



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project SAP 140019

**Environmentally Sound Management and Disposal of
PCB at the Russian Railroad network and other PCBs owners**

**TERMS OF REFERENCE FOR PROVISION OF PCBs DISPOSAL SYSTEM BASED
ON HIGH-TEMPERATURE OXIDATION**

1. GENERAL BACKGROUND INFORMATION

The Stockholm Convention on persistent organic pollutants (POPs) recognizes that POPs, including polychlorinated biphenyls (PCBs), “possess toxic properties, resist degradation, accumulate and are transported through air, water and migratory species, across international boundaries and deposited far from their places, where they accumulate in terrestrial and aquatic ecosystems”. Exposure to PCBs is a major public health concern, particularly upon women and, through them, upon future generations.

The Russian Federation has ratified the Stockholm Convention on POPs on August 17, 2011 with the aim to protect human health and the environment from the adverse effects of POPs. The Ministry of Natural Resources and Environment (MoNRE) was assigned by the Government as the National Focal Point (NFP) for the Convention. In order to facilitate its ratification and to define the actions required for the implementation, in October 2017 Russia adopted the National Implementation Plan (NIP) under the Convention.

The NIP sets priorities for initiating future actions to eliminate the production and use of POPs. The issues of the presence of PCB in electrical equipment and the urgent needs for the protection of the population and environment from leakages of contaminated oil and contacts with contaminated equipment and wastes were given the highest priority in the NIP. It was connected with the understanding that Russia, being in the past one of the largest producer of PCBs, still does not have any efficient legislative system, or technical policy for proper management of the remaining contaminated equipment and wastes. The Government initiated advanced actions for updating the legislation and building up technical capacities for PCB management.

Four (4) years earlier during the NIP development Russia applied to GEF for limited financial assistance to establish the efficient environmentally sound management (ESM) system for PCB. The ESM system includes, among other things, carrying out a full scale inventory study, the development of actions for the removal of PCB equipment still in service, the safe collection and interim storage of such pieces of equipment, the adoption of economical and environmentally friendly technologies for the disposal of PCB wastes.

The production of PCBs in Russia had started in 1934 and terminated in 1995. During this period, the country produced approximately 180,000 tons of PCB (local brand names Sovol and Sovtol), which were mostly used as dielectric material for the energy equipment such as transformers, capacitors and switch-off gears.

In the course of the NIP development, the preliminary inventory of PCB-contaminated equipment was undertaken among the major owners of energy equipment. The inventory covers only 3,000 large enterprises and 3,000 energy sub-stations, which represent only a portion of all available equipment. Several large owners of this equipment, including the Russian Railroads JSC, were not included in this inventory. The additional information on PCBs was received from the inventory conducted by the Secretariat of HELCOM (The Baltic Marine Environment Protection Commission). Their results cover only the Northwest part of Russia.

The preliminary inventory identified 7,514 transformers and 329,026 capacitors containing a total of 20,841 tons of pure PCB. No chemical analysis of the transformer oil was done; therefore, the collected data do not include equipment cross-contaminated during their services. According to the world experience, the number of transformers contaminated during

their service could be approximately 7-10%. If the total number of transformers in Russia could be estimated as 1.5 million, the number of transformers cross-contaminated during their service could be estimated at least 100,000 pieces. This degree of contamination was confirmed by the limited inventory undertaken during the preliminary stage of the project, when the Russian Railroads JSC collected and tested 512 oil samples from their transformers. The results show that 37 transformers (7%) are contaminated at a level higher than 50 ppm.

The project for PCBs environmentally sound management is developed jointly with the Russian Railroads JSC (RZD), which is one of the largest owners of transformers in the country. The company agrees, before the set of PCB-related legislation to be approved, to introduce at its facilities the PCB management system to identify and phased-out PCB contaminated equipment. The RZD is one of the major owners of the transformers and capacitors. They have 1,500 power substations, 6,000 technical maintenance facilities for repair of their rolling stocks and other equipment, and numerous numbers of locomotives and other rolling stocks needed to operate approximately 121,000 km of railroads. The total number of large transformers (10 KVA and more) exceeds 200,000. The company has its own laboratories and technical workshops for required analysis and for maintenance of the electrical equipment.

The other technical partners of the project are the water supply and sewage treatment company of St. Petersburg "Vodokanal" and "Gubkin Russian State University of Oil and Gas" in Moscow.

The United Nations Industrial Development Organization (UNIDO) is represented in Russia by the Center for International Industrial Cooperation that might assist Russian companies to develop the PCBs disposal industry based on the results of the project. In the course of the project implementation, the activities of PCBs disposal companies will be extended to other large owners, who will need to initiate PCB management activities at the point of updating the national regulation

The project is to establish the national environmentally sound management (ESM) system for PCBs phase out and development of technologies for disposal of PCBs at the Russian railroads network and other PCB owners. It consists of three components, as follows:

- Institutional, regulatory and human resources capacity building for establishment and operation of ESM system for PCBs disposal;
- Country-wide inventory of PCB-contaminated equipment and wastes;
- Environmentally sound management (ESM) and disposal of PCB contaminated equipment and wastes.

Currently the ad-hoc project team for the legislation improvement completed the changes for the national legislation. Their changes after the coordination with the other interested government organizations, were submitted to the Parliament (Duma) for approval by law.

Another project team is implementing the inventory of operational transformers and capacitors at the premises of the project partners. The preliminary results of the inventory show 2 groups of equipment:

- A number of capacitors that were filled with pure PCB (Sovtol) as well as transformers contaminated with PCB of different concentration;

- A number of electrical equipment (transformers and switch-off gears) that were contaminated during their service life (or cross-contaminated) with the small degree of contamination from 50 to 5,000 ppm. The number of such transformers is approximately 7% from the total number of tested equipment.

Based on the project document, Stockholm Convention recommendations as well as on global and UNIDO experience, the project has developed the following strategy for disposal of the contaminated equipment:

- The low contaminated equipment (transformers and switch-off gears) (with PCBs concentration in the range of 50-5,000 ppm) will be decontaminated and the oil after the decontamination might be regenerated;
- The high contaminated transformers and capacitors (over the 5,000 ppm of PCBs in oil) as well as its PCBs contaminated liquids will be disposed through the thermal disposal process.

2. THE SCOPE OF SUPPLY

The present Terms of Reference is dealing with the part of the present strategy related to decontamination of highly contaminated equipment.

The selection of technologies will be done based on their BAT characteristics including capital cost of its implementation and operating cost of PCBs disposal.

Through this tender process, the project seeks to purchase a system for thermal treatment of highly PCB-contaminated mineral oil with the capacity of 400 metric tons per year assuming 335 working days per year.

It is expected that the system will be adapted for transportation along the roads and/or railroads to contaminated equipment sites or collection points. Thus, the system should be delivered in the shipping containers. The number of containers is not restricted.

The system must include the PCB destruction unit for the safe disposal of highly PCB-contaminated wastes, as well as pre-treatment unit, exhausted gases treatment unit, waste treatment systems, if applicable, waste-heat recovery unit, drainage systems and other engineering system, directly connected and needed for the proper system operation.

For that purpose the most appropriate technology for PCB decontamination, meeting the requirements of Best Available Techniques (BAT) and Best Environmental Practices (BEP) as set out in the Stockholm Convention's and Basel Convention's BAT/BEP guidelines, will be considered.

The technology when treating PCB contaminated mineral oil should guarantee the destruction and removal efficiency no less than 99,9999%.

The container(s) and the equipment located in them have to be in compliance with the requirements/rules of Russia for transportation of such equipment by roads and railroads. The technology and its operational procedures have to be in compliance with the relevant requirements for occupational safety, environmental standards/limits, other technical

characteristics required by the national legislation for receiving the permits for operation of the equipment. The list of these requirements is given in para 2.2.1, 2.2.2 and 2.2.3.

The scope of good's supply includes the provision of the following equipment:

- one (1) PCB destruction unit for disposal of highly PCB-contaminated liquid wastes (mineral oil with different PCB concentration) based on high-temperature oxidation with a processing capacity of 400 metric tons per year (335 working days per year) using PCB-contaminated oil with concentration over 5000 ppm and that meet the Technology Requirements as defined below in the para 2.2.1. and 2.2.2;
- one (1) pre-treatment unit for the pre-processing of wastes;
- one (1) unit for treatment of exhausted gases and solid/liquid wastes, if such are produced during the unit operation in order to meet the environmental standards established under the Russian legislation;
- engineering and utility systems, including waste-heat recovery unit, that will ensure the whole system operation.

The Contractor shall provide commissioning of the units and demonstrate the continuous operation of the PCB Disposal System for at least one week. The Contractor should demonstrate the required PCBs destruction efficiency (no less than 99,9999%) for the maximum PCB concentration (pure PCB). In addition, the Contractor shall provide on spot training for operation of the systems to allow operators to independently operate the systems thereafter. A minimum period for the hands-on training is expected to be provided not less than for two (2) weeks.

Upon the successful delivery, commissioning, sustained operation and demonstrated performance of the PCB Disposal Systems a Certificate of Acceptance will be signed by the Contractor, Operating Entity and UNIDO.

2.1. Technology Requirements

The technology proposed must meet the following key criteria:

- 2.1.1 The PCB disposal system must use the high-temperature oxidation process for treatment of hazardous wastes and, while in operation, must not produce polychlorinated dibenzodioxins/polychlorinated dibenzofurans (PCDDs/PCDFs) and other POPs, as well as any other halogenated by-products in any outgoing gaseous flow, to comply with the BAT and BEP requirements defined in the Stockholm Convention and Basel Convention.
- 2.1.2 The PCB disposal system must not produce hazardous or toxic wastes. Collection and disposal of any wastes, produced during the technological process, must be part of the whole technology. The produced wastes shall comply with the requirements for wastes of 4 or 5 class of hazard according to the Russian legislation.
- 2.1.3 The PCBs disposal system must be applicable for disposal of PCB-containing liquid wastes – from PCB contaminated transformer and capacitor oils with concentration of contaminant over 5000 ppm to pure PCB.
- 2.1.4 The technology must operate as a closed system that ensures hermetic state of all production lines, as well as collection, analysis and further treatment of derivatives and accessory substances before its removal from the system. In case of non-

- compliance with environmental or technological standards, the secondary flows must be redirected for reprocessing.
- 2.1.5 The PCB disposal system must be equipped with an automated control system for the continuous monitoring and control of all processing flows and its parameters, as well as for redirecting secondary flows for additional processing.
 - 2.1.6 The PCBs disposal system must be equipped with a heat recovery system. The produced heat should be used for the process purposes or as an additional source of energy.
 - 2.1.7 The PCB disposal system must be applicable for either continuous or batch operation. The processing units based in the shipping containers must be transportable by the railroad platforms or by trucks.
 - 2.1.8 The technology should be demonstrably and inherently 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. Inherent safety means that the hazardous substances to be destroyed, as well as any hazardous by-products that might be generated during the processing, shall be kept in the closed system and recycled and/or destroyed; this applies to the totality of the destruction system, including waste preparation unit.
 - 2.1.9 The technology should be commercially available for technology transfer. This means that the technology has already been successfully operated at a full scale in a commercial or other institutional setting and is available for transfer to Russia. Only directly applicable technologies with considerable experience for at least 5 years will be considered.
 - 2.1.10 The technology shall not exceed the emission limits of pollutants in atmosphere and in water established in the regulation of Russia. Any part of the technology systems that contains hazardous substances or processes shall be built and operated in compliance with relevant regulation of Russia concerning hazardous substances and processes.
 - 2.1.11 The PCBs disposal technology when treating PCB contaminated wastes (mineral oil or pure PCB) shall guarantee the destruction and removal efficiency (DRE), which shall be based on the PCB residual level in all outgoing flows and shall not be less than 99,9999%. The PCB residual level should be measured using the available analytical procedures of PCB analysis. This efficiency is calculated by determining the mass emission rate of PCBs in all outgoing flows and dividing this by the PCBs mass input rate, expressed as a percentage.

2.2. Additional Technology Requirements

The proposed technology has to be in compliance with all technical requirements of the Russian environmental and technical regulation needed to receive permissions for their operations.

2.2.1. In particular, the following national and sectoral standards, rules, regulations, guidelines have to be considered and incorporated in the design of the equipment:

- a. Rules of utilization of electrical installations approved by the order #6 of the

- Ministry of Energy dated on January 13, 2003;
<http://base.garant.ru/12129664/>
- b. Technical requirements of the Ministry of Railroads of 27.05.2005 #ИМ-943
 “Technical conditions of fixing of loads in railroad containers;
<http://meganorm.ru/Index2/1/4293832/4293832802.htm>
 - c. The processing units must be certified according to the Technical regulation on safety of the equipment #753 approved by the Government of RF of Sept.15, 2009;
<http://www.tamognia.ru/upload/iblock/8f3/8f3ddb290581c59f2c129a0173700e55.pdf>
 - d. The electrical installation must be in compliance with the Order of the Ministry of Energy #204 of Jul.8, 2002;
<http://docs.cntd.ru/document/1200030216>
 GOST 21130-75; <http://rdocs3.cntd.ru/document/gost-21130-75>
 and the Rules of Electric Equipment approved by the order # 204 of the Ministry of Energy of Jul/8, 2002;
http://www.consultant.ru/document/cons_doc_LAW_98464/
 - e. The mobile unit must comply with fire safety requirements of the Technical Regulation on Fire Safety of Jul.22, 2008 #123-FZ
http://www.consultant.ru/document/cons_doc_LAW_78699/;
 GOST 12.1.004-91
[http://bolid.ru/files/551/729/h_b2f144de9a211568a8dd46ec774da6dc](http://bolid.ru/files/551/729/h_b2f144de9a211568a8dd46ec774da6dc;);
 GOST 12.1.005-88
[http://bolid.ru/files/551/729/h_b2f144de9a211568a8dd46ec774da6dc](http://bolid.ru/files/551/729/h_b2f144de9a211568a8dd46ec774da6dc;);
 GOST 12.1.019-79 <http://www.gosthelp.ru/gost/gost14408.html>;
 and GOST 12.2.007.0-75
[http://protect.gost.ru/document.aspx?control=7&baseC=101&RegNum=47&DocOnPageCount=15&page=1&id=161582](http://protect.gost.ru/document.aspx?control=7&baseC=101&RegNum=47&DocOnPageCount=15&page=1&id=161582;);
 in their parts concerning electric safety of the personnel, fencing of working places, fire safety and leakages prevention;
 - f. The technology and supporting operations must comply with
 GOST 21046-86 “Used oils”
[http://protect.gost.ru/document.aspx?control=7&id=141968](http://protect.gost.ru/document.aspx?control=7&id=141968;);
 and GOST 1510-84 “Labeling, packaging, transportation and storing of oil and oil products” <http://meganorm.ru/Data2/1/4294848/4294848505.pdf>;
 - g. The processing units must be equipped with fire extinguishers according to the Norms and requirements for the rolling stocks of the Federal railroad transportation of 17.12.2010 #2624p,
<http://meganorm.ru/Data2/1/4293803/4293803760.pdf>.
 - h. Federal law “On Industrial Safety of Hazardous Production Facilities” 21.07.1997 №116-FZ http://www.consultant.ru/document/cons_doc_LAW_15234/
 - i. SanPiN 2.1.7.1322-03 Hygienic Requirements for Placement and Decontamination of Production and Consumption Wastes approved by the decision of the Russian Federation Chief Public Health Officer 30.04.2003 №80
<http://meganorm.ru/Data2/1/4294844/4294844913.htm>
 - j. GOST 19433-88 “Dangerous goods. Classification and marking”.

- http://www.znaytovar.ru/gost/2/GOST_1943388_Gruzy_opasnye_Kla.html
- k. Federal law “On safe handling of pesticides and agrochemicals” №109-FZ 19.07.1997 http://www.consultant.ru/document/cons_doc_LAW_15221/
 - l. GOST R 55829-2013 Resources saving. Best available techniques. Environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants <http://docs.cntd.ru/document/1200107969>

The bidders must confirm the compliance with the requirements of the listed laws, rules and standards.

2.2.2. The following international regulations, national technical standards and rules should be taken into account when designing the equipment and during the technology operation:

- a. Basel Convention. Technical Guidelines on Used Oil Re-Refining of Other Re-Uses of Previously Used. Basel Convention series/SBC No. 02/05. First Published in 1997 and reprinted in November 2002 <http://www.basel.int/Portals/4/Basel%20Convention/docs/meetings/sbc/workdoc/old%20docs/tech-r9.pdf>
- b. GOST R 55832-2013 Resources saving. Best available techniques. Environmentally sound management of previously used oil <http://docs.cntd.ru/document/1200107972>
- c. GOST R 55829-2013 Resources saving. Best available techniques. Disposal of wastes, containing persistent organic pollutants. <http://docs.cntd.ru/document/1200107969>
- d. Technical regulation of the Custom Union No. TP TC 030/2012 “Requirements to lubrication liquids and oils” accepted by the decision #59of the Council of Euro-Asia Union of 20.07.2012 in terms of collection, accumulation, storage and disposal of used oils [http://webportalsrv.gost.ru/portal/GostNews.nsf/acaf7051ec840948c22571290059c78f/9fe752e7e38cc18e44257bde0024e7d4/\\$FILE/TR_TS_030-2012_text.pdf](http://webportalsrv.gost.ru/portal/GostNews.nsf/acaf7051ec840948c22571290059c78f/9fe752e7e38cc18e44257bde0024e7d4/$FILE/TR_TS_030-2012_text.pdf)

2.2.3. In order to start operation of equipment the following certification will be required:

- a. The positive evaluation document of the Federal Service for Supervision of National Resources Usage is obligatory for all new technologies and projects, which in the course of their utilization could influence on the environment. This document is due according to the Article 11 of the Federal law #174-FZ of 23.11.1995 “About the ecological expertise”. The operation of equipment cannot be started without this document; <http://meganorm.ru/Data2/1/4293803/4293803760.pdf>;
- b. Certificate of compliance with the Regulation of the Custom Union: Safety operation of equipment; http://www.eurasiancommission.org/ru/act/textreg/deptexreg/tr/Documents/P_823_1.pdf
- c. Certificate of compliance with the Regulation of the Customs Union “Safety of low voltage equipment” (TP TC 004/2011);

- d. <http://www.tsouz.ru/db/techreglam/Documents/TR%20TS%20Downvolt.pdf>;
Certificate of compliance with the Regalement of the Customs Union “Electromagnetic coherence of technical gargets” (TP TC 020/2011)
<http://www.eurasiancommission.org/ru/act/txnreg/deptexreg/tr/Documents/TehReg%20TS%20EMS.pdf>;
- e. Certificate of compliance with the Regalement of the Customs Union “Safety of equipment operating under high pressure” (TP TC 032/2013);
[http://webportalsrv.gost.ru/portal/GostNews.nsf/acaf7051ec840948c22571290059c78f/32efb0de9c7e69d944257d180044c31d/\\$FILE/TR_TS_032-2013_text.pdf](http://webportalsrv.gost.ru/portal/GostNews.nsf/acaf7051ec840948c22571290059c78f/32efb0de9c7e69d944257d180044c31d/$FILE/TR_TS_032-2013_text.pdf);
- f. Protocol of bio-testing for defining a class of liquid or solid hazardous residual substances. In case the equipment produces hazardous wastes, it will be necessary to receive certificates of the classification of these wastes.

The supplier shall obtain and, upon request, provide to UNIDO all the documents named in the above paragraph 2.2 by the time of commissioning of the equipment.

2.3. Operational Requirements and Responsibilities

The contract based on the present Terms of Reference will be made between UNIDO and a selected Contractor. The PCB disposal system should be installed and fully put into operation during the period of no more than 10 months after signing of the contract with the selected Contractor. A schedule of deliverables is summarized in paragraph 5, Table 1, Deliverables and Timeframe.

Since UNIDO is the contracting party acquiring this PCB disposal system, the Contractor shall have a reporting responsibility to UNIDO.

The Contractor is supposed to provide the following:

2.3.1. Installation, Demonstration and Start-Up Operation

- a. The Contractor shall design, construct, deliver, install and test the operation of the PCB disposal system, i.e. waste pre-treatment unit, the main destruction unit, exhausted gases treatment unit, heat-recovery unit, unit of wastes and by-products treatment, if applicable, and all auxiliary equipment directly linked to the PCBs disposal system and necessary for its proper function, before its final delivery to the Customer;
- b. The Contractor should provide the verifiable information concerning the technology requirements as specified in paragraph 2.1 and 2.2 above, operational characteristics of the system, composition of by-products and wastes including protocols of chemical analysis;
- c. The Contractor shall deliver (and accordingly calculate the transportation costs, including equipment unloading) in Moscow region at a destination which will be defined in the first phase of the contract implementation. It shall subsequently install the system at the special site, defined by Contractor and approved by UNIDO and the beneficiary, as well as provide the necessary service equipment, i.e. the supporting engineering systems and equipment. The exact place is to be specified based on the Contractor’s space requirements as well as on the

beneficiary's space availability

- d. The Contractor shall commission the system by demonstrating the PCBs disposal process under the steady state conditions. The Contractor will provide the list of measures for maintaining of the steady state conditions as a part of technical documentations. It is understood that the operation under the steady state conditions are those proposed by the Contractor as the normal operating conditions in terms of batches per day or throughput capacity and PCB concentration in the waste feedstock. By the time of commissioning the Contractor will receive all necessary certification as per paragraph 2.2.2.
- e. The Contractor shall provide the commissioning test and certificates related to the PCBs disposal system commissioning and operation.
- f. The Contractor shall provide and realize the training for managing, operational and technical personnel involved in the system operation as well as provide full on-site technical support. The training shall be held in Russian language.
- g. The Contractor shall carry out Compliance Tests using pure PCB, after successfully achieving the continuous operation of the installation. Acceptable system's performance for the Compliance Test includes:
 - The PCBs destruction and removal efficiency is no less than 99,9999%, and the final PCB level in any of byproducts or wastes (liquid or solid) of the process must comply with the relevant requirements of the Russian legislation that should be confirmed by the relevant chemical analysis;
 - There are no any organo-chlorinated byproducts produced during the PCB disposal process. Analysis of waste feedstock shall be used to demonstrate this requirement;
 - Air emission is in compliance with the Russian standards. Air emission test shall include monitoring for PCBs, PCDDs/PCDFs, and Chlorophenols, volatile and semi-volatile hydrocarbons.
- h. The Contractor shall provide a kit of spare parts and the items to original equipment maintenance and control module in order to ensure the smooth operation of the system during the commissioning of equipment. The spare parts to be provided should be such that needed its replacement more often than 1 time per year.
- i. The Contractor shall provide the plan of the overall system operation monitoring and control, as well as all its processing flows. The operational company/organization(s) will be responsible for the regular control according to the provided plan and following the requirements of the manuals of the producer. The manuals of producer and the service manual have to be provided in Russian language.

2.3.2. Design of the Facility to house the PCB disposal system

For the operation of PCBs disposal system the Contractor shall assess the site approved by UNIDO for its initial operation at the place of location and provide a list and general description of civil requirements needed for the optimal and safe operation of the system. This

list may include water and electricity supply, space requirements, availability of approach drives, places and equipment for feedstock and wastes/ by-products and other materials storing, etc.

The Contractor will prepare schematic drawings or layout of the site as well as technical requirements to the site for the system installation and commissioning. These technical requirements and drawings shall include all technical, civil, mechanical and electrical engineering systems, and shall meet the Russian standards and permit the safe and effective operation of the proposed PCB disposal system. Design and construction of the civil facility are not part of this Request for Proposal.

2.4. Commissioning of the equipment

Once the Contractor has successfully completed the Proof of Performance testing, the Certificates of Acceptance of the PCB Disposal System will be signed by the Contractor, the Operating Entity(ies) and UNIDO.

3. GUARANTEE REQUIREMENTS

The Contractor should apply the best available techniques and best environmental practices in destroying PCBs in a wide variety of matrices using high-temperature oxidation process.

The Contractor should guarantee the quality of the all services and technology performance in accordance with international practice and standards and as specified in the General Scope. The safety guarantee should also be in accordance with international practice and standards.

The Contractor should guarantee that the equipment to be supplied will be new and up-to-date, without any defectiveness in or arising from workmanship or materials, without incorrect operation, the Contractor shall immediately repair or replace at its own expenses and as soon as practicable any defective goods within the warranty period.

The Contractor should warrant that each major equipment group delivered will conform to the major equipment group's specifications in all respects including, but not limited to, physical characteristics, operating characteristics, space requirements, power requirements, maintenance characteristics, compatibility and the like, as may be agreed to in writing by the parties.

The Contractor shall guarantee to transport and set-up the PCB Disposal System (installation, set-up and initial operation) within the terms specified in the Deliverables and Timeframe.

The Contractor shall guarantee that the PCB Disposal System will perform and meet the PCB destruction and removal efficiency, emission and other technical specifications as required by this Term of Reference.

The Contractor shall provide at least 12-month warranty and three-year service maintenance for the destruction system. Technical and mechanical warranty starts from the date of the Certificate of Acceptance of the PCBs disposal system. The operational company/organization will be responsible for the regular service of the equipment following the manual of the producer.

The Contractor shall provide as part of its offer the kit of consumables of the destruction system operation, if applicable, for 3 years period.

Also the Contractor shall ensure availability of unique consumables and spare parts at a reasonable price for an additional period of ten (10) years after the warranty is expired. The producer(s) of such consumables and spare parts should be specified in the Bidder's proposal.

The Contractor's responsibility shall be valid until the expiry of the 12-month warranty period: the Contractor is therefore required to intervene and rectify each operating defect, defectiveness or irregularity that are due to misuse of equipment, accidents, negligence of standard operating procedures (SOPs), faulty reinstallation or any damages as well as the ones caused by imperfect manufacturing or material faults of the equipment. Anything beyond the Contractor's warranty will be at cost of the operating company.

Furthermore, the Contractor has to inform UNIDO if equipment, work, components and materials supplied under the responsibility of the operating entity do not fulfill the safety standards or if the training of the staff did not reach the standards required for the safe operation of the PCB Disposal System.

4. PERSONNEL IN THE FIELD AND LANGUAGE REQUIREMENTS

The Bidder in its offer shall assign number of key personnel with qualifications required for performing the requested activities for all on-site and off-site support activities such as one (1) Chemical engineer; one (1) Civil engineer; one (1) Mechanical engineer; one (1) Electrical engineer and one (1) operator of automated control systems: they should all have a relevant University degree and be licensed with at least 5 year experience on similar/relevant projects.

The working language of the personnel shall be Russian and English.

5. DELIVERABLES AND TIMEFRAME

The overall contract duration is ten (10) months. The table below lists the deliverables and timeframe from the date the contract is signed. The Contractor shall prepare equipment for dispatch to the project site destination in adequate packaging and will prepare and submit a list of goods sent to the project site location listing the serial numbers when available.

Deliverables and Timeframe

Table 1

DELIVERABLES and ACTIVITIES/ MONTHS	1	2	3	4	5	6	7	8	9	10
Detailed technical specifications	X									
Technical advice on design of facility to house PCB Disposal System	X									
Designing of PCB Disposal System	X	X								
Manufacturing of the equipment		X	X	X	X	X	X			

Transportation of the system's modes to the operational site							X			
Assembly/installation and testing at project site								X	X	
Steady State Operation									X	
Training									X	X
Performance testing										X
Certificate of Acceptance										X

The following reports, both in English and Russian languages, are to be provided by the Contractor and submitted to UNIDO for approval

Table 2

Name of the Report:	Activity covered by the Report and/or Content:	Time of submission*
Design of the equipment	Detailed technical specifications; Technical advice on design of facility to house PCB Treatment System; Design of PCB Treatment System	Month 2
Manufacturing report	Manufacture of the equipment and its testing results at the Contractor's site	Month 7
Shipping of the equipment	Shipping documents	Month 8
Steady operation report	Assembling of the equipment at the project site; Steady operation; Training	Month 9
Final report	Performance testing; Certificate of acceptance	Month 10

* The time of submission is expressed in months and is calculated from the signature of the Contract

6. CONTRACTOR'S RESPONSIBILITIES

The Contractor shall be responsible for the set-up of the PCBs disposal system at the project site and for making it fully operational.

The Contractor shall provide complete and detailed facility specifications, including space and all infrastructure needs, and shall provide all necessary advice and assistance in the preparation of the site during the construction. In order to ensure that the premises are ready and available to house the technology according to the detailed facility specifications provided by the Contractor and that all delivery and installation areas are suitable, agreements between the Contractor, the operating entity and UNIDO prior to the date of delivery should be made. Necessity of additional construction works at the defined site for installation of equipment as

well as additional expenses for this purpose will be subject to negotiations between UNIDO, the Contractor and the operating entity. The Contractor shall provide advice on technical and planning matters to the operating entity, which could help allow the completion of construction work on time.

After shipping and installation of the PCB Disposal System, the Contractor shall provide notification in writing that the system is ready for the commissioning and steady state operation of the system. Once the PCB Disposal System has been successfully operated under the steady state condition, the Contractor shall notify in writing to UNIDO that it is ready to conduct the Performance Compliance tests.

The Compliance Acceptance testing is intended to ensure that the technology operates in accordance with the technical specifications, is adequate to perform as warranted by the Contractor, and substantiates a satisfactory level of performance reliability prior to its acceptance. The detailed acceptance test protocols and acceptable parameters will be approved by the contracting parties beforehand. Acceptance testing will be conducted at the project site and the test results will be made available for review by relevant Russian agencies, the operating entity, companies holding the targeted PCBs wastes, representatives of the public interest NGOs and UNIDO.

In the event the technology does not meet the specifications or a satisfactory level of performance during the initial acceptance testing, the Contractor may continue acceptance testing on a day-to-day basis until the specifications and standards of performance are met. If after 60 calendar days from the start of acceptance testing the technology still has not met the specifications and acceptable levels of performance, the Contractor may be declared to be in breach of the contract, the contract terminated, and liquidated damages may apply; or the Contractor may be allowed to provide a replacement at no additional cost. In such a situation, the Contractor can offer to continue the acceptance testing for an additional thirty (30) days at his own cost if accepted.

When the results of acceptance testing show conformity to the specifications and an acceptable level of performance, and upon approval of the test results and certification by the national operator of the equipment and UNIDO (in the form of Certificate of Acceptance), the Contractor can certify in writing the operation of the technology at the project site and the technology operation can then be handed over to the operating entity in an agreed timeframe.

The Contractor shall provide an instruction manual that shall include detailed instructions for machine operation, process controls, sampling and analysis, basic maintenance and troubleshooting and component replacement. The manual should be written in English and Russian. Two copies of the manual in English and Russian should be provided to UNIDO.