

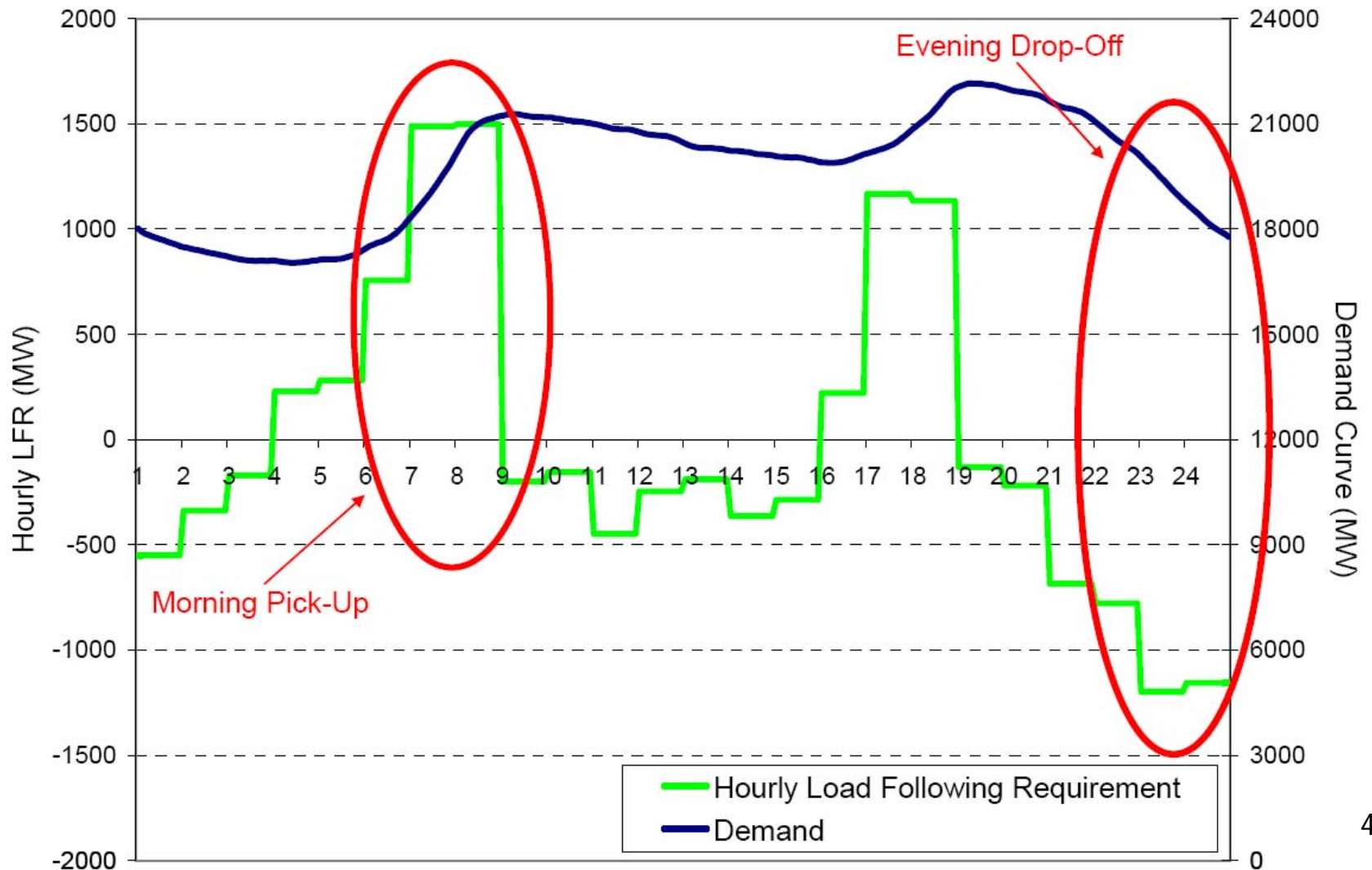
Load Following and Wind Variability Analysis

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November 5, 2008



- 1.) Load Following
- 2.) Wind Variability and Load Following
- 3.) Examples of Wind Variation
- 4.) Next Steps

- Load Following: the act of balancing fluctuations and variations in demand through dispatch of resources.
- Load following is accomplished through the use of dispatchable resources which can control both the amount and the rate at which they can increase and decrease power output.
- Load following requirements are highest during morning pick-up and evening drop-off .
- Due to their intermittent nature, wind generators are unable to contribute to load following.
- As the amount of wind capacity increases in Ontario, the IESO as Ontario's balancing authority will need to account for impacts of wind on load following.



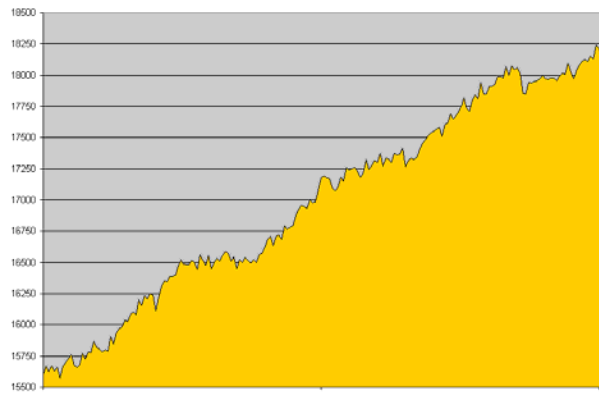
Wind Variability and Load Following

Wind generators have an impact on load following through:

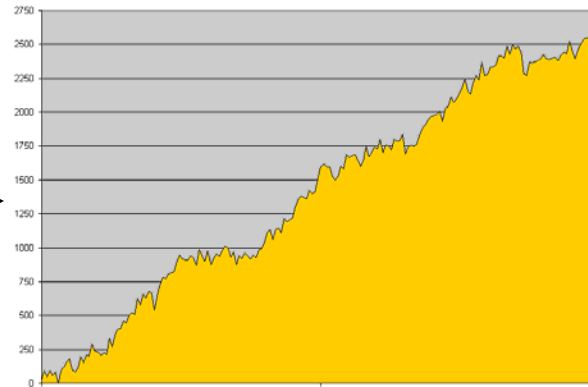
- variations in generator output (wind conditions)
- displacement of dispatchable generation

Load Variation			
Increase	Decrease		
Wind Facilitates Load Following	Wind Hinders Load Following	Increase	Wind Generator Output
Wind Hinders Load Following	Wind Facilitates Load Following	Decrease	

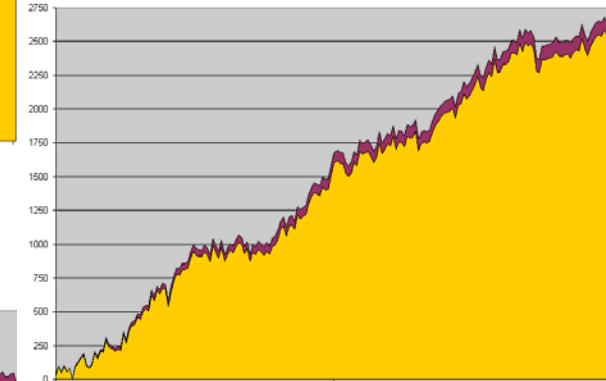
Example of Wind Variation and Load Following Requirement



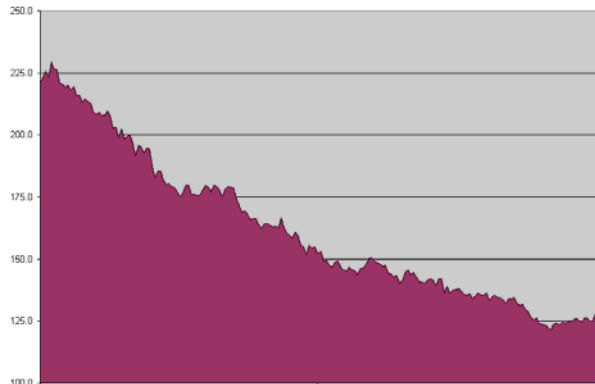
Demand



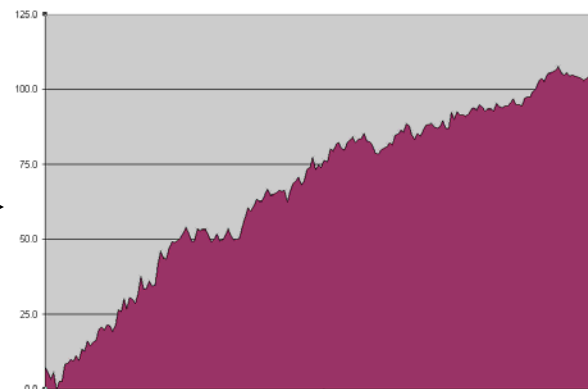
Demand Load Following Requirement



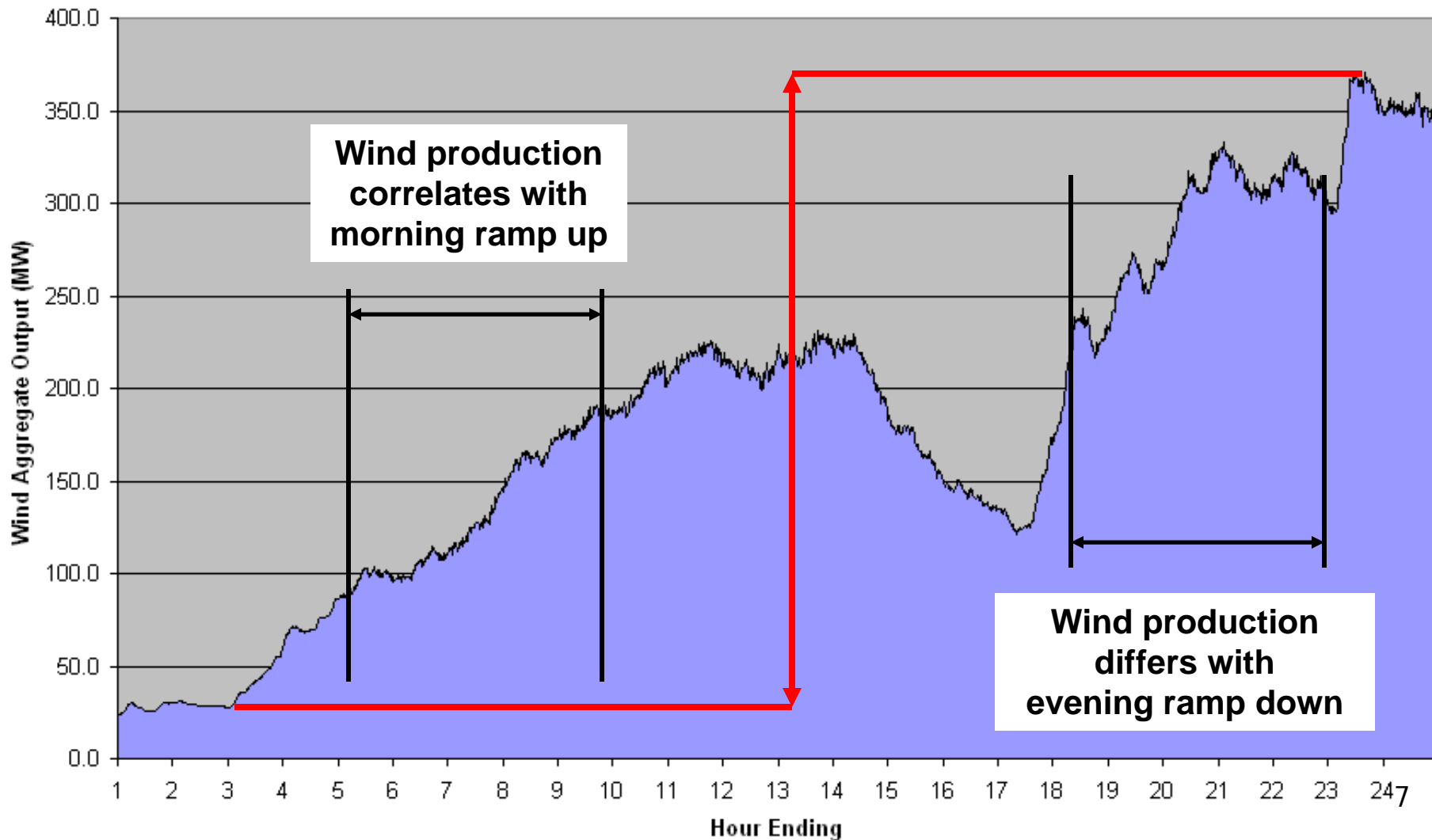
Total Load Following Requirement

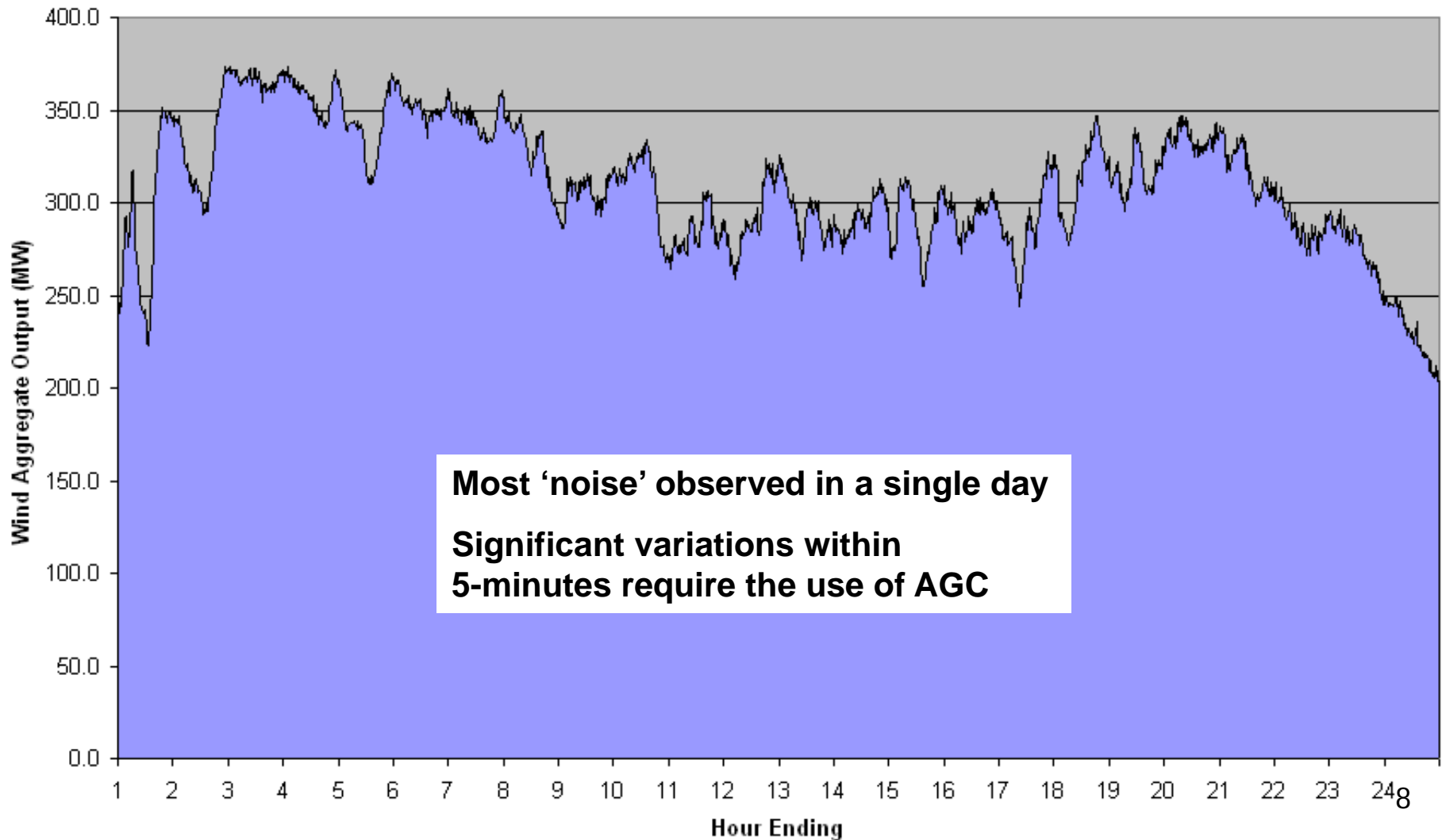


Wind Output



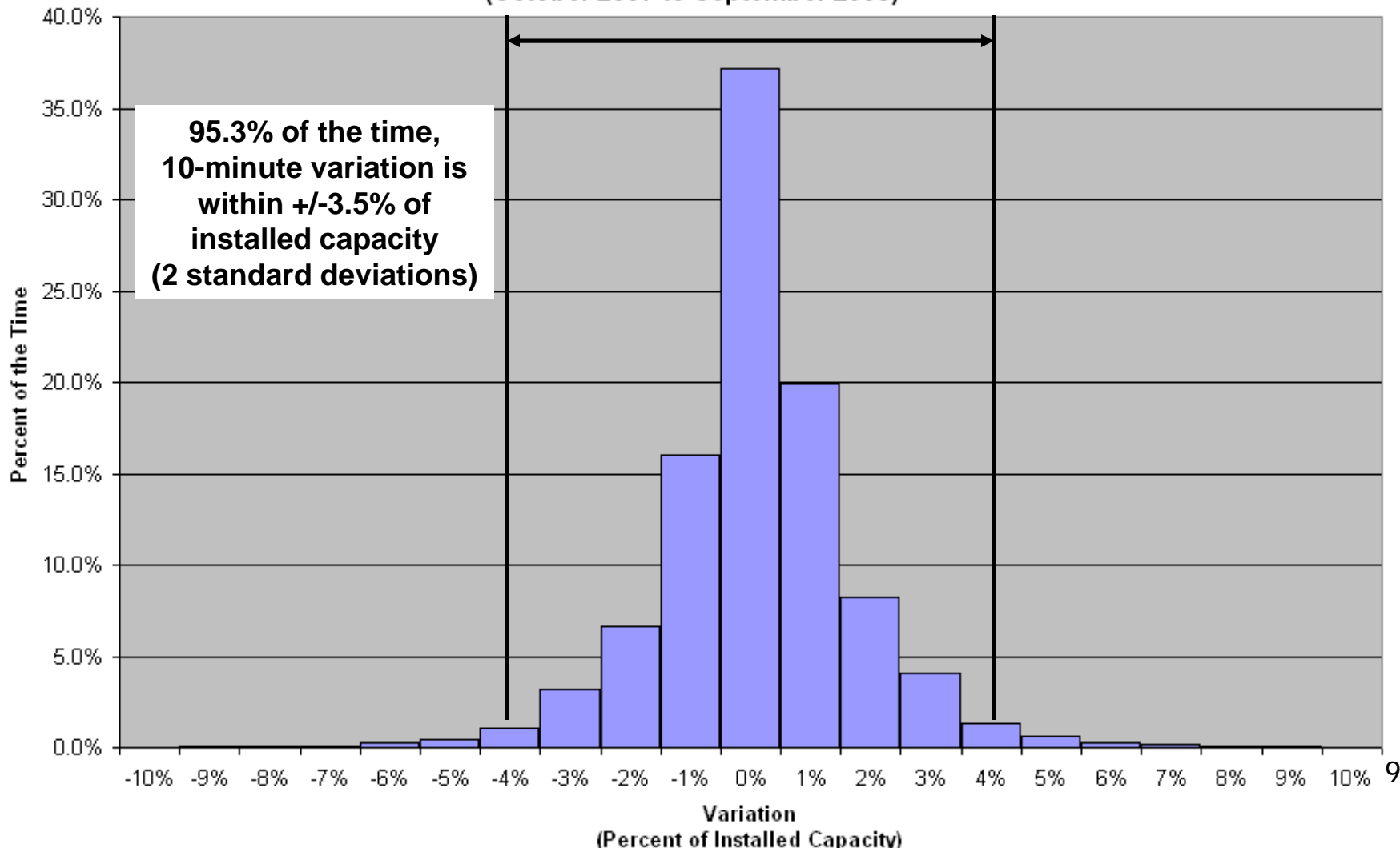
Wind Output Load Following Requirement





A Years Worth of Variation

10 Minute Variation Distribution
(October 2007 to September 2008)



- Largest 10-Minute Variation Observed
 - Maximum Negative Increase: -28.1% of Capacity
 - Maximum Positive Increase: +26.0% of Capacity
- Once installed capacity exceeds 3850MW, the extreme event observed would have exceeded today's largest single contingency (a Darlington Nuclear Unit)

- Further study of wind variation and its impacts on load following (seasonal, time of day, output range)
- Investigation of events where load following is most impacted and future thresholds requiring attention.