



# FSRWP® = THE NEXT GENERATION FSRU (Floating Storage Regasification Unit)

## Key Features

- Long-Term Cost Effective Solution
- ECA Supported Financing
- High Efficiency; lower operating cost
- Time to First Power: ≤ 24 months
- Available on EPCI, BOO or BOOT basis
- Fuel Flexibility: LNG, LPG, Diesel or domestic Natural Gas
- Integrated Fuel Storage & HV Power Substation
- Integrated Power Management System to help balance power supply from renewables
- Multiple Mooring Options: Jetty, Turret or Tower Yoke

## Applications

- Power/Water/Gas supply to Utilities, Industrial Parks or large near-shore Industry (i.e. Mines, Steel Mills, Smelters)
- Power & Water Hub for off-shore Oil & Gas Fields
- Base Load and/or Peak Shaving Power Plant
- Integration with Renewable Offshore Power to balance variable power supply (Solar & Wind) with demand

## Capacities

- Power Generation: 80 to 1,000 MW
- Water Treatment: 10,000 - 400,000 m<sup>3</sup>/day
- LNG Storage: ≤ 135,000 m<sup>3</sup>
- Fuel Autonomy: 12 to > 150 days

## Temporary Power Systems Available

- Time to First Power: 3 months
- Powered by Liquid Fuels or Natural Gas
- Flexible Contract Periods (months to years)

# Pre-Engineered FSRWP® Solutions

MODEC offers a range of Pre-Engineered FSRWP® Solutions ("SMALL", "MEDIUM" and "LARGE") based on MODEC's proven and extensive experience with Floating Offshore Production Systems.

## Comparison: Engine versus GT Efficiency & CO<sup>2</sup> Emission

Power Generation Options (MW per unit)			
Generator	@31°C	@31°C GTCC	FSR-POWER® CCGT
Dual Fuel Engine	18	18.3	18.3
GT-Aero	29	39	43
GT-Industrial	70	110	120

Description	Efficiency (%)	CO <sup>2</sup> (kg/hr/kW)
<b>Oil &amp; Coal</b>		
Coal Fired	33.9%	0.940
Conventional Engine	33.6%	0.743
* Turbo-Charged Engine	48.7%	0.448
<b>Gas Turbine</b>		
Simple Cycle	34-37%	0.551
Combined Cycle	49-51%	0.413
* MODEC Combined Cycle +	52-54%	0.395

\* = MODEC preferred options

## SMALL



FSR-WATER® 60k m<sup>3</sup> water/day

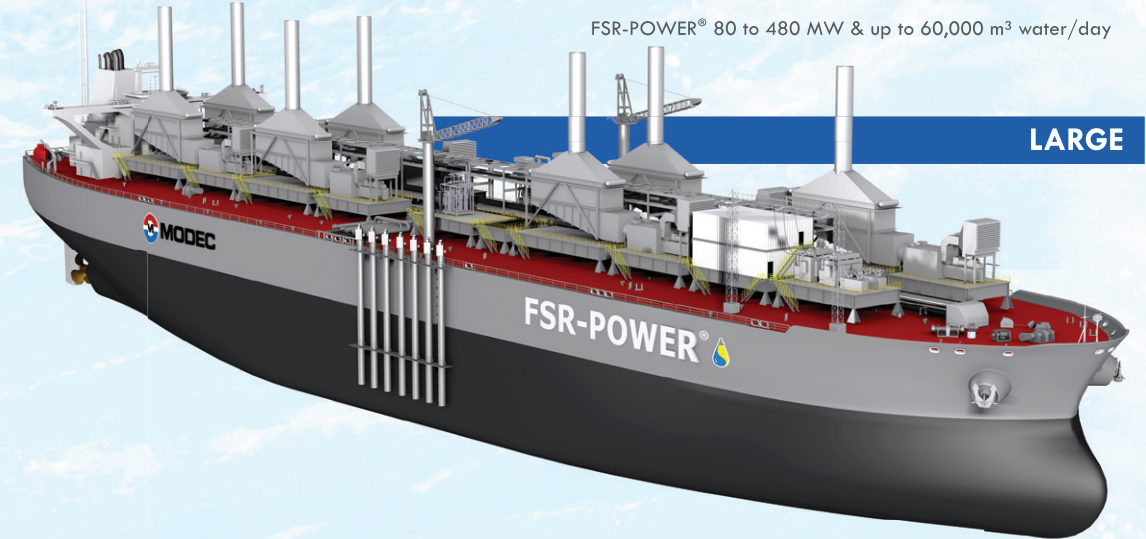


FSR-POWER® 80 to 160 MW



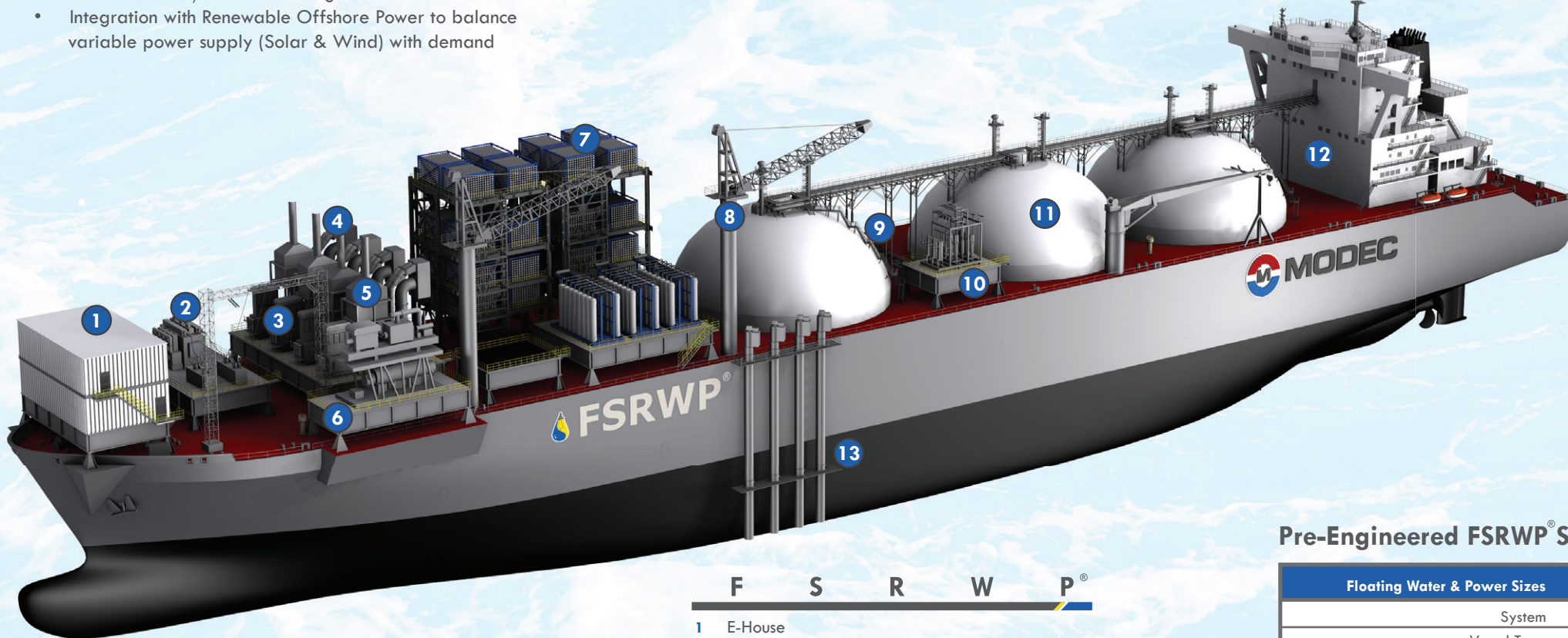
## MEDIUM

FSR-POWER® 80 to 480 MW & up to 60,000 m<sup>3</sup> water/day



## LARGE

FSR-POWER® >1,000 MW



**F S R W P**

- 1 E-House
- 2 Transformers, GIS, GSU
- 3 Gas Turbine Generators
- 4 Air Intake
- 5 HRSG
- 6 Steam Turbine Generator
- 7 Desalination Plant
- 8 Crane
- 9 LNG Offloading System (Manifold, Fenders, LNG Hoses)
- 10 Regasification Unit
- 11 LNG Tanks
- 12 Accommodation Block
- 13 Seawater Intake/Discharge Pipes



Front Cover: FSRWP® - 160 MW & 60k m<sup>3</sup> water/day

## Pre-Engineered FSRWP® Solutions

Floating Water & Power Sizes	"SMALL"	"MEDIUM"	"LARGE"	"ALL SIZES"	"ALL SIZES"
System	FSR-POWER®	FSR-POWER®	FSR-POWER®	FSR-WATER®	FSRWP®
Vessel Type	Barge (New Build)	Moss tanker or Barge	VLCC or New Build	Aframax to VLCC	Various
Power Generation Range (for export)	83-166 MW	83-480 MW	240-1,000 MW	NA	160-1000 MW
Operation & Maintenance	✓	✓	✓	✓	✓
On-board Accommodation	Option	✓	✓	✓	✓
LNG Storage Volume	20 - 25k m <sup>3</sup>	75 - 135k m <sup>3</sup>	48 - 180k m <sup>3</sup>	48 - 100k m <sup>3</sup>	48 - 180k m <sup>3</sup>
Fuel Autonomy (LNG) - at max power	15 - > 30 days	12 - > 150 days	9 - > 40 days	15 - > 45 days	30 - > 105 days
Length (Overall) in meters	110-130	275	330	240-330	330
Beam in meters	30 - 39	44	58 - 60	42 - 60	58 - 60
Draft (moulded) in meters	5 to 8	10 to 12	15 to 20	13 to 20	15 to 20
Self-Propelled	X	✓	✓	✓	✓
Voltage (HV) Substation	✓	✓	✓	✓	✓



# For almost 50 years MODEC has been leading the industry in developing Innovative Engineering Solutions deployed on our Oceans

## MODEC Introduction

MODEC began in 1968 as Mitsui Ocean Development & Engineering Company. During the first two decades MODEC pioneered the development and construction of new solutions (at the time) for the off-shore construction and drilling industry such as Crane-Barges, Jack-Ups and Heavy-Lift Semi-Submersibles.

Starting in the mid-1980s MODEC developed the Floating Offshore Production Business and engineered, built and sold Floating Storage and Offloading (FSO) systems and Floating Production Storage and Offloading (FPSO) systems and then in the late 90s started to lease and operate these systems as well.

- FPSOs, FSOs, TLPs delivered to date: ..... 43
- Current Owned/Operated Fleet: ..... 15
- Current Operated (owned by Others): ..... 4
- Installed Power Generation Capacity: ..... 1,500 MW
- Installed Sea Water Treatment Capacity: ..... 328,000 m<sup>3</sup>/day

## MODEC Track Record

### West Africa



### Southeast Asia



### Oceania



### Brazil



### GOM



FPSO "Prof. John Evans Atta Mills" Ghana



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## FSRWP® - MODEC's new Product Line

Looking to our future in late 2015 MODEC realized that:

- Over a billion people do not have access to clean water;
- One-third of the world populace does not have access to electricity and;
- Around 50% of the global population lives near an ocean;
- The global production capacity of Liquefied Natural Gas (LNG) will increase by around 50% in the next five (5) years and;
- Of the current fuels, Natural Gas is the cleanest source of Power.

As a result MODEC decided to develop the following Floating Water & Power family of products:

- FSRWP®** (Floating Storage, Regasification, Water and Power)
- FSR-POWER®** (Floating Storage, Regasification and Power)
- FSR-WATER®** (Floating Storage, Regasification and Water)