Notes on electricity networks

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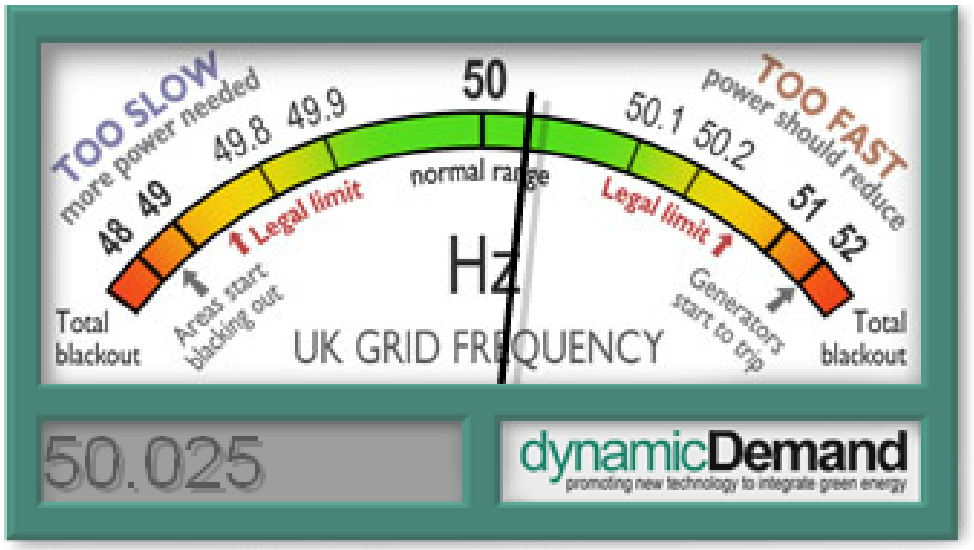
www.statslab.cam.ac.uk/~frank

EURANDOM, April 2011

How balanced is the UK grid at the moment?

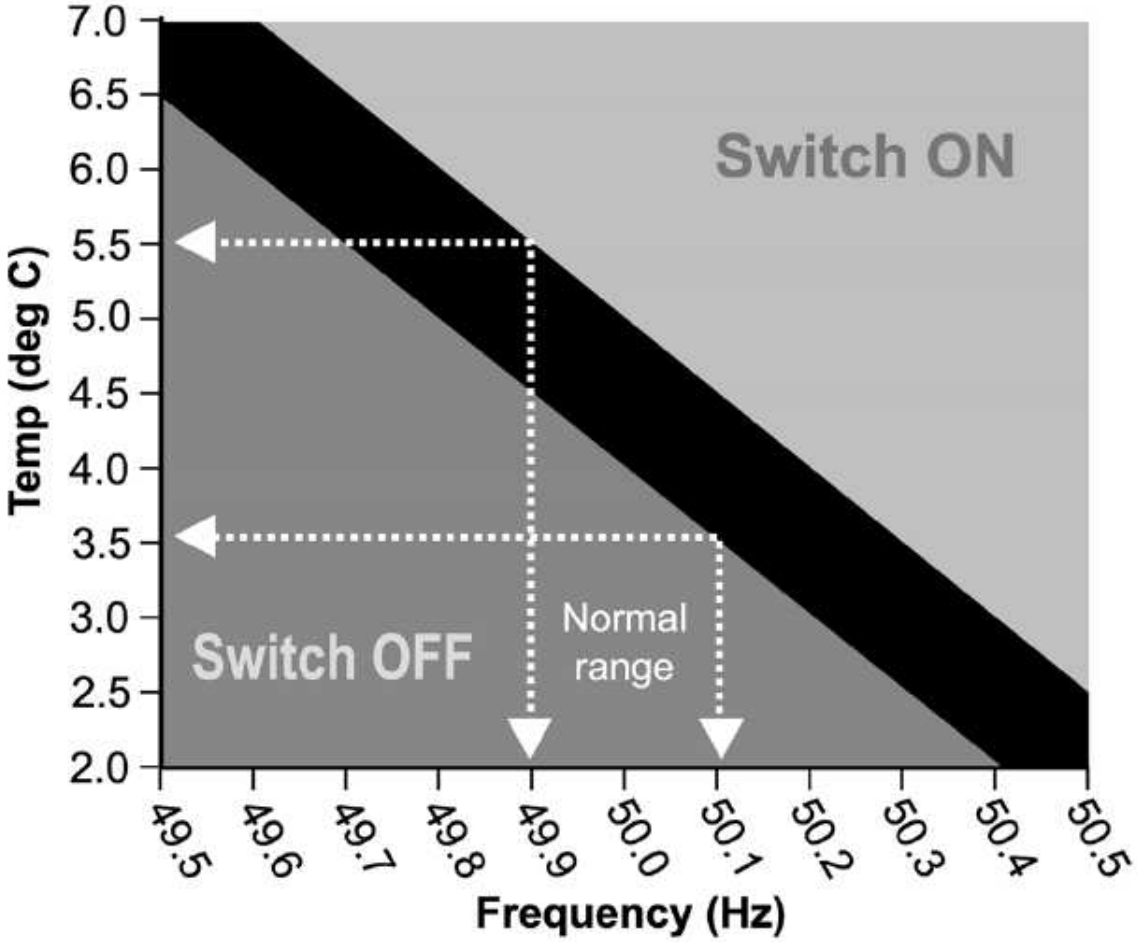


This meter is monitoring the **power balance** of the **UK electricity grid**. If the needle is too far to the left, it means more generation is needed to meet demand.

The meter actually shows the grid's "frequency", which is related to the **speed of rotation** of **generators** all over the country. When there is too little power available, the whole grid "slows down" and the needle moves to the left.

http://www.dynamicdemand.co.uk/grid.htm

Dynamic demand



Use system frequency as a signal to control domestic loads, particularly refrigerators and freezers, to provide operating reserve

From: Frequency responsive loads, Jeremy Colandairaj, NIE

Distribution of frequency

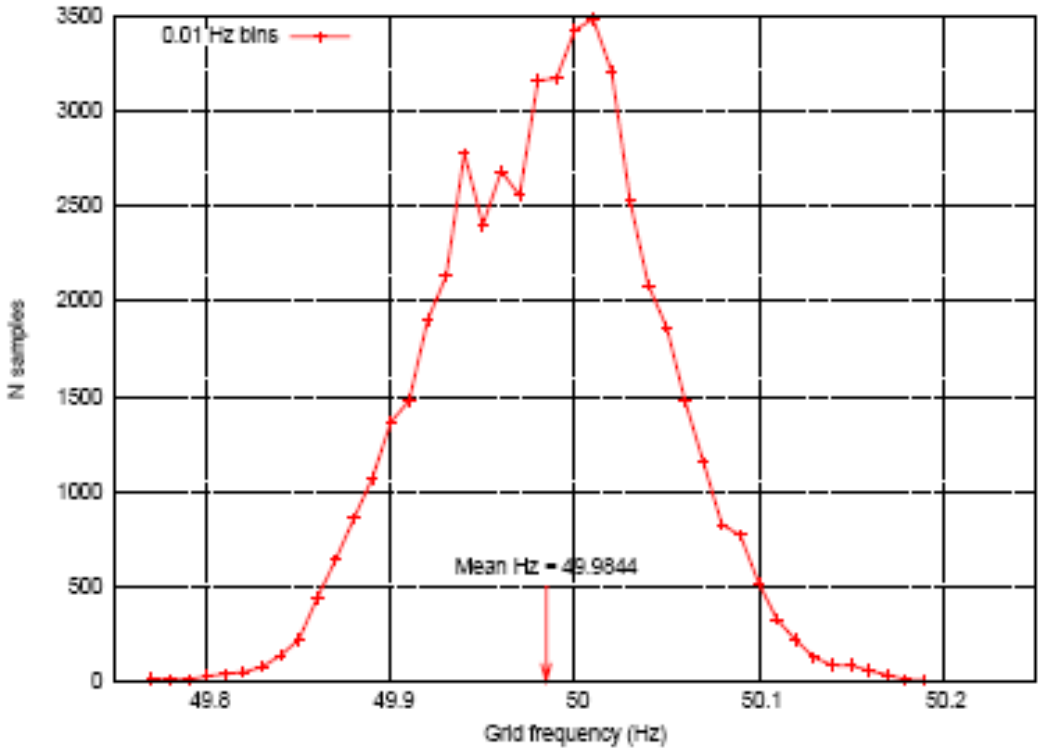


Figure 5: Distribution of grid frequency for a 30 hour period starting 31/08/2005 18:54:00. The mean frequency was slightly lower than nominal.

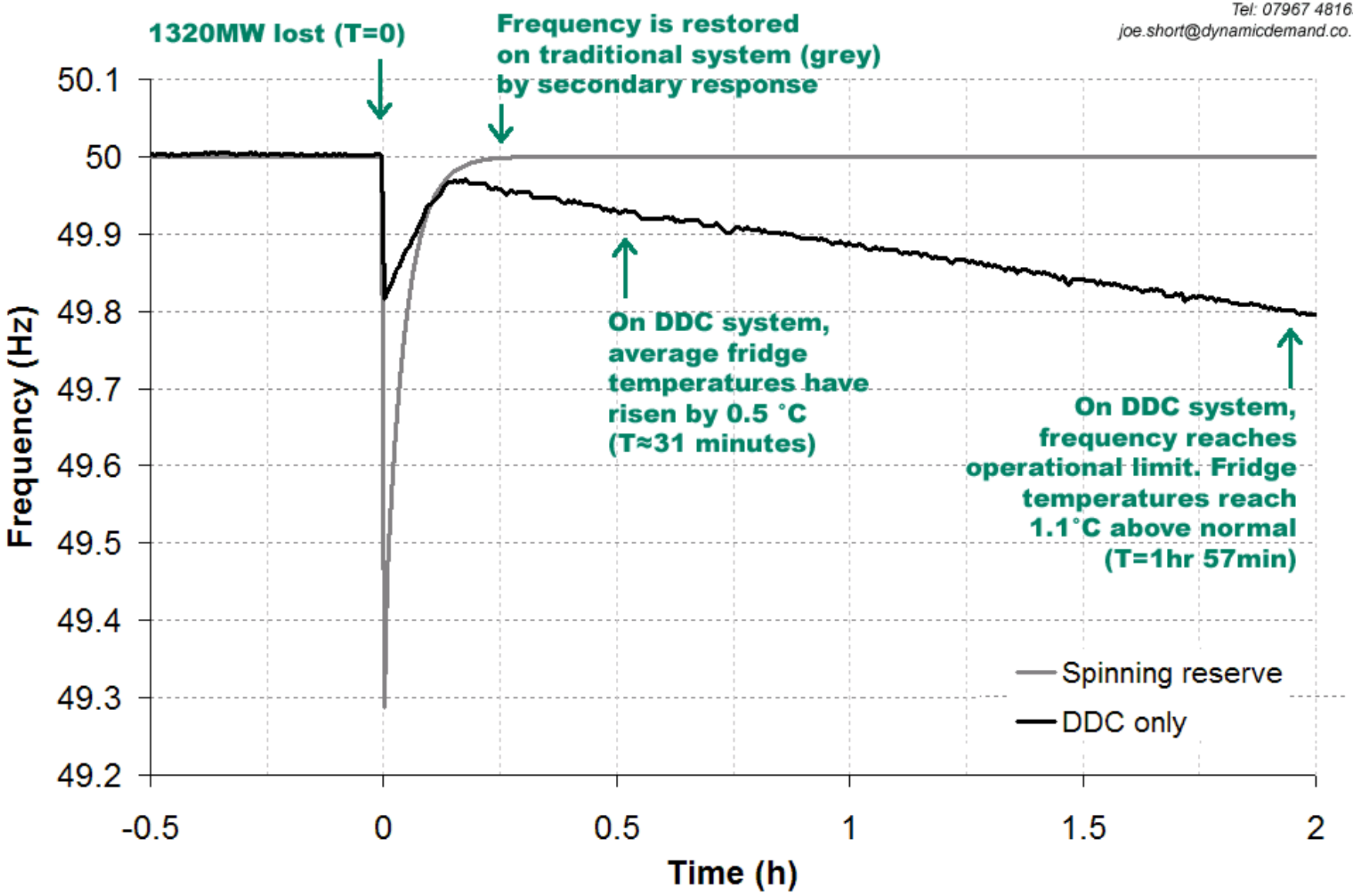
From: www.dynamicDemand.co.uk
(Dynamic Demand is a not-for-profit organisation set up by a grant from the Esmée Fairbairn Foundation)

Simulation of system frequency after a 1320MW loss of generation

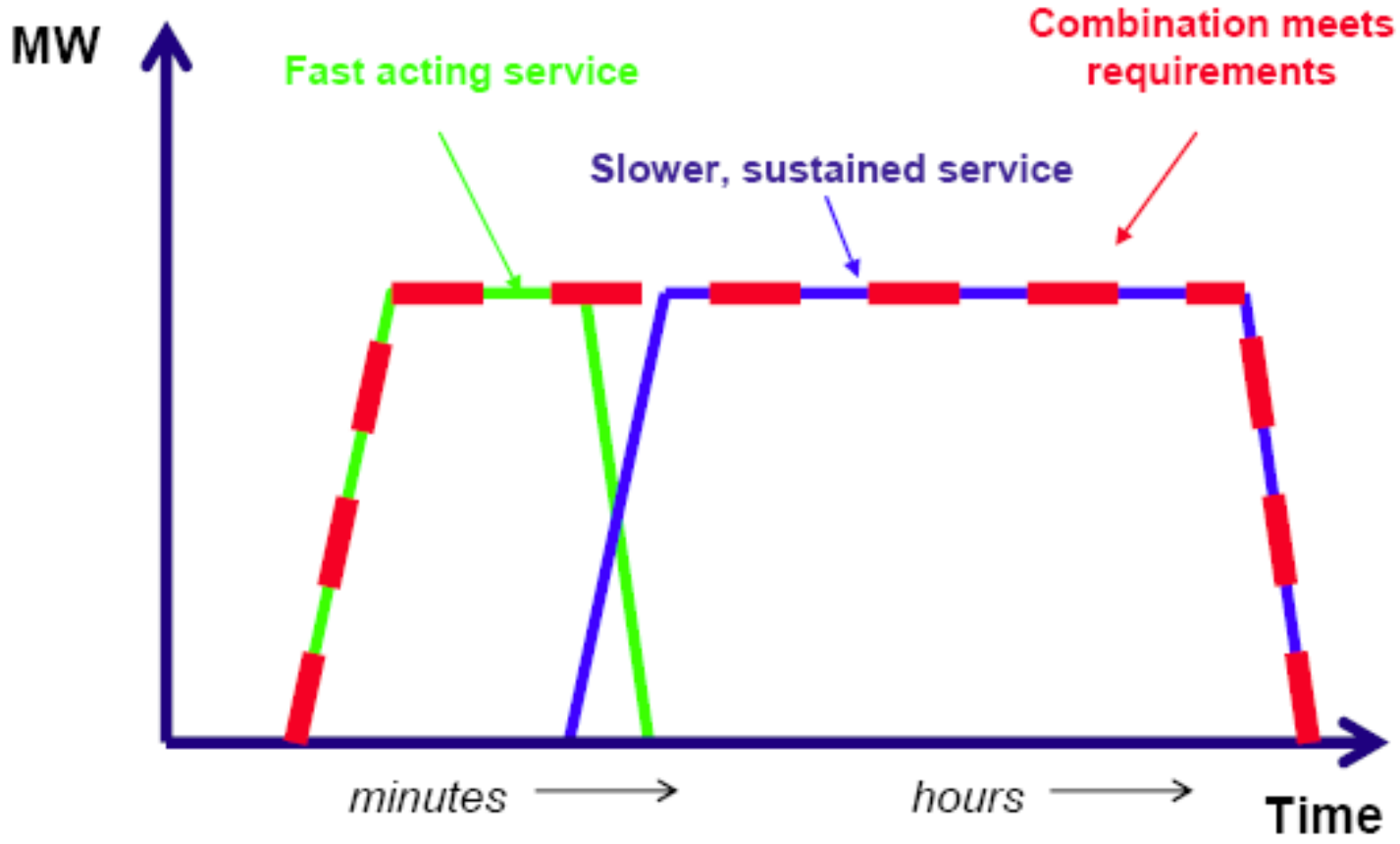
1320MW of Dynamic Demand Control refrigeration (black) compared with 1320MW spinning reserve (grey)
(Total demand = 36GW, DDC constant = 0.2Hz/°C)

dynamicDemand
grid stability through demand control

Simulation output by Joe Short
Tel: 07967 481693
joe.short@dynamicdemand.co.uk

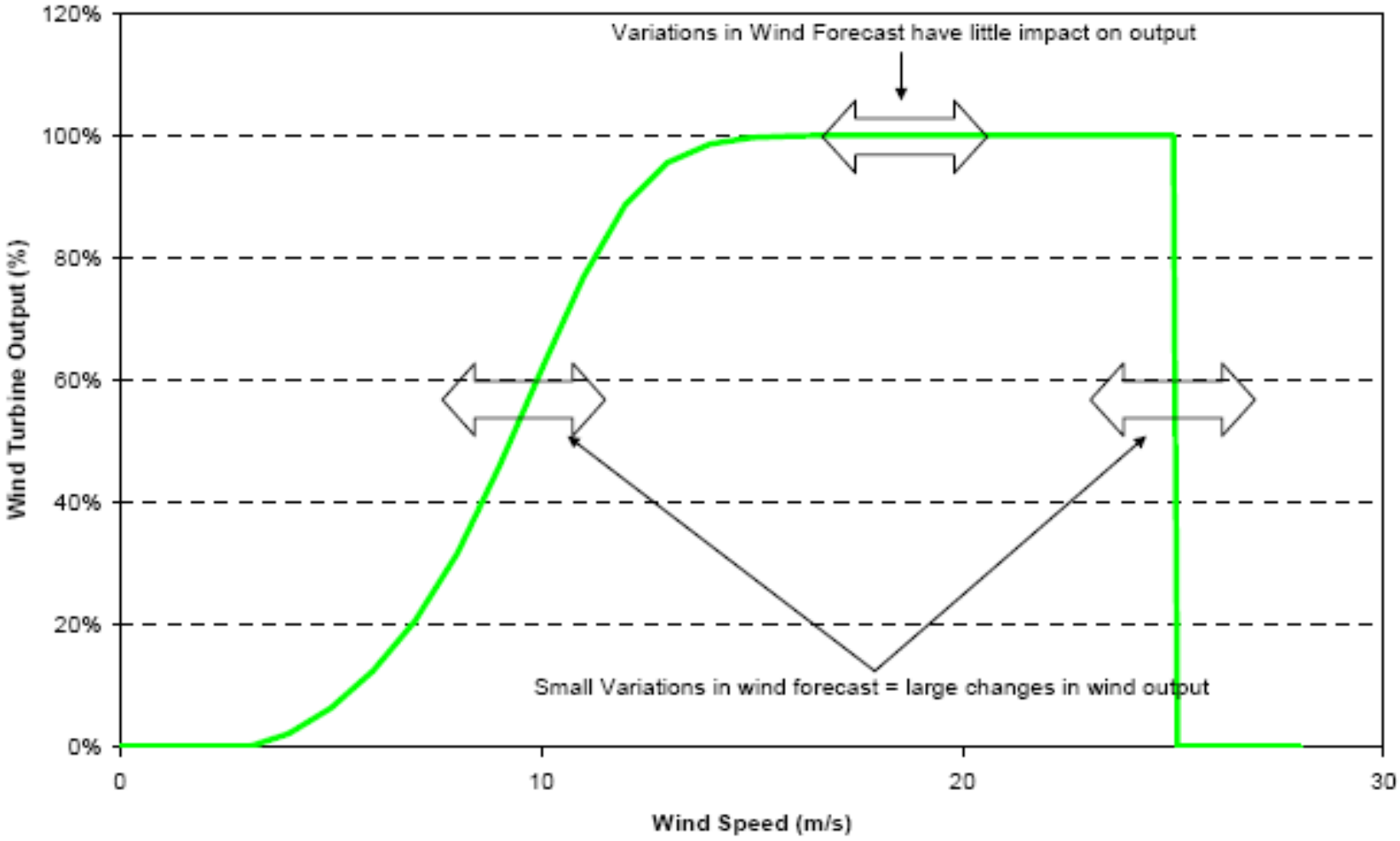


Hybrid reserve service



Operating the Electricity Transmission Networks in 2020, Follow Up Report, National Grid, February 2010

Typical wind turbine power curve



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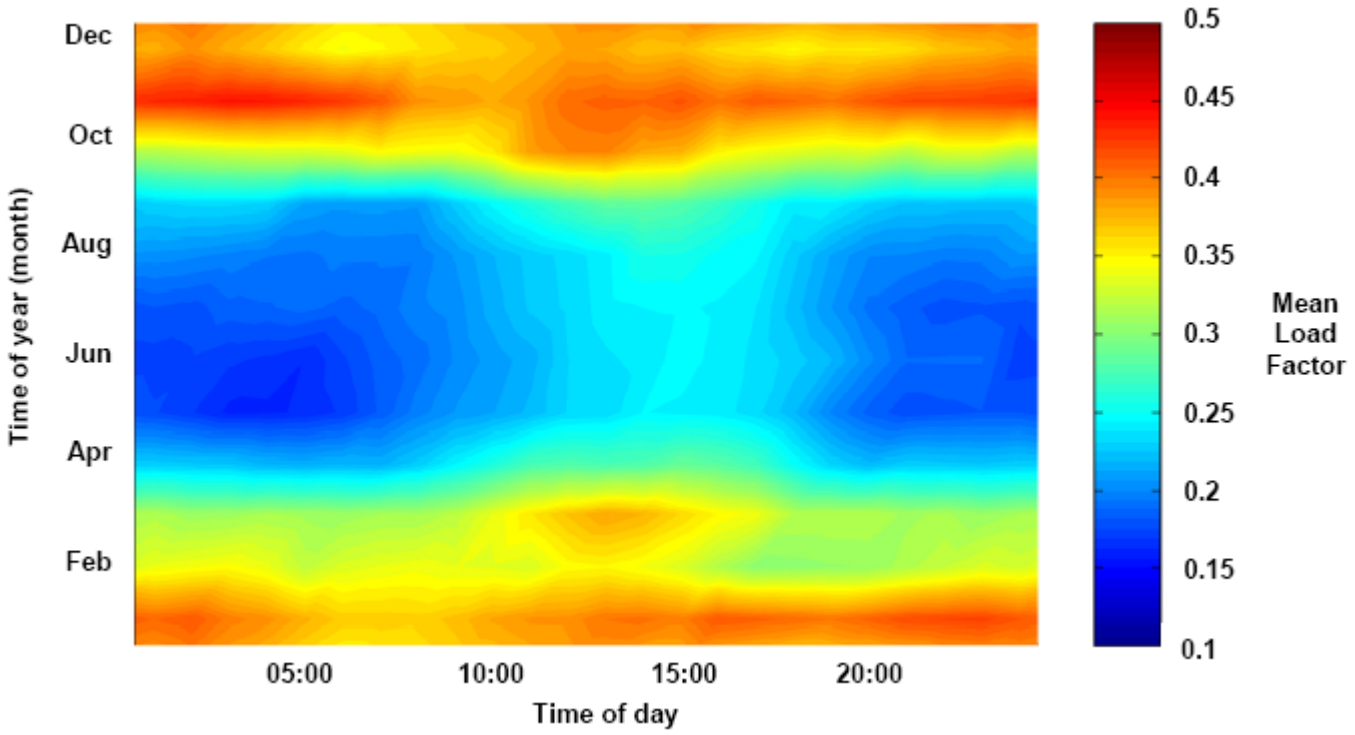
Initial Consultation, National Grid 2009

Recorded wind load factors 2008



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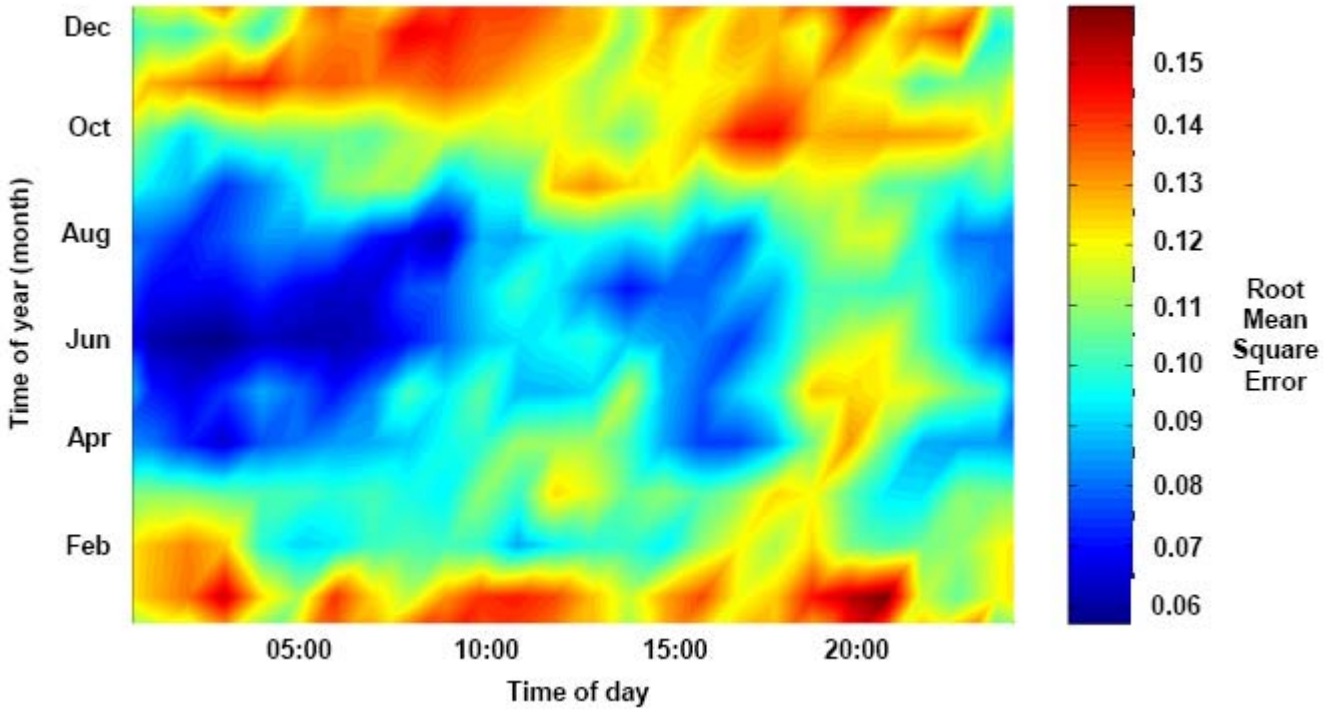
Initial Consultation, National Grid 2009

Persistence errors in forecasting wind



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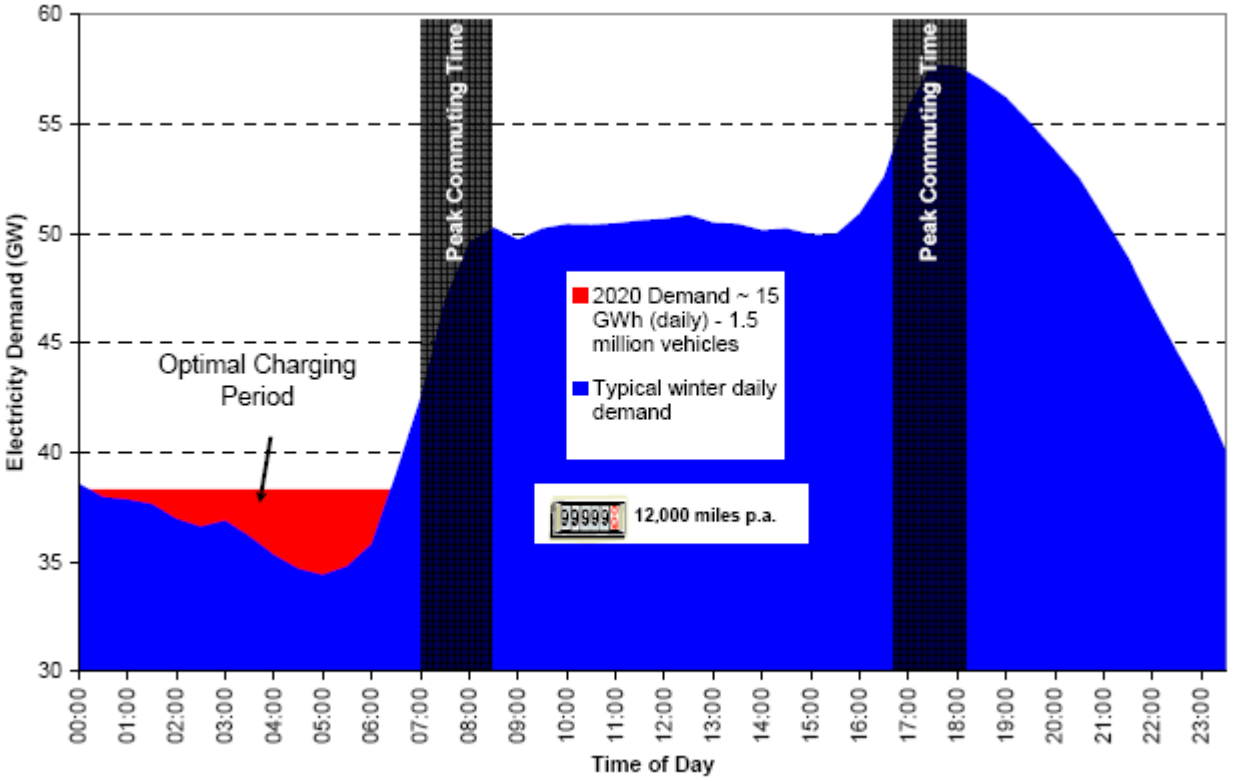
Matching vehicle charging to the current electricity demand profile



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Initial Consultation, National Grid 2009

British Electricity Transmission System

The Transmission System broadly comprises all circuits operating at 400kV and 275kV. In Scotland transmission also includes 132kV networks.

The Transmission System is connected via interconnectors to transmission systems in France and Northern Ireland.


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