

**BEFORE THE
PUBLIC SERVICE COMMISSION OF WISCONSIN**

Application of Wisconsin Public Service Corporation
for Approval of Proposed Changes to its Parallel
Generation Tariffs

6690-TE-114

**DIRECT TESTIMONY OF RACHEL S. WILSON
ON BEHALF OF RENEW WISCONSIN**

1 **I. INTRODUCTION AND QUALIFICATIONS**

2 **Q. Please state your name, title, and employer.**

3 A. My name is Rachel Wilson, and I am a Principal Associate with Synapse Energy
4 Economics, Incorporated (Synapse). My business address is 485 Massachusetts Avenue,
5 Suite 3, Cambridge, Massachusetts 02139.

6 **Q. Please summarize your professional experience.**

7 A. At Synapse, I conduct analysis and write testimony and publications that focus on a variety
8 of issues relating to electric utilities, including: integrated resource planning; federal and
9 state clean air policies; emissions from electricity generation; environmental compliance
10 technologies, strategies, and costs; electrical system dispatch; and valuation of
11 environmental externalities from power plants.

12 I also perform modeling analyses of electric power systems. I am proficient in the
13 use of spreadsheet analysis tools, as well as optimization and electricity dispatch models
14 to conduct analyses of utility service territories and regional energy markets. I have direct
15 experience running the Strategist, PROMOD IV, PROSYM/Market Analytics, PLEXOS,

1 EnCompass, and PCI Gentrader models, and have reviewed input and output data for
2 several other industry models.

3 Prior to joining Synapse in 2008, I worked for the Analysis Group, Inc., an
4 economic and business consulting firm, where I provided litigation support in the form of
5 research and quantitative analyses on a variety of issues relating to the electric industry.

6 **Q. Please summarize your educational experience.**

7 A. I hold a Master of Environmental Management from Yale University and a Bachelor of
8 Arts in Environment, Economics, and Politics from Claremont McKenna College in
9 Claremont, California. A copy of my current resume is attached as Ex.-RENEW-
10 Wilson-1.

11 **Q. On whose behalf are you testifying in this case?**

12 A. I am testifying on behalf of RENEW Wisconsin, Inc.

13 **Q. What is the purpose of your testimony?**

14 A. The purpose of my testimony is to evaluate the reasonableness of Wisconsin Public
15 Service Corporation's (WPSC) proposed energy component of its revised parallel
16 generation rates, to present a more reasonable avoided energy cost forecasting
17 methodology, and to present the results from my own analysis using that methodology.

18 **Q. Have you testified previously before the Public Service Commission of Wisconsin?**

19 A. Yes, I have previously provided direct testimony in Docket Nos. 4220-TE-109 and 6680-
20 TE-107, which are the applications for updates to parallel generation tariffs for Northern
21 State's Power Company Wisconsin and Wisconsin Power and Light Company,
22 respectively. My testimony in this proceeding includes many of the same concepts that I
23 discussed in my testimony in those dockets.

1 **II. SUMMARY OF OBSERVATIONS AND RECOMMENDATIONS**

2 **Q. Please summarize the basis for WPSC’s current avoided energy cost rates.**

3 A. WPSC’s current avoided energy cost rates for its Parallel Generation – Net Energy
4 Billing (PG-4) and Parallel Generation – Purchase by WPSC (PG-2A) tariffs were
5 derived from the actual hourly average day-ahead locational marginal price (LMP) at the
6 WPS.WPSM pricing load zone for the most recently completed November 1 to October
7 31 period (Direct-WPSC-Nelson-6). Avoided energy costs for WPSC’s Parallel
8 Generation – Purchase by WPSC (PG-2B) tariff are based on the day-ahead LMPs at the
9 WPS.WPSM pricing load zone and vary by day (Direct-WPSC-Nelson-6).

10 **Q. What is WPSC’s proposed methodology for calculating avoided energy costs going**
11 **forward?**

12 A. For the PG-2A tariff, WPSC proposes to transition to using forecasted LMP data to
13 determine avoided energy costs and to update those energy costs annually (Direct-
14 WPSC-Nelson-8). For the PG-2B tariff, WPSC proposes to continue to use actual day-
15 ahead hourly LMPs (Direct-WPSC-Nelson-7).

16 **Q. At a high level, what is your reaction to WPSC’s proposal?**

17 A. It is more appropriate to use a long-run forecast of LMPs to set the rate for the energy
18 component of avoided costs. My testimony presents a forecast of LMPs over a 20-year
19 analysis period from 2021 to 2040.

20 **Q. What are your recommendations to the Commission in this proceeding?**

21 A. I recommend that the Commission direct WPSC to base the energy component of its
22 avoided costs for front-of-the-meter resources on a long-run forecast of LMPs, consistent

1 with the methodology described in the technical report attached to my direct testimony
2 (Wisconsin Avoided Energy Costs, Ex.-RENEW-Wilson-2).

3 **III. WPSC'S AVOIDED ENERGY COSTS**

4 **Q. What is WPSC proposing in this docket with respect to the energy component of its**
5 **avoided costs?**

6 A. WPSC proposes to compensate customers at market energy prices consistent with the
7 forecasted day-ahead LMP values that underlie the Company's annual fuel plan dockets,
8 updated each year and simplified into averaged values for its time-of-use pricing periods
9 for its PG-2A tariff (Direct-WPSC-Nelson-7). For its PG-2B tariff, WPSC proposes to
10 use actual day-ahead hourly LMPs (Direct-WPSC-Nelson-7).

11 **Q. Is this a reasonable methodology to forecast the energy component of avoided costs?**

12 A. Neither a single-year forecast of day-ahead LMPs nor actual day-ahead hourly LMPs are
13 reasonably representative of the avoided energy value of distributed generation. A single-
14 year forecast of LMPs only captures the variable cost of generation (fuel costs as well as
15 operations and maintenance costs) from the generating units that are online in that
16 particular year. It does not capture changes in the variable cost of generation that would
17 occur as new capacity comes online in future years. Additional investments in renewable
18 capacity would lower the variable cost of generation, while investments in fossil-fueled
19 generators would increase the variable cost of generation.

1 **Q. WPSC Witness Nelson states that the Company’s proposal is informed by “total**
2 **economic and engineering modeling as required by the 2021 Order” (Direct-WPSC-**
3 **Nelson-8). Do you agree with that statement?**

4 A. No. The modeling that Witness Nelson refers to is a single year of production cost
5 modeling, which dispatches only units that are existing or expected to be coming online
6 within the year. This is problematic for the reasons I describe above, and differs from the
7 modeling approach that I present below, which includes both capacity optimization and
8 production cost components.

9 **Q. Why is it more appropriate to calculate avoided energy costs based on a long-run**
10 **forecast of LMPs?**

11 A. A long-run forecast of LMPs includes any changes to variable costs that result from the
12 addition of new generators to a utility’s system, or the retirement of existing generators.
13 A long-run LMP forecast accounts for the energy costs over the entire analysis period or
14 the period at which a Qualifying Facility (QF) would receive payments commensurate
15 with the avoided energy cost component under a long-term contract. Depending on the
16 length of the contract, the long-run LMP forecast may also account for the avoided
17 energy value over the likely life of the generation asset.

18 **Q. Do you have other concerns with the use of a single-year forecast or actual day-**
19 **ahead market prices?**

20 A. Yes. Developers are unlikely to enter into a contract in which the avoided energy
21 payments over the life of the asset are both variable and unknown. Use of a single-year
22 forecast means that the avoided energy payment from year-to-year would be both
23 variable and unknown. Developers, then, cannot know if the avoided energy payment

1 they would receive would be sufficient to cover the costs associated with the construction
2 of new resources. Long-term certainty is essential to the development of new resources.

3 **Q. Wouldn't the use of fixed pricing lead to compensation for distributed generation at**
4 **a rate that deviates from avoided energy cost?**

5 A. Over the duration of the contract, actual energy prices will likely be higher or lower than
6 the fixed energy price at any given time, but that is true with any forecast. Further, our
7 long-term forecasts are conservative, and are more likely to be lower than future actual
8 energy prices in the MISO market.

9 Matching buyback rates to hour-to-hour changes in market prices is not a
10 reasonable way to encourage renewable resource development. As additional QFs with
11 low to no variable cost are added to a utility's system, the effect is to lower the resulting
12 LMPs in the hours in which these resources are generating. This effect on LMPs is
13 magnified as more QFs are added to the system.

14 Use of hourly market prices would produce, for any given QF, an avoided cost
15 that does not reflect the impact of that QF on LMPs, because the forecast would include
16 the presence of that QF. In other words, under WPSC's proposal, while that QF resource
17 would benefit the system by lowering LMPs, it would not be compensated for the
18 avoided energy value it adds. Instead, WPSC's buyback rate would essentially discount
19 that QF's impact on lowering LMPs. The QF resource should instead be compensated
20 using a long-term price forecast that determines the value of the generator "but-for" its
21 presence on the system.

1 **Q. Is WPSC also proposing to subtract a transaction cost from the LMP it is proposing**
2 **to pay to QFs?**

3 A. Yes, WPSC is proposing to subtract a transaction cost that it says is charged and credited
4 to the Company by MISO from the most recently completed November 1 to October 31
5 period (Direct-WPSC-Nelson-7). For the most recent period, that transaction cost was
6 approximately \$0.00084/kWh (Direct-WPSC-Nelson-7). WPSC Witness Nelson does not
7 explain the reasoning for this adjustment, and at the very least, sufficient justification
8 should be provided to the Commission before this adjustment is adopted. It seems to me,
9 however, that if this transaction charge were to be applied, it should be *added* to the LMP
10 paid to the QF given that it is another cost that is avoided through the purchase of
11 generation from that QF rather than from the MISO market.

12 **Q. What is the best way for WPSC to develop a long-term LMP forecast?**

13 A. The most rigorous way for WPSC to develop a long-term LMP forecast is to use power
14 sector capacity optimization and production cost modeling tools to calculate the long-
15 term impacts of new QF generation on energy dispatch and prices. This modeling
16 exercise requires the development of a future scenario, or scenarios, which includes
17 forecasts of peak demand and annual energy, commodity price forecasts, existing
18 generating unit characteristics, forecasts of costs and availability of new generating units,
19 and relevant environmental regulations. The capacity optimization algorithm then selects
20 the least-cost future resource portfolio. Dispatch of the system with these new additions is
21 simulated over the analysis period and produces a long-term forecast of LMPs.

1 **Q. Did you use power sector optimization and production cost modeling tools to**
2 **produce a long-term forecast of LMPs?**

3 A. Yes. I used the EnCompass model, licensed by Anchor Power, to first perform a capacity
4 expansion simulation of the Eastern Interconnect. Once an optimal resource build had
5 been calculated by the model, hourly dispatch of both new and existing generating units
6 was simulated to produce a forecast of LMPs over the period from 2021 to 2040. A more
7 detailed description of the input assumptions that went into that analysis, as well as the
8 modeling methodology used, is provided in the technical report attached to my testimony
9 (Wisconsin Avoided Energy Costs, Ex.-RENEW-Wilson-2).

10 **Q. Briefly describe your input assumptions.**

11 A. I modeled the entire Eastern Interconnect in order to account for energy flows between
12 markets but focused on MISO for the purposes of this analysis. MISO loads were taken
13 from the *2021 MISO Energy and Peak Demand Forecasting for System Planning* report
14 published by the State Utility Forecasting Group (SUGF) at Purdue University¹ (Ex.-
15 RENEW-Wilson-3) and were adjusted for energy efficiency and future electrification.
16 The system was modeled with unit-level granularity, meaning that we modeled the
17 operating characteristics of each unit that makes up the 180 GW of existing MISO
18 capacity. We included planned additions and retirements as part of the capacity mix and
19 offered new resources to the model using data on capital and operating costs from sources

¹ Lu, Liewei, F. Wu, D. J. Gotham, D. G. Nderitu, T. A. Phillips, P. V. Preckel, M. A. Velástegui. *2021 MISO Energy and Peak Demand Forecasting for System Planning*. Purdue University State Utility Forecasting Group for Midcontinent Independent System Operator, Inc. Available at: [[https://](https://www.purdue.edu/discoverypark/sufg/docs/publications/MISO/MISO%20forecast%20report%202021)] [[www.](http://www.purdue.edu/discoverypark/sufg/docs/publications/MISO/MISO%20forecast%20report%202021)] [purdue.edu/discoverypark/sufg/docs/publications/MISO/MISO%20forecast%20report%202021](http://www.purdue.edu/discoverypark/sufg/docs/publications/MISO/MISO%20forecast%20report%202021) [.pdf.]

1 like the U.S. Energy Information Administration (EIA) and the National Renewable
2 Energy Laboratory's (NREL) *Advanced Technology Baseline*.

3 **Q. Briefly describe your modeling methodology.**

4 A. I used the EnCompass capacity expansion and production cost model, licensed from
5 Anchor Power Solutions, to simulate the Eastern Interconnect over a 20-year period from
6 2021 through 2040. Each year is first modeled in capacity optimization mode, in which
7 EnCompass determines the most cost-effective capacity additions over the duration of the
8 analysis period. The simulation uses a "typical on-peak/off-peak day," in which two days
9 are used to represent the characteristics of each month.

10 When the capacity optimization is complete, the resulting resource build-out is
11 locked down and the model is re-run in production cost mode to simulate the dispatch of
12 those resources. This simulates the least-cost dispatch over all 8,760 hours in the year and
13 of all units in the Eastern Interconnect, subject to transmission constraints. The model
14 will determine the least-cost mix of generators needed to meet load during a given time
15 interval, typically one year in 8,760-hour increments. The production cost model
16 produces the avoided energy cost in the form of energy prices across MISO.

17 **Q. Did you model more than one scenario in your analysis?**

18 A. Yes. I modeled a Reference scenario and a High Gas Price scenario, which use two
19 different forecasts for natural gas prices.

20 **Q. Describe how you derived the Reference and High Gas Price forecasts.**

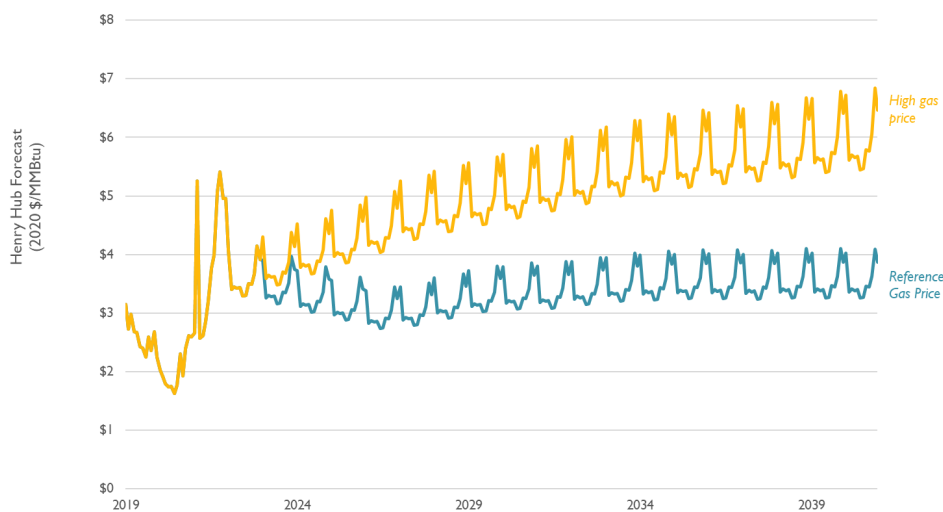
21 A. Both gas price forecasts rely on a combination of New York Mercantile Exchange
22 (NYMEX) futures and the EIA's *2021 Annual Energy Outlook (AEO)*. The NYMEX
23 futures prices represent the actual valuation of gas by the market but become less certain

1 the further the forecast goes into the future. The AEO’s forecast, on the other hand,
2 represents long-term fundamentals pricing. The gas price forecasts used in this analysis
3 are based on NYMEX futures in the short-term, the AEO forecast in the long-term, and a
4 blend of the two in the interim years.

5 Specifically, the Reference scenario assumes a gas price forecast that relies on
6 NYMEX futures in 2022, a blend of NYMEX and AEO in 2023 through 2025, and the
7 2021 AEO Reference Case forecast from 2026 through 2040. The High Gas price
8 forecast utilizes the same methodology but uses AEO’s Low Oil and Gas Supply forecast
9 rather than the Reference Case to derive medium- and long-term values. The range of gas
10 prices created by the Reference Gas Price and High Gas Price scenarios is shown in

11 [Figure 1](#).

12 **Figure 1. Monthly Henry Hub gas price forecast, Reference and High**



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14 **Q. Why was it reasonable to create two scenarios with different gas price forecasts?**

15 A. LMPs are highly correlated with gas prices. Gas-fired generators are often “the marginal
16 generator” in MISO, meaning that they are the generating units that are called upon to

1 meet the next increment of load. As a result, they often set the LMP in many hours.

2 While less volatile than in the past, gas prices in both the short- and the long-term are still
3 uncertain and utilities will often produce modeling scenarios or sensitivities that examine
4 the effects of high gas prices on both capacity optimization (the future resource build)
5 and dispatch of new and existing units in order to make resource decisions. Given that the
6 future gas price forecast will directly impact the energy component of the avoided cost
7 payment, and thus the payments to new QFs, it was also reasonable to model a second
8 scenario that utilizes a higher gas price forecast.

9 **Q. Have gas price futures changed at all since the date of your analysis?**

10 A. Yes. Since the beginning of 2022, gas price futures have more than doubled, increasing
11 from \$3.730/mmBtu to \$7.854/mmBtu in mid-May.² These prices are higher than the
12 expected prices used for 2022 in my analysis.

13 **Q. What were the results of your analysis?**

14 A. As described in Section 3 of Ex.-RENEW-Wilson-2, the LMP forecast for Wisconsin
15 averages the hours designated by WPSC as Summer On-Peak, Summer Off-Peak, Winter
16 On-Peak, and Winter Off-Peak. These four time periods reflect the same time-of-use
17 periods as proposed by WPSC in its application. The EnCompass forecast is
18 representative of the price in Local Resource Zone (LRZ) 2 for Wisconsin. The LMP
19 forecast under Reference gas prices is shown in [Table 1](#), below. EnCompass produces its
20 outputs in nominal dollars. These values have been converted to real 2021 dollars using
21 an assumed inflation rate of two percent.

² de Luna, Marcy and Biana Flowers. May 16, 2022. *Surging natural gas prices squeeze U.S. industrial sector*. Reuters. Available at: [[https://](https://www.reuters.com/markets/us/surging-natural-gas-prices-squeeze-us-industrial-sector-2022-05-16/)] [[www.](https://www.reuters.com/markets/us/surging-natural-gas-prices-squeeze-us-industrial-sector-2022-05-16/)] reuters.com/markets/us/surging-natural-gas-prices-squeeze-us-industrial-sector-2022-05-16/.

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Table 1. Long-run Reference LMP forecast, Wisconsin

| Year | Wisconsin adjusted (\$2021) | | | |
|------|-----------------------------|-----------------|----------------|-----------------|
| | Summer On-Peak | Summer Off-Peak | Winter On-Peak | Winter Off-Peak |
| 2021 | \$33.79 | \$23.24 | \$27.36 | \$17.37 |
| 2022 | \$31.99 | \$23.41 | \$28.06 | \$18.84 |
| 2023 | \$32.58 | \$24.48 | \$30.30 | \$22.11 |
| 2024 | \$34.12 | \$25.31 | \$31.65 | \$24.00 |
| 2025 | \$34.20 | \$25.41 | \$32.08 | \$24.81 |
| 2026 | \$32.96 | \$25.04 | \$31.79 | \$24.84 |
| 2027 | \$32.88 | \$25.08 | \$31.42 | \$24.92 |
| 2028 | \$32.88 | \$25.25 | \$30.57 | \$24.04 |
| 2029 | \$33.33 | \$25.37 | \$30.22 | \$23.65 |
| 2030 | \$33.62 | \$25.37 | \$29.77 | \$23.43 |
| 2031 | \$33.98 | \$25.51 | \$29.50 | \$23.29 |
| 2032 | \$34.17 | \$26.17 | \$29.79 | \$23.54 |
| 2033 | \$34.45 | \$26.55 | \$29.73 | \$23.51 |
| 2034 | \$35.43 | \$27.14 | \$29.81 | \$23.34 |
| 2035 | \$34.32 | \$26.15 | \$28.88 | \$22.48 |
| 2036 | \$32.59 | \$24.96 | \$27.62 | \$21.99 |
| 2037 | \$31.49 | \$24.80 | \$26.85 | \$21.36 |
| 2038 | \$30.90 | \$24.23 | \$25.85 | \$20.39 |
| 2039 | \$31.99 | \$25.05 | \$26.99 | \$21.29 |
| 2040 | \$31.60 | \$24.60 | \$26.35 | \$20.55 |
| 2041 | \$32.19 | \$25.09 | \$26.88 | \$20.96 |
| 2042 | \$32.80 | \$25.59 | \$27.41 | \$21.38 |

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The LMP forecast under the High Gas Price forecast is shown in [Table 2](#). Note that for both scenarios, the EnCompass analysis period extended through 2040 only. Prices for 2041 and 2042 were extrapolated based on the forecasted growth in gas prices due to RENEW Wisconsin's presentation of a 20-year contract term from 2023 to 2042.

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Table 2. Long-run High Gas Price LMP forecast, Wisconsin

| Year | Wisconsin adjusted (\$2021) | | | |
|------|-----------------------------|-----------------|----------------|-----------------|
| | Summer On-Peak | Summer Off-Peak | Winter On-Peak | Winter Off-Peak |
| 2021 | \$33.79 | \$23.24 | \$27.36 | \$17.37 |
| 2022 | \$31.99 | \$23.41 | \$28.06 | \$18.84 |
| 2023 | \$34.66 | \$25.92 | \$31.53 | \$22.84 |
| 2024 | \$38.34 | \$28.22 | \$34.23 | \$25.48 |
| 2025 | \$40.55 | \$29.54 | \$35.12 | \$26.16 |
| 2026 | \$39.79 | \$29.30 | \$33.96 | \$24.68 |
| 2027 | \$40.39 | \$30.10 | \$32.82 | \$24.50 |
| 2028 | \$40.30 | \$29.82 | \$30.74 | \$22.58 |
| 2029 | \$41.42 | \$30.56 | \$30.92 | \$22.79 |
| 2030 | \$42.19 | \$30.88 | \$30.65 | \$23.17 |
| 2031 | \$41.96 | \$31.07 | \$29.30 | \$22.67 |
| 2032 | \$42.19 | \$32.21 | \$29.59 | \$22.42 |
| 2033 | \$42.39 | \$32.59 | \$28.96 | \$22.43 |
| 2034 | \$43.51 | \$33.41 | \$29.17 | \$22.34 |
| 2035 | \$43.14 | \$32.72 | \$28.54 | \$21.78 |
| 2036 | \$41.70 | \$32.10 | \$28.19 | \$22.52 |
| 2037 | \$41.53 | \$32.94 | \$28.83 | \$22.81 |
| 2038 | \$42.01 | \$33.48 | \$29.09 | \$23.35 |
| 2039 | \$42.51 | \$33.87 | \$28.98 | \$22.96 |
| 2040 | \$42.41 | \$33.27 | \$28.77 | \$22.52 |
| 2041 | \$43.19 | \$33.94 | \$29.35 | \$22.97 |
| 2042 | \$44.01 | \$34.62 | \$29.93 | \$23.43 |

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3 **IV. CONCLUSION**

4 **Q. Please restate your recommendations to the Commission in this proceeding.**

5 A. An annually updated forecast of short-run LMPs is insufficient to set the energy
6 component of WPSC’s avoided cost because it represents only those costs that are
7 incurred to generate electricity absent additional investments in new generation capacity.
8 A long-run forecast of marginal energy costs, or LMPs, is a more appropriate
9 representation of the avoided energy cost component for the following reasons: (1) it
10 captures changes in the variable cost of generation that would occur as new capacity
11 comes online in future years; (2) it accounts for the energy costs over the entire analysis

1 period, or the period at which a QF would receive payments commensurate with the
2 avoided energy cost component under a long-term contract; (3) the long-run LMP
3 forecast may also account for the avoided energy value over the likely life of the QF
4 asset; and (4) a long-run forecast gives project developers certainty around future revenue
5 streams, ensuring that QFs are constructed. For those reasons, I recommend that the
6 Commission direct WPSC to (a) use a long-term LMPs forecast for the purposes of
7 determining its avoided energy costs and (b) create more than one gas price forecast
8 scenario as a part of its long-term LMP forecasting exercise.

9 **Q. Does this conclude your testimony?**

10 A. Yes, it does.