Opportunity Cost Methodology

Cost Development
Task Force

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Monitoring Analytics

Long Term Opportunity Cost Example

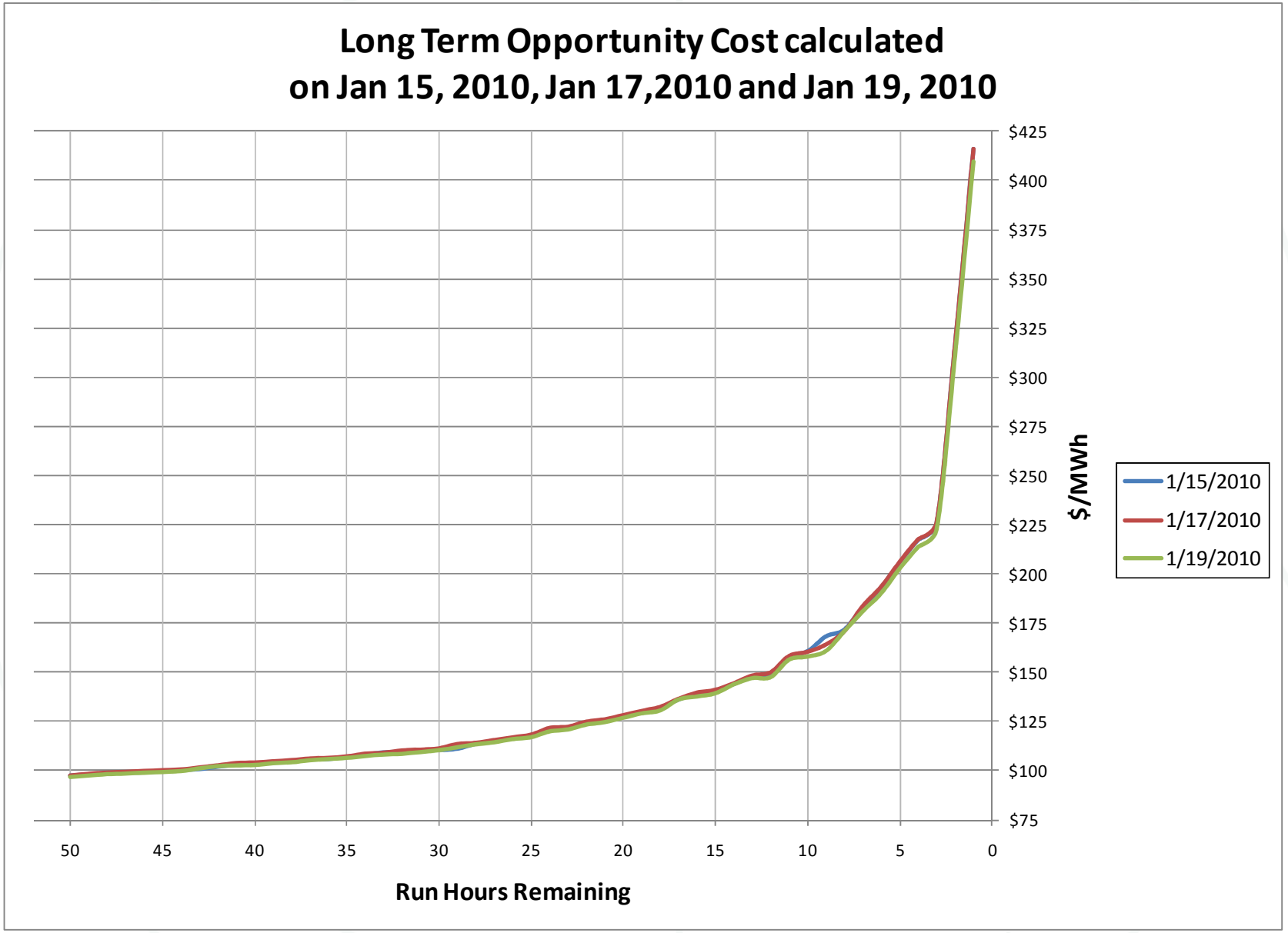
- **As the number of available run hours decrease, the opportunity cost adder increases, holding other factors constant.**
- **As run hours available approach zero, unit's cost-based offers increase due to increased opportunity cost component.**
- **Increased offers reduce the probability that unit will be dispatched.**

Input Example Assumptions:

Natural Gas CT has a limitation of 50 hours in the 2010 calendar year.

Opportunity Cost calculated on Jan 15, 17 and 19.

- **Forward Prices: from 12/29/2009**
- **CO2 Emission Rate: 337.6**
- **NOx Emission Rate: 1.7**
- **SO2 Emission Rate: 0.012**
- **Heat Rate: 10.3**
- **FMU Adder: $0**
- **Fuel Type: Natural Gas - Transco Zone 6 NY**
- **VOM: $0**
- **Use Percentage Adder: No**
- **Use Fuel Volatility: 0**
- **Start Cost: 0**
- **Minimum Run Time: 1**



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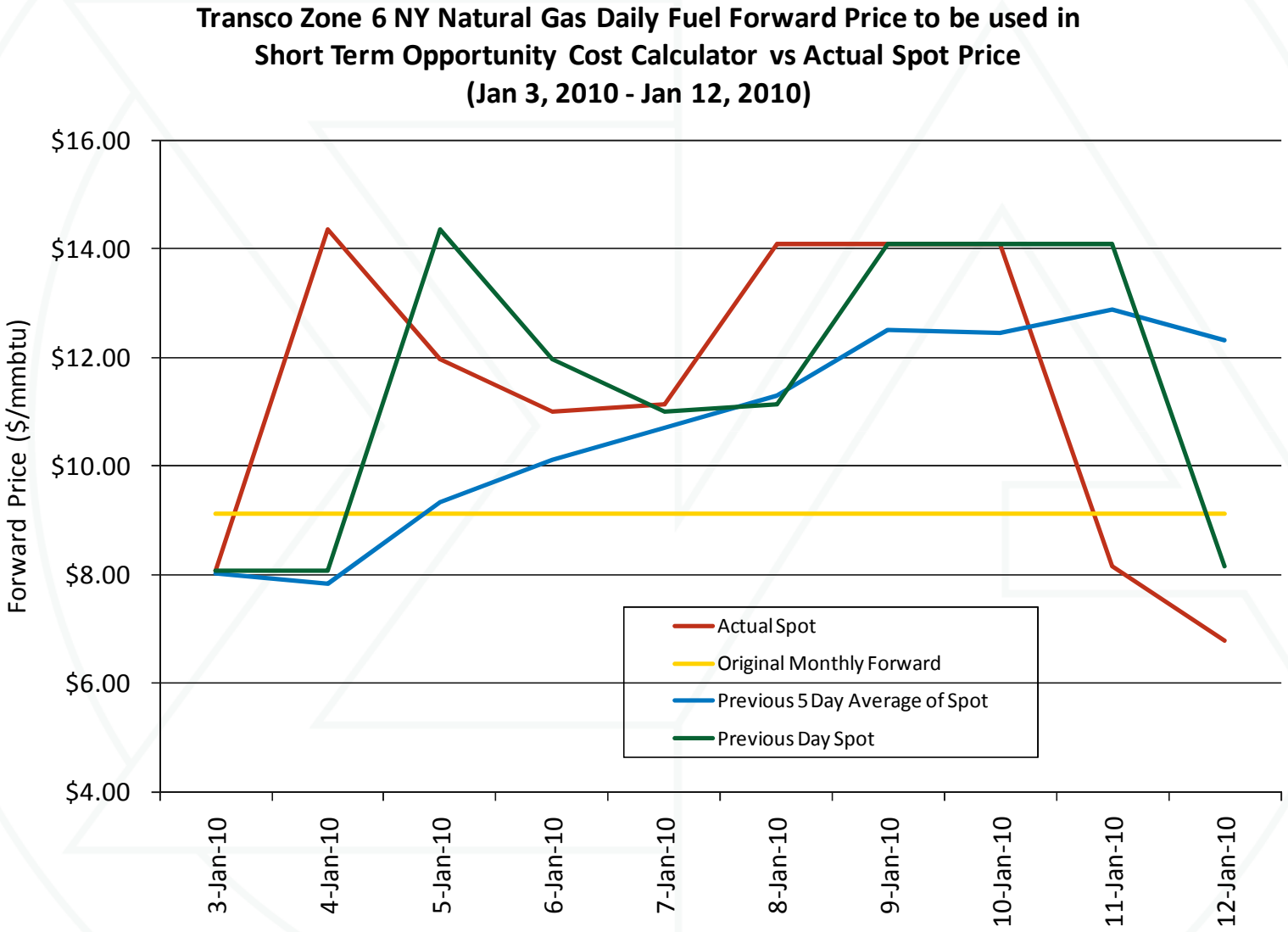
Proposed Short Term Methodology

- **Forward data**
  - **Use spot price of fuel from the last available trading day; and**
  - **Use peak and off-peak electricity spot price from the last available trading day.**
- **Do not use daily fuel volatility scalar**
  - **A daily fuel spot price is used directly**
  - **No reason for a daily scalar in addition**
- **Do not use peak/off-peak hourly volatility scalar**
  - **A daily peak and off-peak spot price is used directly**
  - **No reason for a peak/off peak scalar in addition**

Purpose

- **PJM's Example from 7/26/10 CDTF meeting showed the opportunity cost calculator worked "rationally"**
  - **Calculator will work "rationally" with any input provided**
- **Flaws in using the current methodology for short term opportunity costs**
  - **Fuel intra month price movements are not captured**
  - **Electricity intra month price movements are not captured**
  - **Due to short-term price volatility opportunity costs change daily**
- **Slides show price fluctuations can have a significant impact on opportunity cost component in short term**

Intra Month Increase in Fuel Price



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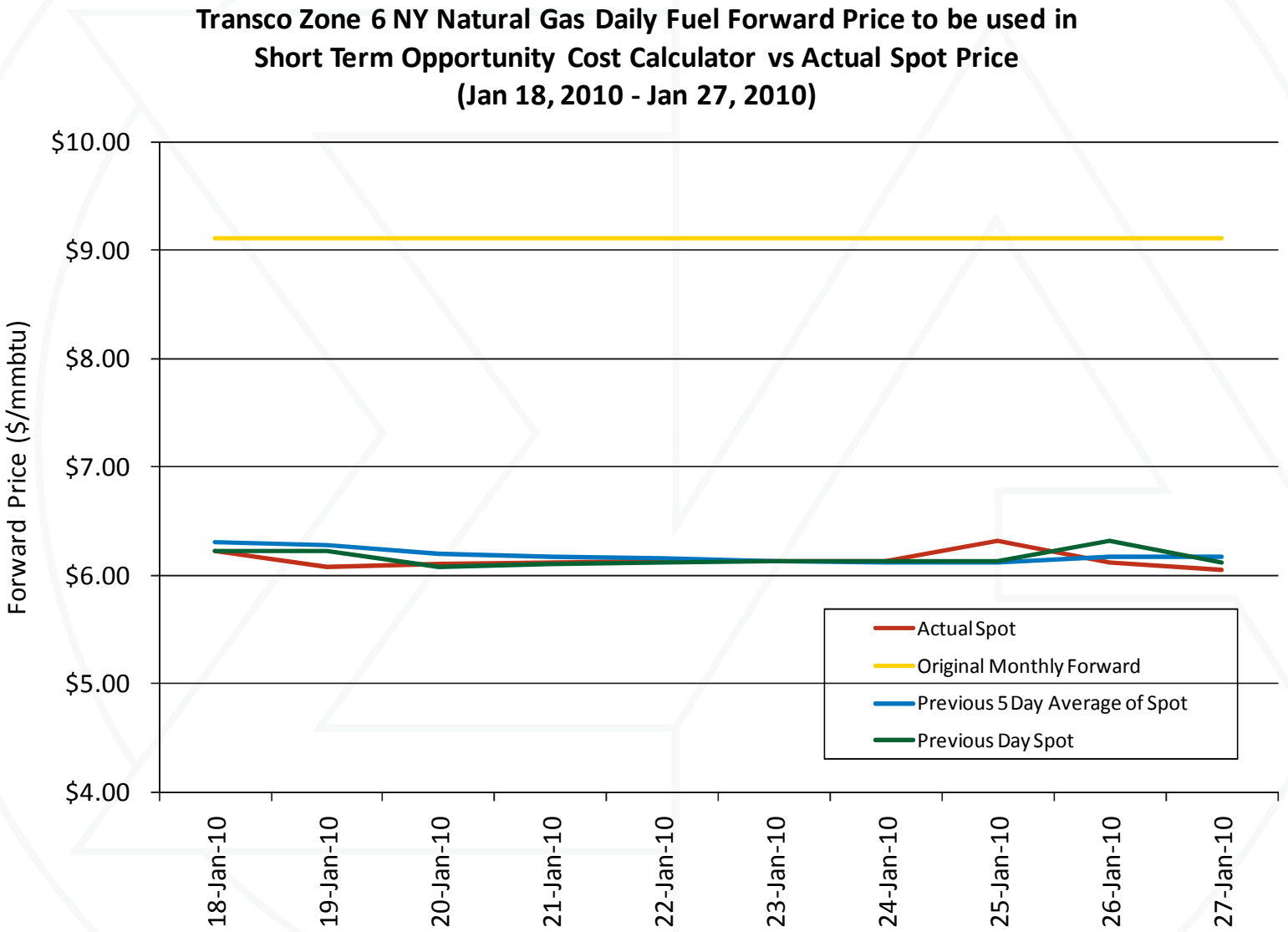
Intra Month Decrease in Fuel Price



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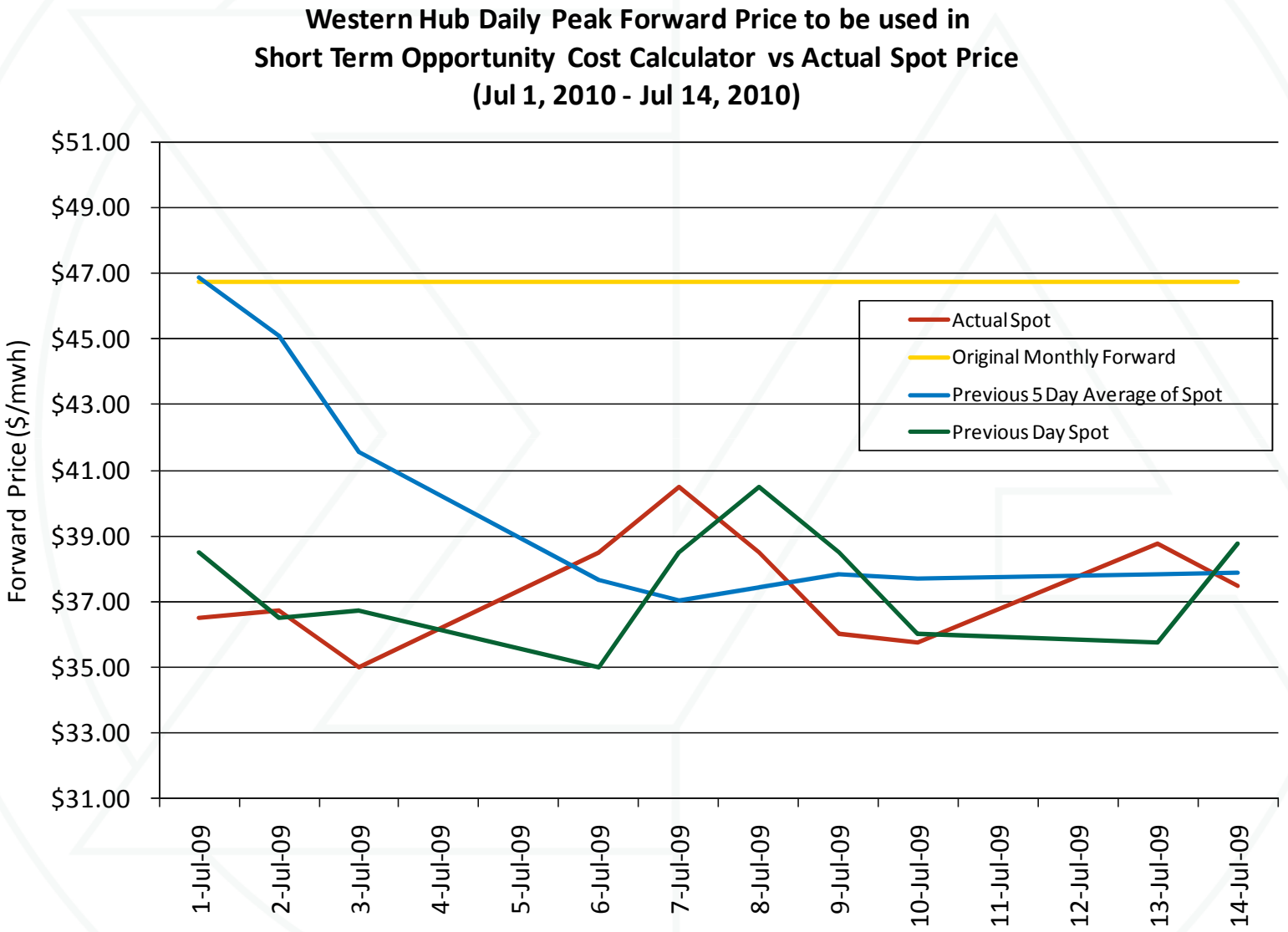
Intra Month Decrease in Western Hub Price



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Input Example Assumptions:

On Jan 3, 2010, a natural gas CT finds out that it only can run 100 hours on gas because the unit is damaged and can not be fixed until Jan 12th, 2010.

- **Forward Prices: from 12/29/2009**
- **CO2 Emission Rate: 337.6**
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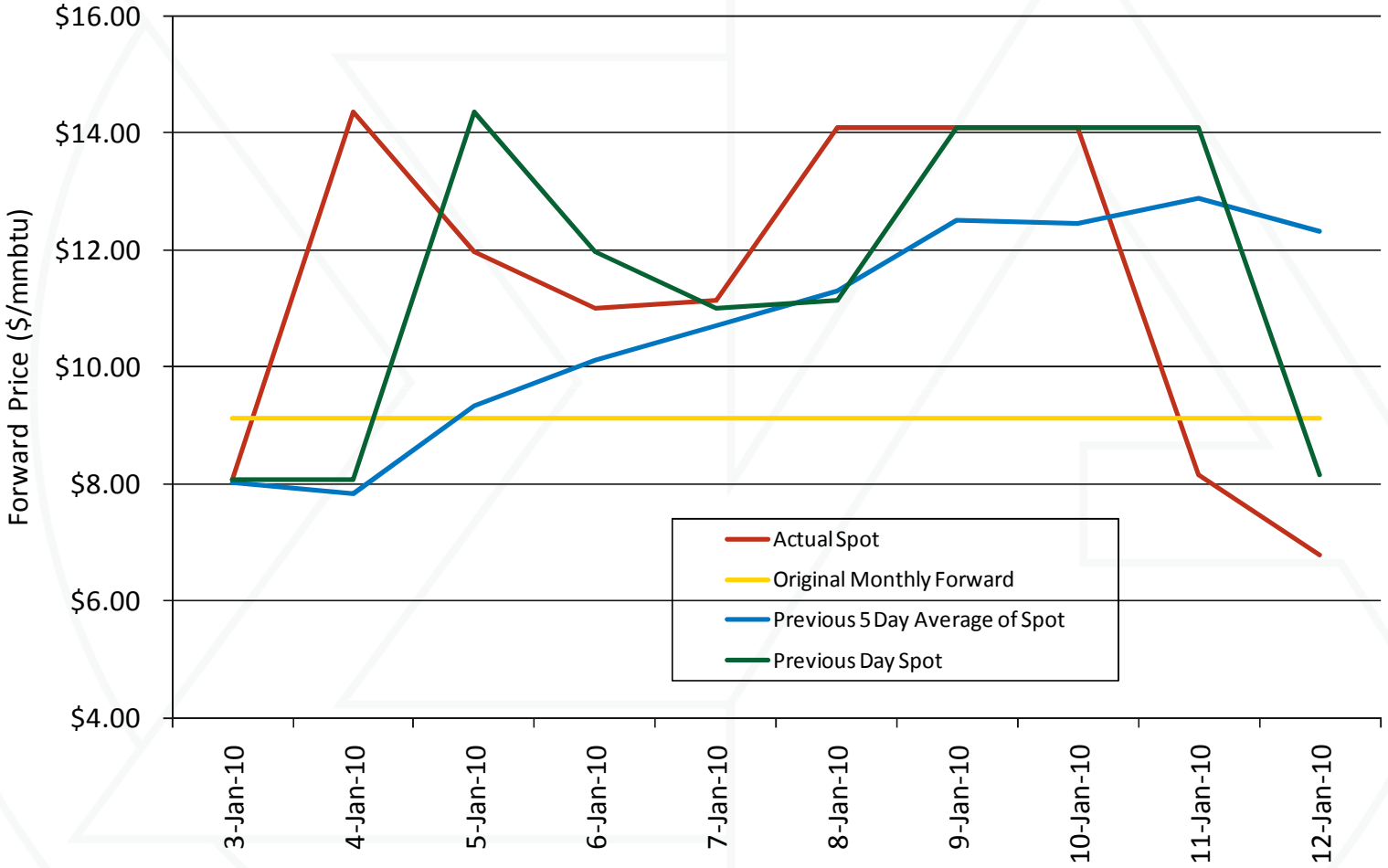
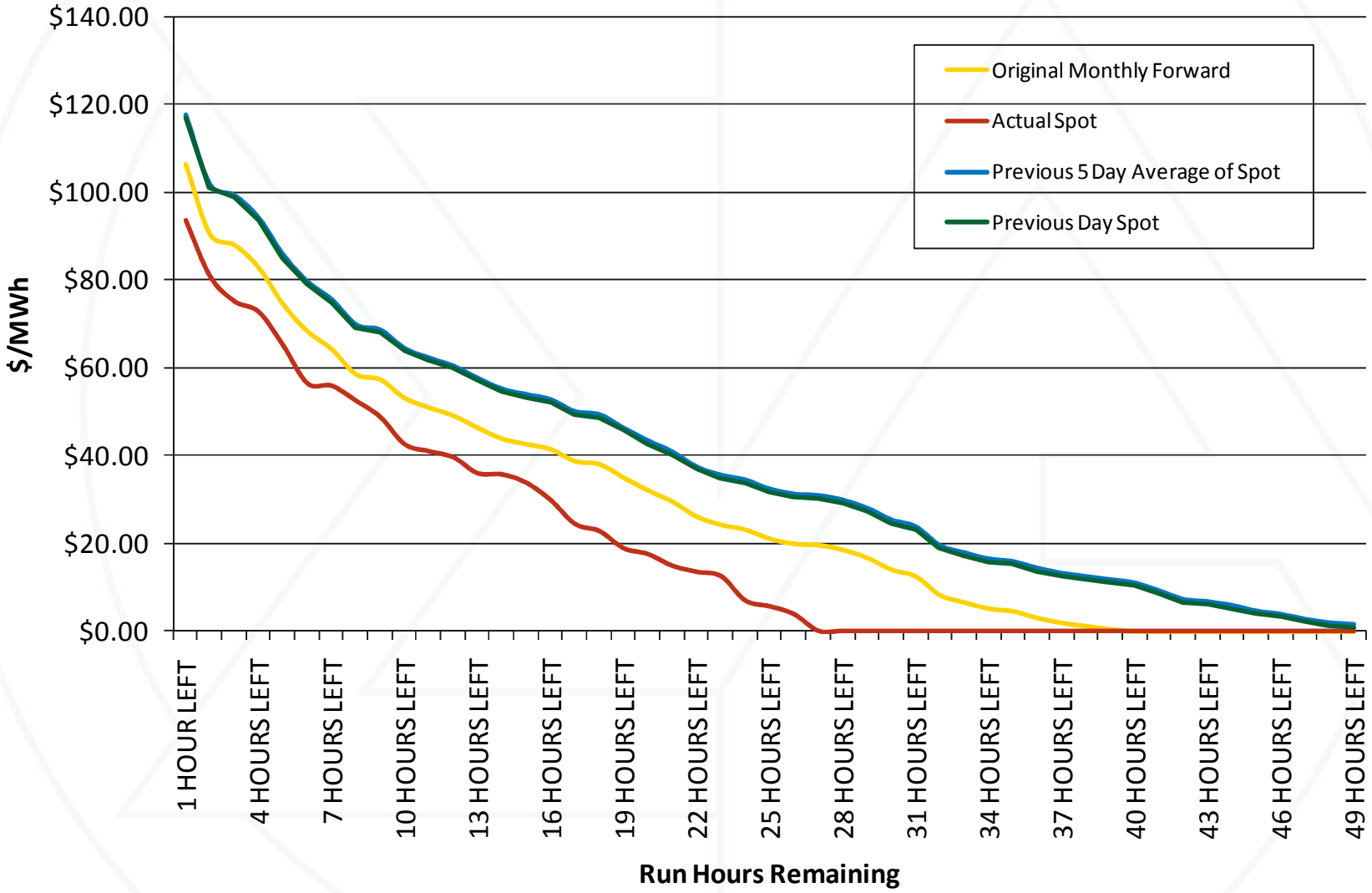
- **SO2 Emission Rate: 0.012**
- **Heat Rate: 10.3**
- **FMU Adder: $0**
- **Fuel Type: Natural Gas - Transco Zone 6 NY**
- **VOM: $0**
- **Use Percentage Adder: No**
- **Use Fuel Volatility: 0**
- **Start Cost: 0**
- **Minimum Run Time: 1**

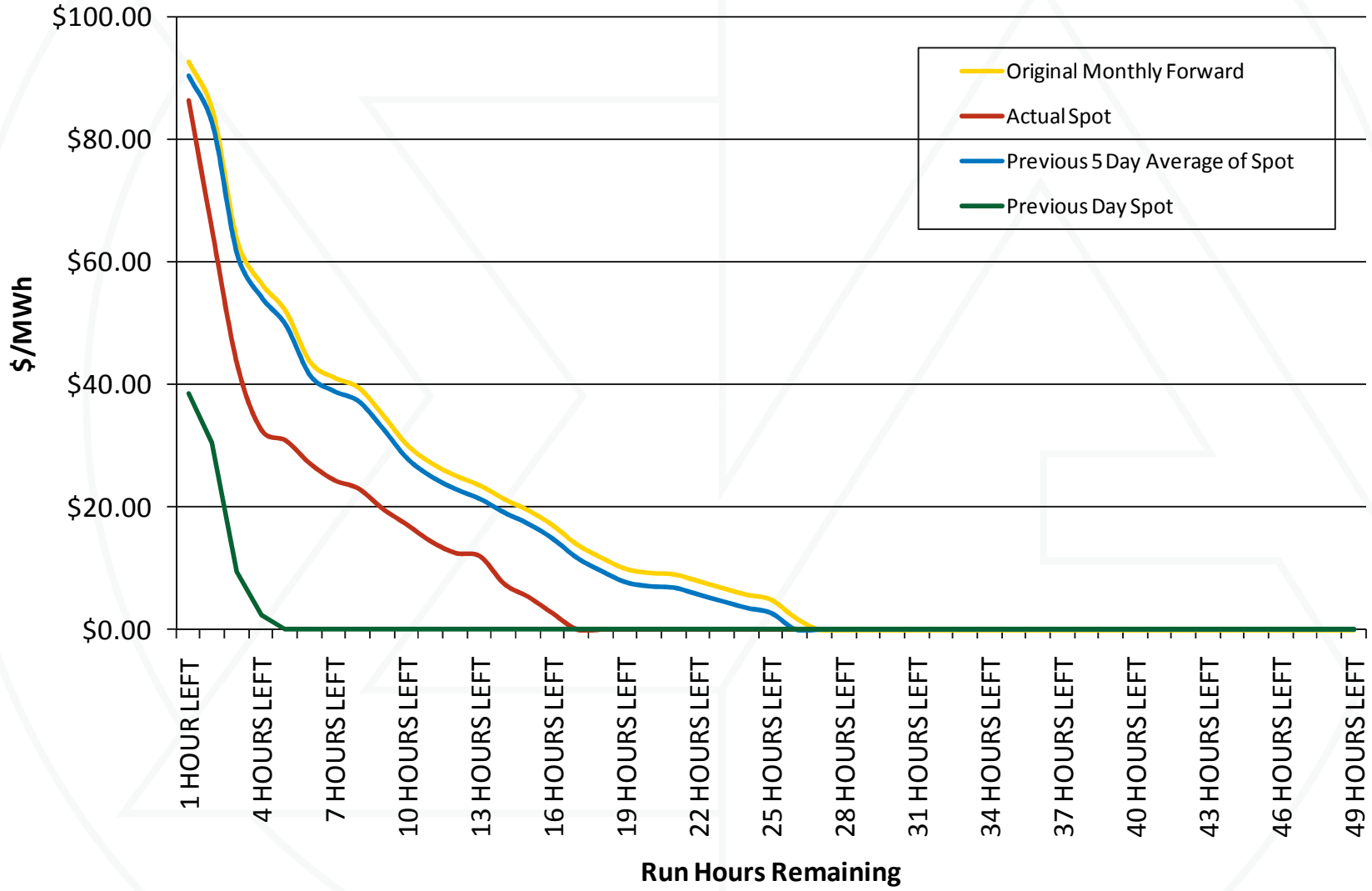
Transco Zone 6 NY Natural Gas Daily Fuel Forward Price to be used in Short Term Opportunity Cost Calculator vs Actual Spot Price (Jan 3, 2010 - Jan 12, 2010)

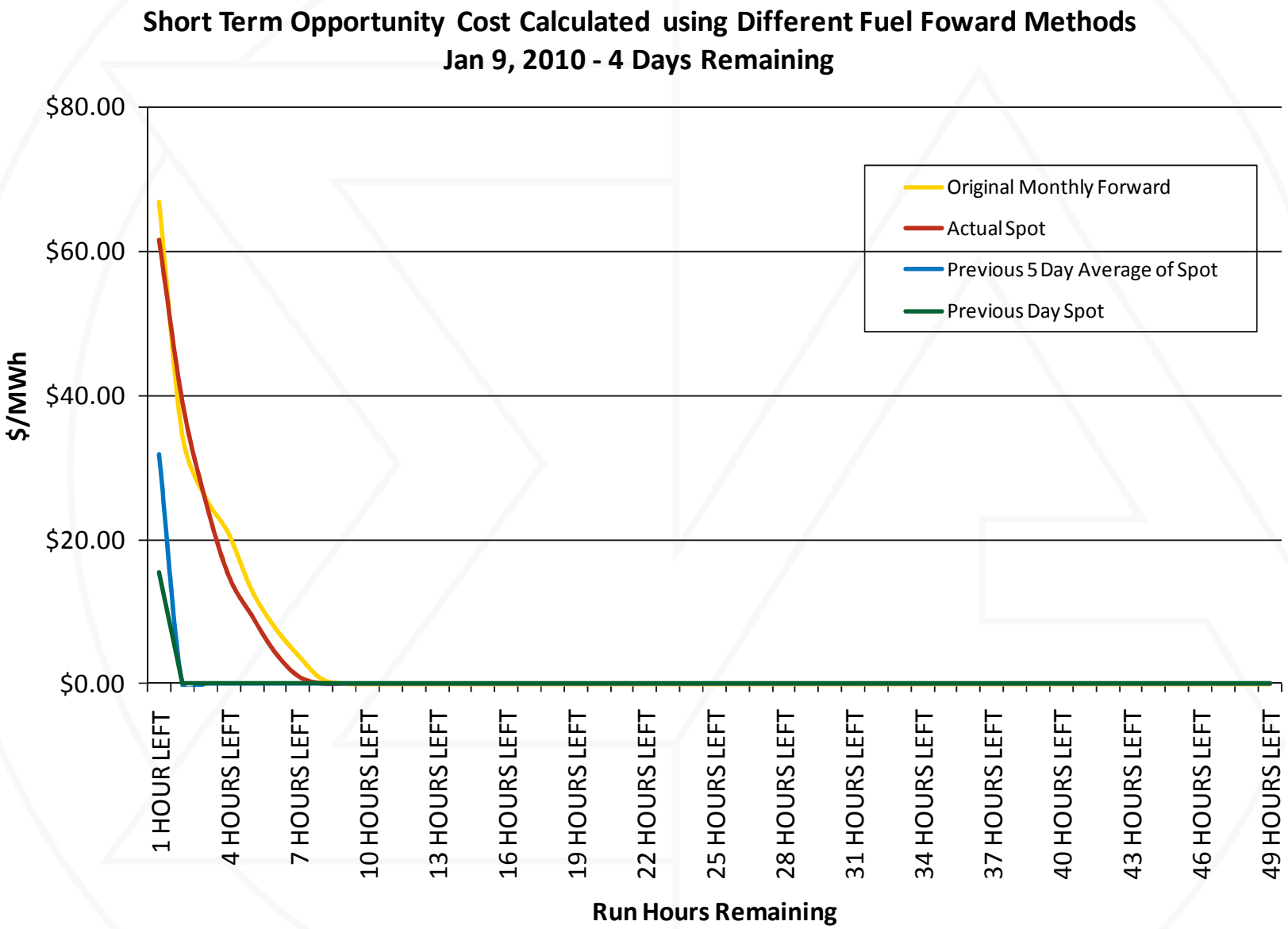


Short Term Opportunity Cost Calculated using Different Fuel Foward Methods
Jan 3, 2010 - 10 Days Remaining

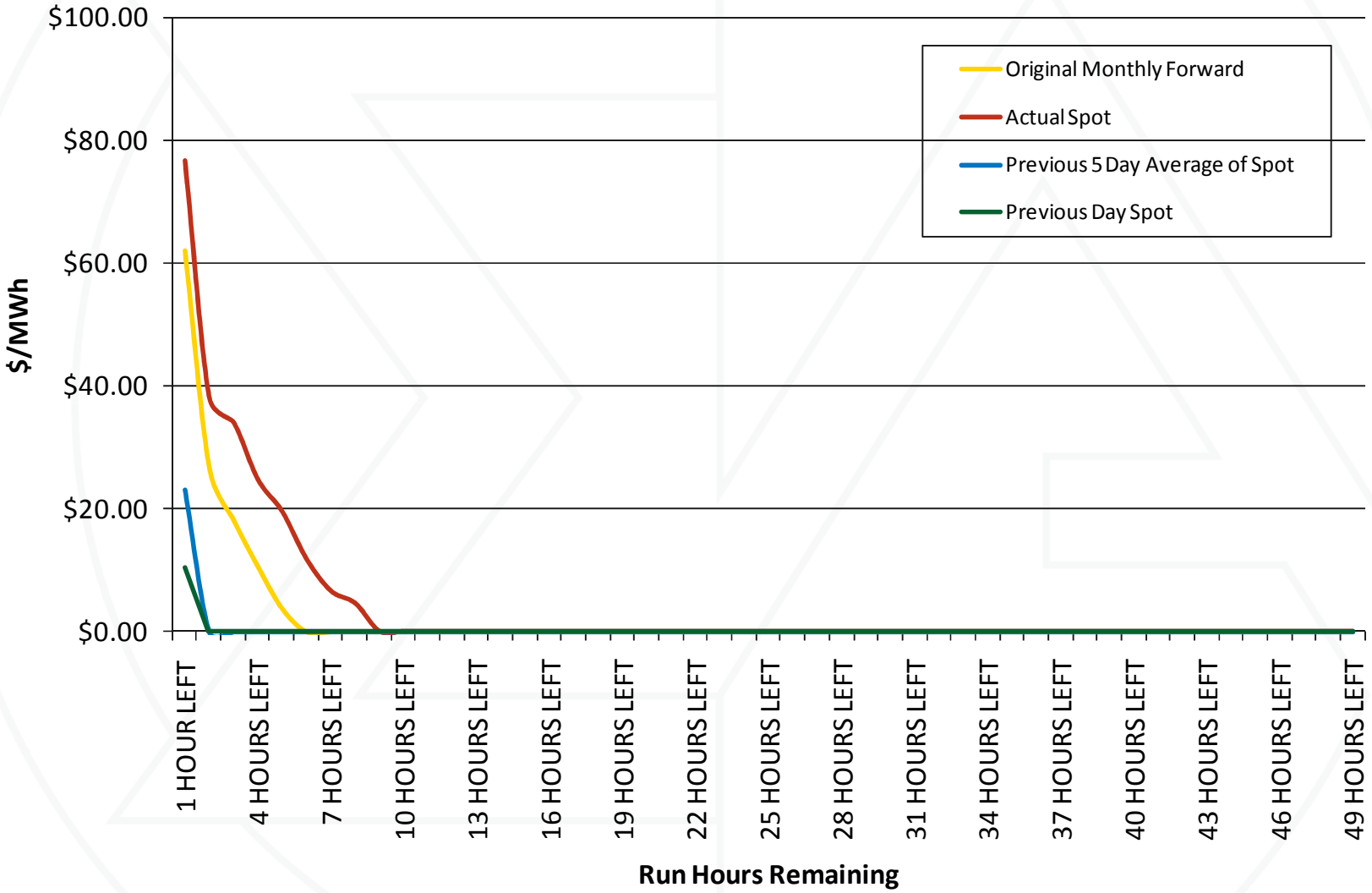


Short Term Opportunity Cost Calculated using Different Fuel Foward Methods
Jan 5, 2010 - 8 Days Remaining




Short Term Opportunity Cost Calculated using Different Fuel Foward Methods
Jan 9, 2010 - 4 Days Remaining
$80.00
$60.00
$40.00
$20.00
$0.00
$/MWh
Original Monthly Forward
Actual Spot
Previous 5 Day Average of Spot
Previous Day Spot
1 HOUR LEFT
4 HOURS LEFT
7 HOURS LEFT
10 HOURS LEFT
13 HOURS LEFT
16 HOURS LEFT
19 HOURS LEFT
22 HOURS LEFT
25 HOURS LEFT
28 HOURS LEFT
31 HOURS LEFT
34 HOURS LEFT
37 HOURS LEFT
40 HOURS LEFT
43 HOURS LEFT
46 HOURS LEFT
49 HOURS LEFT
Run Hours Remaining

Short Term Opportunity Cost Calculated using Different Fuel Foward Methods
Jan 11, 2010 - 2 Days Remaining



Conclusion for Short-Term Periods

- **Forward data from previous month can miss substantial variation in fuel prices.**
- **Solution:**
  - **Use the last available trading day's spot price for fuel; and**
  - **Use the last available trading day's "PJM west" peak and off-peak spot price.**
- **If short term opportunity cost is to be used, generation owners must be required to update opportunity cost component of offer daily due to fluctuating fuel prices.**

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