



## UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

### **Terms of Reference for the provision of services for the decontamination and, where required, final disposal of at least 347 tons of PCB equipment within the Full-sized Project to Implement an Environmentally Sound Management and Final Disposal of PCBs in the Republic of Serbia, 100313**

These Terms of Reference (ToR) provide background information, and define the scope of services to be provided to undertake the project activities related to selection of service provider for the decontamination and, where required, final disposal of at least 347 tons of PCB equipment, within the project “Full-sized Project to Implement an Environmentally Sound Management and Final Disposal of PCBs in the Republic of Serbia”, UNIDO ID: 100313, GEF ID: 4877.

#### **1. GENERAL INFORMATION AND BACKGROUND**

Article 3 of the Stockholm Convention (SC) on Persistent Organic Pollutants (POPs) requires Parties to reduce or eliminate releases from intentional production or use the chemicals listed in its Annex A. Moreover, Annex A, Part II of the Convention promotes the Environmentally Sound Management and disposal of Polychlorinated Biphenyls (PCBs).

Law on Ratification of the Stockholm Convention was adopted in the Serbian legal system in 2009 (*Official Journal RS – International Treaties 42/09*) and the First National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants was adopted by the Serbian Government also in 2009. In line with the Stockholm Convention requirements, the Ministry in charge of environmental protection, started in 2014, in cooperation with UNIDO, as implementing agency, execution of the project “*Updating of the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs)*”. This project was completed in 2015, resulting in the revision of the NIP (updated NIP).

The first NIP as well as the updated NIP identified the phase-out and disposal of PCBs as one of the top priorities requiring strong attention. The rationale and objectives of the project originate from the priorities and key objectives established by the NIPs. During the preparation of the NIPs, preliminary inventories of POPs were compiled and on that ground, measures for elimination or reduction of risks of exposure to POPs were also defined together with measures for POPs monitoring. Activities were outlined with relevant Action Plans and planned for realization in a synchronized manner by the identified stakeholders, as defined in the NIPs. The PCB Action Plan defines one general objective:

- Use of PCB fluids identified and eliminated by 2025; proper disposal of PCBs ensured (liquids with PCBs and equipment containing PCBs) until 2028.

As well as three specific objectives:

- Equipment containing > 50 ppm of PCBs identified and labelled; PCB waste identified; data base on PCB equipment established; process controlling mechanisms established;
- Manners of use and quantities of used PCB fluid in open and partially-closed system identified;
- Equipment containing more than 5 dm<sup>3</sup>, and with concentrations of PCBs above 50 ppm properly disposed of, i.e. decontaminated, and PCB waste properly treated until 2028.

The Republic of Serbia has committed financial, human and institutional resources to protect human health and environment with respect to POPs. The GEF “Full-sized Project to Implement an Environmentally Sound Management and Final Disposal of PCBs in the Republic of Serbia” is envisaged to provide resources to fill in gaps, and to deliver an overall sound management of PCBs. The NIPs have indicated needs for assistance on: (i) enhancing technical and human capacity for PCB management; (ii) introduction of environmental sound management of PCB wastes and contaminated oil and equipment; (iii) establishment of PCB disposal facilities in the country and; (iv) strengthening policy and regulatory framework on PCB management specifically.

The overall objective of the project is to eliminate the usage and releases of PCBs into the environment, through the introduction of environmentally sound management measures. It aims to dispose of and decontaminate at least 200 tons of PCB wastes, PCB-contaminated oil and equipment and address capacity building and policy issues.

The project will help Serbia in meeting its obligations under the SC, and thus contribute to the global efforts to control toxic chemicals in general and eliminate PCBs in particular. It will also indirectly contribute to the objectives of Basel Convention on the Control of Transboundary movement of Hazardous Wastes.

According to the inventory conducted during the previous phases of this project, as well as during both NIPs, the total number of transformers is usually stated to be between 60,000 and 65,000. The overall number of transformer stations is around 20,000, containing around 40,000 transformers, of which more than 90% are owned by state owned energy companies: EPS, EMS and EPS – Distribucija (ODS).

The project has been structured to create the capacity in the Republic of Serbia to sustainably continue to treat remaining PCB equipment and waste after the time-bound completion of the project, allowing for their complete elimination by 2028, as specified in the Stockholm Convention.

This TOR defines the scope of the proposed contract services for treatment systems, which can be easily mobilized to the storage facilities where large amounts of PCB-contaminated oil and associated equipment are stored. The system may be transported to these designated facilities, and treat the PCB-contaminated dielectric oil accumulated at these sites. It is expected that a minimum of 200 tons of PCB-contaminated oil and PCB-containing equipment will be treated and reclaimed as part of this project. It is expected that such a treatment and waste management system will continue to be utilized beyond the life of this GEF-supported project, to treat the remaining PCB-contaminated transformer oil/transformers existing in the Republic of Serbia.

Previous inventories performed on PCB equipment in Serbia, as well as the currently performed inventory, have shown that around 400 tons of “pure PCB” or high PCB-containing transformers are still present in the country. Around 1,500 tons of such equipment have been finally disposed-of through exports within previous activities and projects.

Through the course of previous PCB elimination projects and activities performed in the country, low PCB-containing transformers operating at high voltage (at and above 35 kV) have been decontaminated to a degree of around 90% (around 1,890 tons).

Through the current project inventory, and taking into account previous inventories performed on low voltage grids (10/0.4 and 20/0.4 kV), levels of PCB contamination in transformers were found to range between 3 and 7.8%. The following assumptions which are required for calculation of the number of contaminated transformers present at low voltage grids (10/0.4 and 20/0.4 kV, as determined by several inventories on around 6,700 units) in the Republic of Serbia as a whole, as well as the estimated remaining number of contaminated transformers in the Republic of Serbia, are shown below:

- Average weight of oil per stationary transformer: 400 kg
- Average weight of oil per pole mounted transformer: 150 kg
- Total weight to oil weight ratio: 4
- Average percentage of contamination in Serbia: 6.5 %

- Contamination is uniformly distributed across Serbia
- Total number of low PCB contaminated transformers: 3,900
- Number of stationary contaminated units: 2,570
- Number of pole mounted units: 1,330
- Total weight of low PCB contaminated oil: 1,233 tons
- Total weight of low PCB contaminated equipment: 4,932 tons
- The share of equipment with a PCB content exceeding 2,000 ppm is negligible

Reliability of the above estimate is in the range of +/- 30%.

## **2. AIM OF THE CONTRACT**

The aim of the contract services is to provide for decontamination and, where required, final disposal of at least 347 tons of PCB equipment in the country, following provisions of the Stockholm and Basel Conventions, as well as national legislation and management framework related to PCB equipment and waste.

The above indicated quantity of at least 347 tons of PCB equipment to be decontaminated and, where required, finally disposed of is indicative; should, in the course of contract implementation, a higher quantity need to be decontaminated and disposed of, UNIDO may consider to amend the contract to cover additional decontamination and disposal services.

In the Management plan for PCB equipment and waste in the Republic of Serbia the following approach, consisting of three scenarios (further in text designated as scenarios A, B and C), is foreseen:

- A) "Pure PCB" equipment and waste to be exported for final disposal;
- B) Decontamination of low PCB-containing transformers (which are to be returned to service) in the country or abroad;
- C) Decontamination of low PCB-containing end-of-life transformers for final disposal in the country or abroad, followed by disassembly and recycling of metallic parts, including exports and /or final disposal of contaminated cellulosic materials;

The service provider shall submit a technical proposal that covers the entire system of Environmentally Sound Management of PCB equipment in the Republic of Serbia. The proposed system shall provide solutions for each of the above stated types of PCB contaminated equipment (waste streams indicated in previous paragraph). Description of the system, supported by technical specifications, flow charts, material balances, process parameters, utilities, process chemicals and appropriate drawings, shall be submitted. In the case that hazardous substances are required in the process, these should be clearly indicated with Environmentally Sound Management plans/measures. Proprietary chemical formulations should also be clearly designated.

## **3. SCOPE OF THE PROPOSED CONTRACTED SERVICES**

In close coordination with the Project Team Members and Technical Experts, the Contractor shall perform the activities covering disposal options A), B) and C). Technical requirements for options A), B) and C) are given below.

Risk analysis, packaging/repacking, stowing, storage, transportation and disposal/treatment procedures, including detailed description of risk management measures required for implementation, shall to be developed as part of the technical proposal and be approved during contract implementation.

All handling, storage and process activities shall be according to the National legislation, the relevant EU-legislation concerning PCB and other POPs, and the shipment of waste, as well as the requirements of the Stockholm and Basel Convention and the respective guidelines. A useful link to this legislation is:

<https://eur-lex.europa.eu/summary/chapter/environment/2004.html?root=2004>

<http://www.parlament.gov.rs/upload/archive/files/lat/pdf/zakoni/2016/287-16%20LAT.pdf>

[https://www.paragraf.rs/izmena\\_i\\_dopune/180518-pravilnik-o-izmenama-pravilnika-o-sadrzini-dokumentacije-koja-se-podnosi-uz-zahtev-za-izdavanje-dozvole-za-uvoz-izvoz-i-tranzit-otpada.html](https://www.paragraf.rs/izmena_i_dopune/180518-pravilnik-o-izmenama-pravilnika-o-sadrzini-dokumentacije-koja-se-podnosi-uz-zahtev-za-izdavanje-dozvole-za-uvoz-izvoz-i-tranzit-otpada.html)

The project will especially refer to the directive 2008/98/EC as binding guidelines.

The work to be provided by the Bidder can be divided into the following stages:

**Table 1: Scope of work**

	Stage	Work to be provided
<b>A</b>	<b>Export and disposal of “Pure PCB” equipment and waste</b>	
<b>1</b>	<b>Packing (handling, oil pumping, draining) of PCB transformers and capacitors</b>	<p>Provide UN approved packaging for the transportation of the PCB waste and the drained transformer carcasses (as per Table 2), labels, then personal protective equipment, safety equipment, equipment needed for the draining of the transformers (pumps, valve connectors, etc.), cleaning materials, absorbents, disposables, associated packing and stowing materials (pallets, drip trays, transit bins, wooden boards, slats, airbags) etc.</p> <p>Provide the needed handling and lifting equipment (crane, forklift, scale, etc.).</p> <p>Accomplish the draining of the PCB containing transformers from Pancevo and Smederevo, sealing the empty carcasses to avoid eventual leakage of the remaining oil from the valve and packing of the oil into UN approved packaging, packing of the PCB-containing capacitors, including the associated PCB contaminated solid waste, removing the visible pollution of the outer part of the transformer carcasses to enable safe handling of the transformers; labeling and weighing of the packages and the drained transformer carcasses using appropriate health and safety equipment and preparation of the site for the draining, packing and storage activities.</p> <p>Arrange for the transportation of the drained PCB- containing oil, the transformer carcasses and capacitors from Smederevo and Pancevo at a licensed temporary storage site or arrange safe storage conditions at respective locations at Smederevo and Pancevo where the packed PCB waste is to be temporarily stored until the transportation to the final disposal facility.</p>
<b>2</b>	<b>Transportation</b>	<p>Ensure adherence to all Serbian and international regulations including customs, EC Directive No. 1013/2006 of the European Council concerning the shipments of waste, the Basel and Stockholm Convention documentations for</p>

		<p>transboundary movement of the PCB wastes from the licensed temporary storage site to the destination country including obtaining all the required authorizations and permits from the concerned countries for the transboundary transportation of hazardous wastes, all handling, transportation and disposal according to BAT/BEP standards and including any provisions for insurances, as well as fees for export, transit and/or import permits; possible rental costs for sea containers; possible hazardous waste storage charges, financial guarantees etc.</p>
		<p>Provide either directly or through a sub-contractor, which shall be clearly identified and described in the technical proposal, a sufficient number of cargo vehicles of sufficient capacity ratings for international carriage of shipping containers, packing materials, tools and equipment to avoid interruptions in the work performance due to the lack of vehicles and other media. Ensure the necessary cargo insurance during transportation, which shall include environmental liabilities for the transport of the PCBs. Obtain all the required authorizations for the transboundary transfer of hazardous wastes.</p>
		<p>Provide for licensed temporary storage facility of sufficient capacity which can store the “pure PCB” equipment prior to export for final disposal.</p>
<b>3</b>	<b>Disposal</b>	<p>Arrange for, either directly or through a sub-contractor, which shall be clearly identified and described in the technical proposal, receiving and destroying/treating an amount of PCB wastes, through an internationally recognized and certified technology.</p>
		<p>Provide certification documentation (certificates of disposal) that the PCB wastes have been destroyed/treated in compliance with internationally recognized and mandated emissions standards including official confirmation and stamps from the responsible authority of the receiving country.</p>

	<b>Stage</b>	<b>Work to be provided</b>
<b>B</b>	<b>Decontamination of low PCB-containing transformers for re-use</b>	
<b>1</b>	<b>Preparing the PCB-containing transformers decontamination plan</b>	Accomplish, in cooperation with the owners of the PCB-containing transformers, the preparation of the PCB decontamination plan indicating the schedule for the treatment, the needed logistical equipment, risk reduction procedures and plans, health and safety plans and operational risk analysis and the monitoring plan.
<b>2</b>	<b>Obtaining the needed permits for the PCB treatment*</b>	Accomplish the procedure for obtaining the relevant permits for operation in Serbia or in the domicile country in case of

		treatment abroad and provision of all necessary operating permits.
<b>3</b>	<b>Decontamination of the PCB-containing transformers intended for re-use</b>	<p>Installation of the PCB treatment technology at a licensed location or export the PCB-containing transformers to a licensed facility abroad for decontamination (in the latter case to arrange the transportation activities as per Table 1, item A.2).</p> <p>Accomplish the decontamination of the low PCB-containing transformers as per Table 3, and return the same to the owners in a normal working condition.</p>

\* - in case of treatment in Serbia and no permit obtained yet

	<b>Stage</b>	<b>Work to be provided</b>
<b>C</b>	<b>Decontamination of low PCB-containing end-of-life transformers</b>	
<b>1</b>	<b>Preparing the PCB-containing transformers decontamination plan</b>	Accomplish, in cooperation with the owners of the PCB-containing transformers, the preparation of the PCB treatment plan indicating the schedule for the treatment, the needed logistical equipment risk reduction procedures and plans, health and safety plans and operational risk analysis and the monitoring plan.
<b>2</b>	<b>Obtaining the needed permits for the PCB treatment*</b>	Accomplish the procedure for obtaining the relevant permits for operation in Serbia or in the domicile country in case of treatment abroad and provision of all necessary operating permits.
<b>3</b>	<b>Decontamination of the end-of-life PCB-containing transformers</b>	<p>Installation of the PCB treatment technology at a licensed location or export the PCB-containing transformers to a licensed facility abroad for decontamination (in the latter case to arrange the transportation activities as per Table 1, item A.2).</p> <p>Accomplish the decontamination of the low PCB-containing transformers as per Table 4 followed by equipment dismantling, metals recycling and cellulosic materials exported and/or finally disposed of.</p>

\* - in case of treatment in Serbia and no permit obtained yet

#### **A) “Pure PCB” equipment and waste to be exported for final disposal**

##### **1. Packaging/repacking of the PCB capacitors and transformers (in case of transformers handling, oil pumping and draining)**

- i. The packaging of the PCB waste for transportation shall be carried out at the respective locations in Pancevo and Smederevo.
- ii. Prior to scheduling dates of the intended operations and prior to commencement of any packaging operations, the Project manager assigned by the Contractor shall visit the sites and

shall inspect the sites for purposes of planning the packaging, temporary storage and transportation operations.

- iii. After the site visit performed by the Project manager and prior to commencement of any works at the site, the Contractor shall submit to the Project Management Unit (PMU) a specified work plan and timeline for operations.
- iv. This shall also include a detailed plan for envisaged safety measures during packaging operations and temporary storage, including safety measures to avoid spills and containment during packaging operation (handling, oil pumping, draining) at the site, and an action plan in the event of any possible spillages and contamination.
- v. The Contractor shall arrange for appropriate packing of the “pure” PCB-containing transformers and capacitors as per Table 2 (including packing of 216 PCB containing capacitors, draining of the PCB containing transformers from Pancevo and Smederevo; sealing the empty carcasses to avoid eventual leakage of the remaining oil from the valve and packing of the oil into UN approved packaging; removing the visible pollution of the outer part of the transformer carcasses e.g. with acetone to enable safe handling of the transformers; transportation of 12 PCB-containing transformers carcasses, oil, the packed PCB containing capacitors and the associated PCB-containing solid waste arising from the packing activities from the respective locations in Pancevo and Smederevo to the licensed temporary storage site or to the final disposal facility), ensuring that all necessary safety precautions are taken in order to prevent any possible contamination at the site, as well as measures for potential leakages and/or oil containment in emergency situations. The Contractor shall ensure that the packaging operation is carried out by a duly certified company and duly trained employees and that all packages are UN approved, weighted and appropriately labeled. In the case of an accident during packing process, the Contractor shall be responsible to cover all the costs related to the remediation of the negative effects to the people, environment and property.
- vi. Maintain jointly with the PCB owners from Pancevo and Smederevo and the PMU, an inventory logbook of packed and stored PCB containing wastes.
- vii. Until the time of transportation, the Contractor shall bear full responsibility for the packed PCB-containing oil during such storage.
- viii. In the event that the packing operation would be planned with intermissions, the Contractor shall during such intermissions bear full responsibility for safety on site, the Contractor’s own working equipment, as well as PCB waste envisaged for packing and/or already packed.
- ix. The Contractor shall arrange for safe local transportation of the PCB waste from the respective locations in Pancevo and Smederevo to the Point of Shipment, i.e. to the licensed temporary storage site, or directly to the final disposal facility by respecting the national and ADR provisions for transportation of hazardous goods.
- x. The Contractor shall allow a certain number of persons, indicated by UNIDO and the PMU in advance, to observe the packaging and transportation operation. The list of persons would be provided by UNIDO and the PMU to the Contractor in advance. In this event the Contractor shall provide necessary instructions to ensure safety of these persons, including providing the protective clothing as necessary.

## **2. Transportation**

### **2.1 Obtaining and providing due permits/documents for export, transit, import and transportation. Scheduling the specific dates for packaging and shipping operations**

- i. At least one month prior to the packaging operation, and planned shipment of the packed PCB waste for transportation, the Contractor shall submit to UNIDO, PMU and the holder of the waste the following information:
  - the intended date of the operations;
  - the contact person in charge of the operations;
  - number of employees to be involved for each operation;
  - the intended method for ensuring safety on site;
  - estimated length of operations.
- ii. The Contractor shall prepare all documentation necessary to obtain the import, transit and export permits and shall submit it to the institutions in charge in order to obtain the needed permits. In order to facilitate the administrative and logistical issues, the Contractor will act as “Exporter-Notifier” of the concerning waste.
- iii. The Contractor shall be responsible for obtaining any permits/documentation necessary to carry out the transportation and disposal operation, as required under international regulations and within jurisdiction of the Republic of Serbia.
- iv. Upon obtaining of the import, transit and export permits and prior to commencement of withdrawal of the PCB containing equipment and wastes from the licensed temporary storage site or the respective locations in Pancevo and Smederevo, the Contractor shall submit approved copies to UNIDO and the PMU. The Contractor shall provide to the relevant authorities the Financial guarantee requested for the Transboundary Movement of Waste notification procedure in accordance with Basel Convention and EC Directive No. 1013/2006 of the European Council concerning the shipments of waste.
- v. The Contractor shall submit copies of valid permits for transportation of PCB wastes, class 9.

## **2.2 Transportation of PCB waste to the disposal site**

- i. The transportation of PCB wastes from the locations in Pancevo and Smederevo or from the licensed temporary storage site will be confirmed by the responsible person in written form. Before starting the works on site, all necessary safety precautions shall be undertaken in order to prevent any possible contamination at the PCB owner’s locations or the temporary storage site.
- ii. At least one month prior to the transportation operation, the Contractor shall contact the owners of the PCB transformers or the temporary storage site in order to confirm the transportation date, transportation company (either Contractor or subcontractor as specified in the proposal), estimated length of operation, and shall also provide information about the personnel in charge of the transportation operation (name, contact details, etc.).
- iii. The Contractor shall provide either directly or through a licensed sub-contractor, which shall be clearly identified and described in the technical proposal, a sufficient number of cargo vehicles of sufficient capacity ratings for international carriage of shipping containers, packing materials, tools and equipment to avoid interruptions in the work performance due to the lack of vehicles and other means of transport. The Contractor shall ensure the necessary cargo insurance during transportation, which shall include environmental liabilities for the transport of PCBs and any emergency situations resulting from inappropriate handling of cargo, inclusive of *Force Majeure*.
- iv. The Contractor is to provide either directly, or through a licensed sub-contractor, which shall be clearly identified and described in the technical proposal, all transport documents required by the customs legislation of all involved countries. The Contractor shall arrange customs clearance

and payment of all duties and taxes related with export/transit/import to the country of destination of PCB wastes.

- v. The Contractor shall maintain jointly with the PCB owners from Pancevo and Smederevo and the PMU, an inventory logbook of PCB containing wastes loading and shipping for destruction, which shall correlate with the shipping documents/waybill documentation.
- vi. Upon withdrawal of the PCB wastes for transportation to the disposal site, the Contractor shall submit to UNIDO and the PMU a verification of the withdrawal of the PCB wastes, carried out in compliance with legislative requirements, and pursuant to conditions stated in respective permits.
- vii. Upon delivery of the wastes at the disposal site, the Contractor shall submit to UNIDO and the PMU verification from the disposal site on acceptance of the cargo/shipment of PCB wastes, carried out in compliance with legislative requirements and pursuant to conditions stated in respective permits.
- viii. The above indicated documents and/or requested copies, approved by the Contractor, shall be submitted via email and mail to the contact person assigned by the UNIDO and the PMU.
- ix. Transport from the PCB owners locations or from the licensed temporary storage site to the disposal facility shall comply fully with the National legislation (Law on Waste Management (OGRS 36/2009, 88/2010 and 14/2016); Law on Transport of Hazardous Materials (OGRS 36/2009); Law on Ratification of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (OGFRY - International Treaties 2/99) and Rulebook on the detailed content of documents to be submitted with the request for issuance of a license for the import, export and transit of waste (OGRS 60/2009, 101/2010,... and 38/2018) and international regulations including customs, EC Directive No. 1013/2006 of the European Council concerning the shipments of waste, the Basel and Stockholm Convention documentations for transboundary movement of the PCB wastes, as well as the applicable international transportation agreements, rules and standards such as actual ADR (European Agreement concerning the International Carriage of Dangerous Goods by road); IMDG (International Maritime Dangerous Goods code/transport by sea); RID (Regulation for the international transport of hazardous goods on railways), IATA- DGR (International Air Transportation Association- Dangerous Goods Regulation on the transport of hazardous goods by air) or similar regulation if the receiving country lies outside of Europe.

### **3. Disposal of the PCB waste**

- i. The Contractor is to provide type and full description of a final disposal method (including technology, emission and residue control equipment, compliance with emission/releases standards in a country of disposal, annual capacity for general hazardous waste, and separately for chlorinated PCBs/wastes), full description of intermediate PCB transformers carcass recycling steps involved, if opted for, and selection of a well-established and licensed partners with long-history of operations in this area, description of the quality systems (and quality control) applied during disposal operations.
- ii. The Contractor is to receive and destroy/treat, through an internationally recognized and licensed PCB waste disposal technology, an amount of 114,045 kg of “pure” PCB-containing transformers. The disposal of PCB waste shall be completed within 300 days from the start of the assignment.
- iii. The Certificate of disposal confirming disposal of the PCB wastes shall be issued pursuant to the requirements of the Council regulation (EEC) No. 259/93 or other similar legislation if equally stringent, and shall be issued to the owners of the PCB waste, on condition that a copy is provided to UNIDO and the PMU by the Contractor at latest 1 month after disposal of all the waste, and at latest 3 months after arrival of the waste in the destruction facility.

- iv. The PCB waste will be destroyed by the technology provided by the supplier, to a level that destroys 99.9999% of the PCB contained in the waste. The transformer carcasses should be either destroyed, or decontaminated and disposed of in an environmentally safe manner. In case of treatment of the transformer carcasses, the PCB concentration of the decontaminated metal parts should be  $\leq 10\mu\text{g}/100\text{cm}^2$ .
- v. Emissions must be within the limits set by international bodies for destruction of POPs chemicals, or the country of the destruction facility, whichever is more stringent. Such details of limits shall be provided in the proposal. The Packaging (UN IBC containers and drums) should be destroyed.

## **B) Decontamination of low PCB-containing transformers in the country or abroad which are to be returned to service**

### **1. Preparing the PCB-containing transformers decontamination plan**

- i. The Contractor shall prepare the decontamination plan for the low PCB-containing transformers as per Table 3, indicating the schedule for the treatment, the needed logistical equipment, risk reduction procedures and plans, health and safety plans and operational risk analysis and the monitoring plan.

### **2. Obtaining the needed permits for the PCB treatment**

- i. The Contractor shall be in possession of relevant permits for operation issued in the Republic of Serbia, or should alternatively be capable to proceed with the process of obtaining relevant permits for operation in the country, or issued in the domicile country in case of treatment abroad.

### **3. Decontamination of the PCB-containing transformers intended for re-use**

- i. The Contractor shall install the PCB decontamination technology at a licensed location, or export the PCB-containing transformers to a licensed facility abroad for decontamination (in the latter case the Contractor shall arrange the transportation activities as per Table 1, item A.2).
- ii. The Contractor shall decontaminate the transformers as per data in Table 3 using the technology that meet the following key criteria:
  1. The foreseen non-combustion decontamination technology shall comply with BAT and BEP requirements according to EU 2010/75 directive or with equivalent guidelines/regulations coming from an EU member state's Ministry of Environment and also relevant Conventions (Basel Convention, Stockholm Convention).
  2. The system has to be commercially available and proven in industrial scale applications. This means that the technology of each system has already been successfully operating at full scale in a commercial or other institutional setting and is available for disposing of PCB-contaminated oil and PCB contaminated equipment and wastes. Only directly applicable technologies with considerable experience for at least 5 years, or alternatively 1,000 tons of PCB transformers successfully treated, will be considered.
  3. The technology shall focus on life-cycle management of transformers (oil and metal parts) and their reuse after treatment, i.e. regenerating PCB-contaminated oil as transformer grade reusable oil and reusing the transformer itself. This procedure shall significantly reduce the amount of waste that will eventually still need to be exported for final disposal.
  4. The decontamination processing unit should be able to destroy PCBs in transformer oil that

are off-line as well as already phased-out transformers stored at the owner's site or in the interim storage. These phased-out transformers are still filled with oil. Furthermore, the process should be appropriate for treating the previously drained oil stored in drums, containers, as well as the drained transformers and solid parts.

5. The process applied has to be applicable for transformers which are in use, and which are to be returned to operation following decontamination, as well as not to disturb normal operation at the owner's site.
6. The decontamination process shall warrant the PCB concentration in the treated transformers to less than 50 ppm. The Contractor shall be responsible for obtaining the verification results from an accredited laboratory approved by UNIDO and the PMU. The Contractor shall be also responsible for making properly labelled duplicates of each sample tested for verification. One of the duplicated samples will be stored and kept by the owner in case re-verification is required.
7. In cases where the verification by the Gas Chromatography 90 days after the decontamination confirms that the concentration of the PCBs in the decontaminated transformer returned back in operation is above the limit of 50 ppm, the Contractor is obliged to repeat the decontamination process until reaching the limit of 50 ppm. All expenses related to the additional decontamination shall be covered by the Contractor.
8. Residues and by-products to be disposed of within Republic of Serbia must fulfil the national as well as the EU directives, whereas formation of hazardous waste should be reduced to a technical minimum. All by-products and residues which cannot be landfilled in Republic of Serbia must be prepared (packed and labelled) by service supplier staff for transport and disposal.
9. The system should be demonstrably safe. A "demonstrably safe" technology is one that achieves the highest possible level of occupational safety and has a history of safe operation, with no cases of death or injury or incidents that threatened life or injury resulting from the use of the technology.
10. The system as a whole shall not exceed the emission limit of other pollutants in the atmosphere and in water, established in the Regulations of Republic of Serbia. Any part of the technology system that emits or contains hazardous substances shall be built and operated in compliance with all relevant legislations in Republic of Serbia concerning storage and transport of hazardous waste.
11. All the system technologies which will be established in Republic of Serbia shall be based on non-combustion systems not generating any uPOPs during the process.
12. All system technologies must operate in an essentially "environmental closed" system. It means the complete containment of all process streams to enable analysis of all residues (gaseous, solid, and/or liquid) and their further processing if necessary prior to release, thereby ensuring that uncontrolled releases of POPs and other substances of concern can be avoided. Thus, the system must be equipped with the capacity to monitor and test all process residues and output streams and to redirect the streams for reprocessing if needed.
13. The Contractor is required to present the list of the wastes generated in the PCB destruction process (if any), their quantity, as well as the way and conditions of their reprocessing or disposal if these are not directly reprocessed by the system.
14. The Contractor shall be responsible to take all necessary precautionary measures to avoid any accident that can endanger human health and environment. In the case of an accident during the treatment process, the Contractor shall be responsible to cover all the costs

related to the remediation of the negative effects.

15. The Contractor shall undertake all necessary activities relevant for final disposal of process by-products/residues and other PCB or non-PCB waste arising from the process.
- iii. The Contractor shall return the decontaminated transformers to the owners in a normal working condition, confirmed by electrical and chemical tests in accordance with the parameters specified in Table 5.

**C) Decontamination of low PCB-containing end-of-life transformers in the country or abroad, followed by disassembly and recycling of metallic parts, including exports and /or final disposal of contaminated cellulosic materials**

**1. Preparing the PCB-containing transformers decontamination plan**

- i. The Contractor shall prepare the decontamination plan for the low PCB-containing transformers as per Table 4, indicating the schedule for the treatment, the needed logistical equipment, risk reduction procedures and plans, health and safety plans and operational risk analysis and the monitoring plan.

**2. Obtaining the needed permits for the PCB treatment**

- i. The Contractor shall be in a possession of relevant permits for operation issued in the Republic of Serbia, or should alternatively be capable to proceed with the process of obtaining relevant permits for operation in the country, or issued in the domicile country in case of treatment abroad.

**3. Decontamination of the end-of-life PCB-containing transformers**

- i. The Contractor shall install the PCB decontamination technology at a licensed location or export the PCB-containing transformers to a licensed facility abroad for decontamination (in the latter case, the Contractor shall arrange the transportation activities as per Table 1, item A.2.
- ii. The Contractor shall decontaminate the transformers as per Table 4 using the technology that meets the following key criteria:
  1. The foreseen non-combustion decontamination technology shall comply with BAT and BEP requirements according to EU 2010/75 directive or with equivalent guidelines/regulations coming from an EU member state's Ministry of Environment and also relevant Conventions (Basel Convention, Stockholm Convention).
  2. The system has to be commercially available and proven in industrial scale applications. This means that the technology of each system has already been successfully operating at full scale in a commercial or other institutional setting and is available for disposing of PCB-contaminated oil and PCB contaminated equipment and wastes. Only directly applicable technologies with considerable experience for at least 5 years, or alternatively 1,000 tons of PCB equipment successfully treated, will be considered.
  3. The decontamination processing unit should be able to destroy PCBs in transformer oil that are off-line as well as already phased-out transformers stored at the owner's site or in the interim storage. These phased-out transformers are still filled with oil. Furthermore, the process should be appropriate for treating the previously drained oil stored in drums, containers, as well as the drained transformers and solid parts.
  4. The technology shall focus on life-cycle management of transformers (oil and metal parts) and their reuse after treatment, i.e. regenerating PCB-contaminated oil as transformer grade

reusable oil and recycling of the metal parts. This procedure shall significantly reduce the amount of waste that will eventually still need to be exported for final disposal. The approach to be applied is that the ownership of the unit to be finally disposed of is transferred to the service provider who will be responsible for final disposal.

5. The drained transformer carcasses should be decontaminated for reuse and recycling. The metal parts like casings and coils separated in the dismantling process shall be cleaned with the process and procedures specified by the Contractor to levels at  $\leq 10\mu\text{g}/100\text{cm}^2$ , to ensure a safe reuse/recycling of the scrap. Occupational safety of workers including blood PCB levels of workers, wherever possible, must be given a special attention in the process and procedures.
6. The decontamination process shall warrant the PCB concentration in the treated oil to less than 10 ppm. The Contractor shall be responsible for obtaining the verification results from an accredited laboratory approved by UNIDO and the PMU. The Contractor shall be also responsible for making properly labelled duplicates of each sample tested for verification. One of the duplicated samples will be stored and kept by the owner in case re-verification is required.
7. Residues and by-products to be disposed of within Republic of Serbia must fulfil the national as well as the EU directives, whereas formation of hazardous waste should be reduced to a technical minimum. All by-products and residues which cannot be landfilled in Republic of Serbia must be prepared (packed and labelled) by service supplier staff for transport and disposal.
8. The system should be demonstrably safe. A “demonstrably safe” technology is one that achieves the highest possible level of occupational safety and has a history of safe operation, with no cases of death or injury or incidents that threatened life or injury resulting from the use of the technology.
9. The system as a whole shall not exceed the emission limit of other pollutants in the atmosphere and in water, established in the Regulations of Republic of Serbia. Any part of the technology system that emits or contains hazardous substances shall be built and operated in compliance with all relevant legislations in Republic of Serbia concerning storage and transport of hazardous waste.
10. All the system technologies which will be established in Republic of Serbia shall be based on non-combustion systems not generating any uPOPs during the process.
11. All system technologies must operate in an essentially “environmental closed” system. It means the complete containment of all process streams to enable analysis of all residues (gaseous, solid, and/or liquid) and their further processing if necessary prior to release, thereby ensuring that uncontrolled releases of POPs and other substances of concern can be avoided. Thus, the system must be equipped with the capacity to monitor and test all process residues and output streams and to redirect the streams for reprocessing if needed.
12. The Contractor is required to present the list of the wastes generated in the PCB destruction process (if any), their quantity, as well as the way and conditions of their reprocessing or disposal if these are not directly reprocessed by the system.
13. The Contractor shall prepare Accident Prevention and Emergency Preparedness Plans and Procedures.
14. The Contractor shall be responsible to take all necessary precautionary measures to avoid any accident that can endanger human health and environment. In the case of an accident during the treatment process, the Contractor shall be responsible to cover all the costs related to the remediation of the negative effects.
15. The Contractor shall undertake all necessary activities relevant for final disposal of process by-products/residues and other PCB or non-PCB waste arising from the process.

#### 4. TRANSFORMER/EQUIPMENT SPECIFICATIONS FOR THE RELATED SPECIFIC TASKS TO BE CARRIED OUT UNDER THIS CONTRACT

The Contractor shall perform the required tasks on the transformers specified in tables below:

**Table 2. Final disposal of “pure PCB” equipment**

Nr.	Voltage (kV)	Power rating (MVA)	Total weight (kg)	Oil weight (kg)	Serial No.	PCB cont. (%)	Note	Owner/ Location
1.	6/0.4	2.00	5,300	1,420	31170	100	Not in use	Petrohem/Pancevo
2.	6/0.4	2.00	5,300	1,420	31177	100	Not in use	Petrohem/Pancevo
3.	6/0.4	2.00	5,300	1,420	31179	100	Not in use	Petrohem/Pancevo
4.	N.A.	N.A.	29,000	13,400	ST12803	100	Not in use	HBIS/ Smederevo
5.	N.A.	N.A.	25,500	12,200	ST12802	100	Not in use	HBIS/ Smederevo
6.	N.A.	N.A.	1,570	805	T18543/1	100	Not in use	HBIS/ Smederevo
7.	N.A.	N.A.	1,570	805	36G/TO18543-1	100	In use	HBIS/ Smederevo
8.	N.A.	N.A.	1,205	420	36G/TO18569-1	100	Not in use	HBIS/ Smederevo
9.	N.A.	N.A.	3,780	1,380	36G/TO18530-14	100	In use	HBIS/ Smederevo
10.	N.A.	N.A.	3,780	1,380	36G/TO18530-10	100	In use	HBIS/ Smederevo
11.	N.A.	N.A.	3,780	1,380	T0 18544-1	100	In use	HBIS/ Smederevo
12.	N.A.	N.A.	15,000	3,750	N.A.	100	Not in use	HBIS/ Smederevo
<b>PCB capacitors</b>								
1.	N.A.	N.A.	12,960	4,320	216 units	100	Not in use	HBIS/

								Smederevo
	<b>Total:</b>		<b>114,045</b>	<b>44,100</b>				

**Table 3: Decontamination of low PCB-containing equipment to be returned to service**

Nr.	Voltage (kV)	Power rating (MVA)	Total weight (kg)	Oil weight (kg)	Serial No.	PCB cont. (mg/kg)	Note	Owner/ Location
1.	N.A.	N.A.	4,000	960	86308	288	In use	HBIS/ Smederevo
2.	N.A.	N.A.	41,000	13,600	41577	699	In use	HBIS/ Smederevo
3.	N.A.	N.A.	2,040	380	38597	131	In use	HBIS/ Smederevo
4.	N.A.	N.A.	1,620	350	43838	1247	In use	HBIS/ Smederevo
5.	N.A.	N.A.	3,285	630	448385	93	In use	HBIS/ Smederevo
6.	N.A.	N.A.	3,285	630	448388	51	In use	HBIS/ Smederevo
7.	N.A.	N.A.	3,340	630	448389	83	In use	HBIS/ Smederevo
8.	N.A.	N.A.	3,180	625	54041	442	In use	HBIS/ Smederevo
9.	N.A.	N.A.	3,180	625	54042	436	In use	HBIS/ Smederevo
10.	N.A.	N.A.	3,180	625	54043	457	In use	HBIS/ Smederevo
11.	N.A.	N.A.	3,180	625	54044	455	In use	HBIS/ Smederevo
12.	N.A.	N.A.	4,450	695	65490	208	In use	HBIS/ Smederevo

13.	N.A.	N.A.	4,490	700	65491	540	In use	HBIS/ Smederevo
14.	N.A.	N.A.	4,490	700	65492	131	In use	HBIS/ Smederevo
15.	N.A.	N.A.	4,490	700	65493	110	In use	HBIS/ Smederevo
16.	N.A.	N.A.	4,490	700	65494	52	In use	HBIS/ Smederevo
17.	N.A.	N.A.	4,490	700	65495	466	In use	HBIS/ Smederevo
18.	N.A.	N.A.	4,450	695	67536	81	In use	HBIS/ Smederevo
19.	10/0.4	N.A.	1,075	200	49975	128	In use	Water & Sewer/ Nis
20.	6/0.4	N.A.	1,170	215	77235	79	In use	Water & Sewer/ Nis
21.	10/0.4	N.A.	3,940	665	83763	1353	In use	Water & Sewer/ Nis
22.	10/0.4	N.A.	655	150	43773	116	In use	Water & Sewer/ Krusevac
23.	10/0.4	N.A.	655	150	43774	140	In use	Water & Sewer/ Krusevac
24.	10/0.4	N.A.	2,450	475	72558	727	In use	Water & Sewer/ Krusevac
25.	10/0.4	N.A.	2,450	475	72591	168	In use	Water & Sewer/ Krusevac
	<b>Total:</b>		<b>115,035</b>	<b>26,900</b>				

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**Note: Access to transformers to be decontaminated and returned to service could be time dependent and has to be previously scheduled with owners. This may result in discontinuous operation at the site with delays of up to 10 days.**

**Table 4: Decontamination of low PCB-containing equipment to be finally disposed of**

<b>Nr.</b>	<b>Voltage (kV)</b>	<b>Power rating (MVA)</b>	<b>Total weight (kg)</b>	<b>Oil weight (kg)</b>	<b>Serial No.</b>	<b>PCB cont. (mg/kg)</b>	<b>Note</b>	<b>Owner / Location</b>
1.	N.A.	N.A.	3,130	625	38971	947	Not in use	HBIS/ Smederevo
2.	N.A.	N.A.	830	235	44438	935	Not in use	HBIS/ Smederevo
3.	N.A.	N.A.	637	110	456696	61	Not in use	HBIS/ Smederevo
4.	N.A.	N.A.	400	100	412537	54	Not in use	HBIS/ Smederevo
5.	N.A.	N.A.	655	140	14320	51	Not in use	HBIS/ Smederevo
6.	N.A.	N.A.	655	140	14321	106	Not in use	HBIS/ Smederevo
7.	N.A.	N.A.	73,000	21,000	335054	109	Not in use	HBIS/ Smederevo
8.	N.A.	N.A.	445	110	458322	97	Not in use	HBIS/ Smederevo
9.	N.A.	N.A.	2,700	510	458323	99	Not in use	HBIS/ Smederevo
10.	35/10	N.A.	18,000	4,500	1797/200 84	250	Not in use	Petrohem/ Pancevo
11.	35/10	N.A.	18,000	4,500	1797/400 84	61	Not in use	Petrohem/ Pancevo
	<b>Total:</b>		<b>118,452</b>	<b>31,970</b>				

Proposed services have to include the following activities:

- I. Preparatory phase including planning and timeframe of activities to be performed,
- II. System for collection, storage and export of pure PCB equipment established,
- III. System for decontamination of low POPs equipment established,
- IV. System for final disposal of low POPs decontaminated equipment, followed by equipment dismantling and metals recycling, established,
- V. Analytical services,
- VI. Environmental, health and safety monitoring system established,
- VII. Surveying and assessment of results,
- VIII. Reporting

### **I. Preparatory phase including planning and timeframe of activities to be performed**

A preparatory phase includes determination of locations of individual units which are foreseen to be decontaminated and, where required, finally disposed of, in a realistic timeframe. During this period, an ESM system capable of performing tasks under the following scenarios with requirements as specified under part 3 shall be established:

- A) "Pure PCB" equipment and waste to be exported for final disposal;
- B) Decontamination of low PCB-containing transformers in the country or abroad which are to be returned to service;
- C) Decontamination of low PCB-containing end-of-life transformers for final disposal in the country or abroad, followed by disassembly and recycling of metallic parts, including exports of contaminated cellulosic materials.

The plan should include detailed description of activities and modalities for execution of specific tasks, also including the activities related to permits, environmental monitoring plan and all other relevant documents to be issued by the Government and Enforcement agencies.

### **II. System for collection, storage and export of pure PCB equipment established**

Suitable system for collection, storage and export of pure PCB equipment shall be fully established. The operator has to be in possession of adequate permits issued by the Ministry of Environmental Protection (MoEP) and other enforcement agencies, related to transportation, packing, storage, and cross-border transport.

### **III. System for decontamination of low PCB-containing transformers established**

Technical system, operating unit/entity, for decontamination of low PCB-containing transformers shall be established in the country, by also taking into consideration the possible export for treatment abroad if technically and economically acceptable. The unit has to be in possession of permits for operation, which applies to both mobile and stationary units. The operator has to: be capable of monitoring impact on the environment, provide technical training for any additional staff if needed, be capable of ensuring legally binding methods of waste management, provide for exports of cellulosic materials, strictly follow rules on health and safety of the working staff, and strictly provide all precautions related to mitigation of potential flame hazards and all other organizational provisions normally associated with industrial operations.

**IV. System for final disposal of low PCB-containing end-of-life transformers, followed by equipment dismantling and metals recycling, established**

Technical system, operating unit/entity, for final disposal of decontaminated low PCB-containing end-of-life transformers, followed by equipment dismantling and metals recycling, should be established in the country, by also taking into consideration the possible export for treatment abroad if technically and economically acceptable. The unit has to be in possession of permits for operation at the specified location. The process should be economically feasible and technically efficient in order to provide for safe conversion of end-of-life equipment to separate hazardous and non-hazardous substances. The operator has to; be capable of monitoring impact on the environment, provide technical training for any additional staff if needed, provide for exports of cellulosic materials, be capable of ensuring legally binding methods of waste management, strictly follow rules on health and safety of the working staff, and strictly provide all precautions related to mitigation of potential flame hazards and all other organizational provisions normally associated with industrial operations.

**V. Analytical services**

Following the decontamination of low POPs units, the level of PCB in oil has to be determined, as well as after 3 months following the decontamination. National standards, or international standards, for determination of PCB presence in the following media have to be applied following final disposal of decontaminated equipment: oil, surface of metals, paper and pressboard. Control samples of all decontaminated low POP oils have to be preserved for subsequent random analysis of 20%, for PCB content in decontaminated fluids (scenarios B and C), in separate independent laboratory.

**Table 5: Scope of laboratory analysis and the analytical methods**

Parameter	Method	Approximate number of analyses
<b>Analysis</b>		
PCB in oils	SRPS EN 61619 or equivalent	63
PCB on metallic surfaces, EPA SW	US EPA SW-846 Method 3572 Extraction of Chemical Agents from Wipe Samples Using Microextraction	11
PCB in cellulosic materials		11
PCB, pure or high POPs		42
Functional insulating oil properties in accordance with IEC 60422		
Breakdown voltage, kV/cm	IEC 60156	25
Dielectric dissipation factor 90 °C, tgδ	IEC 60247	25
Acidity number, mg <sub>KOH</sub> /g <sub>oil</sub>	IEC 62021	25
Interfacial tension, mN/m	ISO 6295	25

**Note 1: Prior to filling the decontaminated transformer oil must have breakdown voltage (BDV) of minimum 62.5 kV**

**Note 2: Oil properties after decontamination have to be better than before decontamination following provisions of IEC 60422**

#### **VI. Environmental, health and safety monitoring system established**

Environmental monitoring plan and system design to be submitted which should be used later on in the verification process is to be done by the MoEP. The environmental baseline at the location is to be established. The system installed should provide for adequate periodic sampling and analysis of environmental media through the entire duration of the project. Sampling and analysis should be performed in accordance with national legislation. Monitoring of health and safety parameters within the process unit premises has to be provided as well.

#### **VII. Reporting, surveying and assessment of results**

Results of decontamination and final disposal activities shall be constantly monitored and assessed in order to track execution of tasks, and to avoid potential delays. The PMU and UNIDO shall be timely advised on any potential gaps and delays. Regular monthly and quarterly reports shall be submitted to the UNIDO and PMU.

The draft reports (interim/quarterly and final report) including annexes will be prepared in English language and submitted to UNIDO for review and approval. After receipt of comments provided by UNIDO, the PMU, national experts or by a consultant nominated by UNIDO, the final version of the report will be issued.

The draft (interim/quarterly and final report), as well as the annexes, shall be delivered in electronic forms (doc and pdf formats), while the final versions shall be delivered in hard copies as well.

### **5. GENERAL TIME SCHEDULE**

The activities outlined in this ToR shall be completed within **maximum 12 months** following the signing of contract by both parties.

### **6. LANGUAGE REQUIREMENTS**

The working language is English for the purpose of reporting to the UNIDO and the PMU. Reporting and communication in Serbia should be in Serbian (day to day activities), as well as the Final Report to be submitted to the MoEP and the PSC. All the proposals, associated reference documents, and deliverables should be made available in English. If required, the translation and interpreter costs should be separately indicated in the bidder's proposal.

### **7. BIDDER'S EXPERIENCE AND CAPACITY**

The bidder shall demonstrate corporate experience as direct contractor to organizations of the United Nations System and/or other international agencies and/private sector which is related or relevant to the one required for this Contract. In line with the "Instructions for the Preparation and Submission of Proposals" document, at least 5 project references with information (such as name of the project/contract, value of the contract, Client, starting/end date, export country, amount and kind of waste, etc) shall be submitting with regard to the following areas/sectors:

- i. Bidder's experience in PCB Management issues along the lifecycle;

- ii. Bidder's experience in handling PCB wastes (with indication about the amount of waste, type and location), especially draining and pumping of PCB containing oil from transformers, packing of the PCB-containing capacitors, etc.
- iii. Bidder's experience with decontamination of transformers intended for reuse, as well as of the end-of-life transformers (including the oil and the metal parts);
- iv. Bidder's experience with PCB waste export and transboundary transportation;
- v. Bidder's experience with disposal of PCB containing equipment and waste.

Note that if a subcontractor, where indicated in the proposal, is to provide some of the services, the experience of the subcontractor will be considered too.

Moreover, the bidder shall demonstrate:

**Disposal/decontamination capacities:** Provide information on the capacities of the organization for the disposal/decontamination of the PCB containing equipment and waste, in tons per year.

**Organizational Commitment to Sustainability:** Provide information on obtained Quality Certificates (e.g., ISO, etc. EMAS, ISO 9001, ISO 14001, OHSAS 18001) and/or other similar certificates, awards and citations received by the Bidder, commitment to sustainability through other means, for example internal company policy documents on women empowerment, renewable energies or membership of trade institutions promoting such issues.

## **KEY PERSONNEL**

**Qualification of the key personnel:** Provide information the professional background of the key personnel (e.g. Team Leader, Managerial and general staff) that will be engaged to support the implementation of this contract. CVs should demonstrate qualifications in areas relevant to the Scope of Services including the general experience in hazardous waste management and the specific experience relevant to the assignment. The required language is English, but the knowledge of Serbian will be an advantage.

**Staff time allocation:** Provide a spreadsheet to show the activities of each staff member and the time allocated for his/her involvement.

## **8. CONTENT OF THE BIDDER'S PROPOSAL**

Format and content of the proposal is outlined in the "Instructions for the Preparation and Submission of Proposals" document. However, this section provides additional guidance.

**TECHNICAL PROPOSAL should, among others, contain the following:**

**1. General work plan:** Please describe the overall project work plan and time schedule, providing an organizational chart to indicate supervision and control mechanisms, including risk management. This shall include the approximate timing of the major steps in the packing, transportation and disposal/decontamination operation as well as the deliverables submission timing of Table 7. This section should demonstrate the Bidder's responsiveness to the specifications by identifying the specific components proposed, addressing the requirements as specified, point by point; providing a detailed description of the essential performance characteristics proposed warranty; and demonstrating how the proposed methodology meets or exceeds the specifications.

**2. The plan for export of "pure PCB" equipment:** the plan should be provided as per specifications provided in Section 3, Table 1 - scenario A).

**3. The plan for decontamination of low PCB equipment:** the plan should be provided as per specifications provided in Section 3, Table 1 - scenario B).

**4. The plan for final disposal of PCB equipment:** the plan should be provided as per specifications provided in Section 3, Table 1 - scenario C).

**5. Proposed technical solution with respect to country needs:** sustainability of the proposed technical solution should be addressed in the context of the current and future need in the Republic of Serbia related to PCB contaminated equipment, as described under sections “1. General information and background” and “2. Aim of the contract” of the Terms of Reference.

**6. The technical solution proposed is designed to fulfill the provisions of the Stockholm and Basel conventions:** the impact of the proposed technical solution on the achievement of the goals of both conventions should be addressed.

**7. List of necessary health and safety equipment:** necessary health and safety should be listed and explained (Section 3).

**8. Packing Plan:** please provide details of the packing of the PCB containing wastes and the associated waste with the detailed explanation on the packing procedure (handling, draining, pumping of the PCB containing oil and carcasses, site preparation, needed tools and equipment, labeling, safety and precautionary measures, emergency actions and clean up, type of packaging in accordance with the European Agreement concerning the International Carriage of Dangerous Goods by road (ADR), the Regulation for the international transport of hazardous goods on railways (RID), International Maritime Dangerous Goods code/transport by sea (IMDG) and the International Air Transportation Association-Dangerous Goods Regulation on the transport of hazardous goods by air (IATA-DGR), type of PPE and equipment required for draining, pumping, packaging).

**9. Plan for National/international transportation of PCBs:** describe supervision, contractual obligations, insurance and quality assurance arrangements with regard to overseeing sub-contractor, where required, responsible for transport of PCB wastes from the Point of Shipment (to the final point at the disposal facility (risks and safety precautions, details provided on roles and responsibilities pertaining to transfer from one site, loading/unloading process, customs clearance), means of transport and safety considerations and proposed route of transportation.

**10. Decontamination plan:** indicate the proposed schedule for the treatment, the needed treatment and logistical equipment, description of operational procedures, risk reduction procedures and plans, health and safety plans and operational risk analysis and the monitoring plan.

The following data shall be provided by the Bidder:

- i. Describe the decontamination technology and process, including information regarding ability of reusing of the decontaminated transformers, i.e. to be put back in operation, then relevant chemical reactions, overall process flow, and the output products from the process of PCB decontamination, the name and category (safety data sheets) of the waste such as waste including solvents, residues, oil that cannot be treated, porous PCB waste, etc., management of such wastes (quantity, quality, reprocessing, disposal, etc.), ability of re-using of the oil as transformer grade oil, ability of treatment under load, etc.
- ii. Description of the oil regeneration and transformer dismantling pre-treatment processes, including a range of physical and chemical characteristics of used oil that can be regenerated to transformer grade oil, and carcass disassemble and cleaning process with the description of PPEs to be used in handling low level and high level PCBs, respectively.
- iii. Describe decontamination of transformers which are in use and to be returned to operation following decontamination.
- iv. Nominal processing capacity per different range of PCB concentrations and maximum treatable PCB concentrations.
- v. Detailed description on how the system verifies reaction completion, how emissions and output residues are captured and sampled for assay (including the emissions from the relief valves if applicable and how they can be reprocessed).

- vi. Identification and analyses of potential risks and hazards and description of all safety design features, safety and emergency procedures, contingency plans, and other approaches for minimizing risks and mitigating hazards.
- vii. Occupational safety including PCB and solvent blood concentrations of workers (if not available, provide reasons) and health records or other supporting documentation to demonstrate the safety of the technology during operation

**11. Permits for export, treatment, final disposal and transportation:** please provide information on required permits and licenses, including copies of relevant permits and licenses, or estimated timeline for obtaining such permits if needed. Please provide information of required guarantees and insurances required for transboundary movement of wastes and accidents. Please propose methods for obtaining all the required authorizations for the transboundary transfer of hazardous wastes. Draft versions or samples of filled notifications and other necessary transport documents.

**12. Technical description of the proposed treatment/disposal process:** Please describe clearly and understandable the type and description of disposal method (including technology and capacity) and that the disposal process meets BAT/BEP standards, Pre-treatment of waste, Reuse and/or disposal of possible residues, System of environmental monitoring data by environmental media (air, water etc.), Description of the quality systems (and quality control) applied during disposal operations.

**13. Risk analysis:** Please provide description and documentation of proposed safety measures, appropriate risk analysis (taking all kinds of risks – operational, logistic, environmental, financial – into consideration).

**14 Management Structure:** Describe the overall management approach toward planning and implementing this activity. Include an organization chart for the management of the project describing the relationship of key positions and designations.

## 9. LIABILITY

The Contractor may be requested to provide a Bank Guarantee in amount of 5% of the value of the contract in order to cover environmental, health and property damages and hazards due to the pollution accidents as a result of the Contractor’s activities as well as to ensure the quality and timely performance of the requested operations,.

## 10. DELIVERABLES AND PAYMENT SCHEDULES

Payments will be made within 30 days after approval submitted by the Contractor to the UNIDO, confirming that the required activities are delivered, and upon receipt of respective invoice.

Note that the order of the payments will depend on time of the finalization of the requested deliverables. The activities and related deliverables can be performed/submitted concurrently.

The bidder shall indicated in its proposal the timing of the submission of the below Deliverables.

**Table 7. Deliverables and payment schedule**

Payment #	Deliverables	Timing (to be indicated by the bidder)
1	<b>Progress Report No. 1 covering:</b> - detailed Work Plan and timeline of operations; Accident Prevention and Emergency Preparedness Plans and Procedures; - Health and Safety Plans	
2	<b>Progress Report No. 2 covering:</b>	

	- Packing, transportation and disposal of 70 tons of pure PCB equipment	
<b>3</b>	<b>Progress Report No. 3 covering:</b> - Packing, transportation and disposal of 44 tons of pure PCB equipment	
<b>4</b>	<b>Progress Report No. 4 covering:</b> - Decontamination of 70 tons of low PCB-containing equipment to be returned to service	
<b>5</b>	<b>Progress Report No. 5 covering:</b> - Decontamination of 45 tons of low PCB-containing equipment to be returned to service	
<b>6</b>	<b>Progress Report No. 6 covering:</b> - Decontamination of 70 tons of low PCB-containing equipment to be finally disposed-of	
<b>7</b>	<b>Progress Report No. 7 covering:</b> - Decontamination of 48.4 tons of low PCB-containing equipment to be finally disposed-of	