

Reef Ball™ Breakwater:

A Natural Guardian for the St. Lucie Nuclear Power Plant

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In the warm waters of the Atlantic Ocean, off the coast of Hutchinson Island, Florida, lies the St. Lucie Nuclear Power Plant. Specifically, the plant is situated on a 1,250-acre site on the western shore of the Indian River Lagoon, near the town of Jensen Beach. To mitigate the risks associated with its coastal location, an innovative solution was implemented: the Reef Ball™ Breakwater.

Location of the Breakwater

The Reef Ball™ Breakwater is situated approximately 1,500 feet offshore from the St. Lucie Nuclear Power Plant, spanning a distance of 3,400 feet. It is positioned in 15-20 feet of water, parallel to the shoreline, and covers an area of approximately 5.5 acres.

What is the Reef Ball™ Breakwater?

The Reef Ball™ Breakwater is a submerged barrier composed of thousands of artificial reef balls, each ranging from 200 to 10,000 pounds. These concrete structures are designed to mimic natural reefs, providing a habitat for marine life while also serving as a protective barrier against wave action and erosion.

Smart Reef Modules

The Reef Ball™ Breakwater features innovative Smart Reef Modules (SRMs), designed to enhance the breakwater's ecological benefits. SRMs are:¹

- Modular, artificial reef units that provide a complex habitat for marine life.⁵
- A single Smart Reef Module consists of four Goliath Balls, an articulating mat, and side-by-side Bay Balls
- Goliath Reef Balls weight @5000 lbs the added base on the SMART reef is approx. 5000lbs for a total unit weight of approx 10,000lbs
- Each Goliath Ball provides 230 ft² of surface area for habitat and Bay Balls provide and additional 40 ft² ⁴
- Reef Balls are typically designed to be porous and have a variety of features that promote marine life, such as nooks and crannies, holes for water flow, and rough surfaces for coral attachment.⁵
- Reef Balls have built in receivers and are an ideal location to graph fragments of at peril corals.

The specifications of the St Lucie breakwater are:²

- There are 116 mats
- Each mat has 5 dome-shaped reef balls attached
- There are a total of 580 reef balls
- Each reef ball is about 4 feet high
- There are 3 segments of the breakwater
- The south segment is 200 feet long
- The center segment is 150 feet long
- The north segment is 325 feet long
- Each segment is separated by 100 foot wide gap
- Each segment is about 45 feet wide
- At low tide, the breakwater will sit only a foot or less below the surface
- Buoys will mark the top of the breakwater so boaters will not collide with it

Cost of the Breakwater

The construction of the Reef Ball™ Breakwater was completed in 2004 at a cost of approximately \$12 million. This investment has provided long-term protection for the St. Lucie Nuclear Power Plant, ensuring the reliability of electricity generation for the surrounding community.

Sand Accretion

Since the construction of the Reef Ball™ Breakwater, significant sand accretion has occurred along the shoreline, with estimates suggesting:

- Over 1.5 million cubic yards of sand have accumulated along the beach, widening the shoreline by an average of 150 feet.
- The breakwater has helped to stabilize the shoreline, reducing erosion and preventing loss of beach sand.

Increased Sea Oats

The Reef Ball™ Breakwater has also led to a significant increase in sea oats (*Uniola paniculata*) along the shoreline, with:

- Dense colonies of sea oats now thriving in the stabilized sand, providing additional shoreline stabilization and habitat for wildlife.
- Enhanced biodiversity, as sea oats support a variety of species, including sea turtles, beach mice, and numerous bird species.

How does it protect the St. Lucie Nuclear Power Plant?

The Reef Ball™ Breakwater plays a crucial role in safeguarding the power plant from the impacts of waves, storms, and erosion. By reducing wave energy, it:

- Prevents erosion: The breakwater minimizes the loss of beach sand and sediment, maintaining a stable shoreline and preventing damage to the plant's foundation.
- Dampens wave action: The reef balls dissipate wave energy, reducing the impact of storm surges and waves on the plant's structures.
- Provides a natural barrier: The breakwater acts as a shield, protecting the plant from debris and sediment transport during storms.

Environmental benefits

The Reef Ball™ Breakwater has also become a thriving artificial reef, supporting a diverse array of marine life, including:

- Fish and invertebrates: The structure provides habitat for numerous species, enhancing local biodiversity.
- Coral growth: The reef balls offer a substrate for coral colonization, contributing to the growth of a healthy coral reef ecosystem.

Carbon Sequestration

The St. Luci Reef Ball Breakwater serves as an innovative solution for both shoreline protection and carbon sequestration.

- The Reef Ball breakwater reduces wave action, preventing erosion. As these coastal ecosystems erode, they release carbon. By protecting and restoring them, we can maintain carbon storage.
- Reef Balls provide essential fish habitat (EFH) due to their large surface area and patented design, which generates micro eddy currents. These currents are crucial for filter feeders and thus provide habitat for many crustaceans and corals; the enhanced habitat can provide a powerful carbon sink.

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Conclusion

The Reef Ball™ Breakwater is a remarkable example of innovative engineering and environmental stewardship. By protecting the St. Lucie Nuclear Power Plant from the forces of nature while also supporting marine life, promoting sand accretion, and enhancing sea oat

habitats, this submerged barrier demonstrates the potential for harmonious coexistence between human infrastructure and the natural world.

Resources:

- 1 [Smart Reef Modules | Coastal Protection and Management \(reefinnovations.com\)](https://reefinnovations.com/)
- 2 [FPL reef construction aims to prevent beach erosion near nuclear plant. \(tcpalm.com\)](https://tcpalm.com/)
- 3 [Reef Ball Map Ver2 - Google My Maps](#)
- 4 [Pricing - Reef Ball Foundation](#)
- 5 [Reef Balls | Artificial Structure for Marine Ecosystem Restoration \(reefinnovations.com\)](https://reefinnovations.com/)
- 6 Module Construction Site Video https://youtu.be/Zb_oNCMfhTc

