Energy security and sources of threats to the energy economy

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ENERGY

Politics is
the art of looking for trouble,
finding it everywhere,
misdiagnosing it
and then misapplying the wrong remedies.

(attributed to) Groucho Marx

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Introduction to Energy Security

IEA: „Energy security is the uninterrupted availability of energy sources at an affordable price."

https://safetyculture.com/topics/energy-security/

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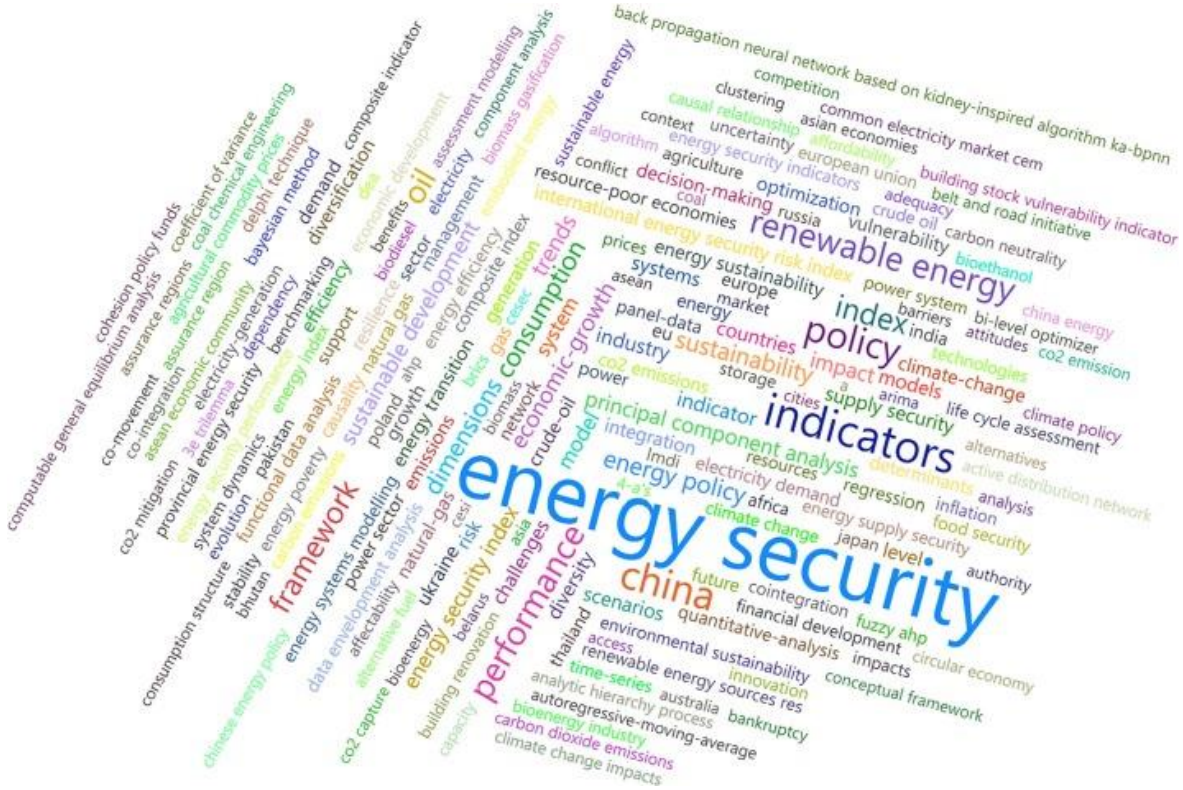
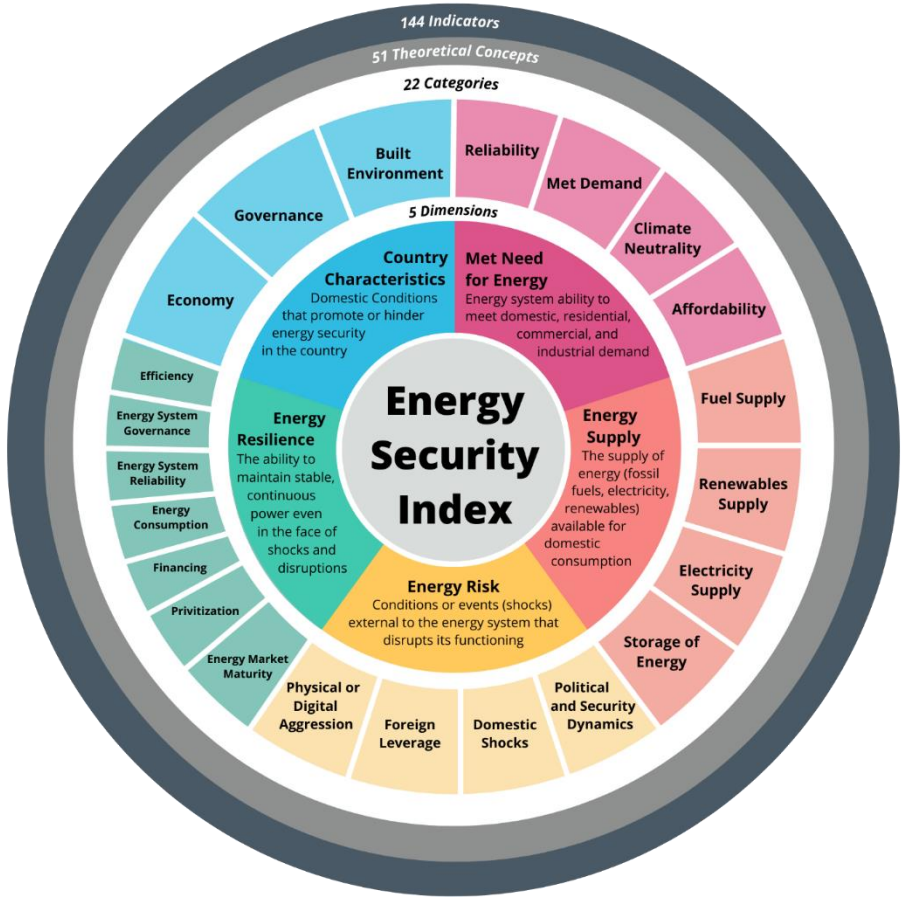
Different Definitions of Energy Security





Indre Siksnelyte-Butkiene, Dalia Streimikiene, Vidas Lekavicius, Tomas Balezentis, Comprehensive analysis of energy security indicators and measurement of their integrity, Technological Forecasting and Social Change,Volume 200, 2024, https://doi.org/10.1016/j.techfore.2023.123167.

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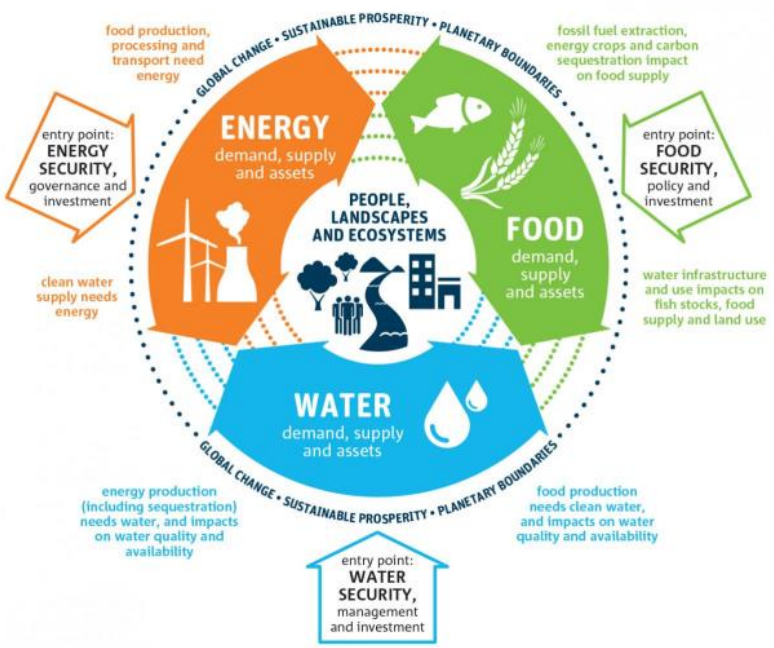
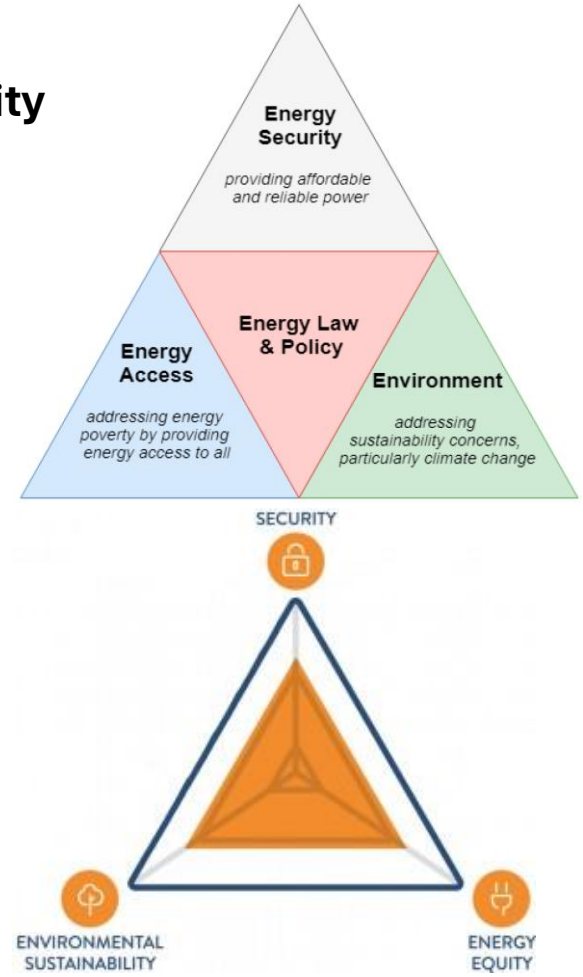
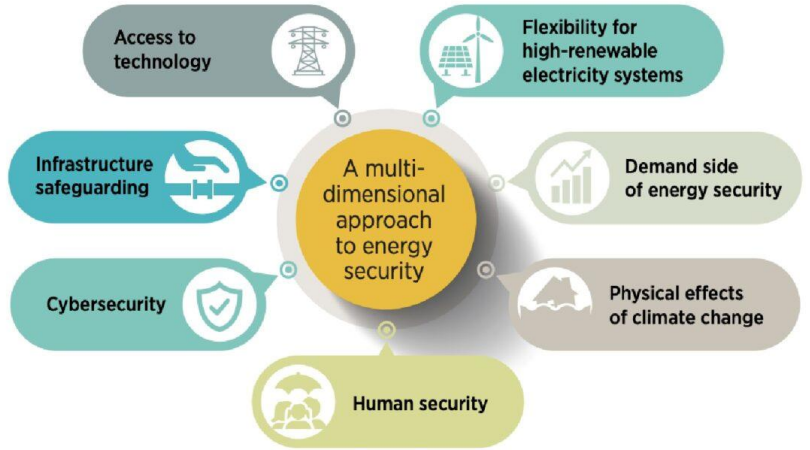
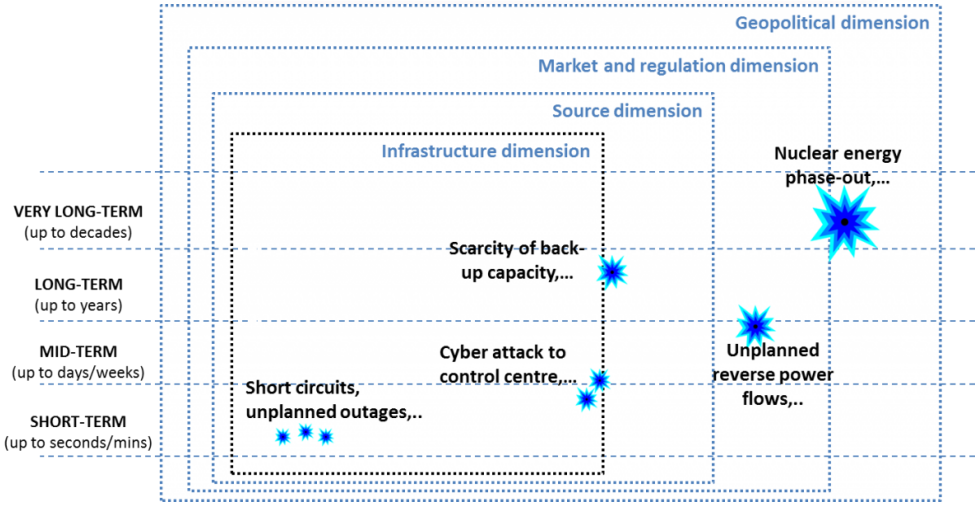
https://docs.aiddata.org/reports/energy-security/europe-eurasia-energy-security-index.html

Different Definitions of Energy Security









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https://ses.jrc.ec.europa.eu/electricity-security
https://geographycasestudy.com/the-water-food-energy-nexus/

IRENA

https://www.worldenergy.org/publications/entry/world-energy-trilemma-index-2017-monitoring-the-sustainability-of-national-energy-systems

Challenges in Defining Energy Security in the EU

Consolidated version of the Treaty on the Functioning of the European Union - PART THREE: UNION POLICIES AND INTERNAL ACTIONS - TITLE XXI: ENERGY - Article 194

Official Journal 115 , 09/05/2008 P. 0134 - 0134

Article 194

1. In the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to:

(a) ensure the functioning of the energy market;

(b) ensure security of energy supply in the Union;

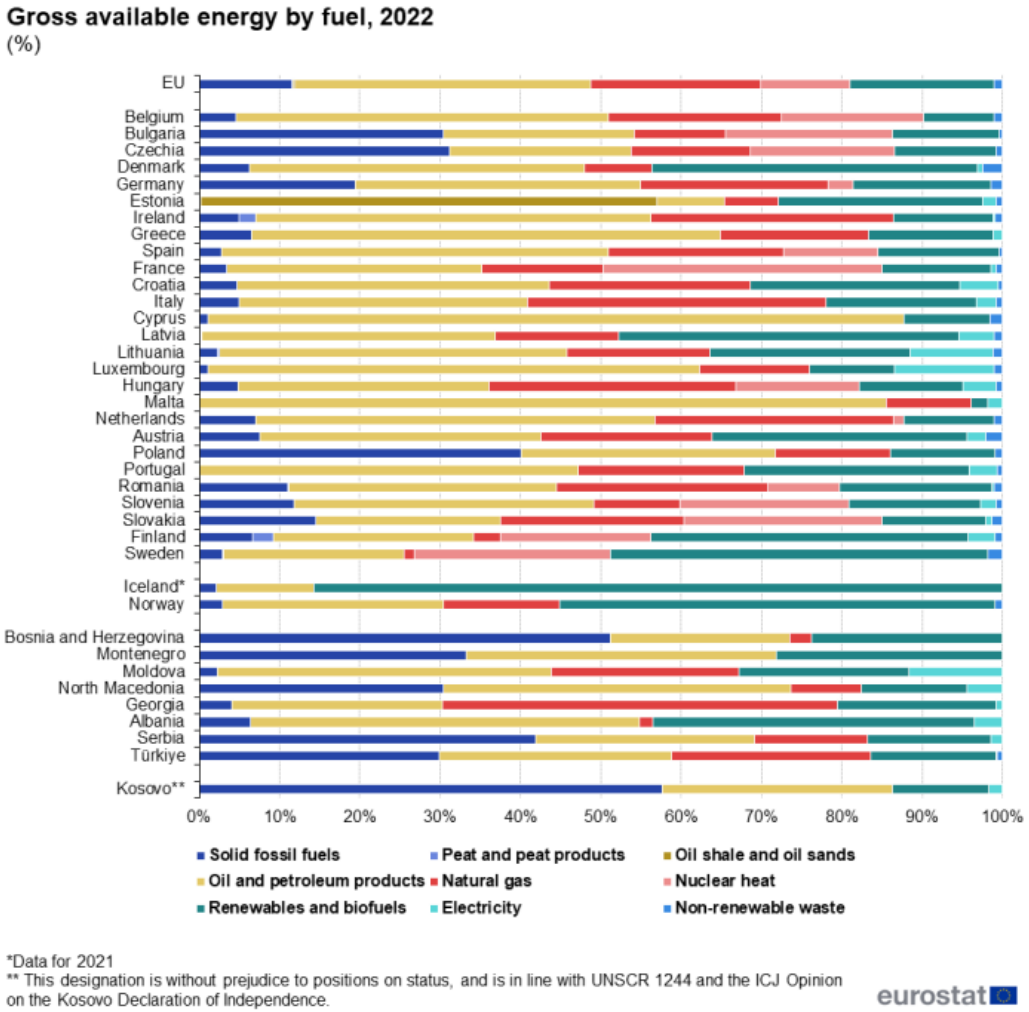
(c) promote energy efficiency and energy saving and the development of new and renewable forms of energy; and

(d) promote the interconnection of energy networks.

2. Without prejudice to the application of other provisions of the Treaties, the European Parliament and the Council, acting in accordance with the ordinary legislative procedure, shall establish the measures necessary to achieve the objectives in paragraph 1. Such measures shall be adopted after consultation of the Economic and Social Committee and the Committee of the Regions.

Such measures shall not affect a Member State's right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply, without prejudice to Article 192(2)(c).

3. By way of derogation from paragraph 2, the Council, acting in accordance with a special legislative procedure, shall unanimously and after consulting the European Parliament, establish the measures referred to therein when they are primarily of a fiscal nature.



*Data for 2021
** This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

eurostat

https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX%3A12008E194%3AEN%3AHTML

https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview#Imports_and_exports

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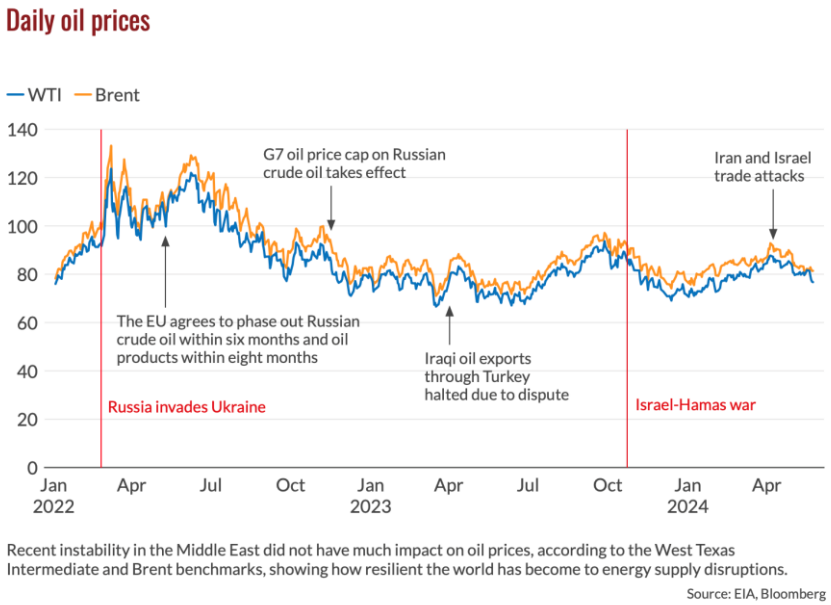
Threats to Energy Security



Recent instability in the Middle East did not have much impact on oil prices, according to the West Texas Intermediate and Brent benchmarks, showing how resilient the world has become to energy supply disruptions.

Source: EIA, Bloomberg

Geopolitical risks: Dependence on imports, political instability (Russia-Ukraine conflict), populisms.

Infrastructure vulnerability: Terrorist attacks, natural disasters, sabotage, cyberattacks (e.g., Nord Stream attack).

Market volatility: Price shocks, supply chain disruptions (e.g., 2022 energy crisis).

Since the first oil shock in 1973, the share of natural gas in global electricity generation has nearly doubled. Prices have been relatively stable over the last year, despite the ongoing Russia-Ukraine war.

Source: Investing

https://www.gisreportsonline.com/r/energy-security-reality/

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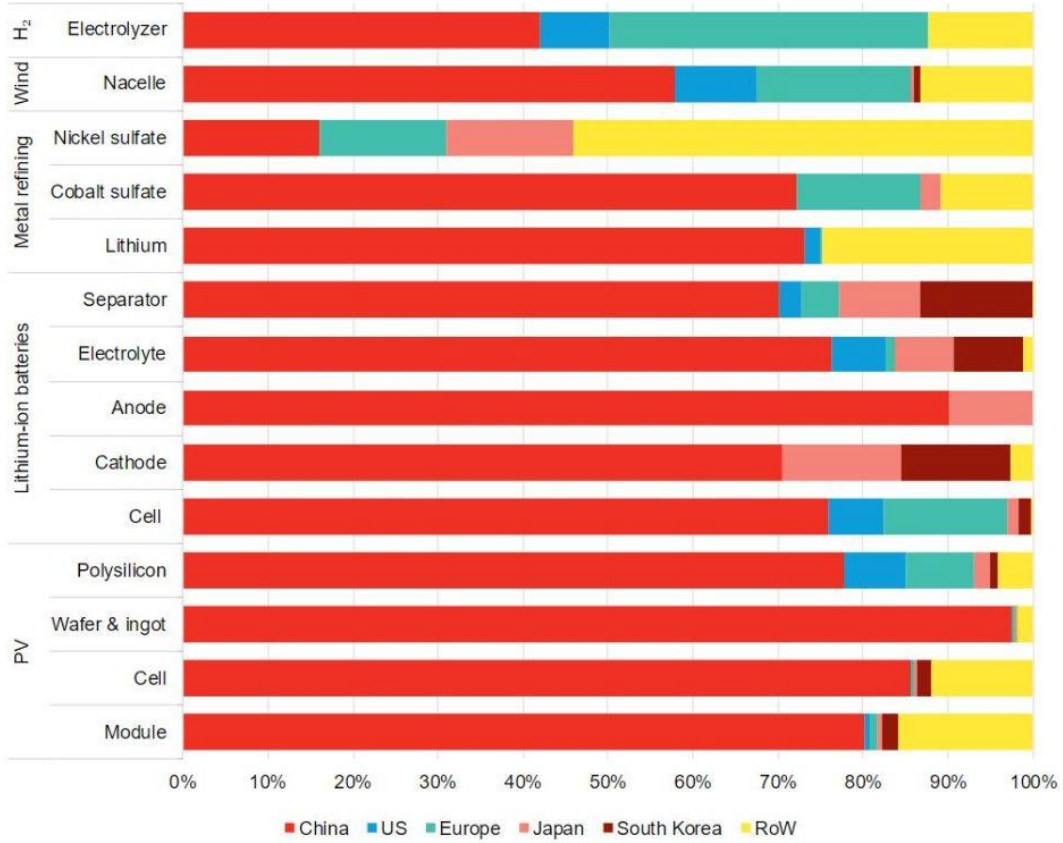
The Energy Transition: Challenges and Risks

Increasing the share of renewable energy across the different sectors of the economy is a key building block to reaching the goal of **reducing net greenhouse gas emissions** by at **least 55%** by 2030 and becoming a **climate-neutral continent by 2050.**

Risks:

- Selfsufficiency?
- Insufficient infrastructure for energy storage
- The need for stable backup sources like coal and gas
- Dependence on imported technologies (e.g., Chinese components for renewable energy).

Clean energy manufacturing capacity by location



Source: BloombergNEF. Note: By factory location. PV, hydrogen and battery components expressed in MW, MWh, m² or tons. Nickel is the class 1 variety, and lithium is in lithium carbonate equivalent. H_2 is hydrogen. Data as of October 2022, except electrolyzers which refer to a 2021 and nacelle data which are for 2020.

https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en

https://about.bnef.com/blog/localizing-clean-energy-value-chains-will-come-at-a-cost/

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NATO and energy security	Dominik Jankowski, Permanent Delegation of Poland to NATO
REPowerEU – the new EU energy security strategy	Agata Romanowska, DISE
The importance of energy infrastructure for state security	Paweł Turowski, National Security Bureau
Protection of energy infrastructure in the context of terrorist threats	Witold Skomra, Government Centre for Security
NATO HQ perspectives	Julijus Grubliauskas, NATO HQ
The role of gas storage in maintaining energy security	Piotr Dziadzio, Oil and Gas Institute
Gas exchange and the security of gas fuel trading	Marcin Sienkiewicz, DISE
EU standards for identifying and monitoring threats to energy security	Jerzy Baehr, WKB Lawyers
LNG infrastructure in Europe	Dariusz Kryczka, EY

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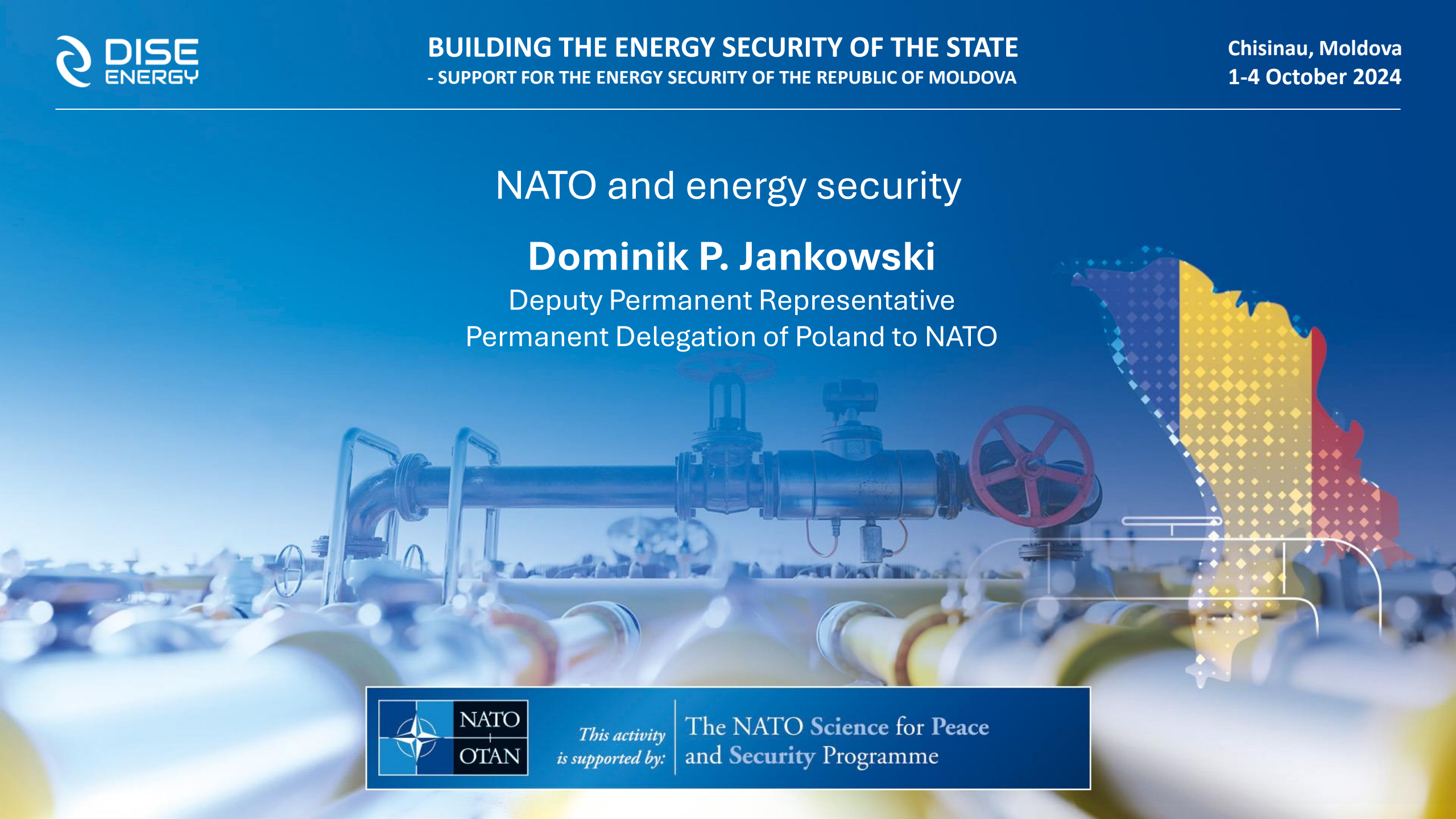
NATO and energy security

Dominik P. Jankowski
Deputy Permanent Representative
Permanent Delegation of Poland to NATO



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Four key areas

1. Russian aggression against Ukraine: support for Ukraine & lessons learned for the Alliance
2. Critical undersea infrastructure (CUI)
3. Energy transition in the armed forces
4. Fuel supply chain

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Russian aggression against Ukraine: support for Ukraine & lessons learned for the Alliance

1. NATO Support and Procurement Agency (NSPA) – fuel for the Ukrainian Armed Forces
2. Comprehensive Assistance Package (CAP) – energy security projects to support Ukraine
3. Dedicated energy security courses – Poland, United States, NATO (2023 – Lublin; 2024 – Bydgoszcz)
4. Joint Analysis, Training, and Education Centre (JATEC) in Poland
5. Lessons learned from the Russian attacks against energy infrastructure in Ukraine
6. Guidelines for Allies on fuel supply – minimizing dependence on Russia in the Allied armed forces

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Critical undersea infrastructure (CUI)

1. Sabotage Nord Stream 1/Nord Stream 2
2. Increased sabotage activities against CUI in the Baltic Sea (Balticconnector pipeline/Newnew Polar Bear; cyberattacks; offshore wind farms)
3. 2023 NATO Vilnius Summit: Maritime Centre for the Security of Critical Underwater Infrastructure within NATO's Allied Maritime Command (MARCOM)
4. Maritime Centre for the Security of Critical Underwater Infrastructure: the operational hub to coordinate efforts between NATO Allies, partners, and the private sector
5. Critical Undersea Infrastructure Network: Strategic Points of Contact & Operational Points of Contact
6. NATO and the EU: joint task force to protect critical infrastructure

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Energy transition in the armed forces

1. Energy Transition by Design:
- Allied armed forces must adapt to a climate changed future operating environment, increase their energy efficiency and introduce cleaner technologies
- Preserve collective defence, operational effectiveness and a credible deterrence posture

2. Energy transition – technology
- Defence Innovation Accelerator for the North Atlantic (DIANA): energy resilience

3. Energy transition – challenges
- Interoperability; critical infrastructure security; costs; technological absorption; supply chains - dependence

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Fuel supply chain

1. Fuel supply chain: NATO Pipeline System (NPS)
2. NPS: military perspective
- Deterrence by denial/forward defence

3. NPS: economic perspective
- Civilian market (Amsterdam, Brussels, Frankfurt)
- Commercial contracts guarantee the primacy of supply to military forces

4. NPS: environmental perspective
- Pipelines are less energy consuming than rail, road and water transport
- Pipelines reduce the greenhouse gas emissions by between 61 to 77 percent compared with rail
- Sustainable Aviation Fuel (SAF)

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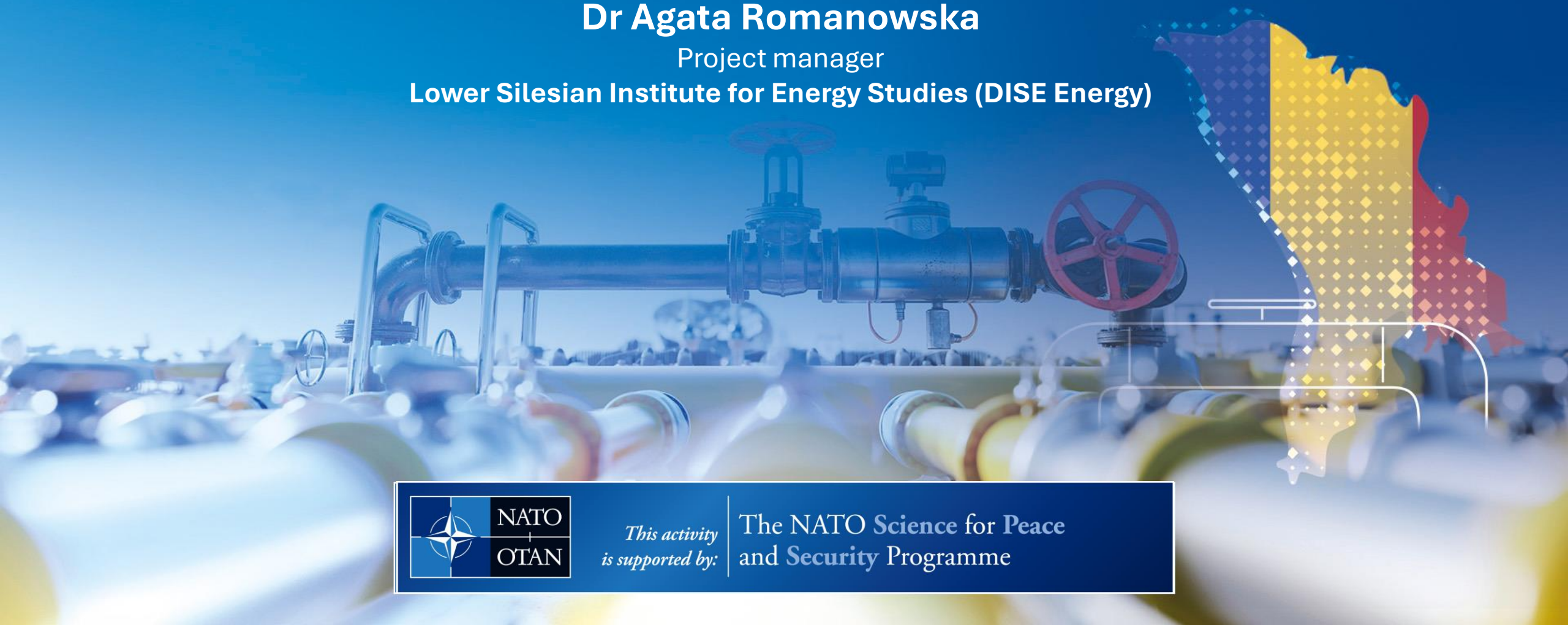
REPowerEU - the European Union's new energy security strategy

Dr Agata Romanowska
Project manager
Lower Silesian Institute for Energy Studies (DISE Energy)



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REPowerEU - the European Union's new energy security strategy

Agenda:

- Decarbonization megatrend in European Union – European Green Deal
- Energy security
- Energy crisis
- REPowerEU plan goals
- Achieved goals and effectiveness
- Biomethane production as a way to decarbonize the traditional gas industry and improve energy independence

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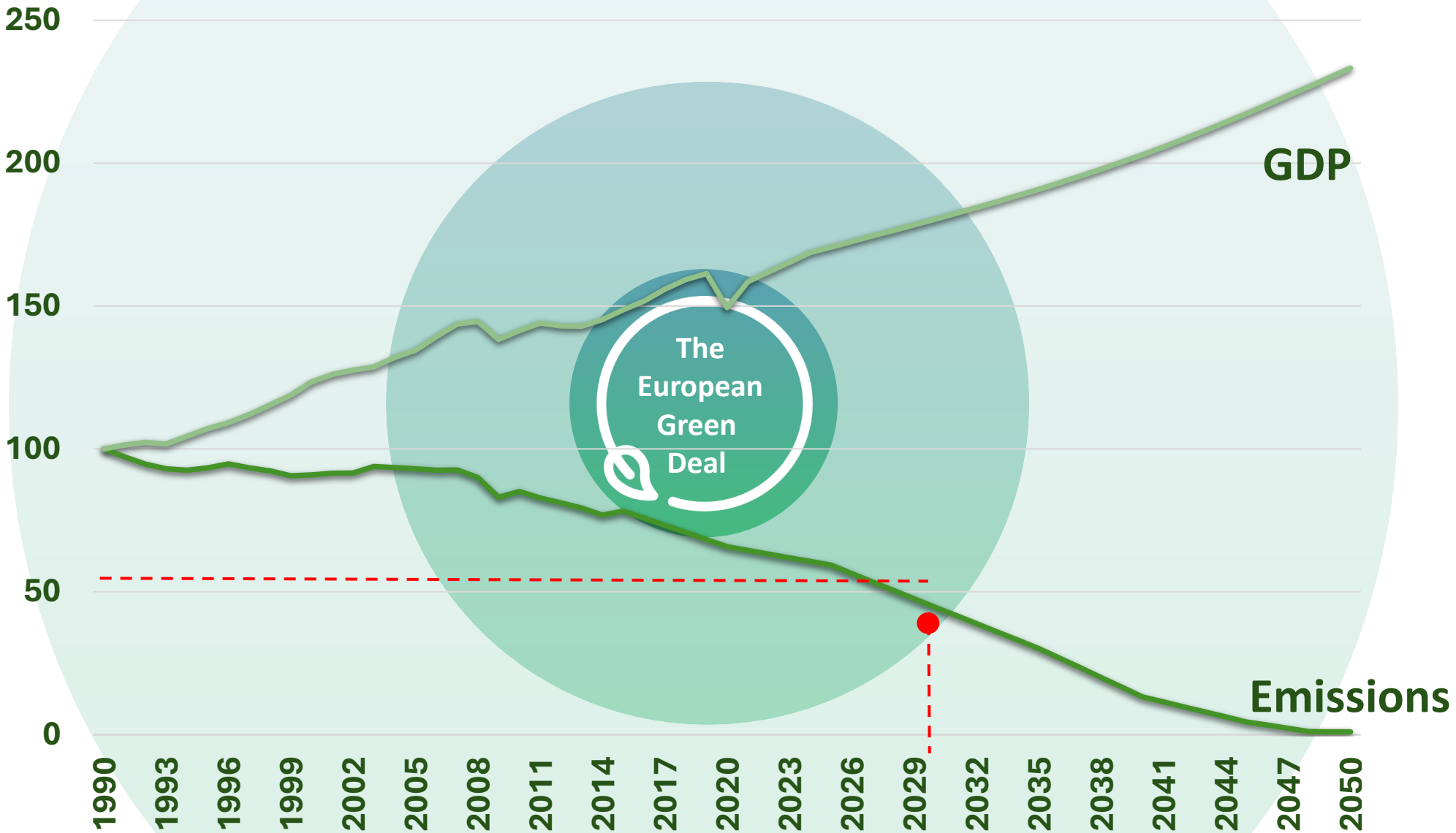
Decarbonization Megatrend: EU's EGD



Source: European Commission DG ENER

Energy security (security of energy supply) is one of the goals of the energy union, conditioning the functioning of the internal market and ensuring environmental protection.

Member states are obliged to cooperate with the EU in the field of energy in accordance with the principle of energy solidarity.
What is needed now is a revision of the understanding of energy security as not only ensuring uninterrupted supply, but also that energy supplies come from stable partners and allow the energy sector and the economy as a whole to develop in a sustainable manner.

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2014: disruption of natural gas supplies from Russia to European Union countries - EU dependence on natural gas imports was 66%.

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL European Energy Security Strategy: 52014DC0330

2022: review EU energy security options and taking immediate action to move away from a mono-commodity gas market and dependence on gas imports, including 40% of Russian supplies

The beginning of the REPowerEU plan

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What is REPowerEU?

REPowerEU is the EU's plan to:

- save energy and improve **energy efficiency**
- diversify **energy supplies**
- accelerate the **clean energy transition**

+ strengthening integration within the energy union and solidarity among member states

Source: www.consilium.europa.eu/en/infographics/repowereu/

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As part of REPowerEU's most urgent actions, the European Commission has planned, among other things:

- **the permissibility of introducing, in an energy market emergency, regulated prices for energy and gas**
- **introduction of minimum filling levels for gas storage facilities**

The measure was concretized through the adoption of: a regulation introducing energy-saving measures and allowing time-limited application of regulated energy prices, and a regulation , which introduced, among other things, that from 2022 on November 1 of each year the minimum filling level of gas storage facilities in member states is to be 80%, and from 2023. - 90%.

Document 32022R1854; Document 32017R1938

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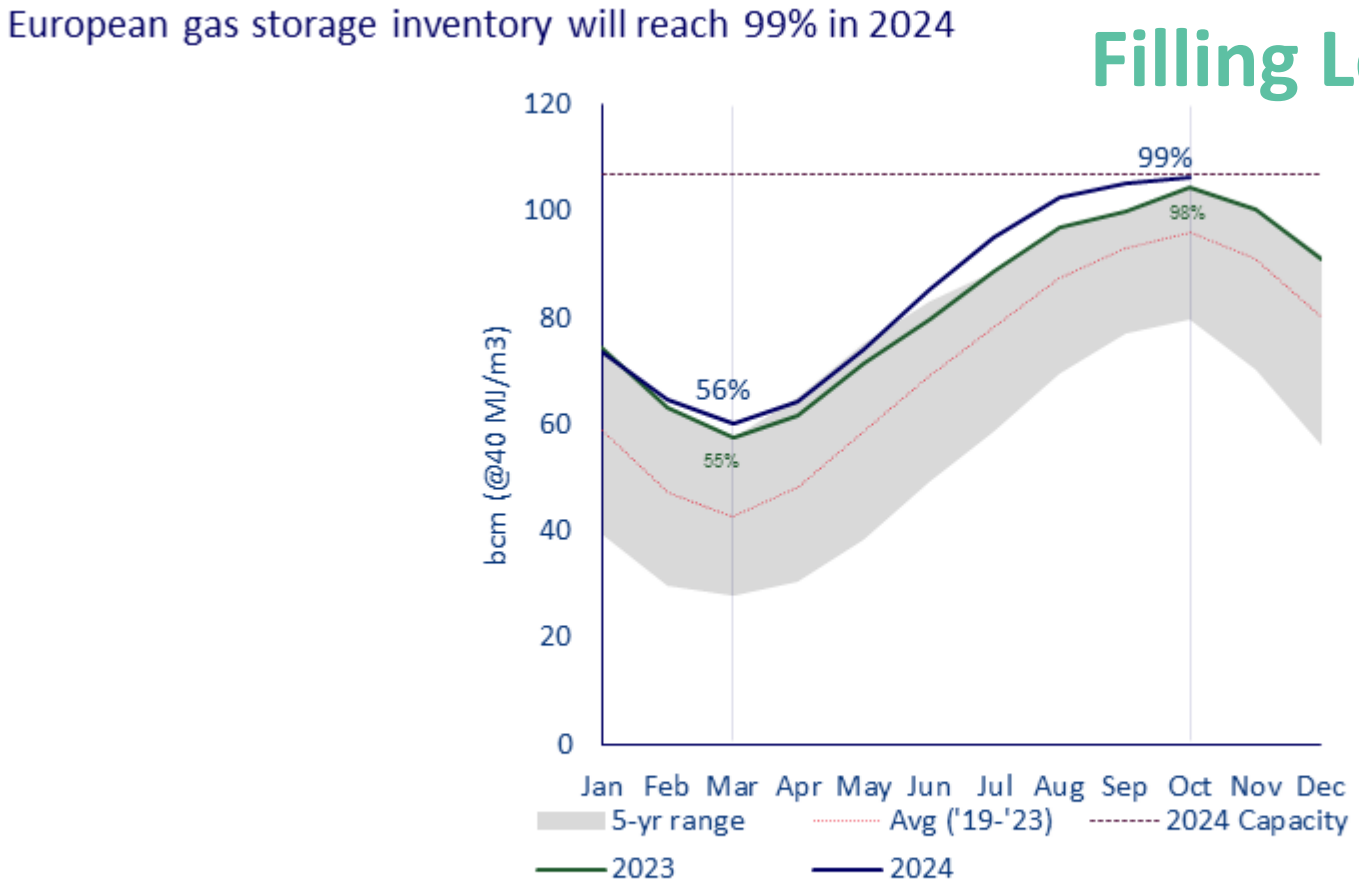
Filling Level of EU Gas Storage



Source: Wood Mackenzie. *Europe excluding Turkey.

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REPowerEU: accelerating the electrification of the internal energy market, implementing energy and fuel conservation measures and diversifying supply routes and sources

- Reducing energy consumption by at least 11.7% by 2030
- A target of a minimum share of energy from renewable energy sources (RES) in gross final energy consumption by 2030 of 42.5%, with an ambition of up to 45%

- Launch of an EU energy platform for voluntary joint purchases of gas, LNG and hydrogen
- Installation of 600 GW of PV capacity by 2030

- Installation of 10 million heat pumps by 2027
- Production of 10 million tons of renewable hydrogen by 2030
- Production of 35 billion m3 (bcm) of biomethane by 2030

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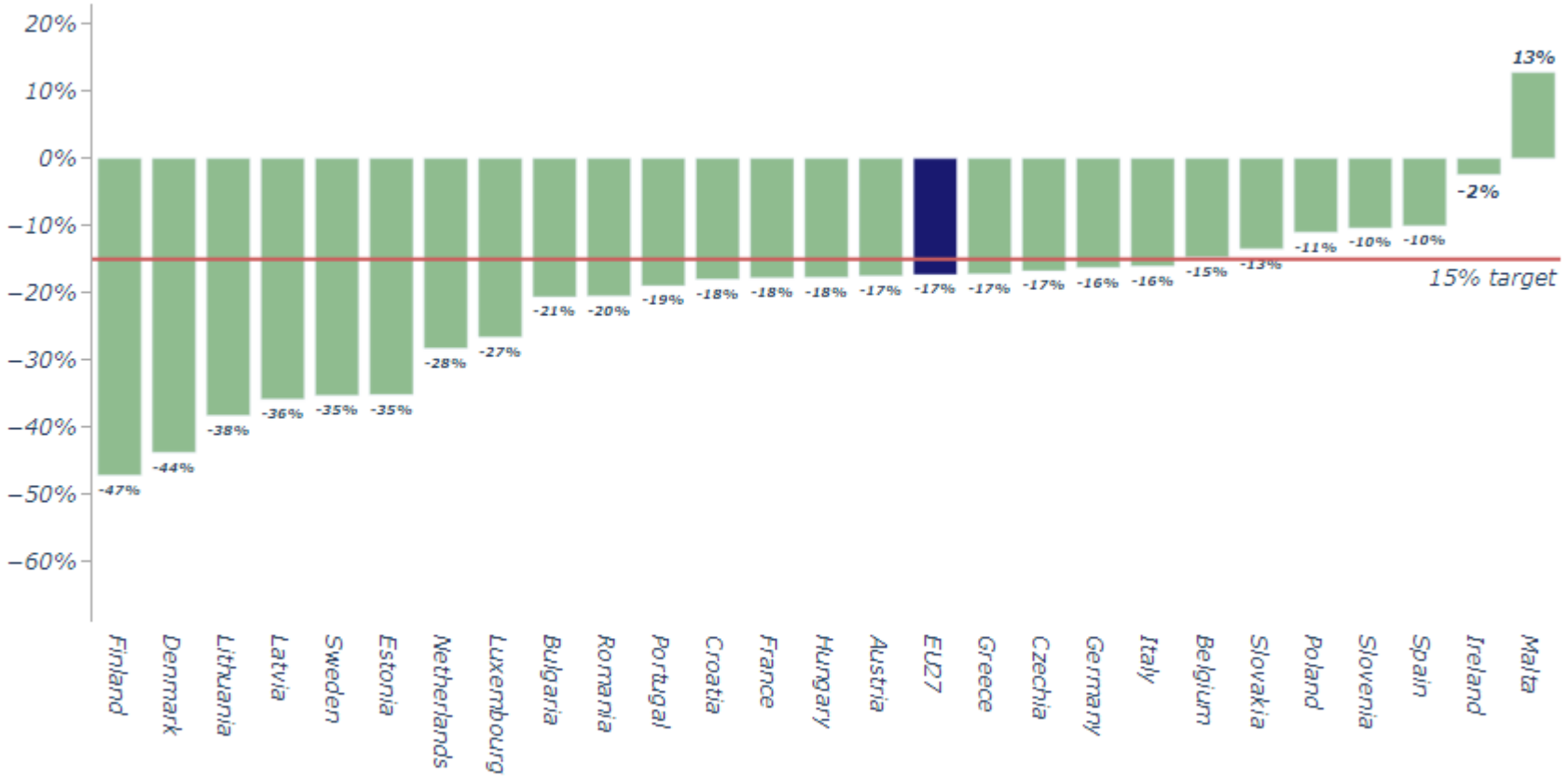
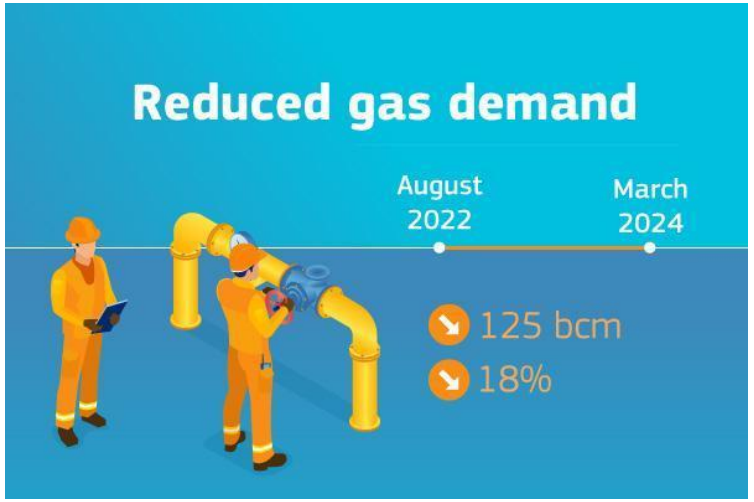
Natural gas demand reduction *(Aug 2022-Jul 2023 vs reference period*)*





Source: *Eurostat*

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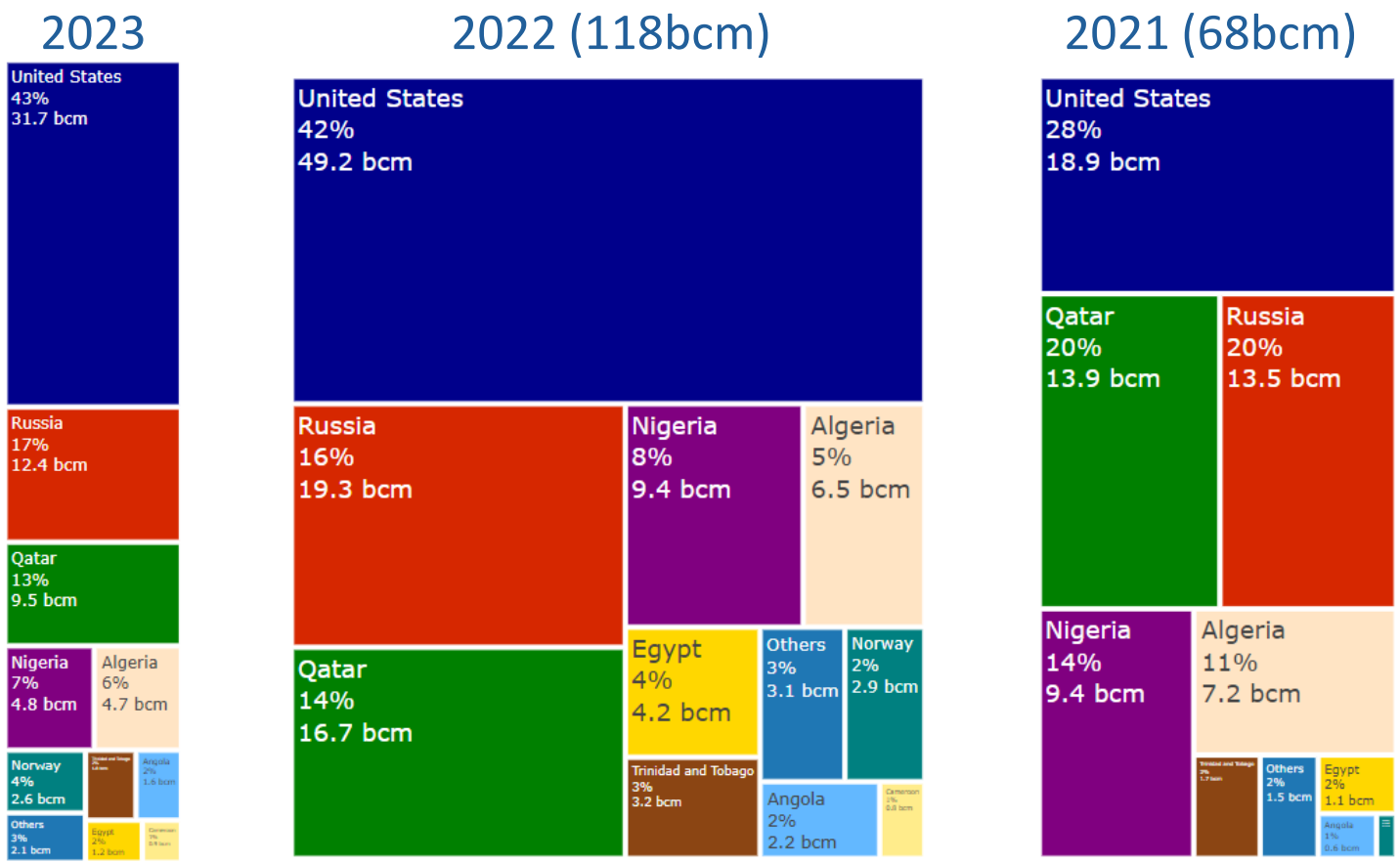
Annual LNG imports in the EU



Source: *European Commission based on ENTSO-G and Refinitiv*

15%

Share of EU gas imports coming from Russia in 2023

45%

Share of EU gas imports coming from Russia in 2021

Source: European Commission, DG ENER

AggregateEU

Who can buy

- EU27 & Energy Community (incl. UKR, MD)
- End consumers, gas traders, gas suppliers

Gas sellers

- All except for Russia

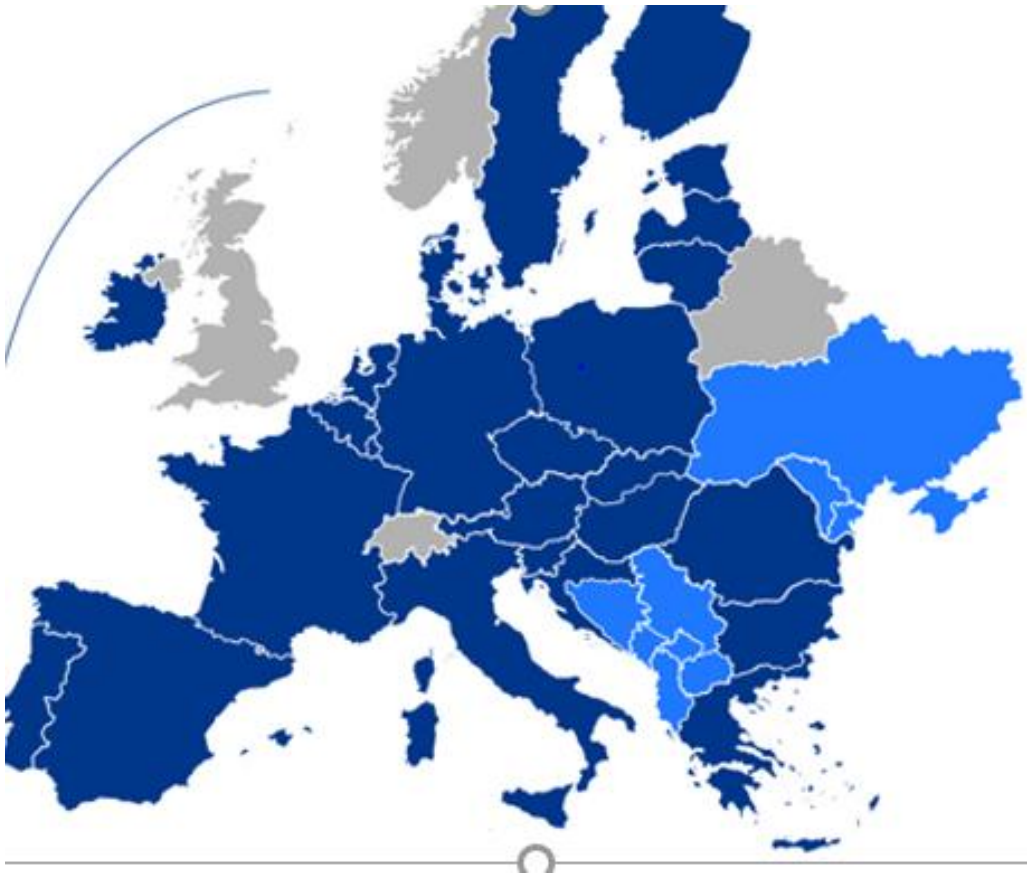
Duration

Until March 2025

Forms of cooperation

Central Buyer

Agent on Behalf



Source: European Commission, DG ENER

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The strategy's implementation by member states is being carried out through the expansion of so-called **National Recovery and Resilience Plans** to include a **REPowerEU chapter**.

It is assumed that these reforms should focus on:

- **improving energy infrastructure and facilities to meet the most urgent needs for security of natural gas supply, especially to enable diversification of supply in the interest of the EU as a whole,**
- **increasing the share and accelerating the spread of renewable energy,**
- **encouraging the reduction of energy demand,**
- **removing internal and cross-border bottlenecks in energy transmission and distribution,**
- **decarbonizing industry,**
- **increasing the production and use of sustainable biomethane and clean or renewable hydrogen,**
- **increasing energy efficiency in buildings,**
- **combating energy poverty,**
- **supporting zero-emission transportation and its infrastructure,**
- **promoting energy storage.**

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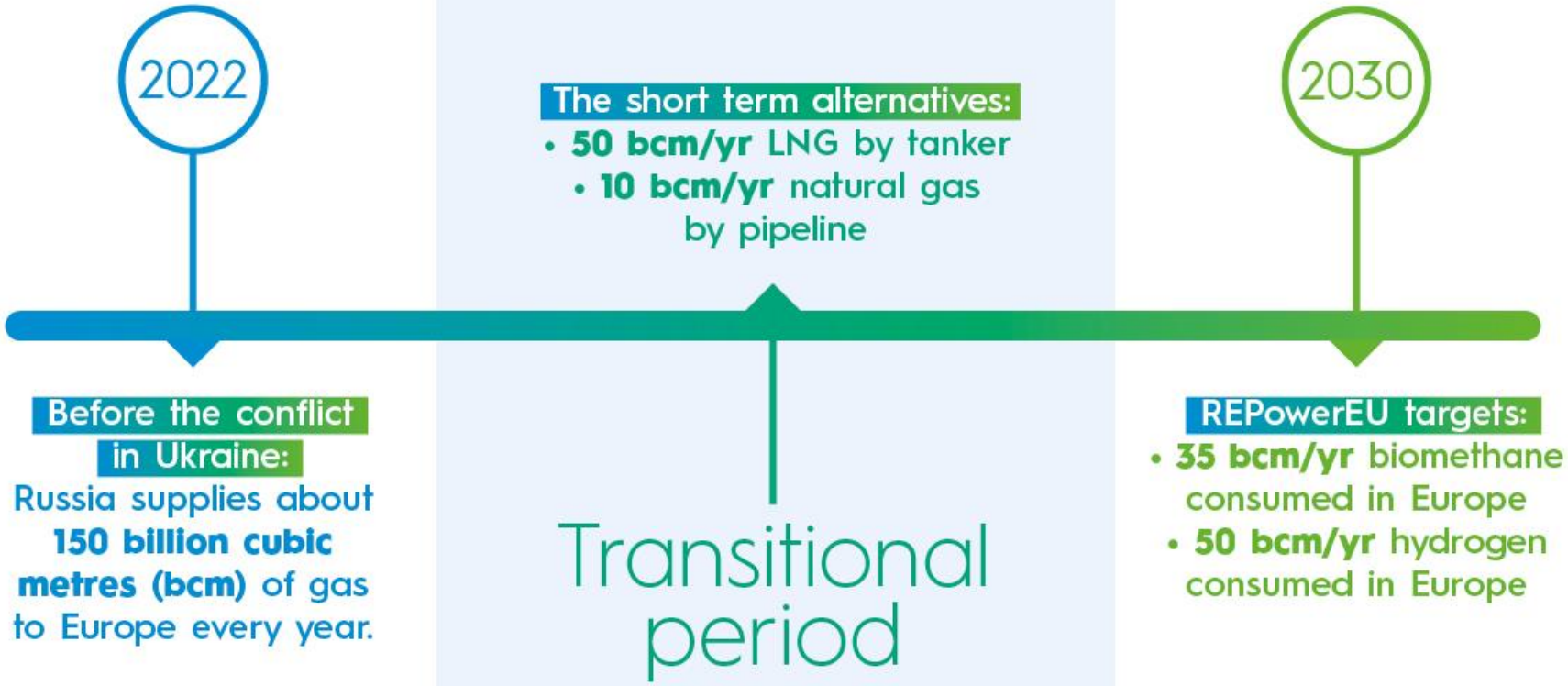
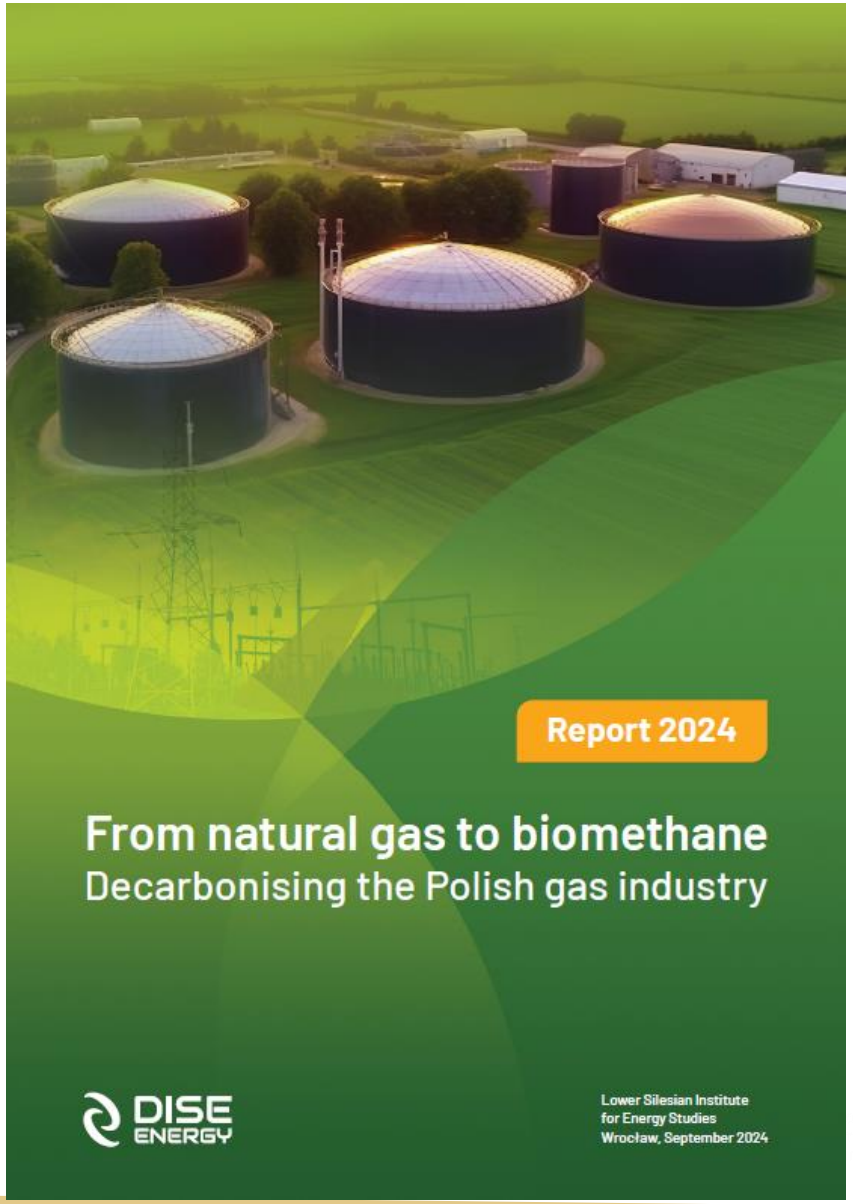


Source: https://www.terega.fr/en/newsroom/editorial/repower-eu-europe-seeks-to-take-control-of-its-energy-independence/

From natural gas to biomethane - Decarbonizing the Polish gas industry

PL

EN



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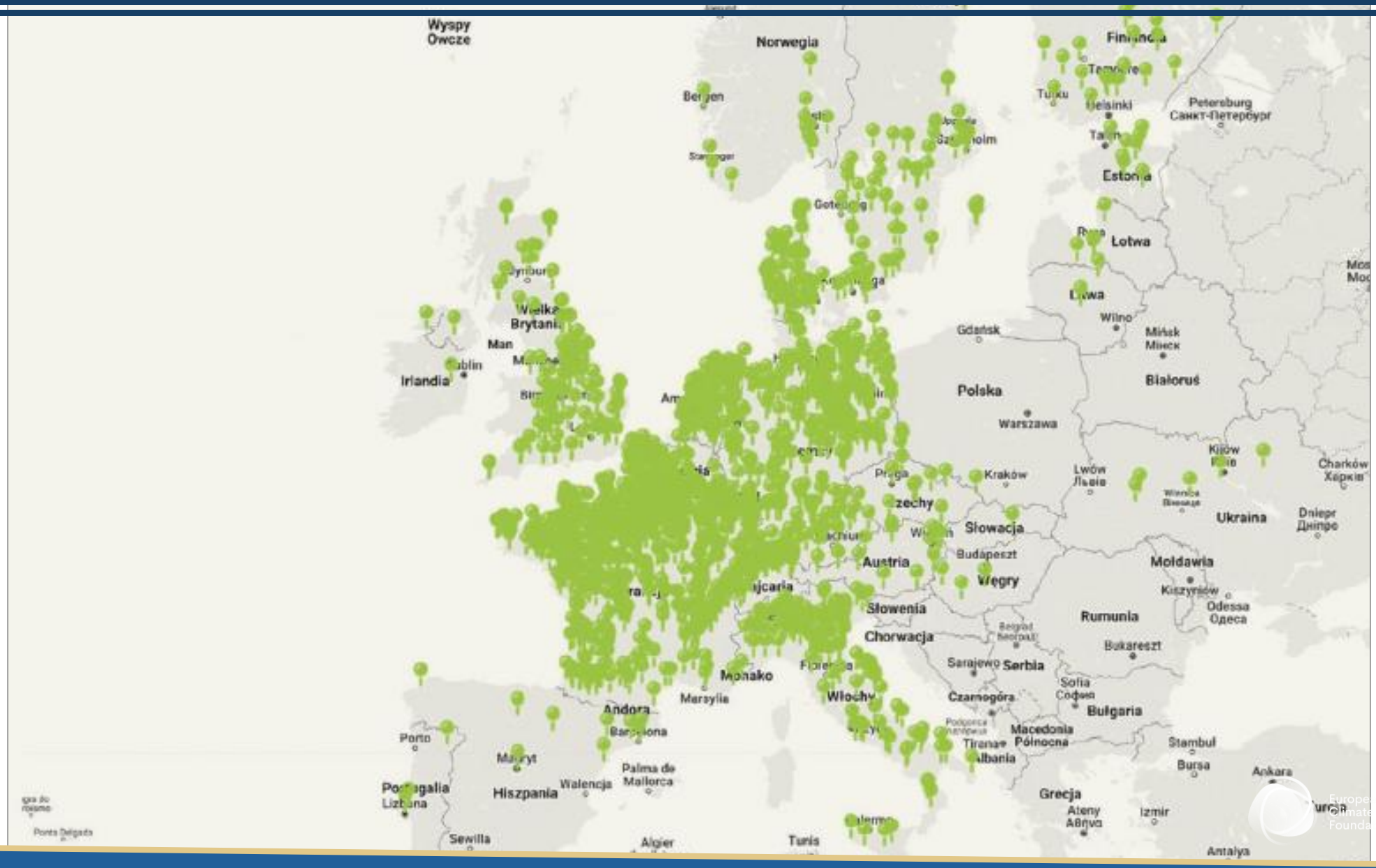
Map of biomethane plant distribution in Europe, as of June 2024 [European Biogas Association]



Determinants of the Polish gas industry

- Confidence in natural gas as a safe fuel has been undermined as a consequence of the 2021-2022 energy crisis - the global natural gas trade will be permanently burdened by political risk.

- The gas sector in Poland (as well as in the whole European Union) currently operates in a political and regulatory environment shaped primarily by aspirations for climate neutrality - but each country pursues its own goals depending on its resources, strategies and circumstances.

- In light of climate targets, quantitative development of the natural gas sector as measured by growth in volumes of gas sold and consumed is unacceptable.

- One solution toward independence, resilience and decarbonization of the gas sector is the development of distributed biomethane production with access to the traditional grid.

FIG. 16. View of the biogas plant (biomethane production potential of 2.1 million m^3/year) at the UPP farm in Przybroda; A - biotechnology accelerator (250 m^3 volume), F1, F2 - fermenters (2 times 870 m^3), ZnP - digestate tank (3600 m^3)

Source: Photo by Jacek Dach

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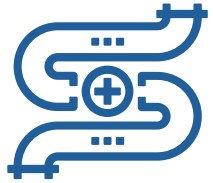
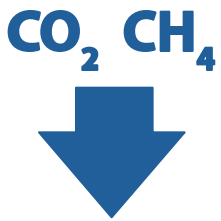
Potential for development of biomethane (purified biogas) production

- Biomethane is produced by the fermentation of organic matter - bio-waste can be used to produce it

- Biomethane production is associated with rural development and new branches of the agricultural sector: substrate extraction, use of digestate



- Biomethane can be injected directly into the traditional natural gas grid

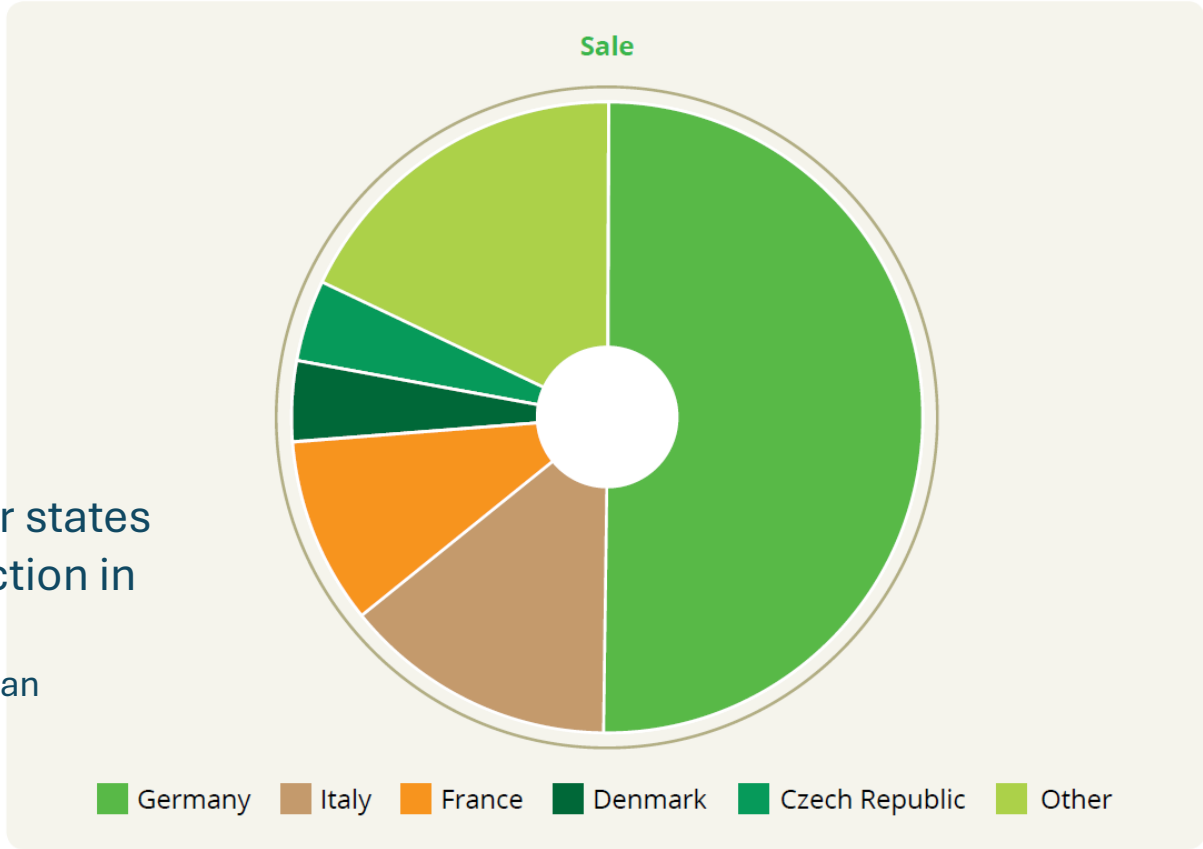


- Biomethane is a renewable gas with even negative emissions

European experience

Share of individual member states in total biomethane production in the European Union
[own elaboration based on European Commission 2021 data]

FIG. 3. Share of individual Member States in total biomethane production in the European Union.



Source: Own compilation based on the European Commission data.

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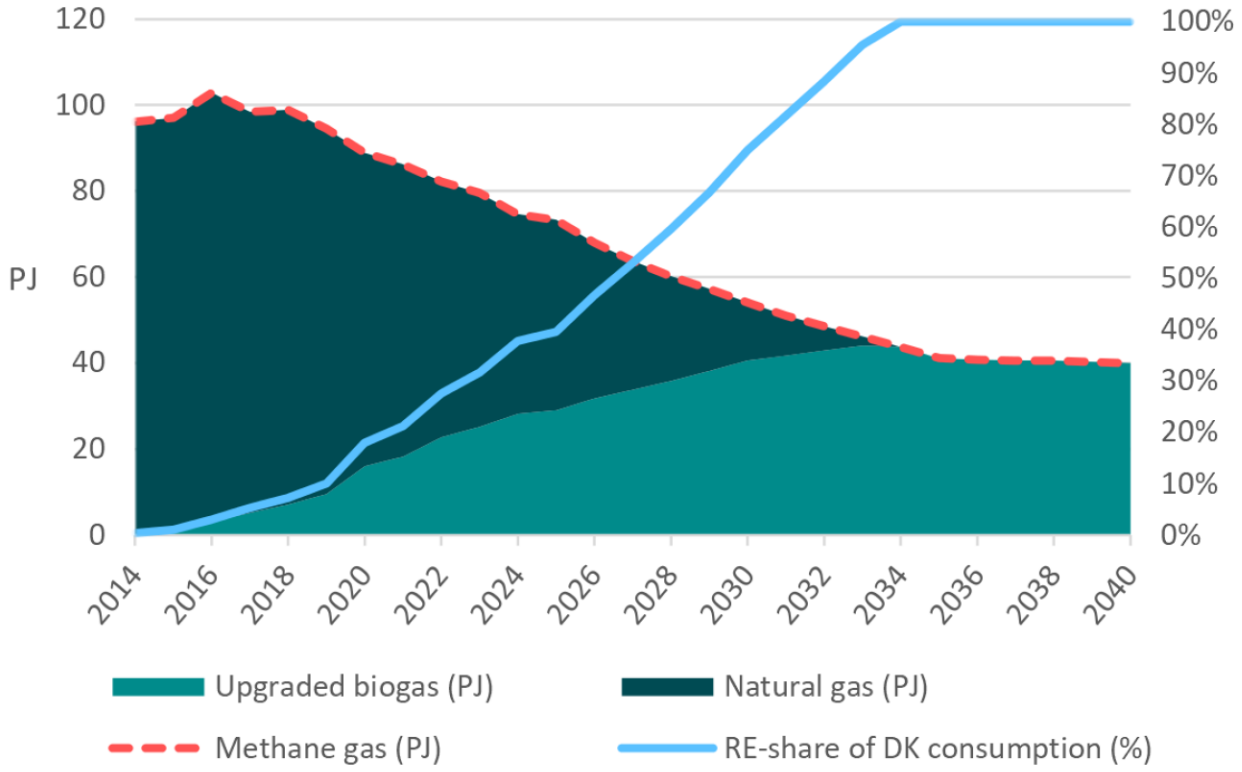
Experiences from Europe: Denmark



Source: Green Gas Strategy: The role of gas in the green transition. Danish Ministry of Climate, Energy and Utilities

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TAB. 3. Possible uses of biomethane depending on its form

No.	Form of biomethane	Use of biomethane
1.	Fuel (bio-CNG)	Highly compressed biomethane used as a substitute for compressed natural gas (CNG), e.g. in vehicles, especially buses, trucks and cars equipped with natural gas engines.
2.	Fuel (bio-LNG)	Liquefied biomethane used as a substitute for liquefied natural gas (LNG), e.g. in vehicles, especially buses, trucks and cars equipped with natural gas engines.
3.	Injection into gas networks	Biomethane meeting quality standards can be injected into existing distribution networks to replace natural gas.
4.	Energy in chemical form	Untreated biomethane (biogas) can serve as an energy carrier and be useful in areas not connected to the gas/electric grid (island grids) where access to traditional energy sources is limited.
5.	Combined heat and power generation	Untreated biomethane (biogas) can be used on site for cogeneration of electricity and heat/cooling.

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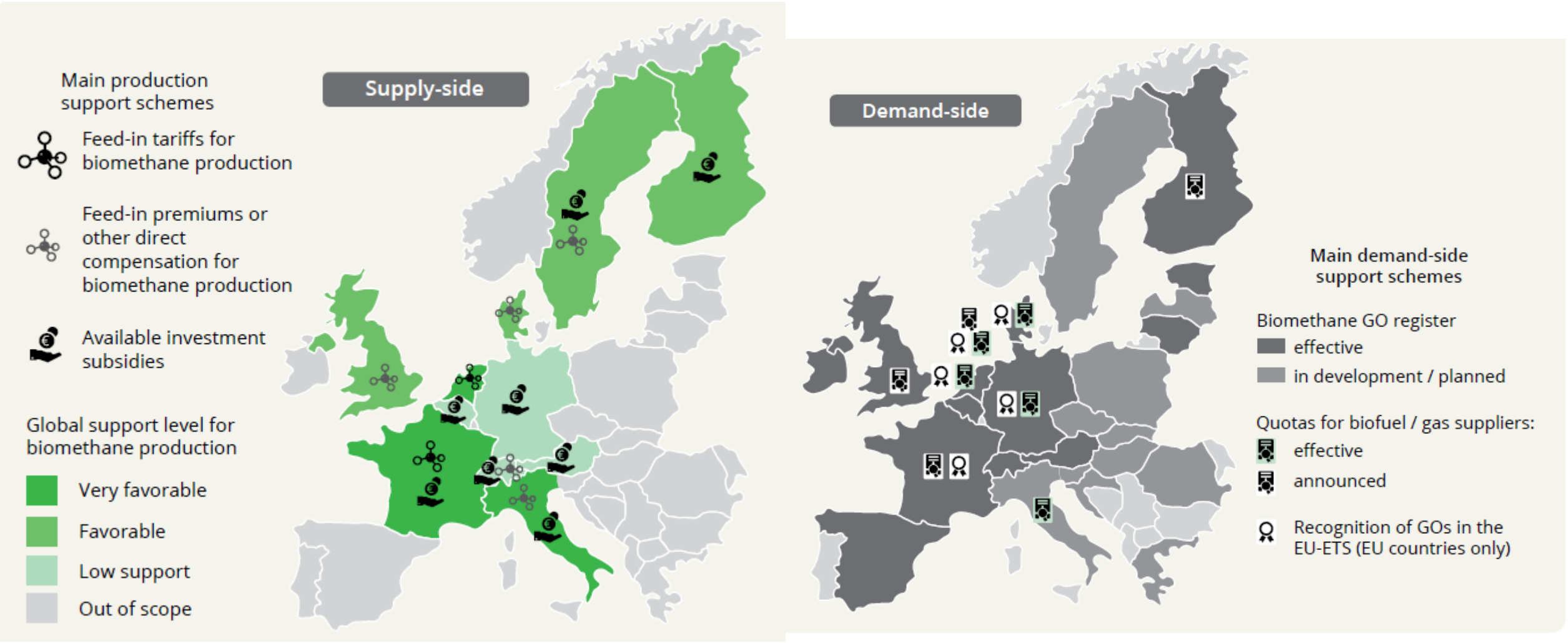


Source: https://www.sia-partners.com/system/files/document_download/file/2023 12/Sia%20Partners_Benchmark_Europe_Biomethane.pdf

Biomethane in Poland - we are at the very beginning of the process

2005

first biogas plant in Poland

2006

Germany's first biomethane plants (2009 biogas upgrading bonus)

2015

enactment of the RES law

2018

RED II (EU's Biofuel Directive)

2021

“Agreement on Cooperation for the Development of the Biogas and Biomethane Sector” (Ministry of Energy and Environment)

2023

Amendment to the RES Act (legal definition of biomethane)

2024/25

Planned opening of Poland's first biomethane plant

Elements of biomethane policy planning

Gas network absorption capacity

Location potential and substrate availability

Localization of demand potential: opportunities to connect to the gas network or to increase off-take capacity

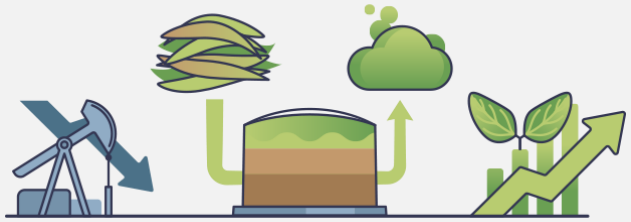
relevant aspects:

- legislation and administrative simplification
- forms of governmental support
- sustainable production

Biomethane: chances and challeges

Large potential for development of biomethane production: agricultural in rural areas, municipal and industrial in cities

The multi-level advantages of biomethane production and use:
Energy security, climate neutrality, sustainable economic development.



Challenges: high investment costs, needed funding - support and incentive system, sustainable production aspects, energy education

Biomethane as an opportunity for energy transition and security

- Energy transition - achieving the goals of decarbonization of the gas industry and other sectors of the national economy
- New funding prospects in post-2030 climate policy

- An opportunity for rural and agricultural development
- Use of substrate and digestate (instead of synthetic fertilizers)
- New jobs

- Energy security: domestic resources, distributed and controllable energy sources, easy storage
- Independence from imports of raw materials
- Reducing the rising cost of emissions

- Energy education of the society
- Extensive organic waste management

Conclusions:

- Concern for the energy system is actually an opportunity for a **long-term economic plan**, new jobs and a more competitive economy
- **Energy security, dispersion of sources, infrastructure resilience, resilience to the effects of climate change and geopolitical risks**
- Decarbonization strategy is inevitable - European climate policy
- **Balancing decarbonization goals and own energy security**
- Europe's traditional gas industry is being forced to transform towards decarbonization
- Each country needs to find its **own decarbonization path and review national resources and potentials**
- Given the natural gas infrastructure, the size of the country and good conditions for agricultural development, the need for independence from imported fuel may be a good way to develop biomethane production.

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THE IMPORTANCE OF ENERGY INFRASTRUCTURE FOR STATE SECURITY

PAWEŁ TUROWSKI
EXPERT/NATIONAL SECURITY BUREAU, POLAND

NATO OTAN
This activity is supported by: The NATO Science for Peace and Security Programme

I.
The Security Environment - Diagnosis

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The Security Environment - Diagnosis

- Moldova has been deeply affected by the Russian invasion of Ukraine;
- Russia has tried to carve out a land corridor to Moldova by force;
- Russia **has resorted to energy blackmail** by drastically reducing natural gas supplies to put pressure on the government and society;
- Russia has taken actions to destabilise the country through cyber-attacks, disinformation and actions to disrupt public order;
- Russia has interfered in Moldova's elections in order to influence or falsify their results;
- Russia has frequently leveraged the local proxies support - corrupt politicians, fugitive oligarchs, and members of the criminal world.

Source:
Moldova's National Security Strategy

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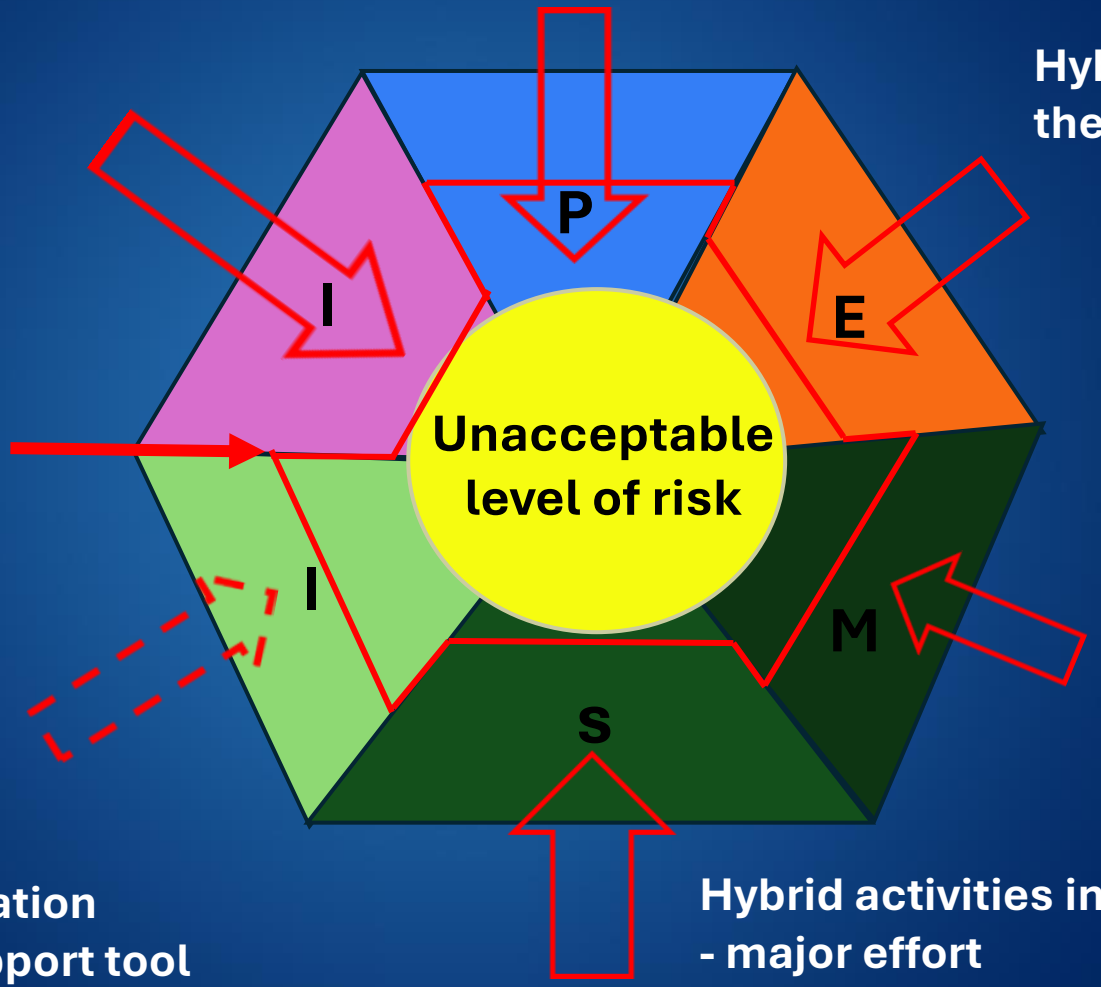
Individual PEMSII areas achieve acceptable risk

Hybrid infrastructure measures - support tool

Hybrid measures in the economic field

Areas:
Political
Economy
Military
Social
Information
Infrastructure



Boundary of the tolerable risk

Hybrid information activities - support tool

Hybrid activities in the socialsphere - major effort

Source: Doctrine and Training Centre of the Polish Armed Forces

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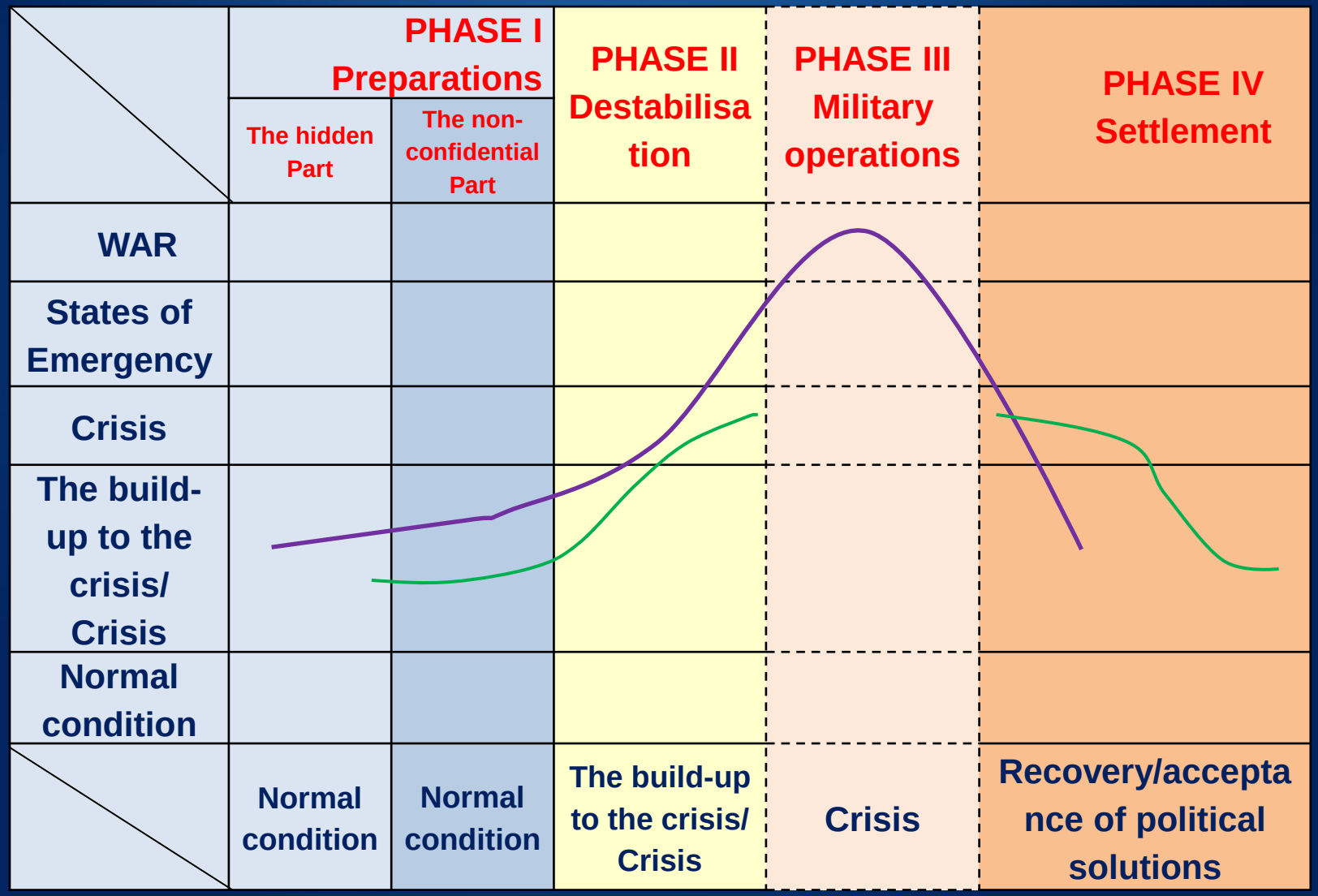
Phases of hybrid operations

An example of an effect of escalation of the threat under the control of a potential adversary, with the ability to maintain the crisis below the threshold of war.



Source: Doctrine and Training Centre of the Polish Armed Forces

II.
Solutions and Tools

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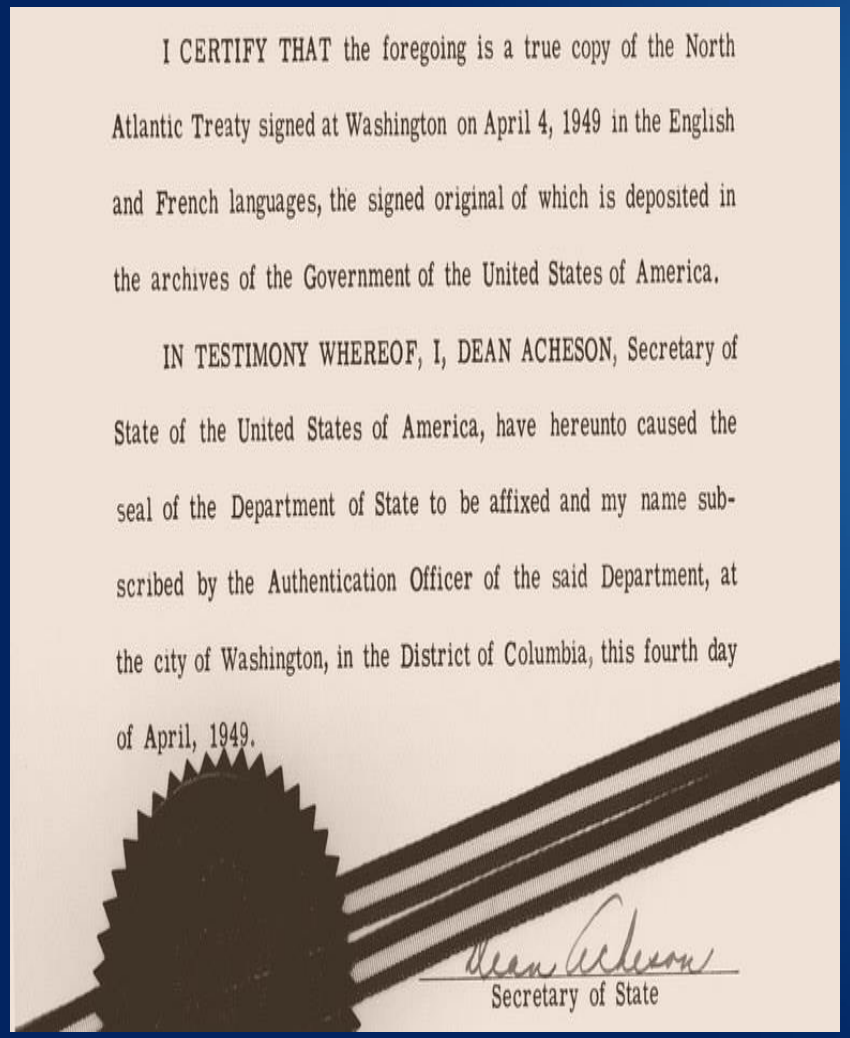
THE NORTH ATLANTIC TREAETY, Washington D.C. - 4 April 1949



I CERTIFY THAT the foregoing is a true copy of the North Atlantic Treaty signed at Washington on April 4, 1949 in the English and French languages, the signed original of which is deposited in the archives of the Government of the United States of America.

IN TESTIMONY WHEREOF, I, DEAN ACHESON, Secretary of State of the United States of America, have hereunto caused the seal of the Department of State to be affixed and my name subscribed by the Authentication Officer of the said Department, at the city of Washington, in the District of Columbia, this fourth day of April, 1949.

Dean Acheson
Secretary of State

ARTICLE 3

- In order more effectively to achieve the objectives of this Treaty, the Parties, separately and jointly, by means of continuous and effective self-help and mutual aid, will maintain and develop their individual and **collective capacity** to resist armed attack.

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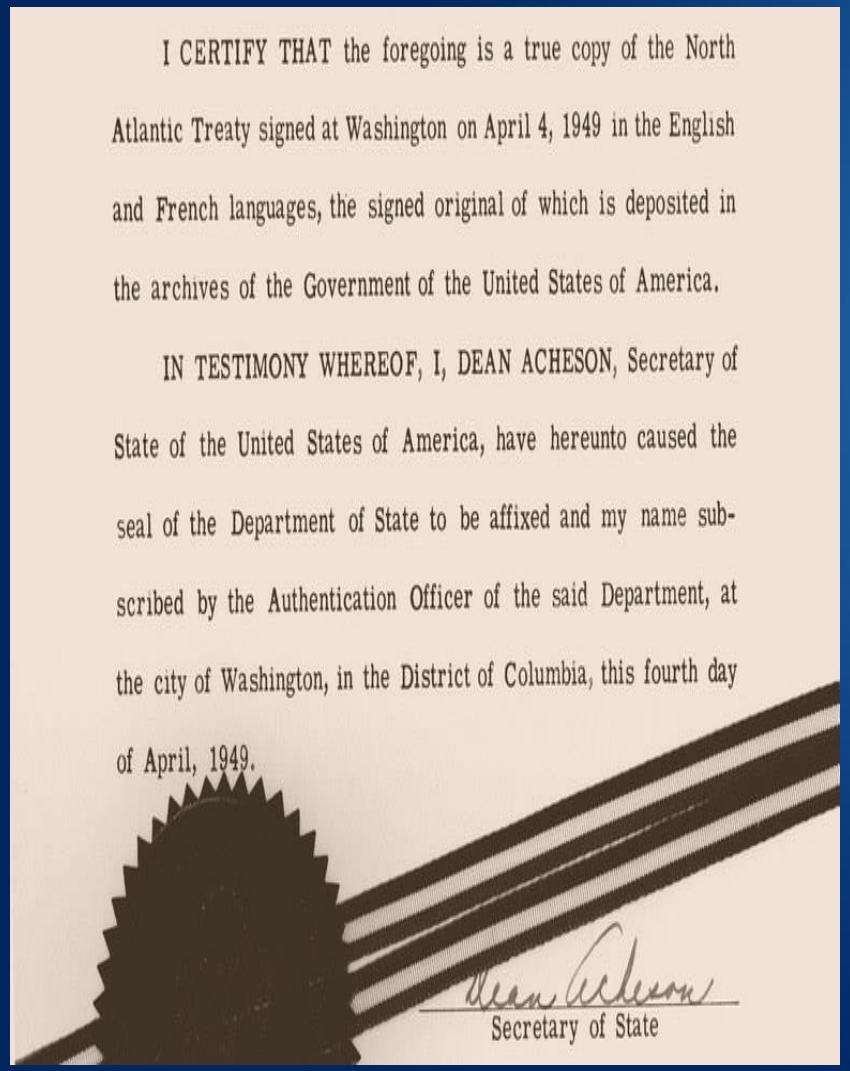
Article 3 and Resilience



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Dean Acheson
Secretary of State

- Every NATO member state **must be resilient** to major shocks such as natural disasters, critical infrastructure failures, **hybrid** or **armed attacks**.

- Resilience is the individual and collective ability to prepare for, **resist**, **respond** to and **recover** quickly from shocks and disruptions, and **to ensure the continuity** of operations.

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GUIDELINES FOR BUILDING STATE RESILIENCE

- In 2014, in the aftermath of Russia's aggression against Ukraine, NATO began to adapt to new security threats and develop mechanisms to respond to them.
- At the NATO summits (Newport in 2014, Warsaw in 2016), it was decided to strengthen deterrence, collective defence, and strengthen support for resilience.
- Allies committed to implementing agreed requirements to enhance national resilience in seven critical sectors.

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GUIDELINES FOR BUILDING STATE RESILIENCE

- Allies have committed to implementing Seven Baseline Resilience Requirements underpinning Alliance defence capabilities. These are:

1) assured continuity of government and critical government services;
2) **resilient energy supplies;**
3) ability to deal effectively with uncontrolled movement of people;
4) resilient food and water resources;
5) ability to deal with mass casualties;
6) resilient civil communication systems;
7) resilient civil transportation systems.

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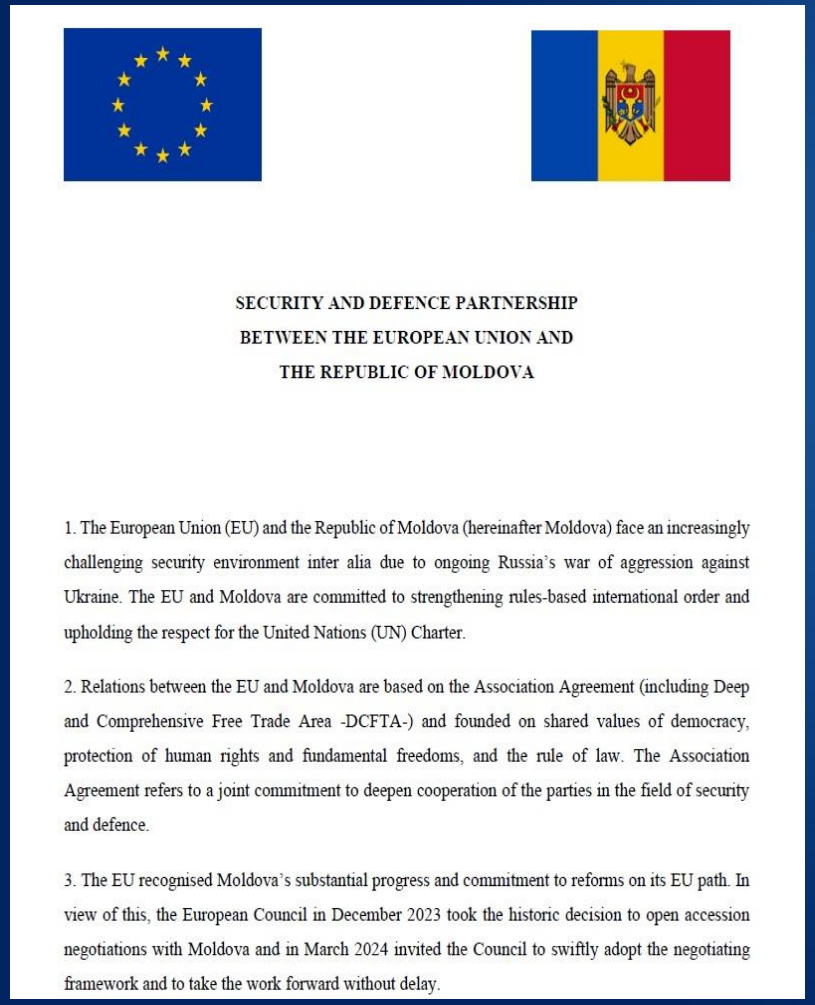
EU-MOLDOVA SECURITY AND DEFENCE PARTNERSHIP, may 2024



SECURITY AND DEFENCE PARTNERSHIP
BETWEEN THE EUROPEAN UNION AND
THE REPUBLIC OF MOLDOVA

1. The European Union (EU) and the Republic of Moldova (hereinafter Moldova) face an increasingly challenging security environment inter alia due to ongoing Russia's war of aggression against Ukraine. The EU and Moldova are committed to strengthening rules-based international order and upholding the respect for the United Nations (UN) Charter.

2. Relations between the EU and Moldova are based on the Association Agreement (including Deep and Comprehensive Free Trade Area -DCFTA-) and founded on shared values of democracy, protection of human rights and fundamental freedoms, and the rule of law. The Association Agreement refers to a joint commitment to deepen cooperation of the parties in the field of security and defence.

3. The EU recognised Moldova's substantial progress and commitment to reforms on its EU path. In view of this, the European Council in December 2023 took the historic decision to open accession negotiations with Moldova and in March 2024 invited the Council to swiftly adopt the negotiating framework and to take the work forward without delay.

The EU-Moldova Security and Defence Partnership

will boost dialoge and cooperation in:

- **countering hybrid threats;**
- cyber security;
- fighting with disinformation;
- trainings and capacity buidings;
- and will open the door to new **security and defence cooperation**.

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NATIONAL SECURITY STRATEGY OF MOLDOVA, December 2023

Energy security and Resilience, lines of action **:**

- strengthening energy security by increasing interconnection capacity with EU to ensure energy supply continuity and diversification;
- ensuring strategic reserve of gas, oil products, and other fuels;
- modernizing energy infrastructure;
- developing and implementing energy crisis management protocols, deepening energy partnerships with EU.

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NATIONAL SECURITY STRATEGY OF MOLDOVA, December 2023

Methods and Lines of Actions in Security Domains:

- an integrated approach involves government institutions' ability to combine information and analyse the full range of challenges;
- it triggers the ability to take countermeasures across multiple domains and mitigate negative impacts more effectively;
- an integrated approach enhances the ability of state institutions to deal holistically with hybrid threats.

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III.
Conclusions

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1) Challenges**: security, infrastructure protection, diversification;**

2) rise of **hybrid threats;**

3) increase in **threats below the threshold of war;**

4) difficulty in attributing hybrid actions;

5) experience from Ukraine - sea drones, air drones, **systemic destruction of energy infrastructure**;

6) key capability - **speed of response**;

7) resources for reconstruction;

8) essential - state cross-sector centre to prevent hybrid threats including energy infrastructure strike.

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Thanks for your attention

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THE IMPORTANCE OF ENERGY INFRASTRUCTURE FOR STATE SECURITY

PAWEŁ TUROWSKI
EXPERT/NATIONAL SECURITY BUREAU, POLAND

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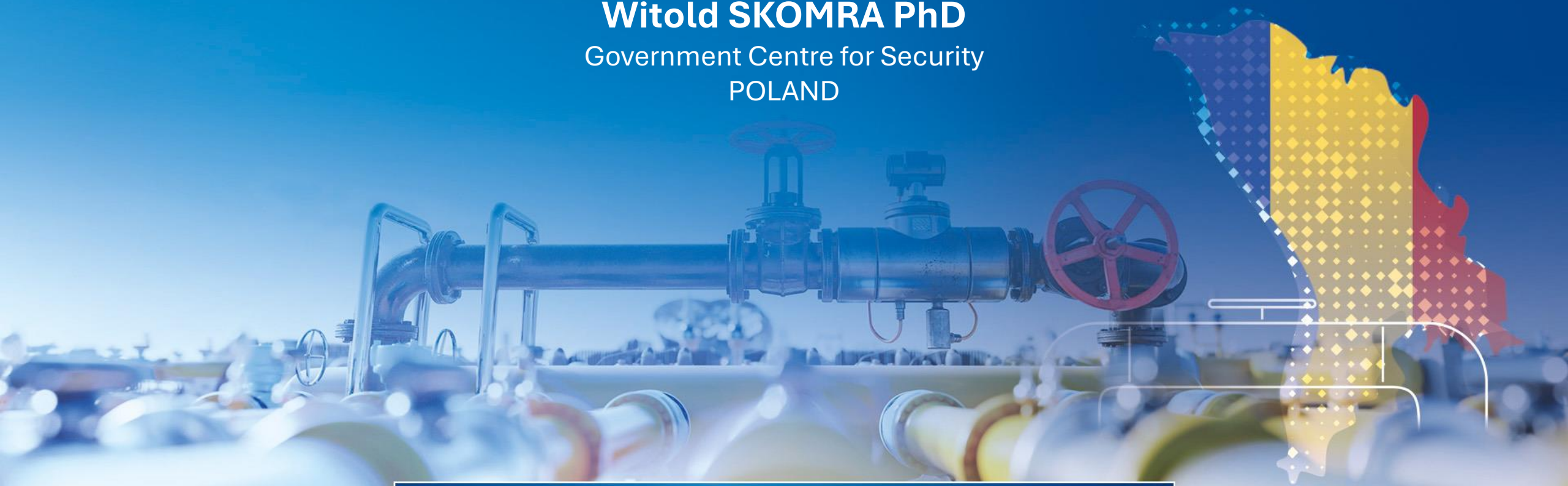
Protection of energy infrastructure in the context of terrorist threats.

Witold SKOMRA PhD
Government Centre for Security
POLAND



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Agenda:

- **How and why CI is as an ideal target for terrorist and hybrid operations?**
- **Polish experience in building CI resilience**

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REASONS WHY CI IS ATTACKED?

- weakening the state and the society,
- introducing chaos, panic and uncertainty in society ,
- loss of confidence in authorities, institutions and the democratic order,
- economic losses of significant size,
- reduce the state's ability to act in support of allies,
- decline of country's international position.

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METHODS:

- terrorist attacks
- cyberattacks
- sabotage activities
- intelligence activity
- disinformation activities

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HOW?

- make it difficult to diversify supply of key raw materials and products,
- identify vulnerabilities and gaps in the protection system,
- carry out systemic devastation of the ability to business continuity.

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CRITICAL INFRASTRUCTURE IS

- essential and crucial
- codependent
- sensitive to soft effects
- susceptible

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MOREOVER – country 's context

Source: G. Miller, L.Morris, M.Ilyushina, *Russia recruited operatives online to target weapons crossing Poland*, August 18, 2023 – the Washington Post.

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RISKS

- 1. energy infrastructure

powerstations, transmission grids, refineries, transshipment terminals (crude oil, LPG, LNG)

- 2. transport infrastructure

road and rail transport of energy resources, **road and rail transport of military and humanitarian aid to Ukraine, airports, logistic hubs**

- 3. ICT infrastructure

central government systems and records, OT, stock exchange/banks

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Polish experience in building CI resilience

The National Critical Infrastructure Protection Programme

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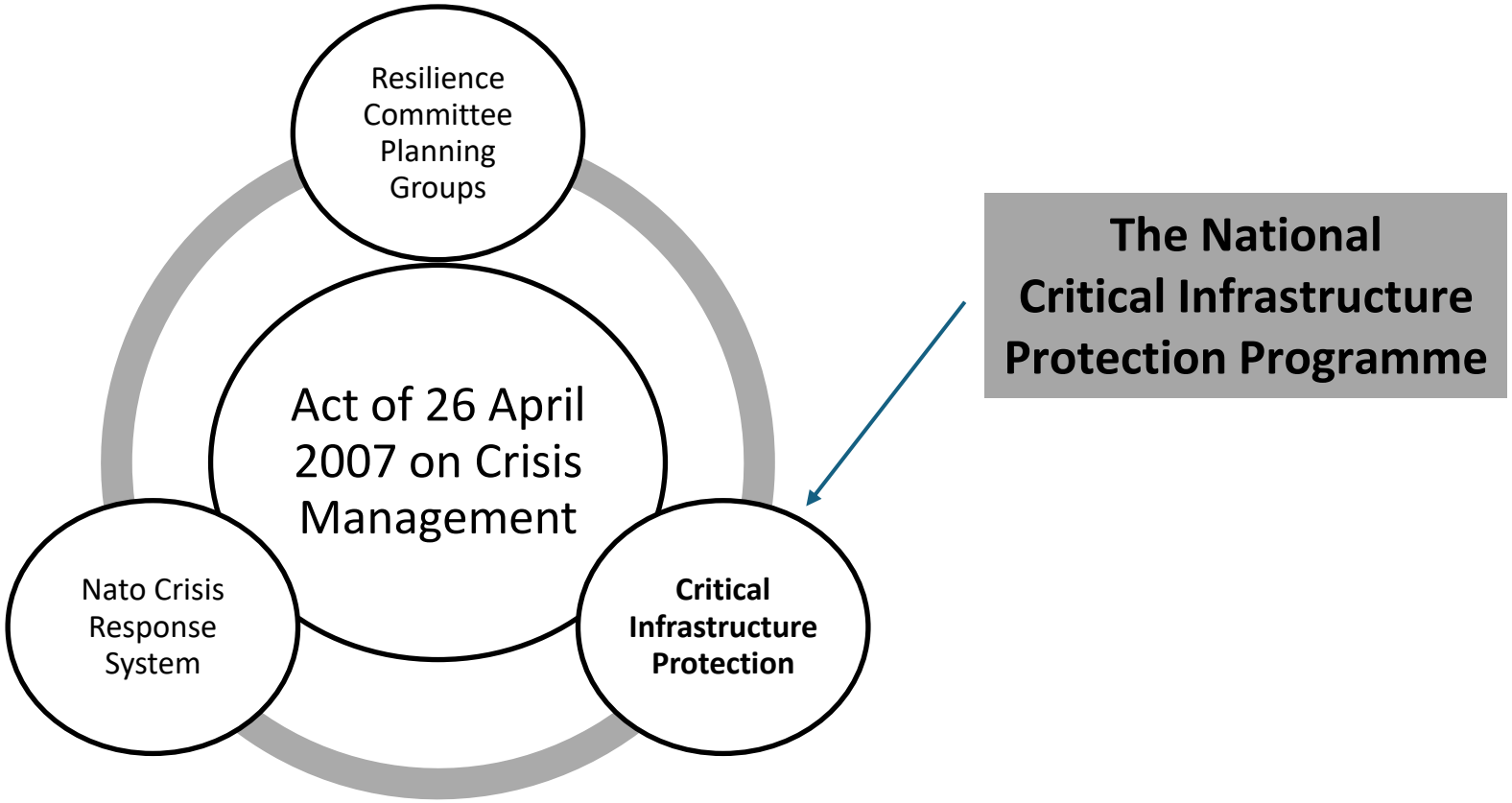

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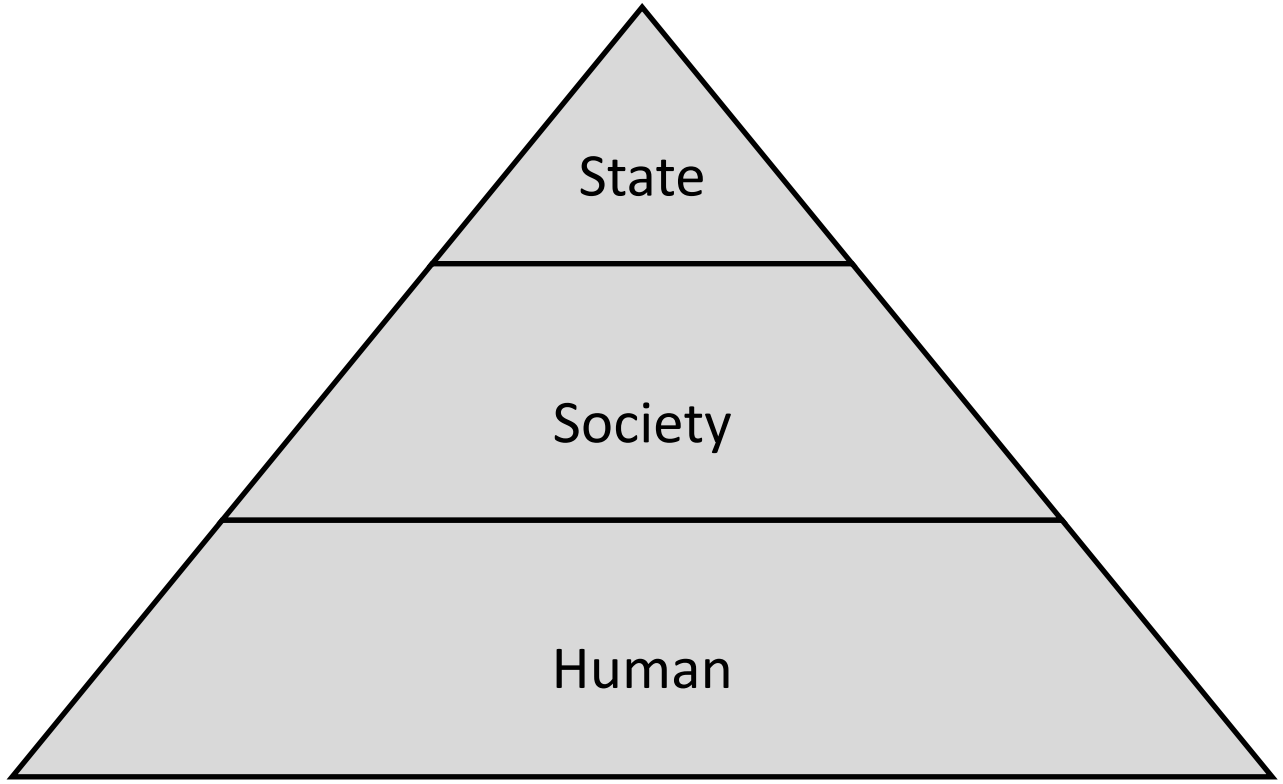
CIP: scope of view



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critical infrastructure

<u>key importance</u>
for the security
of the state
and its citizens

- facilities
- devices
- installations
- **services**

11 systems

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Comprehensive approach:
6 dimensions of security
(six-pack)

Physical security	Technical security (safety)
Personal security	IT/OT security
Legal security	BCM and recovery plans

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Stress – tests

Council Recommendation of 8 December 2022 on a Union-wide coordinated approach to strengthen the resilience of critical infrastructure.

Key objectives of conducting stress tests:

1) Reducing the risk of hazards.
2) Increase resilience and establish barriers to limit the spread of the threat.
3) Checking the mechanisms for managing the consequences of the threat.
4) Checking the organizational and procedural solutions contained in the plans for the protection of critical infrastructure.
5) 5) Checking the circulation of information in an emergency situation.Testing the mechanisms for coordinating information policy in a situation of crisis situation.7) Identify possible weaknesses and loopholes.8) Identify good practices for dissemination.9) Estimate financial and image losses.

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Stress – tests

Council Recommendation of 8 December 2022 on a Union-wide coordinated approach to strengthen the resilience of critical infrastructure.

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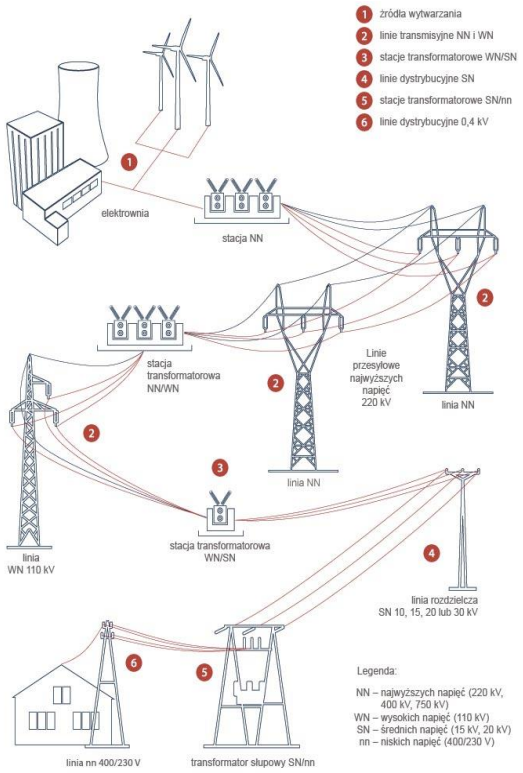
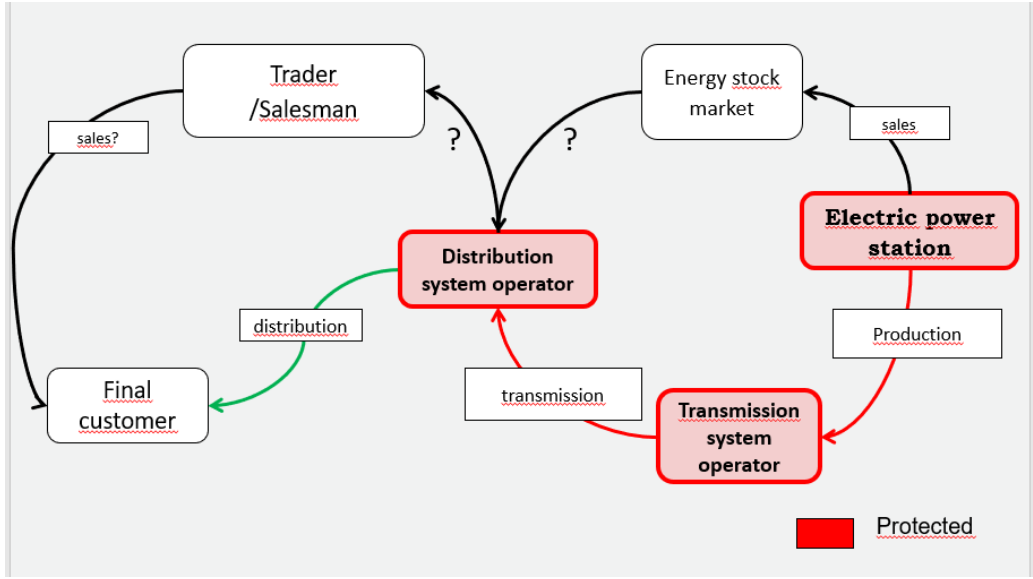
CIP: object vs. proccess oriented approach





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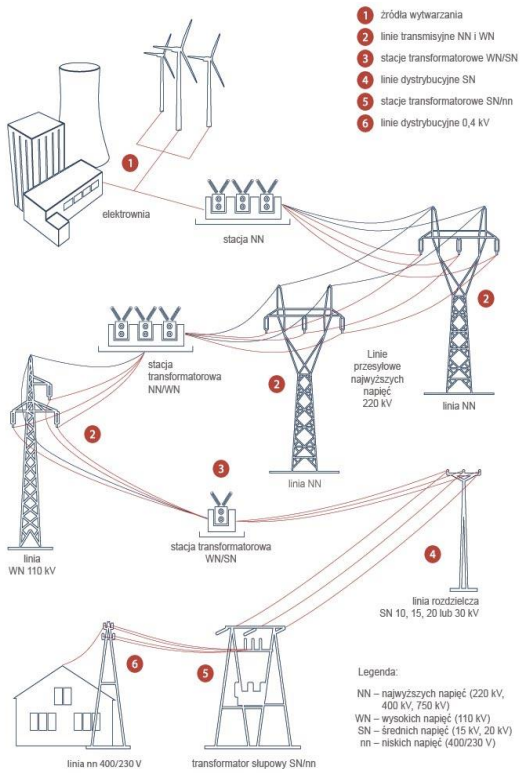

Russia's strategy to destroy Ukraine's energy system:

1. **Destruction of industrial control systems (cyber attacks).**
2. **Physical destruction of key elements (transformers).**
3. **Destruction of elements that provide energy at times of peak demand (coal-fired power plants).**

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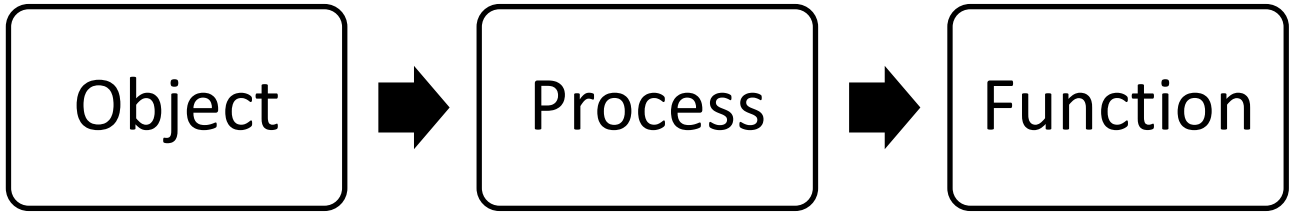
A holistic approach to protecting the functions carried out by the state



National Critical Functions Set

CONNECT	DISTRIBUTE	MANAGE	SUPPLY
▪ Operate Core Network ▪ Provide Cable Access Network Services ▪ Provide Internet Based Content, Information, and Communication Services ▪ Provide Internet Routing, Access, and Connection Services ▪ Provide Positioning, Navigation, and Timing Services ▪ Provide Radio Broadcast Access Network Services ▪ Provide Satellite Access Network Services	▪ Distribute Electricity ▪ Maintain Supply Chains ▪ Transmit Electricity ▪ Transport Cargo and Passengers by Air ▪ Transport Cargo and Passengers by Rail ▪ Transport Cargo and Passengers by Road ▪ Transport Cargo and Passengers by Vessel ▪ Transport Materials by Pipeline ▪ Transport Passengers by Mass Transit	▪ Conduct Elections ▪ Develop and Maintain Public Works and Services ▪ Educate and Train ▪ Enforce Law ▪ Maintain Access to Medical Records ▪ Manage Hazardous Materials ▪ Manage Wastewater ▪ Operate Government ▪ Perform Cyber Incident Management Capabilities ▪ Prepare for and Manage Emergencies	▪ Exploration and Extraction Of Fuels ▪ Fuel Refining and Processing Fuels ▪ Generate Electricity ▪ Manufacture Equipment ▪ Produce and Provide Agricultural Products and Services ▪ Produce and Provide Human and Animal Food Products and Services ▪ Produce Chemicals ▪ Provide Metals and Materials

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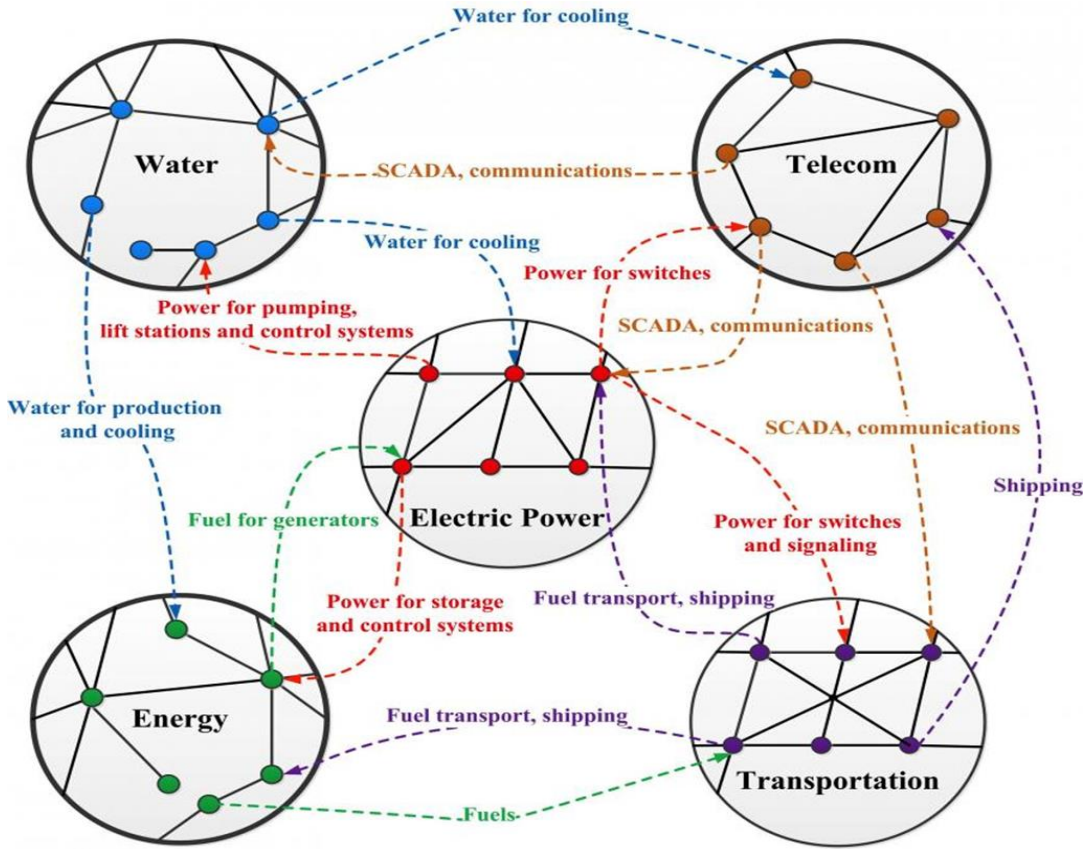

NEXT STEPS:
- interdependencies
- system of systems

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THANK YOU FOR YOUR ATTENTION

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The role of gas storage in maintaining energy security

Dr. Piotr S. Dziadzio
Oil and Gas Institute-National Research Institute
Kraków, Poland

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Scope of presentation

1. What are underground gas storage facilities and how are they classified?
2. What is the role of underground gas storage facilities?
3. A little history
4. How underground gas storage facilities work
5. Gas storage facilities in Europe and Poland and their development
6. Gas storage facilities as an element of energy security
7. Gas reserves in underground storage facilities in Europe (in the light of the war and the EU directive)
8. EU support for Moldova
9. Summary

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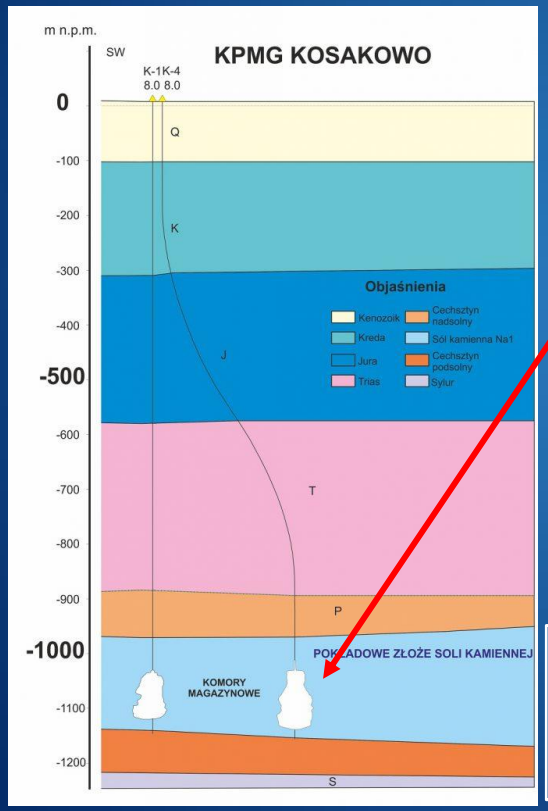
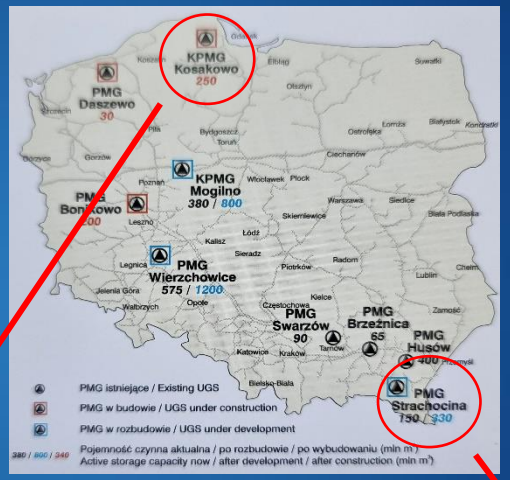
1. What are the underground gas storage facilities? Their classification

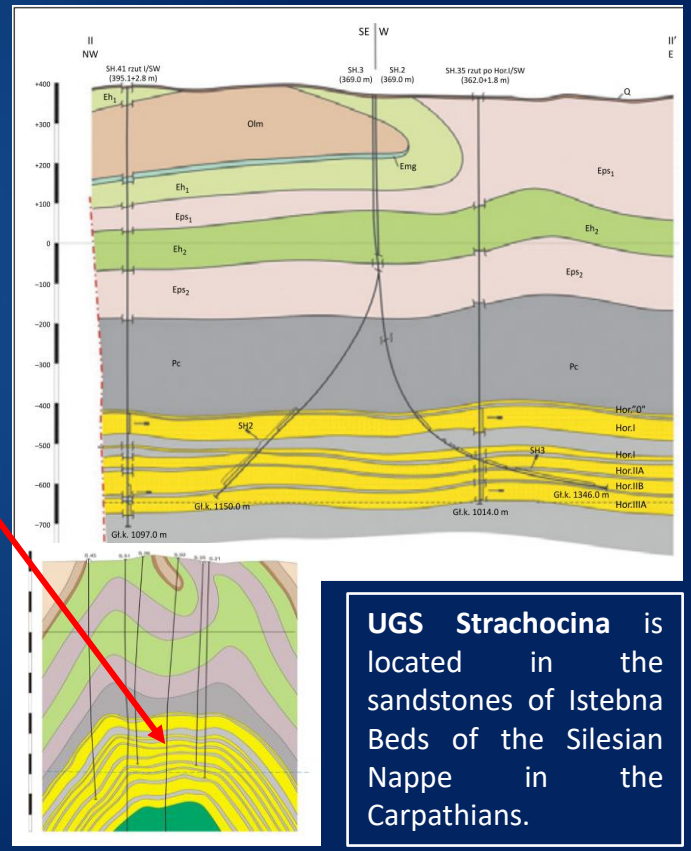
Underground gas storage facilities - UGS are natural reservoirs with large storage capacity, which are most often used in the pore spaces of depleted natural gas and oil fields (reservoir storage facilities) and in the workings made in deposits or salt domes (cavern storage facilities), less often in the underground spaces of coal mines, salt mines or aquifers.





From: Gazownictwo Polskie, 2009.

UGS Kossakowo is located within Permian halite deposits known as Mechelinki deposits in the western part of Peribaltic Syneclise.



UGS Strachocina is located in the sandstones of Istebna Beds of the Silesian Nappe in the Carpathians.

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https://ipi.gasstoragepoland.pl/

2. What role do underground gas storage facilities play?

UGS maintain the required level of natural gas reserves, which are used, among other things, to meet peak demand and to ensure supply during disruptions and interruptions in gas supply. In addition to stabilizing the gas system, UGS are an important element of the raw material and energy security system (Kaliski et al., 2010).

Natural gas should also be treated as a strategic raw material, both politically and economically. It is an important element of the broadly understood energy security of the country, and therefore its storage is an activity of high strategic importance, allowing, on the one hand, further civilization and technological development, and, on the other hand, sustainable energy transformation.

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3. A little bit of the history

In 1915, the world's first underground natural gas storage facility was opened in Welland County (Ontario, Canada).

In 1916, the first U.S. natural gas storage facility was built at the Zoar field near New York, with a capacity of 62 million cubic meters. Both were built on depleted natural gas deposits.

In 1946, the first gas storage facility (Doe Run Upper) was built with a capacity of 113 million cubic meters. In Europe, the first such storage facility was built seven years later in Germany.

The first gas storage facility in Europe was a 35.5 million m3 (69 million m3) gas storage facility in the depleted Roztoki-Sądkowa natural gas and oil deposit in Roztoki near Jasło in the Carpathians. Its construction began in 1954 and it operated until 1980.

In 1961, the first salt cavern storage facility with a capacity of 5.5 million m3 was built in Morton, Michigan (USA).

In Europe, gas storage facilities were built in salt caverns in 1970 in France (Tersanne, with a volume of 158 million m3) and in Germany (Kiel-Rönne, with a volume of 60 million m3).

In Poland, the construction of the first underground gas storage facility began in 1991 in the salt caverns of PMG Mogilno. This storage facility is located in the "Mogilno" salt dome near the "Mogilno" borehole salt mine. The facility started operating in 1997.

The largest natural gas storage facility in the world is the Severo-Stavropolsk natural gas storage facility located in aquifers near Tuma in Russia. Its volume is about 23 billion m3.

There are 12 UGS in Ukraine, near the border with Poland there is a large storage facility Bilche-Volytsko-Uherske with a capacity of 17,050 million m3, and the closest to Moldova - Bohorodchanske.

Currently, there are 389 storage facilities in the USA with a capacity of about 110 billion m3, and 146 storage facilities in EU a capacity of about 90 billion m3.

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4. How do underground gas storage facilities work

The activity of UGS is based on seasonality - it determines consumption.

Demand increases in the autumn-winter period, when temperatures drop and global market demand is high (and the price is high), and decreases in the spring-summer months, when demand decreases and supply increases (and the price decreases).

During warmer periods, natural gas is available under short-term spot or swap contracts (in addition to long-term contracts). It can also be available from domestic production, which does not allow for increased production in the event of increased demand. Domestic production can also be stored in storage facilities with rapid withdrawal capacity (e.g. cavern storage facilities).

Natural gas may also be available from domestic production. However, if demand increases and production cannot be increased for technical reasons, it is good practice to store gas in UGS with quick withdrawal capacity (e.g. cavern storage facilities) during periods of lower demand.

The maximum technical capacity of GSF Kawerna the season 2023/2024.

Group of storage facilities	Storage	Working volume		Max. injection capacity		Max. withdrawal capacity	
		million m^3	GWh	million m^3/day	GWh/day	million m^3/day	GWh/day
GSF Kawerna	CUGS Mogilno	580,92	6 471,4	9,60	106,9	18,00	200,5
	CUGS Kosakowo	296,80	3 309,3	2,40	26,8	9,60	107,0
Total		877,72	9780,7	12,00	133,7	27,60	307,5

The maximum technical capacity of storage facility of UGS Wierzchowice in the season 2023/2024, 2024/2025.

Group of storage facilities	Storage	Working volume		Max. injection capacity		Max. withdrawal capacity	
		million m^3	GWh	million m^3/day	GWh/day	million m^3/day	GWh/day
UGS Wierzchowice		1 300,00	14 729,0	9,60	107,5	14,40	158,4

https://ipi.gasstoragepoland.pl/

GAS STORAGE POLAND

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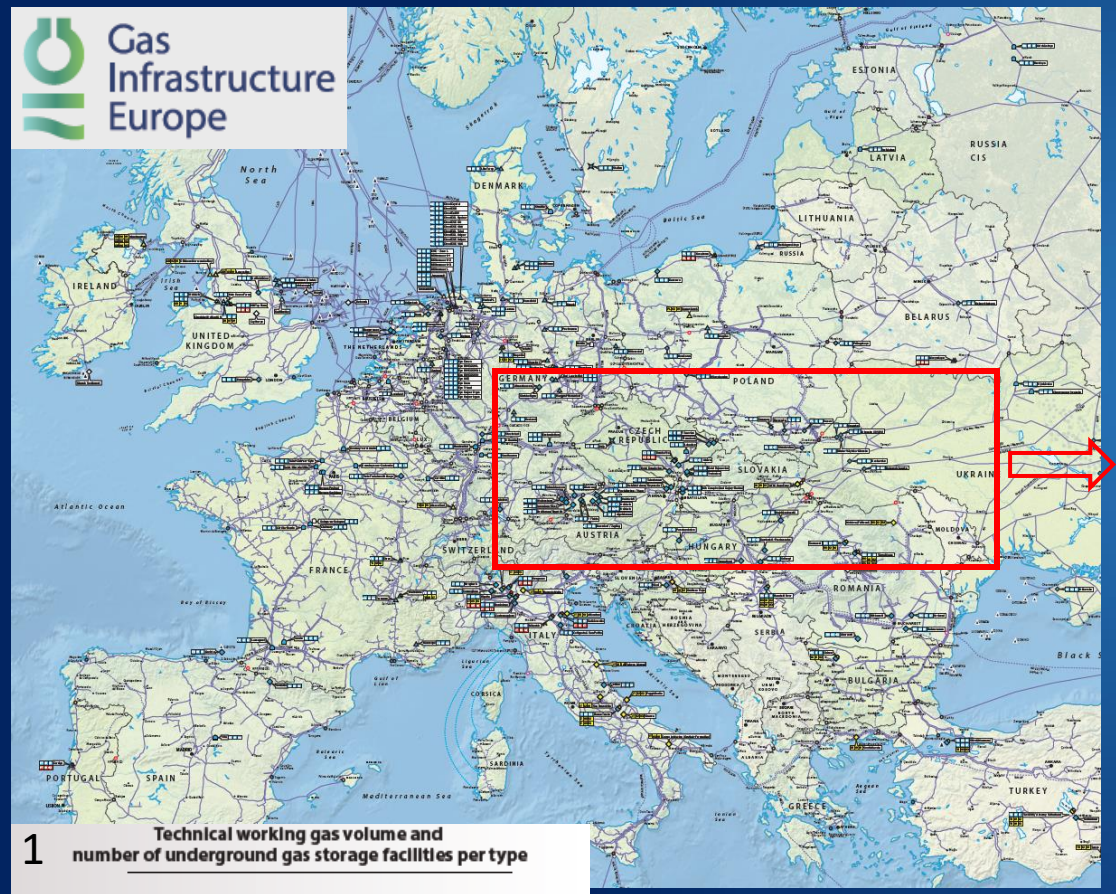
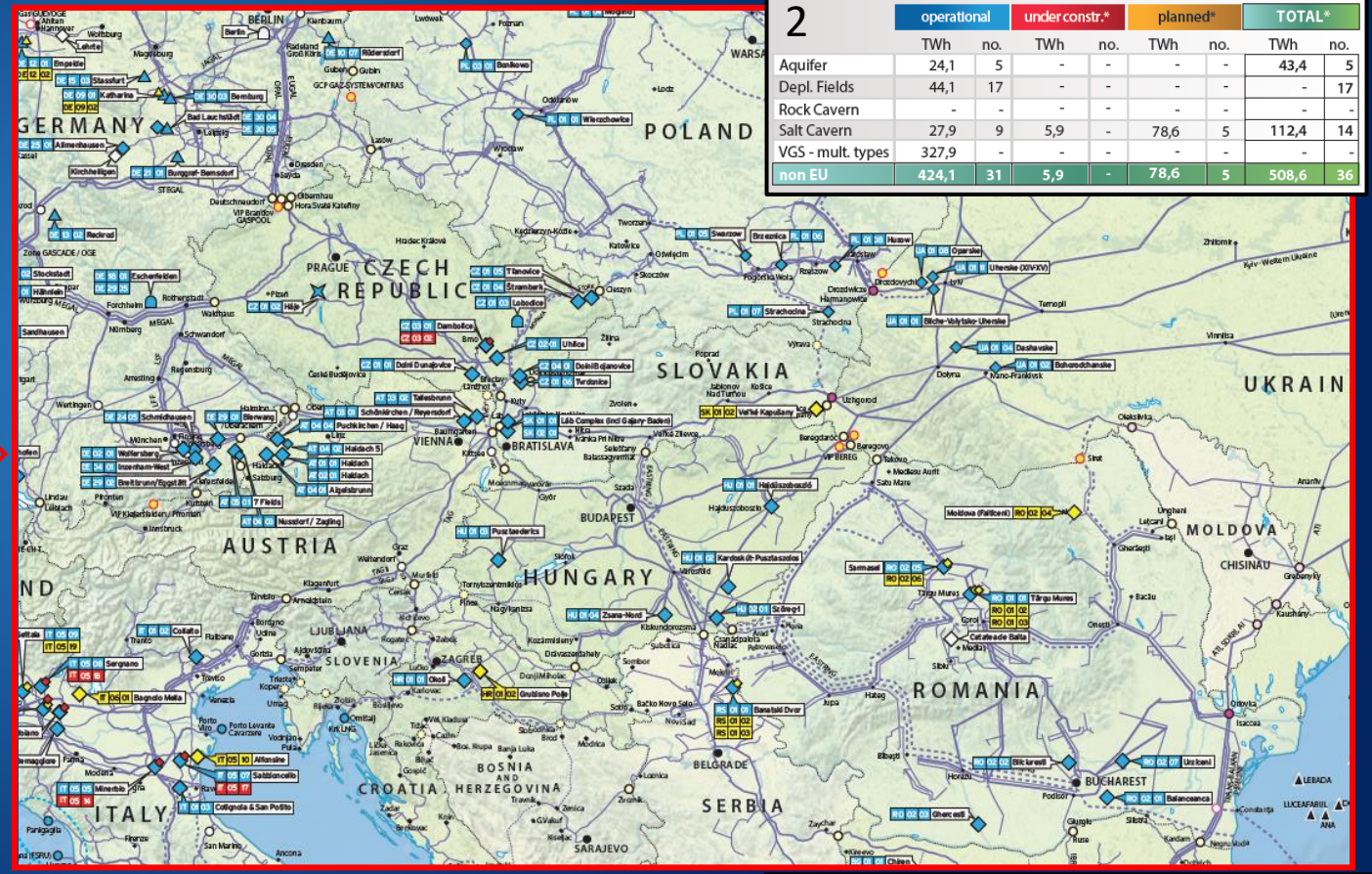
https://ipi.gasstoragepoland.pl/

GAS STORAGE POLAND

5. Gas storage facilities in Europe and Poland and their development





1 Technical working gas volume and number of underground gas storage facilities per type

	operational		under constr.*		planned*		TOTAL*	
	TWh	no.	TWh	no.	TWh	no.	TWh	no.
Aquifer	64,5	22	-	-	-	-	64,5	22
Depl. Fields	717,6	70	9,4	1	66,2	11	793,2	82
Rock Cavern	0,1	2	-	-	-	-	0,1	2
Salt Cavern	175,5	52	0,7	-	19,0	2	195,2	54
VGS - mult. types	190,5	-	-	-	-	-	190,5	-
EU	1148,2	146	10,1	1	85,2	13	1243,5	160

2

	operational		under constr.*		planned*		TOTAL*	
	TWh	no.	TWh	no.	TWh	no.	TWh	no.
Aquifer	24,1	5	-	-	-	-	43,4	5
Depl. Fields	44,1	17	-	-	-	-	-	17
Rock Cavern	-	-	-	-	-	-	-	-
Salt Cavern	27,9	9	5,9	-	78,6	5	112,4	14
VGS - mult. types	327,9	-	-	-	-	-	-	-
non EU	424,1	31	5,9	-	78,6	5	508,6	36

3

	operational		under constr.*		planned*		TOTAL*	
	TWh	no.	TWh	no.	TWh	no.	TWh	no.
Aquifer	88,7	27	-	-	-	-	107,9	27
Depl. Fields	761,7	87	9,4	1	66,2	11	793,2	99
Rock Cavern	0,1	2	-	-	-	-	0,1	2
Salt Cavern	203,4	61	6,6	-	97,6	7	307,5	68
VGS - mult. types	518,4	-	-	-	-	-	190,5	-
TOTAL EUROPE	1572,2	177	16,0	1	163,8	18	1752,0	196

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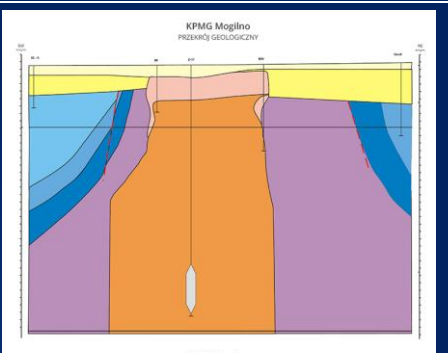
5. UGS facilities in Europe and Poland and their development

There are currently seven underground gas storage facilities in operation in Poland. They are high methane gas storage facilities cooperating with a gas transmission system.
Five of them were created in partially depleted natural gas reservoirs, i.e. UGS Wierzchowice, UGS Husów, UGS Strachocina, UGS Swarzów and UGS Brzeźnica.
Two of them, CUGS Mogilno and CUGS Kosakowo, were built in a salt deposit; gas storage is carried out in the leached salt caverns.

Group of storage facilities	Storage	Working volume		Max. injection capacity		Max. withdrawal capacity	
		million m^3	GWh*	million m^3 /day	GWh/day	million m^3 /day	GWh/day
GSF Kawerna	CUGS Mogilno	580,92	6 471,4	9,60	106,9	18,00	200,5
	CUGS Kosakowo	295,2	3 291,46	2,40	26,8	9,60	107,0
GSF Sanok	UGS Husów	500,0	5 650,0	4,15	46,7	5,76	64,6
	UGS Strachocina	460,0	5 211,8	3,84	43,68	3,36	37,9
	UGS Swarzów	90,0	1 013,4	1,00	11,2	0,91	10,7
	UGS Brzeźnica	100,0	1 126,0	1,44	16,2	1,44	16,1
-	UGS Wierzchowice	1 300,0	14 729,0	9,60	107,5	14,40	158,4
Total		3 326,12	37 493,06	32,03	358,98	53,47	595,2



From: Gazownictwo Polskie, 2009.

In order to further increase energy security, it is also advisable to increase the capacity from the current level of 3.33 billion m3 to the level of 4 billion m3 and the maximum gas collection capacity from 53.5 million m3/day to a minimum of 60 million m3/day in the time horizon of the 2030/2031 winter season.

PEP2040 – Monitor Polski 2021, poz. 264

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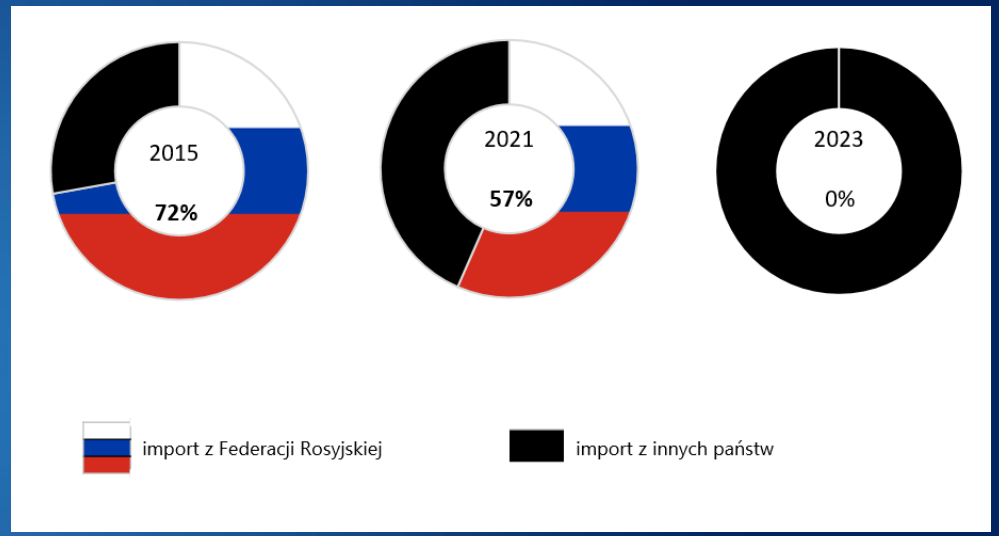
6. Gas storage facilities as an element of energy security

Clearly, the strategic importance of natural gas, but also of its supply and storage for economic purposes in Europe, including supplying the population (especially for heating purposes), was noticed at the time of Russia's attack on Ukraine on February 24, 2022, at which time strategic actions were taken to secure this raw material.

For the EU, not only the diversification of natural gas supplies, but also its storage, started to play an important role.

It should be noted that Poland, understanding the imperial nature of Russia, systematically reduced gas supplies from the East (in 2015 it imported 72%, in 2021 57%, and in 2023 0%), gradually diversifying them (Dziadzio P. 2022). On April 27, 2022, Russia stopped supplying natural gas to Poland, but it did not disrupt the economic and social situation.



Governments of various countries, as well as international institutions and organizations (IEA, GIE) have taken a number of measures to secure gas supplies. Work was carried out on the analysis of increasing storage capacities, restrictions on consumption (e.g. lowering the temperature in rooms, the IEA proposed 1.5 degrees).

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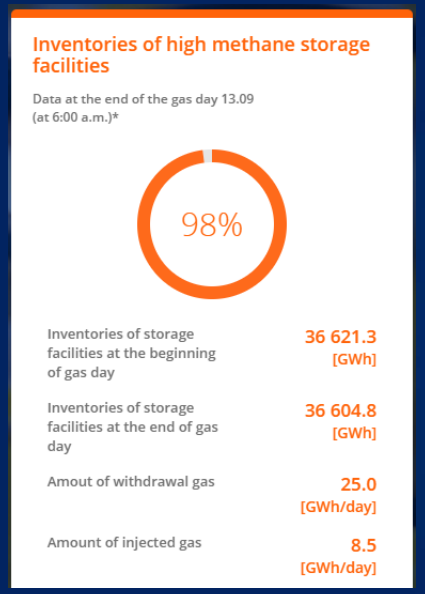
6. Gas reserves in UGS in Europe (in the light of the war and the EU directive)

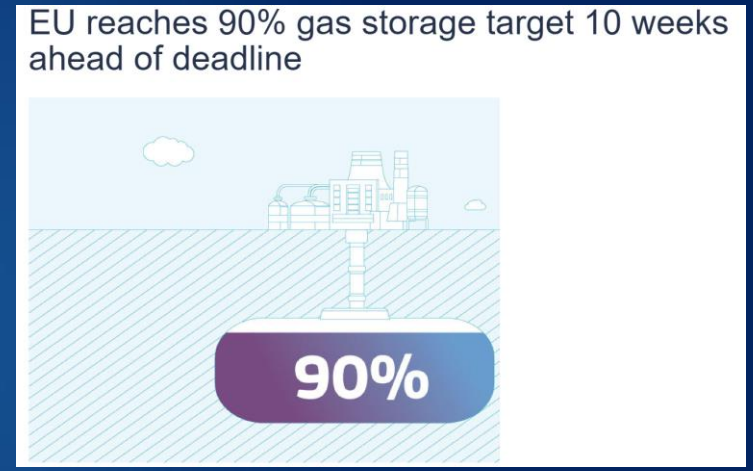


In Poland, seven storage facilities maintain the required level of natural gas reserves and their filling level in September was 98% https://ipi.gasstoragepoland.pl/

The situation at the turn of 2023/2024 in Europe and the world, according to IEA data, indicated weak demand and stable supply of natural gas, which gave a high probability of rebuilding storage reserves in 2024. And so it happened, on August 19, natural gas reserves in European storage facilities reached 90.02% of storage capacity (which corresponds to about 92 billion m3 of natural gas). The EU reached its target of 90% of gas storage capacity in accordance with the Gas Storage Regulation (EU/2022/1032) well ahead of the November 1 deadline.

Gas Market Report, Q3-2024 (iea.blob.core.windows.net/gas storage)

Gas Storage (europa.eu).



Another important and new element is the burden-sharing mechanism. Some EU countries have larger storage than their national consumption, while others have no storage at all. However, all EU countries benefit from the guaranteed levels, so the burden-sharing mechanism ensures that not only EU countries with storage facilities pay for the security of supply costs of the minimum filing target.

In order to optimize the EU's preparation for the winter heating season, the Gas Storage Regulation (EU/2022/1032) of June 2022 sets a binding EU target of 90% filling of storage facilities by 1 November each year, with interim targets for EU countries to ensure steady filling throughout the year. Gas storage is key to Europe's security of supply, as it can meet up to a third of the EU's winter gas demand (Gas storage (europa.eu).

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8. EU support for Moldova

Full UGS and intensive development of gas infrastructure in Europe, diversification of gas supplies and the willingness of the US to supply LPG to the EU are crucial for the EU's energy security. Filled storage facilities can cover up to one third of the EU's winter gas demand. This leaves room for natural gas exports, for example to Ukraine. Today, Ukrainian gas storage facilities can offer 10 billion m3 of storage capacity. The European Union can therefore play a key role in replenishing Ukraine's gas reserves and subsequently ensuring supplies to Moldova.

Gas Market Report, Q3-2024 (iea.blob.core.windows.net), How to Avoid Gas Shortages in the European Union in 2023 - Analysis - IEA

Of course, this is a risky area both economically and politically in the context of Russia's military operations that are currently destroying infrastructure in Ukraine, but something must be done before the end of the war which may last for many years.

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9. Summary

UGS are not only used to maintain the required natural gas reserves:
- to ensure the stabilization of the gas system,
- to meet peak demand
- to ensure supply in case of disruptions and interruptions of gas supply.

UGS are an important element of the raw material and energy security system.
Key points:
- maximum utilization,
- expansion of storage facilities and their storage capacities,
- solidarity-based sharing of accumulated reserves in crisis situations (disruptions, interruptions of supplies, etc.)
- they allow to support with gas surpluses countries in the EU that do not have storage facilities, such as Moldova, or have small capacities.

It is necessary to pursue a policy of solidarity (which does not exclude commercial relations) in the framework of sharing storage resources with countries such as Moldova.

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Thank you for your attention

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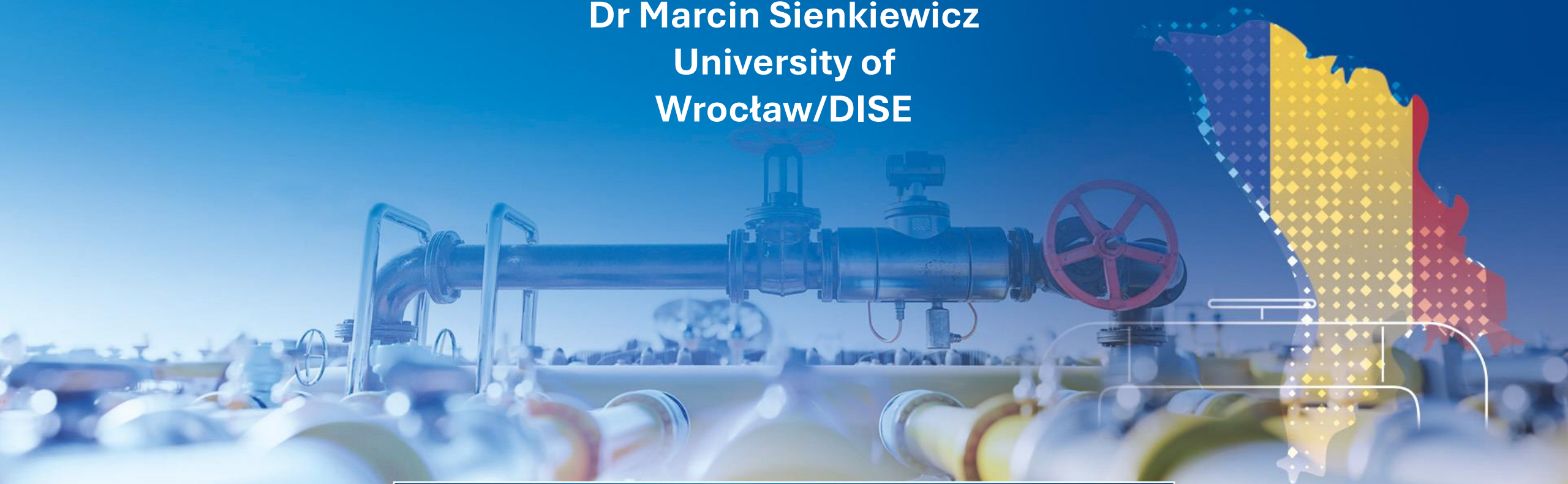
Gas exchange and the security of gas fuel trading

Dr Marcin Sienkiewicz
University of Wrocław/DISE



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KEY ISSUES:

Chisinau, Moldova
1-4 October 2024

- EU Gas Market
- Gas Target Model in UE
- The role of gas exchanges
- Gas prices in EU

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Key facts about gas in European Union

Chisinau, Moldova
1-4 October 2024

- Gas represents 21.5% of EU's **primary energy consumption**. It is the dominant source of energy for households (32.1%).
- Around 40% of **households** are connected to the gas network. On average, they spend EUR 700 on gas, 2.5% of their average income (EUR 27,911). However, this conceals considerable differences among Member States.
- The EU-27 plus UK **gas supply bill** ranges from EUR 75-100 bn per year, depending on the wholesale sourcing price levels. At **retail** level, the final expenditure on gas accounts for approx. EUR 200 bn per annum.
- **396,6 bcm** - gas consumption in 2022 / total 27 countries UE. The EU **imports** 80% of its total gas needs.
- The residential sector accounts for most EU **gas demand** (40%), followed by industry and gas use for power generation. **Industry consumption** has declined by 20% since 2000, whereas in the same period gas use for power generation has risen by 15%.

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Gas Target Model in EU – legal basis

- Since 2009, the EU regulatory framework for gas has been governed by the **Third Energy Package** and its twin gas regulation and directive on conditions for access to the natural gas transmission networks as well as on common rules for the internal market.
- This regulatory framework has been found successful when it comes to liberalising the gas market and increasing competition.
- **The EU hydrogen and gas decarbonisation package**, consisting of Directive (EU) 2024/1788 and Regulation (EU) 2024/1789, was adopted in May 2024.
- It updates the **rules on the EU natural gas market** set out in the Gas Directive 2009/73/EC and the Gas Regulation 715/2009. It also introduces a new regulatory framework for dedicated **hydrogen infrastructure**.

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Gas Target Model in EU – rules

- Separation of natural monopolies in the scope of gas transport activity from its sale – **unbundling**,
- Third party access to transport and storage infrastructure.
- Activities of transmission system operators based on standardized network codes.
- The right for natural gas recipients to choose their supplier.
- **Market mechanism for determining gas prices**.
- Renewable gases are also subject to these rules

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The role of gas exchanges

- Exchanges play an important role in the development of a transparent and competitive market, which shapes the market price of natural gas.
- Their functioning also improves the security of supplies and the security of settlement of concluded transactions.
- The indices published by the stock exchanges are a statistical indicator used to measure prices for the commodity natural gas. Thanks to this, economic entities can read the prevailing market sentiment and estimate risks, which is helpful in the decision-making process at the strategic and operational level.

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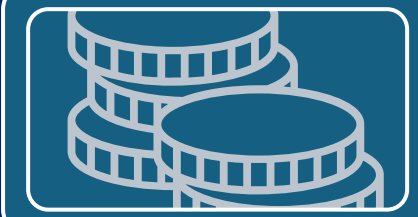
The role of gas exchanges

Chisinau, Moldova
1-4 October 2024

Market Integrator. Gas exchange concentrates supply and demand in one place – because of that it is possible to do business within a competitive market environment. Provides the opportunity to trade on clearly defined terms.



Price Indicator. Gas exchange thanks to the concentration of trade in one place, is able to indicate the gas price on the wholesale market, which is determined under fully competitive conditions. Such price stands as a transparent reference for other bilateral transactions concluded on the gas market. It is also the basis for the calculation of gas indices

Guarantee of safe trading. The gas market run by exchange guarantees full security of trade. The implemented system solutions and control procedures effectively protect market participants against risks related to financial condition of counterparties, manipulation and unfair trading practices.

Market information provider. The gas exchange provides market information for all market participants, who, relying on the published data about prices, volumes and the respective dynamics can make informed business decisions.

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The role of gas exchanges – risk management

- **Clearing house** for commodity products - assures the safety and integrity of commodity markets while providing innovation in risk management, clearing technology and client asset protection.
- By managing the counterparty risk, clearing by Clearing house reduces the systemic risk in these markets compared to OTC (over the counter) uncleared markets.
- During the clearing process, clearing house determines the value of liabilities and receivables resulting from each concluded transaction, sets the required collateral levels and automatically credits or debits bank accounts of the parties to the transactions.

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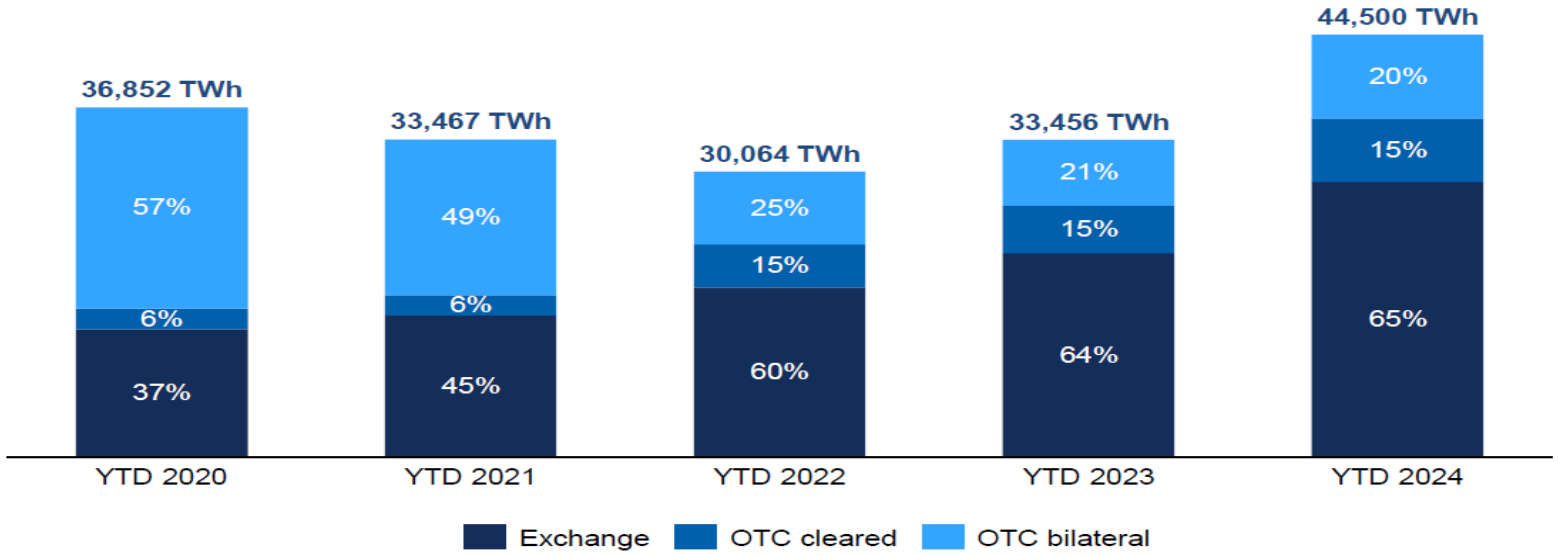
Share of stock markets in gas trade

Traded volumes by trade type



YTD gas traded volumes over five years split by trade type

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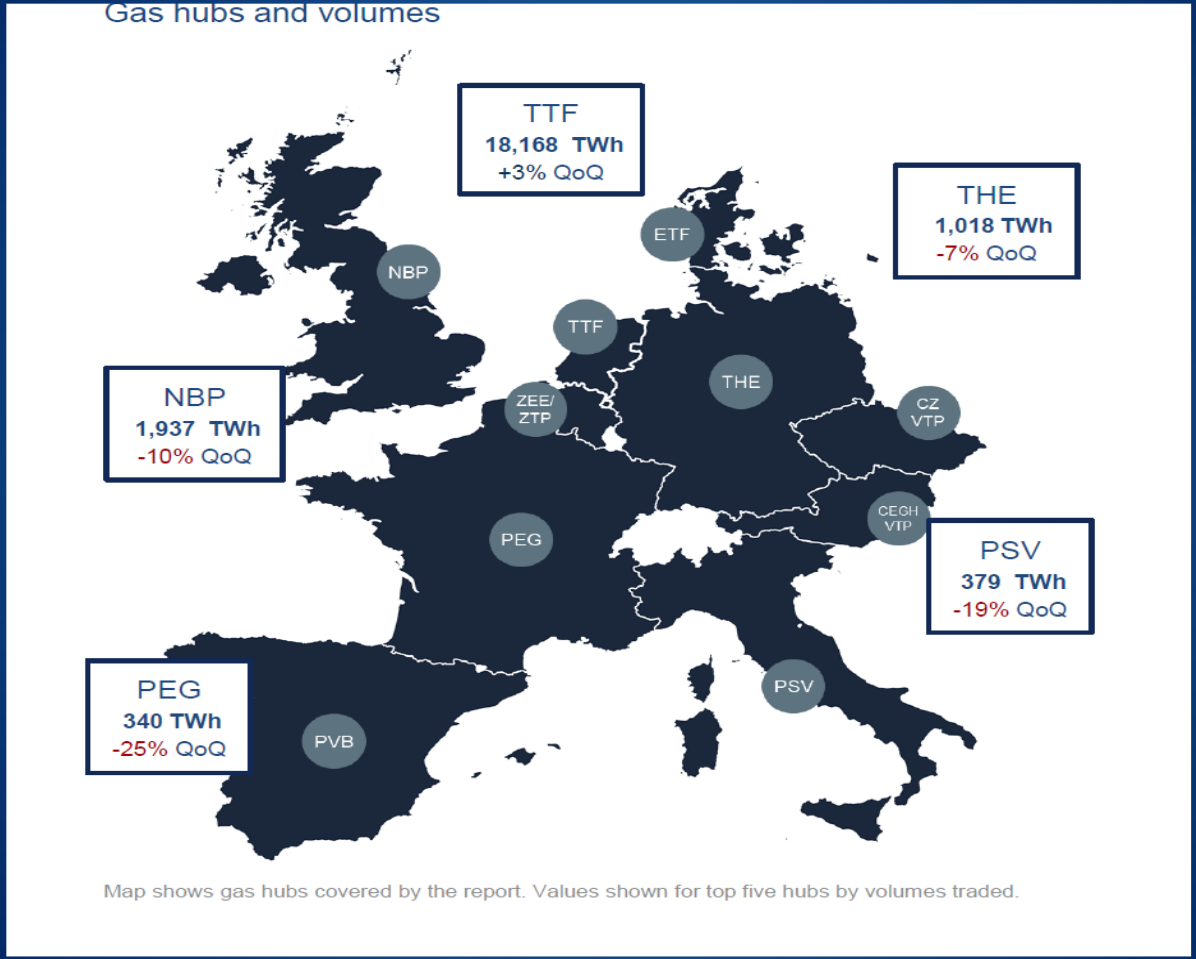
Exchanges support gas hubs

Chisinau, Moldova
1-4 October 2024



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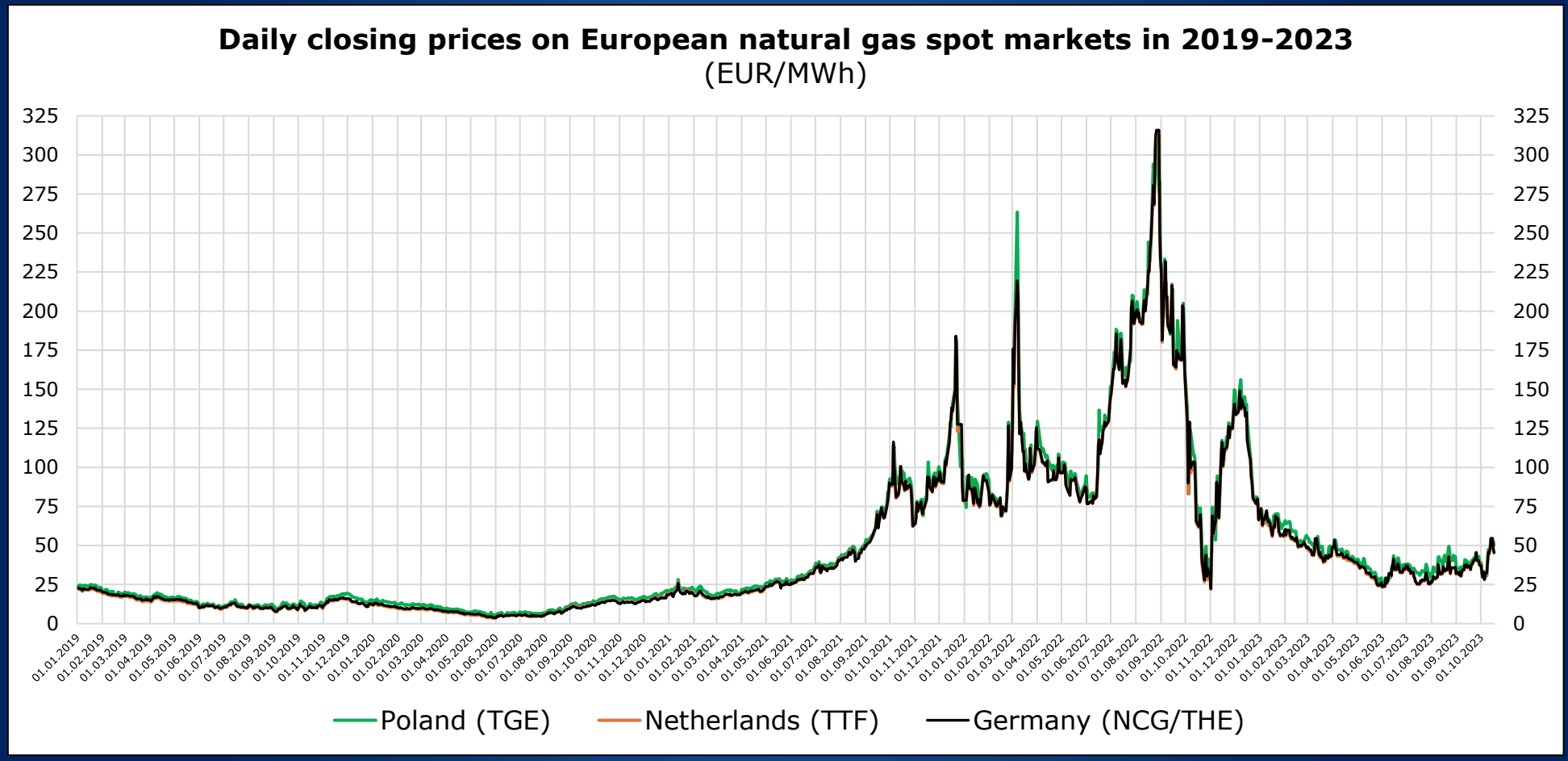
Gas prices in UE

Chisinau, Moldova
1-4 October 2024



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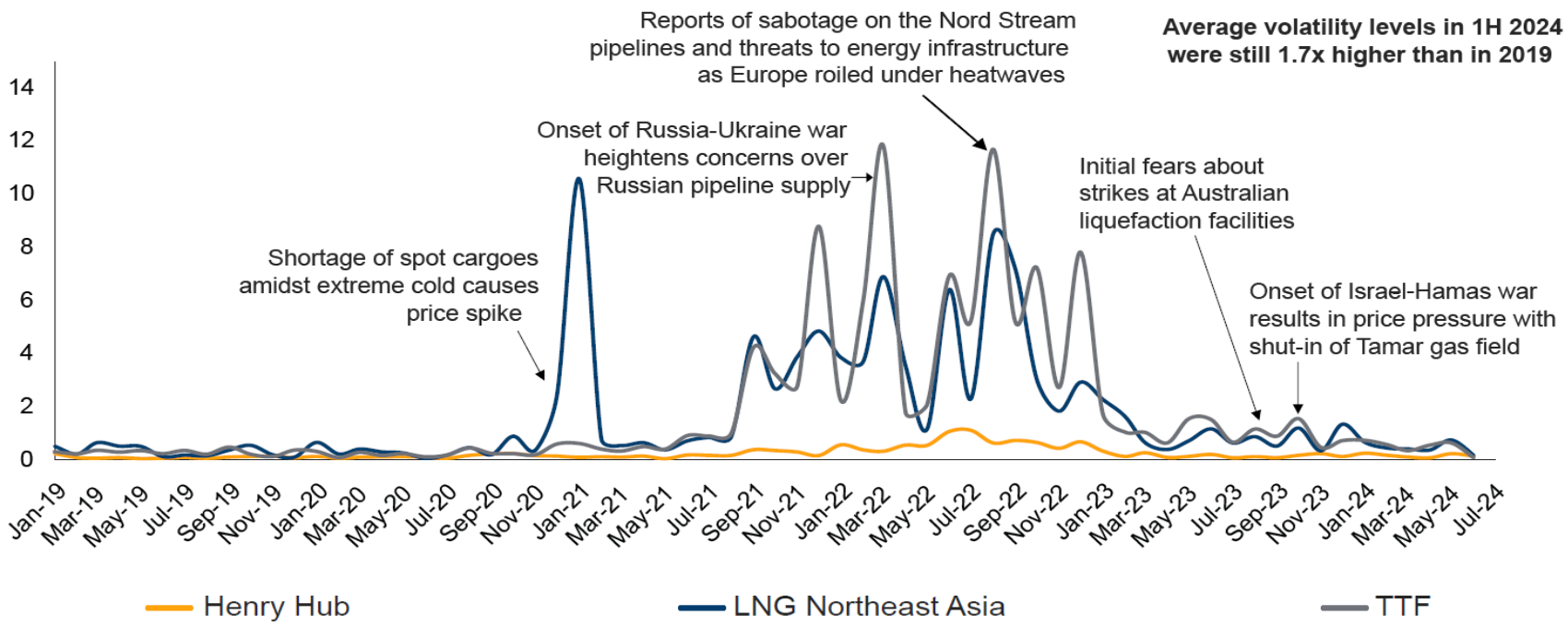

Source: Rystad Energy, Argus (LNG Northeast Asia)

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THANK YOU FOR YOUR ATTENTION

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EU standards for identifying and monitoring threats to energy security

Jerzy Baehr, PhD
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Security of the EU energy sector

- Energy security is "the **resilience of the energy system against exceptional and unpredictable events** that could threaten the **physical integrity of energy flow** or lead to an **unstoppable increase in energy prices** regardless of economic grounds". (*source: https://www.gov.pl/web/polski-atom/bezpieczenstwo-energetyczne-podstawa-rozwoju-społeczeństwa*)

- Energy security is such a state of the economy that **ensures that the current and future demands of fuel and energy consumers are met** in a technically and economically reasonable manner, with the energy sector having a minimal negative impact on both the environment and living conditions in a society.

- Ensuring the security of the European Union's energy supply is one of the **primary objectives of EU energy policy.**

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Security of the EU energy sector

- **The security of the EU energy sector can be assured by, among other things:**
  - ensuring the **security of energy supply** and promoting the **interconnection of energy networks** and the development of new and renewable forms of energy (TFEU),
  - measures for the **coordination and emergency preparedness** of the electricity sector (Regulation (EU) 2019/941),
  - the EU's target for **electricity interconnections** of at least 15% by 2030 (Regulation (EU) 2018/1999),
  - plans for **preventive actions and gas market emergencies** (Regulation (EU) 2017/1938 and 2022/1032),
  - maintaining **minimum levels of gas storage** at 90% of capacity (Regulation (EU) 2017/1938),
  - managing **accidents at offshore oil and gas installations** (Directive 2013/30/EU),
  - EU Member States' commitment to maintain **minimum oil reserves** at a level equal to the higher of:
    - 90 days of average daily net imports; or
    - 61 days of average daily domestic consumption (Directive 2009/119/EC).

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Key entities responsible for EU energy security

- **Key entities participating in the regulation of the European energy market:**
  - European Parliament
  - Council of the European Union
  - European Commission
  - European Union Agency for the Cooperation of Energy Regulators (ACER)
  - European Network of Transmission System Operators (ENTSO) in the areas of:
    - electricity (ENTSO-E)
    - gaseous fuels (ENTSOG)
  - Electricity Coordination Group
  - Gas Coordination Group

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Key entities responsible for EU energy security

- **Council of the European Union**:
  - plays a key role in ensuring the European Union's energy security;
  - develops energy policy together with the European Commission and the European Parliament, including policies promoting the diversification of energy sources and creating common energy infrastructure projects;
  - ensures energy solidarity in emergencies.
- **The European Commission**:
  - has a key role in coordinating, evaluating and supervising the implementation of electricity emergency preparedness activities;
  - receives and evaluates Member States' readiness plans;
  - monitors the implementation of EU legislation;
  - may issue recommendations and coordinate collaboration between Member States in emergency situations

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Key entities responsible for EU energy security

- **ACER - European Agency for the Cooperation of Energy Regulators**:
  - cooperates with national regulators and supervises the operation of the energy market;
  - monitors cross-border energy flows;
  - analyses risks at the EU level and ensures that actions taken by national regulators comply with EU regulations.
- **ECG – Electricity Coordination Group** plays a key role in:
  - monitoring, evaluating and coordinating risk management and responses to electricity crises within the European Union.
- **GCG – Gas Coordination Group**:
  - advises the Commission on facilitating the coordination of security of supply measures in the event of emergencies;
  - is consulted by the Commission regarding the establishment of preventive action plans and emergency plans.

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Key entities responsible for EU energy security

- **ENTSO-E - The European Network of Transmission System Operators for Electricity** is responsible for:
  - developing methodologies and conducting assessments regarding the risk and adequacy of the electricity system;
  - consulting with various industry stakeholders, as well as updating electricity crisis scenarios and adequacy assessments;
  - cooperation with other entities at the EU level to ensure security of electricity supply.

- **ENTSOG - The European Network of Transmission System Operators for Gas** acts to strengthen the security of gas supply in the EU by:
  - developing infrastructure;
  - monitoring the market;
  - coordinating activities in emergencies.

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Security of the energy sector – regulatory measures

Regulation 2019/941
on risk-preparedness in the electricity sector

- **Identification**
  - national competent authorities are designated by the Member States as entities responsible for performing tasks associated with risk-preparedness in the electricity sector;
  - regional electricity crisis scenarios are identified by ENTSO-E in cooperation with the ECG, regional coordination centres, national competent authorities and regulatory authorities (scenarios are updated every 4 years by ENTSO-E);
  - national electricity crisis scenarios are identified by national competent authorities (scenarios are updated every 4 years by the Member States).
- **Risk preparedness**
  - risk-preparedness plans are established by the Member State after consulting TSOs, relevant DSOs, the relevant producers and other stakeholders including regional and bilateral measures to ensure that electricity crises with a cross-border impact are properly prevented or managed (ACER and ENTSO-E may assist at achieving such agreements at the Commission's request);
  - plans are assessed by the Commission based on the views expressed by the ECG.
- **Warning and managing crisis**
  - the competent authority of a Member State, upon receiving information that an electricity crisis may occur, shall issue an early warning to the Commission together with information on its' causes, measures planned or taken for preventing the crisis and on the possible need for assistance from other Member States, who are obliged to cooperate to prevent or manage the crisis;
  - measures taken to prevent or manage electricity crises shall comply with the internal electricity market rules. Non-market-based measures shall be considered only as a last resort.
- **Monitoring**
  - The ECG is obliged to discuss the results of the 10-year network development plan in electricity prepared by the ENTSO-E and the coherence of risk-preparedness plans.

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Security of the energy sector – regulatory measures

Regulation 2019/943
on the internal market for electricity

- **Regional coordination centres perform tasks of regional relevance in the entire system operation region in which they are established**, including, among other things:
  - Supporting the consistency assessment of the TSOs defence plans and restoration plans in accordance with the procedure set out in the emergency and restoration network code;
  - calculating cross-zonal capacities respecting operational security limits using data from TSOs including data on the technical availability of remedial actions;
  - submitting annual reports on the outcome of the monitoring of the coordinated actions and recommendations issued and the effectiveness and efficiency of each of the tasks for which they are responsible and information on their performance to the ENTSO-E, ACER, the regulatory authorities in the system operation region and the ECG.

- **The Commission is authorised to adopt delegated acts to establish network codes** in the areas of, among others:
  - operational emergency and restauration procedures in an emergency;
  - system risk resilience plans;
  - system restoration plans;
  - market interactions, information exchange and communication and tools and facilities.

- **ENTSO-E carries out the European resource adequacy assessment on an annual basis**, based on data regarding expected utilisation of the generation resources supplied by producers and other market participants to the TSOs.

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Security of the energy sector – network codes

- A fully functioning and interconnected internal energy market is crucial for maintaining security of energy supply, increasing competitiveness and ensuring that all consumers can buy energy at affordable prices.
- Europe's cross-border electricity networks are operated according to rules that help govern the work of operators and determine how access to electricity is given to users across the EU. In the past, these grid operation and trading rules were drawn up nationally.
- These rules, known as network codes or guidelines, are legally binding European Commission Implementing Regulations. They govern all cross-border electricity market transactions and system operations alongside the Regulation on conditions for accessing the network for cross-border electricity exchanges.
- EU-wide network codes for electricity contribute to making energy more secure, competitive and affordable for consumers.

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Security of the energy sector – network codes

Regulation 2017/2196
establishing a network code on electricity emergency and restoration

- The Regulation is aimed at **avoiding the spread of disturbances and blackout states**, as well as allowing for an efficient and rapid restoration of the electricity system after an emergency blackout state.

- The Regulation **establishes an electricity network code** that sets requirements for:
  - the management by TSOs of the emergency, blackout and restoration states;
  - the coordination of system operation across the EU in emergency, blackout and restoration states;
  - tests, tools and facilities to guarantee reliable, efficient and fast restoration.

- The TSO may **temporarily suspend market activities** in the event that:
  - the transmission system is in a blackout state or the continuation of market activities would significantly decrease the effectiveness of the restoration process to a normal or alert state;
  - resources necessary to facilitate market activities are not available.

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Safety in the gas sector

- **Approximately a quarter of all energy used in the EU comes from natural gas.** Maintaining a secure supply is therefore essential to ensuring energy security for EU citizens and businesses.

- **Gas supply disruptions may result from** technical or human failures, natural disasters, cyber-attacks and other emerging risks or geopolitical disputes. **Many EU countries import nearly all their supplies**, and some are, or have been, also heavily reliant on a single source, meaning that disruptions along a single transport route can threaten the certainty of their gas supply.

- A key part of ensuring secure and affordable supplies of energy involves **diversifying supply routes**. This includes identifying and building new routes that decrease the dependence of EU countries on a single supplier of natural gas and other energy resources.

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Security in the gas sector - regulatory measures

Regulation 2017/1938
concerning measures to safeguard the security of gas supply

- **Provides that ENTSOG** will conduct (and repeat at least every 4 years) an EU-wide simulation of gas supply and infrastructure disruption scenarios, including:
  - scenarios involving a long-term shutdown of one of the supply sources;
  - the identification and assessment of emergency gas supply corridors; and
  - identifying which Member States can address the identified risks, including in relation to LNG.

- **Entitles the Commission** to oblige the competent authorities concerned to collect and submit to the Commission information necessary to assess of the gas supply situation should the Commission consider the gas supply in the Union or in part of the Union to be at risk or is likely to be at risk that may lead to the declaration of one of the various crisis levels.

- **Establishes three crisis levels:**
  - Early warning level: where there is credible information that a deterioration of the gas supply situation may occur;
  - Alert level: where there is a disruption of gas supply or exceptionally high gas demand, but where the market is still able to manage the disruption without the need to resort to non-market measures;
  - Emergency level: where it is necessary to additionally implement non-market measures in order to, in particular, safeguard gas supplies to protected customers.

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Security in the gas sector - regulatory measures

Regulation 2024/1789
on the internal markets for renewable gas, natural gas and hydrogen

- **Empowers the Commission to adopt acts, among others, in the area of emergency operational procedures**, including:
  - system defence plans,
  - restoration plans,
  - market interactions,
  - information exchange and communication tools and facilities.

- Provides mechanisms to harmonise the network access rules for cross-border exchanges in natural gas

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Safety in the gas sector - network codes (determined in several Commission Regulations)

- To further advance interconnection and stimulate cross-border trade in the EU's gas networks, **the rules that previously fell under national legislation, have progressed into EU-wide network codes and guidelines**.

- Based on information provided by the Agency for the Cooperation of Energy Regulators (ACER) and the European Network of Transmission System Operators for Gas (ENTSOG), **the Commission adopts proposals for network codes**.

- To ensure coherence between the national and the EU level, a gas cross-border committee with specialists from national energy ministries reviews the proposals before the Commission adopts them, with approval from the Council of the European Union and the European Parliament.

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Security in the gas sector - storage

- Gas storage, in particular underground gas storages, are instrumental to the security of supply by providing an additional reserve in case of strong demand or supply disruptions. Typically, storages provides 25-30% of the gas consumed in the EU during winter; they reduce the need to import additional gas and contributes to absorbing supply shocks.
- In 2021, the EU experienced a prolonged period of volatile and high energy prices due to lower-than-usual storage filling levels, among other factors. Increased geopolitical tensions following Russia's invasion of Ukraine in early 2022 increased uncertainty and highlighted the need for well-filled gas storage for future winters.
- **The Gas Storage Regulation** (EU/2022/1032), adopted in June 2022:
  - recognises **gas storage facilities as critical infrastructure**;
  - introduces an **updated certification process for all EU storage operators to reduce the risks of external interference**, in order to reduce security of supply risks and support the EU's competitiveness by ensuring that storage facilities are properly filled;
  - makes it mandatory for **storage operators to report filling levels to national authorities and for EU countries to monitor filling levels on a monthly basis** and report to the Commission.

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Annex - Legislative acts governing energy market security (1)

- Electricity:
  - Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC
  - Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity
  - Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013
- Electricity network:
  - Commission Regulation (EU) 2017/2196 of 24 November 2017 establishing a network code on electricity emergency and restoration
  - Commission Delegated Regulation (EU) 2024/1366 of 11 March 2024 supplementing Regulation (EU) 2019/943 of the European Parliament and of the Council by establishing a network code on sector-specific rules for cybersecurity aspects of cross-border electricity flows

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Annex - Legislative acts governing energy market security (2)

- Gas:
  - Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010
  - 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
  - Regulation (EU) 2024/1789 of the European Parliament and of the Council of 13 June 2024 on the internal markets for renewable gas, natural gas and hydrogen, amending Regulations (EU) No 1227/2011, (EU) 2017/1938, (EU) 2019/942 and (EU) 2022/869 and Decision (EU) 2017/684 and repealing Regulation (EC) No 715/2009
- Gas storage:
  - Regulation (EU) 2022/1032 of the European Parliament and of the Council of 29 June 2022 amending Regulations (EU) 2017/1938 and (EC) No 715/2009 with regard to gas storage
- Crude Oil:
  - Council Directive 2009/119/EC of 14 September 2009 imposing an obligation on Member States to maintain minimum stocks of crude oil and/or petroleum products
  - Directive 2013/30/EU of the European Parliament and of the Council of 12 June 2013 on safety of offshore oil and gas operations and amending Directive 2004/35/EC

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Annex - Legislative acts governing energy market security (3)

- Critical infrastructure and cyber security:
  - Directive (EU) 2022/2555 of the European Parliament and of the Council of 14 December 2022 on measures for a high common level of cybersecurity across the Union, amending Regulation (EU) No 910/2014 and Directive (EU) 2018/1972, and repealing Directive (EU) 2016/1148 (NIS 2 Directive)
  - Directive (EU) 2022/2557 of the European Parliament and of the Council of 14 December 2022 on the resilience of critical entities and repealing Council Directive 2008/114/EC
- Regulatory bodies:
  - Regulation (EU) 2019/942 of the European Parliament and of the Council of 5 June 2019 establishing a European Union Agency for the Cooperation of Energy Regulators
  - Regulation (EU) 2019/881 of the European Parliament and of the Council of 17 April 2019 on ENISA (the European Union Agency for Cybersecurity) and on information and communications technology cybersecurity certification and repealing Regulation (EU) No 526/2013 (Cybersecurity Act)

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Annex - Legislative acts governing energy market security (4)

- Gas network codes:
  - Commission Regulation (EU) 2015/703 of 30 April 2015 establishing a network code on interoperability and data exchange rules
  - Commission Regulation (EU) No 312/2014 of 26 March 2014 establishing a Network Code on Gas Balancing of Transmission Networks
  - 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
  - Congestion Management Procedures Guidelines - 2012/490/EU: 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
  - Commission Regulation (EU) 2017/460 of 16 March 2017 establishing a network code on harmonised transmission tariff structures for gas

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JERZY BAEHR, PhD | attorney-at-law, partner, Energy law team co-manager

individual recognition in international legal rankings

Chambers Europe 2024
Energy & Natural Resources Chambers Europe **Band 1**

The Legal 500 EMEA 2024
Energy & Natural Resources - **Hall of Fame**

Chambers TOP RANKED Europe 2024 Jerzy Baehr

HALL OF FAME Legal500 EMEA 2024

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LNG infrastructure in Europe

Dariusz Kryczka
EY Law, Partner
Energy & Sustainability Advisory

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EY European Green Deal Center of Excellence

What is the EU Green Deal?

The European Green Deal (EGD) is a set of **multi-faceted policy initiatives** proposed by the European Commission with the goal to make Europe **climate neutral by 2050.**

The proposals will turn the political will into a **legally binding framework**, creating foundations for a new European growth strategy, where **all sectors of the economy** will have to adopt **sustainable business models**.

The implications of the EU EGD do not only set up ambitious **domestic goals**, but also have far reaching **global implications. A**t least **EUR 1t** will have to be mobilized to achieve these ambitions.

The EY European Green Deal Center of Excellence (EGD CoE)

is a **multi-disciplinary and cross border team** of seasoned sustainability, climate change, energy, environmental and green finance **lawyers** whose mission is to provide **comprehensive assistance around the EU Green Deal**, offering strategic legal and regulatory advice to help the clients **navigate** continually evolving policies and regulations.

Why work with EY EGD CoE?

The EGD initiatives span over thousands of pages that we can help navigate	We help make connections between different and seemingly not related EGD initiatives
We provide one focal point of expertise that in your organization can be scattered across multiple departments	In collaboration with other EY service lines we can assist in a comprehensive, EGD driven sustainability strategy

The EU gas sector and its transformation

Focus on achieveing climate neutrality

Policy perspective

- **Taxonomy (Regulation (EU) 2020/852)**

Provides a classification system for environmentally sustainable economic activities incl. Emission limit for CHP units and possibility to burn up to 100% low-carbon and renewable gases.

- **Fit for 55**

Sets specific targets to reduce emissions by 55% by 2030, which will require a shift away from fossil fuels and towards cleaner alternatives (CBAM, EU ETS, RED, CEEAG)

- **Hydrogen and decarbonised gas market (Directive (EU) 2024/1788 and Regulation (EU) 2024/1789)**

Updates the rules on the EU natural gas market set out in the Gas Directive and Regulation and introduce a new regulatory framework for dedicated hydrogen infrastructure.

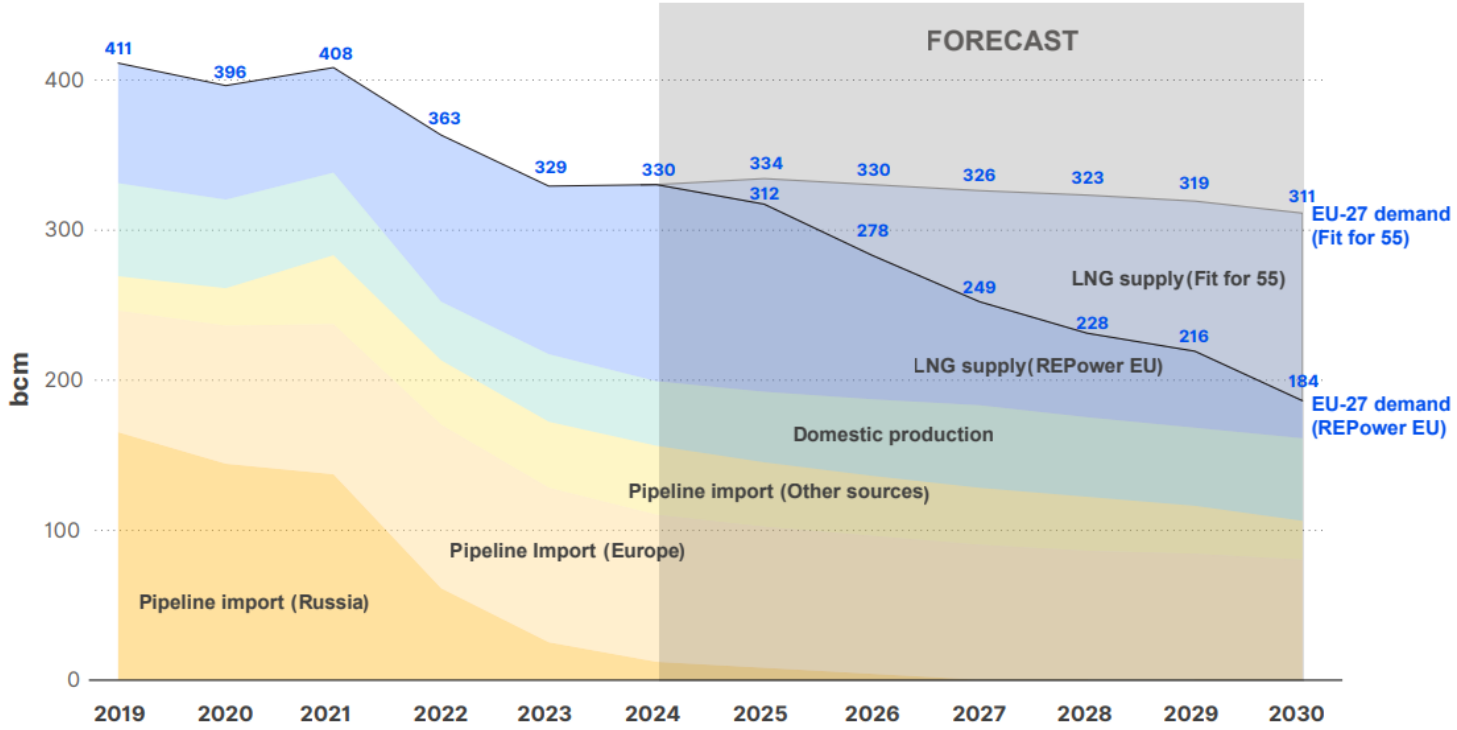
- **RePower EU**

Focuses on energy security and reducing dependency on Russian fossil fuels, which may involve diversifying gas supplies with LNG while accelerating the deployment of renewable energy and alternative fuels.

- **Aggregate EU (Council Regulation (EU) 2022/2576)**

Service for demand aggregation and support more coordinated purchase of natural gas at European level.

EU gas supply and demand outlook and assessed LNG supply needs relative to Fit For 55 and REPowerEU scenarios by 2030 (bcm)



Source: European Union Agency for the Cooperation of Energy Regulators, European Commision

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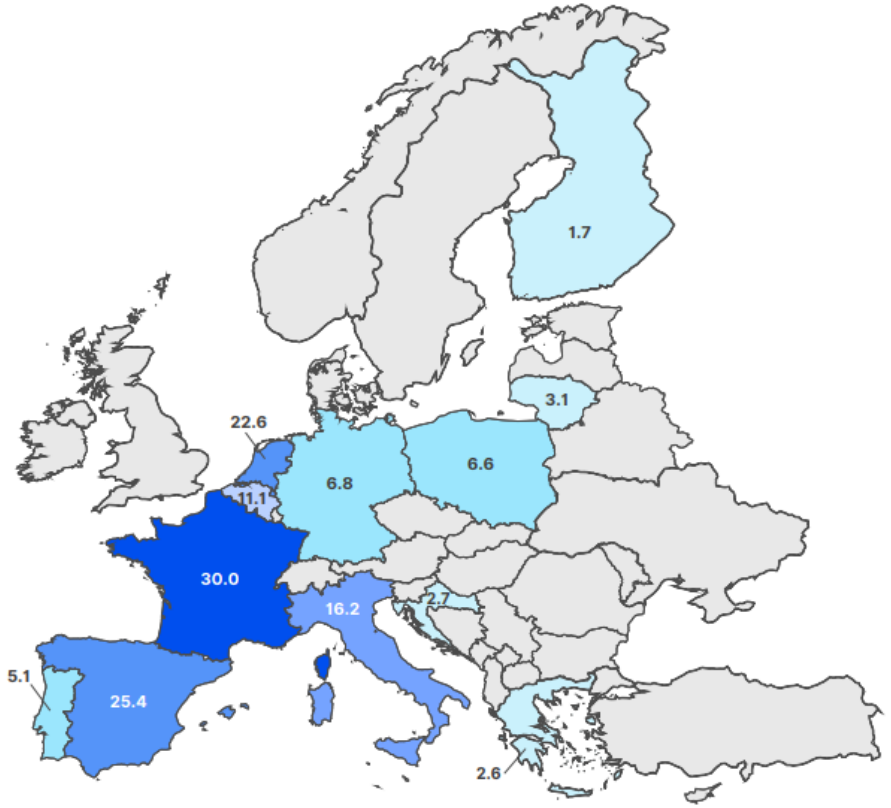
EU LNG trade overview

- **EU Member States imported 134 bcm of LNG in 2023**. The figure represents 42% of the European Union's total gas imports.
- **United States was the largest supplier of LNG to Europe** in 2023 accounting for almost half of the deliveries.
- The **largest LNG importers** in the EU are:
  - France
  - Spain
  - Netherlands
  - Belgium
  - Italy
- Europe in 2023 being the **largest source of incremental demand (57 bcm) compared to 2021**, accounting for more than a quarter of the total LNG trade.

Europe's LNG imports in 2023 (bcm)



Source: European Union Agency for the Cooperation of Energy Regulators, European Commision

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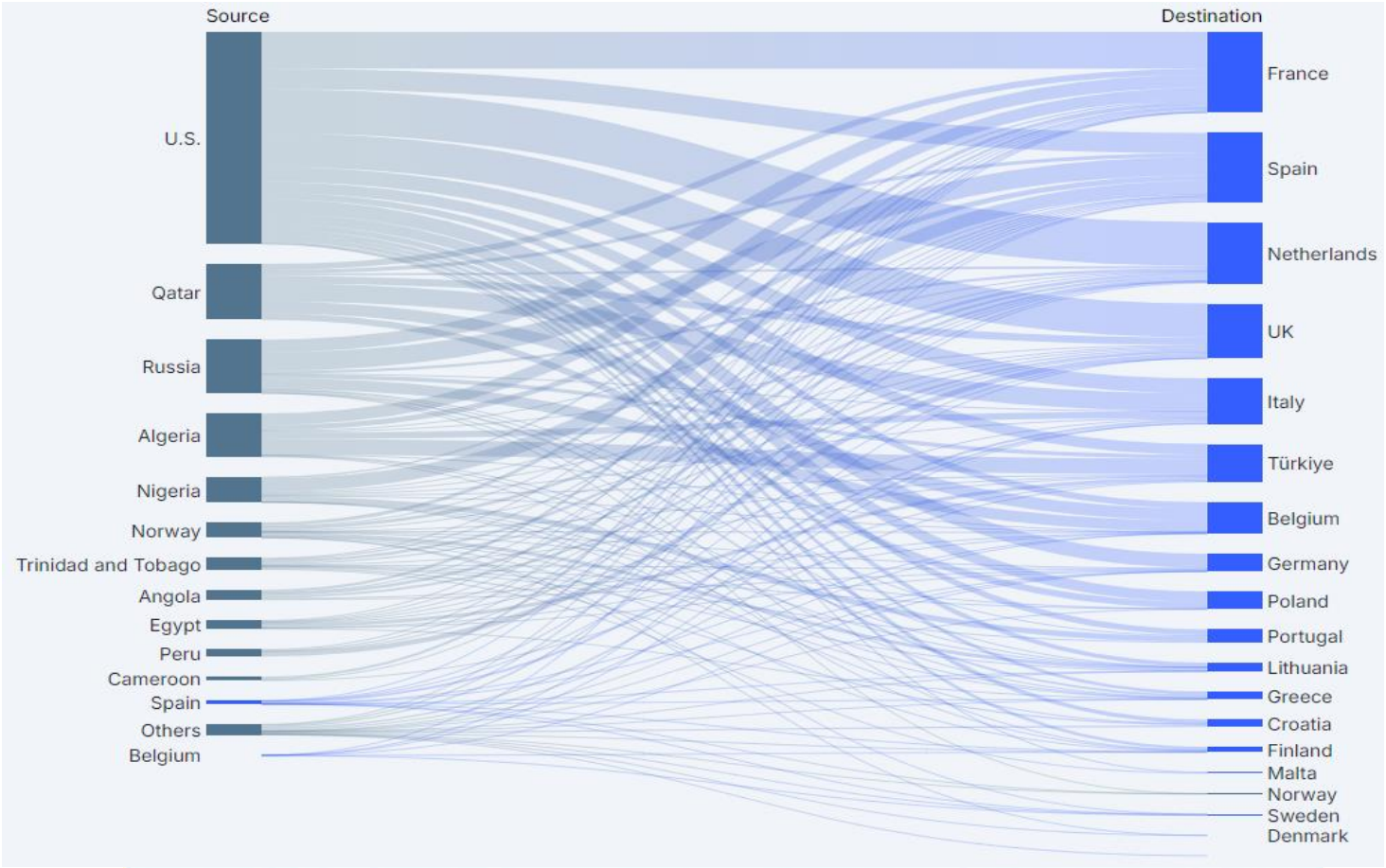
Europe's LNG imports directions in 2023



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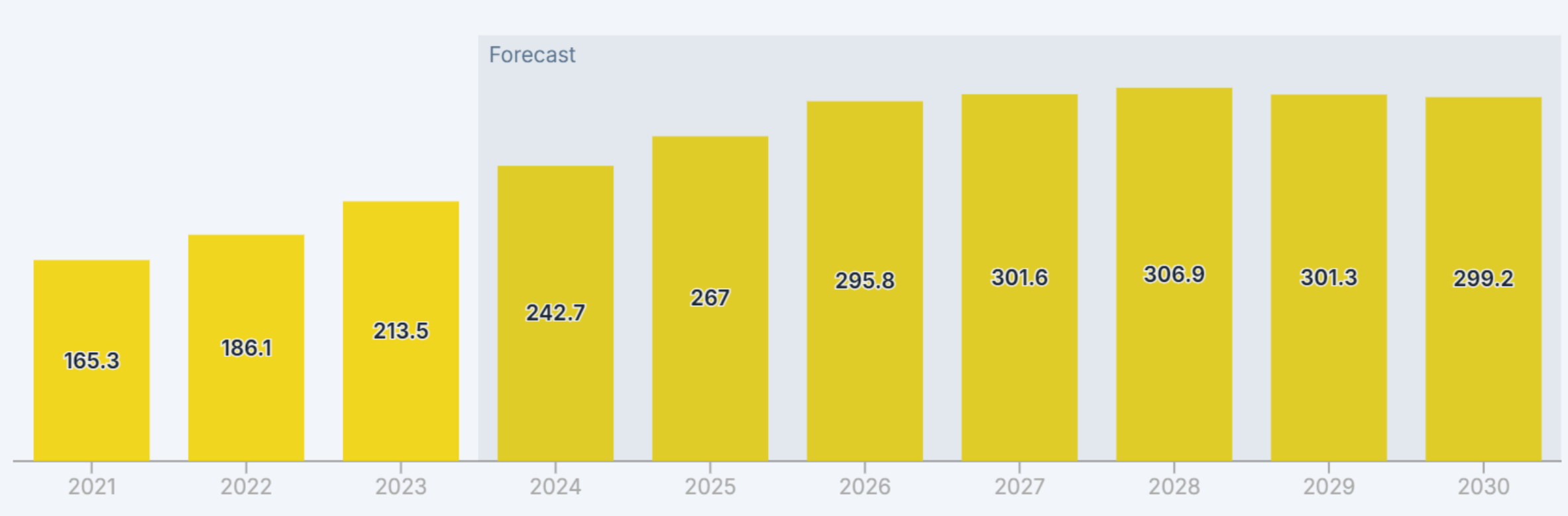
Source: Institute for Energy Economics and Financial Analysis

Existing and planned LNG regasification capacity in the European Union



Source: Gas Infrastructure Europe, Institute for Energy Economics and Financial Analysis

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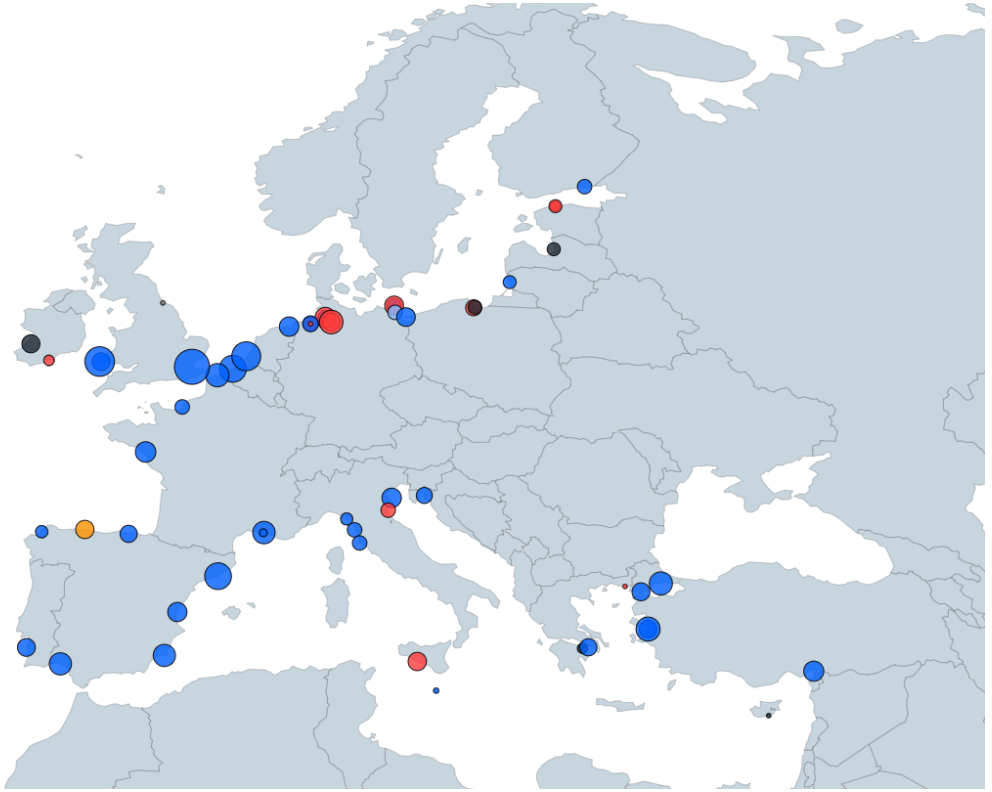
LNG regasification terminals in Europe

- Since Russia's full-scale invasion of Ukraine, **Europe has added 58.5 billion cubic metres (bcm) of new LNG regasification capacity**, of which the EU has added 50.8 bcm.
- This buildout includes **47.7 bcm of new floating storage regasification units** (FSRUs) and **10.8 bcm of expanded terminals.**
- EU countries that have added the most regasification capacity since February 2022:
  - Germany (16 bcm),
  - the Netherlands (13 bcm),
  - Italy (7.5 bcm),
  - France (6.5 bcm)
  - Finland (5 bcm)

Map of the LNG regasification terminals in Europe



Source: Gas Infrastructure Europe, Institute for Energy Economics and Financial Analysis

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LNG terminals in Poland

Świnoujście

- The LNG Terminal in Świnoujście has been in operation since 2016.
- Processes currently handled by the terminal: unloading LNG from a tanker at the unloading wharf, in-process storage of LNG in tanks, regasification of LNG, shipment of gas (NG) to the National Transmission System and loading of LNG onto tanker trucks and ISO-containers.
- The terminal's current regasification capacity is 6.2 billion Nm^3 per year.
- Main investment objective of Gaz-System in 2024 will be to complete the expansion of the LNG terminal and achieve a capacity of 8.3 billion Nm^3.

FSRU (Floating Storage Regasification Unit) in the Gdańsk region

- The investment includes, among other things, mooring in the Gdansk Bay a floating FSRU terminal adapted to receive and regasify liquefied natural gas and provide additional services.
- An important element of the project is also the construction of an offshore gas pipeline and the expansion of the national gas transmission pipeline network.
- The FSRU terminal will be adapted to carry out the regasification process at the level of 6.1 billion m^3 per year.
- The entire investment is expected to be completed in 2028.

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Thank you!

Feel free to contact me

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