



Association
of Gas Producers
of Ukraine

RES and natural gas What can Ukraine offer to Europe?

September 2022

THE WORLD HAS CHOSEN A PATH – A GREEN TRANSITION



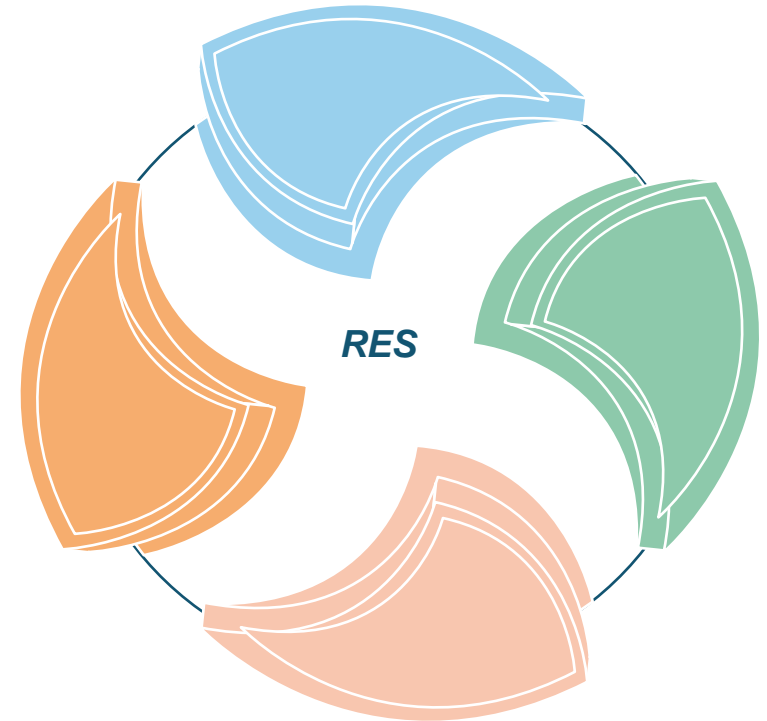
- ⦿ As we know, to overcome challenges such as climate change and environmental degradation, which are an existential threat – the world has outlined a strategy to deal with them efficiently
- ⦿ The transition envisages actions direction in all spheres of life, from climate and energy to finance and research
- ⦿ The world's unity in this regard is the only right choice to prevent negative consequences for the planet from development and increasing resource consumption
- ⦿ Ukraine stays connected with all the novets and systematically adapts its own economy to the European strategies

UKRAINE HAS OUTLINED DOMESTIC STRATEGY, AND CARRIES IT OUT DESPITE EVERYTHING



Energy Strategy of Ukraine 2050 envisages:

- ⦿ Achieving the maximum level of climate neutrality
- ⦿ Maximum reduction of coal use in the energy sector
- ⦿ Renewal and modernization of energy infrastructure
- ⦿ Increasing the efficiency of the use of the resources in the energy sector
- ⦿ Comprehensive integration with the markets of the European Union and effective functioning of internal markets
- ⦿ Providing the energy sector with its own resources, taking into account economic feasibility
- ⦿ Development of alternative energy sources, new products and innovative solutions in the energy sector



ON THE OTHER SIDE, SINCE THE FULL-SCALE INVASION UKRAINE IS SUFFERING FROM A DOWNTURN

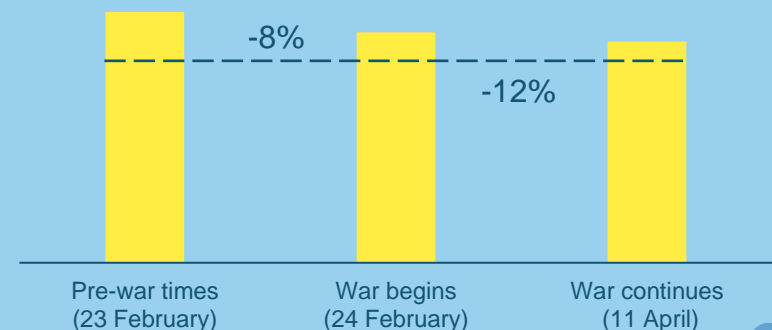
- ⦿ The Regulator has prohibited the publication of information regarding the potential and status of the energy sector of Ukraine
- ⦿ Despite the existing results of the successful counter-attack, during the last 7 months, Ukraine was under round-the-clock pressure in the main production regions
- ⦿ Such pressure continues to be observed, especially on TPPs, NPPs and gas fields in the Eastern region
- ⦿ The full-scale invasion has not caused a domino effect on the production capacities, existing infrastructure injuries are under constant restoration, and producers continue to perform
- ⦿ At the same time, Ukraine continues to develop RES investing in the future

The latest map of the invasion of Ukraine



- Recaptured by the Armed forces of Ukraine
- Temporarily occupied territories by Russia since February 24
- Temporarily occupied territories by Russia before February 24

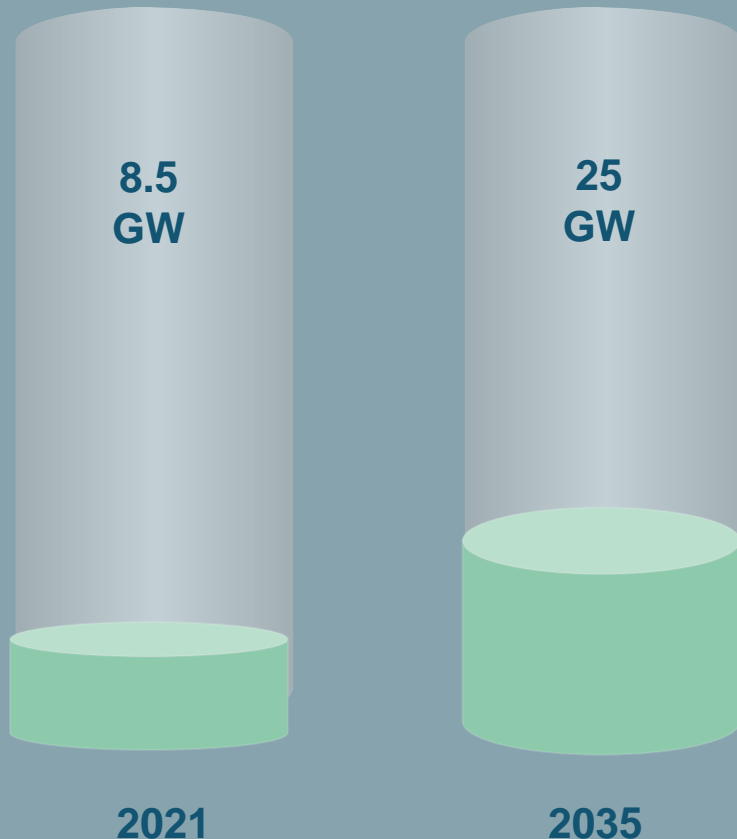
Ukraine's daily natural gas production since the beginning of the war





DEVELOPMENT OF RENEWABLE ENERGY SOURCES IN UKRAINE

Ukraine's RES generation existing and forecasted capacity



- Share of generation of renewable energy sources in 2021
- Money invested in renewable energy sources for the last 10 years
- Share of global investments in renewable energy sources
- Year, when Ukraine plans to give up coal
- Investments are provided for RES in the post-war reconstruction plan for Ukraine

13.4
%

\$12
bln

0.3
%

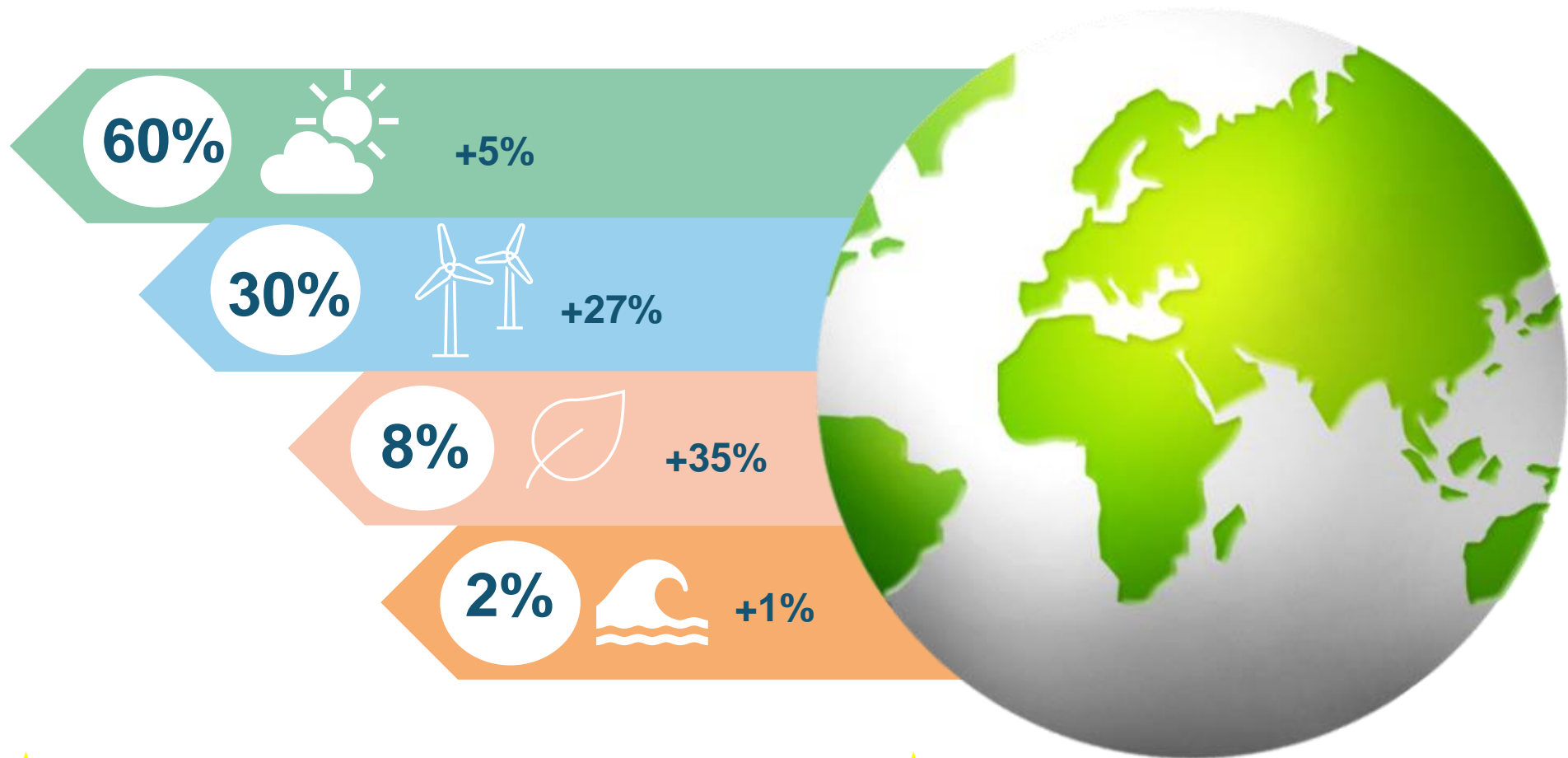
2035

\$130
bln



THE RESULTS OF THE GREEN ELECTRICITY MARKET IN UKRAINE IN 2021

- RES share in total electricity generation in Ukraine, in 2021, increased by 15.3% - up to 12.519 billion kWh and was 13.4%



\$12 bln total investments in RES



8% in total electricity generation



POSSIBILITIES OF ACCELERATED DECARBONIZATION OF THE ECONOMY

Hydrogen and synthesis gas

H₂

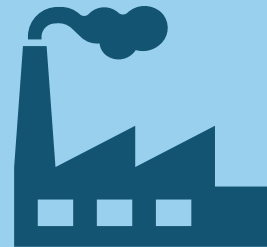
- ⦿ From natural gas and renewable energy sources
- ⦿ With zero CO₂ emission
- ⦿ Can export to EU

Biomethane and biogas



- ⦿ Ukraine is a leader in the agricultural sector
- ⦿ Can use biomethane as a full-fledged alternative to natural gas

Methanol



- ⦿ Methanol can be closely related in production processes with natural gas, hydrogen, biomethane on carbon dioxide

CO₂ storage

CO₂

- ⦿ Ukraine has suitable geological conditions for the creation of CCS
- ⦿ Many depleted oil and gas fields

PROSPECTS OF HYDROGEN PRODUCTION IN UKRAINE

- ⊙ Today, Ukraine can produce both green hydrogen with water and RES and blue hydrogen using natural gas with CO2 capture:



BIOGAS AND BIOMETHANE IS ONE OF THE IMPORTANT STEPS TOWARDS DECARBONIZATION

Over the past 5 years

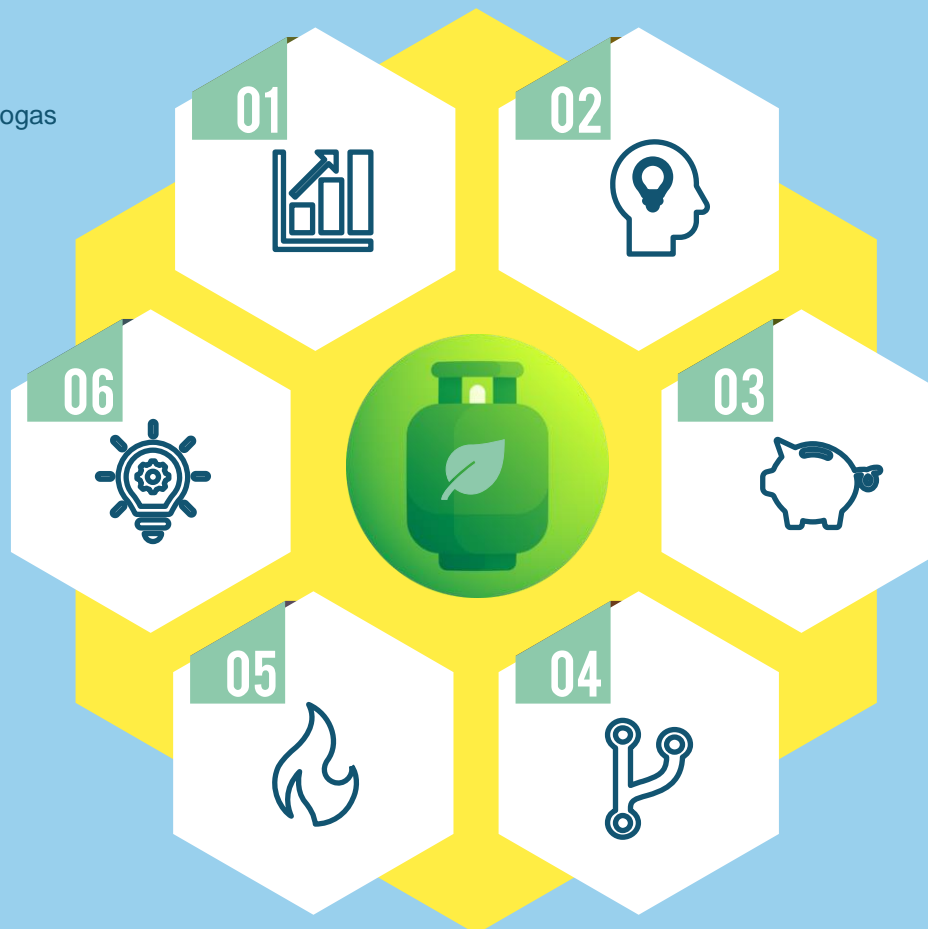
The number of biogas plants has increased from 21 to 60, as well as biogas production from 45 to 267 mcm (160 mcm of which is the potential of biomethane)

The potential of biomethane production (with biogas)

Is more than 8 billion per year (on the waste of the agricultural complex), i.e. 3.8 bln from grain straw, 2.7 bln from silage and 1.5 bln other waste

Current capacities

55 biogas (0 biomethane) plants operating in Ukraine with a total installed capacity of 116 MW.



Role in the economy

Biomethane is an important element in the strategy of developing a carbon-free economy. Ukraine can transport both biomethane and hydrogen to the EU through existing pipelines.

Cost advantage

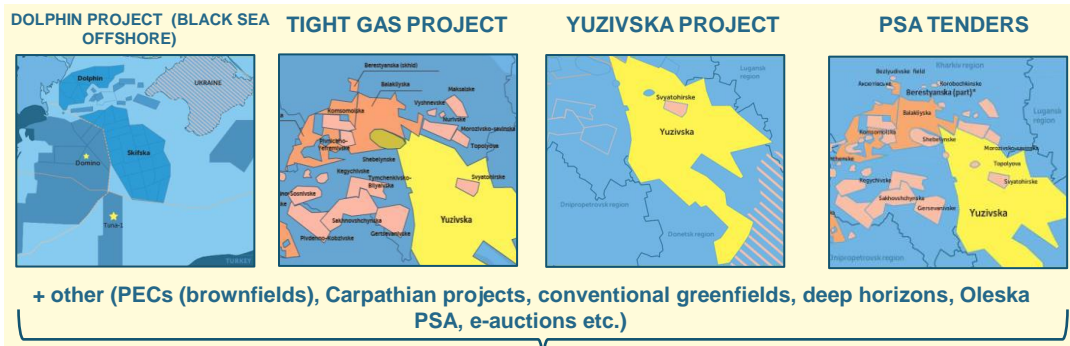
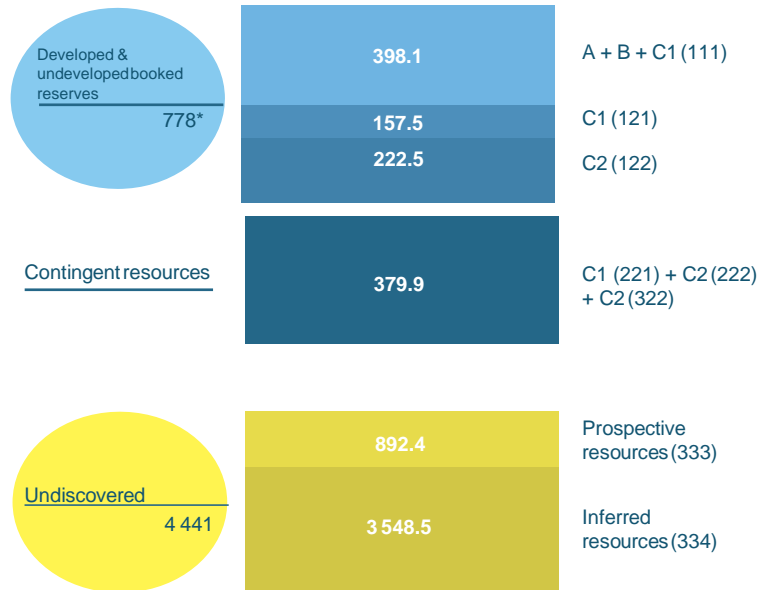
Today cost of biomethane today is 2-3 times lower than European gas prices and green hydrogen

GTS is ready

The gas infrastructure is ready for its transportation and energy use since biomethane is a complete analogue of natural gas. It is possible to submit to GTS without significant investments as for hydrogen 27 biogas projects, which are focused on electricity production. This is 50% more than in 2019.

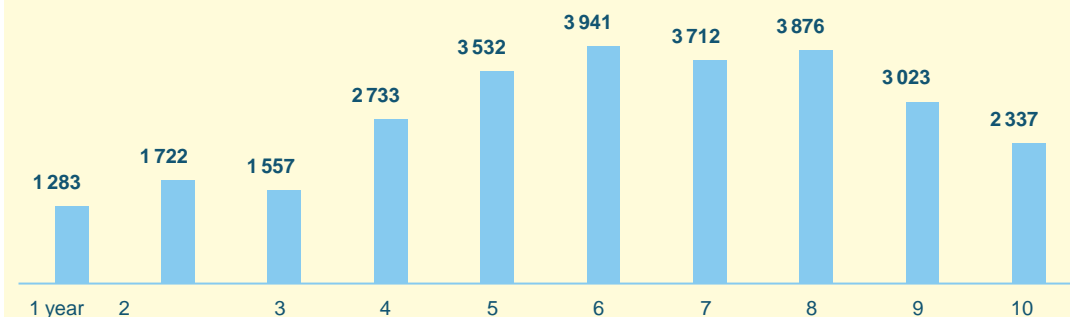
ALL THE MENTIONED ABOVE PROSPECTS WILL NEED GAS AS A TRANSITION FUEL, AND UKRAINE HAS A FRUITFUL AMOUNT OF THE RESOURCES TO DEVELOP

WHY UKRAINE IS A LONG-TERM PARTNER?

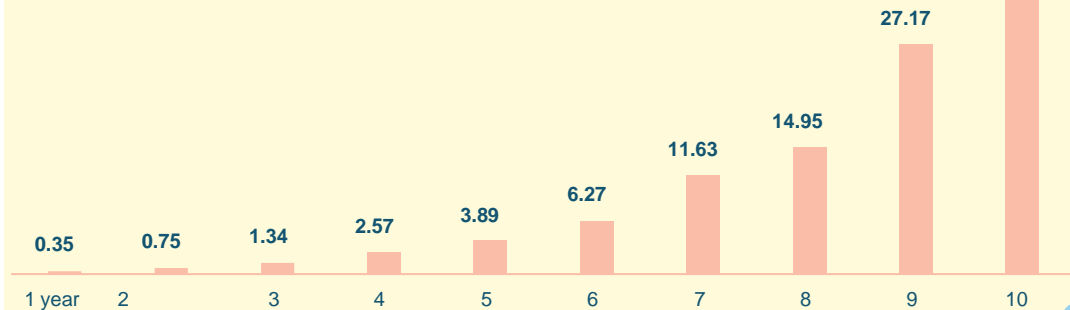


FORECASTED RESULTS FROM INVESTMENT ACTIVITY

Amount of Ukraine's overall projects investment, \$ mln



Forecast production in case of applying such investment, bcm



BECAUSE WE:

Are the European leader in the reserves to production ratio, second after Norway in proven natural gas reserves and fourth in terms of gas production

Operate more than 770 bcm of discovered proven reserves of natural gas and more than 4.4 trln of undiscovered ones

Have one of the largest GTS in Europe with an entry capacity of 281 bcm and exit capacity of 146 bcm, as well as the largest European complex of 12 UGSs with a total capacity of 31 bcm, which is more than a quarter of the total European volume and ranks 3rd after the USA and Russia in the world

Demonstrate successful experience of reformation of the sector for the last 6 years, introducing transparent e-auctions, concluded and signed PSA tenders, PECs, overall liberalization of the market and incentives for business

Possess about 540 licences with an area of more than 94 thousand sq. km and 20 bcm of domestic gas production



WHAT UKRAINE CAN ACHIEVE BY 2030 IN A GREEN ECONOMY



power of
hydrogen
production



potential
production of
biomethane



potential in new
natural gas
projects



the creation of
geological storage
facilities



In 10 years, Ukraine can become one of the main suppliers of green energy to EU countries



At least 50% of produced green energy can be exported

AS A RESULT, BY USING NATURAL GAS, CONSEQUENTLY, UKRAINE MAY HAVE A POSITIVE OUTCOME

- ⦿ If all investment projects will be successfully implemented, Ukraine will gain additional natural gas production by a surplus **20 bcm with a total of 40 bcm by 2032 year**. Also, it is forecasted, that we will have a production of **8 bcm of biomethane** during the next 10 years
- ⦿ In such a case, **75% of domestic natural gas production will satisfy 100% of intercountry consumption**
- ⦿ We will completely **replace coal** and other harmful to the environment fossil fuels **with natural gas**
- ⦿ Such gas will be also used in a combination with CO₂ in the **production of synthetic gases and methanol**
- ⦿ The excess **CO₂ volumes will be buried in CCSs**
- ⦿ In the beginning, **natural gas** will be the main element to produce **“turquoise” hydrogen**.
Natural gas + RES + CCS





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Thank you for your attention!