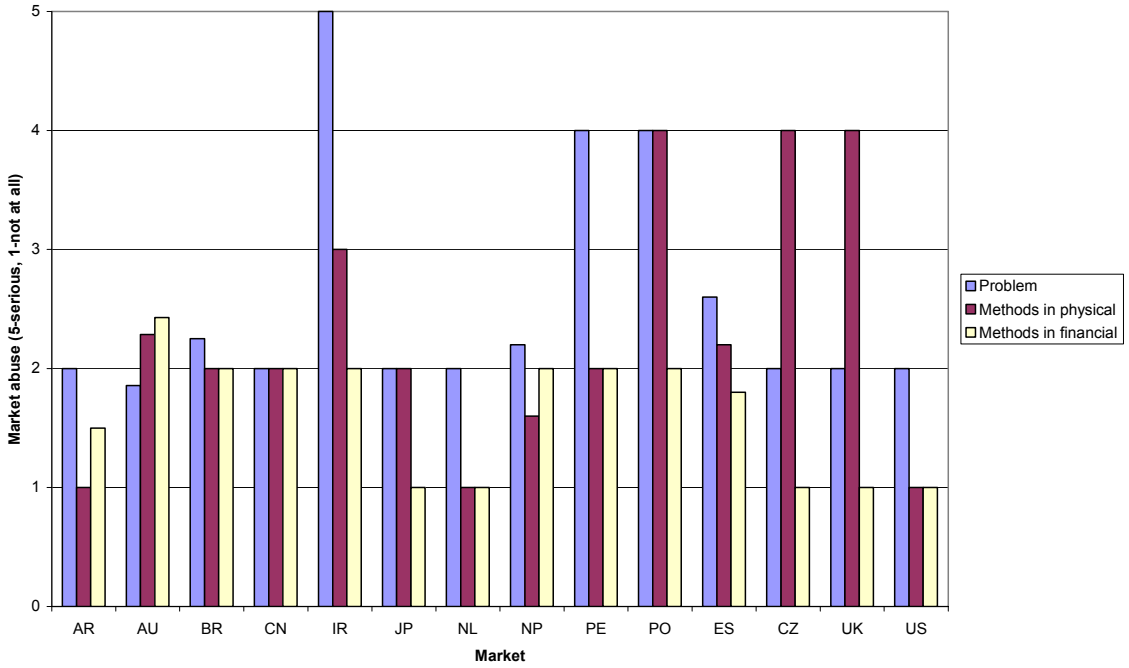

Figure 5 Exercise of market power and influence on risk management methods for physical and financial markets

Figure 5 summarizes the answers to three different questions:

1. To what extent the you consider the exercise of market power is a problem in your electricity market (1- not at all, 5 - very seriously)
2. To what extent the exercise of market power influences the type of risk management used by your company in the physical market (1- not at all, 5 - very seriously).
3. To what extent the exercise of market power influences the type of risk management used by your company in the financial market (1- not at all, 5 - very seriously).

Figure 5 shows the average of the answers for each market, e.g. for the Argentine market the figure shows the average of 4 different for each questions. For the Irish market the exercise of market power is a serious problem. However, this is only based on one response.