



Push for Power

Technology Comparison

	BOOSTCAP Ultracapacitors	Batteries	Fly Wheel	Notes
Maintenance				Ultracaps can run maintenance free for 10-15 years.
Conditioning				Ultracaps require no long initial conditioning.
Lifetime				Ultracaps can run maintenance free for 10-15 years.
Initial Cost			Good, >200kw	Ultracaps have highest initial cost but the lowest cost of ownership.
Power Density				Ultracaps provide the highest power density. Power can be added in small increments.
Energy Density				Batteries provide the highest energy density.
Space Required				Ultracaps and fly wheels are installed in standard cabinets. Due to power density, they take the least space.

Why Ultracaps

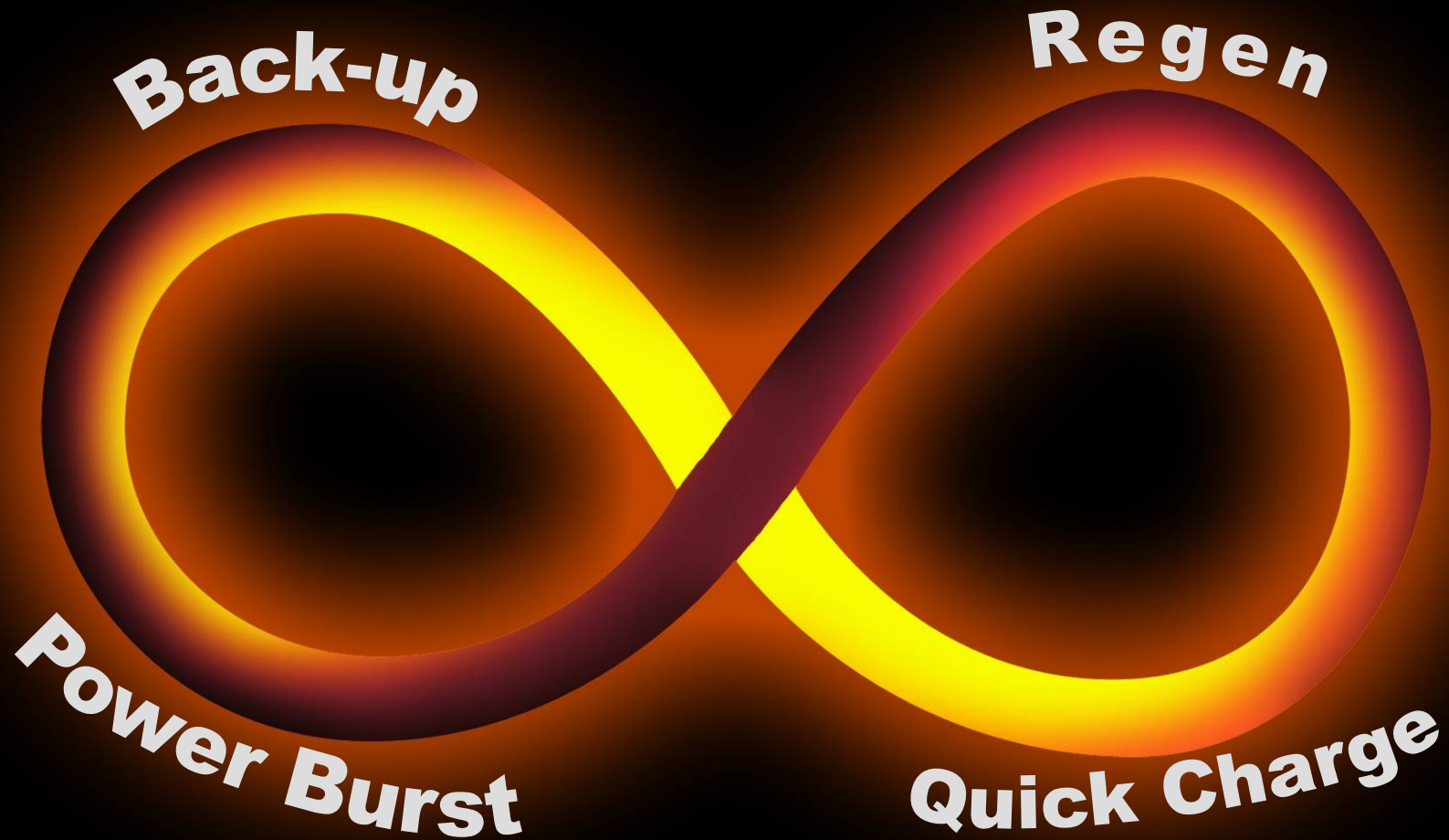
- Long lifetime – 8-14 years
- Predictable wearout
- No toxic materials
- Lowest Total Cost of Ownership
- Fast recharge, fast system recovery
 - ♦ No C rate limitations on lifetime
 - ♦ Less downtime
- High power density (5.5KW per kg)

Total Cost of Ownership Model

- Compares lifetime cost of energy storage: BOOSTCAP ultracapacitors, batteries, flywheel
- Accounts for:
 - ◆ Initial cost
 - ◆ Maintenance costs
 - ◆ Floorspace
 - ◆ Replacement costs
 - ◆ Leakage current

System Requirements		Ultracapacitor System Information		General Inputs			
UPS Power Rating	200000 VA	Energy Storage Power Control Information	Electrical cost	0.1 \$/kwh			
UPS Power Factor/Efficiency	0.95			V max	Floorspace cost		
Power	190000 W				V nominal	36 \$/sq ft/yr	
Max Running Time	15 sec					V minimum	
Total energy Required	792 Wh	Product					
Total Service Life =	15 years						
			BMOD0125-P056 B0				
			7 series X 4 in parallel.				
Cost Inputs							
Ultracapacitor Information		Battery Information		Fly Wheel Information			
Initial Costs		Initial Costs		Applicable only >50KW			
Ultracapacitors 28		Batteries 222		Initial Costs			
\$/ultracapacitor \$1,200		\$/battery \$35		Fly Wheels 2			
Initial ultracapacitor cost \$33,600		Initial battery cost \$7,778		\$/flywheel \$38,000			
Life Costs		Life Costs		Install cost per fw \$5,700			
Maintenance period 15 years		Maintenance period 4 years		Initial Flywheel cost \$87,400			
Maintenance cost		Maintenance cost \$50		Life Costs			
Replacement period 15		Replacement period 4 years		Bearing Life 5 years			
Replacement cost (labor) \$933		Replacement cost (labor) \$7,407		Maintenance Cost \$3,500			
Relative hardware price 100%		Relative hardware price 100%		Pump Life 7 years			
Handling & disposal \$672		Handling & recycling \$0		Maintenance Cost \$2,550			
Operating Costs		Operating Costs		Operating Costs			
Floorspace 15 sq. ft.		Floorspace 15 sq. ft.		Floorspace 15 sq. ft.			
Annual Cost \$540		Annual Cost \$540		Annual Cost \$540			
Standby Power 0.2 kw		StandbyPower 0.00 kw		StandbyPower 0.19 kw			
Annual Electrical cost \$194		Annual Electrical cost \$0		Annual Electrical cost \$166			
Service Life Costs							
Total BOOSTCAP life cost		Total Battery life cost		Total Flywheel life cost			
\$44,617		Total life cost \$61,584		\$110,097			
Projected savings Maxwell BOOSTCAP							

Ultracapcitor Applications



Near **Infinite Life**