



The Horns Rev Wind farm and the Operational Experience with the Wind Farm Main Controller

Jesper Runge Kristoffersen
M.Sc.EE

Elsam Engineering A/S
Wind Power

Copenhagen Offshore Wind 2005, 26-28 October 2005



1. Short introduction to the Horns Rev wind farm
2. Wind Farm Main Controller
3. Operational Experience
4. Conclusion

The Horns Rev wind farm



**80 Vestas V80 turbines
160MW installed**

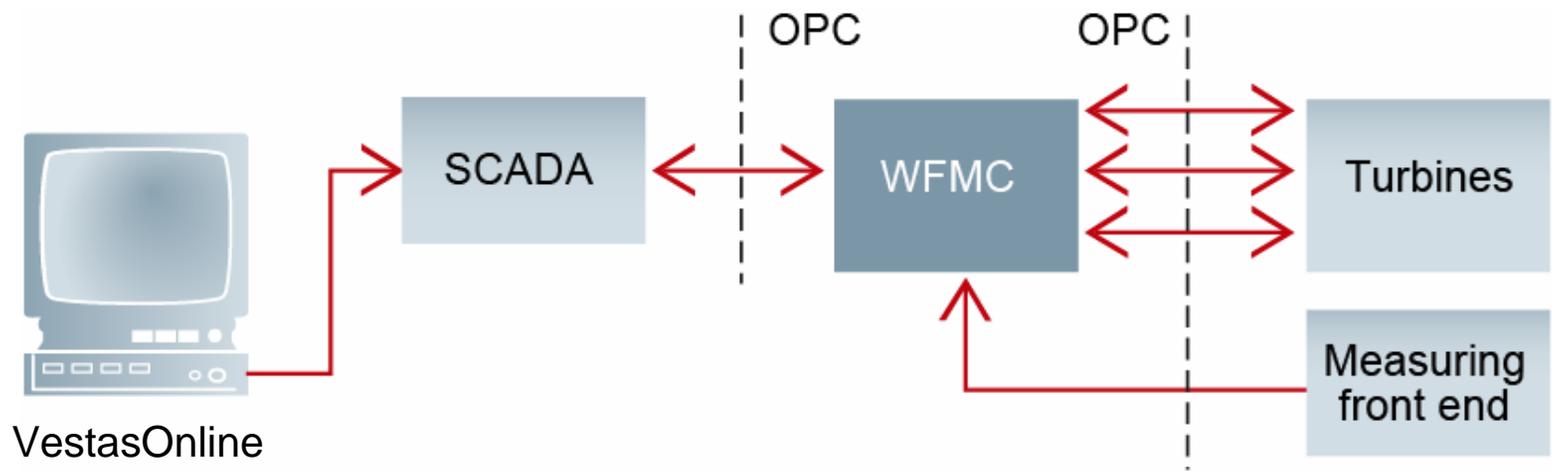


Wind Farm Main Controller

With the WFMC the wind farm acts as a power plant.

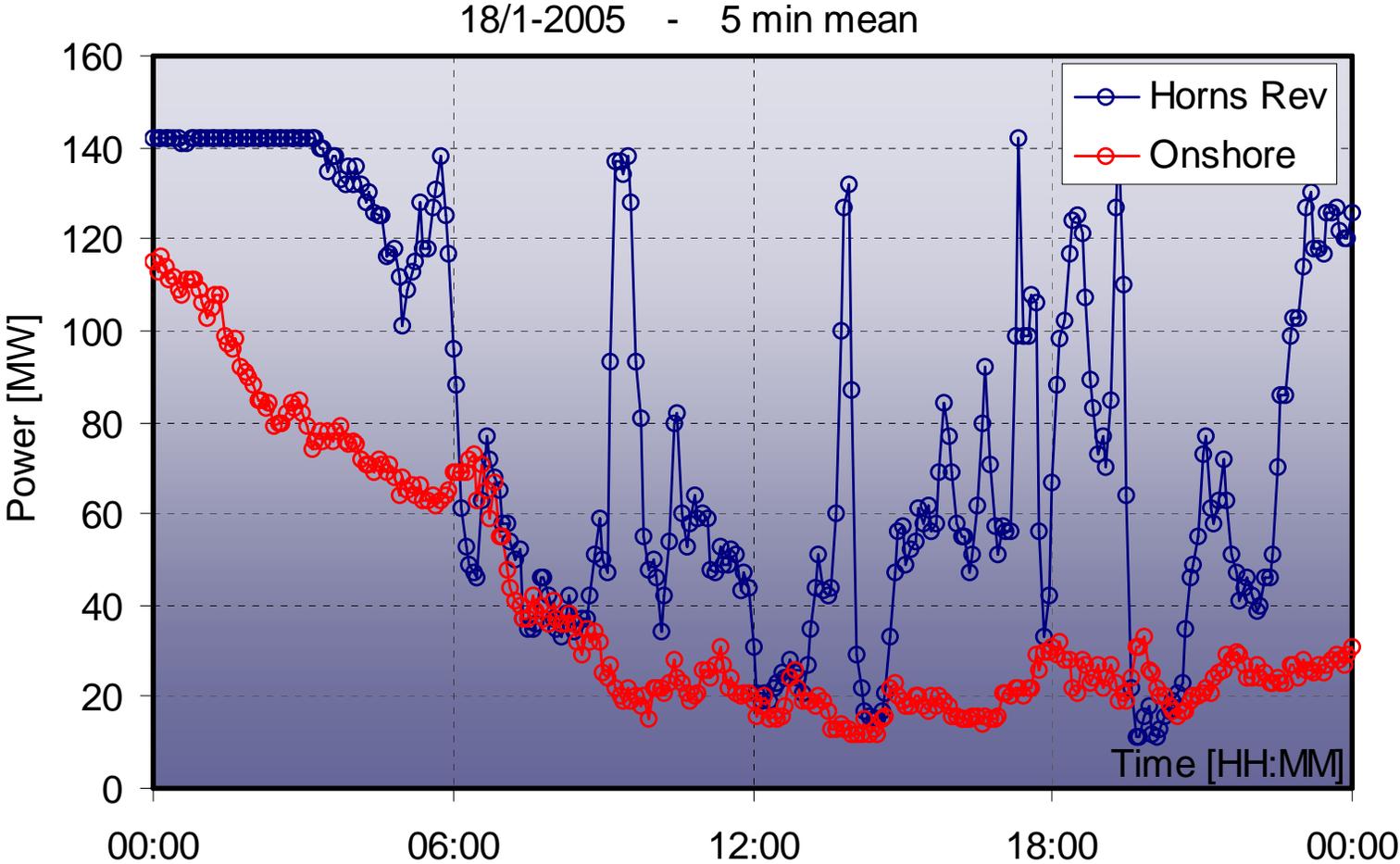
The wind farm is able to participate in both primary (frequency) and secondary (balance/power) control

Developed by Elsam Engineering A/S



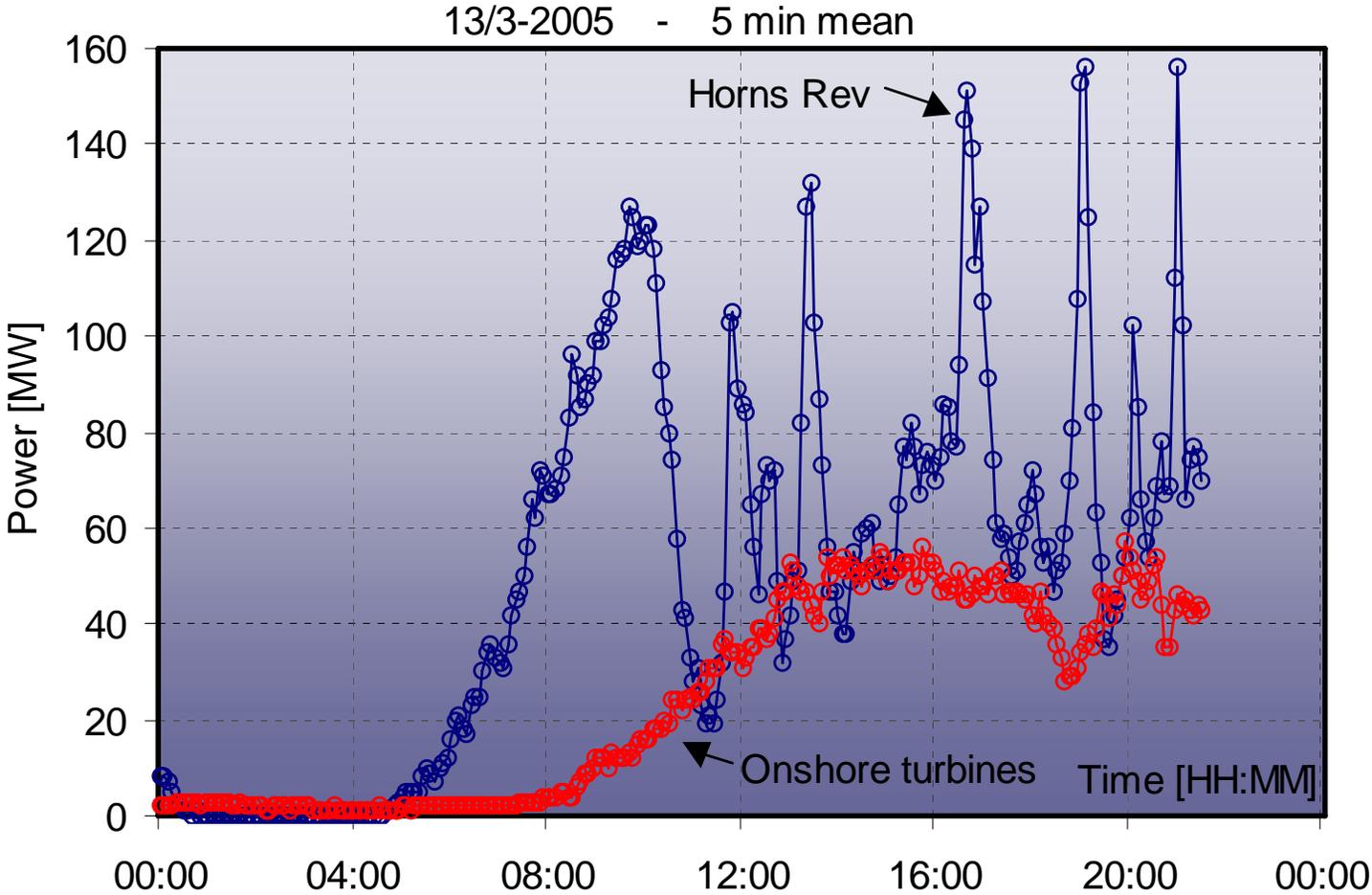
Operational Experiences

Power fluctuations



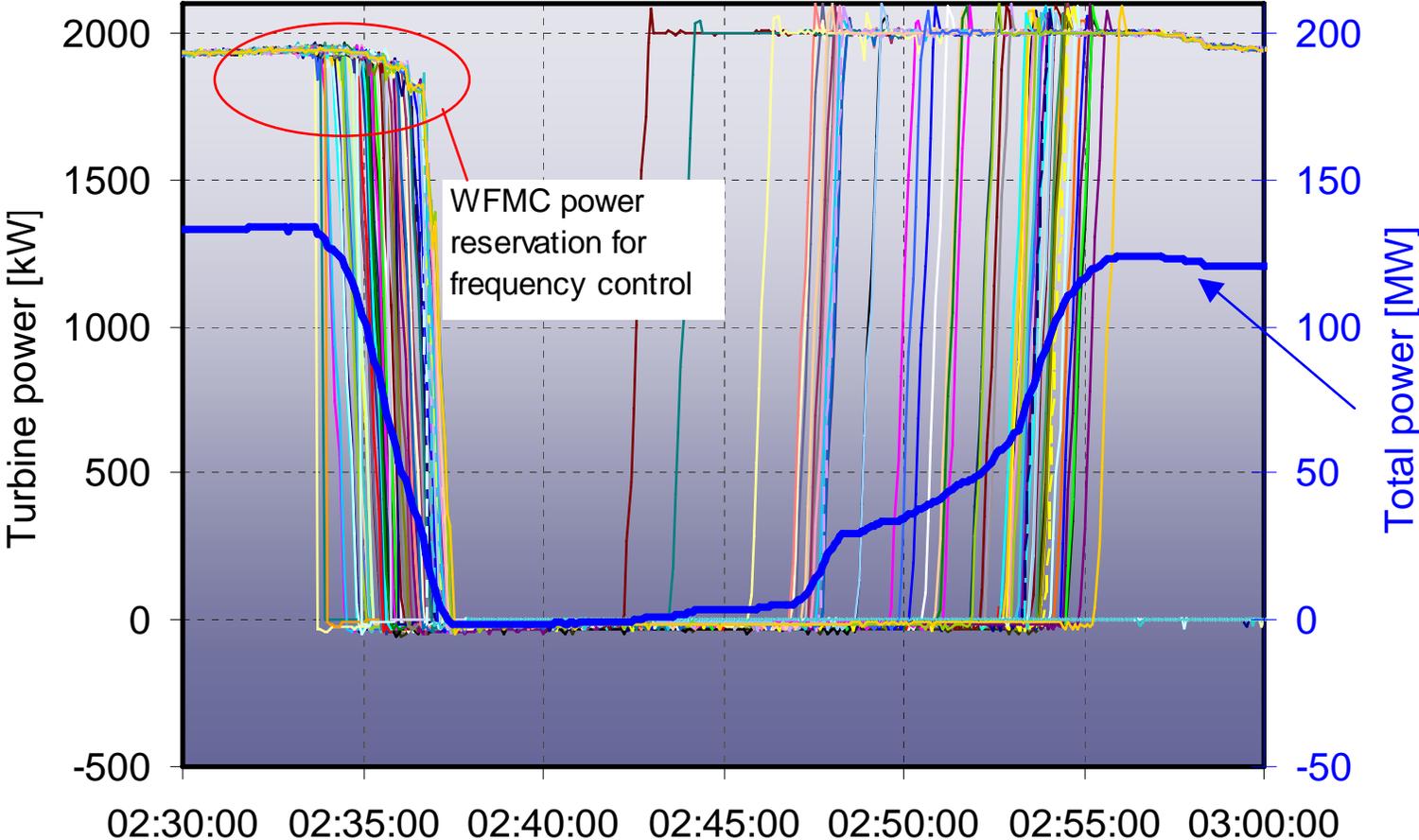
Operational Experiences

Power fluctuations



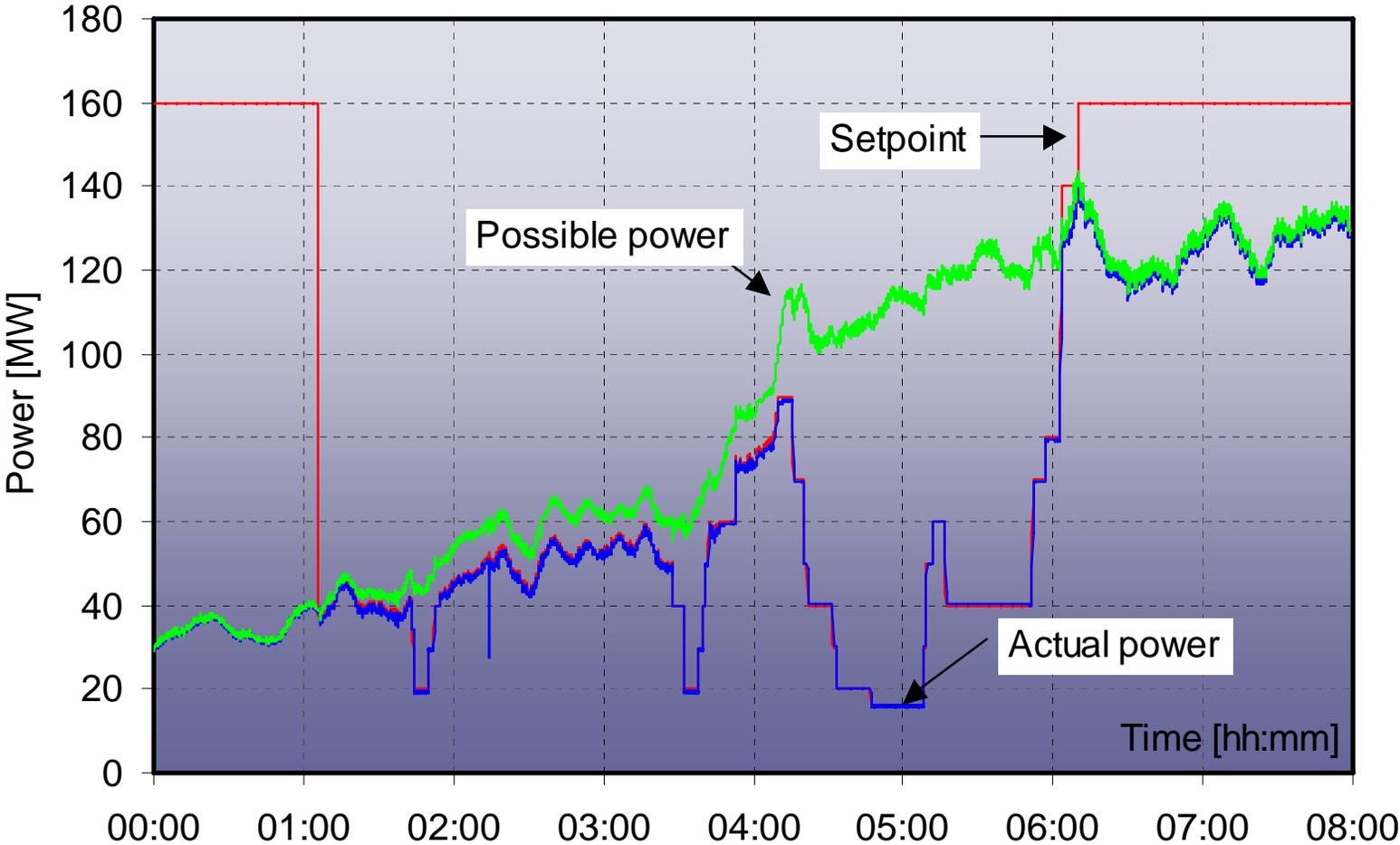
Operational Experiences

Shutdown because of high wind speed



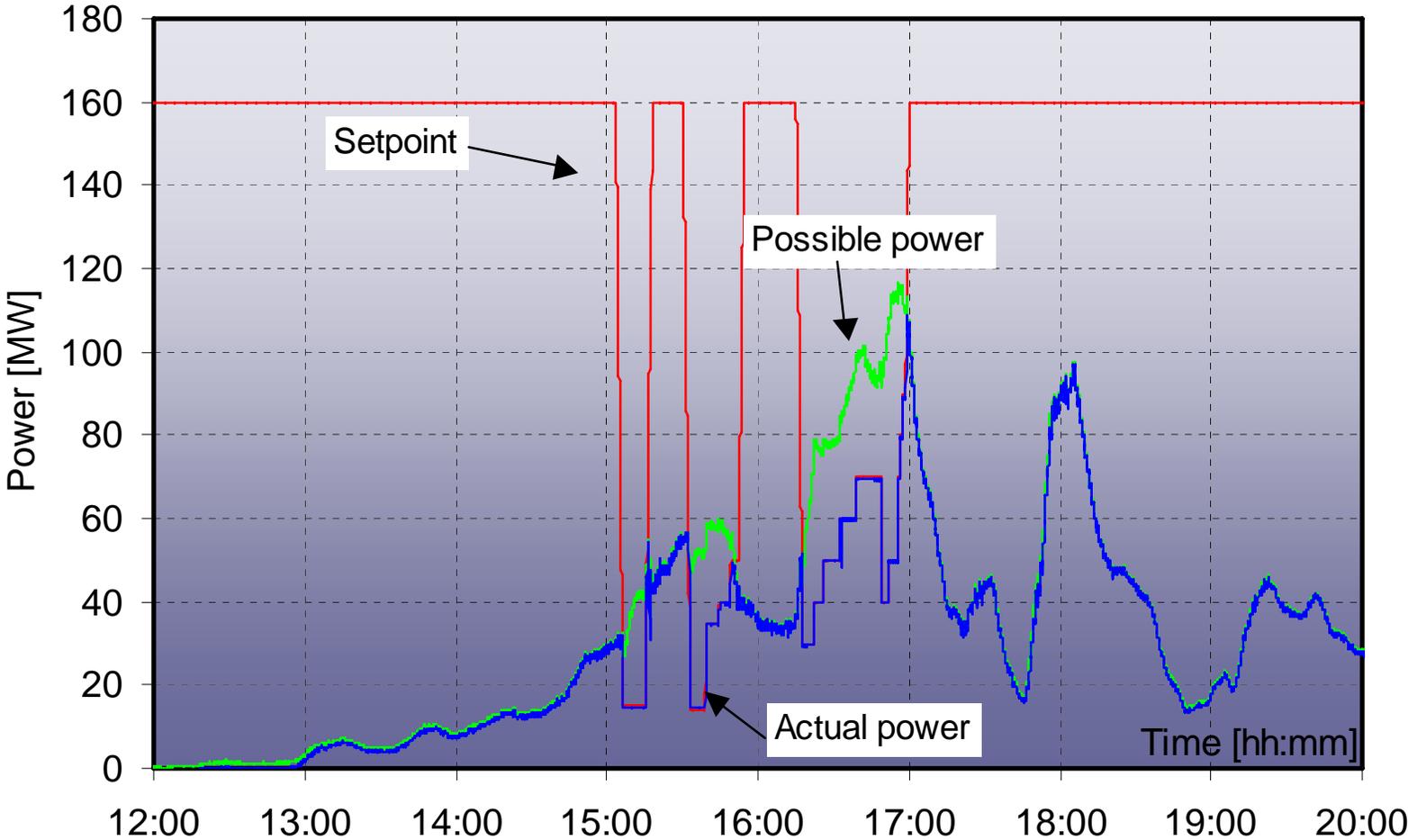
Operational Experiences

Control



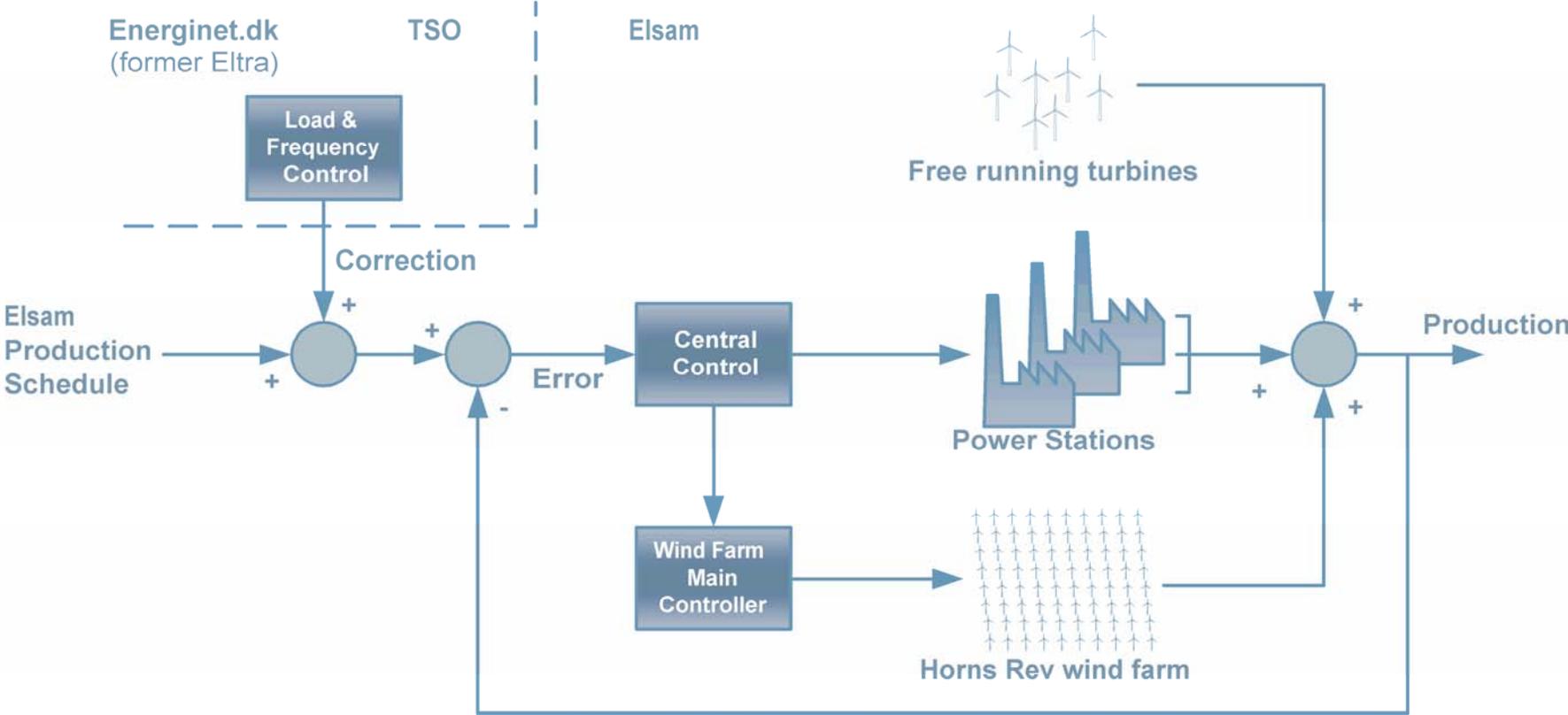
Operational Experiences

Control



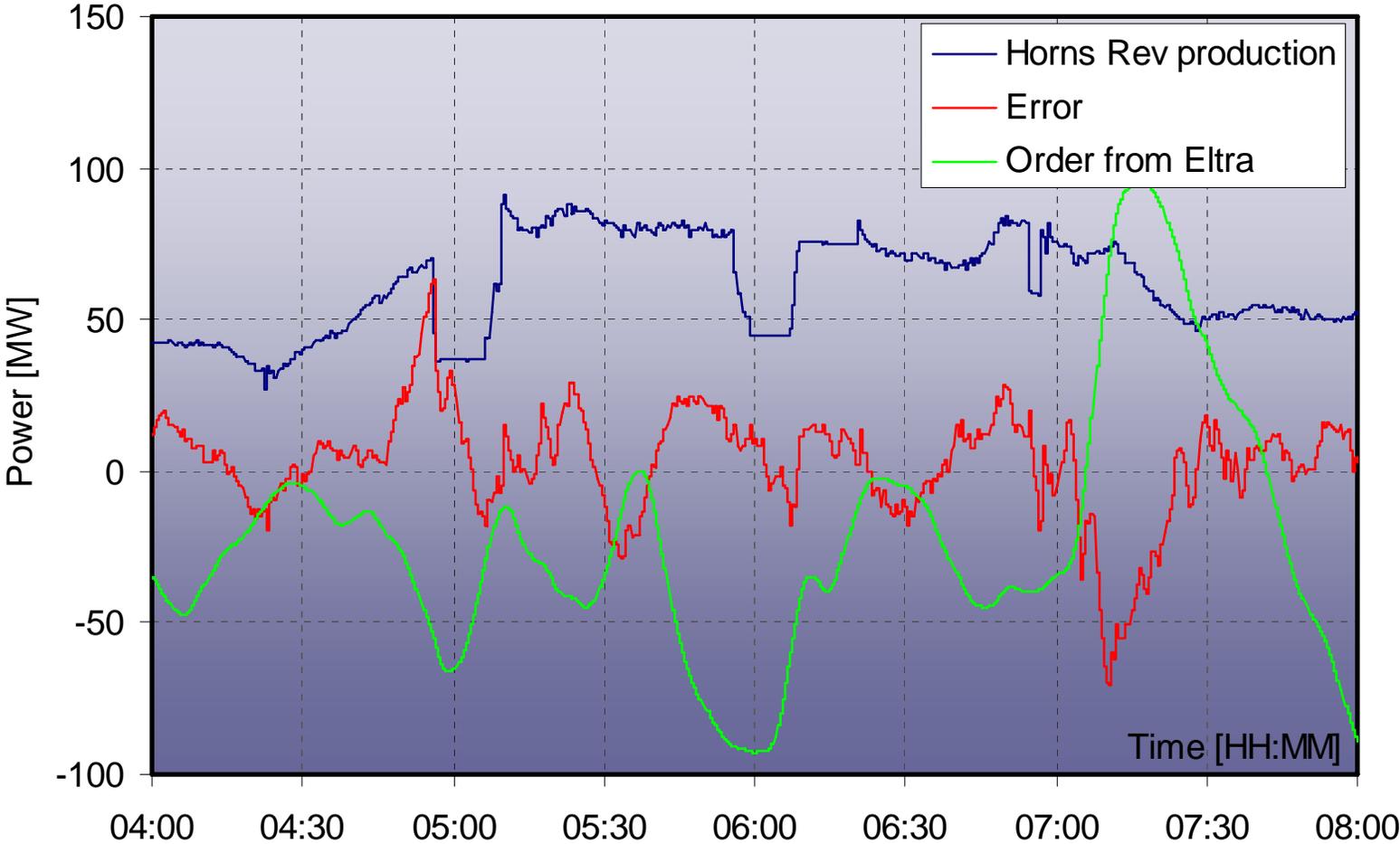
Operational Experiences

Control



Operational Experiences

Control



Conclusion

The controller includes a number of control possibilities to enable Elsam to use the wind farm as a wind power plant in a similar way as Elsam uses the conventional power stations to keep the power equilibrium as agreed on the Nordic electric power market.

The controller makes the wind farm able to participate in primary/frequency control in the same way as conventional power stations.

The advanced control functions in the WFMC are almost indispensable for maintaining balance in the grid, irrespective of whether this is done by a large producer responsible for balancing his own production or by the responsible system operator for other producers.

Questions?

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Stand A 0-18

