

Steering From The Bridge

LNG portfolio analysis

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Timera Energy offers expertise on value & risk in energy markets

Specialist energy consultancy

Focus on LNG and European gas & power assets

Extensive industry expertise

Practical knowledge from senior industry roles

Pragmatic commercial focus

Investment, value monetisation & market analysis

Strong client base

leading energy companies (producers, utilities, funds)

Leading industry blog

15,000+ regular readers, publications, conferences

Our clients include



Our LNG team members

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

May Mannes: Managing Director

*30 years gas industry experience (Statoil, Eclipse, Platts)
Expert in LNG market analysis and modelling
Senior commercial LNG & gas market background*

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*

Jessica Gervais: Director

*10 years commercial & analytical energy market experience
Strong gas market analysis & modelling expertise
Gas trading & commercial analytics industry background*

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*

Howard Rogers: Senior Advisor

*30+ years gas industry experience (BP, OIES)
Expert in fundamental analysis of gas markets
Chairman of Gas Research Programme at OIES*

Rosie Read: Director

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

Relevant recent credentials

Project	Client	Project
1. LNG portfolio model	Multiple clients	Designed, developed & implemented LNG portfolio valuation model to analyse impact of investment options, contracting & hedging decisions
2. LNG optimisation model	Producer	Developed a near term portfolio optimisation model for major LNG portfolio player
3. Supply & regas valuation	LNG trader	Valuation of European supply contracts & regas to support portfolio acquisition
4. LNG hedging tool	Producer	Built an LNG contract valuation tool for analysing / pricing diversion flex value
5. LNG supply contract flex	Oil major	Advice on valuation/restructuring of long term European LNG supply contract
6. NWE regas value	Multiple clients	Analysis of evolution of NW European regas capacity value
7. LNG risk management	LNG trader	LNG risk management methodology advice (e.g. curves building, EaR methods)
8. LNG business model	Producer	Development of framework to assess options for evolution of business model
9. LNG market analysis	Fund	Analysis of evolution of LNG market & interaction with European hubs
10. Regas monetisation	Utility	Advising terminal operator on maximising value from regas capacity sales strategy

What we do

1. We deliver analytical capability

1A. LNG portfolio model: 'LNG Bridge'

We can deliver a configurable & modular stochastic simulation based portfolio valuation model:

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

1B. LNG portfolio analysis solutions

We support clients to develop in-house or 3rd party solutions, via e.g. delivering:

- Valuation/optimisation component modules (from A.)
- Requirements definition
- Design & methodology definition
- Implementation support

2. We provide consulting advice using this capability

2A. Commercial & market analysis

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

2B. Risk management

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

**Model can also be used to value & monetise portfolio components e.g. indexation & flexibility in existing or new supply contracts, shipping, regas & upstream projects.*

The LNG portfolio analysis challenge

How does portfolio analysis create value?

Portfolio construction challenges

1. Does adding regasification capacity to our portfolio add value? How do we quantify?
2. How do we quantify the value of contract flex?
3. How does a new LNG sale/purchase contract interact with our existing portfolio?
4. Does adding shipping capacity create value?

Portfolio monetisation challenges

1. What is the optimal combination of LT contracts & spot sales given an uncertain market outlook?
2. How do we monetise portfolio flexibility value?
3. Quantify the value impact of a hedging strategy?
4. What is the value/risk impact of different contract indexation e.g. Brent vs JKM vs TTF?

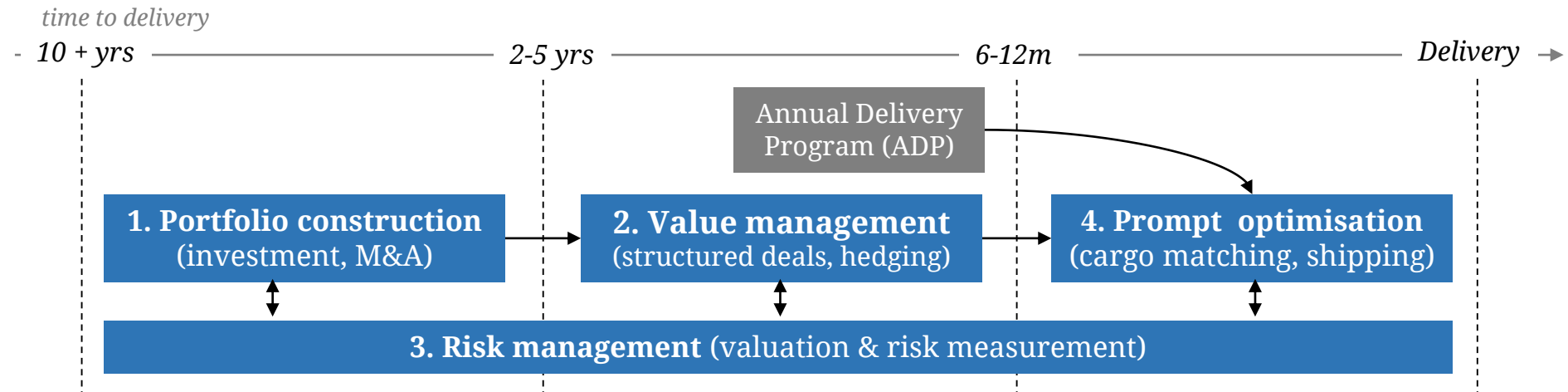
Core elements of an analytical solution

To analyse all questions adequately requires ability to:

1. Model market price uncertainty
2. Optimise portfolio given price changes
3. Monetise portfolio value

Choosing the right weapon

- There analytical challenges that commercial LNG teams face can be grouped into 4 key areas.
- 1. to 3. require a portfolio valuation model. 4. requires a more detailed & granular optimisation tool to capture logistics.



Challenge	Focus	Example
1. Portfolio construction	Asset investment, LTCs & M&A	Unlock/create incremental portfolio value via new assets/LTCs or M&A
2. Value management	Hedging & structured deals	Manage portfolio value/exposures via hedging, structuring & ST/MT deals
3. Risk management	Identify, measure & limit risk	Mark to market exposures & effectively measure & limit portfolio risk
4. Prompt optimisation	Short term physical logistics	Create/manage ADP given shipping/contract constraints & market moves

Defining a portfolio modelling solution

Creating & analysing LNG portfolio value

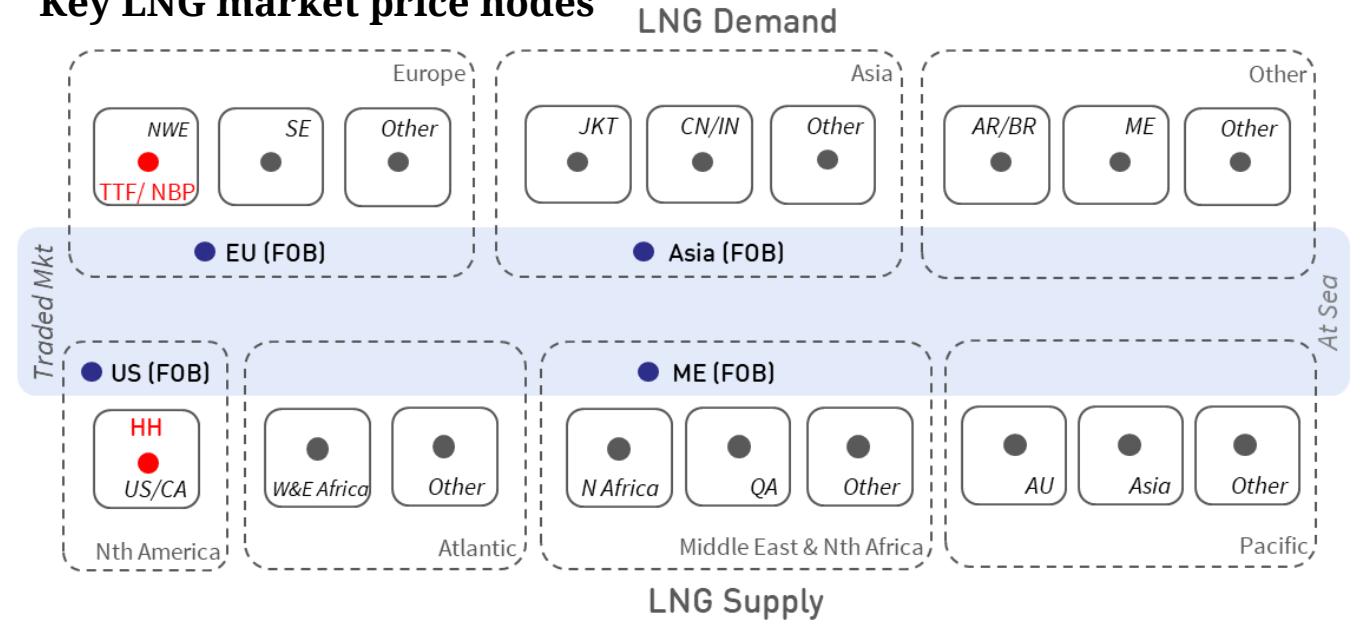
How is value created?

- Value created via interaction between:
 1. Constraints in the LNG supply chain
 2. Changes in market dynamics
- Value captured via constructing & optimising an appropriate combination of portfolio components & optionality

Analytical breakdown

- LNG portfolios can be simplified using price 'nodes' and asset 'exposures'
- Prices act on exposures to drive value
- So an analytical representation is required of:
 - (1) portfolio exposures (e.g. commodity positions, asset flex & constraints)
 - (2) price dynamics (price level, spreads, correlations, volatility)

Key LNG market price nodes



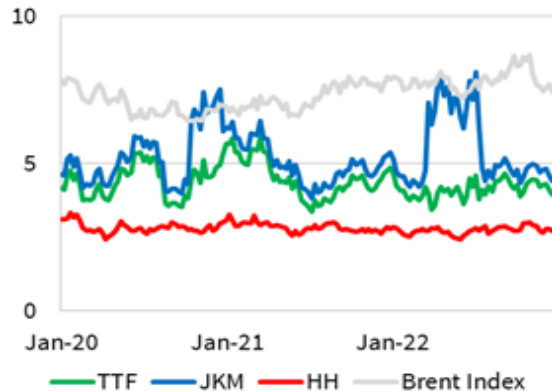
Categories of LNG price exposures

Exposure	Examples
Linear price	- cargos, futures / swaps (TTF, JKM, Brent) - shipping capacity
Linear spread	- locational price spreads (e.g. HH vs TTF vs JKM) - time spreads (e.g. Sum vs Win)
Non-linear commodity	- LNG supply obligations e.g. seller / buyer volume flex rights - embedded options e.g. calls/puts on TTF/JKM/Brent
Non-linear spread	- locational spread options e.g. diversion optionality - time spread options e.g. bankability flex or storage

LNG portfolio modelling: 3 key components

Timera has developed a Monte-Carlo simulation based modelling framework which simulates hundreds of realistic price paths and then analyses how the portfolio responds to changing market prices. The framework has 3 core components.

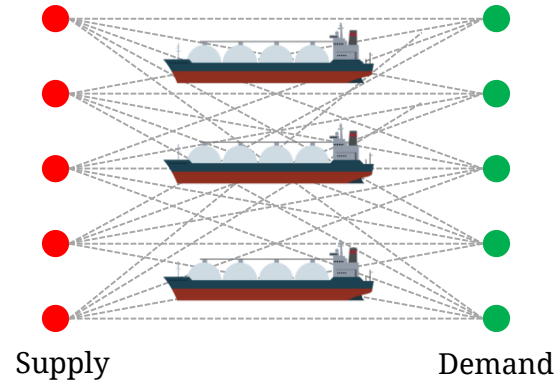
1. Market price behaviour



Key features

- Realistic modelling of prices impacting LNG portfolio value
- Focus on barometers of supply chain stress: price spreads, volatility & correlations

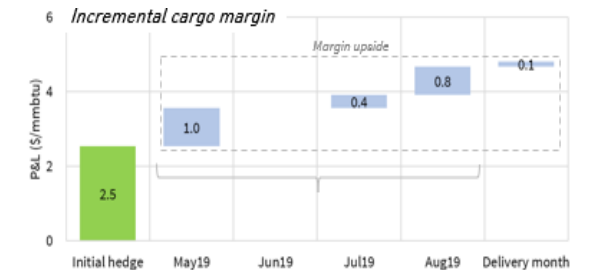
2. Core portfolio optimisation



Key features

- Topology (“nodes & webs”) & rigorous deconstruction of portfolio exposures & flexibility
- Core optimisation problem solved via sophisticated but transparent mathematical techniques

3. Value monetisation



Action:	Initial hedge	Unwind /rehedge	None	Unwind /rehedge	Unwind /rehedge	Unwind /sell spot
Delivery:	NBP	JKM	JKM	NBP	JKM	NBP

Key features

- Overlay of how hedging & optimisation strategies impact value capture & risk
- Key focus on portfolio exposure linkages & market illiquidity

1. Market price behaviour

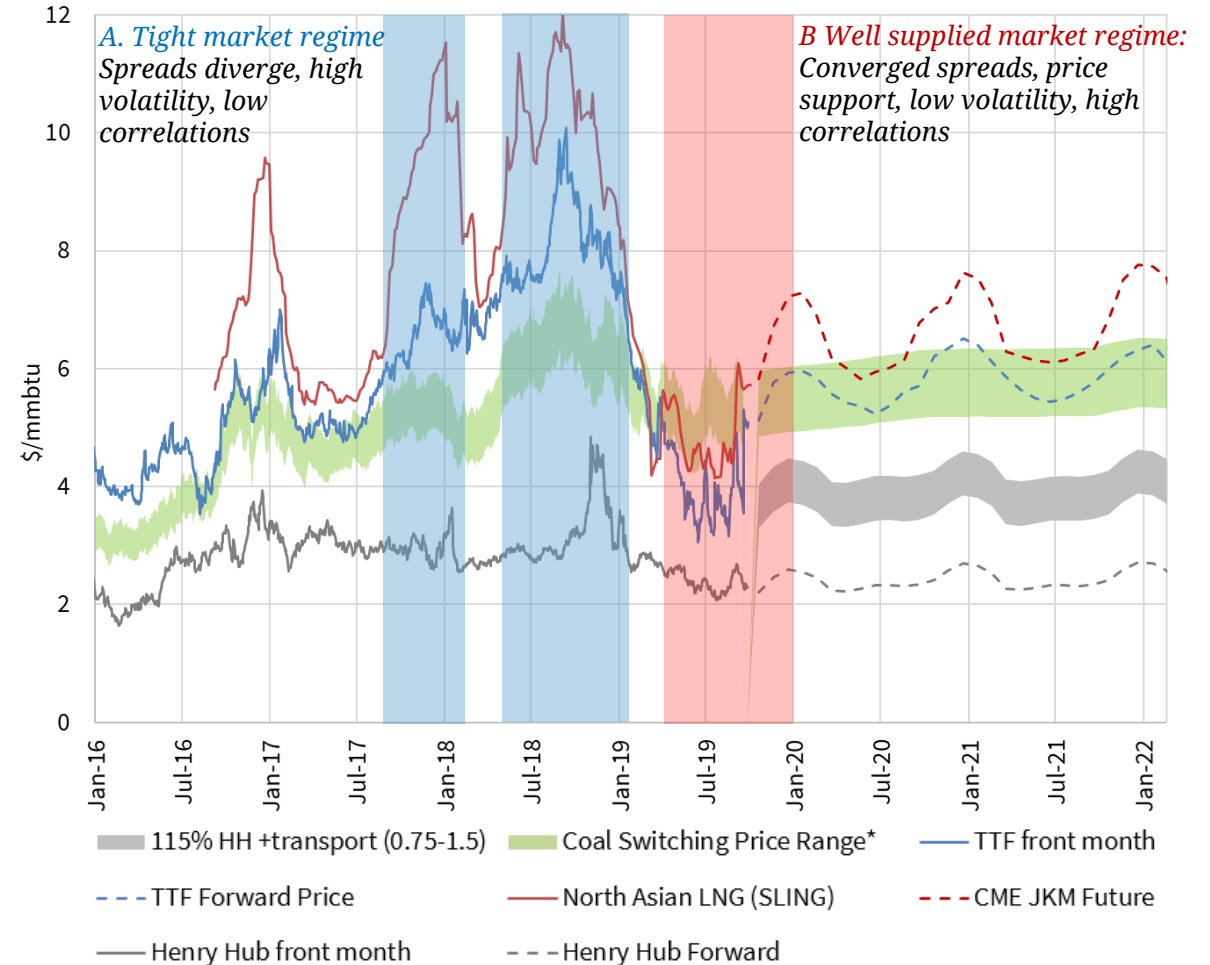
Unique LNG pricing dynamics

- LNG portfolio flex value is driven by LNG price spreads, volatility & correlations
- Timera combines LNG/gas/power market fundamentals with stochastic pricing models to capture a unique 'regime' based analysis of LNG price dynamics:
 - A. 'Tight' versus B. 'Well Supplied' regimes (see chart)
 - Market periodically transitions between regimes

Capturing price dynamics in a model

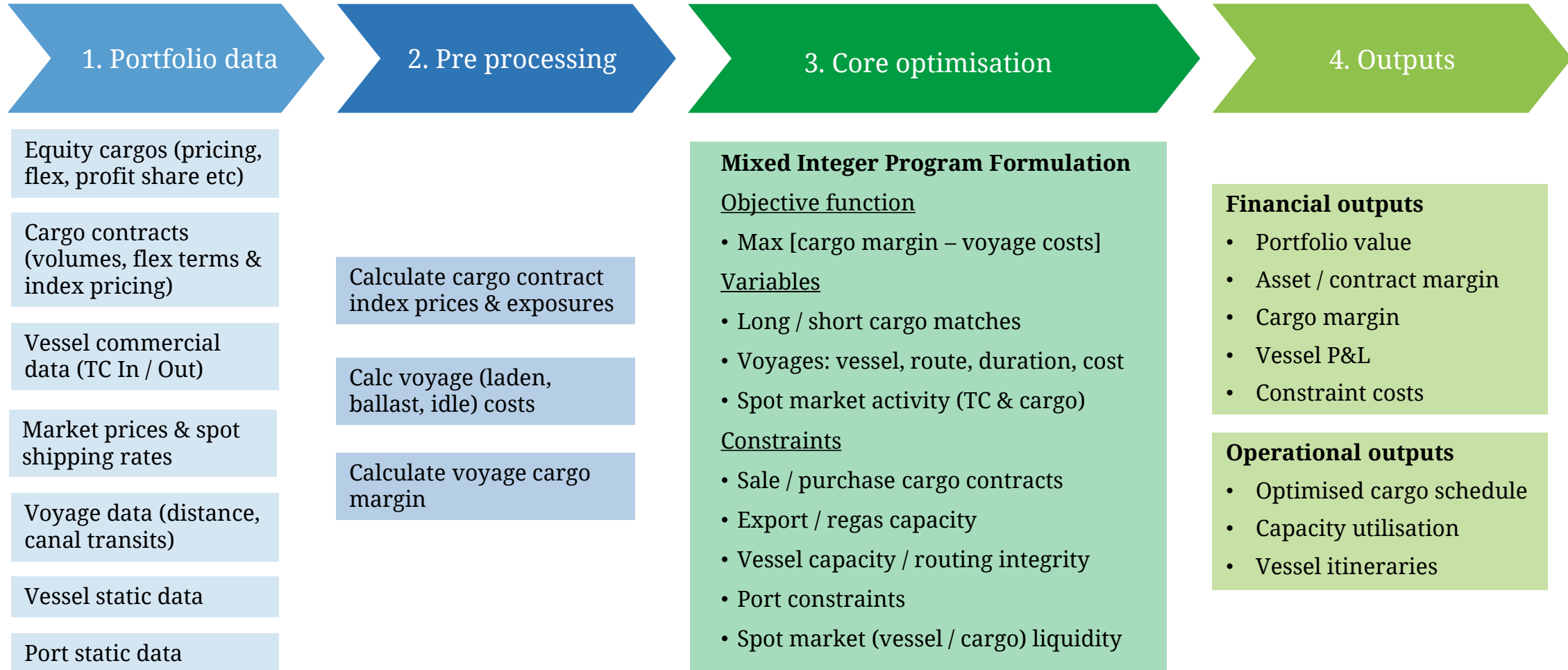
- Valuation models using classic commodity pricing models significantly misrepresents LNG flex value as they do not capture unique LNG price dynamics
- Simulation of market prices forms a core part of the overall Monte-Carlo framework
- For each price simulation the model automatically represents the portfolio optimisation and re-hedging actions that result from changing market prices

Influence on market regime on LNG market prices



2. Core portfolio optimisation

The 4 step process we use for core portfolio optimisation in our LNG modelling framework is summarised below:



3. Value monetisation

Two key ways portfolio value is monetised

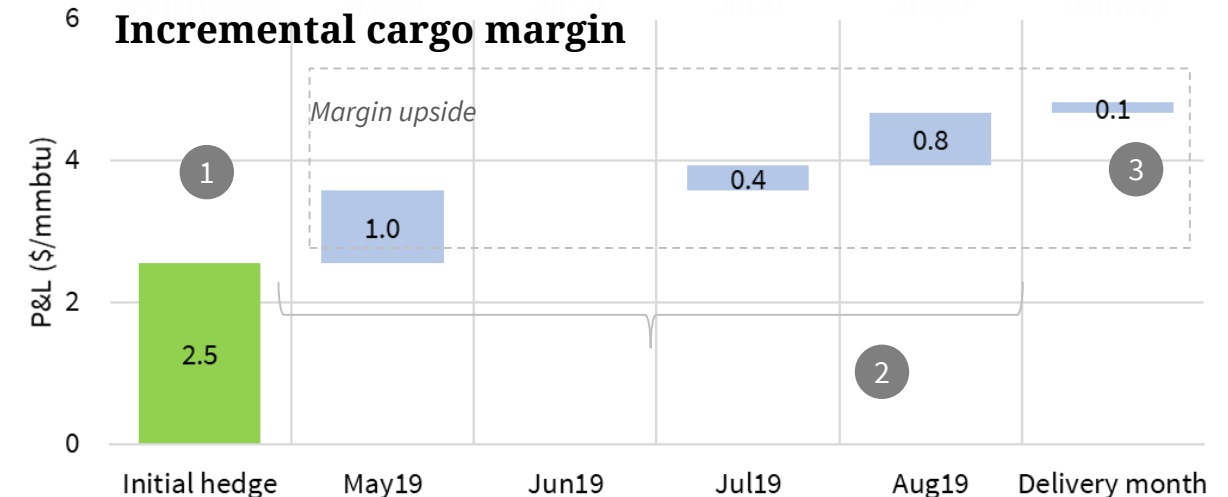
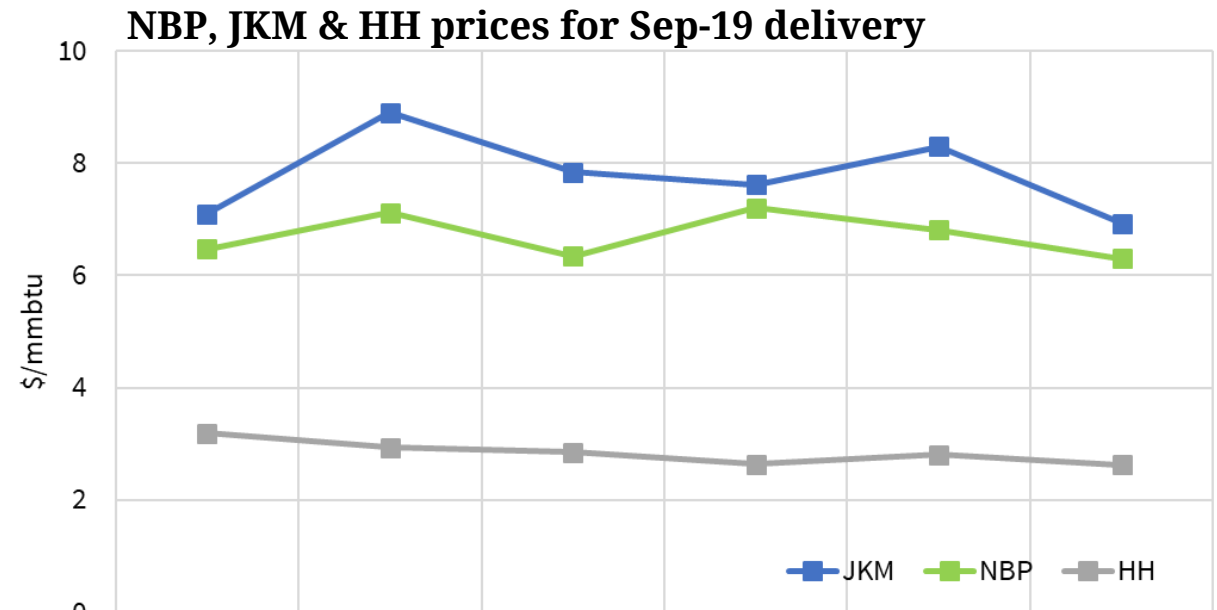
1. Cargo optimisation
 2. Hedging strategy
- Case study below focuses on ‘rolling intrinsic’ forward hedging strategy (most common deployed)
 - But portfolio model analysis is just as relevant for a portfolio where no hedging is undertaken

Forward hedging example

One US Gulf Coast cargo in Sep-19 with optionality to deliver to Europe or Asia (JKM)

- 1 *Initial NBP hedge, with intended cargo delivery to UK (locking in minimum margin).*
- 2 *Multiple opportunities to add value by unwinding existing NBP hedge & re-hedging at JKM.*
Only execute unwinds when profitable to do so (i.e. lock in upside from initial hedge).*
- 3 *Cargo delivery based on final hedge.*

**Based on incremental value to new market, changes in shipping costs & cost of unwinding existing hedge.*



Action:	Initial hedge	Unwind / rehedge	None	Unwind / rehedge	Unwind / rehedge	Unwind / sell spot
Delivery:	NBP	JKM	JKM	NBP	JKM	NBP

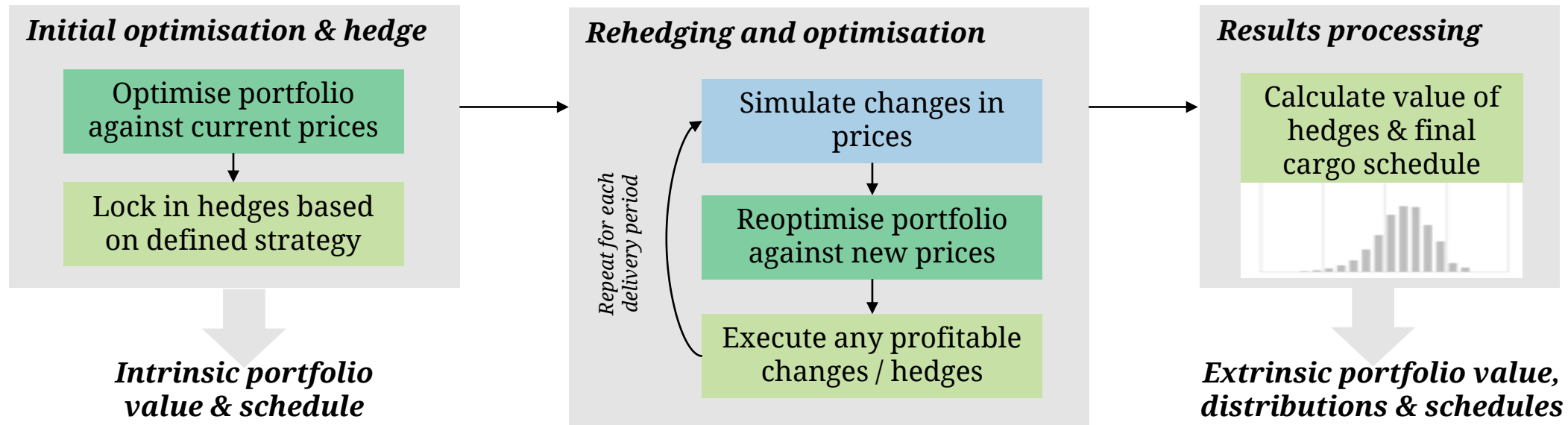
Putting the 3 pieces together

1. Market price behaviour

2. Core portfolio optimisation

3. Value monetisation

- Our 'LNG Bridge' portfolio valuation model is built around a sophisticated but transparent Monte-Carlo price simulation engine*
- The model simulates 500+ individual price paths capturing the unique 'regime' based pricing dynamics in the LNG market
- For each price simulation, the model optimises & rehedges the portfolio in response to market price changes (steps shown below)
- The model then provides a portfolio value distribution (intrinsic & extrinsic), hedge value, risk metrics and a final cargo schedule

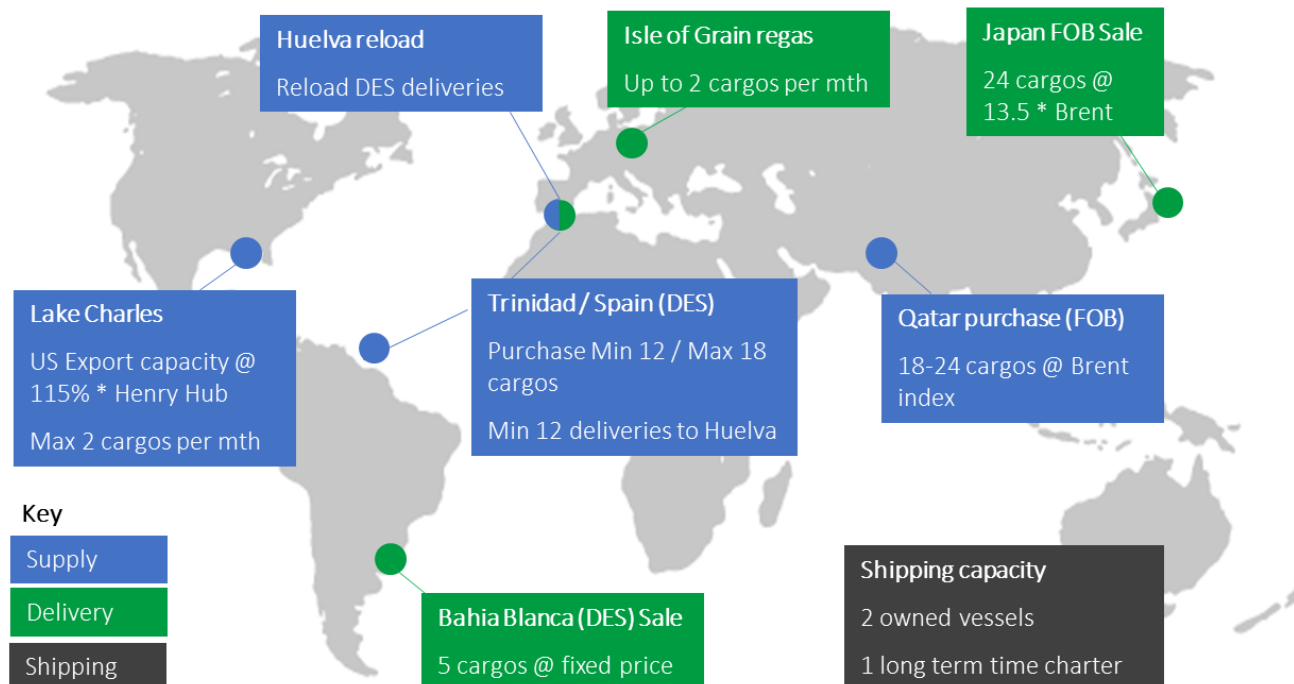


* Core analytical logic built in Python using optimisation libraries (e.g. PuLP / COIN-OR), UI / front end built in Javascript & static, transaction data & results stored in a database.

Portfolio value case studies: Intrinsic scenario 1

The following case study illustrates the benefits of a portfolio valuation framework. A case study 'base portfolio' is defined in the left hand diagram. We optimise the value of this base portfolio and then consider the incremental value impact of 3 scenarios.

Base portfolio components



Optimised base portfolio value

	Cargo (\$m)	Shipping Cost (\$M)	Margin (\$m)
Intrinsic value	278	-69	209

Analyse Scenario 1: Short term vessel time charter @ \$60kpd

	Cargo (\$m)	Shipping Cost (\$m)	Margin (\$m)
Intrinsic value	302	-75	247
Base Δ	+24	-6	+18

Result: Extra shipping length allows more US exports to be delivered to UK. Value increase approx. twice charter cost.

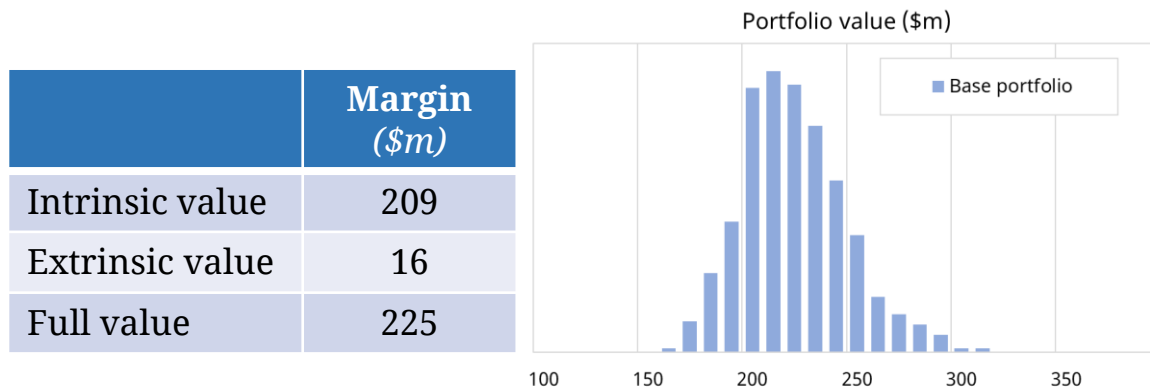
Portfolio value case studies: Extrinsic scenarios 2 & 3

Extrinsic value analysis is required in order to gain a competitive edge in creating portfolio value.

Our model uses a Monte-Carlo simulation framework to enable portfolio value distribution analysis. This captures market price uncertainty & supports extrinsic valuation*.

We look at the incremental value impact of Scenarios 2 & 3 versus the base portfolio value from the previous slide.

Full base portfolio value (& distribution)

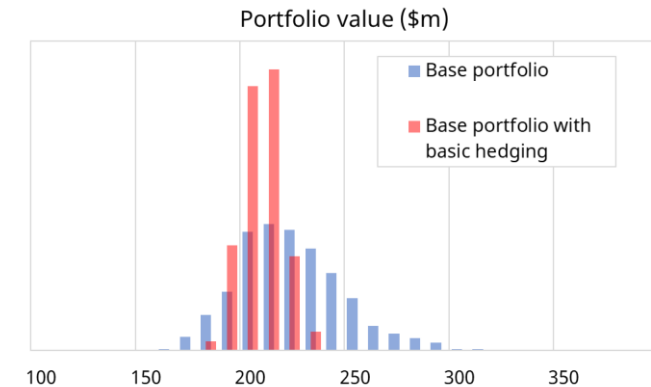


**This is irrespective of whether portfolio owner hedges forward or just optimises vs spot prices.*

Analyse Scenario 2: Apply a 'rolling intrinsic' portfolio hedging strategy

	Margin (\$m)	Risk
Full value	210 ↓	↓

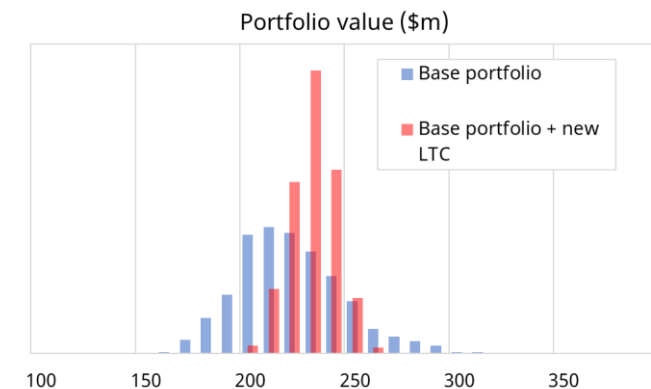
Result: Hedging significantly reduces risk, but also reduces value via transaction costs (churn cost from hedging).



Analyse Scenario 3: Add a new premium Asian LT contract

	Margin (\$m)	Risk
Full value	239 ↑	↓

Result: Value from premium sale offsets lost value from reduced portfolio flex. Portfolio risk falls as well.



Putting portfolio analysis to work

How can we can help?

Deliver analytical capability

1. Deliver a configurable LNG portfolio modelling solution (*LNG Bridge*)
2. Deliver modular solution components e.g. pricing engine, regas value, diversion flex, indexation
3. Support your solution design, methodology and 3rd party selection

Provide consulting services

1. Use our model to work with you on LNG portfolio construction & asset investment
2. Support development of portfolio monetisation & hedging strategies (e.g. quantify impact)
3. Support risk management e.g. exposure deconstruction, MtM, risk measurement, limits

Contact Us

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