DRAFT GRANT FUNDING OPPORTUNITY

Solar +: Taking the Next Steps to Enable Solar as a Distribution Asset

http://www.energy.ca.gov/contracts/index.html

State of California

California Energy Commission

September 2016

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I. Introduction

A. PURPOSE OF SOLICITATION

The purpose of this solicitation is to advance the deployment and grid integration of distributed solar resources through the use of energy storage, smart inverters, and advanced forecasting and modeling techniques. To this end, the solicitation will fund applied research and development and technology demonstration and deployment projects that meet the following objectives from the 2015-2017 EPIC Triennial Investment Plan:

- S3 – Develop Innovative Solutions to Increase the Market Penetration of Distributed Renewable and Advanced Generation;
- S4 – Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems;
- S6 – Advance the Use of Smart Inverters as a Tool to Manage Areas with High Penetrations of PV; and
- S15 – Demonstrate Advanced Energy Storage Interconnection Systems to Lower Costs, Facilitate Market and Improve Grid Reliability

In recent years, distributed photovoltaic (PV) systems have been widely deployed across the California grid, and this trend is only expected to accelerate in order to meet the state's renewable energy goals.[1] A vast majority of these deployed systems have been installed as individual, grid-connected systems that simply provide energy when the sun is shining, but require support from operating reserves and backup power due to their uncontrolled, intermittent generation in order to meet grid demand.[2] As more individual PV systems become integrated with the grid, the risk of oversupply during the day increases and a larger ramp is necessary to satisfy evening demand. Incorporating energy storage into PV systems can mitigate this issue by shifting oversupply to meet evening peak demand and effectively leveling out the net-load "duck curve."

Initial studies have suggested that the operational value of distributed PV can be dramatically increased by improved forecasting as well as by the inclusion of energy storage,[3] advanced inverters,[4] and other enabling technologies at or near the site of generation. Specifically the module-level integration of solar + storage offers a large potential to reduce conversion losses,[5]

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[1] Senate Bill 350

[2] California Independent Service Operator (CA-ISO), "What the duck curve tells us about managing a green grid," available at http://www.caiso.com/Documents/FlexibleResourcesHelpRenewables_FastFacts.pdf

[3] Clean Energy Group, "Closing the California Clean Energy Divide," available at http://www.cleanegroup.org/wp-content/uploads/Closing-the-California-Clean-Energy-Divide.pdf

[4] Clean Coalition, "Advanced Inverters for Distributed PV: Latent Opportunities for Localized Reactive Power Compensation," available at http://www.clean-coalition.org/site/wp-content/uploads/2013/10/CC_PV_AI_Paper_Final_Draft_v2.5_05_13_2013_AK.pdf

[5] Reduced conversion losses would be due to a reduced number of AC/DC conversions by the solar + storage system sharing a single inverter, as opposed to solar and storage each having a separate inverter.

increase efficiencies, and reduce costs[6] when compared to standalone solar and standalone energy storage. Furthermore, strategic installation of distributed PV and energy storage with other Distributed Energy Resources (DER) at specific locations on the distribution grid can reduce the need for other costly system upgrades, which translates to a savings for utilities and electricity customers alike.[7]

Projects must fall within the following project groups:

- **Group 1**: Pilot Demonstration of Advanced Solar + Storage Technologies for Community-Scale Applications;
- **Group 2**: Pilot Demonstration of Advanced Solar + Storage Technologies for Building-Scale Applications;
- **Group 3**: Enhanced Modeling Tools to Maximize Solar + Storage Benefits;
- **Group 4**: Advanced Smart Inverter Capabilities to Support High-Penetration Solar;
- **Group 5**: Holistic Forecasting to Support High-Penetration Solar Grid Operations; and
- **Group 6**: Energy Storage Deployment to Facilitate Storage Interconnection and Enable Integration of High-Penetration Distributed Solar.

See Part II of this solicitation for project eligibility requirements. Applications will be evaluated as follows: Stage One proposal screening and Stage Two proposal scoring. Applicants may submit multiple applications, though each application may address only one of the project groups identified above. If an applicant submits multiple applications that address the same project group, each application must be for a distinct project (i.e., no overlap with respect to the tasks described in the Scope of Work, Attachment 6).

Key Words/Terms

Word/Term	Definition
Applicant	The respondent to this solicitation
Application	An applicant's formal written response to this solicitation
CAISO	*California Independent System Operator*, the grid operator that manages 80% of California's electric grid, including the service areas of the state's three investor-owned utilities
CAM	*Commission Agreement Manager,* the person designated by the Energy Commission to oversee the performance of an agreement resulting from this solicitation and to serve as the main point of contact for the Recipient
CPUC	*California Public Utilities Commission*, the state regulatory agency that oversees privately owned electric utilities

[6] Woodlawn Associates, "Energy Storage 301: Solar + Storage Economics," available at https://woodlawnassociates.com/energy-storage-301/

[7] Clean Coalition, "Locational Benefits of Distributed Generation," available at http://www.clean-coalition.org/site/wp-content/uploads/2013/11/Locational-Benefits-Brief-08_tk-6-Nov-2013.pdf

Word/Term	Definition
Days	*Days refers to calendar days*
DER	*Distributed Energy Resource*, distributed renewable generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies
DRP	*Distribution Resource Plan,* a plan drafted to identify optimal locations for deployment of distributed resources in an IOU service territory
Disadvantaged Community	These are communities defined as areas representing census tracts scoring in the top 25 percent in *CalEnviroScreen 2.0*. (http://oehha.ca.gov/ej/ces2.html) (http://oehha.maps.arcgis.com/apps/Viewer/index.html?appid=dae2fb1e42674c12a04a2b302a080598)
EPIC	*Electric Program Investment Charge,* the source of funding for the projects awarded under this solicitation
Energy Commission	California Energy Commission
ICA	*Integration Capacity Analysis*, to specify how much DER hosting capacity may be available on the IOUs' distribution networks
IOU	*Investor-owned utility,* including Pacific Gas and Electric Co., San Diego Gas and Electric Co., and Southern California Edison Co.
LNBA	*Locational Net Benefits Analysis*, to specify the net benefit that DERs can provide in a given location in an IOU's service territory
NOPA	*Notice of Proposed Award,* a public notice that identifies award recipients
Principal Investigator	The lead scientist or engineer for the applicant's project, who is responsible for overseeing the project; in some instances, the Principal Investigator and Project Manager may be the same person
Project Manager	The person designated by the applicant to oversee the project and to serve as the main point of contact for the Energy Commission
Project Partner	An entity or individual that contributes financially or otherwise to the project (e.g., match funding, provision of a demonstration site), and does not receive Energy Commission funds
PV	Photovoltaic
Recipient	The recipient of an award under this solicitation
SIWG	*Smart Inverter Working Group*, a joint effort between the CPUC and Energy Commission to develop recommendations to the CPUC for the technical steps to optimize inverter-based DER to support distribution system operations
Solicitation	This entire document, including all attachments and exhibits ("solicitation" may be used interchangeably with "program opportunity notice")

Word/Term	Definition
State	State of California

B. BACKGROUND

1. Program Areas, Strategic Objectives, and Funding Initiatives

EPIC projects must fall within the following **program areas** identified by the CPUC:

- Applied research and development;
- Technology demonstration and deployment; and
- Market facilitation

In addition, projects must fall within one of the general focus areas (**"strategic objectives"**) identified in the Energy Commission's EPIC Investment Plans[8] [9] and within one or more specific focus areas (**"funding initiatives"**) identified in the plan. This solicitation targets the following program areas, strategic objectives, and funding initiatives:

2015-2017 EPIC Triennial Investment Plan

- **Program Area:** Applied Research and Development
- **Strategic Objective S3:** Develop Innovative Solutions to Increase the Market Penetration of Distributed Renewable and Advanced Generation
    - **Funding Initiative S3.2:** Develop Integrated and Hybrid Photovoltaic Technologies and Strategies to Reduce Costs and Advance Zero-Net Energy Buildings
- **Program Area:** Applied Research and Development
- **Strategic Objective S4:** Improve Power Plant Performance, Reduce Cost, and Accelerate Market Acceptance of Existing and Emerging Utility-Scale Renewable Energy Generation Systems
    - **Funding Initiative S4.2:** Develop Innovative Tools and Strategies to Increase Predictability and Reliability of Wind and Solar Generation
- **Program Area:** Applied Research and Development
- **Strategic Objective S6:** Advance the Use of Smart Inverters as a Tool to Manage Areas with High Penetrations of PV
    - **Funding Initiative S6.1:** Develop Smart Inverter Capabilities to Improve Grid Operations
- **Program Area:** Technology Demonstration and Deployment
- **Strategic Objective S15:** Demonstrate Advanced Energy Storage Interconnection Systems to Lower Costs, Facilitate Market and Improve Grid Reliability

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[8] 2012-14 EPIC Triennial Investment Plan, http://www.energy.ca.gov/research/epic/documents/final_documents_submitted_to_CPUC/2012-11-01_EPIC_Application_to_CPUC.pdf (Attachment 1), as modified and approved by CPUC Decision 13-11-025, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M081/K773/81773445.PDF.

[9] 2015-17 EPIC Triennial Investment Plan, http://www.energy.ca.gov/2014publications/CEC-500-2014-038/CEC-500-2014-038-CMF.pdf, as modified and approved by CPUC Decision 15-04-020, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M151/K183/151183650.PDF.

- **Funding Initiative S15.1:** Demonstrate Advanced Energy Storage Interconnection Technologies and Systems in Transmission, Distribution, and Customer-Side Applications to Transition to the Commercial Market

2. Applicable Laws, Policies, and Background Documents

This solicitation addresses the energy goals described in the following laws, policies, and background documents.

Laws/Regulations

- **Assembly Bill (AB) 32 - The Global Warming Solutions Act (Statutes of 2006)**

  AB 32 created a comprehensive program to reduce greenhouse gas (GHG) emissions in California. GHG reduction strategies include a reduction mandate of 1990 levels by 2020 and a cap-and-trade program. AB 32 also required the California Air Resources Board (ARB) to develop a Scoping Plan that describes the approach California will take to reduce GHGs. ARB must update the plan every five years.

  Additional information: http://www.arb.ca.gov/cc/ab32/ab32.htm

  Applicable Law: California Health and Safety Code §§ 38500 et. seq.

- **AB 327 (Statutes of 2013)**

  AB 327 required electrical corporations to submit to the CPUC a distribution resources plan proposal to identify optimal locations for the deployment of distributed energy resources.

  Additional information:

  http://www.cpuc.ca.gov/general.aspx?id=5071

  Applicable Law: California Public Utilities Code §§ 769 et. seq. (https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB327)

- **AB 693 – Multifamily Affordable Housing Solar Roofs Program (Statutes of 2015)**

  AB 693 authorizes a third party administrator, selected by the CPUC, to administer clean energy and energy efficiency projects to be installed on qualified multifamily affordable housing properties. Any projects installed pursuant to the program must be primarily used to offset electricity usage by low-income tenants. The program will operate from 2017 through 2030, with a target to install a total generating capacity of 300 MW on qualified properties. The program will have an annual budget of $100,000,000 or 10% of available funds from greenhouse gas allowance revenues, whichever is less.

  Applicable Law: California Public Utilities Code §§ 748.5 and 2870 (https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB693)

- **AB 2514 - Energy Storage Systems (Statutes of 2010)**

  AB 2514 required the CPUC to determine targets for the procurement of viable, cost-effective energy storage systems by load-serving entities. The CPUC adopted the procurement targets in Decision 13-10-040, issued on October 17, 2013 (see the summary of Decision 13-10-040 in the "Policies/Plans" section below).

  Additional information: http://www.cpuc.ca.gov/general.aspx?id=3462

Applicable Law: California Public Utilities Code §§ 2835 et. seq., and § 9620 (http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920100AB2514)

- **SB 350 - Clean Energy and Pollution Rection Act of 2015 (Statutes of 2015)**

  SB 350 requires the following: 1) the amount of electricity generated and sold to retail customers per year from eligible renewable energy resources be increased by 50 percent by December 31, 2030; 2) the California Energy Commisson to establish annual targets for statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030; and 3) provide for transformation of the Independent System Operator into a regional organization.

  Applicable Law: http://www.leginfo.ca.gov/pub/15-16/bill/sen/sb_0301-0350/sb_350_bill_20151007_chaptered.htm

- **California Energy Code**

  The Energy Code is a component of the California Building Standards Code, and is published every three years through the collaborative efforts of state agencies including the California Building Standards Commission and the Energy Commission. The Code ensures that new and existing buildings achieve energy efficiency and preserve outdoor and indoor environmental quality through use of the most energy efficient technologies and construction.

  Additional information: http://www.energy.ca.gov/title24/
  Applicable Law: California Code of Regulations, Title 24, Part 6 and associated administrative regulations in Part 1

Policies/Plans

- **CPUC's Order Instituting Rulemaking on the CPUC's own motion to improve distribution level interconnection rules and regulations for certain classes of electric generators and electric storage resources (R. 11-09-011) (2011)**

  Electric Rule 21 is a tariff that describes the interconnection, operating and metering requirements for generation facilities to be connected to a utility's distribution system, over which the CPUC has jurisdiction. In this rulemaking, the CPUC will review, and, if necessary, revise, Rule 21 to ensure that the interconnection process is timely, non-discriminatory, cost-effective, and transparent. The CPUC also seeks to revise Rule 21 to incorporate processes appropriate for new technologies, such as energy storage.

  This proceeding was closed in May 2016.

  Additional information: http://www.cpuc.ca.gov/General.aspx?id=3962 and http://www.cpuc.ca.gov/General.aspx?id=3968

- **CPUC's Order Instituting Rulemaking Regarding Policies, Procedures and Rules for Development of Distribution Resources Plans Pursuant to Public Utilities Code Section 769. (R. 14-08-013) (2013)**

  The purpose of this rulemaking is to establish policies, procedures, and rules to guide California IOUs in developing their Distributed Resource Plans. Under this rulemaking, "distributed resources" includes distributed renewable generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies.

  Additional information: http://www.cpuc.ca.gov/PUC/energy/drp/

- **CPUC's Order Instituting Rulemaking to Create a Consistent Regulatory Framework for the Guidance, Planning, and Evaluation of Integrated Demand-Side Resource Programs (R. 14-10-003) (2014)**

  This rulemaking considers the development and adoption of a regulatory framework to provide policy consistency for the direction and review of demand-side resource programs. It is intended to be a unified mechanism to authorize and direct the CPUC-regulated electric and gas utilities to achieve demand reduction and load shaping using integrated demand-side management resources.

  Additional information: http://www.cpuc.ca.gov/General.aspx?id=10710

- **Governor's Clean Energy Jobs Plan (2011)**

  In June 2011, Governor Jerry Brown announced a plan to invest in clean energy and increase efficiency. The plan includes a goal of producing 20,000 megawatts (MW) of renewable electricity by 2020 by taking the following actions: addressing peak energy needs, developing energy storage, creating efficiency standards for buildings and appliances, and developing combined heat and power (CHP) projects. Specific goals include building 8,000 MW of large-scale renewable and transmission lines, 12,000 MW of localized energy, and 6,500 MW of CHP.

  Additional information: http://gov.ca.gov/docs/Clean_Energy_Plan.pdf

- **Integrated Energy Policy Report (Biennial)**

  California Public Resources Code Section 25302 requires the Energy Commission to release a biennial report that provides an overview of major energy trends and issues facing the state. The IEPR assesses and forecasts all aspects of energy industry supply, production, transportation, delivery, distribution, demand, and pricing. The Energy Commission uses these assessments and forecasts to develop energy policies. The 2015 IEPR included a multi-agency hearing on drought response and provided recommendations for future research and analysis areas.

  Additional information: http://www.energy.ca.gov/energypolicy
  Applicable Law: California Public Resources §§ 25300 et. seq.

- **CPUC Decision 13-10-040, "Decision Adopting Energy Storage Procurement Framework and Design Program" (2013)**

  The Decision establishes policies and mechanisms for energy storage procurement, as required by AB 2514 (described above). The IOU procurement target is 1,325 megawatts of energy storage by 2020, with installations required no later than the end of 2024.

  Additional information:
  http://www.cpuc.ca.gov/uploadedfiles/cpuc_public_website/content/about_us/organization/former_commissioners/peevey(1)/news_and_announcements/ferron_peevey_concurrence_storaged1310040.pdf

- **CPUC Proceeding R.12-11-005 – Self-Generation Incentive Program (SGIP)**

  The CPUC's SGIP provides incentives to support existing, new, and emerging distributed energy resources. The SGIP provides rebates for qualifying distributed energy systems installed on the customer's side of the utility meter. Qualifying technologies include wind turbines, waste heat to power technologies, pressure

reduction turbines, internal combustion engines, microturbines, gas turbines, fuel cells, and advanced energy storage systems.

Additional information: http://www.cpuc.ca.gov/sgip/ and http://www.cpuc.ca.gov/general.aspx?id=3796

- **Demand Response Auction Mechanism (DRAM)**

  The DRAM is a two-year pilot in which the three IOUs will solicit bids from DERs, which may include onsite renewable generation or energy storage, to participate in CAISO markets. DERs aggregated to a minimum of 100kW may participate in CAISO markets. At least 20 percent of the total procured DRAM bids by each IOU must be residential (in MW terms). During the two-year pilot, the CPUC will gain CAISO market experience and anticipates reducing costs and complexities of aggregating DER for market participation. The contracts selected by the IOUs in the DRAM would also be submitted to the CPUC for approval.

  Additional information: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M143/K552/143552239.pdf; http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M153/K436/153436367.pdf; https://www.pge.com/en_US/business/save-energy-money/energy-management-programs/demand-response-programs/2017-demand-response/2017-demand-response-auction-mechanism.page?WT.mc_id=Vanity_dram; https://www.sce.com/wps/portal/home/procurement/solicitation/dram/!ut/p/b0/04_Sj9CPykssy0xPLMnMz0vMAfGjzOK9PF0cDd1NjDz9Q7yNDBxDgwJ8LNxMDLw9zfULsh0VAcNZk2w!/; and, http://www.sdge.com/2017-demand-response-auction-mechanism-dram

- **AB 2188 – Streamlined Solar Permitting**

  AB 2188 requires the state's cities and counties to adopt streamlined solar permitting processes by September 30, 2015. Adopting a modernized and standardized permitting process for installations of small-scale solar distributed generation technology on residential rooftops will increase the deployment of solar distributed generation, help to expand access to lower income households, provide solar customers greater installation ease, improve the state's ability to reach its clean energy goals, and generate much needed jobs in the state, all while maintaining safety standards.

  Additional information: http://www.opr.ca.gov/s_renewableenergy.php

- **New Residential Zero Net Energy Action Plan 2015-2020**

  The Residential New Construction Zero Net Energy Action Plan supports the California Energy Efficiency Strategic Plan's goal to have 100 percent of new homes achieve zero net energy beginning in 2020. The action plan provides a foundation for the development of a robust and self-sustaining zero net energy market for new homes.

  Additional information: http://www.californiaznehomes.com/

- **Executive Order B-30-15**

  Governor Brown's Executive Order B-30-15 established a new interim statewide greenhouse gas emission reduction target to reduce greenhouse gas emissions to 40 percent below 1990 levels by 2030, to ensure California meets its target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050.

Reference Documents

Refer to the documents below for information about activities associated with advancing the deployment and grid integration of distributed solar resources through the use of energy storage, smart inverters, and advanced forecasting and modeling techniques.

- "Closing the California Clean Energy Divide: Reducing Electric Bills in Affordable Multifamily Rental Housing with Solar+Storage," http://www.cleanegroup.org/ceg-resources/resource/closing-the-california-clean-energy-divide/
- "Community-Scale Solar: Why Developers and Buyers Should Focus on this High-Potential Market Segment," http://www.rmi.org/Content/Files/RMI-Shine-Report-CommunityScaleSolarMarketPotential-201603-Final.pdf
- "Breaking Ground: New Models that Deliver Energy Solutions to Low-Income Customers," http://www.rmi.org/Content/Files/RMI-LEAP-v12.pdf
- "Recent Trends in Variable Generation Forecasting and Its Value to the Power System," http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6996049
- Smart Inverter Working Group, http://www.energy.ca.gov/electricity_analysis/rule21/ and http://www.cpuc.ca.gov/General.aspx?id=4154

C. FUNDING

1. Amount Available and Minimum/ Maximum Funding Amounts

There is **up to $26,000,000** available for grants awarded under this solicitation. The total, minimum, and maximum funding amounts for each project group are listed below.

Project Group	Available funding	Minimum award amount	Maximum award amount	Minimum match funding amount
Group 1: Pilot Demonstration of Advanced Solar + Storage Technologies for Community-Scale Applications	$6,000,000	$2,000,000	$3,000,000	$0
Group 2: Pilot Demonstration of Advanced Solar + Storage Technologies for Building-Scale Applications	$3,500,000	$1,000,000	$1,500,000	

Group 3: Enhanced Modeling Tools to Maximize Solar + Storage Benefits	$1,000,000		$1,000,000	
Group 4: Advanced Smart Inverter Capabilities to Support High-Penetration Solar	$6,000,000	$2,000,000	$3,000,000	
Group 5: Holistic Forecasting to Support High-Penetration Solar Grid Operations	$1,500,000	$500,000	$750,000	
Group 6: Energy Storage Deployment to Facilitate Storage Interconnection and Enable Integration of High-Penetration Distributed Solar	$8,000,000	$1,500,000	$2,000,000	20%

2 Match Funding Requirement

For applicants to Group 6, match funding is required in the amount of at least **20%** of the requested project funds. Applicants that provide more than this amount will receive additional points during the scoring phase (See Part IV).

For applicants to Groups 1-5, match funding is not required for this solicitation. However, applications that include match funding will receive additional points during the scoring phase.

For applicants to Groups 1-6, the Energy Commission will provide no more than 50% of the cost of equipment purchases.

D. KEY ACTIVITIES SCHEDULE

Key activities, dates, and times for this solicitation and for agreements resulting from this solicitation are presented below. An addendum will be released if the dates change for activities that appear in **bold.**

ACTIVITY	DATE	TIME[10]
Solicitation Release	11/30/2016	
Pre-Application Workshop	**12/14/2016**	**10:00 am**
Deadline for Written Questions[11]	**12/16/2016**	**5:00 p.m.**
Anticipated Distribution of Questions and Answers	1/3/2017	
Deadline to Submit Applications	**1/30/2017**	**3:00 p.m.**
Anticipated Notice of Proposed Award Posting Date	3/14/2017	
Anticipated Energy Commission Business Meeting Date	7/12/2017	
Anticipated Agreement Start Date	8/7/2017	
Anticipated Agreement End Date	6/30/2020	

II. Eligibility Requirements

A. Applicant Requirements

1. Eligibility

This solicitation is open to all public and private entities and individuals with the exception of publicly-owned utilities. In accordance with CPUC Decision 12-05-037, funds administered by the Energy Commission may not be used for any purposes associated with publicly-owned utility activities.

2. California Secretary of State Registration

All corporations, limited liability companies (LLCs), limited partnerships (LPs) and limited liability partnerships (LLPs) are required to be registered and in good standing with the California Secretary of State prior to its project being recommended for approval at an Energy Commission Business Meeting. If not currently registered with the California Secretary of State, applicants are encouraged to contact the Secretary of State's Office as soon as possible to avoid potential delays in beginning the proposed project(s) (should the application be successful). For more information, contact the Secretary of State's Office via its website at www.sos.ca.gov. Sole proprietors using a fictitious business name must be registered with the appropriate county and provide evidence of registration to the Energy Commission prior to their project being recommended for approval at an Energy Commission Business Meeting.

[10] Pacific Standard Time or Pacific Daylight Time, whichever is being observed.

[11] This deadline does not apply to non-technical questions (e.g., questions concerning application format requirements or attachment instructions) or to questions that address an ambiguity, conflict, discrepancy, omission, or other error in the solicitation.

B. PROJECT REQUIREMENTS

1. Applied Research and Development Stage

Projects in Groups 1-5 must fall within the "applied research and development" stage, which includes activities that support pre-commercial technologies and approaches that are designed to solve specific problems in the electricity sector. By contrast, the "technology demonstration and deployment" stage involves the installation and operation of pre-commercial technologies or strategies at a scale sufficiently large and in conditions sufficiently reflective of anticipated actual operating environments to enable appraisal of the operational and performance characteristics and the financial risks.[12] Applied research and development activities include early, pilot-scale testing activities that are necessary to demonstrate the feasibility of pre-commercial technologies.

Technology Demonstration and Deployment Stage

Projects in Group 6 must fall within the "technology demonstration and deployment" stage, which involves the installation and operation of pre-commercial technologies or strategies at a scale sufficiently large and in conditions sufficiently reflective of anticipated actual operating environments to enable appraisal of operational and performance characteristics, and of financial risks.[13]

2. Project Focus

a. Group 1: Pilot Demonstration of Advanced Solar + Storage Technologies for Community-Scale Applications

Community-scale solar installations have been shown to be economically advantageous compared to individual rooftop installations due to their ability to leverage economies of scale and bulk equipment purchase. Community-scale solar installations integrated with storage may minimize the need for distribution grid upgrades and ancillary services while providing low-cost energy to local residents, although the specific costs and benefits of community-scale solar + storage technology configurations need further demonstration and verification. There is also a need to develop standardized, replicable solutions that provide both solar and storage to maximize the cost savings and value streams to community-scale customer groups.

For purposes of this solicitation, community-scale is defined as a project located on the distribution system, adjacent to or near the point of consumption, and connected to the grid in front of the customer meter. The total generation for each project must be less than 5 MW and greater than 100kW in size to be eligible for this project group. Target communities include residential, small commercial, and mixed-use communities and must include at least ten individual buildings (such as single-family residences) or one multi-tenant building (such as multi-family housing or office park). Industrial or agricultural projects are not eligible under this project group.

This project group is focused on pilot demonstrations of innovative solar + storage technologies and configurations at the community-scale to identify and exploit synergies between solar and stationary energy storage, reduce overall costs,

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[12] See CPUC "Phase 2" Decision 12-05-037 at pp. 36 and 90, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF.

[13] See CPUC "Phase 2" Decision 12-05-037 at pp. 39-40 and 90, http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/167664.PDF.

maximize value to system owners and customers, and verify locational grid benefits of community-scale solar integrated with stationary energy storage, other DERs, and enabling technologies. The goal of projects in this project group is to create a standardized solar + storage solution for communities to decrease soft costs and enhance the value of distributed PV to utility customers and the grid.

Eligible projects must include the following features, at a minimum:

- Clear description of how the proposed technology solution offers competitive advantages over commercially available market technologies
- Development of advanced solar + storage technology, integrated at the solar array level, and targeted for applications at the community-scale. Examples of advanced technologies are:
    - Integrated solar + storage with a single combined smart inverter
    - Hybrid solar PV/thermal generation technologies with a high-efficiency energy storage component.
    - High-efficiency panels with extended lifetimes beyond 30 years coupled with an advanced battery energy storage system.
- The integrated solar + storage technology must meet the following performance criteria, at a minimum:
    - 10% reduction in costs versus a standalone solar system plus a standalone energy storage system.
    - 10% greater energy generated over the course of an average day compared to standalone solar plus standalone energy storage.
    - The ability to smooth solar intermittency at the point of generation, resulting in a reduction in standard deviation of the system output by greater than 10% compared to traditional PV.
    - An increase in overall system capacity factor by 10% compared to traditional fixed-tilt PV systems.
    - The ability to provide energy later into the evening than traditional fixed-tilt PV systems.
    - The ability to provide distribution grid services, as needed, with an examination of potential compensation strategies for providing these services.
    - Solar module efficiency of at least 30%
    - Storage round-trip efficiency of at least 85%
    - An expected system lifetime of no less than 10 years.
- The pilot demonstration of developed technology at a strategic location on the distribution grid to enable community-scale solar + storage benefits to system owners and the distribution grid.
- The inclusion of smart inverters, defined for the purposes of this solicitation as inverters capable of performing autonomous grid functions and communications[14],
- Prevention of unintended islanding as defined in IEEE 1547a.
- Consideration of potential fire hazard risks and mitigation strategies for community-scale solar + storage to ensure public health and safety.

[14] Defined as Phase I and II smart inverter recommendations from the Rule 21 updated Smart Inverter Working Group

- Evaluation of potential pricing schemes and rate structures that may impact market deployment of community-scale solar + storage.
- Reduction in the total customer evening peak demand of at least 15%.

Projects awarded under this project group should also consider the following features:

- Leverage the LNBA methodology being developed as part of the IOU DRPs.
- Complement and build upon IOU demonstration projects from the DRP proceeding, specifically for project groups C (Demonstrate DER Locational Benefits) and D (Demonstrate Distribution Operations at High-Penetrations of DER).[15]
- Assessment of methods to compensate project owners/lessees for ancillary or grid services.
- Preference for a multi-family affordable housing and/or disadvantaged community[16] demonstration site.
- Letter of awareness/support from the serving utility.
- For multi-family residential communities, projects should aim to reduce tenant electricity bills by at least 25% and demonstrate that the business model can be scaled across California without additional grant funding.
- Evaluation of potential ownership and business models with an eye towards standardization and mass consumer adoption.
- Smart community energy management strategies, which may include DER aggregation approaches and/or virtual power plants
- Demand response capabilities and other distributed energy resources and/or enhancing features that are expected to increase the value of the project to the community and/or to the distribution grid.
- Consideration of community solar models in secondary networked distribution systems as well as in radial networked distribution systems. [17]
- Compatibility with CPUC programs, such as:
    - Meet the requirements to participate in the Demand Response Auction Mechanism (DRAM)[18], if applicable.
    - Meet the requirements for storage portion of the project to participate in the Self-Generation Incentive Program (SGIP)[19], if applicable.
    - For onsite multifamily affordable housing projects, meet the requirements to participate in the Multifamily Affordable Housing Solar Roofs Program[20].

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[15] DRP Final Guidance Document, available at - http://www.cpuc.ca.gov/General.aspx?id=5071

[16] A disadvantaged community is defined for the purposes of this solicitation as one with a score of 81% or greater in the California Communities Environmental Health Screening Tool (CalEnviroScreen).

[17] In secondary network distribution systems, multiple transformers and cables are configured to run in parallel. Power in these cables can flow in any direction along the low-voltage network, preventing the loss of a single line creating an interruption of power. However, voltage in this network must be managed so that electricity does not reverse flow to the medium-voltage feeders, thus there tend to be more restrictions for distributed generation in these areas than in radial systems, where each customer has one source of supply and where controlled reverse flow is more viable.

[18] PG&E: PG&E 2017 DRAM; SCE: SCE 2017 DRAM Request for Offers; SDG&E: SDG&E 2017 DRAM

[19] http://www.cpuc.ca.gov/sgip/

Metrics for Success:

1) Reduce soft costs for distributed PV and storage to under 20% of total system costs,
2) Enable penetrations of distributed PV at least 25%[21] greater than the total MW of distributed PV that could be tolerated on the circuit prior to the project deployment without increases in the System Average Interruption Duration Index (SAIDI) or the System Average Interruption Frequency Index (SAIFI) for that circuit
3) Maximize value streams for distributed PV and storage combined with complementary technologies
4) Determination of ideal use cases for community-scale and distributed PV + storage configurations that balances value to the individual customer with grid needs
5) For multi-family residential communities, reduce tenant electricity bills by at least 25%

b. Group 2: Pilot Demonstration of Advanced Solar + Storage Technologies for Building-Scale Applications

Building owners are increasingly opting to install PV and energy storage to manage onsite energy costs and demand charges. However, these technologies are often procured separately without leveraging the advantages of having a comprehensive solar + storage solution, which has been shown to maximize customer bill savings and minimize payback time. There is a need to develop a standardized, replicable solar + storage solution for buildings that can optimize individual customer cost reduction while supporting distribution grid functions.

This project group is focused on technology development and pilot demonstrations of innovative solar + storage technologies and configurations for building-scale applications to reduce the overall costs and maximize value to building owners and customers. For purposes of this solicitation, building-scale is defined as a project involving a single commercial or industrial building with the onsite energy systems connected behind-the-meter smaller than 500 kW and larger than 50 kW in size.

The goals of projects in this group are to develop and evaluate advanced technologies that exploit the synergies between solar and stationary energy storage to enhance the value of behind-the-meter solar + storage to individual commercial and industrial building owners and tenants. Projects must also incorporate smart building energy management approaches and operational strategies to support local grid operations. Priority will be placed on technology solutions that can be widely replicated for similar building types across the state.

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[20] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB693

[21] IEEE (see http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6186479) and NREL (see http://www.nrel.gov/docs/fy13osti/54742.pdf) have performed case studies looking at the performance of systems with PV penetration significantly higher than 15% of the maximum daytime feeder load without significant adverse effects.

Eligible projects must include the following features, at a minimum:

- Clear description of how the proposed technology solution offers competitive advantages over commercially available market technologies
- Development of advanced solar + storage technology, integrated at the module level for both the solar and the storage, and targeted for commercial and industrial building applications. Examples of advanced technologies are:
    - Building-integrated PV for windows or roofing materials with building integrated energy storage.
    - Hybrid solar PV/ daylighting system with integrated energy storage
    - Building-scale PV/thermal technologies, including solar hot water applications with an energy storage component.
- The integrated solar + storage technology must meet the following performance criteria, at a minimum:
    - 10% reduction in costs versus a standalone solar system plus a standalone energy storage system.
    - 10% greater energy generated over the course of an average day compared to standalone solar plus standalone energy storage.
    - The ability to smooth solar intermittency at the point of generation, resulting in a reduction in standard deviation of the system output by greater than 10% compared to traditional PV.
    - An increase in overall system capacity factor by 10% compared to traditional fixed-tilt PV systems.
    - The ability to provide energy later into the evening than traditional fixed-tilt PV systems.
    - The ability to provide distribution grid services, as needed, with an examination of potential compensation strategies for providing these services.
    - Solar module efficiency of at least 30%
    - Storage round-trip efficiency of at least 85%
    - An expected system lifetime of no less than 10 years.
- The pilot demonstration of developed technology at a single commercial or industrial building situated at a strategic location on the distribution grid to maximize benefits to building owners and tenants while supporting the local grid.
- The inclusion of smart inverters capable of performing autonomous grid functions and communications[22],
- Smart building energy management strategies to smooth net load, reduce evening peak demand and maximize economic benefits while supporting local grid needs.
- Demand response capabilities and other distributed energy resources and/or enhancing features that are expected to increase system value.
- Evaluation of potential pricing schemes and rate structures that may impact market deployment of building-scale solar + storage.

[22] Defined as Phase I and II smart inverter recommendations from the Rule 21 updated Smart Inverter Working Group

Projects awarded under this project group should also consider the following attributes:

- Supporting and leveraging requirement for Zero-Net Energy buildings and time dependent valuation of energy supply and demand.
- Complement and build upon advancements and recommendations from the IDER proceeding at the CPUC.[23]
- Assessment of methods to compensate project owners/lessees for ancillary or grid services.
- Smart, demand response-enabled appliances and building load, such as water heaters or thermostat controls, to support PV smoothing and grid services.[24] [25]
- Preference for buildings located in a disadvantaged community.
- Leverage the LNBA methodology being developed as part of the IOU DRPs.
- Consideration of potential fire hazard risks and mitigation strategies for building-scale solar + storage to ensure public health and safety.
- Assessment of potential ownership and business models with an eye towards standardization and mass consumer adoption.
- Compatibility with CPUC programs, such as:
    - Meet the requirements to participate in the DRAM, if size eligibility requirements are met.
    - Meet the requirements for storage portion of the project to participate in the SGIP, if applicable.

Metrics for Success:

1) Provide greater than 50%[26] of peak load by onsite solar generated at the target building.
2) Smoothing of building demand profile to minimize net-load during evening and morning system peak demand and maximize utilization during mid-day peak solar generation.
    a. Reduction in evening peak demand by 15% or more.
3) Determination of ideal DER portfolios for standardized building types to enable high-penetration PV at the building level.
4) Reducing building owner/tenant utility bills by at least 10%, including demand charge reduction.
5) Proposals should first prioritize value to individual customers, and second consider functions to support the grid.

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[23] http://www.cpuc.ca.gov/general.aspx?id=10710

[24] Smart water heaters behave like thermal energy storage by shifting electricity consumption to absorb excess energy supply and provide demand response services such as frequency regulation. These water heaters avoid compromising user comfort by maintaining a constant water temperature at the top of the heater while the bottom is free to perform energy storage functions.

[25] UC Berkeley, 2008 ACEEE Summer Study on Energy Efficiency in Buildings, "Demand Response-Enabled Residential Thermostat Controls," available at http://aceee.org/files/proceedings/2008/data/papers/1_98.pdf

[26] IEEE (see http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6186479) and NREL (see http://www.nrel.gov/docs/fy13osti/54742.pdf) have performed case studies looking at the performance of systems with PV penetration significantly higher than 15% of the maximum daytime feeder load without significant adverse effects.

c. Group 3: Enhanced Modeling Tools to Maximize Solar + Storage Benefits

Though it is becoming widely recognized that behind-the-meter and community-scale solar + storage projects can benefit the grid and provide greater value to customers than solar or storage alone can, it is not yet clear what those values are or how they can be maximized (nor how the possible adverse impacts of high penetrations of PV can be minimized). The CPUC has directed the IOUs to assess the locational net benefits of DER technologies, but the IOUs' plans have not yet been approved. Any results from the LNBA are still years off and may not include a strong focus on combined solar + storage and where it can provide the greatest value to the grid. In addition, there is no identified method to incentivize customers to install systems, or buy into utility-owned or third party-owned systems, that provide the greatest value to the grid.

This project group is focused on the development of modeling tools and strategies to help streamline the deployment of distributed solar, energy storage, and smart inverters and to maximize benefits to individual customers and the larger grid. This project group will develop and evaluate strategies to reduce non-hardware costs and increase the potential value streams for distributed PV and storage to help strengthen the business case for DER.

Tools should leverage the IOU DRPs and other existing modeling tools to provide additional enhancing features focused on increasing the value of distributed PV and storage with smart inverters to customers and the grid. Funded projects must include:

- Discussion on how the proposed activities will leverage and/or enhance LNBA methodology from IOU DRPs
- Discussion of how the project will benefit relevant CPUC proceedings, such as IDER, DRP, RPS, etc.
- Evaluation of how the marginal cost and value of systems change as a function of PV penetration and location on the feeder
- Varying assumptions regarding participation in net energy metering, time of use rates, availability of investment tax credits, participation in reserve markets, and other relevant economic considerations
- Analysis of compensation strategies for power and ancillary services that will incentivize systems that are of the greatest value to both the grid and the individual customers.
- Assessment of strategies to clarify and minimize interconnection fees for distributed solar + storage projects.
- Development of a module that specifically examines community-scale solar+storage.
- Working closely with recipients of funding in project groups 1, 2, and 6 to leverage preliminary outcomes, results, and technology characteristics defined in those project groups of this solicitation to identify ideal locations for widespread deployment of community solar + storage, building-scale solar + storage, and front-of-meter storage in areas with existing high-penetration distributed solar, across California IOU service territories.
- Focus on needs and perspectives of customers, third-party aggregators, and IOUs.
- Modeling of all three IOU service areas.

Proposals submitted under this project group may also include:

- Community solar + storage under various configurations.
- DER aggregation strategies / virtual power plants.
- Opportunities for participation in demand response programs.
- Consideration of solar + storage deployment impacts to transmission and subtransmission power flow.
- Consideration of distributed PV and storage in both secondary networked distribution systems and radial distribution systems, as well as at the substation level.

Metrics for Success:

1) Identification of most value and least cost configurations of solar + storage for a typical California IOU distribution system with various PV penetrations.
2) Recommendations on maximum levels of PV penetration, both with and without storage, that circuits can accommodate without adverse impacts on the grid, and what factors affect these maximum penetration levels.
3) Recommendations for interconnection fees and compensation levels for reserves and ancillary services that would incentivize the uptake of solar + storage installations with the highest value to the customer, least amount of adverse impacts, and highest benefits to the grid.

d. Group 4: Advanced Smart Inverter Capabilities to Support High-Penetration Solar

The SIWG's Phase I recommendations for autonomous smart inverter functions are expected to reduce adverse impacts of high penetrations of PV on the California grid. These Phase I recommendations are expected to become mandatory for new inverters by the end of 2017. Phase II recommendations relate to enabling communications functionality and Phase III recommendations include the ability for inverters to respond to signals from the utility to support the grid. The schedule for adoption of the Phase II and Phase III recommendations is not yet known, but what is clear is that testing and verification of the recommendations will be necessary. In addition, consensus on the Phase III recommendations was not reached by the broader SIWG, particularly regarding customer compensation when the utility signals their inverters to reduce or stop power flow to the grid.

This project group is focused on pilot demonstrations of advanced smart inverter functions to decrease distributed PV integration costs, increase penetration levels of distributed PV, and/or enhance the value of distributed PV to consumers and the grid. The focus of awarded projects will be the verification of Phase III recommendations as defined by the SIWG, as well as other advanced communication functions the applicant identifies that would be valuable to the grid and individual customers.

Projects will build upon the work already performed under EPC-14-036 with SunSpec Alliance and EPC-14-079 with Electric Power Research Institute, both of which will include verification of the SIWG Phase I, and possibly also Phase II, recommendations.

Projects must include bench-scale verification and pilot-scale demonstration of the following Phase III functions, at a minimum:

- **Monitor Key DER Data**: All DER systems shall have the capability to provide key DER data at the DER's Electrical Coupling Point (ECP) and/or at the point of common coupling. IOUs shall define in their Interconnection Handbooks when and under what conditions the data exchange requirements shall be provided, including what types of data, whether and how it may be aggregated, frequency of monitoring, time latency, etc.
- **DER Cease to Energize:** The "cease to energize" request shall cause a "cease to energize" state at the ECP or optionally shall allow the opening of a switch at a Referenced Point. The cease to energize shall cause the DER to output zero active current flow and (close to zero) reactive power flow.
- **DER Return to Service:** The return to service request shall end the "cease to energize" state or shall initiate the closing of the DER switch at the Referenced Point.
- The **Limit Maximum Real Power** Percent mode shall limit the real power level at the Referenced Point as a percent of the maximum real power capability, and/or the Limit Maximum Real Power Level mode shall limit the real power level at the Referenced Point to a specific real power value.
- For DER systems that can control their real power output (such as energy storage, synchronous generators, etc.), the **Set Real Power Percent** mode shall set the real power level at the Referenced Point as a percent of the maximum real power capability, *and/or* the **Set Real Power Level** mode shall set the real power level at the Referenced Point to a specific real power value.
- The **Frequency-Watt Emergency mode** shall counteract frequency excursions during high and low frequency ride-through events by decreasing or increasing real power. The change in real power may be provided by changing generation, changing load, or a combination of the two.
- The **Volt-Watt mode** shall respond to changes in the voltage at the Referenced Point by decreasing or increasing real power. The change in real power may be provided by changing generation, changing load, or a combination of the two.
- The **Dynamic Reactive Current Support mode** shall provide reactive current support in response to dynamic variations in voltage (rate of voltage change) rather than changes in voltage.
- **Schedules** shall be capable of setting **real and reactive power values** as well as enabling and disabling **DER modes** for specific time periods.
- **Unintended islanding** should be prevented.
- **Additional scheduling capabilities** may optionally be supported, such as providing pricing signals for different scheduled times.

Metrics for Success:

1) Written assessment of SIWGPhase III recommendations

2) Enable penetrations of distributed PV at least 25% greater than the total MW of distributed PV that could be tolerated on the circuit prior to the project deployment without increases in the System Average Interruption Duration Index (SAIDI) or the System Average Interruption Frequency Index (SAIFI) for that circuit
3) Providing data and/or tools that can be used to determine fair levels of compensation for reducing customer's power output to support grid functions
4) Recommendations for cybersecurity and privacy of customer information

e. Group 5: Holistic Forecasting to Support High-Penetration Solar Grid Operations

In recent years, EPIC and other programs have funded a number of projects to advance the accuracy of solar and wind forecasting, but most of these projects are focused on forecasts for individual power plants, regions, or microgrids, rather than a comprehensive, system-wide forecast. Currently there are no tools that consider at high resolution the system-wide impacts of both utility-scale and behind-the-meter solar and wind resources and the interaction with both conventional resources and overall customer load. Such a tool could be particularly beneficial to help identify unusual but costly day-ahead forecast scenarios for grid operators.

This project group is focused on integrated and holistic electricity forecasting approaches for the day-ahead and shorter timescales that consider all grid-connected renewable generation, including distributed generation, along with load forecasts and conventional generation resources. Particular focus should be placed on identifying and avoiding scenarios that would be the most costly for grid operators and ratepayers, such as extreme weather events. The goals for projects funded in this group will be to provide tools that the CAISO will integrate into its grid operations and planning efforts and to evaluate the specific economic benefits the tool will provide.

Projects awarded in this project group must consider the following attributes in a proposal:

- Development of a time-dependent valuation metric for renewable energy forecast errors[27] to determine associated costs of inaccuracies, particularly during peak demand times and ramp events.
- Consideration of coastal marine cloud layers, monsoonal events, atmospheric inversions, and microclimate drought impacts within California.
- Locational forecasting to support development of refined mid-term growth scenarios for DER within distribution territories, with inclusion of solar + storage.
- What additional data is needed to perform accurate forecasts, associated cost impacts for grid operators and ratepayers, and strategies for facilitating secure data transfer.

[27] See "A suite of metrics for assessing the performance of solar power forecasting" at http://www.utdallas.edu/~jiezhang/Journals/JIE_2015_SE_solar_forecasting.pdf for an example of metric development to assess the impacts of improved solar forecasting.

- Establishing a baseline for CAISO and California IOUs to use in evaluating proposed and future forecast improvements.

Projects awarded in this project group should also consider the following attributes in a proposal:

- Methods for resolving cloud optical thickness that combine multiple sensor inputs, including high-resolution ground observations and advanced satellite imaging techniques.
- Models that integrate numerical weather prediction methods with remote sensing and ground telemetry to increase reliability of forecasts for rapid ramp events.
- Consideration of different policies that may affect the growth of distributed renewables and DER within IOU territories over the medium- to long-term and potential impacts for short-term solar forecasting.
- Coordination with the CAISO and/or the IOUs, including letters of support for the project.

Metrics for Success:

1) Minimizing the economic and environmental costs of forecast errors and consequences for over/under generation
2) Data and/or tools that can support CAISO planning and operations
3) Improvement of forecasting accuracy by at least 10% over persistence forecasts, as measure by mean absolute error

f. Group 6: Energy Storage Deployment to Facilitate Storage Interconnection and Enable Integration of High-Penetration Distributed Solar

This project group is focused on demonstrations of energy storage technologies to enable and mitigate the impacts of high-penetration distributed photovoltaics and other DERs while streamlining storage interconnection and reducing integration costs on the distribution grid. The addition of storage systems on circuits with existing PV will prevent the uncontrolled mid-day export of large amounts of solar PV generation to the grid and reduce the evening net load peak and the associated need for fast-ramping generation.

Demonstrations will be sited in front of the meter[28] on circuits with existing high-penetration (aggregated capacity greater than or equal to 50% of peak load on the circuit) solar to offset the need for additional system upgrades and expansion.

Projects awarded in this project group must consider the following attributes in a proposal:

- Coordination with the local electric utility: utility may own or procure the deployed storage, or it may provide a letter of support for the project.

[28] "Front of the meter" is defined for the purposes of this solicitation as being connected to the distribution grid in a location that is not between customer load and that customer's meter.

- Deployment of storage is primarily intended to provide grid support services.
- Locating all storage solutions in front of the meter on the distribution system.
- Use of a management system for efficient operation of the storage.
- Consideration of potential fire hazard risks and mitigation strategies for front-of-the-meter storage to ensure public health and safety.
- Identification of the value provided by the deployed storage.
- Performance metrics:
    - Effective system lifetime of at least 10 years
    - Round-trip efficiency of at least 85%

Projects awarded in this project group should also consider the following attributes in a proposal:

- Bundling multiple technologies to provide a range of grid services in a single package.
- Leveraging the LNBA methodology being developed as part of the IOU DRPs.
- Participating in CAISO reserve markets.
- Meet the requirements to participate in the SGIP, if applicable.

Metrics for Success:

- Improvement of at least 10% in SAIDI, SAIFI, and other reliability measures on the affected circuits
- Deferral of transmission and distribution upgrades with value equal to or greater than the cost of the installed storage
- Storage interconnection recommendations that could be used in the successor to the R.11-09-011 Rule 21 proceeding.
- Demonstrated progress toward achieving 2020 energy storage goals:
    - round-trip efficiency of at least 90%
    - system lifetime of at least 15 years
    - levelized cost of energy of $0.10/kWh or lower