ACER

European Union Agency for the Cooperation of Energy Regulators

Addressing congestion in North-West European gas markets

Special Report

24 July 2023

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Executive Summary

In the wake of the Russian invasion of Ukraine, the changes in supply and demand created gas transportation bottlenecks in the EU. With liquified natural gas (LNG) and increased pipeline supplies primarily entering the EU from the west (in a system primarily designed for transporting Russian supplies to Europe), bottlenecks in transportation occurred.

Due to physical congestion at LNG terminals and at cross-border pipelines in North-West Europe, the system was used at full capacity and gas could not easily flow to where it was needed most during the 2022 energy crisis, which drove hub price-spreads high. To address these bottlenecks in the short term, the existing infrastructure must be optimised to accommodate new supply routes.

During the gas crisis, short-term mitigating actions are important. Europe's voluntary gas-demand reduction target[1] has been extended until 31 March 2024 and storage-filling trajectories[2] for 2023 have been updated. Addressing the most acute bottlenecks presents a no-regret measure to improve market efficiency in the short term.

ACER's Special Report studies how bottlenecks were addressed by the concerned transmission system operators (TSOs) and national regulatory authorities (NRAs) in the most acutely congested markets of Belgium, France, Germany and the Netherlands, and presents recommendations to address future congestion and to be better prepared for market tightness. It supplements the annual report[3] on 'Congestion in the EU Gas Markets and How It Is Managed' that found a tripling of congestion across the EU gas markets in 2022.

What are the key findings?

- Congestion emerged following tight market conditions and the need to reroute gas flows away from historic east-west routes to predominantly west-east routes in Europe;
- LNG terminals as well as gas flows from Belgium to the Netherlands, from Belgium to Germany and from France to Germany suffered from physical bottlenecks;
- Congestion revenues recorded by EU TSOs rose sharply from €55 million in 2021 to €3.4 billion in 2022 and nearly 90% was collected by Germany, Belgium, the Netherlands and France;
- The EU's integrated gas market turned out to be resilient to the crisis, facilitating the reconfiguration of supply and demand, and ensuring gas would flow to where it is needed; and
- TSOs made commendable efforts to address the bottlenecks. While working in crisis mode, coordination between neighbouring TSOs weakened in the process of maximising the availability of firm and interruptible capacities at either side of the respective borders, leading to mismatched transmission capacities.

What does ACER recommend?

- Neighbouring TSOs to extensively coordinate and jointly maximise the availability of firm and interruptible capacities;
- Neighbouring NRAs to extensively coordinate and remove any regulatory obstacles that prevent an optimal use of the existing network for the reconfigured supply routes;

[1] https://data.consilium.europa.eu/doc/document/ST-7649-2023-REV-1/en/pdf.

[2] https://commission.europa.eu/news/commission-sets-trajectories-filling-gas-storage-2023-2022-11-24-0_en.

[3] https://acer.europa.eu/Publications/ACER_10_Gas_Congestion_Report.pdf.

- TSOs to carefully consider if investment is needed where physical bottlenecks remain after the operational optimisation of the existing network and considering whether the bottlenecks would be prevailing over a relevant period; NRAs shall carefully assess the appropriateness of investment that removes structural bottlenecks considering the Union's energy and climate policies, and security of supply while mitigating the potential of future asset stranding. Congestion revenues may be used to finance such network investment;

- TSOs and ENTSOG to prepare a guideline note on the concept of 'Technical Capacity' and to improve the availability of information on the use of the network, on capacity availability and on capacity bookings; and

- ACER and NRAs to review and propose amendments to the Network Code on Capacity Allocation Mechanisms ('CAM NC')[4], the Commission Guidelines on Congestion Management Procedures ('CMP GL')[5] and the Commission Guidelines on Transparency[6] to further promote stronger coordination and better information availability.

A non-expert's cheat sheet:
Congestion, what is it about and is it limited to energy markets?

Congestion happens when the demand for transmission capacity exceeds the available capacity. It occurs in two forms. 'Contractual congestion' means that interest in obtaining capacity rights exceeds the marketed capacity; 'physical congestion' means that all capacity is used to flow gas, up to the technical limits of the gas system.

For comparison, consider a flight that is fully booked while the effective boarding of the plane may be days or even months away. At that point there is '**contractual congestion**'. When all passengers check-in and board the plane, there would be '**physical congestion**' once the full seating capacity of the plane is reached. When a passenger who booked a ticket does not show up to board the plane, there will be an empty seat even if there might have been initial interest by other people who were not able to book a seat. This situation represents an inefficiency of the market and it illustrates the difference between contractual and physical congestion, each requiring its own set of measures to address it.

[4] Commission Regulation (EU) 2017/459 of 16 March 2017 establishing a network code on capacity allocation mechanisms in gas transmission systems and repealing Regulation (EU) No 984/2013.

[5] Commission Decision of 24 August 2012 on amending Annex I to Regulation (EC) No 715/2009 of the European Parliament and of the Council on conditions for access to the natural gas transmission networks (2012/490/EU), OJ L 213/16, 28.8.2012.

[6] Commission Decision of 10 November 2010 amending Chapter 3 of Annex I to Regulation (EC) No 715/2009 of the European Parliament and of the Council on conditions for access to the natural gas transmission networks Text with EEA relevance, OJ L 293, 11.11.2010, p. 67–71.

1. Acute congestion in North-West Europe

1 In the wake of the Russian invasion of Ukraine, the changes in supply and demand created gas transportation bottlenecks. With liquified natural gas (LNG) and increased pipeline supplies primarily entering the European Union (EU) from the west, in a system originally designed for transporting Russian supplies to Europe, bottlenecks in transportation occurred (box 'Increased LNG and pipeline supplies to North-West Europe').

2 Due to physical congestion at LNG terminals and at cross-border pipelines in North-West Europe, the system was used at full capacity and gas could not easily flow to where it was needed most during the 2022 energy crisis, which drove hub price-spreads high (Figure 1). To address these bottlenecks in the short term, the existing infrastructure must be optimised to accommodate new supply routes.

3 Scarcity of much coveted LNG terminal and transmission capacity along new gas supply routes prevented price convergence happening. While historically spreads between EU hubs were often below 1 EUR/MWh, they rose to above 100 EUR/MWh in the summer of 2022.

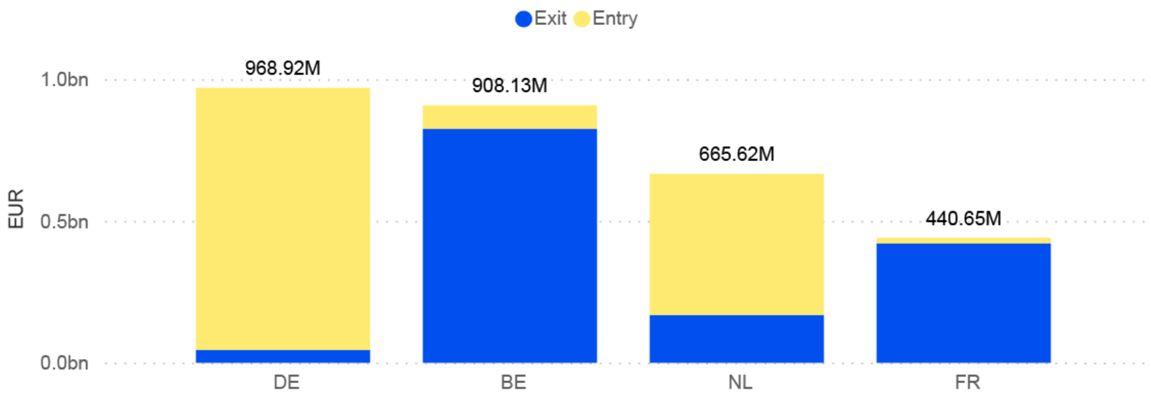
4 Network users competed for the scarce capacities in the auctions and paid a premium on top of the regular network tariff. The transmission system operators (TSOs) of Germany, Belgium, the Netherlands and France recorded around 3 billion euros in congestion revenues, or 90% of the EU's total congestion revenues from transmission auctions held in 2022 (Figure 2).[7]

Figure 1: Day-ahead price spreads between TTF and selected EU hubs, January 2022 – January 2023 (EUR/MWh)

Source: ACER based on ICIS from ACER's Market Correction Mechanism: Preliminary data report (2023).
Note: DE-THE is mostly coinciding with NL-TTF.

[7] ACER calculated congestion revenues for 2022 based on the date capacity products were auctioned; capacity forward products may be for use later than 2022 and TSOs may effectively collect payment at the time the product is being used. In other words, TSOs may not have received the full payment of the 3.4 billion euros and the inclusion of congestion revenue in the regulatory account happens at the time the payments have been made.

Figure 2: TSOs' congestion revenues from auctions held in 2022 for Belgium (BE), France (FR), Germany (DE) and the Netherlands (NL)



Source: ACER calculation on auction data of booking platform operators (PRISMA, RBP, GSA).
Note: EU's total congestion revenues are estimated at 3.4 billion euro. Exit and entry respectively represent capacities to leave and enter a country (market) – Note that part of these revenues may pertain to future payments by contract holders, e.g., when the capacity product will start after 2022.

5 While ACER's Market Correction Mechanism Effects Assessment Report[8] found decreasing price spreads as of the fourth quarter of 2022, west-east flows are expected to continue in the medium-term. LNG capacities in western Europe are further expanding and there are many uncertainties about Russian supplies. The Oxford Institute of Energy Studies outlook report of April 2023, for instance, concludes that winter of 2023/24 and possibly also 2024/25 may prove challenging.[9]

6 EU Member States anticipated the possibility of tight gas markets and have already agreed to extend the voluntary demand reduction targets to the period of 1 April 2023 until 31 March 2024 and storage-filling trajectories for 2023 have been updated as well. Addressing acute bottlenecks is another no-regret measure that helps the EU to handle tight gas market conditions.

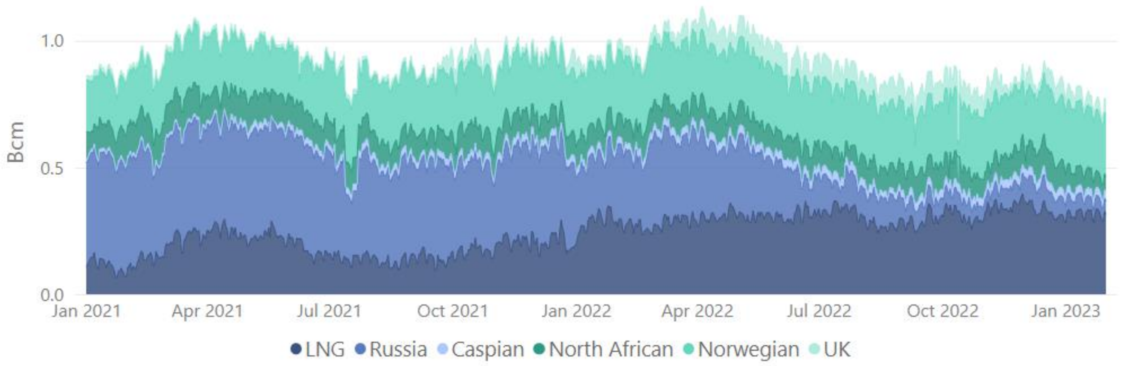
[8] https://acer.europa.eu/Publications/ACER_FinalReport_MCM.pdf.

[9] https://www.oxfordenergy.org/publications/european-gas-demand-fundamentals-2022-q1-2023-review-and-short-term-outlook/.

Increased LNG and pipeline supplies to North-West Europe

In the course of 2022, gas flows in North-West Europe changed significantly in response to reduced supplies from Russia, marked by the complete stop of Nord Stream 1 on 26 September 2022. The missing Russian flows were mainly replaced by LNG supplies arriving in the west of Europe and flowing east. Additionally, Norwegian supplies to Europe were stable at record levels. With the opening of the Baltic Pipe at the end of the year, Norwegian gas started flowing also to Denmark and Poland, relieving somewhat the stress on the North-West European transmission system. Meanwhile also flows from the United Kingdom to the EU ramped up.

Figure 3: Restructuring of gas supplies to the European Union



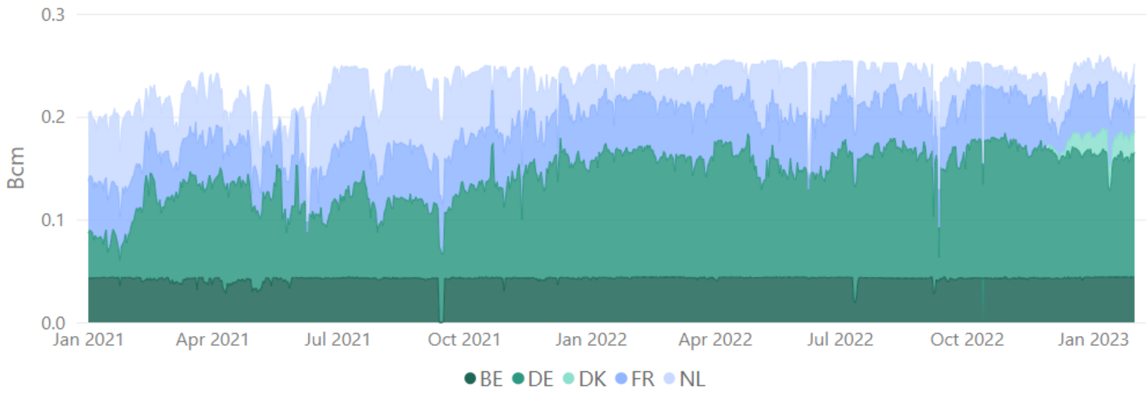
Source: ENTSOG TP & GIE ALSI.

Figure 4: LNG supplies entering Belgium (BE), France (FR), Germany (DE) and the Netherlands (NL)

Source: GIE ALSI.

Increased LNG and pipeline supplies to North-West Europe

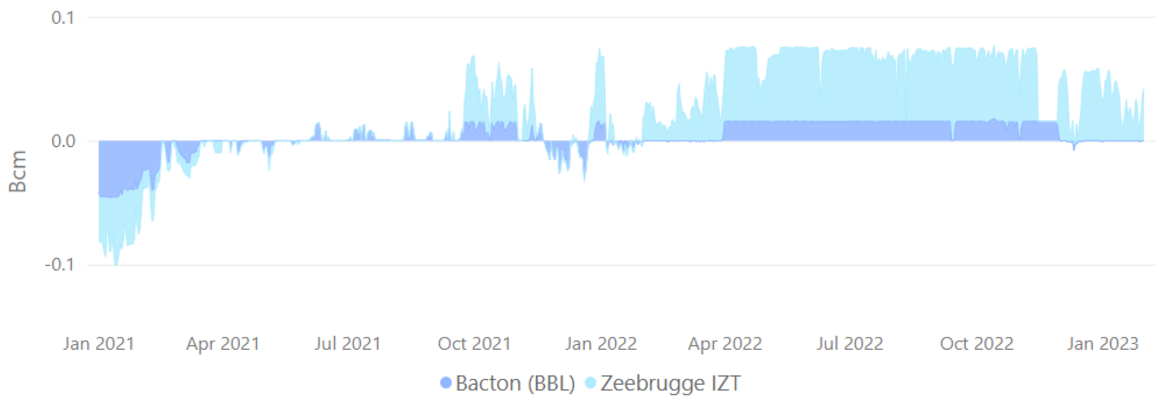
Figure 5: Supplies from Norway entering Belgium (BE), Denmark (DK), France (FR), Germany (DE) and the Netherlands (NL)



Source: ENTSOG TP.

Note: DK covers flows through Baltic Pipe, which started operating at the end of 2022.

Figure 6: Gas entering Belgium (IUK) and the Netherlands (BBL) from UK

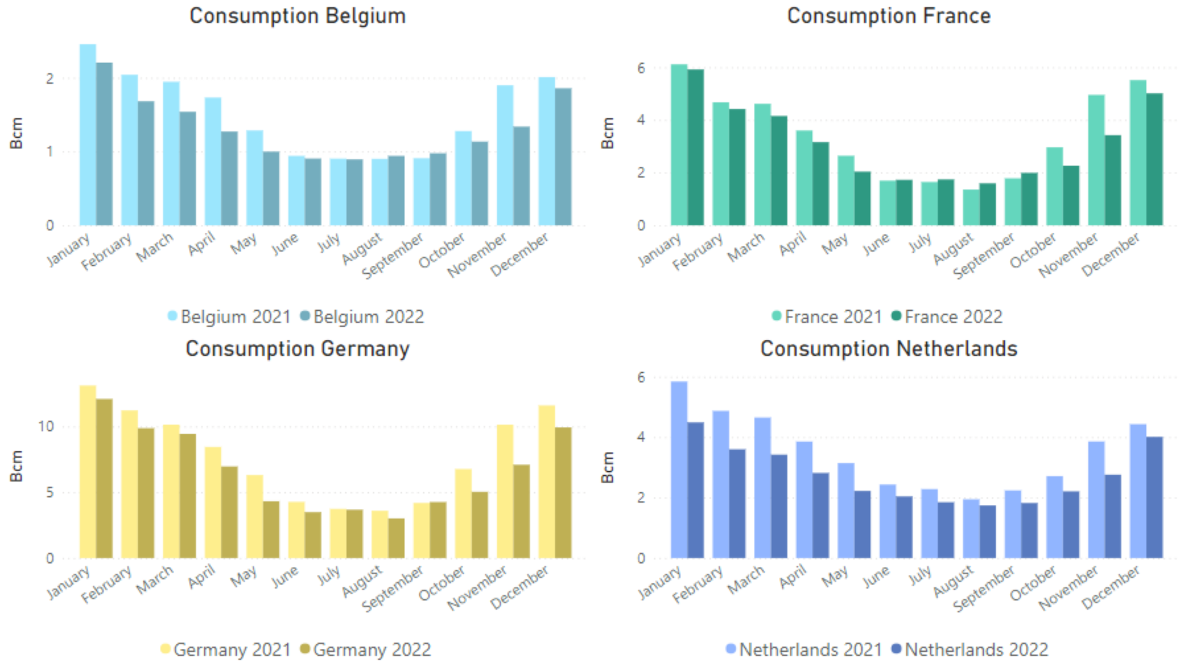


Source: ENTSOG TP.

Voluntary demand adjustments in North-West Europe

Gas demand was lower due to mild weather conditions in winter and a strong reaction from industry to the price signals.

Figure 7: Consumption in Belgium, France, Germany and the Netherlands, 2021/2022 monthly comparison



Source: Eurostat.

2. Coordinated action addresses gas market bottlenecks

7 Following the restructuring of supply and demand and responding to the prevailing hub spreads, gas flows were mostly exiting Belgium and France to reach the high-priced markets in Germany and the Netherlands, leading to acute congestion (box ‘Acute congestion in North-West Europe’).

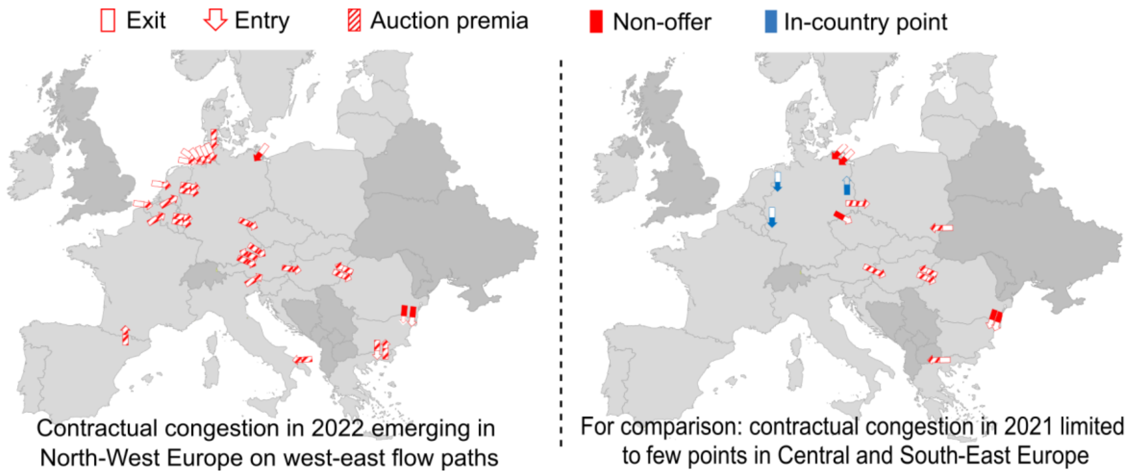
8 To accommodate these new supply routes, sometimes involving physical reversal of flow, the TSOs of Belgium, France, Germany and the Netherlands took several actions:

- Maximising capacity by optimising the network configuration;
- Optimising the efficient sale and use of capacity;
- Bringing back unused capacity to the market; and
- Investing in additional system capacity.

Acute congestion in North-West Europe

ACER’s annual monitoring of congestion in EU gas markets found a tripling of congestion in 2022 compared to 2021. The most acute bottlenecks emerged in North-West Europe.

Figure 8: Congested interconnection points in the European Union in 2022 (left) and, for comparison, in 2021 (right)



Source: ACER

Yearly capacity was also sold out more than one year ahead at several borders in North-West Europe, meaning that market players were already looking beyond the gas year 2022/23 and less firm capacity may be available at shorter timeframes for the gas years 2023/24 and 2024/25.

9 This Section further summarises, first, the coordinated actions TSOs have taken to address congestion in North-West Europe and, second, where ACER identified weakening of coordination between neighbouring TSOs and weakening of information availability. Case studies with neighbouring TSO and NRA actions addressing the most acute bottlenecks in North-West Europe are presented in Annex 1:

- Case study: Flowing gas from Belgium to Germany;
- Case study: Flowing gas from France to Germany and internal bottleneck in France;
- Case study: Flowing gas from Belgium to the Netherlands; and
- Case study: Flowing gas from the Netherlands to Germany.

TSOs' responses to acute congestion

10 Gas transmission capacities are the outcome of considering several gas flow scenarios. When capacity is boosted in one part of the system, it usually means capacity decreases elsewhere in the system. While TSOs must guarantee 'firm capacity' in all possible flow scenarios, they can further optimise the network configuration to accommodate the most likely flow scenarios through non-firm capacities.

11 TSOs **modified their network configurations to accommodate reduced Russian supplies, more LNG and pipeline supplies from the west, and reduced domestic consumption**. Operationally, capacities were reduced at underused connection points and re-allocated to the congested routes (e.g., after the termination of legacy contracts), flows were steered to where they were most needed, and compression was temporarily boosted above usual levels to physically push more gas through the pipelines.

12 NRAs also contributed with regulatory action to accommodate the new flows. The physical flow of LNG and Norwegian supplies from France to Germany became possible on a day-ahead firm basis only after an agreement was reached on how to reconcile the different odourisation practices in both markets.[10] Only after the German NRA issuing regulatory decisions that offered financial assurances against potential damage claims from industrial users, German TSOs could accept odourised gas from the French system.[11] The French NRA also adapted the internal congestion management mechanisms within the French market, including locational price spreads, to help manage the internal bottleneck to flow abundant gas from Spain and the South of France to the North where gas was scarce (for more information, see Annex 1 – Case study: flowing gas from France to Germany and internal bottleneck in France).

13 After the network configuration had been optimised, TSOs worked on the **efficient sale and use of capacity**. While (bundled) firm capacity is not so easy to increase, TSOs sold large amounts of unbundled interruptible capacity in auctions and via 'overnomination' procedures.[12] Overnomination enables network users simply to declare day-ahead and within the day they would like to flow more gas than they have contracted for; these additional capacities (flows) are then allocated based on availability and pro-rata over all network users.[13]

14 Interruptible capacity products have been used extensively in all four markets to flexibly optimise the sale of capacity. Furthermore, interruptible capacity improves the efficiency of the network as it enables to flow gas up to the technical capacity even when some firm capacity would remain unused.

15 TSOs in Germany and the Netherlands even offered unlimited interruptible capacities, which led to high contracted volumes that were disconnected from actual physical flow capabilities. Market parties booked these enormous amounts of interruptible capacities to express their 'willingness to pay' as interruptions are pro-rata and with high levels of interruption, the more capacity you have contracted the larger your share of the confirmed capacity to flow gas. TSOs in Germany started offering interruptible capacities that were more in line with physical reality as of May 2022, enabling network users to express their willingness to pay via the auction premium. The TSO and NRA in the Netherlands

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[10] Odourisation is the practice of adding a chemical component to methane to give it a pronounced smell for safety reasons. Countries may have different odourisation practices in the sense whether the gas is odourised at a TSO or at a DSO level.

[11] BK9-22/606-1 to BK9-22/606-5. These decisions address the financial risk from potential damage claims from gas customers against TSOs for accepting odourised gas not in line with technical standards in Germany. The costs of such damage claims would be covered by network tariffs.

[12] TSOs may sell interruptible capacity when firm capacity is sold out, sold at a premium or was not offered; according to the Network Code on Capacity Allocation Mechanisms (OJ L 72, 17.3.2017, p. 1–28), at least a daily interruptible product shall be offered when the day-ahead firm capacity was sold out or not offered.

[13] Overnomination makes it possible to re-allocate on an interruptible basis any unused firm capacity.

have become also aware of the inefficiency of booking volumes that are disconnected from the physical reality of the networks and are considering a change to have interruptible capacities more in line with physical reality.

16 While 'congestion management procedures' (CMPs) have limited effectiveness to address physical congestion, their application remains important to manage contractual congestion by **bringing any unused capacity back to the market.**[14] CMPs were applied in the Netherlands (mostly 'oversubscription' ('OSBB')) and Germany (mostly oversubscription and 'firm day-ahead use-it-or-lose-it' ('FDA UIOLI')) and not necessarily coordinated at corresponding exits and entries.

17 The secondary market complements the CMPs and enables capacity holders to sell their unused capacity directly to interested network users; 14 transactions happened for exit capacity from the Netherlands to Germany (for a total of 2.346 GWh/h) and 8 additional transactions happened for entry capacity from Belgium to Germany (for a total of 2.01 GWh/h).

18 The importance of bringing unused capacities back to the market was further emphasised in Article 14 of Council Regulation[15] (EU) 2022/2576 that aims at a more effective use of transmission capacities during the gas crisis and that became applicable as of 1 April 2023. In response to this Article, European NRAs confirmed the re-allocation of unused firm capacity on short-term interruptible basis, the application of FDA UIOLI and oversubscription (and various combinations) as measures to avoid unused capacity (see Annex 2 for a map of the implementation across the EU).

19 In addition to maximising the capacities with the existing gas system elements, **the bottlenecks were also addressed through investment in enlarged capacity of the gas system**; not necessarily TSO network investments. These investments are happening primarily in LNG terminal capacities, which is very effective when the additional supply enters the EU gas market behind the bottlenecks.

- Several LNG facilities are planned in Germany to replace Russian gas. Three floating storage and regasification units (FSRU) are already operational in Lubmin, Wilhelmshaven and Brunsbüttel. The capacity in Lubmin and Wilhelmshaven will be further increased by adding additional capacity; another FSRU is expected to start operating in Stade. Permanent terminals with higher capacity will replace some of the FSRU units as of 2026;
- In the Netherlands, the Rotterdam Gate LNG terminal underwent a capacity expansion in 2022 (unrelated to the gas market crisis) adding 4 bcm/y of interruptible capacity to the 12 bcm/y of firm capacity that was already present. The FSRU Eemshaven started operation in September 2022 and more LNG projects are under consideration;
- In Belgium, an extension of the regasification capacity of the LNG Terminal in Zeebrugge is ongoing. The capacity will be increased from the current 528 GWh/d to 724.8 GWh/d by the end of 2023 in several steps; and
- France is acting as well in terms of its LNG receiving capacity. At the Fos terminal, 17 TWh/year of additional capacity was developed in 2022. At the Montoir terminal, investments have been decided to maintain the capacity level, allowing to transport 20 GWh/d of additional capacity. At the Dunkirk terminal, the entry capacity to the network has been increased by GRTgaz from 21.6 GWh/d to 23.95 GWh/d as of July 2022 (it increases the peak flow from the terminal, which is useful for the transmission network to handle internal congestions, but it does not increase its yearly unloading capacity). The FSRU in Le Havre, due to be commissioned in September 2023, will add 45 to 50 TWh/y of import capacity.

[14] The emergence of large hub spreads and acute physical congestion present profitable trading opportunities for market players; in those circumstances, capacity holders will hold on to their capacities for the option value.

[15] COUNCIL REGULATION (EU) 2022/2576 of 19 December 2022 enhancing solidarity through better coordination of gas purchases, reliable price benchmarks and exchanges of gas across borders. OJ L 335, 29.12.2022, p. 1–35.

20 In terms of pipeline capacity investment, Belgium is most advanced, having approved an internal reinforcement between Desteldonk (~Ghent) and Opwijk (~Brussels) (added in blue in Figure 9). The project started construction in March 2023, addresses security of supply and is part of Belgium's hydrogen strategy. It would also support maintaining an increased flow of gas from Belgium to Germany. If it goes further, the second stage of the project would be reinforcing the Zeebrugge to Evergem (~Ghent) pipeline section and it is being planned.

21 A comparison of the cost of day-ahead cross-border transmission capacity with the spread of day-ahead gas prices at the corresponding hubs shows a good correlation (see the case studies in Annex 1).[16] In other words, at least for marginal transactions, when a market party traded day-ahead for the gas and the transmission capacity, the TSO would collect a substantial part of the 'profit' of the gas trade between strongly diverging markets. It shows that the pricing model for transmission capacity worked fairly efficiently in these turbulent gas markets.[17]

A non-expert's cheat sheet:
How is congestion addressed in other sectors?

In our example of a flight, when there is **physical congestion**, the airline may offer passengers to follow a different route using connecting flights (~rerouting flows). The airline might also optimise its capacity, perhaps assigning a larger plane to the congested route (~boosting compression). Eventually, when congestion persists, the airline may decide to add another flight on the route. Similarly, in gas markets, short-term optimisation of the network configuration provides relief against physical congestion. Mid- and long-term relief of structural bottlenecks may require investment to increase the capacity of the gas system.

To address **contractual congestion**, other measures could be taken by the airline. A well-known example is overbooking a flight by selling more tickets than there are seats based on an expectation that not all ticket holders will show up to board the plane. If all passengers show up, the airline may ask for volunteers to skip this flight, usually also offering a compensation (~oversubscription of firm capacity). The airline could also sell non-guaranteed seats, where passengers would be confirmed last minute if they can take the flight (~interruptible capacity), or passengers could give back their ticket if they changed plans and the airline could find another passenger (~surrendering capacity). These latter measures might not be very practical to organise air transportation, but they are applied in the EU gas markets to avoid unused capacity.

Weakening of coordination and lesser information availability

22 TSOs and NRAs made commendable efforts during the crisis to address the bottlenecks and ensure the flow of gas to where it was most needed. Facing difficult circumstances, coordination between TSOs weakened in the process of maximising the availability of firm and interruptible capacities. Furthermore, information availability about how the gas system was used in the crisis weakened, reducing transparency, and making market monitoring more difficult for ACER and NRAs.

[16] The conversion of the usual capacity-based price of transmission capacity into an energy-based price can be done by assuming a load factor for flowing gas. For instance, when a daily capacity product allows to flow 1 MWh/h per day, the user can flow 24 times 1 MWh/h for a total of 24 MWh. Assuming a price of 12 EUR for the daily product and a 100% load factor, the equivalent price would be 12 euro for 24 MWh, or 0.5 EUR/MWh.

[17] No firm conclusions can be made about actual profits of market parties who hold varying positions in gas and transport contracts, concluded in different timeframes.

23 Weakening of coordination leads to inefficiencies when maximising the capacity offering:

- Due to timing mismatches and weaker communication about possible capacity changes, firm capacities were sold unbundled on either side of the border between Belgium and Germany.[18] The opportunity was missed to bundle these capacities, leaving market parties to find matching unbundled exit and entry contracts;
- Diverging practices for selling interruptible capacities led to enormous discrepancies in the amounts of sold interruptible capacities at corresponding exits and entries. The German and Dutch TSOs applied a practice of offering unlimited amounts of interruptible capacities. The contracted capacities were disconnected from physical reality and were largely interrupted;
- The timeframes for interruptible products are not necessarily coordinated. In Belgium, for instance, only the day-ahead and within-day interruptible products are offered, while in Germany also yearly, quarterly and monthly interruptible products are available. These different timeframes make it more challenging for market parties to anticipate and match their capacity bookings; and
- TSOs use different approaches to bring unused capacities back to the market. While interruptible capacity appears to be the preferred measure to ensure the efficient use of the network, bringing unused firm capacities back to the market remains important, but the measures to do that vary and are uncoordinated at corresponding exits and entries.

24 Lesser information availability reduces market transparency and hinders effective market monitoring:

- While TSOs report 'firm technical capacity' on the ENTSOG Transparency Platform ('ENTSOG TP'), this indicator does not allow ACER to assess whether capacity has been maximised and how the network has been used. Complementary information about the full technical capacity (after having optimised the network configuration) is missing;
- The information on virtual interconnection points ('VIPs') and their respective underlying physical interconnection points, where those still exist under the 'dual model'[19], is not easy to navigate and the aggregation of information and calculation of indicators at country or border level is challenging;[20]
- The ENTSOG TP does not include information about the bundling of contracts, which is essential for ACER's monitoring of the transmission capacity market;
- It is unclear whether the information on contracted interruptible capacities on the ENTSOG TP includes the capacity bookings that happened through overnomination. Reported interruptions occasionally exceed contracted interruptible capacities, which should not be possible; and
- Data from the ENTSOG TP about CMPs were difficult to interpret. For instance, surrendered entry capacity from France to Germany referred to non-firm 'backhaul' depending on physical flow from Germany to France. The monitoring of CMPs, though, serves to assess how much unused firm capacities were brought back to the market.

[18] At the border between Belgium and the Netherlands, Belgium exit capacity was sold unbundled, while physical flow well above the level of firm capacities suggest that there may have been an opportunity to sell more firm entry capacity. However, ACER is not in the position to assess the technical potential of the gas networks.

[19] https://acer.europa.eu/en/Gas/Framework%20guidelines_and_network%20codes/Documents/func_vip_issue_acer_entsog_joint_note.pdf.

[20] The 'dual model' applies to several VIPs and their respective underlying physical interconnection points in the Netherlands and Germany; the reporting of information at the physical points will continue until all their legacy contracts have expired.

3. Recommendations for addressing acute congestion

25 The EU's integrated gas market turned out to be resilient to the crisis, facilitating the reconfiguration of supply and demand, and ensuring gas would flow to where it is most needed.

26 Nevertheless, congestion may signal a reduction of market efficiency.[21] In the context of a gas market crisis with significant local congestion, addressing acute bottlenecks is a no-regret short-term measure to improve efficiency.

27 In this Special Report on congestion in North-West European gas markets, ACER found weakening coordination, and lesser information availability, when TSOs were maximising the availability of capacity under difficult circumstances; both issues shall be diligently addressed.

28 While the acute bottlenecks during the 2022 gas crisis were mostly in Belgium, France, Germany and the Netherlands, the recommendations for more coordination and better information are valid across all gas markets.

29 Therefore, **ACER expects neighbouring TSOs to**:

- Extensively coordinate their operational actions;
- Jointly optimise the network to accommodate the restructured supply routes as reflected in the 'technical capacity';
- Jointly maximise marketing of firm bundled capacities as reflected in the indicator for 'firm technical capacity' and allocation of unbundled firm capacities as less as possible;
- Optimise the sale of interruptible capacities considering the 'technical capacity';
- Efficiently bring back unused capacities to the market via congestion management procedures (CMPs); and
- Carefully consider if investment is needed where physical bottlenecks remain after the operational optimisation of the existing network and considering whether the bottlenecks would be prevailing over a relevant period. Potential investment shall be included in the national and European network development plans and be part of market-based procedure for capacity development.

30 **ACER expects neighbouring NRAs to**:

- Extensively coordinate;
- Remove any regulatory obstacles that prevent an optimal use of the network to accommodate the new supply routes, e.g., addressing the TSO's risk due to the different odourisation practices on the route from France to Germany;
- Monitor the use of the network and congestion in their markets; and
- Carefully assess the appropriateness of investment that removes structural bottlenecks considering the Union's energy and climate policies, and security of supply while mitigating the potential of future asset stranding. Congestion revenues may be used to finance such network investment.

31 **ACER recommends reviewing the CAM NC, the CMP GL and the Commission Guidelines on Transparency**, and:

[21] From a societal perspective, a market with occasional congestion may be optimal if addressing such congestion would cost more than the benefits gained from removing the bottleneck.

- Introduce the concept of 'technical capacity', which refers to the (non-static) maximum-flow capacity at a (virtual) interconnection point considering the network that is optimised for a most likely flow scenario, as opposed to 'firm technical capacity', which is the capacity that can be guaranteed in all flow scenarios. Both indicators shall be reported and updated by TSOs regularly;
- Promote further harmonisation in the offering of interruptible capacities considering 'technical capacity';
- Promote coordination of CMPs at corresponding exits and entries; and
- Require the publication of sufficient information about bundling of contracts on the ENTSOG TP.

32 **ACER requests ENTSOG** to **prepare a guideline note on the concept of 'Technical Capacity'** that duly considers the recommendations on jointly maximising capacity. That guideline note may then form an input to a revision of the CAM NC, the CMP GL and the Commission Guidelines on Transparency.

33 Finally, **ACER expects the TSOs and ENTSOG** to **improve the availability of information** about network usage, capacity availability and capacity bookings on the ENTSOG TP, and report:

- Sufficiently frequently updated indicators for 'technical capacity' (on a voluntary basis until defined in the regulations), 'firm technical capacity and 'total interruptible capacity';
- Indicators for booked firm bundled and firm unbundled capacities (on a voluntary basis until a requirement is set in the regulations);
- Indicators for booked interruptible capacities that cover all contracted capacities, including via overnomination procedures;
- Indicators for effective interruptions of interruptible capacity; and
- Indicators for capacity made available via CMPs (matching the timeframes of offered and booked capacities).

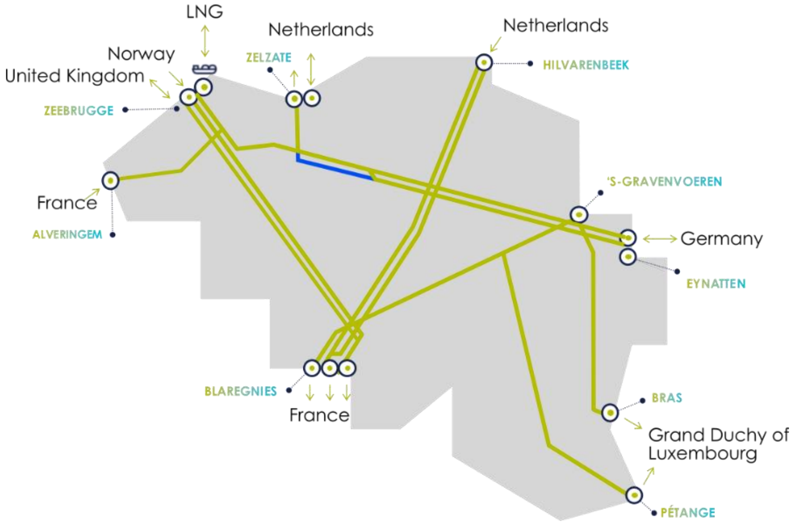
34 ACER and NRAs will continue their monitoring of congestion in the gas markets as well as the follow-up of these recommendations.

4. Annex 1: Concrete TSO and NRA actions addressing the most acute bottlenecks in North-West Europe

Case study: Flowing gas from Belgium to Germany

35 The exit capacities from Belgium to Germany were increased by optimising the use of the network assets (Figure 9): by reducing the technical capacity of other interconnection points, by optimising the flow steering possibilities (for instance, by flowing gas south and then east) and by modifying the network flow scenarios because of lower domestic demand. The capacity optimisation was further facilitated by the increase of pressure (from the contractual 49 Barg up to 60-65 Barg) delivered at the Belgium-Germany border to enable more flow on the German side.

Figure 9: Belgian gas network



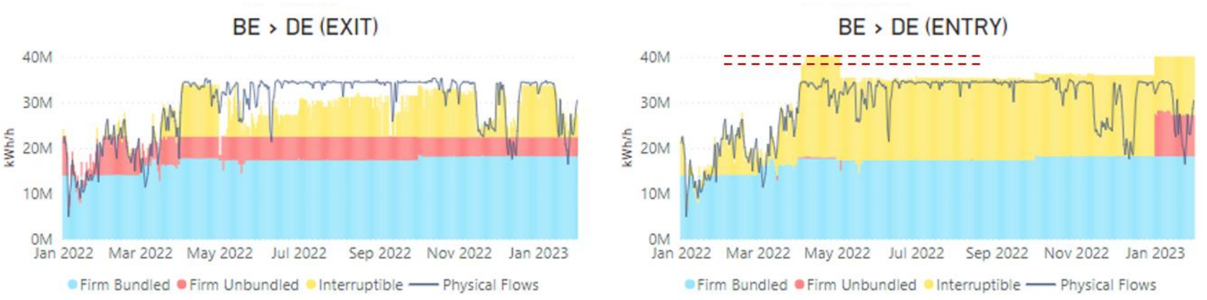
Source: Fluxys.

Note: Investment between Desteldonk and Opwijk added in blue by ACER.

36 By these measures, the maximum export capacity towards Germany increased from 22.6 GWh/h (the maximum firm technical exit capacity reported over 2022) to up to 35 GWh/h as of 1 April 2022 as depicted in Figure 10. This maximum capacity was effectively used to flow gas throughout most of the year (dark blue line).

37 Of these 35 GWh/h, around 18 GWh/h were sold as bundled firm exit and entry capacities (light blue), a 30% increase over the roughly 14 GWh/h of bundled firm capacities contracted in the first months. Belgium sold about 4.2 GWh/h of unbundled firm exit capacity throughout the year, further complemented with day-ahead and within-day (not depicted) interruptible capacities up to 35 GWh/h.

Figure 10: Physical flow and contracted firm and interruptible capacities (cut off for visibility)



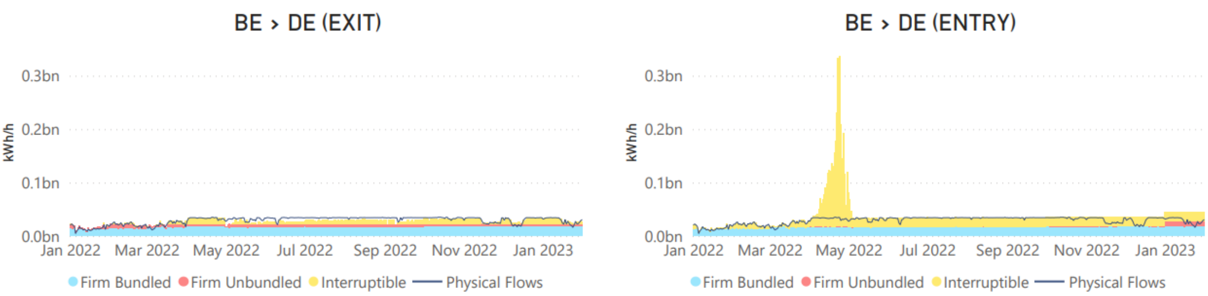
Source: ACER, based on PRISMA auction data of 2021 and 2022 for contracted capacities; ENTSOG TP for physical flow.

Note: contracted capacities do not include interruptible capacity contracted via overnomination (not an auction procedure) and may not show capacity that was allocated in auctions before 1 January 2021; firm entry capacity encompasses also conditional capacity.

38 At the exit side, German TSOs were able to decrease capacity at interconnection points in the East of Germany (after the termination of some legacy contracts) and to increase firm capacity at the Belgium-Germany border from about 18 GWh/h to around 27 GWh/h (the maximum firm technical entry capacity reported over 2022). These ‘additional’ 9 GWh/h of capacity were sold as monthly unbundled firm entry capacity from January 2023 onwards, while the Belgium unbundled firm exit capacity had been sold shortly before in the quarterly auction. Weakening coordination and timing mismatches prevented the maximal bundling of firm capacity.

39 Contract holders of interruptible entry capacity may participate in the auction of the unbundled firm entry capacity and request conversion of capacity they contract; however, any auction premium paid for the interruptible capacity remains due and another auction premium may have to be paid to contract the unbundled firm capacity.

Figure 11: Physical flow and contracted firm and interruptible capacities (without cut-off)

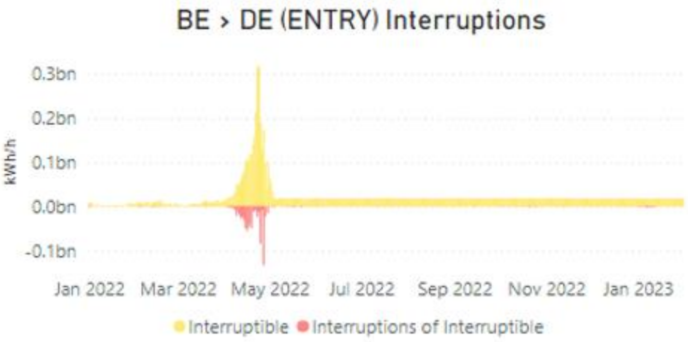


Source: ACER, based on PRISMA auction data of 2021 and 2022 for contracted capacities; ENTSOG TP for physical flow.

Note: Ccontracted capacities do not include interruptible capacity contracted via overnomination (not an auction procedure) and may not show capacity that was allocated in auctions before 1 January 2021; firm entry capacity encompasses also conditional capacity.

40 Weakening coordination also occurred with respect to interruptible capacities. German TSOs in general offer ‘unlimited’ interruptible capacity as no interruption probability is attached. The market players would then express their ‘willingness-to-pay’ through the volume they buy as interruptions take place on a pro-rata basis. At the VIP THE-ZTP between Belgium and Germany, Open Grid Europe marketed around 2147 GWh/h of interruptible capacities; an amount that is completely disconnected from the highest measured flow of about 35 GWh/h and not matched by any interruptible exit capacity. Network users contracted huge amounts of interruptible capacity (up to 317.8 GWh/h), leading to high levels of interruptions (up to 299 GWh/h).

Figure 12: Interruptible capacity contracted and effective interruptions (shown as negative number)



Source: PRISMA auction data for contracted capacity; ENTSOG TP for interruptions.

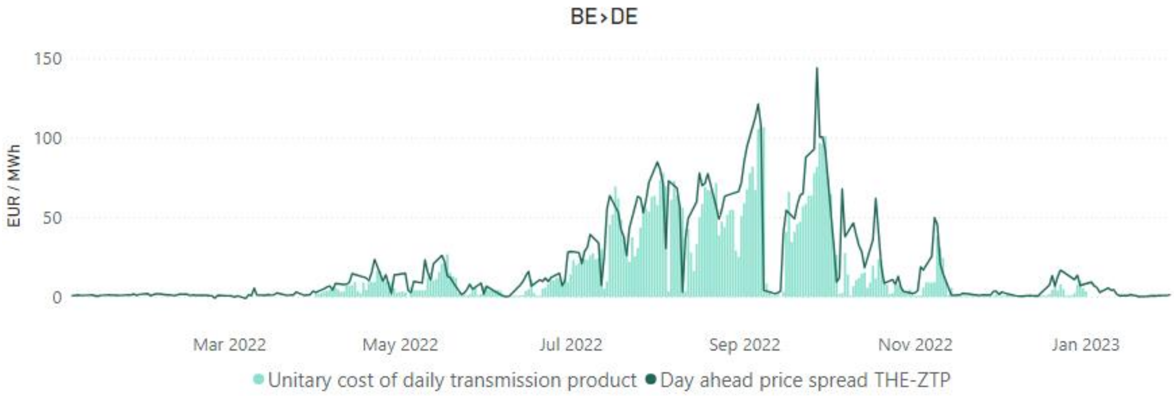
41 German TSOs decided to limit the offer of interruptible capacity at the VIP THE-ZTP as of May 2022 and to allow market players express their willingness to pay via the auction premium.

42 The coordination of unbundled interruptible capacities was also weaker with respect to the timeframes of the products. Belgium so far allows the sale of interruptible capacity on a day-ahead and within-day basis, whereas German TSOs may sell also yearly, quarterly and monthly interruptible products.

43 Flows were driven by the large premium of the German hub 'THE' over the Belgian 'ZTP', depicted for the day-ahead market in Figure 13. When comparing the equivalent 'EUR/MWh' fee for day-ahead transmission capacity from Belgium to Germany with the hub spread, they correspond quite well.

44 This match indicates that TSOs captured part of the scarcity 'profits' via the congestion income and that money can be given back to network users or be used to address bottlenecks and improve the market efficiency, following a joint coordination between them.

Figure 13: Day-ahead hub spread (THE premium over ZTP) and 'EUR/MWh'-cost of day-ahead transmission capacity from Belgium to Germany



Source: ICIS Heren for hub spreads; ACER calculation based on PRISMA auction data for 'EUR/MWh'-cost of transmission capacity.

45 For Belgium, the current tariff methodology 2020-2023 approved by CREG in 2019 did not foresee a specific allocation of the congestion revenues. All other revenues above the allowed revenue are collected into a regulatory account which, in case of a positive balance at the end of the period, the regulator may decide to use for a maximum of €50 million for the financing of investments. The remaining balance will be used for the benefit of the allowed revenues of the next regulatory periods.

46 The next tariff methodology 2024-2027 approved by CREG in June 2022 does foresee a specific allocation for the congestion revenues (auction premia) above the allowed revenue. The regulator may

decide that 50% of the investments intended to reduce physical congestion in the transmission network may be financed from the congestion income or by other support measures. The remaining balance of the premium account can be used for the benefit of the allowed revenues of the following regulatory periods.

47 In its consultation before the approval of the latest tariff methodology, Fluxys explained its plan to return to users EUR 460 million of congestion revenue. Fluxys additionally communicated to ACER its plan to invest EUR 240 million to reinforce the Belgian network and reduce its internal bottlenecks. In addition, Fluxys has paid a solidarity contribution of EUR 300 million decreasing its regulatory account with that same amount.

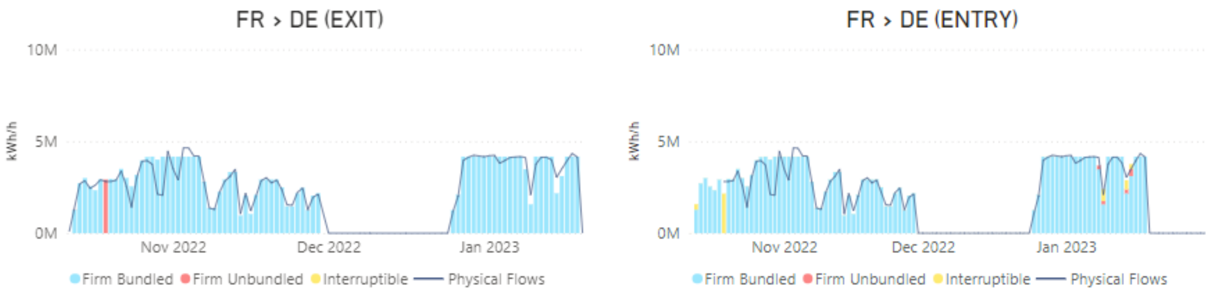
48 In Germany, most of the congestion revenues collected in 2022 (not expected in 2021) were attributed to the regulatory account and will be reconciled later than 2023. Since auction premia are not to be paid upfront for the whole contract period of the affected capacity product, but in monthly instalments as for the capacity itself, some TSOs expect that contracts will be cancelled and hence did not consider the congestion revenue when calculating the tariff for 2023.

Case study: Flowing gas from France to Germany and internal bottleneck in France

50 According to the operational rules in place in France, in case physical congestions occur, several mechanisms can be used: agreements with adjacent operators (swaps), interruption of interruptible capacities, locational spread calls and, as a last resort, restrictions.

51 Technical capacity from France to Germany was created and optimised through increased compression power at the Obergailbach/Medelsheim IP. The French TSO and the German TSOs have worked on the interconnection station to allow for a physical reverse flow allowing gas to flow to Germany as of 13 October 2022 at a rate of maximum 100 GWh/d of firm daily capacity sold day-ahead (Figure 14).

Figure 14: Physical flow and contracted firm and interruptible capacities, as of 13 October 2022



Source: ACER, based on PRISMA auction data of 2022 for contracted capacities; ENTSOG TP for physical flow.

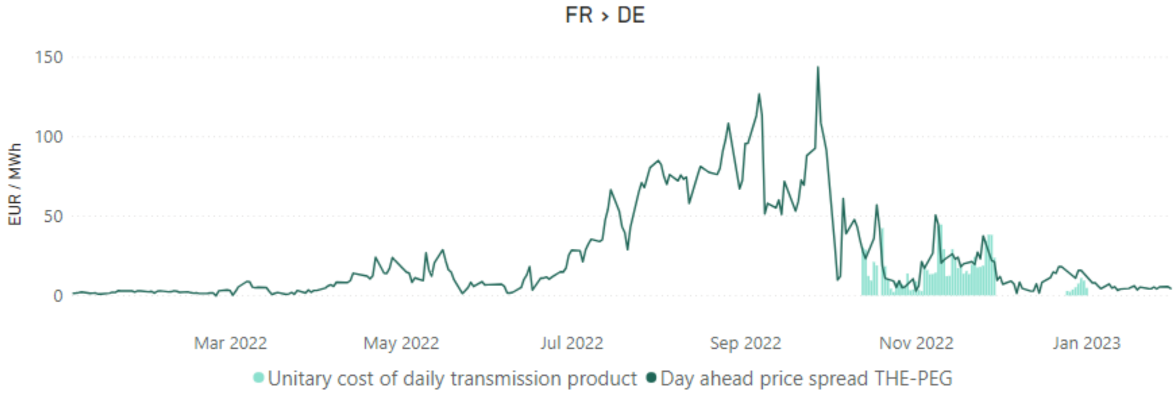
52 To allow for a physical gas flow towards the German market area, CRE issued two decisions: the first one on 29 September 2022 to create the physical exit capacity at the Obergailbach/Medelsheim IP with Germany, and the second one on 7 October 2022 related to the tariff at the exit point. In addition, only after a regulatory decision was made in Germany that offered financial assurances to TSOs against potential damage claims from industrial users, German TSOs could accept odourised gas from the French system.

53 Before 13 October 2022, only a virtual interruptible backhaul capacity was marketed that is dependent on physical flow from Germany to France. That flow was very volatile throughout the year due to the unstable Russian supplies entering Germany. As of 13 October 2022, forward flow from Germany to France discontinued and the virtual backhaul flow stopped as the conditions of the backhaul contracts were no longer met. If the flow reverses again to physical flow from Germany to France, the holders of backhaul contracts could again nominate virtual flow from France to Germany.

54 While the hub spread had a large premium of the German THE over the French PEG (Figure 15), until October, gas had to flow along indirect routes, such as via Belgium, also creating congestion at the Virtualys interconnection point from France to Belgium.

55 France was supplied with gas from Norway, as well as from its own LNG terminals and LNG first arriving in Spain. At the Pirineos VIP between France and Spain, Teréga and Enagas worked to increase the interruptible capacity from Spain to France by 40 GWh, effective from November 2022, thanks to increased compression power. These extra 40 GWh of capacity were made firm from May 2023 to October 2023 at entry France. Enagas and Teréga are currently discussing the possibility to increase further by 20 GWh the capacity from Spain to France.

Figure 15: Day-ahead hub spread (THE premium over PEG) and 'EUR/MWh'-cost of day-ahead transmission capacity from France to Germany



Source. ICIS Heren for hub spreads; ACER calculation based on PRISMA auction data for 'EUR/MWh'-cost of transmission capacity.

56 To tackle the internal congestions (south-north direction) provoked by the decrease in Norwegian gas entries in the North of France at the end of 2022, CRE issued a decision on 13 December 2022, which was aimed at improving the functioning of the Trading Region France (TRF) in the short term by adapting the existing congestion management mechanisms such as 'locational spreads' (making it more interesting for gas to enter in the north) or 'mutualised restrictions' (limiting nominations of contracted capacities for all network users on a pro-rata basis). A public consultation took place during the second quarter of 2023 in this regard, before CRE will decide on longer-term measures to be implemented before the next winter.

57 Until now, the congestion revenues collected by the French TSOs have been accounted for in the regulatory account and returned to network users (transit and domestic) via a lowering of the revenues to be collected by TSOs at network points. The congestion revenues from capacity auctions held in 2022 of the French TSOs pertain partially to forward contracts and the effective payments will happen when the capacity products become mature.

Case study: Flowing gas from Belgium to the Netherlands

58 With respect to the capacities and flows from Belgium to the Netherlands, extremely large amounts of (unbundled) interruptible entry capacities have been offered and contracted (Figure 16) These quantities were not matched by exit capacities and most of these interruptible entry capacities have been effectively interrupted (Figure 17).

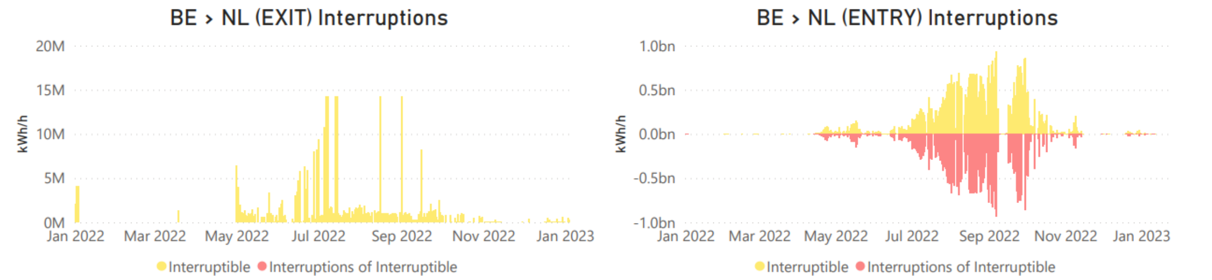
59 By offering unlimited interruptible entry capacities, market players were incentivised to express their willingness to pay for capacity through the volumes they contracted as interruption happens on a pro-rata basis. The Dutch TSO and NRA are reconsidering this marketing practice as they deem it undesirable to sell capacities that could never be used.

Driven by high hub spreads between the Dutch TTF and the Belgian ZTP (Figure 18), physical flow reversed to the direction from Belgium to the Netherlands. Flow exceeded firm contracted capacities throughout the year and capacities and flows were supported by the increased sale of interruptible capacities. Gaps between physical flow and contracted capacities may be due to capacity contracted before 1 January 2021 or may have been allocated through overnomination procedures.

Figure 16: Physical flow and contracted firm and interruptible capacities (top with cut-off, bottom full scale)

Source: ACER, based on PRISMA auction data of 2021 and 2022 for contracted capacities; ENTSOG TP for physical flow.

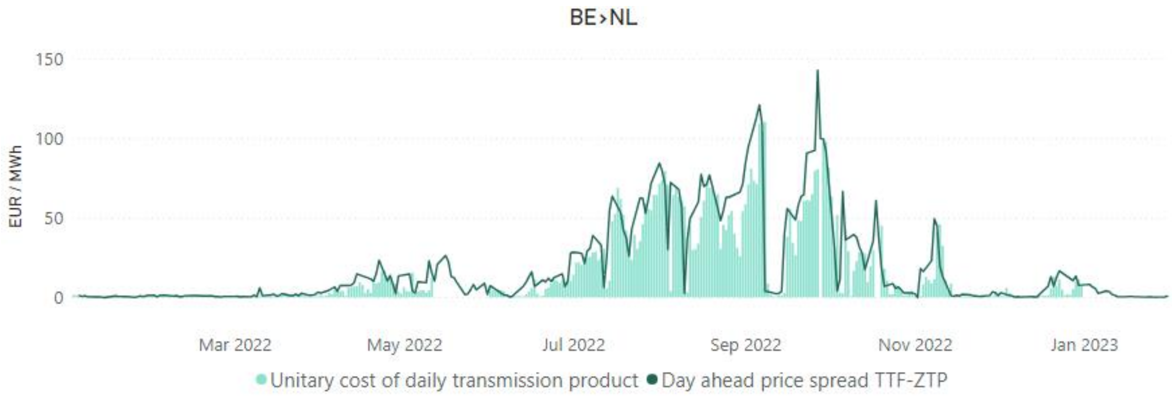
Figure 17: Contracted interruptible capacities and effective interruptions



Source: ACER, based on PRISMA auction data of 2021 and 2022 for contracted capacities; ENTSOG TP for effective interruptions.

60 In the Netherlands, it is foreseen that the congestion income collected by the TSO in 2022 will be retained by the TSO until 2025. Based on current insights, a reconciliation via the network tariffs in 2025 would ensure the most stable development of allowed revenues and network tariffs across 2024 and 2025.

Figure 18: Day-ahead hub spread (TTF premium over ZTP) and 'EUR/MWh'-cost of day-ahead transmission capacity from Belgium to the Netherlands



Source: ICIS Heren for hub spreads; ACER calculation based on PRISMA auction data for 'EUR/MWh'-cost of transmission capacity.

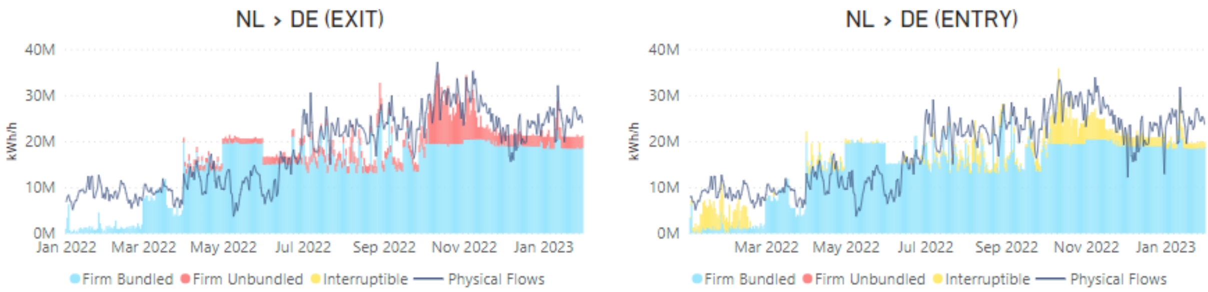
Case study: Flowing gas from the Netherlands to Germany

61 In the Netherlands, capacities have been dynamically recalculated by the TSO to optimise exit capacities from the Netherlands to Germany (VIP TTF-THE-H) since August 1, 2022:

- From 27.9 GWh/h (year) to 36.2 GWh/h in August and September 2022 (day-ahead and within day);
- From 27.9 GWh/h (year) to 34.0 GWh/h in October till January 2023 (month and shorter);
- The aim is to continue to offer 34.0 GWh/h as technical capacity in the winter (2022/23 and 2023/24) and 36.2 GWh/h in the summer, on a monthly basis. This is more than what the firm entry capacities offered so far.

62 This capacity increase has been realised by applying extra compression with existing compressors which leads to higher entry pressure at the German border enabling higher flows on the German side.

Figure 19: Physical flow and contracted firm and interruptible capacities

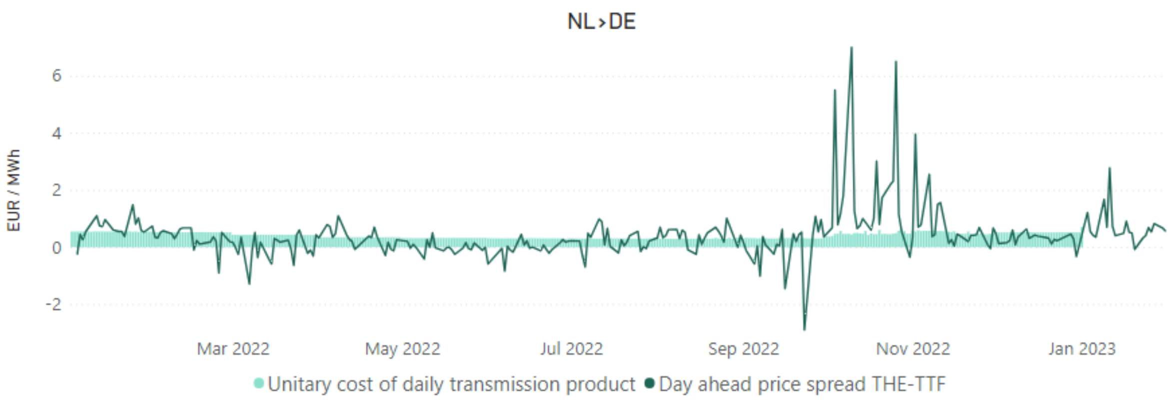


Source: ACER, based on PRISMA auction data of 2021 and 2022 for contracted capacities; ENTSOG TP for physical flow.

63 The hub spread between THE and TTF remained modest throughout most of the year with larger and reversing spreads in October and November 2022.

64 Congestion at this border is of a contractual nature and while physical flow increased in the course of the year, it was also volatile.

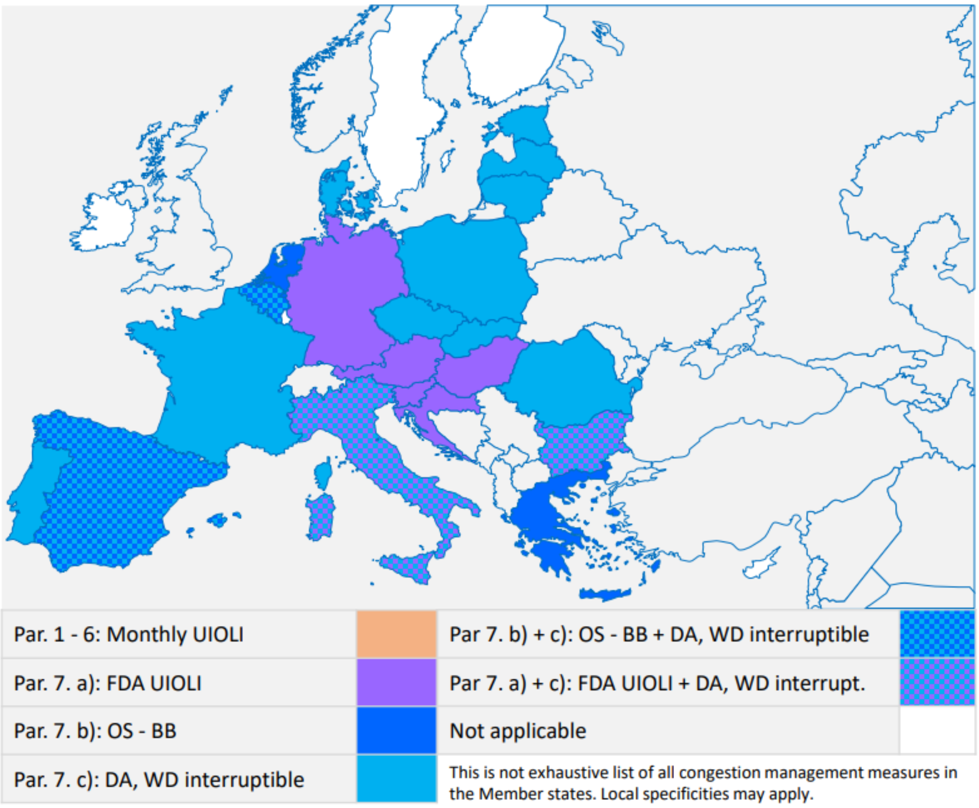
Figure 20: Day-ahead hub spread (positive when THE traded at a premium over TTF) and 'EUR/MWh'-cost of day-ahead transmission capacity from Belgium to the Netherlands



Source: ICIS Heren for hub spreads; ACER calculation based on PRISMA auction data for 'EUR/MWh'-cost of transmission capacity.

5. Annex 2: Member States implementation of Article 14 of Council Regulation (EU) 2022/2576 on 'More effective use of transmission capacities'

Figure 21: Implementation of Article 14 of Council Regulation (EU) 2022/2576 in each Member State



Source: Joint ACER and ENTSOG workshop on maximisation and efficient use of gas transmission capacities.

Note: The measures depicted are those put forward in Article 14 of Council Regulation (EU) 2022/2576; at national level, additional measures might be used to manage congestion as illustrated throughout this report.

6. List of Figures