

Kaniv PSP Construction Project



Key facts

Ownership: state-owned

Land/area: Cherkasy region, Buchak

Project goal: The project seeks to cover peak loads, bridge night "gaps" in Ukraine's United Energy System and create emergency reserves of quick-response capacities in the southern region of Ukraine

Construction period: 78 months (6,5 years)

Form of investment: mixed financing

Technical arguments for putting PSP into operation:

- Increasing the energy independence of the state
- Enhancement of safety and flexibility of the UES of Ukraine due to additional hydropower produced in Ukraine
- Development of infrastructure in the Cherkasy region
- New work places for local population
- Environmental neutrality, minimal impact on the environment
- The system wide effect for the UES of Ukraine is achieved by reducing the number of start-ups of TPP power units, stabilizing their load and saving gas and coal

Financial details

DPP:	18 years
NPV:	US\$ 491,8 mln
IRR:	9.52 %
PI:	1.38
WACC:	5,41%

Total estimated investment US\$ 1,523 bln

Economic effect

- The commissioning of the Kaniv PSP will help Ukraine to fulfill the requirements of frequency and active power regulation during the operation of the Ukrainian UES in the European ENTSO-E grid, as well as to create conditions for the full utilization of renewable energy potential in Ukraine.
- According to the approved project, the commissioning of the Kaniv PSP comprising four hydro units (total installed capacity of 1000 MW in the generator mode and 1040 MW in the pumping mode) will provide electricity production in the amount of 1038 million kWh. annually and electricity consumption in the amount of 1320 million kWh. annually.



Construction of Kakhovka-2 HPP



Key facts

Ownership: state-owned

Land/area: Kherson region

Project goal: Expansion of the Kakhovka hydrosystem due to the construction of the Kakhovka HPP-2 with a capacity of 250 MW and the transfer of the hydrosystem from the basic mode of electricity generation to semi-peak and peak.

Construction period: 6 years

Form of investment: mixed financing

Financial details

DPP: 19,5 years

NPV: US\$ 58,4 million

IRR: 7,3 %

PI: 1,12

WACC: 5,57 %

Total estimated investment US\$ 653 mln

Technical arguments for putting HPP into operation

- The capacity of Kakhovka HPP - 2880 m³/s is lower than the Dnieper (HPP-1 + HPP-2) - 5100 m³/s and above located HPPs;
- The highest rate of installed capacity among HPP - 0.44;
- By function in power system Kakhovka HPP belongs to mid-merit power plant, while power plants located above belong to peak power plant;
- The installation of additional hydrounits will increase the use of of the Kakhovka hydrosystem flow to 95% and thus increase electricity generation;
- To optimize Kakhovka hydrosystem it is necessary to increase its installed capacity by commissioning additional hydrounits.

Expected result

- Increase of the total installed capacity of the Kakhovka hydrosystem by 250 MW;
- Transfer of the hydrosystem from the basic mode of electricity generation to semi-peak and peak, which will improve the stability of Ukraine's energy system;
- Increase the average long-term electricity generation through the use of idle discharges;
- Improving the quality of electricity in the UES of Ukraine due to the involvement of hydro units of Kakhovka HPP-2 in the system of automatic frequency and power control;
- Ukraine will fulfill requirements for frequency and power control during the operation of the UES of Ukraine in the European network (ENTSO-E), in particular in the secondary and tertiary regulation ranges;
- Extension of operational lifetime of existing Kakhovka HPP and hydrosystem in general;
- Development of infrastructure of Kherson region and creation of new jobs.



Construction of the third stage of the Dniester PSP in the composition of hydroelectric units No. 5–7



Key facts

Ownership: state-owned

Land/area: Chernivtsi region

Project goal: increase the reliability and flexibility of the United Energy System of Ukraine through creation of mobile emergency reserve; removal of base station reboots; creation of regulation reserve for connection RES generation.

Construction period: 6 years

Form of investment: mixed financing

Financial details

DPP: 9,4 years

NPV: US\$ 552 mln

IRR: 20,8 %

PI: 1,68

Total estimated investment US\$ 1 238 mln

Technical arguments for putting PSPP into operation

- System-wide effect is achieved by reducing the number of starts of coal-fired TPP units, stabilizing their load by the following components:
 - substitution of natural gas consumption for the start-up of TPP units;
 - saving coal by reducing the transitional and uneconomic regimes of TPPs.

Expected result

- Systemic effect of restraining the growth of electricity tariff in Ukraine from replacement of thermal power units, stabilization of their load and efficiency.
- The system-wide daily effect consists of:
 - substitution of natural gas consumption for TPP units. Depending on the state of the NPP, as well as the possibility of coal-fired TPPs to carry the load and regulate the operation of the grid of Ukraine;
 - coal saving by reducing the transitional and uneconomic regimes of TPPs.

750 kV Pivdennoukrainska NPP (Ukraine) - Isaccea (Romania) OHL rehabilitation and modernisation



Key facts

Ownership: state

Land/area: the route of the line will run from Pivdennoukrainska NPP in Yuzhnoukrainsk, Mykolaiv region to Isaccea (Romania) through the 750/400 kV «Prymorska».

Project goal:

- to increase the capacity of the interconnector with Romania to 1000-1200 MW;
- to increase the reliability of electricity supply to consumers of the southern regions of Ukraine and Moldova;
- leveling of power system restrictions on the output of RES generation capacity in the south of Ukraine.

Construction period: 9 years

Form of investment: mixed (different forms of investment, by domestic and foreign economic entities)

Financial details

DPP: 155 months

NPV: 87 mln. US\$

IRR: 16%

PI: 1,3

WACC: 13,5%

Technical arguments

The line is situated both in the territory of Ukraine, Moldova and territory that is not controlled by the Moldovan authorities (Transnistria). About 90% of the 750 kV Pivdennoukrainska NPP - Isaccea OHL is currently remains in ruins. The voltage class of 750 kV is not typical for ENTSO-E networks.

Therefore, in the framework of studies of integration of power grids and electricity markets of the Black Sea region, a conclusion was made on the feasibility of renewal of 750 kV OHL Pivdennoukrainska NPP – Isaccea in two-circuit design for voltage class 400 kV (consists of 750 kV Pivdennoukrainska NPP-Prymorska and 400 kV OHL Prymorska - Isaccea).



Expected result

The implementation of this project will allow to increase the capacity of the interconnector with Romania to 1000-1200 MW.

Also, the project will contribute to increasing the reliability of electricity supply to consumers of the southern regions of Ukraine, and will eliminate the power system limitations of generating power from RES in the south of Odesa region of Ukraine.

Total estimated investment 208 mln. US\$

New construction of the 330 kV Lutsk pivnichna – Ternopilska OHL with reconstruction of the SS 330 kV “Lutsk pivnichna” and SS 330 kV “Ternopilska”



Key facts

Ownership: state

Land/area: the route of the OHL 330 kV Lutsk pivnichna – Ternopilska will run on the territory of Volyn, Rivne and Ternopil regions with the approximate length 223 km.

Project goal:

- improvement of the power output scheme of the Rivnenska NPP and reduction of the possible downward of the Rivnenska NPP in repair and emergency modes;
- downward of the OHL 330 kV Khmelnytska NPP – Rivne;
- increasing the reliability of the South-Western region electricity supply scheme in repair and emergency modes;
- ensuring the operation of the Dnistrovaska HPSP within three hydro units.

Construction period: 3 years

Form of investment: mixed (different forms of investment, by domestic and foreign economic entities)

Financial details

DPP: doesn't pay off

NPV: -17,76 ths. US\$

IRR: -

PI: 0,2

WACC: 13,5%

Technical arguments

Currently, the SS 330 kV “Ternopilska” is the only source of power for consumers in the Ternopil region. The emergency blackout of the OHL 330 kV Khmelnytska – Ternopilska leads to a drop in the voltage on the 330 kV buses of the Ternopilska substation to 310 kV, which is unacceptable.

The project envisages:

- new construction of the OHL 330 kV Lutsk pivnichna - Ternopilska (estimated route length – 222.4 km);
- reconstruction of SS 330 kV "Lutsk pivnichna", "Ternopilska".

The project will provide reliable and stable electricity supply to consumers of the Ternopil region without restrictions in repair and post-emergency modes and will increase the reliability of electricity output of the Rivnenska and Khmelnytska NPP.

Expected result

Reduction of losses in the transmission system by 8.7 thousand MWh.

Implementation of the project will reduce the amount of possible downward of the Rivnenska NPP in repair and emergency modes and increase the reliability of the South-Western region electricity supply scheme in repair and emergency modes.

Total estimated investment 54 mln. US\$



New construction of the 330 kV Dnistrovaska HPSP – SS 750 kV “Vinnytska” OHL



Key facts

Ownership: state

Land/area: Vinnytsia and Chernivtsi regions

Project goal:

To reduce the existing risk of accidents, losses in the electricity transmission system and to prevent the limitation of electricity supply to consumers of the IPS of Ukraine.

Construction period: 5 years

Form of investment: mixed (different forms of investment, by domestic and foreign economic entities)

Financial details

DPP: 50 months.

NPV: 507 mln. US\$

IRR: >35%

PI: 36,5

WACC: 13,5%

Total estimated investment 20 mln. US\$

Technical arguments

The project envisages construction of the 330 kV double-circuit OHL with 330 kV Dnistrovaska HPSP gas insulated switchgear diversions and SS 750 kV Vinnytska 330 kV outdoor packaged switchgear. The project also envisages the reconstruction of the Dnistrovaska HPSP 330 kV distribution devices and SS 750 kV Vinnytska 330 kV distribution devices and installation of fiber optic communication line.

The approximate length of the 330 kV Dnistrovaska HPSP – SS 750 kV “Vinnytska” OHL is 146.5 km

Expected result

Implementation of the project will make it possible to significantly reduce the existing risk of accidents, losses in the electricity transmission system and prevent restrictions on the electricity supply to consumers of the IPS of Ukraine during periods of maximum consumption and during repair works of the main transits that power this region.

Launching the fourth hydro unit with a capacity of 324 MW in generator mode and 421 MW in pump mode will allow to reduce the operation of the TPP by a similar capacity, which will essentially save money on coal for the production of this electricity capacity.



New construction of the 750 kV Kakhovska- Prymorska OHL with the SS 750/330 kV Prymorska



Key facts

Ownership: state

Land/area: Kherson, Mykolaiv and Odesa Region

Project goal:

- increase in exports
- 600 MW power deficit reduction

Construction period: 8 years

Form of investment: mixed (different forms of investment, by domestic and foreign economic entities)

Technical arguments

During the repair and emergency shutdown of the 750 kV Pivdennoukrainska NPP – Prymorska OHL and 330 kV Tylihulska wind power plant – Adzhalyk OHL, SS Prymorska and Odesa power node consumers are supplied by the 750 kV Prymorska – Kakhovska OHL, that will be loaded in 2027 to 1208 MW, which means 60 % of the durably permissible line load.

The project implementation will ensure:

- improving the stability and reliability of IPS of Ukraine considering the fact that there was a partial destruction of energy sector facilities and the loss of part of the fuel resources and energy complex of Ukraine as a result of armed aggression of the Russian Federation.
- Increasing the efficiency of the use of available capacity and electricity transmission from Pivdennoukrainska NPP, Dnistrovska HPSPP and Zaporizka NPP.
- Strengthening of intergovernmental relations for the purpose of integration with the European Network of Electricity Transmission System Operators (ENTSO-E).
- Increasing the reliability of electricity supply to consumers of the Southern region of the IPS of Ukraine.

Construction includes: autotransformer 750 kV - 2x(3x333) MBA; OHL 750 kV - 425 km; OHL 330 kV -2x50, 2x20, 2x50 and 80 km.

The start of work on the project is possible after the de-occupation of the Kherson region.



Financial details

DPP: 9 years

NPV: 578,2 mln. US\$

IRR: >35%

PI: 5,6

WACC: 13,5%

Total estimated investment

415,3 mln. US\$

Expected results

Additional electric power output
Increase in export of electricity
600 MW power deficit reduction

Green Resilient European Electricity Network (GREEN) (8 SS)



Key facts

Ownership: state

Land/area: Kyiv, Chernihiv, Sumy, Poltava regions

Project goal:

Implementation of an automated process control system. Modernization and replacement of outdated equipment at substations.

Construction period: 4 years

Form of investment: mixed (different forms of investment, by domestic and foreign economic entities)

Technical arguments

SS 330 kV "Losievo", SS 330 kV "Konotop", SS 750 kV "Pivnichnoukrainska", SS 330 kV "Chernihivska", SS 330 kV "Nizhynska", SS 330 kV "Bilotserkivivska", SS 330 kV "Poliana", SS 330 kV "Poltava" reconstruction with the introduction of the automated process control system (APCS). Modernization and replacement of outdated equipment at substations.

Financial details

DPP: doesn't pay off

NPV: 127,189 mln. US\$

IRR: -

PI: -

WACC: -

Expected results

- Reduction of electricity consumption for own needs
- Reduction of repair costs
- Reduction of labor costs.

Total estimated investment

132,7 mln. US\$



Improving Energy Efficiency in Power Transmission (Reconstruction of Transformer Substations) III-V



Key facts

Ownership: state

Land/area: Dnipropetrovsk Region, Odesa Region.

Project goal:

To make a significant contribution to stable and efficient electricity supply in the Ukrainian power system, to increase its the energy efficiency and promote the integration of Ukraine into the European grid. At the same time, the project will contribute to creating a basis for the further integration of renewable energy into the Ukrainian power system and mitigating the effects of climate change by reducing CO2 emissions.

Construction period: 3 years.

Form of investment: mixed (different forms of investment, by domestic and foreign economic entities)

Financial details

DPP: not calculated

NPV: not calculated

IRR: not calculated

PI: not calculated

WACC: not calculated

Technical arguments

The reconstruction of the SS 330 kV Dnipro-Donbas, the SS 330 kV Podilska, the SS 330 kV Nikopolska, the SS 330 kV Kvartsit and the 330 kV Dniprovka substation is planned.

The presence at substations of a significant amount of equipment that has worked for more than 40 years, as well as equipment and devices of RZA that are physically worn out or morally obsolete. The presence of air and compressor facilities at substations requires the constant presence of service personnel.

The continued operation of equipment with an over-standard period of operation leads to a significant increase in operating costs for its repairs and maintenance, and also leads to an increase in the number of damages, accidents and a decrease in the efficiency of the electrical network and the quality of services provided to users.

Expected results

- Reducing the cost and frequency of maintenance and repair works;
- reduction of annual electricity losses;
- additional income from the connection of new RES capacities.



Improving Energy Efficiency in Power Transmission (Reconstruction of Transformer Substations) II



Key facts

Ownership: state

Land/area: Vinnytsia, Khmelnytskyi, Ivano-Frankivsk, Chernivtsi regions

Project goal:

Implementation of an automated process control system. Modernization and replacement of outdated equipment at substations.

Construction period: 5 years

Form of investment: mixed (different forms of investment, by domestic and foreign economic entities)

Financial details

DPP: 17 years

NPV: 14,01 mln. US\$

IRR: 17%

PI: 1,6

WACC: 13,5%

Technical arguments

SS 750 kV "Vinnytska", SS 330 kV "Vinnytska", SS 330 kV "Bar", SS 330 kV "Koziatyn", SS 330 kV "Kamianets-Podilska", SS 330 kV "Khmelnytska", SS 330 kV "Shepetivka", SS 330 kV "Chernivetska" reconstruction with the introduction of the automated process control system (APCS). Modernization and replacement of outdated equipment at substations.

Expected results

- Reduction of electricity consumption for own needs
- Reduction of repair costs
- Reduction of labor costs.

Development of Nuclear Power in Ukraine: New Nuclear Builds



Key facts

Form of ownership: state-owned

In 2021 a strategic decision was made to build new power units using AP1000 design of the U.S. Westinghouse.

- On 31 August 2021, Washington, Energoatom and Westinghouse signed the memorandum on building five AP-1000 power units.
- On 2 June 2022, the parties signed an agreement increasing the number of AP-1000 power units from five to nine.

Project objective: ensure energy independence of Ukraine and strengthen its role in the international electricity market.

Construction period: 57 months (5 years)

Investment form: mixed funding

Pilot project and funding

- Construction of the Khmelnytskyi NPP Units 5 and 6.
- On 22 November 2021, Energoatom and Westinghouse signed two agreements marking the beginning of the project's implementation.
- Work is currently in progress to provide a financing loan in the amount of \$9 billion for 18 years.

Cost of a power unit: \$6 bln.

Technical background

Probability of a gap in electricity production by 2040:

- In 2030-2040 the lifetime of 12 nuclear units may be expired, if it not extended, which may result in a loss of the annual electricity production by 76 bln. kWh.
- By 2055 the lifetime of the remaining nuclear units may expire reducing annual electricity production by additional 21 bln. kWh.

Nuclear capacities are planned to be increased from the current 13,8 GW to 24 GW by 2040.

Economic effect

- Increase in the annual electricity supply.
- low electricity price for consumers;
- stability of the energy system and energy security;
- decreasing CO₂ emissions;
- thousands of new jobs;
- Improvement of the socio-economic development of the region and other territories.

Establishing an EV fast-charging network of SE “NNEGC “Energoatom



Key facts

Form of ownership: state-owned

Location: Kyiv, Ukraine;

траси: M07 Kyiv-Kovel' 438 km,
M06 Kyiv – Chop 849 km,
M05 + M15 Kyiv – Odessa – Reni 758 km

Project objective: establishing EV fast-charging network in Ukraine.

Project background: distribution of Energoatom's branded EV fast-charging stations in Kyiv, regional centers of Ukraine, and at facilities along the main highways of Ukraine.

Construction period:

First stage - 12 months (1 year)

Second stage - 24 months (2 years)

Investment form: mixed funding

Funding

Discounted payback period: 2,5 years

Net present value:

First stage – \$13,4 mln.

Second stage – \$26,8 mln.

Internal rate of return: 29 %

Margin of profit: 2.32

Technical background

- reducing Ukraine's dependence on fossil fuels and optimizing the use of the country's energy resources;
- reducing harmful emissions into the atmosphere, improving the general environmental background;
- approaching the European environmental standards;
- fulfilment of Ukraine's international obligations on decarbonization in accordance with the Paris Agreement within the UN Framework Convention on Climate Change.



Economic effect

- The cost of the implementation of the first stage of the investment project, which involves the placement of 50 EV charging stations in Kyiv, is estimated at \$13.4 million.
- The project funding is expected to be carried out at the expense of borrowed funds and own funds of Energoatom.
- Repayment of both the body of the loan and the interest is planned at the expense of own funds (operation of charging stations).

Total estimated investment US\$ 40,2 mln

Replacement of the outdated bus fleet of Ukrainian NPPs with electric buses



Key facts

Form of ownership: state-owned

Location:

- Rivne NPP, town of Varash;
- Khmelnytsky NPP, town of Netishyn;
- South-Ukraine NPP, town of Yuzhnoukrainsk;
- Zaporizhzhya NPP, town of Energodar.

Project objective: renewal of the outdated bus fleet of the Ukrainian NPPs with electric buses.

Pilot project: replacing the first 10 buses with electric ones at the Rivne NPP and creating 5 charging stations with 10 connections for their service.

Construction period:

First stage - 12 months (1 year)

Investment form: mixed funding

Funding

Discounted payback period : 8,3 years

Net present value:

First stage– \$ 4,5 mln.

Internal rate of return: 15,6 %

Total expected investment \$18,0 mln.

Technical background

- replacement of Energoatom's diesel and gasoline vehicles in NPPs' satellite cities with environmentally friendly electric vehicles.
- reduction of harmful emissions into the atmosphere (absence of exhaust gases and CO2 emissions during the life cycle) and a significantly lower cost of 1 km.
- fulfilment of Ukraine's international obligations on decarbonization in accordance with the Paris Agreement within the UN Framework Convention on Climate Change.

Economic effect

- After the completion of the first stage, it is planned to replace diesel buses with electric ones at all Ukrainian NPPs and increase the number of charging stations for their service.
- The project funding is expected to be carried out at the expense of borrowed funds and own funds of Energoatom.
- Repayment of both the body of the loan and interest is planned at the expense of the company's own funds, obtained as a result of reducing operating costs by using electric buses.

Construction of 400 kV overhead line "Rivne NPP – Lithuania"



Key facts

Form of ownership: state-owned

Location: Varash, Rivne region

Project objective

- Integration of the energy sector into European markets.
- Increasing the export potential of Ukraine.
- Ensuring the power output of RNPP under reduced electricity consumption in Ukraine.
- Ensuring stable and reliable operation of the UES of Ukraine in the European unified energy system.
- Creation of the "Ukraine-Lithuania" energy line.

Construction period: 3 years.

Form of investment: State. Financing from the newly created specialized funds, in particular the Fund for Economic Recovery and Transformation; loans from international financial organizations, such as the EBRD, EIB, etc.

Technical background

The construction of a new 400 kV connection line "Rivne NPP - Lithuania" through the territory of Poland is necessary for:

- increasing the reliability and flexibility of the connection of the UES of Ukraine with the European ENTSO-E network;
- ensuring stable and reliable operation of the UES of Ukraine in the European unified energy system;
- ensuring the export of electricity from Ukraine to the Baltic countries of the European Union and increasing the export-import capabilities of the UES of Ukraine;
- ensuring the output of RNPP capacities and reducing dispatcher restrictions.

Economic effect

- Ensuring electricity exports from Ukraine to the Baltic countries of the European Union under refusal of energy supplies from the Russian Federation.
- Raising income from electricity exports to finance the construction of new power units at the Rivne NPP.

The total amount of expected investment is US\$ 450 million

Improving the physical protection and defense capability of NPP



Key facts

Form of ownership: state-owned

Location:

- Rivne NPP and Varash;
- Khmelnytsky NPP and Netishyn;
- South Ukraine NPP and Yuzhnoukrainsk.

Project goal:

increasing the physical protection and defense capability of the Rivne NPP, Khmelnytsky NPP and South Ukraine NPP together with satellite towns;

construction of fortifications, engineering structures, as well as additional infrastructure to counter new threats to nuclear power facilities under the martial law.

Construction period: 18 – 24 months

Form of investment: mixed financing

The total amount of expected investment is US\$ 300 - 400 million

Technical background

Increasing the level of protection and defense capability of Ukraine's nuclear power plants by technical means and establishing defense structures to prevent and counter threats and dangers that exist as a result of Russian aggression against Ukraine.

The information on the characteristics of defense structures is classified as restricted information and has a "Secret" level of sensitivity.

Economic effect

Creation of a line of defense structures for the protection of nuclear power plants and satellite towns.

Fulfillment of the requirements of the Law of Ukraine "On the Fundamentals of National Resistance" dated July 16, 2021 No. 1702-IX and in order to create additional infrastructure to ensure counteraction to the new threats to nuclear facilities, as well as the performance by units of the Armed Forces of Ukraine, the National Guard of Ukraine and the Territorial Defense Forces of the tasks of defense and protection of nuclear installations, nuclear materials, radioactive waste, other sources of ionizing radiation.



Reconstruction of Bogorodchany booster compressor station



Key facts

Ownership: JSC Ukrtransgaz

Land/area: Ivano-Frankivsk region

Project goal: Ensuring the functioning of Bogorodchany UGS.

Construction period: 12 month

Form of investment: loan

Technical arguments

Reconstruction of Bogorodchany booster compressor station with the replacement of the main equipment and supporting technological facilities, including gas motor compressors (GMC) by new gas pumping units, shop systems and communications of Bogorodchany underground gas storage (UGS).

Financial details

DPP: 36,37 month

NPV: 25 597 thousand US\$

IRR: 22,79 %

PI: 1,51

WACC: 11%

Expected results

Reconstruction of BCS "Bogorodchany" will allow:

- to ensure efficient and stable operation of the aggregate park, shop technological equipment, communications, systems and networks to ensure the operation of Bogorodchany UGS in accordance with the project indicators
- to reduce emissions of harmful substances into the atmosphere
- to reduce the cost of fuel gas, oil, other operating costs, as well as the cost of repairs and maintenance of equipment
- to increase the level of industrial safety of BCS "Bogorodchany"

Total estimated investment US\$ 90 527 500



Brody – Adamowo crude oil pipeline



Key facts

Ownership: private, MPR „Sarmatia” sp. z o.o.

Land/area: Ukraine/Poland

Project goal: Creation of a reliable alternative route for transporting crude oil to Ukraine and EU countries

Construction period: 2023 – 2025

Form of investment: corporate, credits of specialized IFI, grants

Technical arguments

The Brody – Adamowo oil pipeline project envisages construction of the pipeline connecting the Oil Pumping Station “Brody” (the end point of the existing Odessa – Brody oil pipeline in Ukraine) with the oil tank farm in Adamowo (the connection point to northern line of Druzhba pipeline).

- Total length 396,3 km (270,6 km in Poland + 125,7 km in Ukraine).
- Diameter 710 mm (28”).
- Initial capacity 10 MTA with possibility to increase up to 20 MTA on the next stages.



Financial details

DPP: 20 years

NPV: 19,08 USD

IRR: 6,26 %

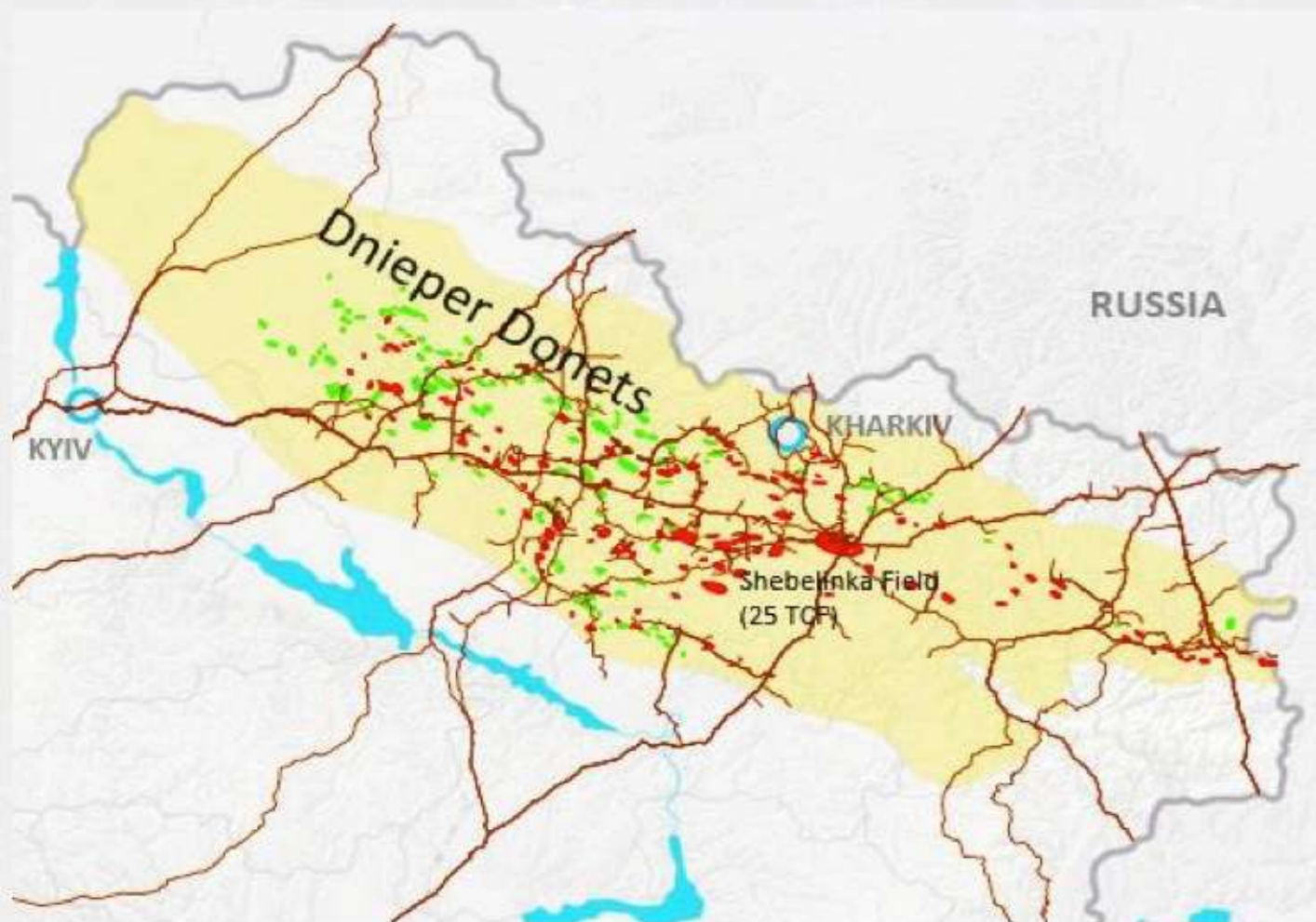
PI: 1,55

Strategic ‘added value’ of the Project

- Improvement of energy security of Ukraine and EU member states by diversification of oil supply routes/sources independent from RF
- Possibility of oil transportation in both directions: from Baltic Sea to Ukraine, Slovakia and Czechia and from Black Sea to Poland
- Better interoperability of EU oil transportation system and enhancing its sustainability in light of rejection oil supplies from RF, minimizing risks of oil delivery interruption
- Contributing NATO security and defense capacities by setting on East European flank North–South “arch” of oil supplies

Total estimated investment approximately 450 mln US\$

Exploration and development of Ukraine's unconventional resource potential



New Unconventional Play on DDB considered as the most promising upstream project in Ukraine (with highest potential). Key geological parameters (TOC, porosity, thickness) of the prospective play are comparable to unconventional hydrocarbon resource basins of the US and Canada

Ownership: under concession & PSA of Naftogaz Group

Land/area: : ~3.2 mln acres (13,000 sq km), North-East

Form of investment: partnership (under PSA), various capital investment forms

Status: exploration – completed, derisking – ongoing

Financial details

(in case of geological success)

DPP: 6 years

NPV: US\$ 4.9 bln

IRR: 48 %

PI: 1,5

WACC: 15,3 %

Technical information

- # licenses: 20+
- Estimated Ultimate Recovery (EUR): ~10.35 Tcf (293 bcm)
- Depth: 6.5K – 16.5K feet (2 – 5 km) – vertical, 6.5K – 10K (2 – 3 km) – lateral
- Initial production rate (typical well): 10.6-17.6 mmcf (300 - 500 ths.m3)
- Currently, derisking stage ongoing: drill 6 E&A wells on several fields with first spud in Q1-Q2 2023 and expected PIO in Q4 2023
- Next stage: full field development

Expected results

Full Unconventional Play development (incl Naftogaz' & other acreage) has potential to convert Ukraine into significant gas exporter to EU with expected production at up to 2.8 tcf (80 bcm) with 2.5 tcf (70 bcm) – export potential per annum

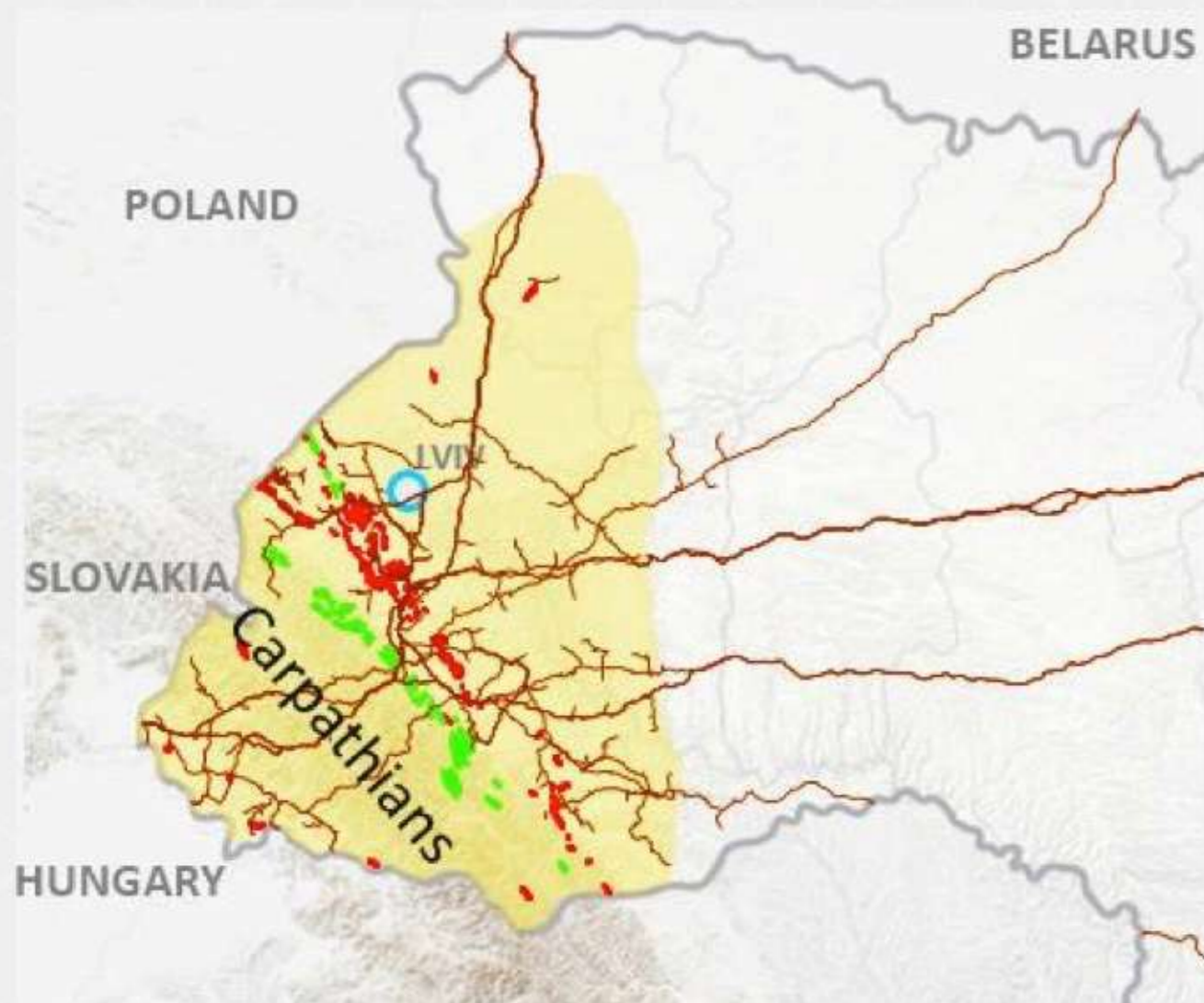
Unconventional Play on DDB has significant advantages in terms of investing:

- Exploration is completed, proven the Play exists
- Key geological parameters are comparable with world first-class unconventional basins

**Total estimated investment: US\$ 20 bln
(in case of geological success)**



Exploration and development of Carpathian oil & gas region



Carpathian region is highly underexplored with significant up to 2.5 mln acres (10,000 sq.km) of free acreage available for E&A activities. Naftogaz Group (state-owned) is the largest owner of assets in Carpathian region: Brownfields (45 licenses) & Greenfields (16 licenses, incl. one PSA)

Ownership: under concession & PSA of Naftogaz Group

Land/area: Western Ukraine

Form of investment: partnership (under PSA, JV, RSC, service contracts)

Status: Naftogaz is in the process of acquisition of large 3D seismic project which covers ~400 ths. acres (1 600 sq.km) and all types of assets & according to plan will be performed in 2022-2023 year

Financial details

in case of geological success and based on gas price of US\$ 14/mcf (US\$ 400/ths. m3)

DPP: 5 years

NPV: US\$ 1.8 bln

IRR: 68 %

PI: 1,9

WACC: 15,3%

Technical information

Berestyanska PSA (Blocks 1-3) with

- Estimated ultimate recovery (P50): 265 bcf (7.5 bcm)
- Depths: 6,500 ft – 13,000 ft (2 – 4 km)
- Expected initial production rates per well: 0.7-3.5 mmcf/day (20-100 ths.m3/day)
- Minimum commitments under PSA: to invest \$18 mln, drill 2 wells & cover 24,700 acres (100 sq.km) by 3D seismic

Greenfields: 15 licenses with

- Estimated ultimate recovery (P50): ~1.9 Tcf (52.5 bcm)
- Depths of potential deposits: 5250 ft -18000 ft (1.6 – 5.5 km)
- Expected initial production rates per well: 0,7-7 mmcf/day (20-200 ths.m3/day)

Expected results

Potential of the Carpathian Region in case of geological success (unrisked) is assessed at up to 42.1 bcf (1.2 bcm) incremental production per annum

Carpathian region has significant advantages in terms of investing:

- Safe region (most distanced region from active war zone)
- Location of large gas storages, direct gas transit to EU
- Significant discoveries in neighboring countries across the Carpathians border
- Substantial potential on shallow horizons with depth less than 13,000 ft (4 km)

Total estimated investment: US\$ 2.8 bln (in case of geological success)

Construction of a methanol production facility with a power of 20 ths t/year



Project goal

- Creation of own production of methanol for internal use (1st stage)
- Utilization of excess carbon dioxide released from natural gas or gas turbine compressors (2nd stage)

Ownership: Controlling interest will be held by Naftogaz Group

Land/area: Poltava region (Lviv region as an alternative)

Construction period: conventional methanol technology - 18 months (1st stage); with the transition to green methanol technology – 18 months (2nd stage)

Form of investment: equity capital of partners and external financing (export credit financing)

Financial details and project economics will be clarified on the next project stage

Technical information

Methanol - technical grade A:

- Natural gas as a feedstock (1st stage)
- Using carbon dioxide and "green" hydrogen as feedstock (2nd stage)

Power – 20,000 tons/year of rectified methanol

The range of capacity utilization – 75-110% of the nominal capacity

Working hours – 24/7, 8,760 hours/year

Expected results

- Ensuring a stable methanol production and supply chain
- Covering the Company's methanol needs to ensure uninterrupted production
- Building own plant will reduce the cost of methanol:
 - 3.0 times when producing from natural gas (1st stage);
 - 5.0 times when produced from carbon dioxide (2nd stage)

Total estimated investment:

Conventional methanol technology (1st stage) - US\$ 21 mln

Green methanol technology (2nd stage) - US\$ 59 mln

Construction of biomethane plant production and CO2 liquefaction



Key facts

Ownership: controlling interest will be held by Naftogaz Group

Land/area: Kyiv region

Project goal: strengthen Ukraine's energy independence via production of substitute product to natural gas from renewable sources

Construction period: 1.5 years

Form of investment: equity capital of partners and external financing (export credit financing)

Technical information

Biogas production: 29 mmcm per year

Biomethane production: 16 mmcm per year

CO2 liquefaction: 15 kt per year

Biogas will be produced by fermenting of animal waste and intermediate crops (corn, wheat silage)

The production of biomethane will be ensured by membrane purification of biogas

In addition, during membrane purification, CO₂ will be released and liquefied

A by-product of production is digestate, which is used in agriculture as a fertilizer



Financial details

DPP: 13 years

NPV: US\$ 2 mln

IRR: 17.3%

PI: 1.1

WACC: 12.9%

Expected results

- Decrease in natural gas import dependence – 16 mmcma
- Strengthen of energy resilience of Ukraine
- Carbon-negative production – capture and liquefaction of CO₂ of up to 15 kta
- Pilot project as a demonstration project to encourage biomethane production market in Ukraine

Total estimated investment US\$ 17 mln

Construction of combined heat and power plants: Portfolio of bio-CHPs



Key facts

Ownership: controlling interest expected to be held by local municipalities, Naftogaz Group acting as energy developer

Land/area: defined on the map

Project goal: diversify energy supply sources and improve the quality of energy supply in the city

Construction period: 10.5 months (every project)

Form of investment: equity capital and external financing

Technical information

Feedstock: Number of projects: 7 CHPs

Total installed capacity:

CHPs based on wood chips: Electrical – 25 MW;
Thermal – 70 MW

CHPs based on agricultural waste: Electrical – 18 MW;
Thermal – 60 MW

Annual electricity generation: 315 mln kWh

Annual heat generation: 541 mln kWh
wood chips and agricultural waste



Financial details

(on portfolio basis)

DPP: 13.7 years

NPV: US\$ 33.5 mln

IRR: 16.1%

PI: 1.2

WACC: 12.9%

Expected results

- Decrease in natural gas import dependence (substitution of up to 62 mmcm per year, due to the use of wood chips and agricultural waste as feedstock)
- Strengthen of energy resilience of Ukraine

Total estimated investment: US\$ 168 mln

Gas Transmission System Operator of Ukraine

Reconstruction of compressor station Dykanka



Key facts

Ownership: state-owned

Land/area: near Dykanka village (Poltava district, Poltava region)

Project goal: optimization of GTS capacities in the process of transporting gas for internal clients

Construction period: 2024-2025

Form of investment: debt capital / grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere.
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market

Financial details

DPP: 18,27 years

NPV: 62,5 mln US\$

IRR: 27,43%

PI: 1,98

WACC (US\$): 26,4%

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction object’s idle time caused by malfunction of equipment

Total estimated investment 95,64 mln US\$



Gas Transmission System Operator of Ukraine

Reconstruction of compressor station Dolyna-2



Key facts

Ownership: state-owned

Land/area: near Kniazholuka village (Kalush district, Ivano-Frankivsk region)

Project goal: optimization of GTS capacities in the process of transporting gas for internal clients

Construction period: 2024 – 2025

Form of investment: debt capital / grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market



Financial details

DPP: 8,6 years

NPV: 91,167 mln US\$

IRR: 31,4%

PI: 2,5

WACC (US\$): 26,4%

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction object’s idle time caused by malfunction of equipment

Total estimated investment 102,75 mln US\$

Gas Transmission System Operator of Ukraine

Reconstruction of compressor station Krasyliv



Key facts

Ownership: state-owned

Land/area: near Krasyliv town (Khmelnyskyi district, Khmelnytskyi region)

Project goal: optimization of GTS capacities in the process of transporting gas for internal clients

Construction period: 2024 - 2025

Form of investment: debt capital / grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market



Financial details

DPP: 18,27 years

NPV: 30,2 mln US\$

IRR: 21,7%

PI: 1,44

WACC (US\$): 26,4%

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction object’s idle time caused by malfunction of equipment

Total estimated investment 83,2 mln US\$

Gas Transmission System Operator of Ukraine

Reconstruction of compressor station CS-16 Oleksandrivka



Key facts

Ownership: state-owned

Land/area: near Haiove village (Oleksandriv district, Kirovohrad region)

Project goal: optimization of GTS capacities in the process of transporting gas for internal clients in obverse or reverse modes

Construction period: 2024 – 2025

Form of investment: debt capital / grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market

Financial details

DPP: exceeds the estimated period of operation

NPV: minus 11,93 mln US\$

IRR: 9,6%

PI: 0,74

WACC (US\$): 26,4%

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction object’s idle time caused by malfunction of equipment

Total estimated investment 71,96 mln US\$



Gas Transmission System Operator of Ukraine

Reconstruction of compressor station Berdychiv



Key facts

Ownership: state-owned

Land/area: near Berdychiv town (Berdychiv district, Zhytomyr region)

Project goal: optimization of GTS capacities in the process of transporting gas for internal clients

Construction period: 2024 – 2025

Form of investment: debt capital / grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market



Financial details

DPP: 18,27 years

NPV: 6,99 mln US\$

IRR: 15,26%

PI: 1,1

WACC (US\$): 26,4%

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction object’s idle time caused by malfunction of equipment

Total estimated investment 94,3 mln US\$

Gas Transmission System Operator of Ukraine

Reconstruction of compressor station Uzhhorod



Key facts

Ownership: state-owned

Land/area: near Chaslivtsi village (Uzhhorod district, Zakarpattya region)

Project goal: optimization of GTS capacities in the process of transporting gas for internal clients in obverse or reverse modes

Construction period: 2024 – 2025

Form of investment: debt capital / grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market

Financial details

DPP: exceeds the estimated period of operation

NPV: minus 7,6 mln US\$

IRR: 11,72%

PI: 0,87

WACC (US\$): 26,4%

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction object’s idle time caused by malfunction of equipment

Total estimated investment 81,28 mln US\$



Gas Transmission System Operator of Ukraine

Reconstruction of compressor station Komarno



Key facts

Ownership: state-owned

Land/area: near Komarno town (Lviv district, Lviv region)

Project goal: optimization of GTS capacities in the process of transporting gas to Poland in obverse or reverse modes

Construction period: 2025 - 2027

Form of investment: grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market
5. Increasing firm gas import capacities from Poland to Ukraine
6. Support in restoring the operation of the existing Ukraine-Poland interconnector

Financial details

DPP: *

NPV: *

IRR: *

PI: *

WACC (US\$): *

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction object’s idle time caused by malfunction of equipment

Total estimated investment 105,12* mln US\$

**Will be specified based on the results of the feasibility study (work in progress)*



Gas Transmission System Operator of Ukraine

Reconstruction of compressor station CS-21 Bohorodchany



Key facts

Ownership: state-owned

Land/area: near Bohorodchany town (Ivano-Frankivsk district, Ivano-Frankivsk region)

Project goal: optimization of GTS capacities in the process of transporting gas for internal clients

Construction period: 2025 - 2027

Form of investment: grant financing from IFIs

Technical arguments

1. Replacement of inefficient, environmentally harmful and materially outdated equipment with modern equipment that meets all environmental requirements, namely compliance with EU Directives in terms of limit emissions of harmful substances into the atmosphere
2. Implementation of measures for energy efficiency, energy saving and reduction of greenhouse gas emissions, which will lead to significant improvement of environmental indicators
3. Ensuring long-term “security of supply” for Ukrainian customers in case of Russian gas transit interruption through the territory of Ukraine
4. Extending assets’ useful life for the needs of Ukrainian internal market

Financial details

DPP: *

NPV: *

IRR: *

PI: *

WACC (US\$): *

Expected results

1. Reduction of fuel gas consumption
2. Reduction of equipment repair costs
3. Reduction of object’s idle time caused by malfunction of equipment

Total estimated investment*

**Will be specified based on the results of the feasibility study (work in progress)*



GTS redesign and optimization



Key facts

Ownership: state-owned

Land/area: GTS elements (CS, GDS, linear part) selected for optimization, except for the reconstruction of the priority CSs (presented as a separate project)

Project goal: modernization of Ukraine's GTS in accordance with market needs in order to ensure "security of supply" and cost-effective tariffs for gas transportation for Ukrainian consumers

Construction period: 2022 – 2025

Form of investment: debt capital / grant financing from IFIs

Financial details

DPP: *

NPV: *

IRR: *

PI: *

WACC (US\$): *

Total estimated investment ~ 1 bln US\$*

**Will be specified based on the results of the future gas transmission system capacities utilization analysis and its redesign requirements development*

Technical arguments

1. There is an urgent need to redesign and optimize the operation of Ukraine's GTS as a result of market and military factors impact (transit / internal market / import) in order to ensure "security of supply" for Ukrainian consumers and to avoid the need for a significant increase in natural gas transportation tariffs for Ukrainian consumers
2. Redundant and inefficient capacities that generate additional costs for the operation of Ukraine's GTS
3. A significant assets operation period and a low level of their automation
4. The diversity of the main equipment, limited access to spare parts produced in the soviet union
5. Possibility of alternative use of the optimized capacities

Expected results

1. Operating costs reduction due to optimization of excessive GTS capacities, as well as modernization of the utilized facilities of the GTS incl. reconstruction of compressor stations (presented as a separate project on the previous slides), reconstruction and automation of gas distribution stations, repair and replacement of selected gas trunk pipelines
2. Creation of new jobs through the implementation of investment projects

Biomethane market development



Key facts

Ownership: private

Land/area: not determined yet (the project consists in creating a special fund to finance the construction of biomethane plants with a capacity of ~ 1 bcm per year)

Project goal: realization of the potential for biomethane production to replace a significant share of natural gas consumption and reduce the need for imported resources (in the long-term, the possibility for Ukraine to become a net exporter on the natural gas and biomethane markets)

Construction period: 2022 –2032

Form of investment: grant financing from IFIs

Financial details

DPP: *

NPV: *

IRR: *

PI: *

WACC (US\$): *

Technical arguments

1. The need to fulfill Ukraine's international obligations on decarbonization, increase the share of ecologically neutral energy sources
2. Growing demand among European suppliers and consumers for renewable gases, particularly biomethane
3. Premium for manufacturers in the form of payment for Guarantee of origin
4. The increase in the price of natural gas
5. High potential in the production of biomethane in Ukraine: significant areas of agricultural land and significant waste from agricultural production

Expected results

In case of full implementation:

1. Potential GDP growth – 2,7-3,9 mln US\$
2. Additional job places – about 10-15 ths

Total estimated investment from 2 to 4 bln US\$ depending on the size of biomethane equipment*

** To be specified based on the results of further analysis*

Ensuring Ukraine's need for energy resources as a result of the development of the hydrogen market and integration into the EU hydrogen market



Key facts

Ownership: state-owned

Land/area: not determined yet (the project is multi-stage – from updating the national hydrogen strategy 2030 to providing domestic industry with self-produced hydrogen and exporting hydrogen to the EU)

Project goal: realization of the potential for hydrogen production to replace a significant share of natural gas consumption and reduce the need for imported resources

Construction period: 2022 – 2032

Form of investment: grant financing from IFIs

Financial details

DPP: *

NPV: *

IRR: *

PI: *

WACC (US\$): *

Technical arguments

1. Growing demand among European suppliers and consumers for hydrogen
2. The increase in the price of natural gas
3. The possibility of transformation of the domestic chemical industry by switching to the use of green hydrogen for the production of environmentally friendly (green) ammonia; and metallurgy through the introduction of direct iron recovery technology
4. High potential in the production of hydrogen from excess capacities of NPPs, HPPs and RES in Ukraine
5. There is a developed infrastructure for pipeline transportation of energy resources to the EU
6. The possibility of creating a significant number of new highly qualified job places
7. GTS usage prolongation

Expected results

N/A

Total estimated investment*

* To be specified based on the results of further analysis since the project is multi-stage