



LNG Liquefaction Project - Variety & Innovation -

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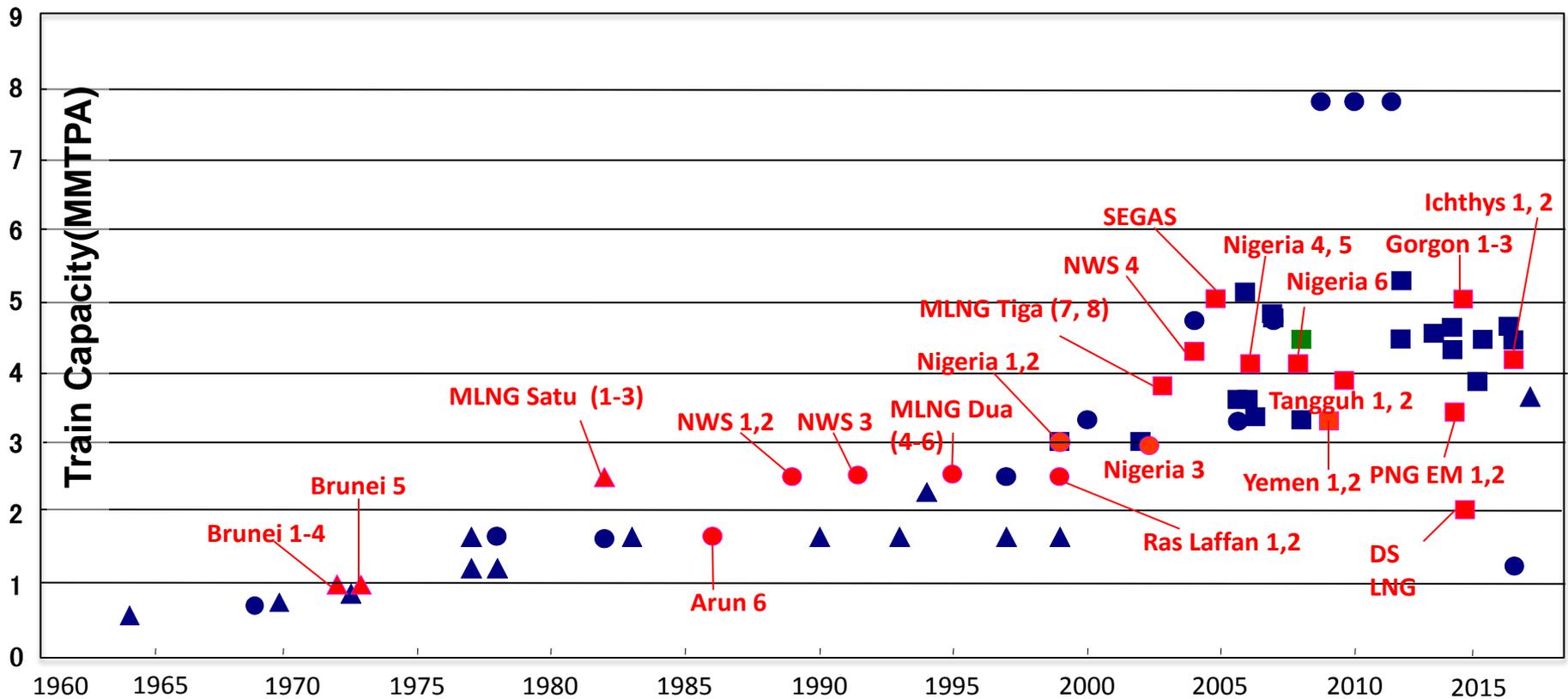
LNG Variety & Innovation

Contents:

- **LNG Plant History and Future**
- **Environment**
- **Safety**
- **Technology**
- **Summary**

LNG Evolution

LNG has become a baseload energy source. Liquefaction technologies continue to evolve from the standpoints of efficiency and capacity. Now is the 'variety' era for production capacity, floating locations, and unconventional gases.



Epoch-making Projects

JGC's track record of LNG projects already delivered/being delivered covers 39 LNG trains. Among them there are many 'First of A Kind'.



BRUNEI
1974

First Base Load



MALAYSIA
1984, 1996, 2003
8 Trains

Show Case of Tech.



INDONESIA
(TANGGUH)
2009

Remote Area,
Environment
Protection, High
Efficiency



Environmental Protection

In environmentally sensitive locations, JGC pays special consideration to local fauna and flora from the very earliest stage of project development.



Saving of Turtles

Consideration is given to minimizing negative impact on egg-laying behavior of turtles.

Against Female Turtles

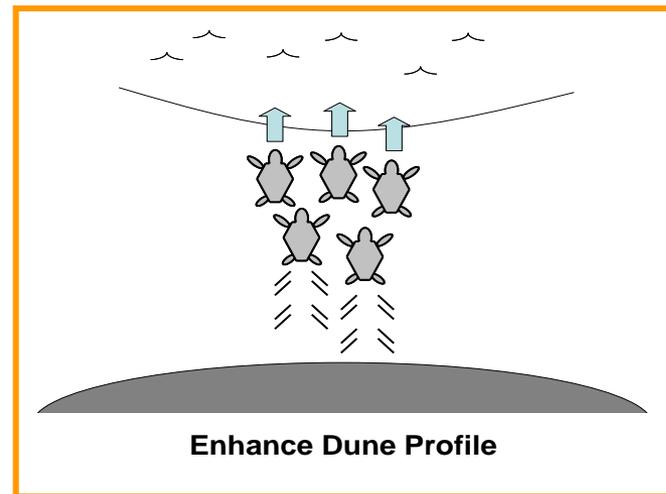
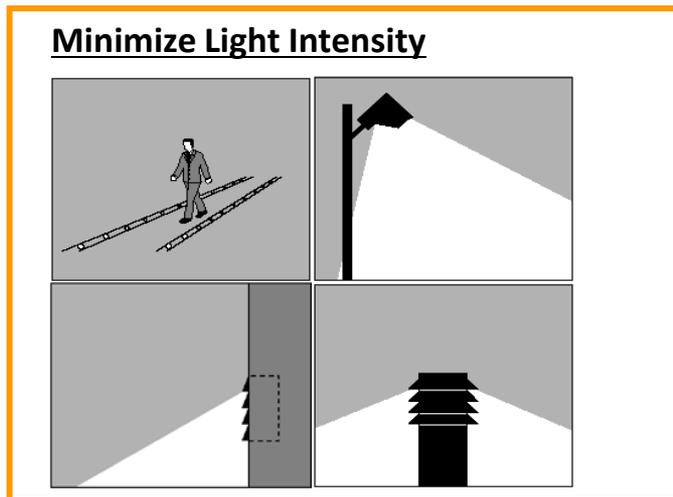
Nesting beach exposed to artificial lighting ⇒ **Fewer Nests**



Against Hatchlings

Landward artificial light ⇒ **Disrupted nocturnal orientation** of hatchlings towards sea

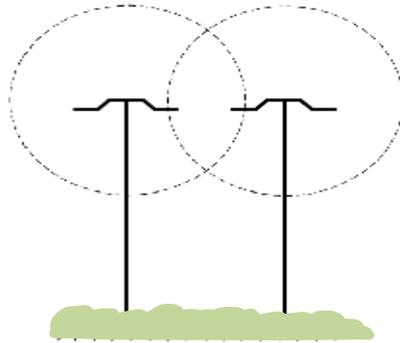
Typical Countermeasures



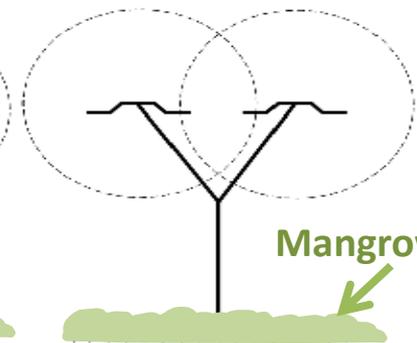
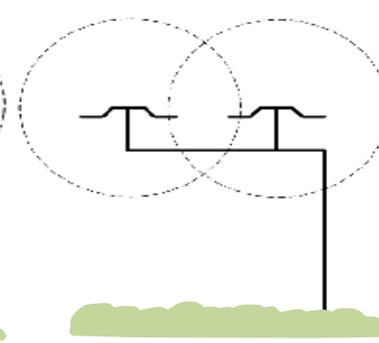
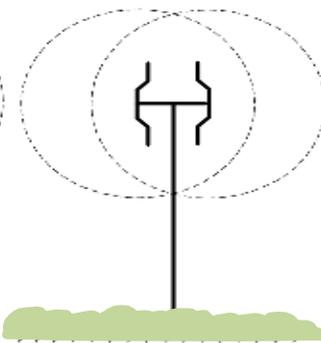
Protection of Coral Reefs / Mangrove Forests

Planning of jetty head configurations for minimization of negative impact on coral reefs/mangrove forests

Individual Trestle for each Jetty Head



Common Trestle for Jetty Heads (Series Head)



Common Trestle for Jetty Heads (Parallel Heads)

Y Shape Trestle for Jetty Heads



Work Safely, Go Home Happily

Safety is the absolute No 1 Priority. Aiming at becoming No 1 in safety in the industry, JGC has implemented various initiatives, campaigns and forums under management leadership.



Technology Improvement 1

In the journey to contributing to enhanced efficiency, cost competitiveness, plant availability, constructability, smaller carbon footprints, JGC offers innovative solutions.

1. Optimized Plot Plan



1ST Generation P/R
(37 meters high)

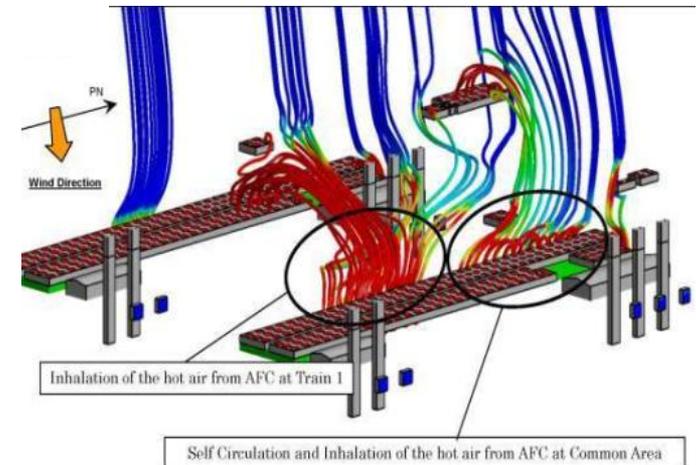


4th Generation P/R
(15 meters high)

- ✓ Stable operation and production
- ✓ Smaller main pipe rack

2. Hot Air Recirculation Analysis

- ✓ CFD Modeling Technology
- ✓ Optimized Cooler Layout



Technology Improvement 2

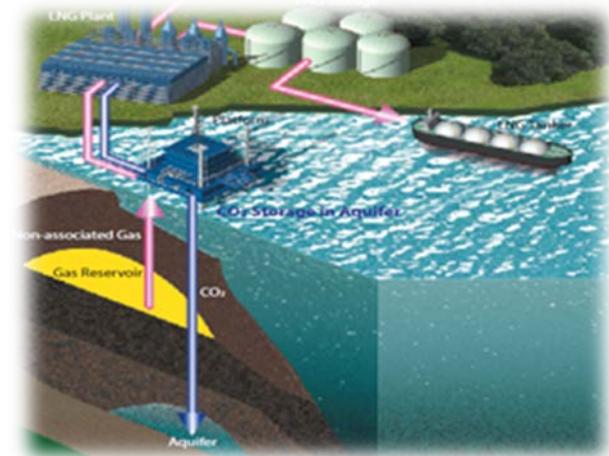
3. Module Construction



- ✓ Application to Remote Area
- ✓ Reduction of labor & required environmental protection

4. Carbon Dioxide Capture Technology

- ✓ JGC-developed HiPACT



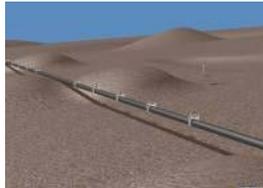
Floating LNG Concept

Floating LNG is a 'real' alternative for land-based LNG. Since completion of initial floating LNG studies in the 1990's, JGC has led advanced studies and project-specific FEED. The company is securing a unique position as a contractor for both onshore and floating LNG.

Platform



Pipeline



LNG Plant



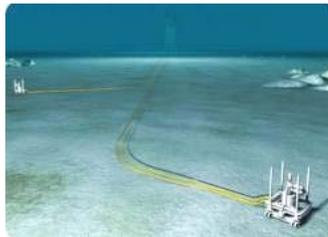
LNG Tank



Marine Facility

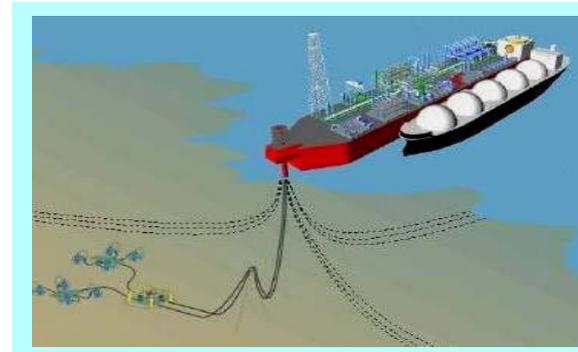


“On-Shore” LNG Plant Approach



Gas Wells at Seabed

Floating LNG Plant Approach



Summary

- Natural Gas (LNG) as key energy source
- Variety / Change highlighted:
 - ✓ Gas Sources: Shale Gas, Coal Bed Methane , Coal Seam Gas, Small / Stranded Fields
 - ✓ Areas of Production: Asia, Middle East, Australia, Americas, Russia, West & East Africa
 - ✓ Geographic Features: Remote islands, Deep water, Polar regions
 - ✓ Gas Producers: Newcomers (private)
 - ✓ LNG Plant Features / Characteristics: Environmental, Safety, Constructability, Lifetime Cost Competitiveness, Capacity Optimization, FLNG