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Proposals to improve the operation of Trading Region France (TRF) for South to North flow patterns

En	June 2023	For the attention of the French Energy Regulatory Commission (CRE)

Purpose: this document describes the measures proposed by GRTgaz to adapt the South-North operation of Trading Region France (TRF), following the congestions encountered during winter 2022/23. It replaces the previous document sent in January 2023, adding new measures and modifying those already proposed.

Summary:

Since winter 2022/23 and the discontinuation of supplies from Virtualys and Obergailbach, the TSOs have faced unprecedented South-North congestions in France. This generated more than €50 million and 5 TWh of locational spread last winter. The situation occurs in particular during cold weather in France and in Europe, generating flows from storage facilities (located mainly in the South of France) to consumption centres (located mainly in the North), which can occur in combination with low flows at the Dunkirk Interconnection Point (PIR). This situation could therefore recur over the coming winters, despite the arrival of the Floating Storage and Regasification Unit (FSRU) in Le Havre (which is favourably located in relation to the congestion); there could be 1 to 6 TWh of congestions per year. However, this congestion volume is expected to decrease over the years due to reduced consumption levels and increased biomethane injections.

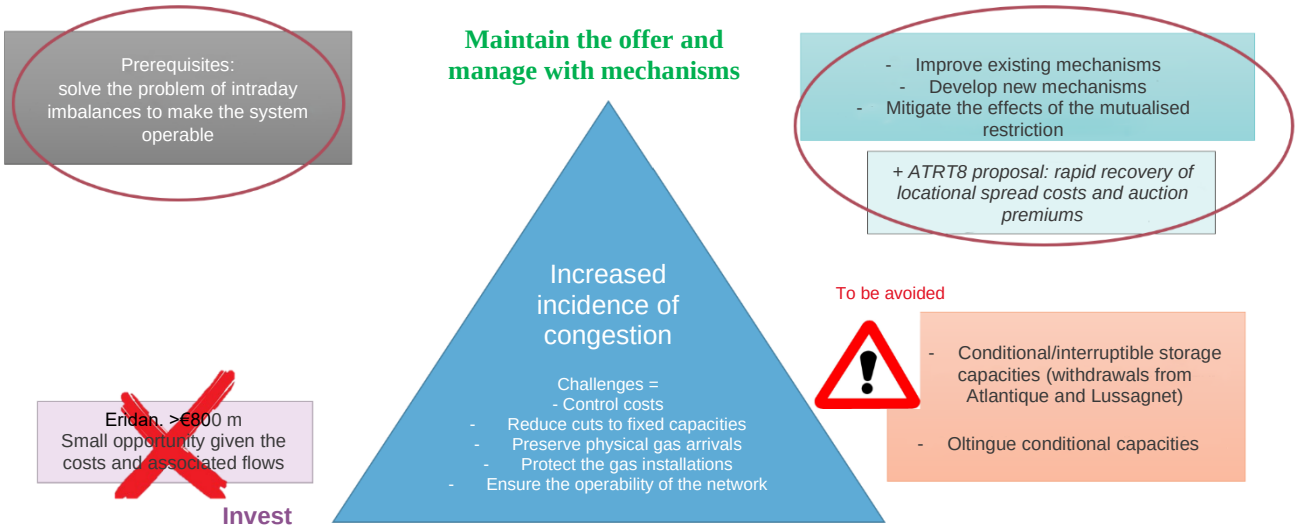
As a reminder, TRF was built to create sustainable North to South flow patterns via a combination of prudent investments improving North-South transmission and mechanisms to manage residual congestion on the network. However, if the flows are in the South-North direction, the sizing of the infrastructures is less well-suited to deliver the entire offer made to shippers, and congestion management costs may be much higher.

There are three ways to manage this flow reversal in France:

- Investments: strengthen the network to transport more gas from the South to the North. This solution is ruled out on both cost-benefit grounds and the implementation time in relation to needs;
- Reduce the capacity offer (as entries upstream of the limits – to the South – or exits downstream – to the North). This solution could be useful, for example by making the firm withdrawal capacities of the Atlantique and Lussagnet storage facilities conditional.

However, this could harm the attractiveness of French storage facilities, and has therefore been set aside for the time being.

- Maintain the offer and optimise decongestion mechanisms to manage the limits: this is GRTgaz's preferred solution for next winter.



Changes are proposed at all levels of the TRF mechanisms' Merit Order:

- New storage swap mechanism operated by the storage and transmission operators.
- Introduction of Use-It-Or-Lose-It (UIOLI) on the Dunkirk PIR to maximise the efficiency of the locational spread;
- Interruption of sales and of the interruptible capacity on both sides of the South-North limits;
- Mitigation of the effects of mutualised restrictions: extension of current measures to preserve gas arrivals at the borders at Pirineos, Montoir and Fos; creation of a new {Atlantique + Lussagnet} superpoint to give customers more flexibility; and anticipated restriction as a last resort in the event of repeated mutualised restrictions to protect the integrity of the installations and the operability of the system.

These measures should make the system more economically efficient. However, congestion management costs may remain high for some years. GRTgaz therefore proposes (see ATRT8 file) a rapid (monthly) recovery of congestion management costs and auction premiums, which is in the interest of both TSOs and shippers.

Priority must also be given to solving the problem of significant imbalances observed during the gas day, which leave the system difficult to operate and make the mechanisms less effective. To do this, GRTgaz proposes cutting UIOLI storage withdrawals in the Atlantique and Lussagnet facilities in the event of South-North congestion. GRTgaz also reminds shippers that they must nominate in a balanced manner, even within the same gas day. If this is not the case, deterrent measures could be implemented.

This new South-North flow pattern also has consequences for the publication of maintenance (which is usually published for North-South flow patterns). GRTgaz proposes not implementing South-North restrictions in addition to North-South restrictions. This proposal should generate acceptable locational spread costs and protect the security of the French gas supply.

Finally, GRTgaz proposes creating two new limits (SN0 and SN4) under the monitoring and alert system. This is necessary for the operational management of TRF and has little impact on shippers.

Feedback will be provided at the end of winter 2023/24 to assess the effects of these various measures and adjust them if necessary.

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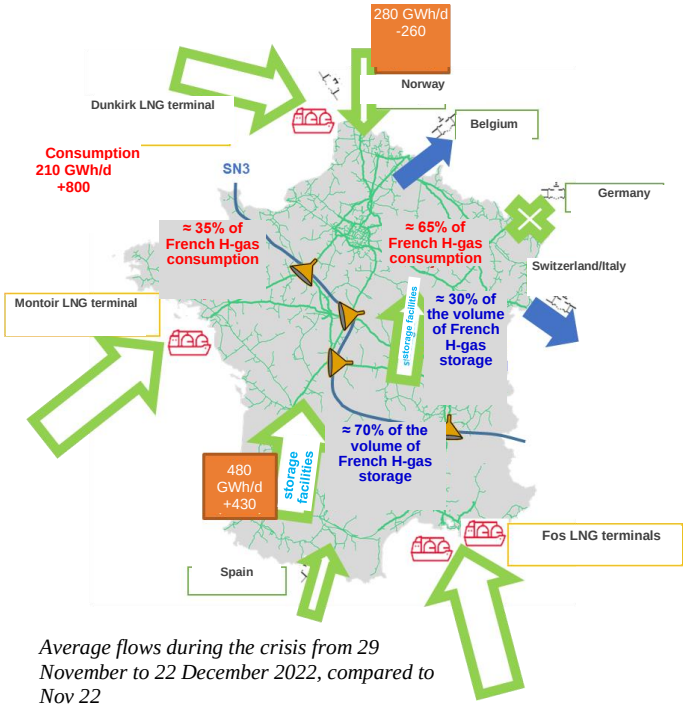
2 Context, causes and consequences

2.1 Reminder of the situation and its causes

Since winter 2022/23, TSOs have faced unprecedented South-North congestion in France. The interruption of Russian gas exports to Europe since autumn 2022 has almost entirely stopped the entry of H-gas into France from Germany and Belgium, resulting in South-North flows on the network during winter. This situation intensified on 28 November, as imports of Norwegian gas via the Dunkirk Network Interconnection Point (PIR) fell sharply. This created a significant gas deficit in the North of France and a surplus in the South, which was supplied by storage facilities, LNG terminals and imports from Spain. The network's current configuration does not allow for all surplus gas to be transferred from the South to the North, creating congestion (reaching the "SN3" limit).

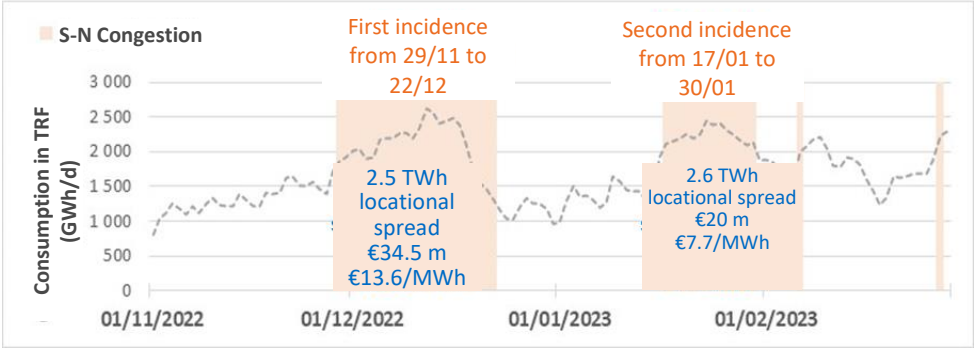
This situation seems to occur when gas consumption is high in France and in Europe. With the PEG having one of the lowest prices in Europe, Norwegian gas is preferentially transported to other countries, to the detriment of France. This explains the drop in flows at the Dunkirk PIR (the stress due to congestion only appears intraday via localised spreads, and is not reflected in the day-ahead price).

Also, two-thirds of French consumption is in the North, while more than two-thirds of storage volumes are in the South. However, increased consumption tends to be reflected in demand for withdrawals from storage, increasing the need to move gas from the South to the North. This likewise contributes to congestion.



Average flows during the crisis from 29 November to 22 December 2022, compared to Nov 22

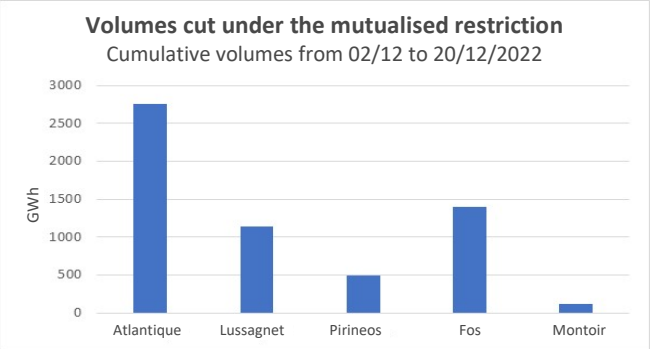
There were two such incidences during winter 2022/23: from 29 November to 22 December 2022, then from 17 to 30 January 2023. Three other one-off instances of South-North congestion were also encountered in February and March 2023.



2.2 Consequences

The TSOs have activated all the mechanisms provided for under TRF to manage this unprecedented situation:

- Stopping sales of daily capacities from France to Germany (almost 4 TWh not sold)
- Cutting interruptible entry capacity at Pirineos and transport UIOLI at the Lussagnet withdrawal facility
- Triggering of the locational spread (1-6 calls per day for a total volume of 5.1 TWh and a cost of €54.6 million)
- The mutualised restriction was triggered on 16 occasions (compared to twice in four years since 2018), cutting customers' intraday firm capacities at entry points upstream of the bottleneck. It should be noted that this mechanism of last resort was frequently triggered in December 2022. However, it was not needed for the rest of the winter to resolve congestion.



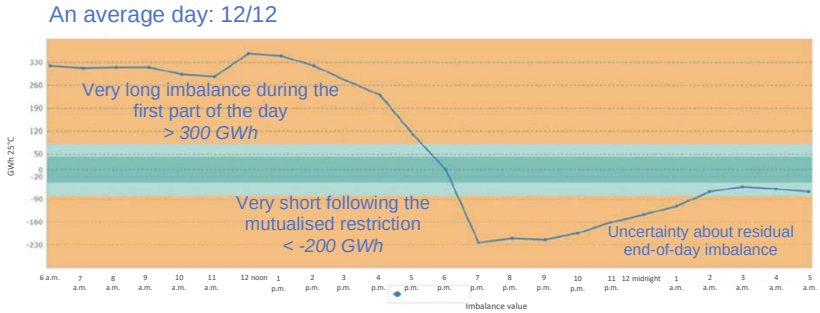
Focus on the December 2022 congestion:

The mutualised restrictions were applied with unusual strength and frequency. They fell outside of the framework initially provided for under TRF, with the following harmful consequences:

- For the market: capacity restrictions (see above) are more problematic as they are discovered at the last moment during the same gas day;
- For the gas infrastructure: strong and recurrent flow variations within the same gas day can damage structures (the transmission network, storage facilities and LNG terminals);
- For network balancing, with a risk to the continuity of supply to customers. The reduction in entry capacities during the day generates a significant gas deficit on TRF. This leads to a risk that the network ends the day in a "short" position, with the chances of customer rebalancing diminishing as the gas day proceeds;
- For the security of supply: physical gas entries in France are needed to guarantee the gas supply over the winter and limit the need to fill storage facilities the following summer.

Note that the mutualised restriction, despite being a mechanism of last resort for managing congestion, cannot be triggered late during the gas day without jeopardising the safety of the network and the continuity of supply to customers. The later the restriction is applied, the more the variations that put the infrastructures at risk are amplified, with options for rebalancing the system increasingly limited.

In addition, very significant imbalances (more than 200 GWh/d on average in the first part of the gas day, i.e. more than 10% of French consumption, and up to 400 GWh/d) were observed every day during the December 2022 congestion:



These very large imbalances have the following effects:

- On congestion management: they reduce the effectiveness of the locational spread mechanism to the extent that it cannot solve congestion within a reasonable timeframe. Even if the first call of the day is successful, congestion may increase during the day when customers are rebalanced (this was always the case in December). However, if congestion remains too high during the gas day, there is a risk that other calls to the locational spread will not be able to resolve it. Reasonable, prudent TSOs must trigger the mutualised restriction mechanism before it is too late, for the reasons explained above;
- On network balancing: due to these exceptional imbalances, and the significant fluctuation of these imbalances during the day in the event of a mutualised restriction, the TSOs are no longer able to ensure the residual balancing of the network using the balancing mechanisms at their disposal (e.g., the impossibility of selling gas in the morning when the network is in significant surplus, to avoid missing out on sales in the second part of the day in the event of a mutualised restriction);
- On the operability of the system: with customer delivery requests during the day clearly decorrelated from both the network capacities and their final delivery requests, the TSOs no longer have enough information to physically manage the network.

It should be noted that excessive imbalances of this level were not encountered until December 2022. For the rest of the winter, when intraday imbalances were smaller, and with the support of the measures implemented (see §2.3), localised spreads were able to resolve congestion without resorting to mutualised restrictions.

2.3 Measures previously implemented

The CRE, in its deliberation of 13 December 2022 (no. 2022-352), determined that the mutualised restriction applies as a priority for storage facility withdrawals (Atlantique and Lussagnet), so as not to constrain physical gas entries via Pirineos and the Fos and Montoir LNG terminals. This also protects the integrity of the LNG terminals.

➔ GRTgaz would like this measure to be extended. In this period of Russian crisis, it is essential to preserve physical gas entries in France, both to protect the balance in winter but also to limit the need to re-fill storage facilities in summer.

GRTgaz has also encouraged all shippers to participate in the locational spread to maximise its efficiency. New contracts were signed during the winter. The daily financial cap on the use of the locational spread has also been increased.

Finally, customers were contacted to encourage them to maximise their supply from the North, to participate in the locational spread, and to nominate in a balanced way from the start of the gas day.

3 Incidence of reaching South-North limits, associated issues, and desirable measures

3.1 Incidence of reaching South-North limits

GRTgaz carried out a study to assess whether the congestion seen in winter 2022/23 could happen again, or if it was exceptional. Different past winters (representing different weather conditions), corrected by the drop in consumption observed in recent months, were replayed by varying the shippers' entry points (LNG terminals, Pirineos and Dunkirk; the introduction of the FSRU of Le Havre was taken into account) as well as the storage levels reached at the end of the winter. The exit points are assumed to be used at their maximum capacities (apart from the Obergailbach exit point, where capacities were not sold on the market in the event of congestion).

Summary of assumptions and parameters:

Temperature	LNG terminal interface points (PITTM) and Pirineos usage rates	End of winter stock level / Dunkirk PIR
Cold winter (2010-11), mild winter (2018-19) or average winter (2017-18) with an impact on consumption (-20% for industrial customers, -13% for public distribution)	- Same average daily volume imported as in 22-23 (before the strikes): 1,150 GWh/d, or 73% use with Le Havre - OR 90% use % increased if necessary to protect the balance	Dunkirk - 500 GWh/d when consumption < 1700 GWh/d, -300 otherwise. Adjusted if necessary to: - Respect the end of winter gates (excluding 2023 increase) - OR reach 10% end-of-winter storage levels (Norwegian gas scenario not very available)
90% initial storage Alveringem and Oltingue exits at 100%		

The results for winter 23/24 are as follows:

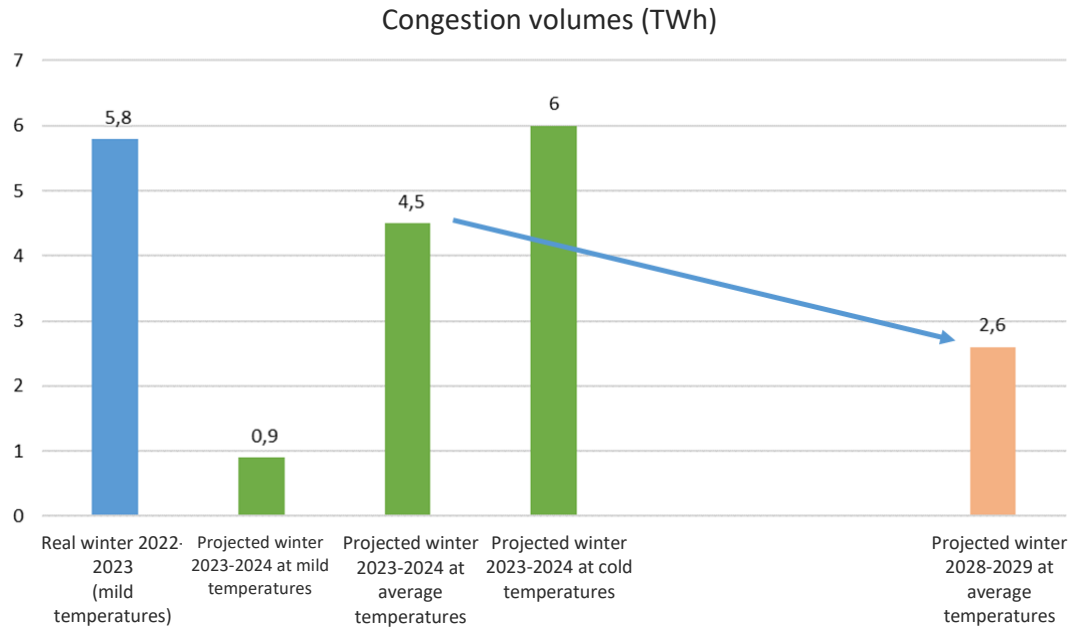
Winter	LNG and Pirineos	Max final storage	Final storage	Congestion Days	Congestion volume (GWh)	Max. congestion (GWh)	Average congestion (GWh)	No. of Rmut	Dunkirk average (GWh/d)
Cold	90%	Respect gates	7%	65	6,276	314	97	2	380
Cold	91%	Respect gates	10%	52	5,823	283	112	3	379
Average	90%	10% UV	10%	72	5,391	222	75	2	229
Average	90%	Respect gates	33%	39	4,648	190	119	0	411
Average	82%	Respect gates	18%	49	4,454	198	91	0	421
Average	82%	10% UV	10%	47	3,308	176	70	0	353
Mild	90%	Respect gates	41%	26	1,962	190	75	0	298
Mild	73%	10% UV	10%	27	1,551	125	57	0	326
Mild	73%	Respect gates	24%	18	837	125	46	0	433

(No.of Rmut = number of days where congestion exceeds 200 GWh/d)

It is thus possible to see 1-6 TWh of congestion, depending on the winter, with average winters generating around 4 TWh of congestion. The coldest winters cause the most congestion because they require high levels of LNG arrivals as well as significant withdrawals from storage facilities. Note that the 22/23 winter was somewhat mild, and that the simulations do not factor in the effect of the shippers' imbalance at the beginning of the day.

The associated cost will depend greatly on the unit cost of localised spreads, which will be higher as market spreads increase. The average cost for last winter was around €10/MWh (and less than €8/MWh in January).

So it is likely that these incidences of South-North congestion will recur at regular intervals in the coming years under this new flow configuration linked to the Russian crisis, despite the arrival of the FSRU in Le Havre, which is positioned favourably in relation to the limits. The frequency and volume of these congestions should nevertheless decrease on average over time due to falling French and European consumption and increasing biomethane production. We would therefore reach about 2-3 TWh/year of congestion for an average winter in 2028/29, without the FSRU in Le Havre:



These simulations were carried out based on scenarios with reduced consumption (226 TWh consumed excluding combined cycle gas turbines (CCGs) in 2028/29 for an average winter (and 27 TWh consumed by CCGs), which corresponds to the level consumed in winter 22/23, which was mild. The proportion of biomethane produced is 18 TWh for winter 28/29 (+14 TWh compared to winter 23/24). The use of LNG terminals is 80% (and the Le Havre terminal is disconnected), as in winter 22/23. Exits to Switzerland and Belgium are at their maximum, and exits to Germany are cut off. The balance is maintained for the Dunkirk PIR, whose average usage is 296 GWh/d over the winter. Despite the drop of more than 100 GWh/d for the Dunkirk PIR compared to winter 23/24, which offset part of the drop in consumption, congestion is decreasing because consumption is largely concentrated in the North of France, as follows:

- *Less gas needs to be transported to the North from storage facilities in the South;*
- *Biomethane is mainly produced in the North of France, and can therefore meet consumption needs without crossing into the congestion zone.*

3.2 Challenges

Measures are hence needed to improve the management of South-North congestion. The challenges are as follows:

- Maintaining the integrity of the gas installations;
- Ensuring the operability of TRF, by reducing imbalances during the gas day and resolving congestion earlier in the gas day;

- Guaranteeing the security of supply by allowing gas to enter at the borders, both in winter and in summer to fill storage facilities;
- Maximising the system's economic efficiency;
- Minimizing the impact on and uncertainty relating to customers' firm capacities.

3.3 Desirable measures

TRF was built to ensure sustainable North-South flow patterns by combining reasonable investments to improve North-South transport and mechanisms to manage residual congestion on the network. The cost of these mechanisms (North-South) had been estimated at around €15 million per year. In practice, however, it has been less than €1 million per year (except for the first year of TRF, when it was €7 million).

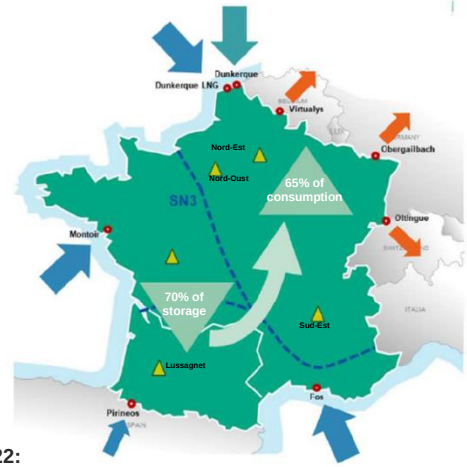
However, if the flow patterns are in the South-North direction, the size of the infrastructures makes them less able to fulfil the entire offer made to shippers, and congestion management costs could be much higher (up to €50 million/year in unfavourable cases: 6 TWh/year with an average locational spread cost of €8/MWh).

Creation of TRF:

- An optimised merger of zones combining reasonable investments and mechanisms to manage the network's residual congestion

Historical flow configuration:

- **North-South** flows resulting mainly from supplies from land entries in the North
- A congestion risk mainly in summer, during the storage injection campaign



Since 2022:

- New supply and export systems reconfigure flows within TRF.
- This exposes TRF to a risk of **South-North** congestion, mainly in winter

There are three ways to manage this change of flow direction:

- Investments: strengthen the network to transport more gas from the South to the North;
- Reduce the capacity offer (at entry points upstream of the limits – to the South – or at exit points downstream – to the North);
- Maintain the capacity offer and optimise decongestion mechanisms to manage limits.

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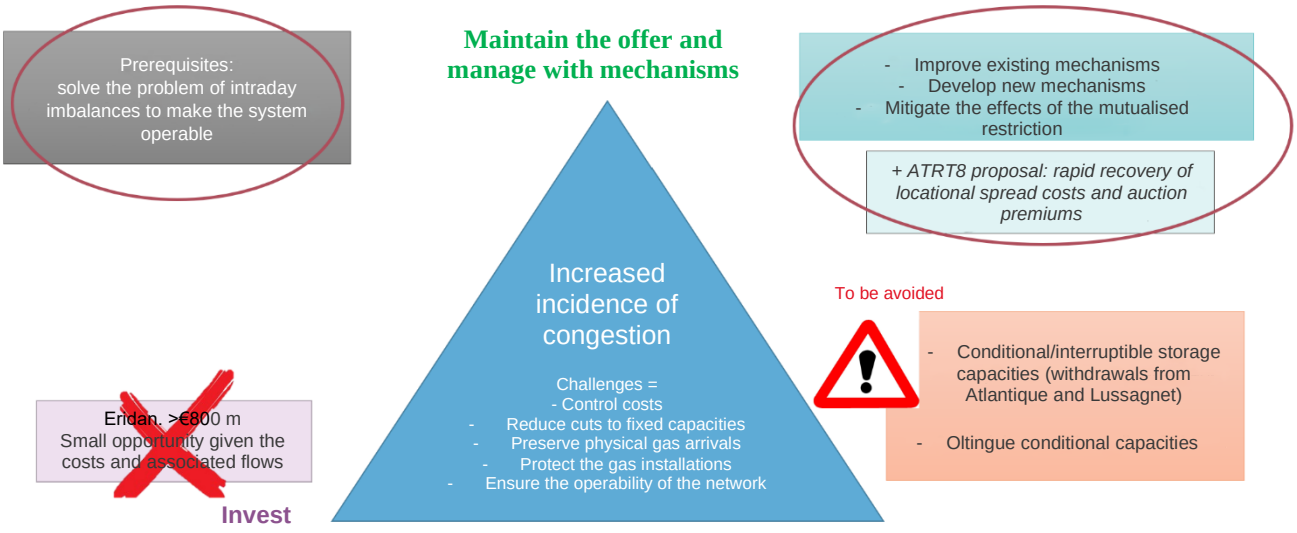


Invest

Reduce capacity offer

The network strengthening measures needed to increase South-North transport are as follows:

- The Eridan project with a 1,050 mm-diameter pipeline: the cost is in the order of €800 million (+20% if H2 ready), for 125 GWh/d of additional transport (this does not resolve all congestion scenarios);
- To transport up to an extra 300 GWh/d, Eridan should be completed using 1,200 mm-diameter pipelines, with either the Est Lyonnais project (total investments: €1.4 bn; H2 ready) or by adding a compression station to the existing Est Lyonnais pipeline (total investment: more than €1 bn). This would resolve most South-North congestion situations.

Network-strengthening projects such as this take six to seven years to complete (so would not ready before 2030, while congestion will have decreased by that time). However, investment costs would far exceed the costs avoided in dealing with the congestion. So these investments do not seem desirable on grounds of both time and economics.

Reduce the capacity offer

Reduce downstream capacity offer: this would involve cutting firm exits in the event of congestion (i.e. making these firm capacities conditional – they can be cut in the event of congestion). In winter, this would mainly affect the Virtualys and Oltingue exits. However, this would not completely solve the problem, particularly if the corresponding gas came from entry points downstream of the limit (e.g. Dunkirk, Le Havre, etc.).

Reduce upstream capacity offer: this would involve cutting firm entrances in the event of congestion, excluding the entry points bringing physical gas to France, which are vital for the security of French supply. This would thus entail cutting withdrawals from the Atlantique and Lussagnet storage facilities in the event of congestion.

- In principle, this measure would be more effective than the previous, as the volumes are larger and most of these withdrawals are used to supply consumption centres or exit points to the North. They hence cross into the congestion zone and create congestion. If these entrances are cut, customers will mainly rebalance downstream of the congestion (upstream, this would be possible mainly for Pirineos, with the intraday flexibility of Fos and Montoir being limited);

- This measure would only anticipate movements that are in any case carried out during the gas day via responses to the locational spread. Shippers are essentially responding to the upstream locational spread for Atlantique and Lussagnet. The difference is that these movements would not be on a voluntary basis, and that shippers would not be compensated.
- The measure would therefore constitute an economic loss for shippers, which they could pass on via their storage auction bids. The attractiveness of the Lussagnet and Atlantique storage facilities would therefore be reduced, and storage compensation should increase.

This solution to convert the withdrawal capacities of Atlantique and Lussagnet into "conditional firm" capacities (i.e. cut in the event of congestion) would therefore be effective. However, it could also impede the attractiveness of these storage facilities, making it difficult to assess the economic balance.

For next winter, we hence propose not reducing the capacity offer but rather working to maximise the effectiveness of the decongestion mechanisms. Feedback can be given at the end of next winter to assess whether these measures are sufficient or whether supply needs to be reduced.

Improve decongestion mechanisms

For next winter, GRTgaz proposes improving the decongestion mechanisms by:

- Improving the existing mechanisms: in particular, by maximising the efficiency of the locational spread (introduction of UIOLI on the Dunkirk PIR) and by interrupting sales and interruptible capacity on both sides of the South-North limits);
- Creating new mechanisms: storage swap;
- Mitigating the effects of the mutualised restriction: creating a new {Atlantique + Lussagnet} superpoint to give customers more flexibility; and, in the event of recurring mutualised restrictions, the use of anticipated restriction as a last resort to protect the integrity of the installations and the system's operability.

These measures should maximise the system's economic efficiency. However, congestion management costs may remain high for some years. We therefore propose (see GRTgaz's ATRT8 file) a rapid (monthly) recovery of congestion management costs and auction premiums, which will benefit both TSOs and shippers.

Priority must also be given to solving the problem of significant imbalances observed during the gas day, which leave the system difficult to operate and make the mechanisms less effective.

4 Reduction of intraday imbalances

4.1 Interrupt "storage UIOLI" for withdrawals upstream of South-North congestion

One of the causes of the extensive imbalances observed during the first part of the gas day is the behaviour of some shippers, who withdraw heavily from storage at the beginning of the day – at levels beyond their rights - under the UIOLI offered by the storage facility – and wait to have these withdrawn volumes secured via UIOLI before selling them to the PEG. They are therefore "long" on their quantities scheduled under TRF at the start of the gas day, and for as long as they have not rebalanced with the PEG.

This phenomenon is accentuated in the storage facilities affected by the mutualised restriction when the use of this mechanism becomes recurrent, as some storage customers anticipate a possible mutualised restriction during the current day and seek to maximise the quantities withdrawn before the restriction is triggered – also beyond their rights, if possible – but without balancing themselves for the other points of their portfolio (physical points or PEG).

GRTgaz observed this phenomenon on its network upstream of the congestion on the Atlantique transport storage interface points (PITS), with strong withdrawal nominations at the beginning of the day, including a part scheduled using UIOLI, dropping off significantly in the second part of the day.

Given the high level of storage capacities upstream of the South-North limits (nominal capacities – excluding the reduction factor – in the order of 550 GWh/d for Lussagnet and more than 600 GWh/d for Atlantique), the volumes of unused subscribed capacities for these storage facilities, accessible via UIOLI, may be significant.

The quantities scheduled for withdrawal under UIOLI upstream of the congestion hence have the dual effect of:

- Increasing congestion;
- Generating a TRF imbalance, due to the nature of UIOLI and the behaviour of the shippers using it, making the decongestion mechanism less effective. Interrupting UIOLI to restore the effectiveness of these mechanisms is hence a necessary measure.

Proposed solution

GRTgaz proposes that UIOLI for storage withdrawals should be completely interrupted under the following conditions:

- In the event of South-North congestion (the procedures for managing North-South congestion are not in question, having worked properly since the creation of TRF);
- Upstream of the congestion limit – i.e. for Lussagnet in the event of congestion at the SN1 limit, and for Lussagnet and Atlantique in the event of congestion at the SN3 limit – it is hence necessary to interrupt only the quantities of UIOLI that both generate an imbalance and accentuate the congestion (the downstream UIOLI, which helps to reduce congestion, is not interrupted).

This entails the following changes to the way the system currently operates:

- For Atlantique storage:

  No action is currently in place for withdrawing this storage in the event of congestion.

  If ad hoc IS changes can be implemented by Storengy (then also by modifying the GRTgaz IS), the interruption of storage UIOLI may be triggered when the South-North congestion alert level changes to red (on Day D-1 or intraday).

  Otherwise, or to implement the measure in a short period of time, the interruption of storage UIOLI must be decided by GRTgaz and communicated to Storengy before 1 p.m. on Day D-1, in order to be compatible with the existing IS. It will then be determined on the basis of the projected congestion at that time for the next day. GRTgaz proposes using the same criterion as that already used to strengthen the interruptible capacities or the sales of daily France-Germany capacities, i.e. an interruption of storage UIOLI in

the event of an orange or red alert level on one of the South-North limits of the French network before 1 p.m. on Day D-1.

- For Lussagnet storage:

  Teréga already interrupts "transport UIOLI" (UIOLI allocated to the PITS by the carrier for the quantities scheduled for a customer beyond its subscribed transport capacity) as soon as South-North congestion reaches the red alert level, if the de-congestion mechanisms – and in particular, the non-marketing of unsubscribed capacities – apply upstream of the limit on that day.

  It will now be a question of interrupting the entire "storage UIOLI" (UIOLI allocated under the storage offer for the quantities scheduled for a customer beyond their storage rights), regardless of the side of the limit on which the decongestion mechanisms apply.

Costs and benefits

Implementing this measure for Atlantique does not require any IS development, only a change in GRTgaz's and Storengy's operating processes.

From a commercial standpoint, it represents a loss of revenue for GRTgaz (corresponding to the UIOLI capacities not allocated on the Atlantique PITS), and a loss of flexibility for users of the affected storage products. These losses will nevertheless be limited to the incidence of South-North congestion, and very low in comparison with the consequences of maintaining UIOLI for dealing with congestion (SL costs, restriction of firm capacities on these same storage facilities).

The main benefit for customers is to reduce the imbalance seen at the start of the day during periods of congestion, and hence maximise the efficiency of the locational spread and reduce the incidence of mutualised restrictions. This reduction in intraday imbalances will also lead to better operational management of the network by TSOs.

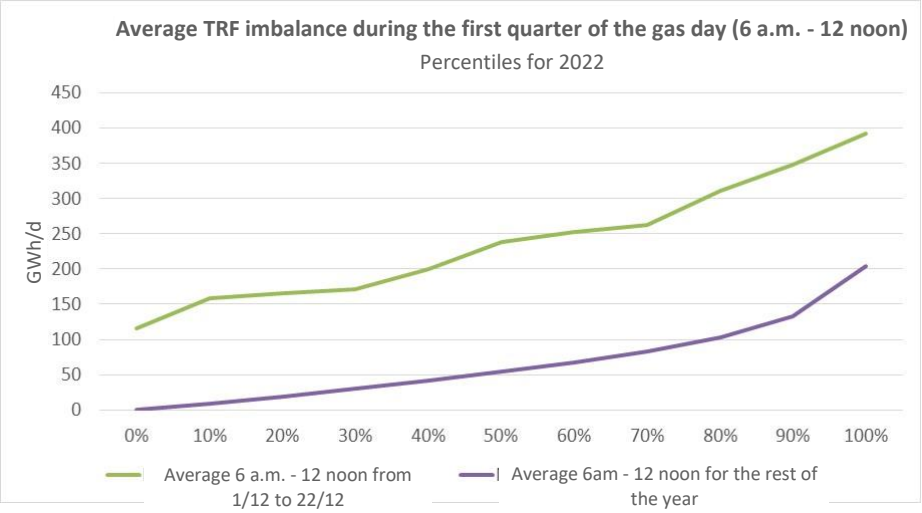
To assess the potential of this measure on the Atlantique PITS, GRTgaz assessed the quantities scheduled at the start of the gas day beyond the subscribed transmission capacities. In a sense, this represents the "transport UIOLI" used at the time, bearing in mind that the share of "storage UIOLI" is higher when the reduction factor applied under the storage offer limits the customer storage rights compared to the nominal level subscribed on the transport side. The volume of these scheduled quantities beyond the subscribed transmission capacities over 14 days are between 30- 90 GWh, and 50 GWh on average. The interruption of "storage UIOLI" would be for a higher volume, which only the storage facility operators can assess. It should constitute a significant part of the intraday imbalance reductions.

4.2 Encourage shippers to take responsibility for balancing

To put the imbalance level observed in December 2022 into perspective, we can note that:

- From 1- 22 December, the average TRF imbalance observed over the first quarter of the gas day was greater than 150 GWh/d, 95% of the time, with an average of 240 GWh/d and a maximum of nearly 400 GWh/d (representing around 20% of consumption in the TRF zone);

- This is compared to an average value of 65 GWh/d for the rest of 2022, and less than 150 GWh/d, 92% of the time.



GRTgaz considers that the exceptional level of imbalances seen in December 2022 reflects the failure of certain shippers to fulfil their responsibility for balancing the network. Note that in accordance with the European Code on Gas Balancing of Transmission Networks, "network users are responsible for balancing their portfolios to minimize the number of balancing actions carried out by the transmission system operators under this regulation" (Article 4).

Proposed solution

GRTgaz considers that the present intraday imbalances are largely proportional to the network's physical capacities, and that offering this flexibility to the market is desirable. Consequently, there are no short-term plans to change the balancing rules in France.

Nevertheless, the abusive use of this tolerance, as seen in December 2022, with risks for the continuity of supply and distribution, cannot be accepted. The condition for maintaining the current balancing system is therefore that all shippers fulfil their responsibility to balance their portfolio. To this end, GRTgaz proposes:

- That this balancing responsibility is reinforced by a CRE deliberation and in the TSOs' distribution contract;
- Increased monitoring of individual imbalances, with the TSOs sending the CRE market monitoring information relating to shippers' individual behaviour.

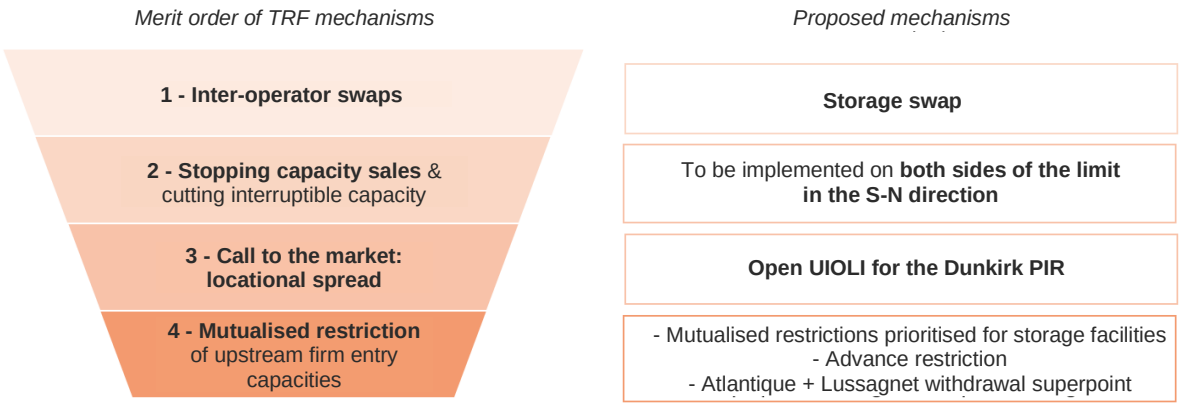
However, if excessive intraday imbalances were encountered again in the future, additional measures should be implemented to deter this behaviour.

In particular, the European Code on Gas Balancing of Transmission Networks gives TSOs the option to apply intraday balancing obligations, with the aim of "encouraging network users to manage their intraday position in a way that guarantees the integrity of the system in its transmission network, and to minimise the need for balancing actions" (Article 24). For shippers, this intraday obligation may, for example, take the form of an incentive to be balanced in line with their balancing portfolio, with the application of a fee based on their individual intraday position.

Following an initial feasibility study, GRTgaz put this option on hold, as it implies an in-depth overhaul of the French balancing system. This would have consequences for all shippers' balancing operations. It would also require significant changes to the processes and ISs of both TSOs and their customers, to manage cases that remain exceptional.

5 Improve decongestion mechanisms

GRTgaz proposes optimising the entire chain of mechanisms planned to manage congestion. This would involve both improving the efficiency of existing mechanisms for South-North congestion and creating new mechanisms:

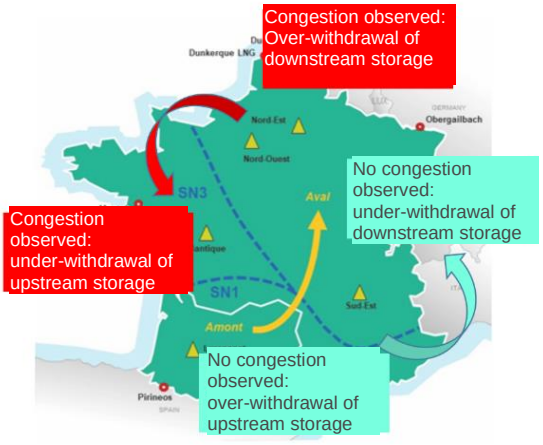


5.1 Storage swaps

The storage swap is a new mechanism that would be triggered, in the same way as for other inter-operator swaps, prior to the other mechanisms. It would be transparent to the market and implemented by transmission and storage operators to reduce the market impact of South-North congestion.

Proposed solution

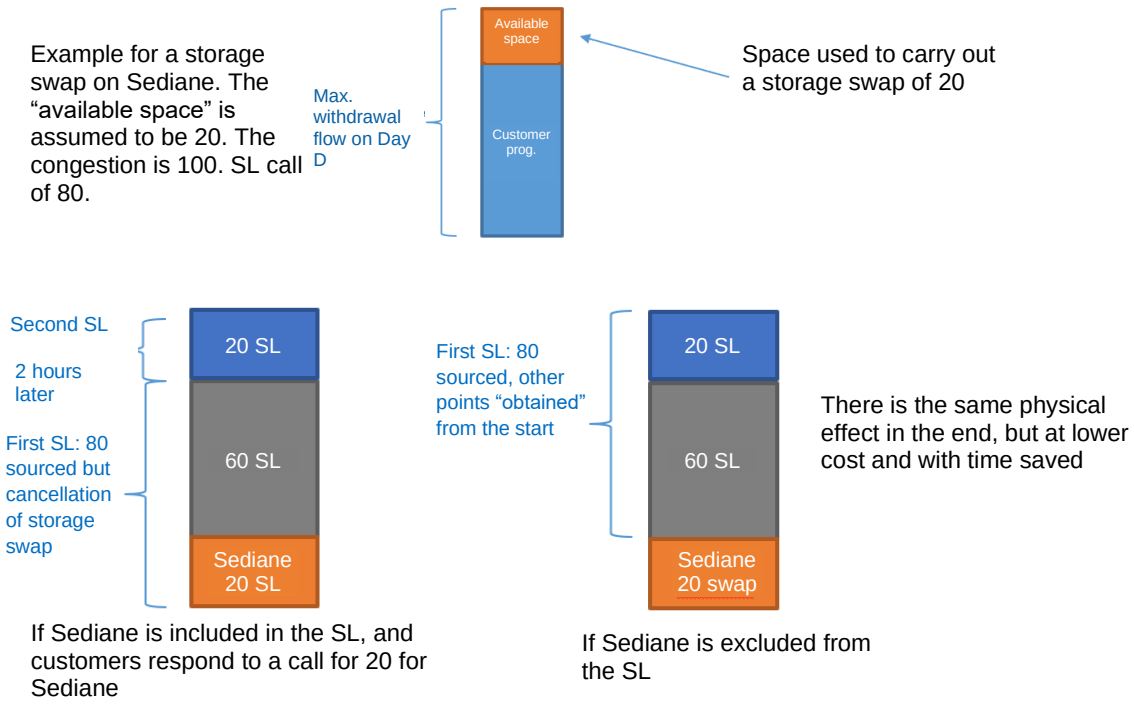
The storage swap would involve moving customers' storage to reduce congestion: an "advance withdrawal" should be made at the beginning of the winter, outside of the congestion period, via an over-withdrawal of the upstream storage (to the South) and an under-withdrawal of the downstream storage (to the North). At times of congestion, the opposite movement would be used to create a counter-flow, relieving the bottleneck.



These movements would therefore correspond to a physical movement that is transparent to the market, generating a difference between the actual physical stored gas and the customers' stored gas located at a given facility. The storage swap must not jeopardise the fulfilment of storage operators' offers, with each storage operator being able to guarantee

its offer regardless of the level of stored gas moved. In addition, the storage swap occurs "after" the storage offer is made. Customer nominations or the optimisation of storage operators' movements are therefore a priority, and the storage swap is interruptible, including intraday.

Advance withdrawals (when there is no congestion) can only be made if the storage facilities in the North are not full. The daily and cumulative quantities must be set each day with the storage operators.
In the event of congestion, the mechanism would be activated on Day D-1 for Day D, prior to the other mechanisms. To guarantee its usefulness and avoid "spoiling" it, however, this mechanism would be reserved for "significant" incidences of congestion. For example, the storage swap should not replace cutting interruptible capacity. It would hence not be used if cutting interruptible capacity would be sufficient to resolve the congestion.
In addition, if intraday customer re-nominations no longer allow for the swap to be made (e.g., following participation in the locational spread), the swap would be cancelled, triggering the launch of another locational spread. To avoid this happening after a locational spread, GRTgaz proposes that, in cases where the storage swap would "use" a significant portion of the withdrawal capacities available for an SN3-limit downstream PITS, this PITS should not be included in the locational spreads for the day. This provision is only envisaged for PITS downstream of the SN3 limit. In fact, only the over-withdrawal of the SN3-limit downstream storage facilities could be limited; it would always be possible to under-withdraw from upstream storage facilities. This would optimise the mechanisms, with the storage swap leading to an initial counter-flow using a PITS, and the locational spread supplementing the quantities for the other points not accessible via the storage swap.



At the end of winter, it will be a question of resorting to the advance withdrawal, which seems feasible as it creates a movement in the opposite direction to the congestion.

Costs and benefits

Benefits	Costs and risks
SL cost reduction and RMUT risk reduction: - Assessment based on last winter: at max 0.5-1 TWh less SL volume, i.e. 15-30% of SLs - (reminder: 5 TWh winter congestion for 22/23, average cost of €10/MWh; up to 6 TWh possible) Depends in particular on the option to advance withdraw from November (limited by the space available in the North). Optimisation/smoothing of intraday storage movements	Operating expenses for storage facility over-cycling or under-cycling: 0.3 to 0.4 €/MWh of stored gas moved in both directions (i.e. to be paid for only once). To be included in congestion management costs (same as SL) IT costs for TSOs Non-fulfilment of the storage operator's offer: risk controlled as the storage swap is sized in such a way as to keep it feasible.

Simulations were carried out between TSOs and storage operators to assess potential savings for the locational spread via the storage swap mechanism. The estimated gain was around 15-30% (0.5 -1 TWh less localised spreads), excluding the operational optimisation of storage facilities and customer re-nominations (which are a priority). However, this estimate was made based on historical data from winter 2022/23, where no advance withdrawal was possible in November as storage facilities in the North were full.

The potential gains are therefore uncertain. But the costs and risks are low. The main costs would be those of over- and under-cycling the storage facilities, which the storage operators would pass on to the TSOs, and which would be integrated into the cost of managing congestion in the same way as the locational spread. It hence seems appropriate to test this mechanism, the benefits of which will vary from one year to the next. GRTgaz thus proposes carrying out an experiment for winter 23/24.

The question arises as to whether or not to include the Lussagnet storage facility in this experiment. Including Lussagnet means operating the mechanism with two storage operators, incurring the legal risks of customers moving gas from one storage operator to another, as well as operational complexity. On the other hand, studies by Storengy show that it is the storage facilities in the North (downstream of SN3) that are limiting, and not those in the South (having Lussagnet in addition to Atlantique is hence not essential for the workings of the storage swap). Finally, Atlantique is certainly downstream of SN1, but it is upstream of SN3, which was the most restrictive limit last winter. Insofar as the Atlantique storage facility seems sufficient for the storage swap, we propose launching the experiment using only the Storengy facilities for the first winter. Depending on the feedback, we can then consider extending it, if appropriate.

5.2 Stopping sales and cutting interruptible capacity: application on both sides of the limit in the event of South-North congestion

The Merit Order for decongestion mechanisms provides that several actions are triggered in the event of congestion (change in the alert level to red), prior to the use of the locational spread. These include:

- The interruption of so-called "short-term" interruptible capacities, i.e. those not confirmed on Day D-1 at 2 p.m. but which remain interruptible at any time on Day D-1

and Day D. This affects Teréga's Pirineos point and GRTgaz's reverse flow capacities (Virtualys and Obergailbach reverse flow facilities);

- Interruption of exit capacities at the PITS beyond the nominal levels decided by the CRE, i.e. the interruptible injection capacities at the PITS;
- The non-marketing of available firm capacities, including stopping sales and the non-activation of Use-it-and-Buy-It (UBI)-type mechanisms.

These mechanisms are only triggered on one side of the limit experiencing congestion:

- Either upstream: they apply to upstream entry points;
- Or downstream: they apply to downstream exit points.

The side on which these applications are applied is set each day according to France's consumption levels.

Proposed solution

In the case of South-North congestion, to avoid worsening the level of congestion that would have to be resolved via the locational spread, the proposed mechanism is to stop sales and systematically cut interruptible capacity on both sides of the limit.

The procedures for applying this mechanism in the event of North-South congestion are not in question. They have worked properly since the creation of TRF. In addition, the configuration of the network entry/exit points on either side of the North-South and South-North limits is different. The widespread application of the proposed measure to North-South congestion would risk disproportionately penalising the system.

In the case of South-North congestion, the mechanism would be applied systematically for all of the following points:

	SN1 Congestion	**SN3 Congestion**
Interruption of "short-term" interruptible capacities	Entries: Pirineos Exits: Virtualys and Obergailbach reverse flow facilities	
Interruption of interruptible PITS exit capacities	Exits: Nord-Est, Nord-Ouest, Sud-Est, Atlantique	Exits: Nord-Est, Nord-Ouest, Sud-Est
Sales stopped, UBI not activated	Entries: Pirineos Exits: Virtualys, Obergailbach and Oltingue	

The deadline for completing the necessary operator IS modifications is yet to be assessed. An implementation date should be set as soon as possible.

Costs and benefits

Compared to the current workings, where decongestion mechanisms are triggered:

- Always upstream in case of SN1 congestion,
- Most often upstream in case of SN3 congestion (downstream application can only occur in summer, excluding cases of works on the limit),

the additional impacts of the measure will hence mainly affect:

- Virtualys, Obergailbach and Oltingue exit capacities;
- Exit capacities on the GRTgaz PITSs.

This measure aims to limit the use of downstream exits for previously subscribed firm capacities, to avoid additional locational spread costs.

If this measure is not implemented, additional congestion could be generated:

- If daily exit capacity remains available (e.g. at the Oltingue exit point, to date, only 205 out of 260 GWh/d have been subscribed by the end of 2023), their daily or intraday sale would worsen congestion, which is not desirable;
- If capacity is fully subscribed, introducing UBI would also worsen congestion. This mechanism led to exit flows at Oltingue of up to 47 GWh/d in 2022, and up to 15 GWh/d during winter 2022-23.
- Given the volatility of Virtualys nominations, reverse flow capacities could also be made available at this point (which may represent a few dozen GWh according to 2022 data).

In rare instances, the measure could also have effects on injection into the storage facilities. This is then rather a case of summer congestion, whereby the storage facilities would be oriented towards injection and supplied mainly from the South of the network, with limited supplies from the North (in particular, when maintenance work is being carried out on the Northern entry points). In this case, it seems appropriate to limit injections to the levels decided by the CRE, namely (figures in force according to deliberation No. 2021-274 of 16 September 2021):

PITS	Firm exit capacity in GWh/d
Nord B	115
Nord-Ouest	165
Nord-Est	130
Sud-Est	145
Atlantique	340
Sud-Ouest	300

Given the current subscription levels for 2023, this would represent around 30 GWh/d of interruptible capacity for Atlantique and 10 GWh/d for Nord-Est.

Under conditions where congestion levels are potentially high, the benefits appear to outweigh the impacts for shippers (less availability of their interruptible capacities) or even for GRTgaz (loss of income linked to UBI). Bear in mind, however, that this measure will only be effective in cases where the entries corresponding to these exits are located upstream.
Implementing this measure will involve IS developments that seem limited to date. However, the impact requires further examination.

5.3 Introduce UIOLI on the Dunkirk PIR to maximise the effect of the locational spread

Customers traditionally respond to the locational spread as a priority for storage facilities, which offer more flexibility. But it is also important that shippers respond for PIRs. On the one hand, this increases competition and hence the chance of lower prices. On the other, it gives rise to physical gas entries and protects storage levels in the North of France (following the actions launched by GRTgaz last winter, new customers also present on PIRs have taken out locational spread contracts).

However, the incompatibility between the intraday Prisma sales schedule and the necessary nomination schedule following participation in the locational spread can hinder the latter's effectiveness for PIRs. For example, for a locational spread launched at 9 a.m., the customer knows that their offer is accepted after 9:30 a.m. for a necessary re-nomination before 10 a.m. If the customer does not already have the corresponding capacity, they must purchase it at Prisma auctions from 10 a.m. to 10:30 a.m. They can then nominate it for the cycle starting at 12 noon. There is hence a two-hour gap with the time required for the locational spread. Some customers take the risk of buying capacity the day before. They are betting on the fact that there will be a locational spread and on the volume requested of them. For others, however, the risk is too high, and this prevents them from participating in the locational spread on the PIRs.

Proposed solution

GRTgaz proposes that in the event of a locational spread on the South-North limits, UIOLI should be introduced for the Dunkirk PIR (and intraday sales on Prisma closed). This would allow shippers to access capacity directly by over-nomination from the next cycle. This measure cannot be proposed for the other PIRs, which are Capacity Allocation Mechanism (CAM) points (i.e. they , must comply with the network code on capacity allocation).

This measure could be implemented automatically after an IT development, within several months of the CRE publishing its deliberation. In the meantime, this would require manual operations each time a locational spread is launched, which could not be done automatically. UIOLI would therefore be introduced from the first locational spread (following the CRE's deliberation) until 31 March 2024 (or earlier if the IS development is ready beforehand). Intraday Prisma sales would be closed during this period. But daily Prisma sales would be maintained.

Costs and benefits

This measure requires IT development at GRTgaz. For shipper customers, introducing UIOLI implies that capacity purchased intraday would no longer be firm but interruptible. However, the probability of interruption seems low, as the available capacity is significant given the low flows in Dunkirk.

The main benefit is to improve the efficiency of the locational spread and to generate physical gas entries in France, preserving storage levels in the North.

5.4 Anticipated restriction as a last resort

As explained above, repeated mutualised restrictions applied during the gas day are extremely problematic, for shippers and gas operators alike. In particular, they threaten the integrity of the gas installations and make TRF difficult to operate.

In cases where the mutualised restrictions apply every day, despite all previous measures, GRTgaz therefore proposes a last resort solution aimed at avoiding unmanageable situations such as those seen in December 2022.

Proposed solution

GRTgaz proposes that an "anticipated restriction" is triggered if mutualised restrictions are in place for five consecutive days:

- The market would be informed that the TSOs are switching to congestion management mode via anticipated restrictions, for as long as the system remains congested;
- A restriction would be applied for the next day, according to the usual rules, on Day D at 2 p.m. for Day D+1. The capacity available for the day would be the same as under mutualised restriction, with the same distribution defined by CRE deliberation No. 2022-352: priority restriction of the Atlantique and Lussagnet storage facilities;
- At the same time, in the event of continued anticipated restriction, shippers would be given visibility of the possible restriction rates over the coming days (rates that depend in particular on the consumption level and LNG entries at Montoir and Fos);
- As soon as the Day D+1 alert level returns to green, the restriction would not be applied for the following day. The system would switch back to its usual congestion management mode.

Specifically, if we replay this solution for the month of December: five consecutive days of mutualised restriction were observed from 5-9 December. This means that an anticipated restriction would have been applied to upstream entries from 10 December for the gas day of 11 December, and remained in place until 22 December (i.e. 12 days of anticipated restriction).

	Alert level	Cut interruptible capacity/UIOLI and stop sales	Locational spread	Mutualised restriction
02/12/2022		Yes	Yes	Yes
03/12/2022		Yes	Yes	No
04/12/2022		Yes	Yes	No
05/12/2022		Yes	Yes	Yes
06/12/2022		Yes	Yes	Yes
07/12/2022		Yes	Yes	Yes
08/12/2022		Yes	Yes	Yes
09/12/2022		Yes	Yes	Yes
10/12/2022		Yes	Yes	Yes
11/12/2022		Yes	Yes	Yes
12/12/2022		Yes	Yes	Yes
13/12/2022		Yes	Yes	Yes
14/12/2022		Yes	Yes	No
15/12/2022		Yes	Yes	Yes
16/12/2022		Yes	Yes	Yes
17/12/2022		Yes	Yes	Yes
18/12/2022		Yes	Yes	Yes
19/12/2022		Yes	Yes	Yes
20/12/2022		Yes	Yes	Yes
21/12/2022		Yes	Yes	No
22/12/2022		Yes	Yes	No

Costs and benefits

Admittedly, this solution presents a disadvantage for shipper customers, as all customers are directly constrained. Under the locational spread, however, reductions can be made on a voluntary basis for those for whom it costs the least. However, the anticipated restriction was triggered precisely because the locational spread had formerly proved ineffective for five consecutive days.

On the other hand, the anticipated restriction's main benefit is that it gives customers visibility. By having an anticipated view of the available capacities, customers can anticipate other supplies and generate physical gas entries in the North. This measure hence benefits the security of supply.

Furthermore, the capacity available for the gas day for both anticipated restriction and mutualised restriction remains the same. It is the distribution of this capacity between the different shippers that changes:

- for mutualised restriction: shippers who nominate the most during the hours preceding the restriction being triggered (those that trigger the imbalance and congestion, and thus damage the system) obtain the most capacity;
- for anticipated restriction: the capacity is evenly distributed among all shippers.

The hourly restriction rate is also lower in the case of anticipated restriction. This is because the mutualised restriction is applied for fewer hours, and must compensate the quantities nominated beyond the bottleneck during the first hours of the day.

From a network perspective, the anticipated restriction preserves the integrity of the structures and guarantees the operability of TRF, both in terms of managing imbalances (which will return to a reasonable level) and the risk to the continuity of supply.

Finally, it is likely that this last resort solution will be triggered only rarely, and for a shorter period than would have been seen in December 2022 (12 days). The measures proposed should increase the effectiveness of the TRF mechanisms.

5.5 Creation of a {Lussagnet + Atlantique} superpoint upstream of the South-North limits

A superpoint upstream of the South-North limits would make it possible to pool the restriction constraint across several entry points upstream of these limits. It would also provide the following flexibilities:

- Flexibility for the distribution of available capacities between the superpoint's various points, for customers with capacities on several of these points;
- The possibility for all shippers to access the available unused capacities on these points (UIOLI superpoint);
- Optimisation of available capacities via "bonuses": exit movements (i.e. upstream of the South-North limits, injections to PITSs, or exports from France to Spain) increase the availability of restricted entries.

Plans are hence in place for the creation of a superpoint. However, there is the question of its configuration. Two configurations were compared:

- Option 1: creation of a superpoint comprising both Lussagnet and Atlantique PITSs, which would be activated in the event of a mutualised restriction applied upstream of SN3;
- Option 2: creation of an "upstream SN3" superpoint comprising Lussagnet, Atlantique and Pirineos, and an "upstream SN1" superpoint comprising Lussagnet and Pirineos. Under this structure, differentiated restriction rates would be applied to PITS, on the one hand, and to Pirineos on the other.

Note that the Fos and Montoir PITTMs cannot be integrated into a superpoint, as customers cannot alter their nominations during the day.

As a reminder, regarding the principles for setting the restrictions for the various entry points upstream of the limit:

- The application of a restriction, with or without a superpoint, normally ensures fair treatment for the various entry points, i.e. a uniform restriction rate for subscribed capacities;
- In the case of South-North congestion, the CRE, in its deliberation no. 2022-352 of 13/12/2022, provided for differentiated restriction rates, with priority restriction of

storage facility withdrawals (up to the technical minimum of these storage facilities) compared to the other entry points;

- In the case of South-North congestion in summer (with injection to storage facilities), and following the same logic, the restriction would be applied first to storage facility withdrawals, up to 100% restriction, before limiting the other entry points.

Comparison of the two options

Functionally, Option 1 (creating a superpoint comprised of just the two PITSs) guarantees that the capacities of the two PITSs and Pirineos remain airtight. Meanwhile, the alternative of a superpoint {Atlantique + Lussagnet + Pirineos} (Option 2) allows a transfer of capacities between the two types of point, which hence favours storage facility withdrawals to the detriment of Pirineos entries. It thus runs contrary to the principles of CRE deliberation no. 2022-352, which aims to preserve gas arrivals at the borders with the aim of securing France's gas supply. Option 2 can therefore only be considered insofar as use cases in winter remain occasional, and will in all cases require an adjustment to the principles of the aforementioned deliberation.

However, Option 2 optimises the use of the capacities available upstream of the South-North limits. These capacity optimisation gains compared to Option 1 are mainly in summer, when injection nominations reduce constraints at the Pirineos entry point. In winter, the benefit sought from creating a superpoint is in the flexibility it offers by spreading the restriction across the two storage facilities, which is useful in light of their very different characteristics. Options 1 and 2 both meet this need.

Option 2 is also likely to produce additional complexity for shippers, both in terms of:

- understanding the workings of the superpoint, which would be a unique case compared to existing superpoints with the introduction of a differentiated restriction rate; and
- IS developments, with the integration of two superpoints (for upstream SN1 and upstream SN3, respectively) instead of one.

GRTgaz's position

The choice of configuration for the superpoint should be made in light of the envisaged use cases. Insofar as there are no plans to apply capacity restrictions upstream of the South-North limits for works (see §6.1), the superpoint would only be activated in the event of a mutualised restriction. The mutualised restriction is a mechanism of last resort that must be used sparingly. All the proposals contained in this document must contribute to ensuring this. Its use must be especially rare in summer, where the risks of South-North congestion are fewer and the levels of congestion lower.

GRTgaz compared the IS developments associated with the two options, bearing in mind that they must remain proportionate to the envisaged use cases. A solution is being examined with Teréga, which would lead to limited, similar developments for GRTgaz under the two proposed options. If the feasibility of this solution is not confirmed, Option 2 would entail some major IS developments for GRTgaz that are absolutely not justified given the very low probability that the situation occurs.

GRTgaz recommends the creation of a superpoint, subject to confirmation of the feasibility of the IS solution being studied. However, it does not make any recommendation on the

preferred configuration, and would like to know market stakeholders' opinions about the two options presented. The benefits and disadvantages presented above must be assessed in light of the mentioned use cases, both in functional terms and with regard to complexity for shippers.

The deadline for completing the necessary operator IS modifications is yet to be assessed. An implementation date should be set as soon as possible.

6 Other measures

6.1 Managing maintenance impacts on the South-North limits without capacity restrictions

The new TRF flow patterns observed since early 2022, with a significant share of LNG imports and the use of the Pirineos point for imports from Spain, also change the network's summer flow patterns. Previously, these were heavily weighted in the North-South direction. Now, flows in summer are more mixed – either North-South or South-North, depending on the days (according to the shippers chosen nominations) and the network zones (South-North flows are seen more in the Southern part of the network).

This new trend raises questions about the risks of reaching the South-North limits in summer, in particular during periods when these limits are impaired due to maintenance operations, and the procedures for managing the impacts of this maintenance work.

As a reminder, the TRF operating framework provides for the following maintenance operations that impair the residual limits of TRF:

- In the event of an impact lower than a "small maintenance threshold" set by the CRE, any congestion on these limits is handled using TRF de-congestion mechanisms;
- In the event of a greater impact, maintenance operations are subject to capacity restrictions that will limit the risk of congestion to borderline cases.

These capacity restrictions are then applied:

- Preferentially, for exits downstream of the limit;
- If a downstream restriction is not possible (because it is insufficient to cover the risk of reaching the limit), the restriction is applied to upstream entries.

For superpoints, these capacity restrictions are applied as soon as possible to optimise the availability of the impacted capacities.

The rules as described were conceived in light of previously understood flow patterns. Since the creation of TRF, they have been applied to publish the impacts of works on the North-South limits of the network.

Note, however, that most of the works carried out on the core network in fact have an impact on both the North-South limits and the South-North limits. Nevertheless, the choice had been made to publish capacity restrictions only for the flow direction considered more likely for the period referred to in the publication, and not to publish restrictions for both flow directions simultaneously. This was to avoid overloading publications and complicating shippers' constraints. This choice, which makes sense when flows are heavily weighted in the North-South direction, must now be questioned. The methods for handling maintenance impacts within TRF must be adapted to cover these new flow configurations.

As a reference point for reaching South-North limits in summer, we can note that:

- Except in the case of works, the South-North limits can generally not be reached while the upstream storage facilities (Lussagnet upstream of SN1 and SN3, Atlantique upstream of SN3) are geared towards injection;
- The impacts of works on these limits are generally always greater than the "small maintenance threshold", and should hence lead to capacity restrictions if they are taken into account.

Option under study (not selected): application of capacity restrictions to cover the impacts of maintenance on the South-North limits (beyond the small maintenance threshold)

The maintenance cases studied come from the 2022 and 2023 works programmes. They show that downstream capacity restrictions would not be effective. To cover the impacts of the works on the South-North limits, capacity restrictions should therefore be applied to upstream entries, namely:

- Upstream of SN1: the Fos PITTM, the Pirineos PITT and withdrawals from the Lussagnet PITS;
- And upstream of SN3: in addition, the Montoir PITTM and withdrawals from the Atlantique PITS.

Concerning the Fos and Montoir PITTMs:

- These points cannot be restricted via a superpoint. They will hence be unable to benefit from the corresponding flexibilities (mentioned in §5.5). This can lead to significant restrictions on the PITTMs (i.e. restriction rates of 30-50 %), without flexibility to reduce their impact.
- Given the lead times of the LNG chain, LNG terminal customers will not be able to benefit from the falls in capacity that could be applied for the next day. In particular, the level of consumption influences the level of restrictions and allows for significant drops in capacity restrictions related to works on the limits. The impact of some works is also inherently uncertain, which may lead to a drop in capacities on Day D-1.

The capacity restrictions experienced by the PITTMs could be a very significant constraint in absolute terms. It may be more restrictive than the actual impact of the works on the capacities upstream of the South-North limits on Day D.

Regarding the Pirineos PITT:

- Depending on the superpoint configuration used upstream of the South/North limits (see §5.5), the point may not be included in a superpoint. As such, it would not benefit from the corresponding flexibility;
- Moreover, even if it was included in a superpoint, with the use of this point being linked to the Spanish market, which is highly dependent on LNG, it is not guaranteed that shippers can benefit from next day capacity reductions by increasing their Pirineos entries.

Note also that the South-North limits are impaired by works for a significant part of the summer. As a first approach, considering that the works published for EO2 (S1, respectively) in the North-South direction also generate impacts for SN3 (SN1, respectively), the consolidated works programme for 2023 would involve around two months of restrictions upstream of SN1, and more than three months upstream of SN3.

The major constraints on the PITTMs or even Pirineos, as explained above, would thus apply over long periods. There would be a major impact on the security of supply by significantly limiting gas imports at these three points – beyond the strict impact of the works on network capacities – which are widely used and needed to fill storage facilities in the summer under current conditions. These constraints could also prevent LNG terminals from emitting all the annual regasification capacities that they have sold.

Finally, this solution would involve simultaneously publishing restrictions for the same points in both North-South (for exits) and South-North (for entries) directions. The complexity of these restrictions for shippers, and the IS implications (particularly linked to the optimisation of superpoints) have not been studied.

In any event, and mainly for the significant risks posed to the security of supply, GRTgaz recommends discarding this solution.

Proposed solution: do not apply capacity restrictions for the impact of maintenance works on the South-North limits, and manage any possible congestion on these limits using TRF mechanisms

Studies carried out based on 2022 and 2023 works schedules show that the risk of South-North congestion in summer is essentially caused not by deterioration of the South-North limits due to maintenance, but rather as a process of accumulation, with limitations on downstream entries (to the North) leading shippers to call on the storage facilities with the fastest withdrawals.

For example, during the summer of 2022:

- Works had significant impacts on the South-North limits for about two months;
- However, there were only two incidences of congestion: 9/06 and 10/06 on SN1, with use of the locational spread for 11 GWh (€37,000) on the first day. These days make up the total interruption of entries at Dunkirk and the limitation of emissions from the Dunkirk LNG terminal for maintenance work. During this period, heavy use was made of Lussagnet storage withdrawals to cover the balance and maintain some injections for the other storage facilities.

The risk of South-North congestion is rather linked, therefore, to withdrawals from upstream storage facilities, and in particular Lussagnet, which has a much shorter duration. Given the need to fill the storage facilities, this use of withdrawals cannot be extended during the summer, leading to a risk of congestion that is broadly one-off and limited in terms of volume.

It occurs rather when maintenance works restrict supplies to the North. This may be maintenance on the French network, or the consequences of maintenance work in neighbouring countries (e.g. the possible impact of maintenance work in Norwegian production fields on entries to Dunkirk).

It is difficult to estimate the impacts of any South-North congestion in summer. Studies have been carried out based on the 2023 works schedule to try to assess the cost of the locational spread in the absence of capacity restrictions covering the South-North impacts of these works. But the results are difficult to interpret:

- Study into the use of points upstream of the South-North limits:

By simulating high-level usage of the Fos, Montoir and Pirineos entry points, low consumption on the network (the most harmful case), and by replaying the history of flows from summer 2022 for the Lussagnet and Atlantique storage facilities, the cumulative summer locational spread requirement remains below 200 GWh (€1 million, with an assumption of €5/MWh);

- Study based on the situation in France:

  Taking high flow levels for the upstream entry points of the South-North limits (Fos, Montoir and Pirineos) and the TRF exit points (all storage facilities except Lussagnet, as well as exits to Switzerland, Germany and Belgium), and for a given use of the downstream entry points, a position for Lussagnet can be calculated to manage the TRF balance and check whether it leads to South/North congestion.

  This extremely conservative study is not representative (in particular, the resultant use of Lussagnet only allows for low-level storage filling). However, it is a way to verify that congestion occurs mainly when storage withdrawals are made in response to the fall in downstream entries. In particular, congestion due to a deterioration of the South-North limits while storage injections are being made remains scare.

These observations indicate that the TSOs now integrate these new flow configurations first seen in 2022 into their works planning. Their aim is to limit, as far as possible, the risk of South-North congestion (e.g. in the 2023 works programme, to limit the need for South-North transport, maintenance operations rendering exit capacities at Oltingue unavailable have been scheduled in parallel with the Gassco works that will interrupt entrances in Dunkirk).

Finally, the question of market transparency arises regarding the impact of these maintenance operations on limits and congestion. We therefore propose modifying the procedures for publishing maintenance impacts on the TSOs' transparency site, as follows:

- Publication of the value of the impact of the works on the limit, in the same way as the impact of works in the North-South direction is published for "small maintenance" (i.e., the same publication channel but the concept of "small maintenance" is eliminated for the South-North limits);
- Publication of the impact of these works on the completed localised spreads: inclusion of these works in the published value (in reality, this provision is already in place).

To set a date for the changes to these publications as soon as possible, the timeframe for completing the necessary operator IS modifications still needs to be assessed.

In summary
GRTgaz proposes:

- Not publishing capacity restrictions to cover the impact of maintenance works on the South-North limits. The concept of "small maintenance" hence disappears for South-North flows, with any congestion on these limits routinely handled via the TRF decongestion mechanisms;
- That the TSOs publish the impact level of these maintenance works on the limits on their respective transparency sites, as well as the locational spread volume generated by the works on a given day.

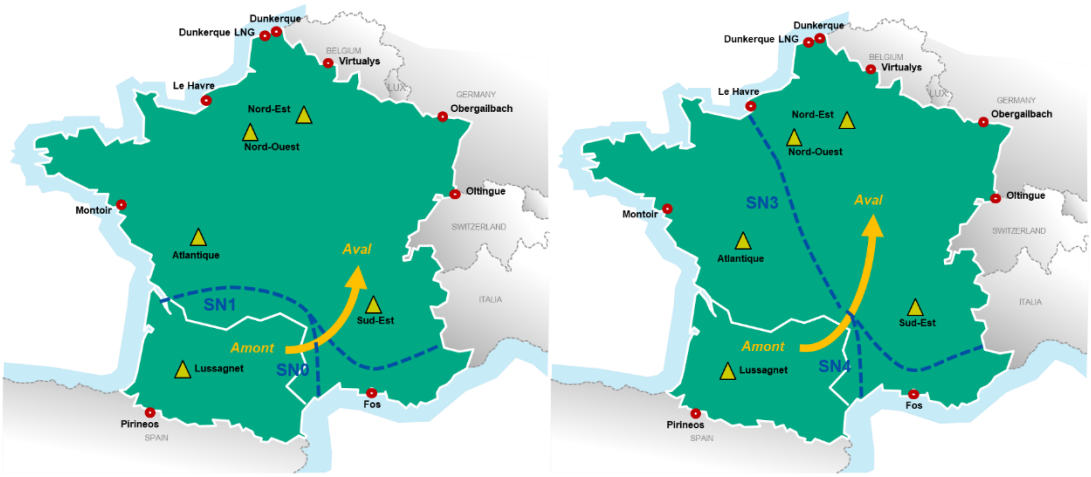
Analyses indicate that this solution incurs a contained risk of using the locational spread. In all instances, this is preferable to the application of capacity restrictions that would strongly

impact entries upstream of the limits over long periods, with significant risks to the security of supply.

6.2 TRF reference framework: addition of two new South-North limits, SN0 and SN4

Two South-North limits – SNO and SN4 – have been integrated into the network's residual limits identified when TRF was created. These are monitored under the existing info-vigilance system and may lead to decongestion mechanisms being triggered. There are other limits on the network, but the probability of their being reached was considered very low. Mechanisms to manage them were therefore not required.

With the emergence of South-North flows since 2022, two other South-North limits have been highlighted: SN0 and SN4. These limits correspond to limits SN1 and SN3, respectively, except that the Fos PITTM is located downstream rather than upstream.



More specifically, the probability of reaching the South-North limits was originally considered low in absolute terms, and was associated with flow scenarios combining highly attractive LNG – and therefore high simultaneous entries at the Fos, Montoir and Pirineos entry points – and withdrawals from storage facilities. Under these conditions, South-North congestions occur at the SN1 and SN3 limits.

However, for the same overall flow scenario, experience has shown that if emissions at the Fos PITTM are occasionally lower, the South-North congestion will occur upstream of Fos, with limit SN0 (SN4, respectively) being reached before limit SN1 (SN3, respectively).

Therefore, reaching limit SN0 versus limit SN1 on the one hand, and SN4 versus SN3 on the other, depends mainly on the level of the entries at the Fos PITTM. The emission rate at Fos below which limits SN0 and SN4 are reached prior to limits SN1 and SN3 depends on France's consumption levels. These are approximately as follows, depending on the month:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fos entries (GWh/d)	155	160	135	85	75	70	70	55	70	80	120	150

In summer, the level of the Fos entries below which the transition from the SN1/SN3 limits to the SN0/SN4 limits occurs is low, and less probable (excluding in the event of works). In winter, conversely, this threshold is higher and lower emissions can be observed.

By way of illustration, the SN0 and SN4 limits were reached during winter 2022/23 in the following situations:

- SN0: the limit was reached in early 2023, when entries to the Fos PITTM were low to zero (LNG terminals subject to a force majeure event), with significant entries to Pirineos and Lussagnet;
- SN4: the limit was reached at the end of 2022, when mutualised restrictions were applied to manage with congestion at the SN3 limit. The mutualised restriction sometimes had the effect of restricting Fos entries to a level below the threshold listed in the table above.

In previous winters, these limits came near to being reached on an occasional basis. They could also be reached in summer in the event of limited entries to the North of the network (Dunkirk, DK LNG) – see §6.1 – coupled with low Fos entries, with a higher probability for SN0.

Proposed solution

GRTgaz wants to integrate the SN0 and SN4 limits into the TRF residual limits subject to monitoring (publication of info-vigilance data). The aim is to be able to trigger the existing TRF mechanisms in the event of congestion at their level. The effect of these mechanisms would be similar to those currently activated to manage the SN1/SN3 limits:

Mechanism	**Activation for SN0 (SN4, respectively)**
Stop sales and cut interruptible capacity	The same effects as for activation on SN1 (SN3, respectively), integrating the adaptation of the mechanism proposed in §5.2, if this is the chosen option.
Locational spread	Same points upstream and downstream of the congestion, with the exception of the Fos PITTM, which will be called on as a downstream entry point

Mutualised restriction	Side to which the restriction is applied: - Always upstream for SN0 (same as SN1) - Upstream or downstream, depending on consumption levels for SN4 (same as SN3), and upstream in winter, in particular. If the restriction is applied upstream (restrictions on upstream entries): the restriction is calculated in accordance with the procedures defined by CRE deliberation no. 2022-352 of 13/12/2022, with the sole qualification that the Fos PITTM is not part of the upstream entries, and applied individually at each upstream entry point and/or by using the upstream superpoint proposed in §5.5, according to accepted findings. If the restriction is applied downstream of SN4 (downstream output restrictions): the points located downstream of SN4 are the Fos PITTM and all the points downstream of SN3. The Fos PITTM is effectively a "bonus" for exits downstream of SN4: within a certain limit (corresponding to reaching limit SN3), PITTM emissions are additional quantities that can be delivered at the downstream exit points. A restriction downstream of SN4 can therefore be applied by using the existing "downstream SN3" superpoint (SPSN3D), and by including the bonus generated by the Fos emissions when calculating the restriction applied to the superpoint. Note: this solution is possible because the Fos PITTM nominations are stable during the gas day. The same method is already applied in the North-South direction during maintenance works on NS3 (NS4, respectively). The capacity restriction is applied to downstream superpoint EO2 (S1, respectively) by including the bonus generated by Fos emissions when calculating the restriction applied to the superpoint.

The deadline for completing the necessary operator IS modifications is yet to be assessed. An implementation date should be set as soon as possible.

Costs and benefits

This adaptation of the TRF residual limit reference framework is needed to operate the system properly. In the absence of mechanisms to manage congestion for limits SN0 and SN4, the TSOs' only option is to seek operational assistance from adjacent operators. This is not necessarily possible – or not possible on a scale sufficient to deal with the congestion – and incurs risks to the continuity of supply and delivery.

It should be noted that the addition of these limits does not correspond to an increase in the risk of South-North congestion. It merely gives the TSOs access to the support they need to manage operations when the limits are reached.

This change can be implemented without significant IS developments for the TSOs, and will have zero or negligible impact on customers (in particular, there is no new superpoint to be integrated into their system).

7 Rapid recovery of locational spread costs and auction revenues

Even with the proposed improvements that will optimise the system's economic efficiency, there may still be years, in particular during cold winters, when the costs of managing congestion will be as high as last winter. Costs of this level were not envisaged when TRF was created. These costs are currently included in the expense and revenue account (CRCP) and invoiced to the market over the following year or years.

GRTgaz proposes a faster recovery of these costs. For instance, on a monthly basis under financial neutrality of balancing invoicing principles (in proportion to the outgoing flows to industrial customers and public distributions). At the same time, GRTgaz proposes that auction premiums are redistributed to customers more swiftly, using the same distribution key. By way of illustration, the extra cost of the locational spreads in the GRTgaz CRCP in 2022 was €25.8 million, and the surplus revenue for the auction premiums was €215 million. The solution is hence a win-win for TSOs and customers alike, as auction premiums will reduce invoices linked to the locational spread. This is all the more relevant, as the costs of locational spreads and the revenue from premiums are both higher when market spreads are large.

These proposals are included in GRTgaz's ATRT8 file.

8 Conclusion and next steps

In conclusion, the simulations show that the congestion seen in winter 2022/23 may recur in the future, despite the arrival of the FSRU.

GRTgaz proposes a set of measures to guarantee the operability of the system, protect gas installations, ensure the security of supply, and optimise the system's economic efficiency while preserving customers' firm capacities.

The decision was made not to reduce the capacity offer but rather to further improve the decongestion mechanisms. Feedback at the end of winter 2023/24 should be provided to assess the effectiveness of the measures implemented.