ATTACHMENT A – TECHNICAL SPECIFICATION for

“Procurement of Cogeneration Units for emergency needs of district heating utilities in Ukrainian cities and settlements”

1. **General provisions:**
   1. The Energy Security Project is the USAID-funded project being implemented by Tetra Tech ES, Inc. The Energy Security Project is cooperating with the Government of Ukraine, private sector, and leaders of civil society to enhance the energy security of Ukraine and to transform the energy sector of Ukraine into a modern, market-oriented, and EU-integrated sector with stable growth. The goals of the Energy Security Project include, in particular, facilitation of competitive energy markets, promotion of the European integration, enhancement of energy independence, assistance in the development of renewable energy, support for improved regulation of the sector, an increase of confidence by population as well as ecological and social responsibility.
   2. One of the specific areas of the Energy Security Project is to provide technical assistance to municipal stakeholders in the implementation of DH reforms and projects to improve the overall productivity and management of their DH systems as well as heat supply efficiency, affordability, and reliability.
   3. For the current RFQ:
      * Procuring Organization (Customer) - TETRA TECH ES, Inc., implementing USAID ESP.
      * Recipient – local partners of the Procuring Organization, engaged in heating supply, including district heating utilities in Ukraine, city councils, universities (location specific).
      * Source of funding – funds of the Procuring Organization.
      * Contracted Supplier – organization(s) winner of the current Procurement.
      * Procurement Object – Small and Medium Cogeneration units (thereafter - Equipment).
   4. Purpose of the procurement: procurement of Equipment (Cogen units) for Recipients engaged in heat supply is conducted in response to Russian hostilities and aiming to ensure resilient heat supply to consumers in Ukraine.
2. **Codes and Standards**
   1. The Equipment (Cogeneration unit) must be manufactured in accordance with the requirements of regulatory documents valid in Ukraine (state standards (DSTU), technical conditions (TC), ISO and other standards and regulations established by the current legislation of Ukraine) for this type of Equipment:
      * the ISO 9001:2015 quality management systems, certification in Design, Manufacture, and Maintenance of Internal Combustion Engines and Cogeneration Plants, Power Plants, and Spare Parts Based on Them.
      * DSTU EN 60204-1:2015 Safety of Machinery. Electrical Equipment of Machines. The Offeror shall submit a copy of a Certificate of Conformity to the requirements specified in DSTU EN 60204-1:2015.
      * Low Voltage Directive (Directive 2014/35/EU of the European Parliament and of the Council dated February 26, 2014).
      * Electromagnetic Compatibility (Directive 2014/30/EU of the European Parliament and of the Council dated February 26, 2014).
   2. When Equipment is proposed within a noise isolating cover (casing), the cover shall meet requirements of “Technical regulation of noise emission into the environment from equipment used from outside the premises”, 2019-12-04 COM resolution #1189.
3. **Documents Submitted by the Offeror**
   1. The Offeror must have experience in installing similar Equipment (Cogeneration units) on the territory of Ukraine or EU/EEA countries. The Offeror shall provide respective reference list with references attached, for at least 5 similar Equipment produced and installed in Ukraine and/or EU/EEA countries.
   2. The Offeror, if he is not the manufacturer of the Equipment (Cogeneration Units), must provide authorization from the manufacturer of the Equipment (Cogeneration Units) confirming his rights to supply the specified Equipment to Ukraine, to carry out montage and commissioning works, to provide manufacturer’s warranty and post-sale service. The letter shall be issued not earlier than 90 days before the submission of the offer.
   3. The Offeror shall submit when responding to this RFQ:
      * A sample of passport/certificate of quality from the manufacturer for a product of similar (or higher) power and voltage class showing technical characteristics.
      * Certificates of conformity to Ukrainian technical requirements.
      * A sample of operational instructions (manuals) of the product, including documentation on scheduled repairs for a product of similar (or higher) capacity and voltage class in Ukrainian language.
      * A sample of dimensional and installation drawings for a product of similar (or higher) capacity and voltage class, control cabinet diagrams.
      * A guarantee letter that the product offered by the Offeror has been manufactured not earlier than 2020.
      * A guarantee letter from the Offeror stating that the product will be accompanied by quality documents (passport and/or quality certificate from the manufacturer) upon delivery.
   4. When manufacturing Equipment (Cogeneration units) proposed for this tender, it is not allowed to use materials and accessories included in the List of goods, prohibited to be imported into the customs territory of Ukraine, which originate from Russian Federation as adopted by the Resolution of the Cabinet of Ministers of Ukraine No. 1147 of 12/30/2015. The Offeror shall submit respective Declaration.
4. **Requirements and technical characteristics of Equipment (Cogen Unit)**
   1. The Equipment must be new, undamaged, manufactured not earlier than 2020.
   2. The Equipment shall be a gas-piston cogeneration plant.
   3. The Equipment shall include: a gas-piston engine equipped with all necessary systems, components, pipelines, and power cables in accordance with the manufacturer’s standard designs, ensuring reliable and uninterrupted operation of the engine in each envisaged operating mode, mounted with a generator on the general frame. The Equipment shall be equipped with the required technological systems:
      * engine lubrication system circulating under pressure, with free oil drainage into the trail;
      * gas supply system;
      * a set of a necessary (required) sensors;
      * electric starting system;
      * a cooling tower that exhausts heat from the (process) mixture cooling circuit;
      * a cooling (emergency) tower that exhausts unutilized heat, for operation in the absence of heat consumption, exhausting excess cooling heat to ensure stable power output of the plant;
      * necessary pumping equipment for cooling circuits;
      * exhaust gas silencer;
      * control system.
   4. The Equipment (Cogen unit) shall:
      * provide for the possibility of autonomous start-up (in the event of a blackout);
      * be able to operate in parallel with the grid;
      * be able for autonomous operation during such power outages;
      * ensure that the value of cos φ in the range of 1.0–0.90 is maintained at the border of the balance when operating in parallel with the general grid;
      * ensure the function of automatic voltage regulation at a set level;
      * ensure control of power flows to and from the grid.
5. The Equipment (Cogen unit) shall be meet the following requirements:
   1. The electric output power shall be at least: Equipment unit specific (see table below).
   2. The heat output power shall be at least: Equipment unit specific (see table below).
   3. Emissions: Mass emissions of nitrogen oxides not more than NOx-190 mg/nm3, with O2=15% or NOx-500 mg/nm3, with O2=5%.
   4. The Equipment (Cogen unit) shall be provided in a container, in a cover (casing) or Indoor (open) version: Equipment specific (see table below).
   5. Maximum dimensions for the unit in a container (max. LxW): Equipment unit specific (see table below);
   6. Maximum dimensions for the unit without a container (max. LxW): Equipment unit specific (see table below);
   7. Technical specification of production:
      * Electrical efficiency, at least 36%.
      * Overall efficiency (electrical efficiency and thermal efficiency), at least 83%.
   8. Generator specification:
      * Voltage, kV: Equipment unit specific (see table below)
      * Current frequency, Hz: 50.
      * Insulation class: H.
      * Pre-load heating class: F.
      * Max ambient temperature: 40C.
      * Winding temperature detectors: available.
   9. Offeror shall submit Attachment B\_Detailed Budget, which corresponds to the table below, attached to their proposal submission for this RFQ. The Offeror shall indicate in Attachment B\_Detailed Budget, which concrete units they are proposing to deliver **within 90 calendar days** once the contract is signed. If Offeror has units that can only be delivered after that initial 90 day period, they shall attach a separate/second Attachment B\_Detailed Budget to their proposal and indicate which concrete units they will deliver **beyond 90 calendar days** and the anticipated delivery timeline. Offeror shall not duplicate proposed units, i.e. the same unit cannot be included into both tables. Tetra Tech will first score the proposals submitted with delivery dates within 90 calendar days. If the entire requirements of this RFQ are not met with those proposals, Tetra Tech will then move on to the proposals for units with delivery days over 90 days from contract signing.

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| **Delivery site** | Electric Output Power, kWe  [min] | Electric Output Power, kWe  [max] | Type: Indoor / Cover / Container | Maximum dimensions for the unit LxW [**max**] | Voltage, V | Procured Quantity, units |
| Chernigiv [500] | 350 | 700 | Indoor | 9000x4000 | 0,4 | 2 units |
| Chernigiv [638] | 600 | 1100 | Cover | 10000x5000 | 0,4 | 1 unit |
| Chernyvtsy [1300] | 1300 | - | Container | 40000x12000 | 0,4 | 1 unit |
| Druzhkivka [350] | 350 | 400 | Container | 20000x8000 | 0,4 | 1 unit |
| Dubno [200] | 180 | 230 | Indoor | 8000x8000 | 0,4 | 1 unit |
| Kamenets-Podilsk [630] | 630 | 1000 | Container | 26000х10000 | 10 | 4 units |
| Kharkiv [80] | 60 | 80 | Container | 2800x1800 | 0,4 | 3 units |
| Kharkiv [100] | 80 | 100 | Container | 2800x1800 | 0,4 | 1 unit |
| Kharkiv [140] | 110 | 140 | Container | 3400x1800 | 0,4 | 1 unit |
| Kharkiv [230] | 180 | 230 | Container | 4400x2000 | 0,4 | 1 unit |
| Khmelnitskiy [100] | 100 | 180 | Container | Not limited | 0,4 | 1 unit |
| Kramatorsk [600] | 600 | 700 | Container | 20000x20000 | 0,4 | 1 unit |
| Kremenchug [500] | 300 | 500 | Container | Not limited | 0,4 | 1 unit |
| Lutsk [550] | 550 | 700 | Container | 5000х3000 | 0,4 | 1 unit |
| Mykolaiv [800] | 800 | - | Indoor | 4200x1700 | 0,4 | 2 units |
| Oleksandrya [1165] | 1165 | - | Container | 5800x3700 | 0,4 | 1 unit |
| Oleksandrya [269] | 269 | - | Container | 6000x3400 | 0,4 | 1 unit |
| Oleksandrya [125] | 125 | - | Container | 4350x2980 | 0,4 | 2 units |
| Poltava [1000] | 1000 | 1200 | Indoor | 17000x7000 | 0,4 | 1 unit |
| Poltava [1500] | 1500 | 1600 | Indoor | 19000x18000 | 6 | 1 unit |
| Rivne [1000] | 1000 | - | Container | 12000x3000 | 0,4 | 2 units |
| Rivne [635] | 630 | - | Cover | 9000x3000 | 0,4 | 1 unit |
| Starokonstantyniv [1100] | 1000 | 1500 | Container | 20000x5000 | 0,4 | 1 unit |
| Shepetivka [250] | 250 | 310 | Indoor | 5620x3670 | 0,4 | 1 units |
| Shepetivka [250] | 230 | 300 | Container | 6000x3500 | 0,4 | 1 unit |
| Vynnitsia [1500] | 1498 | - | Container | 6000x13500 | 0,4 | 1 unit |
| Zaporyzhzhia [350] | 300 | 350 | Container | 12000х2438 | 0,4 | 1 unit |
| Zaporyzhzhia [50] | 50 | 60 | Cover | 6000х2438 | 0,4 | 2 units |
| Zaporyzhzhia [30] | 30 | 40 | Cover | 6000х2438 | 0,4 | 1 unit |
| Zhytomir [1000] | 950 | 1050 | Cover/ Container | Not limited | 0,4 | 1 unit |
| Zhytomir [600] | 530 | 630 | Indoor | 4200x1700 | 0,4 | 1 unit |

* 1. Offeror shall provide a website link to technical manufacturer’s specification to each proposed Equipment unit. The Procuring Organization may decide to assess only those proposed units which have such technical specification by manufacturer.
  2. Control System Requirements:
* automatic control of the engine speed,
* automatic temperature control in the cooling and lubrication systems,
* automatic regulation of the generator voltage,
* automatic recharging of batteries,
* display of the values of the monitored engine-generator parameters on the local engine dashboard (for engine operation parameters) and on the panel of the generator control cabinet (for electrical parameters),
* autonomous operation in case there is no electricity from the IPS,
* smooth voltage regulation in the range from -10% to +5%,
* control of the engine oil pump,
* power supply and control of the engine speed regulator,
* engine start and stop control,
* control of the engine ignition system,
* control of the engine gas valves,
* automatic emergency stop with disconnection and protection of the following parameters (with a signal from the control cabinet to disconnect the generator switch):
  + - overload above 10% of the rated one,
    - in reverse power,
    - ignition malfunction,
    - maximum generator voltage,
    - minimum generator voltage,
    - low gas pressure,
    - gas in the room,
    - inner circuit water pressure,
    - outer circuit water pressure,
    - oil pressure after the filter at the engine inlet,
    - water temperature at the engine outlet,
    - oil temperature at the engine inlet
* Control cabinet and software shall provide for the following:
  + - display of all engine-generator parameters on the panel and screen in the boiler room,
    - the possibility of the engine-generator emergency stop from the console in the operator’s room,
    - automatic connection of the generator to the grid via a synchronoscope,
    - warning and alarm signals when the parameters go beyond the established limits;
    - recording warnings and alarms in the data storage system.
  1. Air-Start System Requirements:
     + The presence of a filter element on the combustion air supply shall be provided.
  2. Cooling System Requirements:
     + Flanged connections for water inlet and outlet of the cooling jacket, flanged connections for inlet and outlet ports shall be available.

1. **Requirements to Cover (casing)**
   1. Cover (casing) of the Equipment shall ensure protection against noise, protection against atmospheric precipitation and mechanical damage to the equipment. Applicable if the Equipment (Cogen unit) is requested in a cover (casing).
2. **Requirements to Container of the Equipment**
   1. The container design shall ensure safe transportation and installation of the Equipment (the container preserves no damage to the Equipment during transportation and installation). The container design ensures that the established microclimate is maintained during operation of the Equipment.
   2. The container shall have a rigid metal structure made of high-quality steel sheets with anti-corrosion treatment and painting, internal thermal insulation of walls and ceiling, and internal lining of the engine room with perforated steel sheets.
   3. The container shall allow implementation of all requirements necessary for the Equipment (Cogen unit) operation (work) in all each envisaged mode. The container design shall allow possibility of internal inspection of the Equipment and access to the main elements of the Equipment to enable regular maintenance.
   4. The container shall have all necessary pipelines and internal cable connections provided and installed inside the container to ensure the Equipment’s standard procedures and operation in each envisaged mode of operation.
   5. The container shall have ventilation windows, which are equipped with special protective grilles on the outside to protect the internal Equipment from precipitation and foreign objects.
   6. The container shall have doors on each side of the container with opening handles on the outside and locks to prevent unauthorized access.
   7. The container equipped with 220V AC interior lighting lamps from an external power supply through a panel or auxiliary service panel (ASP).
   8. The container shall have 220V (10A) sockets, which are mounted in the container from an external power source through a panel or auxiliary service panel (ASP) to connect tools. The sockets are located on each side of the container and next to the control and switchboard cabinet.
   9. Inside the container: pipelines for fuel supply from the gas inlet flange and other necessary elements to ensure gas supply are installed on the outer wall of the container.
   10. The engine cooling system shall be equipped with all the necessary components, pipelines, and power cables to ensure reliable and uninterrupted engine operation in each envisaged operating mode of the Equipment.
   11. The engine exhaust system shall be equipped with a noise muffler and all necessary components and pipelines to ensure reliable and uninterrupted engine operation in each envisaged operating mode of the Equipment.
   12. The container shall have a built-in gas contamination monitoring system employing modern analysers, light and sound detectors, electromagnetic gas supply valves, and methane sensors. The system constantly (continuously) monitors the level of gas inside the container.
   13. The container shall have installed fire alarm system.
   14. Inside the container: a common built-in grounding bus shall be provided for all the main elements of the Equipment (Cogen unit) (i.e. a generator, an engine, panels, lamps, sockets) with 2 points for further connection to the grounding system at the installation site to the outer frame of the container (diagonally on both sides.
   15. The container design shall provide a port to connect to cables of external power, control and alarm.
3. **Delivery period of the equipment**
   1. The Offeror shall propose Equipment (Cogen units) that can be delivered within time period of not more than 90 calendar days starting from the contract signing. The Offeror shall provide evidences proving the current availability of partially or fully manufactured Equipment (Cogen units) at Offeror’s (manufacturer’s) facilities, responding to the current RFQ. It is the intention of the Procuring Organization to procure all quantity of the current RFQ with delivery time within 90 calendar days.
   2. The Offeror may propose Equipment (Cogen units) that can be delivered later than 90 calendar days starting from the contract signing. The Procuring Organization shall review these proposals only if proposals with delivery time of 90 days do not satisfy the entire quantity procured under the current RFQ and if other constraints of the Procuring Organization allow to engage in later deliveries.
   3. The Offeror shall provide “Attachment B Detailed Budget” separately for quantity with delivery time within 90 days, and for quantity with delivery time longer than 90 days, if he opts to propose both delivery times.
4. **Packaging** 
   1. Equipment packaging must guarantee protection against mechanical damages.
   2. Inspection of labeling and packaging must be available - after delivery.
5. **Installation (to be included in the agreement)**
   1. The contracted Supplier guarantees he is staffed with own specialists to carry out service and commissioning works in Ukraine to perform a full range of commissioning works within the established time frame.
   2. The contracted Supplier conducts inspection of the delivered Equipment (Cogeneration unit) at the Recipient’s location before installation of the Equipment and provides inspection report to Customer (Recipient).
   3. The contracted Supplier performs installation, adjustment and testing of the Equipment (Cogeneration unit) at Recipient’s location.
   4. In order to ensure the quality of the installation and the reliability of the Equipment operation, the contracted Supplier guarantees the presence and participation of the supervisors of the Equipment (gas piston Cogeneration unit) manufacturing plant, and if necessary, other qualified experts, at the stage of installation, adjustment and testing of the Equipment to provide technical guidance, qualified and prompt resolution of all technical issues that arise in the process of installation, adjustment, testing with the preparation of all necessary documents within the terms to be determined by the Customer's (Recipient’s) written application.
   5. The contracted Supplier is responsible for Equipment installation, adjustment tests, and commissioning.
   6. The contracted Supplier issues Equipment commissioning notification to the Customer.
6. **Warranty** 
   1. After installation and testing of the Equipment (Cogen unit), the contracted Supplier issues a warranty. The warranty period is at least three years from the date of putting the Equipment (Cogeneration unit) into operation. During this warranty period, the Supplier shall, at its own expense, repair all defects and repair any part of the Equipment that has been properly installed and operated, but fails during the warranty period due to design defects or manufacturing defects attributable to the contracted Supplier. The terms of the warranty apply to the Equipment (Cogeneration unit) that has been repaired or replaced, starting from the time of repair or replacement. The Supplier is also obliged to eliminate at his own expense all deficiencies and defects discovered during the installation and testing of the Equipment (Cogen unit).
   2. The contracted Supplier shall possess a warehouse or equal facility of spare parts for Equipment (gas piston Cogeneration units) in Ukraine to ensure quick repair and maintenance upon necessity. The contracted Supplier shall present confirmation on possession of such facilities with the proposal in response to the present RFQ.
   3. In the event of a warranty case, the contracted Supplier must ensure the arrival of manufacturer’s representatives to the place of installation of the Equipment (Cogen unit) within five working days from the date of the official request of the Recipient.
   4. In the event of a warranty case, the contracted Supplier must provide a full range of repair work and the necessary tests of the Equipment (Cogen unit) at its own expense within the timeframe agreed with the Recipient.
7. **Terms and conditions of product acceptance: (to be included in the agreement)**
   1. the acceptance of the Equipment (Cogen unit) by the Customer (Recipient) is carried out at the place of delivery of the Equipment (Cogen unit).
8. **Training**
   1. The contracted Supplier shall conduct training for specialists of receiving organizations (recipients) on how to operate the installed Equipment.
   2. The training time shall be agreed with the Recipient.
9. **Documentation provided upon the delivery (to be included in the agreement)**
   1. All materials required for on-site installation shall be included in the supply package, listed in the specification, labeled and packaged for transportation.
   2. Operating instructions in Ukrainian shall be provided.
   3. List of Service centers in Ukraine, with information on physical addresses, web-addresses, telephone numbers.
10. **Transportation, storage conditions (to be included in the agreement):**
    1. Delivery of the Equipment (Cogen unit) on **DAP city** basis in accordance with Incoterms 2020 at the delivery address, which includes transportation of the Equipment and unloading at the delivery address.
    2. The availability of technical support for acceptance, joint acceptance with the contracted Supplier.
    3. The equipment packaging must indicate:
       * order number,
       * trademark,
       * name of the manufacturer;
       * gross weight in kg,
       * date of manufacturing (year, month).