

Innovative Smart Grid Technologies Conference

2010 January 20

Mark B. Lively

***Short Run Marginal Cost Pricing
For Fast Responses on the Smart Grid***

Short Run Marginal Cost Pricing For Fast Responses on the Smart Grid -- Mark B. Lively

- Two questions from 2010 January 19
- What is the Smart Grid?
- How do we achieve Interoperability?
- My answers as of 3:19 AM on 2010 January 20

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- What is the Smart Grid?
- SCADA on Steroids
- “The WOLF in Pricing: How the Concept of Plug, Play, and **Pay** Would Work for Microgrids”, *IEEE Power & Energy Magazine*, January/February 2009

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- How to achieve Interoperability?
- Westinghouse vs. Edison
- 60 Hertz AC in US and some of the world
- 50 Hertz AC in much of the rest of the world

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- “The WOLF in Pricing: How the Concept of Plug, Play, and **Pay** Would Work for Microgrids”, *IEEE Power & Energy Magazine*, January/February 2009
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- MIT Professor Ernie Moniz claims “Energy is a Commodity”
- Based on this, Prof. Moniz concludes “Innovation Means Cost Reduction”
- While I conclude we should be able to have a singular market price for electricity
 - dumped on the system or
 - withheld from the system,
 - the same price.

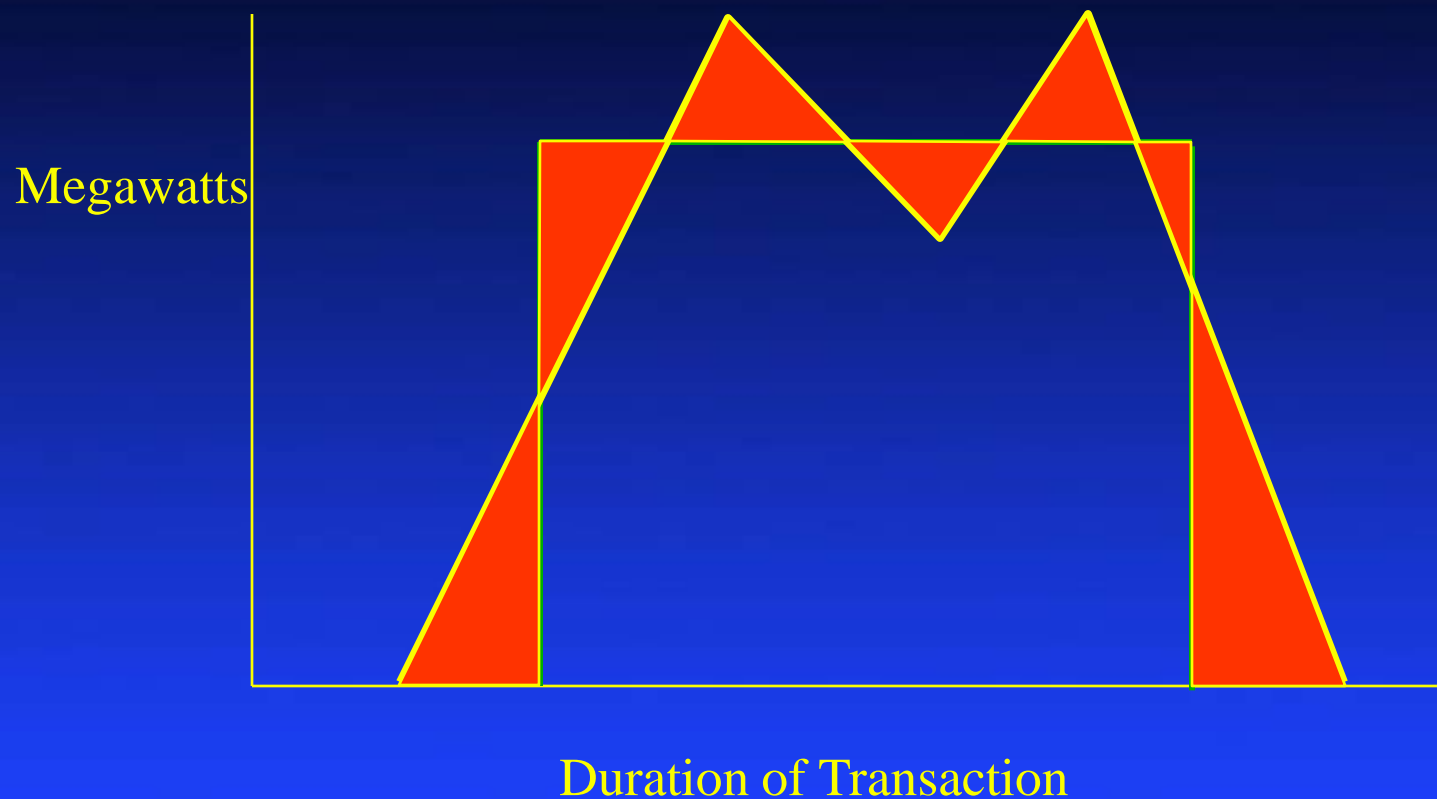
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- Some imbalance tariffs have penalties for exceeding a dead band
- A better imbalance tariff has prices that
 - punish egregious imbalances that hurt the system
 - reward imbalances that help the system
 - 5 MW longs gets paid the same price as is charged 5 MW shorts at the same location and the same time, i.e., zero sum game

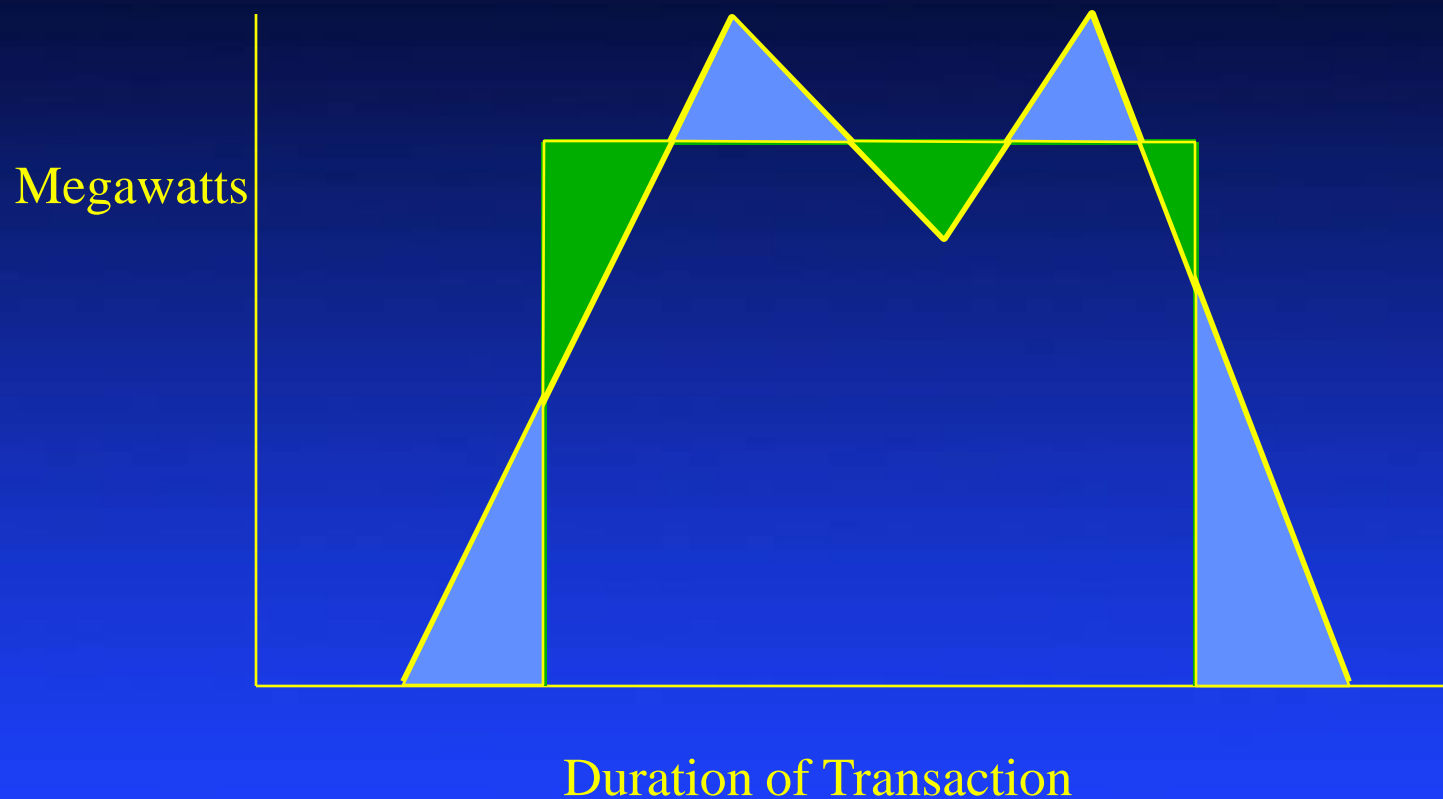
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- Richard P. O'Neill (Chief Economic Advisor, Federal Energy Regulatory Commission), Benjamin F. Hobbs (Department of Geography and Environmental Engineering, The Johns Hopkins University), et al., say ISO markets have non-continuous solutions, *Efficient Market-Clearing Prices in Markets with Nonconvexities*
- Their solution is integer programming
- My solution is to create continuous pricing mechanism for real time imbalances

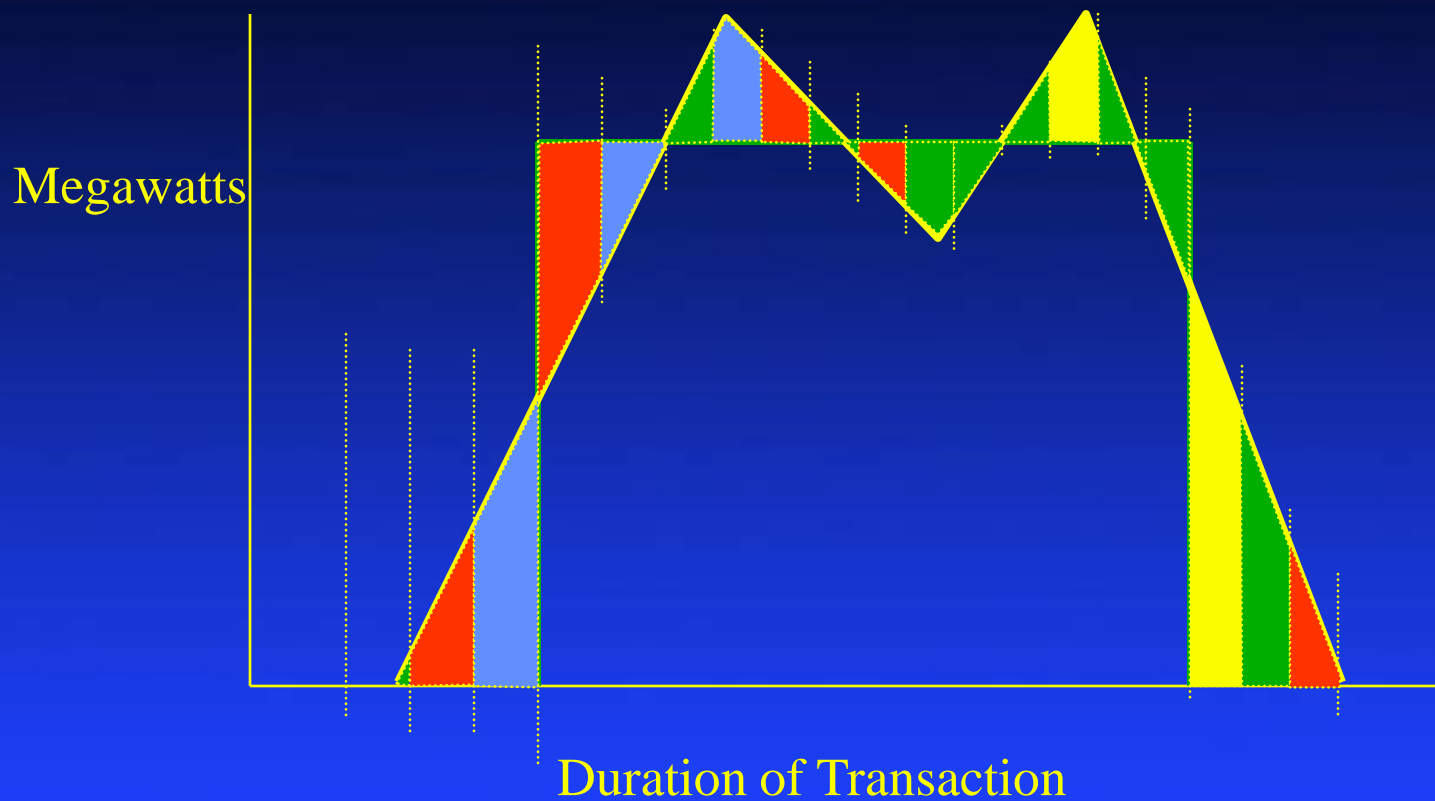
Delivering Active Power



Delivering Active Power



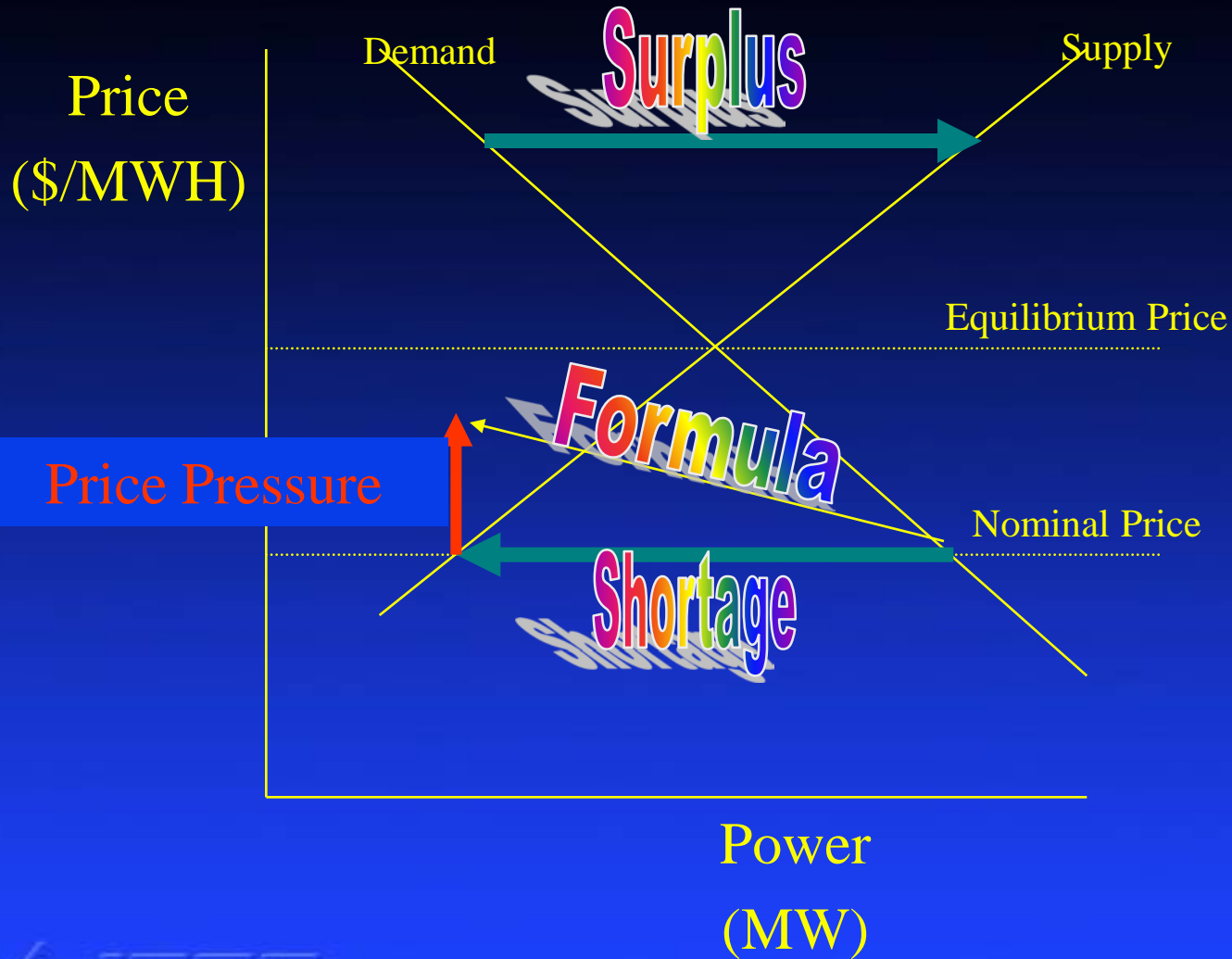
Delivering Active Power



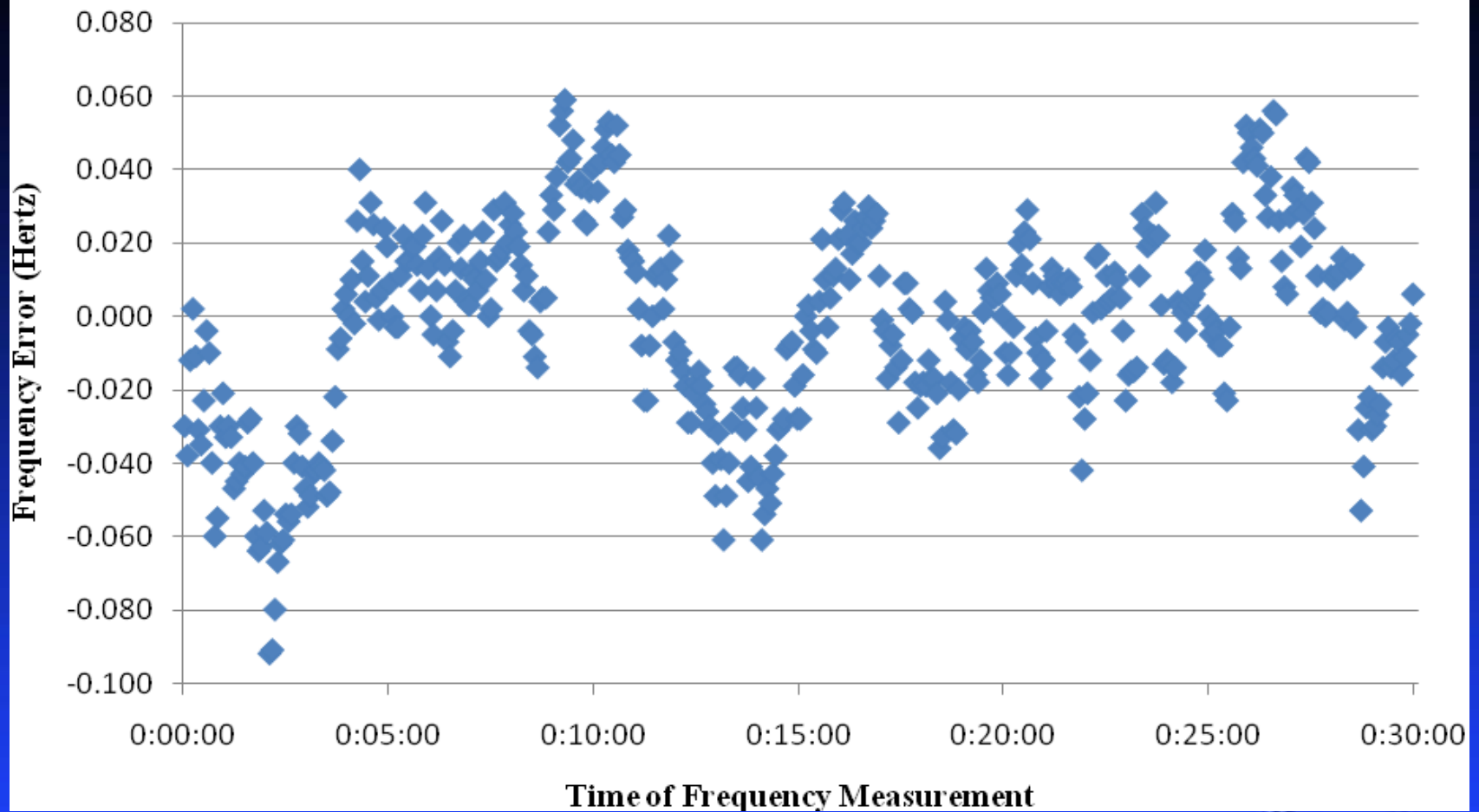
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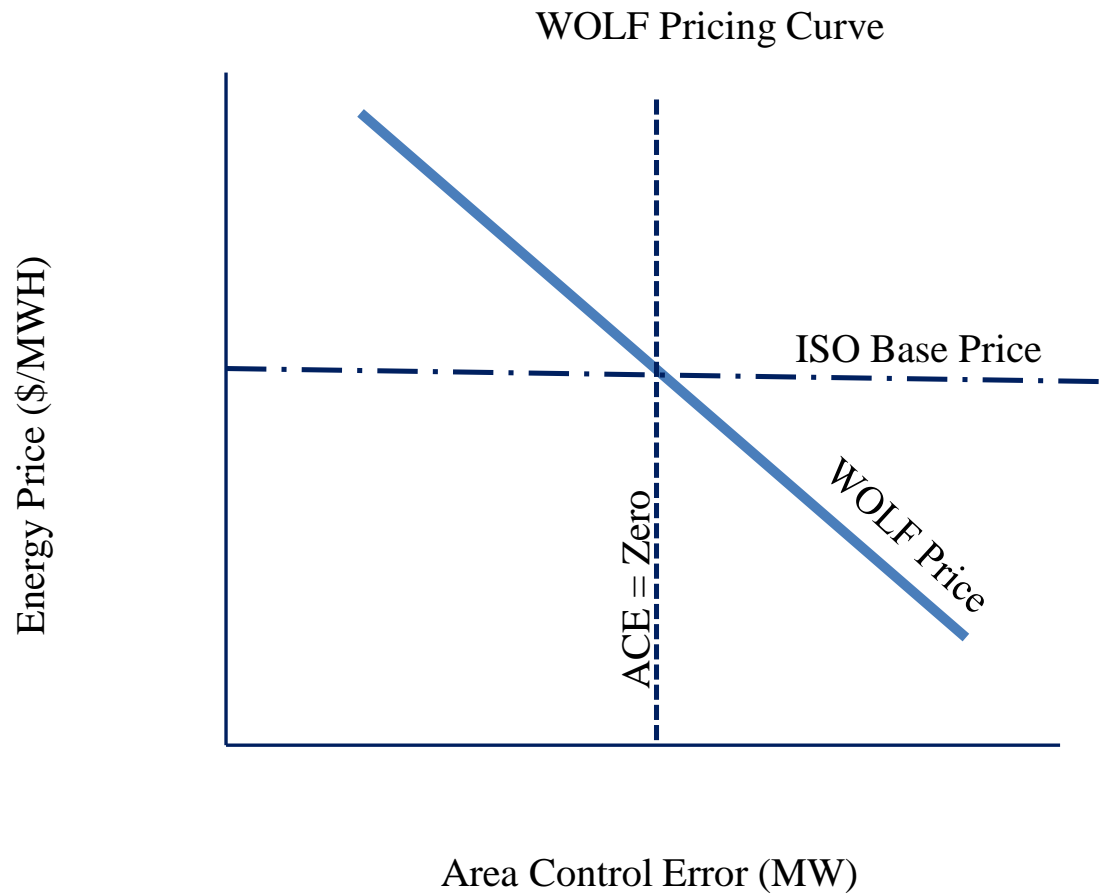
- Tom Woods says that “The Market Always Wins”, admitting the market can be deferred until you run out of
 - Cash
 - Bullets
 - The Willingness to Spend Them
- I say that the winning market in electricity needs to be based on the physics of electricity, else you run out of power

Wide Open Load Following Dynamic Economic Theory



Australia Energy Market Operator Frequency Error 2009 September 16

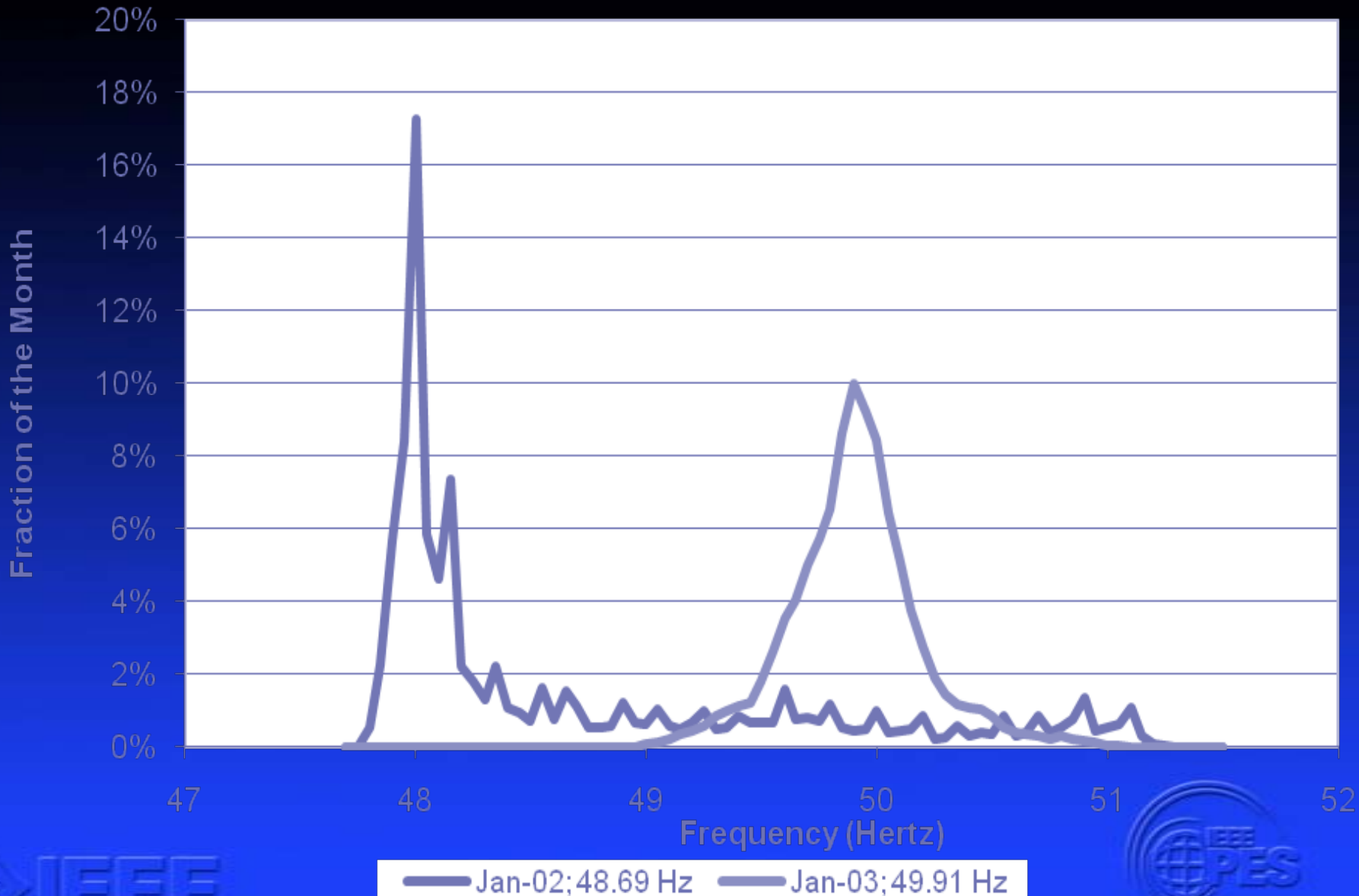




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- Price increases exponentially when ACE is negative
- Price decreases linearly (through zero to being negative) when ACE is positive
- Price when ACE is 0^+ is equal to the price when ACE is 0^-
- Price slope when ACE is 0^+ is equal to the price slope when ACE is 0^-

India Southern Region Frequency Distribution 0.050 Hertz Bucket Size



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- Ralph Russell
- Dominion Virginia Power
- r.w.russell@ieee.org
- Jamboree Electricity & Electronics Merit Badge Booth
- "Check out our updated website
<http://www.facebook.com/l/bfde7;www.emeritbadges.org>

We will have tons of 2010 Jamboree photos. We will also be tweeting, blogging and be on Facebook. Stop by and visit during the Jamboree."

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