Gas storage value recovery

Market drivers & commercial implications

Client briefing pack Sep 2019

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Contents

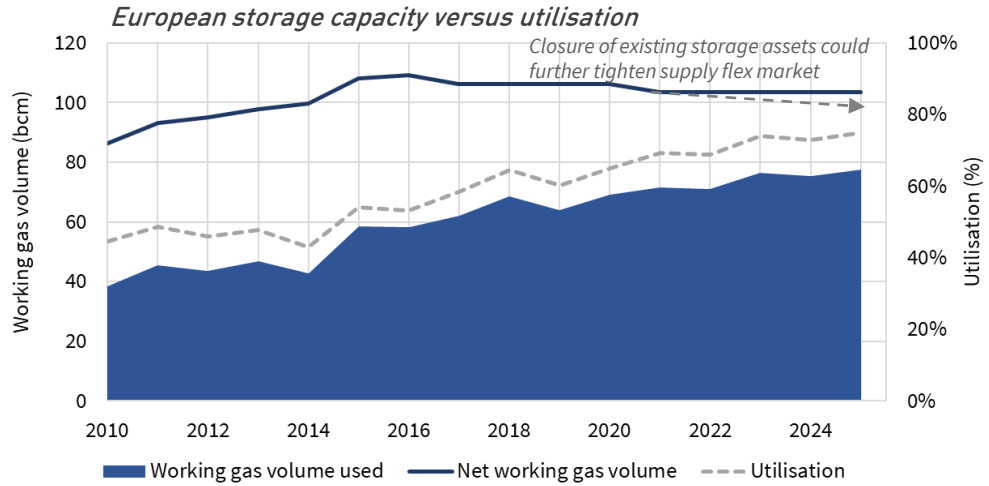
Section	Contents	
5 key takeaways	Executive Summary	3
Tightening flex balance	3 key drivers	4
Storage value recovery	Price signals	5
	Storage margin recovery	6
Storage value capture	5 key trends impacting value capture	7
	Asset economics	8
	5 ways to boost storage asset value	9
Decarbonisation	Decarbonisation pathways & impact on storage	10
What we do	Timera's storage services & credentials	11

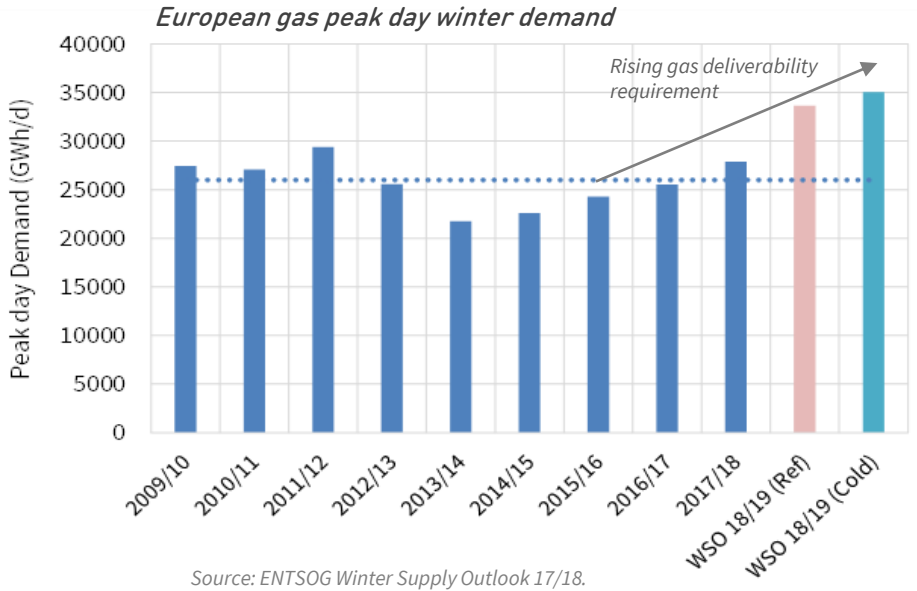
Gas storage value:
5 key takeaways

Takeaway	Description
1. Flexibility balance is tightening	Structural drivers are tightening the European gas flexibility balance: (1) rising import dependency (2) power sector transition (3) ageing infrastructure.
2. Gas storage margin recovering	Price volatility & seasonal spreads are recovering… and so is storage margin capture (see analysis that follows).
3. Storage value capture is evolving	Value recovery is coinciding with the roll-off of LT contracts & an increased focus on short term trading … this is changing the way storage owners capture value.
4. Owners evolving with market	In response to these trends, owners are more dynamically assessing asset economics and ways to boost value capture.
5. Decarbonisation is on the radar	Rapid decarbonisation of power markets is underway. Gas will follow. A framework to analyse & quantify the impact on asset value is important.

3 drivers of a tightening flexibility balance

1. **Rising import dependency**
   i. Structural decline in domestic gas production
   ii. Increasing dependence on longer & less flexible supply chains (e.g. LNG, Russia)
   iii. European hubs providing swing flex to global LNG market
2. **Power sector transition**
   i. Increasing intermittency (backed by gas flex)
   ii. Closure of nukes/coal → rising gas plant load factors & swing flex requirement
3. **Ageing infrastructure**
   i. Investment hiatus in new gas supply flex (2012-19)
   ii. Limited spend on maintenance capex





Source: ENTSOG Winter Supply Outlook 17/18.
Reference winter based on 1 in 2 yr climatic conditions.

Source: Timera Energy

Price signals reflect tightening balance

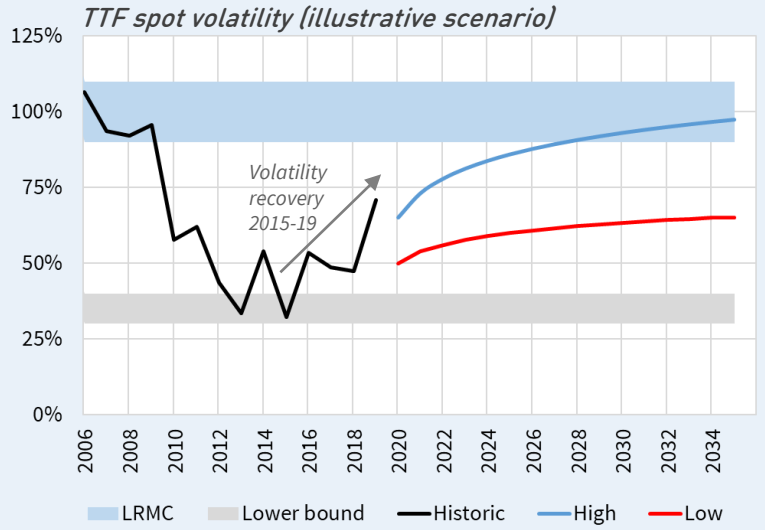
Price volatility

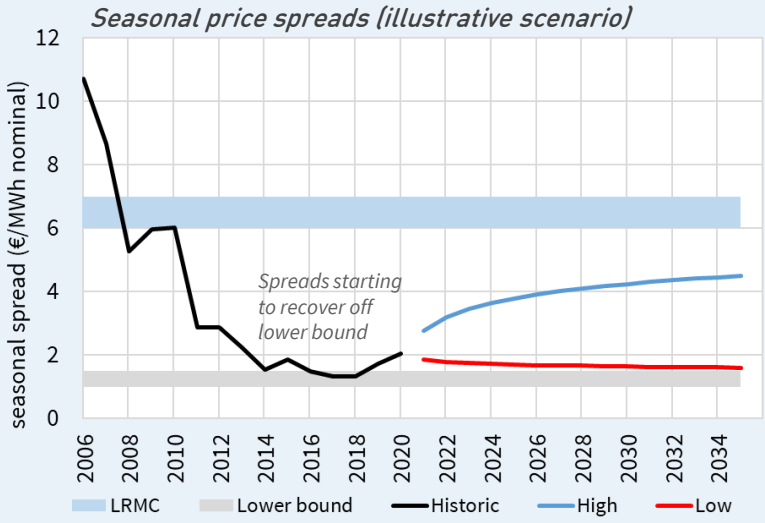
- Recovery in hub price volatility 2015-19… despite well supplied gas market
- Swings in LNG imports supporting volatility
- Market shocks becoming larger & more frequent (e.g. 'Beast from the East')
- Rising volatility → higher value of storage deliverability

Seasonal spread drivers

- Reduced seasonal shape in Russian & domestic production profiles
- Europe providing seasonal LNG flex to Asia
- Higher within year value for storage capacity holders (within-year TTF spreads > 8 €/MWh*)
- Forward spreads also starting to rise (TTF & NBP)
- Spread recovery → asymmetric upside for storage owners given spreads are near lower bound (1.0-1.5 €/MWh)

*Q120 – Sept BOM on 12 Sept.





Source: Timera Energy

Long Run Marginal Cost (LRMC) bounds are the volatility & seasonal spread levels required for investment in new fast cycle & seasonal storage facilities respectively.

Storage value is recovering

Price signal recover → higher margin

Charts show:

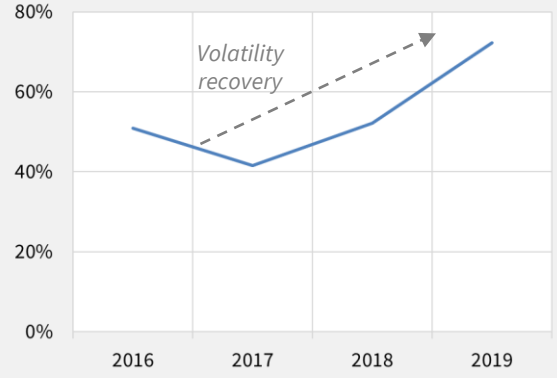
1. Volatility recovering since 2017. Spreads joined in 2019
2. This is translating into higher storage trading margins

Margin rising for owners or buyers?

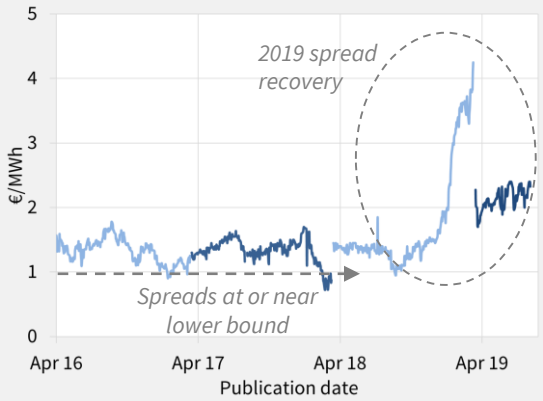
- In the short term, value has primarily been captured by existing capacity holders
- Key focus for asset owners is ensuring value capture from further recovery
- Contracting & capacity sales strategy is key

1 Gas storage price signals

Day ahead historic volatility

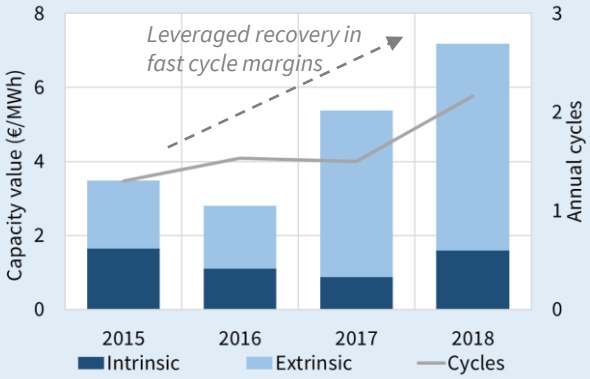


TTF front year seasonal spreads

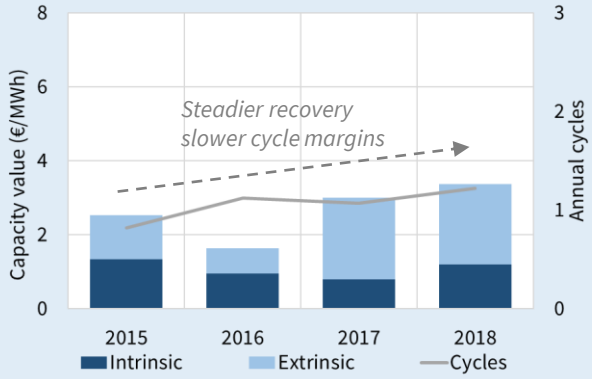


2 Gas storage asset margins

Fast cycle storage asset margin



Seasonal storage asset margin



Fast cycle (60 day cycle) & seasonal asset (180 day cycle) margin estimated by executing a simple & commonly used 'rolling intrinsic' hedging strategy measured against actual TTF prices (assumes 0.75 €/MWh variable cost)

5 key trends impacting storage value capture

Trend	Impact
1. Flex balance tightening	3 structural drivers set to support continued flex balance tightening into mid 2020s → likely to support continued recovery of price signals (spreads & volatility)
2. LT contract challenge	Storage asset LTCs rolling off and can't be replaced (at similar pricing terms) → increasing market exposure for asset owners
3. Value shift to prompt	Asset value capture is shifting nearer to delivery → owners need to evolve contracting & capacity sales strategies in response
4. Increasing asset risk	Increasing returns from market recovery (1.) → come with increasing risks & value capture challenges (from 2. & 3.)
5. Decarbonisation of gas	Decarbonisation has rapidly become a reality in power. It will follow for gas. → owners/investors need a framework to understand/quantify impact on asset value.

Assessing storage asset economics

Storage economics are dynamic not static

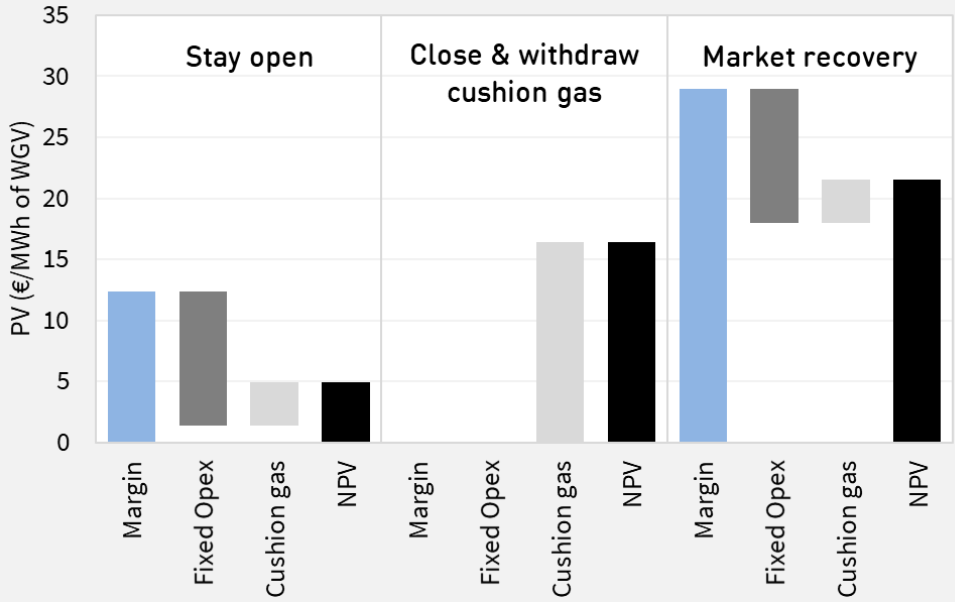
Regular analysis required to quantify optimal commercial strategy, accounting for:

1. Market changes (gas prices, spreads, volatility)
2. LT contract roll off
3. Adjustments to contracting strategy
4. Changes in variable & maintenance costs
5. Decarbonisation risk

Assessing multiple options

- A simple NPV of storage asset value can miss the impact of alternative options
- Even if asset NPV positive, monetising cushion gas & closing may create more value (see chart)
- Quantifying risk/return impact of market recovery & decarbonisation are also important

Asset strategy case study: stick or twist?



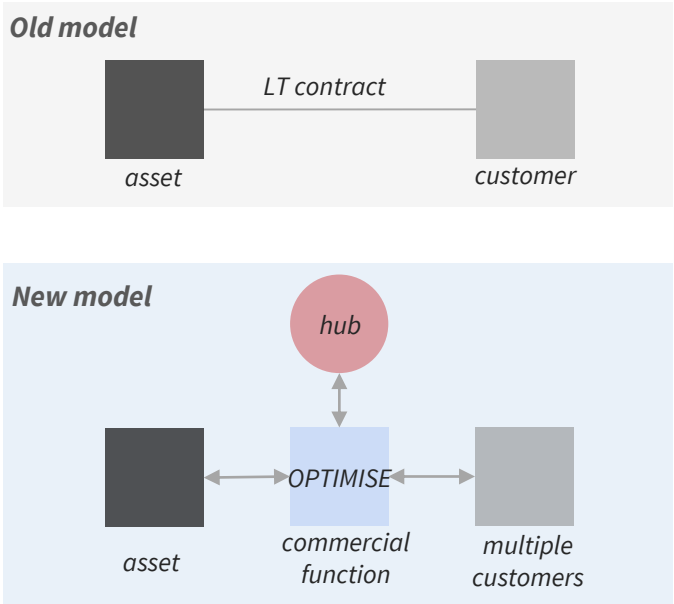
**Close or stay open options generic seasonal asset (180 day cycle)*

Source: Timera Energy

5 ways to boost storage asset value

Action	
1. Optimise variable costs i.e. reduce cost hurdle to capture value	*all assets*
2. Optimise asset supply chain e.g. entry/exit, maintenance, fuel gas	
3. Retain asset flex into prompt i.e. capturing flex value vs selling to buyers	*TPA exempt assets*
4. Use hubs to enhance asset flex & services i.e. de-link services from physical asset	
5. Refine capacity product offering e.g. customer netting, virtual products	

Gas storage value capture models



Confronting decarbonisation

Two possible decarbonisation pathways

1. Gas Transition: Transition to hydrogen & biogas networks
2. Electrification: Steady electrification of gas demand.

- Major policy support, tech development & investment required to facilitate 'Gas Transition'

Decarbonisation impact on gas storage

- Both pathways see significant risk of falling midstream asset utilisation & value
- Owners face complex asset strategy decisions to protect value
- A robust analytical framework is required to quantify impact of decarbonisation on storage asset value & strategy

2 pathways to decarbonisation & storage value impact

Path 1: Gas Transition

- Transition to hydrogen & biogas networks (initially via blending)
- Methane as a feed source for hydrogen production (+ CCS)
- Production location unclear e.g. European borders?
- Potential post 2035 market fragmentation

→

Storage impact: Gas Transition

- Transition to hydrogen vs methane storage requirement
- But hydrogen blending may delay / buffer impact
- Potential asset conversion to store hydrogen
- Uncertain need for hydrogen storage in existing locations

Path 2: Electrification

- Steady electrification of gas demand (power, heat, industry)
- Resulting erosion in gas asset utilisation & value
- Pace & timing depends on policy & technology
- Default scenario in absence of industry/policy push towards 1.

→

Storage impact: Electrification

- Likely more rapid erosion of storage utilisation & value
- Decline in European gas demand key barometer
- Realistic scenarios where rapid demand decline from 2030s
- Likely to result in widespread storage asset stranding by 2050

Source: Timera Energy

Introduction to Timera Energy

Specialist energy consultancy
Focus on LNG and European gas & power assets

Extensive industry expertise
Practical knowledge from senior industry roles

Pragmatic commercial focus
Investment, valuation, contracting & mkt analysis

Strong client base
leading energy companies (producers, utilities, funds)

Leading industry blog
15,000+ regular readers, publications, conferences

Our clients include

What do we do?

1. Market analysis

Unique integrated global LNG, European gas & power market models

- Europe/global supply & demand balance analysis
- Projections of hub prices, seasonal spreads & volatility

2. Asset valuation

Leading edge stochastic asset valuation models (widely used by investors)

- Valuing pipes, regas storage, LNG flex
- Intrinsic & extrinsic margin analysis of flex midstream assets

3. Value capture

Extensive practical industry experience of monetising asset value

- Asset hedging & optimisation
- Capacity sales strategy & asset contracting
- Analytical tools

4. Transaction support (buy side)

Strong track record supporting buyers/investors in European midstream gas asset transactions

- Pre-acquisition: Market & margin modelling (1. & 2. above) + transaction due diligence support
- Post acquisition: Hedging strategy, contract structuring, value chain optimisation, analytic tools (3. above)

Relevant Timera Energy credentials

We have extensive experience advising storage developers, operators & owners (e.g. Gasunie, Uniper, Fluxys, INEOS & TAQA).

Project	Client	Summary
Storage acquisition	Fund	Commercial advisory & due diligence to support purchase of DE storage portfolio
Storage monetisation	Operator	Ongoing advisory on valuation & monetisation of Dutch fast cycle storage asset
Storage acquisition	Fund	Commercial advisory & due diligence to support purchase of SPP storage portfolio
Storage investment	Fund	Analysis of broad range of German & Dutch storage assets in search of targets
Storage valuation	Operator	Market projection and asset valuation for large NW Europe seasonal storage asset
Capacity valuation	Trader	Valuation of storage capacity for multiple assets across Germany & Netherlands
Storage support	Utility	Valuation & capacity sales strategy advice for salt cavern storage asset
Storage development	Developer	Commercial advisor to developer of a UK fast cycle storage project
Supply flex value	PE Fund	Analysis of gas flexibility value (price spreads, volatility) at NW European hubs
Pipeline sale	Infra Fund	Valuation analysis to support sale of large Central European pipeline transaction

Timera Energy gas team members

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

May Mannes

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

David Stokes

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

Jessica Gervais

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

Olly Spinks

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

Howard Rogers

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

Henry Crawford

8 years experience in energy & capital markets
Strong commercial & market analytics experience
Gas trading & analytics background (Nova Energy)

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