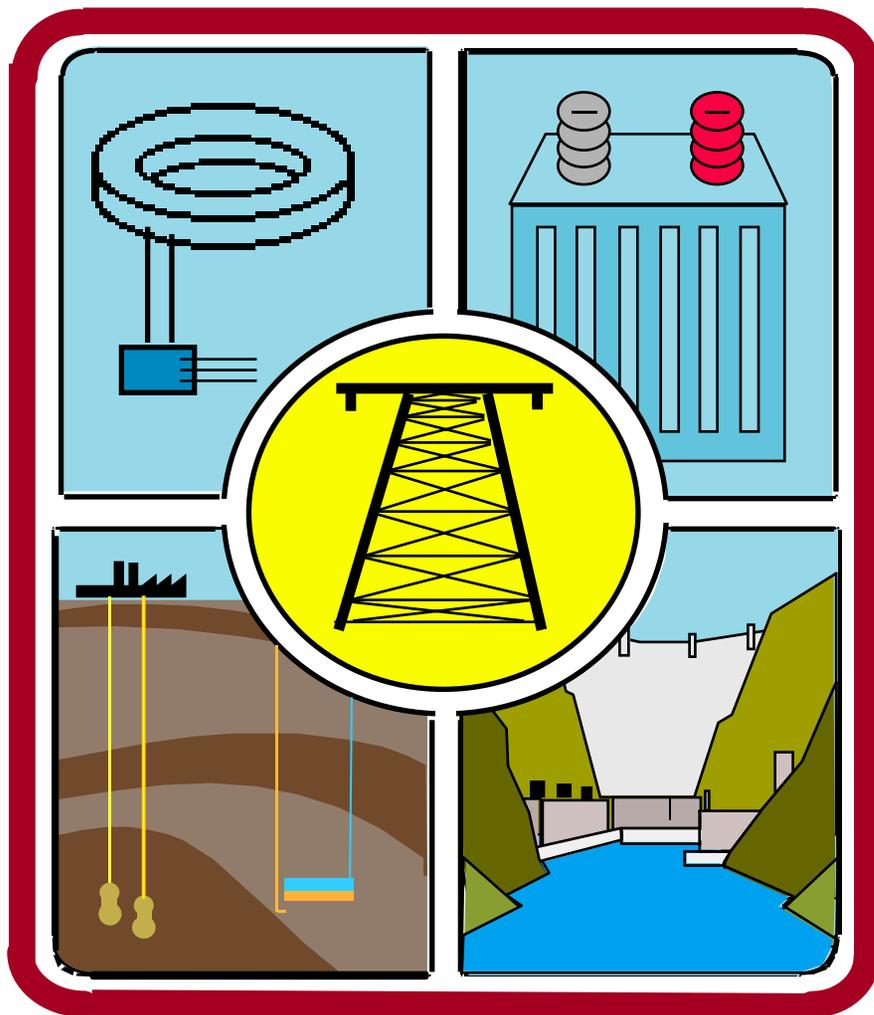




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## Energy Storage: Executive Overview

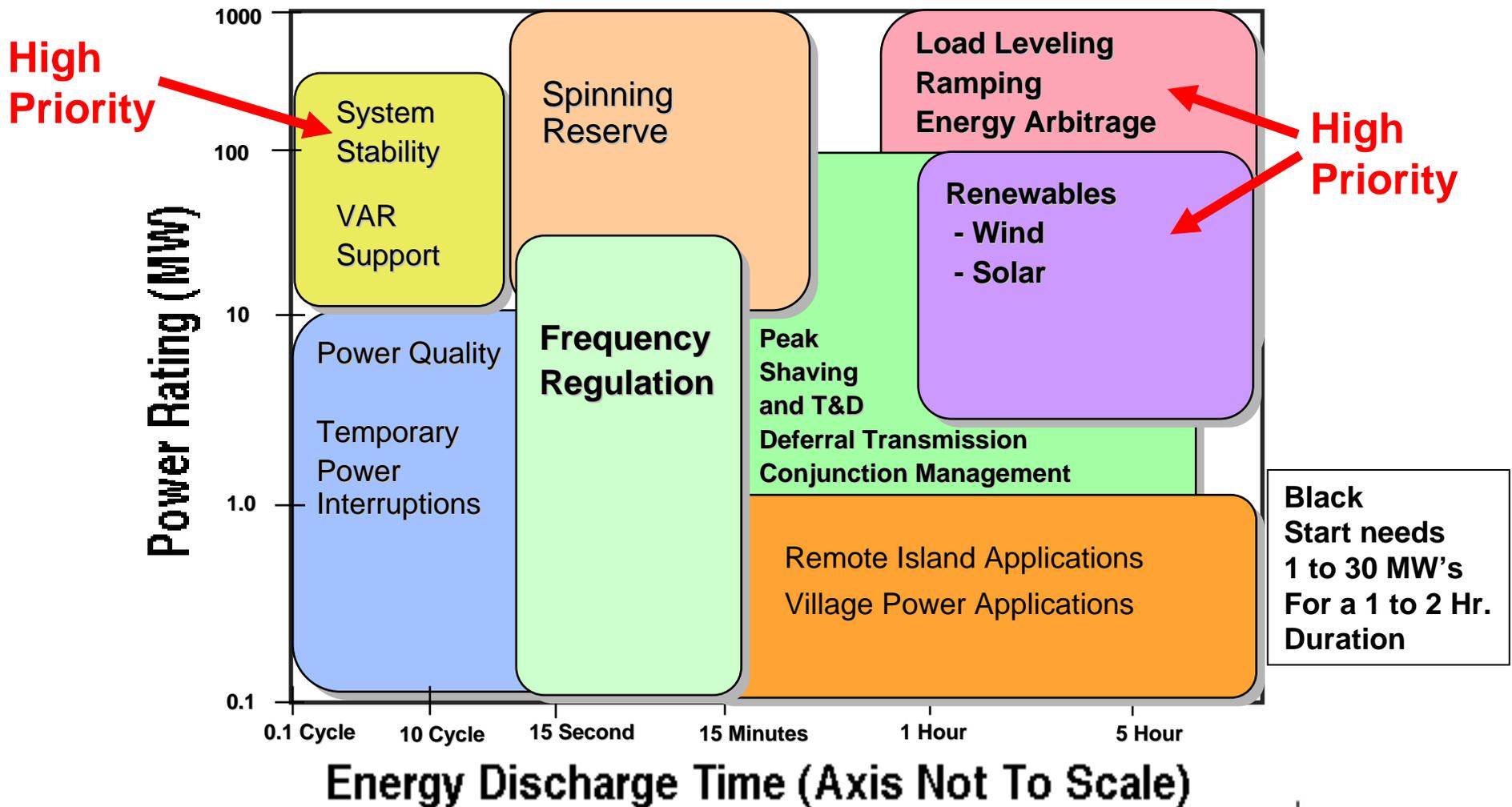
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# Electric Energy Storage Applications

(All Boundary Regions Displayed Are Approximate)



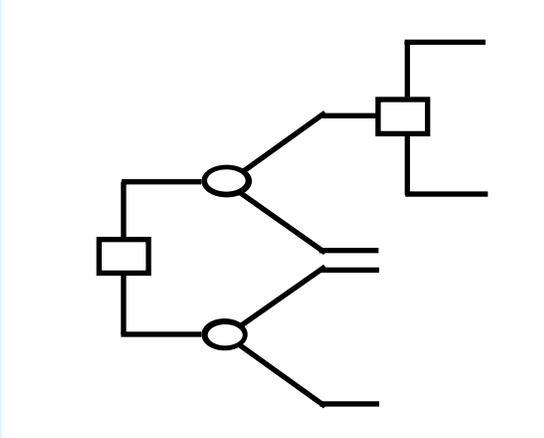
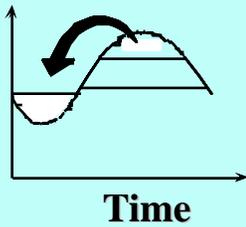
# Energy Storage Plants: Capital Cost Comparisons

Technology	\$/kW	+ \$/kW-H*	x	H	= Total Capital, \$/kW
<b>Compressed Air</b>					
- Large, salt (100-300 MW)	740-830	1-2	10		750 to 850
- Small (10-20MW) AbvGr Str	800-900	200-240	2		1200 to 1380
- Small (10-20MW) AbvGr Str	800-900	200-240	4		1600 to 1860
<b>Pumped Hydro</b>					
- Conventional (1000MW)	1500-2000	100-200	10		2500 to 4000
<b>Battery (10 MW)</b>					
- Lead Acid, commercial	420-660	330-480	4		1740 to 2580
- Advanced (target)	450-550	350-400	4		1850 to 2150
- Flow (target)	425-1300	280-450	4		1545 to 3100
<b>Flywheel (target) (100MW)</b>	3360-3920	1340-1570	0.25		3695 to 4315
<b>Superconducting (1 MW)</b>	200-250	650,000	1/3600		380 to 490
<b>Magnetic Storage</b>		- 860,000			
<b>Super-Capacitors (target)</b>	250-350	20,000	1/360		310 to 435
		- 30,000			

This column determines how many discharge hours one can afford to build.

\* This capital cost is for the storage "reservoir", expressed in \$/kW for each hour of storage. For battery plants, costs do not include expected cell replacements. The cost data are in 2011 \$'s and are updated by EPRI periodically. Costs do not include the substation, permits, contingencies, and interest during construction

# Electric Energy Storage: Value Proposition

Types of Benefits	Physical System		Corporate Perspective	Customer Perspective
	Generation	T&D		
<u>Strategic</u> <ul style="list-style-type: none"> <li>• Enhance Renewables</li> <li>• Mitigate Uncertainty</li> <li>• CO<sub>2</sub> Reduction</li> </ul>				
<u>Operational</u> <ul style="list-style-type: none"> <li>• Dynamic</li> <li>• Load Leveling</li> </ul>			<b>SCENARIOS</b>	<b>STRATEGIES</b> 

# Questions/Comments ?

