

# SUBSTITUTION ALGORITHM FOR REGULATION MARKET CLEARING

# Outline

2

- An Ideal Market
- The Current Market
- How the Substitution Algorithm works
- An Excel Example
- Conclusions
- Credits

# Characteristics of an ideal market

3

- Ensures Reliability
- Provides no incentives to bid below actual cost
- Produces a least cost solution to providing regulation

# Problems of the current market

4

- ❑ Sometimes dispatches far too much RegD, with negative impact on reliability
- ❑ Dispatches all RegD priced at 0, regardless of performance score.
- ❑ Is least cost in dispatch, but at the expense of reliability

# What the Substitution Algorithm does

5

- Step 1 – Dispatch full market of RegA to ensure functioning market and to establish a Marginal Price on which to compare RegA and Reg D

# What the Substitution Algorithm does

6

- Step 2 – Find the Marginal Unit in the Market  
(Could be RegA or D)

# What the Substitution Algorithm does

7

- Step 3 – Using the cost of the marginal unit, Calculate the real cost of all units not currently in the market using  
$$\max(\text{marginal cost, bid price})$$

# What the Substitution Algorithm does

8

- Step 4 – Compare the cheapest unit not in the market to the most expensive one in. If the unit not in the market is less expensive than the most expensive one in. Replace as much of it as possible with the cheaper unit.

# What the Substitution Algorithm does

9

- Step 5 – repeat steps to 4 until the cheapest unit not in the market is more expensive than the most expensive unit cleared

10

# Excel Example

# Conclusions

11

- This method allows RegA and RegD to be compared on merit not cost.
- As long as a RegD resource is cheaper than the Marginal Unit of the whole market, it is eligible to clear
- If a RegD unit becomes the marginal unit, it will be replaced by the best performing cheaper RegD

# Conclusions

12

- Because the Marginal cost is set by the most expensive unit in the whole market, It is still least cost to select units with higher bids as long as they are less than the market price.
- Resources will no longer clear simply because they bid zero, they will have to be competitive against all other resources whose costs are less than the Marginal Resource.

# A.F. Mensah, Inc.

252 Nassau Street  
2<sup>nd</sup> Floor  
Princeton, NJ 08542

115 Stryker Lane  
Building 4 – Suite 10  
Hillsborough, NJ 08844

[www.afmensah.com](http://www.afmensah.com)

Contact Me at

[William.gallgher@afmensah.com](mailto:William.gallgher@afmensah.com)

908-399-2867