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## MEASURES TO SUPPORT THE FUNCTIONING OF THE FINANCIAL ELECTRICITY MARKET

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# MAIN ISSUE OF THE STUDY

- *What is the recommended model or set of principles for TSO involvement in the EPAD market, if such involvement is deemed needed in (any of the) Nordic bidding areas?*

# BACKGROUND: FORWARD CAPACITY ALLOCATION GUIDELINE (FCA GL)

FCA GL requires that regulators

- Assess current hedging opportunities
  - Can available products give *appropriate* hedge? Correlation?
  - Can available products give *efficient* hedge? Trading horizon and liquidity?
- Take action if hedging is found to be inadequate
  - Market consultation regarding the need for intervention
  - Possibly instruct TSO to facilitate cross-border hedging
- Possible reasons for differences in liquidity between bidding zones:
  - Difference in size
  - Different demand for hedging
  - Skewed market structure
  - Dynamic bidding zone delimitation (Norway)

# HEDGING IN THE NORDIC MARKET

## PRICE ZONES



## PRICE RISKS AND HEDGING

- Competitive, but volatile spot prices
- Basic price risks hedged by liquid contracts with reference to the system price
- Remaining risk associated with *the difference between area prices and the system price*
  - Hedged via EPAD contracts
  - No X-border contracts needed
- In 2009, EPAD contracts made up 8% of total turnover, but 30% of open interest year-end
- Low liquidity in some EPADs

# NORDIC POWER VOLUMES 2015

Risk Group	Type	On Orderbook (MWh)	Off Orderbook (MWh)	Total Cleared (MWh)	Part of Total Cleared
ENO Base	DSFutures	706 358 116	459 238 714	1 165 596 830	88.0%
EPAD-Helsinki	DSFutures	4 580 830	38 212 369	42 793 199	3.2%
EPAD-Stockholm	DSFutures	4 808 675	33 886 040	38 694 715	2.9%
ENO Base	Options	54 840	24 177 850	24 232 690	1.8%
ENO Base	Futures	17 185 818	2 852 414	20 038 232	1.5%
EPAD-Sundsvall	DSFutures	1 205 787	6 316 514	7 522 301	0.6%
EPAD-Århus	DSFutures	2 984 633	3 942 370	6 927 003	0.5%
EPAD-Copenhagen	DSFutures	2 271 137	3 898 938	6 170 075	0.5%
EPAD-Malmö	DSFutures	1 412 122	4 393 180	5 805 302	0.4%
EPAD-Luleå	DSFutures	1 565 596	2 697 853	4 263 449	0.3%
EPAD-Oslo	DSFutures	84 936	1 287 042	1 371 978	0.1%
EPAD-Tromsø	DSFutures	63 287	1 267 844	1 331 131	0.1%
EPAD-Riga	DSFutures	200 778	8 784	209 562	0.0%
EPAD-Helsinki	Futures	67 200		67 200	0.0%
EPAD-Stockholm	Futures	33 936	31 248	65 184	0.0%
EPAD-Tallinn	DSFutures	12 312	18 720	31 032	0.0%
EPAD-Malmö	Futures	3 360	21 000	24 360	0.0%
Other	Futures	3 600		3 600	0.0%
EPAD-Sundsvall	Futures	1 680		1 680	0.0%

EPADs represent 9% of total cleared volume in 2015.  
The historical figure has been in the range of 6.5-9% (2008-2015)

# SIX MODELS FOR TSO INVOLVEMENT

Support to market maker in EPAD contracts

- MM gives continuous bid and ask spreads
- TSO agreement with MM or via exchange

Guarantee  ad in EPAD contracts

- The TSO acts as Market Maker
- Requires separate TSO trading body

Auction EPAD contracts

- The TSO auctions EPAD contracts in bidding zones with low liquidity, via existing platform

Auction EPAD combos

- The TSO sells and buys the same EPAD volume in two bid.zones, via existing platform

Auction FTR-options

- TSO sells right to congestion rent btw A and B
- Via separate platform according to FCA GL

Auction FTR-obligations

- TSO trades price difference btw A to B
- Via separate platform according to FCA GL

# SUPPORT MARKET MAKER FUNCTION

## Impact depends on the characteristics of the bidding zone

- No existing market maker
  - Supporting a market maker may be effective
- Existing market maker, but low liquidity
  - Stricter demand on bid-ask spreads may increase liquidity
- Skewed market structure (demand vs supply)
  - Doubtful if introduction of a market maker will be effective
- Low demand for fundamental hedging of area price differences
  - Doubtful if introduction of a market maker can increase the liquidity
  - Assessment and market consultation should show if there is a need

## AUCTION EPADS OR EPAD COMBOS

- Gives a direct increase in the traded volume and increased hedging opportunities
- The market for secondary trade is larger if the auctioned EPAD contract is exactly the same as exchange-traded EPAD contracts and cleared at the same clearing house
- More effective than market maker support if there is a skewed market structure within the bidding zone
- Auctioning of EPAD Combos means that the auctioned buy volume in one bidding zone is the same as auctioned sell volume in another bidding zone
  - EPAD Combos could also be included in a combined auctioning of EPAD contracts - thus enabling different auctioned volumes in the concerned bidding zones



# AUCTION FTR-OPTIONS OR FTR-OBLIGATIONS

- Gives a direct increase in the traded volume
- Lower possibility for increased secondary trading than with EPAD auctions
  - Bilateral secondary trade or resell in later auction on the single allocation platform.
- If congestions in both directions are possible
  - FTR-options less useful for fundamental hedging than FTR-obligations
  - A consumer or retailer wants to hedge the average day-ahead price in a specific bidding zone.
- FTR-obligations can be suitable for fundamental hedging if it can be combined with a liquid area price contract for the other bidding zone
  - We do not expect such combination of FTR-obligations and area price contracts to be preferred in the Nordic market

# DISTORTION OF PRICE SIGNALS?

## Possible distortions in existing financial markets

- Yes, if the liquidity in system price contracts is split between system price contracts and some area price contracts
  - Split liquidity yields less traders and less trading, increased bid-ask spreads and more difficult price discovery
  - Sums up to less efficient financial market and higher trading costs
- Yes, if the same contracts are still traded, but are split between different exchanges connected to different clearing houses
- FTR-options and FTR-obligations
  - May give a push for area price contracts since they are not related to the Nordic system price – reduced trade in system price contracts
  - Liquidity split with another platform since FTRs will be auctioned on the single allocation platform

# STRATEGIC BEHAVIOR

- Questions:
  - Can market participants exploit the proposed instruments?
  - Can the instruments mitigate strategic behaviour if there is market power in the concerned market areas?
- None of the models appear to have substantial impacts

# COMPARISON OF MARKET IMPACTS

	Support market maker function	Auction EPAD contracts	Auction EPAD Combos	Auction FTR- options	Auction FTR- obligations
Liquidity and hedging	++	++	++	0	+
Existing markets	++	++	++	-	-
Strategic behaviour	0	0	0	0	0
Market partici- pants' direct costs	0	0	0	-	-
<b>Overall ranking</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>2</b>

# TSO COSTS AND FINANCIAL EXPOSURE

- Financial exposure
  - Price risks
  - Volume risks/firmness risks
  - Risk premiums
- Administrative costs
- Impact on tariffs and TSO incentives

# APPROACH TO PRICE RISK EXPOSURE (FTR)

- Assumption: Price formation is efficient
- For FTR-options in both directions, the expected value is equal to the congestion rent

$$\text{FTR-OPT}_{AB} + \text{FTR-OPT}_{BA} = \text{CR}$$

- For FTR-obligations in both directions, the expected value is zero

$$\text{FTR-OBL}_{AB} = \text{PTR}_{AB} - \text{PTR}_{BA} = \text{FTR-OPT}_{AB} - \text{FTR-OPT}_{BA}$$

$$\text{FTR-OBL}_{BA} = \text{PTR}_{BA} - \text{PTR}_{AB} = \text{FTR-OPT}_{BA} - \text{FTR-OPT}_{AB} = -\text{FTR-OBL}_{AB}$$

$$\text{FTR-OBL}_{AB} + \text{FTR-OBL}_{BA} = \text{FTR-OBL}_{AB} - \text{FTR-OBL}_{AB} = 0$$

<i>Note: All values are EUR/MWh</i>						Payoff for contract from A to B			Payoff for contract from B to A		
Period	Price A	Price B	Difference, B minus A	Congestion revenue	PTR w/UIOSI	FTR Option	FTR Obligation	PTR w/UIOSI	FTR Option	FTR Obligation	
Case 1	1	20	33	13	13	13	13	13	0	0	-13
	2	20	20	0	0	0	0	0	0	0	0
	3	20	7	-13	13	0	0	-13	13	13	13
<b>Average price or payoff</b>		<b>20</b>	<b>20</b>	<b>0</b>	<b>8,67</b>	<b>4,33</b>	<b>4,33</b>	<b>0</b>	<b>4,33</b>	<b>4,33</b>	<b>0</b>
<b>Accumulated payoff</b>					<b>26</b>	<b>13</b>	<b>13</b>	<b>0</b>	<b>13</b>	<b>13</b>	<b>0</b>
Case 2	1	20	26	6	6	6	6	6	0	0	-6
	2	20	27	7	7	7	7	7	0	0	-7
	3	20	25	5	5	5	5	5	0	0	-5
<b>Average price or payoff</b>		<b>20</b>	<b>26</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>-6</b>
<b>Accumulated payoff</b>					<b>18</b>	<b>18</b>	<b>18</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>-18</b>

Source: Armstrong, et.al. (2015)

# APPROACH TO PRICE RISK EXPOSURE (EPAD)

- Assumptions: Price formation is efficient
  - A surplus area: TSO buys EPADs - B deficit area: TSO sells EPADs
  - Prices always higher in B than in A
- The TSO does not engage in EPADs, i.e. the revenue is equal to the realized congestion rent.

$$\text{TSO revenue} = \text{CR} = P_B - P_A$$

- The TSO only sells EPADs in area B.

$$\text{TSO revenue} = P_{CB} - (P_B - P_{\text{sys}}) + (P_B - P_A) = P_{CB} + P_{\text{sys}} - P_A$$

- The TSO only buys EPADs in area A.

$$\text{TSO revenue} = P_{CA} + (P_A - P_{\text{sys}}) + (P_B - P_A) = P_{CA} - P_{\text{sys}} + P_B$$

- The TSO auctions EPAD combos (sells in B and buys in A)

$$\text{TSO revenue} = (P_{CB} + P_{\text{sys}} - P_A) + (P_{CA} - P_{\text{sys}} + P_B) + (P_B - P_A) = P_{CB} + P_{CA}$$

## TSO revenues:

		Prices			Revenues			Total TSO revenue		
		Price A	Price B	Sys.price	EPAD A	EPAD B	CR	EPAD A	EPAD B	Combo
Case 0	Expected	10	18	14	0	0	8	8	8	8
Case 1	All prices 2 higher	12	20	16	0	0	8	8	8	8
Case 2a	B price higher	10	20	14	0	-2	10	10	8	8
Case 2b	B higher + A lower	8	20	14	-2	-2	12	10	10	8
Case 3a	Sys lower	10	18	12	2	-2	8	10	6	8
Case 3b	Sys lower + A lower	8	18	12	0	-2	10	10	8	8

# SUMMARY OF TSO FINANCIAL EXPOSURE

	PRICE RISK	VOLUME RISK	AUCTION RISK
MARKET MAKER	<ul style="list-style-type: none"><li>▪ CR according to spot price differences</li><li>▪ No change in risk exposure</li></ul>	<ul style="list-style-type: none"><li>▪ No volume risk</li></ul>	<ul style="list-style-type: none"><li>▪ Price of market maker compensation</li></ul>
EPAD AUCTION	<ul style="list-style-type: none"><li>▪ Area price risk and system price risk</li><li>▪ Mitigated by opposite impact on CR</li></ul>	<ul style="list-style-type: none"><li>▪ «Firmness» risk depends on EPAD volume vs. trade volume</li></ul>	<ul style="list-style-type: none"><li>▪ Price should reflect expected value</li><li>▪ Risk premiums depend on volume and hedging effect</li></ul>
EPAD COMBO	<ul style="list-style-type: none"><li>▪ Full hedge of CR if price direction as expected</li><li>▪ Upside if price difference in opposite direction</li></ul>	<ul style="list-style-type: none"><li>▪ «Firmness» risk depends on EPAD volume vs. trade volume</li></ul>	<ul style="list-style-type: none"><li>▪ Price should reflect expected value</li><li>▪ Risk premiums depend on volume and hedging effect</li></ul>
FTR-OPTIONS	<ul style="list-style-type: none"><li>▪ Full hedge of CR with auctions in both directions</li></ul>	<ul style="list-style-type: none"><li>▪ Full firmness risk (in accordance with FCA GL)</li></ul>	<ul style="list-style-type: none"><li>▪ Price should reflect expected value</li><li>▪ Risk premiums depend on volume and hedging effect</li></ul>
FTR-OBLIGATIONS	<ul style="list-style-type: none"><li>▪ No change in risk exposure</li></ul>	<ul style="list-style-type: none"><li>▪ Full firmness risk (in accordance with FCA GL)</li></ul>	<ul style="list-style-type: none"><li>▪ Price should reflect expected value</li><li>▪ Risk premiums depend on volume and hedging effect</li></ul>



# ADMINISTRATIVE COSTS AND RISK PREMIUMS

## MARKET MAKER FUNCT.

## AUCTION EPADS

## AUCTION FTRS

### *Administrative costs*

- Fixed (annual) compensation to the market maker
- Depending on criteria
  - Bid-ask spread
  - Minimum volume

- Auctioning costs (fixed)
  - Via exchange, probably limited
- Settlement of positions

- Single allocation platform participation
  - Co-financing with other TSOs
- Settlement of positions

### *Risk premiums/Auction risks*

- Fixed (annual) compensation to the market maker
  - Depends on criteria
    - Bid-ask spread
    - Minimum volume

- Possible negative risk premium if low demand
  - Depends on liquidity and speculators
  - Easy to adjust

- Possible negative risk premium if low demand
  - Lower liquidity, mainly speculative trade?
  - Not easy to adjust
    - Volumes according to IC capacity

# IMPACT ON TARIFFS AND TSO INCENTIVES

- Increased TSO costs will be borne by market grid customers
  - Net effects: Need to look at changes in total TSO costs
- No impact on TSO incentives expected by any of the models



# REGULATORY RISKS

## 1. Intervening in markets without demand

- No gain, just costs

## 2. Choosing the wrong instrument

- E.g., market maker not efficient in markets with skewed balance between supply and demand
- Careful design of EPAD Combos if risks are to be limited

## 3. Not getting the volumes and frequency right

- High costs (negative risk premiums)
- Volatile prices

## 4. Public procurement process

- Uncertain outcome
- Competition criteria must be carefully aligned with the objectives of the TSO involvement
- Risk for legal appeals and delays – reduced efficiency and uncertain outcomes

# RECOMMENDATIONS

- FTR auctions are inferior to measures supporting the EPAD market in the Nordic market
  - Trading linked to the system price crucial success factor
  - EPADs more suited for hedging than FTRs in the Nordic market
- The measure(s) to support the EPAD market should be assessed on a case-by-case basis (rather toolbox than one single measure)
  - Clearly identify missing hedging opportunities
    - Are market participants sufficiently hedged in other instruments?
  - Identify the cause of the missing opportunities
    - Supply, demand, balance?
  - Determine dosage on a case-by-case basis
    - Consultation with market participants and exchanges
  - If EPAD auctions: Assess TSO risk exposure
    - Individual auctions or EPAD combos?
    - If EPAD combos – what contracts should be combined?



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