Renewable Energy:
Vanquisher or Hapless Victim of High Natural Gas Prices?

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Committee on Energy Resources and the Environment
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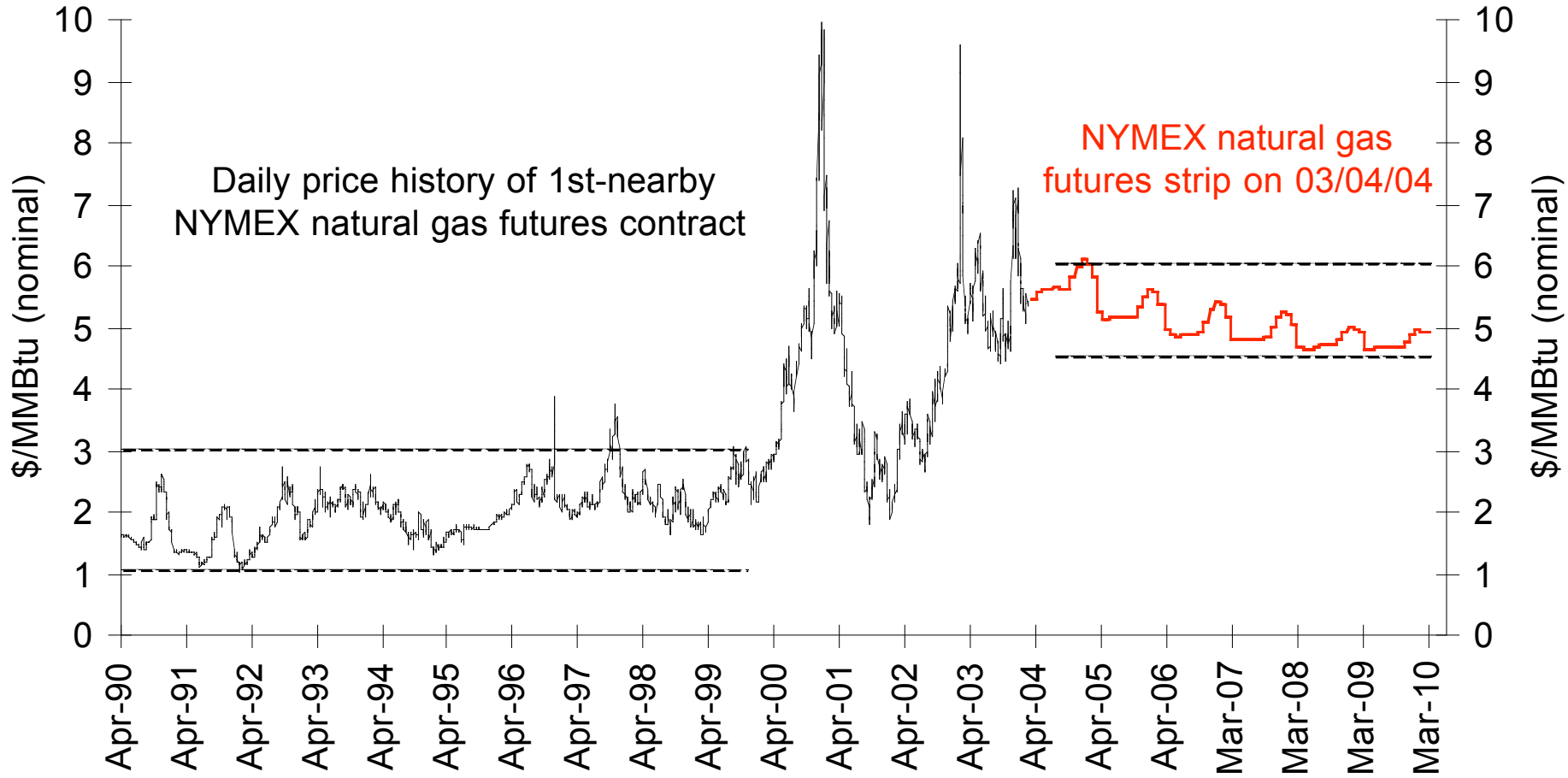
Topics

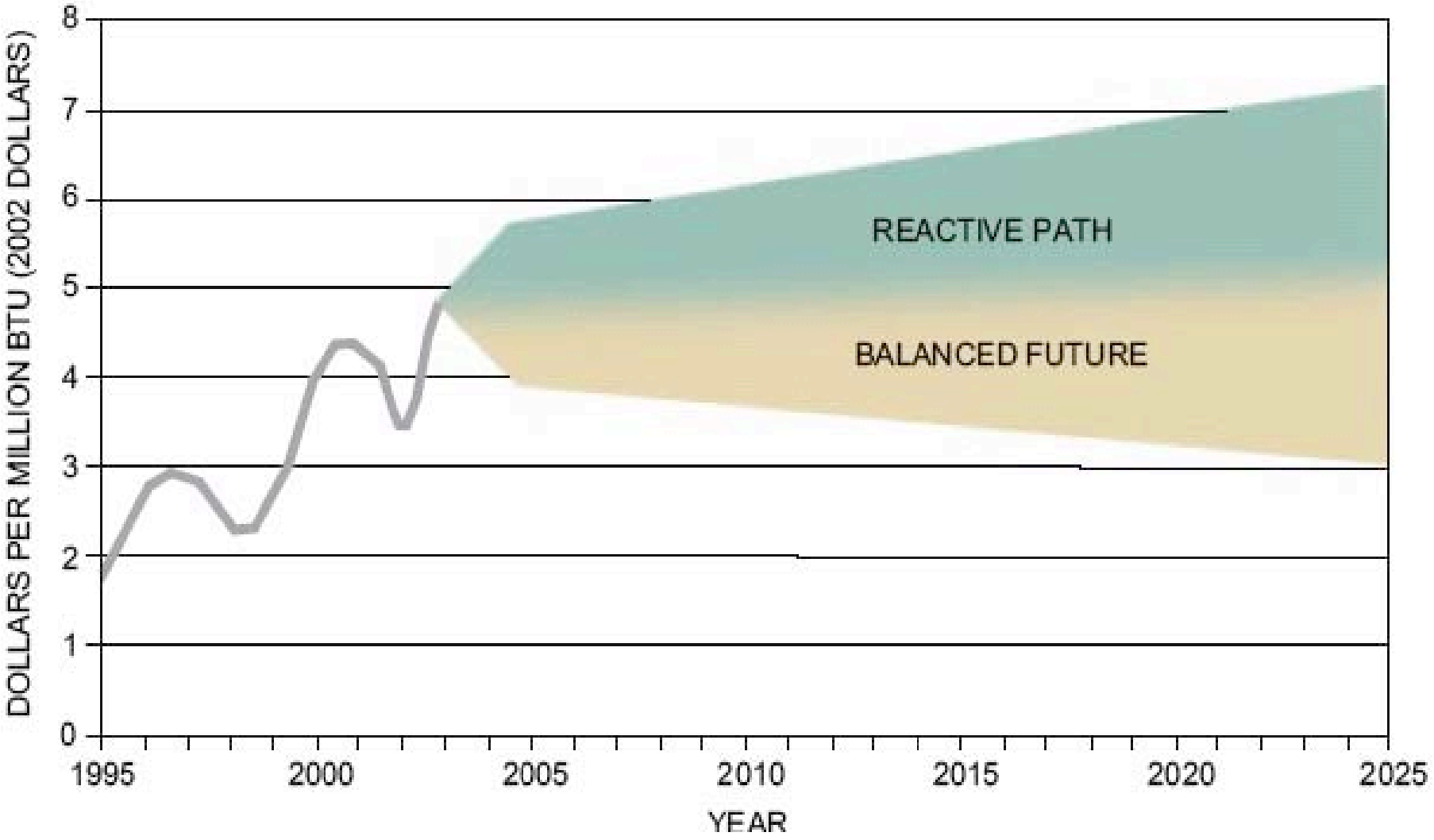
1) Uncertainty over future natural gas prices
2) The value of long-term fixed-price contracts for renewable energy
3) What impact do renewables have on gas prices?
4) What impact do high gas prices have on renewables?

Natural Gas Prices Are High and Volatile

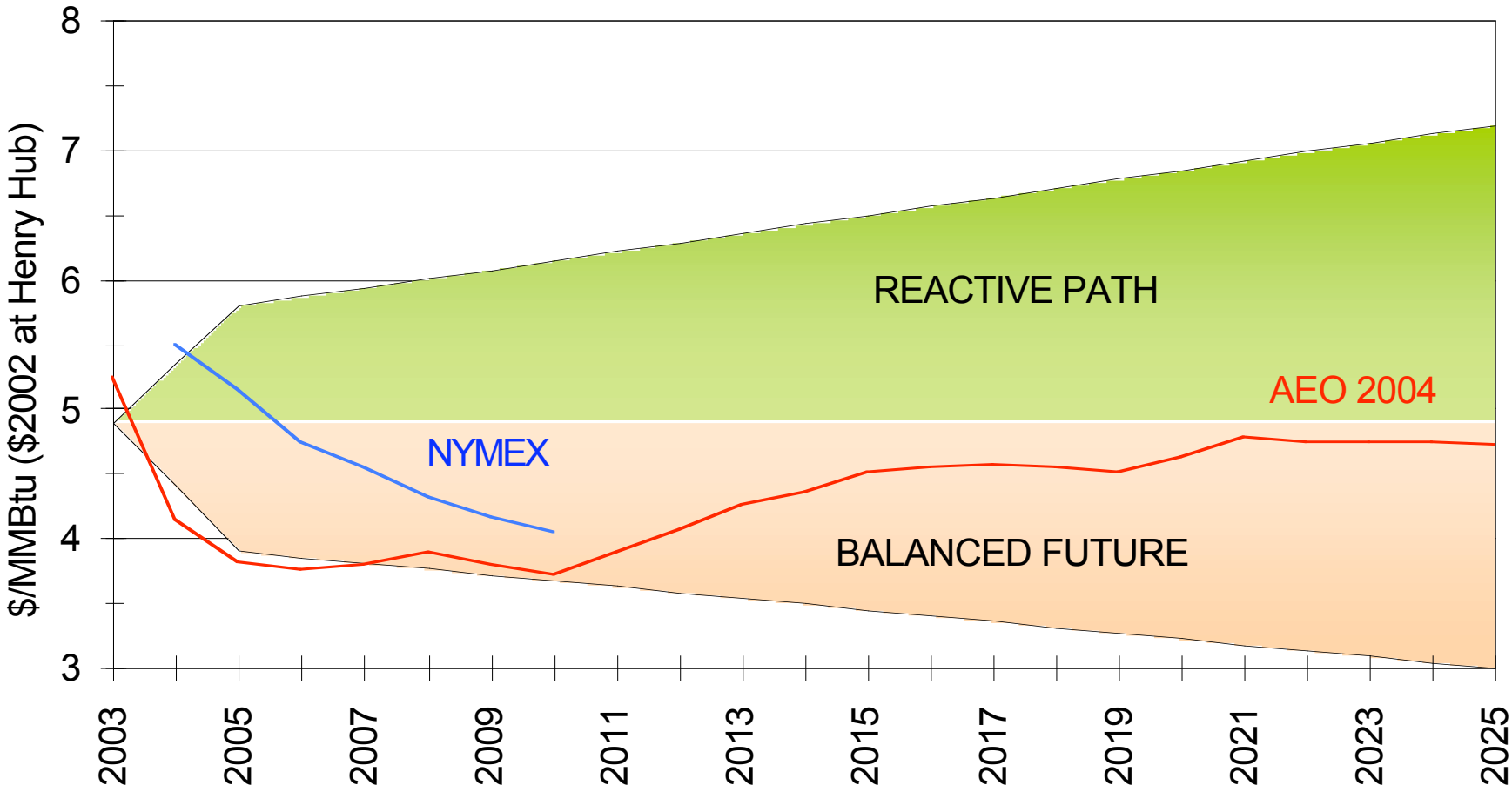


Source: NYMEX

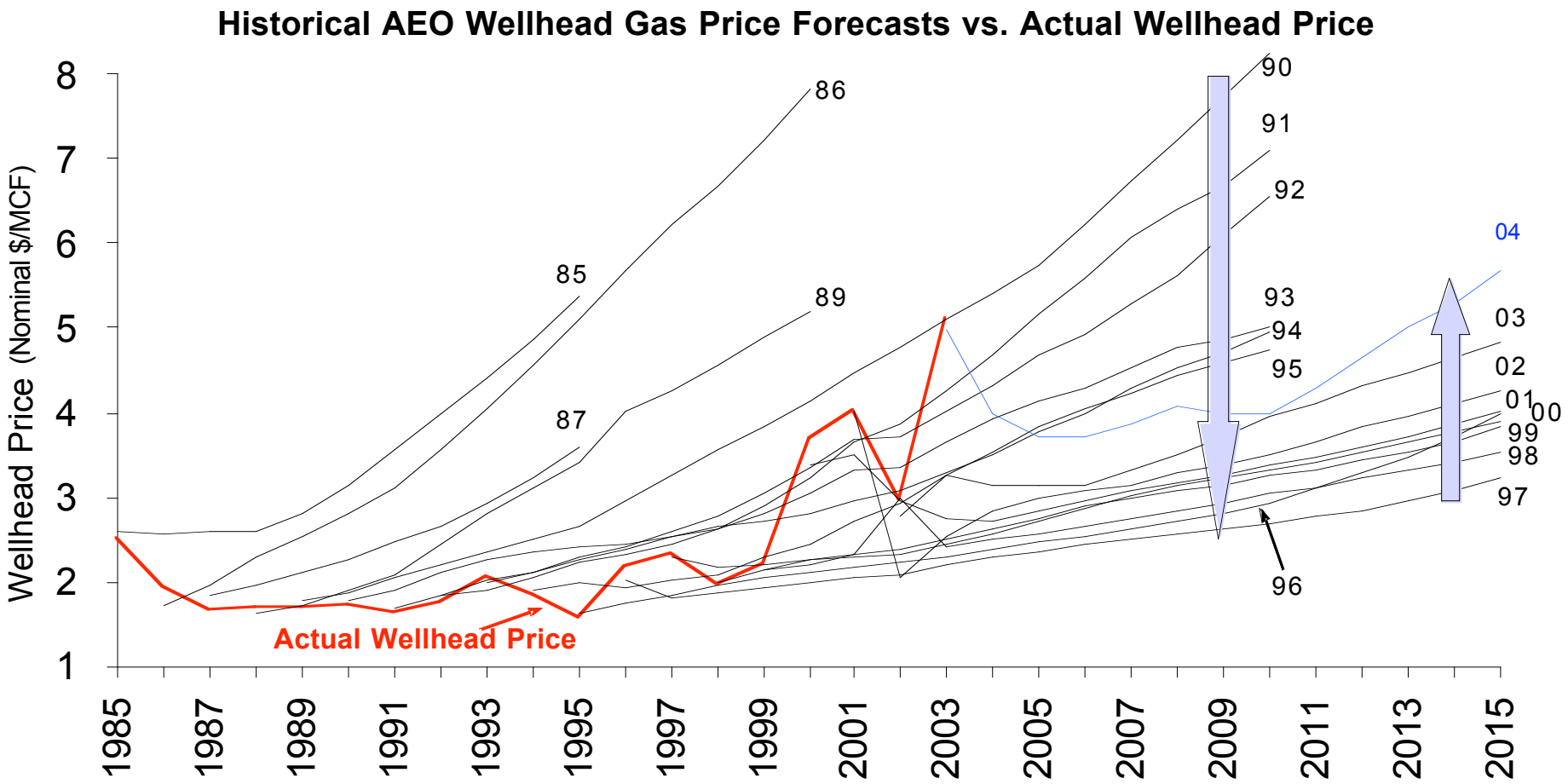
NPC Gas Price Forecast (Henry Hub)



EIA, NYMEX Imply "Balanced Future"



…But Be Wary of Price Forecasts…



Source: EIA

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LBNL's *Accounting for Fuel Price Risk…*

Question: How to compare the levelized cost of fixed-price renewable to variable-price gas-fired generation?

Current Practice:  to 

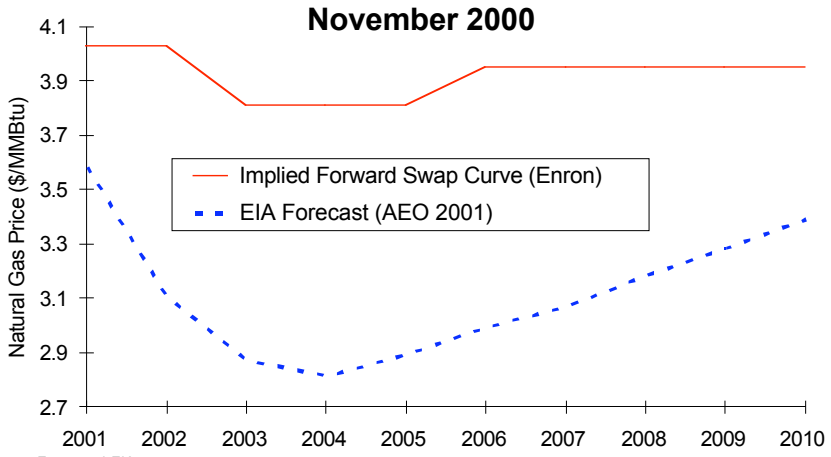
- Cost of renewables is often compared to cost of gas-fired generation based on ***uncertain*** fuel price forecasts

Best Practice:  to 

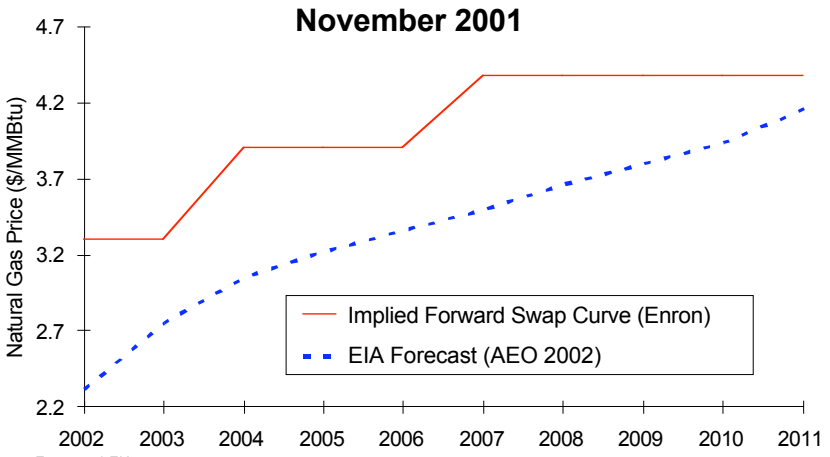
- Cost of renewables should be compared to cost of gas-fired generation based on a ***guaranteed*** fuel price

How do *guaranteed* forward gas prices compare to *uncertain* gas price forecasts??

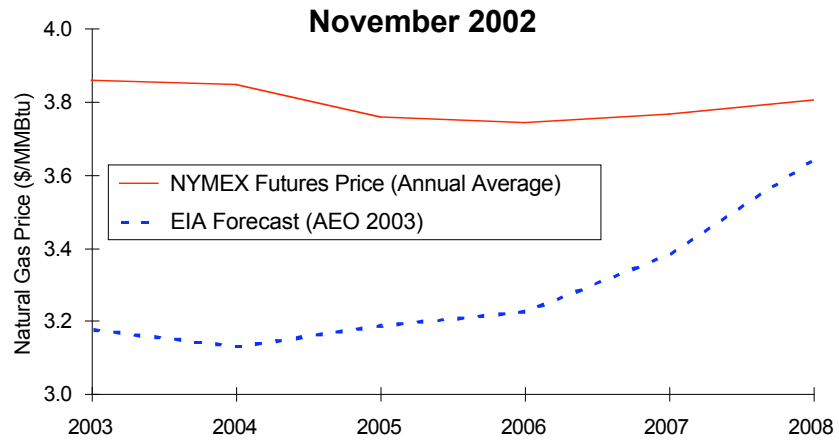
Forward Prices Exceed Price Forecasts



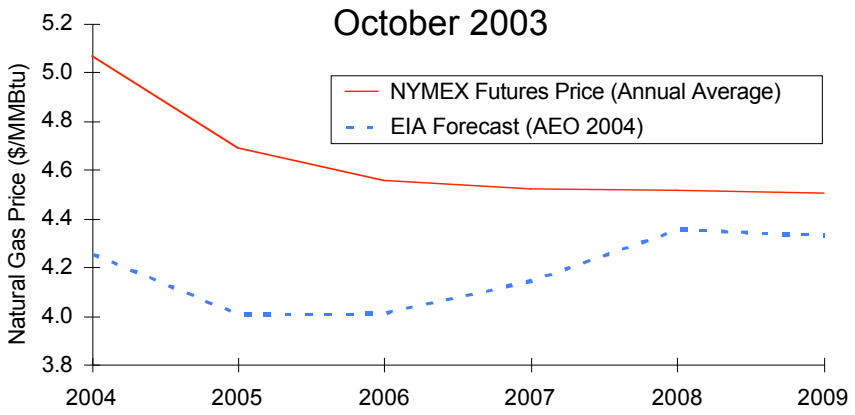
Source: Enron and EIA



Source: Enron and EIA

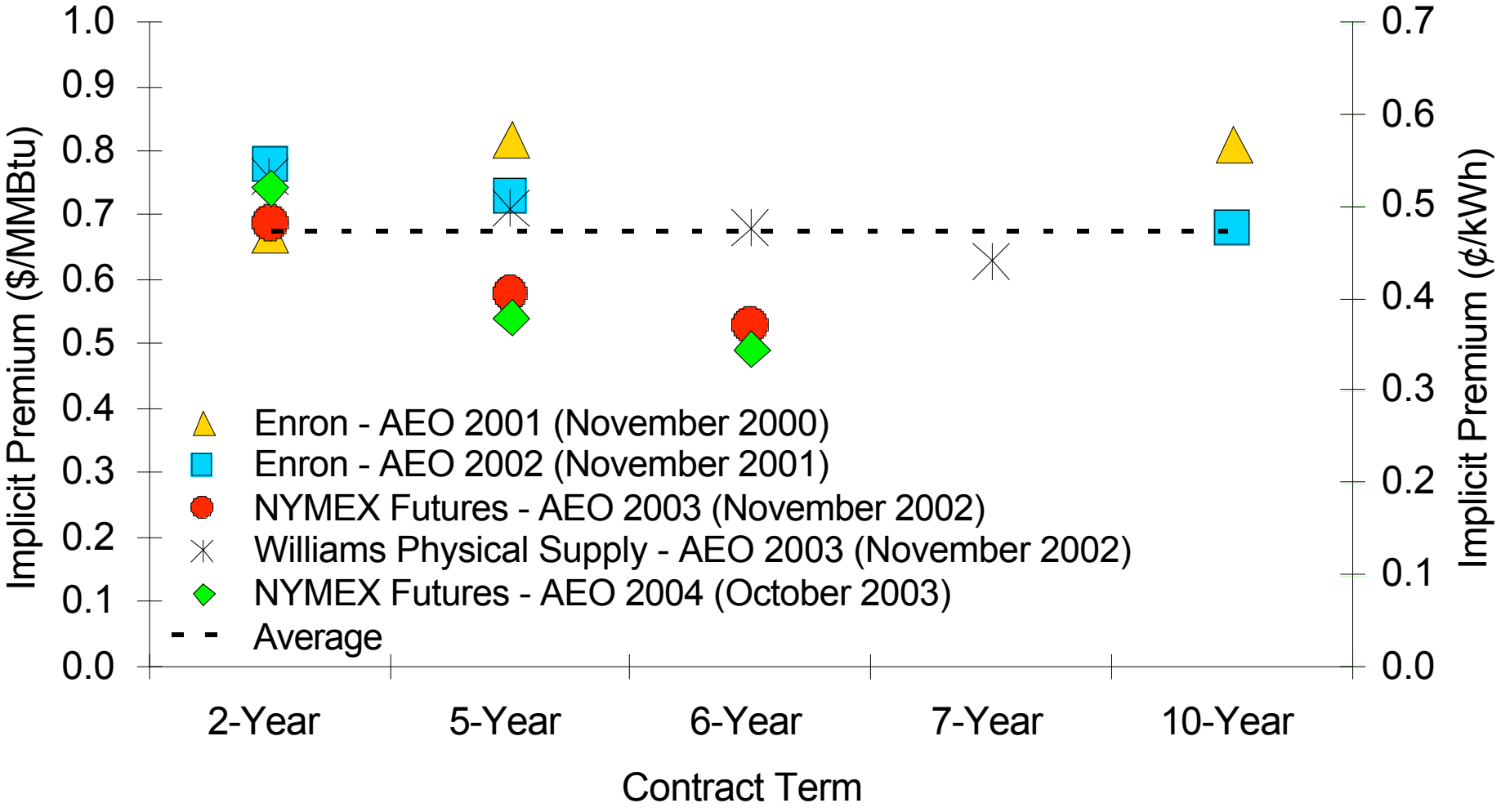


Source: NYMEX and EIA



Source: NYMEX and EIA

Levelized Premiums Average $0.7/MMBtu



Implications

Whether these premiums represent “hedge value” or something else (e.g., biased forecasts) is debatable, but does not change the fundamental implication of this work:

Use forward prices, not price forecasts, when comparing the levelized costs of gas-fired and renewable generation

For more information:

http://eetd.lbl.gov/ea/EMS/reports/53587.pdf

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Renewables Displace Natural Gas

Theory: As renewables displace gas-fired generation, demand for natural gas declines, and the price of gas falls

Author	Date of Study	Model Used	National RPS Modeled	Reduction in US Gas Consumption *Quads (%) in 2020*	Gas Wellhead Price Reduction *$/MMBtu (%) in 2020*	Average Implicit Inverse Supply Elasticity
EIA	1998	NEMS	10% by 2010	1.1 (3.4%)	0.34 (12.9%)	**3.6**
EIA	2000	NEMS	7.5% by 2010	0.4 (1.3%)	0.19 (6.6%)	**3.2**
EIA	2001	NEMS	10% by 2020	1.5 (4.0%)	0.27 (8.4%)	**2.2**
EIA	2001	NEMS	20% by 2020	3.9 (10.8%)	0.56 (17.4%)	**1.5**
EIA	2002	NEMS	10% by 2020	0.7 (2.1%)	0.12 (3.7%)	**1.3**
EIA	2002	NEMS	20% by 2020	1.3 (3.8%)	0.22 (6.7%)	**1.3**
EIA	2003	NEMS	10% by 2020	0.5 (1.4%)	0.00 (+0.05%)	**0.1**
UCS	2001	NEMS	20% by 2020, EE	10.5 (29.7%)	1.58 (50.8%)	**1.7**
UCS	2002	NEMS	10% by 2020	0.7 (2.1%)	0.05 (1.5%)	**0.9**
ACEEE	2003	EEA	6.3% by 2008, EE	1.4 (5.4%)	0.74 (22.1%)	**11.5**
NPC	2003	EEA	-	-	-	**~4**

Average inverse elasticities mostly range from ~1 to ~3:

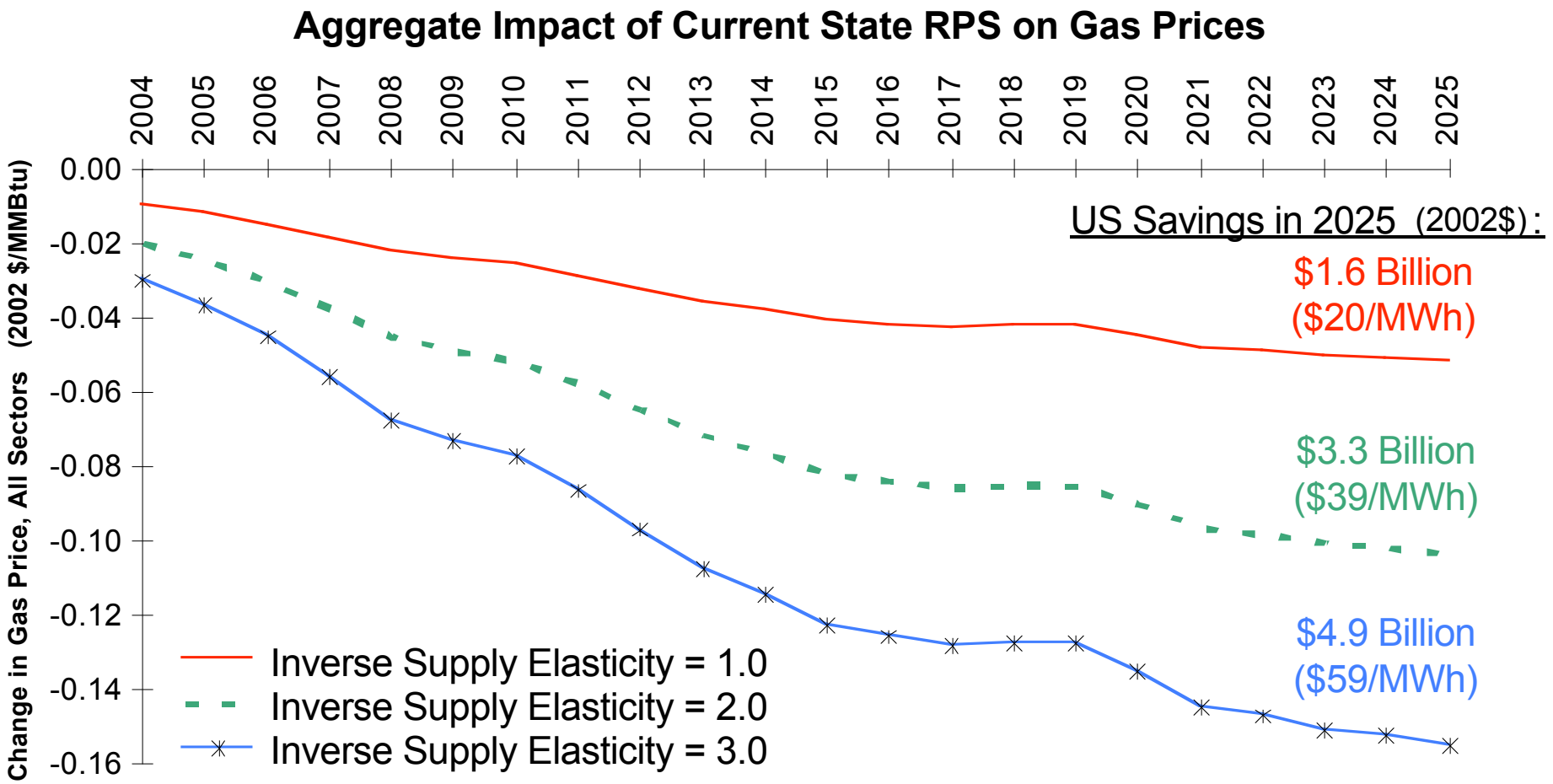
for each 1% drop in demand, gas prices fall 1%-3%

Simplified Method – Inputs

"Model" results, without having to run the model!!

- Gas Displacement (1 MWh RE = 0.6 MWh Gas-fired)
- Heat Rate of Displaced Gas-Fired (7,500 Btu/kWh)
- US Gas Consumption Forecast (from AEO)
- Inverse Elasticity of Supply (range from +1 to +3)
- US Gas Wellhead Price Forecast (from AEO)
- Wellhead to Delivered Prices (1:1)

Simplified Method – Results



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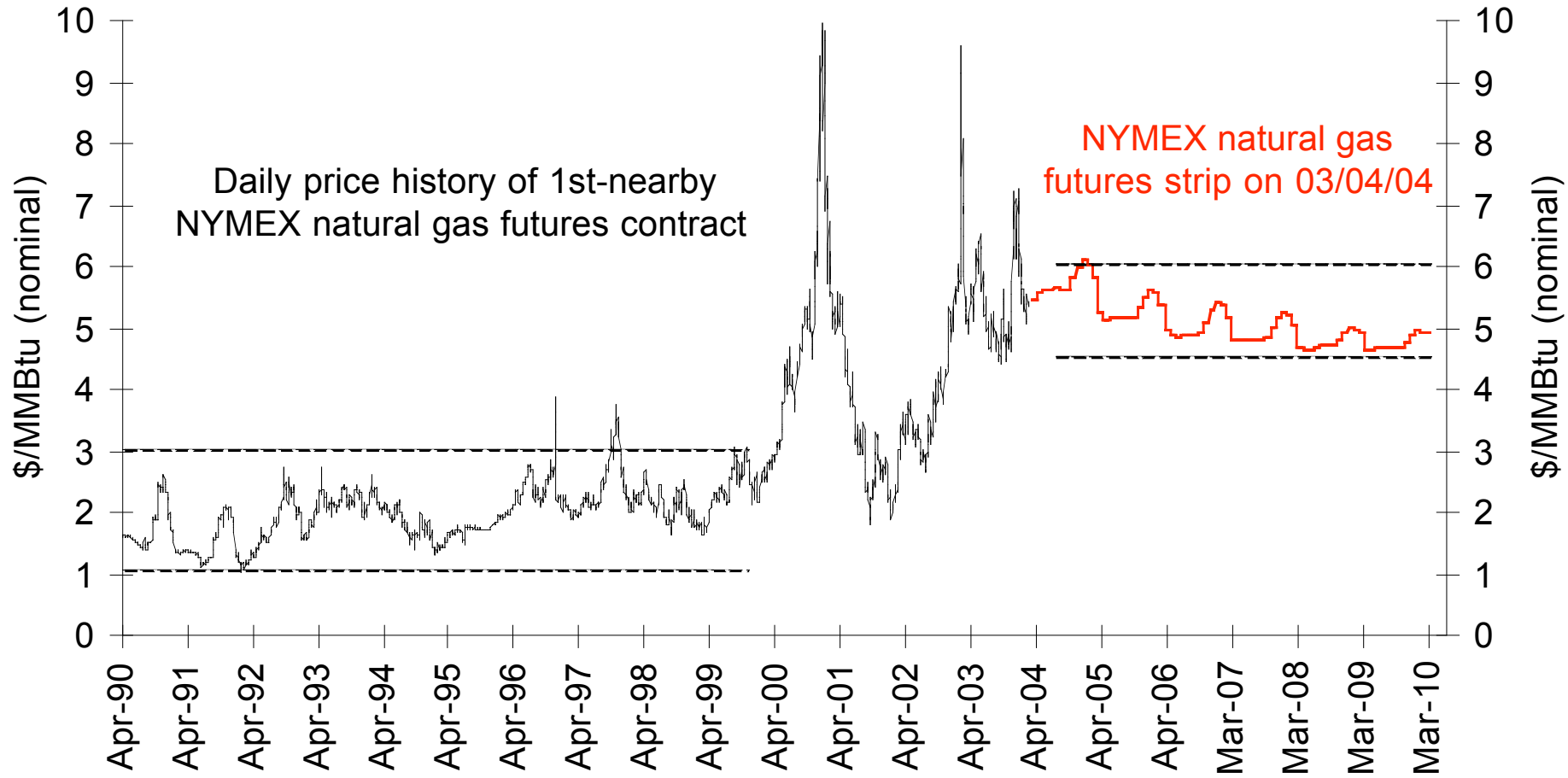
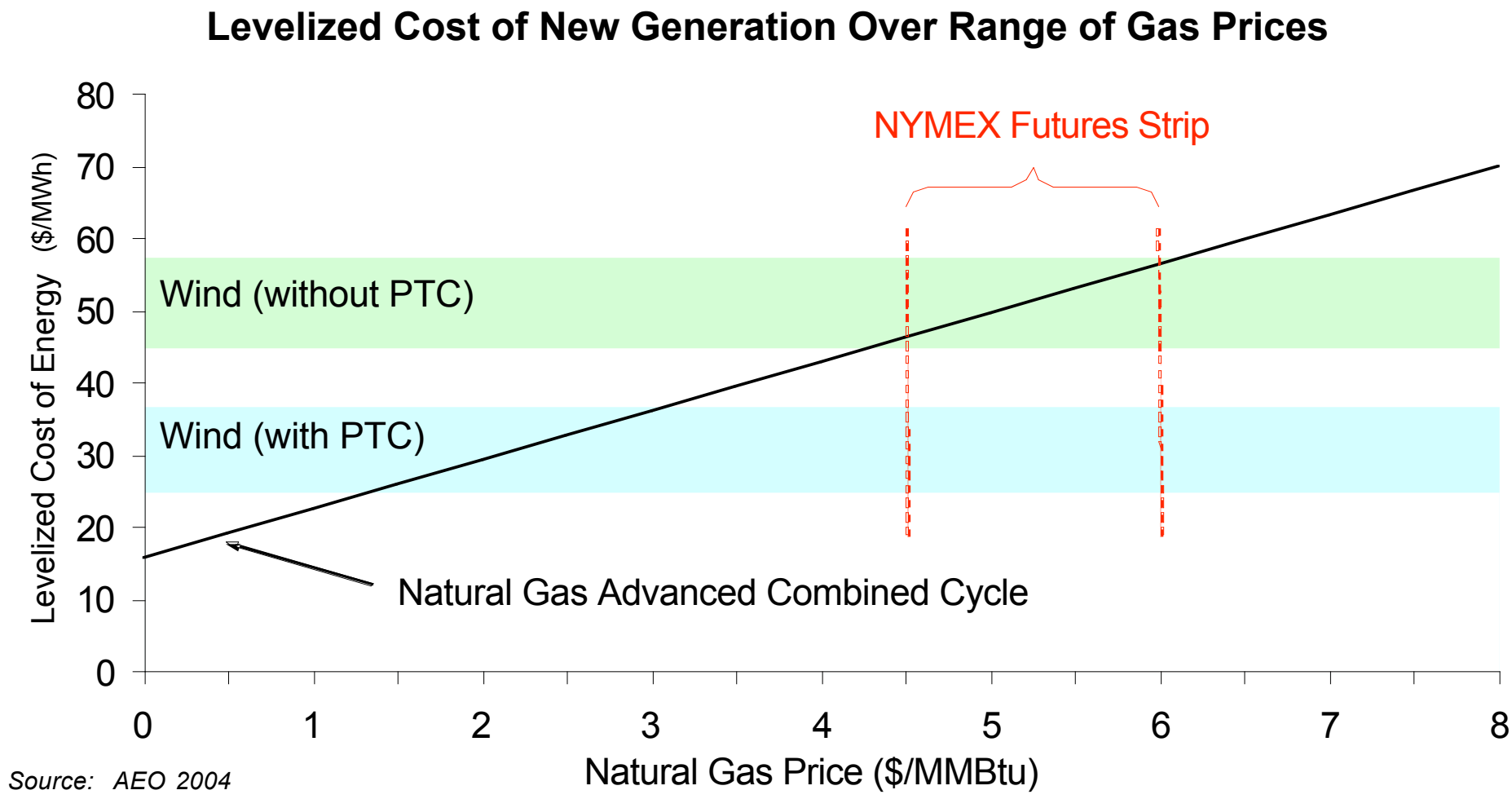
With Gas Prices this High…



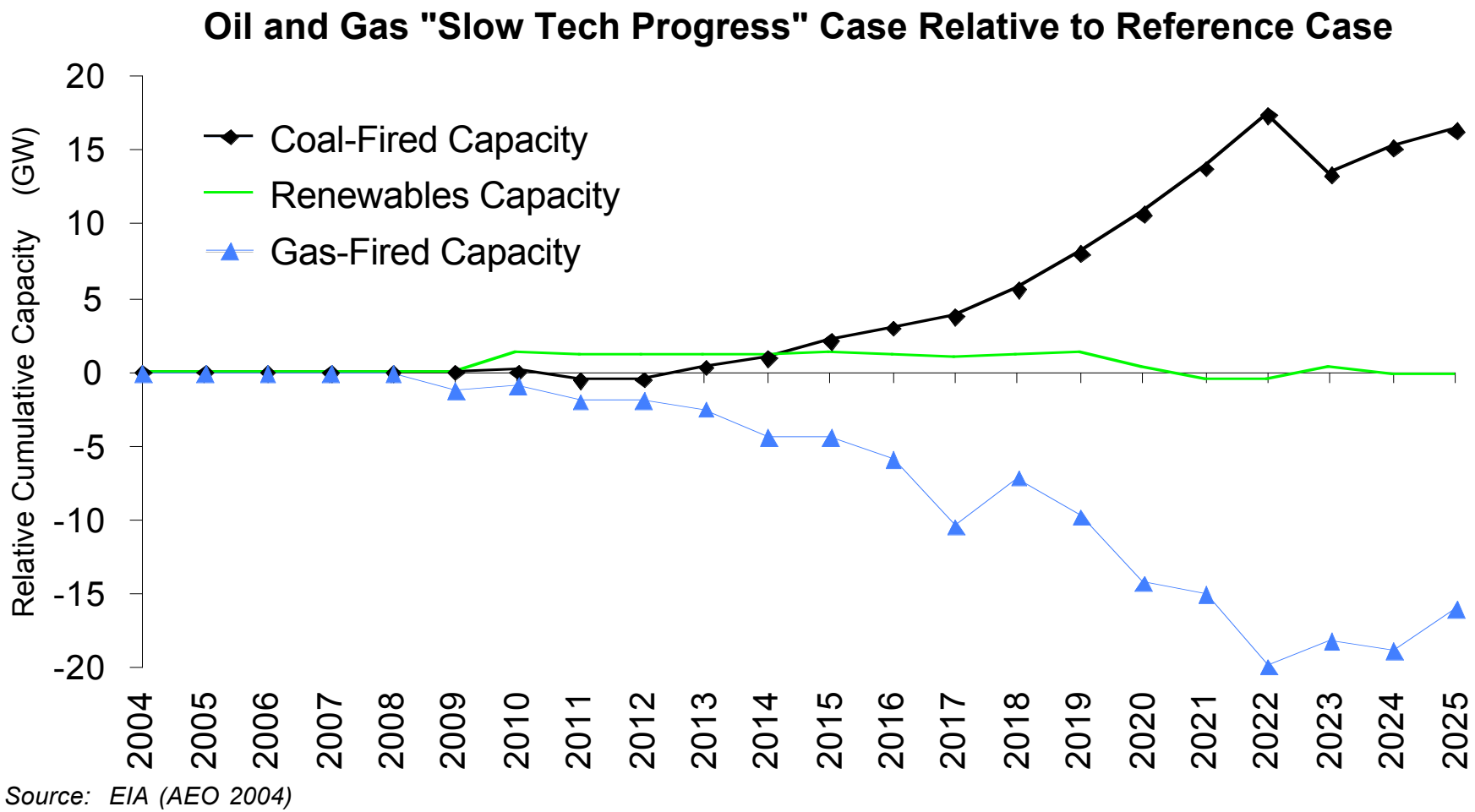
Source: NYMEX

…Renewables are Cost-Competitive



Source: AEO 2004

Yet in High Gas Price Scenario, *Coal Wins(!)*



Source: EIA (AEO 2004)

Gas prices $0.20/MMBtu higher (on average) in this scenario

Reason: Low Capacity Value of Wind

Two implications of low capacity value:

1) Peak load growth requires resources other than wind
   - In a high gas price environment, likely to be coal rather than gas
2) Wind competes as a "fuel saver" against the marginal resource
   - In high gas price environment, *coal replaces gas* as the marginal resource, and wind competes against coal
   - Coal fuel savings not as valuable as gas fuel savings

Model ignores possibility of future carbon regulations…

Conclusions

1) Gas prices are high, volatile, unpredictable
2) Cost of renewables is steady, predictable
   - Achieving similar gas price stability has cost ~$0.7/MMBtu
3) Renewables reduce gas consumption *and prices*
   - Modeling studies imply that a 1% drop in gas demand leads to a 1%-3% drop in gas prices

BUT…

4) Models also suggest that higher gas prices lead to more coal, *not more renewables*