



# Electric Energy Storage

## Update on DOE/California Program Collaboration

by

**Pramod Kulkarni**

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This project is part of the Energy Storage Collaboration between the California Energy Commission (CEC) and the Energy Storage Systems Program of the U.S. Department of Energy (DOE/ESS) and managed by Sandia National Laboratories (SNL). Sandia is a multi-program laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration, under contract DE-AC04-94AL85000.

# California Has Had an Active Electricity Storage Program Since 1990



- California Energy Commission (CEC) has funded several EES technologies for multiple applications.
- Invested in 17 projects since 1990
- Most investments in 2003-2008 period
- \$ 7.00 million in currently funded projects
- \$ 3 million planned projects for FY2008

# Reasons for California Investments in Electricity Energy Storage



## Energy Storage Helps Meet Multiple Policy Goals

- Peak Load Reduction , Energy Efficiency, Load Management
- Integration of Renewable Such as Wind/Solar
- Grid Stability/Congestion Reduction
- GHG Reduction.

# California Energy Storage Program

## Categories of Activities



- Assessment of Technology Performance
- Assess Ability to Seamlessly Integrate EES in Intended Applications
- Develop Protocols & Procedures to Facilitate Integration
- Resource Assessment , Decision Making Tools
- Advocate & Support Use of EES to Consumers, Policy Makers & Utilities.



## Active Program Partners

- US DOE/Sandia National Lab
- Electric Power Research Institute
- Utilities
- Other State Agencies such as CPUC , CARB
- Energy Storage Association



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# DOE & California Energy Commission

- A Working Partnership Since 2003



- A Memorandum of Understanding (MOU) in place since 2003
- A new MOU is approved extending the term till 2012
- DOE, through Sandia, has provided technical assistance of the following types
  1. Technology review/assessment
  2. Economic assessments of storage projects & applications
  3. Development of test plans & design data monitoring
  4. Data collection on performance
  5. Review solicited and unsolicited proposals
  6. Multiple Site visits to assess progress, trouble shooting
  7. Outreach & technology transfer

# DOE & California Energy Storage Program

## - Complement Strengths & Capabilities of Each



### Department of Energy

- National perspective on energy priorities justifying component & system technology developments, based on priorities (e.g. national securities) not commonly handled at state or local level.
- Can justify cost-effective development of components based on national markets.
- Longstanding relationship with other federal agencies to cost-share dual-use technologies such as DoD, NASA
- Act as a stable reservoir of scientific knowledge of technical know-how (e.g. national labs) while the state level need may not justify developing or maintaining such resources.
- Facilitate national technology transfer and cross-fertilization of ideas through national forum

### California Energy Commission

- Understanding of local issues that can be solved by storage and have higher priority as compared to national needs.
- Better understanding of institutional issues (permitting, rebates, interconnection, comparative economics)
- Strong working relationship with local utilities and power suppliers such as wind energy developers
- Ability to define local benefits that form the basis of "value proposition" (e.g. T&D congestion, wind resource integration, peak demand)
- Ability to educate/influence local/regional decision makers and affect policies that facilitate EES adoption, financing and permitting.



# California Energy Commission Funded Projects

## Electric Energy Storage Applications



### List of CEC Energy Storage Projects Since 1990

Title	Year	Funding Amount
1. Compressed Air Energy Storage (CAES) Site Assessment with PG&E	1990	\$ 500K
2. Flywheel for Transportation Application	1996	
3. Trinity 2kW 2 hr Flywheel Project	1998	\$ 1000K
4. ZBB Battery 2MW 2 hour for distribution /substation application	2003	\$ 1800 K
5. Renewable Micro Grid: Super-capacitors at Palmdale Water Districts	2003	\$ 1000K
6. Beacon Flywheel for Frequency Support	2004	\$ 1235 K
7. Super-capacitors for Light Rail Applications- SMUD	2006	\$ 700 K
8. GAIA – 5.5. KW, 10 Hrs Utility Dispatchable, SCADA Connected Modular Storage for residential PV	2007	\$ 75 K
9. 20 kW/9 hr Flow Battery for Peak & Load Management battery at Telecom site		\$ 100 K
10. EPRI CAES Preliminary Site & Plant Study.	2007	\$ 100 K
11. PNL Contract to develop EES Profiles	2008	\$ 200 K
12. Storage Feasibility Analysis Wind Interconnection Points on the SCE system	2008	\$ 500 K
13. Metrics-based Evaluation of Storage at Wind Interconnection Points in CA	2008	\$ 500 K
14. Beacon Flywheel for Managing Wind power Fluctuations at Turbine level	2008	\$ 250 K
15. LBNL-Web calculator to assess economic and technical feasibility for customer-side ESS	2008	\$ 180 k
16. Planned Contracts for Remaining 2008	2008	\$ 2000K
A. CAES Detailed site assessment (6MW/4hrs)		
B. Large Scale Battery at a Substation in Northern CA (6MW/4 hrs)		
C. Large Scale Battery at Catalina Island Off Los Angeles(1MW/7 hrs)		
D. ZBB for Movable Application ( 1MW/1 hr)		
E. PNL-Develop Tariffs & program for EES Products		
		<b>Total&gt;&gt;&gt; Approx: \$ 9.5 million</b>

# California Energy Commission Funded Projects

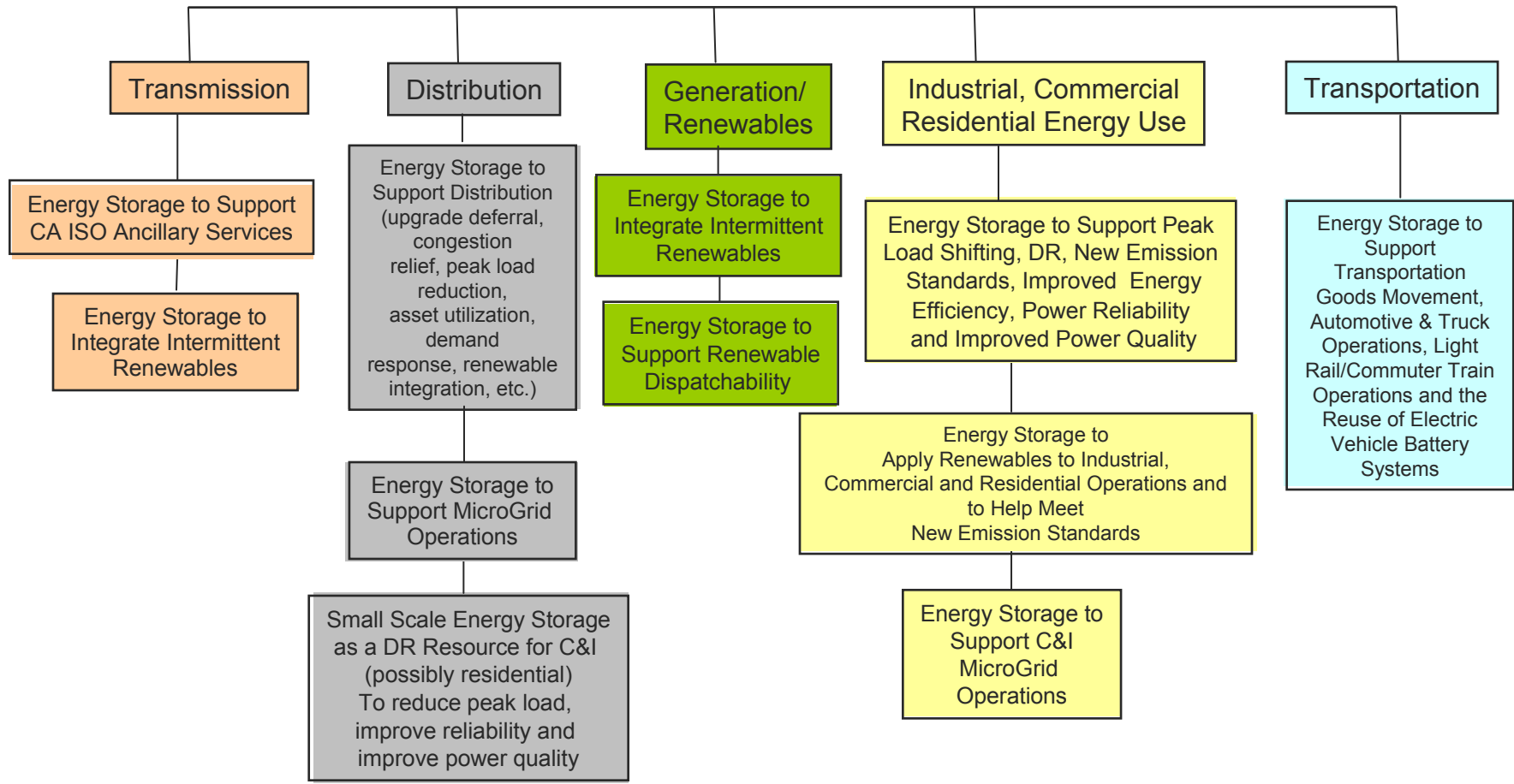
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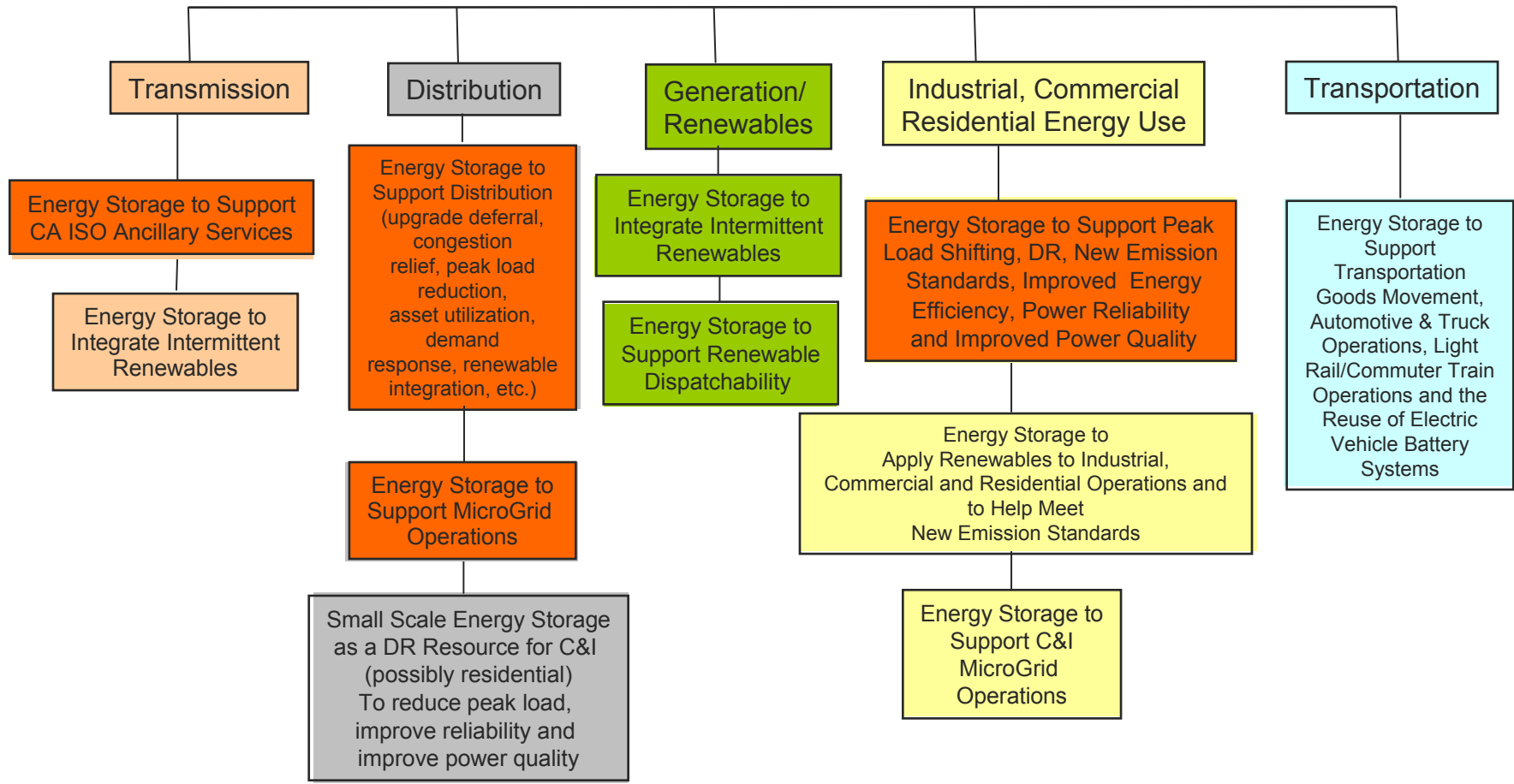
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# Energy Storage Applications Identified by California Energy Commission Program Areas

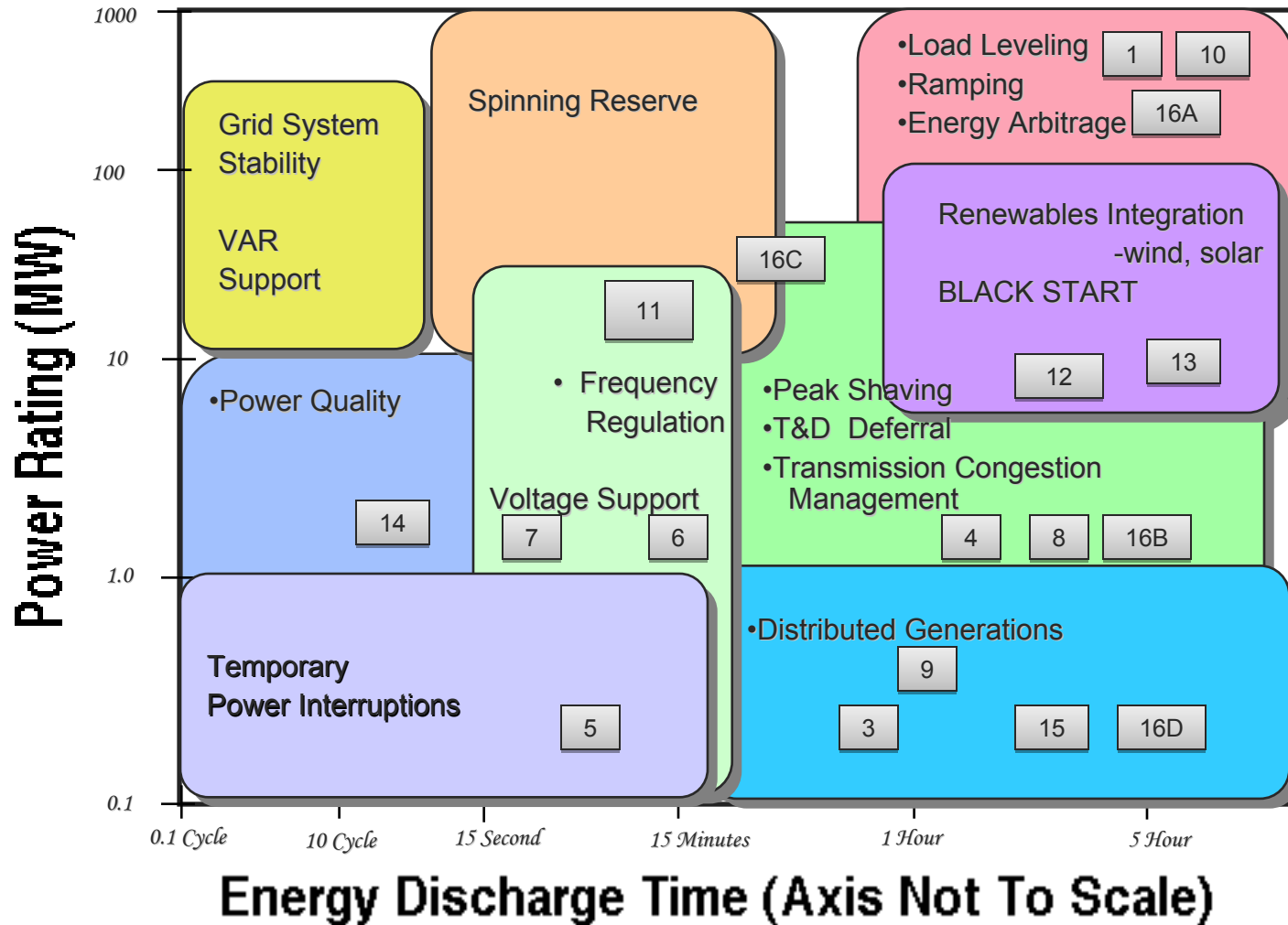


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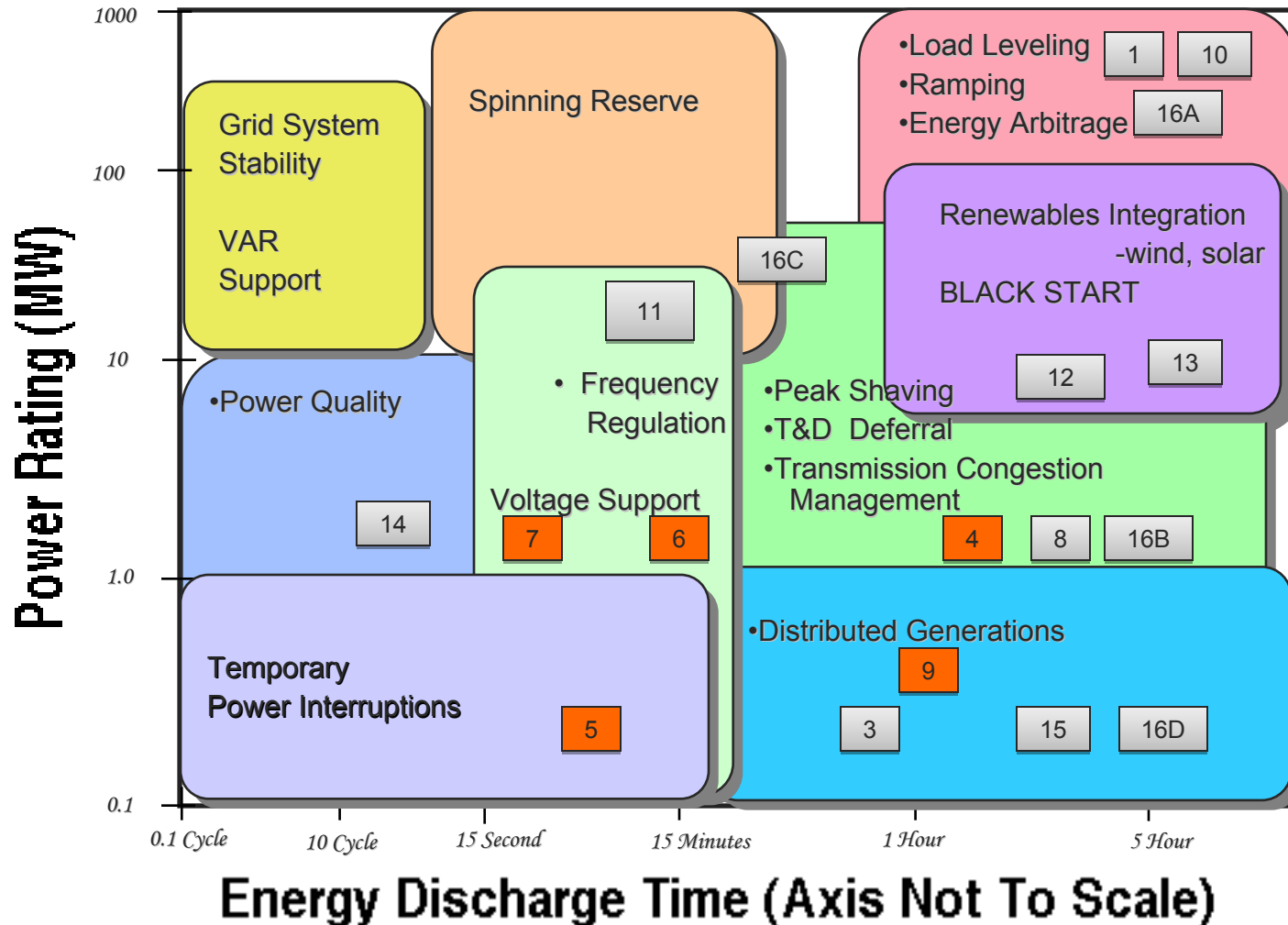
# California Energy Commission Projects Displayed by Electric Energy Storage Applications

(All Boundaries Of Regions Displayed Are Approximate)



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# DOE –A Major Contributor to California's Energy Storage Program Success



California energy storage program has benefitted in multiple ways from the DOE collaboration

- Provided critical technical knowledge and support
- Provided about \$1.2 million dollars in technical support and assistance.
- Brought credibility by validating technology performance leading to further development.
- Enabled recruiting utilities and project development partners.