

50 MW Salt Battery – 150 Wh.
per Kilogram



Lithium Battery – 270 Wh. Per
Kilogram



RedStar's Red Sun
Thermal Battery
Generator 2000 – Wh
Hours per Kilogram with
Steam Generator



18 Cubic Meter, 26
Tons - Transportable by
truck ship and other
locomotives in 20 foot
Container

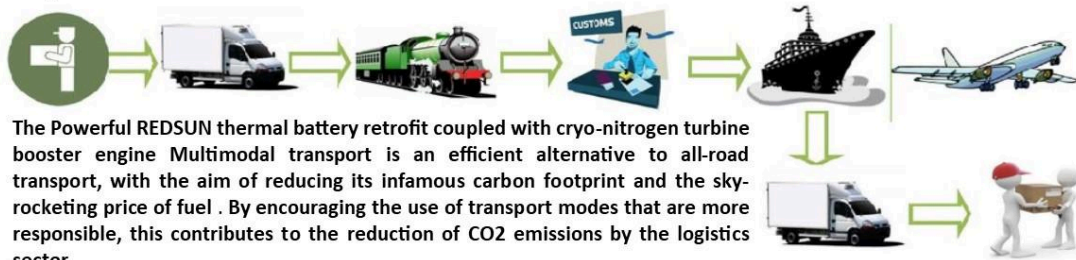
PowerSource 660 holds **2.2 GJ (611 kWh)** of energy for running ship & HVAC on a small 2.5' by 3.4 ft high cylinder weighing 1.5 tons to run **Navi Electric**, at 1.4 kWh per nautical mile, **660** gives **430 nautical miles!**. Currently, the **Navi battery** gives **3 hrs & 43 nm** at 1.5 tons weight vs **660** - giving an order-of-magnitude more range and time on the water with a fire- proof solid state battery with no digital components or moving parts, & built to last for millions of cycles + runs cogens & HVAC to **save 75% of fuel costs** with zero emissions!





Passenger Transport and Freight Train simultaneously in one rail is economically and socially viable system

Multi-Modal Transport Operator



New Markets reached by Transforming roads & rail into power corridors



PowerSource 3.2 MW – 1.6 tons



Red Sun Mobile



Portable Thermal batteries allow offsite fill-up within 6 hours to deliver 40MW

Battery in containers provide base power- 40 MW RED SUN Brayton Cycle systems or PowerSource 3.2 M Wp Batteries. Plugs in Power Tower wind & solar offsite to deliver!

GE Transportation is to develop a battery version of its AC-motored Evolution Series locomotives with 2 400 kWh of onboard energy storage and an energy management system. The prototype is to be tested on BNSF freight trains between Stockton and Barstow, working in multiple with diesel locomotives, and is predicted to reduce the train's total fuel consumption by 'at least 10% to 15%'. 'This project will give us tremendous insight into the capabilities of battery power and the best operational methods of leveraging the technology', which is expected to cost around \$45 million for this locomotive!

Battery-Electric Locomotive

Massive power generation capabilities up to **2400 kWhrs**
Huge fuel savings of at least **10-15%**

Vs. Mag Power Wireless Electric Train Retrofits



Vs. RED SUN 32 MW Thermal Battery = 65,000 kWh
Fuel savings of 94%– 64 MW – weighs 60 tons = 130MWh on Budd car-110 tons
Range of 1400 km to 2100 km- Electric Locomotive Retrofit - \$1.6 mln+ Bat cost
Charge-up with Mag Gas cost 1c/kWh = \$650 USD – 4-6 hr+onboard Recharge
Onboard Charge-up 2x's while running: Induction + MAG GAS genset charger

RED SUN GE Elec Retrofit



The PowerSource 660kW is a thermal battery featuring molten nickel alloys in 0.417 m³ cylinder with 1.25 radius and 3 feet tall. The battery gives 611 kWh per charge, and can take millions of charges lasting 40 years vs. 6 years for marine lithium batteries. More importantly, the energy capacity is 10 x's more, extending range to 430 nautical miles and 30 to 40 hours, vs the current barely adequate 3 hours Navi lithium batteries can manage, which lowers range to 45 nm, or less! Thus, **PowerSource** transforms a hobby boat into a real cruiser and patrol boat! Plus, totally analogue with no digital internal components or moving parts to break or wear- out as molten nickel iron alloy with basalt coving mimics the earth that has billions of years running same molten core, **PowerSource** is built to last for millions of cycles

Radius of Operation & Time on water:

The **Navi hydrofoil** uses 1.4 kWh per nautical mile: $611 \text{ kWh} / 1.4 \text{ kWh/nm} = 436 \text{ nm}$ moreover; the specific heat of nickel- Iron alloy is $550 \text{ J/kg}^\circ\text{C} \times 1500^\circ\text{C} \times 1473 \text{ kg} = 105 \text{ MJ}$; as the specific heat capacity of molten nickel matte typically ranges between 500 and 600 $\text{J}/(\text{kg} \cdot \text{K})$ at typical smelting temperatures (1300 to 1450°C), while pure solid nickel has a specific heat of about 444 J/ °C Kg.

Powersource Pricing \$2.44 per kWh

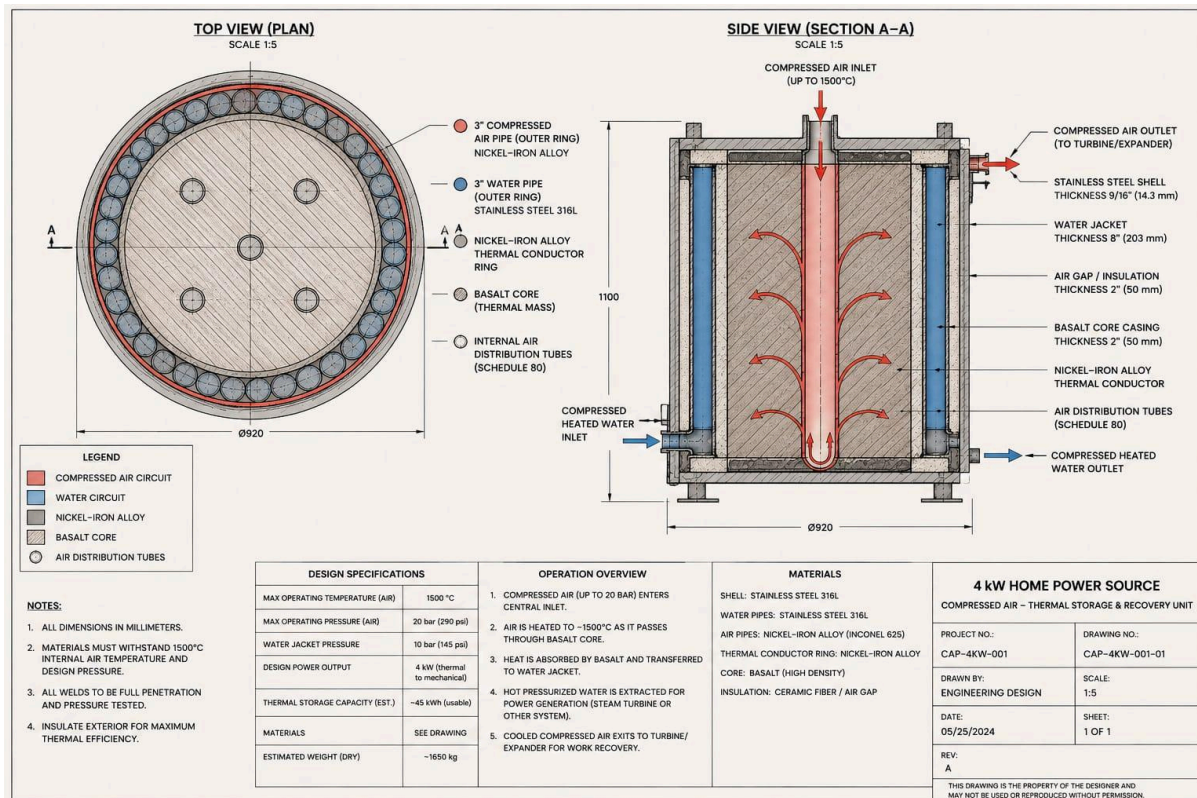
The 611 kWh/ cost of \$250k gives \$2,44/kWh

660 MW PowerSource 660 = \$ 250k vs. \$400k to \$500 k for 500 kW LiFePO4



Addendum 1 ~Navi Hydrofoil Introduction:

<https://www.yachting-pages.com/articles/awake-unveils-navi-news.html>



Addendum 2 - PowerSource 660 multilayer design with basalt 2 inch battery casing can last thousands of years with hardness of 7 on MOH scale- above granite! Gives 611 kWh per charge and runs propulsion, HVAC and charges at 98% efficiency without inverter. Retrofits all diesels, turbines & steam, plus gives supercritical steam for hydrocracking and all high heat industrial and petrochemical applications and desalination flash steam systems.

Addendum 3 ~ LiFePO4 Pricing \$ 800 per KWh to \$1200 per kWh, as marine packs are highly customized. The total investment depends on a few distinct factors:

Estimated Price Breakdown

Standard Marine Systems A 500 kWh (kilowatt-hour) marine-certified lithium battery system generally costs between \$325,000 and \$500,000 (roughly 19 to 29 million PHP), factoring in the battery pack, advanced Battery Management Systems (BMS), and liquid cooling. Prices vary based on chemistry, classification requirements, and hardware.

Sustainable Ships +3

Marine energy storage systems are highly customized. The total investment depends on a few distinct factors:

Estimated Price Breakdown

- Standard Marine Systems (LiFePO4): \$650 to \$850 per kWh
- High-Performance Systems (NMC/NCA): \$900 to \$1,200+ per kWh

- Total Estimated Cost: \$325,000 - \$600,000

Factors Impacting the Final Cost

- Battery Chemistry: [LiFePO4](#) (Lithium Iron Phosphate) is safer, heavier, and lasts longer. NMC (Lithium Nickel Manganese Cobalt) is much lighter and more compact but generally more expensive and requires more complex safety
- Marine Certification: Batteries must pass rigorous classifications from agencies like DNV, ABS, or Lloyd's Register to safely operate on the water. These certifications add a significant premium over standard industrial or off-grid batteries.
- System Integration: You will need to account for supporting hardware, including thermal/liquid cooling management systems, marine-grade inverters, and battery conversion equipment.
- Is it a retrofit for an existing vessel or a new build?
- What is the primary propulsion type (hybrid vs. fully electric)?
- What is the operating voltage needed?

The price of a 500 kWh lithium-ion battery - Ritar International Group

Nov 4, 2024 — In conclusion, the price of a 500 kWh lithium-ion battery can range from approximately \$100,000 to over \$350,000, depending on various factors such as battery

Ritar

Competitive Price 500kw 1mwh 1MW 2mwh 2MW 4mwh Energy Storage ...

Competitive Price 500kw 1mwh 1MW 2mwh 2MW 4mwh Energy Storage Container Lithium LiFePO4 Battery Bess Solar Power Energy Storage System. US\$398,688.



Made-in-China.com

500KWH LiFePO4 Lithium ion Battery with BMS System

* LiFePO4 500kWh 1000kWh 2000kWh Container Bess Solar Battery Energy Storage System. Price: 112500 USD (\$) /



danick power ltd

Foxess EQ Battery Price Sydney (2026) - EQ4800 Cost & Specs

3. Safe Battery Chemistry Uses LiFePO4, known for:



solarworldpower.com.au

Powerful & Compact 12V 10Ah Battery - Buy Today

Dec 11, 2024 — LiFePO4 offers a more stable voltage drain and over 4x longer lifespan, but costs slightly more and is a bit of a heavier and bulkier battery pack. Please consi...



Tracer Power

12V 100Ah LiFePO4 Battery - 2 Pack, Rechargeable 12v Liberia | Ubuy

Utilizing LiFePO₄ chemistry, this battery offers superior thermal and chemical stability, making it (ERY 12V 300Ah LiFePO₄ battery) a safer option compared t...

Ubuy Liberia

The price of a 500 kWh lithium-ion battery - Ritar International Group

Nov 4, 2024 — Residential or Commercial Use: For residential or commercial applications, the performance requirements may be less stringent. Batteries used for backup power o...



Cost Overview - Batteries - Sustainable Ships

Oct 4, 2025 — Assume €650 – €750 per kWh for the battery pack. Assume €90 – €120 per kW for the inverters/system.

Addendum 3 - Nautical Fuel Scale for Ships

Example: 150 m Coast Guard Cutter

Diesel costs are 7 c/ MJ today June 5th 2026. Diesel is 44 MJ/ kg with specific wt of 0.84 kg/ L. MGO price \$1.22/L OR \$1225/ MT, with coast guard cutter using 40 m³/ trip = \$1225/ MT x 40 MT/ day x 0.88 MT/ m³ = **\$43,000 per day current MGO cost**

\$43k/ 24 hrs; 0.07/ MJ x 1549 MJ =

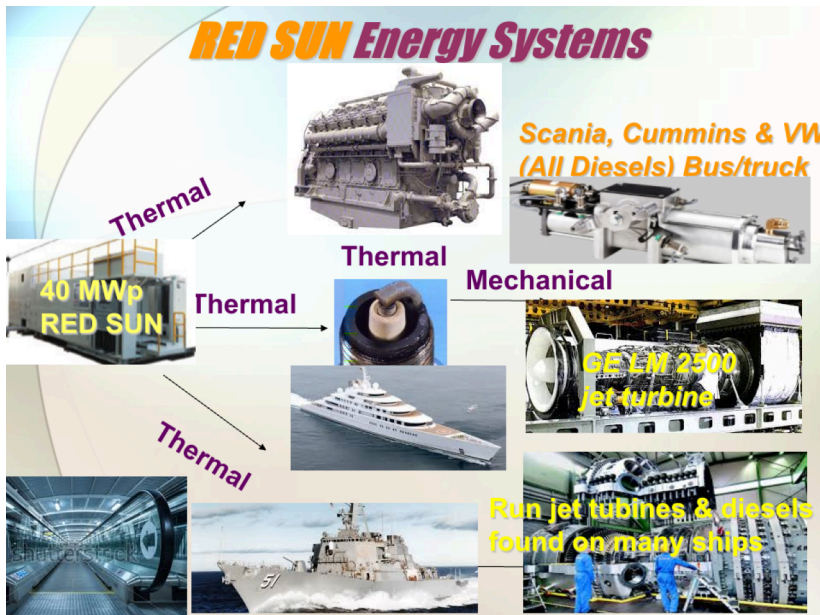
40 m³/d x 880 kg/ m³ x 44 MJ/ kg = 1,490,000 MJ/ day = 1490 GJ/ day = 5360 kWh/ day

32 MW Red Sun battery weighing 26 MT: has 55,000 MJ and holds 10,300 kWh, and 10 batteries can run the ship 55,000MJ/ battery- day, 10 batteries running compressed nitrogen will give 5360 kWh/ day equivalent

Cost to recharge: 10 c/ kWh x 10,300 kWh x 10 batteries = **\$ 10,300 total + cryo nitrogen**

Adding **heated cryo nitrogen at 20 kWh/ L, thus, heating cryo nitrogen at 150°C gives 5360 kWh/ 20 kWh/ L = 268 L cryo nitrogen**

Nautilus Fuel Scale					
NAUTILUS FUEL SCALE					
MAKE & MODEL	FUEL CONSUMPTION	LENGTH	MAKE & MODEL	FUEL CONSUMPTION	LENGTH
Power Boat	133L/hr	14 m	Pearl 65	220L/hr	20 m
MAKE & MODEL	FUEL CONSUMPTION	LENGTH	MAKE & MODEL	FUEL CONSUMPTION	LENGTH
Norwed Spirit	4,163 L/hr	268 m	Freedom of The Seas	10,600 L/hr	339 m
MAKE & MODEL	FUEL CONSUMPTION	LENGTH	MAKE & MODEL	FUEL CONSUMPTION	LENGTH
Cargo Ship	6,250 L/hr	To 400 m	Super Cargo	7,000 L/hr	512+ m
MAKE & MODEL	FUEL CONSUMPTION	LENGTH	SUPER CRUISE	FUEL CONSUMPTION	LENGTH
Navy Frigate	3,785 L/hr	154 m	The Harmony	5,212 L/hr	362 m



Addendum 4 ~ The fires in boats. Lithium batteries are deadly and fires explode and ignite fast and occur in one out of 10,000 batteries. Plus, Lithium-powered battery fires on boats—and general electrical fires, are the main major threat in maritime environments—and; are self-sustaining, incredibly hot ($>2000^{\circ}\text{F}$), and release toxic gases. They are especially dangerous in confined marine spaces because the chemical

reaction generates its own oxygen, making them nearly impossible to extinguish with standard fire extinguishers. [\[1, 2, 3, 4, 5\]](#)

Why Lithium Battery (Li-ion) Fires Happen

Most modern, professionally installed house or propulsion lithium batteries used in boats use Lithium Iron Phosphate (LiFePO₄) chemistry. These are robust, stable, and highly resistant to thermal runaway. [\[1, 2, 3\]](#)

The vast majority of deadly marine battery fires are actually caused by everyday portable devices, e-bikes, and water toys stored or charged onboard: [\[1, 2\]](#)

- Physical Damage: High-speed waves, rough seas, and impacts can puncture or physically damage battery cells, leading to internal short circuits. [\[1, 2\]](#)
- Water Ingress: Saltwater is highly conductive. If water touches unprotected battery terminals or gets inside a device, it can cause rapid short-circuiting. [\[1, 2, 3\]](#)
- Faulty Charging: Using generic chargers or leaving batteries connected and unattended after a charging cycle completes can cause excessive heat buildup. [\[1, 2\]](#)
- Poor Management Systems: A missing or faulty Battery Management System (BMS) fails to stop overcharging or extreme temperature spikes, directly triggering thermal runaway. [\[1, 2, 3\]](#)

Best Practices for Marine Lithium Safety

To protect your vessel and crew, implement these preventative measures: [\[1, 2\]](#)

1. Device Management: Avoid charging e-bikes, e-scooters, or power tools unattended. Keep these portable devices ashore if possible, or store and charge them in well-ventilated, fire-safe areas on deck. [\[1, 2\]](#)
2. Marine-Grade Equipment: Only use certified, marine-rated battery systems with proper BMS and temperature monitoring. [\[1, 2\]](#)
3. Regular Inspections: Routinely check your electrical connections, as vibration and corrosion can cause high-resistance shorts that slowly bake nearby wires until they ignite. [\[1\]](#)
4. Emergency Plan: Do not rely on personal fire extinguishers for lithium fires. Know how to quickly disconnect power, get your crew safely into a dinghy or topside, and have a "ditch bag" with waterproof communication gear ready. [\[1, 2, 3, 4\]](#)

For a quick, 30-second breakdown of how terrifyingly fast a lithium-ion thermal runaway can progress in a confined boat cabin:

[30 Seconds. That's What a Lithium Fire Gives You.](#)

I can help you build a customized fire-prevention plan for your vessel.

Lithium battery fires in boats - LiVault

Jan 8, 2024 — Lithium battery fires in boats are an increasing hazard that every boat owner should understand and prepare for. Lithium-ion battery fires on boats are a growin...

LiVault

MPC: Battery fires require coordinated safety measures - SAFETY4SEA

Apr 1, 2026 — Many incidents stem from inadequate safety protocols and a lack of understanding among crew members and vessel operators about how to handle lithium-ion batteri...

safety4sea

Lithium battery fires on boats - Facebook

Feb 27, 2026 — A couple of which are over charge due to incorrect chargers or chargers not tested by UL, charge from complete dead, and use (load) during extreme cold. We co...

Facebook·Offshore Fishing Club

Small Lithium-Ion Battery Fires on Ships: Hidden Sparks, Big Risks

Jan 6, 2026 — This article will examine the hazards posed by small lithium-ion batteries and how they can be devastating in confined shipboard environments. From handheld rad...

NorthStandard

Lithium-ion battery safety: A series of fires on recreational vessels have ...

Dec 21, 2023 — So, what can you do if you are faced with a lithium-ion battery fire either at home or onboard your vessel? "Personal fire extinguishers won't help," says Dr Be...

The International Institute of Marine Surveying

Lithium Battery Boat Fires – be aware - European Marine Services

Feb 29, 2024 — Lithium Battery Boat Fires - be aware * Monitor Charging Temperatures: Charge batteries within safe temperature ranges. Use chargers specifically designed for l...

European Marine Surveys

Lithium-ion Battery Safety - Boats - NM Insurance

With recent fires aboard recreational vessels linked to lithium-ion batteries, we asked the experts to share some important advice around lithium-ion battery sa...

NM Insurance

Lithium battery-powered devices can cause devastating marine fires

Mar 9, 2026 — When in use, electrons flow between the cathode and the anode through a perforated separator. If this membrane breaks down, either through poor manufacture, old...

Maritime Journal

Important safety reminder regarding lithium-ion batteries aboard ...

Apr 10, 2025 — * Robin Shepherd. Almost all Lithium batteries used in boats as a means of powering either propulsion or the 'leisure bank' of batteries are not Lithium-ion but...

Facebook·Broads Authority

Addressing the challenges of lithium-ion battery fires on board ships

Aug 13, 2025 — The fire originated on the deck where the EVs were stored, rapidly disabling the vessel about 300 miles southwest of Adak Island. Despite evacuation and firefig...

International Maritime Rescue Federation

Lithium battery fires: the 10-point safety checklist every boat owner needs

Nov 25, 2025 — The culprit was a lithium battery that had experienced what's known as 'thermal runaway'. Taryn soon found himself tasked with investigating. "In that case the ...

Yachting World

Lithium-ion battery caught fire in the front compartment of boat at ...

Apr 9, 2025 — Unfortunately, there was also damage on 4 other boats close by. Please be aware: Lithium ion batteries are ubiquitous—in addition to vacuums, on phones, computers and now electric boats

30 Seconds. That's What a Lithium Fire Gives You.

YouTube·Sailing Zingaro

A standard boat has a lot of Lithium Battery devices, here's a quality ...

Nov 12, 2024 — It's crucial to understand that these fires aren't typically from your high-quality, professionally installed LiFePO4 (Lithium Iron Phosphate) boat batteries. I...

Facebook·Fishing Australia TV

LiFePO4 vs. Traditional Lithium-ion: Which Is the Better Battery?

Jul 11, 2023 — The chemistry composition of lifepo4 has higher safety features compared to Li-on batteries. Metals such as phosphorus, iron, and oxygen atoms in the cathode cr...

When Fun Turns to Flames! Lithium-powered water toys are ...

Facebook·Yacht Buoy

Small Lithium-Ion Battery Fires on Ships: Hidden Sparks, Big Risks

Jan 6, 2026 — What Makes Them Dangerous? The biggest threat is thermal runaway, a chain reaction triggered by overheating, damage, or internal faults. Once it starts, it's ne...

NorthStandard

Battery fires at sea

Apr 24, 2024 — Battery fires at sea A fire involving a Lithium-Ion battery (Li-Ion) can be particularly fierce, producing large amounts of heat whilst emitting substantial amo...



britishmarine.com

The risk of EV battery fires should not be downplayed

Nov 8, 2023 — Why EV fires are different Self-sustaining: The characteristics of a lithium battery fire are quite unique from a chemical standpoint. Unlike traditional fires,



Gard.no

EV-Fueled Inferno Forces Crew To Abandon Ship Carrying 3,000 Cars Across Pacific

Jun 4, 2025 — It often takes tens of thousands of gallons of water to douse a burning lithium-ion battery. While it might seem straightforward to put a pump over the side and...



Yahoo Autos

Can a lithium-ion battery fire be put out on a vessel?

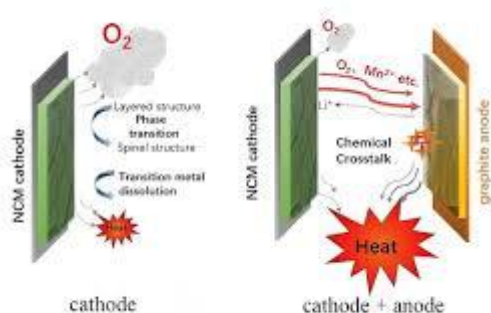
Jun 13, 2018 — Often a source of lithium-ion battery fires comes from the battery management unit itself. This argument is based on the over-reliance on battery management ele...



Innovation News Network

Why LiFePO₄ Thermal Runaway: Causes, Hazards, Solutions

Feb 7, 2025 — A malfunction or failure in the BMS may result in improper monitoring and control, causing the battery to overcharge, over-discharge, or overheat, leading to a ...



www.lifepo4-battery.com

Air clutches are a major fire risk on boats. If they catch fire, it's not just plastic and rubber burning—it's toxic fumes and magnesium fires that water can't extinguish. One wrong move and the ship could sink. #DeadliestCatch

May 30, 2026 — Fire prevention comes down, above all, to maintenance. Here are 10 things you can do to reduce your risk of fire aboard your vessel: 1. Inspect all electrical c...



Facebook

Onboard Fire Fighting

Feb 3, 2024 — If all fails, abandon ship Do not risk serious burns. Have a crewmember position the raft or dinghy in the water where it will be safe from the flames and wont ...

Practical Sailor

Essential Boat Safety Tips Using Lithium Ion Batteries On Boats

Mar 31, 2025 — What to do in the event of a fire Evacuate and alert Ensure everyone on board is safe and prepare to abandon the vessel if necessary. Cut off power Disconnect the battery