BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of San Diego Gas & Electric Company (U 902 E) for Authority to Update Electric Rate Design Regarding Residential Default Time-Of-Use Rates and Fixed Charges.	Application 17-12-____

PREPARED DIRECT TESTIMONY OF

BENJAMIN A. MONTOYA

ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY

CHAPTER 3

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

December 20, 2017

SDGE

A Sempra Energy utility®

TABLE OF CONTENTS

PREPARED TESTIMONY OF

BENJAMIN A. MONTOYA

I. OVERVIEW AND PURPOSE

Decision ("D.") 15-07-001 "direct[s] the IOUs, as part of their 2018 Residential RDW [Rate Design Window] application, to prepare better studies of the potential for cost savings and GHG [Greenhouse Gas] reduction."[1] As the Commission notes, "[i]ntuitively, TOU [time-of-use] is assumed to reduce peak usage, thereby moderating the peak periods during which expensive, higher polluting generation resources must be brought online. This in turn should result in reduced purchased power and infrastructure costs, and potentially GHG emissions, because California will be able to make better use of the cleanest energy sources."[2] The positive impact of TOU periods on GHG emissions is due to load shifting from times in which marginal GHG emissions are high to times in which marginal emissions are low.

The purpose of my testimony is to develop marginal GHG emissions rates that can be used to estimate the potential GHG reduction due to load shifting between TOU periods when proposed TOU rates have been in effect for a full year (i.e., 2020). These marginal GHG emissions rates can then be applied to the expected change in load, due to new TOU rates, and an estimate of the resulting GHG reduction can then be determined. Additionally, I estimated the energy cost impact, due to new TOU rates, using a similar methodology.

II. DETERMINING MARGINAL GHG EMISSIONS

Marginal GHG emissions rates were calculated using the method described in Itron's 2016 SGIP Advanced Energy Storage Impact Evaluation ("Itron Evaluation"): "Assuming that

---

[1] D.15-07-001 at 162.
[2] *Id.*

natural gas is the marginal fuel in all hours, the hourly emissions rate of the marginal generator is calculated based on the … market price curve formulas:

(1) HeatRate[h] = (MP[h] – VOM) / (GasPrice + EF * CO2Cost)

Where:

- MP is the hourly market price of energy (including cap and trade costs)
- VOM is the variable O&M cost for a natural gas plant
- GasPrice is the cost of natural gas delivered to an electric generator
- CO2Cost is the $/ton cost of CO2
- EF is the emission factor for tons of CO2 per MMBTU of natural gas"[3]

Then:

(2) GHG emissions rate = HeatRate[h] * EF

The hourly market price of energy ($/MWh) is first adjusted by an average variable O&M ("VOM") price and then divided by the coincident natural gas price (with a CO2 price added) ($/MMBtu) to calculate an hourly implied market heat rate (MMBtu/MWh). A carbon price must be added to the natural gas price in order to produce a relevant heat rate that includes the cost of carbon. Finally, the marginal hourly GHG emissions rate in tonnes per MWh (t/MWh) is equal to the hourly heat rate (MMBtu/MWh) times the standard CARB emissions factor for natural gas (0.0531 t/MMBtu). For example, if in a given hour the market price is $33/MWh, the VOM is $1/MWh, the natural gas price is $3.20/MMBtu and the CO2 cost is $15/t, then the marginal heat rate for that hour would be:

a) Convert CO2 price to $/MMBtu= $15/t * .0531 t/MMBtu= $0.80/MMBtu
b) Add converted CO2 price to gas price= $3.20 + $0.80= $4.00/ MMBtu
c) Subtract VOM from the market price= $33- $1 = $32

[3] Available at: www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=6442454964, Appendix A, pp. A-11-12

d) Calculate implied market heat rate= ($32/MWh) / ($4/MMBtu) = 8 MMBtu/MWh

And the marginal GHG emissions rate in that hour would be:

8 MMBtu/MWh * .0531 t/MMBtu = 0.425 t/MWh

III. MARGINAL GHG EMISSIONS RATE INPUTS

For my analysis, 2016 prices were used to calculate 2016 emissions rates using the Itron method and then the Avoided Cost Calculator ("ACC") model[4] was used to escalate these values and produce 2020 GHG marginal emissions rates. The 2016 hourly day-ahead SDG&E Default Load Aggregation Prices ("DLAPs") were used for the market price of energy ("MP") inputs. These market prices already carry an implied CO2 price. Corresponding 2016 daily natural gas prices for SoCal CityGate were used for the GasPrice inputs. Since natural gas prices do not carry an implied CO2 price, the recorded annual 2016 CO2 price was converted to a $/MMBtu value by multiplying it by the California Air Resources Board ("CARB") emissions factor (0.0531 t/MMBtu) and then added to the gas price. The ACC model value for the 2016 CO2 price of $ 12.12 was used as the CO2Cost input.

The ACC model value for variable O&M of $0.66/MWh was used for the VOM input. For each hour of 2016, the implied heat rate was calculated using equation (1) above. If the resulting heat rate was negative, implying that a non-conventional resource with zero emissions is on the margin, a floor of zero was assumed. To convert these 2016 values to 2020 values, the incremental differences between 2016 and 2020 heat rate values in the ACC model were added to the 2016 implied heat rates.

[4] Available at: http://www.cpuc.ca.gov/General.aspx?id=5267.

An additional adjustment was made for consistency with the Itron method:

"[T]he avoided cost methodology bounds the maximum and minimum emissions rates based on the range of heat rates of natural gas technologies. The maximum and minimum emissions rates are bounded by a range of heat rates for proxy natural gas plants."[5] These proxy values are 5,500 Btu/kwh for a high efficiency plant and 11,000 Btu/kwh for a low efficiency plant. Heat rates between 5,500-11,000 were left unadjusted. The purpose of bounding the range of heat rates is to avoid using values that are not representative of conventional generation technologies. Finally, these hourly heat rates were multiplied by the CARB emissions factor of .0531 t/MMBtu to produce hourly marginal GHG emissions rates in t/MWh.

IV. CONCLUSION – RESULTING MARGINAL GHG EMISSION IMPACTS

Using the foregoing methods, the following 2020 hourly marginal GHG emissions rates (t/MWh) by TOU period were calculated:

Marginal GHG Emissions Rates (t/MWh)

2020	Adopted TOU Periods			
tonnes/MWh	Weekdays		Weekends and Holidays	
TOU Period	Summer	Winter	Summer	Winter
On-peak	0.617	0.581	0.610	0.569
Off-peak	0.509	0.484	0.529	0.464
Super-off-peak	0.421	0.393	0.428	0.398

2-Period Opt Out Rate	
On-peak	0.593
Off-peak	0.453

To estimate the GHG emissions impact due to load shifting as a result of the adopted TOU rates, you can multiply the incremental change in load in a TOU period by the corresponding GHG emissions rate for that TOU period. This will estimate the net GHG

[5] Itron Evaluation, Appendix A, p. A-12.

emissions impact for that TOU period. Below are the estimated total net load impacts by TOU period as identified in the Direct Testimony of Leslie Willoughby.[6]

Net Load Impacts (MWh)

2020	Adopted TOU Periods				
Load (MWh)	Weekdays		Weekends and Holidays		
TOU Period	Summer	Winter	Summer	Winter	TOTAL
On-peak	(14,986)	(639)	(7,273)	(408)	(23,305)
Off-peak	7,766	109	603	(21)	8,457
Super-off-peak	7,220	530	3,185	193	11,128
TOTAL	0	(0)	(3,484)	(236)	(3,720)

Multiplying these net load impacts by the corresponding GHG emissions rates produces the following GHG emissions impacts due to the implementation of TOU rates in 2020.

GHG Emissions Impacts (t)

2020	Adopted TOU Periods				
GHG (Tonnes)	Weekdays		Weekends and Holidays		
TOU Period	Summer	Winter	Summer	Winter	TOTAL
On-peak	(9,276)	(368)	(4,446)	(227)	(14,317)
Off-peak	4,021	48	323	(10)	4,382
Super-off-peak	3,051	209	1,419	76	4,755
TOTAL	(2,204)	(110)	(2,704)	(161)	(5,179)

V. ENERGY COST IMPACTS

Additionally, the energy cost impact due to the implementation of TOU rates can be estimated by multiplying the marginal hourly electric price by the net load impacts identified in the Direct Testimony of Leslie Willoughby. Assuming that the hourly market price of energy represents the hourly marginal cost of energy, the market price used in equation [1] above is used as a proxy for hourly marginal cost. Multiplying the hourly market price by the hourly net load impacts produces the following cost of energy impacts due to the implementation of TOU rates in 2020.

---

6 Direct Testimony of Leslie Willoughby, p. LW-15, Section V; for illustrative purposes, 1,000,000 customers were assumed for the default TOU.

Energy Cost Impacts ($)

2020	Adopted TOU Periods				
Cost ($)	Weekdays		Weekends and Holidays		
TOU Period	Summer	Winter	Summer	Winter	TOTAL
On-peak	(787,310)	(24,868)	(340,491)	(13,805)	(1,166,473)
Off-peak	276,606	3,060	20,961	(546)	300,081
Super-off-peak	194,227	11,188	88,445	3,728	297,588
TOTAL	(316,476)	(10,620)	(231,085)	(10,623)	(568,804)

This concludes my prepared direct testimony.

VI. STATEMENT OF QUALIFICATIONS

My name is Benjamin A. Montoya. My business address is 8330 Century Park Court, San Diego, California, 92123.

I have been employed as a Principal Resource Planner in the Resource Planning group of San Diego Gas & Electric Company ("SDG&E") since 2000. Prior to that, I was employed in positions of increasing responsibility in the following SDG&E departments: Gas Engineering, Gas Operations, Gas Control, and Gas System Planning. I also served as a project engineer on the Mexicali Pipeline Project with Sempra International for two years. I have been employed with SDG&E for 31 years.

I received a B.S. in Engineering from the United States Naval Academy and an M.B.A. from the University of San Diego. I am a licensed professional Mechanical Engineer in the state of California.

I have previously testified before the Commission on issues related to gas system planning, electric resource planning and in multiple Energy Resource Recovery Account proceedings.