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June 27, 2011

## MEMORANDUM

**TO:** Power Committee

**FROM:** Terry Morlan  
Massoud Jourabchi

**SUBJECT:** Proposed Update of Council Fuel Price Forecasts

Staff is proposing to update the Council's forecast of fuel prices. We will present our proposal to the Power Committee during the July Power Committee conference call meeting. The proposal is most focused on the natural gas prices, due to very significant changes in the outlook for natural gas supplies from shale formations. In addition, responsibility for developing our fuel price forecasts has shifted to Massoud Jourabchi and he has upgraded our forecasting data and tools.

We have worked with the Natural Gas Advisory Committee to develop the proposed updates. They have helped inform us of important changes in the fuel markets, suggested changes in our forecasts, and helped guide us on what the most important factors are that will affect future fuel price changes.

The most significant proposed change is to lower the natural gas price forecast range. The proposed medium natural gas price forecast for 2030 is similar to the medium-low forecast in the Sixth Power Plan. The trends of natural gas prices are lower especially in the near term as shale gas development has led to a significant surplus of supplies that is expected to last for several years. Oil and coal price forecasts have been modified, but less significantly. These prices have less effect on the Council's power plan.

There are a couple of reasons for proposing these changes. One is that many organizations in the region tend to rely on the Council's forecasts and it is important that the dramatic changes in natural gas supply and cost be recognized. A second is that the changes could be viewed as one of the first steps in developing the mid-term review of the power plan.

Our hope is that the Council will be able to approve the proposed changes in August and authorize that they be posted on the Council's website as the current Council view on the forecast of future fuel price ranges.

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# Update to Fuel Price Forecast

July 7<sup>th</sup> 2011

Massoud Jourabchi and Terry Morlan

# In this presentation

- Reasons for the update
- Review of actual fuel prices
- Short-term expectations
- Comparison to other forecasts
- Proposal for update to fuel prices
- Implication of change in fuel prices

# Reasons for updating the fuel price forecast

- There have been some significant long-term changes in natural gas supply .
- Price of natural gas has gone down significantly.
- Other organizations tend to rely on the Council's forecast.
- In preparation for mid-term renew of the power plan.

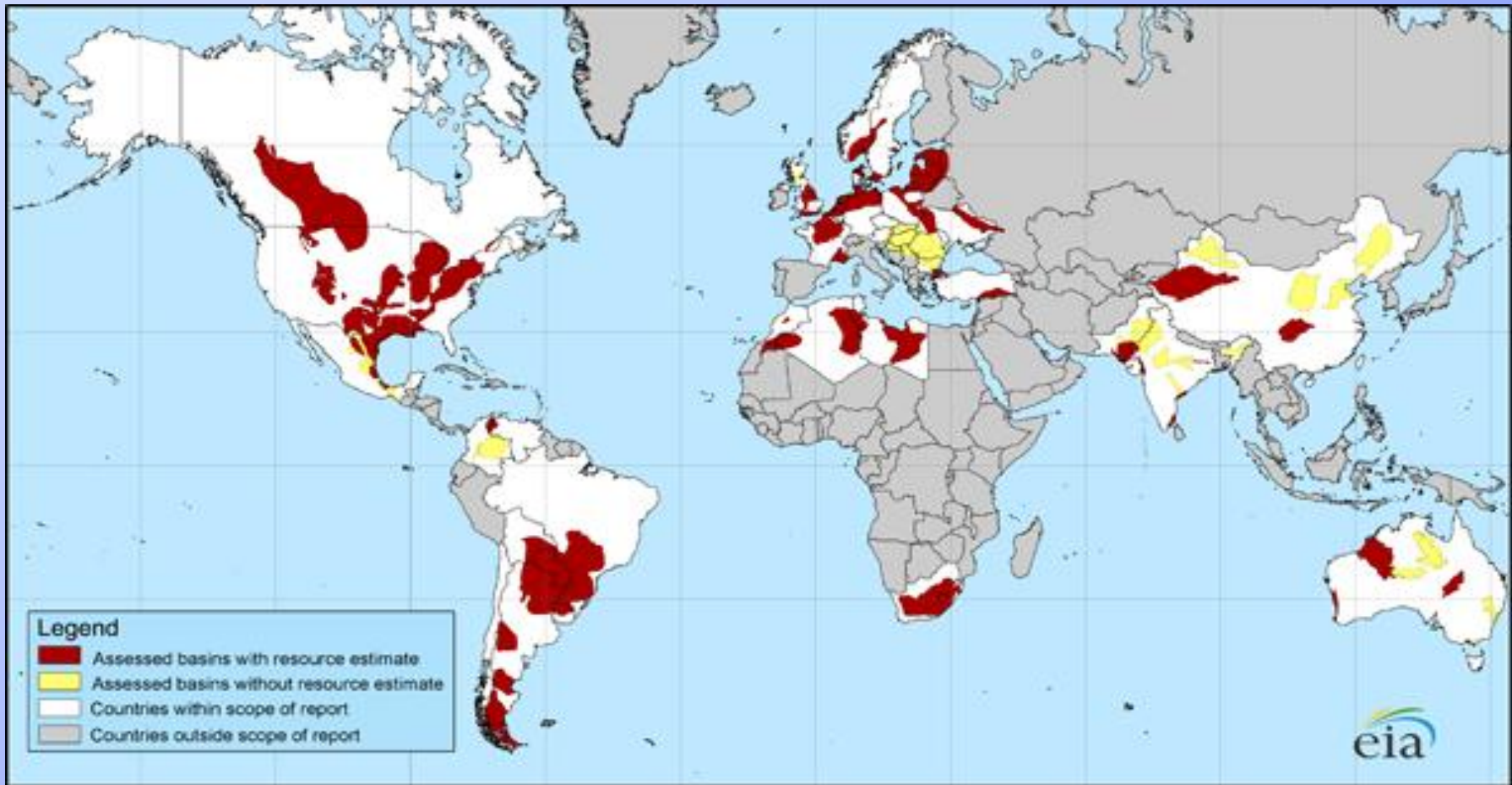
# Average Annual Price Comparison 2010 Actual and Forecast (2010\$)

Council Forecast	Wellhead Price Natural Gas		Refiners Acquisition Cost
Low	\$4	← \$4.05 Actual	\$59
Med-Low	\$4.3		\$64
Medium	\$4.6		\$70
Med-High	\$4.9		\$75 ← \$76 Actual
High	\$5.4		\$80

Evaluation of Natural gas and oil prices may be warranted.

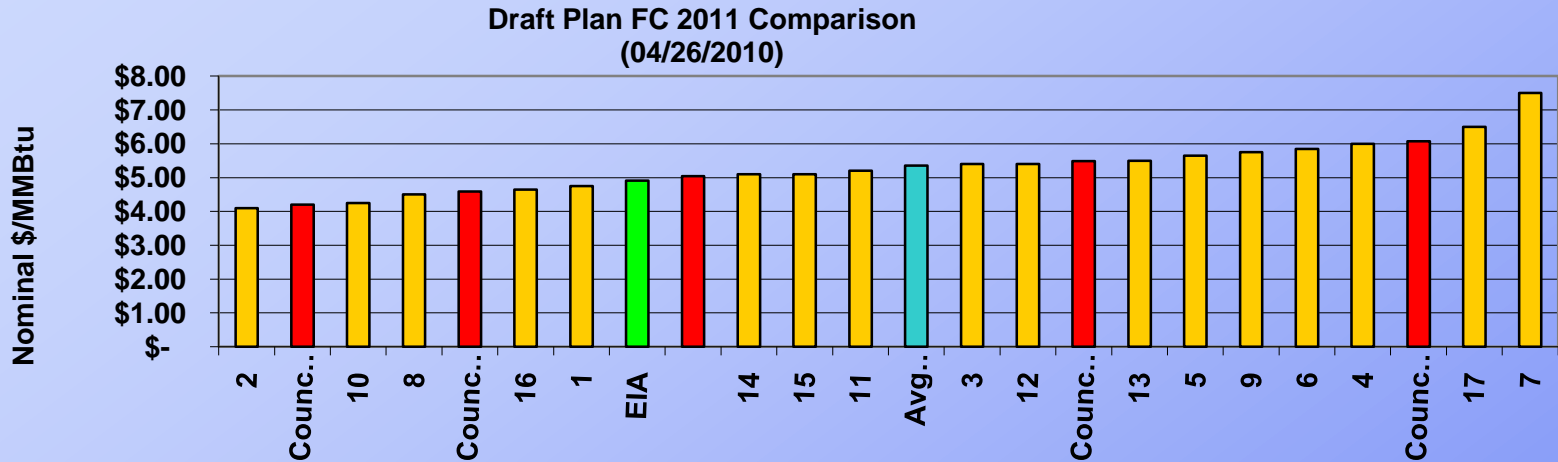
# Shale gas resources worldwide

Energy Information Administration based on Advanced Resources International, Inc. data

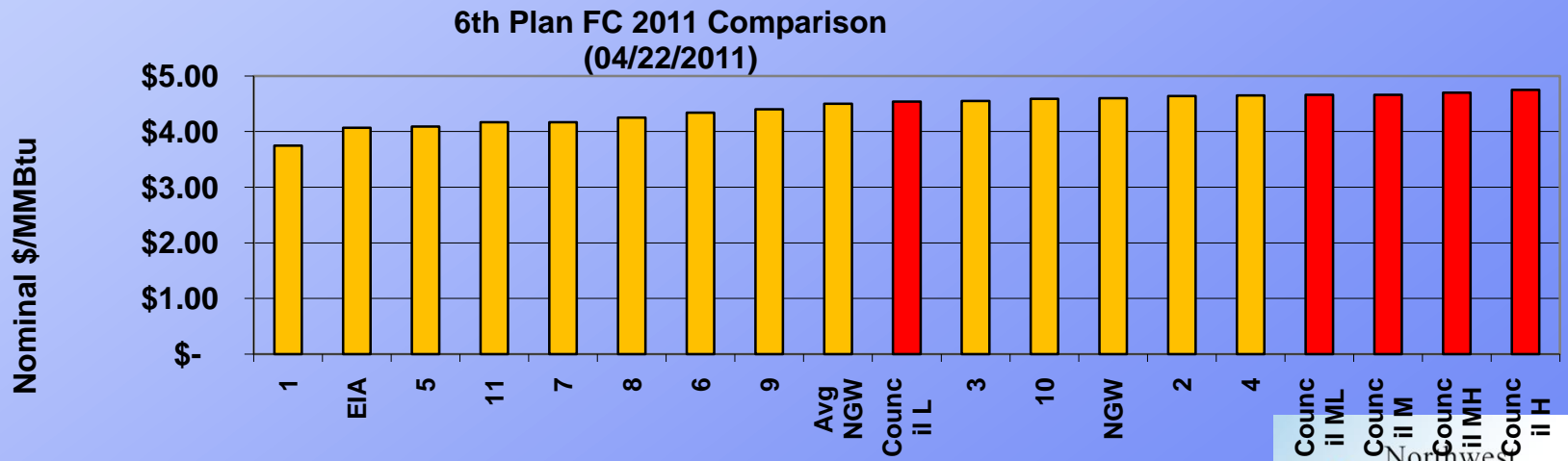


# Forecasts for 2011

- When the last forecast was produced, Council's forecast covered the short-term expectations.

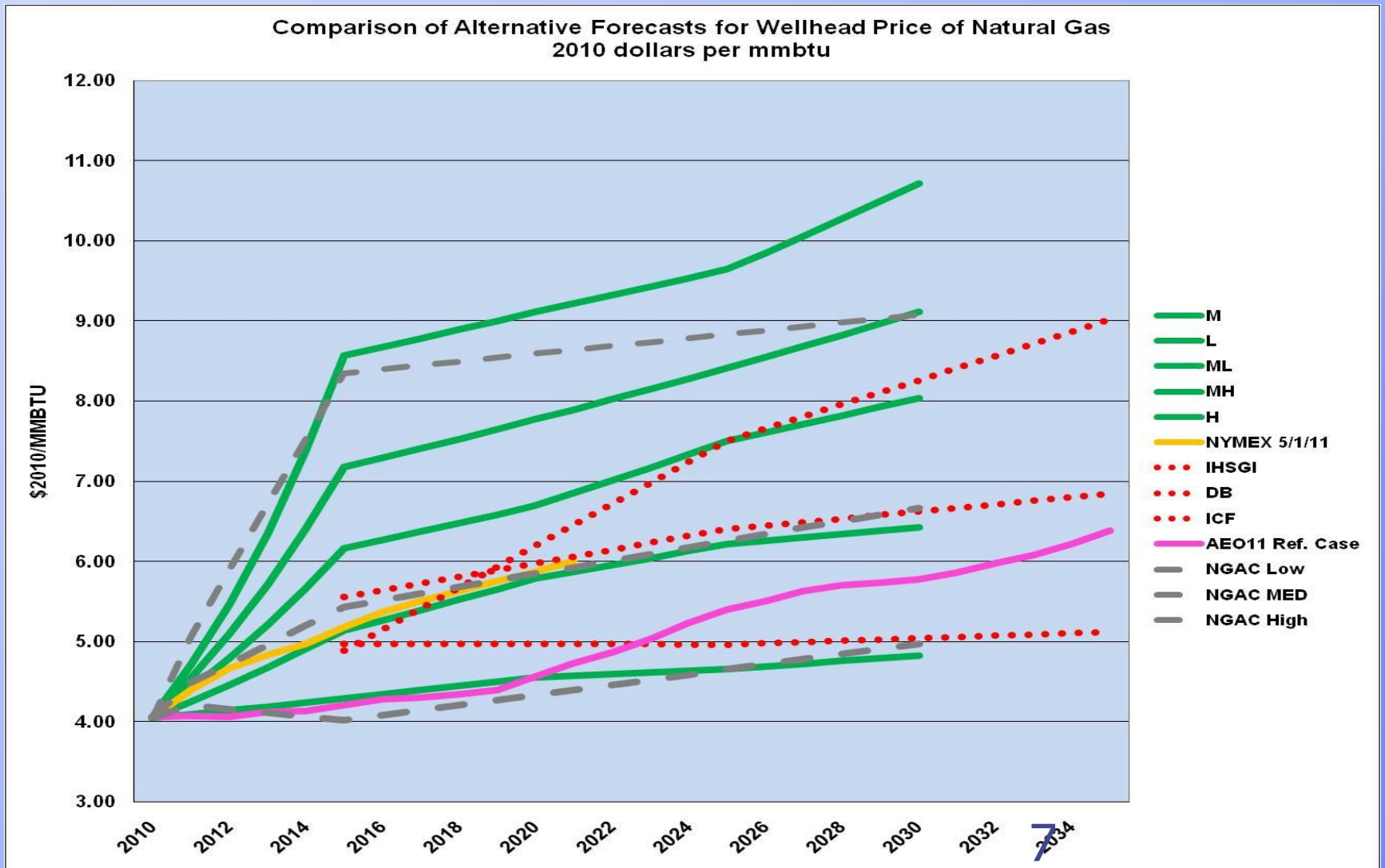


- But by 2010-2011 Council's forecast was on the high range of the short-term expectations.





# Forecast of natural gas prices needs to be updated



# Medium natural gas price scenario

- Economic recovery US and Worldwide
- Shale gas production in the US and worldwide continue to keep downward pressure on prices.
- Some environmental opposition to shale gas development.
- US and Canada as possible source of exporters of LNG.
- Power plant conversions from coal to gas continuing.

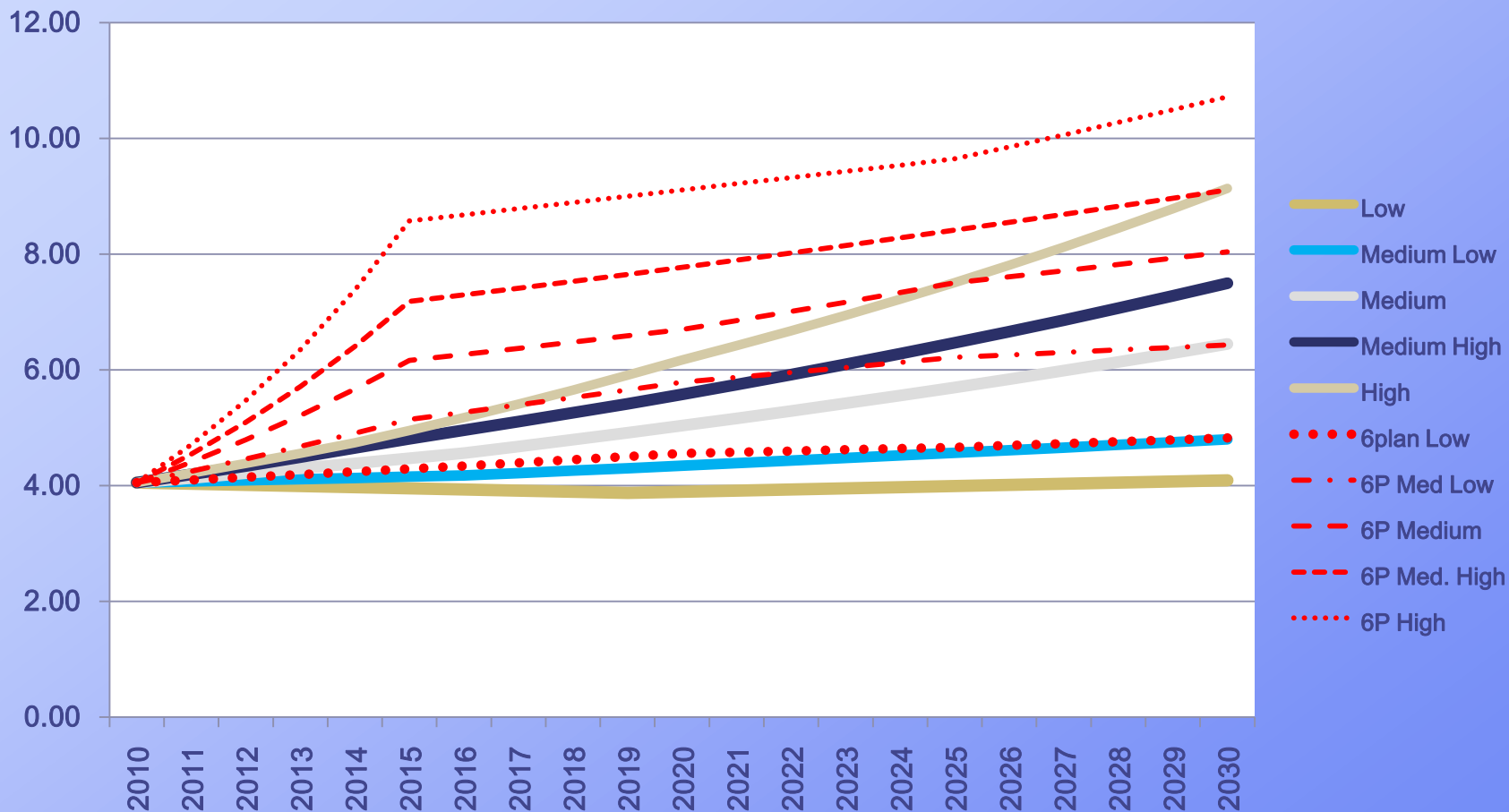
# Low price natural gas scenario

- Slow economic recovery, US and worldwide.
- No serious environmental opposition to Shale gas development.
- Increased availability of shale gas production in the US and worldwide.
- High hydro carbon prices (natural gas liquids including propane, ethane, butane, pentane)
- Delay in environmental regulation (CO2 tax)
- Delay in conversion from coal to natural gas
- No demand from natural gas vehicle development.

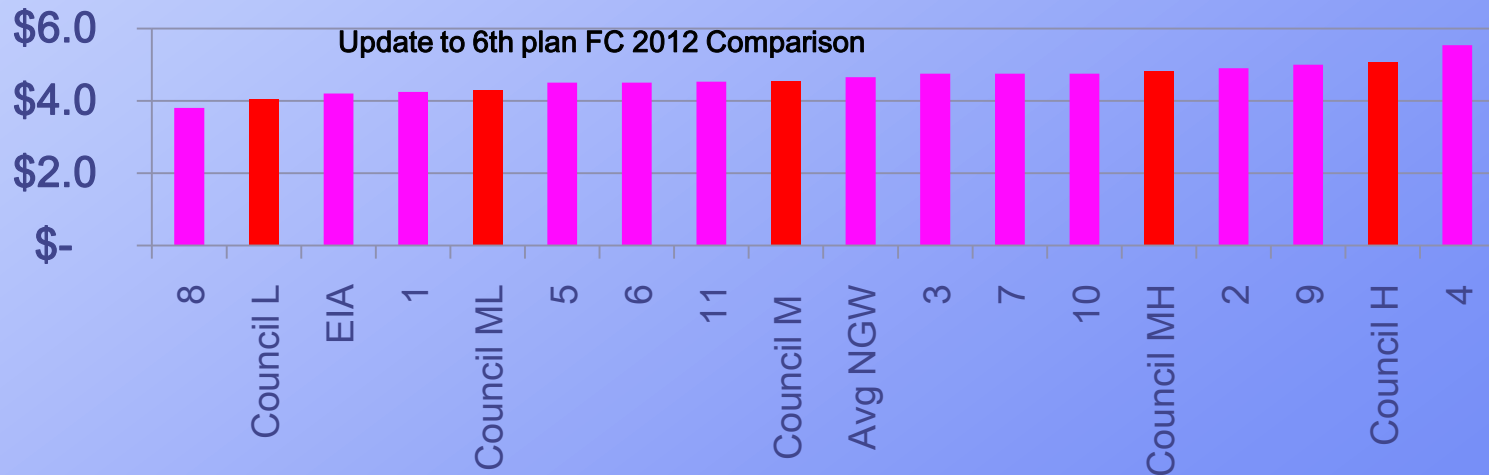
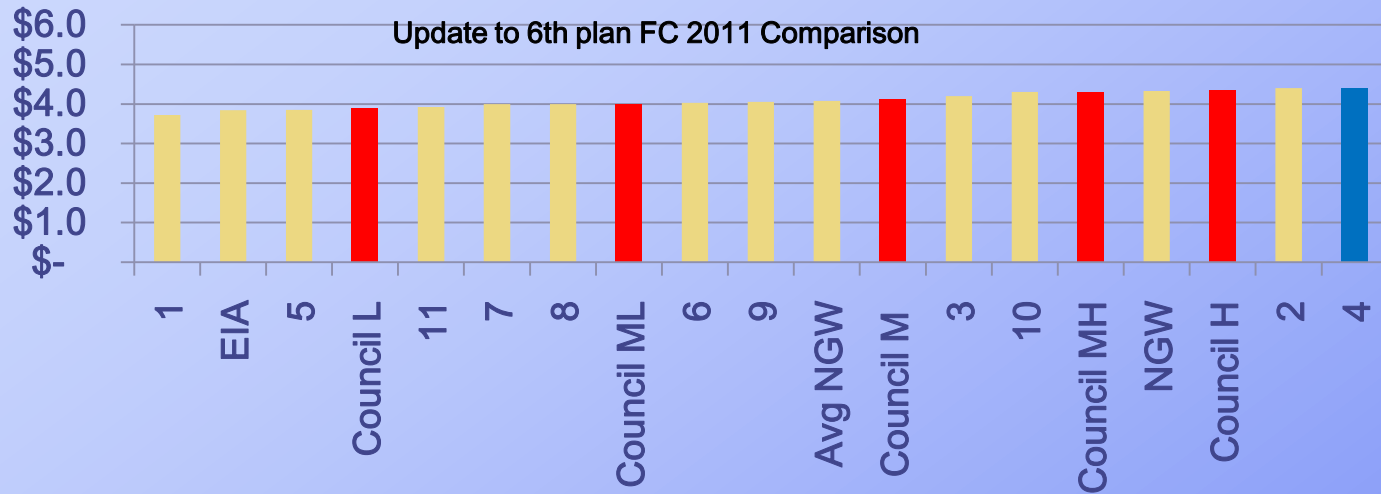
# High natural gas price scenario

- Faster economic recovery in the US and worldwide
- Opposition to shale gas production in the US and worldwide, reduces supply.
- Strict environmental regulation (CO2 tax), causes faster conversion from coal to natural gas power plants.
- Development of Natural Gas vehicles in response to CO2 tax pushes demand for natural gas up.

# Comparison of 6<sup>th</sup> plan and the proposed updated NG prices

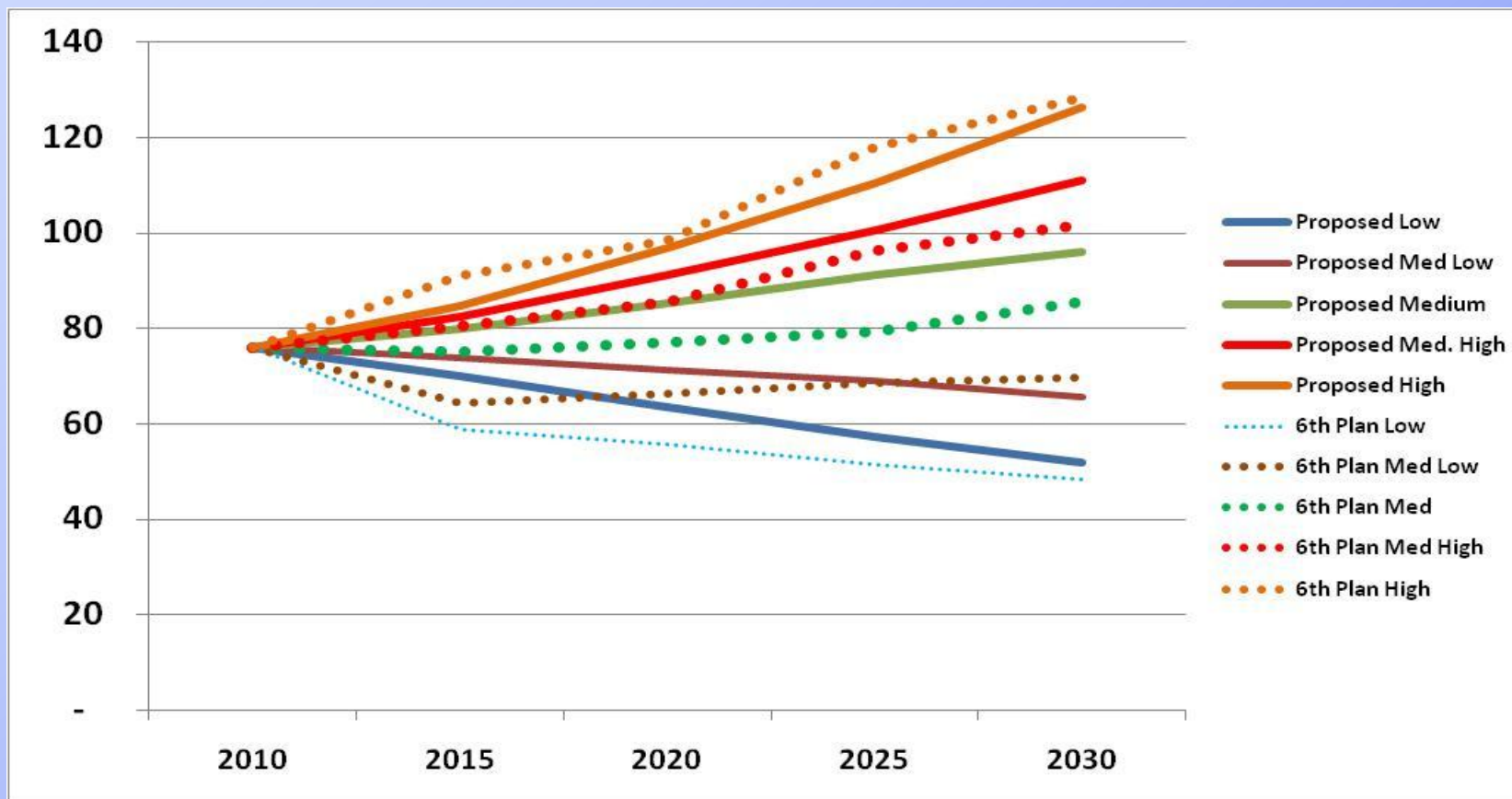


# Proposed Revision – Near Term



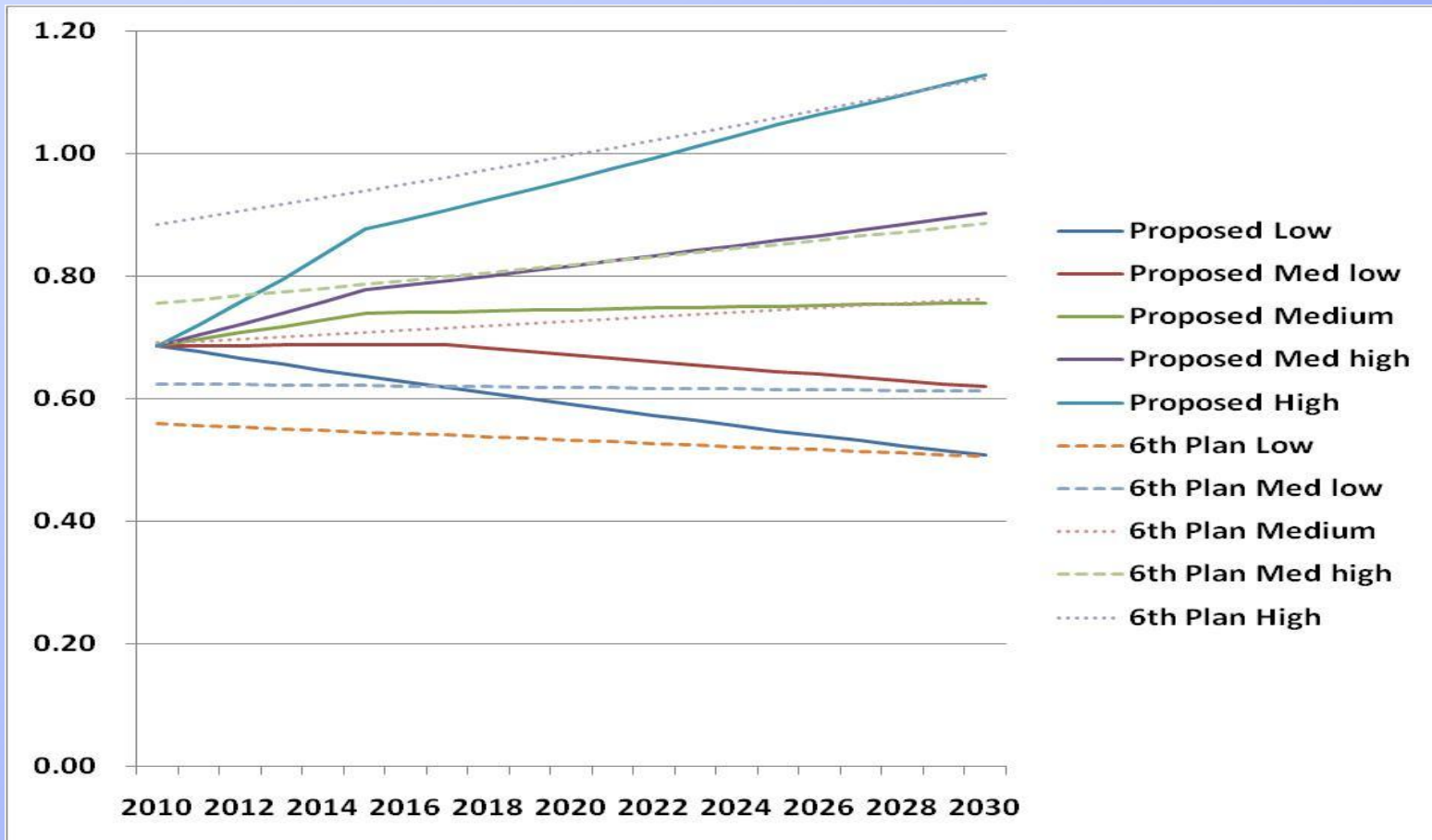
# Proposed oil price revision

Refiners acquisition cost of Oil (2010\$/Barrel)



# Proposed coal price revision:

## Powder River Basin coal (2010\$/mmBTU)





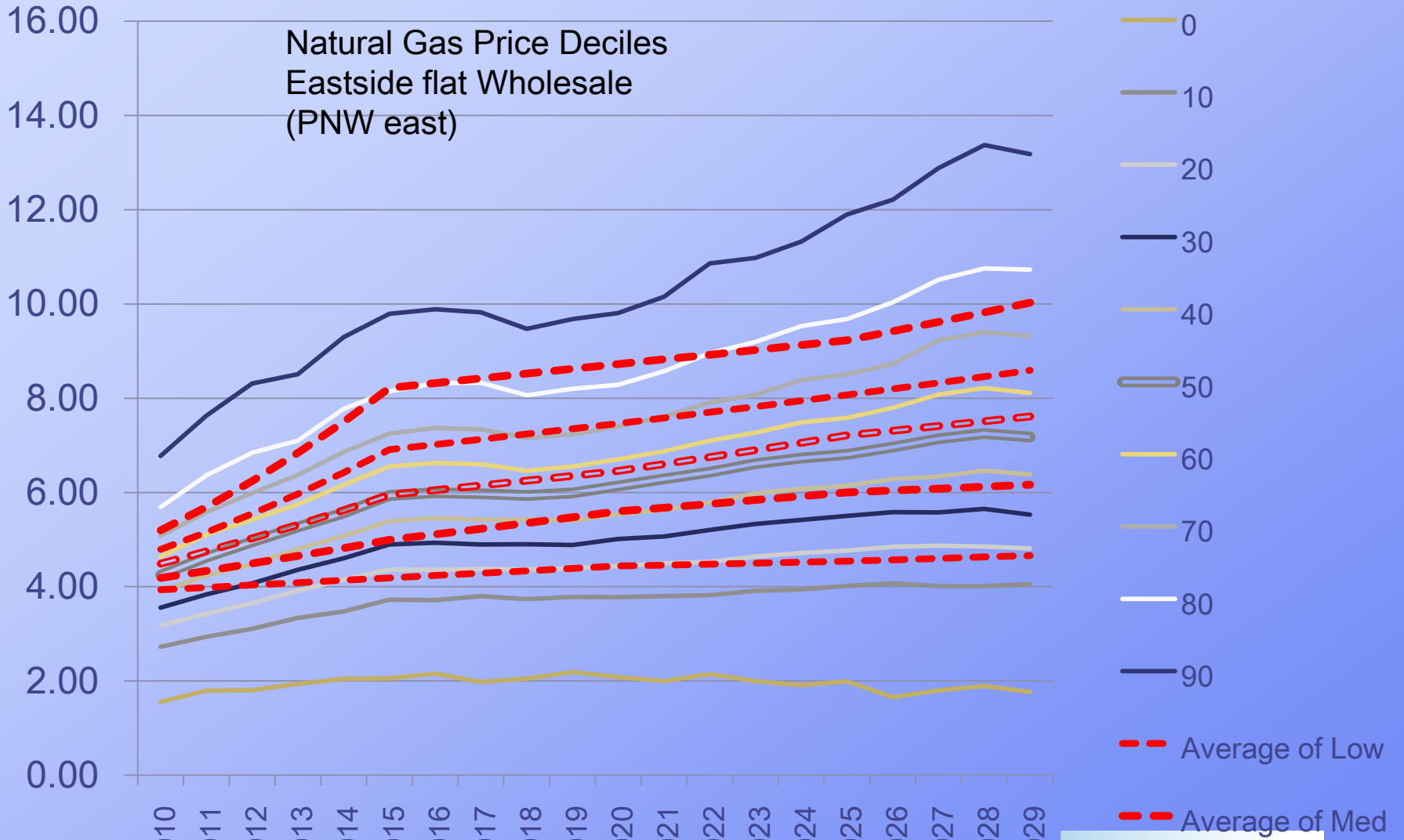
# Implications of price forecast change

- Lower electricity market clearing prices
- Higher transportation cost for coal, however, changes coal prices do not significantly impact wholesale price of electricity.
- Change in fuel prices should not affect significantly the 6<sup>th</sup> plan resources which were RPS and conservation driven, but during the mid-term review this would be evaluated.

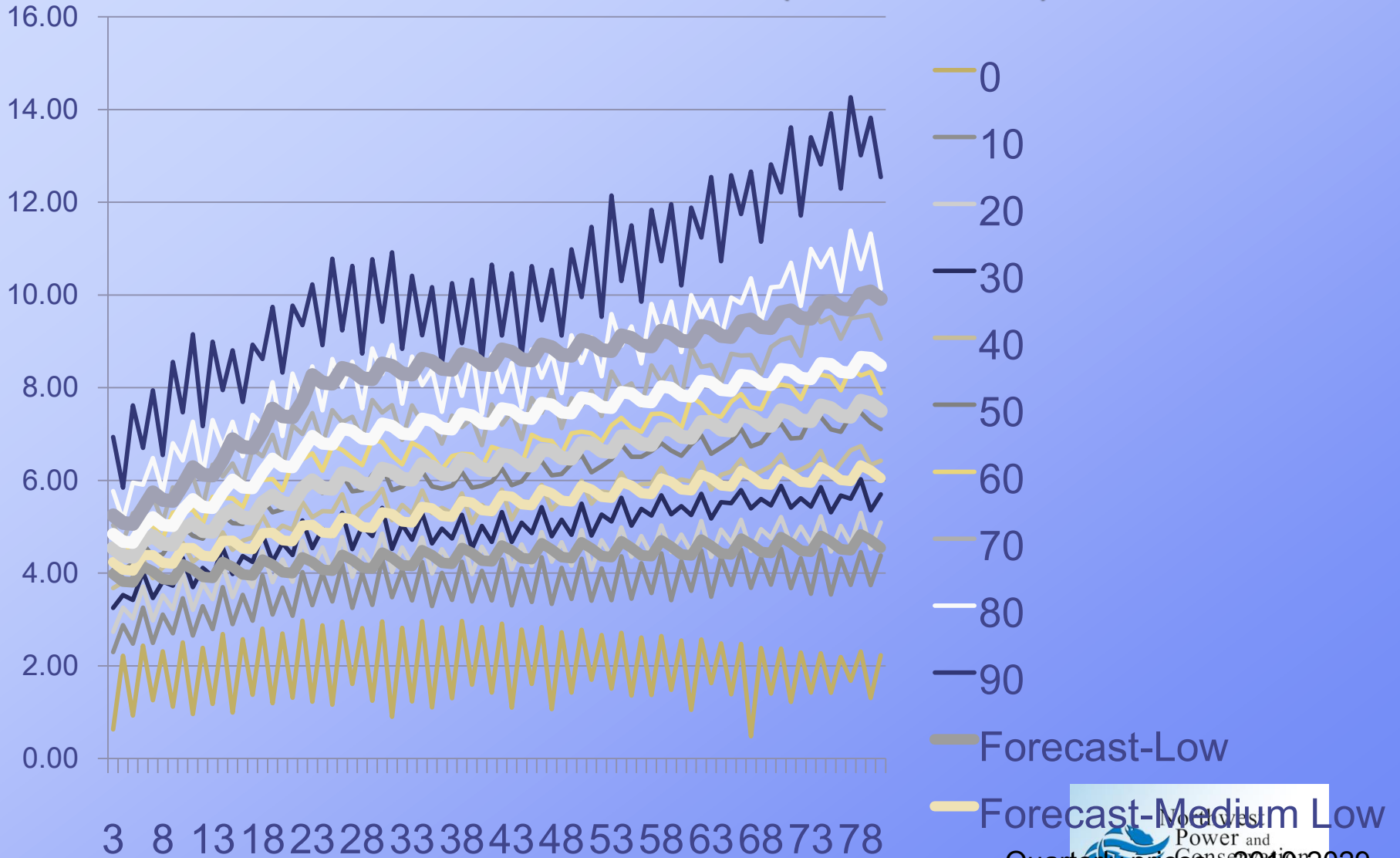
# Additional slides

# Additional price fluctuations

- Long-term fundamental price forecasts are subject to monthly, seasonal fluctuations which are captured in the Regional Portfolio Model.
- Following slides show the range of quarterly fluctuations in natural gas prices modeled in RPM as well as the fundamental price forecasts



# Range of Forecast Natural Gas Price Delivered to Electric Utilities PNW East & 10-90th Deciles used in RPM (2006\$/mmBTU)



# NGAC Poll Results (average)

## Henry Hub 2010\$/mmBTU

	NGAC Low	NGAC Med Low	NGAC MED	NGAC MED High	NGAC High
2010	4.1	4.1	4.1	4.1	4.1
2015	4.0	4.8	5.4	6.3	8.3
2020	4.3	5.1	5.8	6.8	8.6
2025	4.7	5.5	6.3	7.4	8.8
2030	5.0	5.9	6.7	7.9	9.1
2010-2015	-0.2%	3.4%	6.1%	9.2%	15.6%
2015-2020	1.5%	1.5%	1.5%	1.6%	0.6%
2020-2025	1.4%	1.4%	1.4%	1.5%	0.6%
2025-2030	1.3%	1.3%	1.3%	1.4%	0.5%

# Proposed Wellhead Price of Natural Gas \$2010/mmBTU

	Low	Medium Low	Medium	Medium High	High
2010	4.05	4.05	4.05	4.05	4.05
2011	4.03	4.07	4.13	4.19	4.21
2012	4.01	4.09	4.21	4.34	4.38
2013	3.99	4.11	4.30	4.49	4.56
2014	3.97	4.13	4.38	4.65	4.74
2015	3.95	4.15	4.47	4.81	4.95
2016	3.93	4.17	4.56	4.95	5.17
2017	3.91	4.21	4.67	5.10	5.41
2018	3.89	4.26	4.79	5.26	5.65
2019	3.87	4.30	4.91	5.41	5.90
2020	3.89	4.34	5.03	5.58	6.17
2021	3.91	4.39	5.16	5.74	6.45
2022	3.93	4.43	5.29	5.92	6.74
2023	3.95	4.47	5.42	6.09	7.04
2024	3.97	4.52	5.56	6.28	7.36
2025	3.99	4.56	5.70	6.46	7.69
2026	4.01	4.61	5.84	6.66	8.03
2027	4.03	4.66	5.98	6.86	8.40
2028	4.05	4.70	6.13	7.06	8.77
2029	4.07	4.75	6.29	7.28	9.17
2030	4.09	4.80	6.44	7.49	9.58
2010-2015	-0.5%	0.5%	2.0%	3.5%	4.1%
2015-2020	-0.3%	0.9%	2.4%	3.0%	4.5%
2020-2025	0.5%	1.0%	2.5%	3.0%	4.5%
2025-2030	0.5%	1.0%	2.5%	3.0%	4.5%

# Refiners acquisition Cost of Oil \$2010/mmBTU

	Proposed Low	Proposed Med L	Proposed Med	Proposed Med. H	Proposed High
2010	76	76	76	76	76
2011	75	76	77	78	78
2012	74	75	78	79	80
2013	73	75	78	80	81
2014	72	74	79	81	83
2015	70	74	80	83	85
2016	69	73	81	84	87
2017	67	72	81	86	89
2018	66	72	83	88	92
2019	65	72	84	89	94
2020	63	71	85	91	97
2021	62	71	86	93	99
2022	61	70	88	95	102
2023	60	70	89	97	105
2024	58	70	90	99	108
2025	57	69	91	101	111
2026	56	68	92	103	114
2027	55	68	93	105	117
2028	54	67	94	107	120
2029	53	66	95	109	123
2030	52	66	96	111	126
2010-2015	-1.6%	-0.6%	1.0%	1.7%	2.2%
2015-2020	-2.0%	-0.7%	1.3%	2.0%	2.7%
2020-2025	-2.0%	-0.6%	1.4%	2.0%	2.7%
2025-2030	-2.0%	-1.0%	1.0%	2.0%	2.7%