Impact of a new LNG market regime

Briefing pack

May 2022

“The new regime is a game changer for LNG portfolio value & risk.”

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The new market regime

Regime shift:
5 key takeaways

Europe's pivot from Russian gas to LNG has cemented a new LNG market regime.

In this section we analyse regime drivers and how they are impacting market dynamics.

5 market drivers under new regime

Takeaway	Driver	Market impact
1.Prices	Europe & Asia competing for constrained global supply volumes to at least 2025	Global prices to remain elevated
2. Flexibility	Extreme market prices & policy shifts inhibiting market flexibility	Flexibility & prices being driven by less responsive sources of demand
3.Price volatility	Reduced market flexibility & major collateral/liquidity constraints	Structurally higher LNG price volatility
4. Flows	More dynamic flows between Atlantic & Pacific basins required to clear the LNG market	More dynamic inter-regional price signals
5. Correlations	Europe & Asia competing directly for marginal supply	Transition in TTF vs JKM vs Brent price correlations

Europe’s pivot to LNG

From Russia to LNG

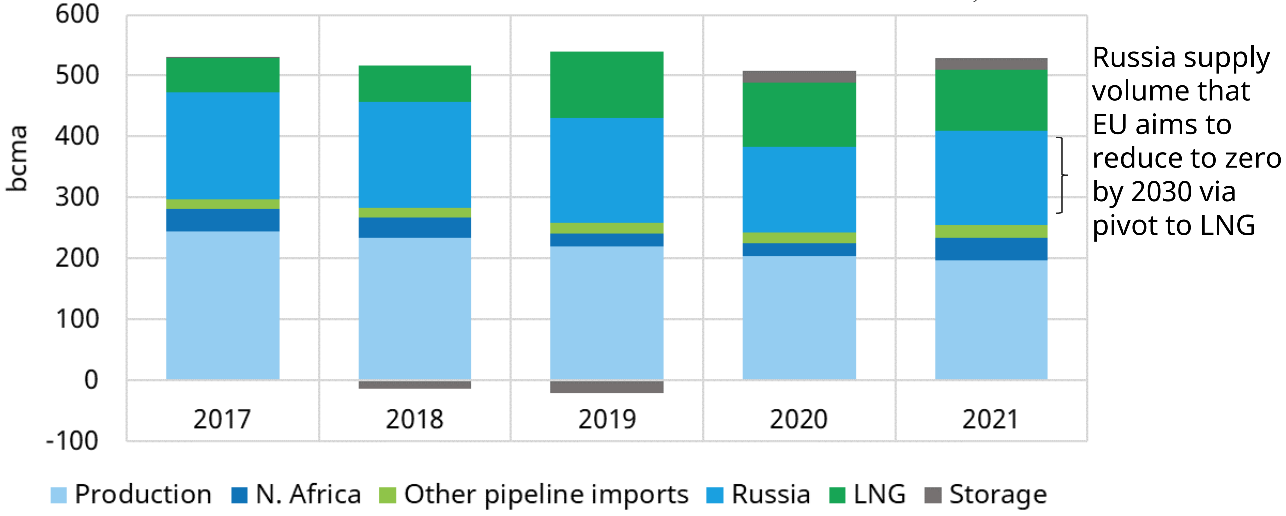
- The Russia – Ukraine conflict has just triggered the most profound shift in European energy policy history.
- Russia has accounted for 30-40% of the European gas supply mix across the last 5 years. The EU has announced its ambition to reduce this to zero by 2030.
- Given the absence of other supply flexibility into Europe, a pivot away from Russia is effectively a pivot towards an already tight global LNG market.

Europe to compete with Asia for LNG

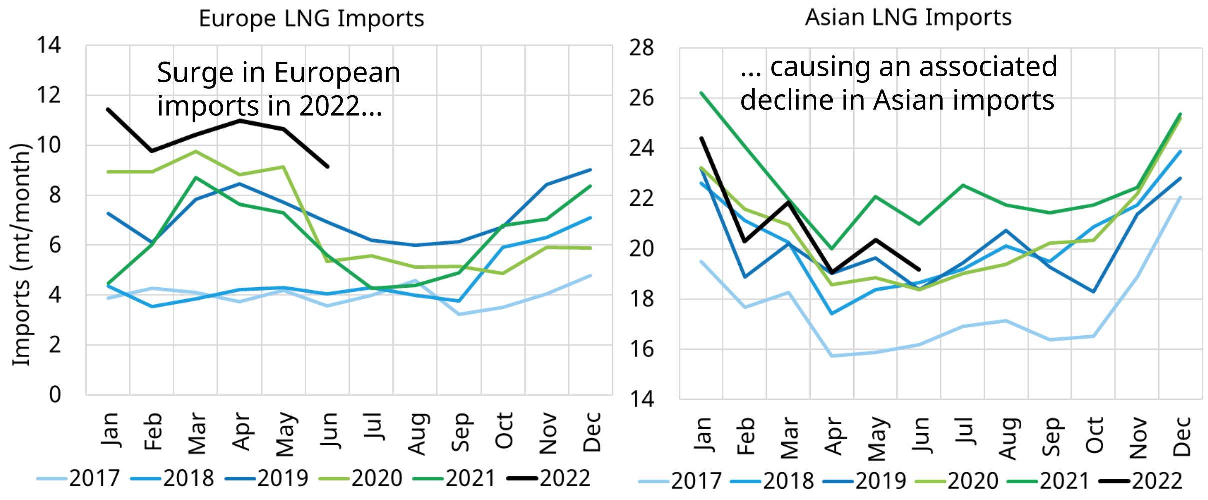
- Europe’s role in the LNG market is transitioning:
  - From a passive and flexible sink for global LNG oversupply (as seen in 2019-20)
  - To a direct and aggressive competitor for LNG against other markets, particularly Asia.
- The traditional flexibilities in the European gas market are being exhausted, with Russian conflict exacerbating the issue.

LNG vs Russian gas in Europe’s supply mix

Source: Timera, ENTSOG



European & Asian LNG monthly imports



Source: Timera, LNG Unlimited

Europe’s flex role

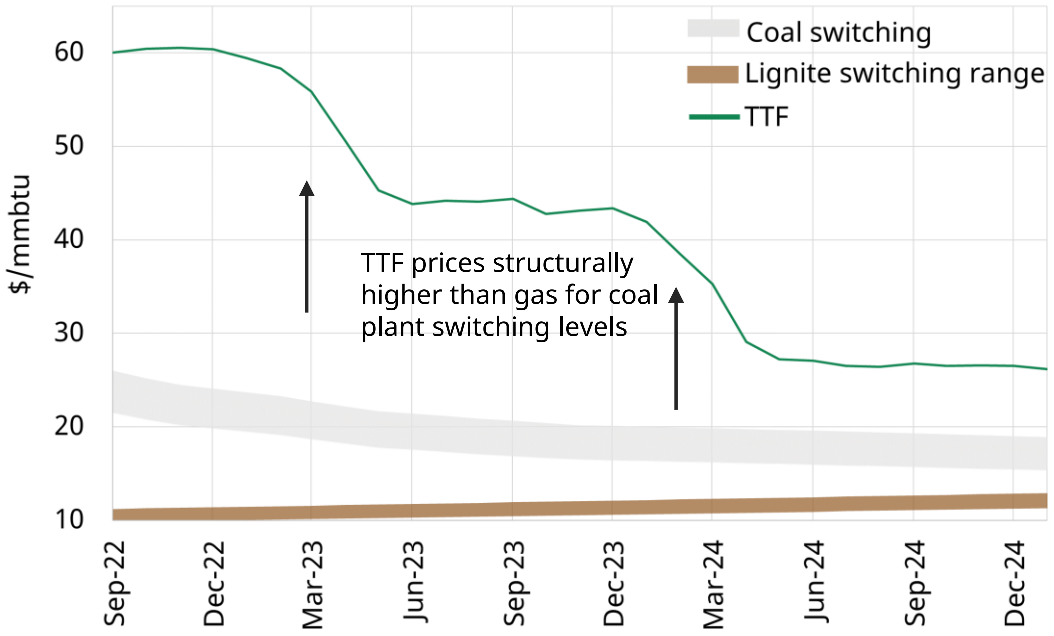
European flex inhibited

- Europe has historically been the key provider of balancing flex to the global LNG market.
- Flex provision gas been enabled by:
  - i. Large power sector switching volumes (gas for coal plants)
  - ii. High storage volumes (relative to Asia)
  - iii. Flex in pipeline supply contracts (dominated by Russia).
- Europe’s ability to provide flex is becoming inhibited by:
  - o Fully switched power sector (see top chart)
  - o Storage level mandates & phase out of Russian supply.

Major implications for pricing dynamics

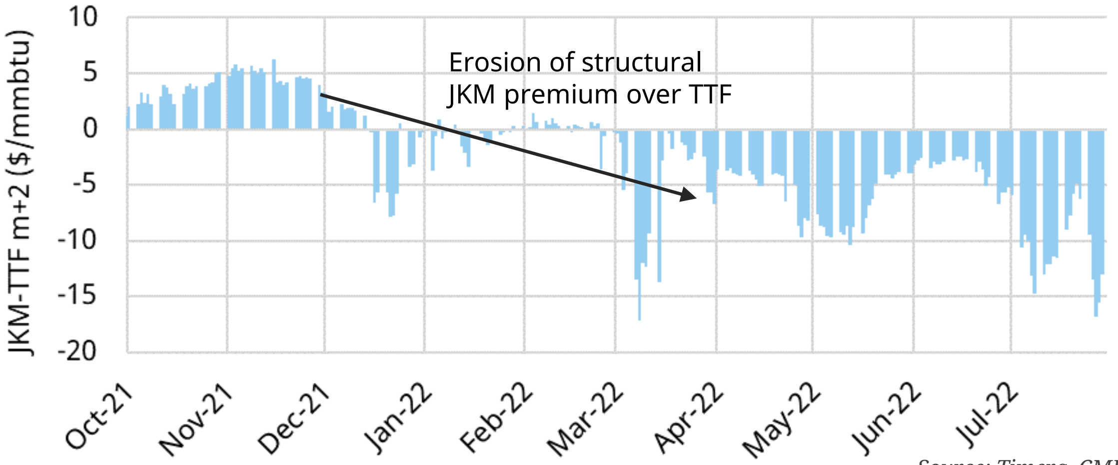
- European flex has been a key driver of pricing at TTF & JKM.
- This flex is set to be replaced by less price responsive & ‘lumpier’ demand response, driving up TTF & JKM price volatility.
- Europe vs Asia competition for cargoes is set to cause the death of the structural premium of JKM prices over TTF (see chart).
- Set to be replaced by a more dynamic JKM vs TTF relationship as the price signal to balance the two basins.

European power sector switching chart



Source: Timera, CME

JKM – TTF price spread (month + 2)



Source: Timera, CME

LNG market impact 2022 - 2025

Supply constraints to 2025

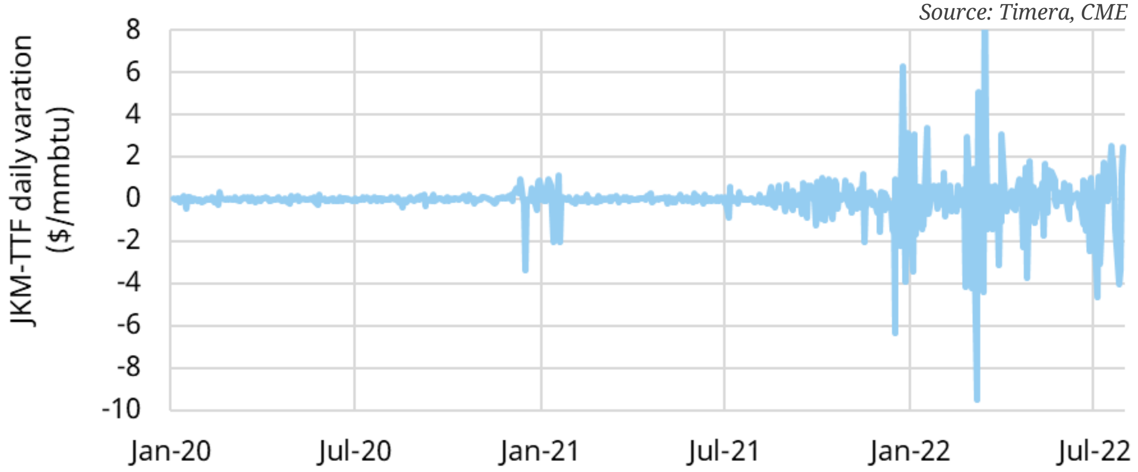
- Global LNG supply is effectively locked in until at least 2025 (given lead times on new liquefaction capacity).
- A surge in European demand is effectively pushing up an inelastic supply curve.
- This supports higher prices & higher volatility.

Structural shift in pricing dynamics

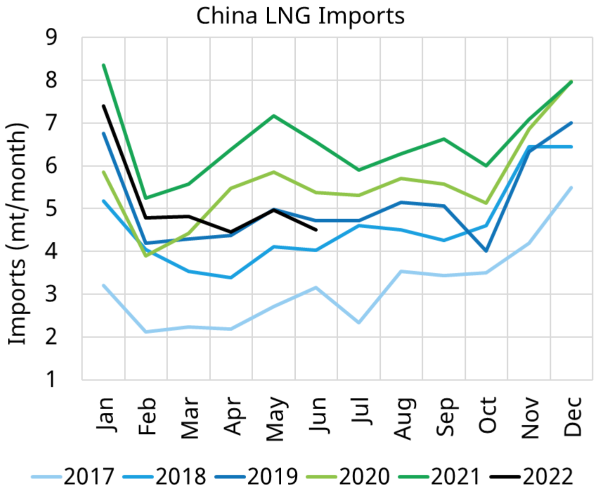
- With traditional European flex sources inhibited, demand response in Europe & Asia will need to play a growing role.
- This will not be as smooth as European switching!
- Expect:
  - i. higher volatility, compounded collateral issues
  - ii. changing TTF vs JKM vs Brent price correlations
  - iii. rising basis risk e.g. DES NWE vs TTF (regas constraints) & intra-European hub price spreads (flow shift West to East).
- These factors create challenges but also substantial value creation opportunities for market participants.

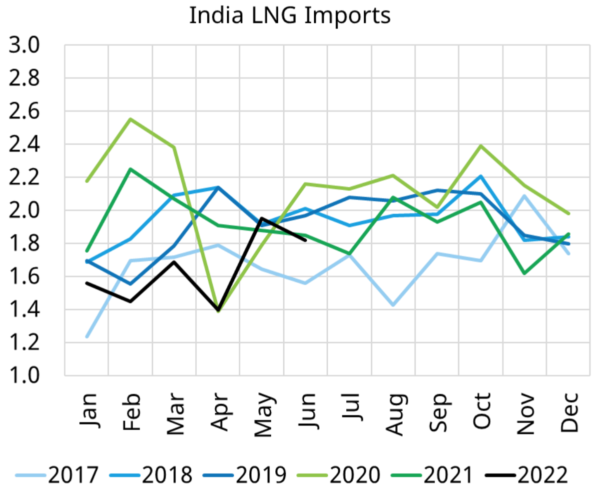
JKM-TTF daily price spread variation

Source: Timera, CME



Asian demand response to high prices





Source: Timera, LNG Unlimited

LNG market impact 2025+

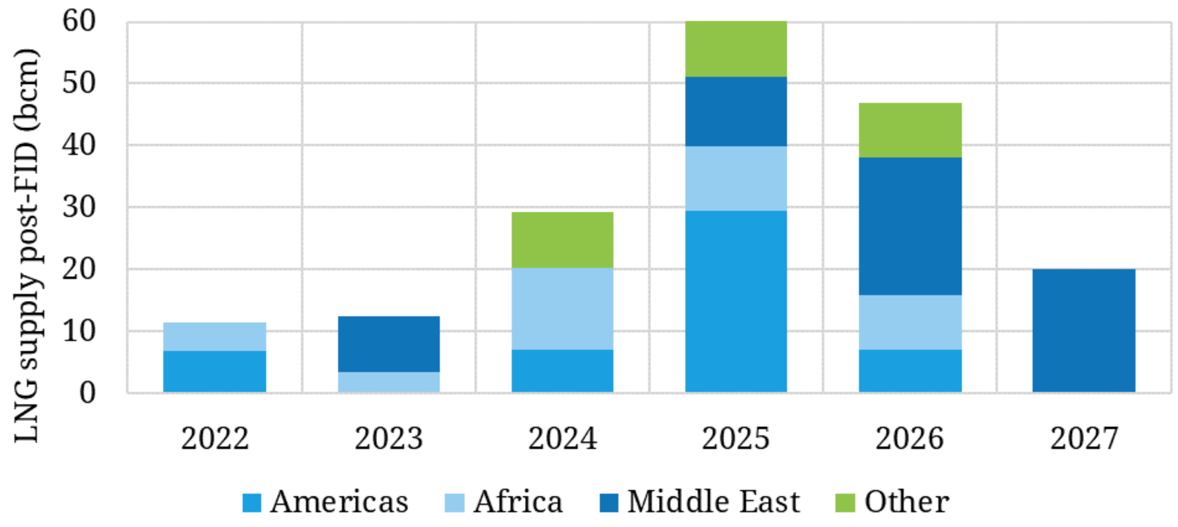
Rebalancing from 2025

- Beyond 2025, LNG market supply response kicks in.
- Substantial new volumes of LNG liquefaction set to be FID'd (e.g. US, Qatar, E Africa) spurring a new wave of contracting.
- Risk of a supply overshoot in later 2020s, particularly if Russian gas volumes make it to market despite Europe pivot.
- Russian crisis is also accelerating decarbonisation of European energy mix, with implications for gas demand.
- Analysing portfolio impact of further regime shifts from mid 2020s is important given uncertainty.

5 enduring impacts of new regime

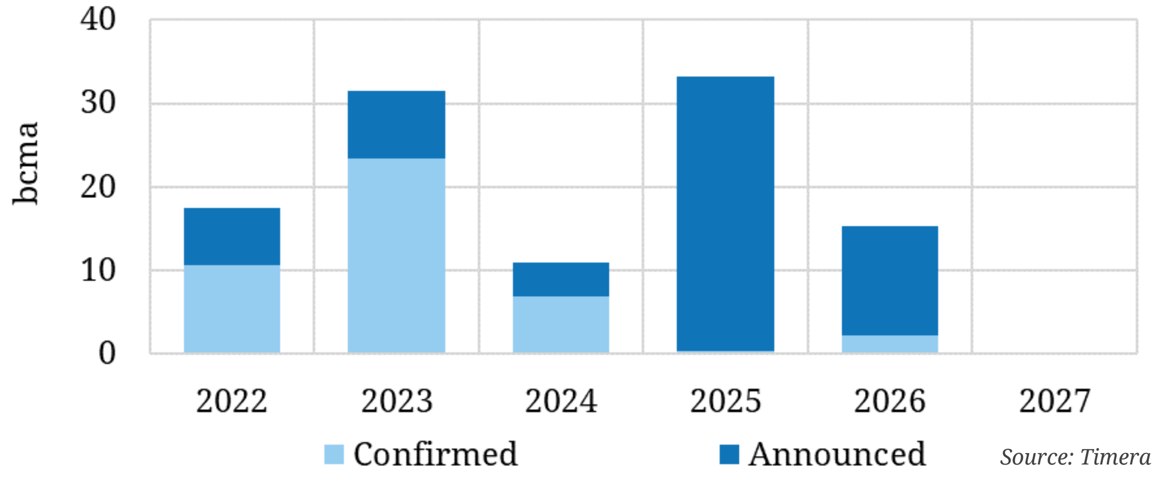
1. Surge in European regas capacity & LNG imports
2. Rising importance of European exposures in LNG portfolios
3. New wave of US LNG contracting, supporting Henry Hub
4. Accelerated hub price penetration via next supply wave
5. Continued growth in role of mid market players, hub price signals & derivatives.

Post-FID supply



Source: Timera

European regas additions (FSRU and fixed)



Source: Timera

Portfolio implications

Key takeaways

The new market regime has come upon LNG portfolios like a freight train out of a tunnel.

We see in our work with large LNG portfolios that the new market regime is having profound implications for portfolio value & risk. We explore some of these in this section.

5 key takeaways

Takeaway	Description
1. Game changer	• New market regime causing seismic shifts in LNG portfolio value… creating opportunities & risks
2. Portfolio construction	• Market transition in 2022 is triggering major strategic reviews across LNG companies • Focus: impact on ‘molecules’ (supply), ‘capacity’ (regas & shipping flex) & ‘pricing’
3. Value management	• High prices & volatility drive importance of dynamic management of interdependent exposures
4. Prompt optimisation	• Higher proportion of value monetised via optimisation within year (+ liquidity / logistical constraints)
5. Risk management	• New regime = step change in portfolio risk; credit/collateral issues require active management

Deconstructing portfolio impact

Impact by activity

- We consider the impact of the new market regime on 4 key commercial activities that underpin effective LNG portfolio management:
  1. Portfolio construction underpins portfolio value creation & risk profile
  2. Value management covers portfolio value capture & hedging across a liquid horizon
  3. Portfolio optimisation enables monetisation of value across the delivery (ADP) horizon
  4. Risk management governs, measures & enforces portfolio risk boundaries.

Four key LNG portfolio management activities

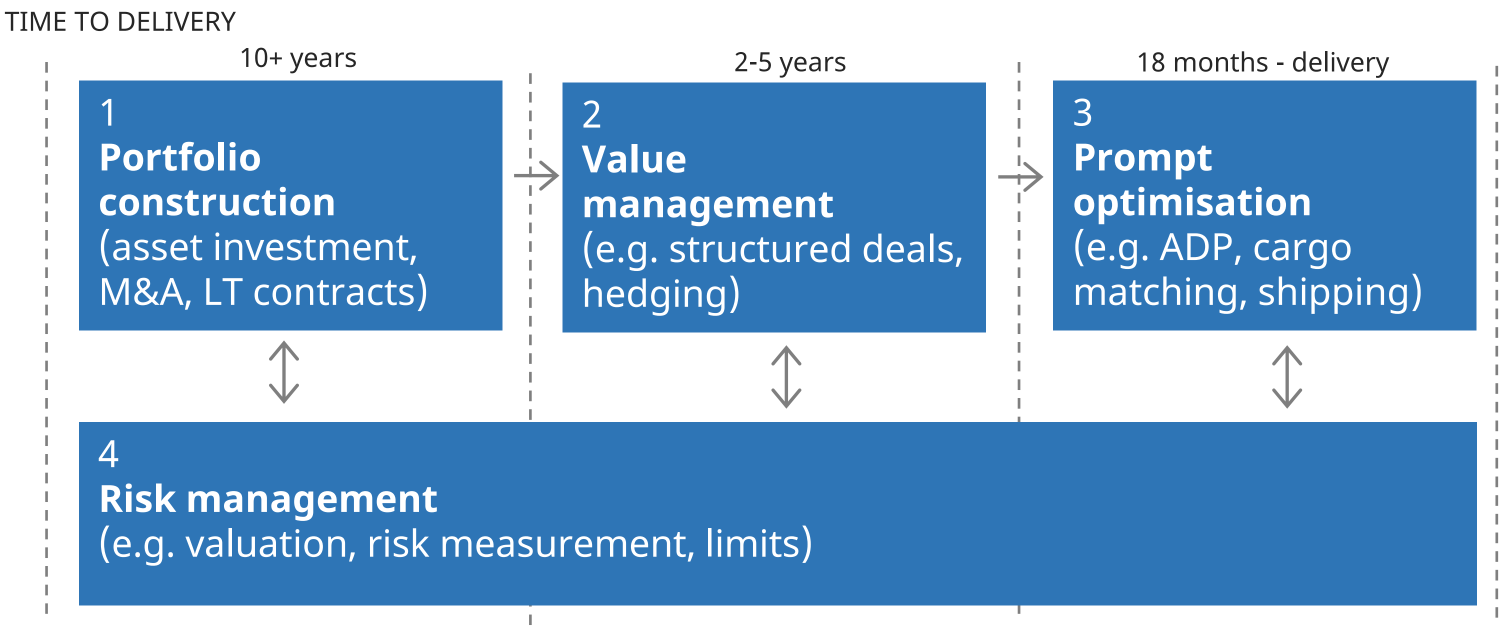


Illustration via case study

- We consider regime impact on each of these 4 activities via a practical portfolio case study (summarised on next slide).
- Case study analysis is conducted in our LNG Bridge stochastic portfolio valuation analysis model.
- Conclusions on portfolio value & risk reflect current implications we are seeing across a range of our large LNG portfolio clients.

Case study portfolio

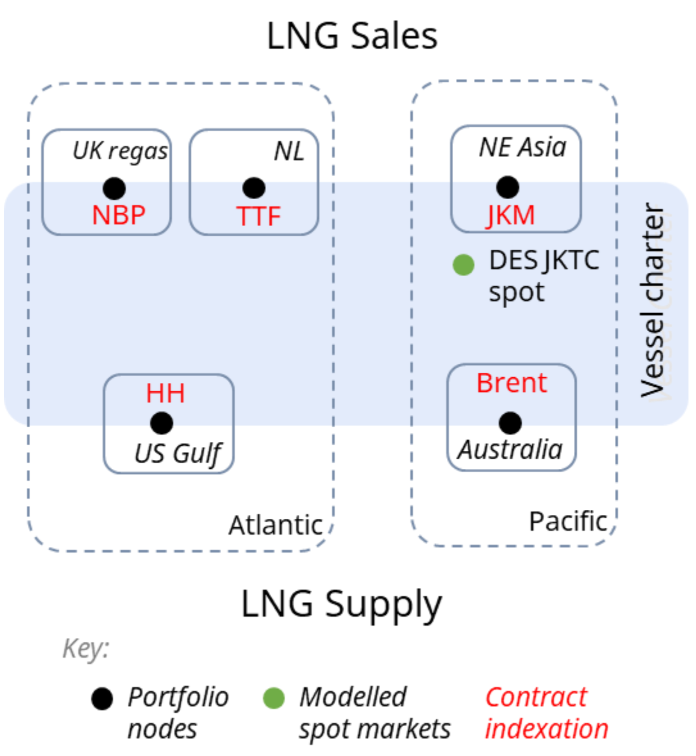
Portfolio summary

- On the right we detail an LNG portfolio with two supply nodes, three sale nodes, spot market access and shipping.
- Across this section we consider 4 case studies to illustrate regime shift impact, one for each of the key activities:
  1. <u>Portfolio construction:</u> value impact of new market regime
  2. <u>Value monetisation:</u> sizing incremental regas positions
  3. <u>Prompt optimisation:</u> reacting to market price signals
  4. <u>Risk management:</u> impact of hedging to reduce risk.

Analytical methodology

- Analysis is done in Timera's **LNG Bridge** portfolio analysis model (used by a broad range of large LNG companies).
- We consider two LNG market price scenarios: 'Old' regime (e.g. 2015-20 conditions) & 'New' regime (current conditions).
- **LNG Bridge** simulates hundreds of correlated price paths consistent with regime dynamics (e.g. volatility/ correlations). The portfolio is then optimised for each simulation across a 5 year horizon to produce value/risk distributions.

Case study portfolio



Volume summary

Node	mtpa
Supply	
US toll	1.3
Australia	0.8
Sales	
NE Asia SPA	1.4
NL SPA	0.6
UK regas	0.6

<u>Shipping:</u> 2 term time charters + access to spot charter market

<u>Portfolio observations</u>

- The portfolio is net long LNG (given ToP levels in sales) and net long flexibility (e.g. from US toll, European regas, SPA flex & shipping)
- Structural basis exposures (buying on Brent & HH, selling on Euro hub & JKM)

1. Portfolio construction

Regime shift sharpens focus on portfolio strategy

- Market transition in 2022 is triggering major strategic reviews across large LNG companies
- Focus areas: new regime impact on portfolio value… growth opportunities & risks … European exposures a big focus.

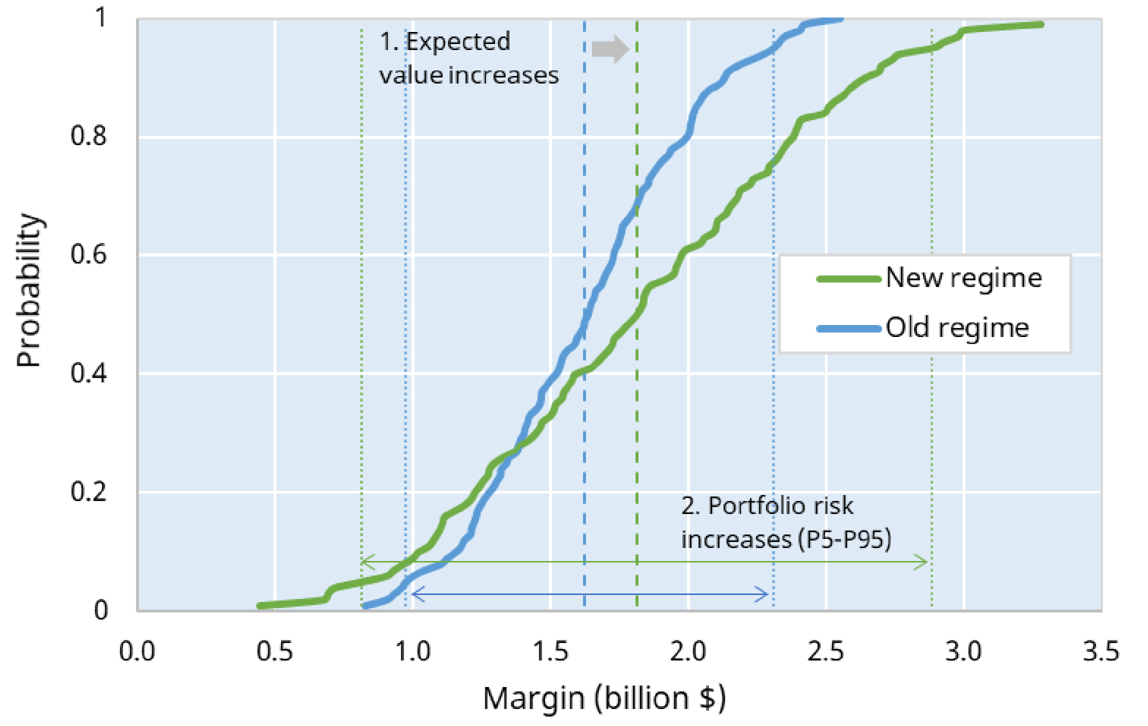
3 key challenges: molecules, capacity & pricing

1. Molecules: sourcing adequate supply
   - triggering a new contracting wave (e.g. backfill Russian volumes with US & Qatari LNG)… structure & valuation of supply flex is key (e.g. basin arbitrage)
2. Capacity: focus on access to regas & shipping
   - EU import constraints driving up regas value… new FSRU capacity coming online… shipping needs changing with shift in structural flow patterns
3. Pricing: transition in pricing & products
   - change in TTF, JKM and Brent relationships… accelerating hub price penetration… growth of derivative & hedging products.

Case study 1: value impact of new market regime

Description: case study portfolio value distributions produced to illustrate impact of Old vs New regime pricing dynamics.

Portfolio value distributions ("S-Curves")



Key takeaways

- Value accretive for portfolios long commodity & flex.
- Substantial increase in risk for most portfolios… sharpens focus on effective portfolio construction (e.g. SPAs, investments, M&A)… rise in flex provision demand / price.

2. Value management

Market driving more active exposure management

- Challenges: high prices & volatility… structural correlation / basis changes … poor market liquidity (collateral & funding constraints).
- Requiring: dynamic management of interdependent portfolio exposures … e.g. DES NWE vs TTF price spread blowout now needs ‘active’ vs ‘passive’ management (given EU regas access constraints).
- Impacts: Structural shift in portfolio value at stake… companies investing in people & analytical capability to bolster value capture.

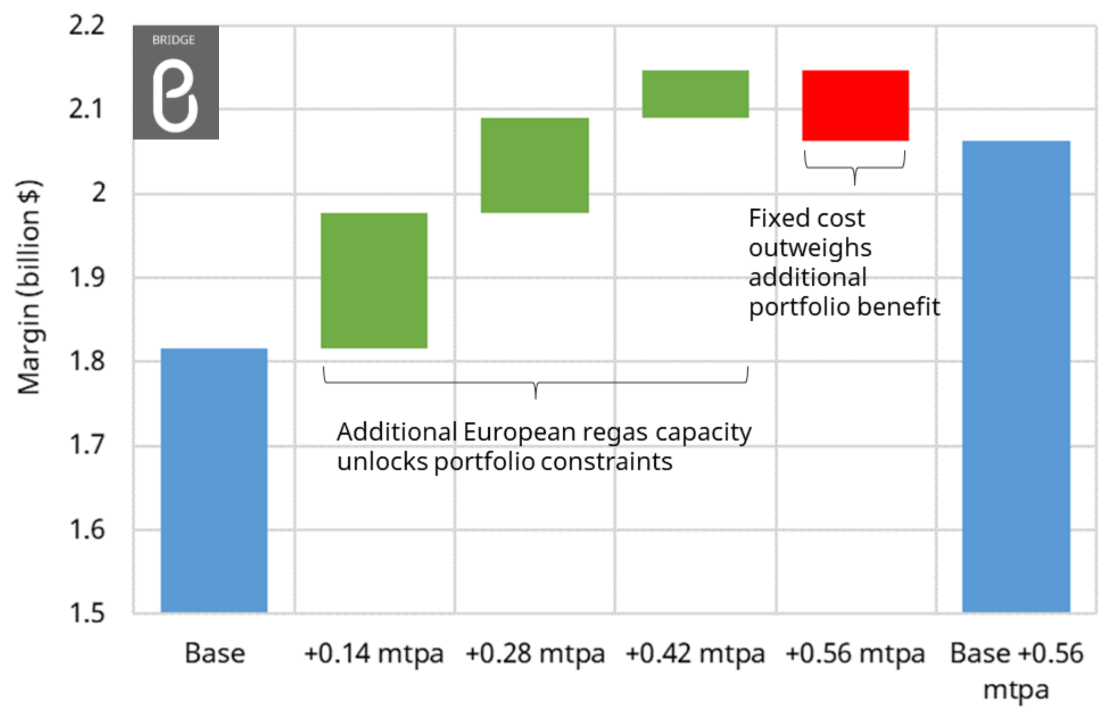
New regime creating opportunities now

- Surge in interest to acquire portfolio flex… e.g. incremental regas capacity (see Case study 2 to right).
- Shifting value of bought & sold contract flex terms (e.g. diversion flex value rising; US cancellation rights falling).
- Growth in ‘liquidity swaps’ and spot cargo deals as companies unwind positions ahead of delivery to reduce exchange margin costs.

Case study 2: sizing incremental regas positions

Description: expected portfolio value waterfall chart used to illustrate impact of adding incremental regas capacity.

Incremental value of adding regas to portfolio



Key takeaways

- European regas capacity unlocks diversion constraints.
- European access needs to be sized to the wider portfolio… given requirement to recover the fixed costs.

3. Prompt optimisation

New regime optimisation challenges

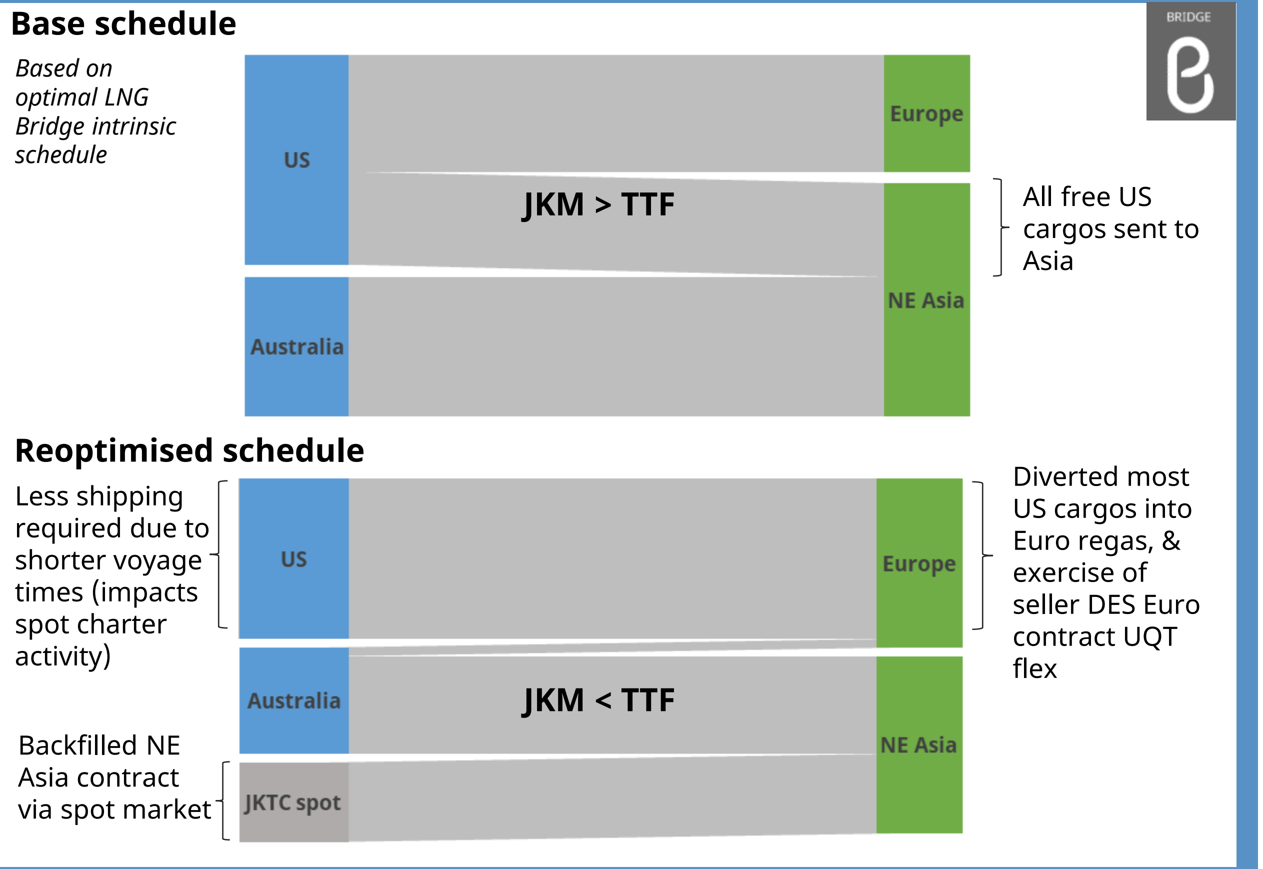
- Challenges: more dynamic flows & pricing (e.g. sharp inversion of the JKM / TTF spread across Q122)… dynamic liquidity, logistics & funding constraints.
- Requiring: greater % of value monetised via dynamic portfolio optimisation and exposure management.
- Impacts: importance of dynamic re-optimisation supports growth in 1. spot cargo liquidity 2. charter liquidity & 3. hedging products.

Identify, prioritise & implement trades

- Identification & prioritisation can be challenging given inherent portfolio complexity, fast markets, poor liquidity.
- Need to define trades that can realistically be actioned (e.g. from dozens that may be identified).
- A single trade may require several changes… issues can substantially reduce delivered value (or cause a loss).
- Significant investment in capability (expertise, tools, systems) and market access required.

Case study 3: reacting to market price signals

Description: re-optimisation of year ahead schedule / flows following a JKM/TTF price inversion.



Key takeaways

- Portfolio reacts to market price signal by diverting cargos to Europe and backfilling sales in Asia from spot.
- Value capture depends on operational capability and flexibility inherent in portfolio contracts.

4. Risk management

Risk management covers measurement and mitigation

- Challenges: large increase in portfolio risk in New regime… driving up risk capital & funding requirements.
- Requiring: dynamic risk measurement of portfolio (vs individual assets)… review of 'at risk' metrics (VaR vs EaR)… assess blindspots e.g. basis risks, sold flex in contracts.
- Impact: focus on appropriate metrics, analytics, limits to mitigate risk… effectively quantifying new regime dynamics.

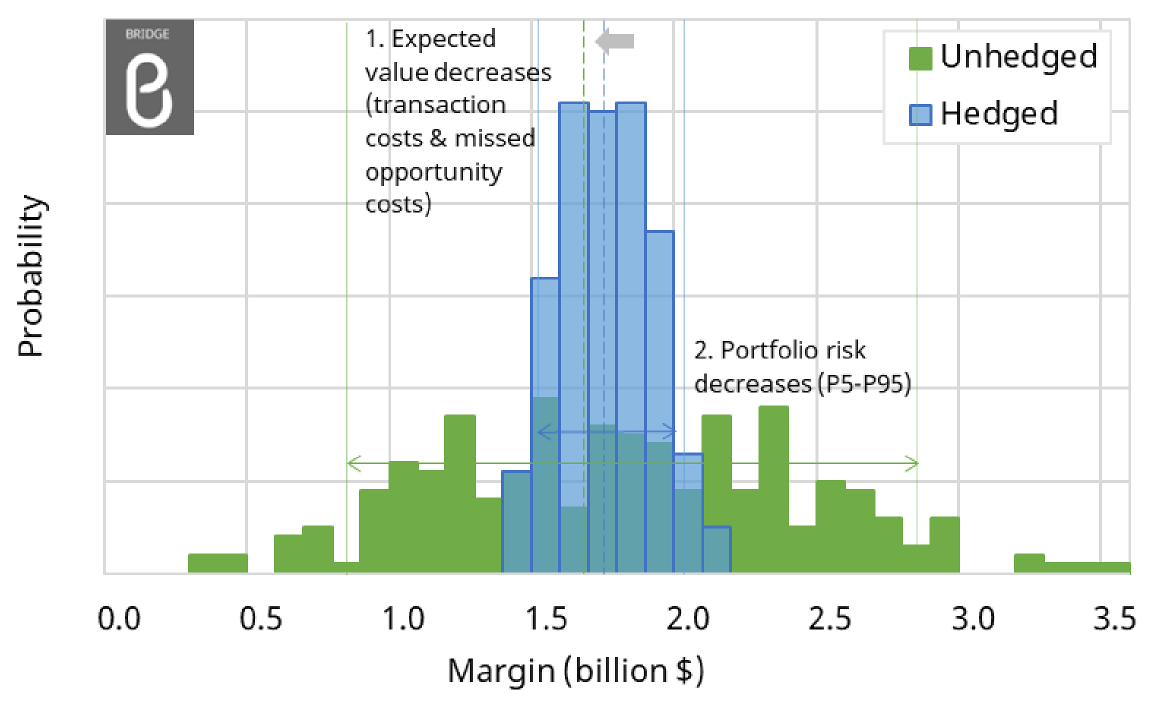
Acute collateral & funding constraints

- Large increases in margin & collateral requirements are impacting funding requirements and ability to transact.
- Old regime - these were secondary issues.
- New regime - constraining ability of LNG portfolios to manage & hedge exposures … with major implications for balance sheet & capital management.
- New products emerging to manage funding issues e.g. liquidity swaps that allow cargo title transfer to banks or hedge funds.

Case study: practicalities of hedging to reduce risk

Description: case study portfolio value distributions used to illustrate impact of hedging on value and risk.

Unhedged vs hedged portfolio value distributions



Key takeaways

- Significantly reduced portfolio risk, slightly lower expected value due to e.g. transaction costs.
- Benefits of hedging (reduced revenue uncertainty, lower capital costs) to be weighed against collateral requirements.

What does Timera do?

About Timera Energy

Specialist energy consultancy

Focus on LNG, gas & power markets

Extensive industry expertise

Practical knowledge from senior industry roles

Pragmatic commercial focus

Covering investment, value monetisation & market analysis

Strong client base

Leading energy companies (e.g. producers, utilities, traders, funds)

Leading industry blog

20,000+ regular readers, publications, conferences

Timera clients include

Timera LNG team members

Our team members have extensive senior industry experience and practical commercial knowledge.

Olly Spinks: Managing Director

20+ years energy industry experience
Expert in flexible gas & LNG asset valuation
Ran BP's gas, LNG & power commercial analytics function

David Stokes: Managing Director

20+ years energy/commodity market experience
Expert in investment/monetization of flex gas assets
Industry roles with Origin, Williams, JP Morgan

David Duncan: Director of LNG & Gas

4 years energy industry experience with RWE Trading
LNG trading & portfolio optimisation experience
Analysis coverage across LNG, gas, coal & power markets

Rosie Read: Director

10 years industry energy industry experience
Optimisation and commercial analysis expert
Analysis, strategy & power trading industry background

Jon Brown: Director of Analytics

9 years industry experience in energy & financial markets
Energy market quantitative analysis expert
Industry experience across commercial and market analysis

Nick Perry: Senior Advisor

30+ years industry experience (Enron, Exxon, Amoco)
Expert in commercial & risk management strategy
Board level experience (Enron Europe, Teesside Power)

What does Timera do?

1. We provide expert consulting advice

1A. Commercial & market analysis

- LNG asset investment & portfolio construction
- Valuation of LNG assets/contracts
- Portfolio hedging & optimisation strategies
- LNG price modelling & fundamental market analysis
- M&A and transaction support

1B. Risk management

- LNG portfolio exposure deconstruction
- Valuation curves; MtM of complex/illiquid exposures
- Risk measurement (e.g. EaR, VaR, credit)
- Limit structures

2. We deliver analytical capability

2A. LNG portfolio model: *'LNG Bridge'*

We deliver a configurable & modular stochastic simulation based portfolio valuation model (details on p 22 - 24):

- Values portfolio flexibility (e.g. 3 mths – 20 yrs)
- Enables intrinsic & extrinsic analysis of investment options, hedging & contracting strategies

2B. LNG portfolio analysis solutions

We support clients to develop in-house solutions, via e.g. delivering:

- Valuation/optimisation component modules
- Requirements definition
- Design & methodology definition
- Implementation support

Recent client work

The following table summarises some of our recent work with LNG clients, both implementing & using the LNG Bridge model.

Project	Client	Project
1. LNG Bridge model	Multiple clients	Implementation & configuration of LNG Bridge as in-house portfolio modelling solution for multiple large LNG portfolios to support contract valuation, investment decisions, portfolio optimisation & hedging
2. Portfolio growth options	Oil major	Analysis of portfolio value/risk impact of new production, sales & regas capacity to support growth
3. Regas valuation	LNG player	Valuation of regas capacity & send-out optimisation value at key NWE terminal
4. Contract renegotiation	LNG trader	Advice/analysis on restructuring of pricing & volume flex in LT LNG supply contract
5. Centrica LNG portfolio	LNG player	Using LNG Bridge model to value individual assets & total portfolio value to support bid
6. Orsted LNG portfolio	LNG trader	Valuation of European supply contracts & regas capacity with LNG Bridge
7. LNG optimisation	Producer	Developed a near term portfolio optimisation model for major LNG portfolio player
8. LNG portfolio strategy	Utility	Developed LNG portfolio construction & growth strategy with European utility
9. LNG hedging tool	Producer	Built an LNG contract valuation tool for analysing / pricing diversion flex value
10. LNG market analysis	Fund	Analysis of evolution of LNG market & interaction with European hubs

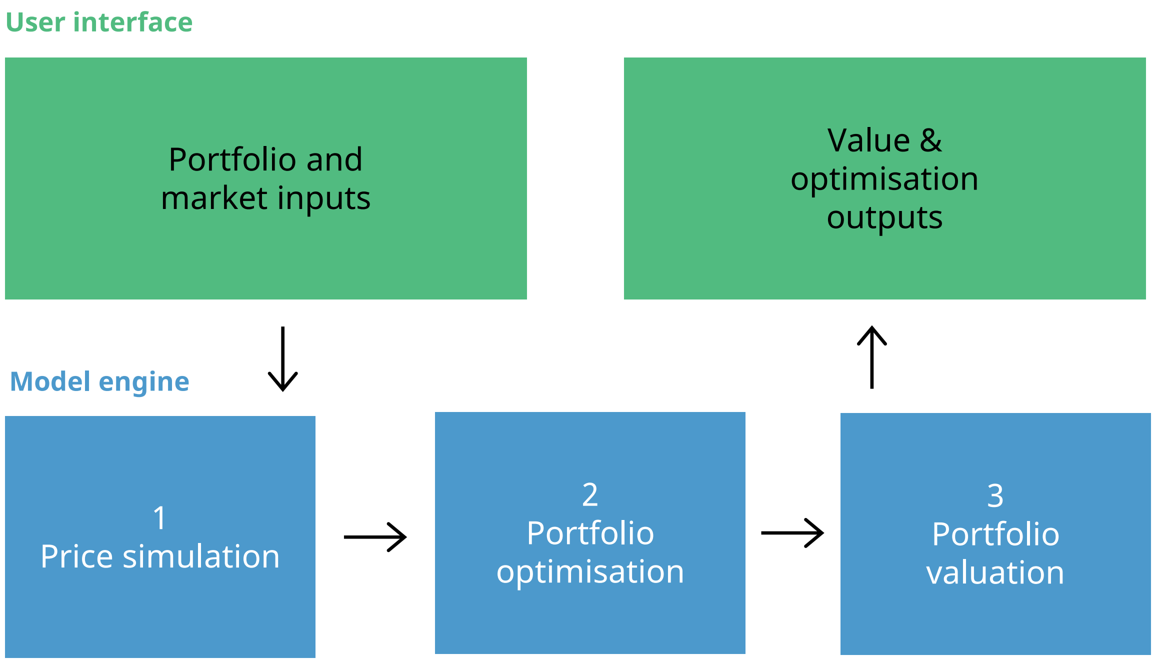
LNG Bridge introduction

- The construction & optimisation of LNG portfolios drives value creation.
- An effective portfolio model is the analytical ‘engine room’ behind portfolio value creation.
- LNG Bridge empowers portfolio analysis that supports effective decision making and creates a competitive edge.

What is LNG Bridge?

- LNG Bridge is an LNG portfolio analysis model.
- It allows companies to quantify & manage the interdependent value of LNG assets within a portfolio.
- LNG Bridge is underpinned by a sophisticated price simulation & portfolio optimisation engine.
- It uses a 3 step process to optimise & quantify value against simulated market prices (see diagram).

LNG BRIDGE MODEL COMPONENTS



Who uses LNG Bridge?

- LNG Bridge has quickly evolved into an industry leading solution, employed across a broad range of LNG portfolios.
- LNG Bridge is developed & supported by extensive LNG commercial experience within our team.

Who uses LNG Bridge?

Our client base is growing rapidly and includes:

- Oil & gas majors
- Large producers
- Utilities
- Commodity traders

Work with clients is underpinned by our first hand commercial expertise of LNG portfolios & markets.

HOW OUR CLIENTS ARE USING LNG BRIDGE

OIL MAJOR

Implementation as global portfolio valuation modelling solution to support value growth.

PORTFOLIO PLAYER

Commercial & risk team implementation to analyse value & risk of existing LNG portfolio & new deals.

PRODUCER

Implementation as global portfolio solution e.g. to analyse spot vs SPA sales strategy & sizing of vessel capacity.

UTILITY

Used to support valuation of large LNG portfolio to support binding bid.

LNG Bridge dashboard

- The Bridge dashboard provides a transparent summary of analysis of portfolio components, optimised flows & margin capture.

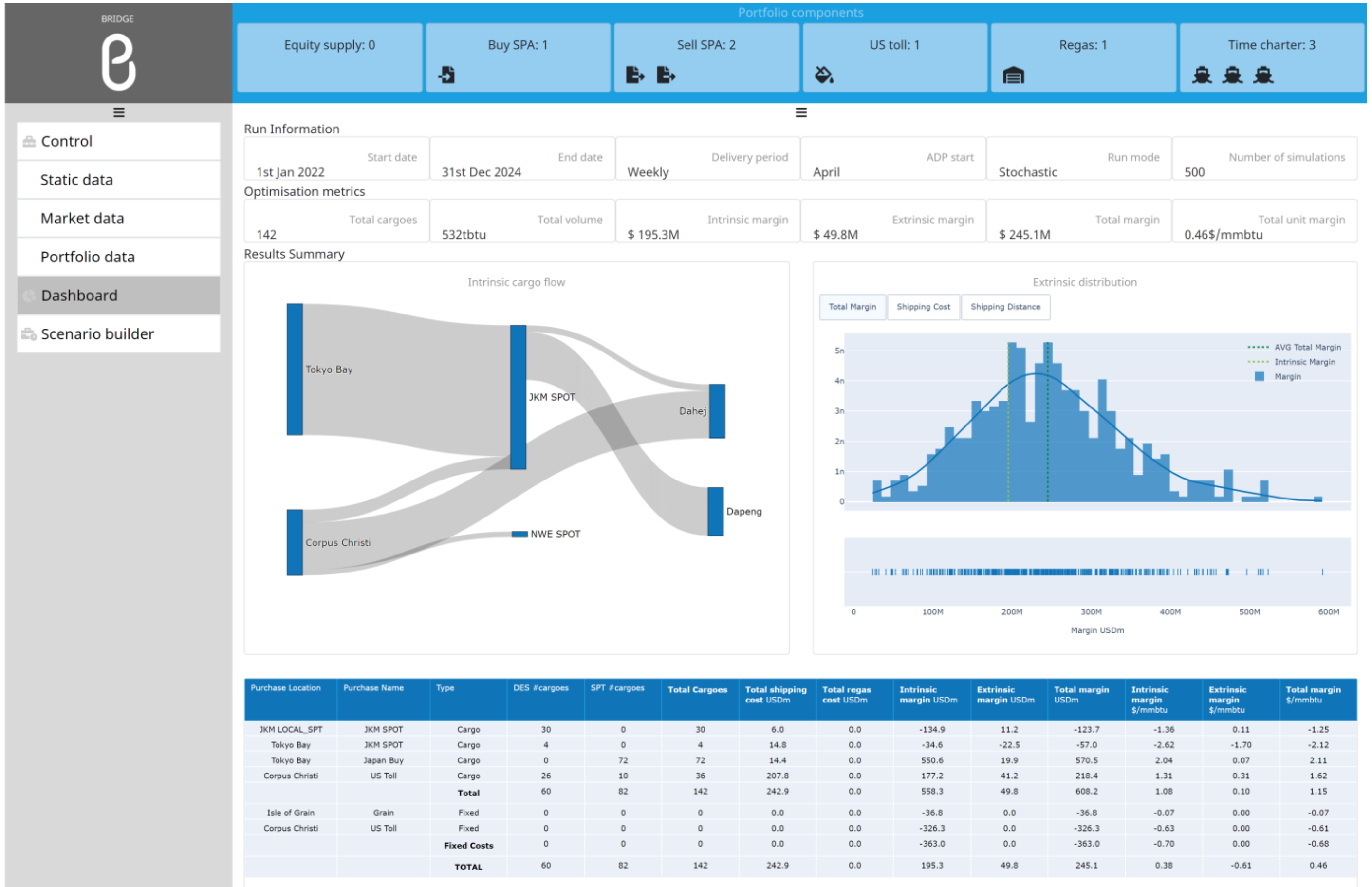
What does LNG Bridge deliver?

- Realistic modelling of LNG market prices
- Individual asset & integrated portfolio value
- Optimised cargo flows & vessel utilisation
- Intrinsic & extrinsic valuations of flexibility
- Expected value & risk distributions / metrics

Some examples of analysis

- Value of deal cancellation or diversion rights
- Portfolio impact of an incremental SPA
- Benefits of adding regas to portfolio
- Balancing portfolio oil vs hub index exposures
- Defining shipping capacity requirements

LNG Bridge User Interface dashboard view



Purchase Location	Purchase Name	Type	DES #cargoes	SPT #cargoes	Total Cargoes	Total shipping cost USDm	Total regas cost USDm	Intrinsic margin USDm	Extrinsic margin USDm	Total margin USDm	Intrinsic margin $/mmbtu	Extrinsic margin $/mmbtu	Total margin $/mmbtu
JKM LOCAL_SPT	JKM SPOT	Cargo	30	0	30	6.0	0.0	-134.9	11.2	-123.7	-1.36	0.11	-1.25
Tokyo Bay	JKM SPOT	Cargo	4	0	4	14.8	0.0	-34.6	-22.5	-57.0	-2.62	-1.70	-2.12
Tokyo Bay	Japan Buy	Cargo	0	72	72	14.4	0.0	550.6	19.9	570.5	2.04	0.07	2.11
Corpus Christi	US Toll	Cargo	26	10	36	207.8	0.0	177.2	41.2	218.4	1.31	0.31	1.62
		Total	60	82	142	242.9	0.0	558.3	49.8	608.2	1.08	0.10	1.15
Isle of Grain	Grain	Fixed	0	0	0	0.0	0.0	-36.8	0.0	-36.8	-0.07	0.00	-0.07
Corpus Christi	US Toll	Fixed	0	0	0	0.0	0.0	-326.3	0.0	-326.3	-0.63	0.00	-0.61
		Fixed Costs	0	0	0	0.0	0.0	-363.0	0.0	-363.0	-0.70	0.00	-0.68
		TOTAL	60	82	142	242.9	0.0	195.3	49.8	245.1	0.38	-0.61	0.46

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