PCNC New Maritime Wave 2026

Beating the Cost Curve

How LNG shipbuilding turned Korean shipyards into innovation centers, and why it is the blueprint for America

Ryan Lynch

Managing Partner, Maritime OIC LLC

THE ARGUMENT

Shipbuilding advantage is serial production and learning, not labor or inputs

01

Korea's advantage is a productivity story

Thirty years of newbuild prices show the real cost of LNG carrying capacity falling 60% while wages and steel rose. Learning, not cheap inputs, did the work.

02

The PRC is replicating it on a compressed timeline

State buyers, state capital and acquired chokepoint IP are moving Chinese yards down the same curve in years, not decades.

03

For the U.S., the curve is the capability

A nation cannot buy its way to the bottom of a learning curve with subsidized hulls. It needs volume and time, or an ally who has already made the climb.

THE FINDING

Korea cut the real cost of LNG carrying capacity by 60% in thirty years

60%

REAL COST PER UNIT OF CAPACITY, 1994–2026

From about $3.7M to $1.5M per 1,000 m³, in today's dollars

3.1%

ANNUAL PRODUCTIVITY GAIN

Log-linear trend across all 385 months, R^2 0.83, significant with autocorrelation-robust errors

2.5×

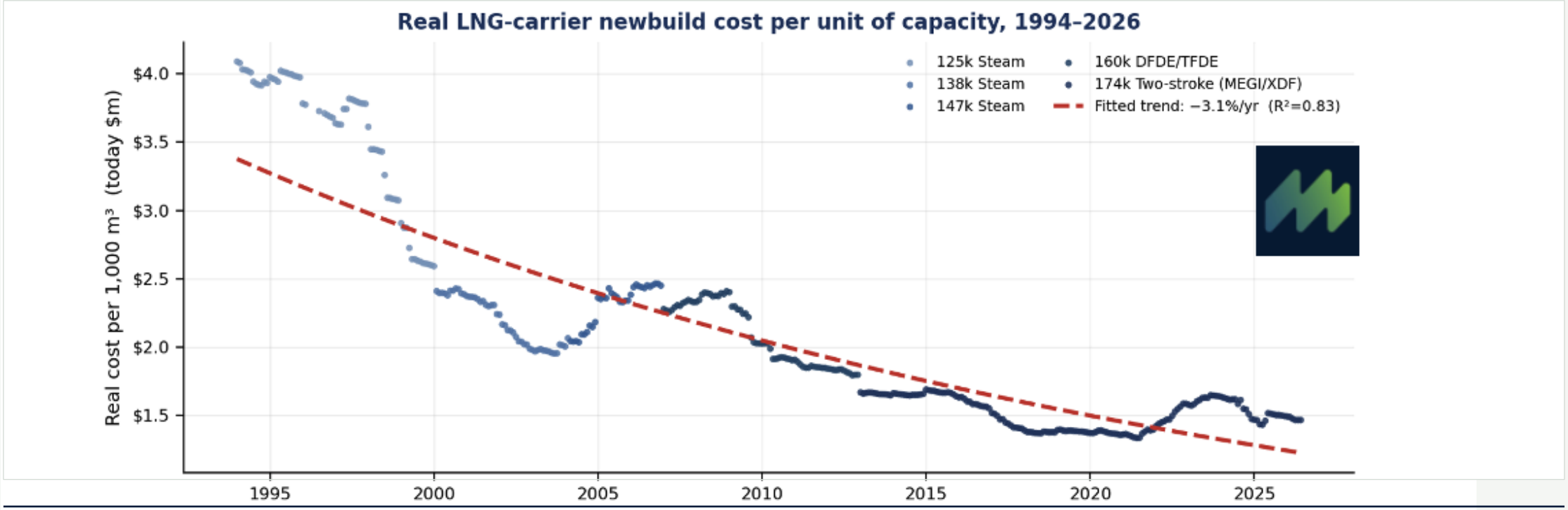
YARD EFFICIENCY, STEAM TO TWO-STROKE

A Korean yard today delivers two and a half times as much ship per real dollar as in 1994

Five generations of vessel: 125,000 m³ steam turbine (mid-1990s) through 138k and 147k steam, 160k DFDE/TFDE, to today's 174,000 m³ ME-GI and XDF two-stroke carriers. MOIC proprietary newbuild pricing, monthly, n = 385.

THE CURVE

385 months, five generations, one trend



YARD EFFICIENCY INDEX
125K STEAM = 1.00

1.00	1.73	1.58	1.85	2.49
125k steam	138k steam	147k steam	160k DFDE/TFDE	174k two-stroke

Each point is one month; colour denotes propulsion generation. Fitted log-linear trend −3.1%/yr, R^2 0.83. Source: Beating the Cost Curve, MOIC, June 2026.

UNDER THE HOOD

Indexation becomes a production story in three steps

STEP 1 · STRIP INFLATION, NORMALIZE FOR SIZE

$$Real_t = Nominal_t \times (CPI_{2026} / CPI_t)$$

Every contract price restated in mid-2026 dollars, then divided by cargo capacity. A larger ship built more economically per cubic meter reads correctly as a yard productivity gain, not an artifact of size.

STEP 2 · THE COBB-DOUGLAS FRAME

$$Y = A \cdot K^{\alpha} \cdot L^{\beta}, \text{ so } A \propto 1 / \text{real unit cost}$$

Treat the yard as an economy of its own. With inflation and scale held fixed, what remains in a falling real unit cost is rising A: total factor productivity. A dual, price-based Solow residual in the spirit of Hsieh (2002).

STEP 3 · ESTIMATE THE TREND

$$\ln(\text{unit cost}_t) = a + b \cdot t, \lambda = -b$$

OLS on the log of real unit cost against time. The slope is the annual rate of change; its negative is the productivity growth rate. Significant, and still significant after a HAC/Newey-West correction for serial correlation.

A reduced-form residual, not a structurally estimated production function: what is left after the obvious is accounted for, not a claim to have observed the factory floor.

REAL ENGINEERING, NOT AN ACCOUNTING ILLUSION

Inputs got dearer while the ships got cheaper

Measure	CPI-deflated	Steel-deflated
Annual productivity gain (λ)	3.1%/yr	4.0%/yr
Goodness of fit (R^2)	0.83	0.89
t-statistic on the trend	43.6	—
Cumulative real cost decline	59.8%	—
Observations (n)	385 months	385 months

Prices reflated with U.S. CPI (BLS CPIAUCSL), vs.steel PPI (BLS WPU101), via FRED.

Objection 1: Inflation

Removed by construction. The series is in today's dollars.

Objection 2: Steel

The opposite is true. Steel roughly tripled over the period, outrunning CPI. Deflating by an input index that grows δ faster than CPI shifts the estimate to λ + δ, so the steel-deflated gain is larger, about 4% a year. The CPI figure is the conservative one.

Objection 3: Labor

Monthly labor cost per employee at large Korean manufacturers rose more than 50% between 2008 and 2018, from ₩5.9M to ₩9.1M, about 4.4% a year (KOSIS). Korea's yards moved down the curve as labor grew more expensive.

WHAT KOREA ACTUALLY DID

A deliberate climb up the technology ladder, one generation at a time

MID-1990S

125k ST

$3.74M per 1,000 m³
Index 1.00

2000S

138k ST

$2.17M per 1,000 m³
Index 1.73

2004–08 BOOM

147k ST

$2.36M per 1,000 m³
Index 1.58

2010S

160k TFDE

$2.03M per 1,000 m³
Index 1.85

TODAY

174k ME-GI / XDF two-stroke

$1.51M per 1,000 m³
Index 2.49

HD Hyundai, Samsung Heavy Industries and Hanwha Ocean moved the fleet from steam turbines to dual-fuel diesel-electric, then to two-stroke dual-fuel engines on the high-pressure Diesel and low-pressure Otto cycles. Each step: a larger, cleaner, more fuel-efficient ship at a lower real cost per unit of cargo.

The less visible gains compounded alongside: membrane containment, robotic welding, air lubrication, shaft generators, integrated design-to-fabrication pipelines, and block construction that builds hull, machinery and containment in parallel rather than in sequence.

THE PRC IS LURKING ON THE SAME CURVE

China is covering in six years what took Korea three decades

87%
Korean share of global LNG carrier contracts, 2020–2024

22%
Chinese share of LNG carrier orders, 2025–2026 (about 38 vessels)

36%
Projected Chinese share of the post-2027 orderbook

88 / 330
Carriers in the global orderbook held by Chinese yards

State buyers signal quality

QatarEnergy: 24 of the 271,000 m³ QC-Max class at Hudong-Zhonghua, roughly $8B. ADNOC L&S: six 175k carriers from Jiangnan from late 2024, six more in 2026. Government-to-government relationships enforce quality where private owners cannot.

Chokepoint IP acquired

CSSC's acquisition of WinGD put low-pressure two-stroke propulsion IP, which Korean yards still license, in state hands. Jiangnan's BrilliancE containment is a step away from GTT. Net cost advantage after risk adjustment: about 4.5%.

A dual-use base, and a ceiling

The same ecosystem commissioned the carrier Fujian and a run of destroyers and frigates. Gains are decelerating as yards approach the frontier Korea occupies; sustaining them means generating technology rather than adopting it.

Source: Lynch, "The Shipbuilding Cost Curve: Korea's Lead, China's Climb, and America's Shipbuilding Choice," forthcoming, National Bureau of Asian Research. Orderbook figures: MOIC

$249M in Korea, $656M at a greenfield U.S. yard: the premium is facility amortization, not labor

Facility amortization per ship	> $300M	< $230M	Demand
Project-finance (cap-rate) adder	$120M	$75M	Demand
Labor inefficiency penalty vs ROK	2.1×	1.75×	Scale, training
Engine and CCS royalty, licensing	10%	5%	Scale
Logistics and outfitting premium	8%	5%	Scale
Skilled-trades wage, boilermaker-equivalent	$65/hr U.S.	$58/hr ROK	Not the driver

MOIC cost build-up: ROK incumbent yard vs a Brownsville, Texas greenfield facility; 8% blended capital hurdle; Everllence ME-GI engines; GTT containment.

2.6×

U.S. premium on a one-off hull, $407M

30×

Facility-cost disadvantage, one hull a year vs ~40

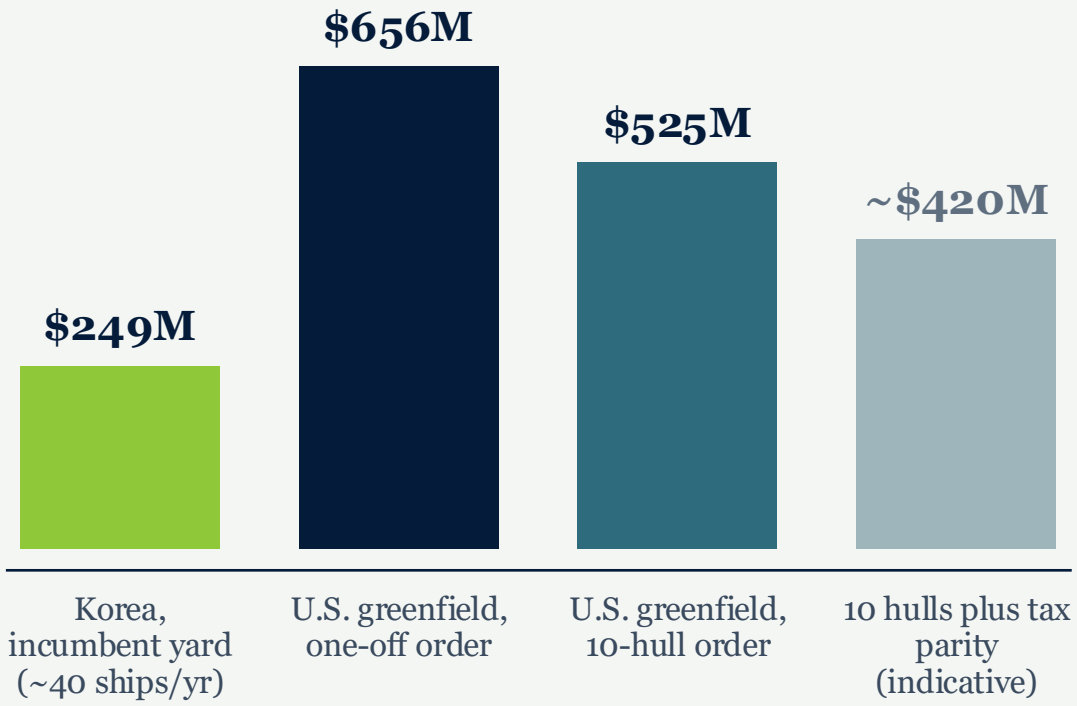
The common assumption is that American labor explains the gap. It does not. Levelized wages for a boilermaker-equivalent trade are broadly comparable, and even after a 2.1× penalty for immature productivity and supply chains, labor is about a quarter of the spread.

More than half comes from facility amortization and project-finance risk: a Korean yard spreads its fixed costs across some 40 hulls a year; a greenfield U.S. yard building one ship carries the entire facility on a single hull. No wage policy or tariff offsets that.

The United States is not at a different point on the Korean cost curve. It is not on the curve yet.

Ten committed hulls is the inflection point

Build cost of a 174,000 m³ LNG carrier, $M



Below ten hulls

Per-ship cost stays above $600M. Investment economics deteriorate and no builder commits capital.

At ten hulls

Amortization per ship falls about 35%, the cap-rate adder drops to $75M, royalties and logistics halve, and licensed engine and containment suppliers see enough ratable demand to invest in U.S. capacity.

Plus tax parity with real estate

Treating shipyard infrastructure like the real estate it resembles removes a further ~20% of financing friction. Still above Korea, but within reach of buyers who value supply-chain security, and it starts the learning clock.

SOURCE: MOIC SHIPBUILDING COST-COMPARISON STUDY, JUNE 2026

The lesson from Korea is not that subsidy wins. Volume, reinvestment and an ally who has made the climb win.

01

A stable, multi-year pipeline of orders

Offtake commitments, cargo preference for LNG exports, or sovereign-linked procurement, so a yard can capture learning effects. Demand certainty is the prerequisite; policy is the accelerant.

02

Capital directed at process and product innovation

Not one-off hulls. Tax parity with real estate (REIT scoping, first-year expensing, credit transferability, CCF extension, recapture cap) takes ~20% off financing friction without permanent subsidy.

03

Partnership with allied Korean yards and capital

Import proven know-how instead of relearning it from zero. Allied lead yard first, U.S. recipient yard second: the sequence Washington already accepted under the Finland Model for Arctic Security Cutters.

SIGNALS ALREADY SENT

Hanwha's 2024 acquisition of Philly Shipyard · Seoul's 2025 pledge of $150B in shipbuilding cooperation · the June 2026 Korea–U.S. Shipbuilding Cooperation Investment MOU · MAP, SHIPS Act and USTR Section 301 as the policy vehicles. Korean builders are the only remaining allied firms walking this curve: Japan has not delivered an LNG carrier since 2019 and aims to resume around 2035.

Korean buyers already underwrite the demand that would put a U.S. yard on the curve

KOGAS	Cheniere, Sabine Pass (LA)	up to 3.5	Firm, delivering
KOGAS	BP, Freeport (TX)	1.58	Firm
SK E&S	Freeport LNG (TX)	2.2	Firm, delivering
Hanwha Aerospace	Venture Global (LA)	1.5	For Gwangyang, 2030
POSCO International	Cheniere, CC Stage III (TX)	0.4	Firm
KOSPO	Cheniere, Sabine Pass (LA)	0.4	Firm, 2024–2046
SK Gas	ET, Lake Charles (LA)	0.4	Subject to FID

Plus the TotalEnergies portfolio deal and undisclosed Trafigura volume to KOGAS. Excludes non-binding MOUs and portfolio deals where the U.S. share is not fixed.

~10–11 mtpa

Contracted U.S.-origin LNG to Korean buyers: a multi-buyer, multi-decade book that is still growing

46.3 Mt

Korea's 2024 LNG imports, the world's third largest; the U.S. its fifth source at 12% and rising. Gas is ~28% of Korean power generation, virtually all of it imported LNG.

25 ships ≈ 20%

Of U.S. LNG export carriage at today's ~60 cargoes a month and a 40-plus-day average voyage. A deliberately modest program.

The nation that masters the productivity curve owns the industry.

When a willing ally offers to teach it, one would be wise to accept.

Korea's thirty-year cost curve: leadership earned through sustained order volume, disciplined reinvestment, and a deliberate climb up a technology ladder.

China has learned the lesson and is applying it with state resources Korea never had, compressing decades into years.

The United States has the policy architecture in draft, the export volumes to anchor demand, and an ally with the know-how. What it lacks is the order pipeline only it can supply.

THANK YOU

Questions welcome in the panel

Ryan Lynch

Managing Partner, Maritime OIC LLC
Houston, Texas
www.maritimeoic.com

Visiting Fellow, National Center for Energy Analytics

MOIC RESEARCH BEHIND THIS TALK

- Beating the Cost Curve: How LNG Shipbuilding Turned Korean Shipyards into an Innovation Machine (June 2026)
- Shipbuilding Cost-Comparison Study: Facility Amortization, Not Labor Costs (June 2026)
- The Shipbuilding Cost Curve: Korea's Lead, China's Climb, and America's Shipbuilding Choice (forthcoming, National Bureau of Asian Research)
- Shipbuilding Capabilities: Road Map for Broad-Based R.O.K. Engagement (September 2026)

The author and the entities he controls, including Maritime OIC LLC and funds managed by them, may invest in maritime assets, shipyards and other maritime-centric infrastructure. This presentation reflects the author's analysis.