



Ice Bear™ 50 Energy Storage Module Product Information

The Ice Bear™ energy storage module is a low cost, off-the-shelf Distributed Energy Storage product for air conditioners that slashes up to 10kW of on-peak electrical demand. The Ice Bear™ unit shifts 50 kW-hours of energy consumption to off-peak, the equivalent to running a 10 SEER, 5-Ton air conditioner at full load for 8 hours. The Ice Bear™ product is a water filled thermal battery that works with any condensing unit and evaporator coil. The installation and commissioning is simple, adding only a few hours of labor to a new air conditioning system project. The Ice Bear™ energy storage module uses an equal or lesser amount of energy in a 24-hour period and consumes lower cost off-peak kilowatts. The Ice Bear™ product boosts the efficiency and cooling capacity of your air conditioning system and eliminates costly evaporator coil “freeze-ups.”

Key Benefits

- ✓ Saves Money, Increases Capacity, Improves Comfort & Reliability!
- ✓ Slashes peak demand fees associated with air conditioning
 - Eliminates up to 95% of on-peak air conditioning demand
- ✓ Cuts air conditioning on-peak electrical consumption costs
 - Lowers cost of air conditioning by shifting consumption to lower cost, more efficient off-peak hours
 - Consumes an equal or lesser amount of energy
- ✓ Improves air conditioner energy efficiency
 - Unlike traditional air conditioners, delivers consistent capacity on 95+ degree days with no increase in power consumption
 - Operates condensing unit at high efficiency with no cycle-losses
 - Preserves the stored thermal energy in a R18+ double-walled tank
- ✓ Offers superior comfort and cooling reliability
 - Provides consistent cooling regardless of outside ambient temperatures
 - Delivers outstanding surge capacity for fast “cool-down”
 - Eliminates “freeze-up”, a major cause of cooling complaints
 - Improves cooling performance of evaporator coils with liquid overfeed
- ✓ Enables compliance to California’s Title 24 2005 Building Energy Efficiency standards
 - Yields up to 22 times more Time Dependent Valuation (TDV) energy savings than a 14 SEER air conditioner
 - Accelerates compliance for existing designs
 - Enhances building design flexibility for new designs or modifications
 - Applicable to remodel projects
 - Demonstrates energy consumption savings in several climate zones
- ✓ Assists LEED certification
 - Adds 3 or more points to the Energy and Atmosphere credits
 - Contributes to Indoor Air Quality (IAQ) credits
 - Brings Thermal Energy Storage (TES) enabling performance to refrigerant based air-conditioning projects
- ✓ Complements solar photovoltaic (PV) renewable energy systems
 - Removes the largest day time electrical load: The air conditioner
 - Reduces area required for solar panels
 - Provides cooling during peak heat of day when solar PV output lags
 - Costs are 1/10th of solar PV

Key Features

- Total Storage Module Capacity: *50 Ton-hours (45 Latent + Sensible, 5 Sensible only)*
- Peak Demand Reduction: *Up to 10kW*
- Maximum Peak Demand: *0.3 kW*
- Energy Consumption Shifted: *50 kWh*
- Reliability: *2 moving parts, 15 year design life*
- Compatibility: *Works with standard refrigerant-based air conditioning equipment*
- Refrigerant Delivery System: *Liquid overfeed*
- Evaporator coil configurations: *Single, multiple, and mini-split*
- Form factor: *5'8"W x 6'8"D x 5'3"H*
- UV Resistance: *HDPE Cross-linked tank material*
- Installation: *Roof or ground. By your local HVAC contractor*
- Maintenance: *Annual check of water level and addition of biocide*
- Warranty:
 - Tank: *10 years*
 - Heat Exchanger: *3 years*
 - Other Components: *1 year parts and labor*





Ice Bear™ 50 Energy Storage Module Product Data

Energy Storage Module Cooling Performance

• Maximum Cooling Load	7.5 tons	Independent of ambient temperature
• Total Storage Module Capacity	50 ton Hours	Capacity stored in ice and chilled water Capacity stored in chilled water only
<i>Latent plus Sensible:</i>	45 ton Hours	
<i>Sensible Only:</i>	5 ton Hours	
• Total System Capacity	60 ton Hours	In direct cooling mode
<i>Storage Module:</i>	50 ton Hours	
<i>Recharge Condenser:</i>	10 ton Hours	

Energy Storage Module Physical Properties

• Dimensions (Width x Depth x Height)	68 x 80 x 63 inches 173 x 203 x 160 cm	
• Weight		
<i>Without water</i>	800 lbs or 363 kg	
<i>Filled with water</i>	5,560 lbs or 2,522 kg	
<i>Load distribution (filled)</i>	358 lbs per ft ²	
• Water Volume	570 gallons 76.3 cubic feet	
• Refrigerant Charge	39 lbs including condensing unit	

Energy Storage Module Electrical Properties

• Electrical Service Requirements	120V, 20 Amp, single phase; Ice Bear storage module only
• Ice Make/Charge (assumes 12 SEER 5-ton condensing unit)	
<i>Average Demand</i>	3.5 kW at an average ambient temperature of 75° F
<i>Power Consumption</i>	40 kWh from fully melted tank of ice at 75° F ambient
• Ice Melt/Cooling Mode Demand	0.3 kW

Energy Storage Module Ice Make/Charge Properties

Ice Make/Recharge Condenser	5 Ton, 12 SEER; Please contact Ice Energy regarding other units
Ice Make/Recharge Time	12 hours from fully melted tank of ice at 75° F ambient

Subcomponents of the Ice Bear™ Energy Storage Module

Ice Bear™ Energy Storage Tank

- The double-walled, rotationally molded tank is comprised of High Density Cross-linked PolyEthylene (HDPE) for structural integrity and to withstand the harmful effects of sunlight.
- The minimum insulation value is R-18.
- Ice loss, due to melting, is less than 1% of rated capacity per day even during the hot summer months.
- The tank holds approximately 570 gallons of tap water, which is treated with standard evaporative cooler tablets on an annual basis.

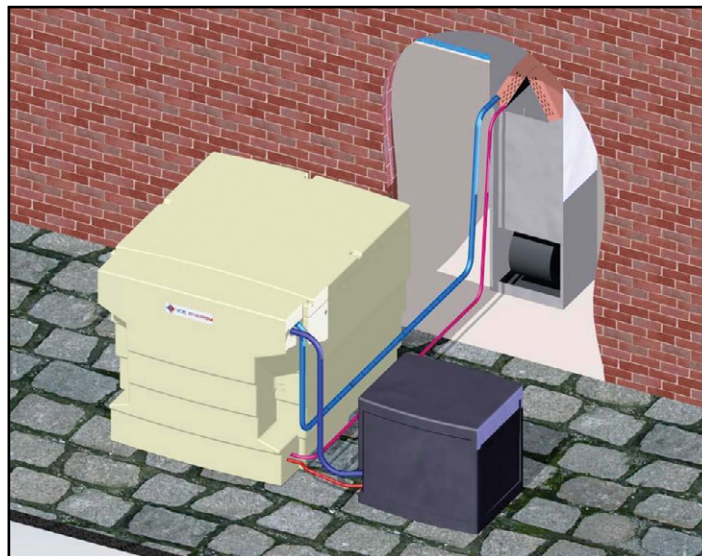
Ice Bear™ Heat Exchanger

- The copper heat exchanger in the Ice Bear™ storage tank operates:
 - *As an evaporator during the ice make/recharge process;*
 - *As a condenser during the ice melt/cooling process.*

Ice Bear™ Refrigerant Management System (RMS)

- The heart of the Ice Bear™ product is the Refrigerant Management System (RMS). The main components of the RMS are the Universal Refrigerant Management Vessel (URMV), the oil distillation heat exchanger, the refrigerant pump, and a water pump.
- The 115V refrigerant pump circulates refrigerant to the evaporator coil(s); consuming less than 100 W.
- The 115 V water pump circulates water within the tank; consuming less than 200W.

Ice Bear™ 50 Energy Storage Module Connection Diagram





Ice Make/Charge Mode Characteristics

Outdoor Temperature (°F)												
Time (Hours)	55°		65°		75°		85°		95°		105°	
	Cumulative Capacity Stored (T-hrs)	Energy consumed (kW-hr)	Capacity Stored (T-hrs)	Energy consumed (kW-hr)	Capacity Stored (T-hrs)	Energy consumed (kW-hr)	Capacity Stored (T-hrs)	Energy consumed (kW-hr)	Capacity Stored (T-hrs)	Energy consumed (kW-hr)	Capacity Stored (T-hrs)	Energy consumed (kW-hr)
1	5.16	4.64	4.90	4.72	4.64	4.82	4.35	4.95	4.07	5.17	3.86	5.40
2	9.85	8.03	9.35	8.10	8.83	8.21	8.28	8.34	7.73	8.61	7.26	8.90
3	14.40	11.42	13.66	11.49	12.89	11.59	12.08	11.72	11.25	12.04	10.57	12.39
4	18.87	14.81	17.90	14.88	16.88	14.98	15.80	15.11	14.71	15.47	13.82	15.89
5	23.30	18.21	22.10	18.26	20.84	18.37	19.48	18.50	18.13	18.90	17.02	19.38
6	27.69	21.60	26.25	21.65	24.75	21.76	23.13	21.88	21.53	22.33	20.17	22.88
7	31.99	24.99	30.35	25.04	28.63	25.15	26.75	25.27	24.89	25.76	23.32	26.38
8	36.21	28.38	34.36	28.42	32.43	28.54	30.33	28.66	28.24	29.20	26.45	29.87
9	40.31	31.77	38.29	31.81	36.16	31.93	33.84	32.04	31.50	32.63	29.54	33.37
10	44.26	35.17	42.10	35.20	39.79	35.32	37.29	35.43	34.72	36.06	32.61	36.86
11	45.58	35.52	45.58	37.54	43.31	38.70	40.66	38.82	37.89	39.49	35.64	40.36
12					45.58	40.00	43.86	42.20	41.00	42.92	38.59	43.85
13							45.58	43.00	43.94	46.35	41.53	47.35
14									45.58	47.11	44.43	50.85
15											45.58	51.29

Ice Melt/Cooling Mode Characteristics

Key Feature: Cooling Performance is Independent of Ambient Temperature

Item	Total Effective Cooling Capacity (Latent & Sensible)	Additional Sensible Cooling (Cold Water)	Total Combined Capacity
Capacity (ton hours)	45.0	5.0	50.0
Refrigerant Temperature	< 50° F	52° F	--
Maximum Cooling Load (tons)	7.5	2.5	--

Refrigerant temperature is defined as the temperature of the refrigerant as it exits the evaporator coil.