Application No. A.14-04-____
Exhibit No.: _____
Witness: Cynthia Fang

Application of SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E) For Approval of its Electric Vehicle-Grid Integration Pilot Program.	))))	Application No. 14-04-___ (Filed April 11, 2014)

PREPARED DIRECT TESTIMONY OF

CYNTHIA FANG

CHAPTER 3

ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

April 11, 2014

#286654

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PREPARED DIRECT TESTIMONY OF

CYNTHIA FANG

CHAPTER 3

I. OVERVIEW AND PURPOSE

My testimony describes the rate design proposal for San Diego Gas & Electric Company's (SDG&E) Vehicle-Grid Integration (VGI) Pilot Program. This rate design proposal will provide price signals that are intended to minimize electric vehicle (EV) charging impacts to SDG&E's system and local distribution capacity. The VGI Pilot Rate is designed for consistency with the California policy objectives outlined in the testimony of SDG&E witness Lee Krevat (Chapter 1) and the optimal rate design principles identified in the California Public Utilities Commission's (Commission) Order Instituting Rulemaking (R.) 12-06-013.[1] SDG&E witness Randy Schimka's testimony (Chapter 2) describes how the VGI Pilot Program is designed to provide an easily understood presentation of the VGI hourly variable rate via a smart phone application or website that will facilitate customer decision-making on when to charge. My testimony describes the time-variant design for the hourly rate behind the customer interface. In this way, the VGI Pilot Program and rate are consistent with the policy stated in California Public Utilities (P.U.) Code § 8360(h), that customers should have timely information and control options, and Commission directive that rates should be understandable.[2]

[1] *See* the June 28, 2012, *Order Instituting Rulemaking on the Commission Own Motion to Conduct a Comprehensive Examination of Investor Owned Electric Utilities' Residential Rate Structures, the Transition to Time Varying and Dynamic Rates, and Other Statutory Obligations* (RR OIR).
[2] P.U. Code § 8360(h); RR OIR, p. 7.

SDG&E's electric rates currently comprise the following components: (1) transmission,[3] (2) distribution,[4] (3) public purpose programs (PPP),[5] (4) nuclear decommissioning (ND),[6] (5) ongoing competition transition charges (CTC),[7] (6) reliability services (RS),[8] (7) total rate adjustment component (TRAC),[9] (8) Department of Water Resources bond charge (DWR-BC),[10] and (9) commodity.[11] SDG&E's VGI Pilot Rate proposal described in Section II of my testimony incorporates the following components:

- The VGI Pilot Rate's hourly "base" component recovers transmission, PPP, ND, CTC, RS, and DWR-BC cost charges.[12] This hourly base component is based on the class average rate for medium and large commercial and industrial (M/L C&I) customers.
- The VGI Pilot Rate's hourly commodity component incorporates the following:
  - the California Independent System Operator (CAISO) day-ahead hourly price;
  - a critical peak pricing signal (Commodity Critical Peak Pricing Hourly Adder or C-CPP Hourly Adder), applied to the top 150 system hours and provided to customers on a day-ahead basis; and

[3] Transmission – charges for costs to deliver high-voltage electricity from power plants to distribution system.
[4] Distribution – charges for costs to distribute electricity to customer premises.
[5] PPP – charges to pay for state-mandated programs such as low-income and energy efficiency programs.
[6] ND – charges to pay for the retirement of nuclear power plants.
[7] CTC – charges to pay the above market costs for long-term power contracts.
[8] RS – charges for services provided by generating facilities to maintain system reliability.
[9] TRAC – charges/credits applied to handle the capping of residential tiered rate pursuant to Assembly Bill (AB) 1X and Senate Bill (SB) 695.
[10] DWR-BC – charges to pay bonds issued by DWR to cover of cost of purchasing power during the 2000/2001 electricity crisis.
[11] Commodity – charges for electricity which includes charges for energy provided.
[12] TRAC is applicable to residential customers and therefore not addressed here.

- day-of pricing benefits in the event that CAISO day-of prices drop below a threshold level relative to CAISO day-ahead prices.

- The VGI Pilot Rate's hourly distribution component incorporates a circuit-level critical peak pricing signal (Distribution Critical Peak Pricing Hourly Adder or D-CPP Hourly Adder), applied to the top 200 circuit hours and provided to customers on a day-ahead basis.

In addition, Section III of my testimony presents the rate and bill impacts associated with the costs and revenue requirements presented in the testimony of SDG&E witness Mr. Jonathan B. Atun (Chapter 4).

II. VGI PILOT PROGRAM RATE PROPOSAL

The VGI Pilot Rate is designed to support California policy and the VGI Pilot Program objectives described in Mr. Krevat's and Mr. Schimka's testimonies, while remaining consistent with and supportive of several progressive rate design principles the Commission has identified as optimal, such as: encouraging reduction of both coincident and non-coincident peak demand; basing rates on cost-causation principles; providing explicit and transparent incentives; and encouraging economically efficient decision-making.[13] The VGI Pilot Rate is also supportive of California smart grid policy goals, including the goal "to modernize the state's electrical transmission and distribution system to maintain safe, reliable, efficient, and secure electrical service, with infrastructure that can meet future growth in demand."[14]

Rate design that provides accurate price signals is one in which costs are recovered from customers on the same basis as they are incurred. A typical electric cost-based rate would have the following structure:

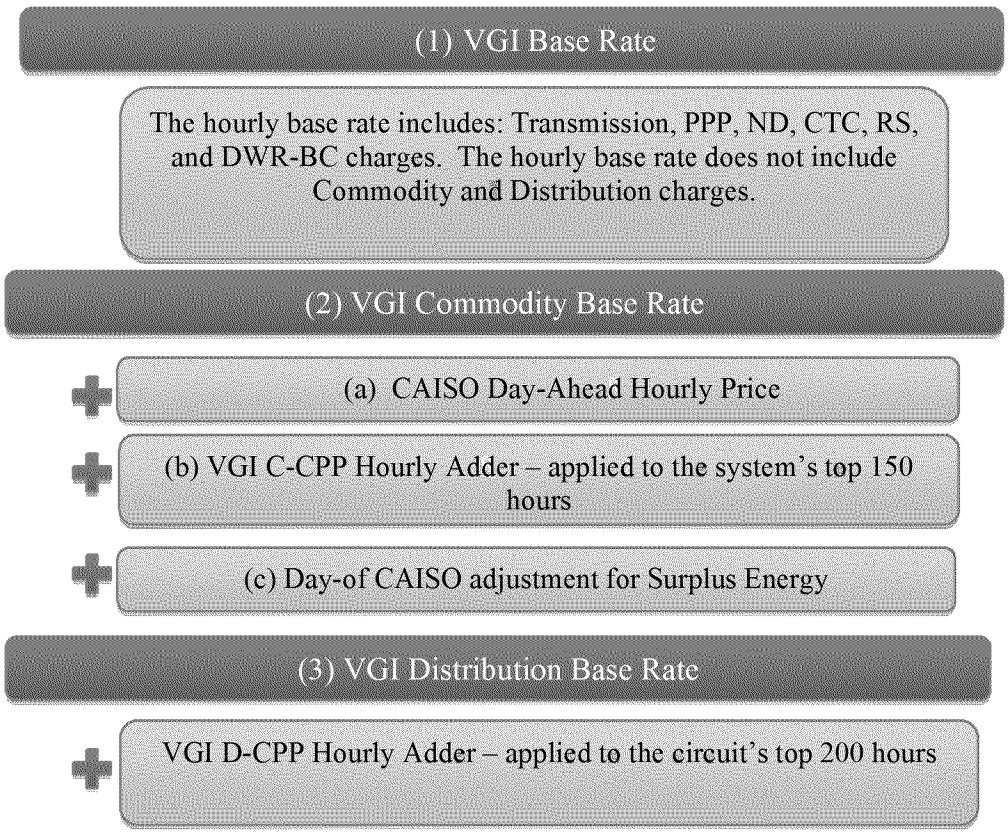
[13] RR OIR, p. 7.
[14] P.U. Code § 8360.

- Customer Costs – SDG&E incurs these costs on a fixed basis for each interconnected customer whether or not the customer uses electricity and therefore should be recovered in a fixed or monthly charge ($/month).
- System Capacity/Transmission Costs – SDG&E incurs these costs independent of energy usage, on the basis of meeting peak capacity needs of the system; therefore these costs should be recovered in a peak demand charge, that is, demand at time of system peak ($/peak-kW).
- Distribution Demand Costs – SDG&E incurs these costs independent of energy usage, on the basis of local capacity needs to meet the combined maximum demand of customers served off of a circuit; therefore these costs should be recovered in a non-coincident demand (NCD) charge ($/NCD – kW).
- Commodity Costs – SDG&E incurs these costs on a variable basis (based on energy usage), and the cost depends on the time of delivery; therefore these costs should be recovered in an energy charge ($/kWh) that varies by time period.

The VGI Pilot Program presents a challenge on how to translate demand charge price signals in a commercial EV charging facility context, where multiple users contribute to the facility's peak load, in line with how capacity costs occur. As Mr. Schimka testifies, the VGI Pilot Program would establish multi-vehicle charging facilities at workplace and multi-unit dwelling (MuD) facilities, where demand for these charging facilities is expected to exceed 20 kW. This is consistent with SDG&E's rates for M/L C&I customers (demand greater than 20 kW), which thus forms the VGI Pilot Rate's base component.

The VGI Pilot Rate is intended to address this challenge in a manner consistent with California rate policy.[15] Specifically, the focus of SDG&E's proposed VGI Pilot Rate is: (1) to examine alternative rate design; (2) to encourage reduction of both coincident and non-coincident peak demand; (3) to provide a rate design that encourages cost-effective grid-integrated charging solutions for EV customers; (4) to avoid cross-subsidies; (5) to base rates on cost causation; and (6) to encourage economically efficient decision making. The VGI Pilot Rate components, which address these principles, are identified in Diagram CF-1:

Diagram CF-1: Proposed VGI Pilot Rate



SDG&E's Proposed VGI Pilot Rate will have the ability to encourage EV charging in a way that would manage peak capacity concerns at the system and local level, as well as address

[15] *See, e.g.,* RR OIR, p. 7; P.U. Code § 8360 (g) and (j).

and manage surplus energy supply situations, both in an hourly pricing structure. The VGI Pilot Rate would facilitate charging at the workplace and at MuD sites when economically efficient and during least-cost hours. The VGI Pilot Program would also allow SDG&E, the Commission, and stakeholders to examine whether the VGI Pilot Rate provides sufficient low-cost hours relative to SDG&E's existing residential EV rate, and potentially SDG&E's proposed super off-peak rate.[16]

The VGI Pilot Rate's three basic components (shown in Diagram CF-1) are discussed in further detail below. Attachment A provides illustrative examples of SDG&E's proposed VGI Pilot Rate.

A. VGI Base Rate

As discussed above, the VGI Pilot Rate is based on rates for M/L C&I customers, the applicable class for non-residential service with demand greater than 20 kW. Excluding the commodity and distribution modifications previously mentioned, the VGI Base Rate will include Transmission, PPP, ND, CTC, RS, and DWR-BC charges based on the M/L C&I class average rate for these components.

[16] Proposed in SDG&E's pending Rate Design Window (RDW), A.14-01-027.

Table CF-1: VGI Base Rate

	M/L C&I Class Average Rate[17] *(cents/kWh)*	*VGI Base Rate (cents/kWh)*
Distribution	4.17	2.85
Transmission	1.80	1.80
PPP	0.84	0.84
ND	0.04	0.04
CTC	0.27	0.27
RS	0.03	0.03
DWR-BC	0.47	0.47
Commodity	9.63	6.44
Total	17.23	12.74

*The sum of the individual rates in Table CF-1 may not tie to the corresponding total in the table due to rounding.

The use of class average energy rates is intended to provide an hourly price structure while limiting the scope of study related to SDG&E's proposed VGI Pilot Rate in its initial implementation. The VGI Pilot Program will allow SDG&E to examine the appropriate rate design for the recovery of system and local capacity costs associated with commodity and distribution rate components through the test-and-learn approach described in the testimony of SDG&E witnesses Randy Schimka (Chapter 2) and J.C. Martin (Chapter 6).

B. VGI Commodity Base Rate

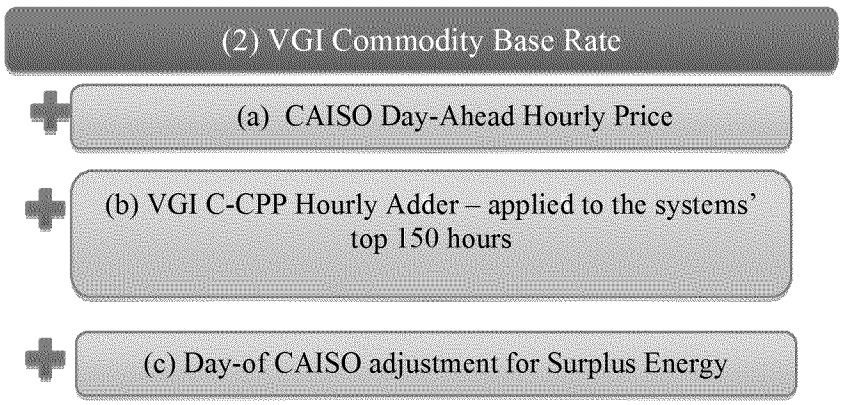
SDG&E's VGI Pilot Rate commodity component is based on the M/L C&I class average commodity rate and will consist of the following:

- A VGI commodity base rate, which includes the CAISO day-ahead hourly price excluding the VGI C-CPP Hourly Adder.
- A VGI C-CPP Hourly Adder applied to the top 150 system peak hours on a day-ahead basis.
- A surplus energy credit applied on a day-of basis in the event that day-of prices are lower than day-ahead prices by one cent or greater.

[17] Based on currently effective rates, rates effective April 1, 2014 (Advice Letter 2587-E).

These commodity components are shown in Diagram CF-2 and Table CF-2:

Diagram CF-2: VGI Commodity Rate



With the inclusion of the CAISO hourly day-ahead price, the VGI base commodity rate will be reduced to reflect the removal of comparable variable costs embedded in current rates.[18] In addition, SDG&E will incorporate commodity price signals based on CAISO surplus energy events. Unexpected events, such as high wind on a sunny spring day, can result in unanticipated negative commodity prices on the day energy is delivered. These surplus energy events would not be captured in CAISO's hourly day-ahead price. To integrate surplus energy events into the VGI Pilot Rate, SDG&E will include day-of credits where the CAISO day-of price falls below CAISO's day-ahead price, in excess of a threshold of one cent for any given hour.

[18] These include: Net CAISO market purchases and fuel and variable operations and maintenance (O&M) costs for both utility owned generators and tolling agreements.

Table CF-2: VGI Commodity Rate

	Rate (cents/kWh)	*Applicability*
M/L C&I Class Average Commodity Rate	9.63	
VGI Base Commodity Rate	6.44	All hours
VGI System CPP Hourly Adder	62.24	Applied to top 150 system hours

1. Commodity Cost Background

Commodity costs consist of the cost of providing energy services, including the cost of energy, capacity/resource adequacy, and regulatory compliance. Currently, commodity costs for M/L C&I customers are recovered through the following rate structure: (1) energy charges ($/kWh) variable by time of use (TOU) period, voltage level and season to recover commodity energy cost; and (2) peak demand charges ($/kW) variable by voltage level and season or CPP Adder ($/kWh) variable by voltage level to recover commodity capacity costs. Pursuant to Decision (D.) 08-02-034, M/L C&I customers defaulted to Schedule EECC-CPP-D, Electric Energy Commodity Cost Critical Peak Pricing Default (CPP-D) beginning in May 2008 for commodity service. The CPP-D rate is a commodity rate structure that includes a higher energy price applied to peak periods on system critical event days that are called on a day-ahead basis.

The CPP rate is designed to recover the costs of system capacity during event days, up to 18 days per year with an assumed 9 days per year, called on a day-ahead basis rate rather than through a peak demand charge every month of the year in order to solicit demand response. The current CPP-D rate is based on preset triggers to call events on a day-ahead basis that would apply a premium price, i.e., CPP Adder to the Otherwise Applicable Tariff (OAT) energy price during a pre-defined event period of 11 a.m. to 6 p.m. The investment in system capacity is driven by anticipated growth in system peak load. The current CPP-D allows from 0 to 18 event

days to be called per calendar year with the rate design based on an assumption of 9 event days. On event days, the CPP Adder is applied to a pre-defined 7 hour event period of 11 a.m. to 6 p.m., resulting in total annual CPP hours of 0 to 126 hours with rate design based on an average of 63 hours.

2. VGI Commodity Rate

a. CAISO Day-Ahead Hourly Price

Consistent with California policy,[19] SDG&E proposes to incorporate the CAISO day-ahead hourly price into the VGI Pilot Rate.[20] The VGI base commodity component would incorporate the CAISO day-ahead hourly price and would be included in the price provided to VGI customers on a day-ahead basis.

b. VGI Commodity Critical Peak Pricing Hourly Adder (C-CPP Hourly Adder)

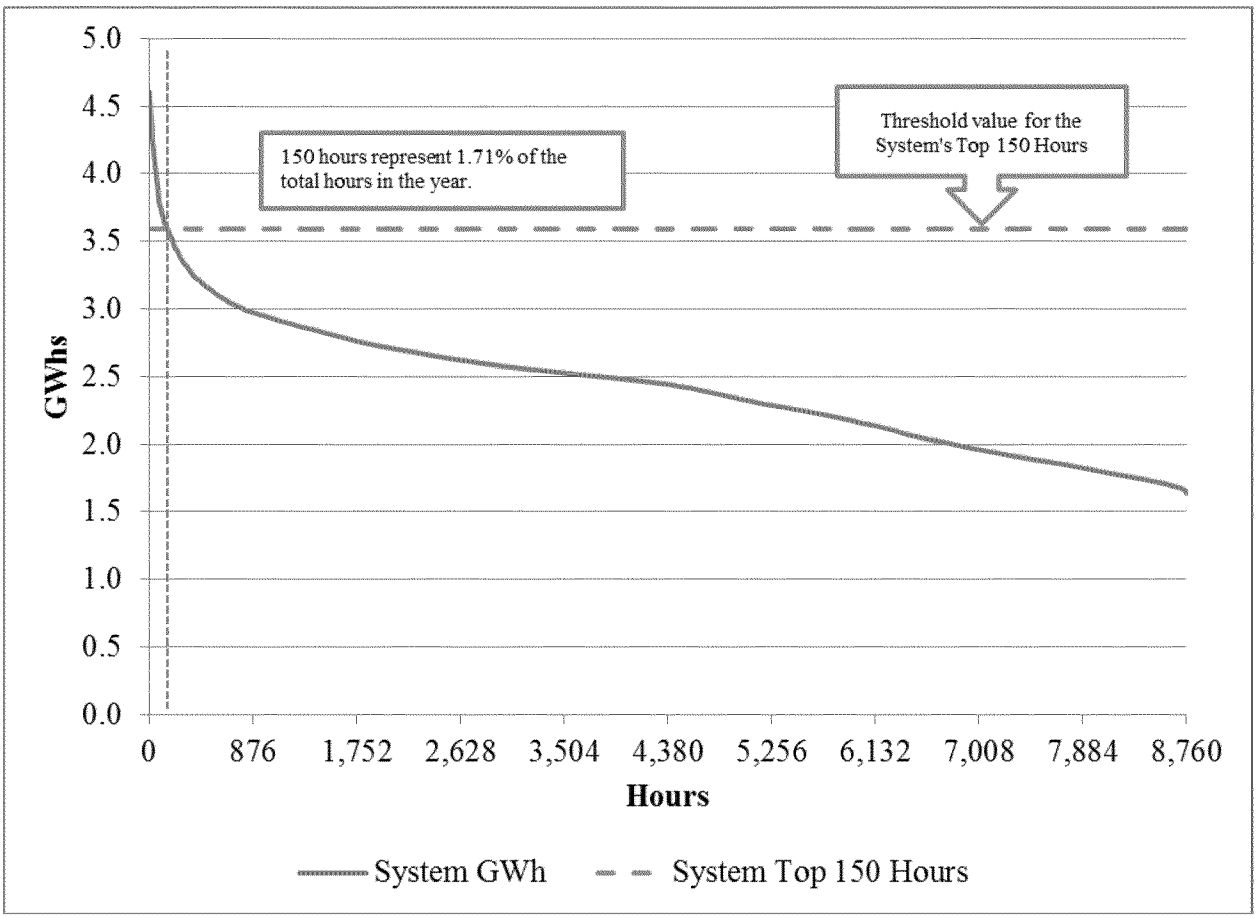
The CPP price signal is intended to provide incentives for customers to avoid adding to the system peak load thereby delaying capacity investments. To ensure that the VGI Pilot Rate sufficiently encourages reduction in system peak demand for EV charging, SDG&E proposes to apply the C-CPP Hourly Adder to the top 150 system hours.

The system's top 150 hours over 8,760 hours in the year represent approximately 1.71% of the hours in the year. These top 150 hours represented approximately 2.79% of the total GWhs of the system load, from January 1, 2013 until December 31, 2013, as presented in Chart CF-1.

[19] *See* P.U. Code § 8360.
[20] http://oasis.caiso.com/mrioasis/logon.do.

Chart CF-1: Load Duration Curve of the System: 8,760 Hours

from January 1, 2013 until December 31, 2013



SDG&E proposes to apply a C-CPP Hourly Adder to the top 150 system peak hours per year. Customers will be notified on a day-ahead basis of when these hours are expected to occur. Currently CPP event days are called day-ahead based on pre-established triggers and the CPP Adder is then applied to a pre-established time period of 11 a.m. to 6 p.m.[21] The VGI Pilot Rate proposal is different in that it identifies the top system hours, not a pre-defined time period on high load days. SDG&E will continue to notify customers on a day-ahead basis of event hours, but the C-CPP Hourly Adder will be applied only to hours in which the CAISO day-ahead

[21] Special Condition 16 on Sheet 6 of http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-SCHEDS_EECC-CPP-D.pdf.

demand forecast exceeds the top 150 hours of the prior year. While this methodology is intended to provide a best estimate of the top 150 system peak hours, the year to year difference in load can result in actual event hours greater than or less than 150 hours. In addition, SDG&E proposes that the event hours would have the same price per hour on a given day. This would be achieved by averaging the event hour prices in any given day. An illustration of the application of the C-CPP Hourly Adder is included in Attachment A.2

In the event that a CPP day is called on the existing CPP program that does not include any forecasted hours, SDG&E will still implement the C-CPP Hourly Adder in a manner consistent with the program, that is, implement C-CPP Hourly Adder to the hours associated with event periods called on SDG&E's existing CPP program.

c. Day of CAISO adjustment for Surplus Energy

Previously, unexpected events (i.e., outages) resulted in higher than anticipated energy prices. Now, unexpected events can result in lower than expected prices and potentially negative energy prices. Potential negative prices currently do not occur in the day-ahead price and are currently showing up in day-of prices. Chart LK-1 presented in the testimony of Mr. Krevat illustrates the potential need for flexible load that can respond to surplus generation events.

SDG&E proposes to include a surplus generation credit as part of the VGI Pilot Rate to encourage charging during these surplus generation events. In the event that there are hours in which day-of prices are below day-ahead prices beyond a pre-set threshold, SDG&E proposes to update those day-of prices to reflect the lower prices in those hours. SDG&E proposes a threshold of one-cent for the reduction in day-of prices. An illustration of the application of the Surplus Energy credit is included in Attachment A.5.

C. VGI Distribution Base Rate

The distribution rate for SDG&E's VGI proposal is based on the M/L C&I class average distribution rate with the modification to incorporate a D-CPP Hourly Adder based on the circuit's top 200 hours. Diagram CF-3 and Table CF-3 present the distribution rate for SDG&E's VGI proposal:

Diagram CF-3: VGI Distribution Rate

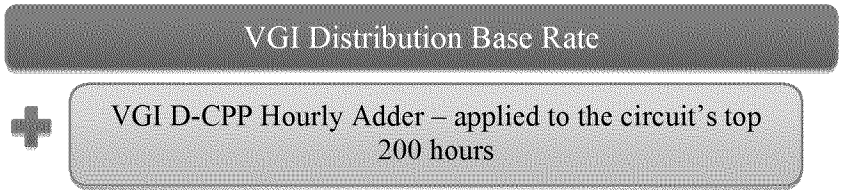


Table CF-3: VGI Distribution Rate

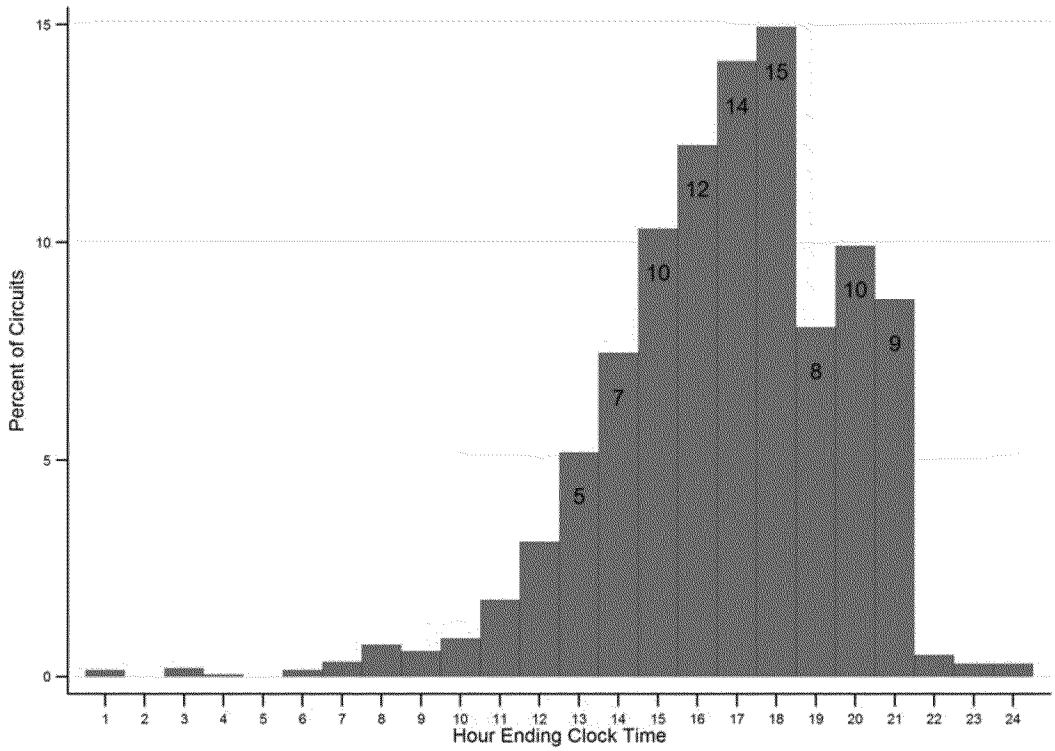
	Rate (cents/kWh)	*Applicability*
M/L C&I Class Average Distribution Rate	4.17	
VGI Base Distribution Rate	2.85	All hours
VGI D-CPP Hourly Adder	39.79	Applied to top 200 circuit hours

1. Distribution Cost Background

Currently, distribution costs for M/L C&I customers are recovered through the following rate structure: (1) a monthly customer charge ($/month) (also known as basic service fee) variable by voltage level and customer size to recover fixed distribution costs; (2) demand charges ($/kW) for both non-coincident demand (NCD) variable by voltage level and peak demand variable by voltage level and season to recover demand related distribution costs; and (3) energy charges variable by TOU period, voltage level and season to recover the remaining distribution costs. The cost-causation behind distribution costs differ from system and commodity costs in that the cost drivers focus on more localized demand drivers. This is because the distribution system is built to meet local, as opposed to system, demand.

Distribution Demand Costs, which include substations, circuits, feeders, and applicable O&M costs, are the costs SDG&E incurs to ensure reliable service to customers at the local neighborhood level. The planning criteria for the distribution infrastructure are based on local load at the circuit and substation level. In other words, in order to provide reliable service to a range of distribution circuits, each of which has different levels of peak demand, the distribution system is designed to have adequate capacity to serve the combined peak demand of all customers served off of a distribution circuit, without regard to when that demand occurs (non-coincident peak). The distribution costs utilities incur to provide service to customers is therefore best measured on the basis of a customer's individual maximum demand, distinct from demand at time of peak system capacity need. As can be seen in Chart CF-3, distribution circuits peak over a wide range of time that do not necessarily coincide with times of system peak capacity need. This has traditionally translated into a NCD charge based on a customer maximum demand at any time, as contrasted with a peak demand charge that measures a customer's demand during the system peak capacity need period.

Chart CF-3: Distribution of 2012-2013 SDG&E Circuit Peaks by Hour Ending



However, the concept of peak load driving incremental costs is true whether that load is system load or local distribution load. The ability to forecast load at the circuit level allows for the ability to break from traditional rate design tools for addressing concerns regarding local capacity and explore alternative approaches to address the same issues.

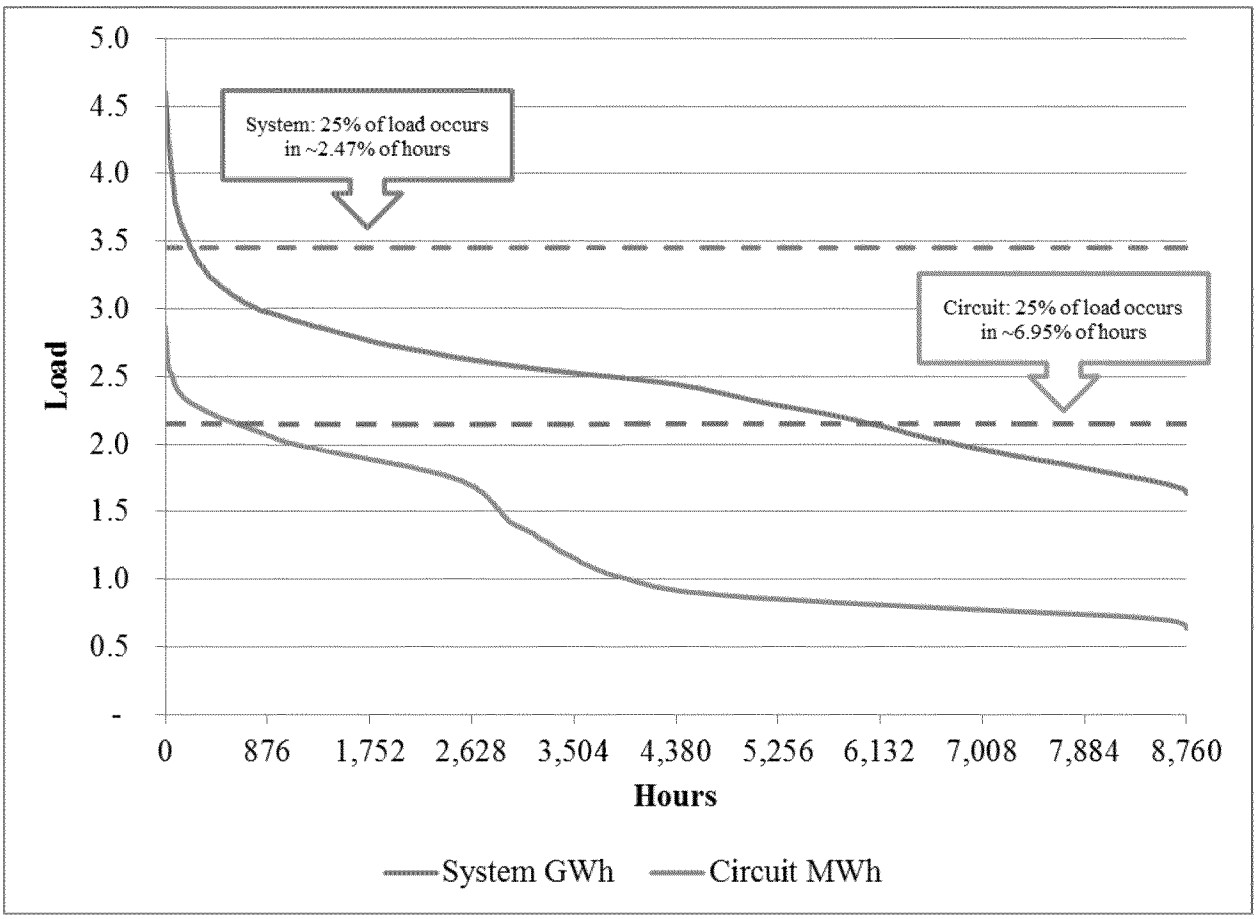
2. VGI Distribution Rate

SDG&E proposes to use the CPP rate design previously only used to address system capacity to now address local distribution capacity. That is, SDG&E proposes to incorporate a D-CPP Hourly Adder to the top 200 circuit peak hours.

Chart CF-4 presents the load duration curve, which ranks distribution of load in descending order of magnitude for all hours, for the system and an illustrative circuit. The

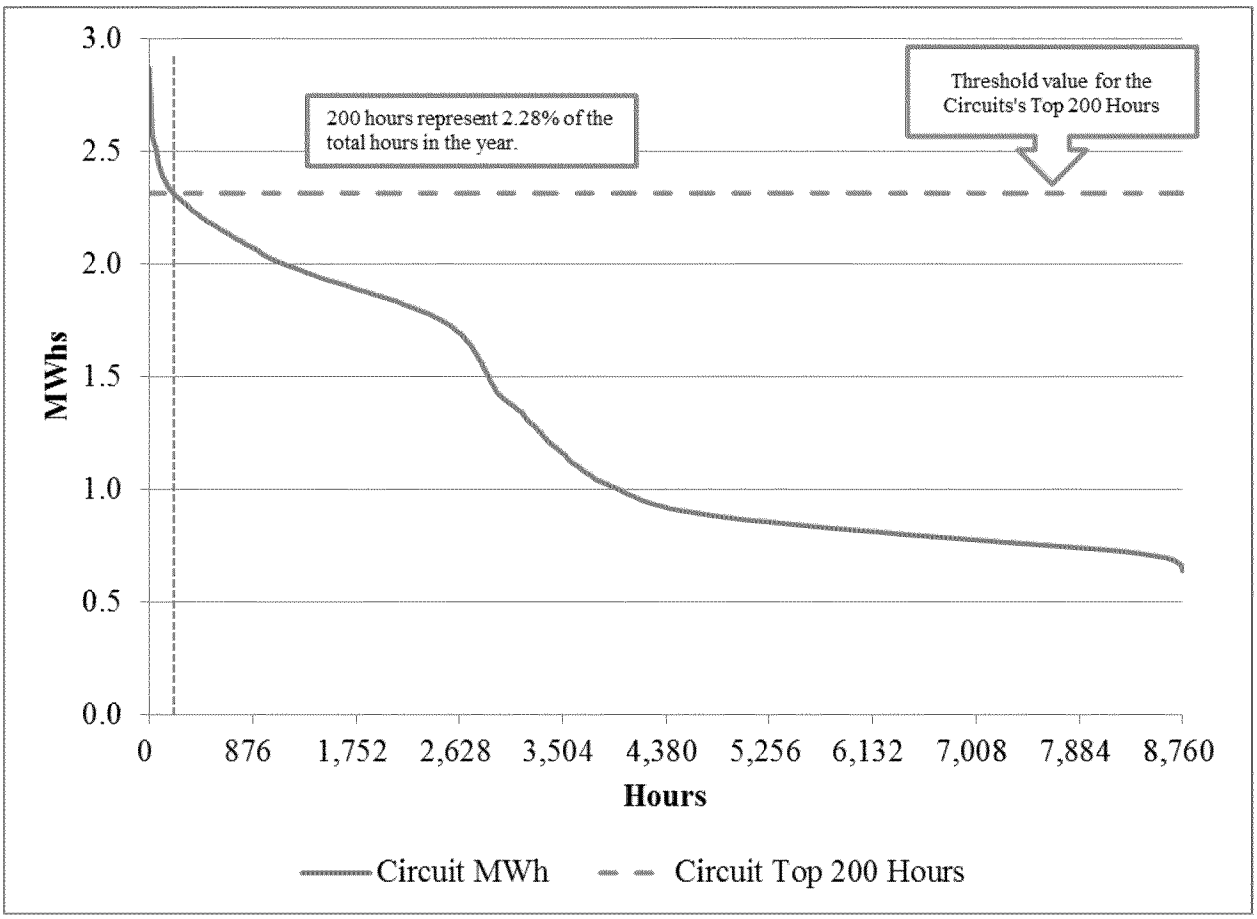
system load duration curve has a much steeper slope than the circuit load duration curve, especially in the top hours. As shown Chart CF-4, 25% of system capacity occurs in less than 2.5% of the hours in a year at the system level, while 25% of circuit capacity occurs in just under 7% of the hours in a year at the circuit level, more than double the hours compared to the system level. Given the differences between the system and circuit load duration curves, specifically that the equivalent peak load occurs over a larger number of hours for the circuit level than the system level, SDG&E proposes that the D-CPP Hourly Adder be applied to a larger number of circuit peak hours than at the system level for the system D-CPP Hourly Adder. To balance the objectives of managing local distribution peak and ensuring that we continue to encourage workplace charging, SDG&E proposes the D-CPP Hourly Adder be applied to the top 200 circuit hours. SDG&E will monitor the occurrence of the circuit peak hours and may revisit the appropriate number of circuit peak hours.

Chart CF-4: Load Duration Curve for the System and an Illustrative Circuit: 8,760 Hours from January 1, 2013 until December 31, 2013



The circuit's top 200 hours over 8,760 hours in the year represent approximately 2.28%. Of this, the total kWh of the sample circuit from January 1, 2013 until December 31, 2013 represented approximately 4.51% of the load, as shown in chart CF-5.

Chart CF-5: Load Duration Curve for an Illustrative Circuit: 8,760 Hours from January 1, 2013 until December 31, 2013



Similar to the system CPP Hourly Adder applied to the top 150 system peak hours, the D-CPP Hourly Adder will be added to the top 200 hours on a day-ahead basis when the forecasted load exceeds a threshold level established based on historic load. The forecast model is based upon historical hourly load at the circuit level with explanatory variables based on the local weather (both dry-bulb temperature and humidity taken into account), and calendar based variables (weekends, holidays, day of week, month, etc.). Historic circuit load will be used to determine the threshold amount for forecasting the top 200 circuit peak hours. When the forecast identifies an hour exceeding the prior year's top 200 hour threshold, a D-CPP Hourly Adder will be applied and presented to the customer on a day-ahead basis. Year-to-year differences in load can result in actual circuit peak hours to differ from the forecast top 200 hours.

SDG&E proposes to collect 50% of the distribution demand costs through the D-CPP Hourly Adder and the remainder through the hourly variable distribution rate. The VGI Pilot Rate is designed to limit any incremental distribution demand growth that can lead to distribution system upgrades. However, VGI customers do utilize the distribution system and have the distribution system standing by to serve their energy needs. While the appropriate levels for utilization and stand by services will be reviewed, at this time SDG&E includes 50% of the distribution demand cost to reflect that those costs are incurred for those customers and provide a service to them.

III. RATE AND BILL IMPACTS

The testimony of SDG&E witness Mr. Atun (Chapter 4), describes the costs associated with the VGI Pilot Program, including the resulting incremental revenue requirements proposed to be recovered from customers. Appendix B of Mr. Atun's testimony identifies the proposed annual revenue requirements to be recovered in rates. [22]

Attachment B of my testimony provide the impact to class average rates associated with recovery of the proposed annual revenue requirements during the 2015-2019 VGI Pilot Program period compared to SDG&E's current rates.[23] The table CF-4 presents the illustrative class average electric rate impacts for 2015 and 2019 of the proposed revenue requirements.

[22] Direct Testimony of Jonathan B. Atun, Appendix B.
[23] Rates effective April 1, 2014 (Advice Letter 2587-E).

Table CF-4- Class Average Rates Impact in cents/kWh

	4/1/2014	*VGI Proposal 2015*	*% Change from 4/1/2014*	*VGI Proposal 2019*	*% Change from 2015 to 2019*
Residential	20.624	20.629	0.02%	20.701	0.35%
Small Commercial	21.172	21.175	0.01%	21.231	0.26%
Medium/Large C&I	17.233	17.235	0.01%	17.265	0.17%
Agriculture	20.869	20.873	0.02%	20.927	0.26%
Lighting	17.696	17.698	0.01%	17.736	0.21%
System Total	18.873	18.877	0.02%	18.925	0.25%

SDG&E proposes to recover the costs of implementing the VGI Pilot Program, which consists of costs for such things as charger equipment, transformers, services and meters as addressed in the testimony of Mr. Atun, through distribution rates, consistent with the recovery of similar costs.

The first year of proposed revenue requirement impacts are anticipated to have an annual bill impact will be approximately 0.18 cents in 2015 for a typical residential customer using 500 kWh per month in both the Inland and Coastal climate zones, as compared to current rates. On a percentage basis, this equates to an increase of 0.02% for a typical residential customer in the Inland climate zone and 0.01% for a typical residential customer in the Coastal climate zone. Table CF-5 describes the illustrative bill impacts for Inland and Coastal Customers for the years 2015 and 2019.

Table CF-5: Annual Illustrative Bill Impacts for Inland and Coastal Customers

	4/1/2014	*VGI Proposal 2015*	*Change from 4/1/2014*	*% Change from 4/1/2014*	*VGI Proposal 2019*	*Change from 2015 to 2019*	*% Change from 2015 to 2019*
Inland							
300 kWh	$556.20	$556.20	$0.00	0.00%	$556.20	$0.00	0.00%
500 kWh	$1,131.00	$1,131.18	$0.18	0.02%	$1,133.10	$1.92	0.17%
750 kWh	$2,238.00	$2,238.60	$0.60	0.03%	$2,247.48	$8.88	0.40%
1,000 kWh	$3,383.34	$3,384.48	$1.14	0.03%	$3,400.26	$15.78	0.47%
1,500 kWh	$5,674.26	$5,676.36	$2.10	0.04%	$5,705.94	$29.58	0.52%
Coastal							
300 kWh	$557.88	$557.88	$0.00	0.00%	$557.88	$0.00	0.00%
500 kWh	$1,242.06	$1,242.24	$0.18	0.01%	$1,245.48	$3.24	0.26%
750 kWh	$2,365.56	$2,366.28	$0.72	0.03%	$2,376.42	$10.14	0.43%
1,000 kWh	$3,511.02	$3,512.16	$1.14	0.03%	$3,529.20	$17.04	0.49%
1,500 kWh	$5,801.88	$5,803.98	$2.10	0.04%	$5,834.88	$30.90	0.53%

IV. SUMMARY AND CONCLUSION

This concludes my prepared direct testimony.

V. STATEMENT OF QUALIFICATIONS

My name is Cynthia S. Fang and my business address is 8330 Century Park Court, San Diego, California 92123. I am the Electric Rates Manager in the General Rate Case and Revenue Requirements Department of San Diego Gas and Electric (SDG&E). My primary responsibilities include the development of cost-of-service studies, determination of revenue allocation and electric rate design methods, analysis of ratemaking theories, and preparation of various regulatory filings. I began work at SDG&E in May 2006 as a Regulatory Economic Advisor and have held positions of increasing responsibility in the Electric Rate Design group. Prior to joining SDG&E, I was employed by the Minnesota Department of Commerce, Energy Division, as a Public Utilities Rates Analyst from 2003 through May 2006.

In 1993, I graduated from the University of California at Berkeley with a Bachelor of Science in Political Economics of Natural Resources. I also attended the University of Minnesota where I completed all coursework required for a Ph.D. in Applied Economics.

I have previously submitted testimony before the Federal Energy Regulatory Commission and have submitted testimony and testified before the California Public Utilities Commission regarding SDG&E's electric rate design and other regulatory proceedings. In addition, I have previously submitted testimony and testified before the Minnesota Public Utilities Commission on numerous rate and policy issues applicable to the electric and natural gas utilities.

APPENDIX

GLOSSARY OF ACRONYMS AND DEFINED TERMS

ACRONYM	TERM
AB	Assembly Bill
CAISO	California Independent System Operator
Commission	California Public Utilities Commission
C-CPP Hourly Adder	VGI commodity critical peak pricing hourly adder
CPP	Critical Peak Pricing
CPP-D	Schedule EECC, Electric Energy Commodity Cost Critical Peak Pricing Default
CTC	On-going Competition Transitioning Charges
D.	Commission decision
D-CPP Hourly Adder	VGI distribution critical peak pricing hourly adder
DWR-BC	Department of Water Resources Bond Charge
EV	Electric vehicle
M/L C&I	Medium and large commercial and industrial
MuD	Multi-unit dwelling
NCD	Non-coincident demand

ND	Nuclear Decommissioning
OAT	Otherwise applicable tariff
O&M	Operations and maintenance
PPP	Public Purpose Program
P.U.	California Public Utilities Code
R.	Rulemaking
RDW	Rate Design Window
RR OIR	Residential Rate Structures Order Instituting Rulemaking
RS	Reliability Services
SDG&E	San Diego Gas & Electric Company
SB	Senate Bill
TOU	Time-of-use
TRAC	Total Rate Adjustment Component
VGI	Vehicle-grid integration

ATTACHMENT TABLE OF CONTENTS
SAN DIEGO GAS AND ELECTRIC COMPANY
VEHICLE TO GRID A. 14-04-XXXX

How to Build the VGI Rate

Step 1: Start with the VGI Rate prior to the addition of the CAISO Day-Ahead Price. This rate includes the VGI Base Rate (Transmission, PPP, ND, CTC, RS, and the DWR-BC), the VGI Distribution Base Rate, and the VGI Commodity Base Rate. This results in a flat hourly rate.

Step 2: Add the CAISO Day-Ahead Price. The CAISO Day-Ahead Price varies by hour.

Step 3: The end result is a VGI Rate that reflects the hourly differences in the CAISO Day-Ahead Price.

	Step 1		Step 2		Step 3
Hour Beginning	**VGI Rate Pre-CAISO**		**CAISO Day-Ahead Price**		**VGI Rate (with CAISO)**
	(cents/kWh)		**(cents/kWh)**		**(cents/kWh)**
0	12.7	+	3.3	=	16.1
1	12.7	+	3.2	=	15.9
2	12.7	+	3.0	=	15.7
3	12.7	+	2.9	=	15.6
4	12.7	+	2.8	=	15.6
5	12.7	+	2.9	=	15.6
6	12.7	+	3.1	=	15.8
7	12.7	+	3.1	=	15.9
8	12.7	+	3.3	=	16.0
9	12.7	+	3.3	=	16.0
10	12.7	+	3.3	=	16.0
11	12.7	+	2.9	=	15.7
12	12.7	+	2.9	=	15.6
13	12.7	+	2.9	=	15.6
14	12.7	+	2.9	=	15.7
15	12.7	+	3.1	=	15.8
16	12.7	+	3.3	=	16.1
17	12.7	+	4.3	=	17.1
18	12.7	+	4.9	=	17.6
19	12.7	+	4.6	=	17.3
20	12.7	+	4.5	=	17.2
21	12.7	+	4.0	=	16.8
22	12.7	+	3.7	=	16.5
23	12.7	+	3.2	=	15.9

Assumptions

The VGI Base rate, the VGI Distribution Base Rate, and the VGI Commodity Base rate are based on the Medium and Large Commercial and Industrial (M/L C&I) class average rate in Advice Letter 2587-E effective April 1, 2014.

The CAISO Day-Ahead price presented above reflects the CAISO Day-Ahead price for January 1, 2013 for node: DLAP_SDGE-APND.

Illustration of a Day with Top 150 System Peak Hours - Example 1

How to Build the VGI C-CPP Hourly Adder into the VGI Rate:

Step 1: Start with the VGI prior to the addition of the CAISO Day-Ahead Price. This rate includes the VGI Base Rate (Transmission, PPP, ND, CTC, RS, and the DWR-BC), the VGI Distribution Base Rate, and the VGI Commodity Base Rate. This results in a flat hourly rate.

Step 2: Add the CAISO Day-Ahead Price. The CAISO Day-Ahead Price varies by hour.

Step 3: Adjust the VGI Rate with the Average CAISO Rate applied to the hours identified within the top 150 System Peak Hours.

Step 4: For the hours identified within the top 150 System Peak Hours, add the VGI C-CPP Hourly Adder to the Averaged CAISO Day-Ahead Price and the VGI Rate.

Step 5: The end result is a VGI Rate that reflects the hourly differences in the CAISO Day-Ahead Price and the VGI C-CPP Hourly Adder.

		Step 1		Step 2		Step 3		Step 4		Step 5
Hour Beginning		**VGI Rate Pre-CAISO**		**CAISO Day-Ahead Price**		**Average**		**C-CPP**		**VGI Rate (CAISO and VGI Hourly Adder)**
		(cents/kWh)		**(cents/kWh)**		**(cents/kWh)**		**(cents/kWh)**		**(cents/kWh)**
0		12.7		4.0						16.8
1		12.7		3.7						16.5
2		12.7		3.4						16.2
3		12.7		3.4						16.1
4		12.7		3.3						16.1
5		12.7		3.3						16.1
6		12.7		3.4						16.1
7		12.7		3.4						16.2
8		12.7		3.7						16.4
9		12.7		4.2						16.9
10		12.7		4.6						17.3
11		12.7		5.2						18.0
12		12.7	+	5.4		6.3	+	62.2	=	81.3
13		12.7		6.1		6.3		62.2		81.3
14		12.7		6.6		6.3		62.2		81.3
15		12.7		6.9		6.3		62.2		81.3
16		12.7		6.8		6.3		62.2		81.3
17		12.7		5.9						18.7
18		12.7		5.6						18.3
19		12.7		5.5						18.3
20		12.7		5.6						18.3
21		12.7		5.0						17.8
22		12.7		4.4						17.1
23		12.7		4.1						16.8

Assumptions

The VGI Base rate, the VGI Distribution Base Rate, and the VGI Commodity Base rate are based on the Medium and Large Commercial and Industrial (M/L C&I) class average rate in Advice Letter 2587-E effective April 1, 2014.

The CAISO Day-Ahead price presented above reflects the CAISO Day-Ahead price for September 1, 2013 for node: DLAP_SDGE-APND.

System Peak Hours are defined as CAISO forecasted load that is in excess of the threshold for the identification of top 150 system hours.

Illustration of a Day with Top 150 System Peak Hours - Example 2

	Step 1		Step 2		Step 3		Step 4		Step 5
Hour Beginning	**VGI Rate Pre-CAISO**		**CAISO Day-Ahead Price**		**Average**		**C-CPP**		**VGI Rate (CAISO and VGI Hourly Adder)**
	(cents/kWh)		**(cents/kWh)**		**(cents/kWh)**		**(cents/kWh)**		**(cents/kWh)**
0	12.7		3.3						16.1
1	12.7		3.2						16.0
2	12.7		3.1						15.8
3	12.7		3.1						15.8
4	12.7		3.2						15.9
5	12.7		3.3						16.0
6	12.7		3.6						16.4
7	12.7		3.7						16.5
8	12.7		3.8						16.6
9	12.7		4.3						17.0
10	12.7		4.9						17.7
11	12.7		5.0						17.7
12	12.7		5.0						17.7
13	12.7	+	5.4		6.1	+	62.2	=	81.1
14	12.7		5.8		6.1		62.2		81.1
15	12.7		6.7		6.1		62.2		81.1
16	12.7		6.4		6.1		62.2		81.1
17	12.7		5.5						18.3
18	12.7		5.2						18.0
19	12.7		5.3						18.0
20	12.7		5.2						17.9
21	12.7		4.5						17.3
22	12.7		4.0						16.8
23	12.7		3.8						16.5

Assumptions
The VGI Base rate, the VGI Distribution Base Rate, and the VGI Commodity Base rate are based on the Medium and Large Commercial and Industrial (M/L C&I) class average rate in Advice Letter 2587-E effective April 1, 2014.
The CAISO Day-Ahead price presented above reflects the CAISO Day-Ahead price for September 16, 2013 for node: DLAP_SDGE-APND.
System Peak Hours are defined as CAISO forecasted load that is in excess of the threshold for the identification of top 150 system hours.

Illustration of a Day with Top 200 Circuit Peak Hours - Example 1

How to Build the VGI D-CPP Hourly Adder into the VGI Rate:

Step 1: Start with the VGI prior to the addition of the CAISO Day-Ahead Price. This rate includes the VGI Base Rate (Transmission, PPP, ND, CTC, RS, and the DWR-BC), the VGI Distribution Base Rate, and the VGI Commodity Base Rate. This results in a flat hourly rate.

Step 2: Add the CAISO Day-Ahead Price. The CAISO Day-Ahead Price varies by hour.

Step 3: Adjust the VGI Rate with the Average CAISO Rate applied to the hours identified within the top 200 Circuit Peak Hours.

Step 4: For the hours identified within the top 200 Circuit Peak Hours, add the VGI D-CPP Hourly Adder to the Averaged CAISO Day-Ahead Price and the VGI Rate.

Step 5: The end result is a VGI Rate that reflects the hourly differences in the CAISO Day-Ahead Price and the VGI D-CPP Hourly Adder.

		Step 1		Step 2		Step 3		Step 4		Step 5
Hour Beginning		**VGI Rate Pre-CAISO**		**CAISO Day-Ahead Price**		**Average**		**D-CPP**		**VGI Rate (CAISO and VGI Hourly Adder)**
		(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)
0		12.7		3.4						16.1
1		12.7		3.3						16.0
2		12.7		3.2						15.9
3		12.7		3.2						16.0
4		12.7		3.3						16.0
5		12.7		3.5						16.2
6		12.7		3.8						16.6
7		12.7		4.0						16.7
8		12.7		4.0						16.8
9		12.7		4.2						16.9
10		12.7		4.4						17.1
11		12.7		4.7		4.8		39.8		57.3
12		12.7	+	4.3		4.8	+	39.8	=	57.3
13		12.7		4.8		4.8		39.8		57.3
14		12.7		4.8		4.8		39.8		57.3
15		12.7		5.4		4.8		39.8		57.3
16		12.7		5.4						18.1
17		12.7		5.1						17.8
18		12.7		5.1						17.8
19		12.7		5.7						18.4
20		12.7		5.2						18.0
21		12.7		4.6						17.3
22		12.7		3.9						16.7
23		12.7		3.7						16.4

Assumptions

The VGI Base rate, the VGI Distribution Base Rate, and the VGI Commodity Base rate are based on the Medium and Large Commercial and Industrial (M/L C&I) class average rate in Advice Letter 2587-E effective April 1, 2014.

The CAISO Day-Ahead price presented above reflects the CAISO Day-Ahead price for September 23, 2013 for node: DLAP_SDGE-APND.

Circuit Peak Hours are defined as forecasted load that is in excess of the threshold for identification of the top 200 circuit hours. The threshold is based on historic data.

Illustration of a Day with Top 200 Circuit Peak Hours - Example 2

	Step 1		Step 2		Step 3		Step 4		Step 5
Hour Beginning	VGI Rate Pre-CAISO		CAISO Day-Ahead Price		Average		D-CPP		VGI Rate (CAISO and Hourly Adder)
	(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)
0	12.7		3.3						16.1
1	12.7		2.9						15.7
2	12.7		2.6						15.3
3	12.7		2.2						14.9
4	12.7		2.5						15.2
5	12.7		3.0						15.8
6	12.7		3.7						16.4
7	12.7		3.9						16.7
8	12.7		5.9						18.6
9	12.7		4.4						17.1
10	12.7	+	4.9	}	6.4	+	39.8	=	59.0
11	12.7		5.3		6.4		39.8		59.0
12	12.7		6.1		6.4		39.8		59.0
13	12.7		7.2		6.4		39.8		59.0
14	12.7		8.7		6.4		39.8		59.0
15	12.7		6.9						19.6
16	12.7		7.1						19.9
17	12.7		6.3						19.0
18	12.7		5.7						18.4
19	12.7		5.7						18.5
20	12.7		6.1						18.8
21	12.7		5.3						18.1
22	12.7		4.4						17.1
23	12.7		3.8						16.5

Assumptions

The VGI Base rate, the VGI Distribution Base Rate, and the VGI Commodity Base rate are based on the Medium and Large Commercial and Industrial (M/L C&I) class average rate in Advice Letter 2587-E effective April 1, 2014.

The CAISO Day-Ahead price presented above reflects the CAISO Day-Ahead price for May 14, 2013 for node: DLAP_SDGE-APND.

Circuit Peak Hours are defined as forecasted load that is in excess of the threshold for identification of the top 200 circuit hours. The threshold is based on historic data.

Illustration of a Day with Top 150 System Peak Hours and Top 200 Circuit Peak Hours

How to Build the VGI C-CPP Hourly Adder and the VGI D-CPP Hourly Adder into the VGI Rate:

Step 1: Start with the VGI prior to the addition of the CAISO Day-Ahead Price. This rate includes the VGI Base Rate (Transmission, PPP, ND, CTC, RS, and the DWR-BC), the VGI Distribution Base Rate, and the VGI Commodity Base Rate. This results in a flat hourly rate.

Step 2: Add the CAISO Day-Ahead Price. The CAISO Day-Ahead Price varies by hour.

Step 3: Adjust the VGI Rate with the Average CAISO Rate applied to the hours identified within the top 150 System Peak Hours and the top 200 Circuit Peak Hours.

Step 4: For the hours identified within the top 150 System Peak Hours, add the VGI C-CPP Hourly Adder and for the hours identified in the top 200 Circuit Peak Hours, add the VGI D-CPP Hourly Adder to the Averaged CAISO Day- Ahead Price and the VGI Rate. If the hours identified in the top 150 System Peak Hours and the top 200 Circuit Peak Hours coincide, both hourly adders will be applied.

Step 5: The end result is a VGI Rate that reflects the hourly differences in the CAISO Day-Ahead Price and the VGI C-CPP and the VGI D-CPP Hourly Adders.

		Step 1		Step 2		Step 3		Step 4		Step 4		Step 5
Hour Beginning		**VGI Rate Pre-CAISO**		**CAISO Day-Ahead Price**		**Average**		**C-CPP**		**D-CPP**		**VGI Rate (with CAISO and VGI Hourly Adders)**
		(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)
0		12.7		3.8								16.5
1		12.7		3.5								16.2
2		12.7		3.2								16.0
3		12.7		3.0								15.8
4		12.7		3.1								15.8
5		12.7		3.4								16.1
6		12.7		3.7								16.4
7		12.7		4.0								16.7
8		12.7		4.7								17.4
9		12.7		4.8								17.6
10		12.7		5.4		7.9				39.8		60.4
11		12.7		5.7		7.9				39.8		60.4
12		12.7	+	6.7		7.9	+	62.2	+	39.8	=	122.7
13		12.7		7.6		7.9		62.2		39.8		122.7
14		12.7		9.1		7.9		62.2		39.8		122.7
15		12.7		9.9		7.9		62.2		39.8		122.7
16		12.7		10.9		7.9		62.2		39.8		122.7
17		12.7		9.2								22.0
18		12.7		7.1								19.8
19		12.7		6.1								18.8
20		12.7		5.8								18.6
21		12.7		5.5								18.2
22		12.7		4.9								17.6
23		12.7		4.4								17.1

Assumptions

The VGI Base rate, the VGI Distribution Base Rate, and the VGI Commodity Base rate are based on the Medium and Large Commercial and Industrial (M/L C&I) class average rate in Advice Letter 2587-E effective April 1, 2014.

The CAISO Day-Ahead price presented above reflects the CAISO Day-Ahead price for June 28, 2013 for node: DLAP_SDGE-APND.

System Peak Hours are defined as CAISO forecasted load that is in excess of the threshold for the identification of top 150 system hours.

Circuit Peak Hours are defined as forecasted load that is in excess of the threshold for identification of the top 200 circuit hours. The threshold is based on historic data.

Illustrative Day with Surplus Energy Occurrence

How to Build the VGI Rate with the Surplus Energy Credit

Step 1: Start with the VGI prior to the addition of the CAISO Day-Ahead Price. This rate includes the VGI Base Rate (Transmission, PPP, ND, CTC, RS, and the DWR-BC), the VGI Distribution Base Rate, and the VGI Commodity Base Rate. This results in a flat hourly rate.

Step 2: Add the CAISO Day-Ahead Price. The CAISO Day-Ahead Price varies by hour.

Step 3: Compare the CAISO Day-Of Price to the CAISO Day-Ahead Price to identify if any of the Day-Of Prices are 1 cent/kWh below the CAISO Day-Ahead Price.

Step 4: The end result is a VGI Rate that reflects the CAISO Hourly Day-Ahead Prices with an adjustment for the surplus energy credit in hours in which the Day-Of price falls 1 cent/kWh below the Day-Ahead Price.

Hour Beginning		VGI Rate Pre-CAISO		CAISO Day-Ahead Price		CAISO Day-of Price		VGI Rate (with CAISO)
		(cents/kWh)		(cents/kWh)		(cents/kWh)		(cents/kWh)
0		12.7		3.3		3.4		16.1
1		12.7		3.2		3.3		15.9
2		12.7		3.0		3.0		15.7
3		12.7		3.0		2.4		15.7
4		12.7		2.9		1.7		14.5
5		12.7		3.0		3.2		15.7
6		12.7		2.9		3.3		15.6
7		12.7		2.7		3.4		15.4
8		12.7		2.9		2.3		15.6
9		12.7		3.1		(6.8)		5.9
10		12.7	+	3.3	+	(7.3)	−	5.4
11		12.7		3.5		0.7		13.5
12		12.7		3.5		(0.3)		12.4
13		12.7		3.7		1.7		14.4
14		12.7		3.7		1.8		14.5
15		12.7		3.8		1.0		13.7
16		12.7		3.8		2.8		15.5
17		12.7		4.3		3.2		15.9
18		12.7		4.6		3.4		16.1
19		12.7		5.5		7.5		18.2
20		12.7		4.8		3.8		16.6
21		12.7		4.4		4.5		17.2
22		12.7		3.7		3.5		16.4
23		12.7		3.5		3.2		16.2

Assumptions

The VGI Base rate, the VGI Distribution Base Rate, and the VGI Commodity Base rate are based on the Medium and Large Commercial and Industrial (M/L C&I) class average rate in Advice Letter 2587-E effective April 1, 2014.

The CAISO Day-Ahead price presented above reflects the CAISO Day-Ahead price for September 22, 2013 for node: DLAP_SDGE-APND.

The CAISO Day-Of price presented above reflects the CAISO Day-of price for September 22, 2013 for node: DLAP_SDGE-APND.

AVERAGE IMPACTS FROM VGI REVENUE REQUIREMENTS

	Current	2015		2016		2017		2018		2019	
Average Rate Impact	Total Rate (cents/kWh)	Total Rate (cents/kWh)	Rate Change (%)	Total Rate (cents/kWh)	Rate Change (%)	Total Rate (cents/kWh)	Rate Change (%)	Total Rate (cents/kWh)	Rate Change (%)	Total Rate (cents/kWh)	Rate Change (%)
Residential	20.624	20.629	0.02%	20.650	0.13%	20.670	0.22%	20.698	0.36%	20.701	0.37%
Small Commercial	21.172	21.175	0.01%	21.192	0.09%	21.207	0.17%	21.228	0.26%	21.231	0.28%
Medium/Large C&I	17.233	17.235	0.01%	17.244	0.06%	17.252	0.11%	17.264	0.18%	17.265	0.19%
Agricultural	20.869	20.873	0.02%	20.889	0.10%	20.904	0.17%	20.925	0.27%	20.927	0.28%
Lighting	17.696	17.698	0.01%	17.710	0.08%	17.720	0.14%	17.734	0.21%	17.736	0.23%
System Total	18.873	18.877	0.02%	18.891	0.10%	18.904	0.16%	18.923	0.26%	18.925	0.28%

Note:
(1) Current Total Rate are the rates in Advice Letter 2587-E effective April 1, 2014.