Elaborating concrete European legislative proposals on gas storage

Phase 1 Final report

18 January 2021

Contents

A cost-effective transition will require gas storage; EU reforms can ensure storage facilities capture their value to the energy system

Gas storage has an important role to play in the future energy system

- To achieve 2050 climate goals the EU must achieve deep decarbonisation in the energy sector. This will create challenges that need to be managed, notably in respect of energy storage and transport
- The Commission's Hydrogen Strategy states that (decarbonised) hydrogen is essential to support EU commitment to carbon neutrality by 2050, in part given its large potential for storage of renewable energy (in particular over seasonal timescales where alternatives are limited)
- The Energy System Integration strategy further notes the importance of gas storage in facilitating the integration of the electricity and gas systems

Reforms should be implemented across the energy system to ensure flexibility tools such as storage capture the full value they bring to the system

- Market failures may prevent gas storage from realising the value it brings to the system
- These failures are compounded by policy-driven uncertainty regarding the future for gas and gas storage (e.g. the level of gas demand, the mix of different gases on the system). Operators are not well-placed to manage such risks.
- Together, this may lead to the (inefficient) premature closure of existing storage sites, making the decarbonisation and system integration process difficult to achieve (including increasing security of supply risks)
- Change is required at the EU level to ensure the legislative framework ensures:
  - gas has a route to benefiting from avoided electricity capacity costs in electricity CRMs
  - that the wider energy system benefits of gas storage are taken into account in market and tariff design, as well as in network planning and regulation
  - that prices react appropriately in times of scarcity, allowing storage to benefit from the insurance value it provides
- Alongside such reforms, further additional interventions could be justified which Member States could implement to address residual failures.

Several EU-level reforms are needed to ensure that storage (and other flexibility sources) can realise the full range of value they provide

We considered how to make the market work better for gas storage…

Efficient Benchmark
Principles for efficient market functioning

Barriers and gaps
Compared to efficient benchmark

Potential Solutions
Addressing the barriers identified

- Focus on market-based solutions (based on assumption of underlying market in place, including for low-carbon gases)
- Appropriateness of market-based approaches will depend on market conditions

…for each of the following categories of value…

Market value
(arbitrage across different timescales)

Avoided electricity costs
(reduced costs of investing in / operating electricity generation)

System value
(reduced gas/electricity network and congestion management costs)

Insurance value
(contribution to energy security)

…and identified several recommended reforms…

Remove barriers to innovative SSO product development

Measures to promote market liquidity

Correct incentives for electricity generators in CRMs to pay for "firmness" of gas supplies

"Whole system" infrastructure planning and regulation to recognise / remunerate benefits of gas storage

Market-based congestion management

Allow full exemptions for storage from financing "legacy" grid costs through tariffs

Ensure market prices can better reflect the value of lost load at times of scarcity

Further intervention could be justified to secure a reliable energy system

…all of which would be compatible (and complementary/additional) with existing regulated regimes to support gas storage

Summary of proposed reforms: Market value

	Rationale	Specific reforms
Remove barriers to innovative SSO product development	▪ Regulations may hinder product development by SSOs	▪ MSs therefore may need to ensure that regulations are specified in a way which does not hinder efficient product development ▪ At EU level, need to clarify whether trading gas / transmission capacity for the purpose of provision of storage products is compatible with unbundling rules
Measures to promote market liquidity	▪ Illiquid markets may mean that shippers have less certainty regarding forward value of gas and the value of storing gas, potentially leading to storage being undervalued in the market	▪ ENTSOG (and national) CBA methodologies should include consideration of liquidity impacts in infrastructure investment / decommissioning decisions ▪ NRAs and MSs should consider other action to enhance liquidity including: ▫ reducing barriers to market mergers ▫ adopting “best-practice” balancing and imbalance charging rules

Summary of proposed reforms: Avoided electricity costs

	Rationale	Specific reforms
Correct incentives for electricity generators in CRMs to pay for "firmness" of gas supplies	▪ Some electricity CRMs effectively assume firm gas supplies for gas generation without requiring plants to demonstrate this is the case. This scheme doesn't explicit the need for gas generators to contract for firm gas supplies and obstructs a stream of revenues for gas storage providers	▪ Plant availability assumptions should be accounted for in CRMs with resulting payment for capacity providers ▪ Use the upcoming opportunity of sector integration legislation to ensure that gas storage operators' rights are clear in this regard, including, where relevant, considering definitions (e.g. of energy storage)

Summary of proposed reforms: System value (1/2)

	Rationale	Specific reforms
"Whole system" infrastructure planning and regulation to recognise / remunerate benefits of gas storage	▪ Non optimal coordination between electricity and gas sectors as well as between TSOs and DSOs in planning for infrastructures may lead to whole system costs not being optimised ▪ This means that flexibility tools such as storage may not be properly considered as alternatives to infrastructure investment, leading to potentially less revenues for SSOs	▪ Ensure coordinated investment planning from a system perspective for transmission and distribution at the national and EU levels, including an assessment of flexibility options across all network levels ▪ SSOs and other infrastructure operators should be included in system planning discussions at the national and EU level ▪ MSs could be required to demonstrate optimised system planning between sectors and between the transmission and distribution grids ▪ NRAs should implement incentives to achieve system cost savings ▪ All network operators should be required to consider flexibility sources if they are more cost effective than network investment ▪ The range of counterfactuals considered in PCI process CBAs should be broadened
Market-based congestion management	▪ With the development of production units connected to the distribution grid, congestion management at the distribution level could become increasingly important. However, there is no congestion management requirement at the distribution level in NC BAL	▪ Implementation of rules for (technology-neutral) market based congestion management at distribution level

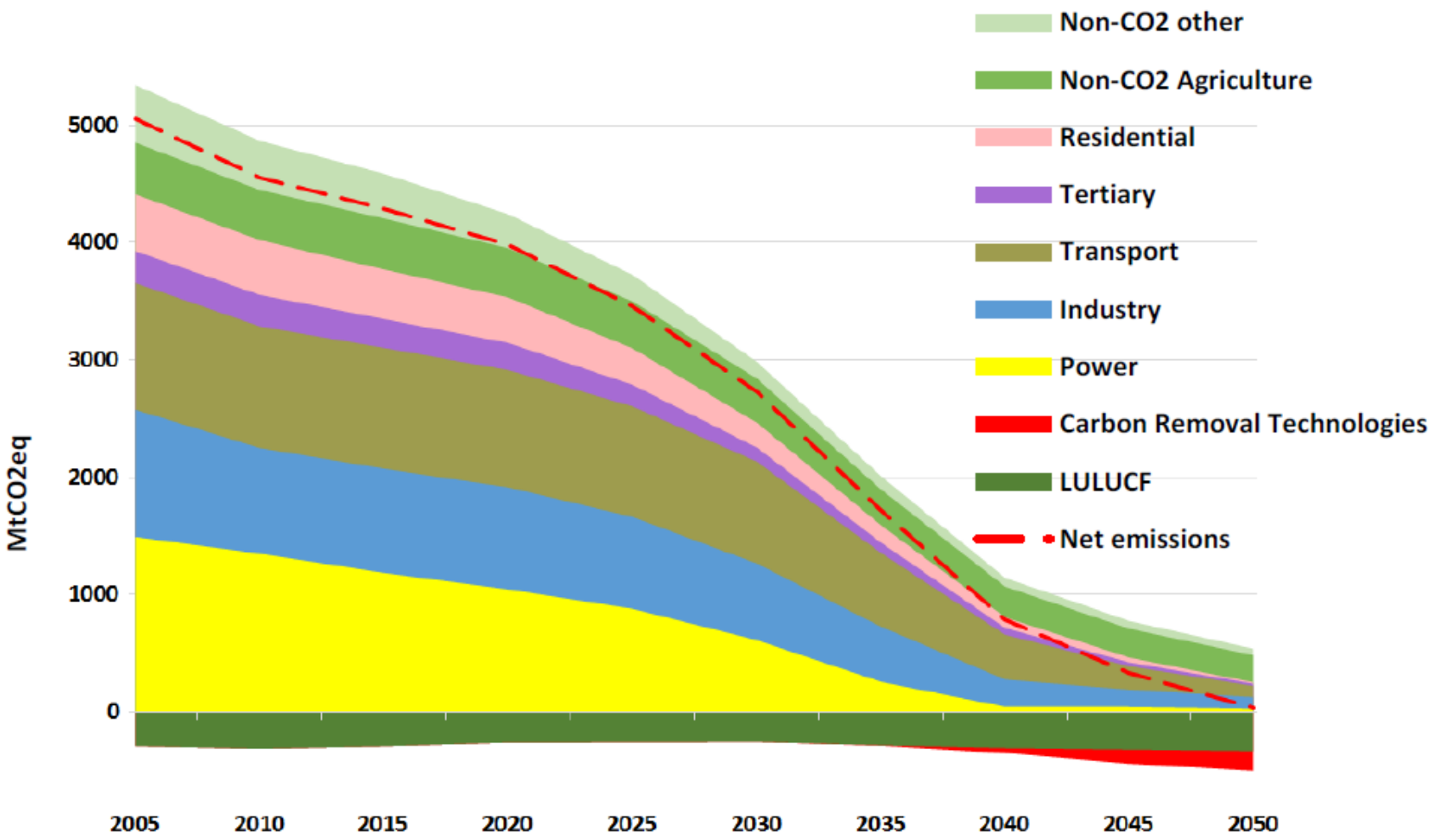
Summary of proposed reforms: System value (2/2)

	Rationale	Specific reforms
Allow full exemptions for storage from financing "legacy" grid costs through tariffs	▪ Storage operators may face tariffs from other infrastructure (e.g. transmission grid) which include not only marginal costs (i.e. costs imposed on the infrastructure from storage) but also sunk costs (i.e. costs incurred to build the infrastructure). Since storage use (capacity and commodity) may be more price sensitive than final use, such "residual" cost recovery charges could reduce the use of storage and lead to inefficient closure	▪ Amend NC TAR to define a tariff structure to ensure distortions from cost recovery charges are minimised ▪ Case for reducing residual cost recovery element of grid tariffs for storage (potentially down to incremental cost only) avoiding double "cost recovery" charging for storage / energy conversion ▪ A starting point short of NC reform might be to require ACER to produce a "best practice" report on tariff methodologies, akin to what is now in place for electricity. This could clarify the concept of "cost-reflectivity" and also be an opportunity for taking a cross-system view on cost-recovery issues. ▪ Ensure consistency across electricity and gas

Summary of proposed reforms: Insurance value

	Rationale	Specific reforms
Ensure market prices can better reflect the value of lost load at times of scarcity	▪ If imbalance prices do not reflect the value of loss load, customers cannot signal the value they associate with loss load. This reduces the incentives for private players to insure themselves against lost load, which leads to flexibility tools such as storage being underused	▪ The NC BAL should be updated to require marginal pricing (unless liquidity issues prevent it) and potentially to require imbalances prices to include a “scarcity adder”. Price caps on imbalance prices should be removed, and any administered prices should have signalling scarcity value as an objective
Further intervention could be justified to secure a reliable energy system	▪ Despite market reforms, residual market failures may persist, leading to insurance value being under-rewarded	▪ Member States could implement further interventions to secure a reliable energy system.

To achieve 2050 climate goals the EU must achieve deep decarbonisation in the energy sector



Source: EC (2018), A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy, COM(2018) 773 final Brussels, 28.11.2018.

The Commission has recognised the important role that the gas system will play in enabling this transition, including through use of hydrogen

EUROPEAN COMMISSION

Brussels, 8.7.2020
COM(2020) 299 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Powering a climate-neutral economy: An EU Strategy for Energy System Integration

EUROPEAN COMMISSION

Brussels, 8.7.2020
COM(2020) 301 final

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

A hydrogen strategy for a climate-neutral Europe

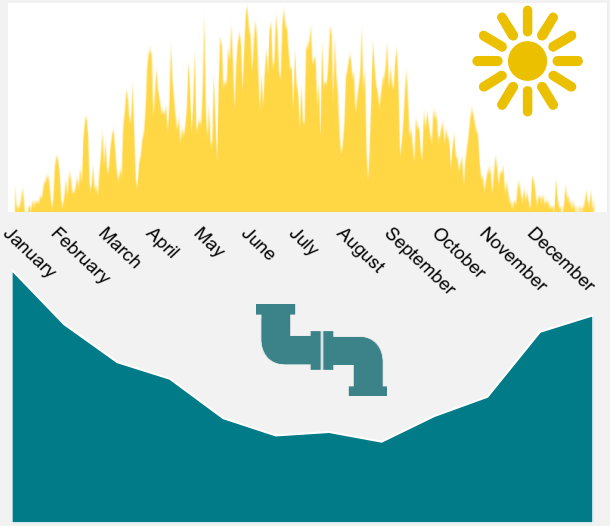
The Commission's Hydrogen Strategy and Energy System Integration strategies note that:

- Large-scale deployment of clean hydrogen is key to enabling ambitious climate EU targets to be met cost-effectively
- Hydrogen (together with other renewable and low-carbon fuels) can replace fossil fuels in otherwise hard-to-decarbonise areas such as carbon-intensive industrial processes and parts of the transport system
- Hydrogen can be used to cost-effectively transport energy and connect renewable energy production locations to more distant demand centres
- Hydrogen has an important role in storing renewable energy, ensuring back up for seasonal variations (see next slide)

Gas storage has an important role in addressing the energy storage challenge

Challenge of energy **storage**

Schematic annual profile of **PV generation**

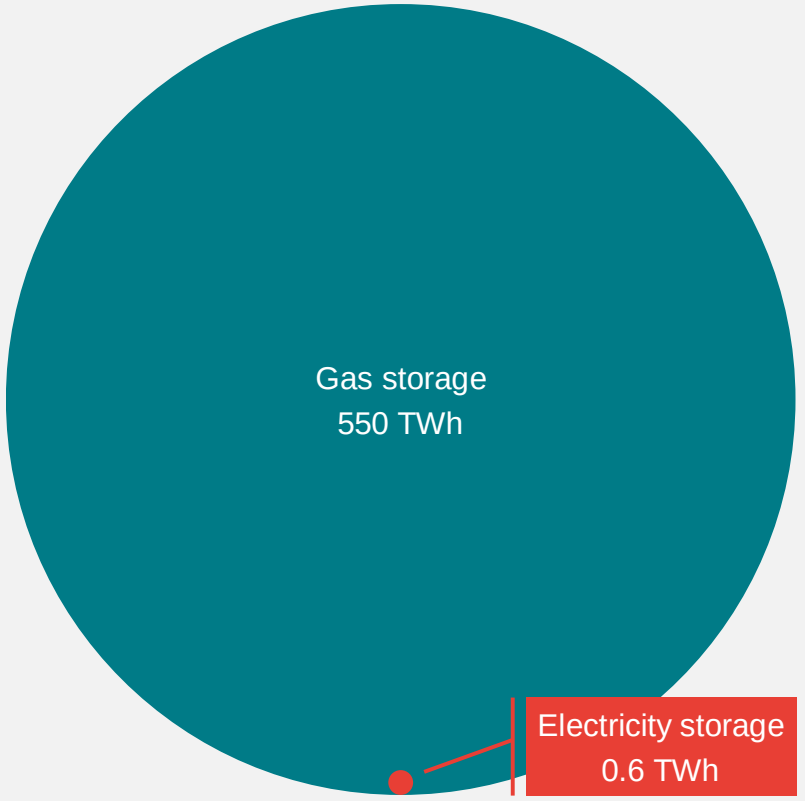


Monthly average **gas load** in 8 countries analysed*

Intermittent renewables and seasonal heat demand **require vast seasonal energy storage**

Gas storage volume is almost 1,000 times as large as electricity storage volume in analysed countries

Energy storage volume in 8 analysed countries



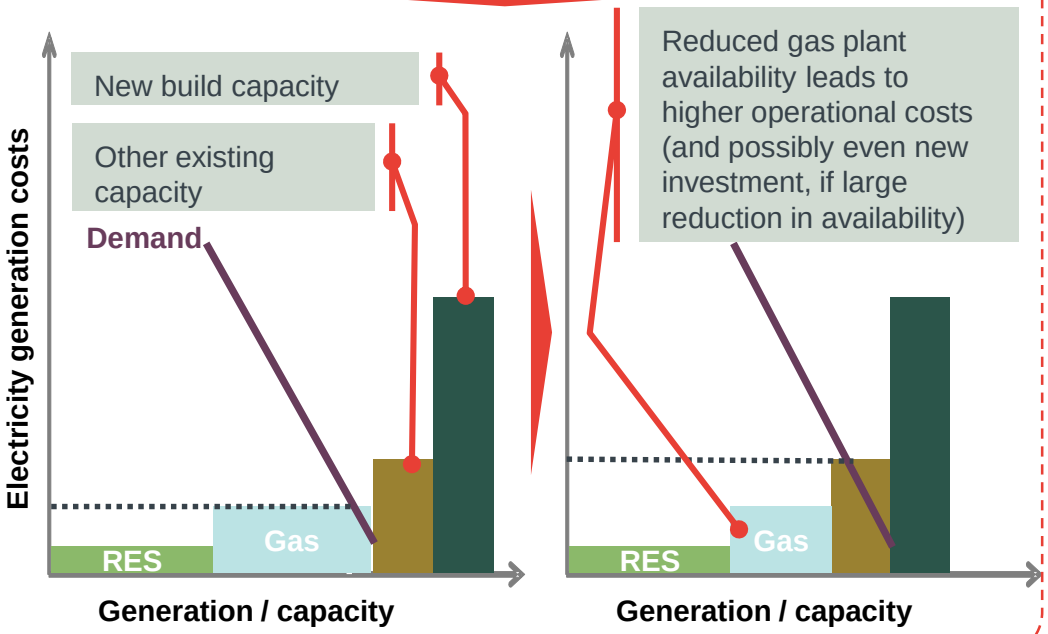
Source: Frontier Economics based on Gas Infrastructure Europe and Geth et al.

*Belgium, the Czech Republic, Germany, Denmark, France, the Netherlands, Sweden and Switzerland.

See: Frontier Economics and IAEW (2019), "The value of gas infrastructure in a climate-neutral Europe".

Using the gas grid (together with gas storage) as a flexibility tool can help reduce costs across the energy system as it decarbonises

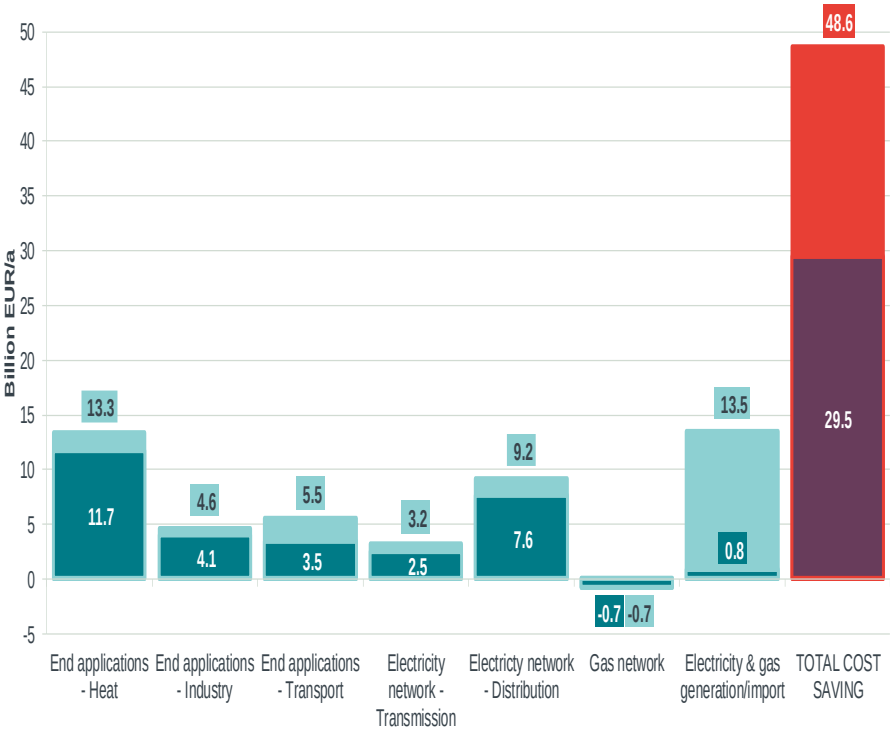
Artelys 2019: "Capacity value" illustration: (**30%**) reduction in gas storage capacity could limit gas generation, resulting in higher costs from operation of potentially more expensive electricity generation (**EUR 8 billion/year**) and investment in additional capacity to meet demand (**EUR 55 billion**).



Source: Illustration by Frontier Economics.

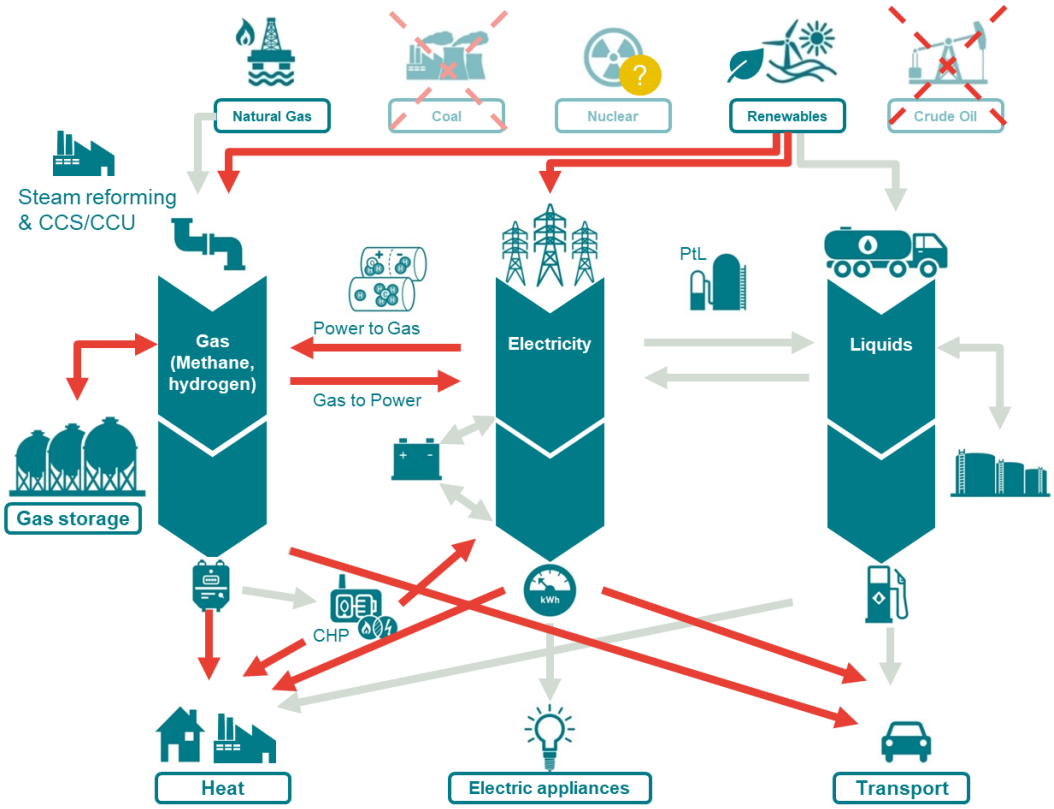
Frontier 2019: the value of gas infrastructure in a climate neutral Europe

The use of gas grid (including storage) can save **€30 to €49 billion per year** in 8 analysed countries in the EU by 2050



In summary, gas storage is a key enabler of sector integration, providing value across the energy system as it decarbonises

Coupling links between gas and electricity



Insurance value

Contribution to energy security – reduced likelihood of supply disruption

System value

Reduced gas / electricity balancing and network costs (incl. congestion management)

Avoided electricity production costs

Reduced capacity and generation costs

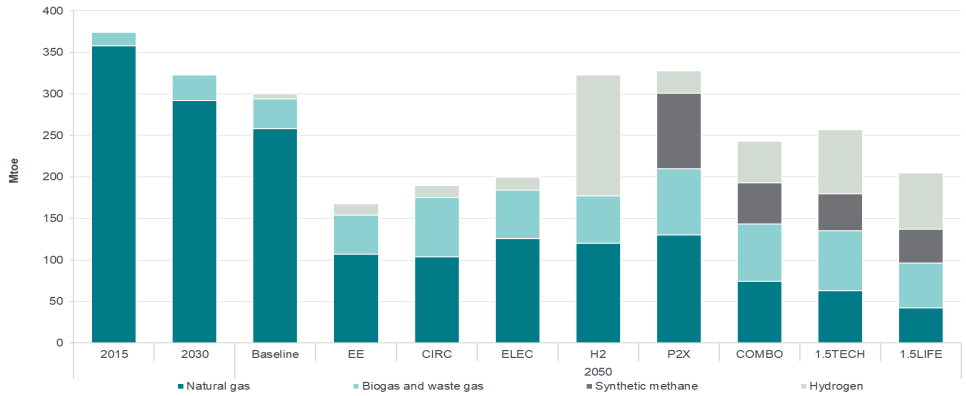
Market value

Arbitrage across different timescales – reduced costs of importing/producing costs at peak

It is clear storage has an important future role – but policy uncertainty leading to site closures may mean it is not available when we need it

Operators are being exposed increasingly to shorter-term movements in market prices as long-term contracts start to expire; but while there is emerging consensus on a role for gas, there remains much uncertainty regarding the level of demand / type of gas that will be demanded

EU demand for gaseous fuels in 2015, forecast for 2030, baseline for 2050 and different decarbonisation scenarios for 2050



Source: Frontier Economics and CE Delft, based on : European Commission (2018) "A Clean Planet for all, A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy", COM(2018) 773 final. We also note that ENTSOs TYNDP 2020 scenarios, which are consistent with the Paris agreement, forecast the total demand for gas to be around 4 000 TWh depending (approx. 340Mtoe) in 2040.*

The uncertainty is largely policy-driven, a risk that investors are less well-placed to manage:

- **Demand uncertainty:** Potential for lower overall future demand for gas(es), but highly uncertain
- **Technical uncertainty:** as to the future composition of any low carbon gas comingled in the gas system, and the ability of storage sites to accommodate such gas
- **Policy uncertainty:** as to the policy applied to competing technology as part of decarbonisation (e.g. support to localised storage at electrolyser sites; decisions regarding use/closure of gas pipelines)

Specifics of storage may make effects of uncertainty more important – environmental considerations in some countries (e.g. DE) may impose site restoration obligations on closure, increasing the cost (and therefore reducing the likelihood) of re-opening following decision to close

- Long-term, policy-driven, uncertainty regarding the future demand of gas (and demand for gas storage) could discourage operators from investing in storage capacity (which may include incurring operating losses) to keep current sites open with the prospect of making profits later on
- This could lead to inefficient closure of gas storage sites that could provide valuable flexibility in the future energy system
- To avoid this risk, there is a **need to formulate concrete solutions**

We have drawn on a number of sources to develop a view on current barriers to storage securing value, and appropriate solutions

Shippers	Generators	TSOs/DSOs	Customers (ideally elec + gas)
Market value (arbitrage across different timescales)	**Avoided electricity production costs**	**System value** (e.g. reduced gas / electricity congestion management costs)	**Insurance value** (contribution to energy security)
▪ Enhanced market revenue (more insurance value, more flexibility value) through product reform (and improvements to market liquidity / functioning)	▪ Enhanced revenue from value created in electricity sector to ensure that "firmness" in gas is properly rewarded	▪ Enhanced revenue from market based congestion management & other locational signals, reflecting avoided costs in the whole system by using storage flexibility ▪ Lower tariff / levy exposure	▪ Enhanced revenue from market reforms (e.g. imbalance prices reflecting scarcity)
Literature review (CEER report)	Artelys analysis; existing CEP text; Frontier experience	Review of existing gas legislation (CMP, TAR NC, BAL BC, Governance Regulation, Security of Supply regulation)	
		CEP implementation plan guidance for electricity	
		Literature review (FTI report, ACER/CEER documents)	
		Frontier research (based on EFET / EC reports, research into national examples of whole system regulation)	

The arrow specifies where the value is sourced from e.g. market value may come from shippers, system value will be provided for by infrastructure operators etc.

For each value stream, we identify existing barriers and potential solutions, taking account of the specifics of the gas system

MS action could be required to ensure regulation does not hinder storage product development, and potentially to boost liquidity

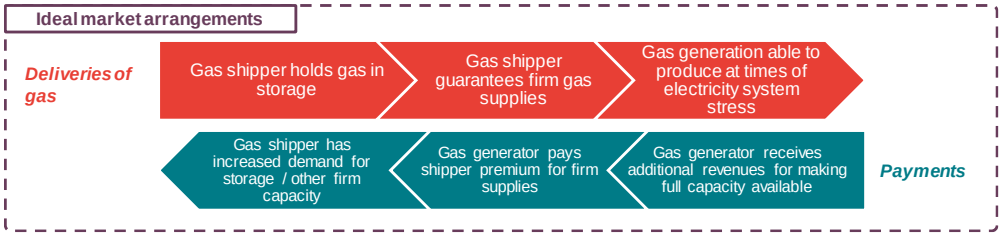
	Specific issues and solutions
Storage product development	▪ **Barrier:** CEER identified that barriers may exist to SSO product development, including that ▫ Restrictions on SSOs' ability to buy and sell gas or book transmission capacity may prevent offering of innovative storage products (e.g. Virtual Trading Point storage) - varies by jurisdiction depending on interpretation of EU unbundling rules ▫ Regulatory framework for transmission capacity can act as a barrier (e.g. to provision of x-b products) ▫ If not carefully specified, storage obligations can be a barrier to product development by restricting users' ability to manage their portfolios and optimise the use of storage ▫ **Solution:** ▫ MSs therefore may need to ensure that regulations are specified in a way which does not hinder efficient product development ▫ At EU level, need to clarify whether trading gas / transmission capacity for the purpose of provision of storage products is compatible with unbundling rules
Illiquidity	▪ **Barrier:** In some markets, lack of liquidity (particularly in forward products) can create a barrier (shippers have less certainty regarding forward value of gas and the value of storing gas, potentially leading to storage being undervalued in the market ▪ **Solution:** ▫ ENTSOG and national CBA methodologies should consider the potential impacts on liquidity in energy system planning, including in infrastructure investment and decommissioning decisions ▫ NRAs and MSs should consider action to reduce barriers to market mergers which may promote liquidity ▫ MSs should adopt "best-practice" (including market-based balancing, clear rules on imbalance charges and clearer information provision) to drive spot market liquidity (which can foster forward liquidity) ▫ MS could consider additional interventions to boost liquidity (e.g. market making obligations) if required

Existing rules may require clarification to ensure gas storage fully realises its value for electricity CRMs

Specific issues and solutions

Capturing value of reliability in electricity CRMs

- **Barrier:**
  - In an ideal world, CRMs would reward generators based on a view of reliability which takes into account the certainty of their fuel supply*



  - In practice, however, some electricity CRMs (e.g. GB) effectively assume firm gas supplies for gas generation without requiring plants to demonstrate this is the case - this removes the incentive for gas generators to contract for firm gas supplies
  - This may be compounded by the CEP which requires CRMs to be open to "energy storage", but defines this to exclude natural (i.e. fossil) gas**. Differences in national implementation may create uncertainty for gas storage operators regarding their ability to ensure their contribution to generation reliability is recognised
- **Solution:**
  - Clarify that eligibility rules and plant availability assumptions for CRMs (and so the resulting payments for capacity providers) should reflect evidence on security of fuel supplies
  - This will improve incentives for generators to secure their gas supplies, which will lead to additional revenues for storage operators
  - Use the upcoming opportunity of sector integration legislation to ensure that gas storage operators' rights are clear in this regard, including, where relevant, considering definitions (e.g. of energy storage)

** Note: this is not an issue outside CRMs. In principle, in a well-designed energy-only market, prices can rise to reflect scarcity (i.e. rise to VoLL), providing generators with incentives to secure their fuel supplies, in order to meet these price spikes*

*** This is further picked up in a recent report for the EC, including the extent to which individual activities that make up the full storage chain are captured by the definition: Trinomics, Artelys and Enerdata (2020) "Study on energy storage – Contribution to the security of the electricity supply in Europe", Final Report, March 2020, p. 87-89.*

Regulation should ensure effective whole system planning (1/3)

	Specific issues and solutions
Co-ordinated system planning between transmission and distribution	▪ **Barrier:** ▫ Lack of coordinated system planning between transmission and distribution may imply that flexibility tools are not optimally used as alternatives to investment ▫ Whilst storage operators are mainly connected to the transmission grid, more and more production of low-carbon gases will be connected to the distribution grid in the future, potentially resulting in an increased need for flexibility (e.g. to manage congestion) ▫ Accessing well-located flexibility at transmission level (i.e. including existing gas storage) could be one solution. But if this is not properly recognised in the planning process, this could lead to excessive investments (in network capacity and/or flexibility) at distribution level ▪ **Solution:** need to ensure coordinated system planning between transmission and distribution at a national level, including: ▫ development of consistent geographic mapping of current and projected production and demand; and ▫ an investment planning process which assesses feasible options across both levels of the network

Regulation should ensure effective whole system planning (2/3)

Specific issues and solutions	
Co-ordinated system planning across energy carriers	▪ **Barrier:** ▫ Lack of co-ordination results in planning focusing on individual fuels, and not recognising ways in which co-ordinated investments across energy carriers (including potential re-purposing of existing infrastructure for other energy carriers, such as hydrogen) could reduce costs. ▫ Some steps have already been taken – at EU level (e.g. joint scenario planning carried out by the ENTSOs and a development of an interlinked gas and electricity model, recognition in Hydrogen Strategy of importance of sound infrastructure planning) – at a national level (the Governance Regulation arguably helps by requiring objectives regarding increasing energy system flexibility and ensuring security of supplies (with emphasis on storage)) ▫ However, more can be done ▪ **Solution**: ▫ ENTSO-E and ENTSOG should be given obligations to further strengthen coordination between electricity and gas system planning, and to ensure flexibility sources are considered alongside network investments. ▫ MS could be required to demonstrate optimised system planning (consistent with ACER proposals to strengthen its role in overseeing the ENTSO TYNDP process).
Representation of all infrastructure operators	▪ **Barrier**: infrastructure operators other than TSOs and DSOs are not included in discussions around whole-energy system planning which may undermine the fact that services they propose are accounted ▪ **Solution**: inclusion of storage operators and other infrastructure operators in discussions at the national and European level (within ENTSO-E and ENTSOG) on system planning

Regulation should ensure effective whole system planning (3/3)

Specific issues and solutions	
Regulatory incentives to achieve system cost savings	▪ **Barrier**: infrastructure operators may not be enough incentivised to consider investments across grids and sectors in order to optimise the whole system planning ▪ **Solution**: In order to incentivise TSOs and DNOs to act in way which minimises whole system costs, incentives to invest only in their own networks should be avoided: ▫ NRAs should implement incentives that promote whole energy system efficiencies across networks and fuels. ▫ Requirements such as those in Article 32 Electricity Directive (for electricity DSOs to consider flexibility sources such as storage if more cost effective than investment in distribution) should be broadened ▫ A similar principle should be applied to the ENTSOs' CBA methodology in the context of the PCI assessment process: – Counterfactual is often "no project" i.e. existing level of infrastructures; Alternative expenditures that could meet the same/similar objectives should ideally also be considered – There could be a wide range of potential substitutes – e.g. gas for electricity (or vice versa) and better use of existing installations instead of new investment

- For example, the regulator in the UK (Ofgem) is considering whether to (see Annex 2 for more detail):
  - Assess networks' business plans on the basis of whether there has been co-ordination/planning between grids – potentially with rewards/penalties through their Business Plan Incentive
  - Introduce a new price control re-opener mechanism that will allow revenue allowances to be shifted between grids in different sectors
  - Change the criteria for applications for innovation funding so that one of the assessment criteria is whether there is a whole systems aspect

Reforms may be required to ensure storage can fully benefit from the value it provides in terms of network and balancing services

	Specific issues and solutions
Market based congestion management	▪ **Barrier:** there are no requirements relating to market-based congestion management at the distribution level, which in some situations could become increasingly important, given expected role and geographical distribution of low-carbon and renewable gas production (with greater shares expected to be located at distribution level). This could lead to under-use of flexibility and over investment in distribution network) ▪ **Solution:** Implementation of rules for (technology-neutral) physical congestion management at distribution level, which could indirectly benefit storage (to extent that transmission network flexibility can help manage flexibility issues at distribution level)

- For example, in relation to transmission:
  - BAL NC requires balancing services and locational balancing services to be procured in a market-based manner (Art 8,9,11)
  - CMP guidelines require TSOs to take cost-effective measures to alleviate physical congestion

The structure of grid tariffs should not result in storage being underused and undervalued

	Specific issues and solutions
Tariffs	▪ **Barrier:** risk that gas storage faces tariffs which distort its use (and hence its value): ▪ Network tariffs typically comprise “cost reflective” components (reflecting the forward-looking incremental costs – or benefits - that users impose on the system) and “cost recovery” components (reflecting residual costs, including, to the extent allowed by NRAs, recovery of sunk costs) ▪ Cost recovery tariffs should be designed to minimise distortions – which means avoiding charging them on activities which are price sensitive (typically placing them as close to final consumption as possible) ▪ Storage use (capacity and commodity) may be more price sensitive than final use. If storage entry and exit is charged a cost recovery component (“double” charging along the overall physical flow from production / import to final consumption), it may reduce value ▪ Moreover, if very different approaches to cost-recovery charges are taken between MS, this could distort the market for cross-border storage ▪ NC TAR does not provide clear framework for this, and does not ensure a cross-energy system view on cost recovery charges ▪ **Solution** ▫ Amend NC TAR to define a tariff structure to ensure distortions are minimised ▫ Ensure the “cost-reflective” components of tariffs are well-evaluated ▫ There is a case for reducing cost recovery components of grid tariffs for storage (potentially down to incremental cost only, beyond the 50% discount from NC TAR), avoiding double “cost recovery” charging for storage / energy conversion ▫ A starting point short of network code reform might be to require ACER to produce a “best practice” report on tariff methodologies, akin to what is now in place for electricity*. This could clarify concept of “cost-reflectivity” and also take a cross-system view on cost-recovery issues. ▫ Consistency in the approach is needed across sectors, to minimise distortions between energy carriers

*We note that while ACER published a report on “The internal gas market in Europe: The role of transmission tariffs” in 2020, it could be further developed as we suggest

Sharpening price signals further could contribute to internalising insurance value

	Specific issues and solutions
Ensuring wholesale prices reflect scarcity	▪ **Barriers**: if prices do not reach VoLL at times of scarcity, shippers may not face sufficient incentives to insure themselves against lost load, for example via booking storage capacity. The current legislation does not ensure that penalties for being out of balance are cost reflective and gives room for implicit price caps which may limit prices from reaching VoLL. In particular, NC BAL: ▫ Supports a weighted average cost approach to calculating imbalance prices and limits any price "adders" to 10% (Art 22) ▫ States that the price of locational products may be taken into account when determining imbalance prices – undermines cost-reflectivity (Art 22(5)) ▫ Allows administered pricing / tolerances in limited circumstances on interim basis (e.g. if limited liquidity, inability to define market price for balancing) (Art 45-50) – still the case for some TSOs today ▪ **Solution:** the NC BAL should be updated to require marginal pricing (unless liquidity issues prevent it) and potentially to require imbalances prices to have a "scarcity adder". Price caps on imbalance prices should be removed, and any administered prices should have signalling scarcity value as an objective.

Residual market failures may jeopardise security of supply and require further interventions

Specific issues and solutions

Residual market failures

- **Barriers**:
  - Despite other market reforms and interventions, residual market failures may persist (see Annex 3 for details)

Reliability as a public good	Consumers are unable to choose their desired reliability and capacity providers are unable to capture the value associated with individual willingness to pay
Missing money	Risk that scarcity mark-ups may not be fully allowed given uncertainty and potential for political influence, impacting investment decisions
Market power / liquidity issues	High market power may lead to lack of liquidity or directly missing money issues if they justify price caps
Politically driven uncertainty	Investors are less able to manage politically driven risk related to the future of gas (demand / compensation of low carbon gas and ability of storage gas to accommodate it / policies applied to competing technologies)

  - These could lead to insurance value being under-rewarded by the market
- **Solution:** Member States could implement further interventions to secure a reliable energy system.

The CEER analysed barriers to securing full market value and the development of storage products to address them

Standard products

- Most common storage product is a Standard Bundled Unit (SBU) which SSOs are legally obliged to provide. This combines injection, space and withdrawal capacity.
- Some SSOs already provide variations of these products, for e.g. products including transmission capacity to Virtual Trading Points or customisable / indexed SBUs

Potential for product development

- Back-up services (achieved by pooling storage facilities in the market to deliver gas when facility cannot be used)
- Storage + gas products
- Cross-border products
- Unbundled products
- Firm/interruptible products
- Swap products / transfer rights

Existing barriers

- Restrictions on SSOs' ability to buy and sell gas or book transmission capacity (varies by jurisdiction) may prevent offering of "storage as a service"
- High transmission tariffs can act as a barrier to develop attractive cross-border products
- If not carefully specified to avoid impact on market, storage obligations can be a barrier to product development by restricting users' ability to manage their portfolios and optimise the use of storage

CEER's conclusion is that the barriers identified relate mostly to national implementation of existing EU legislation and that additional reforms at EU level are not necessary at this point.

Source: CEER (2017) "CEER report on barriers for gas storage product development"

Case study – Ofgem's implementation of regulatory mechanisms that enable whole system solutions (1/2)

Context

- In December 2018, Ofgem conducted a consultation to seek views from market participants on possible mechanisms that may overcome barriers to whole system approaches
- In May 2019, Ofgem decided to take forward three of the potential mechanisms that were considered for the next price control period, RIIO-2, due to be implemented in April 2021

Six potential mechanisms were considered:

Retained

Business plan incentive: Include whole system elements into the Business Plan Incentive assessment, with potential rewards and penalties.

Retained

Coordinated adjustments mechanism: implement a whole system re-opener to facilitate more cost-effective outcomes by realigning revenues and responsibilities.

Not retained

Coordination and information sharing incentive: create a mechanism to incentivise networks to identify potential opportunities for whole system coordination.

Retained

Ensuring innovation has a whole systems focus: Incorporate a whole system aspect as one of the assessment criteria for innovation funding.

Not retained

Balancing financial incentives between traditional & whole systems behaviour: redefine or transfer outputs; create further incentives for whole system outcomes.

Not retained

Whole system discretionary funding mechanism: allow networks to apply for additional funding for unknown projects at the beginning of the price control.

One of the reasons for not retaining this mechanism is that it was considered to be in a way already included in the business plan incentive mechanism

Source: https://www.ofgem.gov.uk/system/files/docs/2019/05/riio-2_sector_specific_methodology_decision_-_core_30.5.19.pdf

Case study – Ofgem's implementation of regulatory mechanisms that enable whole system solutions (2/2)

Business plan incentive

- Companies are expected to provide information on their proposals to enable whole system solutions in their Business Plan.
- These proposals must be well detailed, including for example the methodologies used to calculate the value of the activity for other sectors and towards achieving broader goals.
- Companies may then face a penalty for failing to demonstrate sufficient consideration of whole system thinking, or a reward for demonstrating an ambitious approach.

Ensuring innovation has a whole system focus

- The new framework incorporates a whole system aspect as one of the assessment criteria for innovation funding.
- It replaces the existing innovation funding pot with a redesigned one that is primarily focused on energy system transition challenges, supporting network innovation projects that address a broad range of whole system solutions (including the future of transport, heat and waste).
- Financing will be recovered from the National Transmission System (NTS) Charges.

Coordinated adjustments mechanism

- This mechanism consists of a whole system re-opener for projects which operate across multiple networks and were not identified through the Business Plan process. The re-opener of networks' price control decisions will facilitate more cost-effective outcomes by realigning revenues and responsibilities for projects to be undertaken in the most cost-effective way.
- The mechanism could be triggered by two (or more) cooperating networks, but a single network could also trigger the mechanism as long as it meets the "threshold requirements" (designed in a way to ensure there is a focus on the most valuable projects with reasonable administrative costs).

Many regulatory barriers and market failures can be addressed through reforms; but some issues may remain

The Commission has generally accepted two arguments that market failures persist in electricity – these are also relevant for gas storage operators*…

Reliability as a public good

- Most consumers are unable to choose their desired reliability
- Capacity providers are unable to capture value associated with individual willingness to pay
- If left to the market, this would result in less capacity than socially optimal level
- Improved demand-side participation may go some way to addressing this issue, but only over time – this may be more relevant for electricity than gas

Missing money

- Scarcity mark-ups (and the resulting price spreads) provide essential signals to investors in new capacity. In gas, EU legislation specifically prohibits this (see slide 29), though reforms to EU law could therefore partly address this concern)
- But investors may still perceive regulatory risk, given uncertainty and potential for political influence reducing investment below optimal levels

In gas, the challenges associated with dealing with market power in certain regions may provide an additional justification for further intervention

Market power / liquidity issues

- High market concentration may lead to a lack of liquidity – meaning that interim measures under BAL NC (e.g. limitations to full imbalance exposure) may persist
- Market power issues may also directly lead to missing money – if they justify price caps
- Question regarding feasibility of achieving a “perfect” market (at least over medium term)

However, relying on these arguments alone as a justification for intervention is unlikely to be sufficient – in electricity, some elements of local context which contribute to market failures are usually added (e.g. uncertainty related to renewable penetration, political uncertainty etc.)

**Source: various decisions from the Commission on CRMs in the electricity market.*

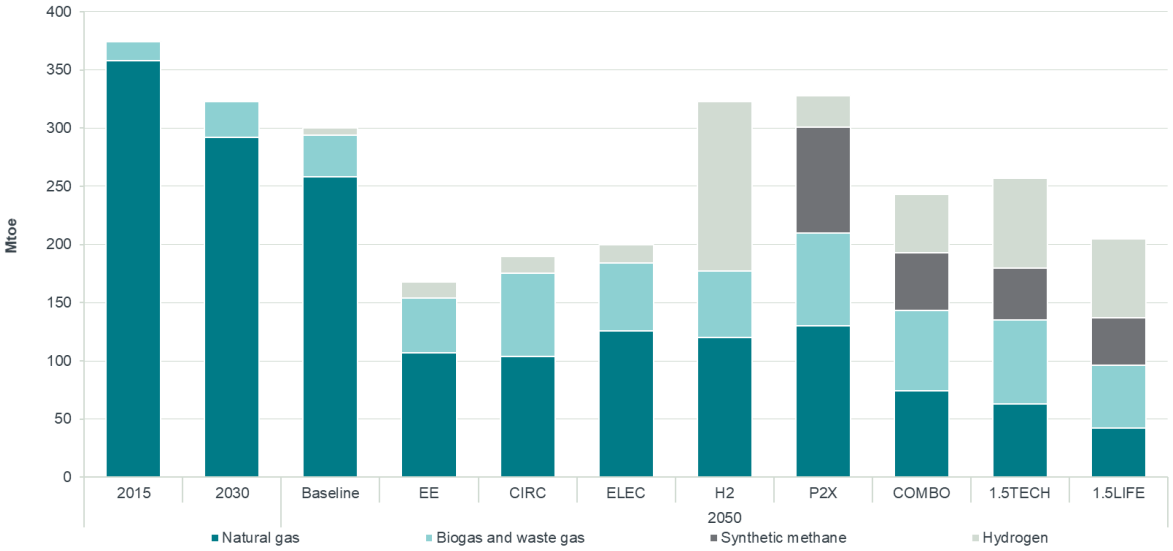
The medium term context for gas is key: storage operators face significant policy driven uncertainty, increasing the risk of inefficient closure

Politically driven uncertainty

Investors are less able to manage politically driven risks:

- **Demand uncertainty:** Potential for lower overall future demand for gas(es), but highly uncertain
- **Technical uncertainty:** as to the future composition of any low carbon gas comingled in the gas system, and the ability of storage sites to accommodate such gas
- **Policy uncertainty:** as to the policy applied to competing technology as part of decarbonisation (e.g. support to localised storage at electrolyser sites; decisions regarding use/closure of gas pipelines)

EU demand for gaseous fuels, in 2015, forecast for 2030, baseline for 2050 and different decarbonisation scenarios for 2050



Source: Frontier Economics and CE Delft, based on : European Commission (2018) "A Clean Planet for all, A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy", COM(2018) 773 final.*

Specifics of storage may make effects of uncertainty more important – environmental considerations in some countries (e.g. DE) may impose site restoration obligations on closure, increasing the cost (and therefore reducing the likelihood) of re-opening following decision to close

This uncertainty may discourage investors from investing in storage capacity (which may include incurring operating losses) to keep current sites open with the prospect of making profits later on

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