

## **TERMS OF REFERENCE**

**Project GF/Sri Lanka**

**Environmentally Sound Management and Disposal of  
Polychlorinated Biphenyls Containing/Contaminated Equipment in Sri Lanka**

**PCB DISPOSAL SERVICES CONSISTING OF THE PROVISION OF BRAND NEW  
TRANSFORMER MINERAL OIL AND TREATMENT AND/OR DISPOSAL OF PCB  
CONTAINING OIL FROM SRI LANKA**

## I. GENERAL BACKGROUND INFORMATION

The United Nations Industrial Development Organization (UNIDO) is the specialized agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalization and environmental sustainability. The mission of the United Nations Industrial Development Organization (UNIDO), as described in the Lima Declaration adopted at the fifteenth session of the UNIDO General Conference in 2013, is to promote and accelerate inclusive and sustainable industrial development (ISID) in Member States. The relevance of ISID as an integrated approach to all three pillars of sustainable development is recognized by the 2030 Agenda for Sustainable Development and the related Sustainable Development Goals (SDGs), which will frame United Nations and country efforts towards sustainable development in the next fifteen years. UNIDO's mandate is fully recognized in SDG-9, which calls to "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation". Accordingly, the Organization's programmatic focus is structured in four strategic priorities: Creating shared prosperity; Advancing economic competitiveness; Safeguarding the environment; and Strengthening knowledge and institutions.

The Directorate of Environment and Energy (EAE), aims to integrate and scale-up the energy and environment activities focusing on supporting governments and industries to provide sustainable and resilient soft and hard infrastructure for industrial development, supporting industries to contribute to climate neutral circular economy, and supporting governments and industries in fulfilling national commitments under multinational climate and environmental agreements.

The Department of Environment (EAE/ENV) contributes to ISID and the implementation of the SDGs, in particular of SDG 9, by greening existing industries and products, as well as by facilitating creation of new green industries and products, and by minimizing resource use along value chains and during the lifetime of products, facilitating uptake of circular economy practices

The Industrial Pollution Mitigation Division (EAE/ENV/IPM) is responsible for supporting developing countries and countries with economies in transition to implement the Chemicals and Wastes obligations and requirements under the Basel, Rotterdam, and Stockholm Conventions and other relevant agreements, in particular where it relates to larger and formalized industries and sectors, and to leverage its experience to address industrial pollution mitigation in general.

The National Implementation Plan (NIP) for the Stockholm Convention of the Democratic Socialist Republic of Sri Lanka identified phase-out and disposal of PCBs as one of the priorities requiring immediate attention and action. The country signed the Convention on 05 September 2001 and ratified it on 22 December 2005. The rationale and objectives of the project originated from the priorities and key objectives established by the NIP.

The NIP identified three major holders of transformers in Sri Lanka, namely the Ceylon Electricity Board (CEB), Lanka Electricity Company (Pvt) Ltd (LECO) and the Independent Power Producers (IPP). Table 1 summarizes the estimated number of transformers in these companies.

**Table 1. Composition and Ownership of Power Sector Transformers in Sri Lanka, (updated to 2020).**

Type of Transformers	CEB			LECO		IPP		Total number of transformers in service	
	2005	2015	2020	2005	2015	2005	2015	2005	2015
Distribution	15,261	19,398	31,312	2,708	3,885	None	None	17,969	23,283
Generation	107	316	225	None	None	74	90	181	406
Transmission	206	320	194	None	None	None	None	206	320
Total	15,574	20,034	31,731	2,708	3,885	74	90	18,356	24,009

In addition to the transformers identified in the electrical utility sector in the NIP, there are thousands of

small distribution transformers being used by electricity users. The welding sector with an estimated number of more than 10,000 small shops and similar number of small distribution transformers also represents a significant source of PCB contaminated dielectric fluid.

Based on the number of transformers, potentially contaminated with PCBs, the management of PCBs in Sri Lanka was identified as one of the most important objective in the country's National Implementation Plan.

Although never produced PCBs, the specific problems related to PCB management and which the project aims to address include: (i) Lack of adequate legislation to control imports; (ii) Environmental impacts and baseline levels not adequately studied; (iii) Lack of sufficient resources for identification and analysis; (iv) Lack of acceptable treatment, disposal and storage systems for PCB contaminated oil and equipment; (v) Contaminated sites yet to be identified; and, (vi) Cross contamination of non-PCB oil with PCB oil. Also, the Government faces various constraints in solving the PCB problem: (i) low level of awareness and equally low level of resources allocated for information campaigns; (ii) weak enforcement mechanisms (lack of technical capability to detect and regulate PCBs in use and releases to the environment, and to control PCB imports); (iii) lack of sustained commitment from other government functionaries; and, need for increased private sector participation (e.g. unwillingness of PCB owners to pay for proper PCB treatment).

Sri Lanka requested UNIDO to assist the country in the implementation phase. As part of this implementation, UNIDO and MERE prepared a proposal on the Environmentally Sound Management and Disposal of PCBs Wastes and PCB Contaminated Equipment in Sri Lanka. The project objective is build capacity to introduce and implement a polychlorinated biphenyl (PCB) management system to reduce and/or eliminate releases from PCB waste stockpiles and PCB-containing equipment in an environmentally sound manner. The proposal was submitted to GEF and obtained its approval for implementation.

The overall objective of the project is to eliminate the use and releases of PCBs to the environment through the introduction of environmentally sound management measures. It aims to dispose, decontaminate or safeguard at least 1000 metric tons of PCB wastes, PCB-contaminated oil and equipment and address capacity building, awareness and policy issues.

As part of early activities planned in the project was to carry out a PCB inventory in the country's electrical system to identify the type and level of contamination that the equipment has and the treatment and disposal options available for the country. These activities showed two main holders of PCB contaminated transformers, namely the Ceylon Electricity Board (CEB) that is the electrical utility that generates, transmit and distribute the electricity in the country and the thousands of independent small welding shops scattered in Sri Lanka.

The updated number and location of the electrical transformers owned and operated by CEB in Sri Lanka is given in Table 2.

**Table 2. Number and location of transformers in CEB electrical generation, transmission and distribution system in Sri Lanka.**

Division	Province	No. of Transformers	
		In-Service	Out-of-Service
Distribution DD1	North	1,650	9
	North Western	4,305	52
	North Central	2,453	2
	Colombo City	1,559	50
	PHM	54	10
<b>Sub-Total DD1</b>		<b>10,021</b>	<b>123</b>
Distribution DD2	WPN	3,063	46
	Central	4,008	18

	Eastern	2,434	136
	PHM	123	43
<b>Sub-total DD2</b>		<b>9,628</b>	<b>243</b>
Distribution DD3	WPSII	2,333	10
	Sabaragamuwa	1,821	323
	Uva	1,764	4
	PHM	28	10
<b>Sub-total DD3</b>		<b>5,946</b>	<b>347</b>
Distribution DD4	WPSI	1,413	28
	Southern	3,444	30
	PHM	72	17
<b>Sub-total DD4</b>		<b>4,929</b>	<b>75</b>
<b>Total Distribution</b>		<b>30,524</b>	<b>788</b>
<b>Total Transmission</b>		<b>171</b>	<b>23</b>
Generation Hydro		82	48
Generation Thermal		95	-
<b>Total Generation</b>		<b>177</b>	<b>48</b>
<b>Total CEB</b>		<b>30,872</b>	<b>859</b>

As indicated in Table 2, CEB electrical system has 30,872 in-service and 859 out-of-service transformers. Out of the CEB 30,872 in-service transformers, there are 30,524 small distribution transformers installed and providing electricity to Ceylon Electricity Board clientele base located in the country's territory, while there are 171 transformers in transmission stations and 177 transformers in generation stations.

All the 194 transmission station and 210 out of the 225 transformers in generating stations are large, greater than 2,000 kVA units, while all 30,536 in the distribution network and 15 in generating stations are smaller, less than 2,000 kVA.

Figure 1 shows the map of Sri Lanka indicating the areas of the country where CEB distribution divisions are located.

**Figure 1. Geographical location being served by CEB electrical distribution divisions**



As part of the UNIDO PCB project in Sri Lanka, CEB undertook an oil sampling and testing program to determine the presence of PCBs in its transformers. Based on this testing program, the project identified a number of PCB contaminated transformers in the generation, transmission and distribution stations at the Ceylon Electricity Board electrical network. Details of the PCB contaminated transformers at CEB are given in the following tables.

Tables 3 and 4 summarize the transformers confirmed to be contaminated with PCBs above 50 ppm in-service in the transmission and distribution electrical system of CEB in Sri Lanka. In addition to the location, weights of the transformer carcass and dielectric oil in the transformers, the tables also include the PCB content, number of times the transformers need to be retrofilled to achieve the decontamination level of less than 50 ppm and the amount of brand new oil require to treat the transformers.

The amount of brand new transformer oil being requested from the Vendor is estimated based on the identified PCB contaminated transformers and the PCB level found in some transformers where the fluid may be required to be replaced a second time to attempt to achieve the less than 50 mg/kg level.

**Table 3. In-Service PCB Contaminated Transformers to be Retrofilled in CEB Transmission Stations**

Division	Reference	Location	Weight of Transformer (kg)	Weight of Oil (kg)	PCB (mg/kg)	Retrofilling Stages	Weight of Oil Needed (kg)
Transmission	TR-00051	Ratmalana	59,000	14,500	360	2	29,000
Transmission	TR-00068	Veyangoda	65,530	17,180	93	1	17,180
<b>TOTAL</b>			<b>124,530</b>	<b>31,680</b>			<b>46,180</b>

**Table 4. In-service PCB Contaminated Transformers to be Retrofilled in CEB Distribution Network**

Division	Reference	Location	Weight of Transformer (kg)	Weight of Oil (kg)	PCB (mg/kg)	Retrofilling Stages	Weight of Oil Needed (kg)
DD1	DD1-04460	CMC department, -, Madampitiya Rd	2,160	370	362	2	740
DD1	DD1-04510	Acme Aluminum Co, Vauxhall Street	1,820	360	243	1	360
DD1	DD1-04515	BOI Building, 14, Sir Baron Jayathilaka	2,040	425	50	1	425
DD1	DD1-04550	Bank of Hatton National, 16, Janadhipathi	2,040	426	165	1	426
DD1	DD1-04579	487/7,487/8, Bloemendhal Road	2,040	425	136	1	425
DD1	DD1-04618		3,110	585	212	1	585
DD1	DD1-04623	Bank of Commercial, 21, Bristol Street	3,110	585	197	1	585
DD1	DD1-04733	Asian Finance	1250	288	187	1	288
DD1	DD1-04759	CGR(Dematagoda), -, Aramaya Road	1,300	250	182	1	250
DD1	DD1-04919	Flat Ranjan Wijeratnepura,	2,145	680	476	2	1,360

DD1	DD1-04949	Ferguson Garment, 123/5, Sri Dharmarama	1,600	290	64	1	290
DD1	DD1-50051	Primary G, High Level	2080	418	244	1	418
DD1	DD1-05827	NWP Merawala	4,800	930	51	1	930
DD1	DD1-05834	NWP Com Bank	7,340	1,420	213	1	1,420
DD1	DD1-05839	NWP/Merawala	4,800	930	51	1	930
DD1	DD1-06528	Wijesiri Fiber Mill	1,050	255	63	1	255
DD1	DD1-06529	Victoriya Fiber Mill	865	246	126	1	246
DD1	DD1-06857	Alawgedara	1,010	275	64	1	275
DD1	DD1-06868	Nandana Fiber Mill	680	136	52	1	136
DD1	DD1-06899	Leelarathna Oil Mill	1,445	460	188	1	460
DD1	DD1-07422	Melsiripura Farm	1,075	298	83	1	298
DD1	DD1-08078	Pambadeniya	1,415	460	90	1	460
DD1	DD1-08099	Walakumbura	1,556	432	119	1	432
DD1	DD1-08117	Panela	1,050	302	155	1	302
DD1	DD1-08202	Telecom	745	215	346	1	215
DD1	DD1-08222	Cement Corp Housing scheme	1560	342	500	2	684
DD1	DD1-09015	Alawaka (Magallegama)	1,275	314	724	2	628
DD1	DD1-09872	Ceylon Glass Factory 2	1,556	432	100	1	432
DD1	DD1-09882	Thamel Fibre mill	680	136	115	1	136
DD1	DD1-10344	Primary Substation G, High level road	1,600	290	244	1	290
DD1	DD1-01166	Madatugama	1,275	314	102	1	314
DD1	DD1-01180	Uragollawa	1010	300	144	1	300
DD1	DD1-01431	Dissanayaka Rice Mill	905	223	72	1	223
DD1	DD1-02207	Army training school	1578	364	770	2	728
DD1	DD1-02211	STF Maduruoya	1788	457	372	2	914
DD1	DD1-10266	Kalaththawa Stores	353	78	117	1	78
DD1	DD1-10282	Kalaththawa Stores	353	78	66	1	78
DD1	DD1-10301	Kalaththawa Stores	1,050	255	96	1	255
DD1	DD1-10303	Kalaththawa Stores	315	83	92	1	83
DD1	DD1-X0001	Stores	2034	402	1127	2	804
DD2	DD2-00402	Gomera T/F	1,030	302	62	1	302
DD2	DD2-00546	Hunuwala - Mangedara	1,300	350	566	2	700
DD2	DD2-00667	Hungampola Rubber Factory	1045	286	106	1	286
DD2	DD2-00776	Gampola Realgal Town	2034	402	80	1	402

DD2	DD2-01056	Mochchikotta	2034	402	270	1	402
DD2	DD2-01371	Minor Export Corporation	745	215	852	2	430
DD2	DD2-01588	Pallekelle Army Camp	2034	402	981	2	804
DD2	DD2-01684	Royal Pack Industrial Estate	2034	402	58	1	402
DD2	DD2-01729	T4 Drivers Quarters Daganagama	2034	402	342	1	402
DD2	DD2-01730	T% Minor Employees RD	2034	402	270	1	402
DD2	DD2-02063	Logie Estate	2034	402	560	2	804
DD2	DD2-02064	Barewell Estate	2034	402	149	1	402
DD2	DD2-02256	Mulhalkelle	2034	402	573	2	804
DD2	DD2-02321	Amherast Estate	2034	402	105	1	402
DD2	DD2-02340	Kotemba	2034	402	92	1	402
DD2	DD2-02515	Watagoda Town	2034	402	166	1	402
DD2	DD2-02586	Protoft	2034	402	132	1	402
DD2	DD2-02740	Hantana Tea Meuciam	1,870	510	181	1	510
DD2	DD2-03027	Stock Home Estate	1,030	302	609	2	604
DD2	DD2-03054	Tincient Estate	1206	347	376	2	694
DD2	DD2-03057	St. Theresa Estate	1560	342	526	2	684
DD2	DD2-03153	Osborn Tea Factory Carfax	1,206	347	372	2	694
DD2	DD2-03192	Bustand Hatton (i)	1,300	350	1,364	2	700
DD2	DD2-03193	C.T.B. Depot	1,300	350	200	1	350
DD2	DD2-06601	Lanlo	1,967	511	130	1	511
DD2	DD2-06758	Batakanda D/C Mill	745	214	352	2	428
DD2	DD2-06843	Banduragoda D/C Mill	1,010	186	1,257	2	372
DD2	DD2-07098	Ranpokunugama - B Zone	1,560	301	586	2	602
DD3	DD2-07131	Gorakadeniya (at the temple)	905	235	107	1	235
DD2	DD2-09239	Textile Processing/shurthi Metal	1,420	365	1,071	2	730
DD2	DD2-09244	SUSCAN	1,810	480	227	1	480
DD2	DD2-09250	Nisol Corrugated	1,420	365	50	1	365
DD2	DD2-09337	NHS Raddolugama (near Police station)	1810	480	1543	2	960
DD2	DD2-09743	Walanagoda PSS	1,303	340	253	1	340
DD3	DD3-00010	Pelawatta PSS	14,100	4,930	62	1	4,930
DD3	DD3-00035	DeGalassa Estate	2085	570	205	1	570
DD3	DD3-00224	Nuyadurupola Rubber Factory	1850	495	56	1	495

DD3	DD3-00264	Siripagama	930	300	68	1	300
DD3	DD3-00478	Heminford Rubber	1,275	314	238	1	314
DD3	DD3-00573	Falmgarden Tea Factory	1,850	495	54	1	495
DD3	DD3-00574	Palm garden R.F.	1,750	451	64	1	451
DD3	DD3-00614	Warakatota(New the bridge)	1,578	364	131	1	364
DD3	DD3-00677	Batangala Farm School	930	300	59	1	300
DD3	DD3-00719	Mitipola	930	300	59	1	300
DD3	DD3-01164	Waleboda Tea Factory	697	199	144	1	199
DD3	DD3-01209	JVS Office Mulgama	1,795	485	69	1	485
DD3	DD3-01425	Embilipitiya concrete Yard	1,540	460	68	1	460
DD3	DD3-01537	Sugar Researching Udawalawa	1,270	248	91	1	248
DD3	DD3-01538	Udawalawa Electrical	3,900	894	55	1	894
DD3	DD3-01997	Kahatapitiya - Old	930	300	55	1	300
DD3	DD3-02014	Jalthara	1,165	365	57	1	365
DD3	DD3-02025	Deutsh Lanka - Tech Stream	3,023	865	51	1	865
DD3	DD3-02534	Ellakanda	1,788	457	106	1	457
DD3	DD3-02769	Raigam Rubber	1,030	302	218	1	302
DD3	DD3-02793	Kenma Tex	950	311	119	1	311
DD3	DD3-03530	Cardiology Unit	1500	255	1927	2	510
DD3	DD3-03532	G.A.Somapala (Jayson Industries)	875	357	72	1	357
DD3	DD3-03576	Union Cold (Jetco)	1,745	185	51	1	185
DD3	DD3-03652	Upali Newspaper	1,600	265	121	1	265
DD3	DD3-03666	Homagama CTB	725	251	101	1	251
DD3	DD3-03924	Bangalawatta	1340	540	163	1	540
DD3	DD3-03956	Alpha Factory	1,578	354	190	1	354
DD3	DD3-05134	TELECOM (BADULLA)	680	136	102	1	136
DD3	DD3-05351	PASSARA ESTATE	3,483	860	51	1	860
DD3	DD3-05388	CANAWERALLA	1,032	250	639	2	500
DD3	DD3-05399	TONNACOMBE	1,206	347	376	2	694
DD3	DD3-05494	UDAWEERIYA	1,206	347	242	1	347
DD3	DD3-05540	PITARATHMALE ESTATE	1,600	265	86	1	265
DD3	DD3-06000	Palawatta PSS	1,180	405	106	1	405
DD3	DD3-06001	Ethulkotte PSS	1,180	405	142	1	405



DD3	DD3-06513	Alpha Factory	1,578	364	1182	2	728
DD4	DD4-01160	Sittras Watta	1,788	456	71	1	456
DD4	DD4-02068	Diyadawa	1,010	186	721	2	372
DD4	DD4-02223	INDOLA	1,010	186	260	1	186
DD4	DD4-02346	CHARLIMOUNT	810	253	185	1	253
DD4	DD4-03910	Volvo	1,010	185	764	2	370
DD4	DD4-04156	Susan Lanka	1,600	265	399	2	530
DD4	DD4-04969		1,275	314	819	2	628
DD4	DD4-04970		1,206	347	747	2	694
<b>TOTAL</b>			<b>201,425</b>	<b>49,116</b>			<b>59,563</b>

In addition to the PCB distribution transformers included in Table 4 that will be treated by replacing the contaminated dielectric fluid, CEB also has a few in-service PCB transformers with concentrations that are considered practically “too high” for treatment. These in-service PCB contaminated transformers are summarized in Table 5.

**Table 5. In-Service High Level PCB Contaminated Mineral Oil Transformers in CEB Transmission Stations to be Disposed**

Division	Reference	Location	Weight of Transformer (kg)	Weight of Oil (kg)	PCB (mg/kg)
DD1	DD1-07378	Yaggapitiya	1,540	460	7,443
DD1	DD1-10271	Kalaththawa Stores	353	78	3,854
DD1	DD1-10307	Kalaththawa Stores	1,045	240	4,489
DD1	DD1-10308	Kalaththawa Stores	745	215	4,615
DD3	DD3-01994	Favourite Garment	1,600	265	3,661
DD3	DD3-06515	CW Mackie	1,600	265	13,432
<b>TOTAL</b>			<b>6,883</b>	<b>1,523</b>	

Based on the high concentration of PCBs in the distribution transformers listed in Table 5, these transformers will be removed from service by CEB personnel and disposed of as part of this UNIDO project.

In addition to the in-service transformers that need to be treated or disposed, CEB also has a number of PCB contaminated transformers stored as spare units. As these transformers will be eventually put in service, they must also be treated to reduce the PCB level to less than 50 mg/kg. Table 6 summarizes the PCB contaminated transformers being stored as spare units at CEB.

**Table 6. Spare PCB Contaminated Distribution Transformers stored for Use in CEB Electrical System**

Division	Reference	Location	Weight of Transformer (kg)	Weight of Oil (kg)	PCB (mg/kg)	Retrofilling Stages	Weight of Oil Needed (kg)
DD2	DD2-ST-4	Mathale Stores	2,034	402	300	1	402
DD3	DD3-00022	Godagama Army	7,700	1,290	595	2	2,580

DD3	DD3-00023	Godagama Army	7,700	1,290	176	1	1,290
DD3	DD3-00025	Udawalana	8,000	1,520	227	1	1,520
DD3	DD3-00026	Udawalana	8,000	1,520	2,665	2	3,040
DD4	DD4-00087	Ratmalana	14,100	4,950	53	1	4,950
<b>TOTAL</b>			<b>47,534</b>	<b>10,972</b>			<b>13,782</b>

Ceylon Electricity Board has also a number of obsolete, out-of-service mineral oil filled transformers that are contaminated with PCBs. Tables 7 and 8 below summarize the list of these transformers in both, Generating and Distribution Stations respectively:

**Table 7. Obsolete, Out-Of-Service PCB Contaminated Transformers in CEB Generating Stations**

Division	Reference	Location	Weight of Transformer (kg)	Weight of Oil (kg)	PCB (mg/kg)	Retrofilling Stages	Weight of Oil Needed (kg)
Generation	GN-S0001	Inginiyagala	179	78	116	1	78
Generation	GN-S0004	Inginiyagala	179	78	53	1	78
Generation	GN-00195	Inginiyagala	27000	8600	71	1	8600
<b>TOTAL</b>			<b>27,358</b>	<b>8,156</b>			<b>8,156</b>

**Table 8. Obsolete, Out-Of-Service PCB Contaminated Transformers in CEB Distribution Divisions**

Division	Reference	Location	Weight of Transformer (kg)	Weight of Oil (kg)	PCB (mg/kg)	Retrofilling Stages	Weight of Oil Needed (kg)
DD1	DD1-50010	Pamankada Store	1250	288	67	1	288
DD1	DD1-10369	Wariyapola Stores	1,206	347	264	1	347
DD1	DD1-10373	Wariyapola Stores	1,540	460	98	1	460
DD1	DD1-10390	Kuliyapitiya Stores	1,788	457	111	1	457
DD1	DD1-20276	Kuliyapitiya Stores	1,788	457	111	1	457
DD2	DD2-09739	Katunayake	2,000	425	54	1	425
DD2	DD2-12558	Ampara Stores	680	135	199	1	135
DD2	DD2-A0036	Kotugoda Stores	680	155	85	1	155
DD2	DD2-A0038	Kotugoda Stores	1560	300	83	1	300
DD3	DD3-07013	Epalapitiya Stores	1,030	302	366	2	604
DD3	DD3-07014	Epalapitiya Stores	1,206	347	326	1	347
DD3	DD3-07100	*Balawinna	1,206	347	104	1	347
DD3	DD3-07139	Karawanella GSC	1,007	185	166	1	185

DD4	DD4-04977	SP Provincial Stores	1390	576	115	1	576
DD4	DD4-04978	SP Provincial Stores	2,730	675	157	1	675
DD4	DD4-04979	SP Provincial Stores	2,730	675	84	1	675
DD4	DD4-04992	SP Provincial Stores	1,788	457	149	1	457
<b>TOTAL</b>			<b>22,659</b>	<b>6,588</b>			<b>6,890</b>

In addition to the PCB contaminated mineral oil transformers found in CEB electrical systems and storage areas, the company also has a few Askarel or PCB-made transformers. These transformers have been removed from service and stored at Laxapana P S storage site waiting for disposal. Table 9 gives the weight of the transformer and the PCB level determined by GC-ECD. The analysis of the fluid to determine the PCB level was unnecessary as the nameplate of the transformers indicated that the dielectric fluid used in its fabrication is Pyranol, a PCB concentrated dielectric fluid.

**Table 9. Obsolete Askarel (High Level PCB Dielectric Fluid) Transformers at CEB**

Division	Reference	Location	Weight of Transformer (kg)	Weight of Oil (kg)	PCB (mg/kg)
Generation	GN-00196	Laxapana PS	2,160	1,140	371k
Generation	GN-00200	Laxapana PS	2,812	1,070	855k
Generation	GN-00201	Laxapana PS	2,812	1,070	461k
Generation	GN-00202*	Laxapana PS	2,486	1,105	221k
Generation	GN-00203*	Laxapana PS	2,486	1,105	532k
Generation	GN-00204	Laxapana PS	2,160	1,140	484k
<b>TOTAL</b>			<b>14,916</b>	<b>6,630</b>	

\* Estimated weights are based on the average of the size of the other two types of transformers in this lot

Table 10 summarizes the total number of transformers and the amount of brand new oil that is required to treat the PCB contaminated oil in Ceylon Electricity Board in Sri Lanka. This table also indicated the type of service required for the transformers.

**Table 10. Summary of PCB Contaminated Transformers in Ceylon Electricity Board in Sri Lanka.**

Division	No. Transformers	Status	Dielectric Fluid	Weight of Transformer (kg)	Weight of Oil (kg)	Service Required
Transmission	2	In-service	Mineral Oil	124,530	46,180	Treatment or disposal of Oil
Distribution	114	In-service	Mineral Oil	208,308	60,708	Treatment or disposal of Oil
Distribution	6	Spare	Mineral Oil	47,534	13,782	Treatment or disposal of Oil
Distribution	6	In-service	Mineral Oil	6,883	1,523	Disposal of transformers, including oil
Generation	3	Obsolete	Mineral Oil	27,358	8,156	Treatment or disposal of Oil
Distribution	17	Obsolete	Mineral Oil	22,659	6,890	Treatment or disposal of Oil

Generation	6	Obsolete	Askarel	14,916	6,630	Disposal of transformer including PCB dielectric fluid
<b>TOTAL</b>	<b>164</b>			<b>437,272</b>	<b>137,239</b>	

The treatment required for the transformers filled with the PCB contaminated mineral oil is essentially the replacement, once or twice, depending on the PCB level, of the contaminated dielectric fluid with brand-new transformer mineral oil. In the case of the Askarel filled or PCB-made transformers, the treatment required is the final disposal of all contents of the transformers using incineration or other approved technologies.

As required by CEB, the dielectric fluid to be used to refill the PCB contaminated transformers must be brand new transformer oil meeting CEB Specification 143-2017 for Unused Mineral Insulating Oil for Transformers and Switchgear. A copy of this specification is included in Annex A.

Thousands of Independent welding facilities have also been identified as a potentially significant source of PCBs in Sri Lanka. In order to engage these facilities in this PCB project, the project obtained the assistance of People To People Volunteers (PTPV), a Non-Governmental Organization of Sri Lanka. People To People Volunteers sampled and tested more than 3,000 transformers from welding shops.

Based on the screening tests carried out by PTPV, the estimated number of PCB contaminated transformers in the welding sector in Sri Lanka was calculated and is summarized in Table 11.

**Table 11. Summary of PCB Contaminated Transformers in Welding Sector in Sri Lanka**

Estimated No. of Transformers in Welding Sector	Estimated No. of PCB Contaminated Transformers	Estimated Volume of PCB Contaminated Oil L	Estimated Weight of PCB Contaminated Oil kg	Estimated Average of PCB Level mg/kg	Service Required
10,212	4,179	106,145	91,285	268	Treatment or disposal of Oil

The testing of the transformers at Lanka Electricity Company (Pvt) Ltd showed only a few, small transformers contaminated with PCBs above the threshold level of 50 mg/kg. The contaminated dielectric fluid has already been drained and stored in Intermediate Bulk Containers by People To People Volunteers. This PCB contaminated oil will be treated or disposed of by the selected Vendor. Table 12 summarizes the PCB contaminated transformer oil belonging to LECO and being stored by PTPV and waiting treatment by the selected Vendor.

**Table 12. PCB Contaminated Oil from LECO and Collected and Being Stored by PTPV**

IBC Number	Oil Volume L	Oil Weight Kg	PCB Level mg/kg	Service Required
LECO 01	1,000	860	191	Treatment or disposal of Oil
LECO 02	1,000	860	102	Treatment or disposal of Oil
LECO 03	1,000	860	178	Treatment or disposal of Oil
<b>Total</b>	<b>3,000</b>	<b>2,580</b>		

In summary, after carrying out a PCB inventory in Sri Lanka, UNIDO's PCB project has identified and quantified a number of mineral oil transformers contaminated with PCBs at levels higher than 50 mg/kg and a few PCB-filled transformers. Table 13 summarizes the materials, weight, owners and holders of PCB containing equipment and the expected service required.

There are several options for the treatment/disposal of PCB contaminated mineral oil. These options include dechlorination using non-destructive chemical technologies to be mobilized and temporarily sited and operated in Sri Lanka or sited and operated elsewhere, destruction using cement kiln or other destructive

technologies within Sri Lanka or other jurisdictions.

Options for the disposal of Askarel transformers are limited only to the used of incineration in Europe or in other jurisdictions that have operating PCB incinerators and allowed the import of PCB wastes.

**Table 13. Summary of PCB containing materials in Sri Lanka that required treatment or final disposal**

Material	Owner	Holder	Weight of the Material (kg)	Service Required
Low Level PCB Contaminated Mineral Oil	CEB	CEB	135,716	Treatment or Disposal
High Level PCB Contaminated Mineral Oil Transformers	CEB	CEB	6,883	Disposal
Askarel Transformers	CEB	CEB	14,916	Disposal
Low Level PCB Contaminated Mineral Oil	Welding Facilities	PTPV	91,285	Treatment or Disposal
Low Level PCB Contaminated Mineral Oil	LECO	PTPV	2,580	Treatment or Disposal

**NOTE: It should be noted that weights of transformers and oil are based on name-plate data and that the actual weights may contain some variations.**

By assisting owners of PCB contaminated transformers to treat and decontaminate PCB containing equipment, the project will assist the Government of Sri Lanka in meeting its obligations under the Stockholm Convention and thus, will contribute to the global efforts to control toxic chemicals in general and eliminate PCBs in particular.

## II. THE SCOPE OF SERVICES

The objective of the tender is to successfully complete the treatment and/or disposal of the PCB containing material listed in Table 13 with a view to properly manage the PCB contaminated oil retrieved from transformers in CEB and Welding Facilities in Sri Lanka.

In addition to the treatment/disposal of the PCB containing material, 135,716 kg of brand new transformer mineral oil, which will be used by CEB personnel to refill the mineral oil filled transformers contaminated with PCBs above the threshold level of 50 mg/kg, shall also be provided.

In view of the above, the scope of services includes the use of a technology within the country and/or abroad to decontaminate/dechlorinate or destroy PCB contaminated transformer oil found in Sri Lanka and other services as listed below:

1. Treatment or disposal of about 140,000 kg of PCB contaminated transformer oil from in-service, spare and out-of-service equipment in the generation, transmission and distribution electrical system of CEB.
2. Treatment or disposal of about 94,000 kg of PCB contaminated transformer oil from LECO inventory and from in-service equipment in Welding Facilities to be collected and made available by People To People Volunteers.
3. Disposal of six (6) Askarel transformers with an estimated total weight of about 15,000 kg. These transformers are being stored at CEB facilities.
4. Disposal of six (6) high level PCB contaminated mineral oil transformers with estimated total weight of about 7,000 kg. These transformers are in-service in CEB distribution network, but will be removed from the electrical company for disposal.

5. Provision of 140,000 kg of brand new transformer oil to be used by personnel from Ceylon Electricity Board to replace the PCB contaminated oil from transformers found in generating and transmission stations and the distribution network of CEB in Sri Lanka. The brand new transformer oil MUST meet the technical specifications listed in Annex A.
6. Deliver (at DAP (Incoterms 2010) Colombo, Sri Lanka, including unloading if/as necessary) to one (1) location in Colombo, Sri Lanka, to be determined by CEB the 140,000 kg of brand-new mineral oil
7. Transport the about 140,000 kg of PCB contaminated oil from CEB sites to the selected location where the PCB treatment facility will be located. The PCB contaminated oil drained from CEB transformers will be temporarily stored in a small number of sites to be determined by CEB.
8. Transport the about 94,000 kg of PCB contaminated oil managed by PTPV to the selected site where the PCB treatment facility will be located. The PCB contaminated oil will be temporarily stored in up to five (5) collection centers set up and managed by PTPV.
9. Sampling and testing of the oil in the PCB contaminated transformers that will be treated as part of this contract. Sampling of the oil will be carried out at least 60 days after the PCB contaminated transformer oil had been replaced with brand new dielectric fluid.

***NOTE: It should be noted that the weight of transformers and the PCB contaminated oil have been estimated based on transformer name-plate information and The above indicated quantities of PCB wastes to be decontaminated and disposed are 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.***

The treatment or disposal of the PCB contaminated oil identified as part of this Terms of Reference can be carried out using any high or low temperature destruction process or chemical treatment system approved and commercially available to be used in Sri Lanka or any other jurisdiction. The selector Vendor MUST obtain in a timely manner any permit required to mobilize, install and operate the proposed technology in Sri Lanka and/or obtain and secure all permits to package, transport and treat/dispose the PCB contaminated material in the proposed facilities elsewhere.

***NOTE: The draining of PCB contaminated transformers and refilling of the empty units with brand new dielectric fluid shall be carried out by CEB personnel or others acting on behalf of Ceylon Electricity Board when handling equipment belonging to CEB.***

The system to be used to render the services hereby requested must meet the Technology Requirements defined in Sections A and B:

#### **A. Technology Requirements**

The system proposed must meet the following criteria:

1. The system(s) to be used shall not produce Polychlorinated Dibenzodioxins/Polychlorinated Dibenzofurans (PCDDs/PCDFs) and other POPs in excess of the limits authorized by the environmental authorities of Sri Lanka or European Union, whatever is stricter.
2. The system(s) to be used shall comply with the BAT and BEP requirements defined in the Stockholm Convention. The system should preferably not generate toxic or hazardous wastes and the handling of any waste generated in the process must be an integral component of the whole treatment process.
3. Emissions from the proposed system(s) shall comply with Sri Lanka or European Union, whatever has stricter, emission standard for similar processes and activities.
4. The proposed system(s) should be applicable for disposing transformer oil collected in drums, tanks or other devices.
5. The proposed system(s) must have the ability to effectively dispose PCBs waste in a wide variety of concentrations in the range of 50 to 3,000 mg/kg when treating or disposing PCB contaminated transformer mineral oil.
6. Independently of the initial PCB levels, the final concentration of PCB in any solid byproduct shall be less than 50 mg/kg or any liquid byproduct shall be 5 mg/kg or less.

7. Total Destruction and Removal Efficiency (DRE) must be greater than 99.9999% for the PCB wastes incinerated
8. The proposed system(s) and any additional process 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.
9. The proposed system(s) should be commercially available and the selected Vendor should have direct experience in providing the requested service to clients. This means that the system(s) has(ve) already been successfully operated at a full scale in a commercial or other institutional setting and is available for use in or for disposing the PCB waste from Sri Lanka; and that the Vendor has already successfully offered this service to clients. Only directly applicable system/technologies and Vendors with considerable experience for at least 5 years offering these services will be considered.
10. The selected Vendor shall package, transport and dispose of the six (6) Askarel transformers and any PCB containing materials NOT treated or disposed in Sri Lanka. Disposal of such material shall be in European disposal facilities (PCB incinerators and/or non-combustion processes) or any other jurisdictions with such systems and able to accept PCB wastes from Sri Lanka.
11. The selected Vendor shall take all necessary activities as applicable (including, but not limiting to requesting permits for setting up the system in Sri Lanka, for transporting PCB waste, for incinerating PCB waste in the country, for exporting, etc.) for the treatment or disposal of PCB wastes within Sri Lanka and/or abroad.
12. The selected Vendor shall properly dispose of any unused reagent and all byproducts generated by the any of the operations in local facilities and/or international facilities.

## **B. Technical Services Requirements**

When carrying out its technical services, the selected Vendor shall consider the following:

1. Request and obtain, as applicable, the License(s) needed to import a mobile treatment system, to site and operate the PCB treatment/disposal system, to package and transport PCB contaminated wastes, to export and ship PCB waste and to receive and accept for disposal in a country with incineration or any other acceptable technologies PCB waste from Sri Lanka.
2. The treatment/disposal system shall be fully operational and ready to start treating or disposing the PCB contaminated transformer oil from Sri Lanka 6 months after the signing of the contract with the selected Vendor.
3. Acquisition and transportation to Colombo, Sri Lanka 140,000 kg of brand new transformer mineral oil that meets the technical specifications for brand new transformer dielectric fluid detailed in Annex A.
4. Plan and agree with CEB on a schedule for delivering of the brand new transformer oil and the removing of the PCB contaminated oil from selected CEB electrical network sites.
5. Packaging and transportation of PCB contaminated transformer mineral oil from waste generation sites and/or temporary storage facilities to treatment/disposal site(s) within Sri Lanka or abroad.
6. Packaging and disposal of any unused, surplus reagent and any liquid and/or solid byproduct generated from the treatment/disposal PCB contaminated oil in Sri Lanka.
7. Packaging and disposal abroad of six (6) Askarel transformers and any other PCB containing wastes not treated in Sri Lanka as part of this project.
8. Demobilization of the PCB treatment/disposal system used to treat or dispose the PCB contaminated oil from Sri Lanka, if applicable.
9. Restoration to its original condition or better of any site used to temporary store PCB wastes or to operate the PCB disposal system.
10. Specify and implement all precautionary measures that are to be taken during the handling, treatment and/or disposal of PCB containing equipment and wastes in order to minimize environmental and occupational hazards.
11. All handling, storage, packaging, transportation and process activities shall be according to Sri Lankan national regulations and guidelines related to toxic and hazardous chemicals including PCBs

and other POPs, if available, or according to USEPA or European Union pertinent international standards and guidelines for PCBs management.

### **Transportation, Installation, Demonstration and Operation if Proposed System Shall Be Installed and Operated in Sri Lanka**

The Selected Vendor, if applicable / depending on the proposed solution, shall transport, install and test the operation of one (1) mobile (transportable) processing system to meet the applicable Technology Requirements specified in Section II. As stated above as well as provide full on-site technical support to successfully complete all the activities summarized in Section II A and B as stated above.

The Selected Vendor shall have all approvals for the installation and operation of the mobile processing unit at the proposed CEB site(s) in Sri Lanka within two (2) months of signing the contract with UNIDO.

The Selected Vendor shall operate the proposed disposal system in such a way to meet the following Acceptable Performance Criteria:

- The final PCB level in treated oil and any of the liquid byproduct of the process is less than five (5) mg/kg or ppm;
- There are not any organic-chlorinated byproducts such as Chlorobenzenes, Polyhydroxy-polychlorinated Chlorophenols;
- Air emission is in compliance with Sri Lankan or European Union standards. Air emission test shall include monitoring for PCBs, PCDDs/PCDFs, and Chlorophenols, volatile and semi-volatile hydrocarbons;
- Water emission is in compliance with Sri Lankan or European Union Standards. Water produced by the process (oil degasification or similar process stage) shall be tested to for PCBs;
- Solid byproduct shall be less than 50 mg/kg or less than 10 µg/100 cm<sup>2</sup> whatever the applicable sampling matrix.

**NOTE:** It is understood as a mobile (transportable) system, a treatment system built on a mobile trailer that when attached to a transport truck can be moved, installed and operated at different locations or a treatment system built on a container or modules that can be loaded onto flat bed and moved, installed and operated at different locations.

### **Packaging, Transportation and Handling of PCB Wastes if Proposed System is Already Installed and Operating Abroad**

The selected Vendor shall have all approvals for the operation of the PCB treatment/disposal system proposed to receive and dispose of the PCB wastes from Sri Lanka.

The selected Vendor shall have all permits from the government of Sri Lanka necessary to export the PCB waste to the destination country where the final disposal of the waste will take place. Prove of these permits shall be submitting to UNIDO within two (2) months of signing the contract.

The selected Vendor shall have all permits from the government hosting the PCB treatment/disposal facilities where the PCB waste from Sri Lanka, as part of this project, will be finally disposed. Prove of these permits shall be submitting to UNIDO within two (2) months of signing the contract.

The selected Vendor shall have all required permits from the intermediaries' jurisdictions for the international shipment of PCB wastes from Sri Lanka to the final disposal location. Prove of these permits, including any associated insurance shall be submitting to UNIDO within two (2) months of signing the contract.

## **III. GUARANTEE REQUIREMENTS**

The Selected Vendor should apply the best available technologies or best environmental practices to treat or dispose the PCB contaminated oil from Sri Lanka.



The Selected Vendor should guarantee the quality of the all services and technology performance in accordance with international practice and standards and as specified in the Terms of Reference. The safety guarantee should also be in accordance with international practice and standards.

The Selected Vendor should guarantee that the equipment to be used is in good working conditions and shall immediately repair or replace at its own expenses and as soon as practicable any defective goods within the service operation period.

The Selected Vendor shall guarantee to transport, set-up and operate the PCB treatment/disposal within the terms specified in the Deliverables and Timeframe.

The Selected Vendor shall guarantee that the PCB treatment/disposal System will perform and meet the PCB destruction efficiency, emission and other technical specifications as required by this Terms of Reference.

The Selected Vendor, if applicable, shall guarantee that the packaging, shipment and handling of PCB waste will be in strict adherence to all requirements for the transboundary movement of Persistent Organic Pollutants.

#### IV. PERSONNEL IN THE FIELD AND LANGUAGE REQUIREMENTS

The Selected Vendor shall provide key personnel with qualifications required for performing the requested activities for all on-site and off-site support activities. The curriculum vitae of each professional must be enclosed and justification of the qualifications of each member within the team shall be detailed.

All written communications with the Project must be in English. Members of the Bidder's professional team must have working-level and communication skills in English or shall be assisted by an authorized and skilled translator.

#### V. DELIVERABLES AND TIMEFRAME

Table 14 below lists the deliverables and timeframe from the date the contract is signed. The duration of the Contract shall not exceed twelve (12) months. The bidder 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.

**Table 14. Deliverables and Timeframe**

DELIVERABLES/ ACTIVITIES	IMPLEMENTATION MONTHS (TOTAL 12 MONTHS)											
	1	2	3	4	5	6	7	8	9	10	11	12
Detailed technical specifications for the operation of the treatment/disposal PCB contaminated oil	X											
Technical specifications for the facility to house the PCB treatment/disposal System	X											
Application for License Approval to transport and Operate PCB treatment/disposal system in Sri Lanka.	X	X										
Acquisition and import into Sri Lanka 140,000 kg of brand-new transformer oil.	X	X										
Packaging and transportation to CEB selected sites the brand-new oil to be		X	X	X	X	X	X	X	X			

used to retrofill the PCB contaminated transformers.														
Packaging and transportation from CEB and PTPV selected sites to the treatment site(s) the PCB contaminated oil.			X	X	X	X	X	X	X	X				
Application for License Approval to package and transport PCB contaminated oil to treatment/disposal site within Sri Lanka or abroad.		X	X											
Installation and testing of PCB treatment/disposal system in Sri Lanka			X	X										
Transportation of PCB contaminated oil from temporary storage sites to treatment/disposal site in Sri Lanka			X	X	X	X	X	X	X	X				
Treatment/Disposal of PCB contaminated oil in Sri Lanka (if applicable)					X	X	X	X	X	X	X			
Packaging, transportation and disposal of Askarel transformers and any PCB contaminated material to international disposal facilities.								X	X	X	X			
Site restoration and demobilization of PCB treatment/disposal system (if applicable).										X	X			
Summary report identifying transformers location, PCB level, testing results following the retrofilling process, waste generated and certificate of treatment/destruction of the PCB waste.														X

## VI. REPORTING REQUIREMENTS

Reports shall be submitted to UNIDO in English. All deliverables/reports must be of such quality that no additional editing is required. The Selected Vendor's reporting requirements are given in Table 15 below:

**Table 15. Reporting and submission requirements**

Name of Report	Content	Indicative Time of Submission
<b>1<sup>st</sup> interim report</b>	<ul style="list-style-type: none"> <li>-Schedule of proposed activities</li> <li>-Inspection report of PCB treatment/dechlorination System before packaging and shipment, if applicable, to Sri Lanka</li> <li>-Submission of Purchase Orders for the 140,000 kg of brand-new transformer mineral oil, confirming shipment to Sri Lanka.</li> <li>-Submission of documentations confirming consignment of shipment of all equipment, reagents and ancillary components, if applicable.</li> <li>-Letter of Acceptance from Waste Disposal Site, Shipping Company and Insurance Companies confirming the Selected Vendor has authority to consign PCB waste for disposal in international facility having the required government approval to receive and dispose of PCB waste from abroad,</li> </ul>	<b>Three (3) months after signing of the contract</b>

	<p>-Letter from CEB confirming acceptance of proposed schedule for the delivery of the brand new transformer oil and the removal of the PCB contaminated oil from CEB facilities.</p> <p>-Letter from PTPV confirming acceptance of proposed schedule for the removal of the PCB contaminated oil from PTPV temporary store centers.</p> <p>-Submission of letter from the Ministry of Environment, Government of Sri Lanka, allowing the import and operation of the PCB treatment/disposal system and/or export of the PCB waste to internationally permitted facility.</p>	
<b>2<sup>nd</sup> interim report</b>	<p>-Letter from CEB confirming receiving at least 70,000 kg (50% of 140,000 kg) of brand new transformer oil from the selected Vendor.</p> <p>-Report on the installation, commissioning and testing of the PCB disposal system in Sri Lanka.</p> <p>-Submission of progress report confirming that at least 50% or 70,000 kg of the PCB contaminated oil from CEB transformers have been collected; and that this oil has been properly treated in Sri Lanka or temporary stored before shipping for disposal in another country.</p> <p>-Submission of progress report confirming that at least 50% or 47,000 kg of the PCB contaminated oil collected by PTPV has been properly treated in Sri Lanka or temporary stored before shipping for disposal in another country.</p> <p>-Submission of progress report confirming that 100% of the Askarel Transformers (six transformers with total estimated weight of 14,916 kg) and 100% of the high level PCB contaminated mineral oil transformers (six transformers with total estimated weight of 6,883 kg) have been removed from CEB and have been secured and packaged for transportation to final disposal facility in Europe.</p> <p>-Submission of progress report describing details of day-to-day operations including results, incidents malfunctioning and any other unexpected activities that may have occurred during the system's operation in Sri Lanka, if applicable.</p>	<b>Six (6) months after signing of the contract</b>
<b>Final report</b>	<p>-Summary of PCB treatment system operation, including volume of oil treated (estimated to be 234,000 kg), and Askarel transformers and other PCB-containing material NOT treated in Sri Lanka, volume of byproducts generated and disposed of, volume and type of PCB wastes.</p> <p>-Weight and disposal means of any surplus reagent</p> <p>-Weight, characterization and disposal means of any byproduct generated during the operation of the PCB disposal System in Sri Lanka, if applicable</p> <p>-Analytical results for PCB content of samples taken from all retrofilled transformers from CEB electrical network and 50 retrofilled transformers from welding facilities. Samples shall not be taken before 60 days from the day the PCB contaminated oil had been replaced with brand new dielectric fluid.</p> <p>-Certificate of treatment for 234,000 kg of PCB contaminated oil in the mobile treatment system in Sri Lanka, if applicable.</p> <p>-Certificate of export and treatment/destruction of 234,000 kg of PCB contaminated transformer oil, the six (6) Askarel transformers the six (6) high level PCB contaminated mineral oil transformers and any other PCB containing waste treated or destroy in approved PCB disposal facilities abroad.</p>	<b>Twelve (12) months after signing of the contract</b>

## **VII. SELECTED VENDOR'S RESPONSIBILITIES**

### **When/if the Selected Vendor treats the PCB contaminated oil in Sri Lanka:**

The Selected Vendor shall be responsible, as applicable, for the import of the PCB treatment system to Sri Lanka, set it up and operate it at the project selected site(s).

The Selected Vendor shall obtain, as applicable, any required permit to handle, package and transport PCB waste in Sri Lanka.

The Selected Vendor shall be responsible for the provision of all reagents, ancillary equipment and manpower to successfully and efficiently operate the PCB treatment in Sri Lanka.

The Selected Vendor shall be responsible for the transportation of all PCB contaminated oil from the temporary storage facilities set up by CEB and PTPV to the PCB treatment site(s).

The Selected Vendor shall obtain, as applicable, any required permit to export PCB waste that is NOT treatable with the PCB treatment system to internationally approved PCB disposal facilities.

After shipping and installation of the PCB treatment/disposal system, the Selected Vendor shall provide notification in writing that the system is ready for the operation and starting of the treatment of PCB contaminated oil in Sri Lanka.

The Selected Vendor shall operate, as applicable, the PCB disposal system until successful completion of the treatment/disposal of the targeted 234,000 kg of PCB contaminated transformer oil in Sri Lanka.

The Selected Vendor shall be responsible for packaging and demobilizing the PCB treatment system.

The Selected Vendor shall be responsible for restoring the operating site(s) to its original or better conditions once the PCB treatment is removed from the operating location(s).

The Selected Vendor shall package, transport and get disposed the 22,000 kg of Askarel and high level PCB contaminated mineral oil transformers and any other PCB-containing material NOT treated in Sri Lanka in internationally available and approved PCB disposal facilities.

### **When/if the Selected Vendor ships the PCB contaminated oil to PCB disposal facilities outside Sri Lanka:**

The Selected Vendor shall be responsible for securing a contract to dispose of the PCB contaminated material from Sri Lanka in an approved PCB disposal facility in abroad.

The Selected Vendor shall obtain, as applicable, any required permit to handle, package, transport and temporarily store PCB waste in Sri Lanka.

The Selected Vendor shall be responsible for providing the manpower and all other resources to safely and efficiently handle the PCB contaminated waste.

The Selected Vendor shall be responsible for the transportation of all PCB contaminated oil from the temporary storage facilities set up by CEB and PTPV to any temporary storage facility to properly secure and package according to international requirements the shipment of the PCB waste to the international PCB disposal facility.

The Selected Vendor shall be responsible for restoring the temporary storage site(s) set up for the handling and packaging the PCB waste once the PCB waste from Sri Lanka has been shipped to the final disposal facility.

The Selected Vendor shall obtain all permits. nationally and internationally to export the Sri Lankan PCB waste to approved PCB disposal facility abroad.

**Annex A**

**TECHNICAL SPECIFICATIONS FOR BRAND-NEW MINERAL OIL  
INSULATING OIL FOR TRANSFORMERS AND SWITCHGEAR**

			<b>Requirement</b>	<b>Test Method</b>
1	Name of the Manufacturer			
2.	Country of Origin			
3.	Category of oil		Transformer class, Uninhibited	
4	Applicable standards		IEC 60296/IEC 60247	
5.	Appearance of oil	Colour	Clear, free from sediment and suspended matter	ASTM D 1500 Should be less than 0.5 max ISO un
	<b>Characteristics/Properties</b>			
	<b>Function</b>			
6.	Kinematic viscosity (maximum)			
	(a) At-30°C	mm <sup>2</sup> /s	1 800	ISO 3104
	(b) At 40°C	mm <sup>2</sup> /s	12	ASTM D445/ISO 3104
7.	Pour point (maximum)	°C	-20	ASTM 097
8.	<b>Maximum water content</b>	<b>mg/kg</b>	≤10 prior to transportation ≤ 20 on the delivery	IEC 60814/ASTM D 1533
9.	<b>Minimum breakdown voltage</b>			
	(a) As delivered	kV/2.5mm	30	IEC 60156
	(b) After treatment	kV/2.5mm	70	IEC 60156
10 .	Maximum density at 20°C	kg/dm <sup>3</sup>	0.895	ISO 3675, ISO 12185, ASTM D1298
11 .	Maximum Dielectric dissipation factor (DDF) 90 °C		0.005	BS EN 60247 IEC61620, IEC 60247
	<b>Refine/Stability</b>			
12 .	Appearance		Clear, free from sediment and suspended matter	
13 .	Acidity (Maximum), Neutralization value	mg KOH/g	0.01	IEC 62021-1

14.	Maximum interfacial tension	mN/m	40	ASTM D 971
15.	Corrosive Sulphur and/or potential corrosivity		Not corrosive	IEC 62535
16 .	Metal passivator additives		Not detectable (< 5mg/kg)	
17 .	Total furfurals and furans		Not detectable (< 0.1mg/kg) max	IEC61198
	<b>Performance</b>			
18 .	Oxidation stability			As per 61125 (Method C)
19.	Tests after oxidation stability test			
	Total acidity (Maximum)	mg KOH/g	1.2	
	Sludge (Maximum) after 164h at 120°C	%	0.8 max	IEC 61125 method C
	DDF at 90 °C (Maximum)		0.500	BS EN 60247, IEC61620, IEC60247.
	<b>Health, safety and environment</b>			
20.	Flash point (minimum)	°C	140	ASTM D 93/ ISO 2719 (closed cup)
21.	Maximum Polycyclic Aromatics(PCA) content	%	3	BS 2000-346 IP 346
22.	Polychlorinated biphenyls (PCB) content	Mg/kg	Not detectable (< 2mg/kg)	IEC 61619
<b>23.</b>	Resistivity			
	(a) At 90°C	GΩm		
	(b) At 40°C	GΩm		
<b>24.</b>	Permittivity at 60°C			
<b>25 .</b>	Specific heat at 60°C			
26 .	Thermal conductivity at 60°C			
<b>27 .</b>	Mean coefficient of expansion			

The oil to be supplied shall be in accordance with the latest editions of the standards specified below and amendments thereof:

(a)	IEC 60296:2012	Fluids for electro-technical applications - Unused mineral insulating oils for transformers and switchgear.
(b)	IEC 60247:2004	Measurement of relative permittivity, dielectric dissipation factor and d. c. resistivity of insulating liquids.
(c)	IEC 61125:1992	Unused hydrocarbon based insulating liquids - Test methods for evaluating the oxidation stability.
(d)	ASTM D1500-12	Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale).
(e)	ASTM D445-15a	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity).

(f)	ASTM D97-17	Standard Test Method for Pour Point of Petroleum Products.
(g)	ASTM D1533-12	Standard Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration.
(h)	ASTM D1298-12b	Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
(i)	BS EN 60247-2004	Insulating liquids. Measurement of relative permittivity, dielectric dissipation factor ( $\tan \delta$ ) and d. c. resistivity.
(j)	ASTM D93-16a	Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester.
(k)	BS 2000-346:1996	Methods of test for petroleum and its products. Determination of polycyclic aromatics in unused lubricating base oils and asphaltene free petroleum fractions. Dimethyl Sulphoxide extraction refractive index method.