




## ***Possibilities for reducing Russian gas dependency of the Danube Region***

*Borbála Takácsné Tóth  
Péter Kotek  
Enikő Kácsor  
Gábor Horváth  
23. November 2022*

# Aim of the project and methodology

- Gas dependency status of DR countries
  - Country fact sheets, easy-to digest indicators and infographics
  - Methodology: Statistics, data analysis
- Effects of phasing out Russian gas in DR by scenario analysis
  - Methodology: Modelling with EGMM (price effects, changing flow patterns, need for curtailment, supply structure)
  - Supply side: modelling infrastructure additions / LNG
  - Demand side: Reduction potential of power, industry and building sector on the short and mid term (2030)
- Estimating gas demand reduction potential in DR countries
  - Identification of short (2022/2023 winter) and longer term options
  - Power&heat, Industry, Buildings potential
  - Methodology: literature based estimate and statistics
- Collecting DR policies and actions to phase out gas and curb demand, list best practices
  - Methodology: news, interviews (by the end of July)
- Formulating proposals for DRS cooperation

# Timeline

Task	Description	Due date	Deliverable
Task 1-2	State of play and modelling (DR countries)	May-June 2022	First interim report
DR meeting	Presenting and finalising Country Fact Sheet concept  Identifying select DR countries to analyse	24.06.2022.	
Task 3	Sectoral gas saving potential and possibilities (4-5 countries)	31.07.2022	Second interim report
Dissemination	Short policy brief	31.08.2022	Policy brief
Task 4-5	Gas phase out plans and actions, possibilities for DR cooperation	15.09.2022	Final study (Policy brief + country fact sheets)
Dissemination	Presenting second interim report, gas saving potential and possibilities of DR countries	19.09.2022.	
Dissemination	Presenting final study	23.11.2022	

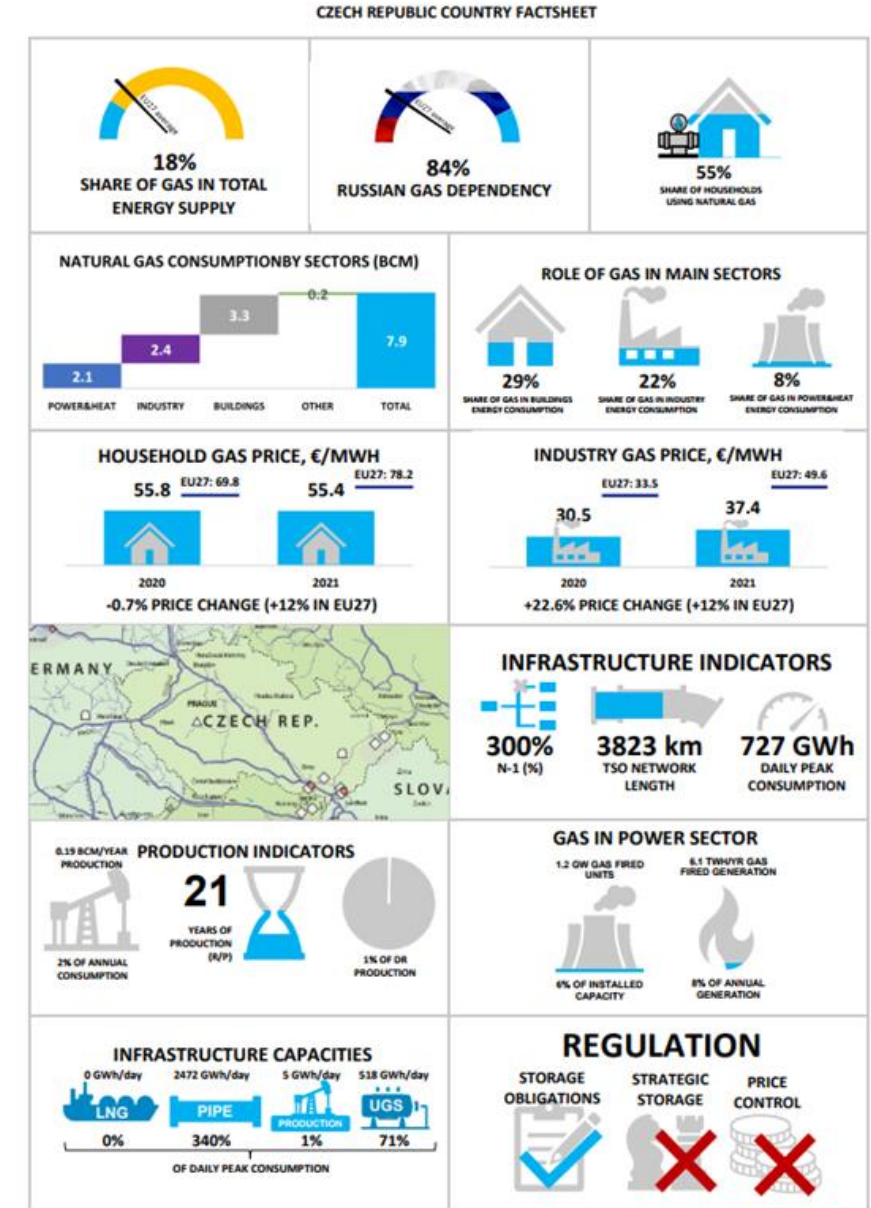
## Outline of the study

- Gas dependency in the Danube Region
  - Importance of gas in the energy mix, Demand of main gas consuming sectors, Supply options
- Prices and price regulation
- Potential for gas demand reduction in the Danube Region
  - Power sector, Industry sector, Household sector
- Case studies on addressing the gas crisis in the Danube Region 33
  - Ukraine, Moldova, Germany, Austria
- Modelling of gas supply reduction scenarios
  - Calibrating the reference case and modelling the supply cut
  - Modelling the short-term effect of supply and demand side measures
  - Long term outlook
- Policy recommendations for the Danube Region PA2 Steering Group

# **GAS DEPENDENCY IN THE DANUBE REGION (PREVIOUSLY PRESENTED)**

# Country factsheets

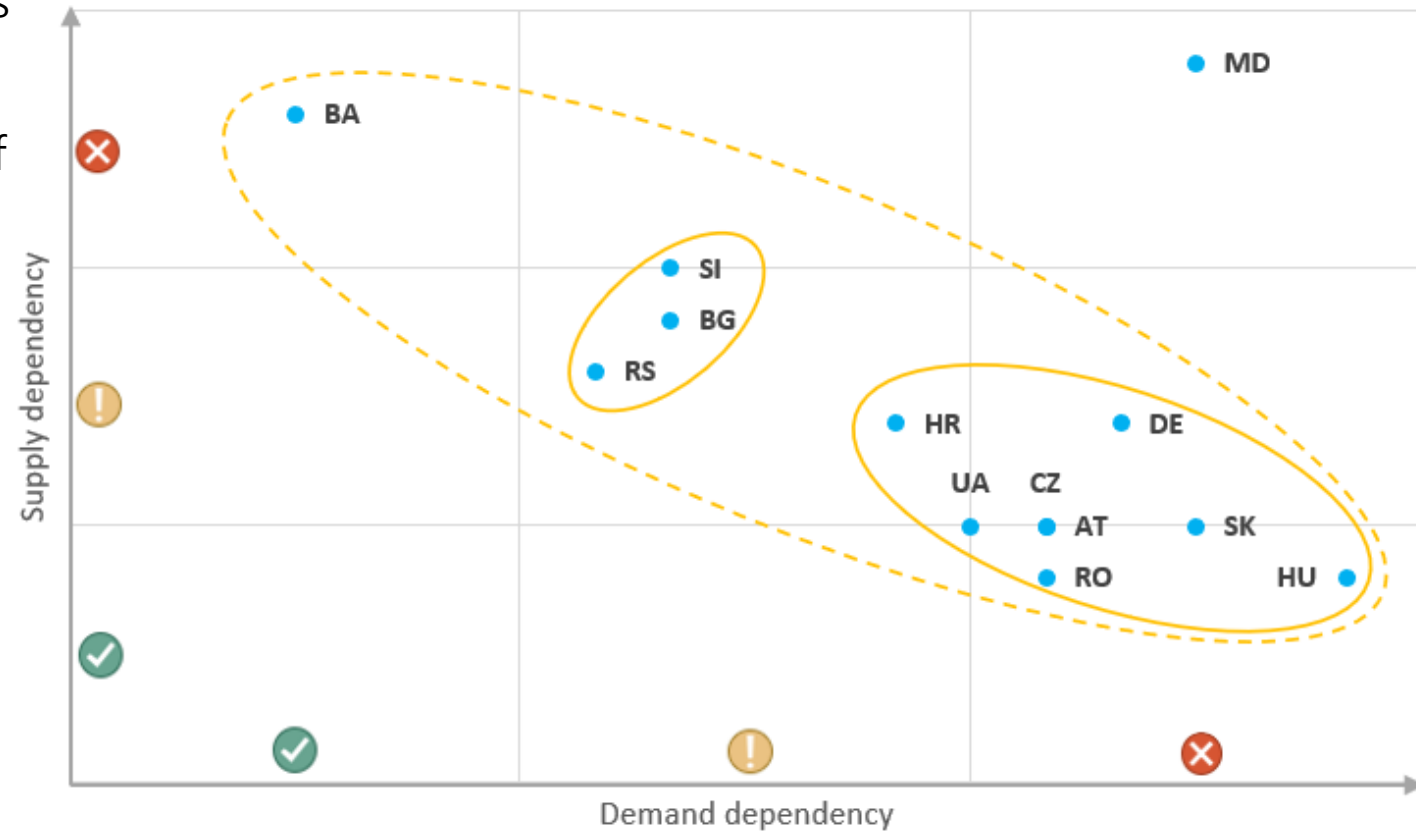
- For each country, the factsheet contains a total of 22 indicators in 12 boxes and a network map.
- During the selection of the indicators and the infographics prepared for them, we tried to give a **comprehensive picture of the countries' gas dependence and Russian gas dependence**.
- The first part of the indicators is related to the **gas consumption** side, while the second part shows the different dimensions of the **natural gas infrastructure**.
- The infographics basically show the **conditions of 2019-2020**, as COVID has changed the already country-specific values in many ways (for example: consumption in the industrial sector). Where this problem did not exist, we displayed the **most recent data** available.
- We used **public databases** that provide information about **multiple countries** and allow for comparability between countries. (For example: Eurostat, ACER, ENTSO-G, ENTSO-E)





## Results of the analysis – what have we learnt?

- Strong negative relationship between the demand-side and the supply-side dependencies
- Those countries that rely heavily on gas have taken significant efforts to ensure the security of supply by adequate infrastructure capacities
- Highly gas dependent with limited supply options: MD
- Highly gas-dependent countries with mostly sufficient supply options: AT, DE, CZ, HR, HU, SK, UA
- Moderately gas-dependent countries with weaker supply options: BG, RS, SI
- Not gas-dependent but have very limited options to find alternative supply sources: BA



# **PRICES AND PRICE REGULATION**



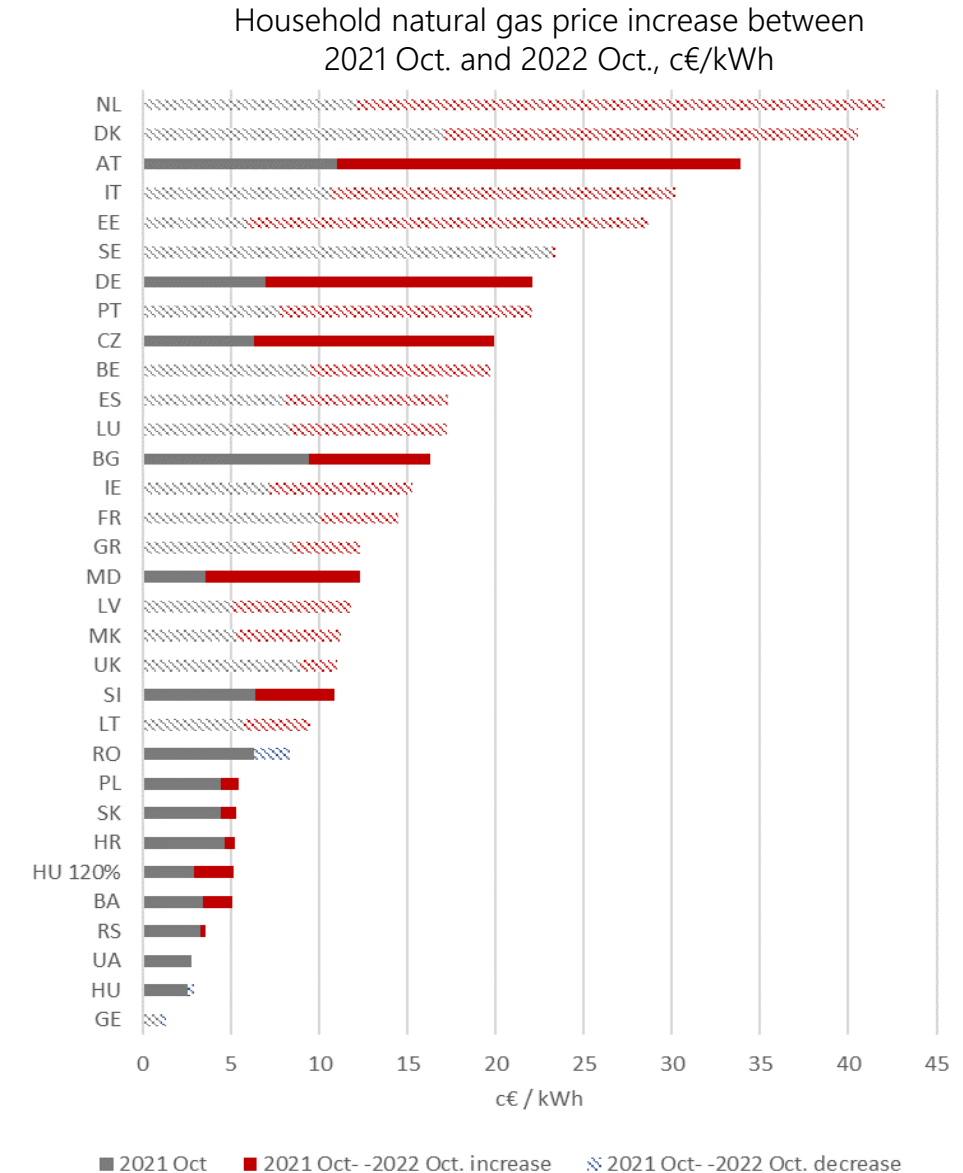
# Price changes in the Danube Region and the European Union

## Household sector

- Between 2021 Oct. And 2022 Oct., the **most significant price increase** was observed among countries located in the central part of Europe and in Estonia. Household gas prices rose by more than 200% **in Austria, the Czech Republic, Germany, the Netherlands and Moldova**.
- In absolute terms**, prices in Western Europe are still higher than in Eastern Europe. Most of the countries of the **Danube Region are in the lower third**, except for Austria, the Czech Republic, Germany, Bulgaria and Moldova. It is clear that the price increase was significant in the case of these Danube Region countries.

## Industry sector

- In the case of industrial gas prices, the **differences between countries are smaller**, but the **price increase is even more significant** in most of the countries.
- The most significant price increase occurred in the **South-Eastern European region**, but the price increase was similar in the case of the Baltic countries as well (**around 200% increase**)
- Growth rate of industrial gas prices exceeded 100% for almost all countries.



# Price regulation and other measures

- We collected the policy measures that were taken in the Danube Region countries to mitigate the high gas prices for the vulnerable consumer groups between January 2021- August 2022.
- The most widely used measures to protect the vulnerable consumer groups from the increasing energy prices are the reductions in the **VAT and direct transfers.**
- The majority of the Danube Region countries are implementing the **retail price regulation**
- The enhancement of the international cooperation in the DR following the example of EU could lead to elaboration of the effective long-term solutions to support the consumers

Measures taken by EU27 and Danube Region countries since September 2021 to mitigate high energy prices

Country / Policy	Reduced energy tax / VAT	Retail price regulation	Wholesale price regulation	Transfers to vulnerable groups	Mandate to State-owned firms	Windfall profits tax / regulation	Business support	Other
Belgium	●	●		●				●
Cyprus	●			●	●			
Czech Republic	●	●		●	●			■
Denmark				●				
Estonia	●	●		●			●	
Finland	●			●			●	
France	●	●	●	●	●		●	
Greece	●			●	●		●	
Ireland	●			●				●
Austria	●			●			●	
Bulgaria	●	●				●	●	
Croatia	●			●				
Germany	●			●		■		
Hungary		●						
Romania		●						
Slovakia		●						
Moldova		●						
Serbia								
Ukraine		●						

## NOTES

- Danube Region Countries
- Selected EU countries

We define a measure to be 'discussed' (■) when important actors in civil society, such as political parties, have publicly discussed the measure but no formal action to implement it has been taken. By the term 'proposed' (●) we refer to measures that have been publicly announced by high government officials such as ministers. Finally, 'enacted' (●) are all those measures already in implemented.

# **POTENTIAL FOR GAS DEMAND REDUCTION IN THE DANUBE REGION – HOUSEHOLD AND INDUSTRY SECTOR**

# Demand reduction: household and industry sector

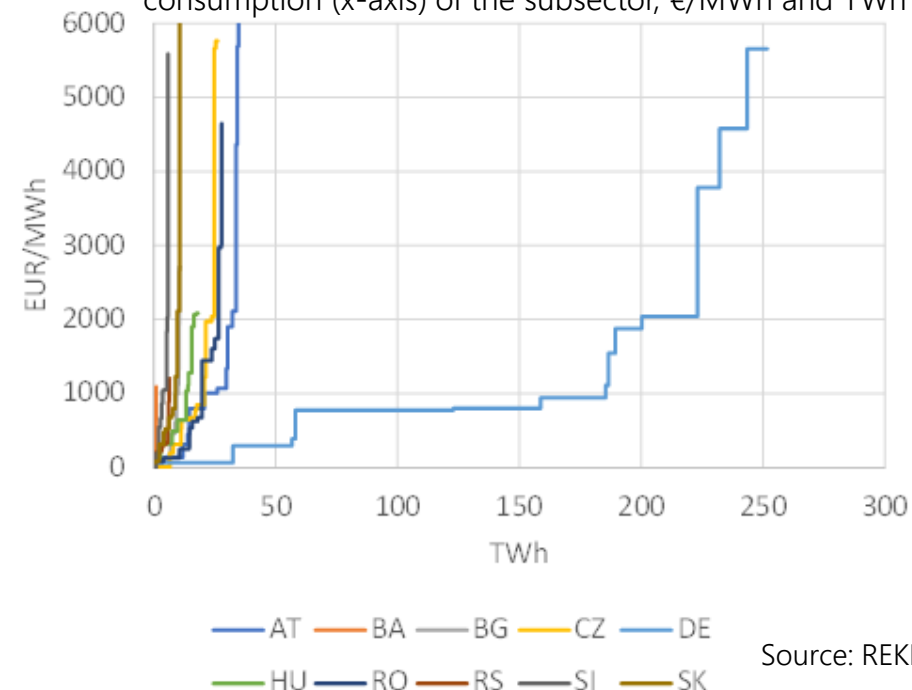
## Household sector

- The IEA estimated that about 10 bcm (2.5% of consumption) can be saved in Europe if indoor temperature is reduced by 1 Celsius.
- Increasing prices gas can also incentivise households to reduce gas consumption by lowering the temperature or decreasing the heated floor area. However, in some countries of the Danube Region, households are already underheated, and the effect of price changes does not affect consumers due to regulation.
- Mixed incentives will result in probably very different reactions from the households in their winter consumption **in 2022/23**, but **on average we can expect an overall decrease of 2.5-7%**.
- On the long term the investment into the building stock must start with a renovation wave. According to literature a deep renovation can save up to 50% of the energy need of a building, depending on its age and original condition.
- **We assume that at least a 15% demand reduction can be achieved in the Danube Region in the long run.**

## Industry sector

- On the short-term, **curtailing industry gas demand means the limiting of production** and decreasing industrial output. Subsectors with low curtailment costs are expected to curtail their consumption first. In the Danube Region countries these sectors were the same (non-metallic minerals, chemical and petrochemical, iron and steel).
- On the long term, **industry sector may be able to invest in fuel switching, replace process heat or reduce industry gas demand**. The cost of switching is unique for each industrial process and **possibilities may even be limited**.

Curtailment cost: Gross value added per unit of gas consumed (y-axis) and total gas consumption (x-axis) of the subsector, €/MWh and TWh



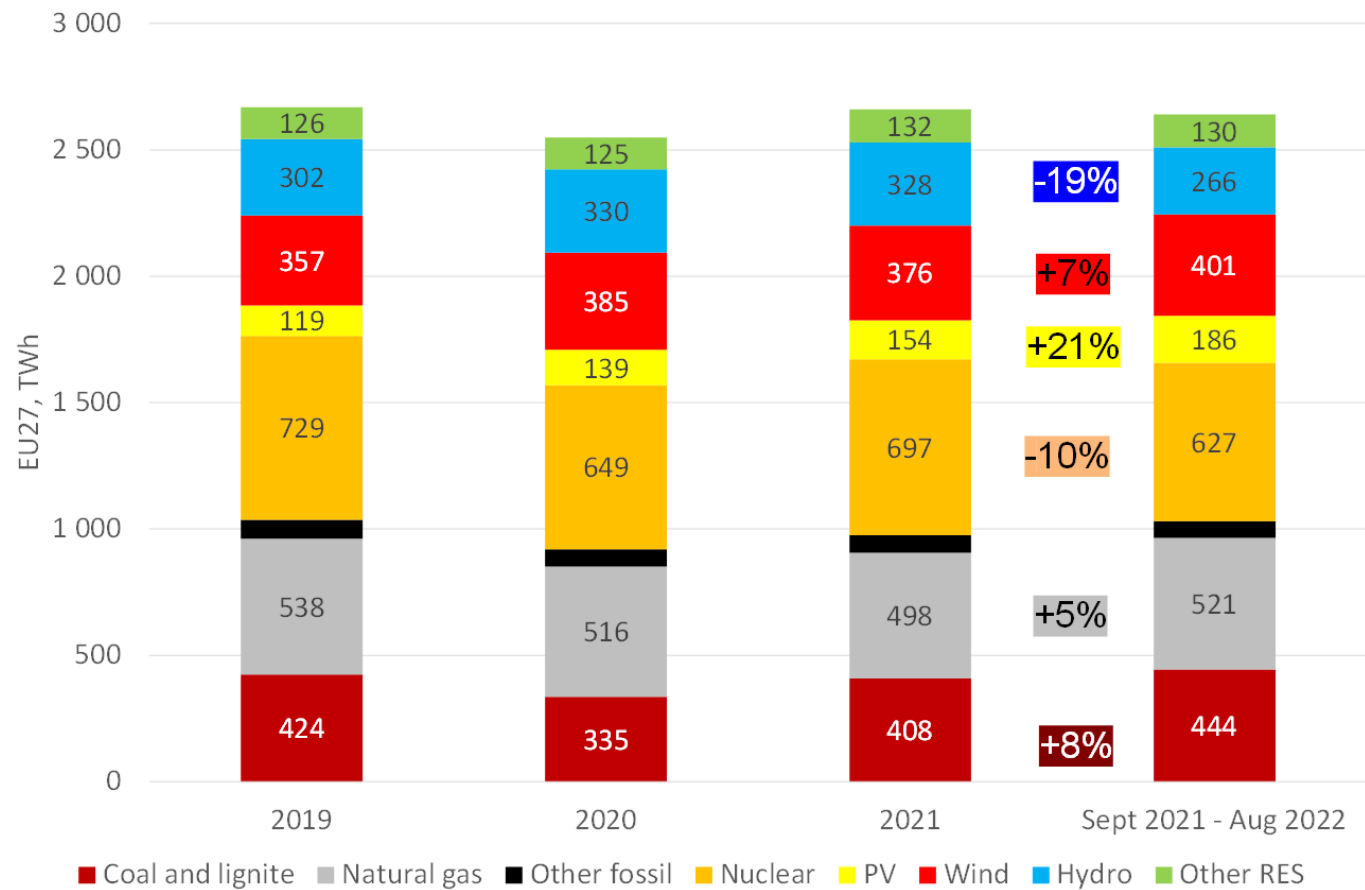
Source: REKK based on Eurostat

# **POTENTIAL FOR GAS DEMAND REDUCTION IN THE DANUBE REGION - POWER SECTOR MODELLING**

# Approach to assess the gas consumption reduction potential in the power sector

- We assessed the developments and identified the most important drivers in the last 3 years
- We calibrated the model to reflect the overall gas consumption of the power sector for the period 2021 September – 2022 August
  - this was the basis of comparison when we calculated the consumption reduction potential
- Short term (September 2022 – August 2023)
  - Base case reflects the best estimate (~80 €/MWh gas price level, no special measures)
  - MinGas - minimum gas consumption level in the power sector, with which it can still operate safely, meaning all consumers and flexibility need is served (very high gas prices → gas-based production is always the most expensive option on all markets)
  - Sensitivity analyses: low and average hydro and nuclear availability
- Long term (2030)
  - Base case (best estimate) and MinGas (gas is only a last resort option)
  - Sensitivity analyses: two different renewable pathways, a somewhat slower uptake (Reference), and a more ambitious one, as envisaged by the REPower EU Strategy (REPOWER)

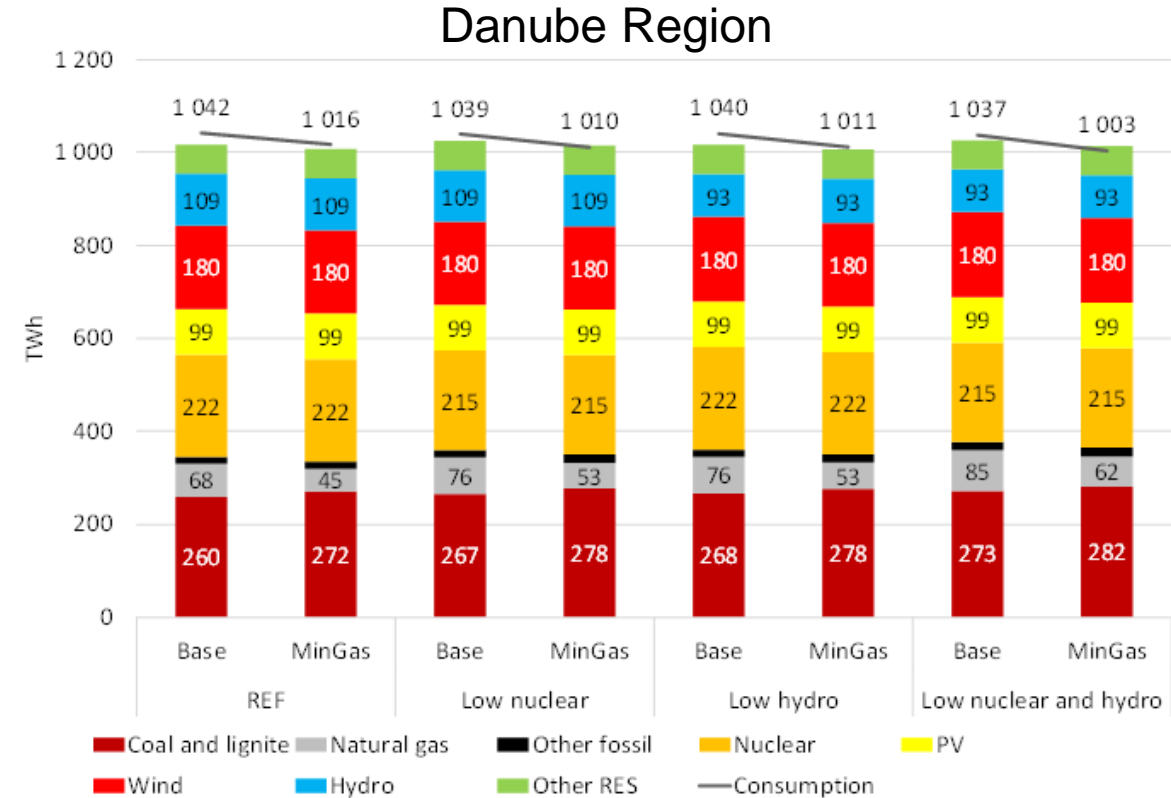
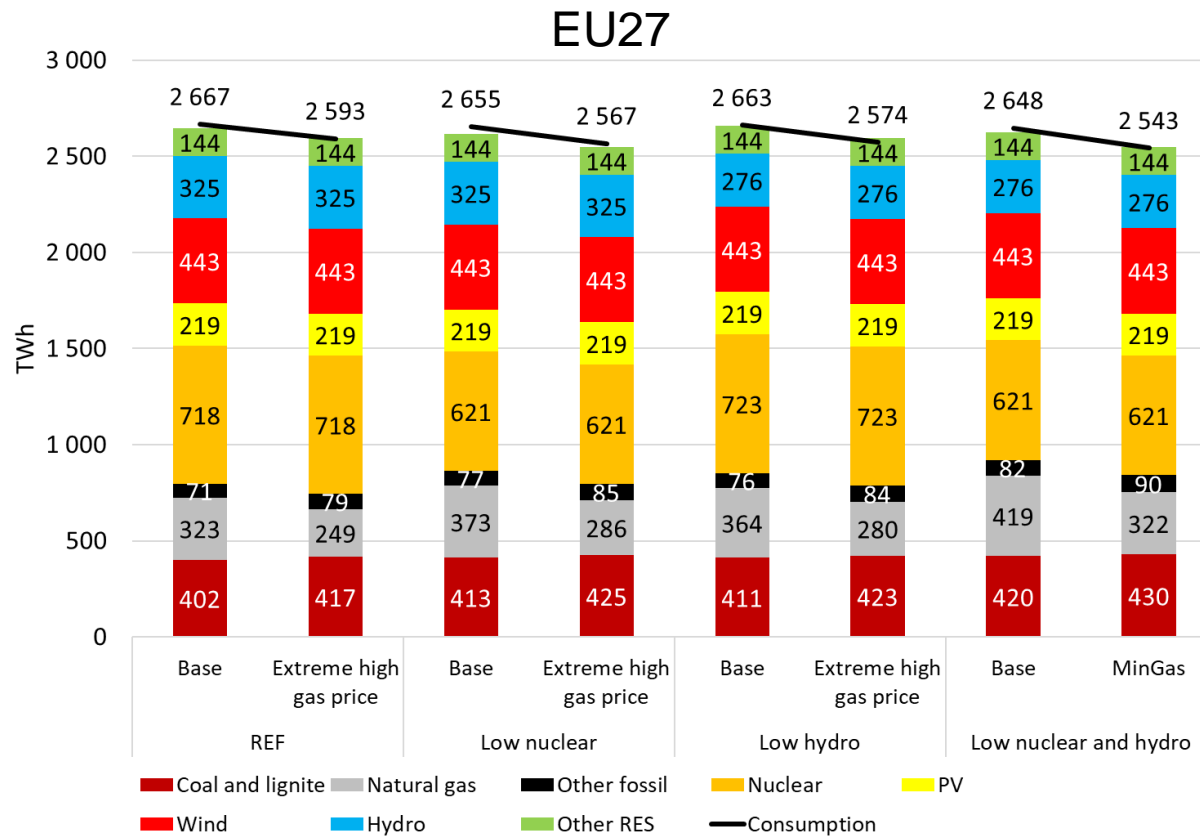
## Developments in the last three years



- In 2022 we saw extreme weather conditions that meant hydro-based production decreased by almost 20% in the EU
- Nuclear generation was also 10% lower than a year before
- While variable RES penetration and through that also production increased (PV + 21%, wind +7%), the low availability of hydro and nuclear plants led to an increase in gas-based power production, despite the extreme price environment
- Increased generation in coal plants only covered some part of the power need, as coal phase-out has already started, and availability of coal plants is also limited

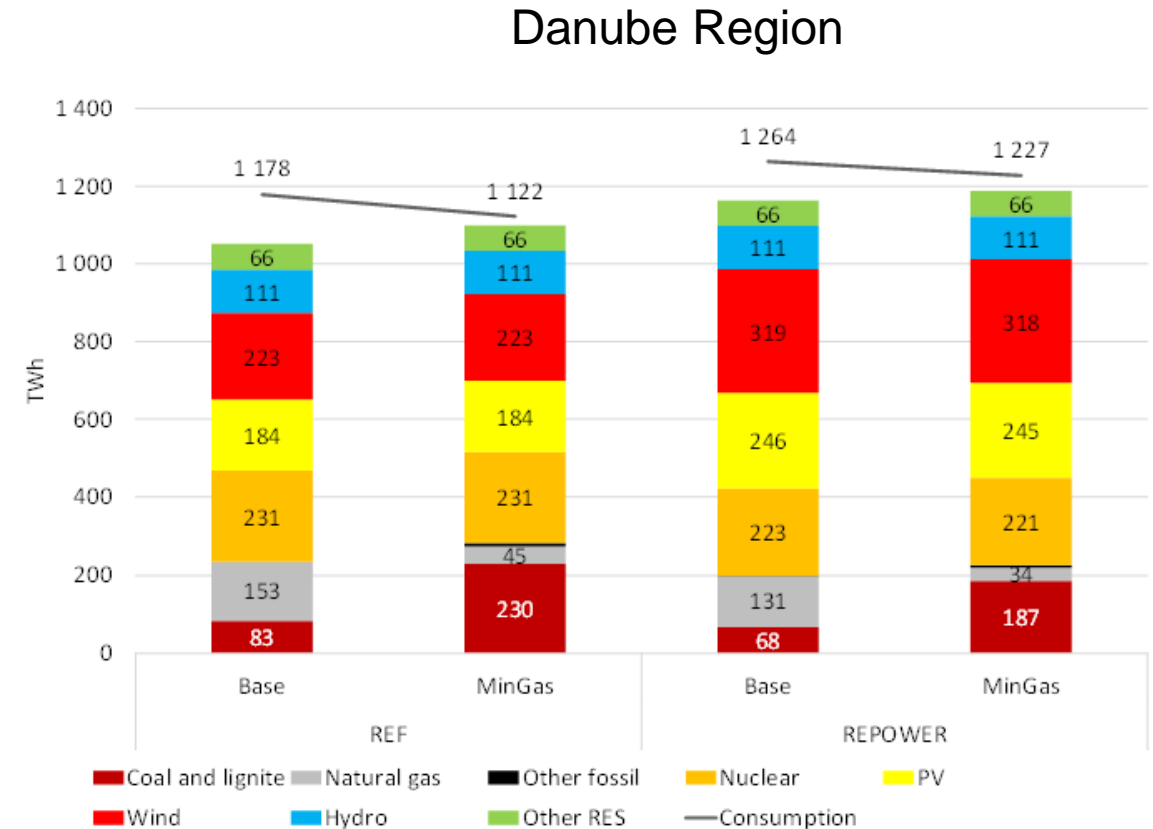
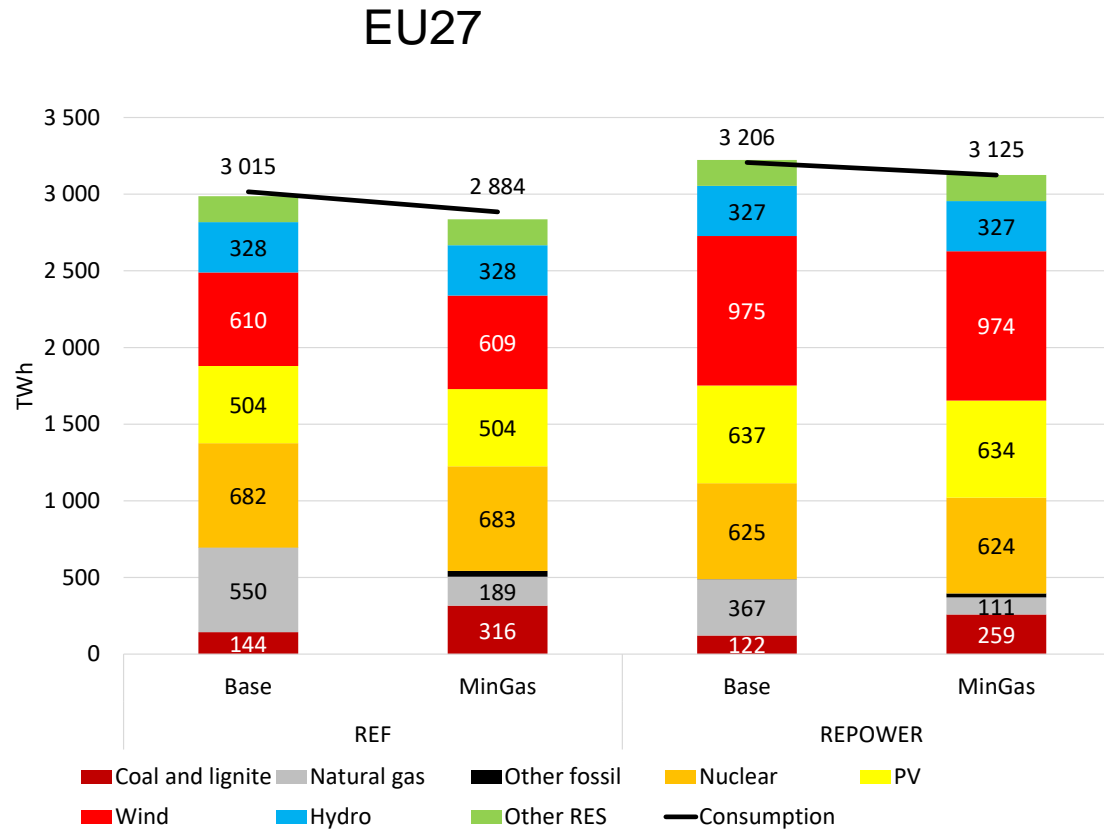


# Short term analysis of the power sector (2022 September – 2023 August)



- In the REF scenario we assume that French nuclear capacities come back online, the German nuclear closure is delayed to 2023 H2, and we calculate with a historical average hydro availability. Low hydro and nuclear availability means 2021 Sept-2022 August values.
- Total **natural gas consumption reduction potential for the EU27** is somewhere **between 284 and 430 TWh** depending on nuclear and hydro availability. Part of the saving comes from the elasticity of the power sector.
- In the **Danube Region** the same values are **62 and 98 TWh** in the most pessimistic (low nuclear-low hydro) and in the REF case.

# Long term analysis of the power sector (2030)



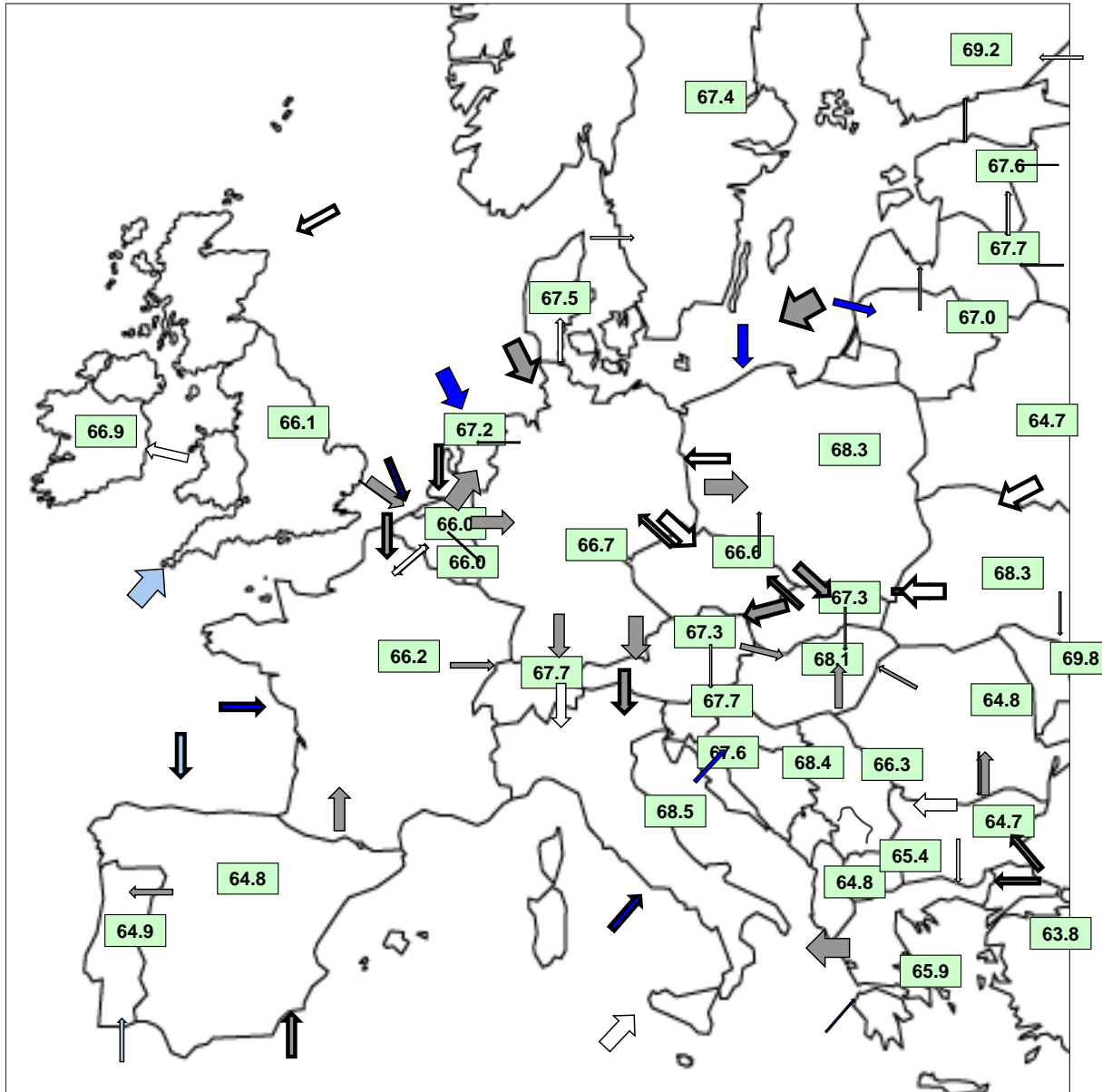
- Minimum natural gas consumption in the power sector can be decreased to around 370 and 220 TWh in the EU27 if gas is only used when there is no other option
- In the Danube Region if gas prices normalise and there is no measure to further decrease gas-based generation (Base cases), then gas consumption even increases from the level in 2021-2022, by around 60-100 TWh. If gas is only used as a last resort, then renewables can help a lot to decrease gas consumption, by around 100-125 TWh compared to consumption of the last 12 months.

# Policy conclusions for the power sector

- Short-term
  - Gas phase-out **potential** of the power sector **depends to a large extent on the availability of nuclear and hydro plants**, when this availability is low there is much higher need for gas-based power generation both in the EU and in the Danube Region countries
  - The overall **gas demand reduction potential of the Danube Region** for the period 2022 September-2023 August is **60 to 100 TWh** compared to the consumption level of the period from September 2021 to August 2022
- Long term
  - By 2030 **renewables can substitute most of the gas need** in the EU27 and **phase out coal** at the same time
  - This happens despite the additional flexibility need that comes together with variable renewable capacities
  - The **minimum overall gas consumption of the power sector in the Danube Region can be reduced to 67-89 TWh** depending on renewable capacity developments if **gas is only used as a last resort**

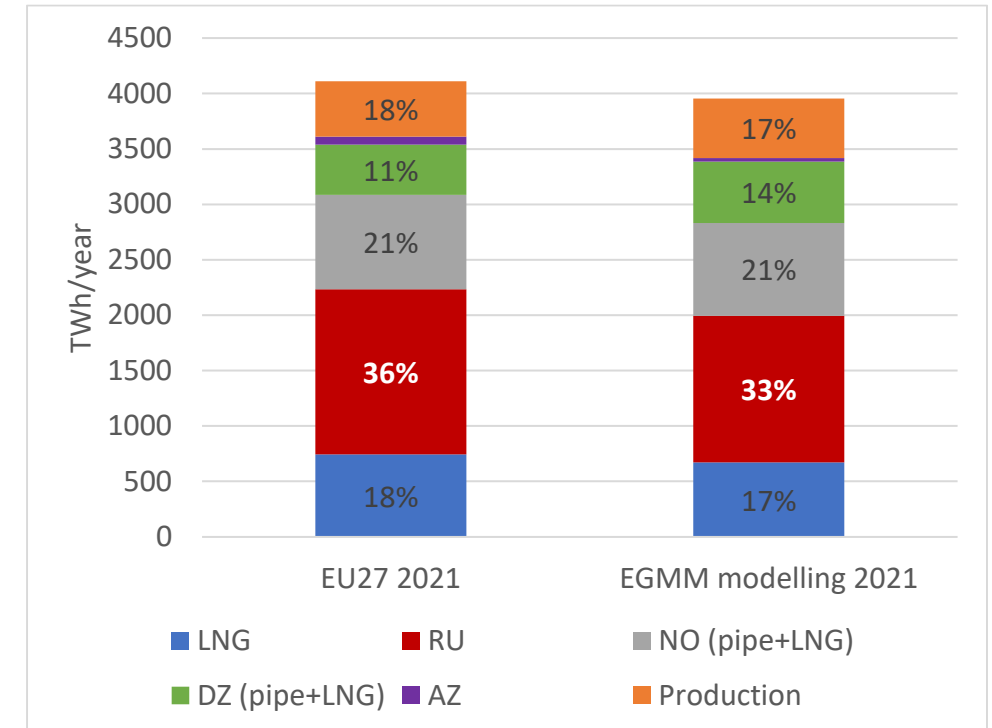
# **MODELLING OF GAS SUPPLY REDUCTION SCENARIOS**

# Modelling reference 2021

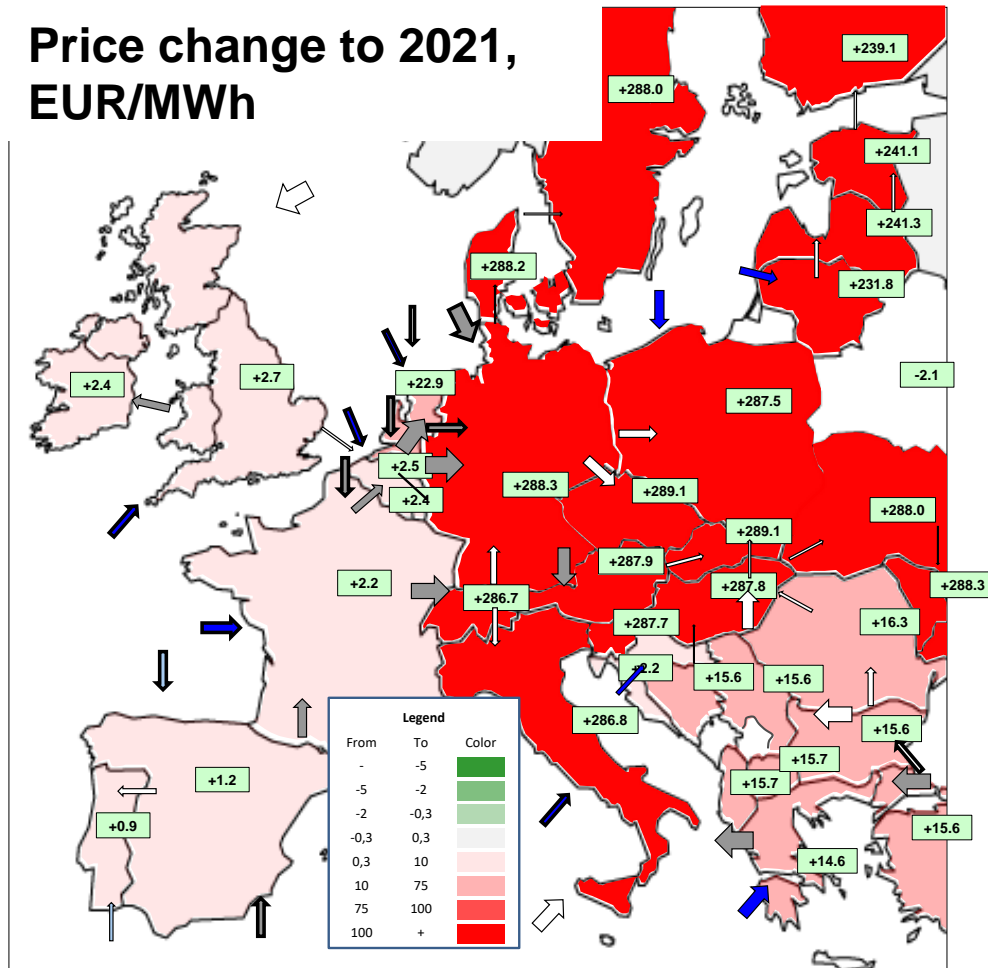


- Reference scenario was calibrated to the 2021 European gas market demand and supply structure, capacity and use of infrastructure, and price environment.
- Price levels are around 65-70 EUR/MWh, indicative of H2 2021
- High Asian demand and tight LNG market is assumed.

Supply structure in our 2021 reference compared to fact data



# Full Russian cut without measures



**-902**  
TWh/yr

**EU27 demand  
adjustment  
compared to 2021**



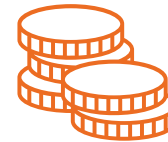
**1226**  
TWh/yr

**LNG supply to EU27  
(incl. NO, DZ)**



**+290**  
€/MWh

**Price change in CEE  
compared to 2021**

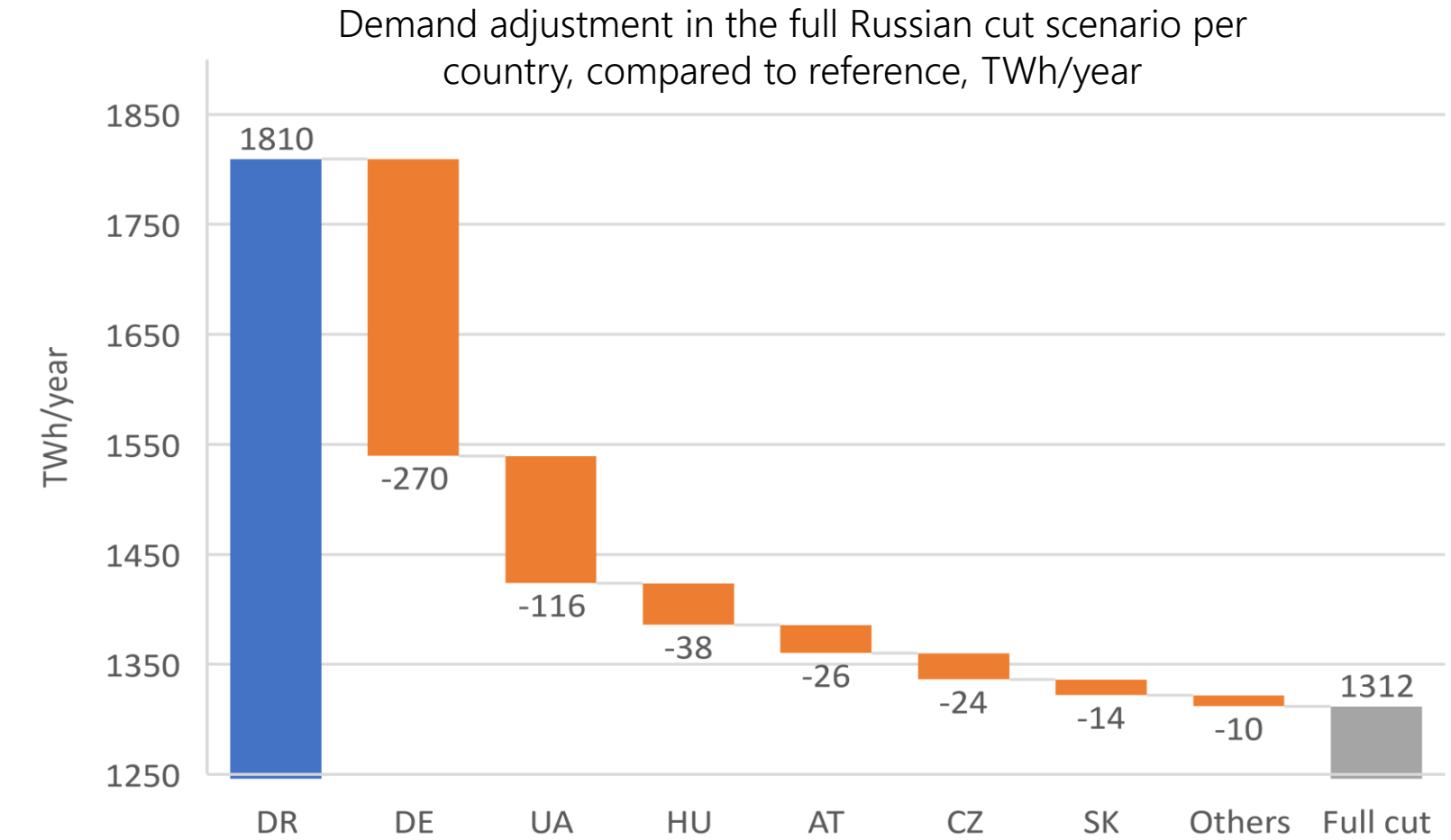


**+149%**

**EU 27 gas bill  
compared to 2021**

- CEE is hit most: Price zones emerge based on ability to access to LNG and global markets.
- Internal congestion: LNG inflow can not increase further with existing infrastructure.

## Full Russian cut without measures: Danube Region

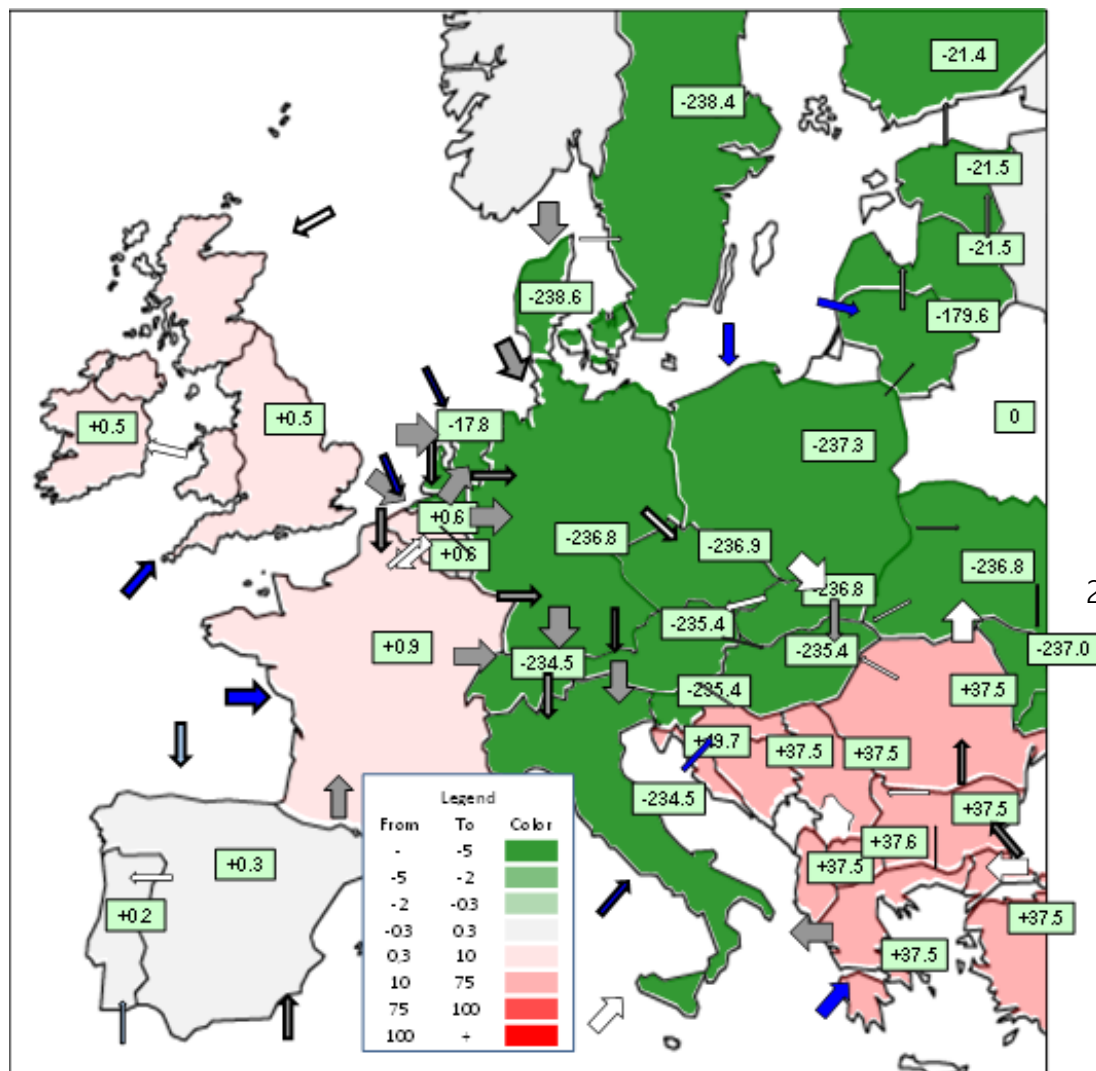


Source: REKK, EGMM

- The demand adjustment is related to Germany (-270 TWh), Ukraine (-116 TWh) and the CEE region (~100 TWh overall).
- The demand adjustment is proportional to market size.

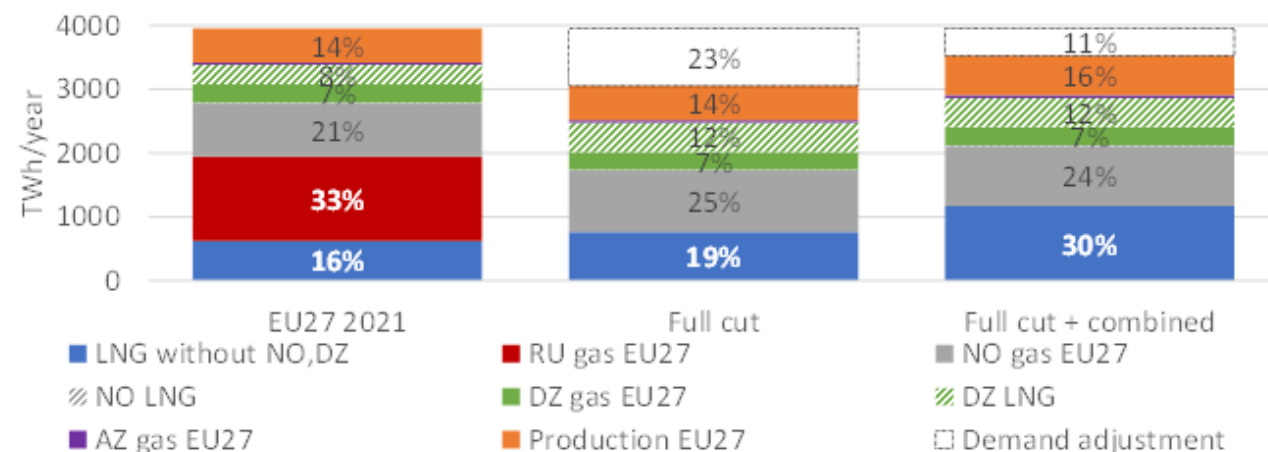


# Full Russian cut with all supply measures



- Based on the supply side measure modelling of the Full cut scenario we can conclude, that the infrastructure investments already decided before 2021 - mainly PCI projects from the 4th list with substantial EU funding sources from the Connecting Europe Facility - help to mitigate the effect of reduced Russian gas supplies to a large extent.
- However, the additional infrastructure decided in 2022 – mainly the German LNG terminals) are very much needed to help LNG reaching the Danube Region. Compared to the LNG sources that are available on the global market the volume and the impact of additional EU natural gas production and increased production of RES gases is negligible.

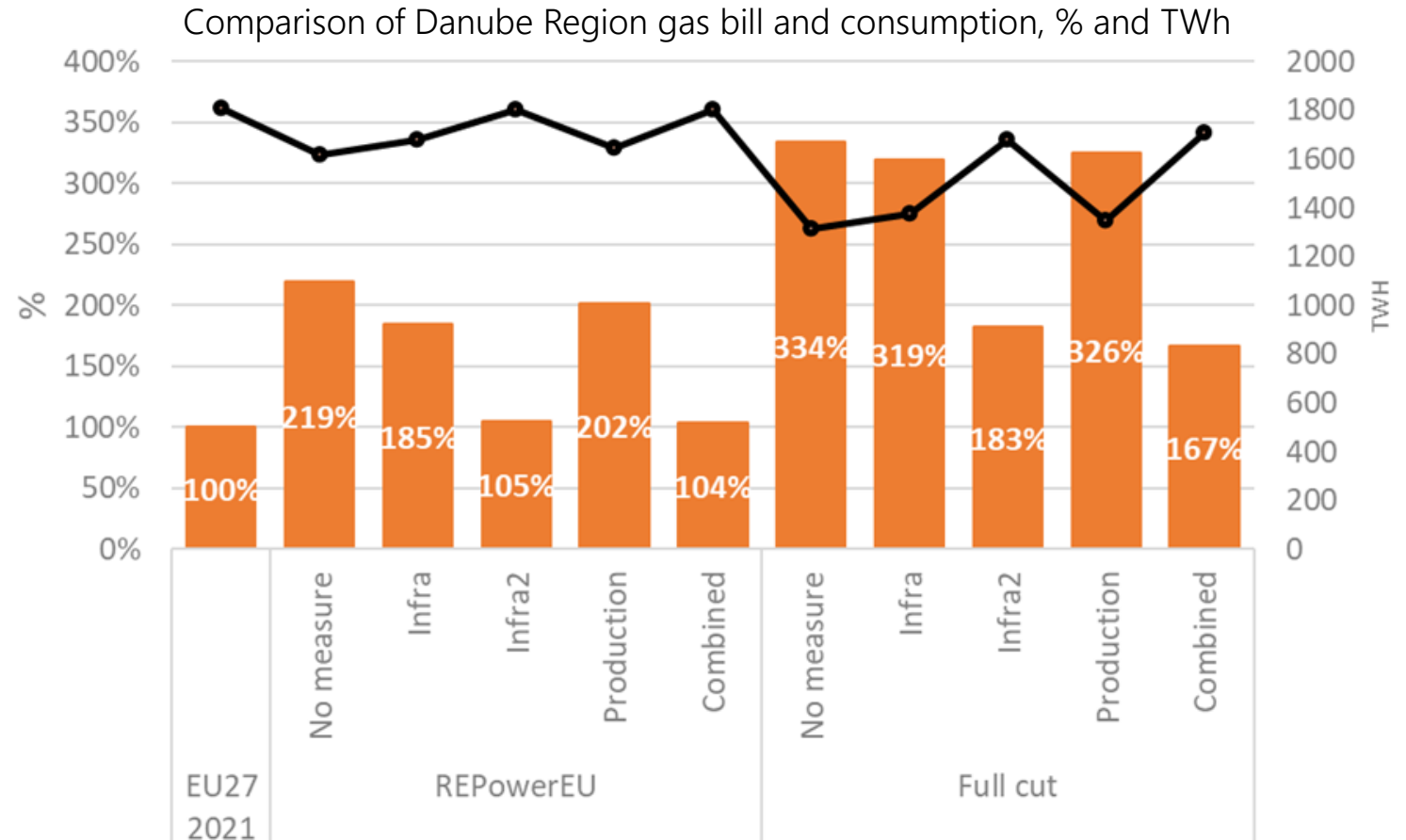
Modelled natural gas supply structure and consumption of the EU27 by main sources in the 2021 reference, full cut scenario and the full cut scenario with combined measures, TWh/year



Source: REKK, EGMM

# Short-term: Comparison of gas bill and consumption in the Danube Region

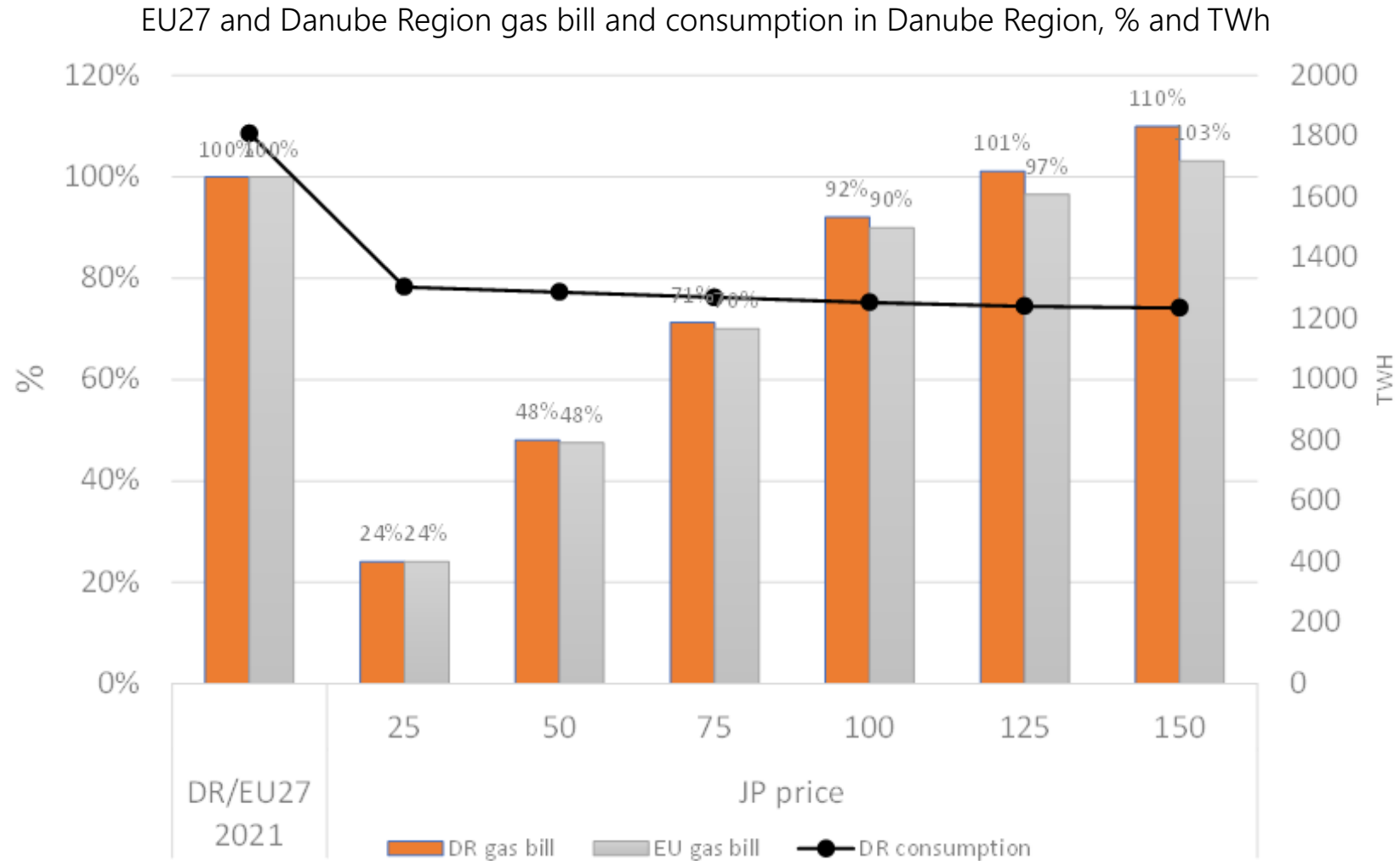
- Overall, the region pays less for gas if there are Russian sales in all scenarios
- The available additional domestic production and short-term new infrastructure (Infrastructure 1 scenario) can only slightly decrease the Danube Region gas bill
- The commissioning of all the assumed new infrastructure (Infrastructure 2 scenario) has a more significant effect since:
  - It allows additional sources to enter the European market and also release important capacity constraints
- Applying these measures together can cut down the region's gas bill to its reference level where Russian gas is not constrained in case of the REPowerEU scenario, but remains higher in case of the full cut scenario.**



Source: REKK, EGMM

# Long-term: Gas bill and consumption in the Danube Region

- The total gas bill of the Danube Region and EU countries changes with the Japanese price
  - Higher prices in Japan absorb the higher share of global LNG supply and leads to tight LNG supply
- The total gas bill in the Danube Region countries moves together with the EU gas bill
- **If Japanese prices are extremely high there is a risk for Danube Region countries to suffer from higher price increase**
- **If Balkan countries do not reduce their demand significantly Turkey can cause a supply deficit in the region**



Source: REKK, EGMM

# **POLICY RECOMMENDATIONS FOR THE DANUBE REGION PA2 STEERING GROUP**

## Policy recommendations for the Danube Region PA2 Steering Group

- Regular updates of the dependency indicators calculated in this study can provide important insight into how the shift of vulnerabilities changes the relative and absolute dependency position of the countries.
- Updated modelling of the geopolitical developments and the impact of those on the EU, the Danube Region and on individual countries can support defining common goals and positions that can also be communicated on EU level and contribute to the common goal of strengthening the European gas market resilience to supply shocks.
- Supply options – mainly the LNG infrastructure already under construction – if implemented will help the EU and also to the Danube Region countries to mitigate the energy crisis, both in terms of high prices and to avoid supply disruptions.
- Demand reduction is key: We encourage the Danube Region countries to prioritize demand reduction measures that target gas savings and avoid direct subsidization of gas prices to household consumers. Most vulnerable households might be a temporary exemption.
- Demand response combined with alternative sources can compensate the full cut of Russian supplies even in the Danube Region for the 2022/23 winter.
- Solidarity and interconnectedness of the Danube Region country is key to keep the energy supplies under control. We suggest to monitor the development of the solidarity mechanisms between Danube Region countries as well.

**THANK YOU FOR YOUR ATTENTION**