

Load Control in the Norwegian Balance Market

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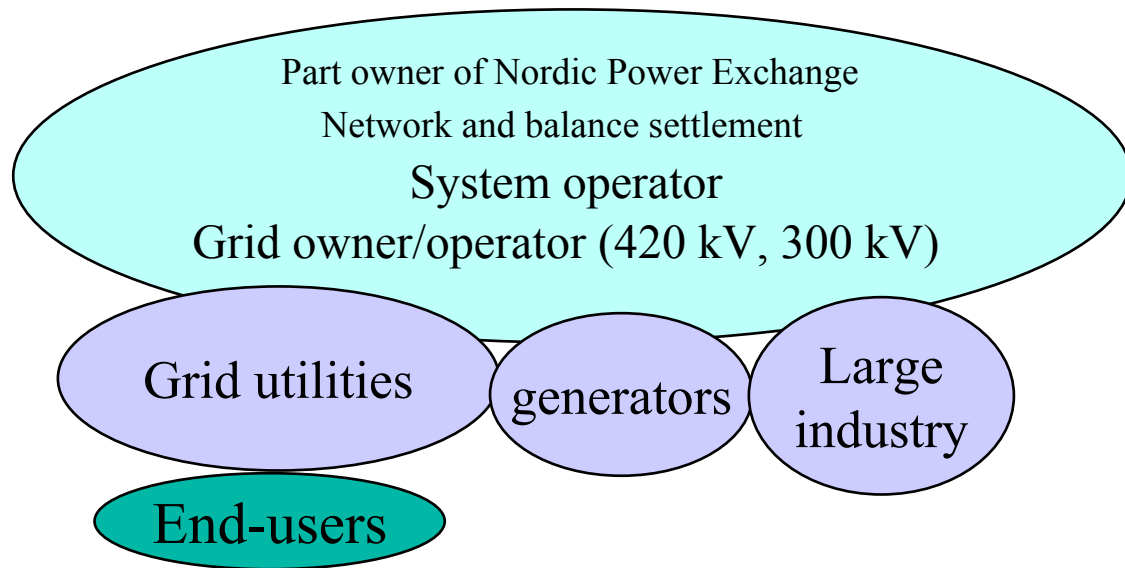
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Statnett: The Norwegian TSO

a state owned enterprise

Main revenues from transmission customers



Business idea: "***Statnett shall efficiently promote and facilitate a well-functioning electricity market***"

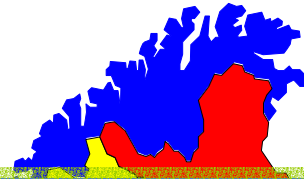
Demand response a necessary tool

The Nordic Power Market

4 countries, 1 common Power Exchange

Ca 50% hydro (99% in Norway), ca 45% thermal, increasing share of wind power

Peak load: ca 67 000 MW (23 000 MW in Norway)



The Energy and Capacity Balance has become tighter the last 10 years

Norwegian DR Potential ca 5 000 MW?

Financial market
Elspot = Day-ahead market (DAM), (hourly)
- Market share: 30% of total consumption
- Zonal pricing, Market splitting between areas

Elbas: Balance adjustment market (hourly)
- hourly market for deliveries today and tomorrow

Regulating Capacity Market (RCM)
(balance market)

=TSO tool in operational phase
- frequency and area export/import control, counter-trade



Relation between RCM (Balance Market) and RCOM (Capacity Reserves Market)

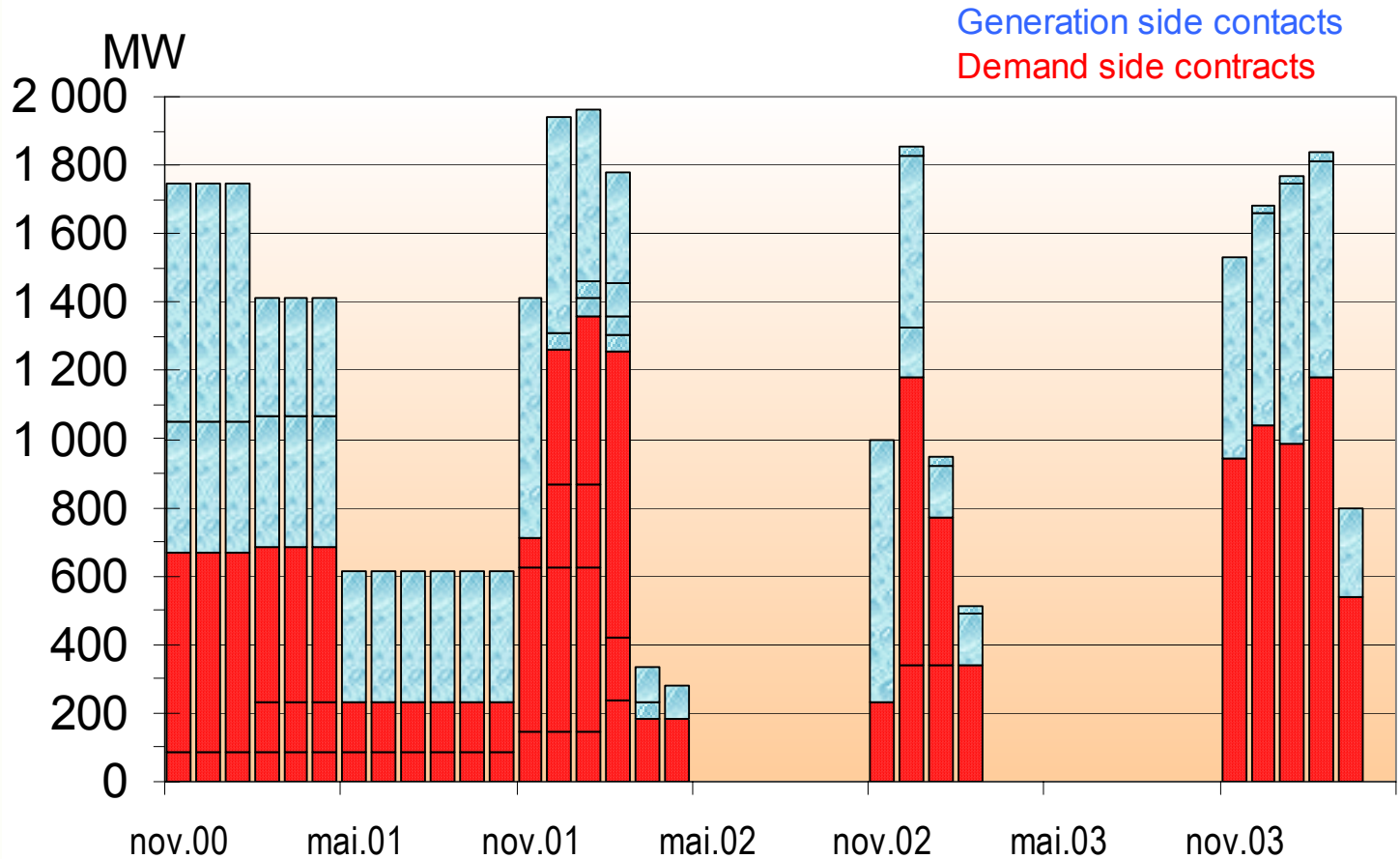
Principle RCM bid list

(Bid prices are illustrating examples)

Bid Price	Name	Volume
(Forced load shedding)		
xxx	Cellouid1(d)	25 MW
xxx	Ferro1 (d)	50 MW
xxx	Aluminium1(d)	100 MW
50	Gen7 (g)	200 MW
40	Gen6 (g)	50 MW
40	Gen4	100 MW
....
32	Gen2	50 MW
31	Gen1	200 MW
Day-ahead market price = 30 €/MWh		
29	Gen5	50 MW

- The Regulating Capacity Market (RCM) is a TSO tool for handling imbalances in the operational phase
 - 15 minutes' notice time
- The Regulating Capacity Options Market (RCOM) is a market-based ancillary service providing **extra** RCM resources in peaking periods (winter)
 - TSO requirement: > 2000 MW
- Monthly RCOM auctions (weekly from autumn 2004)
- **RCOM contractors** receive an option price
 - Obligated to submit RCM bids
 - Decide RCM bid price themselves

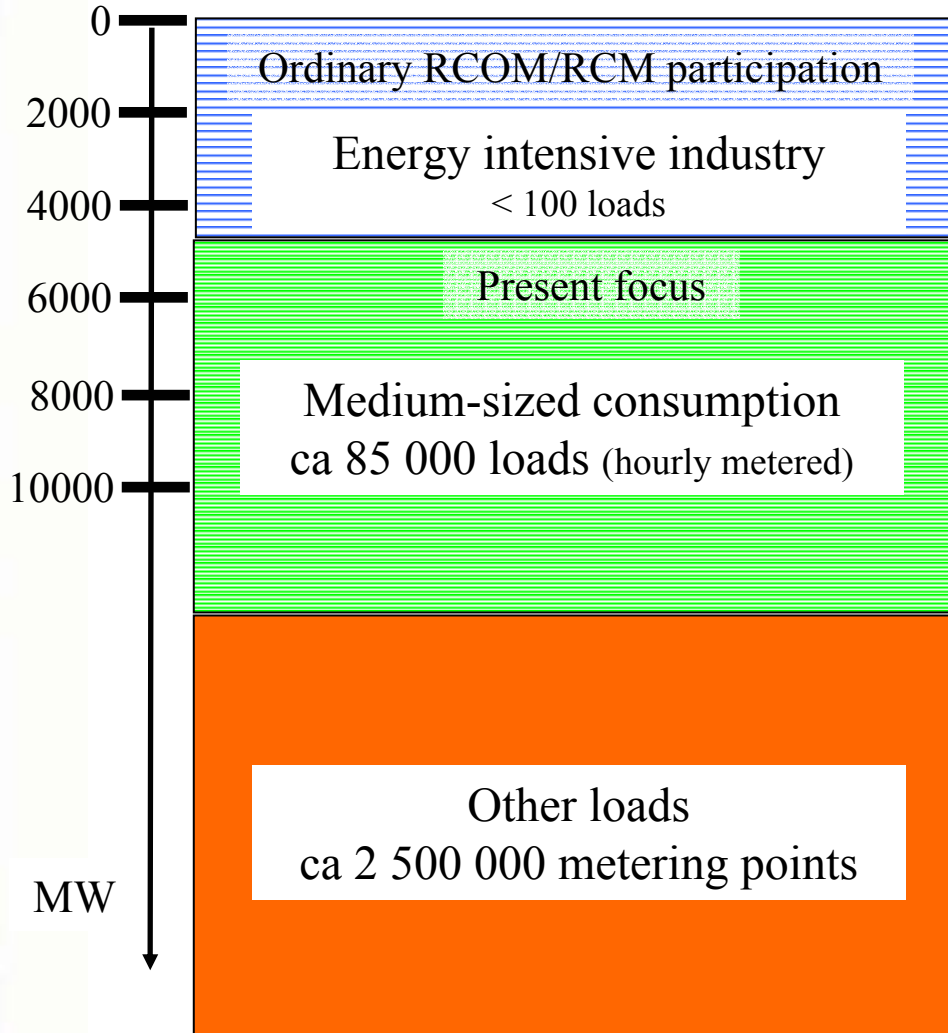
Historic RCOM Purchase



RCOM experiences

- Successful participation from large industry due to:
 - Predictable revenues (Option price typically 800 – 2000 €/month)
 - Acceptable technical requirements (notice time, duration etc.)
 - High power market competence
 - Large units (> 25 MW)
- Change in attitude:
 - "process protection" => "business opportunity"
 - Industry now also submitting price-flexible bids in day-ahead market
- Short-term risk of capacity shortage avoided, **but**:
 - Frequent activations may be negative for the industry
 - Possible high industry activation costs may have negative consequences (power market, society)
 - Other consumption has lower activation costs?

Statnett focus on medium-sized consumption (1) Justification and challenges

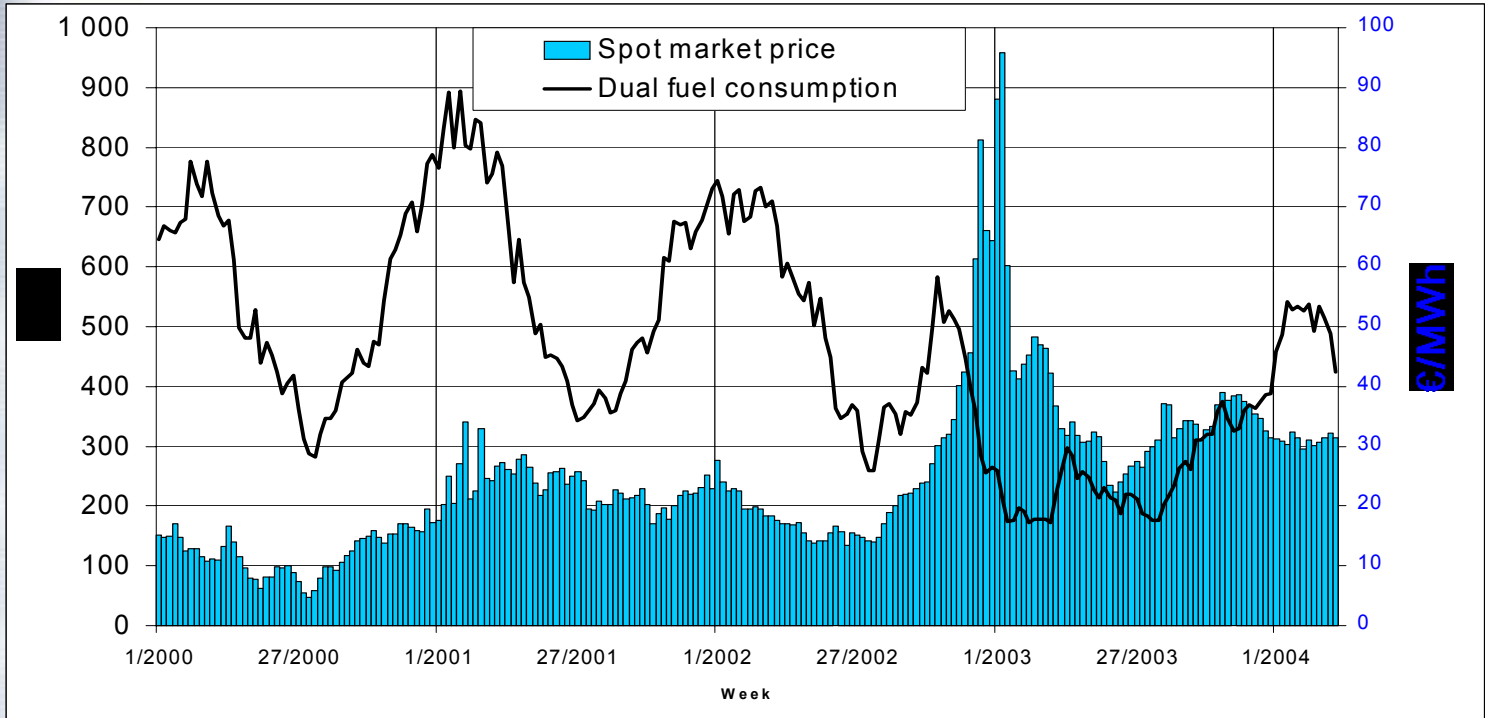


- Increasing unit enabling costs
But low activation costs (?)
- Dual fuel: ca 50 €/MWh ?
 - Back-up gen.: ca 200 €/MWh ?
 - Air-conditioning: ?

”Someone” has to work up this potential:

- Marketing
- Contracts
- Competance
- Technology

Statnett focus on medium-sized consumption (2) Dual fuel consumption (DFC) already price elastic



Challenges:

Achieve price elastic bidding of DFC in DAM in order to avoid extreme price spikes

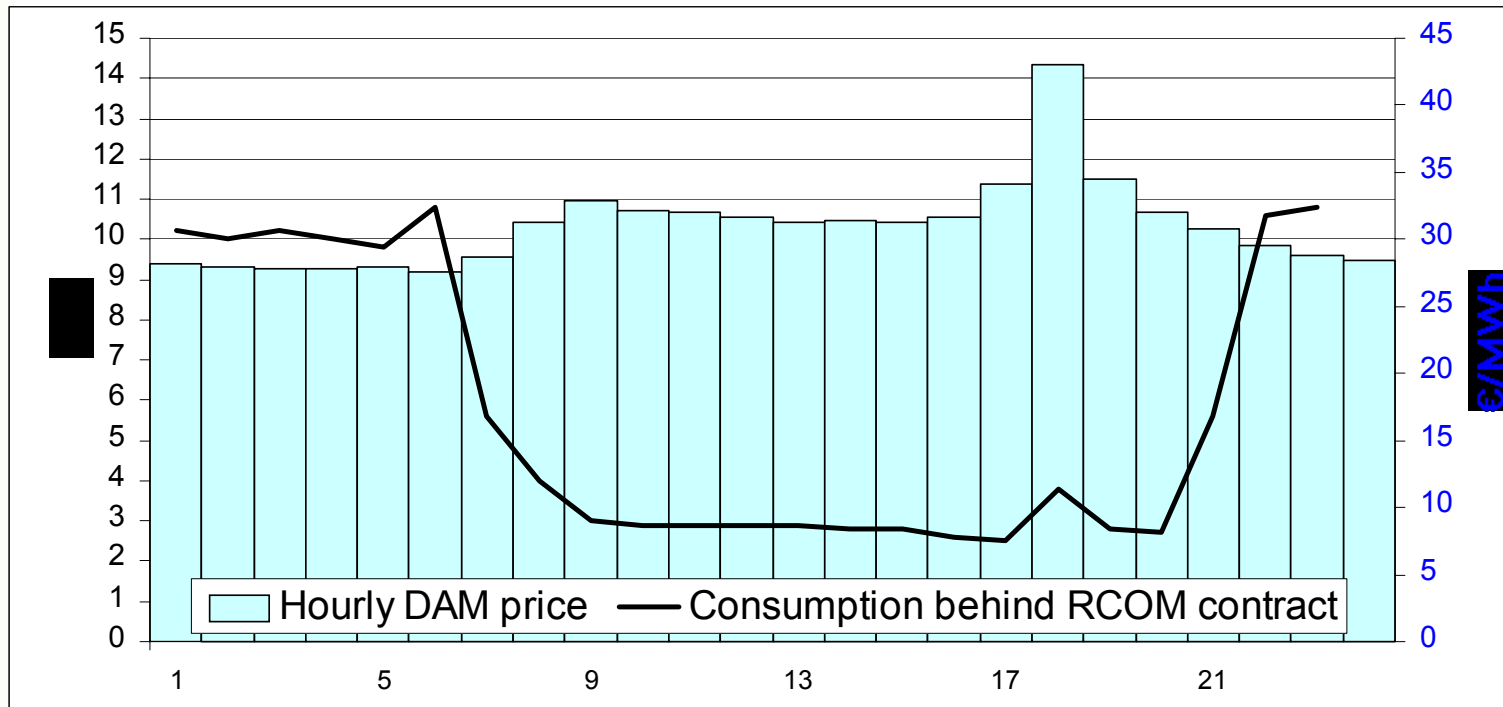
Have DFC bid as dispatchable resources in RCM

Statnett focus on medium-sized consumption (3)

Statnett pilot projects RCOM

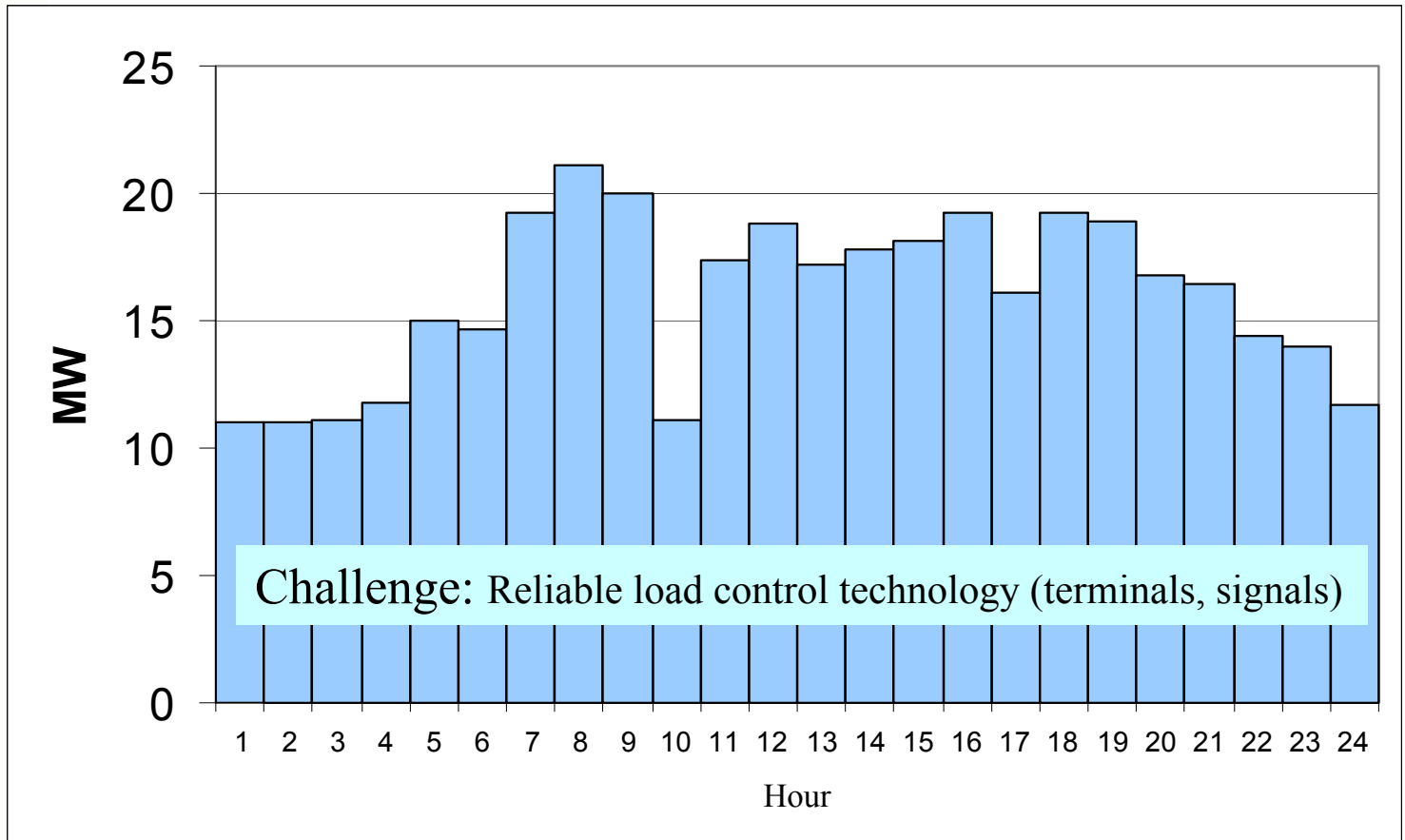
- Purpose:
 - Implementation / development of enabling technologies
 - Stimulate to price-elastic bidding
- How:
 - Giving predictable income to partners
 - 3-winter contracts (distribution utilities, supply companies, independant aggregator)
- Experiences:
 - Achieved results so far: 40-50 MW dispatchable load in RCM
 - Expensive marketing,unstable load-control tecnology
- Improved efficiency of Statnett's DR program by co-ordination with Energy Efficiency programs?
 - Marketing, enabling technologies, end-user competence

Statnett focus on medium-sized consumption (4) Example of price elastic bidding in DAM



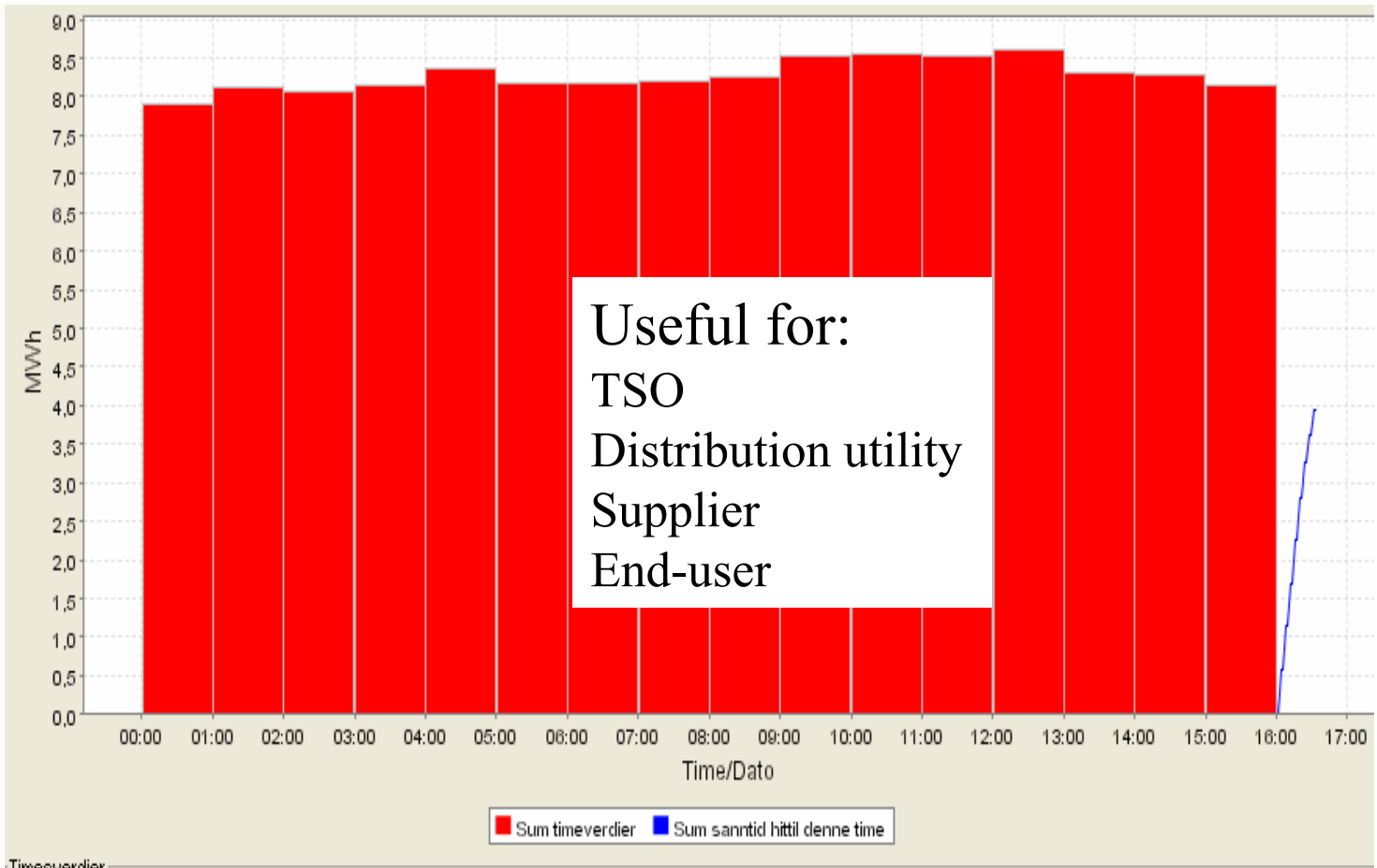
Statnett focus on medium-sized consumption (5)

Partly (un)successful disconnection test in RCM (ca 100 loads)



Statnett focus on medium-sized consumption (6)

Real time reporting of dispatchable RCM reserves to TSO



Timeverdier

Conclusions

- DR is actively used by Statnett to realize business idea:
 - promote and facilitate a well-functioning electricity market
- With RCOM Statnett has achieved large industry participation in the RCM
 - 1300 MW
- Statnett is now also focusing on DR from medium-sized consumption
 - Promising, but still challenges to overcome

References

- Statnett (www.statnett.no)
 - "Market-based Power Reserves Acquisition"
- Nordel (co-operative body of Nordic TSOs): (www.nordel.org):
 - "Peak Production Capability and Peak Load in the Nordic Electricity Market"
 - Common Balance Management in the Nordic Countries
 - Nordic Model for Balance Pricing and Settlement
- The Nordic Power Exchange: NordPool (www.nordpool.com)