Market/Grid models at Svenska Kraftnät

-Brukarforum 2015 Trondheim

- Erik Böhlmark

Why do we as a TSO use market models?

- Calculation of indicators for CBA of new projects
- Input for grid planning
  - Realistic (market based) balances as input for PSSE simulations (instead of manually created “worst cases”)
  - Realistic estimation of future max loads of AC-lines
- Input for feasibility study (future average loads)
  - Show that requirements for magnetic fields are met)
- Forecasting of future congestion rents (flaskhalsintäkter)

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Cost Benefit Analysis (CBA)

- Socio Economic Welfare=Producer surplus + Consumer Surplus + Congestion rent (flaskhalsintäkter)
- Grid losses
- System Adequacy – Monte Carlo simulation with 100s of cases
- Cost for counter trade
- Cost for reserves (FNR, FDR) – Day/night prices
- Integration of renewables
- Life Cycle Analysis of the project

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Market models at Svenska Kraftnät

- Samkörningsmodellen- Samlast- Samnett
  - Balances for grid planning,
  - load calculations
  - Loss calculations
- BID3
  - Calculations of Socio economic welfare for increased interconnection,
  - System adequacy calculations

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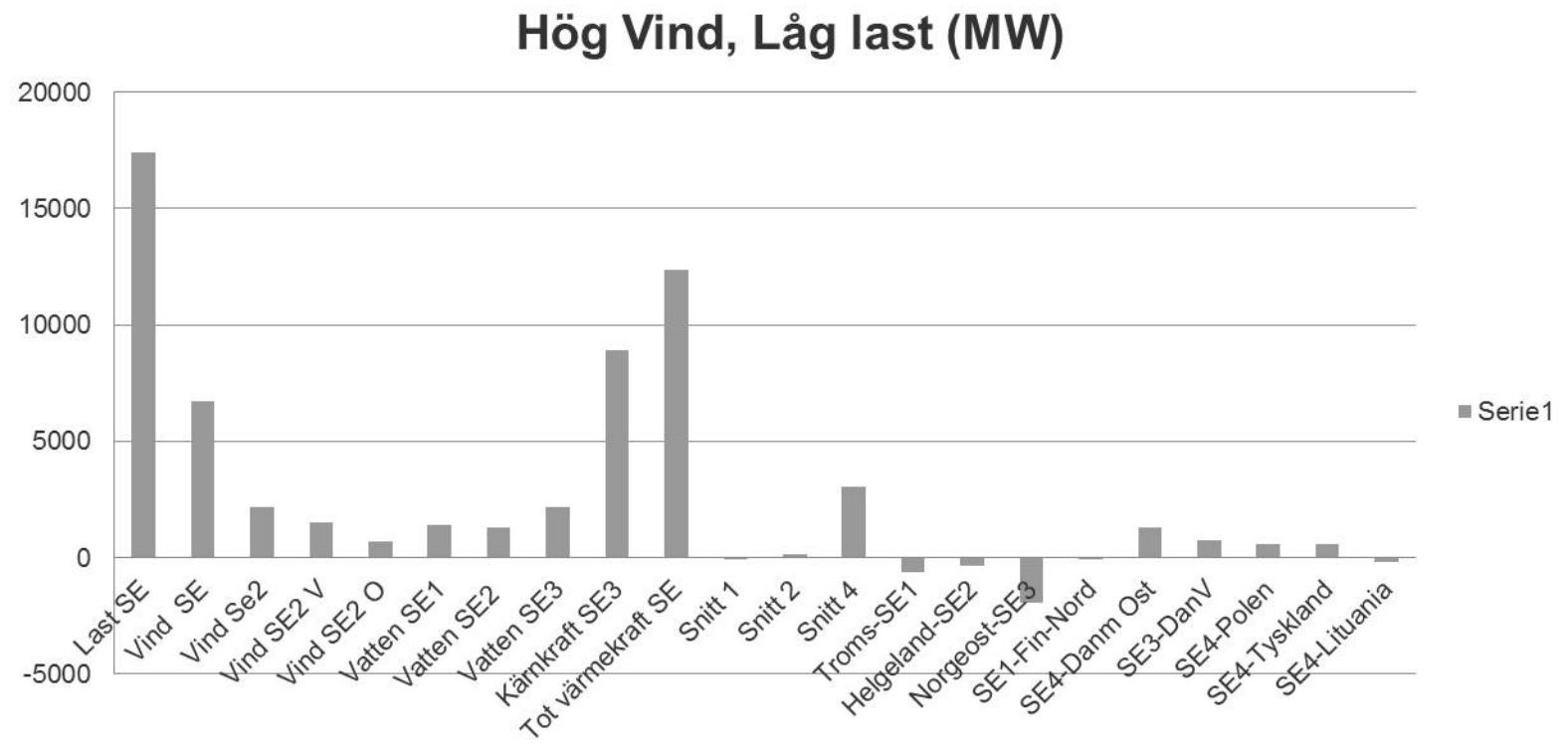
Balances for grid planning

> Example of future balance (2018, high wind, low load)



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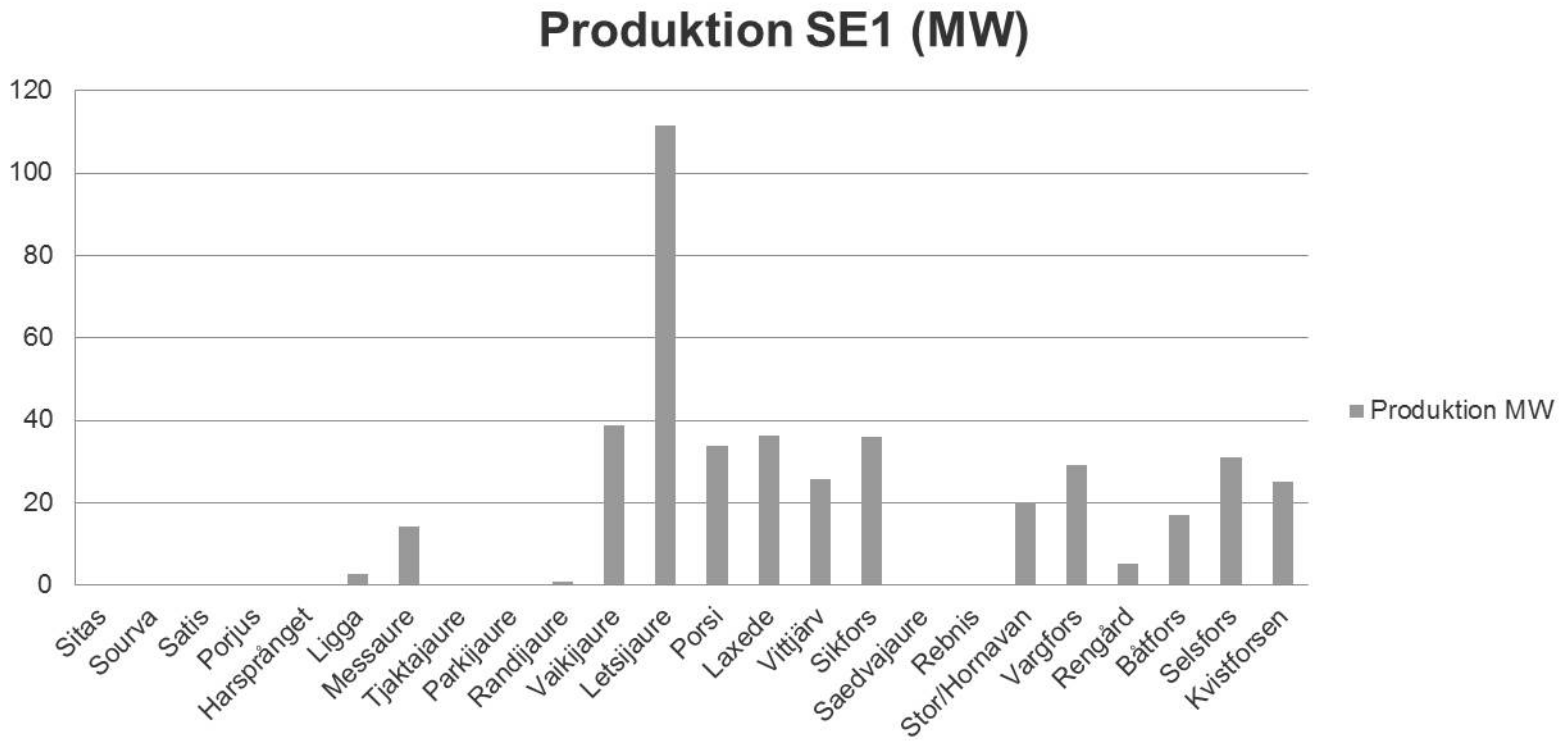
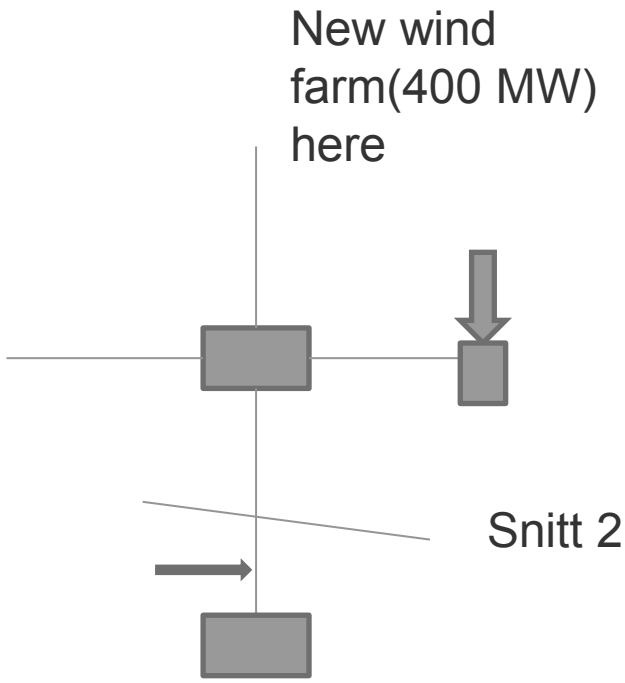
Balances.

> Distribution of production in SE1



Future loads

- Example of wind power connection
- How is the future load affected by new wind power



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Small effect in high load situations

> Meshed grid means less effects on individual lines

> Hydro is down regulating in case high flows on “snitt 2” (SE2-SE3)

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Can we use the results for grid planning?

> Is the flexibility of hydro power correctly modeled?

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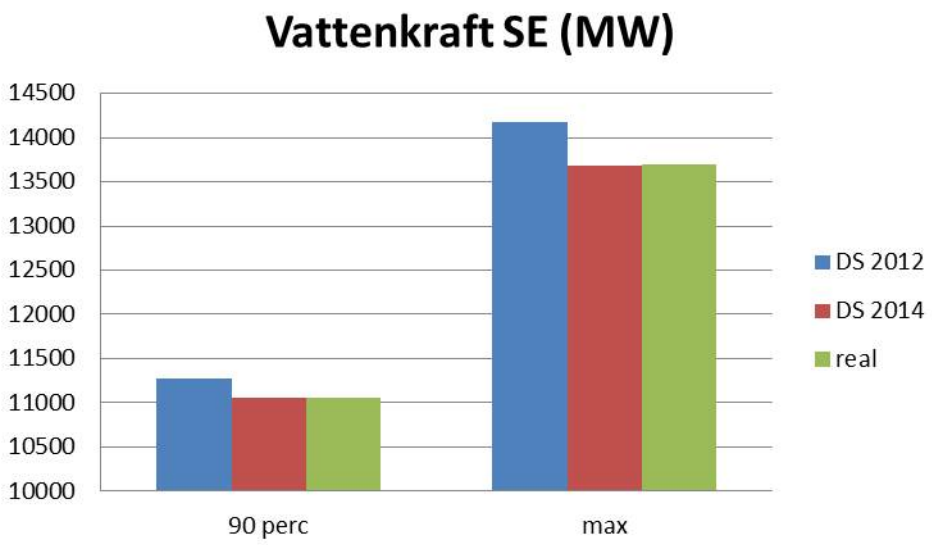
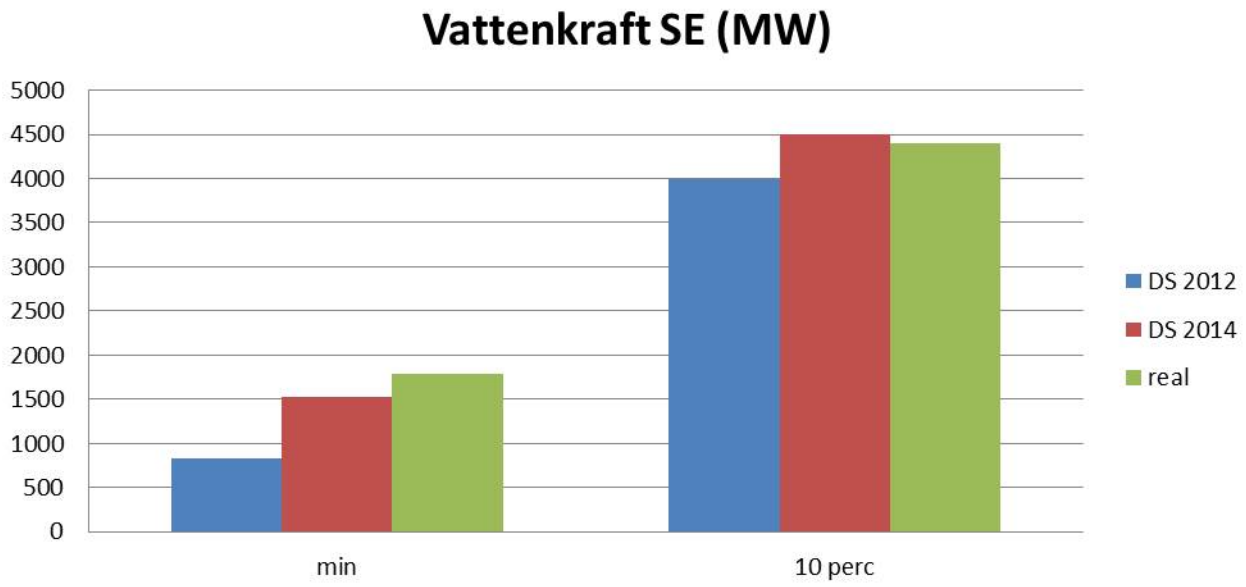
Hydro flexibility high load



Hydro flexibility low load



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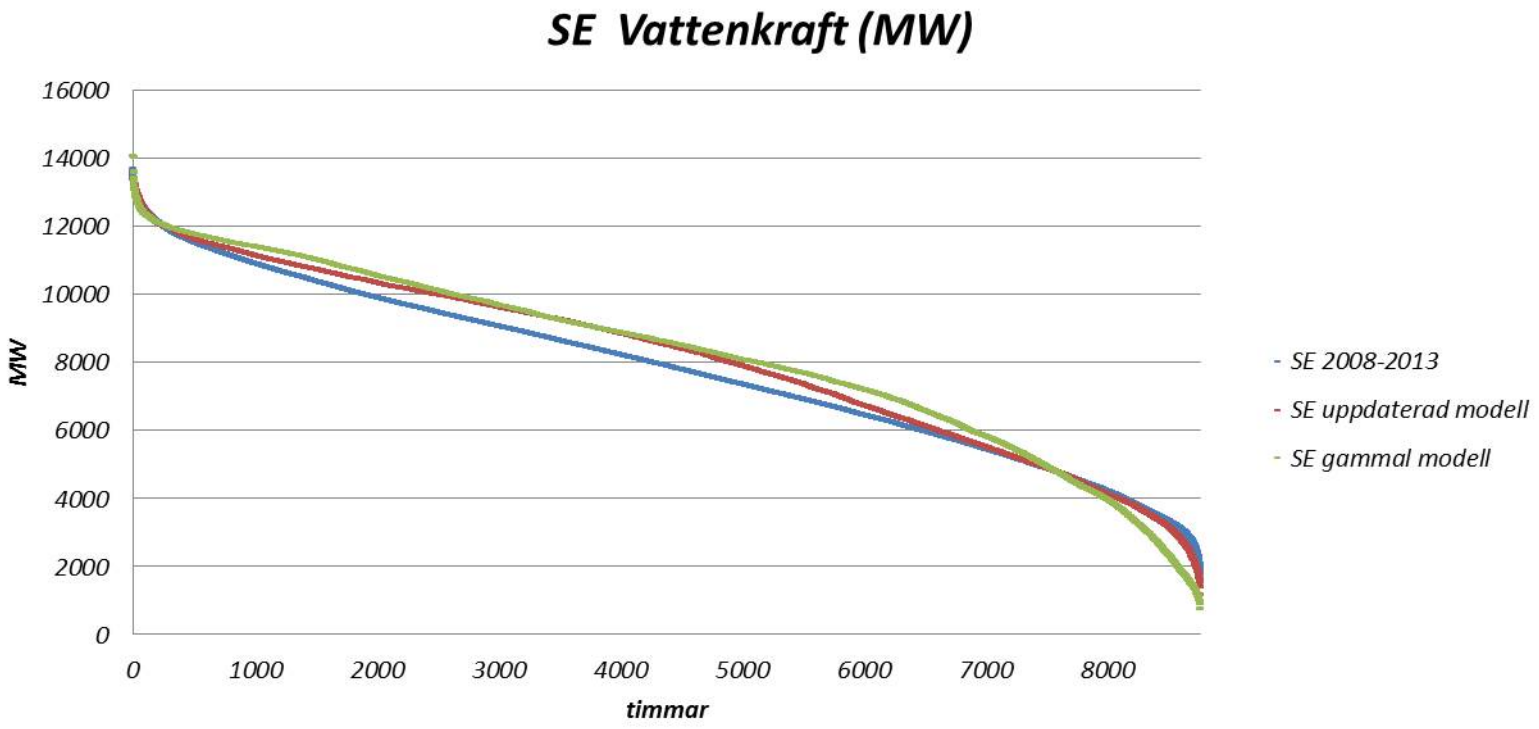
Hydro duration curve (SE)



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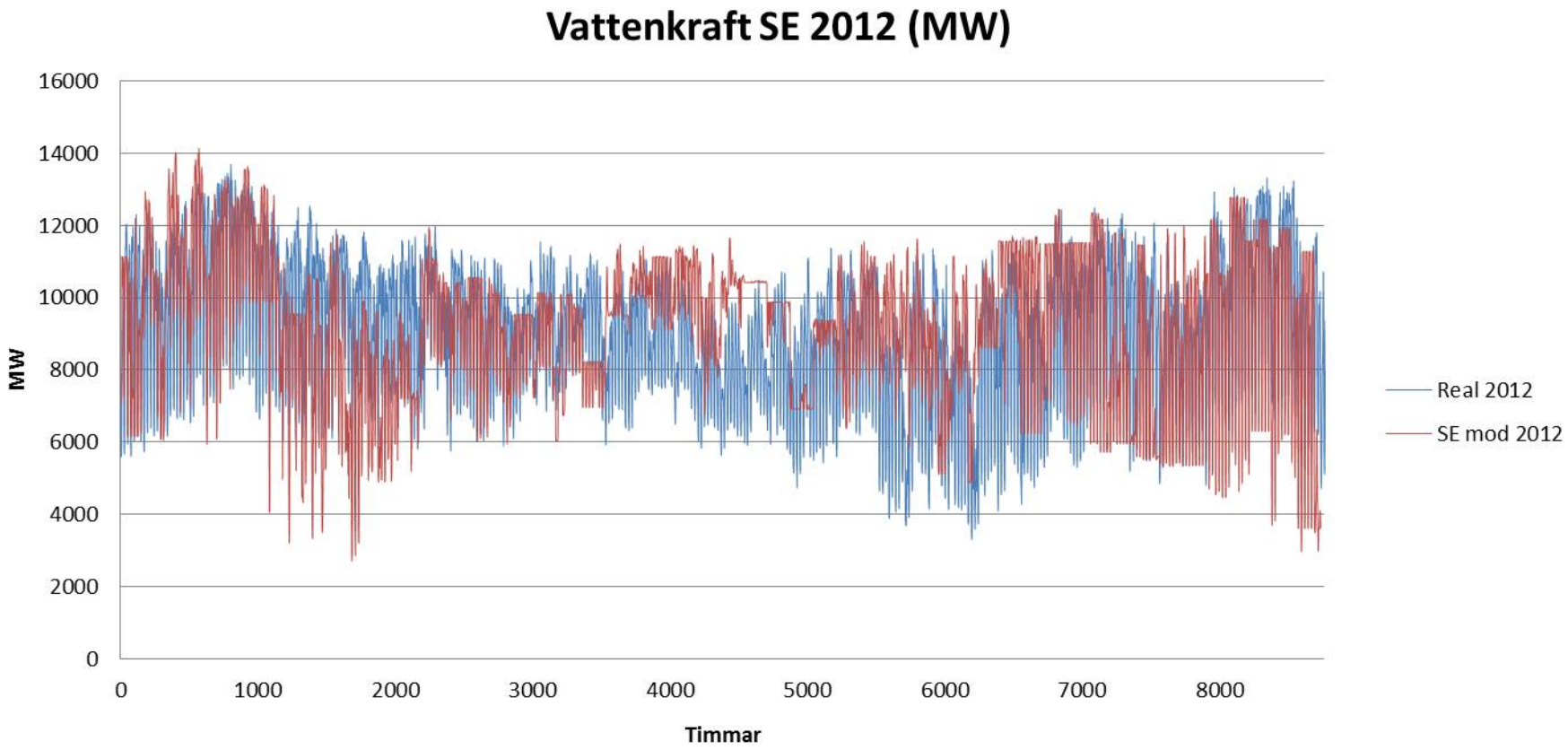
Short term hydro flexibility

> Some underflexibility during summer (no backtesting data, only inflow and temperature)



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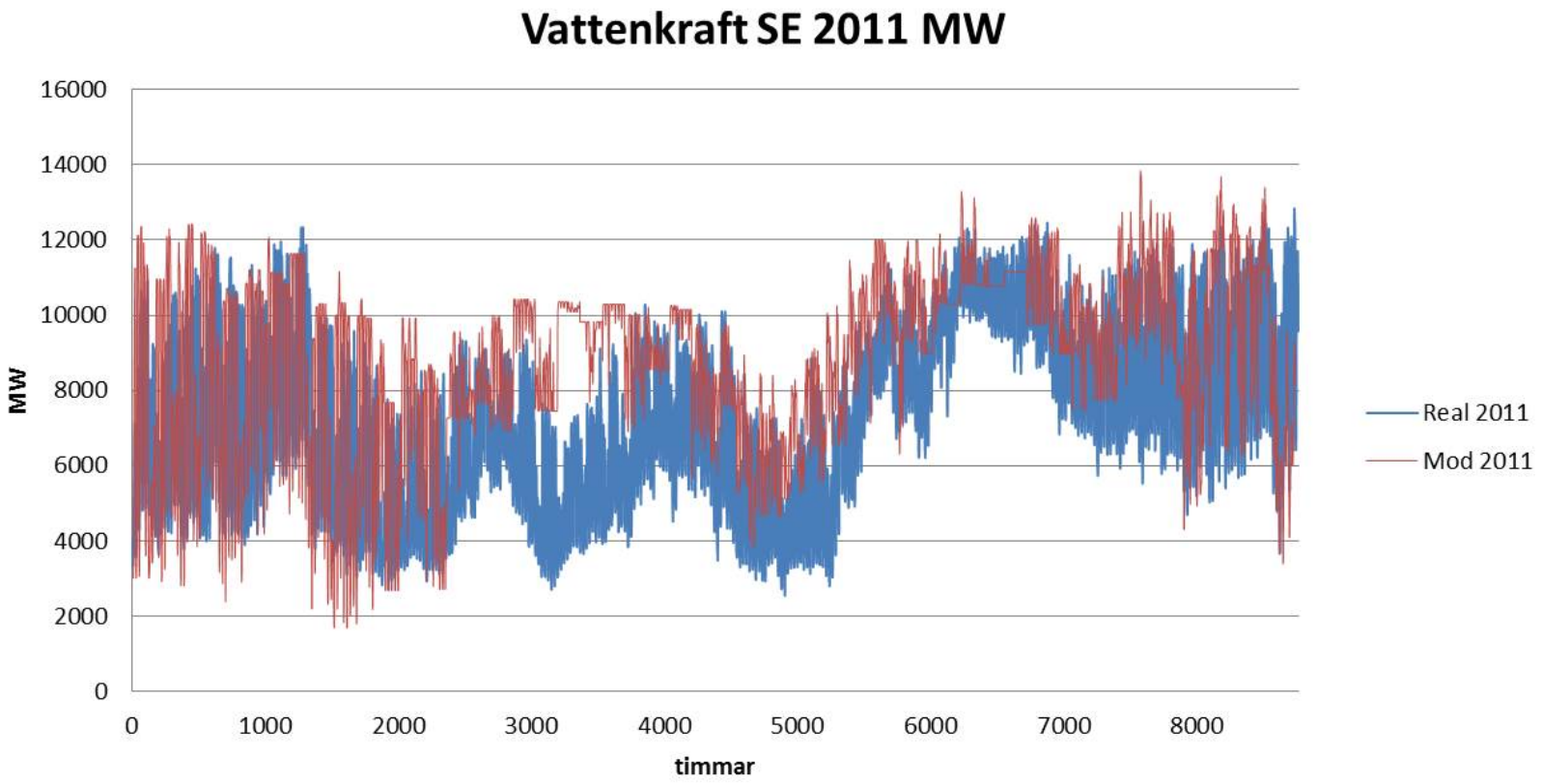
2011



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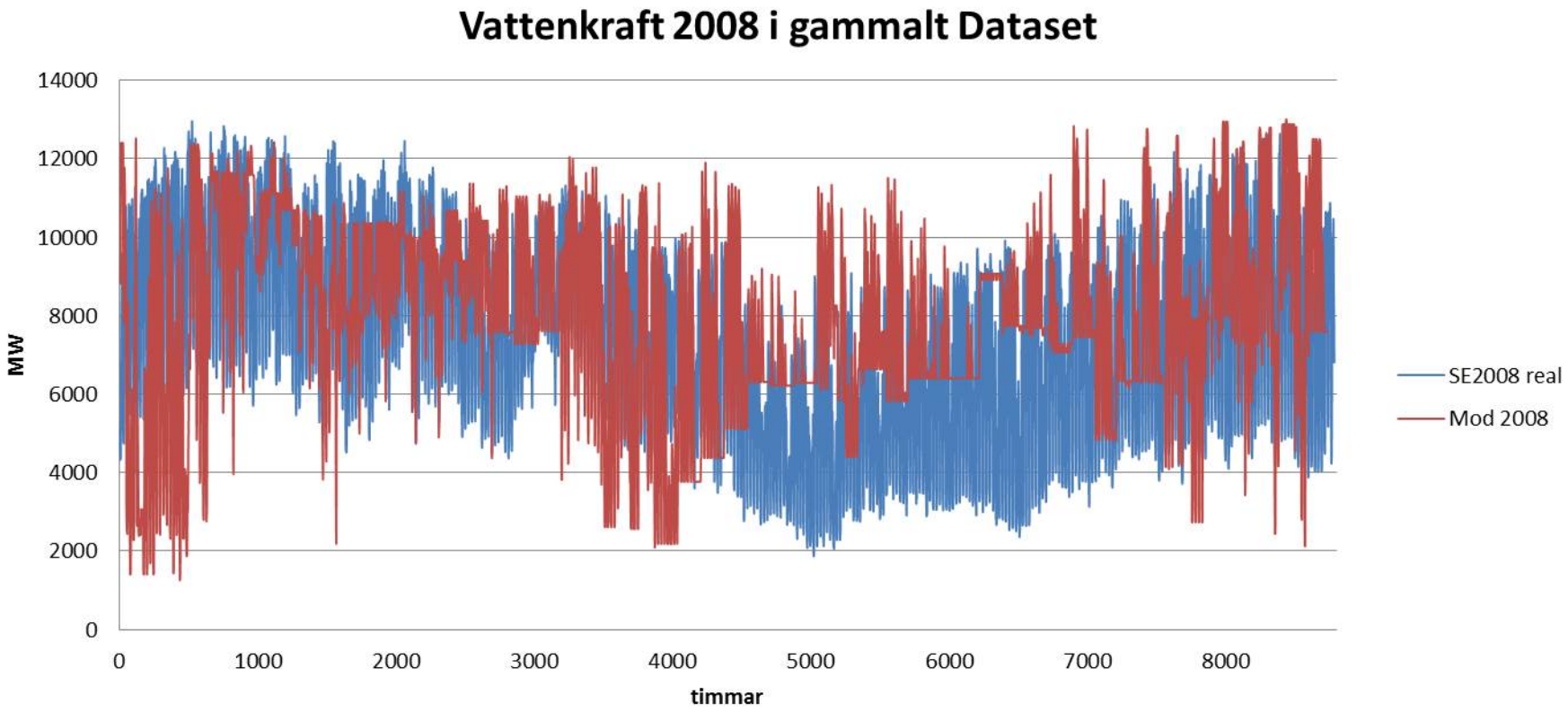
Improvements compared to older datasets



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Are we happy with our EMPS results??

- On area level : yes!
- On individual lines: Partly, there is some development needed to ensure that production (tappefördelning) and load (data issue) is distributed correctly.
- Short term prices variations are not showing up in the EMPS model which is important if the model should be used for SEW purposes

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Developments

- ”MAD” model aggregation and disagregation
  - Short term price variations might show in model results
  - Better ”Tappefördelning” improves how production is distributed in the grid
- Exogenous price series and uncertainty in fuel prices
  - Results from BID3 can be used to for the continent and Samlast for the Nordics. **This is our wanted position in the use of market models**

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Thank you

> Questions?

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