



**GEODYN
SOLUTIONS 150
MW HYBRID
SARGASSUM-
ALGAE BIOGAS
POWER & CIRCULAR
BIOECONOMY
PLANT WITH HRSG +
ORC – PUERTO RICO**

EXECUTIVE SUMMARY





Geodyn Solutions proposes a 150 MW hybrid biogas power plant in Puerto Rico that utilizes seasonal Sargassum seaweed and year-round cultivated algae to generate renewable baseload electricity through anaerobic digestion, now enhanced with HRSG and Organic Rankine Cycle (ORC) systems for waste heat recovery. This advanced circular bioeconomy facility also produces organic fertilizer and high-protein algae biomass for food and feed, providing Puerto Rico with sustainable power, agricultural inputs, and economic opportunity.

By converting waste heat into additional electricity, the integrated HRSG-ORC system improves plant efficiency, increases total output, and delivers a 12-year ROI of over 300%, making this project a high-performance investment with triple-impact returns.

PROJECT SUMMARY

PARAMETER	DETAIL
Location	Puerto Rico (coastal/industrial zone)
Project Type	Hybrid Sargassum-Algae Biogas with HRSG + ORC
Installed Capacity (Biogas CHP)	150 MW continuous baseload
Additional Output (ORC)	~15 MW (from waste heat recovery)
Total Effective Capacity	~165 MW
Feedstock	Sargassum (seasonal) + Cultivated Algae (year-round)
Additional Products	Organic Fertilizer, Algae Protein (Food/Feed)
Deployment Timeline	18–24 months
Power Sale Rate	\$0.19 per kWh



BIOMASS & ENERGY STRATEGY

- **Sargassum Seaweed:** Harvested seasonally from Puerto Rico's coasts, turning an environmental burden into a renewable resource.
- **Cultivated Algae:** Grown in open ponds on non-arable land using recycled wastewater and industrial CO₂.
- **Anaerobic Digestion:** Converts biomass into methane-rich biogas.
- **CHP Units + HRSG + ORC:** Generates power and recovers waste heat for additional electricity output (~10%).



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LAND REQUIREMENTS

- **Open Pond Algae Cultivation:** ~9,000–12,000 acres (36–48 km²) for 70–80% year-round biomass support.
- **Sargassum Collection:** No land needed—harvested directly from coastal zones.
- Site selected based on access to CO₂ sources, water, transmission, and logistics.

CAPITAL EXPENDITURE (CAPEX)

Component	Cost Estimate (USD)
Algae Cultivation (Open Ponds)	\$120 million
Anaerobic Digestion Units	\$180 million
CHP Generators & Biogas Engines	\$120 million
Sargassum Collection & Pretreatment	\$50 million
CO ₂ Injection + Water Reuse Systems	\$30 million
HRSG + ORC Waste Heat Recovery Systems	\$45 million
Fertilizer Processing Infrastructure	\$35 million
Algae Biomass Drying & Feed Facilities	\$45 million
Grid Interconnection & Substations	\$35 million
Site Development & Civil Works	\$35 million
Contingency (25%)	\$175 million
Total Estimated CAPEX	\$870 million

OPERATING EXPENDITURE (OPEX)

Category	Annual Cost (USD)
Labor, Admin, Security	\$16 million
Algae Pond Operations	\$18 million
Sargassum Collection (seasonal)	\$9 million
Equipment Maintenance & Spares	\$15 million
Biomass Processing (fertilizer/feed)	\$7 million
Environmental Compliance & Monitoring	\$3 million
Utilities, Water Management	\$4 million
Insurance, Permits, and Taxes	\$4 million
Total Annual OPEX	\$76 million

REVENUE STREAMS



ELECTRICITY SALES (FROM CHP + ORC)

- **Output:** 150 MW CHP + 15 MW ORC = 165 MW
- **Annual Generation:** 165 MW × 85% capacity × 8,760 hrs = 1,227 GWh
- **Revenue:** 1.227B kWh × \$0.19 = \$233.13 million/year

ORGANIC FERTILIZER SALES

- ~300,000 tons/year of digestate
- **Revenue:** \$100/ton = \$30 million/year

ALGAE-BASED FOOD & FEED PRODUCTS

- ~15,000 tons/year of dry algae biomass
- **Revenue:** \$2,500/ton = \$37.5 million/year

TOTAL ANNUAL REVENUE:

\$233.13M (Electricity) + \$30M (Fertilizer) + \$37.5M (Feed) = \$300.63 million/year



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12-YEAR FINANCIAL SUMMARY

Metric	Value
Total Revenue (12 Years)	\$3.607 billion
Total OPEX (12 Years)	\$912 million
Total Net Profit	\$2.695 billion
Total CAPEX	\$870 million
12-Year ROI	~310%
Payback Period	~3.7 years



CARBON SEQUESTRATION & ENVIRONMENTAL BENEFITS

Benefit Area	Detail
CO ₂ Sequestration	~400,000 tons/year via algae & Sargassum
Coastal Remediation	Sargassum removal improves tourism, water quality
Emissions Reduction	Replaces fossil diesel, near-zero net CO ₂ emissions
Water Recycling	>90% reuse in algae systems
Circular Economy	Closes loops in energy, agriculture, and waste



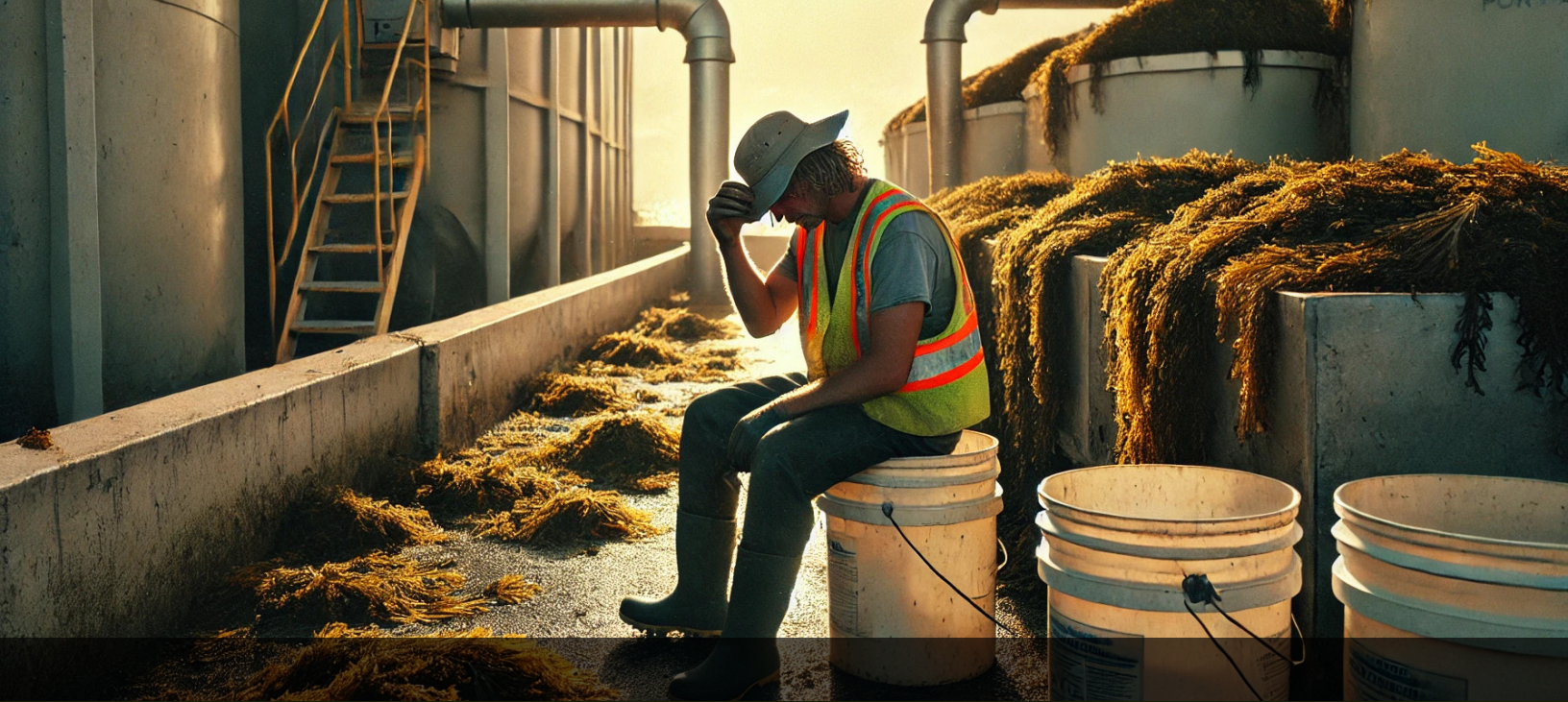
JOB CREATION IMPACT

Category	Estimated Jobs Created
Construction (2 years)	800–1,000
Plant Operations & Maintenance	250
Algae Cultivation & Processing	200
Sargassum Harvest Teams	150+ (seasonal/coastal)
Logistics & Admin Support	150
Total Job Impact	~1,500+ jobs



STRATEGIC BENEFITS FOR PUERTO RICO

- **TRANSFORMS ENVIRONMENTAL LIABILITIES (SARGASSUM) INTO REVENUE**
- **PROVIDES STABLE, CLEAN BASELOAD ENERGY USING LOCAL BIOMASS**
- **SUPPORTS FOOD, ENERGY, AND SOIL SECURITY**
- **ENABLES ELIGIBILITY FOR CARBON CREDITS, GREEN BONDS, AND DOE/USDA GRANTS**
- **STRENGTHENS PUERTO RICO'S LEADERSHIP IN RENEWABLE AND CIRCULAR ECONOMY SOLUTIONS**



IMPLEMENTATION & BUSINESS MODEL

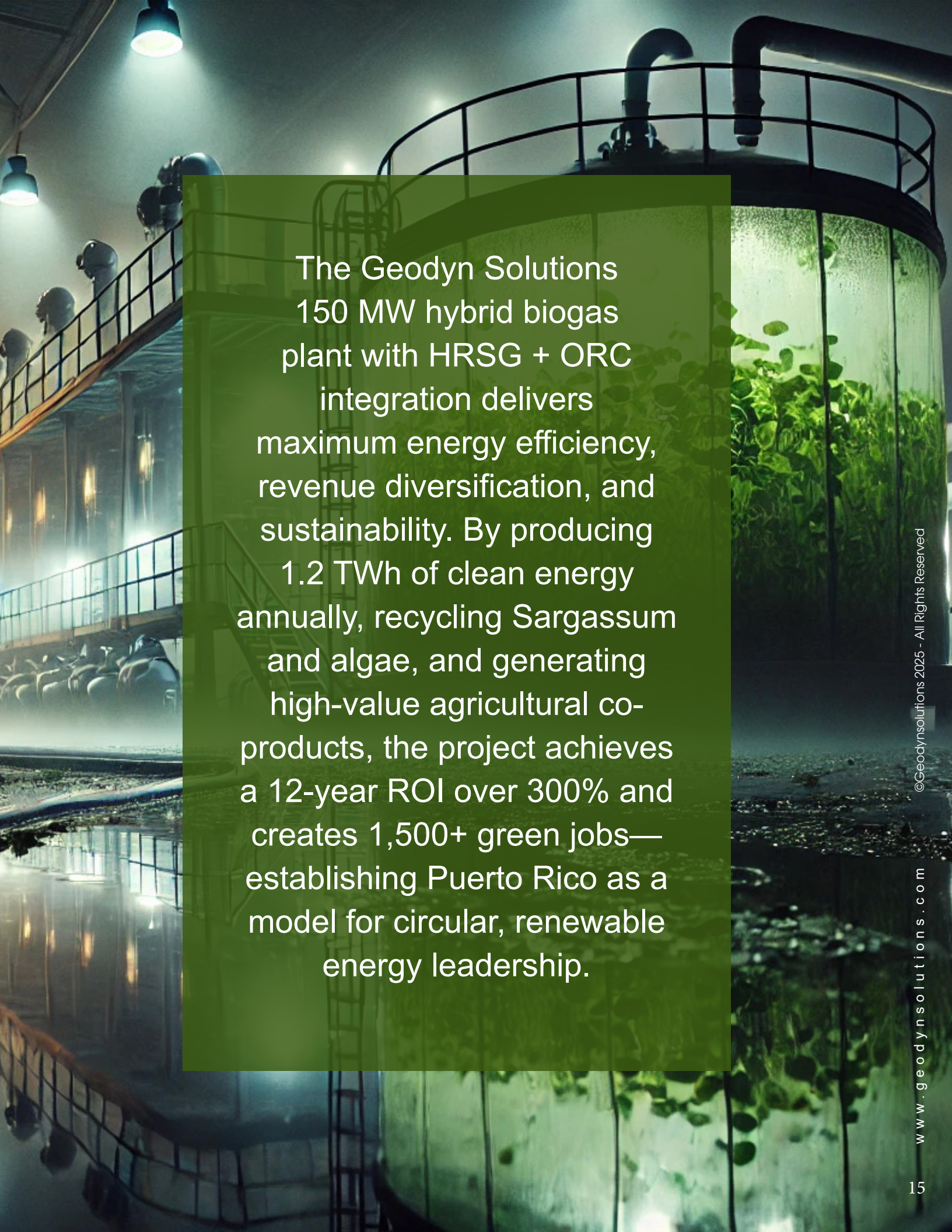
LEAD DEVELOPER/OPERATOR: GEODYN SOLUTIONS

REVENUE MODEL: PPA-BASED ELECTRICITY + DIRECT SALES OF FERTILIZER AND ALGAE FEED

CONTINGENT FEE: 25% SUCCESS-BASED DEVELOPMENT COMPENSATION

FINANCING: ESG FUNDS, BLENDED FINANCE, GREEN CAPITAL MARKETS

PARTNERSHIPS: PREPA, WASTEWATER AGENCIES, UNIVERSITIES, FOOD/FEED BUYERS



The Geodyn Solutions 150 MW hybrid biogas plant with HRSG + ORC integration delivers maximum energy efficiency, revenue diversification, and sustainability. By producing 1.2 TWh of clean energy annually, recycling Sargassum and algae, and generating high-value agricultural co-products, the project achieves a 12-year ROI over 300% and creates 1,500+ green jobs—establishing Puerto Rico as a model for circular, renewable energy leadership.



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