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| **Descriptive form** | |
| **Program name** | HORIZON-CL5-2023-D3-02-01 |
| **Call module** | HORIZON-CL5-2023-D3-02-01: Development of near zero-emission biomass heat and/or CHP including carbon capture |
| **Website of program** | https://ec.europa.eu/info/funding-tenders |
| **Project name** | Bioenergy4Water; |
| **Project duration** | Max 36 months |
| **Aim of project** | This project has three purposes: the first; Developing bio-based heat and/or CHP technologies with high efficiency and utilization of solid biomass residues originating from WWTPs. latter; contributing to the circular economy with the sustainable use of the power/heat ratios of biomass fuels as a heat source. Third; It is the integration of solar thermal energy systems as a renewable energy source into cogeneration systems that cause high cost effectiveness for the consumer. In this way, it provides lower energy costs and reduces harmful gas emissions, including NOx and SOx, to near-zero amounts during use.  Improving the quality of solid biomass residues from WWTPs after an appropriate bio-based treatment is the main challenge of the project. Reducing the cost of bio-based heat, improving technical performance and increasing efficiency and developing CHP technologies are among the challenges. In addition, the acquisition and reuse of biofuel and the reduction of the load created by biomass on WWTP systems make the project challenging.  Generally, this project has addressed the above-mentioned potential challenges. It increases the sustainability of biomass-based heat and/or CHP by making biofuels efficient through the use of new technologies with a holistic management system. Especially in reducing emissions and air pollution, ensuring environmental sustainability and reducing vulnerability to climate change, and the transition to carbon reuse in fossil fuel-based economic areas and resource acquisition and circularity. In addition, it is to ensure the active use of renewable energy systems by integrating hybrid PV and ST (solar thermal) modular systems as an energy source. |
| **List of partners and a brief explanation of their role in the project** | 1. İstanbul Technical University 2. Istanbul Water and Sewerage Administration (ISKI) 3. Turkish Cogeneration Association (CogenTURK) 4. Potential Partner-1 5. Potential Partner-2 6. Potential Partner-3   In this project;  ITU will take part in the scientific research section and will be responsible for conducting research studies and ensuring the integration of bio-based solar thermal systems into the system for the establishment of a pilot-scale facility and evaluating the results.  İSKİ will support the project in providing the necessary space for research activities in the Cogeneration facilities selected for the project, which are included in the WWTPs, and in the operation of the pilot facility with the necessary analysis studies.  CogenTURK will be a partner in conducting the efficiency improvement survey and preparation of the and Efficiency Improvement Package Report (gas turbines, boilers, drying systems and balance of plant) and capacity building activities in the selected plants, in the analysis of policies and strategies related to “bio-based” and “solar thermal” energy that are used for decarbonization and drying support policy improvements/developments in strengthening the circular economy concept and contribute to the dissemination of project results. |
| **The expected role of the Potential Partner-1** | The potential partner will be responsible to taking an innovative approach to biotechnology |
| **The expected role of the Potential Partner-2** | The potential partner is the boiler manufacturer and will be responsible for the rehabilitation or re-manufacturing of the boilers. |
| **The expected role of the Potential Partner-3** | The potential partner will be responsible for the development, production and installation of solar thermal systems for the project. |
| **Brief Information About the Project** | The Istanbul Water and Sewerage Administration (ISKI) generates its energy through cogeneration (a technology in which electricity and thermal energy are generated together to use energy more efficiently) and solar panels.  In the cogeneration plants at the Advanced Biological Wastewater Treatment plants; Paşaköy (4.6 MW gas turbine), Tuzla (2x4.6 MW gas turbines), Ambarlı (2x4.6 MW gas turbines) and Ataköy (2x4.6 MW gas turbines) biological wastewater treatment plants, electricity and heat are generated simultaneously in the same system and used to meet the plants' electricity needs and for sludge drying.  İSKİ uses the generated energy for lighting, which covers the internal needs of the plants, and for pressurising the water in the pumping stations. The power plants and units also meet the energy needs of many processes such as dewatering.    However, rising natural gas prices have made our CHP plants less efficient. Therefore, in a pilot project to be carried out, taking into account ISKI's existing solar energy generation potential and the topographical features of our facilities, land use constraints and system performance, we are considering proposing a hybrid PV and ST (solar thermal) modular system that generates heat and power at medium temperature with low environmental impact, low cost and high efficiency in cogeneration units in advanced biological wastewater treatment plants.  The main objectives of this project can be listed as;   * Energy is used intensively depending on the processes and equipment used during the operation of waste water treatment plants. In order to meet the current heat and electricity needs in the most efficient and economical way, in the area selected as the Pilot Application Project in order to reduce energy costs; examination of the existing project heat and electricity systems of the facilities, reporting the electricity and heat needs of the existing systems are among the studies to be done in the first place. Thus, by making technical studies for the units in the current system to work more efficiently; rehabilitation or the addition of alternative units instead will be evaluated and the necessary application studies will be carried out accordingly. * The generation of electrical energy required for more efficient operation of cogeneration plants can be possible by using biogas obtained from wastewater. In this context, by examining the WWTP processes and determining the detailed biogas composition of the biogas formed as an end product in sludge digesters (using detailed analysis studies of inlet and outlet design and operating parameters) and designing the necessary biogas upgrading units in order to increase the biogas capacity of the facilities, preparing the essential feasibility reports and then carrying out the required technical design studies, the biogas capacity produced in the facility will be increased. This will also contribute to the electricity drawn from the grid and the operating cost of the facility. * By utilizing the biomass obtained from wastewater, energy will be obtained and the biogas produced from biomass will be burned in the facility to provide electrical energy, which will reduce energy costs since waste heat is used for sludge drying. The thermal energy cost, required for the sludge drying process, will be prevented. Thus, the environment will be protected in terms of CO2 emissions while obtaining energy from biomass. * By utilizing the waste heat generated in the cogeneration plants, the heating needs of the plant can also be met. By carrying out the necessary rehabilitation works for the effective and efficient use of waste heat, the steam used in the sludge drying unit will no longer be an extra cost. * Integrating PV and Solar thermal systems as energy sources instead of gas turbines in order to meet the energy needs of the entire facility and also the thermal energy needs of the drying unit of the cogeneration systems, high energy efficiency, lower energy consumption, lower greenhouse gas emissions and lower operating costs in wastewater treatment plants and especially in cogeneration units will be achieved by using this energy in another area of the facilities in case of power outages or if needed.   This study, which is designed to increase the sustainability of biomass-based heat and/or CHP by addressing socioeconomic problems and to support CHP with alternative sources it produces. environmental sustainability, especially in reducing emissions and air pollution and will also ensure that carbon reuse and circularity issues are addressed, particularly in fossil fuel-based economic areas in transition. Accordingly, the project is in full compliance with Sustainable Development Goals 6, 7, 11 and 13 (SDG 6, SDG 7, SDG 11 and SDG 13) as it creates energy efficiency and an alternative heat source in CHPs and provides solutions to potential risks. This project focuses on the development and improvement of CHP technologies with reduced cost and improved technical performance and efficiency of Bio-based heat. With the integration of renewable energy sources, it is of great importance as it will offer a sustainable solution to the problems related to both the use of biomass and energy consumption. |
| **Profiles of partners for carrying out the proposed activities** | **İTÜ University**  **……………………………..**  **Istanbul Water and Sewerage Administration (ISKI)**  Founded in 1981 with the launch of ISK Law No. 2560, ISKI is a public utility of Istanbul Metropolitan Municipality with an independent budget. The managerial board of the administration, where the Mayor of Istanbul is the Board Chairman, is the Metropolitan Municipality Council. The General Director of ISKI is elected upon the proposal of the Metropolitan Municipality Mayor and approved by the Minister of Interior Affairs. The General Director of ISKI also acts as the Vice Chair of the Management Board that also includes 4 members including a senior Deputy General Director. Two inspectors elected by the ISKI General Board (Municipal Assembly) conduct inspection services. The administration includes 5 Deputy General Director Offices, Department of Inspection Committee, Legal Advisor’s Office, Internal Auditing Unit, 20 Departments and 104 Directorates. A total of 9,905 staff includes 7,100 workers and 2,805 officers with a majority of technical background. To receive ISKI’s services, water and wastewater subscription is required through a contract with İSKİ. Water consumption is identified and measured via mechanical or smart meters. Contracts are classified according to the consumer groups of households, businesses, public institutions, industrial locations, village settlements and offices as well as municipal buildings.  **Turkish Cogeneration Association (CogenTURK)**  CogenTURK was established in 1998 in Istanbul. Its principal goal is to work towards the wider use of cogeneration or combined heat and power (CHP) in Turkey for a sustainable energy future  Vision of CogenTURK is widespread use of CHP technology in efficient, economical, reliable, and sustainable energy production in Türkiye.  CogenTURK has 91 members which include international and local manufacturers, enginering-procurement-construction companies, academicians and energy expert individuals. CogenTURK is member of Cogen World Coalition and Cogen Europe. |