

# **LIST OF MATERIALS**

## **Transmission (EHV Substation)**

**Acceptable for Use on Systems of  
SARAWAK ENERGY BERHAD**

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The items shown in this Transmission Approved Products List (TAPL) covers material and major equipment used for transmission substation. The list stipulated in this document supersedes all preceding issues including revisions. The updated documents shall be made available on SEB website.

Manufacturer who desire to have their items listed in the Transmission Approved Products List (TAPL) for transmission substation or wish to address any omission in the list, such as an obsolete item, etc, should address to: -

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## 1.0 SUBSTATION PRIMARY EQUIPMENTS

Where NOT specified as GIS, the equipment listed is defined for AIS substations.

### 1.1 500/275/33kV, 275/132/33kV, 275/33kV and 132/33kV Auto/Power Transformer

#### 1.1.1 500/275/33kV Auto Transformer

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
ABB	-	Ludvika, Sweden
SIEMENS	-	Nuremberg, Germany
GE Grid Solutions	-	Kocaeli, Turkey
Fuji Electric Co., Ltd	-	Tokyo, Japan
Hyosung	-	Changwon, Korea
Hyundai Electric & Energy Systems Co., Ltd.	-	Ulsan, Korea

#### 1.1.2 275/132/33kV Auto Transformer

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
ABB	Up to 240 MVA	Thailand; Chongqing China
TBEA Shenyang Transformer Group Co	Up to 240 MVA	Shenyang, Lioing Province, China
SPECO	Up to 240MVA	Shangdong, China
PT Elsewedy Electric Indonesia*	Up to 240MVA	Bogor, Indonesia
Hyundai Electric & Energy Systems Co., Ltd.	Up to 240MVA	Ulsan, Korea
Siemens	Up to 240MVA	Jinan, China
Nantong Hyosung	Up to 240MVA	Nantong, China
BALIKESİR ELEKTROMEKANİK SANAYİ TESİSLERİ A.Ş. (BEST A.S.)	Up to 240MVA	Balikesir, Turkey
Toshiba	Up to 240 MVA	Changzhou, China
<b>*Defect liability period further extended to another 3 years by OEM after completion of the main contract.</b>		

1.1.3 275/33kV Power Transformer

<b>Manufacturer</b>	<b>Type / Catalogue / Model. No</b>	<b>Country of Manufacture</b>
Meidensha	Up to 120 MVA	Japan
ABB	Up to 120 MVA	Thailand; Chongqing China
TBEA Shenyang Transformer Group Co	Up to 120 MVA	Shenyang, Lioing Province, China
SPECO	Up to 120MVA	Shangdong, China
PT Elsewedy Electric Indonesia*	Up to 120 MVA	Bogor, Indonesia
Nantong Hyosung	Up to 120MVA	Nantong, China
Hyundai Electric & Energy Systems Co., Ltd.	Up to 120 MVA	Ulsan, Korea
Siemens	Up to 120MVA	Jinan, China
BALIKESİR ELEKTROMEKANİK SANAYİ TESİSLERİ A.Ş. (BEST A.S.)	Up to 120MVA	Balikesir, Turkey
Toshiba	Up to 120MVA	Changzhou, China
<b>*Defect liability period further extended to another 3 years by OEM after completion of the main contract.</b>		

#### 1.1.4 132/33kV Power Transformer

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
ABB	Up to 120 MVA	Samutprakarn, Thailand
TBEA Shenyang Transformer Group Co	Up to 120 MVA	Shenyang, Lioning Province, China
Tirathai	Up to 120 MVA	Samutprakarn, Thailand
Meidensha	Up to 80 MVA	Japan
ABB	Up to 80 MVA	Chongqing China
Daihen	Up to 80 MVA	Thailand
SPECO	Up to 120MVA	Shangdong, China
PT Elsewedy Electric Indonesia*	Up to 80 MVA	Bogor, Indonesia
Hyundai Electric & Energy Systems Co., Ltd.	Up to 80 MVA	Ulsan, Korea
Siemens	Up to 120MVA	Jinan, China
Nantong Hyosung	Up to 120MVA	Nantong, China
Shihlin Electric and Engineering Corporation	Up to 120MVA	HsinChu, Taiwan
Tatung Co.	Up to 120 MVA	Taoyuan, Taiwan
BALIKESİR ELEKTROMEKANİK SANAYİ TESİSLERİ A.Ş. (BEST A.S.)	Up to 120 MVA	Balikesir, Turkey
Toshiba	Up to 120 MVA	Changzhou, China
<b>*Defect liability period further extended to another 3 years by OEM after completion of the main contract.</b>		

#### 1.2 500kV, 275kV and 33kV Shunt Reactor

##### 1.2.1 500kV Shunt Reactor

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
ABB	-	Ludvika, Sweden
SIEMENS	-	Nuremberg, Germany
GE Grid Solutions	-	Kocaeli, Turkey
Fuji Electric Co., Ltd	-	Tokyo, Japan
Hyosung	-	Seoul, Korea
Hyundai Electric & Energy Systems Co., Ltd.	-	Ulsan, Korea

### 1.2.2 275kV and 33kV Shunt Reactor

<b>Manufacturer</b>	<b>Type / Catalogue / Model. No</b>	<b>Country of Manufacture</b>
ABB	-	Chongqing China
Crompton Greave	-	India
TBEA Shenyang Transformer Group Co	-	Shenyang, Lioing Province, China
Hyundai Electric & Energy Systems Co., Ltd.	-	Ulsan, Korea
BALIKESİR ELEKTROMEKANİK SANAYİ TESİSLERİ A.Ş. (BEST A.S.)	-	Balikesir, Turkey



### 1.3 Circuit Breaker

#### 1.3.1 500kV Circuit Breaker

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens*	3AP series	Berlin, Germany
ABB*	HPL series	Ludvika, Sweden
GE Grid Solutions*	GL317 series	Boulogne Billancourt, France
<b>*Circuit breaker shall be spring operated mechanisms.</b>		

#### 1.3.2 275kV Circuit Breaker

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens*	3AP series	Germany / India
ABB*	HPL series	Sweden / Beijing China
GE Grid Solutions*	GL314 series	France / Suzhou China
<b>*Circuit breaker shall be spring operated mechanisms.</b>		

#### 1.3.3 132kV Circuit Breaker

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens*	3AP series	Germany / India
ABB*	LTB series	Sweden / Beijing China
GE Grid Solutions*	GL312 series	Germany / Suzhou China
<b>*Circuit breaker shall be spring operated mechanisms.</b>		

### 1.4 500kV, 275kV and 132kV Isolator

#### 1.4.1 500kV Isolator

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Coelme	STC series	Venezia, Italy
GE Grid Solutions	S3CD series	VE, Italy
Hapam	SSBIII series	The Netherland

#### 1.4.2 275kV and 132kV Isolator

<b>Manufacturer</b>	<b>Type / Catalogue / Model. No</b>	<b>Country of Manufacture</b>
Coelme	CBD series	Venezia, Italy
GE Grid Solutions	S2DA series	VE, Italy
Hapam	SBII series	The Netherland

#### 1.5 500kV, 275kV and 132kV Current Transformer

##### 1.5.1 500kV Current Transformer

<b>Manufacturer</b>	<b>Type / Catalogue / Model. No</b>	<b>Country of Manufacture</b>
GE Grid Solutions	OSKF series	Kassel, Germany
Trench	IOSK series	SV, Italy
Arteche	CA series	Viscaya, Spain

##### 1.5.2 275kV and 132kV Current Transformer

<b>Manufacturer</b>	<b>Type / Catalogue / Model. No</b>	<b>Country of Manufacture</b>
GE Grid Solutions	OSKF series	Brazil
Trench	IOSK series	SV, Italy
Trench High Voltage Products Ltd., Shenyang	IOSK series	Shenyang, China
TBEA Shenyang Transformer Group Co	AGU series (132kV only)	Shenyang, Lioning Province, China
GE Grid Solutions	OSKF series	Tamil Nadu, India
Emek Elektrik Endustrisi A.S	AT series	Ankara, Turkey
Arteche High Voltage Instument Transformer	CA series (132kV only)	Dalian Liaoning Province, China

#### 1.6 500kV, 275kV and 132kV Capacitor Voltage Transformer

##### 1.6.1 500kV Capacitor Voltage Transformer

<b>Manufacturer</b>	<b>Type / Catalogue / Model. No</b>	<b>Country of Manufacture</b>
GE Grid Solutions	OTCF series	Charleroi Pa, USA
Trench	TCVT series	SV, Italy
Arteche	DFK series	Viscaya, Spain

### 1.6.2 275kV and 132kV Capacitor Voltage Transformer

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
GE Grid Solutions	OTCF series	Charleroi Pa, USA
Trench	TCVT series	SV, Italy
Emek Elektrik Endrustri A.S	KGT series	Ankara, Turkey

### 1.7 500kV, 275kV, 132kV and 33kV Surge Arrester

#### 1.7.1 500kV Surge Arrester (Porcelain/ Polymer Type)

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens	3EP / 3EQ series	Berlin, Germany
ABB	EXLIM / TEXLIM series	Ludvika, Sweden
Tridelta	SB / SBKT series	Hermsdorf, Germany

#### 1.7.2 275kV, 132kV and 33kV Surge Arrester (Porcelain Type)

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens	3EP series	Berlin, Germany
ABB	EXLIM series	Ludvika, Sweden
Hubbell	MH series	USA
Tridelta	SB series	Hermsdorf, Germany
Xi'AN XD	Y20W Series Y10W Series Y5W Series	Shaanxi Province, China

#### 1.7.3 275kV and 132kV Surge Arrester (Polymer Type)

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens	3EL3/ 3EQ4 series	Berlin, Germany
ABB	PEXLIM/ TEXLIM series	Ludvika, Sweden
Tridelta	SBKC/ SBKT series	Hermsdorf, Germany
Toshiba	RVLQB Series	Kanagawa, Japan

## 1.8 500kV, 275kV, 132kV and 33kV Connector

### 1.8.1 500kV Connector

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
PLP Subcon	-	Dornbirn, Austria
Lorünser	-	Schlins, Austria
Arruti	-	Bizkaia, Spain

### 1.8.2 275kV, 132kV and 33kV Connector

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Tyco Simel	-	France
PLP Subcon	-	Dornbirn, Austria
GE Grid Solutions	-	VE, Italy
Lorünser	-	Schlins, Austria
Arruti	-	Bizkaia, Spain

## 1.9 33kV Neutral Earthing Resistor

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Powercap	-	Malaysia
AnyOhm	-	Malaysia
Pestech	-	Malaysia

## 1.10 275kV and 132kV Cable and Accessories

### 1.10.1 275kV Underground Cable

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
LS	275kV Cable (Lead Sheath)	Korea
ILJIN	275kV Cable (Lead Sheath)	Korea
TAIHAN	275kV Cable (Lead Sheath)	Korea
TBEA	275kV Cable (Lead Sheath)	China

### 1.10.2 275kV Cable Accessories

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
LS	<ul style="list-style-type: none"> <li>275kV Outdoor Termination (Composite)</li> <li>275kV Indoor Termination (Plug In)</li> <li>275kV Premolded Insulation Joint</li> </ul>	Korea
ILJIN	<ul style="list-style-type: none"> <li>275kV Outdoor Termination (Composite)</li> <li>275kV Indoor Termination (Plug In)</li> <li>275kV Premolded Insulation Joint</li> </ul>	Korea
TAIHAN	<ul style="list-style-type: none"> <li>275kV Outdoor Termination (Composite)</li> <li>275kV Indoor Termination (Plug In)</li> <li>275kV Premolded Insulation Joint</li> </ul>	Korea
TBEA	<ul style="list-style-type: none"> <li>275kV Outdoor Termination (Composite)</li> <li>275kV Indoor Termination (Plug In)</li> <li>275kV Premolded Insulation Joint</li> </ul>	China
Pfisterer	<ul style="list-style-type: none"> <li>All types for 275kV Cable Termination</li> </ul>	Switzerland

### 1.10.3 132kV Cable Accessories

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Pfisterer	<ul style="list-style-type: none"> <li>All types for 132kV Cable Termination</li> </ul>	Switzerland
Taihan Electric Wire Co. Ltd	<ul style="list-style-type: none"> <li>132kV Outdoor Termination 132kV GIS Termination</li> <li>132kV Plug-In Type GIS Termination 132kV Insulation Joint</li> <li>132kV Straight Through Joint</li> </ul>	Gyeonggi-do, Korea
G&W (Shanghai) Electric Ltd	<ul style="list-style-type: none"> <li>132kV Porcelain Outdoor Termination (PAT140)</li> <li>132kV Premolded Rubber Joint (PMJ 140)</li> </ul>	Shanghai, China

### 1.11 275kV and 132kV Capacitor Units and Capacitor Banks

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens	-	Brazil
GE Grid Solutions	-	Finland
ABB	-	Xi'an China

### 1.12 STATCOM IGBT

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Hitachi Energy	SVC LIGHT HP	Sweden
SIEMENS	SVC PLUS	Germany
GE	-	UK
Hyosung	SMART Q	Korea
RXHK	MAXI VAR	China
NR Electric Co., Ltd	PCS-9583	China

### 1.13 145kV Gas Insulated Switchgears

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
GE Grid Solutions	F35	Suzhou, China
ABB	ELK-04	Xiamen, China
Hyundai Electric & Energy Systems Co., Ltd.	145SP	Ulsan, Korea
Hyosung	HSG-144	Changwon, Korea
Siemens	8DN8	Shanghai, China

### 1.14 275kV Gas Insulated Switchgears

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens	8DQ1	Berlin, Germany
GE Grid Solutions	B105	Aix-les-Bains, France
ABB	ELK-14	Zürich, Switzerland
Hyundai Electric & Energy Systems Co., Ltd.	550SR	Ulsan, Korea

### 1.15 500kV Gas Insulated Switchgears

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
Siemens	8DQ1	Berlin, Germany/ Shanghai China
GE Grid Solutions	T155	Aix-les-Bains, France/ Suzhuo, China
ABB	ELK-3	Zürich, Switzerland/ Xiamen China
Hyundai Electric & Energy Systems Co., Ltd.	550SR	Ulsan, Korea
Hyosung	550HSG	Changwon, Korea

### 1.16 DC System

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
AEG Power Solutions	-	Singapore
Sunpower Technologies Sdn. Bhd	-	Negeri Sembilan, Malaysia
PMI Elektrik ve Elektronik Sistemleri Dis. Tic. Ltd. Sti	-	Ankara, Turkey
Nimac Power System (M) Sdn Bhd	NPT Series	Selangor, Malaysia
STATRON	BDTe Series	Petaling Jaya, Malaysia

### 1.17 500kV, 275kV, 132kV and 33kV Post Insulator

#### 1.17.1 500kV Post Insulator

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
NGK	C16-1800	Tokyo, Japan
LAPP	C16-1800 II	Wunsiedel, Germany
PPC Insulators	C16-1800	Nove Sady, Slovakia
Suzhou Porcelain Insulator Works Co., Ltd	C16-1800	Weiting Town, China

1.17.2 275kV, 132kV and 33kV Post Insulator

Manufacturer	Type / Catalogue / Model. No	Country of Manufacture
NGK	C10-325 C8-650 C16-1175	Tokyo, Japan
LAPP	C10-325 C8-650 C16-1175	Wunsiedel, Germany
PPC Insulators	C10-325 C8-650 C16-1175	Nove Sady, Slovakia
Modern Insulator Limited	C8-650 (132kV only)	Rajasthan, India
Suzhou Porcelain Insulator Works Co., Ltd	C10-170 C8-650 C16-1050	Weiting Town, China



## APPENDIX A – STL MEMBERS LABORATORIES

STL Member	Member Laboratories	Country
<b>Intertek (ASTA)</b>	Testing & Certification Australia Lane Cove Testing Station	Sydney, Australia
<b>KEMA</b>	KEMA Testing, Inspections & Certification High Power Laboratory	AR Arnhem, The Netherlands
	KEMA Testing, Inspections & Certification KEMA High-Voltage Laboratory	AR Arnhem, The Netherlands
	KEMA Testing, Inspections & Certification KEMA – Powertest Inc	Chalfont, USA
<b>CESI</b>	CESI Centro Elettrotecnico Sperimentale Italiano S.p.A.	Milano MI, Italy
	Institut “Prieffeld für elektrische Hochleitungstechnik” GmbH (IPH)	Berlin, Germany

	FGH Engineering & Test GmbH	Mannheim, Germany
<b>KERI</b>	High Power High Voltage Testing & Evaluation Division in Main Office	Gyeongsangnam, South Korea
	Power Apparatus Testing & Evaluation Division in Ansan office Korea Electrotechnology Research Institute	Gyeonggi-do, South Korea
<b>CPRI</b>	Central Power Research Institute Central Research & Testing Laboratory (CRTL)	Bangalore, India
	Central Power Research Institute Switchgear Testing & Development Station (STDS)	Bhopal, India
	Central Power Research Institute UHV Research Laboratory (UHVRL)	Hyderabad, India
<b>PEHLA</b>	ABB Switzerland Ltd. High Voltage Products and Components, Dept. PTHX	Baden, Switzerland
	High-Voltage Institute Kassel	Kassel, Germany

	GE Grid Solutions GmbH	
	ABB AG Calor Emag Medium Voltage Products	Ratingen, Germany
	FGH Engineering & Test GmbH	Mannheim, Germany
	Institut „Prueffeld fur elektrische Hochleistungstechnik“ GmbH (IPH)	Berlin, Germany
	Siemens AG	Berlin, Germany
	Siemens AG	Frankfurt am Main, Germany
<b>SATS</b>	ABB AB	Ludvika, Sweden
	STRI AB	Ludvika, Sweden
	NEXANS Norway AS	Halden, Norway
	NEFI	Skien, Norway
<b>ESEF</b>	Laboratoires des Matériels Electriques (LME), Site des Renardieres, EDF-R&D-LME	Moret-sur-Loing Cedex, France
	Centre d'Essais Rhodanien De l'Appareillage, CERDA, GE Grid Solutions	Villeurbanne Cedex, France

	L2E VOLTA, Schneider Electric Industries SAS	Grenoble Cedex 9, France
<b>JSTC</b>	Central Research Institute of Electric Power Industry CRIEPI	Kanagawa, Japan
	Japan AE Power Systems Corp. Kokubu High Power Laboratory 1-1, Kokubu-cho	Ibaragi, Japan
	Japan AE Power Systems Corp. Numazu High Power Laboratory	Shizuoka, Japan
	Mitubishi Electric Corp. High Voltage & High Power Testing Laboratories	Hyogo, Japan
	High Voltage and High Power Testing Laboratory Nissin Electric Co., Ltd	Kyoto, Japan
	Toshiba Corp. Hamakawasaki High Voltage and High Power Testing Laboratory	Kanagawa, Japan
<b>STLNA</b>	Powertech Laboratories Inc.	British Columbia, Canada
		Franksville, USA

	Cooper Power Systems – High Power Lab	
	KEMA PowerTest Inc.	Chalfont, USA
	Eaton Corp.	Pittsburgh, USA
	LAPEM-CFE	Irapuato, GTO Mexico
	S&C Electric Company	Chicago, USA
	AREVA T&D BRASIL	Minas Gerais, Brasil
<b>VEIKI-VNL</b>	VEIKI-VNL Electric Large laboratories Ltd	Budapest, Hungary
<b>ZKU</b>	ZKU, Zkušebnictví, a.s. Czech Republic	Czech Republic
	ZKU Member Laboratories Zkušebnictví, a.s. (ZKU) Czech Republic	