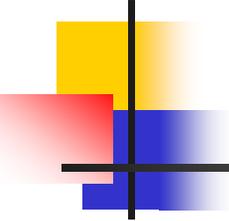


Status and Outlook of the Energy Storage Market

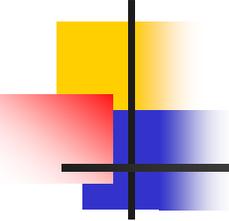
IEEE/PES General Meeting 2007
Tampa FL, June 26





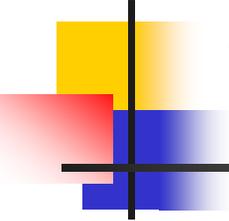
Electricity Storage Association

- Trade Association with 70+ members from three continents
- Utilities, suppliers of energy storage equipment and services, research institutions
- Mission: To promote the development and commercialization of competitive and reliable electricity storage delivery systems ...
- www.electricitystorage.org



Established large-scale storage

- Pumped hydro capacity in USA
 - 20.5 GW in 2004
 - Plus 77.9 GW of conventional hydro
 - Ongoing developments in Asia
- Areas of interest
 - Underground reservoirs
 - Adjustable-speed turbines



Will CAES ever be successful?

- Existing facilities
 - 1978 – Huntorf, Germany, 290 MW
 - 1991 – McIntosh, AL, 110 MW
- New plants very capital-intensive
 - Iowa 200 MW facility online by 2011
- New developments
 - Adiabatic cycle – no fuel needed
 - CAES integrated in wind turbines
 - Above-ground CAES

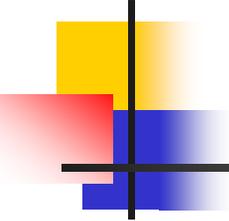
Successes with traditional batteries



16 MVA, 30 sec.

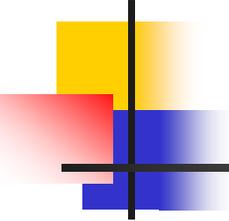


27 MW, 15 min.



Emerging smaller-scale storage

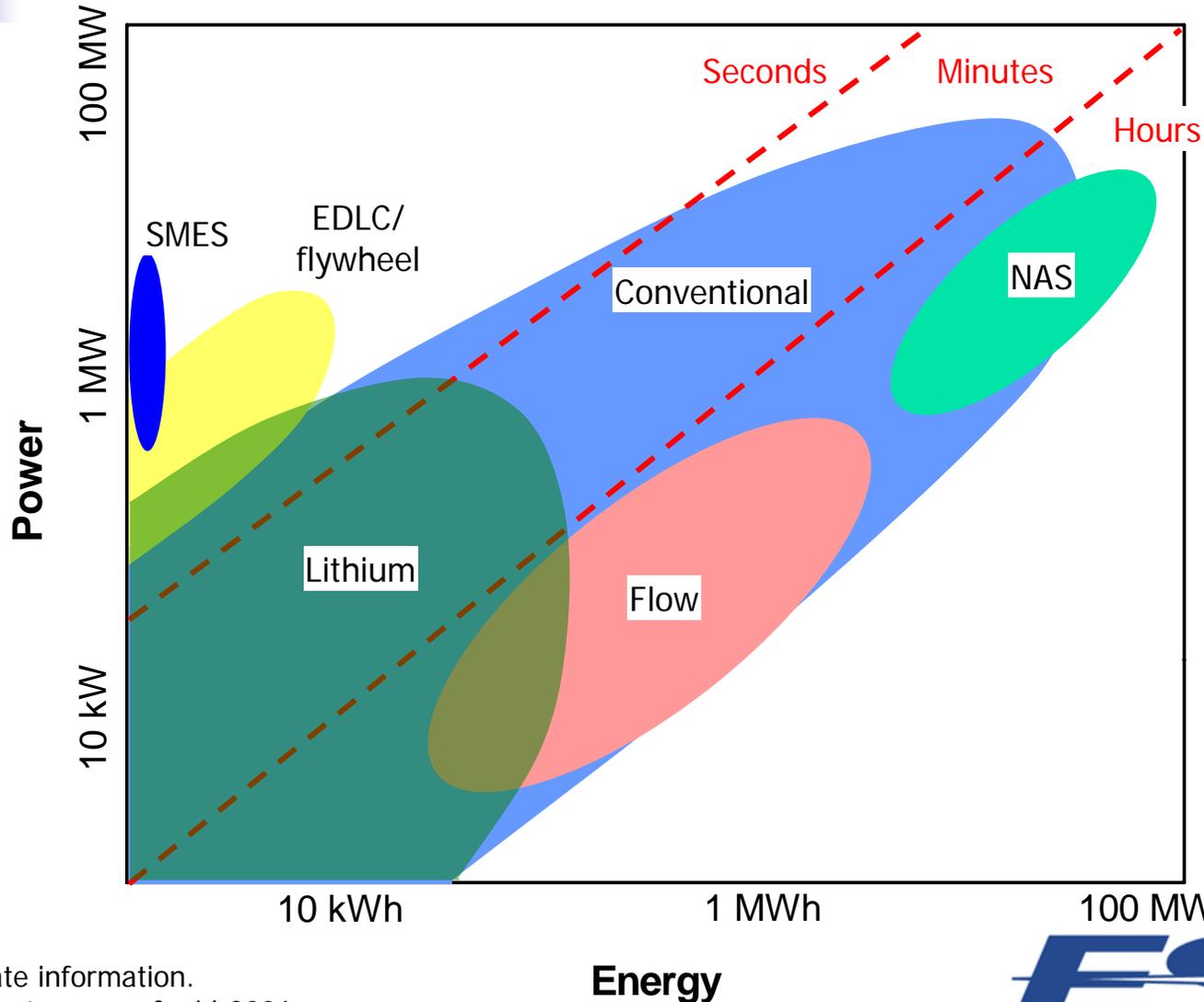
- Recent battery developments
 - Flow
 - High-temperature
 - Lithium
- Non-battery technologies
 - Flywheels
 - Electric double-layer capacitors
- Power electronics developments



Application issues

- Power vs. energy
 - High-power, short-duration discharges
 - High-energy, long-duration discharges
- Scalability
 - kW → MW
 - kWh → MWh
- Cycling capability

Power, Energy & Scale



Approximate information.
Installed systems as of mid-2006.

Advanced technologies in action



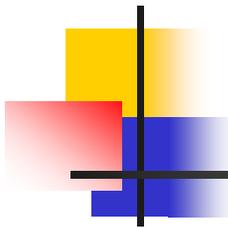
AEP – Sodium-Sulfur
1.2 MW / 7.2 MWh



PacifiCorp – VRB
250 kW / 2 MWh

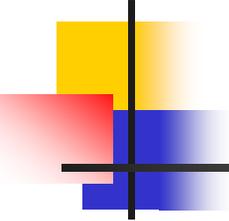


Beacon Power Flywheels
100 kW / 25 kWh



“Hot button” issues for storage

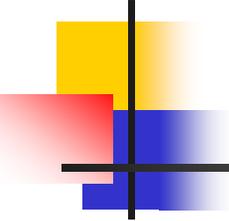
- Integration of renewables
- Decentralization / microgrids
- Impact of plug-in hybrid vehicles
- Improved efficiency, reliability and security



Gathering momentum...

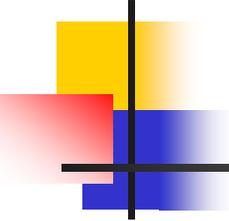
- Installation of electricity storage is accelerating
 - Demonstration systems
 - 'Low-hanging fruit'
- More installations help lower costs
 - Bringing more installations
- The technology is ready...





Overcoming barriers

- Barriers still exist
 - Government subsidies
 - Regulatory
 - Tariff-based
 - Cultural
- The storage industry must work with all parties to overcome these barriers
 - Governments
 - Regulators
 - Utilities
 - Operators



For further information...

- Any questions:
 - jim.mcdowall@saftbatteries.com
- Electricity Storage Association
www.electricitystorage.org
(includes links to ESA member companies)