

Hybrid Graphene Super Capacitor Golf Cart Modules



**100AH & 60AH 48V
Ultra-Fast Charging**

16W" x 16L" x 6.3H" (406mm x 406mm x 160mm)
100AH: 79 lbs (36 kg) 60AH: 55 LBS (25kg)

The unique fast-charging nature of CEG super capacitor modules, in combination with standard regenerative braking, provides multiple rounds of golf per charge.

CEG offers 110V & 220V chargers that quickly charge modules
Standard golf cart chargers work but will charge slower

PERFORMANCE COMPARISON	HYBRID GRAPHENE SUPER CAPACITOR MODULES VS CONVENTIONAL ENERGY STORAGE			
	HYBRID GRAPHENE SUPER CAPACITORS	Standard Super Capacitors	Lithium-ion (general)	Lead Acid Batteries
Function				
Charge Time	3 to 30 Mins	2-3 hrs	2 to 3 Hrs	4 to 8 Hrs
Charge/Recharge Life Cycles	1,000,000	1,000,000	3,000 to 5,000	200 to 300
Energy Discharge	Programmable!	FAST	SLOW	SLOW
Individual Supercap Voltage	4.2V	2.7 or 3.0V	3.6 - 3.7V	Many
Energy Density (Wh/kg)	220	NA (Fast Discharge)	150 - 250	40 to 50
Power Density (W/kg)	500	18,000	150 to 250	< 100
Farrads / Capacitor	21,000	3,000	NA	NA
Efficiency	99%	99%	85% - 95%	60% - 75%
Charge Temperature	-20° to 60° C (-4° to 140° F)	-40° to 65° C (-40° to 149° F)	0° to 45° C (32° to 113° F)	-20° to 50° C (-4° to 122° F)
Discharge Temperature	-20° to 60° C (-4° to 140° F)	-40° to 65° C (-40° to 149° F)	-20° to 60° C (-4° to 140° F)	-20° to 50° C (-4° to 122° F)
Risk of Fire	NO	NO	YES	NO
Shipping Restrictions	NO	NO	YES	NO
Hazardous Components	NO	NO	YES	YES
Performance Fade	NO	NO	YES	YES
Depth of Discharge	100%	100%	80%	50% - 75%
Cost/kWh	To Specifications	\$1,400	\$200	\$100

= Graphene # Modules Feature:

- Recharge in as little as 3 minutes versus hours for lithium-ion and lead acid batteries
- Up to 1 million charge / discharge cycles (typical of capacitors) versus 3,000 to 5,000 for batteries. Thus, each supercapacitor module should last longer than a golf cart and can be transferred to new golf cart once a golf cart wears out
- Virtually no fade in performance for 1 million cycles (typical of capacitors)
- Programmable rate of discharge - as slow as conventional batteries, as fast as capacitors or anywhere in between
- 33 times more farads per capacitor than standard super capacitors
- Operation in extremely cold and extremely hot conditions
- No end of life toxic waste - no hazardous materials
- No transportation restrictions versus batteries with risk of fire
- 100% depth of discharge (lithium-ion can require twice as many batteries)



CEG Modules Include a Back-lit LCD Screen for the Cockpit to Display Real Time Charge Status. Or, monitor charge status via Bluetooth with phone app.