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ALJ	:	J. Wong
Witness	:	T. Renaghan

OFFICE OF RATEPAYER ADVOCATES
CALIFORNIA PUBLIC UTILITIES COMMISSION

Report on the Results of Operations for Pacific Gas and Electric Company Test Year 2015 Gas Transmission and Storage Rate Case

Chapter 14
Throughput Forecast

San Francisco, California
August 11, 2014

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THROUGHPUT FORECAST

I. INTRODUCTION

This testimony presents ORA's analysis of PG&E gas throughput recommendations for test year 2015, 2016, and 2017. PG&E relies upon econometric and non-econometric methods to generate its throughput forecasts for the 2015 – 2017 forecast period.

Econometric models are used to forecast gas demand to the residential, small commercial, large commercial, industrial distribution, industrial transmission, and industrial backbone sectors. PG&E's econometric models establish a statistical relationship between historic gas demand to constant dollar (real) gas rates, economic conditions in PG&E's service territory, weather, and seasonal effects. Forecasts are developed under average and cold temperature conditions. ORA also relied upon similar econometric models to forecast gas demand to these sectors.

Forecasts of gas throughput for the electric generation, cogeneration, and resale sectors are developed with non-econometric methods. For the electric generation sector, for example, PG&E relies upon the Market Builder Model. This is a proprietary model which relates electric generation gas throughput to gas prices, hydro-electric conditions, and forecasted electric demands in the Western Region of the U.S.[1] Forecasts of resale throughputs, for the most part, were taken directly from the resale customers themselves.

Section II of this testimony summarizes and compares ORA's and PG&E's proposed throughput forecasts for test year 2015, 2016, and 2017. Section III provides a detailed discussion of ORA's and PG&E econometric model results and forecast assumptions. Section IV discusses PG&E's and ORA's non-econometric throughput results.

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[1] While ORA does not have access to the Market Builder Model, ORA analyzed the reasonableness of PG&E's forecast by requesting PG&E to re-run the model with different input assumptions. PG&E Response to ORA-DRA-02 Q3 and PG&E Response to ORA-DR-051 Q3.

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II. SUMMARY OF RECOMMENDATIONS

The following summarizes ORA's recommended throughput forecasts under average and cold year temperature conditions.

- For the residential class of service ORA recommends test year 2015 throughput of 519 (Mdth/D) while PG&E recommends residential test year throughput of 528 (Mdth/D). This is a difference of 1.73 percent. On a cold year basis ORA recommends test year throughput of 582 (Mdth/D) . PG&E recommends a cold year residential throughput of 590 (Mdth/D). For the remainder of the forecast period, 2016 and 2017, ORA recommends lower residential throughput. Under average temperature conditions ORA recommends residential throughput of 515 (Mdth/D) in 2016 and 514 (Mdth/D) in 2017. For these years PG&E forecasts, respectively, average temperature throughput of 525 (Mdth/D) in each year. Under cold year conditions ORA forecasts residential throughput of 755 (Mdth/D) in 2016 and 754 (Mdth/D) in 2017. PG&E forecasts cold year throughput of 765 (Mdth/D) in 2016 and 773 (Mdth/D) in 2017.
- For test year 2015, ORA and PG&E arrive at identical recommended small commercial throughput volumes. Under average temperature conditions, ORA and PG&E recommend small commercial throughput volumes of 232 (Mdth/D). Under cold temperature conditions ORA and PG&E recommend small commercial throughput volumes of 249 (Mdth/D). For 2016 and 2017, ORA forecasts average year volumes of 212 (Mdth). Under average year conditions, PG&E forecasts, respectively, small commercial throughput of 233 (Mdth/D) and 240 (Mdth/D) in 2016 and 2017. Under cold temperature conditions, ORA forecasts small commercial throughput of 227 (Mdth/D) in 2016 and 225 (Mdth/D) in 2017. For these years, PG&E forecasts, respectively, cold year throughputs of 229 (Mdth) and 230 (Mdth).
- For the large commercial customer class ORA and PG&E arrive at identical forecasts. Over the entire forecast period, 2015 – 2017, under

both average and cold temperature conditions, ORA and PG&E recommend a large commercial throughput forecast of 21 (Mdth/D).

- For the core interdepartmental class of service, ORA and PG&E recommend a throughput forecast of 0.4 (Mdth/D) under average and cold temperature conditions.
- For core natural gas vehicles, ORA and PG&E recommend a throughput forecast of 7 (Mdth/D) under average and cold temperature conditions.
- For test year 2015, ORA recommends slightly lower total core throughput than PG&E. Under average temperature conditions, ORA recommends total core throughput of 759 (Mdth/D). This is approximately one percent below PG&E total core throughput forecast of 767 (Mdth/D). On a cold year basis ORA forecasts total core throughput of 836 (Mdth/D) while PG&E forecasts total core cold year throughput of 847 (Mdth/D). For 2016 and 2017 ORA forecasts average year total core throughput of 755 (Mdth/D) and 754 (Mdth/D), respectively. For 2016 and 2017, PG&E forecasts respectively, total core throughput of 765 (Mdth/D) and 773 (Mdth/D). Under cold year conditions, ORA forecasts 2016 total core throughput of 834 (Mdth/D) while PG&E forecasts total core throughput of 845 (Mdth/D). In 2017 ORA forecasts that total core cold year throughput will increase to 836 (Mdth/D) while PG&E is forecasting that total core throughput will increase to 848 (Mdth/D).
- For the industrial distribution non-core class of service ORA and PG&E arrive at nearly identical results. Over the 2015-2017 forecast period ORA forecasts industrial distribution gas demand of 68 (Mdth/D) in each year. PG&E's results are identical with the exception that in 2017 PG&E forecasts industrial distribution throughput of 69 (Mdth/D). Similarly, under cold year conditions, ORA and PG&E forecast industrial distribution throughput of 70 (Mdth/D) in 2015 and 2016 and 71 (Mdth/D) in 2017.

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- For the industrial transmission class of service ORA forecasts test year 2015 throughput of 434 (Mdth/D) while PG&E forecasts throughput of 420 (Mdth/D) to this class of service.[2] For 2016 and 2017, ORA forecasts, respectively, throughput of 428 (Mdth/D) and 434 (Mdth/D). For 2016 PG&E forecasts that industrial transmission throughput will remain at its 2015 level. For 2017, PG&E forecasts industrial transmission throughput of 424 (Mdth/D).
- For the 2015-2017 forecast period ORA forecasts marginally higher throughput to the industrial non-core backbone class of service.[3] In test year 2015 ORA forecasts industrial backbone throughput of 4.8 (Mdth/D) while PG&E forecasts industrial backbone throughput of 4.6 (Mdth/D). Fpr 2016 and 2017 the situation is similar with ORA forecasting industrial backbone gas demand of 4.8 (Mdth/D) in 2016 and 4.9 (Mdth/D) in 2017. By contrast, PG&E forecasts industrial backbone throughput of 4.5 (Mdth/D) in 2016 and 4.5 (Mdth/D) in 2017.
- ORA adopts PG&E's recommended non-core Natural Gas Vehicle (NGV) recommendations for the 2015-2017 forecast period of 1 (Mdth/D).
- Under average and cold temperature conditions ORA and PG&E forecast throughput to the non-market electric generation class of service of 175 (Mdth/D) in 2015, 2016, and 2017.
- Under average year conditions ORA and PG&E forecast market electric generation throughput of 478 (Mdth/D) in test year 2015, 470 (Mdth/D) in 2016, and 463 (Mdth/D) in 2017. Under cold year conditions ORA and PG&E forecast market generation throughput of 483 (Mdth/D) in test 2015, 475 (Mdth/D) in 2016, and 468 (Mdth/D) in 2017.

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[2] This customer class is not weather sensitive. Therefore, ORA's and PG&E's forecasts do not differ between average and cold temperature years.

[3] Similar to the industrial transmission class of service, this customer class is not we ather sensitive.

- For test year 2015 ORA forecasts total non-core throughput of 1,170 (Mdth/D) while PG&E forecasts total non-core throughput of 1,150 (Mdth/D). This is a difference of 1.70 percent. For 2016 and 2017 ORA's and PG&E's total non-core throughput forecasts differ by less than one percent. Under cold temperature conditions the results are similar. For test year 2015 ORA forecasts total non-core throughput of 1,171 (Mdth/D) and PG&E forecasts total non-core throughput of 1,157 (Mdth/D). This is a difference of 1.19 percent. For the remainder of the forecast period, 2016 and 2017, ORA's and PG&E's forecasts differ by less than one percent.
- Under average and cold temperature conditions, ORA's and PG&E's forecasts of total throughput volumes differ by less than one percent. For test year 2015, for example, ORA forecasts total throughput volumes of 1,938 (Mdth/D) while PG&E forecasts total gas throughput volumes of 1,927 (Mdth/D). Under cold temperature conditions, ORA forecasts total test year volumes of 2,007 (Mdth/D) and PG&E forecasts total throughput volumes of 2,014 (Mdth/D).

Table 14-1 compares ORA's and PG&E's TY2015 gas throughput forecasts under average temperature conditions. Table 14-2 compares ORA's and PG&E's throughput forecasts under cold year conditions.

Table 14-1
ORA and PG&E Throughput Forecasts
Average Year

(Mdth/Day)

Category	2015	2016	2017
Residential			
ORA	519	515	514
PG&E	528	525	525
PG&E>ORA (%)	1.73 %	1.94 %	2.14 %
Small Commercial			
ORA	211	212	212
PG&E	211	212	219
PG&E>ORA (%)	0.00 %	0.00 %	3.00 %
Large Commercial			
ORA	21	21	21
PG&E	21	21	21
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Interdepartmental			
ORA	0.4	0.4	0.4
PG&E	0.4	0.4	0.4
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Core NGV			
ORA	7	7	7
PG&E	7	7	7
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %

Table 14-1
ORA and PG&E Throughput Forecasts
Average Year

(Mdth/Day)

Category	2015	2016	2017
Total Core			
ORA	759	755	754
PG&E	767	765	773
PG&E>ORA (%)	1.05 %	1.58 %	2.52 %
Non Core			
Industrial Distribution			
ORA	68	68	68
PG&E	68	68	68
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Industrial Transmission			
ORA	434	428	434
PG&E	420	420	424
PG&E>ORA (%)	-3.22 %	-1.87 %	-2.30 %
Industrial Backbone			
ORA	4.8	4.8	4.9
PG&E	4.6	4.6	4.5
PG&E>ORA (%)	-4.17 %	-4.17 %	-8.16 %
NonCore NGV			
ORA	1	1	1
PG&E	1	1	1
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %

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Table 14-1
ORA and PG&E Throughput Forecasts
Average Year

(Mdth/Day)

Category	2015	2016	2017
Non-Market Electric Generation			
ORA	178	178	178
PG&E	178	178	178
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Market Electric Generation			
ORA	478	470	463
PG&E	478	470	463
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Total NonCore			
ORA	1,170	1,152	1,150
PG&E	1,150	1,142	1,139
PG&E>ORA (%)	-1.70 %	-0.86 %	-0.96 %
Total Volumes[4]			
ORA	1,938	1,917	1,914
PG&E	1,927	1,917	1,922
PG&E>ORA (%)	-0.56 %	0.00 %	0.42 %

[4] Total volumes is the sum of core demand non-core demand and wholesale demand of 10 (Mdth/D) in each of the forecast years.

Table 14-2
ORA and PG&E Throughput Forecasts
Cold Year

Category	2015	2016	2017
Residential			
ORA	582	578	589
PG&E	590	587	589
PG&E>ORA (%)	1.37 %	1.56 %	0.00 %
Small Commercial			
ORA	227	227	228
PG&E	228	229	230
PG&E>ORA (%)	0.44 %	0.88 %	0.88 %
Large Commercial			
ORA	21	21	21
PG&E	21	21	21
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Interdepartmental			
ORA	0.4	0.4	0.4
PG&E	0.4	0.4	0.4
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Core NGV			
ORA	7	7	7
PG&E	7	7	7
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %

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Table 14-2
ORA and PG&E Throughput Forecasts
Cold Year

Category	2015	2016	2017
Total Core			
ORA	836	834	836
PG&E	847	845	848
PG&E>ORA (%)	1.31 %	1.32 %	1.43 %
Non Core			
Industrial Distribution			
ORA	70	70	71
PG&E	70	70	71
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Industrial Transmission			
ORA	434	428	434
PG&E	420	420	424
PG&E>ORA (%)	-3.23 %	-1.87 %	-2.30 %
Industrial Backbone			
ORA	4.8	4.8	4.9
PG&E	4.6	4.6	4.5
PG&E>ORA (%)	-4.17 %	-4.17 %	-8.16 %
NonCore NGV			
ORA	1	1	1
PG&E	1	1	1
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %

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Table 14-2
ORA and PG&E Throughput Forecasts
Cold Year

Category	2015	2016	2017
Non-Market Electric Generation			
ORA	178	178	178
PG&E	178	178	178
PG&E>ORA (%)	0.00 %	0.00 %	0.00 %
Market Electric Generation			
ORA			
PG&E	483	475	468
PG&E>ORA (%)	483	475	468
Total NonCore	0.00 %	0.00 %	0.00 %
ORA	1,171	1,157	1,157
PG&E	1,157	1,148	1,146
PG&E>ORA (%)	-1.19 %	-0.78 %	-0.95 %
Total Volumes[5]			
ORA	2,007	1,991	1,993
PG&E	2,014	2,004	2,005
PG&E>ORA (%)	0.35 %	0.65 %	0.60 %

[5] Total volumes is the sum of core demand non-core demand and wholesale demand of 10 (Mdth/D) in each of the forecast years.

III. ECONOMETRIC METHODOLOGY AND RESULTS

ORA and PG&E developed econometric models to forecast gas demand to the residential, small commercial, large commercial, industrial distribution, industrial transmission, and industrial backbone classes of service. The econometric models are designed to establish a statistical relationship between historic gas demand and explanatory variables such as weather, real average gas rates, economic conditions, and seasonal factors. The historic and forecast data used by ORA and PG&E incorporate energy efficiency savings.[6] The coefficients generated by the econometric models are then coupled with forecasts of the explanatory variables to produce the econometric forecasts.

A. Economic and Demographic Assumptions

Since the economic and demographic assumptions play a large role in the econometric forecasts recommended by ORA and PG&E, it will be useful to explore these assumptions before turning to a discussion of the specific econometric results obtained by ORA and PG&E. PG&E relied upon Moody's Analytics for its forecast of economic conditions in its service territory.[7] PG&E explains that it: "populates its forecast models with economic projections developed by Moody's Analytics. Specifically, forecasts of future economic and demographic activity for PG&E's service area, such as industrial and commercial output, employment, and growth in

[6] PG&E explains that: "In order to adjust the econometric forecast for energy efficiency, PG&E compares the annual average reported and evaluated energy efficiency savings over the historic portion of the regression series with the annual average energy efficiency savings forecast. If future savings are projected to be greater than the observed levels of savings embedded within the historic sales data then the econometric forecasts are decremented to account for the increase in expected energy efficiency savings. In the case of this forecast the expected energy efficiency savings did not exceed the level of those observed in the historic period so no additional adjustments to the econometric forecasts to account for energy efficiency were needed." PG&E response to ORA Data Request ORA-DR-01 Q12.

[7] ORA does not subscribe to Moody's Analytics but instead relies upon The UCLA Anderson Forecast For The Nation and California to analyze the reasonableness of PG&E's economic and demographic assumptions.

the number of households are taken from Moody's Analytics 2013 Forecast of the PG&E service area economy. The projection is for the recovery to continue expanding during the rate case due to a rebound in housing prices, new construction activity, and continued growth in the tech sector and personal incomes across the service area."[8] The December UCLA forecast For The Nation and California reaches a similar conclusion noting that: "Along the coast from Marin to San Diego…California employment gains are outpacing the U.S.…Indeed, Silicon Valley over the past twelve months generated employment at twice the U.S. rate."[9] For the state as a whole UCLA concludes that: "Real personal income growth is forecast to be 0.6 % in 2013, followed by 3.2 % and 3.1 % in 2014 and 2015. Unemployment will fall through 2013 and will average approximately 8.9 % for this year. In 2014 we expect the unemployment rate to drop to 8.2 % on average, one percentage point higher than our U.S. forecast thence to 7.3 %"[10] Since PG&E's forecast of economic conditions in its service area are generally consistent with the UCLA forecast, ORA has adopted PG&E's economic and demographic assumptions.[11]

The econometric forecasts are also impacted by forecasted weather conditions. PG&E explains that: "Because residential and commercial customers use natural gas primarily for space heating purposes, temperature conditions are the single most important factor influencing winter and, by extension annual Core gas demand…For this proceeding…PG&E has prepared demand forecasts for two design temperature conditions – average year and 1-in-35 cold winter…Each series of temperature conditions also employs a slight warming pattern to account for climate change."[12] Forecasts of average and cold temperature heating degree days

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[8] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett) , pp. 14-3 to 14-4.

[9] The UCLA Anderson Forecast For the Nation and California, December 2013, p.54.

[10] UCLA Anderson Forecast for the Nation and California, December 2013, p. 58.

[11] ORA requested PG&E's detailed economic and demographic data. PG&E provided this detailed data, but explains that Moody's considers the data to be proprietary. The fact that the Moody's data is proprietary precludes ORA from including in this testimony a detailed comparison of PG&E's and UCLA's economic and demographic forecasts.

[12] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett), p. 14-5.

were developed by the National Center for Atmospheric Research.[13] Since this is a well respected source for climate analysis, ORA has adopted PG&E's forecasts of average and cold year heating degree days.

B. Residential Econometric Model

PG&E models residential use per customer as a function of real average gas rates lagged two months, heating degree days, the post-1978 housing stock, and monthly seasonal dummy variables.[14] A log-log functional form is used with the model estimated over the period April 2000 through June of 2013.[15]

ORA's residential econometric model is similar to PG&E's. ORA regresses historical residential average use on heating degree, the post-1978 housing stock, and monthly seasonal dummy variables. Similar to PG&E ORA, relies upon a log-log functional form with the model estimated over the period April 2000 through the December 2013. ORA models the real residential price term as an 8 month polynomial distributed lag. ORA's model also includes two additional dummy variables, one for the month of October 2004 and the other for the month of December 2012.

Over the 2014-2017 forecast period, ORA and PG&E are projecting declines in residential throughput. These declines are consistent with the long-run decline in historical residential gas usage. Over the period 2000 through 2013 residential gas throughput declined, on average, by 0.38 percent per year. Between 2013 and 2014 PG&E forecasts that residential gas demand will decline by 3.94 percent. ORA is projecting a 5.58 percent decline in residential gas demand between 2013 and 2014. PG&E's then projects a further 1.62 percent decline in gas throughput between 2015

[13] PG&E provided a copy of this study to ORA. See, PG&E response to ORA_DR-01 Q11.

[14] A dummy variable is a variable that takes on the value 1 at a particular observation and 0 elsewhere.

[15] ORA obtained updated actual data for the period July through December 2013 directly from PG&E. PG&E Response to ORA-DR-13 Q1.

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and 2014. ORA forecasts a slightly lower decline of 1.07 percent between 2014 and test year 2015. The pattern is similar for 2016 and 2017 with PG&E and ORA forecasting declines in residential gas demand of less than one percent between 2016 and test year 2015.

C. Small Commercial Econometric Model

PG&E models small commercial gas throughput as a function of real average small commercial gas rates lagged three months, a measure of commercial economic activity in the PG&E service area, heating degree days, and monthly dummy variables. PG&E explains that its measure of economic activity for the small commercial sector: "is a function of gross metro product data relevant to PG&E's small commercial customer class base on North American Industrial Classification System (NAICS) codes."[16] A log-log functional form is used with the model estimated from May of 2005 through June of 2013.[17]

Similar to PG&E, ORA adopts a log-log functional form regressing historic small commercial gas demand on heating degree days, real average small commercial gas rates, PG&E's measure of economic activity, and monthly seasonal dummy variables. ORA models real average small commercial gas rates as a twelve month polynomial distributed lag while the measure of economic activity is specified as an eight month polynomial distributed lag. ORA's small commercial model also includes several additional dummy variables for April 2004, September 2005, April 2006, December 2012 and December 2013. ORA estimated its small commercial model over the period February of 2001 through December 2013.

Similar to the residential class of service, ORA and PG&E are projecting small commercial gas throughput to change very little over the 2014 – 2017 forecast period. Over the 2000 – 2013 historic period there has been virtually no growth in small commercial gas demand. The historic pattern of small commercial gas

[16] PG&E Response to ORA-DR-01 Q4.

[17] ORA obtained actual updated data for the period July through December 2013 directly from PG&E. PG&E Response to ORA-DR-13 Q2.

demand also displays some fairly wide year to year variations. For example, between 2010 and 2011 small commercial gas throughput rose by 3.21 percent. This was followed by a 3.26 percent decline in small commercial gas demand between 2011 and 2012.

Between 2013 and 2014 PG&E projects a 1.59 percent decline in small commercial gas throughput. ORA is projecting a similar decline of 1.98 percent between 2013 and 2014. Between 2014 and the remainder of the forecast period ORA and PG&E are projecting that small commercial gas throughput will rise by less than one percent per year in each of the forecast years.

D. Large Commercial Econometric Model

PG&E models large commercial throughput as a function of current average real gas rates, heating degree days, and quarterly dummy variables. Consistent with PG&E's other sector econometric models a log-log functional form is employed and the model is estimated from the second quarter of 2000 through the second quarter of 2013.[18]

ORA models historic large commercial throughput as a function of real average large commercial gas rates, manufacturing employment in PG&E's service area, heating degree days, a dummy variable capturing the impact of the 2009 recession, and quarterly seasonal dummy variables. Similar to PG&E, a log-log functional form is used with real average gas rates and manufacturing employment modeled as four quarter polynomial distributed lags. The model is estimated over the period from the first quarter of 2001 through the fourth quarter of 2013.

Over the 2014 and 2017 forecast period ORA and PG&E are projecting declines in large commercial throughput. Over the 2000 – 2013 historic period, large commercial gas demand decline, on average, by 1.19 percent per year. Similar to the small commercial sector, large commercial gas demand displays large yearly variations. Between 2007, 2008, and 2009 large commercial throughput declined in

[18] ORA obtained actual data for the third and fourth quarter of 2013 directly from PG&E. PG&E Response to ORA-DR-13 Q3.

each year. This was followed by 4.53 percent increase in large commercial gas demand between 2009 and 2010.

Over the period 2013 through 2015 ORA and PG&E are forecasting large commercial gas demand to decline by less than one percent per year. Thereafter, between 2015 through 2017 ORA and PG&E are projecting that large commercial gas demand will increase by less than one percent per year.

E. Transmission Level Industrial Econometric Model

PG&E's industrial transport model links historic industrial throughput to lagged real industrial gas rates, a measure of industrial economic activity in the service area, and quarterly dummy variables. PG&E explains that its measure of industrial economic activity: 'is a function of gross metro product data for industries relevant to PG&E's transmission level industrial class based on North American Industry Classification System(NAICS) codes."[19] A log-log specification is used and the model is estimated from the third quarter of 2002 through the second quarter of 2013.[20]

ORA also adopts a log-log specification and regresses historical industrial transmission demand as a function of real average industrial gas rates, PG&E's measure of economic activity, a dummy variable capturing the 2009 recession, quarterly seasonal dummy variable, and a dummy variable representing the second quarter of 2004. Real average prices are modeled as a 6 quarter polynomial distributed lag and the measure of economic activity specified as four quarter polynomial distributed lag. ORA's model is estimated from the fourth quarter of 2001 through the fourth quarter of 2013.

ORA and PG&E are forecasting that industrial transmission gas demand will decline in the 2014 – 2017 forecast period. Over the historic 2000 – 2013 period there has been little growth in industrial transmission gas demand. Over the 2000 –

[19] PG&E Response to ORA-DR-01 Q18.

[20] ORA obtained actual data for the third and fourth quarters of 2013 directly from PG&E. PG&E Response to ORA-DR-13 Q4.

2013 period, industrial transmission gas throughput grew, on average, by 0.47 percent per year. Similar, to the industrial distribution sector, the history of gas demand in this sector shows large year to year variations. For example, between 2007 and 2008, industrial gas demand rose by 12.27 percent. This was followed by a decline of 3.48 percent between 2009 and 2008. Between 2010 and 2012 industrial gas demand rose each year. In the most recent recorded period, 2012 – 2013, industrial gas demand declined by 3.77 percent.

Between 2013 and 2014 PG&E is forecasting a 3.35 percent decline in industrial transport throughput while ORA is projecting that industrial demand will rise by less than one percent. For the 2014 – 2015 period PG&E projects a drop in gas demand of less than one percent. ORA forecasts that demand will decline by 1.49 percent. Between 2016 and 2015 the results are similar with PG&E forecasting demand to decline by less than one percent and ORA projecting that industrial transmission gas demand will decline by a little over one percent. Between 2016 and 2017 ORA and PG&E are forecasting that gas demand will rise by a little over one percent.

F. Backbone Level Industrial Model

PG&E models industrial backbone throughput as a function of quarterly dummy variables and industrial backbone throughput lagged four quarters. A log-log specification is used and the model is estimated from the first quarter of 2006 through the second quarter of 2013.

ORA's backbone industrial backbone model is quite similar to PG&E's. ORA models industrial backbone gas demand as a function of backbone gas demand lagged four quarters, real average backbone industrial gas rates, and quarterly dummy variables. Similar to the other econometric models discussed in this section a log-log specification is used and the model is estimated from the first quarter of 2006 through the fourth quarter of 2013.[21]

[21] ORA obtained actual data for the third and fourth quarters of 2013 directly from PG &E. PG&E Response to ORA-DR-13 Q5.

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Over the 2014 – 2017 forecast period PG&E is projecting that gas demand to this sector will decline, on average, by less than one percent per year. With the exception of the 2013-2014 period and 2016 – 2017 period ORA is forecasting that backbone industrial gas throughput will increase by less than one percent per year.

The difficulty in forecasting gas demand to this sector is its limited history and the large year to year variations. The series is only available from 2005. While industrial backbone gas demand averaged 7.53 per cent per year over the 2005 – 2013 period, there were some very large year to year variations in demand. For example, between 2006 and 2007 industrial backbone throughput rose by nearly 25 percent. Similarly, between 2011 and 2016 backbone throughput rose by 28 percent. Between 2009 and 2010 industrial backbone throughput declined by 5.79 percent.

IV. Non-Econometric Methodology and Results

This section discusses ORA's recommended gas demand for Utility Electric Generation and gas throughput forecasts to PG&E's resale or wholesale customers. PG&E divides the Electric Generation sector into customers that are sensitive to changes in the demand for electricity and natural gas and those that are not.

A. Non-Market Electric Generation

PG&E explains that: "This group consists of gas-fired cogenerators whose output is generally not sensitive to prices in the electricity and gas markets because they generate electricity along with some other energy product, usually steam."[22] To forecast demand to this class of service PG&E relies "on the most recent available 12 months of actual deliveries (October 2012 through September 2013)."[23] For test year 2015, PG&E forecasts demand to this class of service of 178 (Mdth/D). The

[22] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett) p. 14-9.

[23] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett) p. 14-10.

same level of gas throughput to this class is recommended for 2016 and 2017. ORA has reviewed PG&E's methodology and considers it reasonable. Therefore, ORA is adopting PG&E's forecast of non-market electric generation throughput for the entire 2015 – 2017 forecast period.

B. Market Responsive Electric Generation

PG&E relies upon the Market Builder Model to forecast gas throughput to the market responsive electric generation gas demand market. PG&E explains that the: "MarketBuilder is an economic-equilibrium program that has been applied to various markets with spatially distributed supplies and demands, such as the North American natural gas market. In MarketBuilder, supplies are represented as price/supply functions, in which additional supplies are available at higher prices."[24] The primary input assumptions impacting PG&E's market responsive electric generation gas demand are forecasted electricity demand, hydro electric conditions, natural gas prices and power plant additions.

1. Forecasted Electric Demand

Regional electric demands are taken from the "WECC electricity market as 11 subregions with transmission connections between them."[25] Ten of the regions are used to couple electric demands with available electric generation. The ten regions include: (1) New Mexico and that portion of Arizona east of electric transmission Path 49, (2) California north of electric transmission Path 26, (3) California south of electric transmission Path 26 and west of electric transmission Path 46, (4) Southern Nevada and portions of western Arizona and eastern California between electric transmission Paths 46 and 49, (5) Washington, Oregon, and Northern Idaho (western part of the Northwest Power Pool), (6) Southern Idaho, Montana, Utah, (western part of the Northwest Power Pool), (7) Rocky Mountain Power Area – Colorado and eastern Wyoming, (8) Alberta, (9) British Columbia, (10) Comision

[24] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett) p. 14-11.

[25] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett) p. 14-12.

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Federal de Electricidad, northern Baja.[26] For the two California regions in the model PG&E relied upon the final mid-case forecast from the California Energy Commission (CEC) 2012 Integrated Energy Policy Report. For the regions outside of California, forecasted electric demands were obtained from IHS Cambridge Energy Research Associates (CERA).[27]

The MarketBuilder model is a proprietary product and ORA does not have access to it. To partially gage the impact of electric demand on PG&E's electric generation gas demand ORA requested PG&E to re-run the MarketBuilder model with an updated 2013 CEC forecast for the two California regions. The results of this simulation showed lower gas demand under the updated CEC forecast than reported in PG&E's initial testimony. For example, under the updated CEC forecast test year market responsive electric generation gas demand drops from 478 (Mdth/D) to 469 (Mdth/D). The results are similar for 2016 and 2017. For 2016 market responsive electric generation gas demand drops from 470 (Mdth/D) to 461 (Mdth/D) and for 2017 market responsive electric generation gas throughput drops from 463 (Mdth/D) to 456 (Mdth/D).[28]

2. Hydro Electric Conditions

Market responsive electric generation throughput is also impacted by forecasted hydro electric conditions. PG&E explains that its "forecast of market-responsive power plant gas demand is a weighted average result with 45 percent probability assigned to the average case, 35 percent probability assigned to the wet case, and 20 percent probability assigned to the dry case."[29] California is currently experiencing drought conditions which has a negative impact on hydro-electric

[26] PG&E Workpapers, Chapter 4, p. WP 14-68.

[27] ORA requested from PG&E a complete description of the methodology used by CERA to forecast electricity demand for the regions outside of California. PG&E provided such a description but indicated that the description that the description is confidential. As a result, ORA is unable to quote from the description of the CERA methodology provided by PG&E. See, PG&E Response to ORA-DR-02 Q2.

[28] PG&E response to ORA Data Request ORA_051 Q03.

[29] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett) p. 14-13.

capacity. To account for the current draught conditions ORA requested PG&E to rerun the MarketBuilder model by raising the probability of the dry case to 40 percent. PG&E explains that in deriving "the impact on the market-responsive electric generation (EG) gas demand of raising the probability of the dry case to 40 percent, PG&E calculated the average of the eight water-years with the lowest hydroelectric generation between 1992 and 2011; PG&E also reduced the probability of the average case to 25 percent and calculated the average of the remaining five water-years. The impact on the forecast of market responsive electric generation gas demand of changing the aforementioned probabilities was minimal."[30] For test year 2015 the demand forecast remained unchanged from PG&E's initial testimony. For 2016 and 2017 there was only a 1 (Mdth/D) difference in the forecast results.

3. Natural Gas Price Forecasts

Market responsive electric generation gas demand is also impacted by forecasted natural gas prices. PG&E explains that: "Gas Price forecasts were obtained from the October 2013 forecast by CERA".[31] ORA data requested PG&E to provide an explanation of CERA's methodology underlying the gas price forecasts. PG&E responded by providing a description but noted that the description of the methodology is confidential.[32]

ORA evaluated PG&E's gas price forecasts by developing several econometric models relating PG&E's historical gas prices to an index of Henry Hub gas prices developed by IHS Global Insight. These equations were estimated with monthly observations over the period January through December 2013. Specifically, ORA regressed the historic monthly gas price data reported on page 14-90 of PG&E's gas throughput workpapers on the IHS Global Insight variable PGNHH. Forecast values for the variable PGNHH were taken from IHS Global Insight publication US Economic Outlook. The forecasts produced by these econometric

[30] PG&E Response to ORA-DR-51 Q3.

[31] PG&E Prepared Testimony, Volume 2 (Swanson, Bennett), p. 14-14.

[32] PG&E Response to ORA-DR-02 Q5.

equations were similar to the monthly forecasts reported in PG&E's gas throughput workpapers. As a result, ORA concludes that PG&E's gas price forecasts are reasonable.

Based on ORA's analysis of the major input assumptions for the MarketBuilder model, ORA concludes that PG&E's forecast of market responsive electric generation gas demand is reasonable.

C. Wholesale Gas Demand

PG&E's forecasts of gas throughput to its various resale customers is taken primarily from these customers themselves. PG&E explains that it: "received gas sales forecasts from the following wholesale customers: City of Palo Alto, Island Energy, and West Coast Gas Company (for both Castle AFB and Mather AFB). Simple forecasts were created by PG&E for Alpine Gas Company and City of Coalinga."[33] Since the City of Palo Alto and Island Energy represent the majority of PG&E's resale gas throughput, ORA concludes that PG&E's forecast of wholesale throughput is reasonable.

D. Off-System Revenues

Off system revenues consistent of volumes delivered through the Redwood system, the Baja system, and the Silverado systems with the bulk of the volumes flowing through the Redwood path. Rather than forecast volumes directly, PG&E opts instead to forecast revenues directly. PG&E explains that it "has explored several options to forecast…off-system deliveries. Initially, PG&E used an econometric model to forecast off-system throughput as a function of the price differences between the various receipt and delivery locations. However, due to many changes in the off-system market over the last several years, the development of this model has been problematic, and the results have been inconsistent…For this

[33] PG&E Response to ORA-DR-01 Q3.

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reason, PG&E chooses to forecast off-system revenues directly instead of forecasting off-system throughput."[34]

ORA reviewed the workpapers and methodology underlying PG&E's forecast of off-system revenues. Based on this review, ORA has not made any adjustments to proposed off-system revenues.

V. Conclusion

This chapter has presented ORA's analysis of PG&E's proposed core and non-core throughput forecast for test year 2015 as well as the forecast years 2016 and 2017. PG&E and ORA relied upon econometric models to forecast throughput to the residential, small commercial, large commercial, industrial distribution, industrial transmission, and industrial backbone sectors. Forecasts of gas throughput to the electric generation, cogeneration, and resale sectors are developed with non-econometric methods.

With the exception of the residential sector and the industrial transmission sectors ORA's throughput forecasts are very close to PG&E's. For the residential sector, ORA forecasts lower throughputs for the entire 2015 – 2017 forecast horizon than PG&E. In contrast to PG&E, ORA forecasts higher throughputs to the industrial transmission sector.

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[34] PG&E Prepared Testimony, Volume 2 (Swanson, Howe) p. 14-14.