



# **DOE Energy Storage Systems Program Overview**

## **Energy Storage Systems Program Annual Peer Review November 19-20, 2002**

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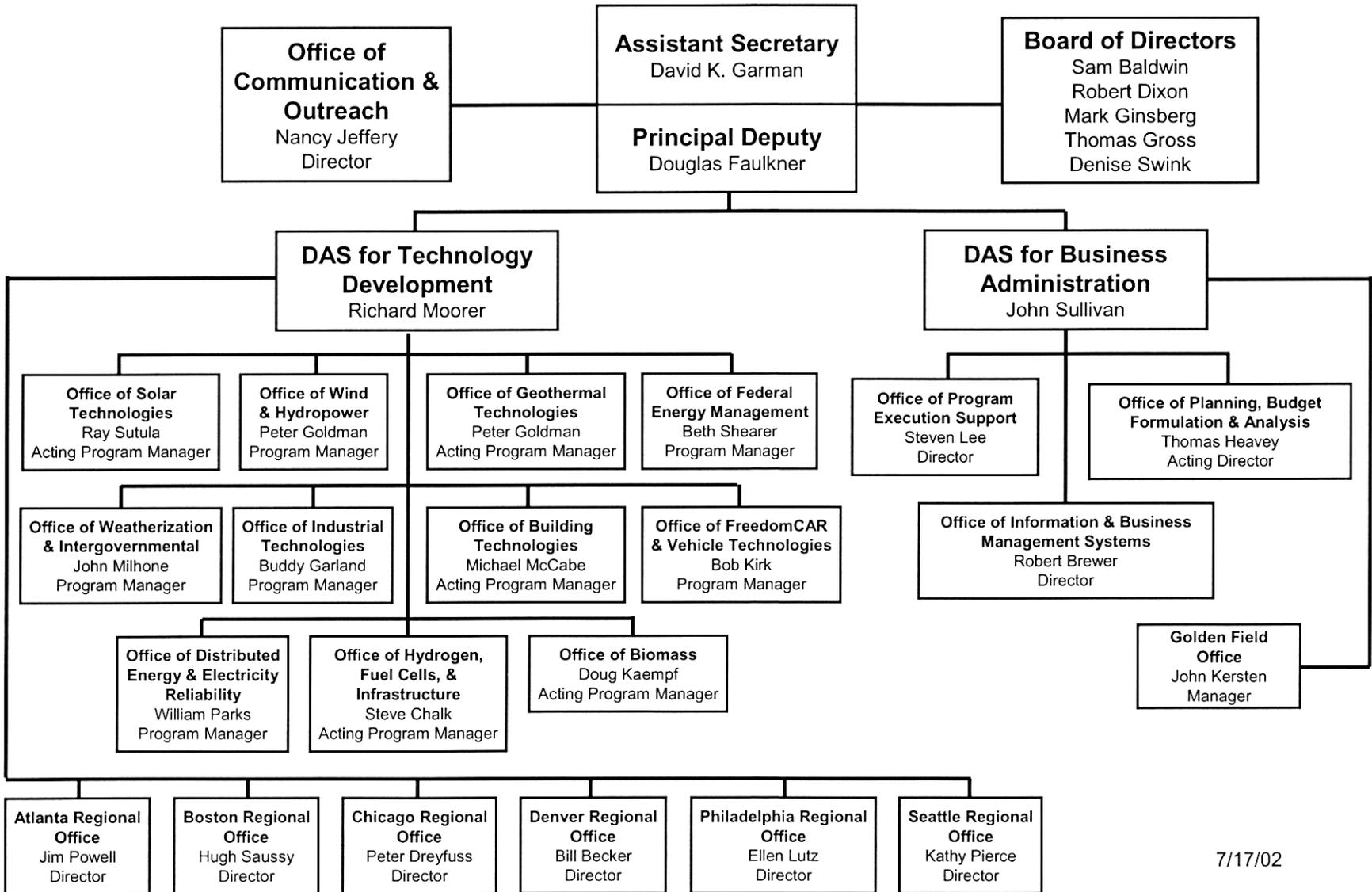
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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy under contract DE-AC04-94AL85000.



# Office of Energy Efficiency and Renewable Energy Organization Chart





# Energy Storage Systems Program Mission

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**Strengthen America's electric energy infrastructure by developing advanced energy storage technologies that increase the security, reliability, performance, and competitiveness of electricity generation, transmission, distribution, and use in both grid-connected and off-grid systems.**



# Energy Storage Systems Program Goals

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- **Develop and evaluate integrated energy storage systems**
- **Develop batteries, SMES, flywheels, supercapacitors and other advanced energy storage devices**
- **Improve multi-use power electronics, controls, and communications components**
- **Analyze and compare technologies and application requirements**
- **Encourage program participation by industry, academia, research organizations and regulatory agencies**

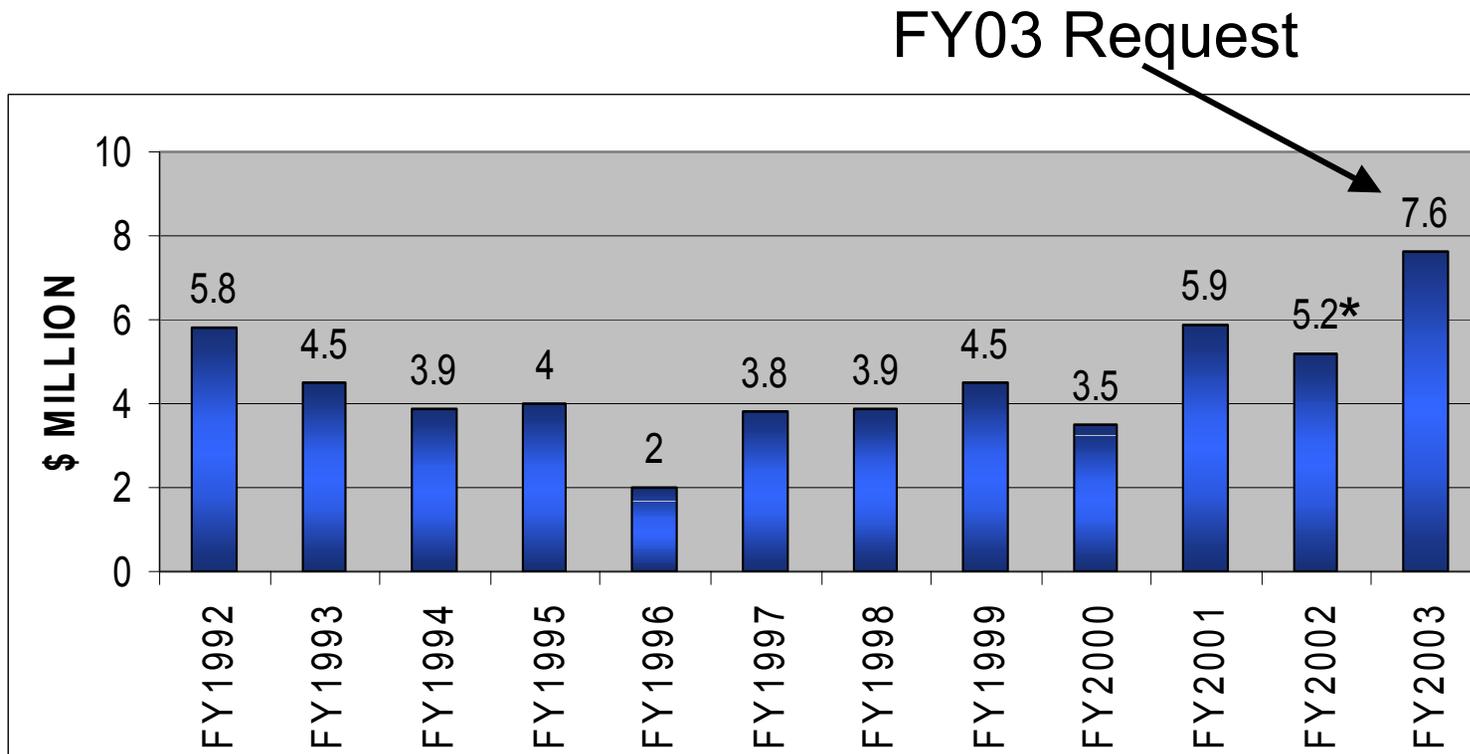


# ESS Program Elements

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- **System Integration**
  - pursues a strategy to reduce the inefficient, one-of-a-kind system engineering historically required when utility energy storage systems have been designed and built
  - evaluate and disseminate information on systems in the field
- **Subsystem Development** - develop and evaluate the components of the energy storage system to achieve lower cost, higher performance, and better integration than currently available.
  - storage component (e.g., flywheel, battery, supercaps or SMES)
  - power conversion and control subsystems
- **Strategic Research** - formulation and application of analytical methodologies necessary to identify utility applications and estimate the technical and economic benefits of energy storage.

# Energy Storage Systems Program Funding

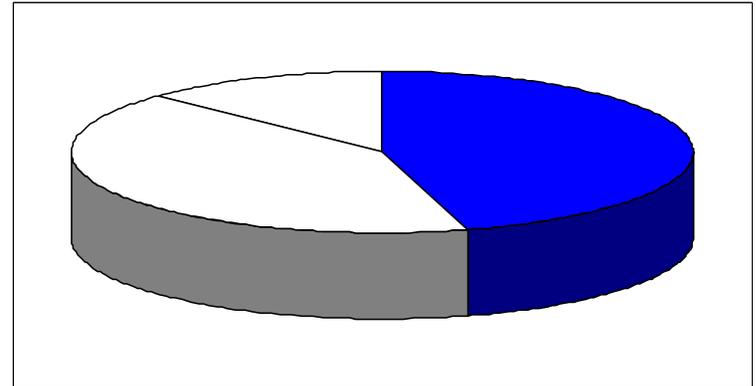


\* Earmarks removed

# System Integration Projects

## FY02 \$ 2.3 M

- Regenesys and NAS Monitoring
- Integration of Storage with FACTS Devices
- PV/Hybrid Systems Field Test at STAR
- Alternative RGS System
- Alaska Battery-Diesel System
- Zinc Bromine Flow Battery Tests
- Vernon & Metlakatla VRLA Battery Monitoring
- Peru RAPS System Study
- Univ. of Maryland DER/Battery System Study



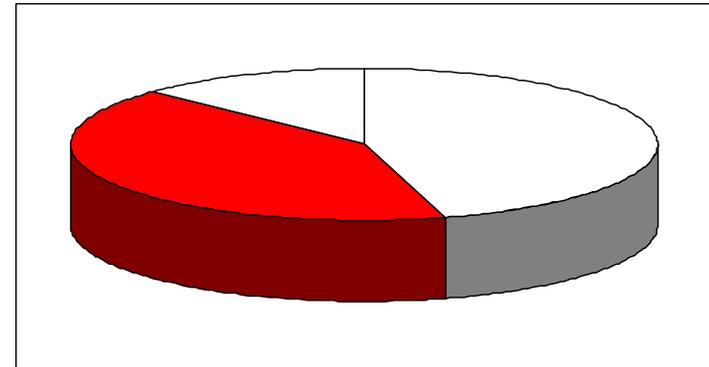
FY02 System Integration  
Budget  
46%

# Subsystem Development Projects

## FY02 \$ 2.1 M

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- ETO switch development
- ETO switch testing
- Li Ion Battery Module
- Bipolar NiMH battery
- Superconducting Flywheel
- Improved Flywheel Rotor
- Supercapacitor testing
- Optically Isolated HV-IGBT MW Inverter (SBIR)
- Nanostructured Electrodes (SBIR)
- Advanced Intelligent Controller
- Inverter Reliability Improvement

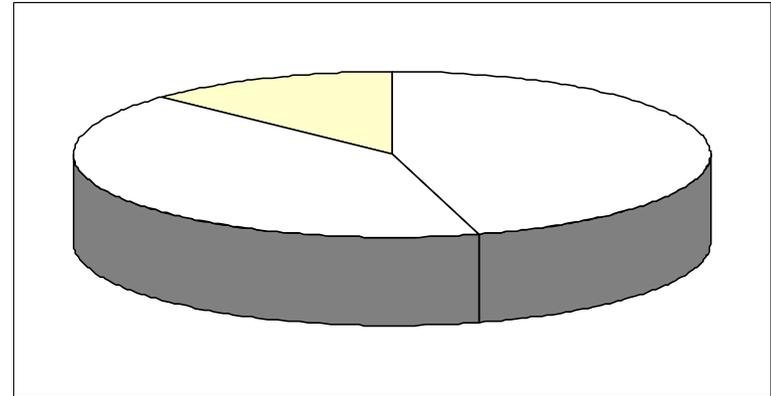


FY02 Subsystem  
Development Budget  
42%

# Strategic Research Projects

## FY02 \$ 0.6 M

- **Secondary Use of EV Batteries**
- **Short and Long Term Storage**
- **Bulk Energy Storage for Island of Hawaii (SEP Project)**
- **PV-Battery System for Transmission Mgmt. (SEP Project)**
- **Supercapacitor/Micro-turbine System Modeling**
- **I-Grid PQ Monitoring (HQ contract)**
- **Modeling Lead acid batteries**
- **Value of Storage in Restructured Utility**
- **EESAT 2002**
- **Reporting**



FY02 Strategic Research  
Budget  
12%



# FY02 Program Highlights

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- **Partnerships formed with TVA and AEP to monitor and analyze data from a 120 MWh Regenesys System and a 100 kW NAS system**
- **ETO – High Power testing initiated in collaboration with the Naval Surface Weapons Center in Philadelphia**
- **Completed testing of 100 kW Li-ion BESS system**



# FY02 Program Highlights

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- **Inverter reliability improvement project begun jointly with DOE PV and DER Electric Systems Integration Programs**
- **Partnership formed with California Energy Commission for a \$5 - \$6 M Energy Storage Initiative**
- **Study using PJM data shows that potential for energy storage systems is in the GWs**
- **EESAT 2002 Conference**
  - **165 Attendees from 13 countries**