Exhibit No. ____

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of San Diego Gas & Electric Company (U 902-E) for Approval of the Results from Its 2016 Track IV Local Capacity Requirement Preferred Resources Request for Offers	Application No. 17-04-___ (Filed April 19, 2017)

PREPARED DIRECT TESTIMONY

OF SCOT ROLFE

ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY

PUBLIC REDACTED VERSION*

April 19, 2017

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ATTACHMENTS

PREPARED DIRECT TESTIMONY OF SCOT ROLFE

I. OVERVIEW AND PURPOSE

My testimony describes the process used to evaluate and select the shortlisted offers in San Diego Gas & Electric Company's ("SDG&E") 2016 Track IV Local Capacity Requirement Preferred Resource Request for Offers ("Preferred Resources LCR RFO").

II. TRACK IV PREFERRED RESOURCES LCR RFO EVALUATION PROCESS

SDG&E utilized an evaluation methodology that ensured all resource types evaluated in the Preferred Resources LCR RFO were considered on a level playing field with consistent evaluation protocols, agnostic to ownership of the resource. In accordance with D.14-03-004, SDG&E used a Least-Cost, Best-Fit ("LCBF") methodology to value and award contracts in this RFO.[1] Offers were submitted by both third parties and utility owned offers by the SDG&E Cost Development Team. As discussed in the testimony of Patrick K. Charles,[2] a strict code of conduct was followed, governing the activities and communications between Bid Evaluation team members and Cost Development team members.

A. Track IV PR RFO Background and Overview

As discussed in the testimony of Patrick K. Charles, the first step in processing offers received in response to the Preferred Resources LCR RFO was to ensure conformance with the solicitation requirements, including safety. Once the conformance was confirmed, the conforming offers were evaluated. SDG&E's offer evaluation process follows LCBF principles.

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[1] D.14-03-004, *Decision Authorizing Long-Term Procurement for Local Capacity Requirements due to Permanent Retirement of the San Onofre Nuclear Generation Stations* [sic] ("Track 4 Decision") at ordering paragraph ("OP") 6 requires SDG&E to observe all elements of D.13-02-015, OP 4 (*id.*, item h., requires conducting a least-cost, best-fit analysis).

[2] Citations to witness testimony herein are to the prepared direct testimony in support of this application and served concurrently therewith.

This includes both quantitative and qualitative evaluation elements, which both impact the final offer ranking and shortlist selection. This methodology is consistent with evaluations performed by SDG&E in other solicitations including: Renewable Portfolio Standard ("RPS"), Combined Heat and Power ("CHP"), Energy Storage ("ES"), and All-Source RFOs.

The quantitative evaluation involves a Net Market Value ("NMV") analysis, which provides a net present value ("NPV") of the forecast of (1) the value of the contract benefits, (2) the value of the contract costs, and (3) the net value of (1) less (2).

SDG&E conducted a series of meetings with internal stakeholders and the Independent Evaluator ("IE") to identify and consider the qualitative aspects of each of the top-ranked offers. In addition to conformance requirements and shortlisting objectives discussed in the testimony of Kendall Helm, qualitative factors were discussed when determining the final shortlist. Qualitative factors considered were those that cannot be quantified and include:

- Safety plan for construction and operation of facilities
- Developer experience
- Development milestones
- Consideration of the flexibility of resources (D.13-02-015 Track 1 decision requirement)
- Diverse Business Enterprise ("DBE") Status
- Permitting and Interconnection
- Water usage

While all factors were considered, no one qualitative factor was determinative.

B. Track IV PR RFO Evaluation Details

1. General

Locational benefits were also considered by SDG&E while developing the evaluation methodology. SDG&E received a Locational Effectiveness Factors ("LEFs") study from the California Independent System Operator ("CAISO"), which attempted to differentiate the locational effectiveness of generation resources. The result of the LEF study, along with the CAISO 2016 Local Capacity Technical Analysis ("2016 LCT"), which states, "all units within this area have the same effectiveness factor,"[3] led SDG&E to conclude that no locational differentiation should be applied in this evaluation. Please refer to the testimony of Patrick K. Charles for a detailed description of the LEF study results.[4]

Ratepayer benefits related to the useful life of assets are embedded in the NMV of each offer. All storage offers included a contract term of guaranteed capacity. Beyond the term of guaranteed capacity, each asset will have some period of remaining useful life. For utility owned offers, SDG&E ratepayers will automatically benefit from a useful life of these assets beyond the initial contract term. Also for utility owned storage offers, all calculated benefits are assumed to extend beyond the contract term, based on schedules of capacity degradation provided by the equipment suppliers. These residual benefits lasted between 5 and 10 years, depending on the equipment supplier. For third-party owned storage offers, any residual benefits are embedded by the bidder in the proposed contract price during the initial contract term. The amount of residual benefits included in the price is unknown to SDG&E; however, ratepayers could still benefit from them via a lower contract price if included by the counterparty.

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[3] 2016 Local Capacity Technical Analysis – Final Report and Study, available on the CAISO website at: https://www.caiso.com/Documents/Final2016LocalCapacityTechnicalReportApr302015.pdf; the quoted statement is on p. 100 of the report.

[4] Testimony of Patrick K. Charles, PKC-8 – 11.

2. Benefits

a. Energy

i. Energy Efficiency

Energy Efficiency ("EE") offers provided annual energy savings profiles for the term of the offer. The energy benefits were calculated by multiplying these profiles by the forecasted energy forward price curve. EE benefits are gained from load reductions, so the energy benefits are then increased by SDG&E's distribution loss factor of 5.5% to reflect avoided line losses.

ii. Dispatchable Demand Response (including behind the meter storage)

For dispatchable demand response offers, energy benefits are retained by the seller in SDG&E's current demand response Pro-Forma.

iii. Energy Storage ("ES")

To maintain consistency in valuations across different resource types, SDG&E adapted its approach to valuing dispatchable thermal resources for use in the valuation of ES. SDG&E worked with Financial Engineering Associates to develop an ES dispatch optimization model which calculates an optimized energy dispatch profile utilizing the unique resource constraints and operating characteristics of ES. Typical constraints included maximum energy output, maximum energy input, round-trip efficiency, and maximum cycles per day/month/year. Inputs include forecast energy prices and energy price volatilities, and contract terms, such as Variable Operations and Maintenance ("VOM"). The model also runs a set of price simulations that generates a variety of hourly price scenarios and charge/discharge combinations through a decision tree optimization. The resulting revenue outcomes are averaged to obtain a single net energy benefit.

iv. Baseload/Must-take resources

For baseload and must take resources, SDG&E calculated the energy benefits by multiplying the forecasted energy forward price curve by the offer's expected delivery profile.

b. Capacity

Capacity benefits are derived first by calculating the residual capacity value of a new-build flexible gas-fired resource using SDG&E's most recent executed power purchase agreements to determine an escalating annual residual capacity cost for long-term new capacity.

[redacted]

i. Energy Efficiency

The hourly capacity quantity for each offer is equal to the energy savings profile provided in each offer. This hourly quantity is multiplied by the hourly capacity values described above to determine the capacity benefit for EE resources.

[5] RA RFO results for 2014-2015 were used in this calculation.

ii. Dispatchable Demand Response

Demand response resources receive capacity value for each hour the program is available for dispatch during the year, with a capacity quantity equal to the hourly savings profile provided in the offer. The hourly quantity is multiplied by the hourly capacity cost curve to determine the capacity benefit.

iii. Energy Storage

Being fully dispatchable, ES resources receive their full offered contract capacity for all hours of the year. This capacity is multiplied by the annual capacity cost to determine the capacity benefit.

iv. Renewable resources

The capacity quantity for Renewable resources is determined by taking the lesser of the CAISO maximum resource capacity factor or the capacity factor derived from the expected delivery profile provided by the offer. This hourly profile is multiplied by the hourly capacity cost.

v. Ancillary Services ("A/S")

A/S benefits are calculated by taking a historical ratio of the amount of revenue (for each of the A/S types) to the amount of energy revenue generated by SDG&E's existing portfolio of A/S capable resources. This approach encompasses both the bidding strategies utilized by SDG&E and the CAISO's dispatch of A/S versus energy, to determine the real benefit of A/S.

3. Costs

a. Variable Energy Costs (dispatch costs, including Greenhouse Gas ("GHG") compliance)

i. Fuel

Fuels costs are calculated from the expected delivery profile for each resource.

ii. Variable Operating and Maintenance ("VOM")

VOM costs are provided in the offer forms for dispatchable resource types, if applicable, and calculated based on the expected delivery profile for these resource types.

iii. Start-up costs

Like fuel and VOM, start-up costs are provided in the offer forms for dispatchable resource types and are calculated based on the number of starts determined by the expected delivery profile. This expected delivery profile is determined by the energy benefit modeling described above.

iv. Round-trip efficiency (storage losses)

Round-trip efficiencies are provided for the energy storage product type within the offer forms and are used in calculating the expected delivery profile and associated storage losses. In short, not all the energy put into the storage resource is returned to the grid when the storage resource is discharged. These round-trip losses are inherent to the ES product type and vary by storage technology and other factors. SDG&E gathered the round-trip efficiency information from the offerors in the offer forms.

v. GHG compliance costs

Any resource that must meet a GHG compliance requirement has a compliance cost calculated based on the fuel usage and SDG&E's forecasted compliance instrument forward prices.

vi. Capacity Payments

For each of the five product types included in the Preferred Resource LCR RFO, SDG&E included in the offer forms an explanation of the capacity payment information to be collected from the offerors. These included total fixed contract payments, including fixed O&M.

vii. Interconnection Costs

For resource types that require an electrical interconnection (that is, all resource types except EE and DR), SDG&E collected the reimbursable network upgrade costs from the offerors in the offer forms. These costs generally come from an interconnection study or upgrade cost estimates.

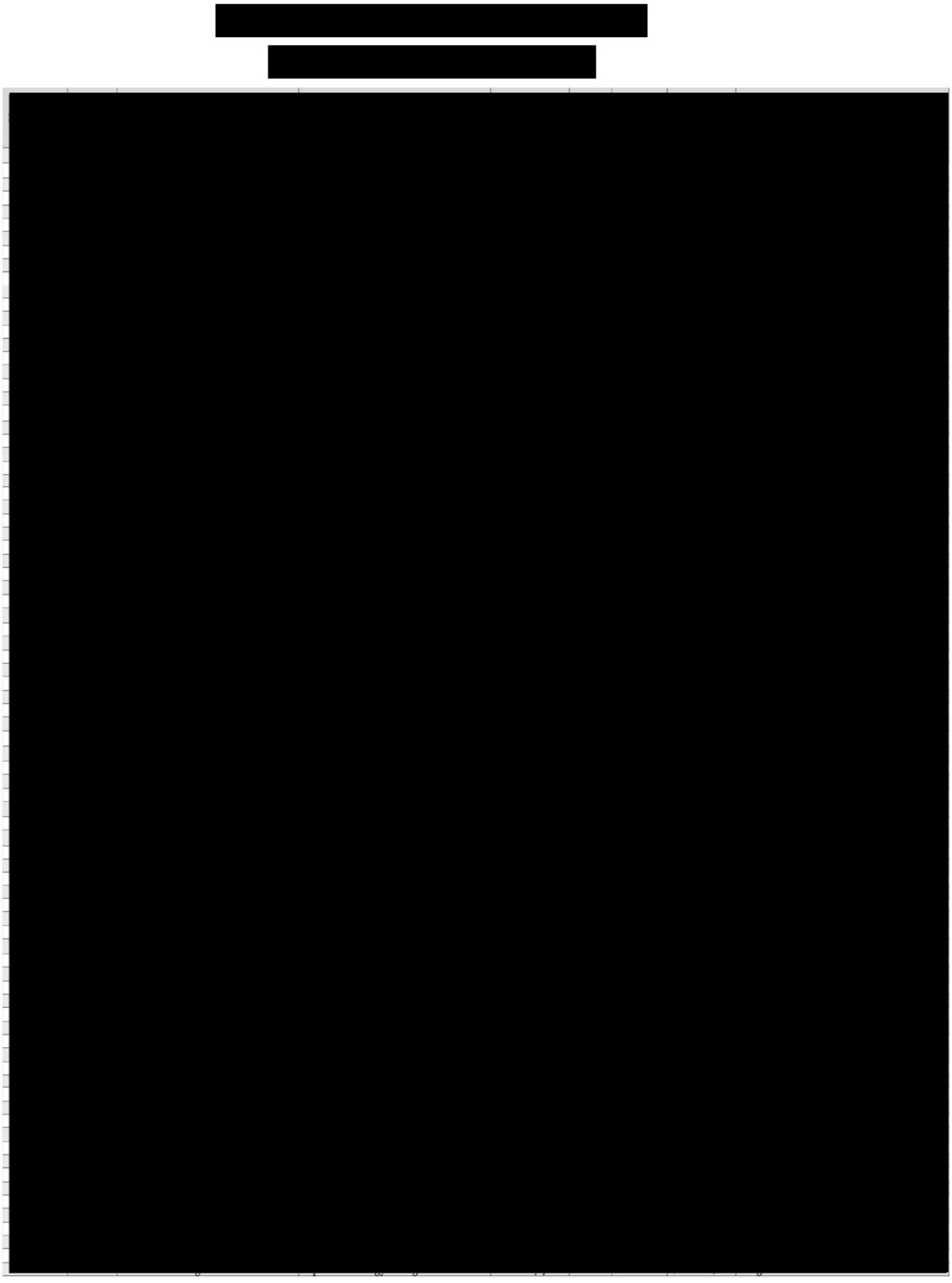
III. QUANTITATIVE EVALUATION RESULTS

Based on the foregoing evaluation methodology, the quantitative analysis resulted in a NMV in total dollars which was discounted back to the 2018 base year. This total NMV figure was then divided by the offer's total capacity (in megawatts) to arrive at a per megawatt ("MW") NMV which was rank ordered from the highest NMV/MW to the lowest NMV/MW. The results of this quantitative analysis are included in Confidential Attachment A.

As required in D.13-10-040, and further modified in D.14-10-045, an alternative analysis was conducted for all shortlisted ES resources using the Consistent Evaluation Protocol ("CEP") methodology. This methodology is used for reporting and benchmarking purposes only, and did not affect the outcome of this RFO. The CEP is Attachment B hereto.

IV. QUALITATIVE EVALUATION RESULTS AND OVERALL EVALUATION RESULTS

Based on the quantitative ranking, SDG&E conducted two in-depth, cross departmental discussions on the ~100 highest ranked offers and their variations. Based on the outcome of those discussions and the quantitative ranking, SDG&E arrived at its recommended shortlist. The tables and chart below summarizes the outcome of the analysis and qualitative discussions. Note that data from Table SR-1 was provided as part of the CAM PRG presentation and discussion conducted on October 21, 2016:



SDG&E chose to shortlist 7 offers. They include two utility owned energy storage offers, three third-party owned energy storage offers, and two demand response offers. (see Table SR-2). [redacted]

V. QUALITATIVE DISCUSSION SUMMARY FOR SELECTED PROJECTS

SDG&E selected a shortlist of 95.5MW of capacity from projects that met its RFO requirements and objectives. This total was reduced to 88MW during negotiations when [redacted] withdrew their offer. The overall shortlist includes projects that meet both Track IV and Energy Storage procurement targets. They include two utility owned energy storage offers, three third-party owned energy storage offers, and a demand response offer, providing resource diversity. They also include seven different suppliers and contract tenors ranging from 5 to 20 years, providing additional supplier and tenor diversity within SDG&E's portfolio. Of note, the two utility owned projects that were shortlisted were among the highest

quantitatively ranked projects considered, before including additional qualitative factors.[6] For each resource, a discussion of qualitative benefits is provided below.

A. AES – Energy Storage Resource

[redacted]

B. RES – Energy Storage Resource

[redacted]

C. Enel – Energy Storage Resource

[redacted]

[redacted]

D. Powin – Energy Storage Resource

[redacted]

E. OhmConnect – DR Resource

[redacted]

F. Advanced Microgrid Solutions – Energy Storage Resource

[redacted]

[redacted]

[redacted]

VI. WITNESS QUALIFICATIONS

I, Scot Rolfe, have been employed by SDG&E for 4 years in the role of Principal Business Analyst in the Origination group of Electric & Fuel Procurement ("EF&P"). Prior to this position, I spent 5 years in the Scheduling group of EF&P performing real-time and day-ahead trading, scheduling, and analysis of generation resources. I have an additional 15 years of experience, prior to my employment with SDG&E, in various roles in the wholesale energy trading industry, including Risk Management, Generation Dispatch, both Electric and Natural Gas Portfolio Optimization, and both Electric and Natural Gas Trading.

I have not previously testified before this Commission.

This concludes my prepared direct testimony.

ATTACHMENT A

Quantitative Evaluation Results Table

(This Document is Considered Confidential in Its Entirety)

ATTACHMENT B

Consistent Evaluation Protocol

(Portions of this Document are Confidential)

Attachment 1 to the Consistent Evaluation Protocol: "CEP Spreadsheet"

The Consistent Evaluation Protocol (CEP) is for energy storage benchmarking and general reporting purposes, per D.13-10-040.

CONFIDENTIAL INFORMATION. Data provided to the CPUC herein is confidential under California Public Utilities Code Section 583, D.06-06-066, and D.13-10-040.

		1	2	3	4	5
Descriptive Items						
	IOU (PGE / SCE / SDGE)	SDGE	SDGE	SDGE	SDGE	SDGE
	Name of Shortlisted Project	AES Fallbrook	RES Miramar	Enel Pomerado	Powin Don Lee	AMS Capistrano
	Interconnection Voltage (kV)	69kV	69kV	12kV	12kV	12kV
	Interconnection Level (Transmission / Distribution)	Transmission	Transmission	Distribution	Distribution	Distribution
	Local Capacity Area	San Diego	San Diego	San Diego	San Diego	San Diego
	Zone (NP / ZP / SP)	SP	SP	SP	SP	SP
	Status (New / Existing)	New	New	New	New	New
	Product (Dispatchable / RA)	Dispatchable	Dispatchable	Dispatchable	Dispatchable	Dispatchable
	Energy Storage Technology	Lithium-Ion Battery	Lithium-Ion Battery	Lithium-Ion Battery	Lithium-Ion Battery	Lithium-Ion Battery
	Commercial Operation Date	3/31/2021	1/1/2020	12/31/2021	6/30/2021	12/1/2019
	Term (Years)	20	20	15	10	20
	Max Capacity (MW)	40	30	3	6.5	4
	Min Capacity (MW)	-	-	-	-	-
	Qualifying RA Capacity (MW)	[redacted]				
	Duration of Max Sustainable Discharge Rate (Hours)					
	Efficiency at Max Capacity (%)					
	Max Daily Switches -- Charge / Discharge (# Charges)					
	Max Cycles per Lifetime (# Cycles)					
	Self-Discharge in Stand-by (MW / Hour)					
	Ramp Rate -- Charge / Discharge, Up / Down (MW / Hour)					
	AGC (Yes / No)					
	Regulation at Zero (Yes/No)					
	Contract Cost ($)					
	Variable O&M for Discharging ($/MWh)					
	Fixed O&M ($/kW-Year)					
Quantitative Items*						
Market Benefits (CEP Assumptions)	Levelized Capacity RA Value ($/kW)					
	Levelized Energy Value ($/kW)					
	Levelized Ancillary Services Value ($/kW)					
	Distribution Investment Deferral Value - if applicable ($/kW)					
Market Costs (CEP Assumptions)	Levelized Capacity Payments and Fixed O&M Cost ($/kW)					
	Levelized Charging Costs and VOM Cost ($/kW)					
	Levelized Network Upgrade Cost ($/kW)					
	Levelized GHG Compliance Cost (if applicable) ($/kW)					
	Levelized Debt Equivalency Cost ($/kW)					
	Levelized Market Participation Costs ($/kW)					
NPV (CEP Assumptions)	Levelized Net Market Value $/kW					
NPV (Proprietary IOU Assumptions)	Levelized Net Market Value $/kW					
Applicable End	[redacted]					
ISO / Market	Ancillary Services: Frequency Regulation					
	Ancillary Services: Spin / Non-Spin / Replacement Reservces					
	Ancillary Services: Ramp					
	Black Start					
	Real Time Energy Balancing					
	Energy Price Arbitrage					
	Resource Adequacy					
Generation	Intermittent Resource Integration: Wind (Ramp / Voltage Support)					
	Intermittent Resource Integration: PV (Time Shift, Voltage Sag, Rapid Demand Support)					
	Supply Firming					
Transmission / Distribution	Peak Shaving					
	Transmission Peak Capacity Support (Upgrade Deferral)					
	Transmission Operation (Short Duration Performance, Inertia, System Reliability)					
	Transmission Congestion Relief					
	Distribution Peak Capacity Support (Upgrade Deferral)					
	Distribution Operation (Voltage / VAR Support)					
Customer	Outage Mitigation: Micro-Grid					
	Time-of-Use (TOU) Energy Cost Management					
	Power Quality					
	Back-Up Power					

*With the exception of "NPV (Proprietary IOU Assumptions)" all of the Quantiative Items are calculated using standardized planning assumptions, as discussed in the Section C of the CEP.