Kremenchuk District Heating Renovation Project

Key results:

- 25,000 people in the Rakovka District of Kremenchuk City have continuous access to reliable and more affordable heating (20 pct. increase of average hours of supply per year) and hot tap water.
- Demonstration of the potential cost savings from using modern efficient equipment and renewable energy for district heating.
- Demonstration of the potential CO_2 emission savings, expected 10,600 t CO2/year, from using modern efficient equipment and renewable energy for district heating.

Justification for support:

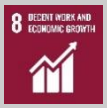
- The project promotes Danish development priorities of supporting inclusive and sustainable growth, cf. World 2030. Moreover, the project is aligned with the Danish Neighbourhood Programme (DANEP) 2017-2021, that focus on energy efficiency in Ukraine.
- Ukraine is an important partner in the EU neighbourhood and Denmark has an interest in Ukraine's positive development.
- The project is aligned to the Ukraine Energy Strategy 2017-2035, which emphasises energy security and efficiency, and addresses concerns raised by Kremenchuk City and Teploenergo utility.
- The project will have a significant development impact by ensuring reliable and affordable heating for the population in Rakovka and reduction of CO2 emissions.
- The partnership between Danida Sustainable Infrastructure Finance and NEFCO is a learning opportunity for DSIF.

Major risks and challenges:

- Deterioration of the political situation of Ukraine.
- Fragile financial situation of the district heating company, which requires continued subsidies from the City Government or tariff increases.

File No.	2020-42168				
Country	Ukraine				
Responsible Unit	Danida Sustainable Infrastructure Finance				
Sector	Energy				
DKK mill.	**2020**	**2021**	**2022**	**2023**	**Total**
Commitment	38,1				38,1
Projected annual Disbursements		38,1			38,1
Duration	2020-2023				
Finance Act code.	06.38.01.13				
Head of unit	Signe Albjerg/Morten Elkjær (IFU)				
Desk officer	Lone Bøge Jensen/Maike Hebogård Schäfer /Annemette Ditlevsen (IFU)				
Financial officer	Marie Gro Svendsen				

Relevant SDGs

Primary impact	 Affordable and Clean Energy	 Sustainable Cities and Communities	 Partnerships for the Goals
Secondary impact	 Good Health and Well-Being	 Decent Work and Economic Growth	 Climate Action

Total construction project budget: DKK 94,6 million
Of which DSIF cash grant financing: DKK 33,1 million
DSIF total grant commitment (cash grant + TA): DKK 38,1 million

Grant element according to OECD definitions and regulations (Concessionality level):
35% of total project investment

Strategic objective:

The overall Project objective is to maintain the life, health and environment in the Rakovka district of the city of Kremenchuk by securing reliable and affordable heating and hot-tap water.

Justification for choice of partner:

Kremenchuk Teploenergo is the district heating utility, owned by the City Government of Kremenchuk. Its primary business is to provide reliable and sustainable heating for households, public buildings and commercial areas within the City of Kremenchuk. Teploenergo is considered a technically capable company.

Summary

The district heating system in Rakovka District of Kremenchuk City is in bad shape. The gas-fired boiler house providing heating and hot water has long passed its designed lifetime, and the distribution system is inefficient, leading to considerable heat loss. The boiler house is scheduled for closure within the next year. There is an urgent need for a renewal of the system. The proposed project consists of two new 20 MW gas-fired boilers and one 4 MW biomass boiler, a Central Heat Accumulator Tank, 122 individual Heat Substations, network improvements and installation of a Centralised Supervisory Control and Data Acquisition System (SCADA). This is an investment in energy efficiency with a substantial life time emission reduction impact. The project provides a bridge to renewable energy based systems with biomass technology, which holds a significant potential in Ukraine.

Budget for construction project (not including Technical Assistance)

Million DKK	**Total**	**Share**
Output 1. 4 MW biomass Boiler House	20.1	
Output 2. 2 x 20 MW gas Boiler House	41.0	
Output 3. 3,000 M3 Central Heat Accumulator Tank	3.7	
Output 4. 0.7 km network Improvements	1.2	
Output 5. 122 new Individual Heat Substations	12.4	
Output 6. Installation of SCADA system	1.1	
Contingencies (5%)	3.7	
VAT	11.4	
Total budget (incl. VAT)	**94.6**	
Of which:		
City of Kremenchuk	16.8	18%
NEFCO	44.7	47%
DSIF grant	33.1	35%

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ACRONYMS

DANEP	Danish Neighbourhood Programme
Danida	Danish International Development Aid
DBF	Danida Business Finance (now DSIF)
DCFTA	Deep and Comprehensive Free Trade Agreement
DKK	Danish kroner (1 Euro = 7.44 DKK, 1 USD = 6.60 DKK)
DSIF	Danida Sustainable Infrastructure Finance (earlier DBF)
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ESA	Environmental and Social Analysis
ESAP	Environmental and Social Action Plan
FS	Feasibility Study
GoU	Government of Ukraine
IFC	International Finance Corporation (part of World Bank Group)
IFU	Investment Fund for Developing Countries
IMF	International Monetary Fund
MECI	Ministry of Energy and Coal Industry
Minregion	Ministry of Regional Development, Construction and Housing and Communal Services of Ukraine
MW	Megawatt (1 MW = 1,000 kilo Watt = 1,000,000 Watt)
NEFCO	Nordic Environment Finance Corporation
NEIF	Neighbourhood Energy Investment Fund
NEURC	National Energy and Utilities Regulatory Commission
PIU	Project Implementation Unit
SCADA	Centralized Supervisory Control and Data Acquisition
SDG	Sustainable Development Goals
ToR	Terms of Reference
UAH	Hryvna (1 Euro = 30 Hryvna)
UDEC	Ukraine Denmark Energy Centre

1 Introduction

Ukraine is area wise the second largest country on the European continent. A close and strategically important neighbour to the EU, Ukraine is a lower middle-income country facing a range of development challenges, including rehabilitation of run-down critical infrastructure. The present Danish Country Programme with Ukraine is an integrated part of the Danish Neighbourhood Programme, through which Danish-Ukraine development cooperation has evolved since 2004. This DSIF engagement is another concrete demonstration of Denmark's commitment to support Ukraine's sustainable development.

Danida Sustainable Infrastructure Finance (DSIF) is supporting the sustainable and inclusive growth objective of the Danish-Ukraine cooperation through strengthening of the local governments' ability to deliver public heating services, as well as ensuring energy efficiency. This project will in particular support UN Sustainable Development Goals 7 on Clean and affordable Energy, 13 on Climate Action and 17 on Partnerships for goals.

Earlier this year, the Danish Ministry of Foreign Affairs and the Government of Ukraine entered into a Memorandum of Understanding, supportive of DSIF engagements in Ukraine. In parallel to the drafting of the agreement, DSIF and the Nordic Environment Finance Corporation (NEFCO) have been collaborating on a financing model to offer loans to Ukrainian municipalities. NEFCO is an international financial institution founded by the Nordic countries with the purpose of providing loans for investments in green growth and climate mitigation and adaptation. The Kremenchuk District Heating Renovation project is the second of three joint DSIF-NEFCO-projects (the first was endorsed by Danida Council for Development Policy in October 2020). The DSIF-NEFCO model allows for the realization of projects that have important benefits to communities and the country, but which are not otherwise financially viable. At the same time, DSIF obtains experience in Ukraine through working with a trusted and experienced partner.

The project comprises of prioritised rehabilitation tasks identified in the long-term investment plan for the Rakovka district heating system. The total construction budget is DKK 94.6 million and comprises a new 4 MW biomass boiler house, two 20 MW gas boiler houses, a central heat accumulator tank, 122 individual heat substations, as well as 700 meters of network improvements and a new monitoring system. The relative expensive biomass plant is justified by the purpose of producing hot tap water outside the heating season and by the demonstration effect of introducing cost efficient renewable energy for district heating.

DSIF provides a grant element of DKK 33.1 million to supplement the NEFCO loan of DKK 44.7 million to the City of Kremenchuk (beneficiary), where NEFCO takes the credit risk with a municipal guarantee. The City of Kremenchuk provides the remaining project funding of DKK 16.8 million. DSIF was in charge of the project preparation (feasibility studies) and NEFCO will be responsible for project implementation, which implies an open international tender for the contract of works. Based on a request from the City of Kremenchuk, DSIF will fund technical assistance (estimated DKK 5 million) for the project.

The feasibility study for the project was undertaken by Ramboll. The feasibility study and a draft Project Document were finalised in February 2020. An independent consultant carried out an appraisal in April 2020 (as a desk-study due to COVID-19) and the recommendations from this report have been included in the present Project Document.

2 Project Context

2.1 Socio-economic context

Since the 'Maidan' uprising in February 2014, Ukraine has experienced acute political, economic and security challenges, including the outbreak of conflict in Eastern Ukraine and the Russian annexation of Crimea. President Volodymyr Zelenskyy won the election in April 2019 with 73 per cent of the votes and his government is committed to ambitious and wide-ranging reforms in order to improve trust in public institutions and combat widespread corruption. One of President Zelenskyy's main electoral promises was to end the conflict in Eastern Ukraine, where Russian-supported separatists are in power in parts of two provinces, but despite some progress, a solution still seems far away.

After an abrupt decline in GDP in 2014-2015, the Ukrainian economy has showed some improvement, with growth rates reaching 3.2 per cent in 2019. However, manufacturing and investment growth remained weak and GDP per capita is still very low: 2,660 USD in 2018[1]. Before the COVID-19 pandemic the expectations for 2020 was continued consolidation and an annual growth around 3 per cent. The impact of the pandemic is presently difficult to predict, but the restrictions due to the pandemic, lower remittances from workers, due to the decline in economic activity in Poland and other EU countries, and lower commodity prices contribute to the prediction that the Ukrainian economy will contract with 8.2% in 2020 (IMF, June 2020).

2.2 The socio-economic situation in Kremenchuk

Kremenchuk is an important industrial city in central Ukraine, located on both banks of the Dnieper River, with a population of approximately 219,000 people (2019). The Rakovka District is located on the right bank of the Dnieper River in Kremenchuk. Residents typically live in low- and high-rise apartment buildings, two to nine stories high. The project area includes the Kremenchuk City Hospital, the Secondary Vocational School Number 6 and some industrial and construction enterprises. The project area is not located within any designated nature sites, nature reserves or existing nor proposed natural heritage areas.

The project mainly targets the population in Rakovka district, where the majority depend on the district heating system for heating and hot water. Reliable district heating is essential in Kremenchuk, where the temperatures during winter are below zero Celsius. Faced with the low level of service, the more well-off people have the option to disconnect from the district heating system and invest in their own solutions. However, the data presented in the Feasibility Study show that most of the households continue to depend on the district heating, indicating that individual solutions are expensive. The project is thus a contribution to improving the service for the poorer segments of the population, and to securing the human right to adequate housing with basic services, which include heating.

2.3 The energy sector: policies, district heating and the biomass market

Energy authorities and policies

The key authorities in Ukraine's energy sector governance and regulatory framework include the Ministry of Energy and Coal Industry (MECI) and the National Energy and Utilities Regulatory Commission (NEURC). MECI forms and implements state policy within the energy sector and reports progress to the Cabinet of Ministers, as well as the Rada (parliament) and the Presidential Administration. MECI and NEURC remain central to regulating the country's energy sector, particularly in setting tariff policies and

1 https://datacatalog.worldbank.org/dataset/gni-capita-ranking-atlas-method-and-ppp-based

in implementing relevant pricing policy. The Ministry of Regional Development, Construction and Housing and Communal Services of Ukraine (MinRegion) is responsible for policy guiding district heating.

Ukraine's primary energy source is coal (30%), closely followed by natural gas (28%) and nuclear energy (24%), with only 5% from renewable sources (2018). The Energy Strategy of Ukraine 2017-2035, aims at making the energy market more sustainable and reaching 25% renewable energy by 2035. It promotes energy security and efficiency, market development and independence, investment attractiveness, and environmental considerations. The strategy also targets network integration with the EU for electric power and gas complexes.

The strategy is divided into three phases: (i) seeking to achieve energy sector reform; (ii) infrastructural development and optimisation (by 2025), and (iii) long-run sustainable development. Within each phase, the strategy lists key targets and objectives based on energy sub-sectors. One important use of energy is for district heating.

District heating

Ukraine is among the largest district heating markets in the world. Most of the district heating infrastructure was built during the Soviet times and has much lower resource and energy efficiency than modern ones. The situation is aggravated by deterioration of the assets due to inadequate maintenance over a long period of time. Consequently, the district heating systems in Ukraine have high losses of energy, resulting in very high CO2 and other emissions, due to an overwhelming share of fossil fuels in the fuel mix. Natural gas is by far the most important fuel and number one expenditure for district heating utilities.

The district heating companies in Ukraine are owned and managed by Local Governments. The tariffs are approved by the National Energy and Utilities Regulatory Commission (NEURC). As a result of low tariffs and poor management, financial sustainability is low[2] in particular after 2014 when significant increases in natural gas prices were enacted. Gaps in the operating cash flow of district heating companies are typically covered by the State, municipalities and through accumulation of debts to the State-owned gas company Naftogaz.

International Development Partners, including the World Bank, have recommended reforms of the district heating sector, and in May 2018[3] an 'Action Plan for the Implementation of the Concept of District Heating Sector Reform' was formally adopted by the cabinet of Ministers. One of the key expected outcomes of the reform is the creation of transparent, stable and predictable regulatory and business environment, under which district heating utilities can attract investments for modernization. For the last few years, a major source of financing for district heating modernisation investments has been international financial institutions, including the World Bank, European Bank for Reconstruction and Development (EBRD), the European Investment Bank (EIB) and NEFCO.

Biomass market

Ukraine is considered to have potential within biomass, both from extensive forests in the North-Western parts of the country and from agricultural production. It is Government policy to increase the use of biomass as part of the policy to diminish the present high dependency on imported coal and natural gas.

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2 Modernization of the District Heating Systems in Ukraine: Heat Metering and Consumption-Based Billing. ESMAP/WB 2012

3 '*Setting the agenda for further district heating reform in Ukraine*', ESMAP/WB May 2019

In general, although the potential of solar energy and wind power is high in specific regions, biomass is the renewable energy source with the greatest potential across all regions in Ukraine. If just a fraction of the 120 million tonnes of biomass feedstock (including crop production, waste, animal, wood and food processing residues) produced yearly in Ukraine could be sold to biomass electricity and heat generators, not only would agricultural businesses gain from the trade, but they would be able to guarantee supply for numerous operators in the biomass sector[4]. There is a gradually growing interest in the use of different kinds of biomass, in particular pellets, which have economic and environmental benefits compared to non-processed biomass.

2.4 The present situation for the district heating in Kremenchuk

Kremenchuk's district heating system is mainly centralized and supplies thermal energy for heating and hot tap water to connected buildings. All current boiler houses use gaseous fuel. District heating is supplied during the winter season from November to April, with most boilers closed down during the summer season from May to October.

The city has two district heating utilities. The Poltavaoblenergo utility, owned by the provincial authorities and supplies the majority of district heating, including all of the left bank of the Dnieper river. Kremenchuk Teploenergo utility, owned by Kremenchuk City, supplies district heating to multiple districts on the right bank. The Teploenergo supply system is split into seven individual areas that are not connected to each other, one of which is Rakovka District, which is the target of the project implementation.

To provide district heating to the approximately 25,000 residents of Rakovka District, Teploenergo currently purchases heat produced by a boiler house located at, and owned by, the Kryukov Railway Car Building Factory. This boiler is out-dated and very inefficient, and the provider has informed the city's authorities of their intention to stop supplying heat to the district heating system in 2020. Teploenergo owns the distribution networks and large parts of the network are in urgent need of upgrade or repair. Much of the infrastructure for distribution was installed in the 1960s, meaning that it is operating beyond its intended operational lifetime and should be replaced with modern and technically advanced solutions capable of providing better fuel efficiency. The general heat loss in the system varies across the city, with an average heat loss in the system of around 30-35%.

In cases when a customer cannot - or will not pay - the heating bill, Teploenergo is unable to stop the supply of heat to an individual apartment without stopping the supply of heat to the entire building. This means that Teploenergo has to cover the deficit. With planned tariff raises on gas, there is a growing concern that Teploenergo will have an increasing number of non-paying customers / households. Thus, there is considerable political and economic pressure to modernize the system in order to deliver reliable heating services to justify future adjustments of tariff increases.

2.5 Relation to other relevant partners and actors

Ukraine has received sizeable support from international financial institutions and multilateral and bilateral donors. On top is the EU and EU-countries, which in the 5-year period 2014-2019 committed 16 billion Euro (through EBRD, EIB, the EU Commission and bilateral aid), of which 65% was disbursed. IMF committed in the same period 28.5 billion Euro, of which half was disbursed. Other mayor development partners were the World Bank Group, USA, Canada and Japan.

4 Ibid.

A host of international development partners are engaged in the Energy Sector. Among the bigger ones is IFC (World Bank Group), which has a USD 235 million programme with MinRegion for boosting energy efficiency in the residential sector in the period 2019-2022. Another important partner is NEFCO.

3 Danish priorities, interests, and strengths

3.1 Key Danish policies and priorities

The project supports the Danish Strategy for Development Cooperation and Humanitarian Action 'World 2030', by facilitating investments within one of the strategy's four strategic aims, namely "inclusive and sustainable growth with a special focus on energy, water, agriculture, food and other areas, where Denmark has particular knowledge, resources and interests". The project also supports the broader Danish strategic framework for cooperation with Ukraine and the Strategy for the Danish Neighbourhood Programme (DANEP) 2017-2021.

Denmark is actively pursuing foreign and security policy goals in relation to the EU approximation process and the EU response to the security situation in Ukraine. The goal is to support peaceful and prosperous development in an important neighbouring country to the EU, by supporting the governments' reform programmes and sustainable and inclusive growth. The EU is by far the largest development partner in Ukraine, supporting democracy and human rights, rule of law, good governance and sustainable development. DANEP supports the EU programmes on decentralization and anti-corruption and aims at complementing the EU assistance through targeted and flexible interventions. One of the targeted engagements focuses on climate and improved energy efficiency.

A mid-term review of the DANEP programme in 2019-20 recommended 1) continued support to the Ukraine-Danish Energy Center (UDEC) and the Ukraine-Denmark Energy Partnership Programme (UDEPP), 2) facilitation of new investments in the energy sector from IFU and 3) posting a growth advisor at the Embassy in Kiev. The Danish embassy in Ukraine will have an important role in ensuring coherence and coordination between this investment and the new energy partnership, in line with the coherence aspect of Danida Doing Development Different (DDD) agenda. The mid-term review also suggested involving new Danish partners in order to pave the way for future opportunities for cooperation with Denmark beyond traditional development assistance. The second phase of Ukraine-Denmark Energy Partnership Programme (UDEPP) is presently being formulated, with an estimated start during the first half of 2021.

The DSIF framework agreement with Ukraine focuses on concrete investments within the energy, water and sanitation sectors.

The project is highly relevant in the overall context of Danish cooperation with Ukraine:

- The main aim of the project is energy saving solutions and includes integration of renewable energy (biomass), thereby contributing directly to the Danish engagement in the energy sector.
- The project draws on Danish know-how to provide up-to-date solutions within district heating, energy savings and biomass-based boiler technology, and opens opportunities for Danish contractors and suppliers, which is in line with the Danish Neighbourhood Programme (DANEP) 2017-2021 focus on in e*conomic diplomacy and market opportunities* within strategic areas like energy efficiency, renewable energy and green technology.

The project aligns with DSIF's guiding principles as follows:

- The project is economically beneficial, but **not viable under commercial conditions.**

- IFC performance standards and **UN guiding principles** for business and human rights are reflected in the guidelines of NEFCO, who will be DSIF's main partner.
- The project will be tendered based on **total life cycle cost**, including operating cost (e.g. cost-effectiveness of energy efficiency).
- Contributing to **poverty reduction indirectly** by supporting sustainable public infrastructure in line with the SDGs. DSIF-funding is well-suited for single-project investments in urban/peri-urban areas with a mix of poor/non-poor populations.
- The project supports the Government of Ukraine's 2017 'Energy Strategy of Ukraine until 2035', in particular the goal of promoting energy security and efficiency;
- The project will be tendered in accordance with NEFCO rules, which require an open international tender. This is compatible with existing DSIF regulations, which allow for untying from Danish bidders under certain circumstances.

3.2 Main Danish strengths and lessons learned

The Danish Embassy has extensive experience with Ukrainian government institutions and development partners, in particular the EU. Through DANEP, the Embassy holds regular meetings with national authorities responsible for service provisions at local level. Due to the close and open dialogue with the Danish Energy Agency (DEA) and relevant ministries in Ukraine, including access to local authorities, the embassy is in a good position to support NEFCO and DSIF in the implementation of the project.

The on-going government-to-government energy cooperation between Denmark and Ukraine initiated under DANEP and implemented by Danish Energy Agency has been focusing on strengthening the enabling environment for sustainable energy, energy efficiency and district heating since 2014. A new 5-year Ukraine-Denmark Energy Partnership Programme starting in 2021 is currently under formulation with the ambition of continuing the long-term cooperation on energy planning, renewable energy integration, and economic diplomacy. The latter aspect, coupled with the provided technical assistance to improve the regulatory framework conditions for energy efficiency, district heating and renewable energy projects, is of particular relevance and offers potential synergies with this DSIF project.

The Danish Investment Fund for Developing Countries (IFU) has the technical and operational responsibility for DSIF and the project will be able to draw on lessons learned and relations established by IFU during many years of engagement. Historically, IFU has had a significant portfolio in Ukraine and estimates indicate that approximately 300 Danish enterprises are active in Ukraine. An important component of DANEP is the Neighbourhood Energy Investment Fund (NEIF) implemented by IFU. NEIF covers investments in Ukraine and Georgia, and aims to strengthen IFU's strategic focus on renewable energy and energy efficiency in Ukraine. NEIF builds on lessons learnt from the Ukraine Investment Facility (UFA) and the Neighbourhood Energy Facility (NEF), both implemented by IFU in the periods 2016-2019 and 2014-2017, respectively.

NEFCO's local presence and resources can provide added value to a DSIF project. In parallel to the this project, DSIF is currently collaborating with NEFCO in developing two wastewater treatment projects, one in Zaporizhzhia and one in Lviv. With these three projects, DSIF and NEFCO are testing a finance model where NEFCO will be responsible for project implementation. As NEFCO rules prescribe an open international tender, the NEFCO-DSIF finance model will furthermore provide lessons learned of including Danish green solutions and know-how in project design without tying the contract to Danish suppliers.

Danish companies in the energy sector have expertise within all the main elements of the present project: district heating, energy efficiency and biomass. Danish industrial capacities and know-how match the present project very well. The business environment is challenging. However, the safeguards imbedded in the implementation procedures of NEFCO backed by the support from DSIF and the Embassy are considered sufficient to persuade potentials bidders to participate in the tendering process, even if Ukraine has a reputation for opaqueness in relations between business and government.

4 Strategic considerations and justification

This project is in its core fully aligned with Denmark's environment and climate priorities, as well as technical skills development based on the transfer of Danish expertise. The main strategic considerations behind the proposed project are:

- The project will have a significant development impact by ensuring reliable and affordable heating for the population in Rakovka District (SDG 11 Sustainable Cities and Communities) and reducing the emissions of CO2 from using modern efficient equipment, as well as partial use of biomass (SDG 7 "Affordable and clean energy").
- The project provides a demonstration effect, likely resulting in replication in other localities of Ukraine. The project promotes the transfer and diffusion of environmentally sound technologies by implementing up-to-date district heating technology (SDG 17 Partnerships for the Goals), implying potential cost and CO2 savings, which will likely inspire further renovation projects in the district heating sector (SDG 13).
- Ukraine is an important partner in the EU neighbourhood and Denmark has an interest in Ukraine's positive development. The project is aligned to Ukraine's Energy Strategy 2017-2035, which emphasises energy security and efficiency, and addresses concerns raised by Kremenchuk City and Teploenergo utility.
- The project promotes Danish development priorities of supporting inclusive and sustainable growth, cf. 'World 2030', by ensuring reliable and affordable heating and hot tap water. Moreover, the project is aligned with the Danish Neighbourhood Programme (DANEP) 2017-2021 focus on energy covering Ukraine and Georgia.
- The partnership between Danida Sustainable Infrastructure Finance and NEFCO is a learning opportunity for adjustments to the DSIF-model. The combination of NEFCO's experience with local authorities in Ukraine and a finance model resting on results-based green finance will reduce the risk and increase the probability of successful implementation.

5 Theory of change

The theory of change builds on the following pathways, all of which are subject to the main contextual risk of a deteriorating economic and political situation in the country, which could result in social conflicts and slowdown in the implementation of the reforms of the energy sector.

- By upgrading critical parts of the existing district heating system in Kremenchuk City, the project will ensure improved reliable and affordable basic service in the form of heating and hot tap water services for the 25,000 users of the existing system, thereby contributing to sustainable long-term socio-economic development of the city. The City government will provide own financing of the project. This is a precondition for the loan agreement. Furthermore, it is an assumption that the

staff of Teploenergo has the capacity to operate the new plant and the new technologies of the biomass boiler house.

- The renovation of the district heating system will improve the energy efficiency considerably, bringing down the total cost recovery by tariffs from a necessary tariff increase of 43 pct. to 33 pct. (including repayment of the loan). By reducing operational costs, the company will have the financial capacity to further rehabilitate the piping system and thereby increase energy efficiency, and cost savings. The key assumption for this to happen is continued political will of the municipal government to support the long-term development of the district heating system by subsidising Teploenergo's budget.
- It is expected that the project could have a broader development impact by demonstrating energy efficiency and cost savings from introduction of state-of-the-art technology and savings in CO2 emissions from using efficient technology and renewable energy for district heating. It is a precondition for the investment in the biomass boiler house that the municipality obtains a commitment from local producers of agro-pellets to supply the plant. The potential for replicating use of biomass plants for district heating is subject to the future development of the market for biomass fuel in Ukraine.

6 Project objectives and impact assessment

6.1 Project objectives

The overall project objective is to maintain the life, health and environment in the Rakovka district in the city of Kremenchuk by securing reliable and affordable heating and hot-tap water.

The outcomes are a continuous heating service for 25,000 people in Rakovka district, energy savings and avoided CO2 emissions with the indicators shown below. See Annex 3 for the list of outputs.

Thematic Programme title		**Kremenchuk District Heating Renovation Project**	
Thematic Programme Objective		To maintain the life, health and environment in the Rakovka district in the city of Kremenchuk by securing reliable and affordable heating and hot-tap water	
Impact indicator 1		Service level as average hours of supply per year	
Baseline	Year	2019	10.950
Target	Year	2028	13.140
Outcome 1		25,000 residents in Rakovka District have continuous access to reliable and affordable heating and hot tap water with minimal disruptions due to network repairs	
Outcome indicator		Number of pipe bursts per year	
Baseline	Year	2018	15
5 year target	Year	2028	0
Outcome 2		Demonstration of the potential cost savings from using modern efficient equipment and renewable energy for district heating	
Outcome indicator		Euros saved annually from increased energy efficiency and partial use of biomass instead of natural gas	

Baseline	Year	2019	0
5 year target	Year	2028	€1,632,000
Outcome 3		Demonstration of the potential CO_2 emission savings from using modern efficient equipment and renewable energy for district heating	
Outcome indicator		Tonnes of CO_2 emissions avoided annually through higher energy efficiency and use of biomass	
Baseline	Year	2019	0
5 year target	Year	2028	10,600 t CO_2/year

6.2 Social and Environmental Impact assessment

The main positive *social impact* of the project is the improved heating supply, thereby contributing to securing the human right to adequate housing with basic services, especially for the poorest segments of the population. The main positive *environmental impact* is a reduction in CO2 emissions due to improved energy efficiency and the introduction of biomass as fuel.

The Feasibility Study included an Environmental and Social Analysis (ESA). To ensure compliance with the IFC Performance Standards, an Environmental and Social Action Plan (ESAP) has been developed (see Annex 7). The ESAP includes the tasks of the Project Implementation Unit (PIU) to complete.

The ESAP concludes the following regarding *the environmental impact*:

- The main negative environmental impact from the project is during construction (dust, noise etc.). A Traffic Management Plan for the construction phase will be included in the contract of works.
- In order to ensure a safe handling of waste during construction the ESAP includes a waste management plan and a final construction waste report as part of the contract of works.
- A separate Environmental Impact Assessment in accordance with the Ukraine law needs to be produced. The Environmental Impact Assessment will be prepared by the PIU and the recommendations implemented by the PIU before the construction of the plant can start.

The Appraisal recommended developing a waste management plan for the ashes produced by the biomass boiler. The task will included in the final ESAP and implementation of the plan will be managed by the Project Implementation Unit once the detailed project design is finalised.

The negative *social impact* of the project is considered to be minor and can be mitigated by using well established international standards for e.g. working conditions at the construction site and compensations to project-affected people living in the neighbourhood of the new boiling houses.

The project is not expected to result in physical displacement or resettlement of households. However, some people's property and livelihood may be affected. In order to mitigate the impact on affected people, the ESAP includes a Livelihood Restoration Plan following the procedures and standards described in IFC performance standards on Environmental and Social Sustainability.

Main actions described in the ESAP regarding *social impact*:

- Elaboration of a livelihood restoration plan and establishment of mechanisms for grievances, combined with communication strategy for informing and engaging the local community during preparation and implementation of the project.
- Elaboration of a Health, Work and Safety Plan for the construction and operational phases of the plant. The plan will have a separate focus on the biomass plant (storage and handling of the biomass). A health and occupational safety specialist will be hired by the PIU who will be responsible for implementation of the plan.

7 Management arrangement

7.1 Project setup

A Project Implementation Unit (PIU) will be set up by the city of Kremenchuk for the implementation of the project. The PIU will consist of employees from Teploenergo and the City of Kremenchuk. The PIU will be assisted by a qualified consultant team ("the Consultant"), engaged by NEFCO and funded by DSIF. The Consultant will support the project implementation in accordance with the NEFCO "Guide to Municipal Investment Projects" and provide capacity building during all phases of project implementation, including hands-on training in the project procedures system, financial management system and project management system. The Consultant will monitor and evaluate the progress of the project implementation and report to NEFCO. The Consultant will also act as liaison between Teploenergo and a Danish utility provider engaged in a possible twinning arrangement.

NEFCO will monitor the work of the PIU and the Consultant, including the administrative and financial management, which is standard NEFCO proceeding. The specific duties of the PIU assisted by the Consultant comprise, among others, the elaboration of plans and reports, carrying out the tendering process (in an open, international tendering), and ensuring compliance with environmental and social requirements in Ukraine as well as the requirements of DSIF and NEFCO.

The Environmental and Social Analysis (ESA) in the Feasibility Study points to a series of issues that need to be addressed. These issues are included as specific actions in the Terms of Reference (ToR) for the PIU, and will also be part of the Consultants assistance:

- Elaboration, public consultation and approval of an Environmental Impact Assessment according to Ukrainian regulations (which according to the Feasibility Study is a requirement);
- Development of a project specific Waste Management Plan;
- A study of the local market for biomass from the agricultural sector, including transformation to agro-pellets, and an analysis of the sustainability of the envisaged biomass supply chain;
- Elaboration of an Environmental Risk Summary Report for the Project and an Environmental Management Plan;
- Development of a Livelihood Restoration Framework according to IFC Performance Standards;
- Elaboration of a Health, Work and Safety risks assessment related in particular to the biomass plant (storage and handling of the biomass).

7.2 Operation and maintenance

Institutional capacity of Teploenergo

According to the Feasibility study, Teploenergo has quite good capacity at the technical level, and the operation and management of the rehabilitated system should not constitute a major challenge. However, the company is assessed to be weaker when it comes to overall management.

The Consultant assisting the PIU will assess the need for capacity building both in overall management functions and the technical capacity of Teploenergo staff responsible for operating the new technology introduced, in particular in the operation of the biomass boiler house. The Consultant will be responsible for providing the needed capacity building, while technical operational training will be part of the contract of works.

Fjernvarme Fyn has been involved in the preparation of the project and the possibility of involving a Danish district heating company a twinning arrangement focusing on practical operational support and training has been discussed and will be further explored during the design phase.

Financial sustainability of Teploenergo

Once the project has been commissioned, Teploenergo has the full responsibility for operation and management of the district heating system. The analysis of Teploenergo's finances in the Feasibility Study shows that the company in 2018 had a loss of 6.7 million Hryvna (UAH) (1.637.000 DKK), which constitutes around 3% of total revenue. The cash flow was slightly positive. Approximately 45% of the revenue came from subsidies from the state and city budget, despite a hike in tariffs of 35-41% in the period 2016-2018. The company is thus far from being financially sustainable.

The main financial benefit from the investments of the project is energy efficiency and savings on fuel costs. As an isolated investment, the project will improve the finances of Teploenergo, even taking into account the repayment of the loan from NEFCO.

Taking into account the crucial importance of the heating services and the political sensitivity of increasing tariffs, Teploenergo will most likely be dependent on subsidies also after the rehabilitation of the district heating system.

The biomass supply chain

The project plans to use agricultural waste for the biomass part of the heat generation (4 MW out of 44 MW). The Feasibility Study has verified that there are biomass resources in the area around Kremenchuk, and that the preferred fuel for the biomass boiler is pellets manufactured from agricultural waste. However, it is not yet clear how the biomass supply can be organised, i.e. which farms will supply the biomass and how it will be collected, transformed and transported. It will therefore be a task for the PIU to make a more detailed analysis of the supply chain and its sustainability.

Budget	**DKK million**	**Share**
Output 1. 4 MW biomass Boiler House	20.1	
Output 2. 2 x 20 MW gas Boiler House	41.0	
Output 3. 3,000 M3 Central Heat Accumulator Tank	3.7	
Output 4. 0.7 km network Improvements	1.2	
Output 5. 122 new Individual Heat Substations	12.4	
Output 6. Installation of SCADA system	1.1	

Contingencies (5%)	11.4	
VAT	3.7	
Total budget (incl. VAT)	**94.6**	
Funding provided by:		
City of Kremenchuk	16.8	18%
NEFCO loan	44.7	47%
DSIF grant	33.1	35%
DSIF-financed Technical Assistance, incl. 20% margin	5.0	
DSIF total grant (appropriation)	**38.1**	

The boiler houses (output 1 and 2) establish a new production capacity for the Rakovka district heating system, with the biomass boiler reducing the dependence on natural gas. The total 44 MW capacity is deemed adequate to cover peak loads. The biomass boiler and one of the gas boilers will be located close to the existing boiler house, while the second gas boiler will be build at a separate site.

The heat accumulator tank (output 3) provides the thermal storage necessary to cope with demand variation, since a biomass boiler has a low ability to modulate its output compared to a gas boiler.

As part of the project, the district's 4-pipe system will be reduced to a modern 2-pipe system. Instead of providing hot tap water through separate pipes from the existing central heat stations, new building-based individual heat substations will provide the hot tap water (output 5). These modern substations change the system from fixed flow to variable flow, which will result in a significant reduction in the network's heat loss as well as a reduction in operation and maintenance costs. To optimise this investment, 700 meters of additional transits pipes are needed to centralise substations for some buildings (output 4). Several pipe sections in the remaining network are in critical condition and will be gradually upgraded by Teploenergo.

Introducing the SCADA system (output 6) ensures continuous optimisation of the heat-generating equipment and efficient remote control and management of the district heating system in real time.

The technical assistance component of the budget will be provided through a NEFCO contract with a consulting company possessing adequate experience in management of infrastructure projects. The contract will be financed by DSIF.

The budget estimate is based upon the tenders of a recent NEFCO project. In case the costs are higher than allowed for in the budget, the City of Kremenchuk will finance the difference.

8 Procurement

The Project will be tendered using the NEFCO tendering process for contractors in accordance with NEFCO Procurement Guidelines (12 December 2013). The guidelines comply with DSIF requirements, processes and safeguards, and call for open international tendering with fair and transparent processes. Safeguards against corruption include that NEFCO reviews and provides no-objection to the

procurement and contract administration processes, i.e. the tender documents, as well as to the tender evaluation and contract award procedures. The same safeguards are also used in DSIF implemented projects. The NEFCO Policy on Anti-Corruption and Compliance (December 2019) requires that all stakeholders under NEFCO-financed contracts observe the highest standard of transparency and integrity during the procurement, execution and implementation of such contracts.

9 Lending arrangements and financial management

According to the Framework Agreement between DSIF and NEFCO, NEFCO provides a loan, while DSIF provides a grant to soften the conditions of the NEFCO loan and a grant for procurement of technical assistance. The City of Kremenchuk will provide the remaining funding for the project. DSIF will disburse the grant directly to NEFCO. NEFCO will be responsible for financial management, procurement and physical implementation and monitoring. NEFCO will report to DSIF quarterly.

NEFCO takes the credit risk without requirement for a guarantee from the export credit agency. Hence, the NEFCO loan will not be guaranteed by the Danish official development budget, as would be the case in a DSIF project financed by a commercial bank.

10 Risk Management, preconditions and monitoring

10.1 Risks

This section presents the main risks, while Annex 4 outlines the full set of risks.

The main ***contextual risks*** are:

- The deterioration of the political situation in Ukraine and the conflict in the Eastern part of the country, as it affects the environment in which Teploenergo will be operating, including the speed of the reforms in the energy sector. However, the impact on the project is considered to be minor. Teploenergo is providing a basic service in Kremenchuk, and the service is unlikely to be interrupted due to national politics.
- The impact from COVID-19, which may imply a considerable deterioration of the economy and the financial situation of the Government. This may affect the capacity of the city to continue subsidising the district heating systems.

The main ***programmatic risks*** are:

- The capacity of Teploenergo to manage the rehabilitated system may be insufficient. This risk is considered unlikely, given the technical capacity of the staff, but the impact would be major. Among the mitigating actions are training of the technical staff, and a possible twinning with a Danish utility.
- The financial capacity of Teploenergo may be insufficient to ensure a proper maintenance of the new system. The project will in itself reduce operational cost and reduce the need for major repairs during the first 5-10 years of operation. However, some subsidies from the city will be needed and there will be a risk that the city may chose not to reduce subsidise to district heating. District heating is a basic public service also for the poorest segments of the population and it is considered likely that the city council will prioritise to continue ensuring a proper service level.
- For the biomass boiler, the main risk is related to the price of the biomass, and the local capacity to transform the biomass into agro-pellets, which will be the fuel for the boiler. This risk is difficult to assess given the lack of a study of the local market for biomass and the transformation

capacity. The mitigating action is the elaboration of a biomass supply plan that will by part of the ToR of the PIU support consultants and the ToR for the PIU.

The main ***institutional risk*** is:

- Irregularities during tender and construction. This risk is considered to be low, as NEFCO will be managing the process and has substantial experience in operating in the opaque and complex environment in Ukraine.

10.2 Preconditions

DSIF's main development partner in the project is NEFCO, who will be responsible for implementing the grant for the subsidy linked to the NEFCO loan to the City of Kremenchuk.

In the agreement between NEFCO and the City, it will be a pre-condition that the City confirms available local funding on an annual basis before disbursements under the loan can be made.

Before the DSIF Grant for the loan is transferred from DSIF to NEFCO, the following conditions shall be met:

- Approval of the project by Denmark's Minister for Development Cooperation.
- Final Investment Approval of the project by NEFCO Board.
- Environmental and Social Action Plan (ESAP) revised based on results of Environmental Impact Assessment and accepted by DSIF. The ESAP includes biomass supply planning and a plan for disposal of ashes from the biomass boiler.
- Key terms of the NEFCO loan agreement, acceptable to DSIF, signed by NEFCO and the Ukrainian project owner.

11 Monitoring and communication

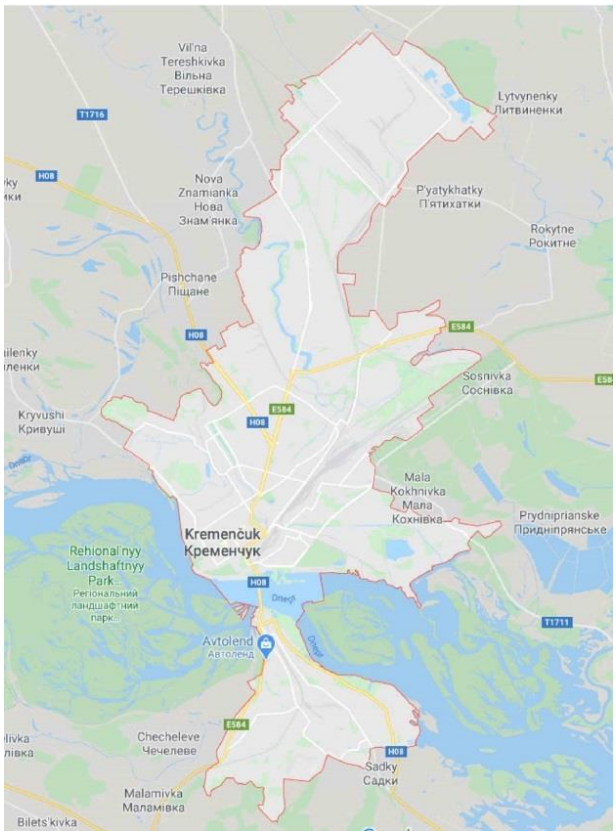
11.1 Monitoring mechanisms

The PIU will be required to review the baseline data for the results indicators and, if needed, suggest changes to these indicators. The PIU support consultants will assist the PIU and Teploenergo in monitoring the results framework and updating the indicators on an annual basis. Reporting format and requirements are defined in the DSIF-NEFCO framework agreement.

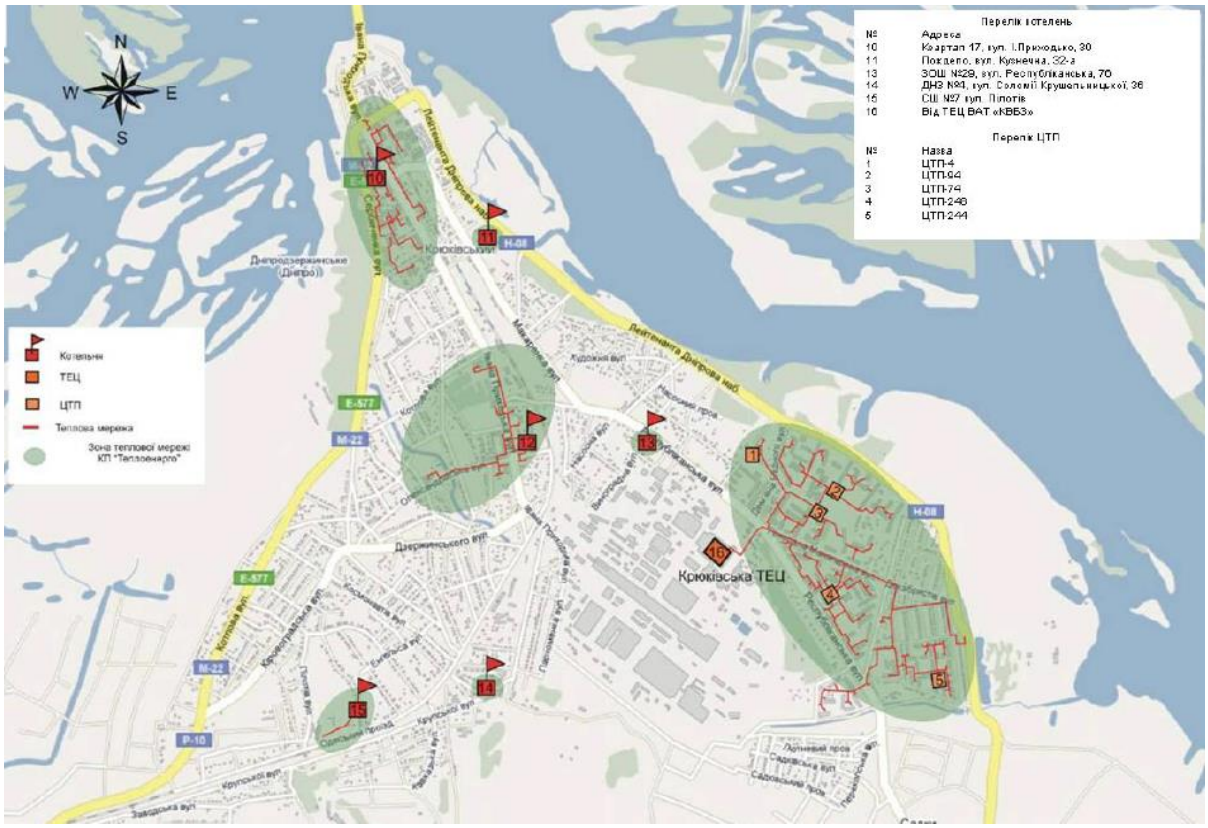
DSIF shall have the right to carry out any technical or financial revision that is considered necessary to monitor the implementation of the project. After termination of the project support, DSIF reserves the right to carry out an evaluation of the project.

The PIU support consultant will 5 years after commissioning make an evaluation to assess whether the expected impact has been achieved.

Annex 1. Maps of the Kremenchuk District Heating System



Map 1. Kremenchuk City (left bank in the north, right bank in the south)



Map 2. Teploenergo service areas on the right bank. Rakovka district on bottom right, currently supplied by Boiler House 16.

Annex 2. Partners

Kremenchuk Teploenergo

Kremenchuk Teploenergo is a natural monopoly entity in the district heating sector. Its primary business is to provide reliable and sustainable heat for private households, public buildings and commercial areas within the City of Kremenchuk.

Teploenergo currently employs a total of 373 people of which 112 are women. In terms of main infrastructure, the company has 18 boiler houses that provide a total of 84,222 Gcal/h; 46 central heat substations; and approximately 217,641km of heating pipe network. All boiler-houses operate on natural gas and all operate during the heating season (mid-October to mid-April) but only 6 boiler-houses operate during the summer season (May-September).

The company produces heat from the combustion of natural gas as purchased from NJSC Naftogaz of Ukraine under contract. The gas is supplied through regional distribution companies that enter into tripartite agreements for gas supply. The prices are updated regularly by the signing of new contracts. From June 1, 2019 gas prices are set in accordance to the Decree of the Cabinet of Ministers of Ukraine dated 04.04.2019 No. 293. The company also purchases heat from the third party 'Kryukov Railway Car Building Factory'. The factory has a boiler house generating excess heat and is located within City on their 100-hectare facility site located at 139 Prihodko Street.

Nordic Environmental Finance Corporation, NEFCO

NEFCO was established in 1990 by the five Nordic countries with an aim to finance environmental and climate projects of interest to the Nordic countries. NEFCO has a particular focus on Eastern Europe, as well as the Baltic Sea, Arctic and Barents regions. NEFCO is working closely with various partnerships and global organisations) and is a trusted partner to IFU and the Danish Ministry of Foreign Affairs, e.g. via a Trust Fund Agreement implementing Energy Efficiency Demonstration Projects in Georgia. NEFCO has extensive experience working in Ukraine in cooperation with other IFIs and DFIs, such as Sida and the European Bank for Reconstruction and Development (EBRD).

Summary of key partner features

Partner name	Core business	Importance	Influence	Contribution	Capacity	Exit strategy
What is the name of the partner?	What is the main business, interest and goal of the partner?	How important is the programme for the partner's activity-level (Low, medium high)?	How much influence does the partner have over the programme (low, medium, high)?	What will be the partner's main contribution?	What are the main issues emerging from the assessment of the partner's capacity?	What is the strategy for exiting the partnership?
Kremenchuk District Heating Renovation Project						
Teploenergo (Kremenchuk District Heating Company)	The Company's primary business is to provide reliable and sustainable heat for private households, public buildings and commercial areas in Kremenchuk "the City".	High. Without the assistance of the programme there is a high risk 25 000 residents will not have access to a reliable and sustainable heating source.	High.	The Company will provide a skilled workforce to populate and manage the Project Implementation Unit (PIU). Via the City, funds will also be provided to assist in the finance of the Project.	The Company has a good professional and technical capacity. However, the Company does not have experience of procuring and managing Construction contracts and requires assistance in this regard.	The project is limited to the period of construction and commissioning.

Annex 3. Results Matrix

Thematic Programme title		**Kremenchuk District Heating Renovation Project**	
Thematic Programme Objective		To maintain the life, health and environment in the Rakovka district in the city of Kremenchuk by securing reliable and affordable heating and hot-tap water	
Impact indicator		Service level as average hours of supply per year	
Baseline	Year	2019	10.950
Target	Year	2028	13.140
Outcome 1		25,000 residents in Rakovka District have continuous access to reliable and affordable heating and hot tap water with minimal disruptions due to network repairs	
Outcome indicator		Number of pipe bursts per year.	
Baseline	Year	2018	15
5 year target	Year	2028	0
Outcome 2		Demonstration of the potential cost savings from using modern efficient equipment and renewable energy for district heating	
Outcome indicator		Euros saved annually from increased energy efficiency and partial use of biomass instead of natural gas	
Baseline	Year	2019	0
5 year target	Year	2028	€1,632,000
Outcome 3		Demonstration of the potential CO_2 emission savings from using modern efficient equipment and renewable energy for district heating	
Outcome indicator		Tonnes of CO_2 emissions avoided annually through higher energy efficiency and use of biomass	
Baseline	Year	2019	0
5 year target	Year	2028	10,600 t CO_2/year
Output 1		Construction of a 4 MW biomass boiler house	
Output indicator		MW of biomass boiler house in place and operational	
Baseline	Year	2019	0
Annual target	Year 1	2023	4 MW
Output 2		Construction of 2x20 MW natural gas boiler house	
Output indicator		MW of gas boiler houses in place and operational	
Baseline	Year	2019	0
Annual target	Year 1	2023	2x20 MW
Output 3		Construction of 3,000 m^3 semi-pressurized hot water storage tank	
Output indicator		Capacity for storage of hot water in m3	
Baseline	Year	2019	0
Annual target	Year 1	2023	3,000 m^3

Output 4		Improvements of the heating network	
Output indicator		Km of pipelines rehabilitated	
Baseline	Year	2019	0
Annual target	Year 1	2023	0.7 km
Output 5		Construction of 122 heat substations	
Output indicator		Number of substations in place and operational	
Baseline	Year	2019	0
Annual target	Year 1	2023	122
Output 6		Installation of a Centralized Supervisory Control and Data Acquisition (SCADA) system	
Output indicator		SCADA system in place and operational	
Baseline	Year	2019	0
Annual target	Year 1	2023	1

Annex 4. Risk Management Matrix

Contextual risks

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
The main contextual risk is a deterioration of the political situation in Ukraine and increased conflicts in the eastern part of the country, as it affects the environment in which Teploenergo will be operating, including the speed of the reforms in the energy sector.	Likely	Minor	EU and individual EU countries (including Denmark) have committed to continue supporting Ukraine economically and politically. This will possibly mitigate the impact.	Minor	Teploenergo is providing a vital service in Kremenchuk, and the service is unlikely to be interrupted due to national politics or economics. However, the quality of the maintenance may deteriorate.
The impact from COVID-19 which may imply a considerable deterioration of the economy and the financial situation of the Government. This may affect the capacity to continue subsidising the district heating systems.	Likely	Minor	As above	Minor	As above

Programmatic risks

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
The City does not make the agreed local contribution to the project.	Unlikely	Major	NEFCO will be have close communication with the City Government to ensure that it continues to support the project.	Minor	The project has very high priority for the City Government. The experience during the project preparation is that the City officials are competent and fully behind the project.
Contract tenders received are higher than the budget.	Unlikely	Major	There is a contingency included in the project budget.	Minor	The price estimates are based on recent tenders for similar projects.
The capacity of Teploenergo to manage the rehabilitated system may be insufficient.	Unlikely	Significant	A training package is included in the project.	Minor	According to the Feasibility Study, the technical capacity of Teploenergo is quite good. However, training in the specific equipment to be used in the project will be needed.

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
The financial capacity of Teploenergo may be insufficient to ensure a proper maintenance of the new system.	Likely	Significant	EU and individual EU countries (including Denmark) have committed to continue supporting Ukraine economically and politically. This will possibly mitigate the impact. The planned twinning arrangement between a Danish utility and Teploenergo is also put in place to aid in capability building.	Minor	The District Heating sector is caught between the Government's need to increase heating tariffs to make the systems financially sustainable and the need to secure affordable heating for the poorer segments of the population. The impact will probably not be felt very much the first 5-10 years where there should not be much need for replacement of equipment, if it is operated properly, but in the medium term this may become more of a problem. It should be noted that the rehabilitation in itself will lower the operational costs and the need for repairs in Rakovka District.
There may not be sufficient biomass available at a reasonable price for the biomass part of the project, and the local capacity to transform the biomass into agro-pellets may not be sufficient.	Likely	Significant	The project implementation unit will be responsible for including af biomass supply plan in the final Environmental and Social Impact Assessment that will ensure sufficient agro-pellets for the plant.	Minor	The Feasibility Study has analysed the availability of biomass in the region and concluded that it is abundant. The doubt is more related to the supply chain, including the transformation into agro-pellets.
Natural gas price increases to an unaffordable level for City Consumers	Possible	Major	Introduction of biomass fuel supply chain to the market will open up for an alternative fuel supply.	Minor	If gas prices are increased further and there is not a corresponding increase in the heating tariff, the company will need higher subsidies. One way or another, it is unlikely that the district heating sector will be left to default.

Institutional risks

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
Possible corruption during tendering could affect DSIF and NEFCO reputation.	Unlikely	Significant	NEFCO will be fully responsible for the PIU and will carry out the tendering following its own proceedings.	Insignificant as the safeguards will make it very difficult for corruption to take place	NEFCO has much experience in implementing projects in Ukraine.
Inadequate consultation and compensation to the project affected people	Unlikely	Significant	The scope of work for the PIU will include full adherence to IFC Performance Standards. This will further be followed by the Monitoring Consultant.	The risk will still be there, but it will be minor.	As the project is mainly rehabilitation of an existing system, it is estimated to have low environmental and social impact. However, some people may be affected and this has to be analysed properly.

Annex 5. List of main material consulted

The materials used are listed in Annex 1. The main documents used, apart from the partner documentation, are the following:

Danida documents

1. '*Guiding Principles for Danida Business Finance*", April 2016
2. *'Aid Management Guidelines',* Danida;
3. *'Danida Business Finance',* Danida, January 2012*;*
4. *'Danida Business Finance, Rules for Procurement',* March 2017;
5. *'General Conditions for Loan Agreements and for the Provision and Administration of Interest Subsidy under the Mixed Credit Programme',* Danida, October 2010*;*
6. *'Plan of Action 2017-2020 for the Partnership between the Government of the Kingdom of Denmark and the Government of the Republic of Ethiopia',* Danish Ministry of Foreign Affairs and Government of Ethiopia;

Project documents:

7. '*Draft Final Report. Feasibility Study For Energy Efficiency Improvements In The District Heating System In Kremenchuk*, Rambøll, March 3, 2020 (including 7 annexes);
8. '*Concept note for Kremenchuk District Heating Renovation Project. First Draft, Danida Program Committee*', no date;
9. '*Strategic Framework for the Danish Neighbourhood Programme 2017-2021*', Danida, October 2017;
10. *'DANEP 2017-2021. Ukraine Country Programme Document',* Danida, October 2017;

Other documents

11. *'Performance Standard 5, "Land Acquisition and Involuntary Resettlement'*, IFC, April 30, 2006
12. '*Policy Brief on Green Economy options for Ukraine: Opportunities for greening the energy sector*', developed within the "*Greening Economies in the Eastern Neighbourhood*" (EaP GREEN) programme, under the coordination of the United Nations Environment Programme (UN Environment), Kiev-Geneve 2018;
13. *'Energy Strategy of Ukraine till 2035: New Security, Energy Efficiency, Competitive Ability. Brief description'*. Razumkov Centre, Kyiv, Ukraine;
14. '*Liberalizing Ukraine's Electricity Market: Benefits and Risks*', Andrian Prokip, May 6, 2019;
15. '*Ukraine. Recent Developments*.' World Bank, March 2030;
16. '*Market conditions for biomass-to-energy projects in Ukraine',* IFC, 2015;
17. '*Benefits and Costs of DCFTA: Evaluation of the Impact on Georgia, Moldova and Ukraine*', Amat Adarov and Peter Havlik, The Vienna Institute for International Economic Studies, December 2016;
18. *'Fostering Investment in the Biomass Sector in Ukraine*', OECD, December 2015;
19. '*Strategic guide for biomass heat policy in Ukraine*', S2Biom for EU, October 2016;
20. '*Modernization of the District Heating Systems in Ukraine: Heat Metering and Consumption-Based Billing*', Yadviga Semikolenova, Lauren Pierce, Denzel Hankinson, World Bank 2012;
21. *'Ukraine. Market opportunities for bioenergy*', NL Agency. Ministry of Economic Affairs, Agriculture and Innovation, Netherlands, September 2012;

22. '*REMAP 2030. Renewable Energy Prospects For Ukraine*', IRENA, April 2015;

23. '*Improving the performance of District Heating Systems in Central and Eastern Europe. 'District Heating in Ukraine*. Prepared by: KT-Energy LLC. Horizon 2020 (H2020-EE-2017-PPI). Project N°784966 (EU);

24. '*Snapshot of Ukraine's Energy Sector. Institutions, Governance and Policy Framework'*. OECD, October 2019;

25. '*Setting the agenda for further district heating reform in Ukraine*'. World Bank/ESMAP, May 2019;

26. 'Ukraine. Economic Update'. World Bank, November 19, 2019*;*

27. 'Upgrading the performance of district heating networks. Best practice instruments and tools for diagnosing and retrofitting of district heating networks', Carlo Winterscheid Solites – Steinbeis Research Institute for Solar and Sustainable Thermal Energy Systems Germany, for EU, September 2018;

Annex 6. Process Action Plan

	Activity/Output	Date	Responsible
1	Prepare Final Draft Programme Document for appraisal.	August 2020	Consultant
2	Appraisal	September 2020	Appraisal consultant
3	Prepare final Programme Document based on input from appraisal	September 2020	Consultant/DSIF
4	Presentation of the project to Minister	December 2020	UM/GJL
5	Final Project Approval by Danida	December 2020	Minister
6	Signing of NEFCO/DSIF agreement Form of Contribution letter + Handover to NEFCO	January 2021	DSIF/NEFCO
7	Procurement of PIU Consultant including pre-qualification.	August 2021	NEFCO/Teploenergo
8	Detailed design and preparation of tender documents	Jan-June 2021	Teploenergo/NEFCO/PIU Consultant
9	Tender of construction contracts and signing of contracts.	Sep-March 2022	Teploenergo/NEFCO/PIU Consultant
10	Contract effective – after signing and approval of Loan Agreement.	June 2022	NEFCO/Teploenergo Contractor
11	Construction of project	June 2022-June 2024	Contractor
12	Commissioning	July 2024	Contractor/Teploenergo

Annex 7. Plan for Communication of results

The plan is to include support for elaboration of a communication strategy into the ToR for the NEFCO/DSIF monitoring consultant, which will follow the project with periodic visits once the project starts. The monitoring consultant will thus have an important role in assisting NEFCO and DSIF in the communication of the results.

What? (the message)	**When?** (the timing)	**How?** (the platforms)	**Who?** (Target groups)	**Responsible and resources**
Denmark is bringing affordable and sustainable heating to people in Ukraine	• When the contract is signed • When the boilers and associated facilities are commissioned	• The IFU and NEFCO web pages • Ukrainian media (TV, newspapers) • Selected Danish media	• The Ukrainian and Danish public to ensure transparency and accountability of the use of Danish development funds	DSIF in cooperation with NEFCO
Danish companies are providing green solutions to Ukraine	• The timing is relatively open. Could be done during construction or after commissioning	• Communication Company /Consultant hired to propose and elaborate the product – e.g. a video.	• Private sector in Denmark and the Danish Public in general	DSIF in cooperation with NEFCO

Annex 8. Environmental and Social Action Plan (ESAP)

ENVIRONMENTAL AND SOCIAL ACTION PLAN (ESAP) FOR "*KREMENCHUK DH*"

No	Action	Deliverable / Completion Indicator	Timeline	Implementation responsibility	Comments
1. Environmental and Social Management Systems, Occupational health and safety					
1.1	Project specific Environmental and Social Management Plan (ESMP) to address the environmental and social impacts and issues identified, including a "Construction Environmental and Social Management Plan"	• Update Sponsor' existing Environmental and Social Management Plan (ESMP), or similar document, to include the company's activities • Appointing a person to be in charge of its implementation (EHS manager) • The program of environmental and social monitoring • Plan for training of staff on EHS issues	Prior construction and to be updated according to occurring needs	Project Implementation Unit with delegated authorities by the City Council	EHS requirements as well as staff training on EHS issues to be included in the construction contract(s) with EPC and sub-contractors
1.2	**Environmental Impact Assessment EIA** An Environmental Impact Assessment in accordance with Ukrainian Legislation as stated within the Law of Ukraine "On Environmental Impact Assessment" (2017) No. 2059 VIII (the "EIA Law") as per Article 3 Project Category 2 sub category 4. And ensure all environmental permits are in place	• Environmental Impact Assessment Report (EIA) • Measures depending upon the results of the EIA • All relevant environmental permits	Prior construction	Project Implementation Unit with delegated authorities by the City Council	Results from the EIA shall lead to changes in the ESAP
1.3	**Environmental and social risks** Environmental Risk Record is produced and summarized in an Environmental and Social Risk Summary Report for the Project.	• Environmental and social Risk Record	Prior construction and to be updated according to occurring needs	Project Implementation Unit with delegated authorities by the City Council	This should detail all the environmental threats to the Project with a risk determination of whether or not there are potential environmental threats that require further investigation.

No	Action	Deliverable / Completion Indicator	Timeline	Implementation responsibility	Comments
1.4	**Occupational Health and Safety** The updated Health, Work and Safety Plan for the construction and operational phases of the project should be developed to actively manage the health and safety of workers. The plan must include; hazard and risk identification; protection and prevention measures;measures relating to the storage and handling of biomass materials; safety behavioural programme and training; accident reporting and investigation procedure. The plan must be accessible to all workers and to the local community. Develop register for OHS incidents and record potential OHS incidents	• A Health and occupational safety specialist to be appointed or if already appointed to be assigned to this project • Health, Work and Safety Plan to be updated to reflect the proposed changes introduced by the Project. • Register for OHS incidents	Prior construction and to be updated according to occurring needs	Project Implementation Unit with delegated authorities by the City Council	
1.5	**Emergencies** Ensure that the project team and staff has a high level of preparedness for emergencies and major incidents (e.g. fire, explosion, etc.), Include the local community in the emergency plan.	• Emergency plan • Appointing a person to be in charge of its implementation (could be the EHS manager)	Prior construction and to be updated according to occurring needs	Project Implementation Unit with delegated authorities by the City Council	
1.6	**HR Policy** Ensure labour conditions/rights are in place for employees and contract workers.	• HR Policy including grievance mechanism for employees	Prior to construction	Project Implementation Unit with delegated authorities by the City Council	Labour condition requirements to be included in the construction contract(s) with EPC and sub-contractors

No	Action	Deliverable / Completion Indicator	Timeline	Implementation responsibility	Comments
2. Resources					
2.1	**Annual environmental reporting** Follow up of the environmental impacts by the project	• Annual report as specified by NEFCO	During operation	Project Implementation Unit with delegated authorities by the City Council	
2.2	**Energy balance reporting** Aim to increase the ratio between energy extracted and energy invested in the system	• Full and quantifiable reporting on energy extracted and energy invested based on energy flows and energy quality	During operation	Project Implementation Unit with delegated authorities by the City Council	To be available after first full financial year of operation This line item would be a part of the yearly environmental reporting to NEFCO
2.3	**Mass balance reporting** Aim to increase resource utilization	• Full and quantifiable reporting of volume streams to and from the system	During operation	Project Implementation Unit with delegated authorities by the City Council	To be available after first full financial year of operation This line item would be a part of the yearly environmental reporting to NEFCO
2.4	**Sustainable biomass for energy** Biomass must be supplied from sustainable sources. FSC Accreditation or a similar accreditation scheme for the biomass supply chain it chooses to use. The Company must document sustainability with regard to a range of criteria notably calculations of the carbon footprint in all parts of the value chain -from forest / farm to burning.	• Biomass Sustainability Certification, FSC Accreditation or a similar accreditation scheme or relevant documentation that the biomass used is a residual or waste product with no other alternative usages • Annual follow up on volumes, sources and sustainability of these sources	Prior operation and During operation	Project Implementation Unit with delegated authorities by the City Council	
3. Environmental protection					

No	Action	Deliverable / Completion Indicator	Timeline	Implementation responsibility	Comments
3.1	**Emission prevention and minimization** Best Available Techniques (BAT) are used to prevent and minimise operational emissions and incorporated into the Project at the design stage	• Design to be done according to the European Commission's Best Available Technique Reference Document (BREF)5 on Large Combustion Plants 5 Article 13(1) of the Industrial Emissions Directive (IED, 2010/75/EU)	Prior construction	Project Implementation Unit with delegated authorities by the City Council	BREF documents describe applied techniques, present emissions and consumption levels, techniques considered for determination of best available techniques as well as BAT conclusions and any emerging techniques.
3.2	**Flora and fauna** Ecological Impact Assessment to determine the presence of any protected flora or fauna species	• The Ecological Impact Assessment to be carried out • Mitigation measures depending upon the results of the field survey and the suggestions in the Ecological Impact Assessment	Prior construction	Project Implementation Unit with delegated authorities by the City Council	
3.3	**Ground** Ground Investigation Study where the Biomass Boiler House; the two Gas Boiler Houses; and the Central Heat Accumulator Tank are planned to be constructed.	• Ground Investigation Study	Prior construction	Project Implementation Unit with delegated authorities by the City Council	
3.4	**Noise and Vibration** The Noise and Vibration Impact Assessment should identify all sensitive receptors within the project area and suggest mitigation measures depending upon the results of the assessment.	• The Noise and Vibration Impact Assessment for both the construction and operational phases of the project	Prior construction	Project Implementation Unit with delegated authorities by the City Council	

No	Action	Deliverable / Completion Indicator	Timeline	Implementation responsibility	Comments
3.5	**Air quality and noise** Develop an adequate construction traffic management plan to prevent injuries and nuisance to third parties. Regulate route, time and speed of traffic used for construction to mitigate noise in the night time.	• Construction Traffic Management Plan, including routing plans, restrictions to timing of vehicle movements, temporary enabling works and parking suspensions • Operational Traffic Management Plan to manage the impact of vehicles delivering agro-pellets to the Biomass Boiler House.	Prior construction, Prior operation	Project Implementation Unit with delegated authorities by the City Council	To be included in the contractual agreement with suppliers to the project If necessary, provide wetting the roads in the dry season. Limit working hours during the construction phase (only on weekdays, daytime only).
3.6	**Waste** - Procedures for safe handling and storage of all waste materials prior to their removal off site (including hazardous and non-hazardous waste); - Methods to verify proper off-site management of related wastes by contract waste managers; - Measures to minimise waste generation and maximise reuse and recycling. - Waste Management practices should be in accordance with Waste Management Hierarchy.	• Final construction waste report, documenting quantities of wastes in different streams leaving the site. • Waste management plan, including a reporting template making it possible to track, trace and quantify waste streams from the project during operation	Prior construction During construction During operation	Project Implementation Unit with delegated authorities by the City Council	Construction waste report to be included in the contractual agreement with suppliers to the project
4. Community engagement					
4.1	**Stakeholder Engagement** Stakeholder Engagement Plan to be developed for the Project, including formal strategy to communicate with project stakeholders to achieve their support for the project, and including Grievance Mechanism to record and respond concerns associated with the project.	• Stakeholder Engagement Plan including Grievance Mechanism	At the start of the project and updated frequently as the project develops.	Project Implementation Unit with delegated authorities by the City Council	

No	Action	Deliverable / Completion Indicator	Timeline	Implementation responsibility	Comments
4.2	**Livelihood Restoration** Livelihood Restoration Framework to be developed This framework should outline the general principles, procedures and entitlement framework to produce a Livelihood Restoration Plan. The Livelihood Restoration Plan should establish the entitlements of affected persons and communities and should ensure that these are provided in a transparent, consistent and equitable manner.	• Livelihood Restoration Plan	Prior construction	Project Implementation Unit with delegated authorities by the City Council	
	Community Health and Safety and security plan including traffic management Ensure impact on community from mainly construction activities such as dust, noise and traffic accidents, are reduced and managed and proper mitigation measures are in place.	• Community Health and Safety Plan (including potential security and traffic aspects).	Prior construction	Project Implementation Unit with delegated authorities by the City Council	

Annex 9. Appraisal recommendations and follow-up

Rec. #	Recommendation	Responsible	Action
1	To reduce the risk related to the supply of biomass (agro-pellets) for the biomass boiler, it should be made a condition for DSIF support that there exist some sort of commitment from one or more providers of agro-pellets (provisional contract, Memorandum of Understanding or similar).	PIU	Included in ESAP, which is a precondition for the DSIF grant.
2	The issue of the disposal of the ashes from the biomass boiler is not clarified in the Feasibility Study or the Project Document (deposit in landfill, use as fertilizer or other?). This should be done before the approval of the project.	PIU	Included in ESAP, which is a precondition for the DSIF grant.
3	The Environmental and Social Assessment carried out by the Feasibility Study points to a series of issues that have to be addressed, but have not been so in the Feasibility Study. It is therefore recommended to explicitly make these issues part of the Terms of Reference for the Project Implementation Unit (and included in the Project Document). Among the issues to be included in the Terms of Reference for the PIU are: • Elaboration, public consultation and approval of an Environmental Impact Assessment according to Ukrainian regulations (which according to the Feasibility Study is a requirement); • A project specific Waste Management Plan should be developed; • A study of the local market for biomass from the agricultural sector, including transformation to agro-pellets, and an analysis of the sustainability of the envisaged biomass supply chain; • Elaboration of an Environmental Risk Summary Report for the Project and an Environmental Management Plan; • Development of a Livelihood Restoration Framework according to IFC Performance Standards; • Elaboration of a Health, Work and Safety risks assessment related in particular to the biomass plant (storage and handling of the biomass);	PIU	Made part of the ToR for the PIU Consultant

Annex 10. Quality Assurance checklist for Appraisal[5]

File number/F2 reference: 2020 - 11344

Programme/Project name: Kremenchuk District Heating Renovation Project

Programme/Project period: 2020-2023

Budget: DKK 38.1 million

Presentation of quality assurance process:

The project has undergone an independent appraisal in April 2020. The project was appraised according to Danida guidelines. Due to COVID-19 travel restrictions, the appraisal was desk-based, relying on video-meetings with the team behind the feasibility study (Ramboll). It is the overall impression that the appraisal has been thorough and that recommendations are appropriately reflected in the final project document.

☐ **X The design of the programme/project has been appraised by someone independent who has not been involved in the development of the programme/project.**

Comments: The appraisal was undertaken by PEM-consult, who was not part of the preparation of the project.

☐ **X The recommendations of the appraisal has been reflected upon in the final design of the programme/project**.

Comments: All recommendations have been accorded appropriate consideration during the finalization of the project document.

☐ **X The programme/project complies with Danida policies and Aid Management Guidelines.**

Comments: The project supports the overall Danish engagement in Ukraine and contributes directly to Danish development priorities of promoting inclusive and sustainable growth with a special focus on energy, water, agriculture, food and other areas, where Denmark has particular knowledge, resources and interests.

☐ **X The programme/project addresses relevant challenges and provides adequate responses.**

Comments: The appraisal concludes that that the project is relevant as a response to the challenges faced by Teploenergo. The project is completely aligned with Ukraine's Energy Strategy and the Danish Neighbourhood Programme. The proposal is based on a thorough analysis of the existing system and long-term investment programme. The interventions are assessed to be the most cost-efficient solution

5 This Quality Assurance Checklist should be used by the responsible MFA unit to document the quality assurance process of appropriations where TQS is not involved. The checklist does not replace an appraisal, but aims to help the responsible MFA unit ensure that key questions regarding the quality of the programme/project are asked and that the answers to these questions are properly documented and communicated to the approving authority.

with the given budget. Danish experts were consulted during project preparation and Danish know-how and expertise will be part of the proposed twinning arrangement.

□ X Issues related to HRBA/Gender, Green Growth and Environment have been addressed sufficiently.

Comments: The Feasibility Study included an Environmental and Social Analysis, and the project team has developed an Environmental and Social Action Plan, detailing the steps that need to be undertaken prior as well as during construction/operation. An Environmental Impact Assessment (EIA), as required by Ukrainian law, will be undertaken once the Project Implementation Unit has been established.

□ X Comments from the Danida Programme Committee have been addressed (if applicable).

Comments: Comments from the programme Committee have been reflected in the project document and in its preparation. The project document includes a better description of alignment with DANEP and the Ukraine country programme, the specific structure of the projects and the relationship between the different stakeholders. The feasibility study included an analysis of the financial situation of Teploenergo.

□ X The programme/project outcome(s) are found to be sustainable and is in line with the partner's development policies and strategies. Implementation modalities are well described and justified.

Comments: The project is in line with Ukraine's development policies and energy strategy, by making the Kremcenchuk district heating system more sustainable and shifting towards less dependence on imported fossil fuels. However, as remarked in the appraisal, the overall sustainability of the intervention is influenced by outside factors, including the tariffs paid by customers, subsidies provided by the government, the price of gas as well as the development of the local biomass market.

□ X The results framework, indicators and monitoring framework of the programme/project provide an adequate basis for monitoring results and outcome.

Comments: A few baselines will have to be established/verified during the final design/elaboration of tender documents.

□ X The programme/project is found sound budget-wise.

Comments: The proposal is based on a thorough analysis of the existing system and long-term investment programme. The appraisal concludes that project design choices are the most cost-efficient solution with the given budget. The budget estimate is based upon the tenders of a recent NEFCO project.

□ X The programme/project is found realistic in its time-schedule.

Comments:

□ X **Other donors involved in the same programme/project have been consulted, and possible harmonised common procedures for funding and monitoring have been explored.**

Comments: The project is a collaboration between DSIF and NEFCO, no other donors are involved.

□ **Key programme/project stakeholders have been identified, the choice of partner has been justified and criteria for selection have been documented.**

Comments: not relevant.

□ X **The executing partner(s) is/are found to have the capacity to properly manage, implement and report on the funds for the programme/project and lines of management responsibility are clear.**

Comments: NEFCO is considered a professional development organisation with extensive experience from Ukraine. The Project Implementation Unit (PIU), consisting of employees from Teploenergo and the City of Kremenchuk, will be assisted by a consultant throughout the tender process and during construction. The implementation consultant will be recruited by NEFCO and financed by DSIF.

□ X **Risks involved have been considered and risk management integrated in the programme/project document**.

Comments: The main risks and mitigation measures are included in the project document, while Annex 4 presents the full risk management matrix. The appraisal confirms the evaluation of risks, albeit with a downgrading of the contextual risk related to the political situation from major to minor, and proposes a mitigating action regarding the supply of biomass.

□ X **In conclusion, the programme/project can be recommended for approval: yes**

Date and signature of desk officer:	09.12.2020	Lone Bøge Jensen
Date and signature of management:	09.12.2020	Theo Ib Larsen