Company: San Diego Gas & Electric Company (U 902 M)
Proceeding: 2019 General Rate Case
Application: A.17-10-007/008 (cons.)
Exhibit: SDG&E-253

SDG&E

REBUTTAL TESTIMONY OF TED REGULY

(DER PROJECTS)

JUNE 18, 2018

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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SOCALGAS/SDG&E REBUTTAL TESTIMONY OF TED M. REGULY (DISTRIBUTED ENERGY RESOURCES AND DERMS)

I. SUMMARY OF DIFFERENCES

TOTAL CAPITAL - Constant 2016 ($000)					
	2017	**2018**	**2019**	**Total**	**Variance**
SDG&E	$5,541	$21,970	$21,694	$49,205	
ORA	$6,069	$6,221	$6,220	$18,510	$30,695
TURN	$5,541	$10,922	$3,778	$20,241	$28,964

II. INTRODUCTION

This chapter provides rebuttal testimony regarding San Diego Gas & Electric Company's (SDG&E) request for Distributed Energy Resources (DER) and Distributed Energy Resources Management System (DERMS) addresses the following testimony from other parties:

- The Office of Ratepayer Advocates (ORA) as submitted by Mr. Thomas Roberts (Exhibit ORA-06), dated April 13, 2018.
- The Utility Reform Network (TURN), as submitted by Mr. Eric Borden (Exhibit TURN-01), dated May 14, 2018.

Please note that the fact that I may not have responded to every issue raised by others in this rebuttal testimony does not mean or imply that SDG&E agrees with the proposal or contention made by these or other parties.

In addition, this chapter (1) adopts the direct testimony of Alan Colton supporting SDG&E's incremental cost forecasts for the Distributed Energy Resources (DER) Integration capital projects;[1] and, (2) adopts the direct testimony of Alan Dulgeroff supporting DER policy.[2]

Distributed Energy Resources (DERs) are being installed at a rapid pace throughout SDG&E's service territory due in part to California's low carbon policy and customer adoption of energy technologies. With this transformation, SDG&E faces new challenges in operating the

[1] December 2017, Revised SDG&E Direct Testimony of Alan F. Colton (Electric Distribution Capital), Ex. SDG&E-14-R at AFC-127 – AFC-137.

[2] October 6, 2017, SDG&E Direct Testimony of Alan M. Dulgeroff (Distributed Energy Resources Policy), Ex. SDG&E-13.

distribution grid safely and reliably. SDG&E's installation of energy storage and the continued advancement of DERMS are key enablers of a safe, reliable distribution system that accommodates customer choice. The DER projects and DERMS expenditures SDG&E is proposing are not in conflict or duplicative to Electric Program Investment Charge (EPIC) or other California Public Utilities Commission (CPUC) initiatives/proceedings. The projects outlined in SDG&E's General Rate Case (GRC) are intended primarily for maintaining and/or enhancing the electric distribution system's reliability, aiding with the integration of intermittent renewables, and/or addressing distribution circuits that are most prone to outages. Therefore, SDG&E takes issue with the recommendations by ORA and TURN to reduce or eliminate budgets for these projects. SDG&E believes these projects are foundational to the safe, reliable, continued operation of SDG&E's electric distribution system as California moves to a lower carbon economy.

A. ORA

ORA issued its report on Distributed Energy Resources projects on April 13, 2018.[3] ORA claims that SDG&E's various DER projects are duplicative or conflict with various commission proceedings. ORA further alleges that SDG&E has not provided enough information for approval. SDG&E disagrees and addresses each project below.

B. TURN

TURN submitted testimony on May 14, 2018.[4] TURN takes issue with two DER projects: Advanced Energy Storage project and Microgrid for Energy Resilience. TURN claims that SDG&E does not provide enough information for approval of the Advanced Energy Storage project, including the requested expenditure, specific circuits that SDG&E has identified for this project, operational problems that energy storage would resolve, or alternatives to storage.[5] TURN further states that SDG&E does not explain why or how the requested funds for

[3] April 13, 2018, Prepared Direct Testimony of Thomas Roberts, Report on the Results of Operations for San Diego Gas & Electric Company, Southern California Gas Company, Test Year 2019, General Rate Case, SDG&E – Electric Distribution Capital Expenditures, Part 1 of 2, Ex. ORA-06.

[4] May 14, 2018, Prepared Direct Testimony of Eric Borden, Addressing the Proposals of San Diego Gas & Electric and Southern California Gas Company in their Test Year 2019 General Rate Case Related to Electric Distribution Capital, Gas Transmission Operation, Gas Major Projects, Cash Working Capital, and Customer Forecast, Ex. TURN-01.

[5] Ex. TURN-01 (Borden), pp. 37-38.

Microgrid for Energy Resilience are necessary, nor does it show that this project is cost effective.[6]

SDG&E disagrees with TURN on these points, and the issues are addressed below within each individual project.

III. REBUTTAL TO PARTIES' CAPITAL PROPOSALS

	Figures in thousands of 2016$								
	2017			**2018**			**2019**		
	SDG&E	ORA	TURN	SDG&E	ORA	TURN	SDG&E	ORA	TURN
BC 11246 Smart Transformers	$258	$4	$258	$-	$-	$-	$-	$-	$-
BC 11247 Advanced Energy Storage	$-	$1	$0	$5,154	$1,748	$0	$10,000	$3,452	$0
BC 14243 Borrego Springs Microgrid Enhancements	$1,769	$3,531	$1,769	$515	$175	$515	$-	$-	$-
BC14259B Vanadium Flow Battery Project	$539	$408	$539	$-	$-	$-	$-	$-	$-
BC 16243 Microgrid for Energy Resilience	$-	$-	$-	$5,894	$1,999	$-	$7,916	$2,733	$-
BC 17244A Volt-Var Optimization Transformer	$-	$16	$-	$500	$170	$500	$100	$35	$100
BC 17245 ITF	$523	$-	$523	$1,050	$356	$1,050	$-	$-	$-
BC 17246 Borrego Microgrid 3.0	$209	$-	$209	$5,230	$1,773	$5,230	$-	$-	$-
BC 14860A DERMS	$2,243	$2,109	$2,243	$3,627	$-	$3,627	$3,678	$-	$3,678
TOTAL	**$5,541**	**$6,069**	**$5,541**	**$21,970**	**$6,221**	**$10,922**	**$21,694**	**$6,220**	**$3,778**
VARIANCE		**$528**	**$-**		**$(15,749)**	**$(11,048)**		**$(15,474)**	**$(17,916)**

A. BC 11247 Advanced Energy Storage

1. ORA

ORA takes issue with capital forecast for budget code 11247 Advanced Energy Storage (AES). Specifically, ORA states that "the AES program is a distribution deferral proposal," and, based on this assumption, claims that SDG&E needs to meet the criteria established by the

[6] Ex. TURN-01(Borden), pp. 23-24.

Commission governing distribution deferral investments.[7] ORA also criticizes the AES program for not predefining the particular reliability needs being served,[8] not specifying the scope of work,[9] nor determining whether the AES program is cost-effective.[10] Separately, ORA asks SDG&E to justify its reliance on utility-owned energy storage.[11] By pointing out that SDG&E has already met its energy storage mandate under Assembly Bill (AB) 2514 for distribution connected energy storage, ORA highlights that the energy storage that is part of the AES program will not count towards SDG&E's AB 2514 target.[12]

ORA recommends a total budget reduction of 34% of this budget based on the objections summarized above. SDG&E disagrees with ORA's recommendation on the primary basis that the AES program, contrary to ORA's flawed assumption, is not intended for distribution deferral purposes. Rather, the overall purpose of the program is to maintain and/or enhance the safety and reliability of the electric distribution system, like the other capital programs outlined in Mr. Colton's testimony. Mr. Colton's testimony and accompanying workpapers do not describe the installation of energy storage as a distribution deferral program because the AES program is not designed to defer any investments of traditional electric distribution infrastructure. Furthermore, while language in the Capital Budget Documentation (CBD) from 2013 referenced by ORA,[13] which was created prior to the Distribution Resource Plan[14] rulemaking, arguably suggests it could support distribution deferral, as it states that one of the many benefits of the AES program is the potential for "deferred capacity investments," it is important to highlight the fact that distribution deferral is not listed as a primary objective. Therefore, since the AES program was not intended to defer traditional distribution capacity upgrades, but rather to integrate renewables

[7] Ex. ORA-6 (Roberts), pp. 93-94.

[8] Ex. ORA-6 (Roberts), p. 94.

[9] Ex. ORA-6 (Roberts), p. 95.

[10] Ex. ORA-6 (Roberts), pp. 95-96.

[11] Ex. ORA-6 (Roberts), p. 98.

[12] Ex. ORA-6 (Roberts), p. 96.

[13] Ex. ORA-6 (Roberts), p. 93.

[14] R.14-08-013, Commission established policies, procedures, and rules to guide California investor-owned electric utilities (IOUs) in developing their Distribution Resources Plan (DRP).

and harness their benefits, the processes and solicitations as contemplated in the DRP and Integrated Distributed Energy Resources (IDER) proceedings are not applicable.

SDG&E has determined that the AES program will provide value to ratepayers. By strategically deploying energy storage devices on distribution circuits with an abundance of solar photovoltaic (PV) penetration, the energy storage devices will be able to leverage excess renewable energy to charge during the day when the circuit is experiencing lighter load levels, and discharge during times of higher loading. The AES program will allow for the increase of generation interconnection capacity (enabling more DER to interconnect without reaching system limitations) by mitigating power backflow from distributed generators. In addition, as SDG&E integrates additional energy storage managed by DERMS, it will help enhance the integration process and operability of future energy storage, utility or third-party. These preferred resources could also be used to potentially fulfill SDG&E's remaining Local Capacity Requirement (LCR) as identified in the CPUC's Track 4 decision.[15]

SDG&E is still in the planning and engineering phase of the AES program implementation and is considering a variety of circuits with an abundance of solar PV that could benefit from the installation of an AES. More generally, the objective of the AES program is to deploy energy storage to effectively manage the reliability of the gird. SDG&E believes that it is beneficial to its customers for SDG&E – as the distribution system operator – to own, operate, and maintain these assets and to have the operational flexibility and control that comes with ownership. Utility AES are essential in this application, to optimize system power flow specific to their area of interconnection and renewable integration. Utility AES are not necessarily driven by a specific customer or wholesale benefit (*e.g.* tariff), and instead can be dispatched for the needs of all customers, system safety and reliability, and renewable integration.

Availability and expected duration to respond when requested is critical to ensure the operation and mitigation performed by the AES asset is achieved.

In summary, the AES program, including SDG&E installing, operating, and maintaining energy storage, is primarily justified by the need to address intermittency and operational challenges associated with the variable and coincident output of renewable energy resources. ORA nevertheless asserts that SDG&E fails to meet its burden in showing that the AES program

[15] *See* Decision (D.) 14-03-004; D.15-05-051.

is cost-effective and relies upon Public Utilities Code (PUC) Section 2836.6 in its assertion.[16] ORA further asserts that the AES program would not count towards SDG&E's D.13-10-040 targets because SDG&E has exceeded its distribution-connected need.[17]

ORA's assertions, however, are incorrect insofar as they assume that all energy storage procured by a load-serving entity must be procured through D.13-10-040 and for AB 2514 purposes. Indeed, PUC Section 2836 (a)(4) specifically states otherwise: "Nothing in this section prohibits the commission's evaluation and approval of any application for funding or recovery of costs of any ongoing or new development, trialing, and testing of energy storage projects or technologies *outside of the proceeding* required by this chapter."[18] Accordingly, there is no prohibition on SDG&E proposing energy storage projects, such as the AES program, for the Commission's approval outside of D.13-10-040, nor is the Commission prohibited from approving such proposals.

Moreover, because SDG&E's AES program proposal is outside of the proceeding implementing AB 2514 and resulting in D.13-10-040, SDG&E's AES program proposal is not subject to the requirements (*e.g.* solicitation, ownership) in that decision cited by ORA. Therefore, ORA's assertions are unsupported and do not restrict the Commission's ability to review SDG&E's AES program under its own merits. Were SDG&E's AES program to be subject to the requirements of D.13-10-040, the specific purpose of the AES program proposal (facilitating the integration of renewable energy) would fall within an exception expressly noted in D.13-10-040. D.13-10-040 expressly states:

> We acknowledge that, in some instances involving distribution-connected storage, beyond distribution reliability applications, utility-owned storage may be allowable to facilitate preferred resources (*e.g.*, intermittent) and for reliability purposes outside of a competitive solicitation. Accordingly, as noted earlier, procurement of energy storage in these instances outside of a competitive solicitation can be considered on a case-by-case basis.[19]

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[16] Ex. ORA-6 (Roberts), p. 95. SDG&E notes that PUC Section 2836 et seq. implemented AB 2514, which resulted in the Decision Adopting Energy Storage Procurement Framework and Design Program (D.13-10-040.

[17] Ex. ORA-6 (Roberts), p. 96.

[18] PUC Section 2836(a)(4) (emphasis added).

[19] D.13-10-040, p. 56.

Accordingly, SDG&E here is providing the Commission an opportunity to review a program proposal that would facilitate the integration of preferred resources (in the AES program case, rooftop solar). The planned AES program is only scoped to address the few cases where there is a significant amount of renewable distributed generation relative to the circuit loading.

2. TURN

TURN takes issue with capital forecast for budget code 11247 Advanced Energy Storage. TURN states that SDG&E did not demonstrate the need for the AES project, challenging the sufficiency of SDG&E's demonstration of operational problems at the distribution level resulting from solar PV.[20] Moreover, TURN avers that SDG&E did not present alternatives to storage to help identify the most cost-effective solution.[21] TURN recommended zero funds allocated to this budget based on TURN's concerns summarized above.

SDG&E disagrees with TURN's recommendation for reasons that are similar to the points discussed in Section III.B.1, below. In addition to Mr. Colton's testimony and workpapers detailing the cost driver, providing the business justification for the AES program, and the business purpose, Section III.B.1 highlights additional benefits to install an AES system along with providing resolutions to majority of TURN's concerns.

TURN submitted a data request (DR),[22] requesting an abundance of circuit information for SDG&E's distribution system. Based on the data provided by SDG&E, TURN concluded SDG&E does not have a single circuit with reverse power flow, and therefore rejects the need. SDG&E disagrees with this conclusion. The need is not driven solely by reverse power flow, as discussed earlier. In addition, TURN's data request did not explicitly request the number of circuits with reverse flow, but rather requested a percentage that solar PV represents of the peak and minimum load. SDG&E provided data based on its interpretation of the data request. In addition, reverse power flow can occur at many locations on a circuit, not all of which have monitoring equipment. SDG&E believes that the items discussed in Section III.B.1 and

[20] Ex. TURN-01 (Borden), p. 37.

[21] Ex. TURN-01 (Borden), p. 38.

[22] Ex. TURN-SEU-DR-003, Question 44, attached as Appendix A.

clarification on the data request submitted all support SDG&E's request to fully fund the requested budget.

B. BC 14243 Borrego Springs Microgrid Enhancements

1. ORA

ORA takes issue with capital forecast for budget code 14243 Borrego Springs Microgrid Enhancements. ORA states that SDG&E's parallel requests for funding demonstrates that research, development, and demonstration (RD&D) projects should be funded exclusively from one source: EPIC.[23] ORA points out that SDG&E pursued upgrades to the Borrego Springs Microgrid "through three independent sources: EPIC, DRP, and Test Year (TY) 2016 GRC."[24] Finally, ORA states "it will be difficult to determine the final price tag for this project, which demonstrates why the CPUC required that all demonstration project should be funding through EPIC, rather than GRCs."[25]

SDG&E disagrees with ORA's position that the Borrego Microgrid project should be funded through EPIC, because EPIC funding is for RD&D purposes. SDG&E acknowledges that the initial phases of the Borrego Microgrid project were in part RD&D and were, therefore, appropriately partially funded by EPIC type funds; however, once an RD&D project does not equate to always an RD&D project. The Borrego Microgrid is now an integral part of SDG&E's distribution system. The Borrego Microgrid is required to provide safe and reliable electric service to the Borrego Springs community. The funds requested in this GRC are not for RD&D purposes; rather, they are to update the Borrego microgrid. One such update, for example, is to enhance availability and operational flexibility of the microgrid and improve power quality, which are necessary to continue providing safe and reliable electric service to the Borrego Springs community. Specifically, GRC funds were used to install an ultracapacitor and upgrade an existing energy storage system for improved voltage and frequency management, to utilize a load bank to safely test and commission the microgrid without impacting customers, and to harden cabling for the generators for increased safety. SDG&E is continuing microgrid development as microgrids defined as using DER with the capability to island a defined

[23] Ex. ORA-6 (Roberts), p. 102.

[24] Ex. ORA-6 (Roberts), p. 102.

[25] Ex. ORA-6 (Roberts), p. 103.

electrical load can vary from very basic to extremely advanced. For instance, the Borrego Springs Microgrid, which islands across multiple circuits and leverages varying utility-owned and controlled and third-party-owned and controlled resources such as solar PV, diesel generation and energy storage resources, is considered to be a tremendously advanced and complex form of microgrid. SDG&E has proven some use cases of the Borrego Microgrid operations, for example, using the diesel generators as isochronous resources, with energy storage to support varying load conditions to seamlessly transition from parallel to island and back to parallel. SDG&E continues to investigate more complex use cases, such as controlling a third party solar PV system as part of the microgrid, or using the energy storage as the isochronous resource, thus limiting the amount of diesel generation required to operate the microgrid in island mode. Therefore, while some aspects of our microgrids may be advanced or R&D, in other respects SDG&E's microgrids are more properly considered as being in commercial service.

SDG&E did, in fact, pursue funding for the Borrego Microgrid Enhancements through the three sources listed by ORA. These are separate and distinct from the funding being requested in the GRC. The RD&D funds are to develop and test automated microgrid controls, including the integration of a third-party renewable energy system and data analysis, which falls under RD&D. The funds proposed in the GRC are required to safely and reliably operate the existing microgrid, as previously stated.

Regarding ORA's reference to SDG&E requesting funds for Borrego Microgrid within the DRP proceeding, SDG&E acknowledges that the Commission approved SDG&E utilizing the existing microgrid at SDG&E's Borrego Substation for its DRP Demonstration Project E, and that the Commission authorized SDG&E recovery of incremental costs associated with that demonstration. However, ORA is incorrect in suggesting that any of the requested and/or authorized Demonstration Project E funds were to "pursue upgrades to the Borrego Springs Microgrid."[26] As stated and referenced in the Commission's Decision, D.17-02-007, SDG&E requested and was authorized $550,000 of incremental costs associated with Demonstration Project E, and these costs were identified as associated with design & engineering ($330,000) and data analysis and results ($220,000). Also of importance is that by no means should one

[26] Ex. ORA-6 (Roberts), p. 103.

unfamiliar with the DRP demonstration projects incorrectly assume that the word "demonstration" in this context automatically equates to research and development-type projects. While the Commission approved some of the DRP demonstration projects based in part on EPIC sourced funding for those projects, the Commission also approved DRP demonstration projects that were identified as not utilizing EPIC funds and being required to ensure the ability to provide safe and reliable services equivalent to a utility's traditional infrastructure investment; the Borrego Springs Microgrid project falls under this category.

SDG&E has spent $13,052,000 as part of RD&D efforts, $16,413,000 in capital, and $550,000 through the DRP towards the Borrego Springs Microgrid. Table 1, below, provides more detail on how this money was spent.

Table 1. Summary of Borrego Springs Microgrid Spending

Funding Source	Dollar Amount ($000)			Description
	RD&D		GRC	
	Federal	State		
Borrego 1.0	6,098	2,808		Microgrid Demonstration and Energy Storage
			10,346	SDG&E Contribution
Borrego 2.0		4,146		Develop an advanced microgrid controller with remote capability, integrate with 3rd Party DER and evaluate the microgrid controller with NREL
			6,067	Frequency/voltage ride-through, energy storage, commissioning and training, seamless island transition, generator enhancements, electric OH hardening and field automation
DRP Demo E			550	Power quality monitoring for continuous microgrid operation optimization, specific studies on harmonics, load flow, short circuit balance of energy and power, arc flash and stability, and customer outreach/focus groups.

C. BC 16243 Microgrid for Energy Resilience

1. ORA

ORA takes issue with capital forecast for budget code 16243 Microgrid for Energy Resilience. ORA infers that the budget request is duplicative to the AES program[27] and AB 2868 investments.[28] Separately, ORA calls out SDG&E's request to continue microgrid development work in Borrego 3.0, as contradictory to our statement that SDG&E has "demonstrated that microgrids can provide additional reliability and operational flexibility, and would allow system operators to incorporate renewable energy"[29] and, that finally, our proposal to deploy microgrids as a developed solution is "not in sync with CEC efforts to develop a 'Roadmap for Commercializing Microgrids in California."[30]

SDG&E does not believe that the issues raised by ORA justify eliminating SDG&E's requested funding. AB 2868 directs SDG&E to "file applications for programs and investments to accelerate widespread deployment of distributed energy storage systems" and "prioritize programs and investments toward public sector and low-income customers." SDG&E's AB 2868 application focuses on investing in energy storage to provide back-up power to public critical agencies like Cal Fire, local sheriff departments, water pumping stations, and emergency shelters. SDG&E's GRC request is not duplicative to AB 2868 because SDG&E AB 2868 application has not been approved, and its specific outcome cannot be determined now. Moreover, SDG&E's AB 2868 application, if approved in its current form, is incremental to the need to provide energy storage-based utility microgrids in SDG&E fire prone areas. During potential fire threats, SDG&E must shutdown transmission lines that power backcountry communities. The microgrid projects intended for energy resilience will help ensure that customers, not only public sector and low-income customers, receive resilience benefits. Separately, the microgrid for energy resilience is distinct from the AES program. The AES program is aimed at deploying energy storage to smooth out intermittency because of high solar

[27] Ex. ORA-6 (Roberts), p. 105.

[28] Ex. ORA-6 (Roberts), p. 106.

[29] Ex. ORA-6 (Roberts), pp. 105-106.

[30] Ex. ORA-6 (Roberts), p. 106.

PV penetration on circuits to maintain and/or enhance reliability and not to provide microgrid resiliency benefits for customers located out in the backcountry and other wildfire prone areas.

Nor has SDG&E contradicted itself concerning the Borrego Microgrid project. Rather, SDG&E has, in fact, demonstrated that utility microgrids can provide a vital service, supplemental reliability, resiliency and operational flexibility, allowing utilities to better incorporate renewable energy onto the distribution system.

SDG&E's request to deploy utility microgrids for energy resiliency furthers the deployment of technology in support of the safe and reliable operation of the distribution grid.

2. TURN

TURN claims, "SDG&E hasn't even attempted to demonstrate why or how the requested funds are necessary or will result in ratepayer benefits that outweigh the costs of the project."[31] TURN also alleges that SDG&E does not provide cost effectiveness analysis for Microgrid for Energy Resilience "that demonstrates the project is a) the least-cost option and b) if not the least-cost option, that benefits outweigh the costs."[32]

SDG&E disagrees. Microgrid for Energy Resilience projects will provide backup power to customers that would otherwise be disconnected from service during times of wildfire risks. The benefits of maintaining basic energy service to customers in a safe manner, particularly in regions that typically endure high temperatures, is critically important. Microgrid for Energy Resilience projects will provide backup power to customers that would otherwise be disconnected from service during times of wildfire risks. Additionally, SDG&E will deploy this energy storage in a way that maximizes grid benefits for all customers. Therefore, in SDG&E's view, the costs are reasonable for the benefits to SDG&E's customers from the capabilities these resources will provide.

D. BC 17244A Volt/Var Optimization Transformer

1. ORA

ORA takes issue with capital forecast for budget code 17244A Volt/Var Optimization Transformer. ORA states that the program is based on specialized equipment from a "defunct

[31] Ex. TURN-01 (Borden), p. 23.

[32] Ex. TURN-01 (Borden), p. 24.

manufacturer" and that consequently, additional investments should be suspended until alternative equipment is available.[33]

SDG&E disagrees with that statement. Gridco Systems has ceased operation; however, SDG&E has deployed 35 of these regulation devices in the field and has 26 devices in inventory. Most of the remaining devices in inventory are being considered for installation at locations where they are the most cost-effective solution to resolve a localized secondary voltage issue and, potentially improve energy efficiency, as stated in Mr. Colton's testimony. These devices are also being considered as a possible solution for situations where high penetration of DERs (rooftop solar) and/or electric vehicles on a circuit results in voltage issues on the secondary.

Even though the vendor has ceased operation, SDG&E is aware of other manufacturers actively considering acquiring the intellectual properties of the devices to continue with this technology commercialization. SDG&E has also been in contact with other companies capable of providing a similar technology. Some of these companies are detailed in the article provided by ORA in their data request submittal Ex. ORA-SDG&E-164-TCR. In my experience, it is not uncommon to have vendor fluctuations during any stage of any technology as specialized equipment is based on supply and demand. With SDG&E being one of the leaders in high solar PV penetration and the demand for this type of technology being limited, SDG&E foresees additional value pursuing this technology to potentially mitigate secondary voltage issues and possibly providing expertise to other utilities as well as potentially reduce any systematic issues from spreading.

E. BC 17246 Borrego Microgrid 3.0

1. ORA

ORA takes issue with SDG&E's capital forecast for budget code 17246 Borrego Microgrid 3.0. ORA states that SDG&E's summary of Borrego Microgrid 3.0 is insufficient because it does not provide a history of microgrids and Borrego or an explanation of how this project relates to Borrego Microgrid 2.0.[34] Specifically, ORA claims that SDG&E's forecast budget of $5,439K is not supported by findings from previous development work that demonstrates a need for this round of upgrades, nor that the level of solar and storage density is

[33] Ex. ORA-6 (Roberts), p. 107.

[34] Ex. ORA-6 (Roberts), p. 99.

feasible on a system wide basis.[35] Moreover, ORA claims SDG&E has not explained why the current amount of DER in Borrego is lacking, and how a microgrid with more solar PV is technically or economically feasible as a model for system-wide deployment.[36] ORA rejects SDG&E's request for 12 MW of solar PV and 150 MWh of storage as an attempt to bypass and expand the DRP Demo E cost cap without filing the required Tier 3 AL.[37] ORA interjects that SDG&E states that this is an ongoing project that is expected to continue through the test year, despite including $0 forecast for 2019.[38]

SDG&E disagrees. Today, SDG&E's Electric Operations relies on the Borrego Springs microgrid as an operational tool to mitigate outages in Borrego Springs. Upon completion of the EPIC Project EPC-14-060, this will cease to be a R&D funded program even though the assets will be in the field and serving as components of SDG&E's electric system. The existing backup diesel generation, which is a main resource of the Borrego Springs microgrid, requires frequent maintenance and repairs. Long term availability of the diesel generators is questionable and puts the microgrid capabilities at risk. The existing 1.5 MW/4.5 MWh of energy storage is insufficient. Temperatures can be above 100°F beyond daylight hours therefore and more storage is needed to allow the microgrid to operate for extended periods. A long-term and more sustainable solution is required.

Through the demonstration projects, Borrego 1.0 and 2.0, SDG&E has demonstrated microgrid and islanding success. However, SDG&E has learned that the existing assets are not sufficient for a production environment, with evolving operational needs. Borrego 3.0 will add 12 MW_{ac} of solar generation and 30 MW, 150 MWh of energy storage to the Borrego microgrid yard. The additional DER will create a renewable-based microgrid that can island for more extended periods on solar generation resources. It builds off the R&D efforts of Borrego 2.0, which integrated third party's 26 MW_{ac} solar array into the microgrid, but diesel generators are still required for microgrid operations, due to insufficient amounts of energy storage relative to the amount of solar on the circuits. That said, there has been and continue to be issues with

[35] Ex. ORA-6 (Roberts), p. 104.

[36] Ex. ORA-6 (Roberts), p. 104.

[37] Ex. ORA-6 (Roberts), p. 104.

[38] Ex. ORA-6 (Roberts), p. 104.

utilizing the third-party resources. For instance, even though the third-party facility owner has acquiesced to some of SDG&E's requests to be a participant in the microgrid, the process continues to be arduous and error prone because of the lack of operational control and limited system information. In addition, by coupling utility owned solar with storage it will allow SDG&E to take advantage of Federal Tax Credits, which will reduce the overall solution cost to ratepayers.

The solar and storage proposed in Borrego 3.0 will ensure operational success and is sized to the meet long term energy needs of the Borrego Springs community. Borrego 3.0 will build on what has already been installed through Borrego 1.0 and 2.0, including infrastructure, assets and control systems, and will provide enhanced reliability, safety and renewable integration to the 2,800 customers that reside in Borrego Springs. SDG&E's forecast of $5,439K for this project will initiate the land acquisition process and the engineering and planning to build the expansion to the current Borrego Microgrid. SDG&E will continue to apply for grants to cover the costs of the proposed distributed energy as part of Borrego 3.0.

ORA's statement that SDG&E's request for this project represents an attempt to bypass the DRP cost cap is incorrect and unfounded. SDG&E's proposal to "use an existing microgrid at its Borrego Substation" for its DRP Demonstration Project E was approved without modification by the Commission. This effort will be completed by Q3 2018. It involves performing and reporting on performance tests utilizing the existing microgrid, and has a cost cap of $550,000 in incremental costs: $330,000 associated with design & engineering and $220,000 associated with data analysis and results. Simply put, SDG&E is not expanding the scope of Demonstration Project E. Therefore, ORA's statement that funds requested for Borrego Microgrid 3.0 should be requested via a Tier 3 advice letter filed within the DRP proceeding is incorrect.

The equipment identified to be installed as part of Borrego Microgrid 3.0 and the associated request for funding is in no manner associated with any aspect of SDG&E's DRP Demonstration Project E. ORA provided no support for their statement that Borrego Microgrid 3.0 represents an expansion of the DRP Demonstration Project E. At bottom, these are two different activities. In SDG&E's view, ORA is attempting to rely on their common name to create the appearance of these two activities being a single project in order to support denying

SDG&E's funding request. SDG&E believes ORA's effort should be rejected and, instead, SDG&E should receive the funding it requested.

F. BC 14860A DERMS

1. ORA

ORA takes issue with the capital forecast for budget code 14860A DERMS. ORA expresses support in concept for the DERMS program, but alleges that SDG&E has not provided sufficient support for this request.[39] Furthermore, ORA points out that no prior DERMS requests are mentioned and, subsequently, that the adjusted recorded costs for all years are shown as zero,[40] compared to previous testimony from SDG&E's TY 2012, which states that the total estimated expenditures for DERMS in the 2012-2016 period is ~$57.4 million.[41] ORA goes on to say that SDG&E's application does not explain how this project relates to past funding for DERMS approved in prior GRCs and provides no indication of the total cost to develop and deploy DERMS. More generally, ORA criticizes the adequacy of the showing in SDG&E's application concerning the development status of the DERMS system, its objectives, and how the system supports those objectives.[42] ORA states that "SDG&E's justification for the project appears to be the creation of a DER market rather than enabling cost effective DER."[43] ORA concludes that they can only support a specific deployment of DERMS once it has been considered sufficiently mature to deploy.[44] Separately, the scope of the program, its objectives, and total estimated costs beyond the TY 2016 GRC must be provided.[45]

SDG&E disagrees with ORA. In response to an ORA data request, SDG&E provided a substantial amount of detail about the DERMS project – including development status, scope, objectives, and total estimated costs across rate cases.[46]

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[39] Ex. ORA-6 (Roberts), p. 4.

[40] Ex. ORA-6 (Roberts), p. 108-109.

[41] Ex. ORA-6 (Roberts), p. 109.

[42] Ex. ORA-6 (Roberts), p. 108.

[43] Ex. ORA-6 (Roberts), p. 113.

[44] Ex. ORA-6 (Roberts), p. 114.

[45] Ex. ORA-6 (Roberts), p. 114.

[46] Ex. ORA-SDG&E-DR-178-TCR, Questions 1, 3, 7, attached as Appendix A.

The DERMS project, included in the direct testimony of Chris Olmstead, is not a new program. The business objectives in Mr. Olmstead's testimony and copied below, are the same business objectives included in the original 2013 Work Order Authorization (WOA) for the DERMS project:

> The development of a DERMS solution that is capable of monitoring, optimizing, and dispatching DER connected at the distribution and transmission system levels. This solution acts as a primary enterprise-wide solution integrated with the OMS and DMS.[47]

The version of DERMS that is currently deployed and in use by SDG&E is a continuation of the DERMS project that was funded through prior GRCs. Since 2014, SDG&E has continually worked with the DERMS software vendor to develop additional functionality and implement product enhancements from one release to the next. DERMS is currently capable of monitoring and dispatching DER in real-time, and scheduling operations at future dates for automatic dispatch. DERMS is being used to monitor and control the Borrego Microgrid, the Carmel Valley energy storage system, and the Ortega energy storage system. Additionally, DERMS is capable of real-time optimization of DER operations to meet specified business objectives. All this functionality is in line with the original WOA and the objectives described in testimony of Mr. Olmstead.[48]

SDG&E provided a description of the status of the DERMS system upgrades in response to ORA's data request, also copied below:

a) Release 2.4.9 of Wave is in production in the datacenter – applicable to two battery storage systems.

b) Release 2.4.10 of Wave is in production at the datacenter and in Borrego Springs – applicable to the Borrego Springs Microgrid.

c) SDG&E is currently testing release 4.2 prior to a planned 2018 deployment.

[47] October 2017, Capital Workpapers to Prepared Direct Testimony of Christopher R. Olmsted on Behalf of San Diego Gas & Electric Company, Ex. SDG&E-24-CWP, p. 474.

[48] Ex. SDG&E-24-CWP (Olmsted), p. 474.

d) SDG&E and [DERMS vendor] are continuing to develop future releases to complete scope.[49]

Additionally, in response to ORA's request for objectives, scope and schedule of DERMS development and deployment, SDG&E provided a DERMS product release schedule and description of key functionality included with each release to provide an overview of the work completed, in progress, and planned for the future.[50]

SDG&E disclosed the DERMS project expenditures by year—all charged to budget code 14860 – as part of the same ORA data request:

a) 2013: $127,613 ($128,503 w/AFUDC)
b) 2014: $4,906,032 ($5,104,466 w/AFUDC)
c) 2015: $3,072,211 ($3,575,615 w/AFUCD)
d) 2016: $2,341,844 ($3,127,120 w/AFUDC)
e) 2017: $2,261,423 ($2,836,273 w/AFUDC)
f) 2018 (through Feb): $247,063 ($259,742 w/AFUDC)[51]

At the time the 2012 testimony was filed, SDG&E expected the first major release of DERMS to be in 2015, and total DERMS expenditures from 2012-2016 were estimated at $57.5 million. However, the DERMS project scope and schedule was further refined in 2013, after issuing an RFI for DERMS, selecting a DERMS vendor, and ultimately, signing a contract with the DERMS vendor in March 2014. SDG&E approved a December 2013 WOA, for $20,506,443, with forecasted spending in 2013, 2014, and 2015. This cost forecast and schedule was revised from $57.5 million to $20.5 million after negotiations with the DERMS vendor, including functionality to be included in DERMS, types and locations of SDG&E's DER within the DERMS scope, and estimated schedule to develop, test, and deploy the DERMS product. After the initial product release and deployment in 2014, SDG&E and the DERMS vendor recognized the need to adjust the DERMS release schedule, resulting in a longer development time to deliver the agreed upon scope and within the approved budget amount. SDG&E updated its DERMS deployment in 2016, followed by the first major release of DERMS in 2017, which

[49] Ex. ORA-SDG&E-DR-178-TCR, Question 3, attached as Appendix A.

[50] Ex. ORA-SDG&E-DR-178-TCR, Question 1, attached as Appendix A.

[51] Ex. ORA-SDG&E-DR-178-TCR, Question 7, attached as Appendix A.

included the Microgrid and Advanced Energy Storage Applications. The next major release is expected in 2018.

SDG&E's forecasts for DERMS in 2018 and 2019 are scoped to:

- Develop and test additional DERMS functionality required to successfully operate dual use batteries, meaning the energy storage can be bid into the CAISO market and can be operated for grid resiliency,
- Deploy the new DERMS functionality to existing energy storage assets, and
- Integrate the DERMS application with SDG&E's OMS/DMS used by Electric Distribution Operations.

Despite SDG&E's work to advance its current DERMS, the DERMS product is mature enough to deploy at multiple sites and is currently operational.

SDG&E is not creating a DER market. SDG&E abides by PUC section 769 in that the DERMS project provides a solution to the challenge of coordinating operations of DER on the distribution system, increasing the locational benefits by enabling remote operations to be scheduled in advance or operated in real time and, therefore, maximizing benefits of DER.

G. BC 11246 Smart Transformers, BC 14259B Vanadium Flow Battery Project, BC 17245 ITF-Integrated Test Facility Improvements

1. ORA

ORA recommends reducing the budgets for three of SDG&E's projects, specifically budget code 11246 Smart Transformers, budget code 14259B Vanadium Flow Battery Project, and budget code 17245 ITF-Integrated Test Facility Improvements without providing any discussion, analysis or justifications. SDG&E disagrees with ORA's recommended reductions because ORA provides no basis for the budget reductions. SDG&E stands by the original requests for these three projects as described in Alan Colton's revised direct testimony.[52]

IV. CONCLUSION

To summarize, this testimony outlined how SDG&E's DER projects proposed in the TY GRC 2019 will serve distinct needs on the distribution system and are not in conflict with or duplicative to other CPUC initiatives and proceedings. Moreover, the testimony herein describes

[52] Ex. SDG&E-14-R (Colton).

how SDG&E's DER projects will be deployed in a manner that is focused on maximizing benefits to its customers. SDG&E is committed to clean, safe, and reliable energy and has proposed these DER projects to meet both the company's goals, and California's low carbon policy.

This concludes my prepared rebuttal testimony.

V. WITNESS QUALIFICATIONS

My name is Ted Reguly. I assumed sponsorship of this testimony area from Alan F. Colton. My business address is 8690 Balboa Ave., San Diego, CA 92123-6507. My title is Director of Growth & Technology Integration.

I am currently the director of Growth and Technology Integration at SDG&E. My previous director positions were at Sempra Renewables Operations, SDG&E's Substation and Transmission Operations and Maintenance, Customer Programs, Smart Meter, and Customer Services Organizations. I am a registered California Mechanical Engineer and hold a Bachelor of Science degree in Mechanical Engineering from California State, Long Beach and a Master of Business Administration with an emphasis in Finance from San Diego State University.

I have previously testified before the Commission.

APPENDIX A
ORA-SDGE-178-TCR
TURN-SEU-03

APPENDIX A

ERRATA AND DISCOVERY RESPONSES

ORA-SDGE-178

1. Provide existing SDG&E documents that describe the objectives, scope (in terms of the geographic deployment, and any excluded regions in SDG&E service territory), and schedule of DERMS development and deployment. If SDG&E does not have existing documents, explain why and provide a narrative response to this question.

SDG&E Response 01:

See the accompanying files, "ORA-SDGE-178-TCR Overview – Key Aspects of DERMS.pdf", "ORA-SDGE-178-SDG&E DER Roadmap.pdf", "ORA-SDGE-178-TCR-DERMS - Business Case.pdf" and "ORA-SDGE-178-Wave Project Release Schedule.pdf".

3. Describe the current status of DERMS development and deployment at SDG&E.

SDG&E Response 03

Release 2.4.9 of Wave is in production in the SDG&E datacenter which is applicable to two battery storage systems. Release 2.4.10 of Wave is in production at the datacenter and in Borrego Springs – applicable to the Borrego Springs Microgrid. SDG&E is currently testing release 4.2 prior to a planned 2018 deployment. SDG&E and the vendor, Spirae LLC, are continuing to develop future releases to complete the project scope.

7. Provide SDG&E's annual recorded expenditures, by year, for DERMS development and deployment. Provide these expenditures per the budget code to which they were recorded.

SDG&E Response 07:

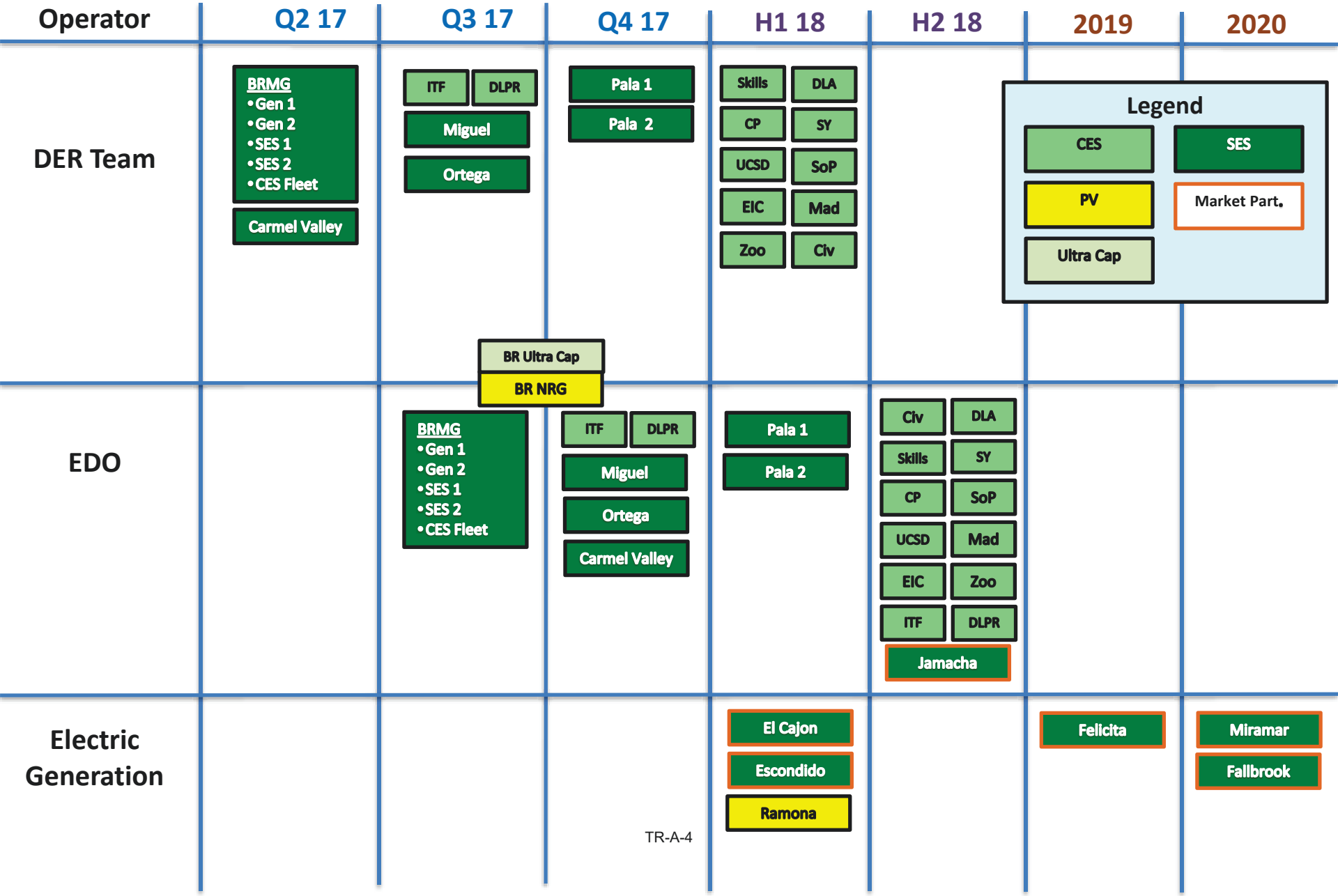
Expenditures were recorded from budget 14860, in nominal dollars.

2013: $127,613 ($128,503 w/AFUDC)
2014: $4,906,032 ($5,104,466 w/AFUDC)
2015: $3,072,211 ($3,575,615 w/AFUCD)
2016: $2,341,844 ($3,127,120 w/AFUDC)
2017: $2,261,423 ($2,836,273 w/AFUDC)

Overview – Key Aspects of DERMS

- A system capable of monitoring, optimizing, and dispatching DER over multiple time horizons (day ahead, hourly, 15 minute).
- Creates the ability for SDG&E to manage rapid growth in utility, 3rd party and customer-owned DER systems of various types.
- Interacts with microgrids & other DER controllers as well as future Demand Response Management Systems (DRMS) to balance generation and load within a geographical area or electrical subsystem.
- Uses load forecasting, day-ahead price signals, demand programs (DRMS), etc. providing multiple options for optimization and scenario-based operations.
- Enables microgrid controllers to interact with DRMS to balance generation and load within a geographical area.
- Primary enterprise-wide solution for current and future microgrids.
- Integrates with OMS/DMS, GIS, Distribution SCADA, CAISO, third party aggregators, and other systems.
- Supports SDG&E's long term strategy to implement unbundled rates and price-driven system management.

SDG&E DER Roadmap –REVISED (JUNE 2017)—Timeline for DERMS Integration



Distributed Energy Resource Management Solution (DERMS) and Microgrid Controller (MGC) Business Case

Smart Grid Management Team

July 1, 2013

Agenda

- Overview
- Drivers
- Budget
- Benefits
- Summary

Agenda

- **Overview**
- Drivers
- Budget
- Benefits
- Summary

Overview – DERMS Wears Many Hats

- Grid Optimizer
  - Coordinates conventional grid assets (capacitors, LTCs, etc) and DER
  - Optimizes operations based on current network topology

- DER Aggregator (Virtual Power Plant)
  - Real-time monitoring and control for DER
  - Provides DMS appropriately aggregated view of DER

- Market Enabler
  - Provides market signals to DER

Overview – Key Aspects of DERMS

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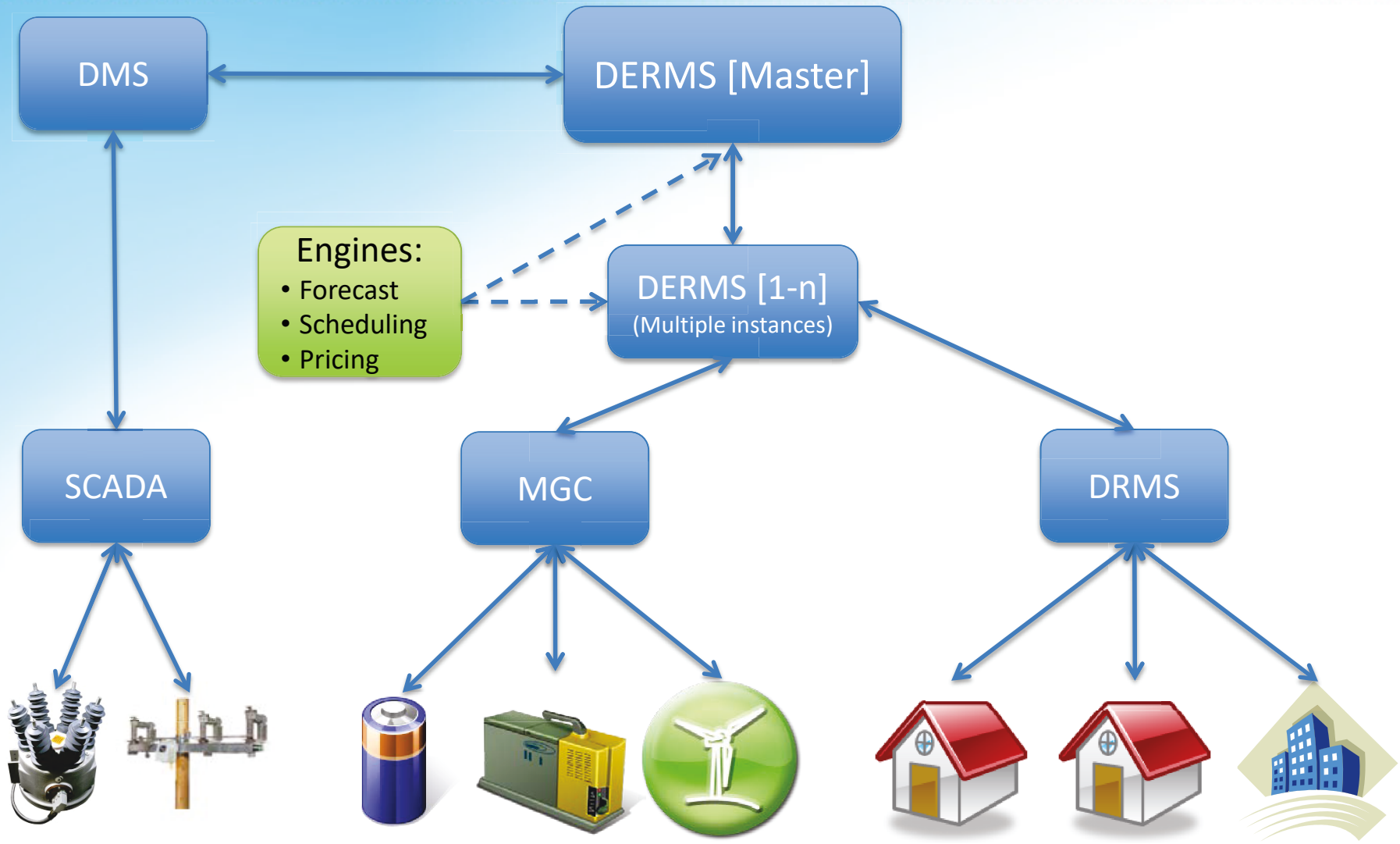
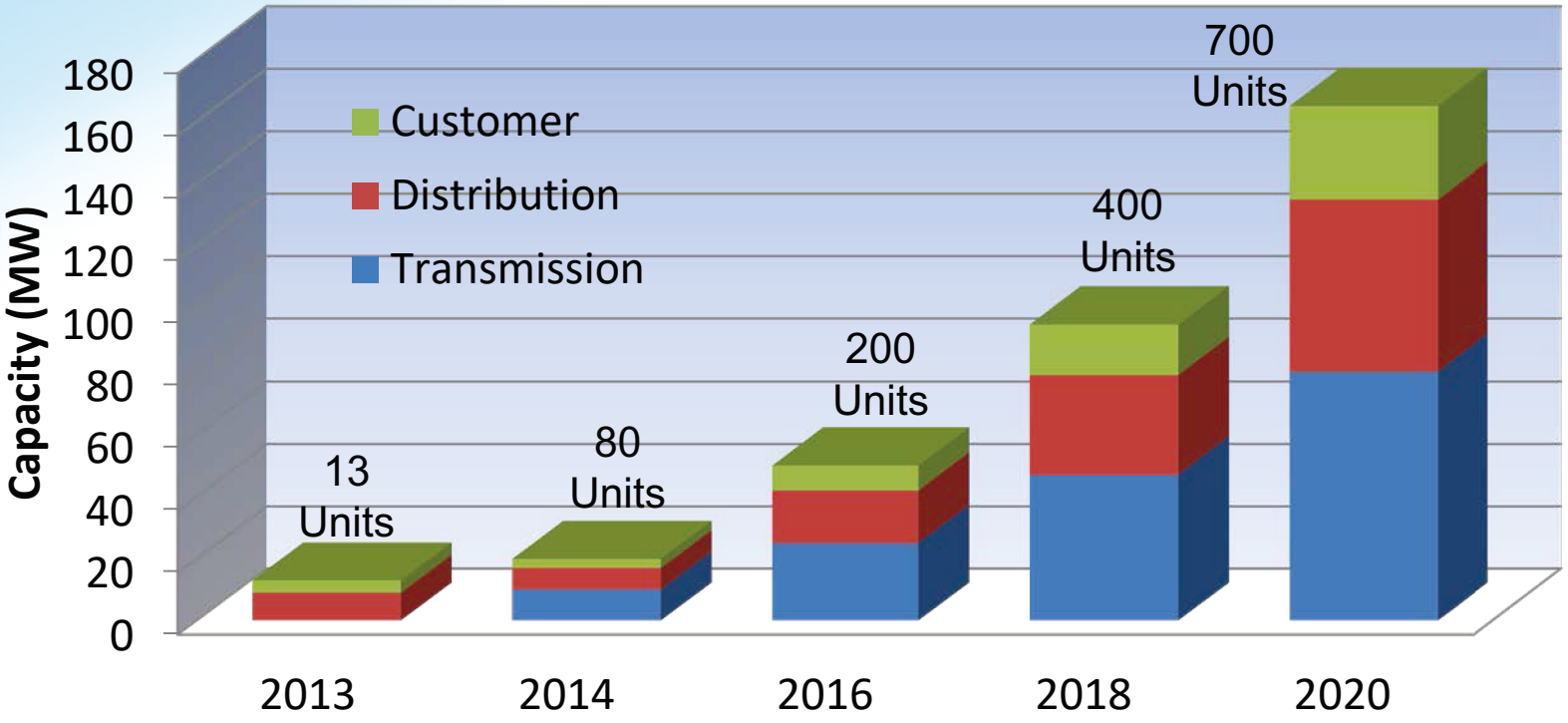
- Primary enterprise-wide solution for current and future microgrids.
- Integrates with OMS/DMS, GIS, Distribution SCADA, CAISO, third party aggregators, and other systems.
- Supports SDG&E's long term strategy to implement unbundled rates and price-driven system management.

Overview – Distributed Control Hierarchy



- Overview
- **Drivers**
- Budget
- Benefits
- Summary

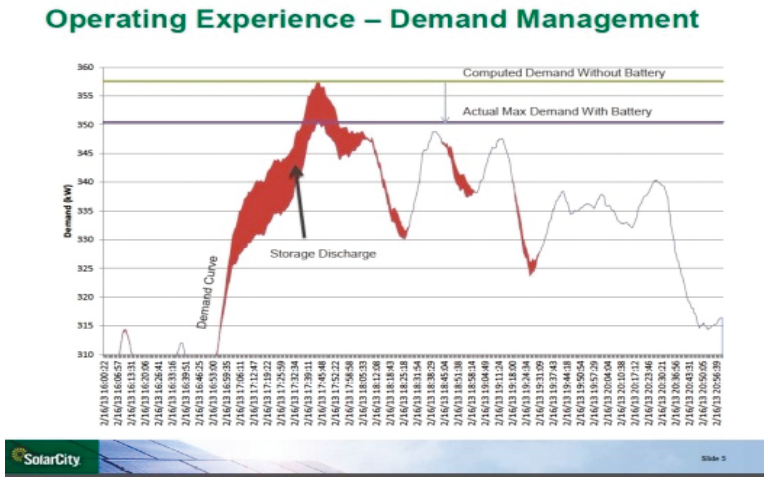
Drivers – Growth in Advanced Energy Storage (AES)



TR-A-12

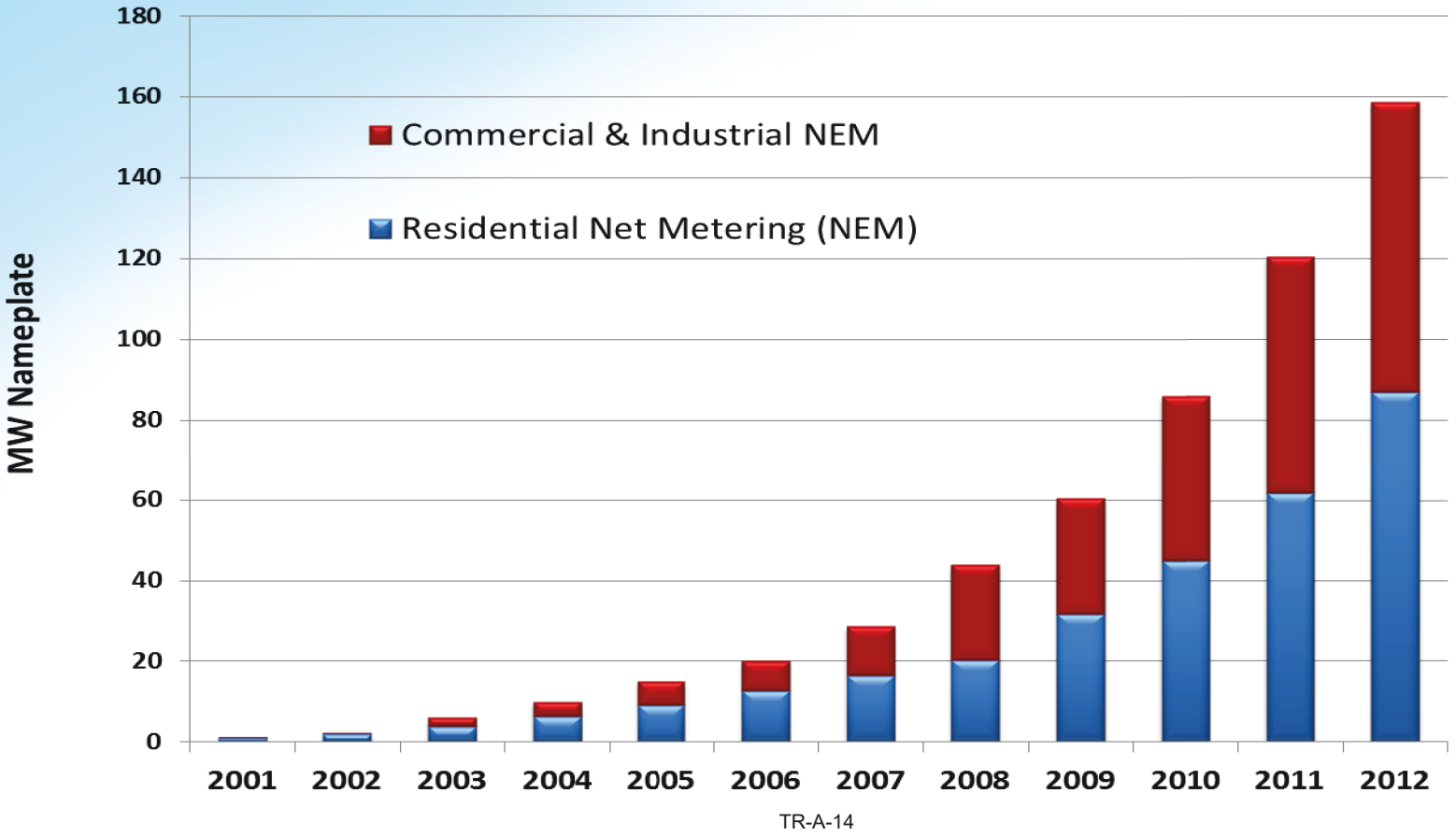
Drivers – Developing Customer Side DER Markets

- Customer devices will require some type of control (pricing or other) from the utility
- Third Parties such as STEM and Solar City are already leveraging storage to reduce energy bills
  - Targeting Demand Charges by peak shaving
  - Investigating leveraging same storage for Demand Response for increased profits



Drivers – Growth in Commercial/Residential Solar Generation

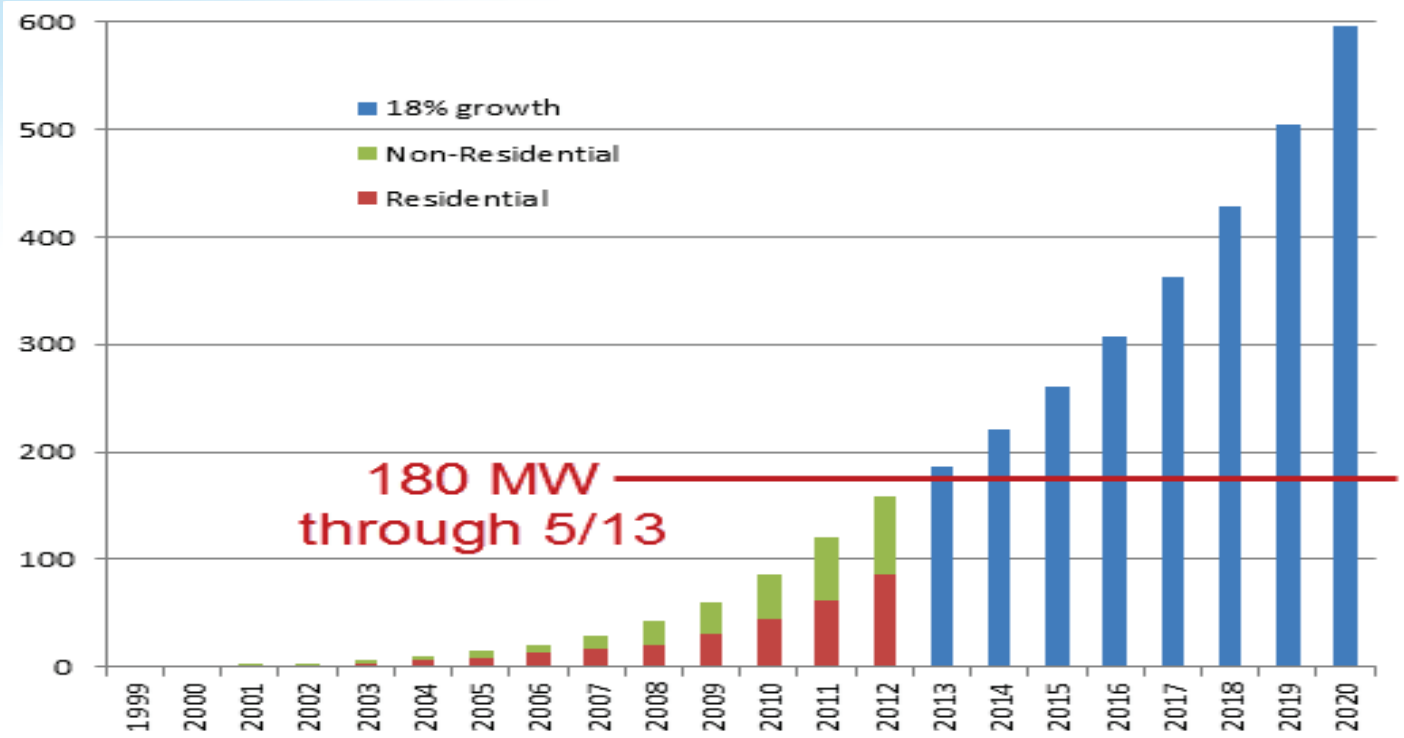
- NEM production "hides" load
- Ability to create voltage issues and excess equipment operations



TR-A-14

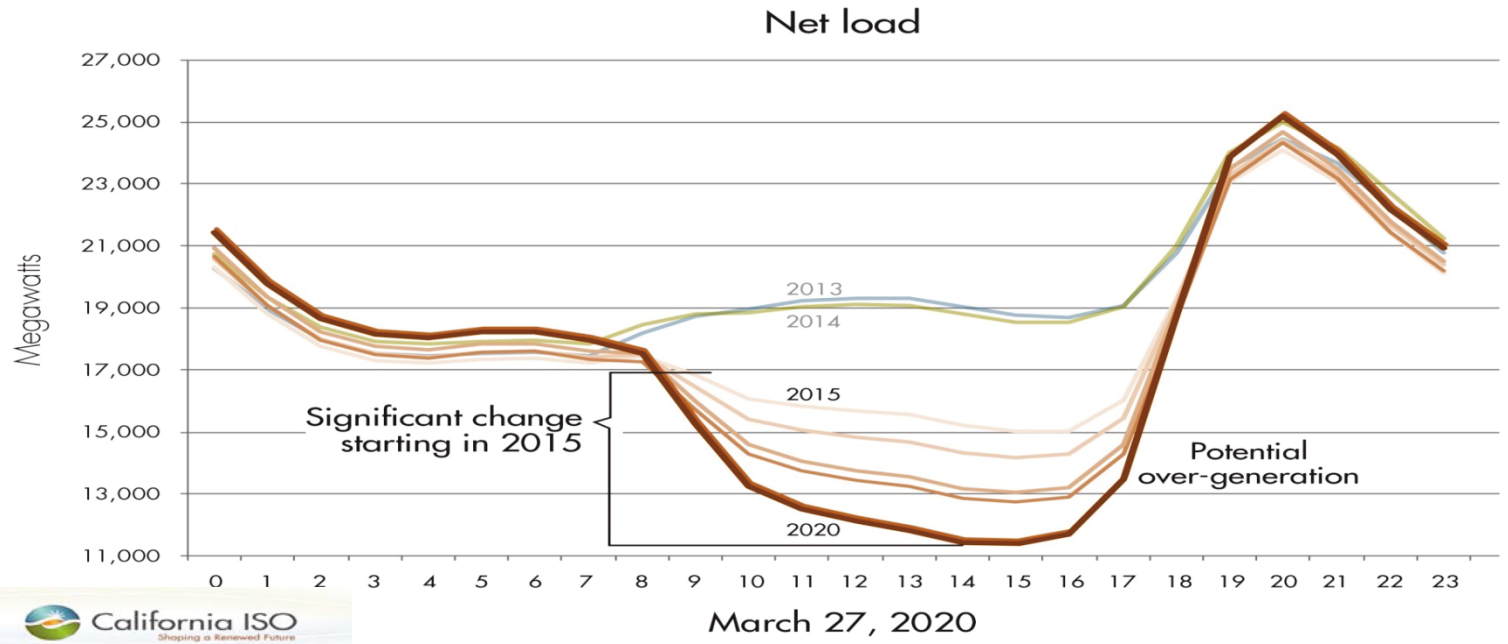
Drivers – Fast Forward to 2020

- Rule 21 is being revisited to consider requiring "smart" inverter functionality
- Smart Inverters have the ability to respond to control signals from the utility



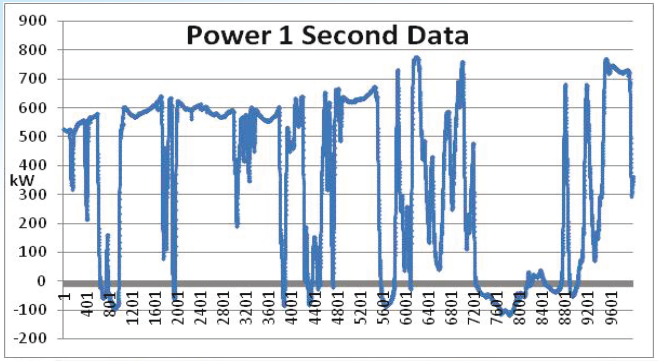
TR-A-15

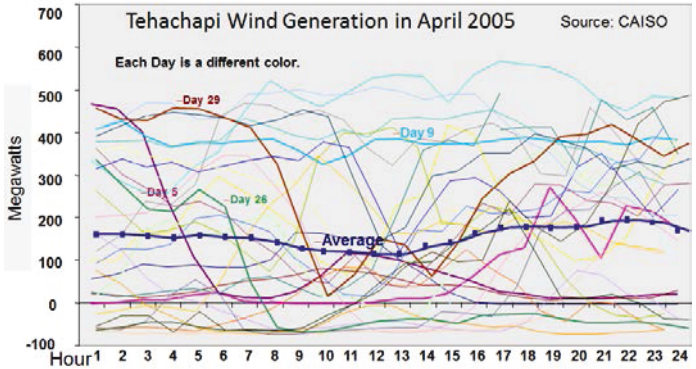
- Significant ramping will be required in both AM and PM to accommodate renewable production
- Governor has a plan for 12 GW of DER (> 1 GW for SDG&E)
- Coordinated operation of various DER can help reduce requirements

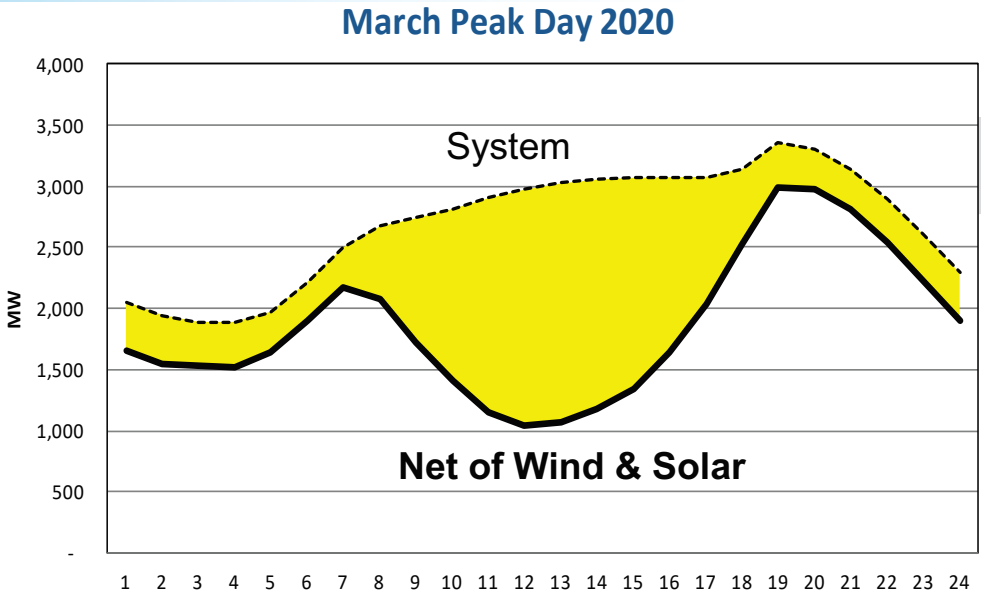


TR-A-16

- Advanced forecasting capabilities for dispatching DER
- Distributed controls for smoothing spikes





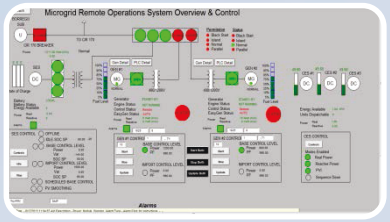


2020 Installed Capacity

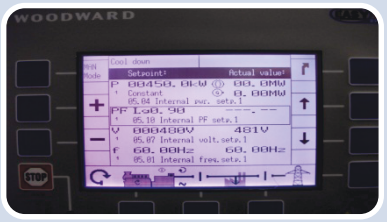
MONTH	SOLAR DG (MW)	SOLAR Central (MW)	WIND (MW)
Mar	600	1250	725

TR-A-17

Drivers –
Managing DER today is very labor intensive

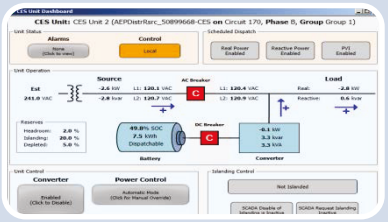


Microgrid Controls



Woodward controls for generators

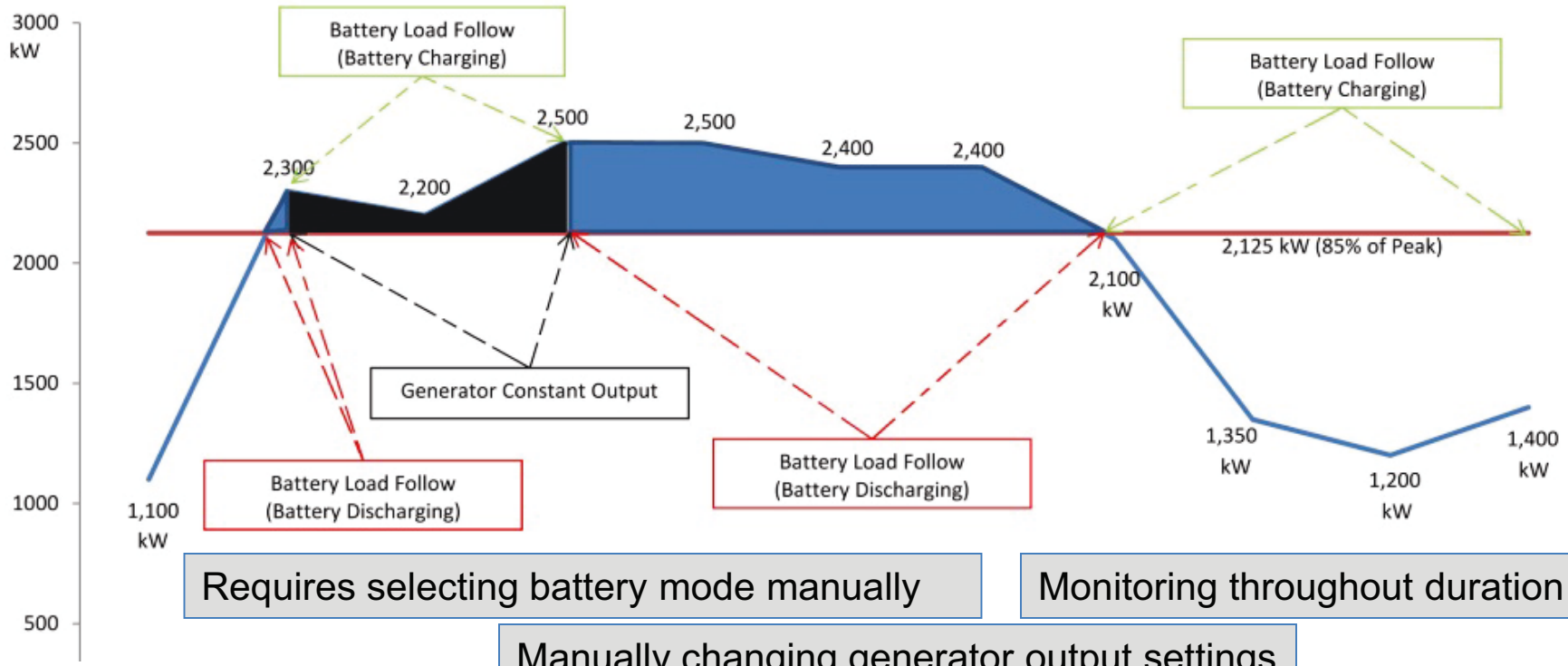
Saft SES unit



S&C CES units

Drivers – Today's DER Operations are Labor Intensive

Generator		DG-CO SES-LF (Peak Shave) 104								DG-CO SES-LF (Peak Shave) 104		
SES	SES Load Follow (Peak Shave) 48											
	Discharge	Charge		Discharge						Charge		Discharge
	Generator Operation Allowed			No Generator Operation Allowed						Generator Operation Allowed		
Time	22:00	23:00	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00



Requires selecting battery mode manually

Monitoring throughout duration

Manually changing generator output settings

- Overview
- Drivers
- Budget
- **Benefits**
- Summary

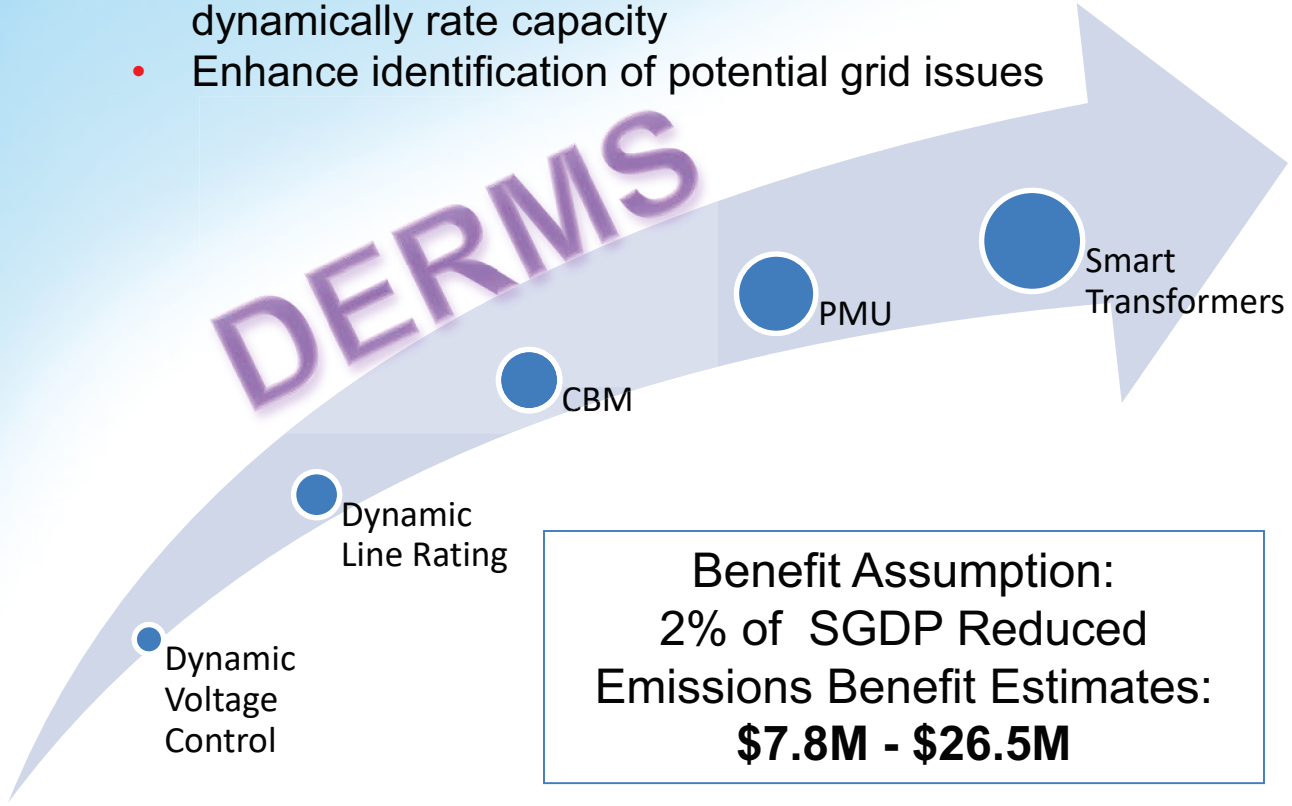
Benefits – Stakeholder Identified Benefits

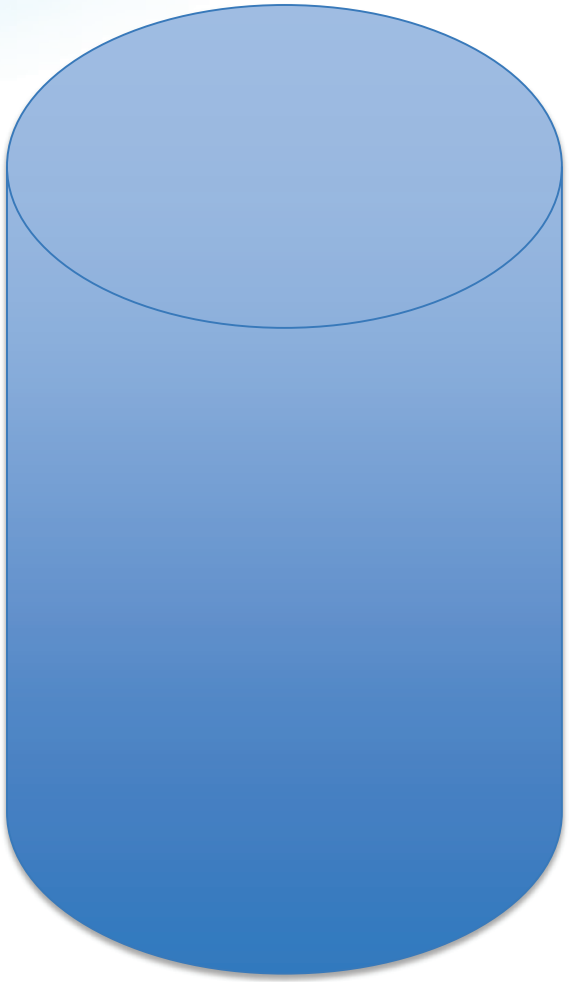
Category	Reliability	Reduced O&M	Deferred Capital Investment	Safety	Direct Customer Benefit	Economic Optimization	Environmental
Reduced Outages to End Customers (MAIFI, SAIFI, etc.)	X	X			X		X
Improved Equipment Monitoring		X	X	X			X
Enhanced Power Quality Mgmt - Volt/Var/Freq/Pwr Fact	X	X	X		X	X	X
Support Fine-Grained Peak Shaving	X		X		X	X	X
Improved Load Forecasting at Circuit Level and Below	X					X	X
Enhanced Voltage Conservation Management	X					X	X
Aggregation of DER Into a Larger Virtual Resource					X	X	X
Support Market Participation / Arbitrage					X	X	
Extends Platform for Other Systems (ADMS, GIS, DRMS, etc.)				X		X	
Minimization of Upstream Stress on Transmission System	X	X	X				
Deferred Investments in Sub and Dist System Upgrades			X				
Support Higher Renewable penetration on Existing Circuits	X						X
Reduced Wear and Tear on Existing Assets (e.g. tap changer)	X	X	X				
Reduce Instances of Fires Through Equipment Monitoring	X			X			

TR-A-21

Benefits – SGDP Societal / Environmental

- Smooth voltage fluctuation from high PV penetration on circuits
- Monitor line capacity, ground clearance and performance during high load conditions
- Monitor substation transformer condition to dynamically rate capacity
- Enhance identification of potential grid issues





Benefit Assumption:
2% of SGDP Reduced Emissions Benefit Estimates:
$7.8M - $26.5M

TR-A-22

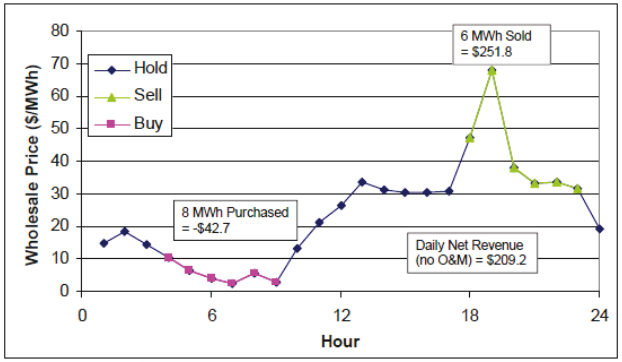
Benefits – SGDP Economic / Reliability

	Benefit Category	Low	High
8.4.2	Renewable Growth	$445	$926
8.4.4	Reliability and Safety	$666	$1,443
8.4.6	Operational Efficiency	$308	$440
	Totals	$1,419	$2,809
	1% attributable to DERMS	**$14.2M**	**$28.1M**

TR-A-23

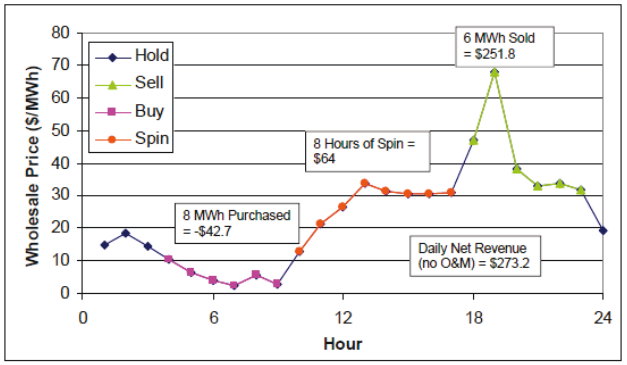
Benefits –
Ability to "Stack" Benefits – AES Example

Example: Arbitrage Only



1 MW, 6 MWh Device, 75% efficiency

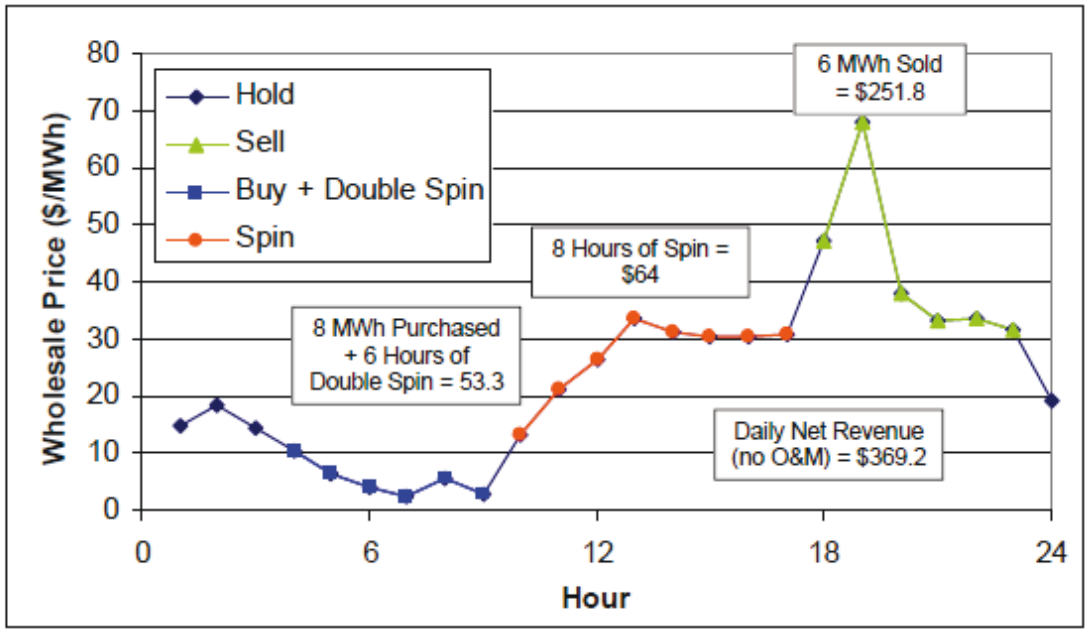
Add Spinning Reserves..



1 MW, 6 MWh Device, 75% efficiency

Ability to optimize and dynamically switch modes produced a **76% increase** in daily revenue

"Double Spin"



TR-A-24

Benefits – Opportunity to "Stack" AES benefits

- **DERMS provides the ability "stack" multiple benefit streams**

- CPUC Storage OIR proposes a target of 165MW for SDG&E in 2020
- Suppose target ends up being between 25 MWh – 75 MWh
- At an assumed cost of $500k/MWh → $12.5M - $37.5M installed cost
- *Cost-Effectiveness of Energy Storage in California*, June 2013 by EPRI for CPUC suggests distribution SES could have a cost-to-benefit ratio of 1.20
- If we use a cost-to-benefit ratio of 0.5 → $6.3M - $18.8M of potential benefits
- Through stacking benefits, you would be able to obtain at least an additional 10% of benefits
- **DERMS would be responsible for benefits of $0.6M - $1.9M**

Benefits – Business Approach that offers Value

- DERMS is not a fully functioning, "off the shelf" product
- Exploring partnership with potential DERMS vendors
- Opportunity vs. buying a product
- Monetize SDG&E's IP
- Potential benefits depend on the vendor, terms, and SDG&E's appetite
  - Discounts (licenses, hardware, software maintenance)
  - Co-development IP
  - Equity stake
  - Royalties
  - Joint services offering

Benefit Summary

		Low	High		Low	High
SGDP - Societal / Environmental Benefits	2%	$391M	$1324M		$7.8M	$26.5M
SGDP - Economic & Reliability Benefits	1%	$1,419M	$2809M		$14.2M	$28.1M
Stacking Benefits for AES	+10%	$6.3M	$18.8M		$0.6M	$1.9M
					$22.6M	**$56.5M**

- Overview
- Drivers
- Benefits
- **Budget**
- Summary

Budget – Capital and O&M Estimates

Capital	2013	2014	2015
Internal Labor	$ 979,228	$ 1,450,438	$ 1,202,960
External Labor	$ 529,333	$ 3,477,800	$ 3,522,800
Infrastructure	$ 35,000	$ 200,000	$ -
Software	$ 7,500	$ 2,250,000	$ -
Annual Capital Cost	$ 1,551,061	$ 7,378,238	$ 4,725,760
10% Contingency	$ 155,106	$ 737,824	$ 472,576
Annual Capital and Contingency	**$ 1,706,168**	**$ 8,116,062**	**$ 5,198,336**

Total Project Capital $ 15,020,565

O&M	2013	2014	2015	2016	2017 ->
IT Labor	$ -	$ 32,500	$ 65,000	$ 97,500	$ 130,000
Business Labor	$ -	$ 39,000	$ 78,000	$ 117,000	$ 156,000
IT Non-Labor (ex: Licenses)	$ -	$ 14,400	$ 464,400	$ 464,400	$ 464,400
Annual O&M		**$ 85,900**	**$ 607,400**	**$ 678,900**	**$ 750,400**

Budget – GRC Decision Summary

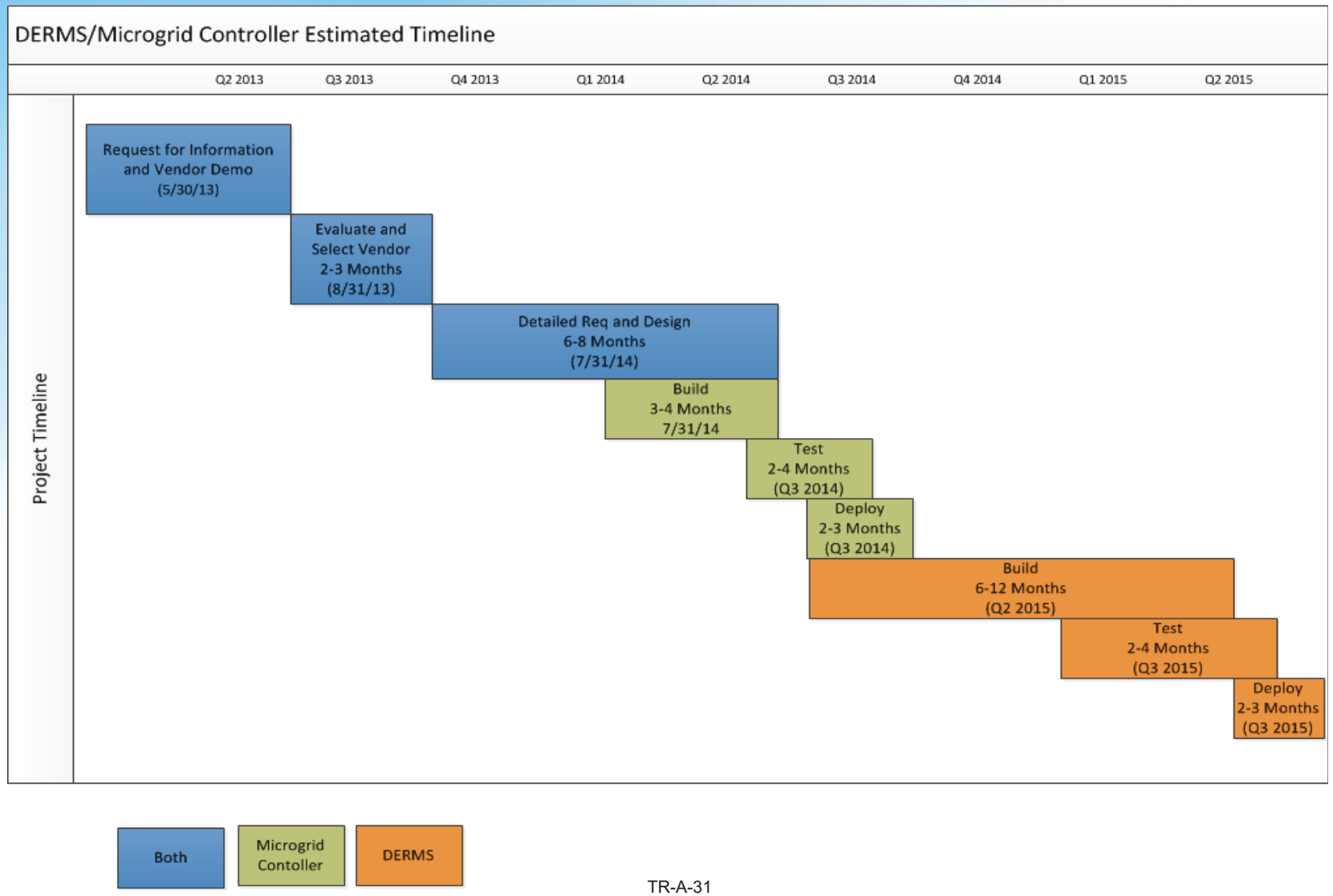
- GRC Final Decision - DERMS

  Based on our review, SDG&E's funding request for this project is too high, given the work that needs to be done. Under the circumstances, it is reasonable to authorize capital expenditure ***funding of $4.550 million in 2012*** *for this project.*

- 2012 dollars (unloaded)
- Escalations per year from 2012 - $4.55M
  - 2.65% in 2013 = $4.671M
  - 2.75% in 2014 - $4.799M
  - 2.75% in 2015 - $4.930M

Total Funding Allocation = $18.950 M

Budget – Schedule



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Agenda

- Overview
- Drivers
- Benefits
- Budget
- **Summary**

Summary – Accomplishments and Next Steps

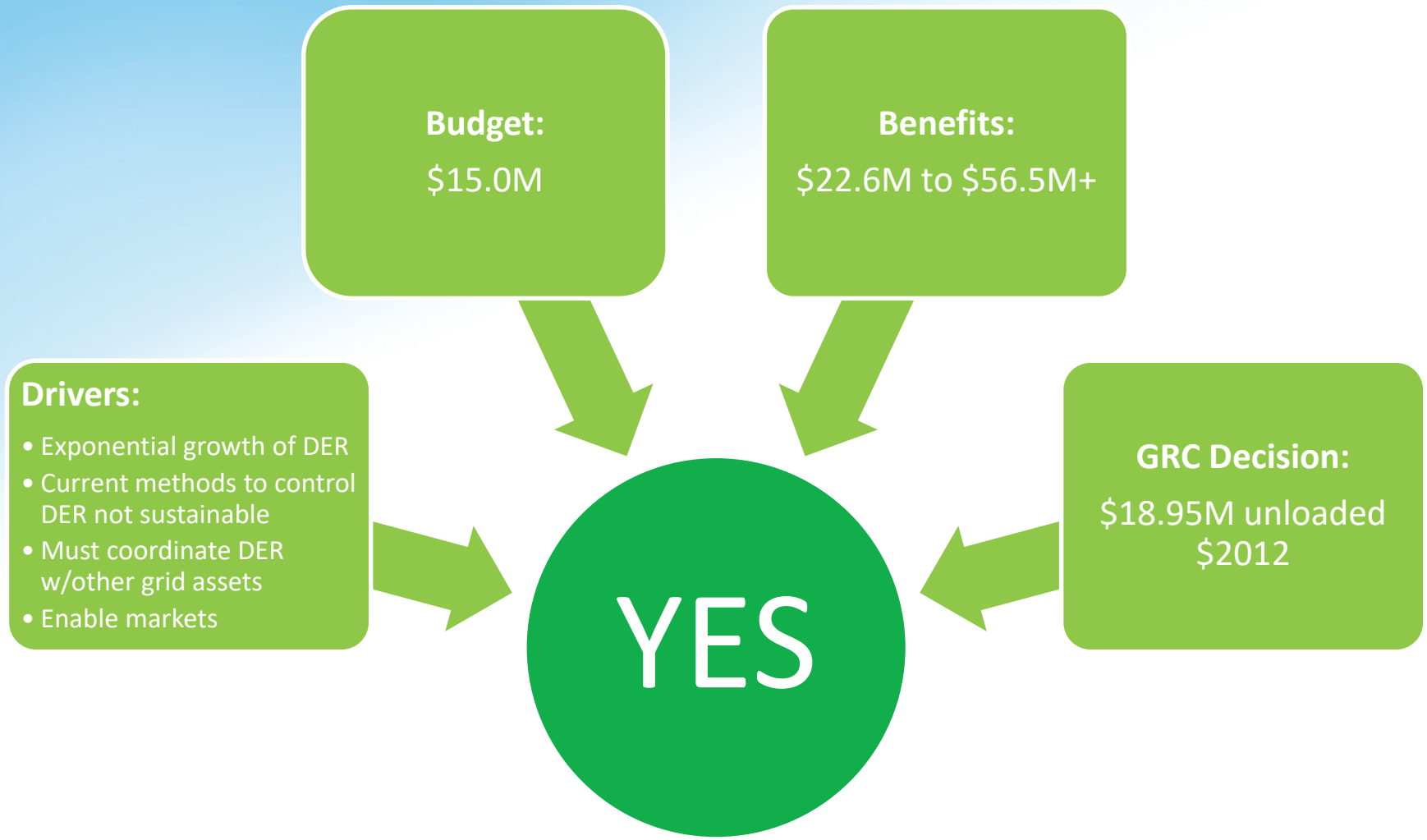
Completed Activities

- Smart Grid Engineering and Architecture (SGEA), Q3 '12 to Q1
- Sent RFI for DERMS to 20 companies and received 17 responses, Q1
- Conducted full day on-site demos with the 6 short listed vendors, Q2
- Down-selected vendors based on business terms, Q2

Next Steps

- Proceeding with top two, holding two, released two, Q2
- SGMT business case review and approval – 7/1 (hopefully)
- Demos and site visits – week of 7/15
- Scope of work development (high level requirements) – 7/22 to 8/2
- Negotiations/Contract – August 2013
- Start work – September 2013

Summary – Time to Vote "YES" for DERMS



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Wave: Project Release Schedule

Complete/deployed
Dev complete; testing
In development
In planning

SDGE connected
A Sempra Energy utility

Wave Release		Schedule		
Name	**Key Functionality**	**SDG&E Begin Testing**	**Deployable**	**User**
Blue Fin 2.0	• **M&C for generators, Parker-Saft, CES at BRMG**	**Jun 2014**	**Sep 2014**	**DER**
CORAL M&C (2.3)	• **Ability to control both batteries at BRMG** • **Improved UI**	**Feb 2016**	**Mar 2016**	**DER**
CORAL (2.4.9)	• **Reservations** • **Access via desktop client** • **MG: optimization (e.g. non-forecast TTL)** • **AES: manage SoC; dispatch energy; storage aggregation; cycle counting** • **Integration with two additional SES (Carmel Valley, Ortega)**	**May 2016**	**Apr 2017 (MG – Island 1)** **May 2017 (AES)** **Oct 2017 (MG – Island 2)**	**DER**
DORADO (3.1)	• Logging updates • DDS secure middleware – access via desktop client • Several "base" updates ("under-the-hood") in prep for future releases • New AES UI, including navigation (searchability), configurability • SOC mgmt updates • Grouping enhancements (including configurability, asset selector) • Peak load management	6/1/2017	SDG&E will not deploy Dorado	DER – AES
Coral+ (2.4.10)	• Ability to operate NRG as part of the MG App • Critical defect patches (selected defects that were addressed in Eel)	10/9/2017	Feb 2018	DER Island 1, 2, 3 EDO* – Island 1, 2
EEL (4.0)	• Standardize asset properties • Alarm customization/notification • Constraints mgmt • Reservation enhancements	8/1/2017	May 2018	**EDO**
Future	• Enhanced configurability • Reservation enhancements – MG schedule aware • Net load shifting • Optimization engine • Dispatch analyzer • Alarm customization/notification enhancements	12/15/2017 Iterative	Iterative	**EDO**

*EDO operations dependent on microwave link in place; DER team will plan to operate Island 3 until the subsequent release of Wave

TURN DATA REQUEST-03
SDG&E-SOCALGAS 2016 GRC – A.17-11-007/8
SDG&E_SOCALGAS RESPONSE
DATE RECEIVED: DECEMBER 20, 2017
DATE RESPONDED: JANUARY 24, 2018

44. Regarding the Advanced Energy Storage Project (11247):

a. Please provide the list of circuits energy storage will be installed on. Please include all relevant identifying information for each circuit.

b. Please provide the number of circuits storage will be installed on.

c. Please provide the number of times reverse power flow has been experienced on each of the circuits listed in part (a).

d. Please provide the percentage of annual peak load PV generation comprises on each of the circuits listed in part (a).

e. Please provide the percentage of annual minimum load PV generation comprises on each of the circuits listed in part (a).

f. Please provide all supporting workpapers that support the costs for this project, including the capacity of storage that will be installed and the cost per kWh.

g. What alternatives exist to installing energy storage on high PV circuits? Please explain and provide a unit cost for each alternative, and explain why the alternative was not selected.

h. Please explain why SDG&E does not propose this project as part of the energy storage mandate or AB 2868.

i. Please provide a list of battery storage installations, including capacity of the storage, in SDG&E's territory and the primary and secondary uses (purpose) of the storage installation.

Utility Response 44:

a. SDG&E has identified potential circuits, but has not finalized a list. SDG&E is still completing engineering analysis to verify these locations.

b. This project will install up to six energy storage systems.

c. The number of times reverse power flow has been experienced is still in the engineering and planning phase, and these circuits have not been determined.

d. The percentage of annual peak load PV generation comprised is still in the engineering and planning phase, and these circuits have not been determined.

e. The percentage of annual minimum load PV generation comprised is still in the engineering and planning phase, and these circuits have not been determined.

f. The forecasted costs are shown below.

2018

Description	Unit	Quantity	Cost ($1000) (material, direct charges, contract costs)

Energy Storage Unit	EA	2	$3,880.5
DERMS Integration	EA	2	$120.0
Labor	HR	20,981	$1,154.0
Total			$5,154

2019

Description	Unit	Quantity	Cost ($1000) (material, direct charges, contract costs)
Energy Storage Unit	EA	4	$7,761.0
Labor	HR	40,709	$2,239.0
Total			$10,000

g. SDG&E has explored other power electronic devices in the pilot arena, and the technology continues to emerge. At this time, energy storage systems, coupled with inverter technology, provide the most operational flexibility and functionality, and provide renewable integration in the evening hours when the sun is not shining.

h. SDG&E will be proposing projects to deploy energy storage, as part of AB 2868. The Advanced Energy Storage Project will focus on distribution circuits that have high concentration of PV penetration.

i. A list of battery storage installations, including capacity of the storage, in SDG&E's territory and the purpose of the storage installation is shown below.

Project	**ES Size (kW)**	**Energy (kWh)**	**Purpose**
Borrego Microgrid Yard- SES1	500	1500	Reliability
Borrego Microgrid Yard- SES2	1000	3000	Reliability
Pala Energy Storage Yard	500	1500	Renewable Integration & Reliability
Pala Unit 2	1000	2000	Renewable Integration & Reliability
Mission Valley - Skills Training Center	25	72	Testing & Training
Clairemont	25	72	Renewable Integration
Poway	25	72	Renewable Integration

Borrego Springs CES	25	50	Renewable Integration & Reliability
Borrego Springs CES	25	50	Renewable Integration & Reliability
Borrego Springs CES	25	50	Renewable Integration & Reliability
Century Park CES	50	82	Testing & Training
Energy Inovation Center- Indoor	4.5	10.7	Testing & Training
Energy Inovation Center- Outdoor	10	10	Testing & Training
San Diego Zoo	100	130	Renewable Integration & Vehicle Charging
UCSD MESOM	6	10.7	Renewable Integration & Reliability
Suites at Paseo (SDSU Private Dormitories)	18	32.1	Renewable Integration & Reliability
Del Lago Academy	100	200	Renewable Integration & Reliability
Ortega Highway (Quest) 1243 Unit 1	1000	3000	Existing Project Delayed
Ortega Highway (Quest)1243 Unit 2	1000	3000	Existing Project Delayed
Carmel Valley (Canyon Crest)	1000	3000	Renewable Integration & Reliability
Santa Ysabel Substation	6	11	Renewable Integration & Reliability
Santa Ysabel Substation	30	36	Renewable Integration & Reliability
Caltrans Park-N-Ride Del Lago (OPRA)	200	400	Vehicle Charging
ITF (OPRA)	200	400	Testing & Training
Civita Microgrid	125	200	Renewable Integration & Reliability

Miguel Substation	3,000	8,000	Renewable Integration
El Cajon BESS 1	7,500	30,000	Resolution E-4791
Escondido BESS 1	10,000	40,000	Resolution E-4791
Escondido BESS 2	10,000	40,000	Resolution E-4791
Escondido BESS 3	10,000	40,000	Resolution E-4791

APPENDIX B
GLOSSARY OF TERMS

AB	Assembly Bill
AES	Advanced Energy Storage
DER	Distributed Energy Resources
DERMS	Distributed Energy Resources Management System
GRC	General Rate Case
LCR	Local Capacity Requirement
ORA	Office of Ratepayer Advocates
TURN	The Utility Reform Network
WOA	Work Order Authorization