




## Intraday Capacity Pricing Workshop

Den Haag | 10th October 2011



- 
1. Auction-based mechanism of intraday capacity pricing
    - Functional overview
    - Economic and functional issues
  2. Continuous capacity pricing mechanism
    - Functional concept
    - Economic rationale
  3. How to measure welfare gains in continuous markets ?
  4. Summary and open questions

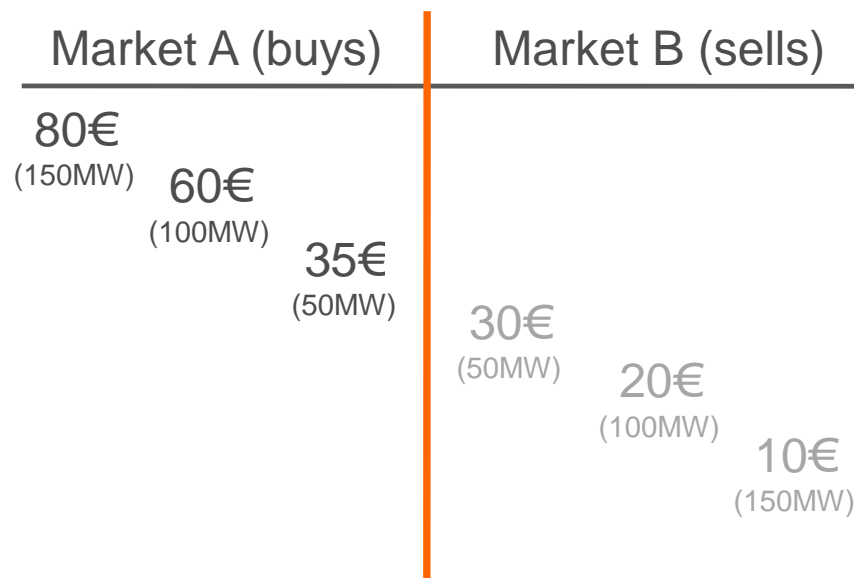
- 
1. Auction-based mechanism of intraday capacity pricing
    - Functional overview
    - Economic and functional issues
  2. Continuous capacity pricing mechanism
    - Functional concept
    - Economic rationale
  3. How to measure welfare gains in continuous markets ?
  4. Summary and open questions

## What happens when additional capacity appears in the intraday timeframe?

- This already happens every day :
  - **When TSOs give capacity** (at the beginning of the trading session – maybe after intraday recalculation in the future)
  - **When capacity is netted**
- **Issue** : When this happens, part of the cross-OBK\* which was not visible becomes visible (*see example next slides*)
  - Cross-spreads cases need to be avoided on the screen
  - Automatic matching can solve these cases
- **Food for thought:** *Should these situations – where capacity actually increases – be considered as « congestion cases »?*

\* OBK = Order book

## Functional overview of the mechanism

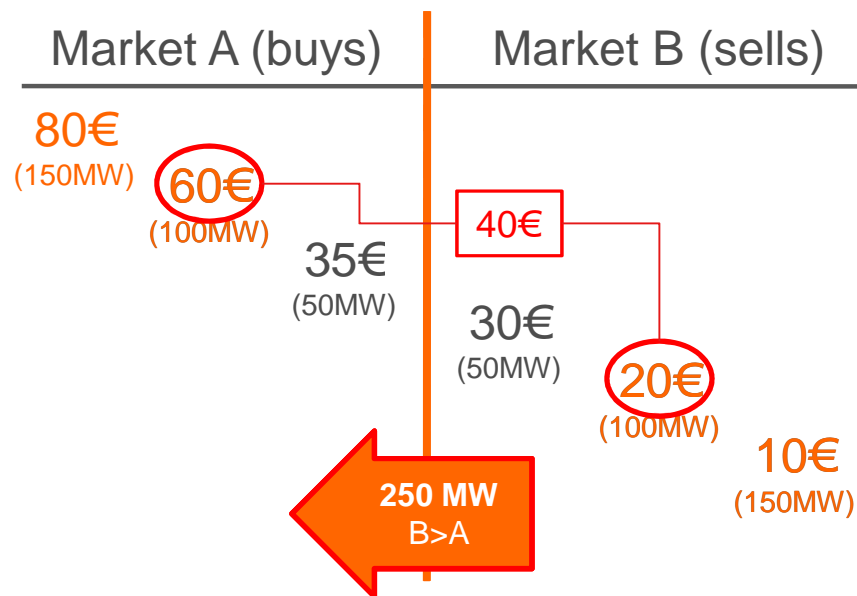


*Without congestion rent:*

### Spreads are crossed:

- No capacity available between markets A and B (or insufficient capacity)
  - **The cross-priced orders are not visible from one hub to the other**

## Functional overview of the mechanism



*Without congestion rent:*

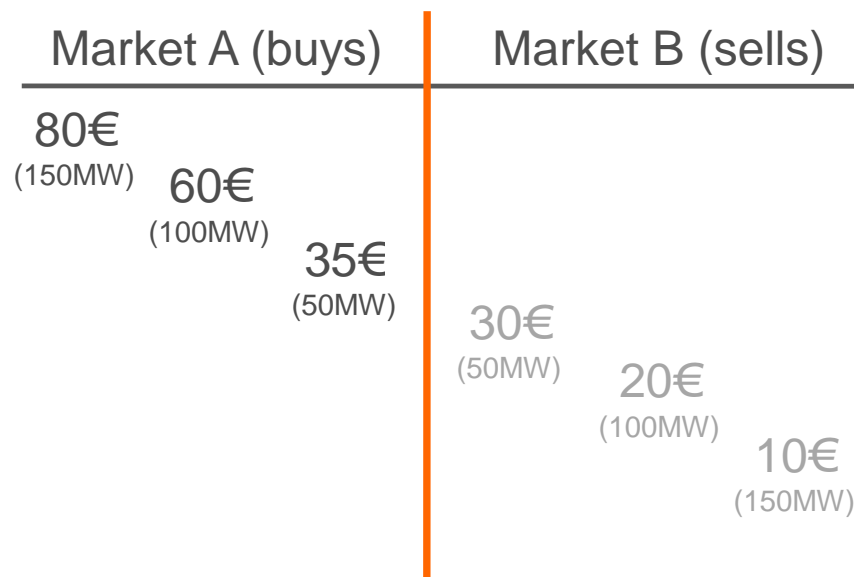
**Spreads are crossed:**

- Capacity is made available between markets A and B

→ **The cross-priced orders need to be automatically matched**

- Best bid-ask executed first
- Automatic matching stops when capacity is used
- Common matching price can be set as the mid of the last matched orders (here 40€)
- **Pay-as cleared mechanism**

## Functional overview of the mechanism

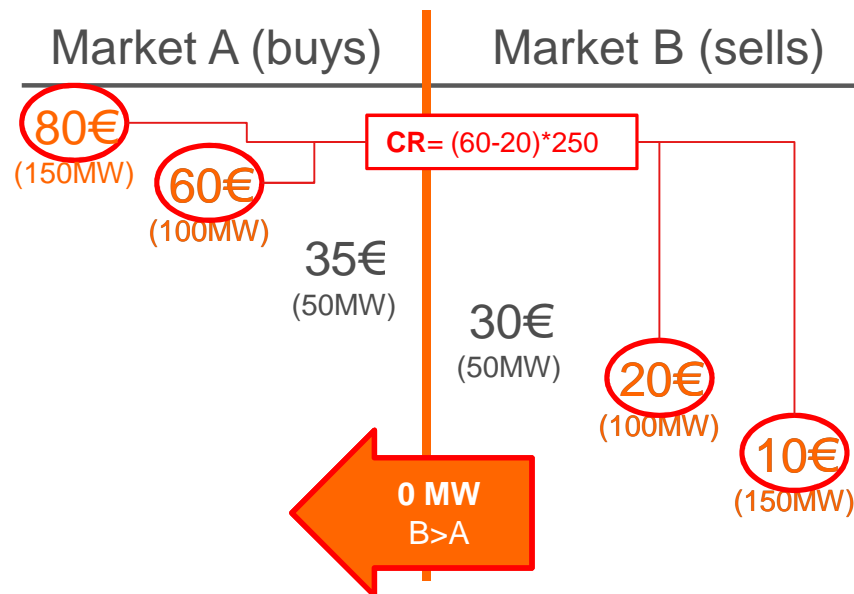


*With a congestion rent:*

**Spreads are crossed:**

- No capacity available between markets A and B (or insufficient capacity)
- **The cross-priced orders are not visible from one hub to the other**

## Functional overview of the mechanism



*With a congestion rent:*

**Spreads are crossed:**

- Capacity is made available between markets A and B

→ **The cross-priced orders need to be automatically matched**

- Best bid-ask executed first
- Automatic matching stops when capacity is used
- **Pay-as-bid auction mechanism, with the Congestion Rent materialized as the bid/ask spread**



## Counter-intuitive economic effects:

- In the auction-based mechanism, capacity is subject to pricing **in situations where its amount actually increases:**
  - When TSOs provide new capacities on the allocation platform
  - When netting creates additional capacity in one direction
- **It is when capacity is the least scarce than it is subject to a price**
- This provides counter-intuitive, thus **potentially misleading price signals**
- The mechanism **fails to anticipate congestion cases**

## Counter-intuitive economic effects:

- The auction-based mechanism does not modify the market results compared to existing procedures of automatic cross-matching:
  - Capacity is allocated to the same orders
  - No additional volumes are matched
  - **No additional « economic surplus » or « welfare »** is created
- **The same economic surplus** is now split between:  
Consumer surplus + Producer surplus + **Congestion Rent**
- The auction-based capacity pricing mechanism **does not enhance the efficiency of capacity allocation, it only redistributes the surplus** in a different manner
- **Note:** *Creation of a congestion rent is not per se negative – however, doesn't it need to be justified by the enhancement of capacity allocation ?*

## Some functional issues:

1. **Occasional « mini-auctions »** to resolve cross-OBK cases have a minimum impact on the trading session - **However multiplications of auction sessions would cause severe adverse effects for continuous trading:**
  - Shift from a continuous market model to an « auction-based » intraday market, which no longer secures the supply and demand balance in real-time
  - In breach with the *Framework Guidelines* with respect to the intraday Target Model?
2. **Uncertain market behaviour at the moment of the auctions:**
  - If the time of capacity recalculation is known in advance, risk of a liquidity drawn (order withdrawals) from market participants until the capacity gets free again
  - If the time of capacity recalculation is not known, can we assume that the price-spread in the OBK truly reflects the « willingness to pay » the cross-border capacity at a given time?
3. **Inclusion of OTC capacity requests is not an important issue:**
  - The CMM/SOB can collect and rank the PXs capacity requests (implicitly priced) and the OTC capacity requests (explicitly priced on a “shadow auction” platform)
  - In any cases, inclusion of OTC capacity request in such an auction mechanism is not likely to produce significant enhancements of capacity allocation efficiency: arbitrage between OTC and PXs prices should already ensure today that the capacity is allocated to the best energy deal in most of the cases (subject to NRAs monitoring)

## Any cost / benefit case? Possible congestion rent to be extracted from an auction-based intraday capacity pricing mechanism in NWE

NWE total volume (TWh)	<b>23,5</b>
NWE CB volume (TWh)	<b>3,5</b>

Yearly NWE Intraday Congestion Rent (M€)						
% of CB congestion / av. spread €	0,5	1	2	3	5	10
0,33%	0,006	0,012	0,023	0,035	<b>0,058</b>	0,116
1%	0,018	0,035	0,071	0,106	0,176	0,353
5%	0,088	0,176	0,353	0,529	0,881	<b>1,763</b>
10%	0,176	0,353	0,705	1,058	1,763	3,525
25%	0,441	0,881	1,763	2,644	4,406	8,813
50%	0,881	1,763	3,525	5,288	8,813	17,625
75%	1,322	2,644	5,288	7,931	13,219	26,438
100%	1,763	3,525	7,050	10,575	17,625	35,250

### Assumptions:

- **NWE total intraday volumes:**  
10TWh (DE) + 1TWh (FR) + 0.5TWh (Benelux) + 2TWh (Nordic) + 10TWh (UK) = **23.5TWh**
- **NWE cross-border volumes:**  
~15% of total turn-over (as observed on the DE-FR border) = **3.5TWh**
- **Price-spread benchmark:**  
Average price spread between the EPEX Spot FR and DE markets was ~5€/MWh until Q2'11
- **Benchmark for the share of trades subject to a "mini-auction" matching:**  
0.33% of total intraday cross-border volumes in EPEX Spot FR-DE market until Q2'11

- The amount of the congestion rent will be a factor of:
  - The amount of cross-border trades subject to pricing of capacity
  - The size of the market price-spread (i.e. willingness to pay the capacity)
- For near to 50% of the cases, **the annual NWE congestion rent would be <1M€** (and would need to be shared between 10 TSOs)
- Cases where the congestion rent is >1M€ correspond to **quite extreme scenarios** (10€ price spreads, >10% cross-border trades subject to auction-matching)

*Are implementation costs of the mechanism proportionate to the expected benefits?*

1. Auction-based mechanism of intraday capacity pricing

- Functional overview
- Economic and functional issues

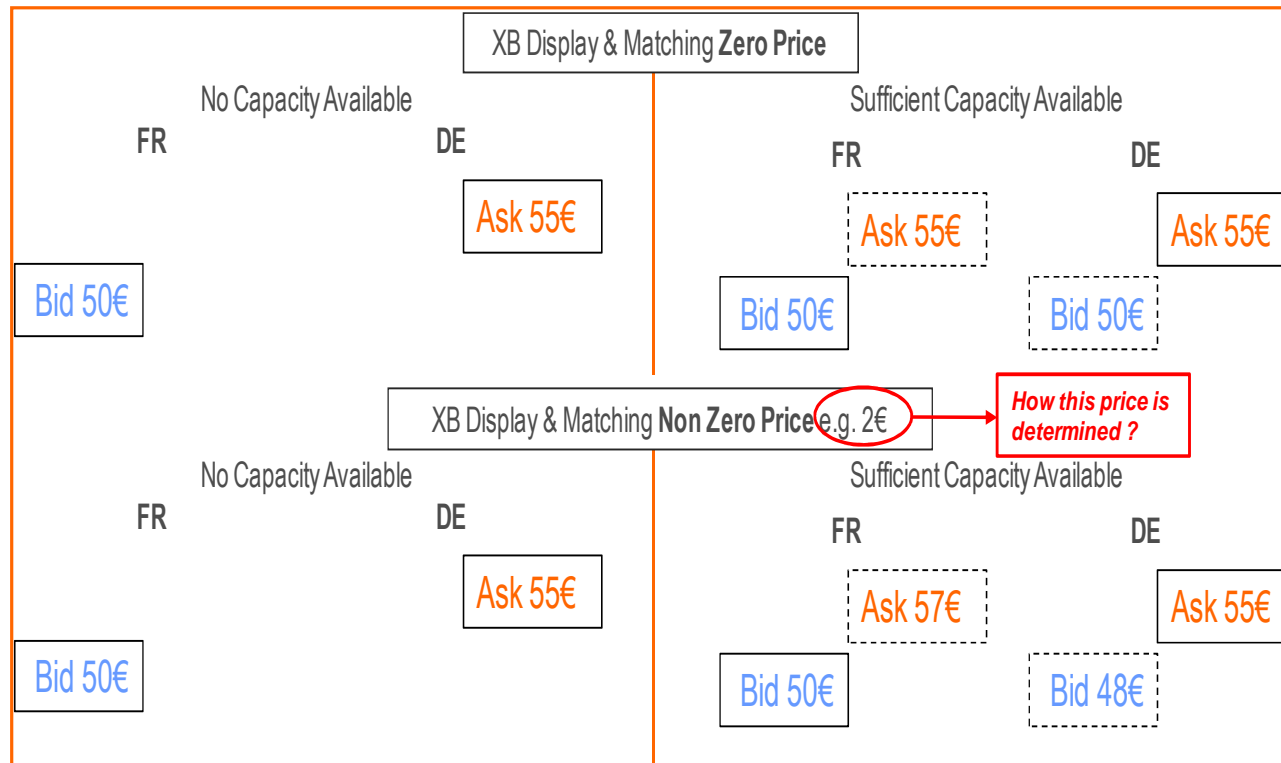
2. Continuous capacity pricing mechanism

- Functional concept
- Economic rationale

3. How to measure welfare gains in continuous markets ?

4. Summary and open questions

# Continuous capacity pricing mechanism: Functional concept

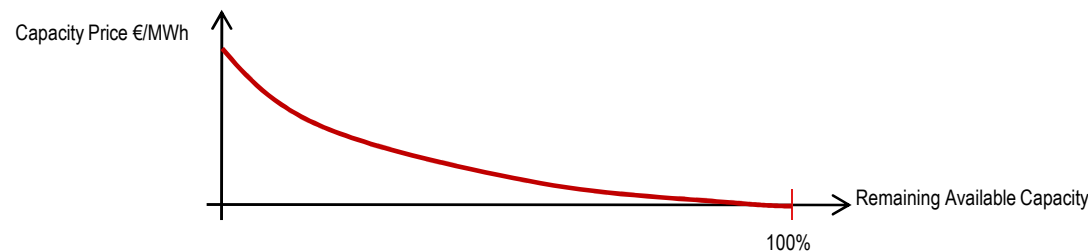


- Continuous pricing of the capacity should be functionally simpler and more adapted to continuous trading:
  - Based on a constant or dynamic price modelled on parameters (see next slides)
  - Capacity price to be reflected real-time on the energy price displayed continuously on the PXs OBK
  - Capacity price can equally apply to explicit capacity requests, without operational problem
  - Note however that **XB orders are made less competitive than local orders** due to the cross-border capacity price


The main issue remains **how to determine the capacity price?**

## Continuous capacity pricing mechanism: **Economic rationale** (and related political issues)

- **The efficiency gains of continuous capacity pricing** relies on the assumption that the price set for the use of the capacity **will incentivise a timely use of the capacity, for the period when it is needed the most** – i.e. when the willingness to pay for it is the highest
  - *This is the only way capacity pricing can be seen as a mean to enhance capacity allocation, compared to situation where capacity is allocated for free*
- Such pricing of the capacity will need to be based on the following factors:
  - **Probability of future congestion**
  - **Expected willingness to pay** for the capacity in a given congested situation / potential welfare loss for not allowing highly-valued bids to be matched in the future



- *These parameters need to be set by NRAs and TSOs*
- *However, these are very difficult to evaluate, without using proxies - setting these parameters could likely be the result of a negotiation as much as a real estimation*

- 
1. Auction-based mechanism of intraday capacity pricing
    - Functional overview
    - Economic and functional issues
  2. Continuous capacity pricing mechanism
    - Functional concept
    - Economic rationale
  3. How to measure welfare gains in continuous markets ?
  4. Summary and open questions



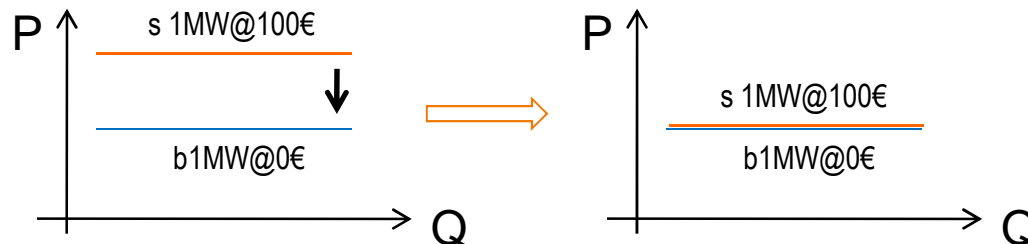
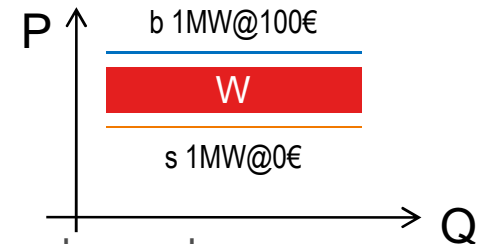
## The « One-million \$ question »: How to measure welfare gains in continuous markets?

- A non-ambiguous and commonly agreed definition of capacity allocation efficiency is necessary as soon as we await for an improvement of this efficiency
  - It is needed to be able to **measure capacity allocation efficiency** : otherwise it is impossible in practice (e.g. on examples or simulated cases) to assess to what extent capacity allocation has been made more efficient
  - Ideally the definition of capacity allocation efficiency should rely on an agreed economic rationale and be shared by market members
  - « **Social Welfare** » is commonly used in the day-ahead auction-based markets as an indirect measure of capacity allocation efficiency  
*(more precisely, the difference of social welfare between coupled and uncoupled configurations with same order books reveals the benefit from capacity allocation; it is commonly agreed that maximizing this difference, hence maximizing the coupled welfare is equivalent to maximizing capacity allocation)*
- **Can an similar « Social Welfare » criteria be designed for intra-day continous markets ?**

# The « One-million \$ question »: How to measure welfare gains in continuous markets?

## Is Welfare a good indicator of efficiency for a continuous market ?

- Day-ahead welfare
  - Assume a buy order 1MW@100€ and a sell order 1MW@0€
  - Matching these two orders produces a welfare of 100€
- In continuous order books, sell orders **always** have a higher price than buy orders
- Matching occurs only when one order moves towards the other

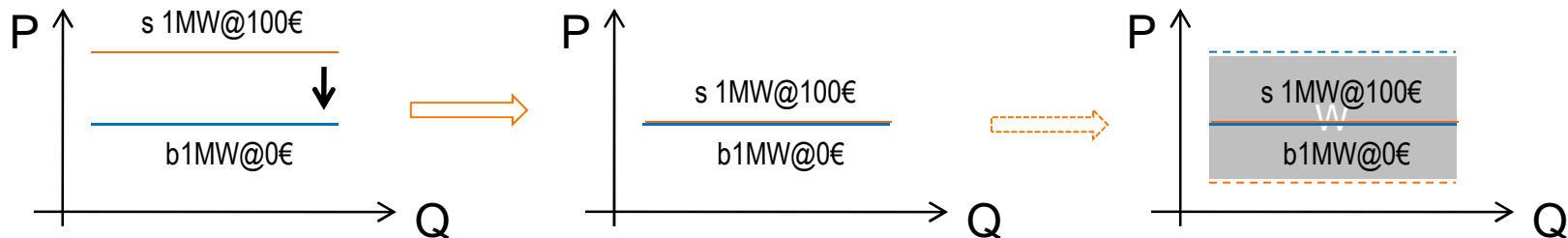
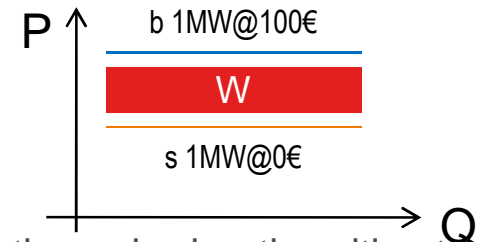


- **The welfare (as measured in the day-ahead auction markets)** produced by the matching of these two orders **is null**, once prices have moved to allow this matching
- The nullity of the welfare will be always satisfied and will not depend on capacity allocation

# The « One-million \$ question »: How to measure welfare gains in continuous markets?

## Is Welfare a good indicator of efficiency for a continuous market ?


- Day-ahead welfare
  - Assume a buy order 1MW@100€ and a sell order 1MW@0€
  - Matching these two orders produces a welfare of 100€
- In a continuous market, we never know the « dead limit » price of the order i.e. the ultimate limit the member is ready to put his order in the order book



- **Welfare remains hidden, never measurable**

**Note:** More practicable indicators can be used today to measure the efficiency of intraday capacity allocation mechanisms

- Impact on local markets liquidity
- Number of users of the cross-border capacity
- Total volume of cross-border capacity used

- 
1. Auction-based mechanism of intraday capacity pricing
    - Functional overview
    - Economic and functional issues
  2. Continuous capacity pricing mechanism
    - Functional concept
    - Economic rationale
  3. How to measure welfare gains in continuous markets ?
  4. **Summary and open questions**

## Open questions for NRAs and TSOs:

- What should be the « objective function » for the capacity pricing mechanism?
- How to define and measure capacity allocation efficiency?
- What are the expected amount of « intraday congestion cases »?
- How to build the cost / benefit analysis for intraday capacity pricing?
- How to involve market participants for the evaluation of the impact of the mechanism?

	<i>1. Auction-based mechanism</i>	<i>2. Continuous-based mechanism</i>
<b>Pricing mechanisms options</b>	<ul style="list-style-type: none"> <li>• Operational issues due to the inflexibility of the mechanism</li> <li>• No creation of welfare, but mere redistribution of economic surplus</li> <li>• Counter-intuitive pricing effect</li> </ul>	<ul style="list-style-type: none"> <li>• Simpler set-up and more adapted to continuous trading</li> <li>• Potential efficiency gains in the allocation of capacity</li> <li>• How to set the pricing parameters?</li> </ul>
<b>Conceptual and regulatory issues</b>	<ul style="list-style-type: none"> <li>• Estimation of welfare (therefore measurement of efficiency gains linked to capacity pricing) is very tricky</li> <li>• Is there a « business case » for intraday capacity pricing (with respect to expected congestion rent)?</li> </ul>	

# EPEXSPOT

EUROPEAN POWER EXCHANGE



Thank you for your attention !

**Contacts:**

[d.assaad@epexspot.com](mailto:d.assaad@epexspot.com)

[t.henri@epexspot.com](mailto:t.henri@epexspot.com)

[www.epexspot.com](http://www.epexspot.com)

