RED SUN TECHNOLOGIES

Aqueous Homogeneous Reactor (AHR) + Red Sun Thermal Battery

Independent Technical & Commercial Evaluation
with Strategic Business Plan

Prepared: June 2026

Based on Original Project Documentation (70-page PDF)

Executive Summary

This report provides an independent evaluation of the Red Sun Technologies / RedStar EGG initiative to commercialize a modernized Aqueous Homogeneous Reactor (AHR) integrated with a high-temperature mobile thermal battery system (PowerSource 660 / Red Sun battery). The project targets decarbonization of shipping, rail, and industrial heat in the Philippines and globally, while generating revenue from medical radioisotopes.

Key Findings: The core technologies build on real historical nuclear research (ORNL AHR program, 1950s) and emerging thermal storage concepts. The value proposition—dual revenue from clean energy retrofits and high-margin isotopes—is strategically sound. However, many performance and cost claims in the source materials are highly optimistic and unproven at commercial scale. A phased, de-risked approach starting with isotope production and pilot demonstrations offers a realistic path forward.

Recommendation: Proceed with targeted R&D validation and pilot projects (especially isotopes + small thermal battery demos) rather than immediate full-scale deployment. Significant capital, regulatory navigation, and technical maturation are required before the integrated system can achieve the transformative impact described.

Original Project Visuals (Selected from Source PDF)

Figure 1: Red Sun Technologies branding and AHR + Thermal Battery overview infographic (Page 1 of source document).

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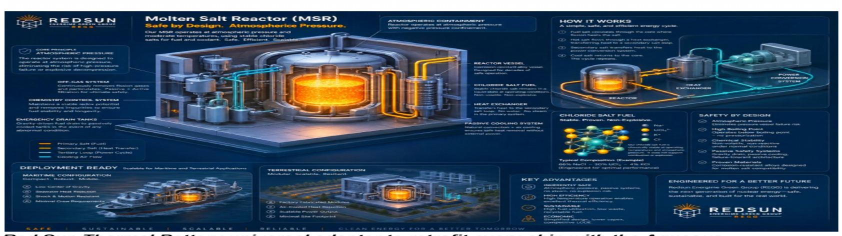


Red Sun Thermal Battery universal adapter to retrofit every ship with the Aqueous Homogeneous Reactor - AHR - which runs Flash Ni/Cu Smelter Executive Summary
AHR + Red Sun Battery/Transformer/ Amplifier
Wireless Power Executive Study
Jay Dubinsky, CEO ~Bioengineer
Alex Paurom ~Lawyer
Dan Winter EE ~H2 Engineer
Jack Wong~Hydrogen Reactor Eng
Andrejs Zagars ~Formulary Chemist
Elizabeth Donavan - Radioisotope Chemist

Figure 2: PowerSource 660 advanced thermal energy storage platform concept (Page 2).

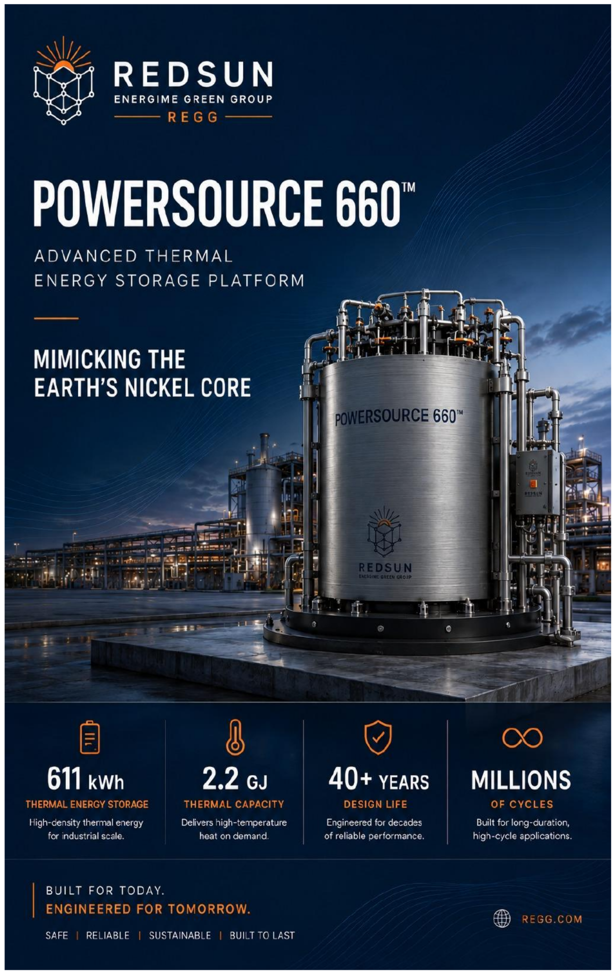
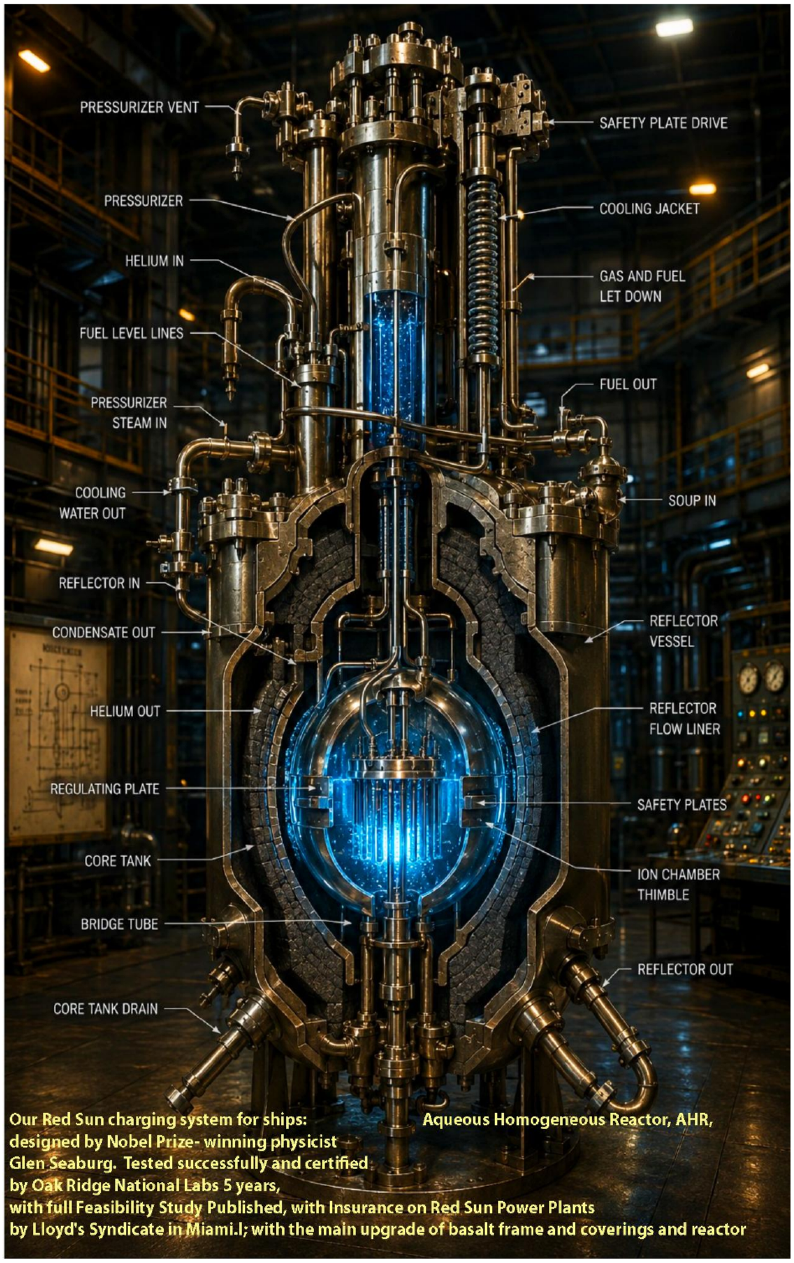


Figure 3: Aqueous Homogeneous Reactor (AHR) cutaway diagram and ship retrofit concept (Page 3).



Our Red Sun charging system for ships: Aqueous Homogeneous Reactor, AHR,
designed by Nobel Prize- winning physicist
Glen Seaburg. Tested successfully and certified
by Oak Ridge National Labs 5 years,
with full Feasibility Study Published, with Insurance on Red Sun Power Plants
by Lloyd's Syndicate in Miami.l; with the main upgrade of basalt frame and coverings and reactor

Technology Reality Assessment

Aqueous Homogeneous Reactor (AHR)

The AHR is a genuine historical technology developed at Oak Ridge National Laboratory in the 1950s under Nobel laureate Glenn Seaborg's influence. The Homogeneous Reactor Experiment (HRE) series successfully demonstrated key features: self-regulation via strong negative temperature coefficient, high neutron flux suitable for isotope production, and online fuel processing. Modern interest has revived primarily for medical isotope production (Mo-99) because solution reactors allow continuous extraction with far less waste than traditional target irradiation.

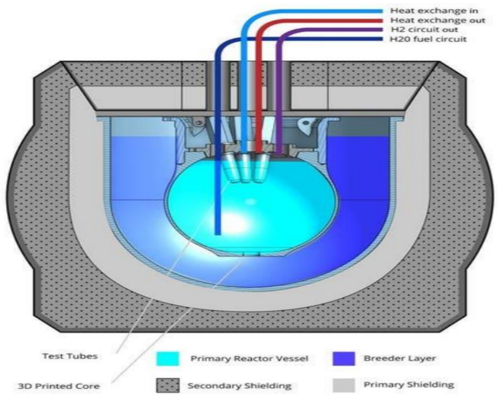
Strengths (Real): Inherent safety characteristics, excellent isotope production potential (Mo-99, Sr-89, others via off-gas), low water consumption for cooling compared to light-water reactors, and no plutonium production (non-proliferation advantage).

Challenges (Significant): Limited operating temperature (~250–300°C), radiolysis and hydrogen management, materials corrosion (historically addressed with nitrate solutions), and—most critically—the absence of any modern commercial power-producing AHRs. Current SMR development focuses on solid-fuel or molten-salt designs. Regulatory approval for a new power reactor design would require years of testing and billions in investment.

Cost Claims: The source document claims ~$500/kW installed. This is unrealistic. Even optimistic advanced SMR targets are in the $2,500–6,000/kW range for first-of-a-kind plants; recent NuScale estimates reached significantly higher figures. The $500/kW figure appears to ignore modern licensing, quality assurance, and supply-chain realities.

Figure 4: ORNL Historical AHR and modern diagram (Page 10–11 of source).

TO RUN ON Redstar's patented Non- Combustion Brayton Cycle, cleans all emissions, complies with new 2028 IMO emission reductions, while retrofitting all existing diesel and turbine propulsion in existence!
The Philippines has become the preferred hub for companies that have a presence in China: https://www.pna.gov.ph/articles/1246635



Aqueous Homogeneous Reactor (AHR) is a two (2) chamber reactor consisting of an interior reactor chamber and an outside cooling and moderating jacket chamber. They are a type of nuclear reactor in which soluble nuclear salts (usually uranium sulfate or uranium nitrate) are dissolved in water. The fuel is mixed with heavy or light water which partially moderates and cools the reactor. The outside layer of the reactor has more water which also partially cools and acts as a moderator. The water can be either heavy water or ordinary (light) water, which slows neutrons and helps facilitate a stable reaction, both of which need to be very pure.

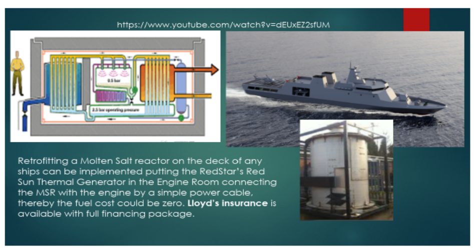
Figure 5: ORNL Aqueous Homogeneous Reactor historical photograph (Page 11).

Aqueous homogeneous reactor at ***Oak Ridge National Laboratory-ORNL***

Their self-controlling features and ability to handle very large increases in reactivity make them unique among reactors, and possibly safest. At Santa Susana, California, Atomics International performed a series of tests titled The Kinetic Energy Experiments. In the late 1940s, control rods were loaded on springs and then flung out of the reactor in milliseconds. Reactor power shot up from ~100 watts to over ~1,000,000 watts with no problems observed. With full ***ORNL AHR Feasibility Study***, Redstar reactors will be insured by ***Lloyds Syndicate*** with Red Sun batteries providing the transformer to retrofit the AHR to all existing diesels, turbine gensets and propulsion systems.

Aqueous Homogeneous Reactors were sometimes called "***water boilers***" (not to be confused with boiling water reactors), as the water inside appears to boil, though the bubbling is actually due to the production of hydrogen and oxygen as radiation and fission particles dissociate the water into its constituent gases, a process called radiolysis. AHRs were widely used as research reactors as they are self-controlling, have very high neutron fluxes, and were easy to manage. As of April 2006, only five AHRs were operating according to the Research Reactor database.[1]

Corrosion problems associated with sulfate base solutions limited their application as breeders of uranium-233 fuels from thorium. Current designs use nitric acid base solutions (e.g. uranyl nitrate) eliminating most of these problems in stainless steels.



Paradigm Shift:
Applications of Modern Aqueous Homogeneous Reactors using 32 MW Red Sun mobile 29 ton thermal 360 MWh transformer/ battery / 32 MW amplifier connecting nuclear energy into direct 65% efficient propulsion; making steam- to electricity; and electric charges the battery 98.6% to 1850°C to run diesels, heating long- forgotten cryo nitrogen to triple torque and expand range 10 x's. Thus, the AHR can run any ship, train, truck,turbine with 0 emissions

Red Sun Thermal Battery (PowerSource 660)

The concept of a high-temperature (~1,500–1,850°C), containerized molten-metal thermal battery for mobile use and engine retrofits is innovative but at the extreme end of current thermal storage technology. Containerized thermal batteries (sand, molten salt, PCM) are an active development area globally (NREL, Rondo, EnergyNest, etc.). Cryogenic nitrogen expansion for zero-emission torque assist is also real (prototype cryogenic engines exist).

Assessment: The specific performance numbers (32 MW / 360 MWh in a 29-ton 20-ft container at 1,850°C with 60-year life and dramatic efficiency gains over diesel) lack independent validation. Achieving safe, reliable containment and heat transfer at 1,850°C in a mobile package is a major materials and engineering challenge. Integration with existing diesel/turbine propulsion via "non-combustion Brayton cycle" with cryo N2 is conceptually interesting but unproven at ship scale.

Radioisotope Production Opportunity

This is one of the strongest elements of the proposal. Solution reactors are well-suited for on-line extraction of Mo-99 and other isotopes. The global Mo-99 market exceeds $5 billion and is growing.

Supply security concerns (past reactor outages) create openings for alternative production methods. The source document's isotope table and revenue projections are directionally reasonable, although exact per-gram pricing for all listed isotopes should be validated against current radiopharmacy markets.

Figure 6: Medical isotope transition chart and Hyundai nuclear-powered cargo ship concept (Page 23 of source).

Medical Isotopes, expanded focus (each is an additional product line)

Isotope	Direct from Core?	Source	Decay Path	half life	Medical Use(s)/other
^{90}Sr	yes		$^{90}Sr \rightarrow {}^{90}Y + \beta^-$	28.8y	radiotracer, osteosarcomas
^{90}Y	yes		$^{90}Y \rightarrow {}^{90}Zr + \beta^-$	64.6h	hepatocarcinomas
^{60}Co	transmute with core	$^{59}Co + n \rightarrow {}^{60}Co$	$^{60}Co \rightarrow {}^{60}Ni + \beta^- + 2\gamma$	5.27y	sterilization, radiation source
^{99}Mo	yes		$^{99}Mo \rightarrow {}^{99m}Tc$	65.9h	^{99m}Tc source
			$^{99m}Tc \rightarrow {}^{99}Tc + \gamma$	6.01h	many tracer uses/nuclear med.
^{82}Rb	α flux from "core"	$^{82}Kr + \alpha \rightarrow {}^{85}Sr/{}^{82}Sr$	$^{82}Sr + EC \rightarrow {}^{82}Rb$	25d	^{82}Rb source
			$^{82}Rb \rightarrow {}^{82}Kr + \beta^+$	1.27m	radiotracer (K^+, Na^+ sub), PET
^{131}I	yes		$^{131}I \rightarrow {}^{131}Xe + \beta^-$	8.02d	many med uses: tracer, ablation, thyroid
^{89}Sr	transmute with core (enrichment req'd.)	$^{88}Sr + n \rightarrow {}^{89}Sr$	$^{89}Sr \rightarrow {}^{89}Y + \beta^-$	50.57d	prostate cancer, osteosarcoma (palliative)
^{89}Sr	transmute with core (enrichment req'd.)	$^{88}Y + n \rightarrow {}^{89}Sr$	$^{89}Sr \rightarrow {}^{89}Y + \beta^-$	50.57d	prostate cancer, osteosarcoma (palliative)
^{177}Lu	transmute with core (enrichment req'd.)	$^{176}Lu + n \rightarrow {}^{177}Lu$	$^{177}Lu \rightarrow {}^{177}Hf + \beta^-$	6.65d	scintigraphy, radiotracer, neuroendocrine, prostate cancer
^{177}Lu	transmute with core (enrichment req'd.)	$^{176}Yb + n \rightarrow {}^{177}Lu$	$^{177}Lu \rightarrow {}^{177}Hf + \beta^-$	6.65d	scintigraphy, radiotracer, neuroendocrine, prostate cancer
^{133}Xe	yes		$^{133}Xe \rightarrow {}^{133}Cs + \beta^-$	5.25d	radioimaging (lung, brain)
^{68}Ga	α flux from "core" (enrichment req'd.)	$^{66}Zn + \alpha \rightarrow {}^{68}Ge$	$^{68}Ge + EC \rightarrow {}^{68}Ga + \beta^+$	270d/ 67.8m	neuroendocrine cancer screening/PET
^{111}In	α flux from "core" (enrichment req'd.)	$^{109}Ag + \alpha \rightarrow {}^{111}In$	$^{111}In + EC \rightarrow {}^{111}Cd + 2\gamma$	2.8d	radiotracer: monoclonal antibodies, pep-tides, biologics
^{113m}In	transmute with core (enrichment req'd.)	$^{112}Sn + n \rightarrow {}^{113}Sn$	$^{113}Sn + EC \rightarrow {}^{113m}In + \gamma$	115d/ 99m	radiotracer: monoclonal antibodies, pep-tides, biologics
^{153}Sm	transmute with core (enrichment req'd.)	$^{152}Sm + n \rightarrow {}^{153}Sm$	$^{153}Sm \rightarrow {}^{153}Eu + \beta^-$	46.28h	lung, prostate, breast, bone, palliative osteosarcoma
^{186}Re	transmute with core (enrichment req'd.)	$^{185}Re + n \rightarrow {}^{186}Re$	$^{186}Re \rightarrow {}^{186}Os + \beta^-$	3.71d	dosimetry, imaging, radiotracing: peptides, pharmaceuticals, palliative osteosarcoma
^{188}Re	transmute with core (enrichment req'd.)	$^{186}W + 2n \rightarrow {}^{188}Re$	$^{188}Re \rightarrow {}^{188}Os + \beta^-$	17h	dosimetry, imaging, radiotracing: peptides, pharmaceuticals, biologics, monoclonals
$^{225}Ra/{}^{225}Ac$	yes (breeding)	$^{233}U \rightarrow {}^{229}Th$...	$^{225}Ra \rightarrow {}^{225}Ac \rightarrow {}^{221}Fr \rightarrow {}^{217}At \rightarrow {}^{213}Bi \rightarrow {}^{213}Po \rightarrow {}^{209}Pb \rightarrow {}^{209}Bi \rightarrow {}^{205}Tl$ Targeted Alpha Therapy (TAT) cascade: anticancer		

Above- Transition Chart *of Radioisotopes the AHR can make for $1500 to $46,000 per gram giving 80% of AHR income with dual production.*

Hyundai **plans Nuclear Powered Colossal Cargo Ship:**

Strategic Business Plan (Recommended Phased Approach)

Given the technical and regulatory realities, the following phased roadmap prioritizes de-risking and early revenue while building toward the full integrated vision.

Phase 1: Validation & Foundation (12–24 months)

- Laboratory-scale AHR chemistry validation and isotope extraction experiments (partner with university or national lab).
- Bench-scale Red Sun thermal battery module + cryo N2 expansion testbed on a marine diesel engine.
- Secure core IP (molten metal battery design, hybrid cycle integration).
- Engage regulators early on non-power isotope production pathway (lower barrier than full power reactor).
- Raise seed/grant funding ($10–30M) from DOE isotope programs, maritime decarbonization funds, and strategic investors.

Phase 2: Pilot Demonstrations (Years 2–4)

- Build and operate a small research/pilot solution reactor for commercial-grade Mo-99 and other isotopes.
- Deploy first Red Sun container prototypes (1–6 MW thermal) on a yacht, small patrol vessel, or industrial heat application in the Philippines.
- Generate initial isotope revenue and paid demonstration contracts.
- Obtain necessary permits and begin Lloyd's or equivalent risk assessment process.

Phase 3: Commercial Launch & Scaling (Years 4–7+)

- First commercial isotope production facility or integrated small AHR + Red Sun systems for Philippine Navy/rail/industrial clients.
- Scale containerized battery production and retrofit kits.
- Expand revenue streams: long-term isotope supply contracts, battery leasing/swap services, energy savings PPAs, carbon credits, and technology licensing.
- Replicate model in other Southeast Asian markets and global shipping fleets.

Revenue Model

Primary near-term: Medical isotope sales (high margin, recurring). Secondary: Energy/heat service contracts and efficiency savings sharing (target competitive delivered cost vs. diesel/marine fuel). Tertiary: Carbon credits, licensing, and maintenance. The dual-use nature (energy + isotopes) is the key differentiator and risk mitigator.

Risks, Challenges & Mitigations

1. **Regulatory & Licensing:** Nuclear projects face long timelines. Mitigation: Start with isotope-only or research facilities; engage regulators immediately.
2. **Technical Integration:** High-temperature mobile storage + propulsion retrofit is complex. Mitigation: Rigorous phased testing with clear go/no-go gates.
3. **Capital Intensity:** FOAK nuclear + advanced thermal systems require substantial funding. Mitigation: Use isotope revenue and grants to fund early phases; attract strategic investors (shipping, energy, radiopharma).

4. **Competition:** Established SMR developers, thermal storage companies, and alternative fuels. Mitigation: Focus on unique mobile/retrofit flexibility and Philippines/SEA beachhead.

Conclusion & Recommendations

The Red Sun AHR + Thermal Battery concept represents an ambitious and potentially valuable contribution to clean maritime and industrial energy systems, combined with a smart revenue diversification strategy via medical isotopes. While the source materials contain optimistic projections that exceed current technological and economic realities, the underlying ideas are rooted in legitimate science and address real market needs.

Recommended Path: Adopt a disciplined, phased development program that prioritizes early isotope production capability and small-scale thermal battery demonstrations. This approach generates revenue and credibility while systematically de-risking the more challenging integrated power/propulsion applications. With strong execution, credible partnerships, and realistic expectations, this initiative could evolve into a meaningful player in the global energy transition and medical isotope supply chain.

— End of Report —