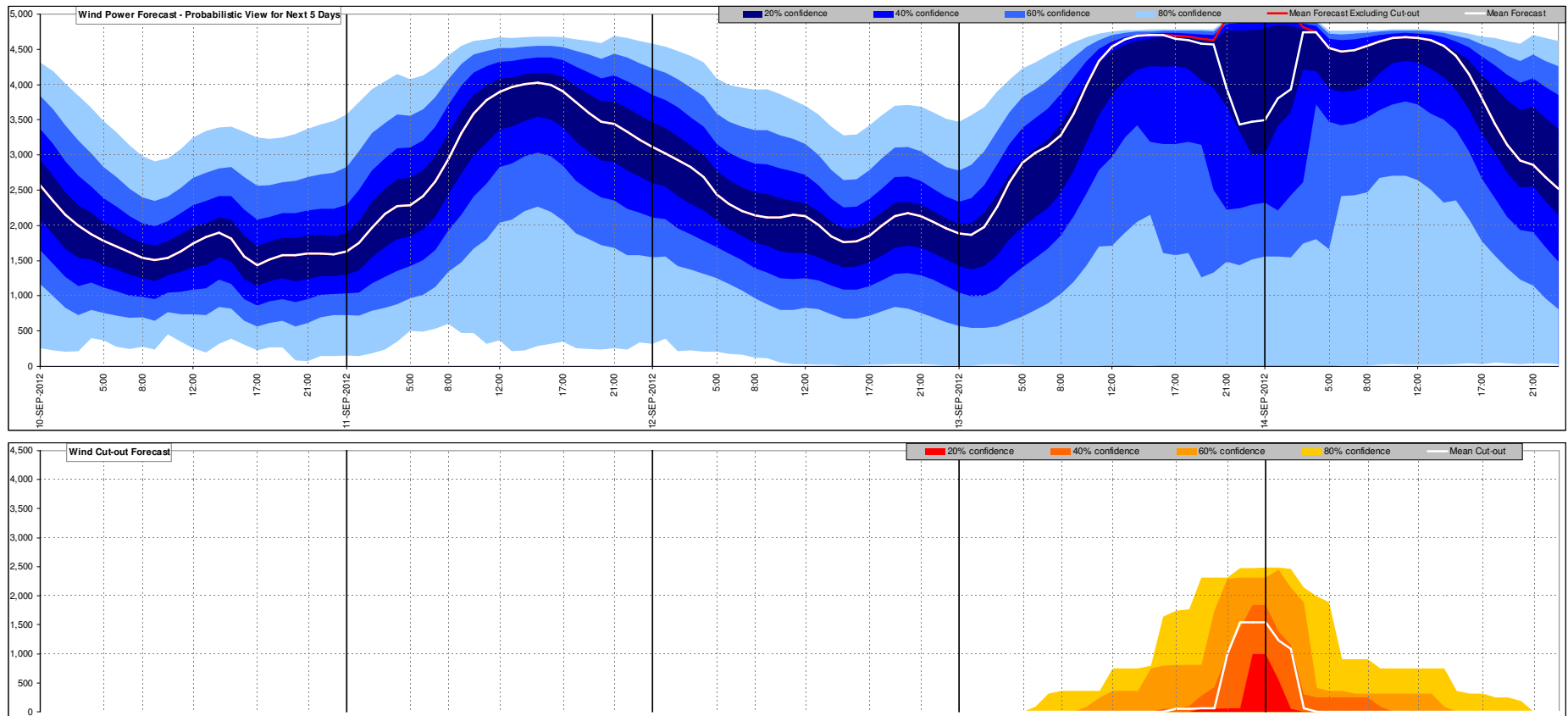nationalgrid

High Wind Speed Shutdown

David Lenaghan
Tuesday 9th October 2012

Fred.Olsen Renewables : Crystal Rig 2

- Fred.Olsen Renewables have kindly given permission for some detailed analysis of information from Crystal Rig 2 to support better industry understanding.

- Information provided includes alarm signals from individual turbines that indicates whether they have been automatically shut down due to high winds.

- It is hoped that this analysis will enable us to consider what data and analysis is required to more successfully manage the power system during times of gale force winds.
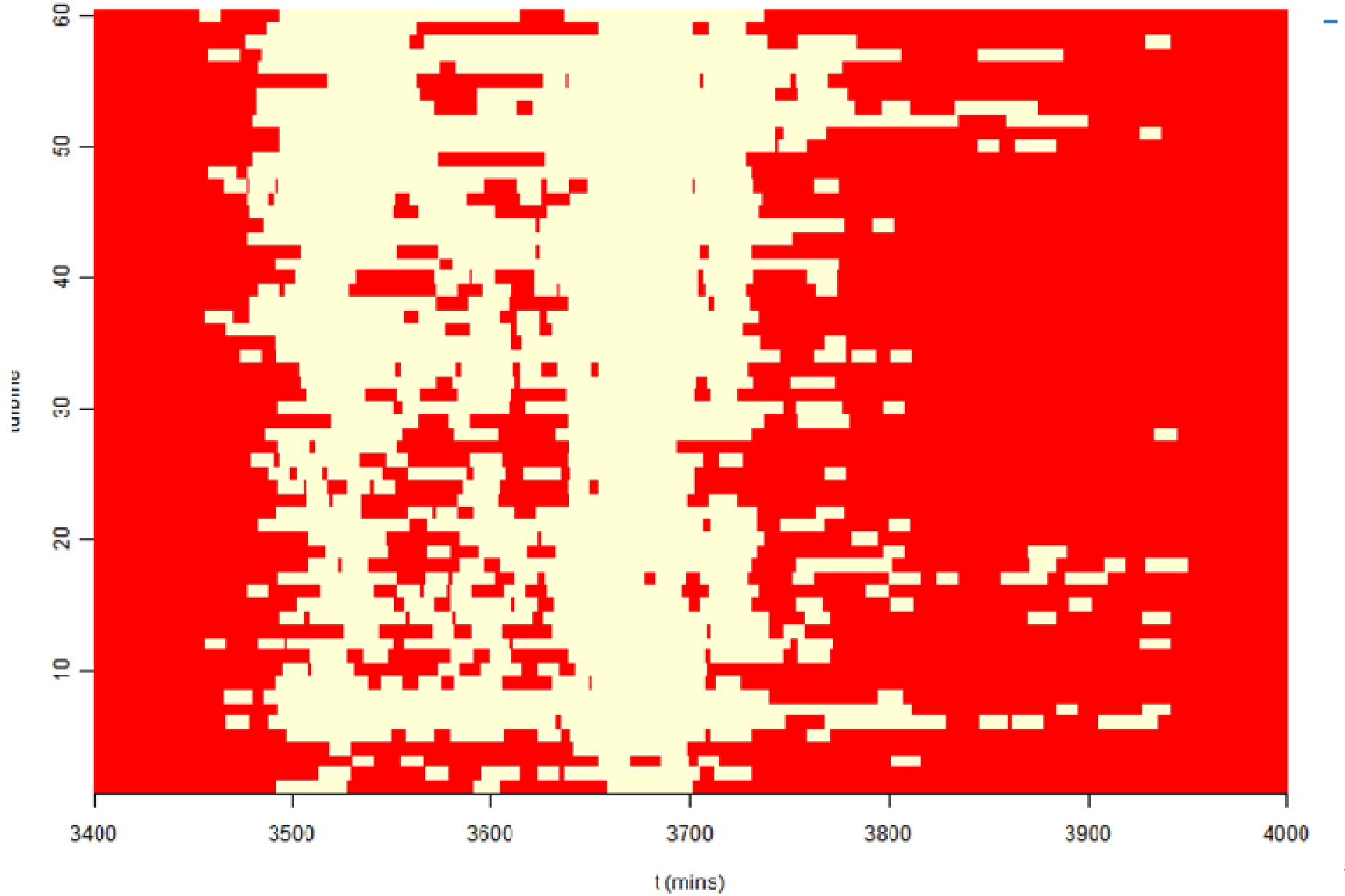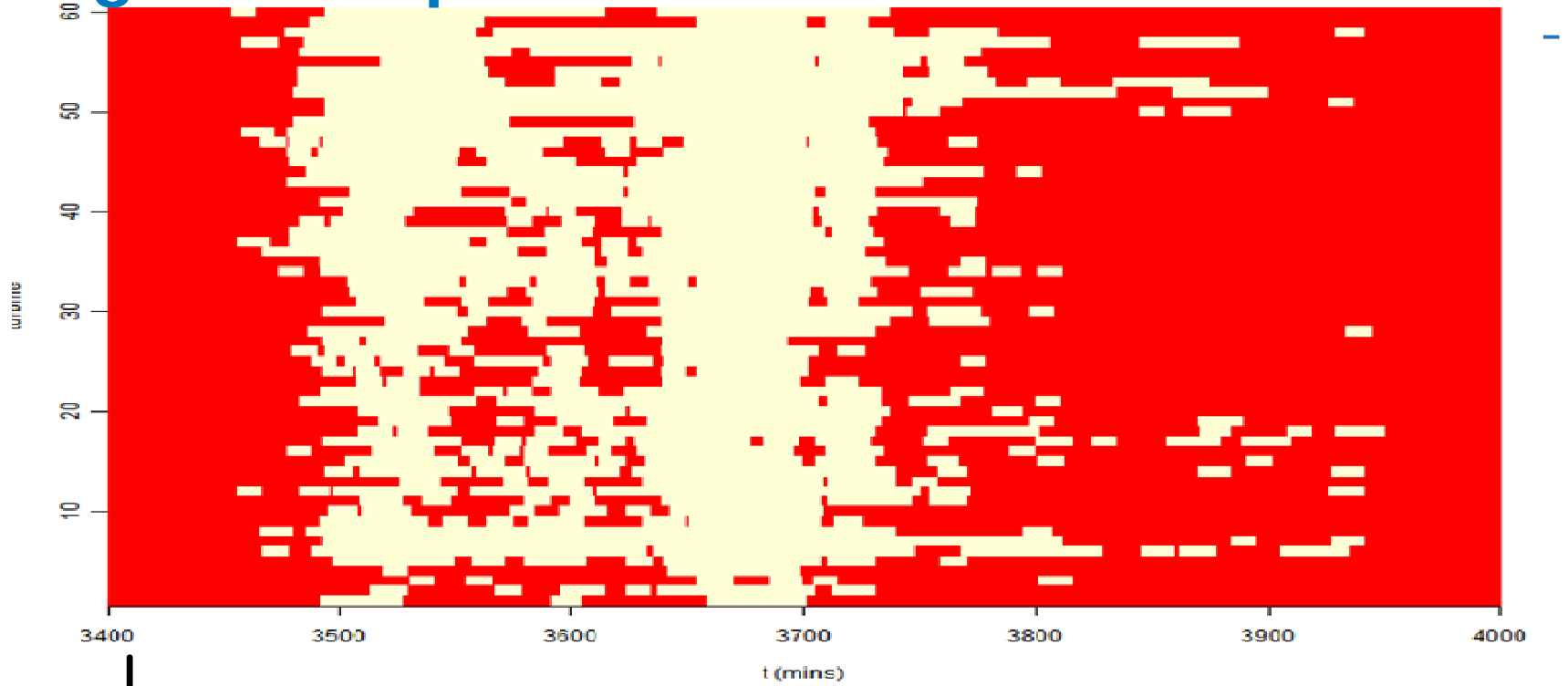
Example of forecasted shutdown

High Wind Speed Shutdown
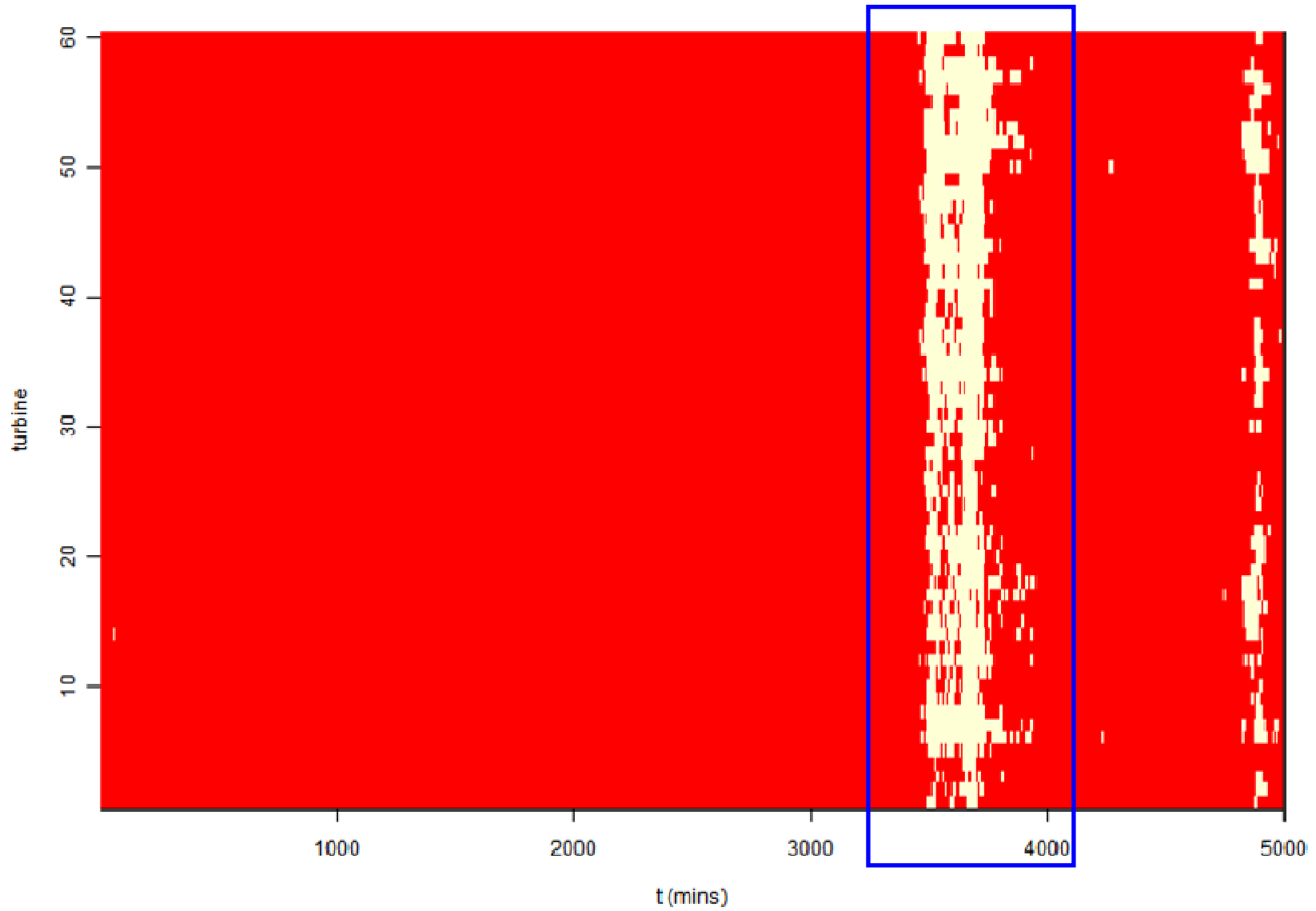
High Wind Speed Shutdown

High Wind Speed Shutdown

High Wind Speed Shutdown

- Why would this analysis be useful?

  - It would provide National Grid with an early warning of High Wind Shutdown.

  - It would allow early forecasts to be refined in terms of timing and magnitude.

  - It would allow National Grid more certainty in committing reserves to allow for loss of wind MW.

High Wind Speed Shutdown

- Things to consider : Short term forecasting of Shutdown

    - Statistical models could be created that would respond to real time shut down alarms.

    - Once an alarm from one turbine is received the forecast could be revised over the next 4 hours to indicate the likely shutdown profile.

High Wind Speed Shutdown

- Things to consider : Re-connection & re-generation

    - When a turbine has been shut down due to high wind it will automatically re-connect to the system and commence generation when the wind drops sufficiently.

    - This can be an equally difficult problem to deal with because reserves would have already have been committed to manage the shutdown scenario.

    - These reserves will have to be pulled back again to manage the re-connection and re-generation.

High Wind Speed Shutdown

- Things to consider : Data

    - Is this all the data that we need?

    - What other sources of information are available?

    - What is the quality & quantity of the data?

    - What would happen if incorrect data was submitted?

    - What can be achieved with the data that we already have?

    - Who, how what is the obligation to supply data?

High Wind Speed Shutdown

- Things to consider : Standardisation of data

  - Can all wind farm control systems output the same data in the same format?

  - Are measurements of wind speed and wind direction performed in the same way on all wind farm sites?

High Wind Speed Shutdown

- Things to consider : Count down to shutdown

  - For many wind farms the control system starts a timer when the wind speed exceeds 25 m/s.

  - This timer waits for 10 minutes.

  - If the average wind speed is greater than 25 m/s then the turbine shuts down.

  - It would be useful if there were notification of this timer being active.

  - This notification could be of the form of individual turbines or the number of turbines that are at risk of shutdown.

High Wind Speed Shutdown

- Things to consider : History or real time

  - Clearly a lot of analysis can be achieved just by using historical data.

  - If we are to be able to provide the control room with adequate warning and refinement of forecasts then it is necessary to have real time signals.

High Wind Speed Shutdown

- Conclusions ……..