Demand Forecast Study 2025 – 2034

Market & System Development Department

Strategy & Development Division

September 2024

Table of content

Executive Summary I/IV

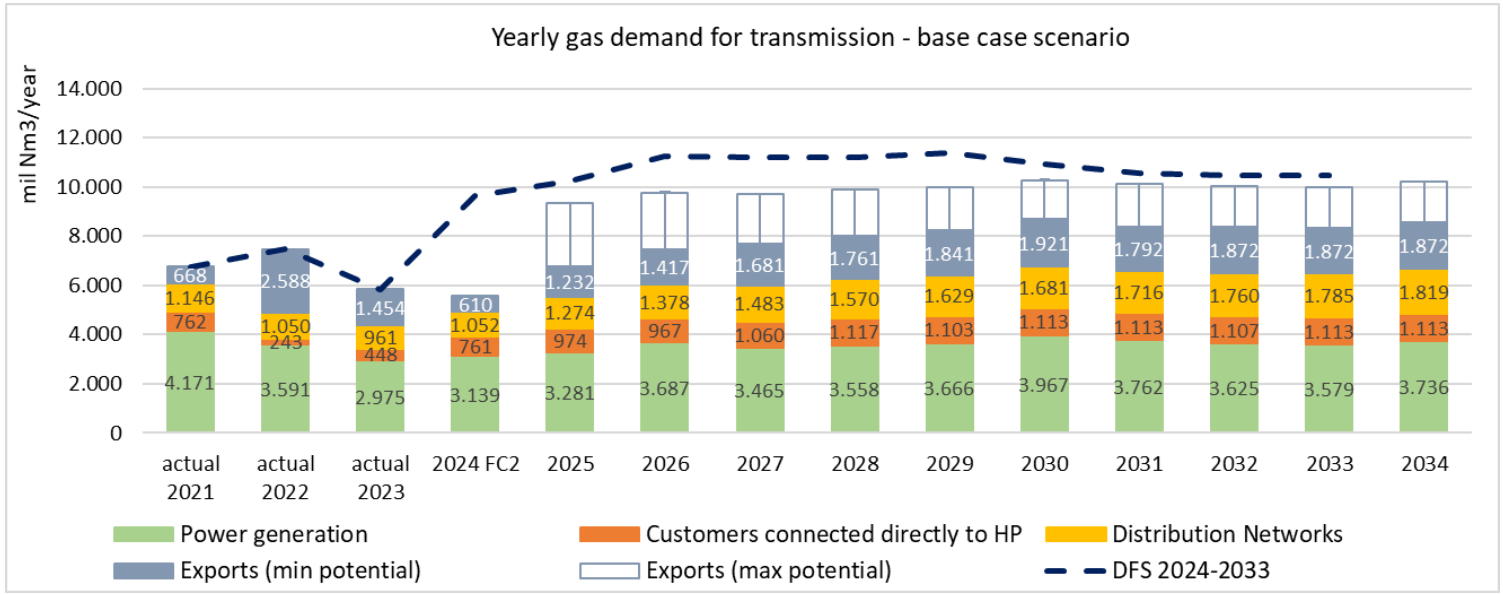
METHODOLOGY AND KEY ASSUMPTIONS

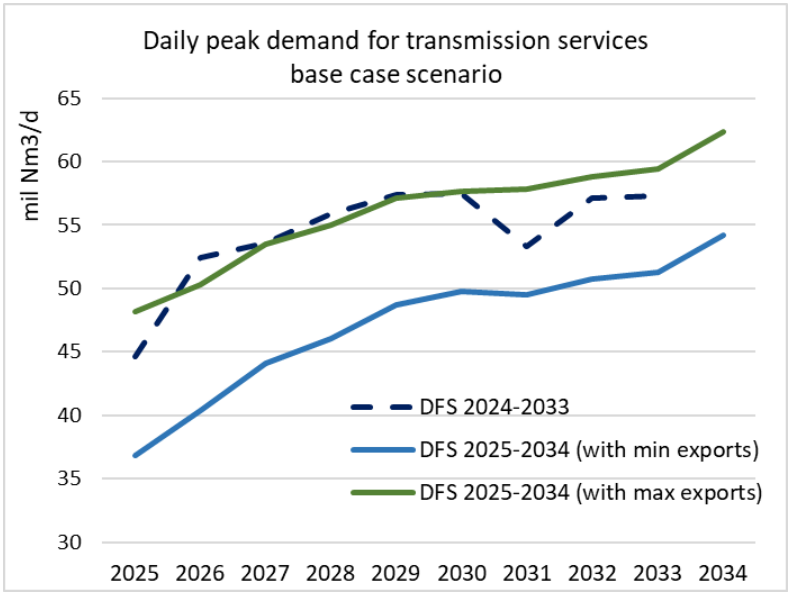
- The Demand Forecast Study (DFS) 2025-2034 is based on the latest available information regarding the evolution of both the power system and the final gas demand and on an evaluation of the conditions that will affect gas exports in the next decade
- Regarding the evolution of the power system, four scenarios were built in order to capture the effect of RES penetration in the electricity system ("base" and "high" RES penetration scenarios), and the effect of net imports ("base" and "low" net imports scenarios). As far as final gas demand is concerned, a single scenario was used, based on data provided by Network Users and DSOs. The aggregation of the "base" scenario regarding gas demand for power generation and the final gas demand scenario consists the "base case" domestic gas demand forecast
- As far as exports are concerned, geopolitics and policy decisions regarding the pace of energy transition affect market conditions and flows in a much more unpredictable manner than in the pre-2022 era, increasing substantially the uncertainty of any outlook. In this context, DFS presents a range of potential exports from Greece towards SEE and CEE, the low end of which is based on known/estimated bookings at interconnection points, while the high end is based on the part of the regional "supply gap" that could be filled by Greece in case Russian gas inflow is eliminated

Executive Summary II/IV

RESULTS - OVERVIEW

- DFS 2025-2034 base case scenario forecasts domestic gas demand at a level of 5,5bcm in year 2025 and 6,6bcm in year 2034. The exports potential range between 1,2 – 3,8 bcm in year 2025 and 1,8 – 3,5 in year 2034. Daily peak demand for domestic market is expected to increase mainly due to the power generation sector. Peak demand does not deviate significantly across the different scenarios on power generation, reflecting the flexibility role that gas units will play in the power system, independent of fluctuations on annual demand. On the other hand, daily peak demand on exports depends on the scenario of exports that will be actually realized





Note: this study is not based on hydraulic simulations

Executive Summary III/IV

RESULTS - DOMESTIC DEMAND

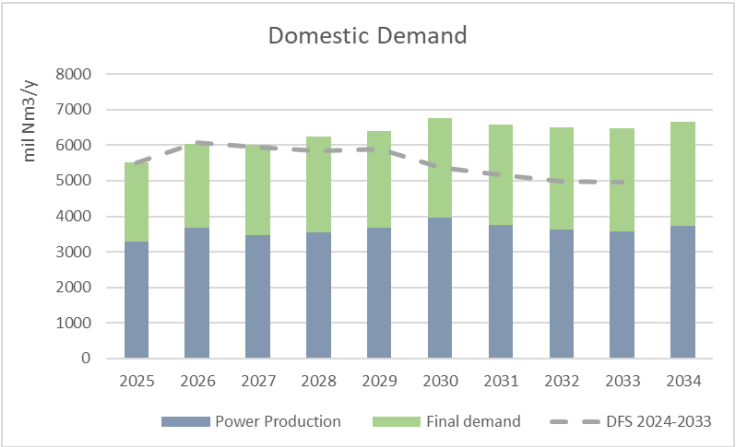
- Gas demand for **Power Production (PP)** is affected significantly from the RES penetration rate. In the most realistic scenario, the annual gas demand for power generation is expected to peak at 3,9 bcm in 2030 and start declining slowly afterwards
- Gas demand in the **Distribution Networks** is expected to grow from 0,9bcm @2023 (a year of lower consumption due to high energy prices and warm weather) to 1,8bcm @2034 (+90%), based on DSOs plans
- Gas demand for **Consumers directly connected to the HP network,** whose demand is highly price-elastic**,** is expected to partially overcome the sharp decline observed in the last years. Assuming that prices will stabilize already from 2025, the expected growth foreseen is from 0,45bcm @2023 to 1,1bcm @2033 (+150%)

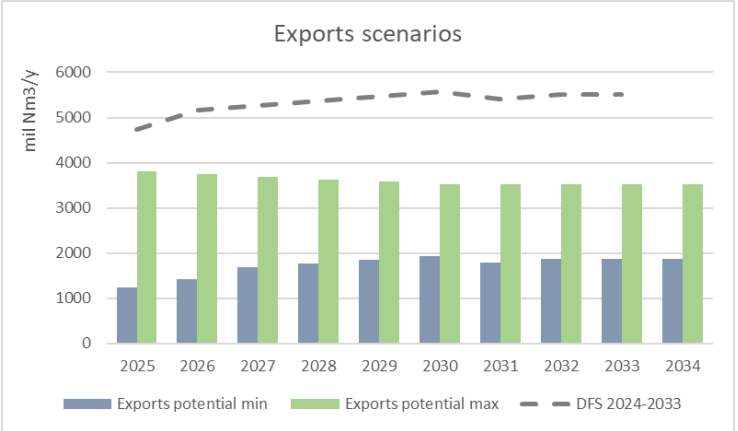
RESULTS - EXPORTS

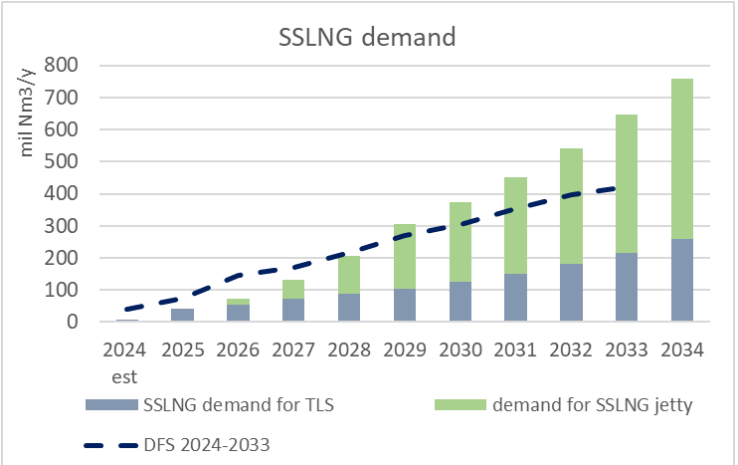
- The low end of the export potential (based on known and estimated bookings at interconnection points) ranges from 1,2 to approx. 2 bcm/y during the reference period of the study. Respectively, the high end of the export potential (based on the part of the regional “supply gap” that could be filled by Greece in case Russian gas inflow is eliminated) ranges from 3,4 to 4 bcm/y

RESULTS - SSLNG

- Demand for SSLNG is foreseen at the level of 40 mil Nm3 @2025 up to 760 mil Nm3 @2034, where both TLS and SSLNG jetty will be operational

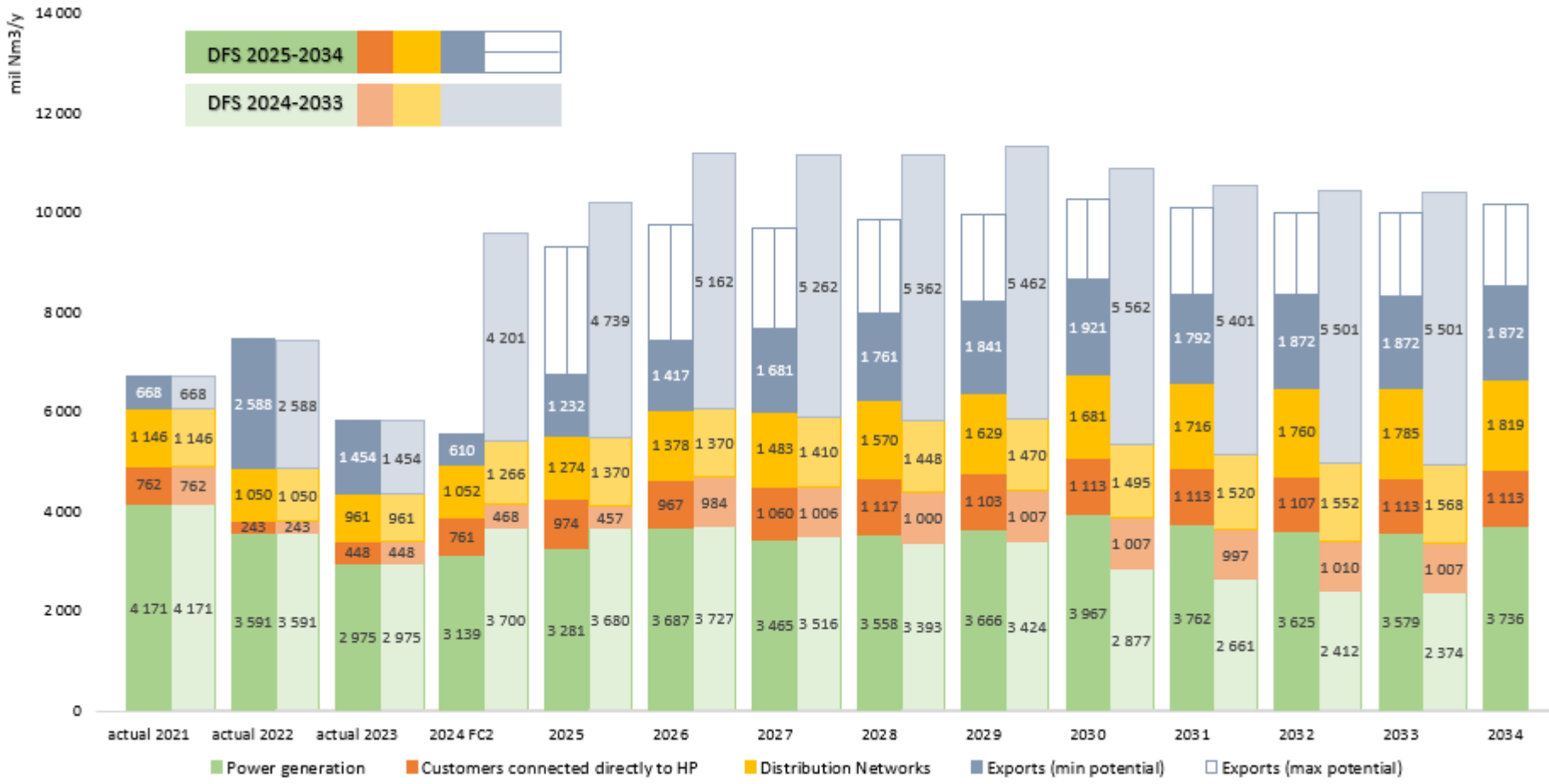






Executive Summary IV/IV

- The differences between the “base case” scenario of DFS 2025-2034 and the “base case” scenario of DFS 2024-2033 are presented below



*SSLNG data are not included

Total natural gas demand (mil Nm3/y)	actual 2021	actual 2022	actual 2023	2024 FC2	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
DFS 2025-2034 (with min exports)	6.747	7.471	5.838	5.561	6.761	7.449	7.688	8.006	8.239	8.682	8.383	8.364	8.349	8.540
DFS 2025-2034 (with max exports)	6.747	7.471	5.838	5.561	9.329	9.776	9.695	9.877	9.974	10.281	10.113	10.016	10.003	10.195
DFS 2024-2033	6.747	7.471	5.838	9.635	10.246	11.244	11.195	11.203	11.363	10.941	10.579	10.475	10.449	

Table of content

Methodology / Scenario Building

- Gas demand forecast for power generation is based on the simulation of the Greek power market for the period 2025-2034
- The scenarios for the power market simulation are built taking into consideration all available information until the end of June 2024
- The simulation is performed by Global Consulting Services (GCS), in close cooperation with DESFA

Different simulation scenarios (a "Scenario Matrix", as shown below) are built by **a combination of the following parameters**, the values of which are presented in detail in the following slides:

- RES share in system load
- Net Imports level

2 values ("base" and "high" for RES, "base" and "low" for net imports) are considered in order to formulate the scenario matrix

- System Load
- Gas and CO2 prices
- New generation capacity
- Plan of withdrawal of lignite-fired power plants
- Plan of new interconnections with neighboring countries
- Plan of interconnection of islands to the mainland

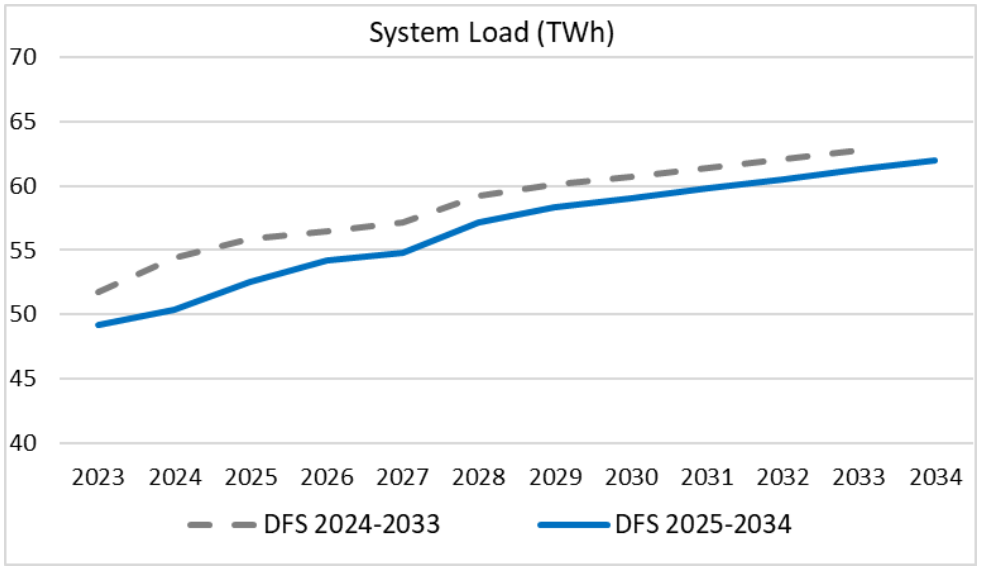
a single value for each parameter is considered across all scenarios

Scenario Matrix

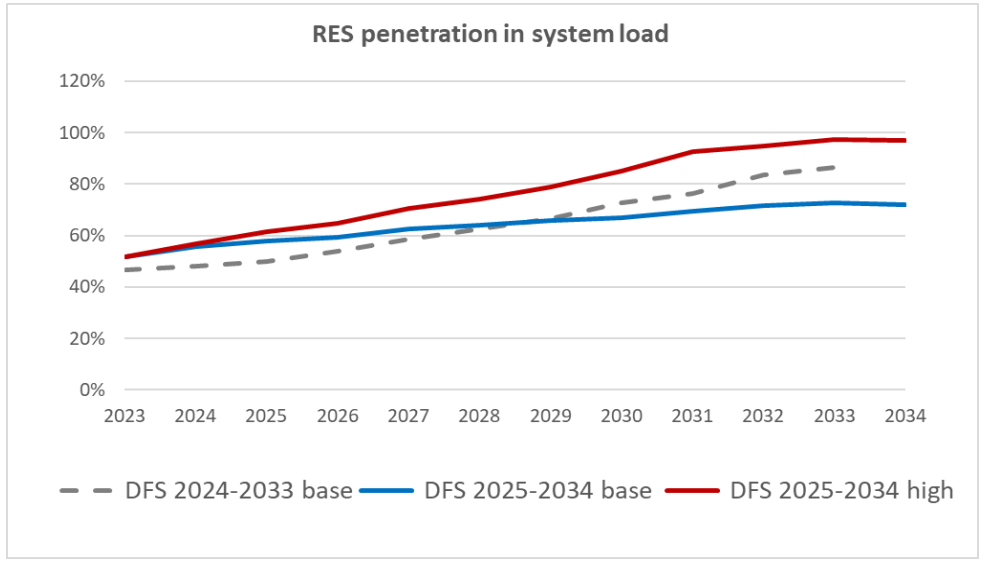
Scenario name	RES penetration	Net Imports
Scenario 1_High RES_base imports	high	base
Scenario 2_Base RES_base imports	base	base
Scenario 1a_High RES_low imports	high	low
Scenario 2a_Base RES_low imports	base	low

Scenario 2 is the **base case scenario** for δesfa

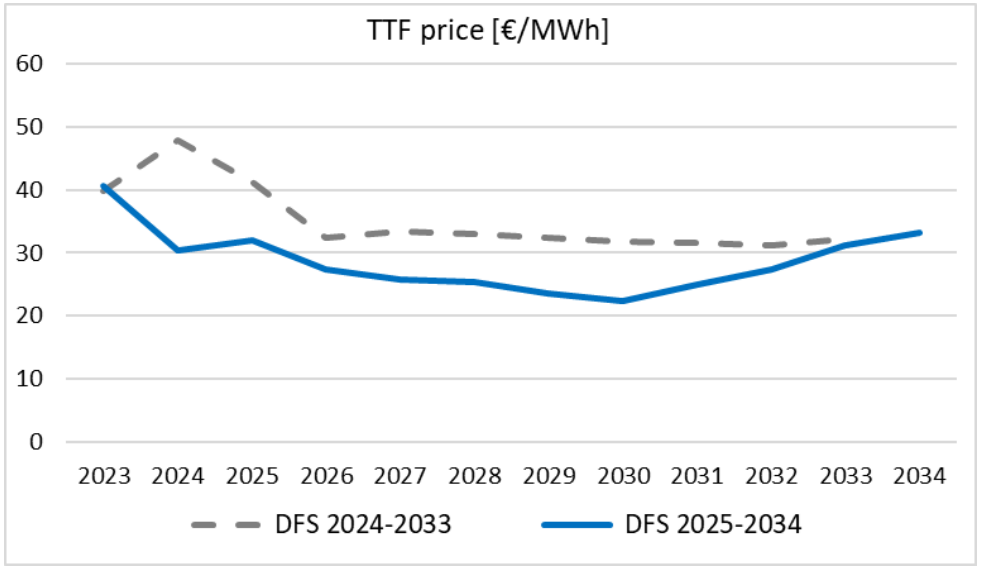
Parameter values (I/II)



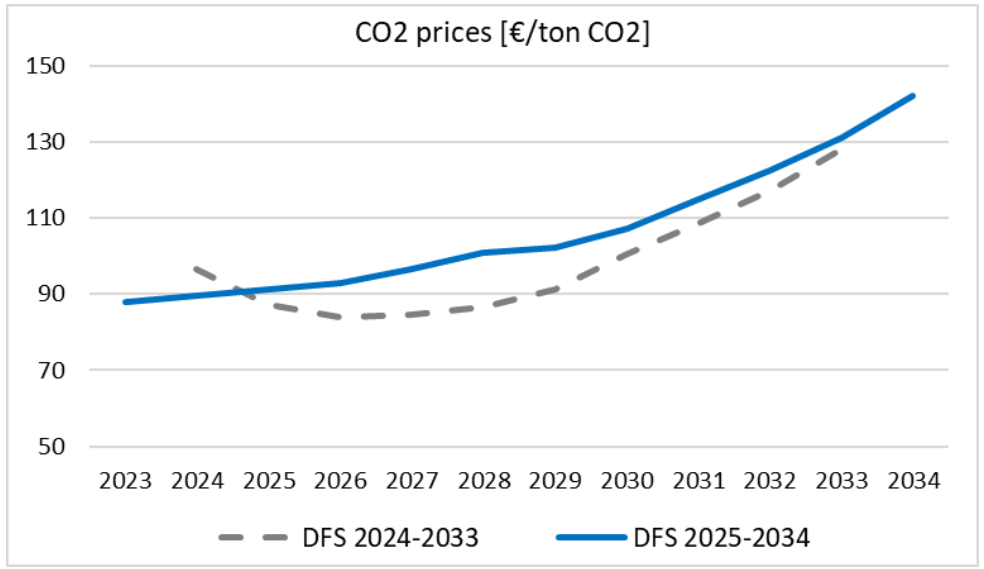
Source: IPTO



Source: draft NECP, DESFA estimates



Source: S&P Global, annual average TTF DA price



Source: S&P Global, ETS prices

Parameter values (II/II)

Decommissioning of power plants in 2025-2034 period

Lignite power plants	Capacity (MW)	Decommissioning Year
Agios Dimitrios 1	274	Dec 2024
Agios Dimitrios 2	274	Dec 2024
Agios Dimitrios 3	283	Dec 2025
Agios Dimitrios 4	283	Dec 2025
Agios Dimitrios 5	342	Dec 2025
Megalopoli 4	256	Dec 2025
Meliti	289	Dec 2024
Ptolemaida 5	616	Dec 2028

Decommission plan of lignite units follows the latest available information

Commissioning of new power plants in 2025-2034 period

Natural gas power plants	Capacity (MW)	Commissioning Year
New CCGT 1	≈2.600	operational by mid 2026
New CCGT 2		
New CHP		
New CCGT 3		operational by beg 2029

Electricity interconnections in 2025-2034 period

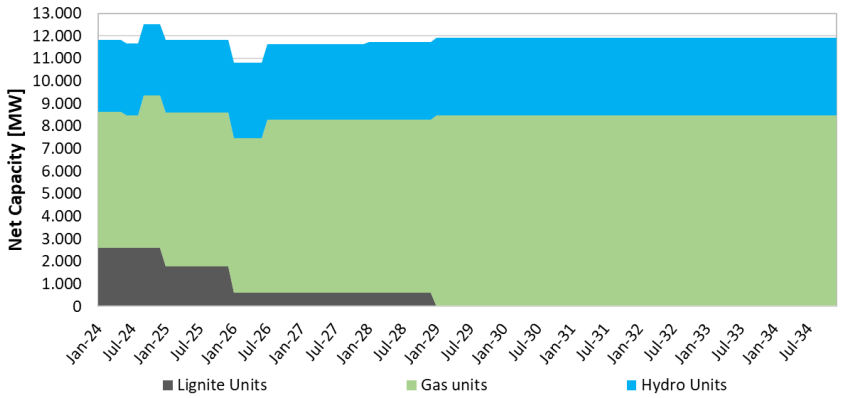
with neighboring countries

- ❑ new interconnection lines are scheduled to become operational connecting Greece with Cyprus (2030) and with Turkey, Albania and Italy in 2032

with islands

- ❑ West Cyclades by 2025
- ❑ DC interconnection with Crete by July 2025
- ❑ Dodecanese by 2028
- ❑ North Aegean by 2029

Conventional generation capacity in mainland in 2025-2034 period



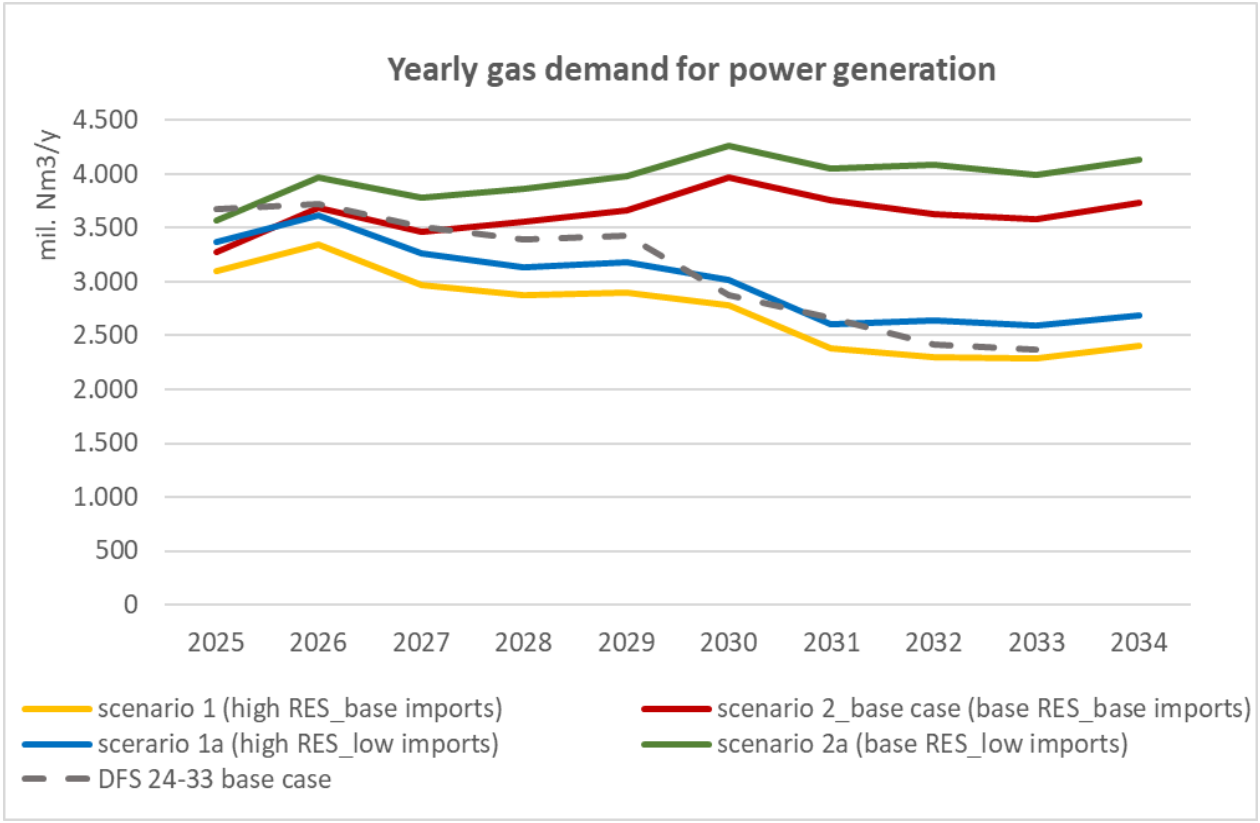
Annual gas demand

Remarks

- From the two RES penetration scenarios, the “base” one is considered the most likely to eventually realize, given the current challenges faced by the RES market in Greece (mostly the forced curtailments, questioning the viability of the plans) but also the challenges that will be faced in case of a very high (and fast) RES penetration (potential supply chain issues, questionable viability that makes financing difficult etc.). Nevertheless, such a “high” RES penetration scenario was also considered in this study, reflecting the current expectations and the policy narrative regarding the development of the sector

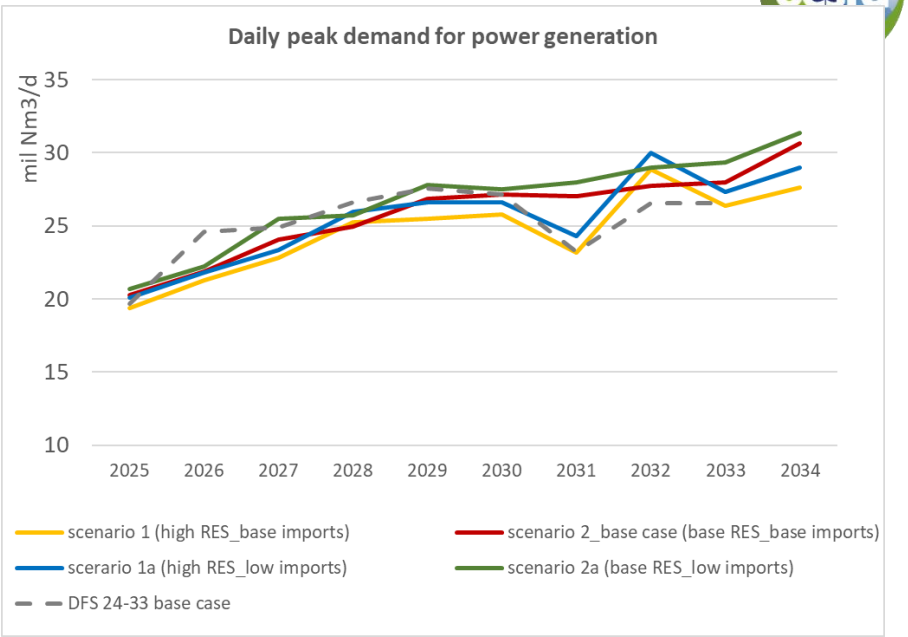
Results

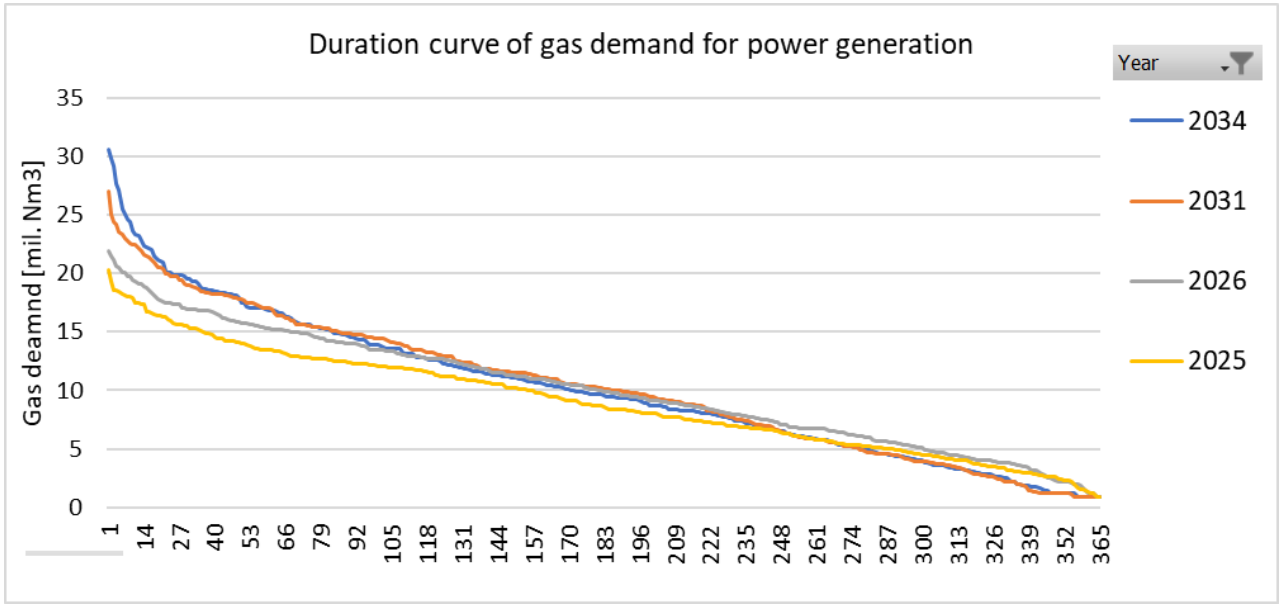
- The most critical factor affecting gas demand for power generation is the RES penetration, having a much greater effect than the amount of net imports
- In particular, in the more likely “base” RES penetration scenario, gas demand for power generation remains practically stable for the whole period considered, roughly between 3,5 bcm/y (“Base” net imports) and 4,0 bcm/y (“Low” net imports), reflecting a continuing, stable role for gas units overall, although the degree of utilization of new and older gas units may differ significantly)
- A continuously and severely decreasing role is foreseen for the gas units in the high RES penetration scenario, for both “Base” and “Low” net imports

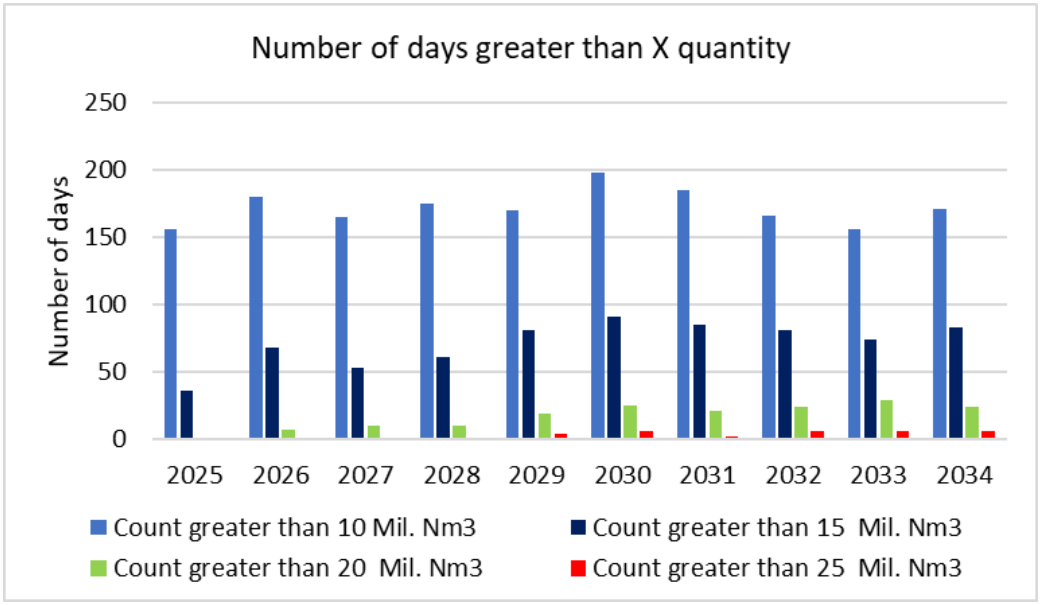


Daily peak demand

- Contrary to what was observed regarding annual demand for power generation, the peak demand is expected to increase across the reference period in all scenarios, reflecting the flexibility role that gas units will have to play in a power system with significant share of RES
- Taking -as a point in case- year 2032, a higher peak demand is forecasted on the “high” RES penetration scenario vs the “base” RES penetration scenario, indicating the significant role of gas units in the stability of the system, even though their share in the annual power production is diminishing
- An analysis of the gas consumption duration curves for each year of the reference period is presented in the graph below. In particular:
  - Demand over 20 milNm3 is expected to appear already from year 2026, where almost all new gas-fired units will be operational
  - At the same time, the forecasted daily gas consumption for power generation starts being higher than 25 milNm3/d, for a limited number of days in the year, from 2029 onwards
  - Annual power production from gas-fired units is decreasing, however the flexibility needs, in a constantly increasing system load, will lead to higher peaks

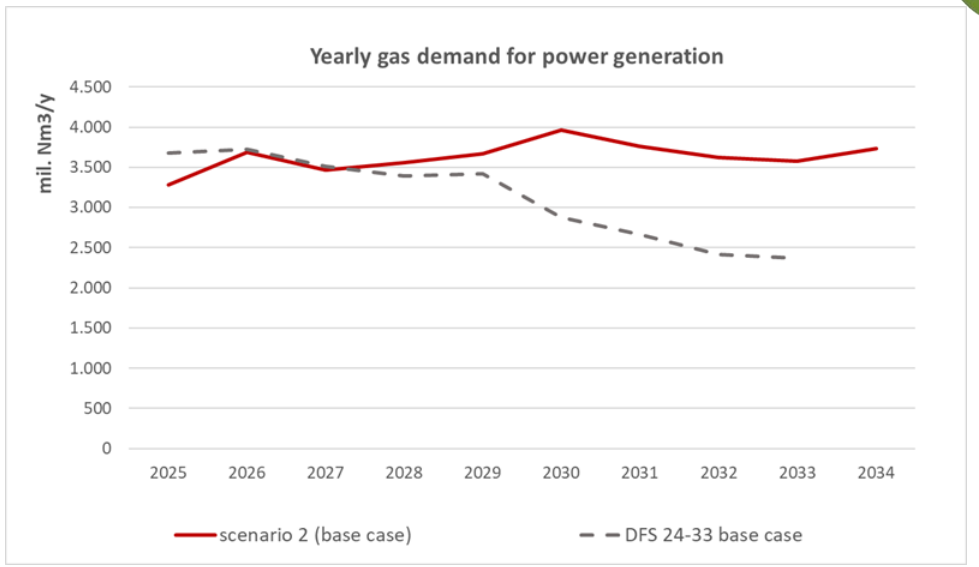


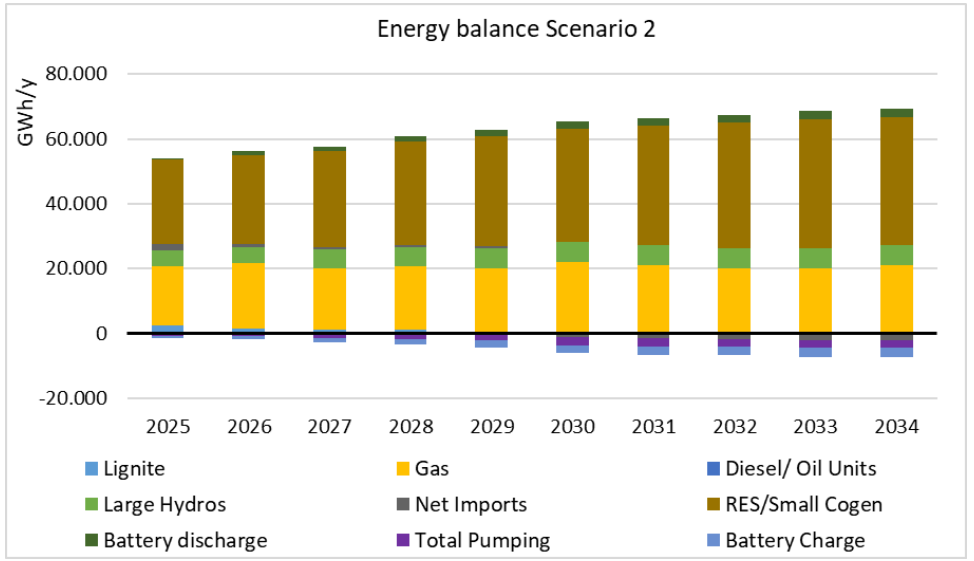




Overview of the power generation mix in the base case scenario

- The system load of the interconnected system is increasing from 52,25 TWh in year 2025 up to 62 TWh in year 2034
- Gas-fired power plants generation is expected to range from 17,9 TWh in 2025 to 21 TWh in 2034, operating approximately 2300 to 2800 equivalent full load hours per year (although the degree of utilization of new and older gas units may differ significantly)
- RES penetration is occurring on a stable pace, leading to an increase of RES share in the system load from ≈59% in 2025 to ≈73% in 2034
- Lignite-fired power plants are expected to cover only 5% of total power injections in year 2025, with the percentage decreasing every year until the complete phase out of lignite plants in 2028
- Curtailments of RES generation are lower in the "base" RES penetration scenario (compared to the scenario with high-RES penetration). This constitutes an additional positive aspect of a more balanced RES penetration to the Greek energy system vs an aggressive one. Expected RES curtailments for all scenarios are presented in the appendix
- It is forecasted that net imports will start decrease throughout the reference period and Greece will become a net exporter already from 2030, mostly related to the interconnection with Cyprus





*energy mix of all scenarios are included in the Appendix

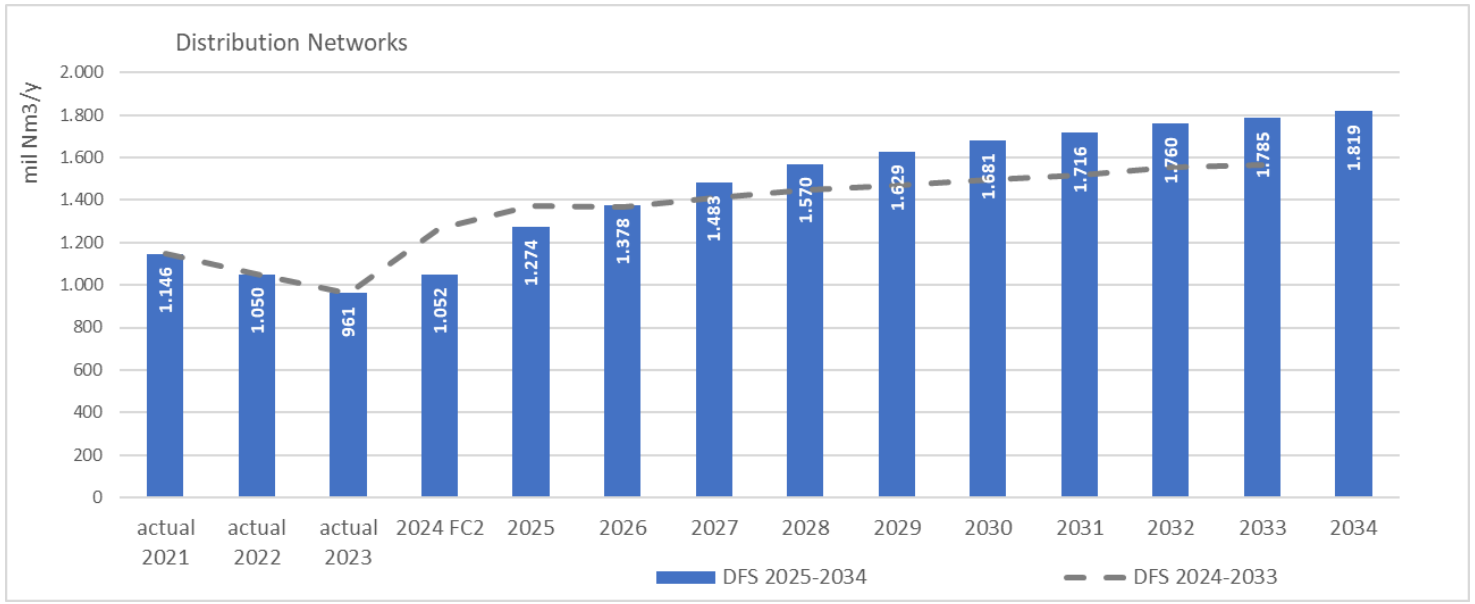
Table of content

Distribution networks

- The annual demand forecast for distribution networks is based on data provided to DESFA by the DSOs (i.e. ENAON and HENGAS)
- According to the Development Plans of the DSOs, gasification of new areas is planned in the regions of Central Greece, Eastern Macedonia &Thrace, Central & West Macedonia, West Greece, Peloponnese and Epirus
- The region of Epirus and some areas in Western Macedonia and in Western Greece are planned by DSOs to be supplied on a permanent basis via SSLNG(*) services (truck loading)

Results

- Gas demand for distribution networks in 2034 is expected to reach 1,8 bcm, increasing by 89% compared to year 2023
- Compared to last year's forecast, higher gas demand (in the order of additional 180 mil. Nm3/y, on average) is expected for each of the years 2027-2033
- This is due to increased gas demand forecasted by the DSOs in Greek regions outside the large urban centers in Attika, Thessaloniki and Thessaly, that more than counterbalances a notable decrease in demand forecasted by the DSOs for the aforementioned urban regions



(*) Demand expected to be served via SSLNG services is included in the forecast of SSLNG demand and not in this section

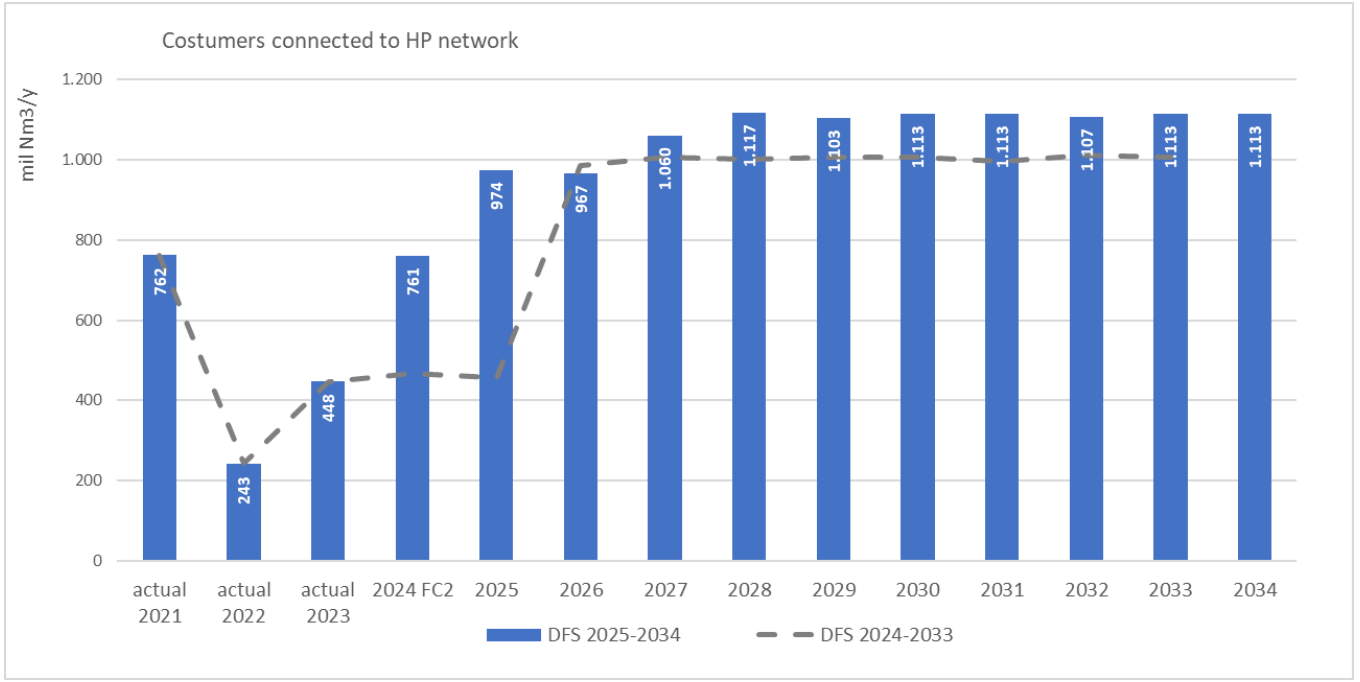
Customers connected directly to High Pressure network

Remarks

- Gas consumption in years 2022 – 2023 was severely affected by the high natural gas prices. Demand in years 2022 and 2023 dropped by 68% and 42%, respectively, compared to 2021
- This decrease in demand is mainly driven by the oil refinery sector, where price elasticity is very high due to the technical ability to quickly switch to alternative fuels in case of an increase in natural gas prices
- Recovery in demand is already observed in the first half of 2024, returning to "business-as-usual", due to a return to moderate/low gas prices
- A new industrial customer (ELVAL) is expected to connect to the HP network in year 2027

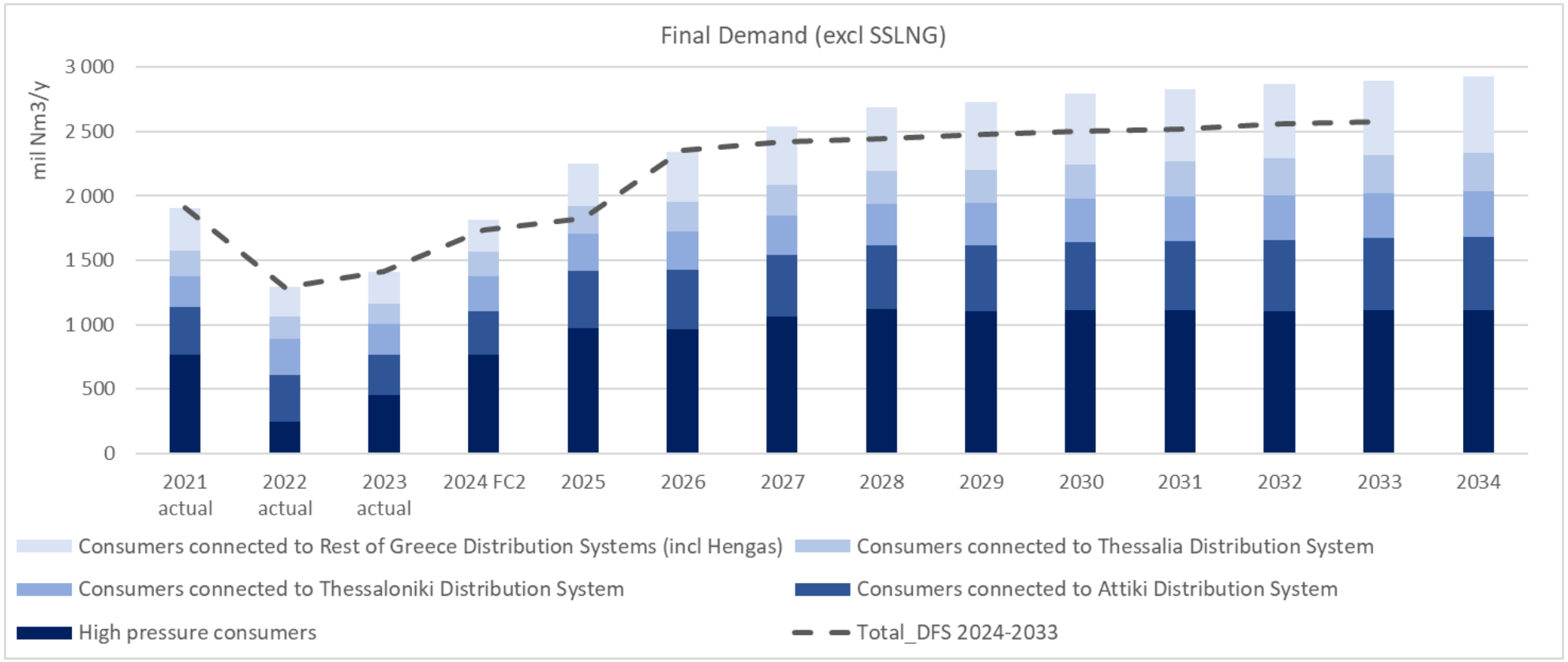
Results

- Overall, gas demand of customers directly connected to HP is expected to exceed 1bcm in 2034 (+358% compared to year 2022 and +148% compared to year 2023 (or +45% compared to year 2021)
- For the reasons explained above, full return to "business-as-usual" is expected to occur in 2025, one year earlier than what was foreseen in the DFS 2024-2033
- A slightly higher gas demand (in the order of additional 100mil Nm3) is expected from year 2028 onwards compared to last years' forecast, due to an upward demand projections from the refinery sector



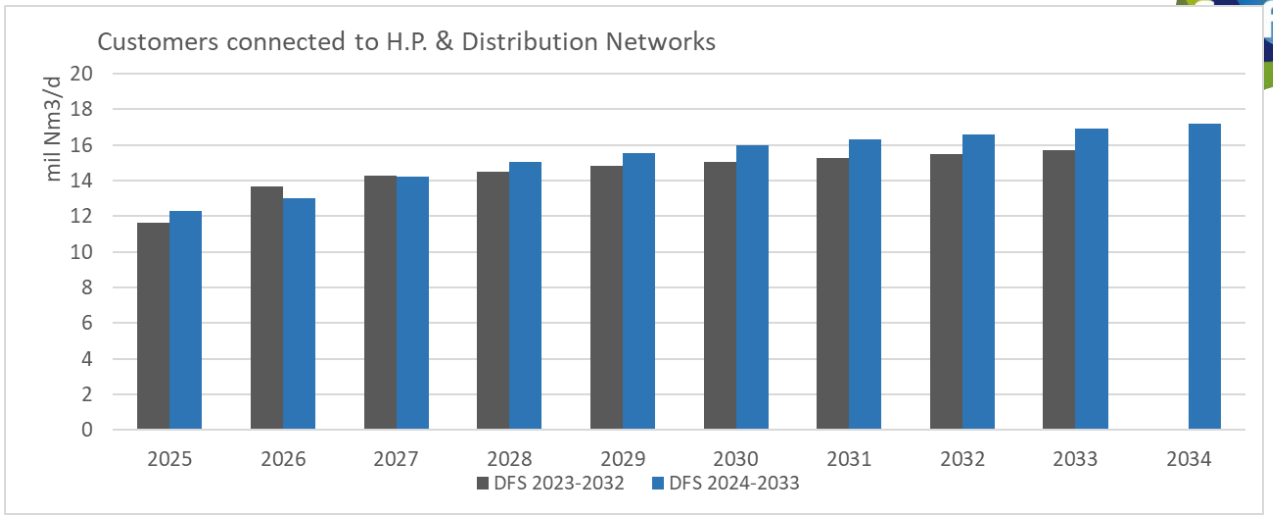
Final demand (annual) - aggregated results

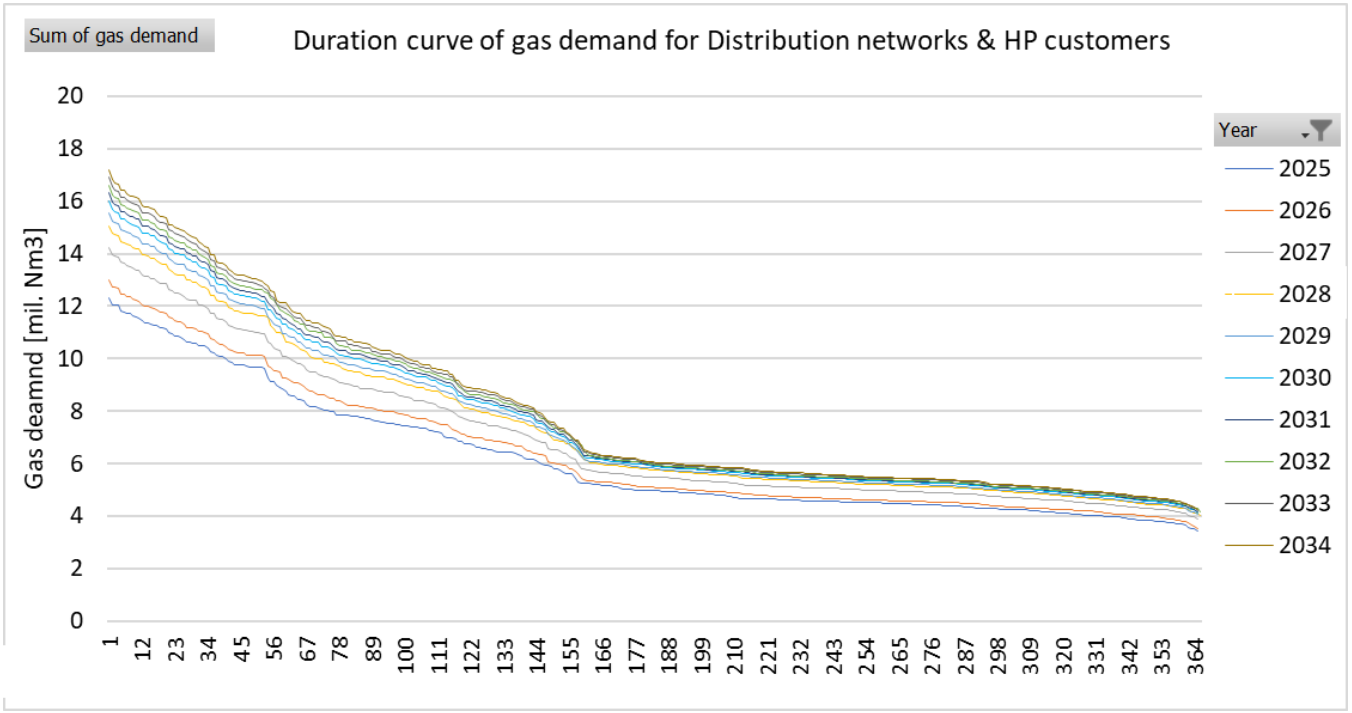
- Annual data for all categories presented in the graph below are based on Users and DSO's best estimates



Final demand (peak) - aggregated results

- The peak presented in the graph is the maximum daily total demand forecasted per year for both final demand categories on the same day
- The duration curve indicates the variations of daily demand throughout the year. The base load vs seasonal increase for residential & commercial demand is shown in the graph below





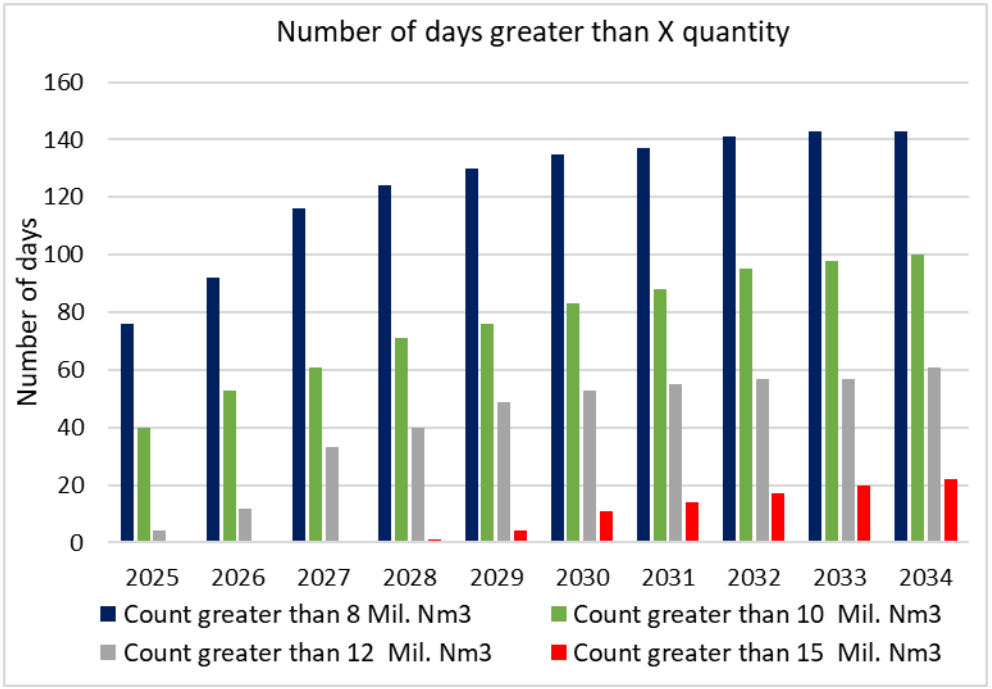


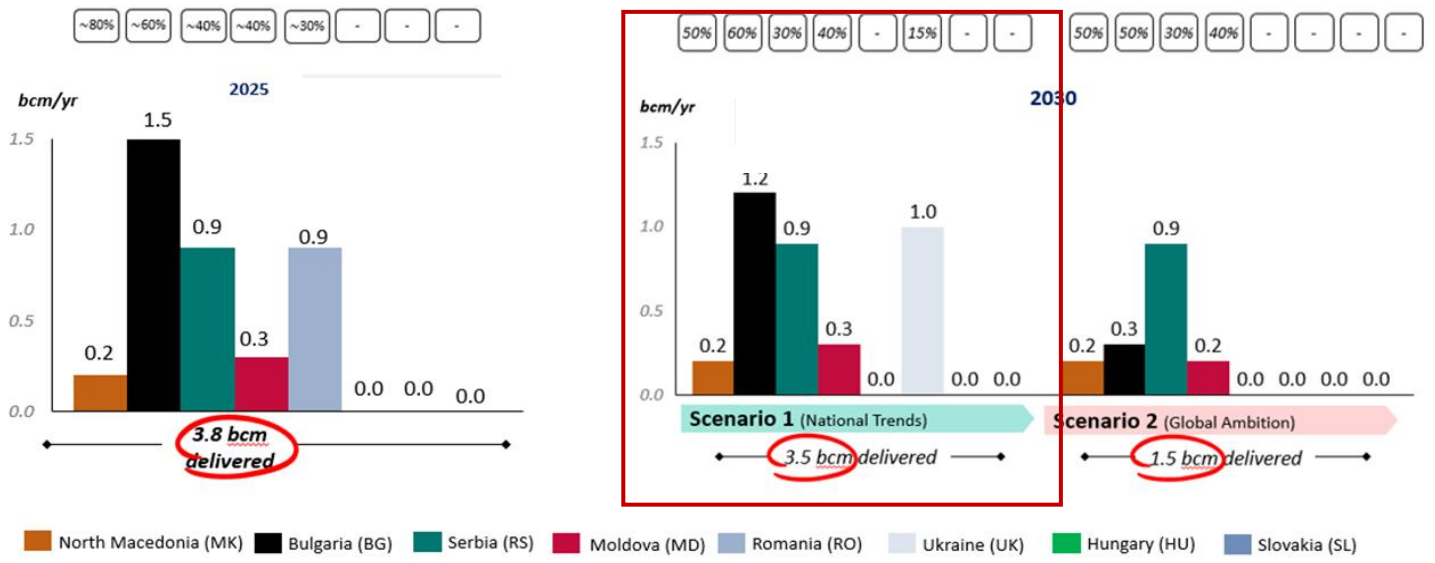
Table of content

Exports - Remarks

- Geopolitics and policy decisions regarding the pace of energy transition affect market conditions and flows in a much more unpredictable manner than in the pre-2022 era, increasing substantially the uncertainty of any outlook. A point in case is that the record-high exports from the Greek gas system to SEE in 2022 & 2023 following Russia's invasion of Ukraine were followed by nearly zero exports in 2024, so far
- In this context, DFS presents a range of potential exports from Greece towards SEE and CEE, the low end of which is based on known/estimated bookings, while the high end is based on the part of the regional "supply gap" that could be filled by Greece in case Russian gas inflow is eliminated
- The upper limit on gas exports is estimated as the addressable demand that can be served by Greece (being the more competitive option compared to other alternatives) in case of interruption of Russian gas flows. The addressable demand is estimated using ENTSOG data: a single "best estimate" demand scenario for 2025 and two demand scenarios for 2030 (National Trends and Global Ambition). The addressable demand could be served via 7 competing gas routes (with Russian supply options excluded): 3 entering from the south-east side (Greece, Turkey and TANAP-TAP-Bulgaria) and 4 entering from the north-west (Germany, Poland, Croatia, Italy), with Turkey being a direct competing source for the closest countries to Greece

- The maximum export potential is estimated as follows:
  - For year 2025, using the "best estimate" demand scenario
  - For year 2030, using the National Trends scenario
- The minimum export potential is estimated based on known and estimated capacity bookings at interconnection points
- It should be noted that upsides even on the maximum export potential are possible, through an increase of gasification of the Balkans along with/due to slower energy transition and geopolitical evolutions

2030 MAX EXPORTING POTENTIAL % of addressable demand supplied by Greece



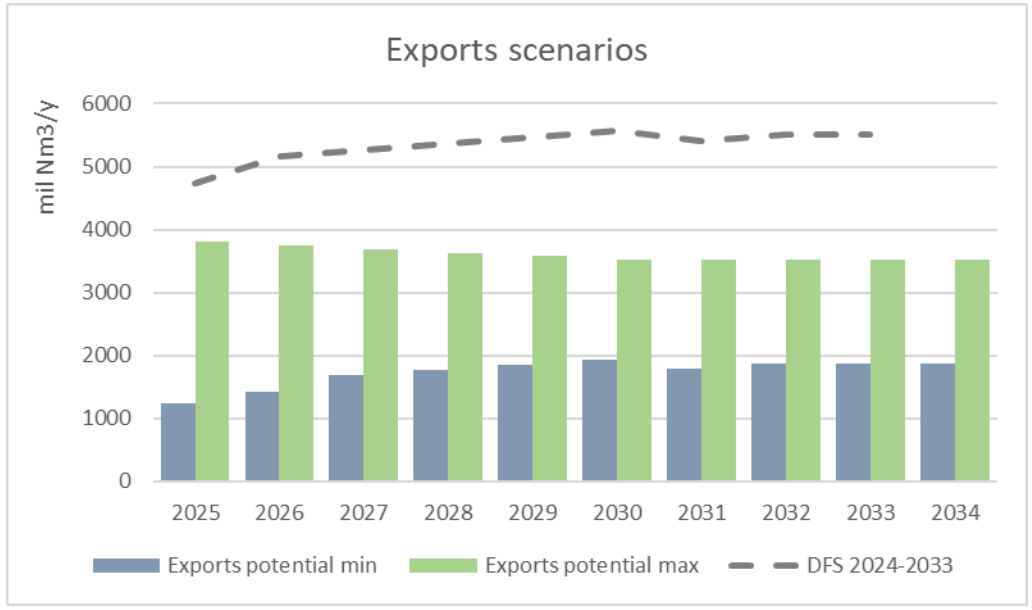
* Analysis of SEE and CEE region based on National Trends & Global Ambition scenarios of ENTSOG, non-Russian ng LT term contracts and indigenous production

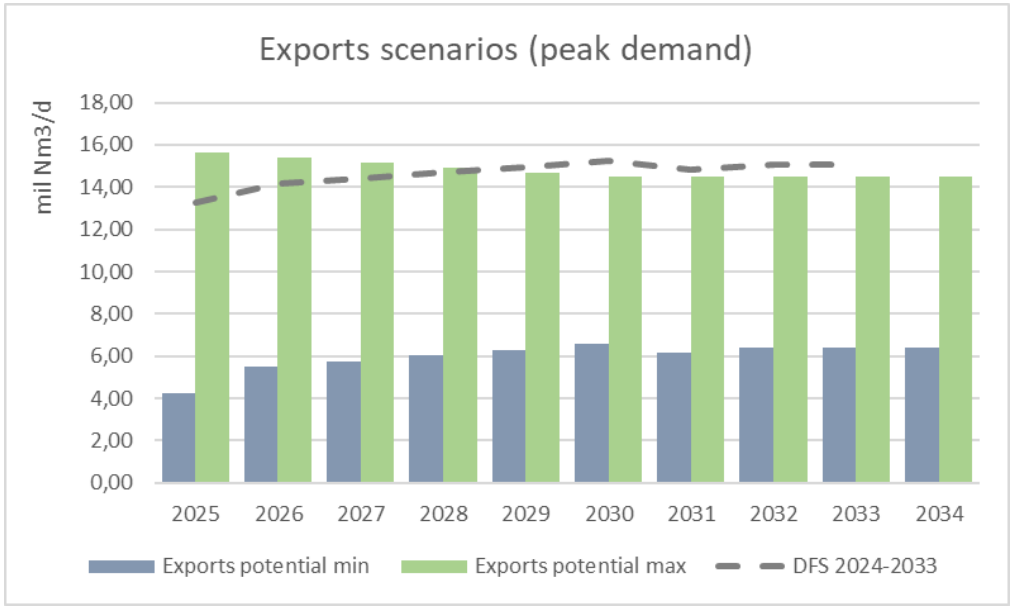
Results

The range of exports and relevant peaks are presented in the following graphs

The low end of the export potential (based on known and estimated bookings at interconnection points) ranges from 1,2 to approx. 2 bcm/y during the reference period of the study. Respectively, the high end of the export potential (based on the part of the regional “supply gap” that could be filled by Greece in case Russian gas inflow is eliminated) ranges from 3,4 to 4 bcm/y

Peak demand (in the max exports potential is roughly similar to last year’s forecast



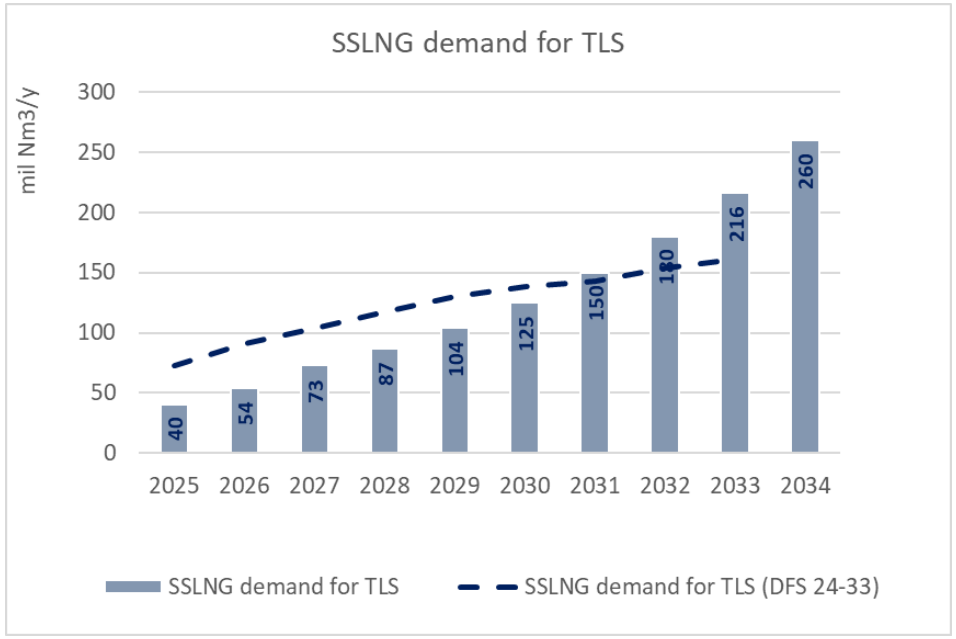


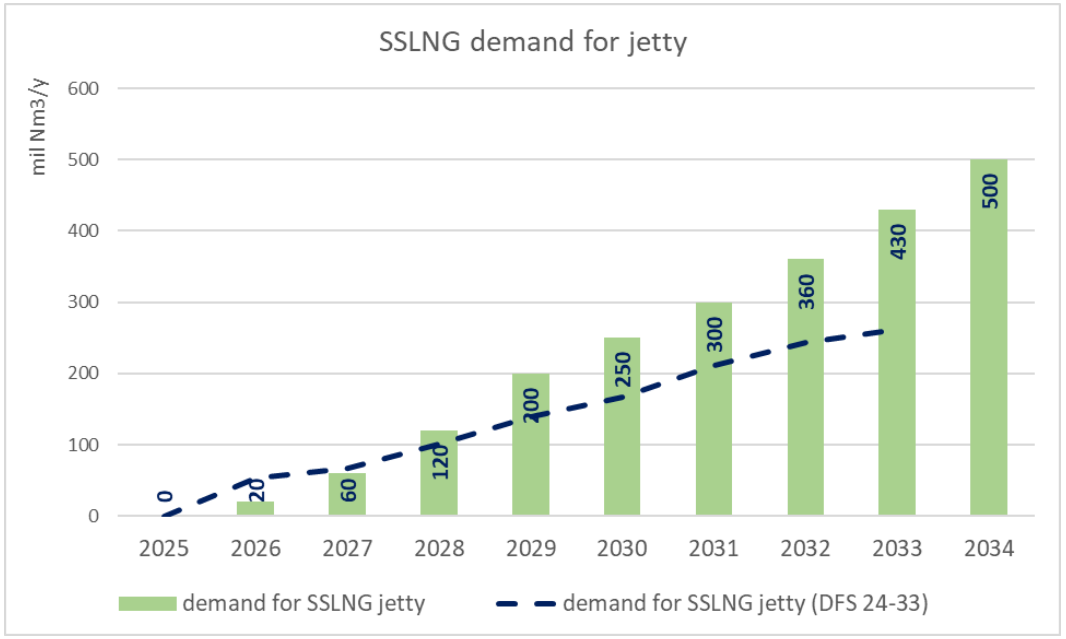
- For the minimum export potential estimation, daily capacity bookings were transformed to yearly volumes using a LF equal to 0,8
- For the maximum export potential estimation, a LF equal to 0,7 is used

Table of content

SSLNG services

- A separate demand scenario is established for each of the two SSLNG services:
  - Truck Loading Station (TLS)
  - new SSLNG jetty
- Gas demand forecast for each SSLNG service is based on information provided by Users



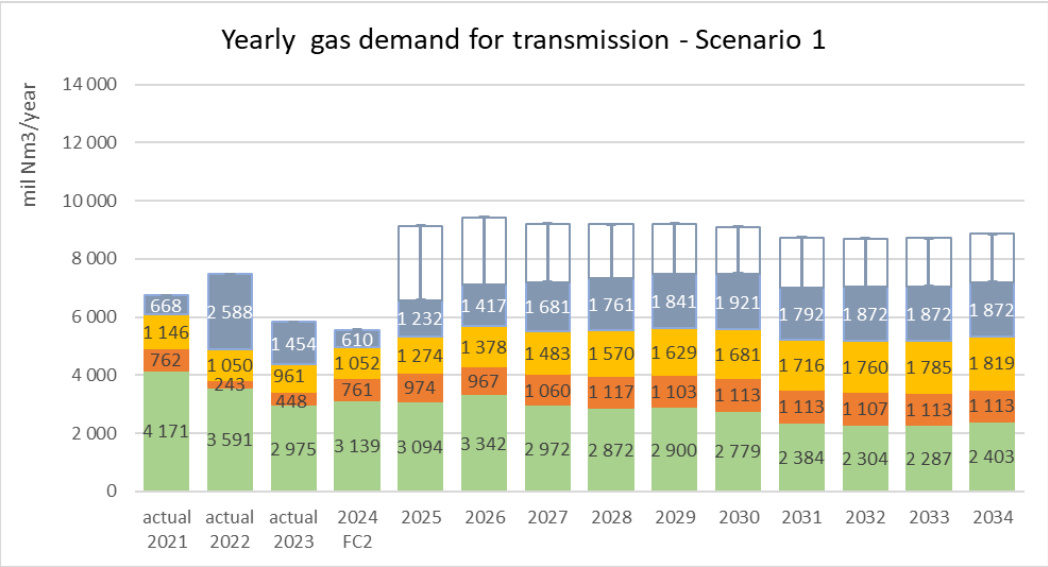


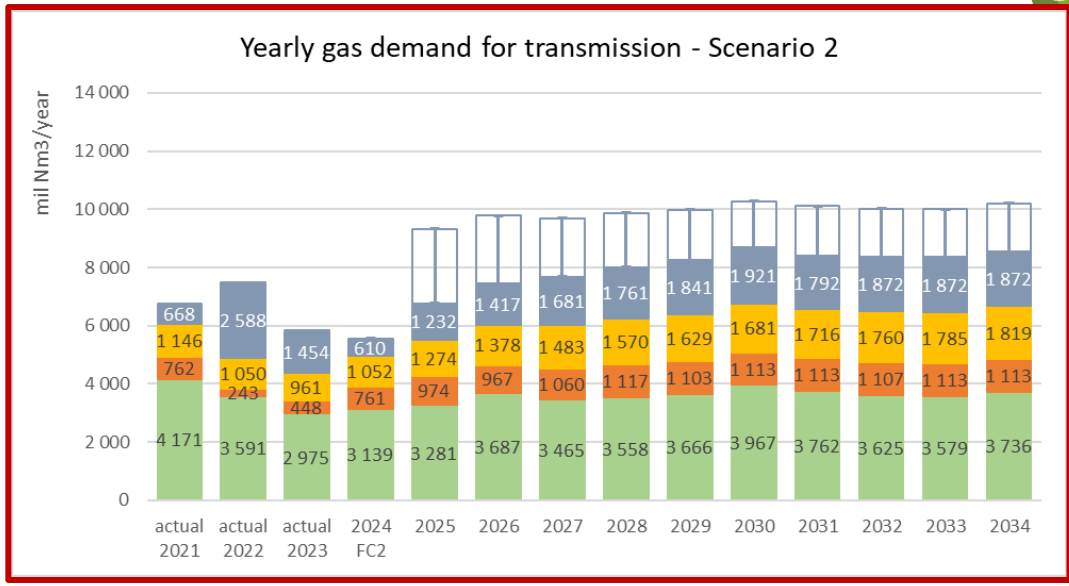
Note: graphs present the potential demand for SSLNG &TLS services without considering the limitations of the infrastructure yet

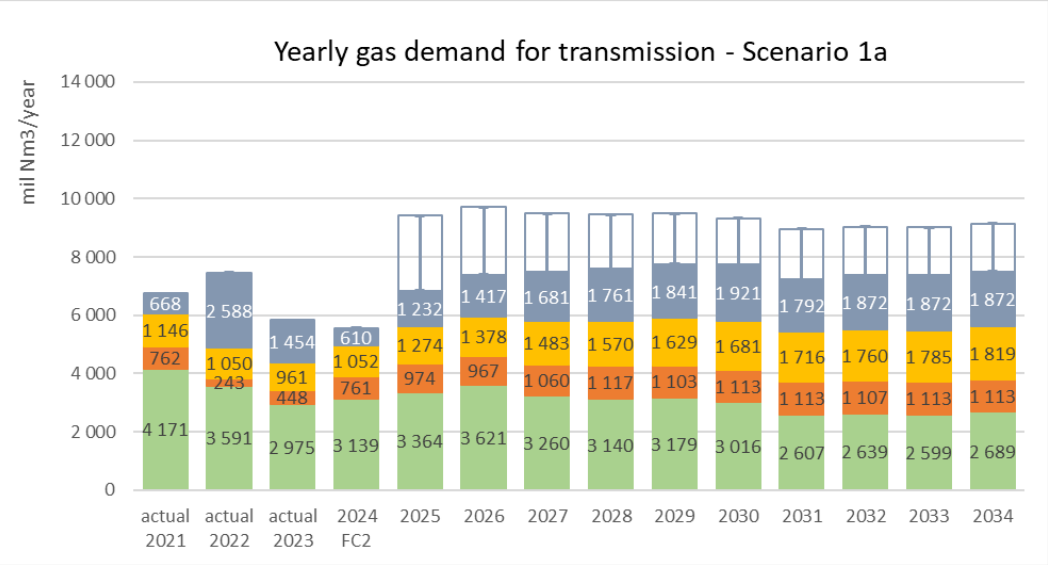
Table of content

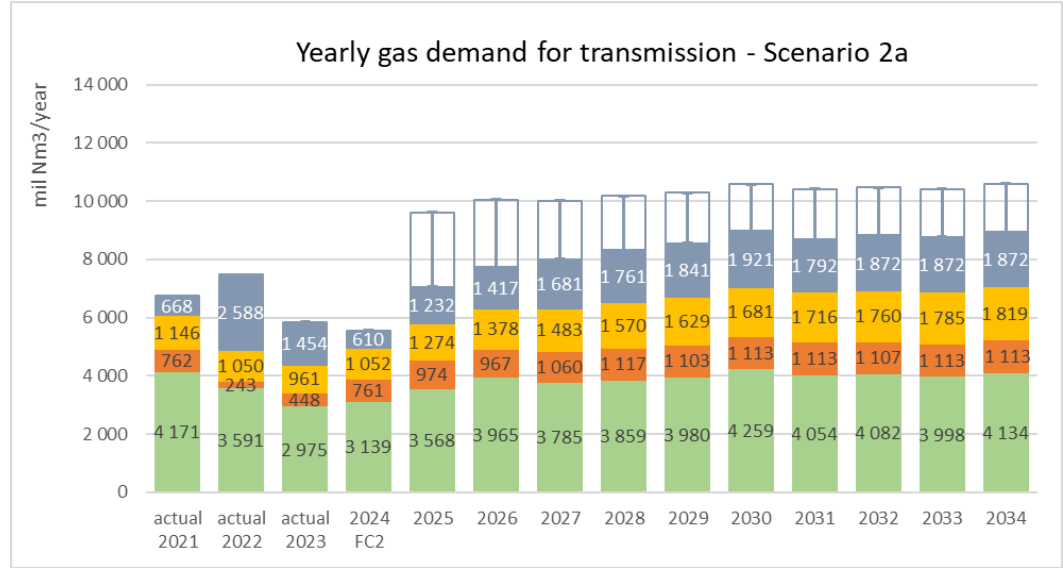
Total gas demand for transmission system breakdown – all scenarios

BASE CASE SCENARIO





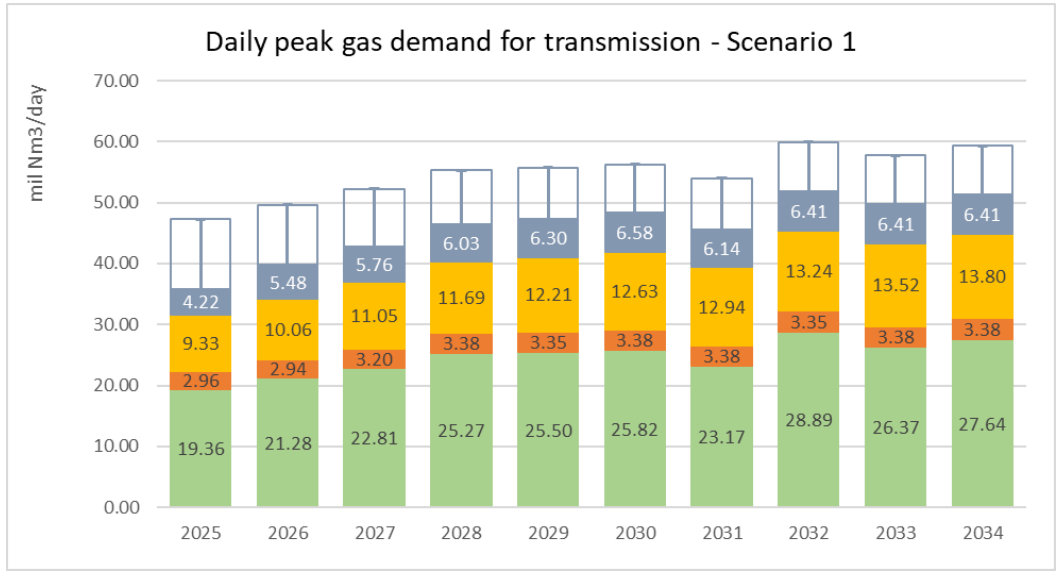


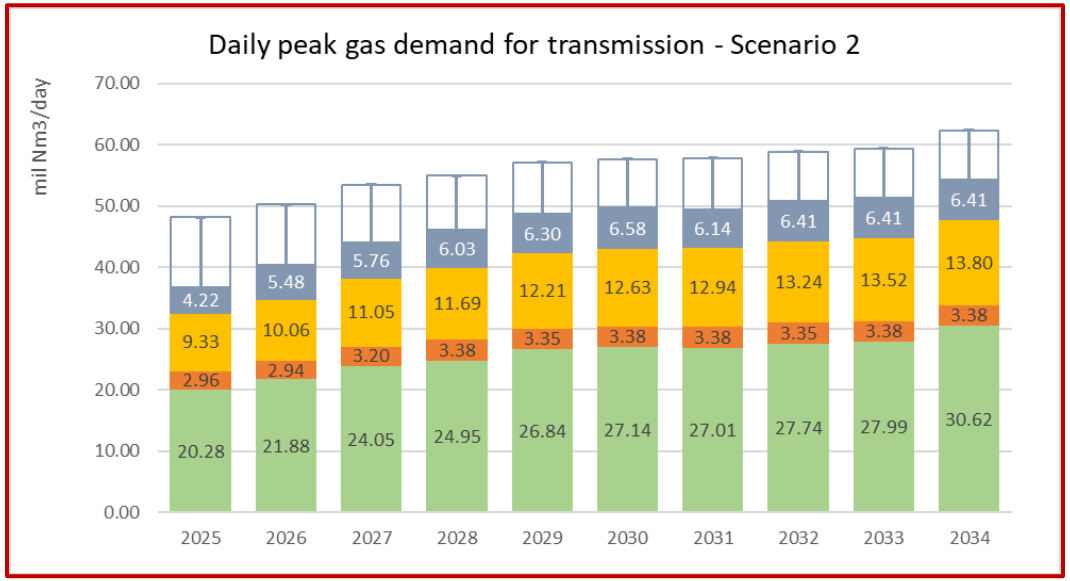


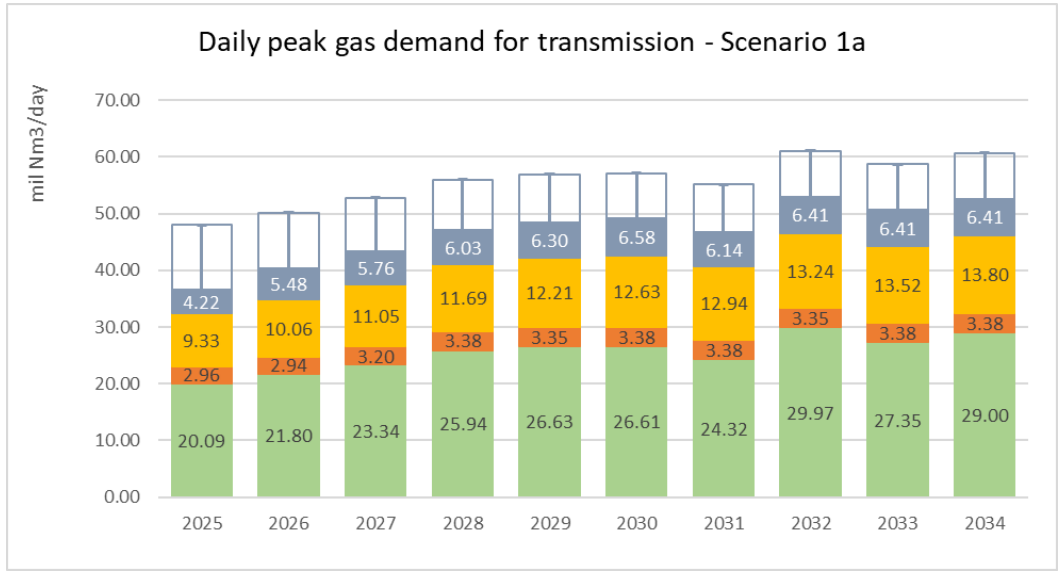
Power generation | Customers connected directly to HP | Distribution Networks | Exports (min potential) | Exports (max potential)

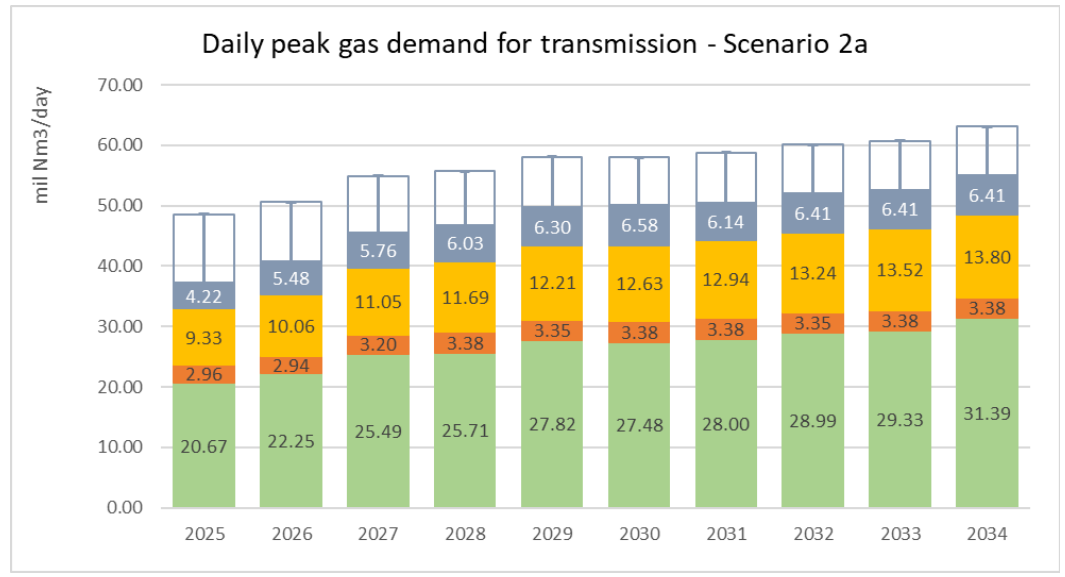
Daily peak gas demand for transmission system breakdown – all scenarios

BASE CASE SCENARIO









Power generation | Customers connected directly to HP | Distribution Networks | Exports (min potential) | Exports (max potential)

Total gas demand for SSLNG services

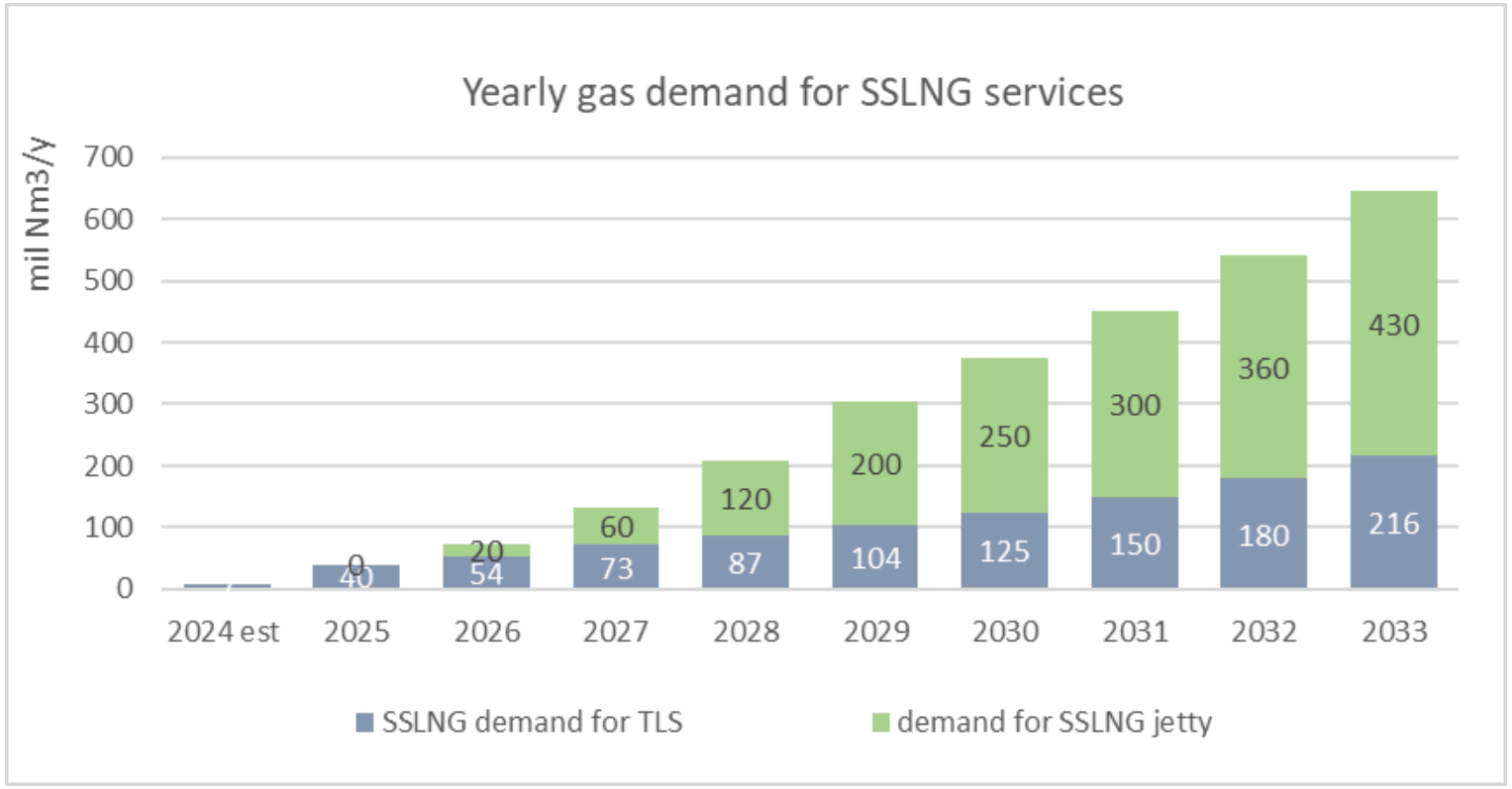


Table of content

Energy mix of the electricity system –1, 1a, 2a gas demand scenarios & RES curtailments