

Incorporation of Smart Monitoring System using
IoT Technology for District Heating and
Establishment of Renewable Energy Integration
Network Plan
in the District Heating system of Belgrade
(24 months/ USD 550,000)

Serbia

Project Concept Paper

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<i>Applicant Information</i>	
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PROJECT/PROGRAM CONCEPT PAPER (PCP)

SECTION 1. BASIC PROJECT INFORMATION		
1.1	Country	Republic of Serbia
1.2	Title	Incorporation of Smart Monitoring System using IoT Technology for District Heating and Establishment of Renewable Energy Integration Network Plan in the District Heating system of Belgrade
1.3	Location(s)	Belgrade city
1.4	Duration	24 months (2021-2022)
1.5	Budget (total)	US\$ 0.55 million
1.6	Objectives	Derivation of methodologies for improving the efficiency of district heating system and reducing greenhouse gas emissions in Belgrade
1.7	Beneficiary	Direct beneficiary is the PUC Beogradske elektrane as the managing company of district heating system in Belgrade city. Indirect beneficiary is the city government of Belgrade which owned PUC BE and the wider beneficiaries are customer of district heating in Belgrade which 305,000 households.
1.8	Counterpart organization	1. PUC Beogradske Elektrane (BE) 2. City of Belgrade

SECTION 2. PROJECT RATIONALE

SITUATION ANALYSIS: Please provide a brief introduction to the current social and economic situation related to the Project (geographic region and beneficiaries, etc.)

please describe the problem or critical issue which the project seeks to resolve, how the problem was identified, and how will the Project address the problem. If relevant, analysis on gender equality needs to be described.

According to the First Biennial Update Report of the Republic of Serbia under the UNFCCC (2016), emissions from the energy sector amounted to 49,661.06 Gg CO₂eq, or 79.4% of total GHG emissions in 2013. Since 2010, emissions have decreased by 2.6%, mainly as a result of lower consumption of diesel and gasoline in road transport and fuel consumption in manufacturing industries and construction. However, gross final energy consumption is expected to increase by 12.9% by 2020 compared to 2009, without the application of energy efficiency measures. The bulk of gross final energy consumption is related to the heating and cooling sector, which is projected to increase to the share of 45.5% in 2020. As such, improving energy efficiency in the heating and cooling sector is a national priority for Serbia. Furthermore, electricity consumption is relatively high, primarily due to the use of electricity for household heating and the low energy efficiency of buildings (mainly built in the 1970s and 1980s).

2.1

The DH system in Belgrade is the largest in Serbia and one of the largest in Europe with a total network length of 1,420 km and a capacity of over 2,800MW, almost half the total capacity in the country. PUC 'Beogradske Elektrane' (BE) manages the DH system which consists of three principal components: heat production plant, a distribution network for transporting heat and 8,700 energy transfer stations to transfer heat to buildings' central heating systems. The average age of the distribution network is 25 years. BE supplies heat to approximately 50% of households in Belgrade (over 305,000 households) and also maintains approximately 150 boilers in schools, kindergartens and social institutions.

The majority of the networks is run on natural gas boilers (85% of capacity) and fuel oil boilers (13% of capacity) with no waste heat from cogeneration or other sources being used and very little renewables (0.75% of capacity). The primary energy efficiency of the system is estimated to be 72%. Energy efficiency of the building stock is quite low, and the intensity of energy consumption is high. Belgrade's publicly owned DH operator BE has identified that the required level of capital investment, which is based on the expected cost of replacement of parts of heating network is approximately EUR 380 million to be allocated for life span of 25 years, giving an annual level of required investments in the amount of EUR 15,232,000. The operator has also identified the need for fuel substitution and is considering

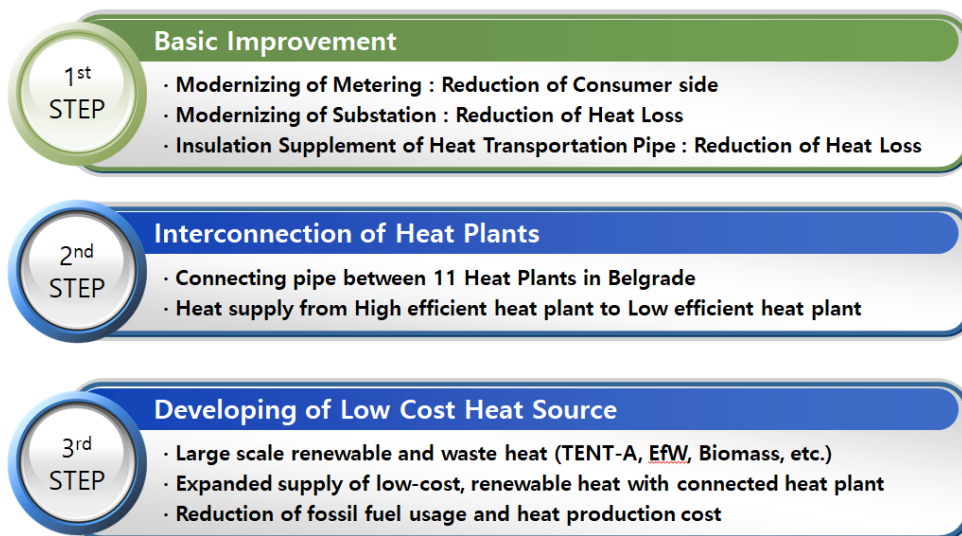
	conversion to renewable energy (away from natural gas) for various parts of its operation. One third of buildings in Belgrade that are not connected to the DH system use electricity for heating, and the remaining two thirds use solid (coal and firewood), liquid or gaseous fuels. According to the Belgrade Air Quality Plan (2016), air quality (SO₂) is significantly worse during the winter season in areas using individual heating solutions. Recently, the soot content of the air has decreased after a series of measures, the most important being: the expansion of DH system, switching to gas in power stations and the closing of boilers for solid and fuel oil. Drivers for modernization of the system include: security of supply (natural gas and fuel oil are imported); expansion of the network to reduce air pollution; improved efficiency of DH and buildings; reduced CO₂ emissions from the DH network; and improved quality of heat supply to consumers. The city will benefit from this project that assesses the DH system related to international best practice and with and understanding of these drivers.
2.2	COUNTRY DEVELOPMENT STRATEGIES AND POLICIES: Please describe how the Project relates to other relevant national development strategies and policies, and provide the ongoing status of their implementation, results and effects, if any. In general, the level of integration of climate change issues in the sectoral and the general development strategies, the level of knowledge, institutional and individual capacities, the available technology and, above all, the financial resources are not sufficient for effective and prompt response to climate change and to combat its impacts and effects. The country still lacks a comprehensive national climate change strategy. The National Climate Change Strategy with action plan is currently being developed and it will provide a clear framework of activities against climate change between 2020 and 2030, as well as the framework for 2050. Energy policy, as the key sector for GHG emission reduction is defined through several strategies. These strategies are also prioritizing issues that are tackled in this project and they include: Draft Energy Development Strategy (DEDS) until 2025 with projections to 2030 (2015) based on the annual energy balances, Second Energy Efficiency Action Plan of the Republic of Serbia for the period from 2013 to 2015 (2013), National Renewable Energy Action Plan of the Republic of Serbia (2013), Decree on Incentive Measures for Privileged Energy Producers – Decree on feed-in tariffs (2013). DEDS is analyzing the climate change issues, while the

	implementation of the remaining documents would have direct impact on reducing GHG emissions. The Energy Development Strategy (EDS) of Belgrade has been drafted in 2008, while the implementation of the measures and achievement of its goals is being monitored. These include energy efficiency increase, increase in supply security, environmental protection, decrease of dependence on imported energy, increased investment in energy sector and reduction of required heat energy for heating buildings by 1% per year. Serbia is also working closely together with UNEP under the Global District Energy in Cities Initiative. The City of Belgrade has been selected as one of the first pilot cities, aiming to drive a switch to low-carbon, energy efficient heating by developing, retrofitting or scaling-up district energy systems. Furthermore, the City of Belgrade has recently joined the Building Efficiency Accelerator Partnership Platform, that will assist the City in improving the energy efficiency of buildings in their jurisdiction through multi-sectoral collaboration, which could help facilitate action on building efficiency policies and projects. Against this backdrop, this project will be in line with Serbia's policies and on-going efforts by filling in the gaps and by producing synergies.
2.3	JUSTIFICATION FOR INTERVENTION: Please describe how the need for the Project was determined, and what the rationale/justification for the Project (why the Project is considered to be the most effective way the problem is resolved.).

Multiple cities in Serbia face similar barriers to modernizing and expanding DH systems, which include lack of finance, institutional capacity, buildings' thermal insulation, holistic planning in cities, resource mapping of renewable potentials, renewables and waste heat demonstrations, and technical expertise on renewables, PPPs and innovative business models.

In 2019, a study was undertaken to incorporate renewable or waste heat energy for Belgrade DH systems by the CTCN Technical Assistance. This Technical Assistance reviewed five renewable energy sources applicable to the Belgrade district heating system, and conducted a feasibility study on the application of the solar thermal district heating system to the Cerak heat production plant. The Cerak heat plant has about 38,000 square meters of surplus land, and it has been proposed to install 10,000 square meters of solar panels to produce heat. It was proposed that the heat produced by the system partially cover the heating load during the summer, thereby reducing the use of natural gas. And the economic analysis was conducted for the installation and operation of this solar system.

The Technical Assistance report also proposed a long-term investment plan for the Belgrade district heating system. The plan consisted of three steps, the first step is a basic improvement, the second step is thermal linkage between heat production plants, and the third step is the development of low-cost heat source. The basic improvement plans of the first step include the modernization of metering to reduce the heat consumption of the user side, the modernization of the substation to reduce the heat loss and the strengthening of the insulation of the heat transport piping. The second step proposed the installation of an interconnection system between the thermal production plants in Belgrade, to provide high efficiency and low-cost heat to other thermal production plant supply areas. In the third step, it was proposed to develop low-cost heat sources such as renewable energy and waste heat energy and to incorporate them into the heat production facilities.



	The activities which will be conducted throughout this project will contribute to the implementation of the first step of the investment plan, modernizing of the metering system. Based on the Korea's advanced IoT technology, a modernized metering and smart monitoring system will be designed in accordance with the Belgrade's district heating system and demonstration will be carried out. In parallel, to achieve development of the low cost heat source, long-term roadmap for the incorporation of the renewable energy and hybrid district heating system of Belgrade will be established, as a follow-up to the CTCN Technical Assistance. Korea's experience and lessons learned on the fourth generation district heating system will be applied and reflected in the process.
2.4	LESSONS LEARNED: Please describe what lessons Partner Country has drawn on (from Partner Country's own and other's past experience) in designing this Project. Korea's district heating system actively utilizes cogeneration and low-cost incineration waste heat, which enables economic district heating with a low overall cost of heat production. This contributes to the socio-economic benefits of the community by providing consumers with district heating at cost-effective rates. In Korea's district heating system, there is an interconnection system between heat production facilities, which lowers the overall heat production cost of district heating by supplying heat preferentially from low costs heat production plants. In this way, district heating in Korea contributes to sustainability and climate change response in the heating sector. The district heating charge system is based on the usage, and the modernized measurement system and remote monitoring system are established, and the satisfaction between the heat supplier and the user is high. In addition, continuous efforts are implemented to improve the energy efficiency of heat production facilities, and R & D is actively used to utilize renewable energy sources. Recently Research and Development of the district heating sector in Korea are concentrated in the development of monitoring systems and control technology to improve the efficiency of use by combining IoT technology. During the implementation of the CTCN TA, the City of Belgrade and the PUC Beogradske elektrane (BE) identified that Belgrade's district heating system needs to improve its energy efficiency. In Belgrade, 14 heat plants are installed and each of them independently supplies heat to the corresponding supply zone through a

	Heat Only Boiler, and there are not heat interconnection pipes between the heat plants. However, if large-capacity, low-cost heat sources are developed in the future, being able to supply them to a number of nearby heat sources rather than using them from just one heat source would be beneficial to lower the unit cost of heat production for the entire district heating system. For this reason, it is necessary to consider the installation of interconnection pipes between heat plants, in line with possible scenarios analyzed in the prefeasibility study on interconnection within the Belgrade's DH system. Based on these lessons learned, the current project has been designed to improve the efficiency of heating supply and its stability. The outcome of this project is twofold. The demonstration of the IoT based smart monitoring system will be established based on Korea's experience and expertise and it will show the applicability of the related technology in the Belgrade district heating system. Also, a plan for renewable energy integrated network will be developed to propose a detailed and long-term roadmap to lower the heat source cost and to maximize the effect of reducing fossil fuel and GHG emissions.
SECTION 3. PROJECT DESCRIPTION	
3.1	Objective/Outcome/Output: Please outline the objectives, the expected outcomes, and outputs of the Project. Objectives; Derivation of methodologies for improving the efficiency of district heating system and reducing greenhouse gas emissions in Belgrade Outcomes 1. Demonstration of metering and smart monitoring pilot system on district heating demand side in Belgrade, Serbia 2. Proposal for metering and smart monitoring system implementation plan on district heating in Belgrade, Serbia

	3. Establishment of long term plan of incorporating renewable energy integration network on district heating in Belgrade, Serbia, building upon the work undertaken by the District Energy in Cities Initiative as part of the District Energy Action Plan for the next 20 years 4. Proposal of implementation alternatives of over 2(two) types of renewable energy integration to existing district heating network in Belgrade, Serbia Outputs 1. Design and demonstration of metering and smart monitoring in user-side of district heating system 2. Algorithm for energy optimizing in user side system of district heating system 3. Roadmap for phased introduction of renewable energy to district heating 4. Development of hybrid district heating network scenario by renewable energy technology combination 5. Analysis of carbon/GHG reduction effect by hybrid scenario 6. Development of priority cooperation project and feasibility study including investment plan 7. Capacity building and awareness strengthening program for beneficiary stakeholders
3.2	Activities: Please describe what will be carried out in terms of planned activities, their timing and duration, and who will be responsible for each activity. It should indicate the sequence of all major activities and implementation milestones. 1) Basic investigation and data collection • Desk study on available information about the district heating network, heat source plants, heat supply system, sub-station on demand side, status of district heating usage etc. • Status of existing metering system, data collection and database utilization • Study on the potential of available renewable energy sources (Solar thermal, Water, Geothermal, Waste energy, etc.) building upon the previously undertaken work. • Analysis and evaluation of utilization ability of renewable energy sources. 2) Conceptual design and case study of renewable energy integration to existing district heating network and GHG emission reduction

	• Development of hybrid district heating network scenario according to applicable renewable energy technology combination • Analysis of carbon/GHG reduction effect according to hybrid system integration scenario • Establishment of long-term roadmap for the phased incorporating renewable energy building upon work undertaken by the District Energy in Cities Initiative and the developed District Energy Action Plan 3) Feasibility study and proposal of investment plan for priority cooperation project • Development of priority cooperation projects and selection of high priority cooperation project • Establishment of basic plan for high priority cooperation project and detailed feasibility study • Establishment of financial structure and staged investment plan for the follow-up project, investigation of local investment laws, etc. 4) Invitation seminar and benchmarking of Korean best practice for the Serbian government and Belgrade City officials (Public officials and experts) 5) Design and implementation of demonstration metering and smart monitoring system using IoT Technology • Selection of customer (households, end users) for installation of demonstration system (around 50 households and 5 sub-stations) • Design and installation of database such like RTDB (Real-Time Database), RDB (Relative Database) etc. • Design and installation of household facilities (Room temperature sensor and controller, proportional control valve, supply/return temperature sensor, flow meter) • Design and installation of data transmission and control method (LORA or RS485) • Investigation and design of HMI based district heating monitoring system platform • Monitoring and control system management items, software design and installation 6) Test, operation and troubleshooting • FAT (Factory Acceptance Test): Isolation Test
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	• SAT (Site Acceptance Test): Isolation & Integration Test • Data collection and analysis of database on monitoring system with local operating and consultant team. • Analysis of overall DH system's efficiency and identification of problems in regular operation within the limitation of available data and information • Proposal of existing system improvement • Development of optimal control algorithm for efficient use of district heating customer energy • Analysis of carbon/GHG reduction effect by energy efficiency 7) Held progress report (kick-off, interim) and final report • Kick-off and final report meeting as local seminars in both (Serbia) • Held on interim report to check and share project progress (Korea) • Technical training for ongoing operation and maintenance of monitoring system														
	Budget: Please provide a brief requirement by activities. The budget requirement is not a full and well-defined. The detailed budget requirement will be fully elaborated after the PCP is selected. Nevertheless, this information is to help KOICA to better understand the project. <table><tr><th>Activity</th><th>Contents</th><th>Proposed budget (in USD)</th></tr><tr><td>Basic investigation</td><td> • Investigation, data collection and study on status of existing DH system • Study on the potential of available renewable energy sources </td><td>25,000</td></tr><tr><td>Conceptual design and case study</td><td> • Derivation of renewable energy hybrid DH network scenario • Analysis of carbon/GHG reduction effect • Establish of long term roadmap </td><td>50,000</td></tr><tr><td>Priority cooperation project</td><td> • Derivation of priority cooperation project • Basic plan and detailed feasibility study • Financial structure, staged investment plan </td><td>50,000</td></tr><tr><td>Benchmarking of best practice</td><td> • Invitation seminar of Serbia stakeholders </td><td>50,000</td></tr></table>	Activity	Contents	Proposed budget (in USD)	Basic investigation	• Investigation, data collection and study on status of existing DH system • Study on the potential of available renewable energy sources	25,000	Conceptual design and case study	• Derivation of renewable energy hybrid DH network scenario • Analysis of carbon/GHG reduction effect • Establish of long term roadmap	50,000	Priority cooperation project	• Derivation of priority cooperation project • Basic plan and detailed feasibility study • Financial structure, staged investment plan	50,000	Benchmarking of best practice	• Invitation seminar of Serbia stakeholders
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Benchmarking of best practice	• Invitation seminar of Serbia stakeholders	50,000													

		Benchmarking visit of best practice in Korea	
	Design of demonstration system	- Design of DB (RTDB, RDB) - Design of DH monitoring system platform (HMI) - Software design of monitoring/control system	100,000
	Installation, test, operation and troubleshooting	- Installation of demonstration system in Belgrade - FAT/SAT and analysis of DB on monitoring system - Trouble shooting and improvement - Derivation of optimal control algorithm	200,000
	Travel cost	Travel cost between Korea and Serbia	50,000
	Presentation and reporting	- Kick-off, interim and final - Operation and maintenance training	25,000
	Total		550,000

SECTION 4. STAKEHOLDER ANALYSIS

	TARGET BENEFICIARY: Please describe the following information: a) direct and indirect/wider beneficiary group, b) number of beneficiary, with gender segregation if necessary (e.g. 300 children rather than children in 3 schools), c) how the target group was identified, d) why they were selected as target group, e) how intended beneficiaries have been involved in Project design, and their expected role in Project implementation and evaluation. If relevant, the target group needs be disaggregated by sex.
4.1	a) Direct and indirect/wider beneficiary group: direct beneficiary is the PUC Beogradske elektrane as the managing company of district heating system in Belgrade city. Indirect beneficiary is the city government of Belgrade which owned PUC BE and the wider beneficiaries are customer of district heating in Belgrade which 305,000 households. b) Belgrade has a population of about 1.3 million and 606,433 households (Census 2011). Among them, the district heating households are 305,000 households, which is about 50%, and about 650,000 people use district heating. c) The target group of the demonstration system is 50 households which were connected to district heating. The 50 households, the target group for the demonstration system, will be divided into approximately five buildings.

	d) The target group was selected primarily for buildings with suitable substation for the installation of demonstration system in the heat supply areas of 14 heat production plants located in urban area of Belgrade. e) The beneficiaries identified the improvements required for the Belgrade district heating system during the project's design process. In the implementation phase of the project, the beneficiaries will also provide the Belgrade district heating system status data, the building's machine room and household heating system data, and build a cooperative system with the target group.
4.2	OTHER STAKEHOLDERS: Please describe other stakeholders (e.g. partner government agency, international organization, NGO, donor agency, etc.), if any, including a) name/group, b) respective role(s) and cooperation/coordination mechanism, etc. <u>Ministry of Mining and Energy</u> Ensure compliance of the project activities with the energy efficiency strategy on the state level. Ensure the involvement of all the relevant stakeholders to the process, including strengthening of an institutional framework. <u>Ministry of Environmental Protection</u> Serve as the National Designated Entity (NDE) and focal point for the CTCN. Ensure that the project reflects national circumstances and priorities in line with the climate change policies and strategies. Coordinate with other process that address climate change at national level. <u>UN Environment Programme (UNEP)</u> UNEP hosts the District Energy in Cities Initiative's Secretariat that has been implementing the district energy project in Belgrade over the last 3 years. UNEP is a core actor in policy creation and technical advisory services, provides an up-to-date knowledge database on district energy, ensures quality control and technical backstopping, and builds partnership for implementation of modern district energy. <i>NOTE: a cooperation arrangements between the donor/implementing entity from Korea and UNEP will need to be discussed prior to project kick-off, to ensure effective coordination with the Initiative's programme in Serbia.</i>

SECTION 5. PROJECT MANAGEMENT AND IMPLEMENTATION

	PROJECT MANAGEMENT: Please describe a) who will be responsible for planning and management of the Project operations as well as coordinating other bodies and organizations associated with the Project, b) what arrangements will be established to ensure that there will be effective coordination with other relevant programs and activities.
5.1	Project planning and management of demonstration system operations should be implemented under the responsibility of the implementer selected by the donor country. The implementer will set up a project coordination team composed of the implementer, the main beneficiary (Belgrade district heating company) and a group of local consultants. The project coordination team will communicate on the overall implementation of the project and ensure the availability of the technical, legal and institutional data required for the project. A local consultancy will be engaged for gathering data and information, monitoring day to day operation of the demonstration system, facilitating the communication with the beneficiary experts the implementer, and coordinating different stakeholders.

The following documents as annex, are required to be submitted with the PCP.

Annex 1. Project Location Map

- 2. Project Design Matrix**
- 3. Project Work Plan**
- 4. Environmental Screening Checklist**
- 5. Gender & Development Screening Checklist**

Annex 1. Project Location Map



Annex 2. Project Design Matrix

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS AND RISKS
Objectives Derivation of methodologies for improving the efficiency of district heating system and reducing greenhouse gas emissions in Belgrade	Establishment on implementation plan of demonstration system and starting of priority cooperation project in district heating system of Belgrade	Belgrade's District Heating Policy	
Outcomes - Demonstration of metering and smart monitoring pilot system on district heating demand side in Belgrade, Serbia - Proposal of metering and smart monitoring system implementation plan on district heating in Belgrade, Serbia - Establishment of long term plan of incorporating renewable energy integration network on district heating in Belgrade, Serbia based on identified priorities in the BE's District Energy Action Plan - Proposal of implementation alternatives of over 2(two) types of	- Demonstration system for DH smart monitoring including 5 substations and 50 household user monitoring device - Report on feasibility study and proposal of investment plan for priority cooperation project	- Confirmation of installation of demonstration system and functional evaluation - Deliverable report to the beneficiaries	Maintain the district heating supply in the area subject to demonstration system installation

renewable energy integration to existing district heating network in Belgrade, Serbia			
Outputs			
- Design and demonstration of metering and smart monitoring in user-side of district heating system - Algorithm for energy optimizing in user side system of district heating system - Roadmap for phased introduction of renewable energy to district heating - Derivation of hybrid district heating network scenario by renewable energy technology combination - Analysis of carbon/GHG reduction effect by hybrid scenario - Derivation of priority cooperation project and feasibility study including investment plan - Capacity building and awareness strengthening program for beneficiary stakeholders	- Completeness on design of demonstration system - Performance of algorithm - Evaluation of presented Roadmap - Diversity of renewable energy combinations and Evaluation of network scenarios - Evaluation of carbon /GHG reduction effect - Evaluation of report - Number of participants and satisfaction	- Report of design - Operation and evaluation report of demonstration system - Evaluation Report of roadmap - Report of hybrid district heating network scenario - Analysis report of carbon/GHG reduction effect by hybrid scenario - Report of priority cooperation project - Capacity building report	Maintain the cooperation of residents in demonstration system installed household

Activities	Inputs		
• Basic investigation and data collection • Analysis of alternatives of RE integration to DH network • Feasibility study and proposal of investment plan for priority cooperation project • Invitation seminar and benchmarking of Best Practice • Design and implementation of demonstration metering and smart monitoring system • Test, operation and trouble shooting	• Donor Country: Total input budget 550,000usd - Demonstration: 300,000usd - RE network scenario: 125,000usd - Travel and Presentation : 75,000usd - Benchmarking and capacity building : 50,000usd	• Recipient Country - Obtain of object household for demonstration system installation - Provide local data - Provide day-by-day operation staff of demonstration system - Supporting of local licensing and administrative	• Complain and opposition of residents to the heating quality or heating cost during operation of demonstration system • Stable heat supply to the target area of the demonstration system from district heating source

Annex 3. Project Work Plan

[illegible]

[illegible]

Annex 4. Environmental and Social Safeguard Screening Questionnaire

☐ Project name: Incorporation of Smart Monitoring System using IoT Technology for District Heating and Establishment of Renewable Energy Integration Network Plan in the District Heating system of Belgrade

☐ Prepared on: 10.02.2020.

☐ Prepared by: Goran Djelic

-Department: PUC "Beogradske elektrane"

-Position: Head for unit for planning and development

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_____ (Signature)

1. Preliminary questions

[1-1] Is this a development consultation project?

☐ Yes ☒ No

[1-2] Does this project include facility/infrastructure construction?

☐ Yes ☒ No

➡ If your answer to [1-1] is "yes" and your answer to [1-2] is "no," please do not proceed to No. 2.

2. Project overview

2-1. Location or address of project site

[City of Belgrade, Republic of Serbia]

2-2. Basic information related to project including scale (e.g. facility production capacity, etc.)[23](#)

PUC Beogradske elektrane are equipped with 37 heat sources (14 thermal heat plants, 10 block boilers and 13 individual boilers). Heat sources are grouped into five heating zones (sectors): Dunav, Cerak, Centar, Zemun and New Belgrade.
Overall PUC production capacity (data from 2017): 3,127,746 MWh
Overall consumption capacity (2017): 2,735,680 MWh

☐ Drawing/satellite photo (check if attached)

2-3. Major impacts caused by project

① Does the project include construction of a new building, extension of an existing building, or repair of an existing building?

☐ Yes (Land size:) ☒ No ☐ Unknown

② Will the project cause a change in topography or land use?

☐ Yes (Land size:) ☒ No ☐ Unknown

③ Will the project include development or use of water resources?

☐ Yes (Amount:) ☒ No ☐ Unknown

④ Will the project cause occurrence of waste?

☐ Yes (Amount:) ☒ No ☐ Unknown

⑤ Will the project result in involuntary relocation of local residents?

☐ Yes (Number of people:) ☒ No ☐ Unknown

⑥ Is the project likely to cause complaints or disputes with local residents?

☐ Yes (Reason:) ☒ No ☐ Unknown

3. Assessment of whether project is subject to your country's requirements for environmental impact assessment, etc.

3-1. Does your country have laws or regulations related to environmental/social impact assessment?

☒ Yes ☐ No ☐ Unknown

3-2. Is the project subject to environmental/social impact assessment or other relevant impact assessment under these laws or regulations?

☐ Yes ☒ No ☐ Unknown

■ If your answer to the above question is “yes” and your country separately categorizes laws or regulations to deal with environment and society, please state the relevant category.

[]

3-3. If the project is subject to environmental/social impact assessment and environmental/social management plan, please mark where applicable.

☐ Completed ☐ Under way ☐ Scheduled ☐ Not Completed
(date/time:)

4. Project location features and project type

4-1. Is the project site located in or adjacent to an area listed below?

☐ Yes ☒ No

■ If your answer to the above question is “yes,” please mark all applicable.

- ☐ Virgin forest or tropical forest
- ☐ Ecologically important habitat areas (coral reef, mangrove wetland, tidal flats)
- ☐ Habitat of rare species protected by domestic laws or international treaties
- ☐ Areas with risk of soil erosion on large scale
- ☐ Areas with notable desertification tendency
- ☐ Government-designated reserve area such as national park
- ☐ Archaeologically, historically, or culturally valuable areas
 - ☐ Living areas of ethnic peoples, indigenous peoples, or nomads who retain a traditional lifestyle
- ☐ A densely populated area that poses a risk of large scale involuntary relocation of people
- ☐ An area with special social value

4-2. Does the project fall under one of the categories listed below?

☐ Yes ☒ No

If your answer to the foregoing question is “yes,” please mark all applicable

- | | |
|---|--|
| ☐ Hydropower, dams, and reservoirs | ☐ Urban development |
| ☐ Roads, railroads, and bridges | ☐ Airport/port |
| ☐ Water supply, sewage treatment | ☐ Solid waste treatment |
| ☐ Stream and erosion control | ☐ Power transmission and distribution lines |
| ☐ Mining development | ☐ Industrial development |
| ☐ Tourism | ☐ Agriculture involving large-scale land clearing or irrigation |
| ☐ Forestry | ☐ Fishery |

5. Environmental/social impact

Question	Yes	No	Unknown	Remarks
1. Is the project likely to have an impact on a nearby ecologically important or sensitive area (e.g. wetland, stream, coast, mountain, forest)?		☐		
2. Is the project likely to have an impact on nearby natural scenery or geographic feature?		☐		
3. Is the project close to a culturally or historically valuable area?		☐		
4. Does the project considerably encroach on an area that needs environmental consideration or require the alteration of surface texture or physical properties of the nearby land?		☐		
5. Does the project require a large amount of water or energy during construction or operation?		☐		
6. Will the project require water supply, sewerage, or transportation that current infrastructure facilities cannot provide?		☐		

Question	Yes	No	Unknown	Remarks
7. Will the project produce a large amount of waste, particularly of hazardous or toxic nature?		☐		
8. Will the project produce a large amount of drain water or air pollutants?		☐		
9. Will the project have a serious impact on a nearby important body of water?		☐		
10. Is the project likely to have a serious impact on surface/underground water in terms of amount or quality?		☐		
11. Does the project require lodging facilities or other accommodations for workers during construction or operation?		☐		
12. Does the project require using a large amount of fertilizers or pesticides?		☐		
13. Does the project include introduction of foreign species of wildlife to the area?		☐		
14. Does the project involve any risk of turning the area into a habitat for pests or animals carrying infectious diseases?		☐		
15. Will the project cause harm to people in a nearby densely populated area due to air pollution, noise, vibrations, or stench?		☐		
16. Will the project cause serious soil erosion or degradation due to its location (e.g. steep slope or vulnerable soil area)?		☐		
17. Will the project cause an influx or relocation of a large number of people in the area?		☐		

Question	Yes	No	Unknown	Remarks
18. Will the project cause involuntary relocation of a large number of people elsewhere?		☐		
19. Will the project cause a change in way of life for local residents?		☐		
20. Will the project have a negative impact on cultural heritage objects/sites in the area?		☐		

Annex 5. Gender & Development Screening Checklist

Question1.	Women/Girls as beneficiaries or participants
1-1	Does this project include women or girls as a target group as direct or indirect beneficiaries? ☒ Yes ☐ No
1-2	Do women or girls participate in implementing process as one of the decision makers? ☒ Yes ☐ No
1-3	Did this project proposal complete based on the needs assessment of men and women/boys and girls? ☐ Yes ☒ No
Question 2.	Relevance to women's empowerment
2-1.	What are the key gender issues in the sector/subsector that are likely to be relevant to this project or program? <u>Taking into account that women and children receive more benefits on heating services than men as they spend more time in home in general, multiple co-benefits are expected from this assistance concerning gender, in particular (i) access to cleaner, safer and reliable heating system, (ii) reduced domestic chores related to space heating, and (iii) reduced incidence of carbon monoxide poisoning and accidental fire.</u>
2-2.	Does the proposed project or program have the potential to make a contribution to the promotion of gender equity and/or empowerment of women by providing women's access to and use of opportunities, services, resources, assets, and participation in decision making? ☒ Yes (→2-2-1) ☐ No
2-2-1	If yes, what measures are included in the project design to promote gender equality and women's empowerment— ☐ Gender action plan ☐ Other actions or measures ☒ No action or measure
2-3	Can the proposed project have an adverse impact on women and/or girl or widen gender inequality? ☐ Yes ☒ No
2-4	Indicate the intended gender mainstreaming category*: ☐ GEN (gender equity) ☒ EGM (effective gender mainstreaming) ☐ SGE (some gender elements) ☐ NGE (no gender elements)

○ GEN : Gender Equity

- A project is assigned GEN, if the project outcome directly addresses gender equality and/or women's empowerment by narrowing gender disparities through access to social services(e.g. education, health, and water supply/sanitation); and/or economic and financial resources and opportunities (e.g. employment opportunities, financial services, land, and markets), and/or basic rural and urban infrastructure(e.g. rural electrification, rural roads, pro-poor energy distribution, and urban services for the poor); and/or enhancing voices and rights(e.g. decision making process and

- structures, political empowerment, and grievance mechanisms); and,
- the outcome statement of the project design and monitoring framework(DMF) explicitly mentions gender equality and women's empowerment and/or, the outcome performance indicators include gender indicators.

- **EGM : Effective Gender Mainstreaming**

- A project is assigned EGM, if the project outcome is not gender equality or women's empowerment, but project outputs are designed to directly improve women's access to social services, and/or economic and financial resources and opportunities, and/or basic rural and urban infrastructure, and/or enhancing voices and rights, which contribute to gender equality and women's empowerment.

- **SGE : Some Gender Elements**

- A project is assigned SGE, if it meets either of the following:
 - (i) by its nature it is likely to directly improve women's access to social services; and/or economic and financial resources and opportunities, and/or basic rural and urban infrastructure, and/or enhance their voices and rights(e.g. education, health, rural development, microfinance, water supply and sanitation, food security, and emergency food and rehabilitation assistance), but that included little, if any gender analysis and few or no specific design features; and did not meet the EGM criteria, or
 - (ii) is unlikely to directly improve women's access to social, economic or financial resources or opportunities, but significant efforts were made during project preparation to identify potential positive and negative impacts on women. Some gender features are included to enhance benefits to women(e.g. targets for employment of women in project construction work, provision of equal pay for equal work, information campaigns on HIV/AIDS risk, gender training of executing/implementing agencies, and adherence to core labor standards, esp. child labor); and where resettlement is involved includes attention to women in the mitigation/resettlement plans(such as compensation payments to both men and women, joint-ownership of replacement land/housing, restoration of livelihood initiatives for women, and so forth).

- **NGE : No Gender Elements**

- A project is assigned NGE, when it does not include any gender design features (e.g. no indicator or goal for gender equality, no women's participation or empowerment, no resource or no opportunity for women, etc.).

**Sourced from ADB (2012) Guidelines for Gender Mainstreaming Categories of ADB Projects*