

การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย

REGISTRATION FORM

INVITATION TO BID NO. TS12-S-19

FOR SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS) AND
IMPROVEMENT OF 230 KV KAENG KHOI SUBSTATION
TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

AVAILABLE DURATION FOR PURCHASING March 14, 2018 TO April 18, 2018

PRICE USD 256.- OR THB 8,000.-

COMPLETE DATA IS REQUIRED FOR THE BIDDER'S OWN BENEFITS

(โปรดกรอกรายละเอียดให้ครบถ้วนเพื่อประโยชน์ของบริษัท)

Step 2 : Bring the payment receipt and filled-out registration Form (in English) to receive the bidding documents at Transmission System Development Area Foreign Procurement Department (Room No. 1202/2, 12th Floor, Building Tor. 101) Tel no. 02 436 0241-42

FOR PURCHASER		TAX ID :	
NO.	RECEIPT NO. :	DATE :	
PURCHASER (ผู้ซื้อ):			
BIDDER'S NAME (บริษัทผู้ซื้อเอกสาร)			
ADDRESS (ที่อยู่)			
		COUNTRY :	
ATTN. (ผู้รับผิดชอบ):	FAX NO.:	TEL.:	
E-mail :	e-GP Registration Date :		
LOCAL REPRESENTATIVE (ตัวแทนในประเทศ)			
ADDRESS (ที่อยู่)			
		TAX ID :	
ATTN. (ผู้รับผิดชอบ):	FAX NO.:	TEL.:	
E-mail :			
FOR PROCUREMENT OFFICER		CHANGE OF BIDDER'S NAME	TAX ID :
BIDDER'S LETTER NO. :		DATED :	
NEW BIDDER'S NAME (ชื่อผู้ซื้อเอกสารเปลี่ยนเป็น)			
ADDRESS (ที่อยู่)			
		COUNTRY :	
ATTN. (ผู้รับผิดชอบ):	FAX NO.:	TEL.:	
E-mail :	e-GP Registration Date :		
LOCAL REPRESENTATIVE (ตัวแทนในประเทศ)			
ADDRESS (ที่อยู่)			
		TAX ID :	
ATTN. (ผู้รับผิดชอบ):	FAX NO.:	TEL.:	
E-mail :	e-GP Registration Date :		
FOR PROCUREMENT OFFICER		FOR PURCHASER	
Procurement Officer (ผู้ส่งมอบเอกสาร)		Document received by (ผู้รับมอบเอกสาร)	

Step 1 : Submit this part for payment at Receivable Cashier Section (1st Floor, TOR 100 Bldg., Counter 4-8) Tel no. 02 436 5512

FOR PURCHASER		TAX ID :
BIDDER'S NAME (บริษัทผู้ซื้อเอกสาร)		
ADDRESS (ที่อยู่)		
BID NO. <u>TS12-S-19</u>	PRICE <u>USD 256.- OR THB 8,000.-</u>	
	DURATION FOR PURCHASING <u>March 14, 2018 TO April 18, 2018</u>	

Transmission System Development Area Foreign Procurement Department Tel no. 02 436 0241-42

(รพพศ.)



INVITATION TO BID NO. TS12-S-19

SUPPLY AND CONSTRUCTION OF 230/115 kV SARABURI 6 SUBSTATION (GIS) AND
IMPROVEMENT OF 230 kV KAENG KHOI SUBSTATION
TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

The Electricity Generating Authority of Thailand (EGAT) is calling for the subject Invitation to Bid to be financed by EGAT's fund. The escalation factor (K) for price adjustment is applied to this Bid.

Place of Construction : Saraburi 6 Substation and Kaeng Khoi Substation

Medium Cost (including Value Added Tax and other expenses) : THB 560,000,000.-

Eligibility of Bidders

1. The Bidder shall be a juristic person who provides such services and shall not be named in the List of Work Abandoners published by the Office of Prime Minister and/or in the Debarment List and/or in the List of Work Abandoners declared by EGAT.
2. The Bidder shall neither fail to submit the Revenue and Expense Accounts nor fail to present proper and complete accounts under the Notification of National Anti-Corruption Commission Concerning Principles and Methods of Preparing Revenue and Expense Accounts of Project between Individual/Company and Government Agencies B.E. 2554 (A.D. 2011) issued on August 11, 2011 as amended from time to time ("the Notification").
3. The Bidder shall register for e-Government Procurement (e-GP) at Thai Government Procurement website (www.gprocurement.go.th) at telephone No. 66 2127 7386 – 89) of the Comptroller General's Department of Thailand.
4. The Bidder shall not be a Jointly Interested Bidder with other Bidders as from the date of EGAT's issuance of the Invitation, or shall not be a person who undertakes any action as an "Obstruction of Fair Price Competition" for this Invitation.
5. The Bidder shall not either be EGAT's consultant or involve in EGAT's consultancy company under this Invitation to Bid, or shall not have EGAT's personnel involved in his business as shareholder having voting right that can control his business, director, manager, officer, employee, agent, or consultant except those who are officially ordered by EGAT to act or participate therein.
6. The Bidder shall not be the person who is privileged or protected not to be taken any legal proceedings under Thai Court; Provided that such Bidder's government declares that such special privilege is waived.
7. The Bidder who is a joint venture or consortium shall carry out all the work under such formation from the time of bidding until the fulfillment of the Contract.

Availability of Bidding Documents

Bidding Documents in CD-ROM will be available for examination of Bidder's Qualifications and purchase during 8:00 hrs. to 15:00 hrs., Bangkok Standard Time, as from March 14, 2018 to April 18, 2018 at USD 256.- or THB 8,000.- per copy, non-refundable, at the following address :

Transmission System Development Area Foreign Procurement Department
(Room No. 1202/2, 12th Floor, Building Tor. 101)
Foreign Supply and Procurement Division
Electricity Generating Authority of Thailand
Bangkrui, Nonthaburi 11130, Thailand
Fax no. 66 2433 6317, 66 2433 5523, 66 2434 4064
Telephone no. 66 2436 0242
E-mail : procurement.tse@egat.co.th

Nilanath Osotpavapost

For more details and downloading Registration Form for purchasing Bidding Documents on website : <http://www4.egat.co.th/fprocurement/biddingeng/>

Payment can be made by a certified cheque or money order payable to EGAT or by a telegraphic transfer to EGAT's current account no. 109-6-01958-2 (swift code : KRTHTHBK), Krung Thai Bank Public Company Limited, Bangkruai Branch, Nonthaburi. All bank charges and fees incurred by the payment of bidding documents shall be under the buyer's responsibility.

Bidding Documents in CD-ROM will be either airmailed or airfreighted to the buyer at EGAT's expense upon receipt of the relevant remittance. In case the buyer requires the Bidding Documents to be sent by Express Mail Service (EMS), the charge will be at the buyer's expense.

Delivery of Bids

Bids shall be submitted at Room No. 1202/1, 12th Floor, Building Tor. 101 during 9:30 hrs. to 10:00 hrs., Bangkok Standard Time, May 15, 2018 and will be opened publicly at 10:00 hrs.

ELECTRICITY GENERATING AUTHORITY OF THAILAND

March 5, 2018

Nilanate Osotpavapusit

(Mrs. Nilanate Osotpavapusit)

Chief, Transmission System Development Area
Foreign Procurement Department



ประกาศการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เรื่อง ประกวดราคาจ้าง เลขที่ TS12-S-19

การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย (กฟผ.) มีความประสงค์จะจัดหาและจ้างก่อสร้างสถานีไฟฟ้าแรงสูง 230/115 KV สาระบุรี 6 (GIS) และจัดหาและจ้างปรับปรุงสถานีไฟฟ้าแรงสูง 230 KV แก่งคอย สำหรับโครงการขยายระบบส่งไฟฟ้าระยะที่ 12 โดยทำสัญญาแบบปรับราคาได้ (ค่า k) โดยใช้งบประมาณ กฟผ.

สถานที่ก่อสร้าง : สถานีไฟฟ้าแรงสูงสาระบุรี 6 และสถานีไฟฟ้าแรงสูงแก่งคอย

ราคากลาง (รวมภาษีมูลค่าเพิ่มและค่าใช้จ่ายอื่นๆ) : 560,000,000.- บาท

คุณสมบัติของผู้เสนอราคา

1. ต้องเป็นนิติบุคคลผู้มีอาชีพรับจ้างตามประกวดราคาจ้างดังกล่าว และต้องไม่เป็นผู้ทำงานซึ่งสำนักนายกรัฐมนตรีได้แจ้งเวียนชื่อไว้ หรือต้องไม่เป็นผู้ที่ กฟผ. ห้ามติดต่อหรือห้ามเข้าเสนอราคา หรือต้องไม่เป็นผู้ที่ได้รับผลของการสั่งให้นิติบุคคลหรือบุคคลอื่นเป็นผู้ทำงานตามคำสั่ง กฟผ.
2. ต้องไม่อยู่ในฐานะเป็นผู้ไม่แสดงบัญชีรายรับรายจ่าย หรือแสดงบัญชีรายรับรายจ่ายไม่ถูกต้องครบถ้วนในสาระสำคัญ ตามประกาศคณะกรรมการป้องกันและปราบปรามการทุจริตแห่งชาติ เรื่อง หลักเกณฑ์และวิธีการจัดทำและแสดงบัญชีรายการรับจ่ายของโครงการที่บุคคลหรือนิติบุคคลเป็นคู่สัญญากับหน่วยงานของรัฐ พ.ศ. 2554 และที่แก้ไขเพิ่มเติม
3. ต้องเป็นนิติบุคคลที่ได้ลงทะเบียนในระบบอิเล็กทรอนิกส์ (e-Government Procurement : e-GP) ของกรมบัญชีกลางที่เว็บไซต์ศูนย์ข้อมูลจัดซื้อจัดจ้างภาครัฐ (www.gpprocurement.go.th) โทรศัพท์ หมายเลข 0 2127 7386 – 89
4. ต้องไม่เป็นผู้มีผลประโยชน์ร่วมกันกับผู้เสนอราคารายอื่น ณ วันประกาศประกวดราคาครั้งนี้เป็นต้นไป หรือต้องไม่เป็นผู้กระทำการอันเป็นการขัดขวางการแข่งขันราคาอย่างเป็นธรรมในการดำเนินการประกวดราคาครั้งนี้
5. ต้องไม่เป็นที่ปรึกษาของ กฟผ. หรือมีส่วนร่วมในบริษัทที่ปรึกษาของ กฟผ. ในงานนี้ หรือต้องไม่มีผู้ปฏิบัติงาน กฟผ. เข้าไปมีส่วนร่วมในกิจการของผู้เสนอราคา ไม่ว่าจะในฐานะผู้ถือหุ้นที่มีสิทธิควบคุมการจัดการ กรรมการ ผู้อำนวยการ ผู้จัดการ พนักงาน ลูกจ้าง ตัวแทนหรือที่ปรึกษา ยกเว้น ในกรณีที่มีผู้ปฏิบัติงานได้รับคำสั่งอย่างเป็นทางการจาก กฟผ. ให้ไปปฏิบัติงานหรือเข้าร่วมในกิจการของผู้เสนอราคา
6. ต้องไม่เป็นผู้ได้รับเอกลิขสิทธิ์หรือความคุ้มครอง ซึ่งอาจปฏิเสธไม่ยอมขึ้นศาลไทย เว้นแต่รัฐบาลของผู้เสนอราคาได้มีคำสั่งให้สละสิทธิ์และความคุ้มครองเช่นว่านั้น
7. ผู้ประสงค์เข้าประกวดราคาในนามของกิจการร่วมค้า (Joint Venture or Consortium) จะต้องดำเนินการทุกขั้นตอนของการประกวดราคา ในนามของกิจการร่วมค้าตั้งแต่การเสนอราคาจนถึงสิ้นสุดข้อผูกพันกับ กฟผ.

ไพจิตร โงงทองงาม

การขายเอกสารประกวดราคา

ผู้สนใจติดต่อขอทราบรายละเอียด เพื่อตรวจสอบคุณสมบัติของผู้เสนอราคา และขอซื้อเอกสารประกวดราคา ในราคาชุดละ 8,000 บาท ได้ที่ แผนกจ้างงานวิศวกรรมระบบส่ง (ห้อง 1202/2 ชั้น 12 อาคาร ท.101) กองจัดหาต่างประเทศสายงานพัฒนาระบบส่ง ฝ่ายผลิตและจัดหาต่างประเทศ การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เชียงสะพานพระราม 7 จังหวัดนนทบุรี ในวันทำการระหว่างเวลา 08:00 น. ถึง 15:00 น. ตั้งแต่วันที่ 14 มีนาคม 2561 ถึงวันที่ 18 เมษายน 2561 หรือสอบถามทางโทรศัพท์ หมายเลข 0 2436 0242 หรืออีเมล procurement.tse@egat.co.th ทั้งนี้ สามารถ download แบบฟอร์มลงทะเบียนผู้ซื้อเอกสารประกวดราคาได้ที่เว็บไซต์ <http://www4.egat.co.th/fprocurement/biddingeng/>

การยื่นซองประกวดราคา

กำหนดยื่นซองประกวดราคา ในวันที่ 15 พฤษภาคม 2561 เวลา 9:30 น. ถึง 10:00 น. และเปิดซองประกวดราคา เวลา 10:00 น. ณ ห้อง 1202/1 ชั้น 12 อาคาร ท.101 การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เชียงสะพานพระราม 7 จังหวัดนนทบุรี

ประกาศ ณ วันที่ 5 มีนาคม 2561

นิพนธ์ โองจางกุล

(นางนิลเนตร โอสธภาภูษิต)

หัวหน้ากองจัดหาต่างประเทศสายงานพัฒนาระบบส่ง

ตารางแสดงวงเงินงบประมาณที่ได้รับจัดสรรและราคากลาง(ราคาอ้างอิง)

ในการจัดซื้อจัดจ้างที่มีชิ้นงานก่อสร้าง

1. ชื่อโครงการ ประกวดราคาเลขที่ TS12-S-19

งานจัดหาและจ้างก่อสร้างสถานีไฟฟ้าแรงสูง 230/115 kV สระบุรี 6 (GIS)

และจัดหาและจ้างปรับปรุงสถานีไฟฟ้าแรงสูง 230 kV แก่งคอย

โครงการขยายระบบส่งไฟฟ้าระยะที่ 12

/หน่วยงานเจ้าของโครงการ ฝ่ายแผนงานและโครงการระบบส่ง การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย

2. วงเงินงบประมาณที่ได้รับจัดสรร

โครงการขยายระบบส่งไฟฟ้าระยะที่ 12 งบประมาณ 60,000 ล้านบาท

3. วันที่กำหนดราคากลาง 16 กุมภาพันธ์ 2561 (วันที่ รวพส. อนุมัติ)

ราคารวมภาษีมูลค่าเพิ่มและค่าใช้จ่ายอื่นๆ เป็นเงิน 560,000,000.00 บาท ราคา/หน่วย ตามเอกสารแนบ

4. แหล่งที่มาของราคากลาง หลักเกณฑ์การกำหนดราคากลางงานจัดซื้อจัดจ้างสายงานพัฒนาระบบส่ง

5. รายชื่อเจ้าหน้าที่ผู้กำหนดราคากลาง

5.1 นางสาววิลาวัลย์ ตันวีระ หสอร-พส. กวอ-พส.

5.2 นางสาววิภาสรี ฉัตรพุทธรักษา หมพ-พส. กวอ-พส.

5.3 นายสุริยะ ประงษ์ชัยเมือง หสพ-พส. กวอ-พส.

5.4 นายสรพรพวุฒิ ชตเจริญ หวป-พส. กวย-พส.

5.5 นายคณพศ หอมเกษร หวพว-พส. กวป-พส.

5.6 นายนพรัตน์ จงก้องเกียรติ กวส-ส. อรส.

หมายเหตุ ค่าใช้จ่ายอื่นๆ ได้แก่ ค่าใช้จ่ายที่ กพผ. ต้องจ่ายตามวิธีการพิจารณาเปรียบเทียบราคาที่กำหนดไว้ในเอกสารประกวดราคา เช่น อกรักษาเข้า เป็นต้น

๐๑๐๗

วิมลภา ชิวชนาภรณ์กุล

หจส-ห.

- 5 มี.ค. 2561

MEDIUM COST FOR BID NO. TS12-S-19

SUMMARY OF BID PRICE

SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS) AND IMPROVEMENT OF 230 KV KAENG KHOI SUBSTATION
TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

Schedule	Description	Currency	Supply of Equipment		Local Currency (excluding VAT) Baht Amount	Local Transportation (excluding VAT) Baht Amount	Local Transportation, Construction and Installation (excluding VAT) Baht Amount
			Foreign Supply	Local Supply			
			CIF Thai Port	Ex-works Price (excluding VAT) Baht			
			Amount	Amount			
1	230/115 KV SARABURI 6 SUBSTATION (GIS)	THB	191,669,720.80	58,594,729.75	225,162,230.86	654,543.44	32,307,265.43
2	230 KV KAENG KHOI SUBSTATION	THB	642,000.00	6,508,859.00		40,800.00	1,636,942.50
BID PRICE		THB	192,311,720.80	Baht 65,103,588.75	Baht 225,162,230.86	Baht 695,343.44	Baht 33,944,207.93
OTHER EXPENSES		THB	3,846,234.42	XXXXX	XXXXX	XXXXX	XXXXX
VAT		THB	13,731,056.87	Baht 4,557,251.21	Baht 15,761,356.16	Baht 48,674.04	Baht 2,376,094.56

วิไลภา ชีวชนากรณ์กุล

- 5 มี.ค. 2561

(นางสาวพนา สุภาวกุล)

อวส.

หจส-ห.

filename : Total Price_TS12-S-19.xlsx

MEDIUM COST FOR BID NO. TS12-S-19

SUMMARY OF BID PRICE

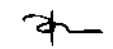
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS) AND IMPROVEMENT OF 230 KV KAENG KHOI SUBSTATION


TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

Schedule	Description	Currency	Supply of Equipment		Local Currency (excluding VAT) Baht Amount	Local Transportation (excluding VAT) Baht Amount	Local Transportation, Construction and Installation (excluding VAT) Baht Amount
			Foreign Supply	Local Supply			
			CIF Thai Port	Ex-works Price (excluding VAT) Baht			
			Amount	Amount			
	SUMMARY OF BID PRICE	THB	209,889,012.09	Baht 69,660,839.96	Baht 240,923,587.02	Baht 744,017.48	Baht 36,320,302.49
	TOTAL MEDIUM COST	THB	557,537,759.04				
	TOTAL MEDIUM COST (ROUND)	THB	560,000,000.00				

Schedule 1 and 2 are related schedules referring to Article F-15. Liquidated Damages for Late Completion and Late Delivery, item a. For Complete Construction of Substation.

In case Bidder proposes price discount without specifying whether or not it includes Value Added Tax (VAT), EGAT will consider it as the price discount excluding VAT.


(นางสาวพนา สุภาวกุล)
อ.ส.
19 ก.พ. 61


วิไลภา ชีวชนากรณ์กุล
ท.จ.ส.-11
- 5 มี.ค. 2561

MEDIUM COST FOR BID NO. TS12-S-19
SCHEDULE 1 : 230/115 KV SARABURI 6 SUBSTATION (GIS)
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

Description	Currency	Supply of Equipment		Local Currency (excluding VAT) Baht	Local Transportation (excluding VAT) Baht	Local Transportation, Construction and Installation (excluding VAT) Baht
		Foreign Supply	Local Supply			
		CIF Thai Port	Ex-works Price (excluding VAT) Baht			
		Amount	Amount			
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT	THB	181,998,647.10	55,449,200.75			32,307,265.43
PART 1C : CIVIL WORK				225,162,230.86		
PART 1D : SUPPLY OF SPARE PARTS	THB	9,671,073.70	3,145,529.00		654,543.44	
TOTAL PRICE	THB	191,669,720.80	Baht 58,594,729.75	Baht 225,162,230.86	Baht 654,543.44	Baht 32,307,265.43

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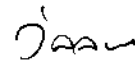
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
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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12


Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1AB1 : Power Transformer and Marshalling Control Cubicle			237,000.00	23,700.00
Schedule 1AB2 : Distribution Transformer			900,000.00	90,000.00
Schedule 1AB4 : Surge Arrester	THB	642,000.00	174,000.00	81,600.00

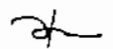

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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1AB5 : Current Transformer and Junction Box	THB	2,961,000.00	506,000.00	346,700.00
Schedule 1AB6 : Coupling Capacitor Voltage Transformer, Coupling Capacitor, Voltage Transformer and Junction Box	THB	3,330,000.00	573,000.00	390,300.00
Schedule 1AB7 : SF6 Gas Insulated Switchgear	THB	169,898,652.00		16,989.865.00


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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1AB9 : Power Circuit Breaker	THB	2,193,500.10		219,350.01
Schedule 1AB10 : Disconnecting Switch	THB	990,000.00	419,047.20	140,904.72
Schedule 1AB11 : Power Fuse, Fuse Link and Hook Stick	THB	494,525.90		49,452.59

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
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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1AB12 : AC&DC Distribution Board and Termination Box			2,114,038.00	211,403.80
Schedule 1AB13 : Stationary Battery and Battery Charger	THB	881,100.00	690,384.10	157,148.41
Schedule 1AB14 : Substation Steel Structure			7,105,256.40	1,776,314.10

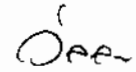

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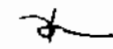
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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1AB15 : Insulator				124,190.00
Schedule 1AB18 : Low Voltage Cable and Conductor			19,463,648.60	4,865,912.15
Schedule 1AB19 : Switchyard Lighting Fixtures			1,431,447.60	357,861.90

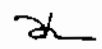

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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1AB20 : Aluminum Tube, Connector and Miscellaneous Hardware			311,582.15	77,895.54
Schedule 1AB21 : Bus Fitting	THB	178,226.70		44,556.68
Schedule 1AB22 : Grounding Material	THB	381,700.00	666,960.36	262,165.09

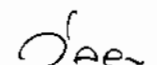

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

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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

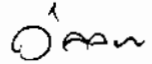
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		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) • Baht	
		Amount	Amount	
Schedule 1AB23 : Substation Miscellaneous	THB	47,942.40	357,411.34	101,338.44
Schedule 1AB24 : Control and Protection System			16,681,807.00	1,749,598.00
Schedule 1AB25 : Fault Recording System			3,042,728.00	304,272.00
Schedule 1AB34 : 48 VDC Stationary Battery, Battery Charger and DC Power Panel			686,600.00	75,000.00



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MEDIUM COST FOR BID NO. TS12-S-19
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12


Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1AB35 : Optical Fiber and Line Accessories			88,290.00	150,990.00
Schedule 1AB38 : Remote Terminal Unit				980,747.00
Schedule 1AB39 : Commissioning				2,736,000.00
PART 1AB	THB	181,998,647.10	Baht	Baht
			55,449,200.75	32,307,265.43



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MEDIUM COST FOR BID NO. TS12-S-19
PART 1C : CIVIL WORK
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12


Description	Local Currency (excluding VAT) Baht
	Amount
Schedule 1C1 : Foundation Work	14,232,965.78
Schedule 1C2 : Cable Trench	3,840,677.84
Schedule 1C3 : Control Building	146,520,776.87
Schedule 1C4 : Earth Work, Road and Crushed Rock Surfacing	8,087,195.48
Schedule 1C5 : Water Supply System	1,288,259.44
Schedule 1C6 : Drainage System	13,612,602.15
Schedule 1C7 : Special Construction Works	3,522,016.80
Schedule 1C8 : Miscellaneous	4,283,058.30
Schedule 1C9 : Fire Protection System	29,774,678.20
PART 1C	Baht 225,162,230.86

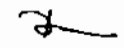

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MEDIUM COST FOR BID NO. TS12-S-19
PART 1D : SUPPLY OF SPARE PARTS
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12


Description	Currency	Supply of Equipment		Local Transportation (excluding VAT) Baht
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	(excluding VAT) Baht
		Amount	Amount	Amount
Schedule 1D7 : Spare Parts for SF6 Gas Insulated Switchgear	THB	9,274,296.00		463,714.80
Schedule 1D9 : Spare Parts for Power Circuit Breaker	THB	341,898.70		17,094.94
Schedule 1D11 : Spare Parts for Power Fuse, Fuse Link and Hook Stick	THB	54,879.00		16,463.70
Schedule 1D24 : Spare Parts for Control and Protection System			2,671,017.00	133,546.00


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MEDIUM COST FOR BID NO. TS12-S-19
PART 1D : SUPPLY OF SPARE PARTS
SUPPLY AND CONSTRUCTION OF 230/115 KV SARABURI 6 SUBSTATION (GIS)
TRANSMISSION SYSTEM EXPANSION PROJECT NO.12


Description	Currency	Supply of Equipment		Local Transportation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 1D25 : Spare Parts for Fault Recording System			474,512.00	23,724.00
PART 1D	THB	9,671,073.70	Baht 3,145,529.00	Baht 654,543.44



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MEDIUM COST FOR BID NO. TS12-S-19
SCHEDULE 2 : 230 KV KAENG KHOI SUBSTATION
SUPPLY AND CONSTRUCTION FOR IMPROVEMENT OF 230 KV KAENG KHOI SUBSTATION
TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

Description	Currency	Supply of Equipment		Local Currency (excluding VAT) Baht Amount	Local Transportation (excluding VAT) Baht Amount	Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply			
		CIF Thai Port	Ex-works Price (excluding VAT) Baht			
		Amount	Amount			
PART 2AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT			6,334,859.00			1,636,942.50
PART 2E : WORK ON SUPPLY EQUIPMENT BASIS	THB	642,000.00	174,000.00		40,800.00	
TOTAL PRICE	THB	642,000.00	Baht 6,508,859.00	Baht	Baht 40,800.00	Baht 1,636,942.50


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MEDIUM COST FOR BID NO. TS12-S-19
PART 2AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION FOR IMPROVEMENT OF 230 KV KAENG KHOI SUBSTATION
TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 2AB12 : AC&DC Distribution Board and Termination Box			126,150.00	12,615.00
Schedule 2AB18 : Low Voltage Cable and Conductor			3,636,710.00	909,177.50
Schedule 2AB24 : Control and Protection System			2,571,999.00	307,574.00
Schedule 2AB25 : Fault Recording System				12,000.00
Schedule 2AB38 : Remote Terminal Unit				358,576.00

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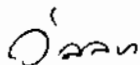
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PART 2AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT
SUPPLY AND CONSTRUCTION FOR IMPROVEMENT OF 230 KV KAENG KHOI SUBSTATION
TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

Description	Currency	Supply of Equipment		Local Transportation, Construction and Installation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 2AB39 : Commissioning				37,000.00
PART 2AB			Baht 6,334,859.00	Baht 1,636,942.50


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MEDIUM COST FOR BID NO. TS12-S-19
PART 2E : WORK ON SUPPLY EQUIPMENT BASIS
SUPPLY AND CONSTRUCTION FOR IMPROVEMENT OF 230 KV KAENG KHOI SUBSTATION
TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

Description	Currency	Supply of Equipment		Local Transportation (excluding VAT) Baht Amount
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	
		Amount	Amount	
Schedule 2E4 : Surge Arrester	THB	642,000.00	174,000.00	40,800.00
PART 2E	THB	642,000.00	Baht 174,000.00	Baht 40,800.00

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DATA SHEET

for

Invitation to Bid No. TS12-S-19

This Section consists of provisions that are specific to each procurement and supplement the information or requirements included in Bidding Documents.

1. Article B-3. Bid Security

The amount of bid security shall be USD 891,390.- or THB 28,000,000.-.

2. Article F-15. Liquidated Damages for Late Completion and Late Delivery, item a. For Complete Construction of Substation,

If the Contractor fails to meet any of the completion dates for Schedule No. 1 : 230/115 kV Saraburi 6 Substation (GIS) or Schedule No. 2 : 230 kV Kaeng Khoi Substation, the liquidated damages shall be at the rate of one-tenth of one (0.10) per cent of the total Contract Price for Schedule No. 1 : 230/115 kV Saraburi 6 Substation (GIS) and Schedule No. 2 : 230 kV Kaeng Khoi Substation for each Day of delay. This sum is payable regardless of the actual loss and/or damages incurred. In no event shall the aggregate amount of liquidated damages exceed ten (10) per cent of the total Contract Price of those schedules.

3. Maintenance Guarantee Period

3.1 For all Work except 500 kV System

The Contractor shall guarantee the proper functioning of the Work for a period of one (1) Year except the following Equipment the guarantee period of which shall be as follows :

<u>Equipment</u>	<u>Period of Guarantee (Year)</u>
- Fault Recording System	2
- Control and Protection System	2

3.2 For 500 kV System

The Contractor shall guarantee the proper functioning of the Work for a period of five (5) Years.

4. Defective Equipment to be replaced with the whole new set

Not Applicable

ELECTRICITY GENERATING AUTHORITY OF THAILAND

Nonthaburi
Thailand

Tlx No. 72348 EGAT TH
Facsimile No. : 66 2433 6317

INVITATION TO BID NO. TS12-S-19

SUPPLY AND CONSTRUCTION OF 230/115 kV SARABURI 6 SUBSTATION (GIS) AND IMPROVEMENT OF 230 kV KAENG KHOI SUBSTATION TRANSMISSION SYSTEM EXPANSION PROJECT NO. 12

Invitation

The Electricity Generating Authority of Thailand (EGAT) hereby invites sealed bids for supply and construction of 230/115 kV Saraburi 6 Substation (GIS) and Improvement of 230 kV Kaeng Khoi Substation under Transmission System Expansion Project No.12 as described herein in accordance with terms, conditions and Specifications described in these Bidding Documents.

Work Description

The supply and construction of 230/115 kV Saraburi 6 Substation (GIS) and Improvement of 230 kV Kaeng Khoi Substation will be on a supply and construction basis, the Contractor shall be responsible for complete supply, installation, construction and also engineering design work to the standard specified and best modern practice. The substations to be constructed and the scope of work under this Invitation are described in Section H. Scope of Work.

Eligibility of Bidders: General Requirements

All Bidders shall meet the following requirements; failure to so comply shall constitute sufficient ground for rejection.

- a. The Bidder shall be a partnership, firm or company, either alone or in joint venture or in consortium.
- b. The Bidder shall be well-established and maintain a permanent place of business.
- c. The Bidder shall not be, or supply the Equipment, from the country under the state of Civil War.
- d. The Bidder shall be a juristic person who manufactures or provides such material or services, as the case may be, and not be named in the List of Work

Abandoners published by the Office of Prime Minister and/or in the Debarment List and/or in the List of Work Abandoners declared by EGAT.

- e. The Bidder shall be a juristic person who neither fails to submit the Revenue and Expense Accounts nor fails to present proper and complete accounts to the Revenue Department of Thailand, in accordance with the Notification of the National Anti-Corruption Commission Concerning Principles and Methods of Preparing Revenue and Expense Accounts of Project between Individual/Company and Government Agencies B.E. 2554 (A.D. 2011) as amended from time to time (“the Notification”).
- f. The Bidder shall be a juristic person who registers for e-Government Procurement (e-GP) at Thai Government Procurement website (www.gprocurement.go.th at telephone No. 662 1277386 – 89) of the Comptroller General’s Department of Thailand.

Due to the fact that the e-GP system is not ready for registration for foreign Bidders who have no taxpayer identification number at this moment, foreign Bidders are, therefore, temporarily released from this qualification. However, whenever the e-GP system is ready, all foreign Bidders shall register in the e-GP system.

- g. The Bidder shall not be a Jointly Interested Bidder with other Bidders as from the date of EGAT's issuance of the Invitation to Bid, or shall not be a person who undertakes any action as an "Obstruction of Fair Price Competition" as defined in Additional Regulation for this Invitation.
- h. The Bidder shall not either be EGAT's consultant or involving in EGAT's consultancy company under this Invitation, or have EGAT's personnel involved in his business as shareholder having voting right that can control his business, director, manager, officer, employee, agent or consultant except for the ones who are officially ordered by EGAT to act or participate therein.
- i. The Bidder shall not be the person who is privileged or protected not to be taken any legal proceeding under Thai Court; provided that such Bidder's government declares that such special privilege is waived.
- j. In case of a joint venture or consortium, the Bidder shall carry out all the work under such formation from the time of bidding until the fulfillment of the Contract.
- k. The Bidder shall have purchased the Bidding Documents from EGAT as described under Article A-7. Availability of Bidding Documents. For a joint venture or consortium, only one member of the joint venture or consortium is required to purchase the Bidding Documents.

All Bidders should preferably meet the following requirements; failure to so comply may constitute sufficient ground for rejection.

- a. The Bidder shall have adequate fund to meet financial obligations incidental to this Contract.
- b. The Bidder shall supply documentary evidence established in accordance with Article B-8. Information to be Submitted with Bid to demonstrate adequately that he is eligible to bid and is qualified to perform the Contract if his bid is accepted. Bidder should also demonstrate his capacity to perform the Work either with or without the use of subcontractor.

Eligibility of Bidders: Technical Requirements

I. All Bidders shall meet the following requirements; failure to so comply shall constitute sufficient ground for rejection.

- a. Being well-established and maintaining a permanent place of business.

If the Bidder is a new company formed by acquisition of or merger with other companies or business units before submitting the Bid, the experience records of any of such previous companies or business units that meet the requirements set forth herein are acceptable as the experience records of the Bidder.

If Bidder is a new company formed by acquisition of or merger with other companies or business units, the pending claim of any of such previous companies or business units shall be considered pending claim of the Bidder.

Reference records of either the parent or affiliated companies shall not be considered as the record of such Bidder.

- b. The Bidder shall have one of the following qualifications regarding experiences executing contract of supply and construction substation.
 - 1) Having experience with EGAT in executing at least one (1) contract as contractor (not as subcontractor) for supply and construction of a complete 115 kV or above conventional or GIS substation, with its overall performance satisfactory to EGAT;
 - 2) Having experience in executing at least one (1) contracts as contractor (not as subcontractor) for supply and construction of 220 kV or above conventional or GIS substation in an overseas country (not his own country).

Experience record of the Bidder or either member of the joint venture /consortium, including experience record derived from being a member of other joint venture or consortium in previous project(s) is acceptable. It is not allowed to combine the experience records of each member of the joint venture/consortium in order to meet the experience requirements.

- c. Further to b.1) mentioned above, having a record of experience within the last ten (10) years on the technical knowledge and practical experience on design, construction and installation of Equipment of a 115 kV or above complete conventional or GIS substation. Bidder shall also demonstrate his capacity to perform Work.

Further to b.2) mentioned above, having a record of experience within the last ten (10) years on the technical knowledge and practical experience on design, construction and installation of Equipment of a 220 kV or above complete conventional or GIS substation. Bidder shall also demonstrate his capacity to perform Work.

Experience record of the Bidder or either member of the joint venture /consortium, including experience record derived from being a member of other joint venture or consortium in previous project(s) is acceptable, provided that there is a letter from the project owner certifying that the Works as described in c. above were performed by the Bidder or either member of the joint venture/ consortium of this project. It is not allowed to combine the experience records of each member of the joint venture/consortium in order to meet the experience requirements.

With respect to item b. and c. above, reference records of either the parent or affiliated companies of the Bidder or of either member of joint venture or consortium shall not be acceptable. If the Bidder has previously formed as the joint venture/consortium with other company and the experience record(s) of the joint venture/consortium meet(s) the requirement set forth herein, such experience record(s) of the joint venture/consortium is(are) also acceptable as the experience record(s) of the Bidder.

- d. The Bidder shall propose Equipment manufactured by the qualified manufacturers who shall fulfill the following requirements :
1. Regularly manufacturing of Equipment of the type and similar ratings proposed.
 2. Being well-established and maintaining a permanent place of business.
 3. The manufacturer shall have the experience records that meet the requirements set forth herein.

Reference records of either parent or affiliated companies shall not be considered as the records of such manufacturer.

4. If the Manufacturer is a new company formed by acquisition of or merger with other companies or business units, and any of such previous companies or business units has the experience records that meet the requirements set forth herein, such experience records are acceptable as the experience records of the new company, provided that each item of the equipment to be supplied under this bid shall be manufactured from the same source of supply as indicated in each of such relevant supply records as described in Item I.d.5 thru I.d.8 below. Otherwise, it shall not be acceptable and shall be sufficient grounds for rejection.

For the avoidance of doubt, it is not allowed to combine the experience records of the previous companies or business units in order to meet the experience requirements.

5. For 230/115 kV Ratings of Gas-Insulated Switchgear (GIS). These Equipment shall be manufactured by the qualified manufacturers who shall fulfill the following requirements :

- 5.1 Having one of the following qualifications:

- 5.1.1 Proposing the Equipment of the type and ratings which has already been accepted by EGAT.

OR

- 5.1.2 For 230 kV Gas-Insulated Switchgear (GIS):

Having a supply record of Equipment of the type proposed at the nominal system voltage of 220 kV or above, 3000 A or above, 50 kA or above, with successful operation/use of at least three (3) consecutive years in overseas country (not his own country) and at least three (3) substations of which total GIS bays shall not be less than twelve (12).

However, the Equipment of the type and short circuit current ratings proposed shall have a supply record of successful operation/use of at least three (3) consecutive years in overseas country (not his own country) and at least one (1) substation of which total GIS bays shall not be less than four (4).

In case that the supply record of Equipment of the type and ratings proposed fulfills the requirement, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use of at least three (3) substations of which total GIS bays shall not be less than twelve (12) and having minimum one (1) year in overseas country (not his own country). The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgment whether or not to consider or accept the proposed developed or modified type.

- For 115 kV Gas-Insulated Switchgear (GIS):

Having a supply record of Equipment of the type proposed at the nominal system voltage of 110 kV or above, 2000 A or above, 40 kA or above, with successful operation/use of at least three (3) consecutive years in overseas country (not his own country) and at least three (3) substations of which total GIS bays shall not be less than twelve (12).

However, the Equipment of the type and short circuit current ratings proposed shall have a supply record of successful operation/use of at least three (3) consecutive years in overseas country (not his own country) and at least one (1) substation of which total GIS bays shall not be less than four (4).

In case that the supply record of Equipment of the type and ratings proposed fulfills the requirement, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use of at least three (3) substations of which total GIS bays shall not be less than twelve (12) and having minimum one (1) year in overseas country (not his own country). The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgment whether or not to consider or accept the proposed developed or modified type.

5.2 Having a past design test record of the Equipment as proposed, if specified in EGAT's specification. Such past design test record shall conform to the test specified in EGAT's specification.

6. For 230/115 kV Ratings of Power Circuit Breaker shall be manufactured by the qualified manufacturers who shall fulfill the following requirements :

6.1 Having one of the following qualifications:

6.1.1 Proposing the Equipment of the type and ratings which has already been accepted by EGAT.

OR

6.1.2 For 230 kV Power Circuit Breaker:

Having a supply record of Equipment of the type proposed at nominal system voltage of 220 kV or above, 3000 A or above, 50 kA or above, with successful operation/use of at least three (3) consecutive years in an overseas country (not his own country) and at least three (3) three phase sets.

However, the Equipment of the type and short circuit current ratings proposed shall have a supply record of successful operation/use of at least three (3) consecutive years in overseas country (not his own country) and at least one (1) three phase set.

In case that the supply record of Equipment of the type and ratings proposed fulfilled the requirement, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use of at least one (1) year in overseas country (not his own country) and at least

three (3) three phase sets. The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgment whether or not to consider or accept the proposed developed or modified type.

For 115 kV Power Circuit Breaker:

Having a supply record of Equipment of the type proposed at nominal system voltage of 110 kV or above, 2000 A or above, 40 kA or above, with successful operation/use of at least three (3) consecutive years in an overseas country (not his own country) and at least three (3) three phase sets.

However, the Equipment of the type and short circuit current ratings proposed shall have a supply record of successful operation/use of at least three (3) consecutive years in overseas country (not his own country) and at least one (1) three phase set.

In case that the supply record of Equipment of the type and ratings proposed fulfilled the requirement, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use for at least one (1) year in overseas country (not his own country) and at least three (3) three phase sets. The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgment whether or not to consider or accept the proposed developed or modified type.

- 6.2 Having a past design test record of the Equipment as proposed, if specified in EGAT's specification. Such past design test record shall conform to the test specified in EGAT's specification.
7. For 230/115 kV Ratings of following Equipment: Instrument Transformer, Surge Arrester and Disconnecting Switch. These Equipment shall be manufactured by the qualified manufacturers who shall fulfill the following requirements :

- 7.1 Having one of the following qualifications:

- 7.1.1 Proposing the Equipment of the type and ratings which has already been accepted by EGAT.

OR

- 7.1.2 Having a supply record of Equipment of the type and ratings proposed with successful operation/use of at least three (3) three-phase sets and having minimum three (3) consecutive years in an overseas country (not his own country).

In case that the supply record of Equipment of the type and ratings proposed fulfills the requirement, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use of at least three (3) three-phase sets and having minimum one (1) year in overseas country (not his own country). The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgment whether or not to consider or accept the proposed developed or modified type.

Supply records of the higher rating Equipment shall not be considered if the Bidder does not propose such higher rating Equipment in his bid.

- 7.2 Having a past design test record of the Equipment as proposed, if specified in EGAT's specification. Such past design test record shall conform to the test specified in EGAT's specification.
8. For 230 kV Control and Protection System and below, having the following qualifications:
 - 8.1 Being local manufacturer.
 - 8.2 Having one of the following qualifications :
 - 8.2.1 Having at least three (3) consecutive years' supply record of successful operation/use in 220 kV or above Transmission System of at least three (3) units of each type of Protective Relay Panels of which the characteristics are similar to the ones specified herein to EGAT or other Electricity Authorities of Thailand
 - OR
 - 8.2.2 Having a letter of acceptance for manufacturing and/or fabrication of the specific Equipment issued by EGAT within the scope specified therein.

II. All Bidders should preferably meet the following technical requirements; failure to so comply may constitute sufficient ground for rejection.

- a. The Bidder shall have sufficient capacity to carry out the work.
- b. The Bidder shall have no just or proper claims pending against him with respect to breach in the performance of Contract on other similar works awarded by EGAT. In case the Bidder is a joint venture/consortium, either member of the joint venture/consortium shall have no just or proper claims pending against him with respect to breach in the performance of Contract on other similar works awarded by EGAT.

- c. The Bidder himself or his subcontractors, at the time of submitting this proposal, shall not carry excessive work nor be in a default position with respect to work with EGAT. Unsatisfactory past performance on Contract awarded by EGAT may be a sufficient reason of being disqualified.
- d. The Bidder shall propose Equipment from manufacturers who fulfill the requirements below. If there is any deficiency, EGAT reserves the right to require the Bidder to propose new manufacturer or new type/model of Equipment without any additional cost to EGAT.
 1. Regularly manufacturing of Equipment of the type and similar ratings proposed.
 2. Being well-established and maintaining a permanent place of business
 3. The manufacturer shall have the experience records that meet the requirements set forth herein.

Reference records of either parent or affiliated companies shall not be considered as the records of such manufacturer.

4. If the Manufacturer is a new company formed by acquisition of or merger with other companies or business units, and any of such previous companies or business units has the experience records that meet the requirements set forth herein, such experience records are acceptable as the experience records of the new company, provided that each item of the equipment to be supplied under this bid shall be manufactured from the same source of supply as indicated in each of such relevant supply records as described in Item II.d.5 thru II.d.13 below.

For the avoidance of doubt, it is not allowed to combine the experience records of the previous companies or business units in order to meet the experience requirements.

5. For 33, 22 and 11 kV ratings of following Equipment : Metal-Clad SF₆ Gas Insulated Switchgear, Power Circuit Breaker, Instrument Transformer, Disconnecting Switch and Surge Arrester

Having one of the following qualifications :

- 5.1 Proposing the Equipment of the type and ratings which has already been accepted by EGAT.

OR

- 5.2 Having a supply record of Equipment of the type and ratings proposed with successful operation/use of at least three (3) consecutive years in an overseas country (not his own country) and at least three (3) three phase sets. The ratings and features of Equipment shall be the same or similar rating as EGAT specifies.

In case that the supply record of Equipment of the type and ratings proposed fulfilled the requirement, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use of at least one (1) year in overseas country (not his own country) and at least three (3) three phase sets. The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgment whether or not to consider or accept the proposed developed or modified type.

Supply records of the higher rating Equipment shall not be considered if the Bidder does not propose such higher rating Equipment in his bid.

6. For Distribution Transformer, Power Fuse, AC&DC Distribution Board and Lighting Relay Panel (LRP), Load Center Unit Substation (LCUS), Junction Box, Battery Charger, Substation Steel Structure, 33 kV and below Cable Terminations, **115 kV and below** XLPE Power Cable, Power Cable, Control Cable and Switchboard Wire, Lighting Cable, Copper Ground Wire, Overhead Ground Wire, Aluminum Conductor, Optical Fiber Cable, Switchyard Lighting Fixtures, Aluminum Tube, Compression Connector and Miscellaneous Hardware, Bus Fittings, Ground Rod, Thermite Welding Material, Grounding Hardware, Conduit and Conduit Fittings

- 6.1 Being local manufacturer for the following Equipment :

Distribution Transformer, AC&DC Distribution Board and Lighting Relay Panel (LRP), Load Center Unit Substation (LCUS), Junction Box, Battery Charger, Substation Steel Structure, 115 kV and below XLPE Power Cable, Power Cable, Control Cable and Switchboard Wire, Lighting Cable, Copper Ground Wire, Overhead Ground Wire, Aluminum Conductor, Single mode optical fiber cable, Switchyard Lighting Fixtures, Aluminum Tube, Compression Connector and Miscellaneous Hardware, Thermite Welding Material and Conduit.

- 6.2 Having been granted a licence for producing standard product by Thai Industrial Standard Institute (TISI), Ministry of Industry for the following Equipment:

60 kV through 115 kV XLPE Power Cable, Lighting cable and Aluminum conductor.

- 6.3 Having one of the following qualifications :

- 6.3.1 Having supply record of Equipment of the type and similar ratings proposed with successful operation/use for at least one (1) year.

OR

6.3.2 Having a letter of acceptance for manufacturing and/or fabrication of the specific Equipment issued by EGAT within the scope specified therein (For the local manufacturer).

7. For Insulator

Having one of the following qualifications :

7.1 Having supply record with successful operation/use for at least three (3) consecutive years in overseas country (not his own country) and for following equipment :

7.1.1 Suspension Insulator, at least 10,000 units having the similar ANSI class as proposed.

7.1.2 Station Post Insulator, having the similar ANSI technical reference number as proposed.

OR

7.2 Having a letter of acceptance for manufacturing and/or fabrication of the specific Equipment issued by EGAT within the scope specified therein (For the local manufacturer).

8. For Stationary Battery

Having one of the following qualifications :

8.1 Having supply record of Equipment of the type and similar ratings proposed with successful operation/use in substations/switchyards of at least three (3) consecutive years and at least three (3) sets.

In case that the supply record of Equipment of the type and similar ratings proposed fulfilled the requirements, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use of at least one (1) year. The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgement whether or not to consider or accept the proposed developed or modified type.

OR

8.2 Having a letter of acceptance for manufacturing and/or fabrication of the specific Equipment issued by EGAT within the scope specified therein (For the local manufacturer).

9. For above 33kV through 230 kV Outdoor Type Cable Termination and Cable Termination for GIS.

Having one of the following qualifications :

9.1 Proposing the Equipment of the type and ratings which have ever been accepted by EGAT.

OR

9.2 Having a supply record of Equipment of the type and ratings proposed with successful operation/use for at least three (3) consecutive years in an overseas country (not his own country) and at least five (5) three phase sets. The ratings and features of Equipment shall be the same or similar rating as EGAT specifies.

In case that the supply record of Equipment of the type and ratings proposed fulfilled the requirement, the manufacturer may propose a newly developed or modified type of such Equipment with successful operation/use for at least one (1) year in overseas country (not his own country) and at least five (5) three phase sets. The detailed information of the development or modification shall be submitted with his proposal. EGAT, however, reserves the right and will make its own judgment whether or not to consider or accept the proposed developed or modified type.

Supply records of the higher rating Equipment shall not be accepted if the Bidder does not propose such higher rating Equipment in his bid.

10. For 230 kV XLPE Power Cable

Having one of the following qualifications :

10.1 *Having a supply record of Equipment of the type and similar ratings proposed with successful operation/use for at least three (3) consecutive years in an overseas country (not his own country).*

OR

10.2 *Having a letter of acceptance for manufacturing and/or fabrication of the specific Equipment issued by EGAT within the scope specified therein (For the local manufacturer).*

11. Proposing the protective relay from the manufacturers as listed in EGAT's Specifications and shall be in compliance with the details specified in EGAT's Specifications. Type/Model of the main protective relays proposed shall be as specified in EGAT ACCEPTED MAIN RELAY LIST NO.1 and NO.2 attached at the end of Section A. Invitation to Bid.

12. For Fault Recording System.

12.1 Having one of the following qualifications :

12.1.1 The cabinet and all equipment is completely wired by the manufacturer before shipping to Thailand.

OR

12.1.2 The cabinet and the equipment are wired in Thailand by the manufacturer that has obtained special permission from EGAT for manufacturing and/or fabrication of the Control and Protection System within the scope specified in the Letter of Permission which is issued by EGAT (for the local manufacturer). The design and engineering shall be performed by the FRS's manufacturer. The assembly, factory test and commissioning shall be in accordance with the FRS's manufacturer standard and performed under the manufacturer's supervisor.

12.2 The Fault Recording System (FRS) proposed shall be in compliance with the details specified in EGAT's Specifications. Manufacturer/type/model of FRS proposed shall be as specified in EGAT ACCEPTED FAULT RECORDING SYSTEM LIST attached at the end of Section A. Invitation to Bid

13. Being local manufacturer for steel supporting structure of Instrument Transformer, Surge Arrester and Disconnecting Switch.

14. For Closed-circuit television (CCTV) system and equipment

14.1 Proposed camera and Network Video Recorder (NVR) manufacturer shall have a representative or a branch office of manufacturer in Thailand for at least ten (10) years.

14.2 Proposed brand of IP cameras shall have a supply record of IP cameras for at least five hundred (500) IP cameras per contract with successful operation/use for at least three (3) years in Thailand.

14.3 The bidder or subcontractor shall have one of the following qualifications:

14.3.1 Having experiences in installation and cabling of outdoor-type IP cameras for at least fifty (50) cameras per contract with successful operation/use for at least three (3) years in Thailand.

OR

14.3.2 Having experiences in optical fiber cabling in substation switchyards for at least five (5) substations per contract with successful operation/use for at least three (3) years in Thailand.

14.4 Being local manufacturer for the following Equipment: CCTV Rack cabinet, Monitoring desk, CCTV pole, 12-core ADSS optical fiber cable.

- e. Proposing the manufacturer who has no just or proper claims pending against Equipment of the same type/model to be proposed under this bid.

In case the manufacturer is a new company formed by acquisition or merger with other companies or business units, the pending claim of any of such previous companies or business units shall be considered pending claim of the manufacturer.

- f. Proposing reputable subcontractors, for the portion of the work to be subcontracted, having adequate technical knowledge, ability and capacity to perform such work and having at least three years experience in the performance of similar work and of equal magnitude to the work to be subcontracted. If any proposed subcontractor(s) is (are) not qualified in the opinion of EGAT, the Bidder is required to select other subcontractor(s) at his own cost to the satisfaction of EGAT.

EGAT ACCEPTED MAIN RELAY LIST No.1

Scheme	Technique	Accepted Type/Model	Manufacturer	Acceptance for			Notes
				500kV	230kV	115&69kV	
Current Differential	Numerical	RED670	ABB	YES	YES	YES	Only software version 1.1 is accepted.
		P543	GE	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		L90	GE	YES	YES	YES	
		SEL-311L	SEL	YES	YES	YES	
		7SD52	Siemens	YES	YES	YES	
		GRL100	Toshiba	YES	YES	YES	
		P543	Schneider Electric	YES	YES	YES	
		EF-LD	INGETEAM	YES	YES	YES	
		PCS-931	NR Electric	YES	YES	YES	
Distance Protection	Numerical	REL670	ABB	YES	YES	YES	Only software version 1.1 is accepted.
		P443	GE	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		D30	GE		YES	YES	Only for three pole tripping and line protection that no need carrier scheme.
		D60	GE		YES	YES	
		ALPSDA1	GE	YES	YES	YES	
		SEL-311C	SEL			YES	Only for three pole tripping and line protection that no need carrier scheme.
		SEL-421	SEL	YES	YES	YES	For 21P, 85, 67N. The relay with auto-reclosing function can not be accepted.
		7SA522	Siemens	YES	YES	YES	
		7SA6 series	Siemens	YES	YES	YES	
		GRZ100	Toshiba		YES	YES	
		GRZ200	Toshiba		YES	YES	
		ZLV	ZIV		YES	YES	
		P443	Schneider Electric	YES	YES	YES	
		EF-ZT	INGETEAM	YES	YES	YES	
		PCS-902	NR Electric	YES	YES	YES	
Transformer Differential	Numerical	RET670	ABB	YES	YES	YES	Only software version 1.1 is accepted.
		RET650	ABB	YES	YES	YES	3-restraints.
		P64x	GE	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"

2.7

EGAT ACCEPTED MAIN RELAY LIST No.1

Scheme	Technique	Accepted Type/Model	Manufacturer	Acceptance for			Notes
				500kV	230kV	115&69kV	
Transformer Differential	Numerical	T35	GE		YES	YES	
		T60	GE		YES	YES	
		Duobias	Siemens		YES	YES	The manufacturer's name "Reyrolle" is changed to "Siemens"
		SEL-387	SEL		YES	YES	4-restraints.
		SEL-487E	SEL	YES	YES	YES	
		SEL-587	SEL			YES	2-restraints.
		SEL-787	SEL			YES	2-restraints.
		7UT6	Siemens	YES	YES	YES	5-restraints.
		GRT100	Toshiba	YES	YES	YES	
		GRT200	Toshiba	YES	YES	YES	
		IDV	ZIV	YES	YES	YES	
		P645	Schneider Electric	YES	YES	YES	
		EF-TD	INGETEAM	YES	YES	YES	3-restraints.
		PCS-978	NR Electric	YES	YES	YES	
Busbar Protection	High Impedance	REB650	ABB	YES	YES	YES	
		SEL-587Z	SEL	YES	YES	YES	
		GRB150	Toshiba	YES	YES	YES	
Busbar Protection	Numerical Low Impedance	REB670	ABB	YES	YES	YES	Only software version 1.1 is accepted.
		REB500	ABB	YES	YES	YES	
		P746	GE	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		P740	GE	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		B90	GE	YES	YES	YES	
		B30	GE	YES	YES	YES	Only use in case that the bus arrangement is Breaker-and-a half, Double-bus-Double-Breaker or Main-and-Transfer.
		P747	GE	YES	YES	YES	
		SEL-487B	SEL	YES	YES	YES	
		7SS52	Siemens	YES	YES	YES	
7SS60	Siemens	YES	YES	YES	Only use in case that the bus arrangement is Breaker-and-a half, Double-bus-Double-Breaker or Main-and-Transfer.		

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EGAT ACCEPTED MAIN RELAY LIST No.1

Scheme	Technique	Accepted Type/Model	Manufacturer	Acceptance for			Notes
				500kV	230kV	115&69kV	
Busbar Protection	Numerical Low Impedance	7SS85	Siemens	YES	YES	YES	
		GRB100	Toshiba	YES	YES	YES	
		P746	Schneider Electric	YES	YES	YES	
		P740	Schneider Electric	YES	YES	YES	
Breaker Failure Protection	Numerical	RAHB411	ABB	YES	YES	YES	
		REQ650	ABB			YES	
		P141	GE	YES	YES	YES	3-phase Breaker failure function only. The manufacturer's name "ALSTOM" is changed to "GE"
		P14Nx	GE	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		C60	GE		YES	YES	
		F60	GE		YES	YES	
		SEL-501	SEL	YES	YES	YES	3-phase Breaker failure function only.
		P821	Schneider Electric		YES	YES	Only firmware version 1.F is accepted.
		7VK6 series	Siemens	YES	YES	YES	The function and the operating time for each system shall be conform to Specification nos. 1005 and 1002.
		GRC100	Toshiba		YES	YES	
		GRD200	Toshiba	YES	YES	YES	
		EF-ZT	INGETEAM	YES	YES	YES	
		PCS-9611	NR Electric	YES	YES	YES	3-phase Breaker failure function only.

Note

- The procedures for being listed in EGAT ACCEPTED MAIN RELAY LIST can be requested from Transmission System Engineering Division.
- If any type of relay in the list is planned not to be manufactured, the manufacturer or the representative is responsible for informing EGAT at least 1 year before it is obsolete.
- The relays shall be configured to comply with all EGAT's needed functions.

EGAT ACCEPTED MAIN RELAY LIST No.2

Scheme	Technique	Accepted Type/Model	Manufacturer	Acceptance for				Notes
				500kV	230kV	69&115kV	22&33kV	
Directional Overcurrent Relay	Numerical	REQ650	ABB	YES	YES	YES	YES	
		P14Dx	GE	YES	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		P841	GE	YES	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		SEL-351A	SEL	YES	YES	YES	YES	
		SEL-451	SEL	YES	YES	YES	YES	
		SEL-751	SEL	YES	YES	YES	YES	
		GRE140	Toshiba	YES	YES	YES	YES	
		GRD200	Toshiba	YES	YES	YES	YES	
		7SJ62	Siemens	YES	YES	YES	YES	
		7SJ85	Siemens	YES	YES	YES	YES	
		IRV	ZIV		YES	YES	YES	
		EF-MD	INGETEAM	YES	YES	YES	YES	
		PCS-9611	NR Electric				YES	None of line fault locator. Only use with feeder.
Overcurrent Relay	Numerical	REQ650	ABB	YES	YES	YES	YES	
		P141	GE	YES	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		P14Dx	GE	YES	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		P14Nx	GE	YES	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		P841	GE	YES	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		F60	GE	YES	YES	YES	YES	
		F650	GE	YES	YES	YES	YES	
		SR350	GE	YES	YES	YES	YES	
		P120	Schneider Electric	YES	YES	YES	YES	

N.V

EGAT ACCEPTED MAIN RELAY LIST No.2

Scheme	Technique	Accepted Type/Model	Manufacturer	Acceptance for				Notes
				500kV	230kV	69&115kV	22&33kV	
Overcurrent Relay	Numerical	P122	Schneider Electric	YES	YES	YES	YES	
		SEL-351A	SEL	YES	YES	YES	YES	
		SEL-451	SEL	YES	YES	YES	YES	
		SEL-551	SEL	YES	YES	YES	YES	
		SEL-751	SEL	YES	YES	YES	YES	
		SEL-751A	SEL	YES	YES	YES	YES	
		7SJ61	Siemens	YES	YES	YES	YES	
		7SJ62	Siemens	YES	YES	YES	YES	
		7SJ85	Siemens	YES	YES	YES	YES	
		GRE140	Toshiba	YES	YES	YES	YES	
		GRD200	Toshiba	YES	YES	YES	YES	
		IRV	ZIV		YES	YES	YES	
		EF-MD	INGETEAM	YES	YES	YES	YES	
		PCS-9611	NR Electric	YES	YES	YES	YES	3 pole trip only
Synchronism Check Relay	Numerical	REQ650	ABB	YES	YES	YES		
		SPAU140C	ABB	YES	YES	YES		
		P841	GE	YES	YES	YES		The manufacturer's name "ALSTOM" is changed to "GE"
		F60	GE	YES	YES	YES		
		F650	GE	YES	YES	YES		
		SEL-279H	SEL	YES	YES	YES		
		SEL-351A	SEL	YES	YES	YES		
		SEL-451	SEL	YES	YES	YES		
		SEL-751	SEL	YES	YES	YES		
		SEL-751A	SEL	YES	YES	YES		
		7VK61	Siemens	YES	YES	YES		
		7SJ85	Siemens	YES	YES	YES		
GRD200	Toshiba	YES	YES	YES				

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EGAT ACCEPTED MAIN RELAY LIST No.2

Scheme	Technique	Accepted Type/Model	Manufacturer	Acceptance for				Notes
				500kV	230kV	69&115kV	22&33kV	
Synchronism Check Relay	Numerical	EF-MD	INGETEAM	YES	YES	YES		
		PCS-9611	NR Electric	YES	YES	YES		
	Static	RASC	ABB	YES	YES	YES		only use in Interposing Panel.
Auto Reclosing Relay	Numerical	REQ650	ABB	YES	YES	YES		
		P841	GE	YES	YES	YES		The manufacturer's name "ALSTOM" is changed to "GE"
		F60	GE		YES	YES		3 pole reclose only
		F650	GE		YES	YES		3 pole reclose only
		DRS	GE		YES	YES		3 pole reclose only
		SEL-279H	SEL		YES	YES		3 pole reclose only
		SEL-351A	SEL		YES	YES		3 pole reclose only
		SEL-451	SEL		YES	YES		3 pole reclose only
		SEL-751	SEL		YES	YES		3 pole reclose only
		7VK512	Siemens	YES	YES	YES		
		7VK61	Siemens	YES	YES	YES		
		GRR100	Toshiba	YES	YES	YES		
		GRD200	Toshiba	YES	YES	YES		
		EF-ZT	INGETEAM	YES	YES	YES		
		PCS-9611	NR Electric		YES	YES		3 pole reclose only
Overfluxing Relay	Static	RALK	ABB	YES	YES	YES		
	Numerical	7RW600	Siemens	YES	YES	YES		
		EF-TD	INGETEAM	YES	YES	YES		
Frequency Relay	Numerical	P94Vx	GE	YES	YES	YES	YES	The manufacturer's name "ALSTOM" is changed to "GE"
		MIV	GE		YES	YES	YES	
		SEL-351A	SEL	YES	YES	YES	YES	
		SEL-451	SEL	YES	YES	YES	YES	
		SEL-751	SEL	YES	YES	YES	YES	

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EGAT ACCEPTED MAIN RELAY LIST No.2

Scheme	Technique	Accepted Type/Model	Manufacturer	Acceptance for				Notes
				500kV	230kV	69&115kV	22&33kV	
Frequency Relay	Numerical	SEL-751A	SEL	YES	YES	YES	YES	
		7SJ85	Siemens	YES	YES	YES	YES	
		EF-MD	INGETEAM	YES	YES	YES	YES	
		PCS-9611	NR Electric	YES	YES	YES	YES	
Under/Overvoltage Relay	Numerical	MIV	GE		YES	YES	YES	
		P94V	GE	YES	YES	YES	YES	None of VT input (open delta connection) for 59N.
		SEL-351A	SEL	YES	YES	YES	YES	
		SEL-751	SEL	YES	YES	YES	YES	
		SEL-751A	SEL	YES	YES	YES	YES	
		7SJ62	Siemens	YES	YES	YES	YES	
		7SJ85	Siemens	YES	YES	YES	YES	
		GRD200	Toshiba	YES	YES	YES	YES	
		IRV	ZIV	YES	YES	YES	YES	
		EF-MD	INGETEAM	YES	YES	YES	YES	
		PCS-9611	NR Electric		YES	YES	YES	C-Bank protection only

Note

- The procedures for being listed in EGAT ACCEPTED MAIN RELAY LIST can be requested from Transmission System Engineering Division.
- If any type of relay in the list is planned not to be manufactured, the manufacturer or the representative is responsible for informing EGAT at least 1 year before it is obsolete.
- The relays shall be configured to comply with all EGAT's needed functions.

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EGAT ACCEPTED FAULT RECORDING SYSTEM LIST

Accepted Type/Model	Manufacturer
IDM+	QUALITROL
M871	GE
7KE85	SIEMENS
TESLA 4000	ERL Phase
TR2100	Rochester (RIS)

Note

- The procedures for being listed in EGAT ACCEPTED FAULT RECORDING SYSTEM LIST can be obtained from Transmission System Engineering Division.
- If any type of FRS in the list is planned not to be manufactured, the manufacturer or the representative is responsible for informing EGAT at least 1 year before it is obsolete.

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EGAT ACCEPTED MANUFACTURER LIST FOR PROTECTIVE RELAY

Description	Manufacturer / Country
Protective Relay	ABB / Sweden, Switzerland, USA
	GE / USA, Canada, Spain, UK
	SEL / USA
	Siemens / Germany
	Reyrolle / UK
	Toshiba / Japan, Vietnam
	Schneider Electric / France, UK
	ZIV / Spain
	INGETEAM / Spain
	NR Electric / China
	Mitsubishi / Japan

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EGAT ACCEPTED MANUFACTURER LIST FOR FAULT RECORDING SYSTEM

Description	Manufacturer / Country
Fault Recording System	Qualitrol / UK
	Siemens / Germany
	Rochester / USA
	GE / USA
	ERL Phase / Canada

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1.4

SCOPE OF WORK

H-1. General

<u>No.</u>	<u>Substation</u>	<u>Page</u>
1.	SARABURI 6 SUBSTATION (SR6) (Job No. TS12-11-S04)	H1-1
2.	KAENG KHOI SUBSTATION (KKI) (Job No. TS12-11-S05)	H2-1

1. **230/115 kV Saraburi 6 Substation (Job No. TS12-11-S04)**

General

The Transmission System Development for reinforcement to supply power demand of these areas is then needed. To enhance the transmission system's capability and to maintain its reliability, the construction of the new 230 kV Gas Insulated Substation (GIS) are required.

The new 230/115 kV Substation consists of 230 kV Gas Insulated Switchgear (GIS) with Breaker & A Half Scheme and 115 kV conventional switchyard. The GIS modules shall be installed inside the new separately GIS building.

The Contractor shall furnish a complete supply of equipment, materials and installation work etc., which is necessary to complete construction substation on a supply and construction basis, in accordance with the Contract Documents.

The Scope of work comprises two schedules as follows:

Schedule 1 : 230/115kV Saraburi 6 Substation (GIS) (Job No. TS12-11-S04)

The 230/115kV Saraburi 6 Substation is located at Tumbon Na Phra lan , Amphur Chaloe Phra Kiat, Saraburi Province.

For Electrical Work

The new 230kV Substation shall consist of 230kV indoor GIS and the bus arrangement shall be Breaker-and-a-half Scheme which consists of six (6) feeders as follows:

- Three (3) feeders for 300 MVA, 230/115-22 kV autotransformers KT1A, KT2A, KT3A
- Two (2) feeders for 230kV lines No.1 & No.2 to Kaeng Khoi
- One (1) feeders for 230kV lines (Live Spare)

The new 115 kV conventional switchyard consists of three (3) feeders as follows:

- Three (3) Feeders for PEA

Work included in this Contract (Schedule 1)

The Work included in this Contract to be performed by the Contractor shall be as specified in the Contract Documents and as follows:

GIS and Switchyard

1. Design, supply and installation of equipment required for a complete 230 kV GIS Substation.
2. Design, supply and installation of equipment required for a complete 115 kV Switchyard.
3. Design, supply and installation of equipment required for a complete 22kV power supply system, including raceways.

4. To meet EGAT's service continuity requirements, the GIS gas compartment can be designed as indicated in the single line diagram or can be designed differently under a condition that the design of the gas compartment shall fulfill the requirements as specified in the Rating and Features (RF).
5. The GIB shall not be installed in multiple stacks for the purpose of convenient maintenance.
6. The marking pins for referenced positions from the main bus shall be provided in the GIS building. The positions of the marking pins shall be shown on the drawings for future GIS extension.
7. The detachable walk way (Cat walk) for visual inspection shall be properly installed on each GIS module and removable service platform, removable ladder shall be provided for GIS inspection.
8. The detachable feeder nameplates as well as phasing and switching numbers shown on the GIS module shall be mounted on the enclosure of GIS.
9. Design, supply and installation of miscellaneous hardware which comprises at least the following equipment for:
 - 9.1. The connection from the 230 kV GIS air bushings to
 - 230/115-22kV autotransformers (KT1A, KT2A, KT3A)
 - 230kV overhead lines
 - 9.2. The connection from the autotransformers (KT1A, KT2A, KT3A) to
 - 115 kV overhead lines

Grounding system

10. Design, supply and installation of the grounding system of the following:
 - 230 kV GIS switchgear and 115 kV switchyard
 - 230 kV GIS building (with control and relay rooms)

The grounding conductor for the substation grounding system shall be of the 4/0 AWG bare copper wire type.
11. Design, supply and installation of the grounding equipment and miscellaneous hardware for the 230 kV GIS switchgear and 115 kV switchyard and the 22 kV system.
12. Design, supply and installation of the grounding system of the isolating transformer. The grounding system of the isolating transformer shall be separated from that of the substation.
13. The fault current division factor (sf) value = 1 shall be used for determining the RMS symmetrical grid current.
14. The 40 kA fault current and fault clearing time (tf) of 1 second shall be used for determining the size of grounding conductors for the substation grounding system.

15. The estimated soil resistivity value for the grounding design calculation shall be 150 ohm-meters for Schedule 1. After the field soil resistivity measurement, substantial changes in the grounding system work with detailed calculation shall be concluded by the Contractor for EGAT's approval as extra work or deducted work. If the grounding calculation shows that the grounding system cannot be made safe by adding the grounding conductor, the grounding system shall be improved by back-filling the earth trench for the grounding conductor in which the soil resistivity value shall be not more than 10 ohm-meters. The earth trench shall be 0.60-meter wide at the top, 0.40-meter at the bottom and 0.70-meter deep.

Lightning protection

16. Design, supply and installation of the substation lightning protection system complete with all related equipment. The Contractor shall design the lightning protection system for the protection of all substation equipment which is under the protective zone. To meet EGAT's design criteria for the lightning protection system and to enhance the stability of lightning protection system, the Basic Insulation Level voltage (BIL) of
- 900kV for 230kV Substation
 - 550kV for 115kV Substation
- shall be used for the calculation instead of Critical Flashover voltage (CFO).
For 22 kV Substation, the stroke current of 2 kA shall be used for the calculation.
17. For the design of lightning protection system for the GIS buildings the overhead ground wire is not permitted. Air terminal rods installed at the roof shall be used instead.
18. Lightning protection system shall be designed to meet IEC, NEMA and E.I.T. standards or internationally-accepted standards.

Station service system

19. Design, supply and installation of the station service system complete with integral accessories to provide the complete system operation. The station service system shall mainly consist of as follows:
- 500 kVA, 22,000-400/230V distribution transformer (KW1A)
 - 500 kVA, 22,000-400/230V distribution transformer (KW2A)
 - Load Center Unit Substation (LCUS)
 - 22 kV drop-out fuses
 - 600 V, 800A safety switches
 - 22 kV equipment, and AC&DC distribution boards, stationary batteries, battery chargers, power cables, and all related equipment for the complete operation.
20. Design, supply and installation of equipment required for a complete 400/230V power supply system.
21. Design, supply and installation of the stationary battery, in which the battery is capable of delivering power to the control and protection for tripping all circuit

breakers and emergency essential load for at least 8 hours if normal station service fails. The capacity of the battery shall not be less than 600Ah. In case of bus faults occurring on the last hour of battery power, the battery shall generate sufficient power for tripping all circuit breakers. The stationary battery shall be designed and calculated in accordance with IEEE or other acceptable international standards. In addition, the size of the stationary battery shall be designed to support the operation of existing and future bay as shown on the attached bidding document drawings. The calculation shall be submitted to EGAT for approval.

Telecommunication system

22. Design, supply and installation of the telecommunication tower. The telecommunication tower shall be constructed and divided into appropriate portions which are painted white and orange alternately with the top and bottom portions being painted orange. The obstruction lighting system shall be controlled by automatic flash box (AFB) that gives 30-60 flashes per minute. The AFB shall be turned on and turned off by a photo-light switch. The lightning protection system for the telecommunication tower shall be calculated and designed by the Contractor and the said calculation shall be submitted to EGAT for approval.

Facility system

23. Outdoor facility system:

- Design, supply and installation of a switchyard lighting system complete with all integral accessories to provide a complete system operation. The lighting system shall mainly consist of equipment lighting, fence lighting, access road lighting, two (2) lighting relay panels, raceways, and wiring cables for lighting circuits.
- The lamps for outdoor facility lighting system shall be LED type with all integral accessories, e.g. lamp holders, fixtures, reflectors, and etc. The Contractor shall provide drawings that show details for installation.
- Design, supply and installation of circuits for the main entrance gate. The control of the entrance gate shall be operated both manually and remote control which shall be controlled from the control room or the guardhouse.

24. Indoor facility system:

- Design, supply and installation of the GIS building facility system which mainly consists of lighting system, grounding system, power supply, fire alarm and protection system, and ventilation system, air-conditioning system, and telephone & LAN system in the GIS building. All cable wiring systems shall conform to NEC and IEC standards or internationally-accepted standards.
- The fire protection system of the indoor facility system shall mainly consist of a fire alarm control panel, smoke detector, heat detector, annunciator, fire exit-sign, and related accessories to the complete operation. The fire protection system shall be designed to meet NFPA or other acceptable international standards.

25. The size of low voltage cable shall be sufficient to keep the voltage drop at the load point less than 5% at rated load current.

Other work

26. Testing and commissioning of all equipment required to make the substation function properly.
27. Modification to Junction box supporting structure (JB003) for the installation of Outdoor receptacle box (ORB1 and ORB3).
28. Design, supply and installation of a means to keep safe electrical clearances between the 230 kV lines and nearby steel structures e.g. Take-off columns as mentioned on the bidding document drawings.
29. Design, supply and installation of suspension and post insulators and all hardware for suspension and post insulator assembly.

Control and Protection System

30. Design, supply, installation, wiring, test and commissioning of a complete control and protection system which comprises at least the following equipment:
 - 30.1. Swing-rack type switchboard panel
 - 30.2. Interposing relay panel and transducer panel
 - 30.3. Marshalling panel for the teleprotection interface
 - 30.4. Marshalling panel for the control system
 - 30.5. Fault Recording System and marshalling panel for the fault recording system
 - 30.6. Marshalling panel for the Remote Terminal Unit (RTU)
 - 30.7. EGAT - PEA Interfacing panel
 - 30.8. Outdoor antenna and GPS receiver panel
 - 30.9. 400/230 VAC, 125 VDC Power panel and 125 VDC distribution boards.
 - 30.10. Cables and accessories as well as connection of cables among all of the boards and the associated equipment in order to complete the function of the control and protection system
31. Design, supply, installation, wiring, test and commissioning of GPS Receiver and Ethernet Switch which is used as a reference time base to the equipment in substation including sufficient number of cables and accessories for interfacing the GPS Receiver with protection equipment, metering equipment and RTUs.
32. Design, installation, wiring, test and commissioning of the Remote Terminal Unit (RTU) and the Master Station Unit which are supplied by EGAT whereas configuration included in this Contract must be fulfilled under EGAT's supervision.

33. Installation of the application software database, control function and display for the Computerized Control System, whereas the application software is supplied by EGAT. The installation shall be under EGAT's supervision.
34. Design, supply, installation, wiring, test and commissioning of Optical Fiber Cables of the Remote Terminal Unit (RTUs) and the Fault Recording System (FRS) that connection within the control room
35. The Contractor shall be responsible for the complete optical fiber system for the control and protection system. The optical fiber cables with accessories shall be laid and installed from the pigtailed of the EGAT-PEA Interfacing Panel to the OPGW of the Joint Boxes as specified under Item Nos. 1AB24-17 to 1AB24-21. The Contractor shall also conduct the field test for the complete optical fiber system.
36. The Contractor shall be responsible for providing complete schematic and wiring diagrams of the control and protection systems.

Civil and Architectural work

37. Design and construction of

37.1. 230 kV GIS and Control Building

37.1.1. Structure & foundation. The proper structure can be selected for the design and construction and shall be submitted to EGAT for approval.

37.1.2. RC and/or steel structure for roof.

37.1.3. Fire protection for steel structure shall conform to legal provision, EGAT's Standard Design Manual of Fire Protection and Suppression for Substation (คู่มือมาตรฐานการออกแบบเพื่อป้องกันและระงับอัคคีภัยสถานีไฟฟ้าแรงสูงการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย). Therefore, Fire protection for steel structure specification in Architecture drawing shall be cancelled.

37.1.4. Architecture of the whole building.

37.1.5. 230 kV GIS and Control Building shall be designed with reference to Typical GIS substation (Dwg.No.TYP2-GIS-8-01A) but size of building and equipment layouts shall conform to electrical drawing (Dwg. No. SR6-S-2). Other facilities layouts shall conform to requirements with reference to architectural drawings and scope of work, apart from the referenced drawings, the pantry room shall be added.

37.1.6. The contractor shall construct the building in accordance with "IEEE STD- 979-1994 (R2004)" (IEEE Guide for Substation Fire Protection).

- 37.1.7. The design of building shall analyze and take the following aspects into consideration: Site, Environment, Context, Function, Climate (sunlight, wind, rain, heat etc.), Energy efficiency, Safety and including aesthetic of architecture to encourage EGAT corporate identity.
- 37.1.8. The wall system for GIS zone can be selected for the design and shall be submitted with the proposal in the bidding process.
- 37.1.9. The roofing system for GIS zone shall be double skin roof system; the boltless system with galvanized clip on the top and bolt system on the bottom with insulation system between roofing sheets and 10 years guarantee of material and installation. Therefore, the ceiling system for GIS zone shall be cancelled.
- 37.1.10. The high flexible cementitious waterproofing coating material shall be applied to the working rooms to prevent moisture from the ground. Therefore, the floor remark section in the referenced drawings concerning installation areas of the said material shall be cancelled.
- 37.1.11. Building facilities
- Electricity and illumination system including cable work for illumination, ventilation system, power supply, air conditioning system, and telephone system.
 - Plumbing system for water supply, building drain and vent, storm water drainage including sanitary wares and fittings.
 - Miscellaneous including grounding and labeling.
 - Cable routing and cable support (cable tray and cable ladder) installed in cable room and main cable trench.
 - Overhead traveling crane, of lifting capacity not less than 7.5 metric tons and wireless crane remote control.
 - Furniture as specified in Architectural Drawings.
 - Signboard on building and room name sign on each room.
 - Access floor, switchgears and heavy-duty areas type.
 - Warning Sign provided in accordance with EIT Standard or Quality and Safety Development Division Standard (EGAT).
 - Apart from the referenced drawings, the furniture list shall be added as the following details;
 - Furniture List
 - One dining table : Rectangular or square table with melamine and not less than 1 mm.thk. of PVC edge-banding, leg shall be finished with powder coating system.
 - Three seat : Backrest and seat made from polypropylene, base shall be finished with powder coating system.
 - Complete set of pantry storage side board and consists

base cabinet and wall hanging cabinet also include one stainless steel sink tap and full set of pantry accessories.

37.2. Fire protection system for 230 kV GIS and Control Building.

37.2.1. Control area shall consist of Total flood clean agent fire suppression system with heat detector, addressable type smoke detector and aspirated smoke detector.

37.2.2. GIS area shall consist of video image smoke detector system, optical beam smoke detector and aspirated smoke detector.

37.2.3. Fire protection system of 230 kV GIS and Control building shall have trouble and operation visual and audible signals (environmental monitoring), which indicate change of state of any connected device, shown and recorded at control room in 230 kV GIS and Control Building. The installation practice shall be in accordance with the last edition of NFPA 72.

37.2.4. There shall be sounder and beacon on the roof of the building.

37.2.5. For system requirements for indoor fire protection system as shown on specification 3001-10.13.1 part e, item no.1 and 6 shall be changed to the new details as follow

(1) System description and operation : Supply and Installation of a Total Flood Clean Agent Fire Suppression System utilizing IG-100 shall cover all these zones :

Zone 1: Equipment (Control/Relay) Room ;

Zone 2: Electrical Room ;

Zone 3: Under Raised Floor;

Zone 4: Battery Room ;

Zone 5: Cable Room;

Zone 6: Inert Gas Room

Other zone (If required)

Each protected zone shall have its own set of IG-100 cylinders.

(6) Detectors shall be cross-zoned detection requiring 2 detectors to be in alarm before discharge. A zone of A or B of addressable smoke detector and a zone C of all ASD shall be crossed.

37.2.6. For Air sampling smoke detector as shown on specification 3001-10.13.2 part i item no.1, 7, 13 and 14 shall be changed to the new details as followings :

i. Air Sampling Smoke Detector.

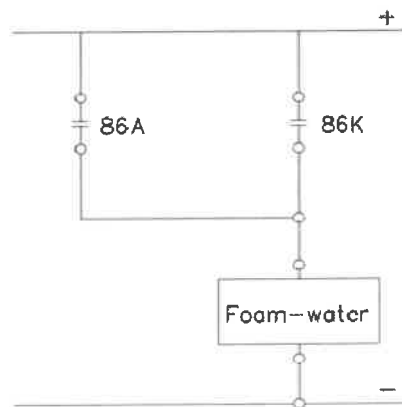
(1) Shall consist of a high sensitivity type detector, using light scatter technology.

(7) Detection system must be included in all control cabinet and can locate a scene

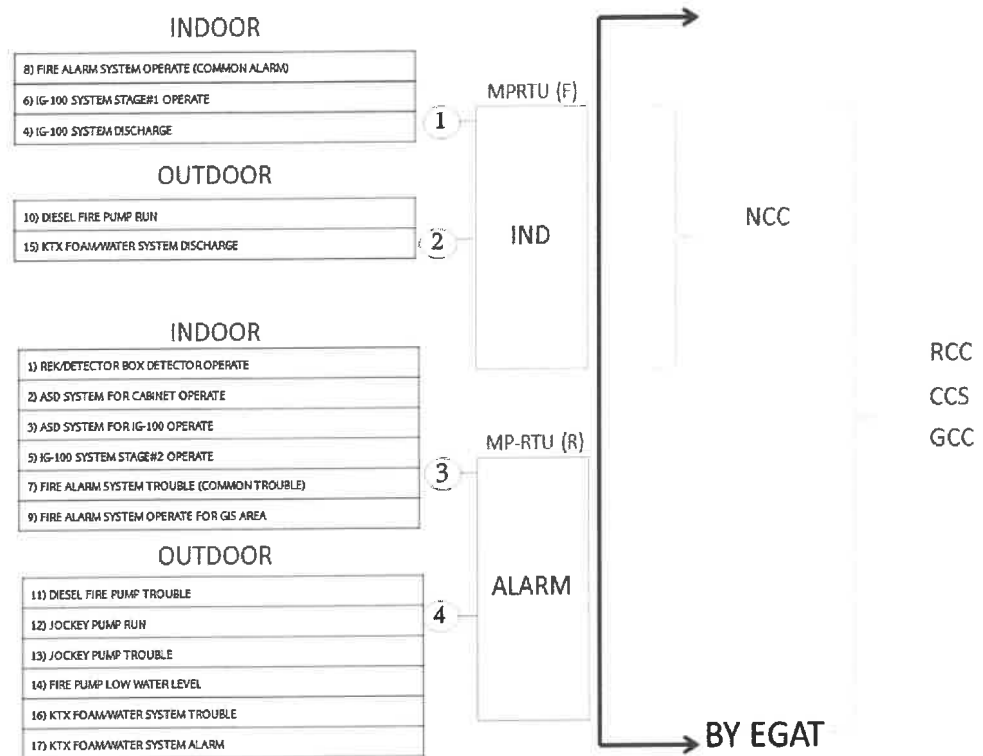
(13) The minimum sensitivity settings for a single sampling hole are so that the detection system alarm at 1.5% obs/ft (4.95% obs/m). A sampling hole maximum coverage area is 400.0 sq.ft (37.2 sq.m).

- (14) Maximum transport time from the most remote port to the detection unit of an air-sampling system shall be a maximum of 90 seconds.
- 37.2.7. Fire protection system, fire alarm system, installation room and accessories shall be in accordance with the applicable requirements set forth in the latest edition of the following codes and standards:
- NFPA 2001: Clean Agent Fire Extinguishing Systems
 - NFPA 70 : National Electrical Code.
 - NFPA 72 : National Fire Alarm Code.
 - NFPA 75 : Standard for the Fire Protection of Information Technology Equipment.
 - NFPA 76 : Standard for the Fire Protection of Telecommunications Facilities.
 - EGAT's Standard Design Manual of Fire Protection and Suppression for Substation. (คู่มือมาตรฐานการออกแบบเพื่อป้องกันและระงับอัคคีภัยสถานีไฟฟ้าแรงสูงการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย)
 - IEEE Std 979: IEEE Guide for Substation Fire Protection.
 - NFPA 850: Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Substations.
- 37.2.8. There shall be one control panel for fire detection system and IG-100 fire suppression system for each room which is protected by the IG-100 fire suppression system.
- 37.2.9. There shall be a protective clear polycarbonate cover which can be immediately lifted or opened for all IG-100 manual release stations.
- 37.3. Fire protection system for the switchyard to meet the requirement as specified in IEEE Guide for Substation Fire Protection : IEEE Std 979, all requirements of NFPA 850 and EGAT's Standard Design Manual of Fire Protection and Suppression for Substation. (คู่มือมาตรฐานการออกแบบเพื่อป้องกันและระงับอัคคีภัยสถานีไฟฟ้าแรงสูงการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย)
- 37.4. Fire protection system for the Transformer : The Foam-water spray system shall comply with the following ;
- 37.4.1. Foam-water spray system: NFPA 13, NFPA16 & NFPA 850
- 37.4.2. Bladder tank Vessel construction Standards : Carbon steel to ASME code section VIII for unfired pressure vessel.
- 37.4.3. Nozzles : NFPA 16 and as per Manufacturer's Recommendation
- 37.4.4. Detection system : Air Expansion Linear Heat Detection System (LHB)
- 37.4.5. Equipment for system : FM approved, UL Listings , Vds
- 37.4.6. EGAT's Standard Design Manual of Fire Protection and Suppression for Substation. (คู่มือมาตรฐานการออกแบบเพื่อป้องกันและระงับอัคคีภัยสถานีไฟฟ้าแรงสูงการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย)

- 37.4.7. Foam-water spray system provided for Transformer should be designed for a density of 10.2 litre/min-sq.m over the exposed surface at the transformer.
- 37.4.8. There shall be one linear heat detector box for each transformer / shunt reactor.
- 37.4.9. There shall be one control panel for fire detection system and foam/water spray system for each transformer which is protected by the foam/water spray system.
- 37.4.10. 250 cu.m water storage tank, fire pump, and jockey pump shall have trouble and operation visual and audible signals (environmental monitoring), which indicate change of state of any connected devices, shown and recorded at control room in 230 kV GIS and control building. The installation practice shall be in accordance with the latest edition of NFPA 72.
- 37.4.11. For Control System Logic as shown on specification 3001-13.4 item 4.1 shall be changed to the new detail as following
- (4.1) In case of fire, Heat Detector and the tubular expansion detector first give alarm. If rate of rise/fixed temp in heat detector/tubular expansion detector sense fire condition, there shall be alarm in control room and the detected transformer shall be tripped before applying Foam-Water spray as the condition shown in the diagram below ;



- 37.5. Signals of indoor fire protection system of each room and signals of outdoor fire protection system of each Transformer/Shunt reactor shall be sent to local CCS, GCC, RCC, and NCC as following details;



- 37.6. Fire protection system circuits for buildings and switchyards : notification appliance circuits, and signaling line circuits, shall be class A circuit. Initiating device circuits can be class B circuit.
- 37.7. There shall be only one subcontractor engaging in design, supply and installation of Fire Protection System for Buildings and Switchyard.
- 37.8. Fire Pump System. (conformed to NFPA 14, 20, 24, 72).
- 37.9. Water supply system.
- 37.10. Steel structure and foundations for Specified equipment and the others not shown in “For Construction drawings” and / or EGAT’s specification.
- 37.11. Road and drainage system.
- 37.12. Drainage system for cable trench.
- 37.13. Remote control and door phone system for main & switchyard entrance gate. (shall be controlled from either the control room or the guard house)
- 37.14. Three minutes 3D animation presentation file (MP4, resolution not less than 1440 p; 2500 x 1440) demonstrating details of switchyard and interior and exterior buildings shall be arranged.
- 37.15. There shall be one fire alarm system graphic annunciator at each building to enable responding personnel to identify the location of a fire accurately and to indicate the status of emergency equipment or fire safety functions.
- 37.16. There shall be one graphic annunciator which displays alarm, discharge and trouble signals of fire alarm system of other buildings, (fire pump houses, transformers) at the building where control room locates.

Construction

38. Construction of

- 38.1. Equipment structure foundation with sub trench (if required).
 - 38.2. Dead man hook for loading transformer
 - 38.3. Oil containing pit with steel grating and black steel spiral-seam pipes (TIS 427-2531) with protection method according to AWWA C217, C205.
 - 38.4. Transformer loading.
 - 38.5. Cable trench.
 - 38.6. RC. Road.
 - 38.7. Oil separator.
 - 38.8. Crushed rock surfacing.
 - 38.9. Site office.
 - 38.10. Guard house.
 - 38.11. Lamp post for fence and access road lighting LED type foundation.
 - 38.12. Foam house
 - 38.13. Cabinet with 2x50 lbs wheel fire extinguisher.
 - 38.14. Wire mesh fence and gate.
 - 38.15. Take-off foundation.
 - 38.16. Main entrance gate 8.00 m width (sliding).
 - 38.17. Signboard structure and foundation.
 - 38.18. Firewall
 - 38.19. Flag pole
 - 38.20. Fire pump house
 - 38.21. Water storage tank for fire protection system (capacity not less than 250 cu.m).
 - 38.22. Underground water tank 50 cu.m.
 - 38.23. Water tank tower 15 cu.m.
39. The drawings and calculation of all buildings shall be verified with adequate details for intended application and submitted to EGAT for approval.
 40. All design works and the fabrication drawings for all steel structures shall be submitted to EGAT for approval.
 41. All design, construction and testing shall be in accordance with Specification No.3001 : Civil and Architectural Work.
 42. EGAT's Soil Investigation Report attached to the Contract is a document that can be a reference for design, however; the review of the soil investigation report shall be under responsibility of the Contractor and the warranty of work shall remain following all obligations as specified in the Contract.
 43. All foundations shall be as specified in layout drawing. Except the result of soil investigation shows that the specified foundations are not appropriate, the Contractor shall design the proposed foundations.

44. The Contract price shall be adjusted (added or reduced) in case that the soil investigation results to be used for the design works is different from the layout and standard drawings.
45. The Contractor shall perform a static load test for 230 GIS and control building foundations in accordance with ASTM D1143 (if pile type foundation is required).
46. Dynamic load test (DLT) according to ASTM D4945-89 shall be applied to at least 2% of driven piles (if driven pile type is required) except for driven pile of fence and lamp post.
47. Seismic load test (sonic integrity test) according to ASTM D5882-96 shall be applied to all bored piles (if bored pile type is required).
48. Plate bearing test according to ASTM D1194-94 shall be submitted to EGAT for approval.(if pad type foundation is required).
49. The Contractor shall remove all debris from construction material and other works in order to make the site clean and be in the condition acceptable to EGAT.
50. According to the Contract Document Section G-3 : Contractor's Office and Other Construction Facilities; the detail in paragraph 3 shall be changed as follows : the Contractor shall provide for EGAT an office container at the site during construction with a minimum space of 36 square meters for office area, 24 square meters for conference room which shall both be air-conditioned and 4 square meters for toilet. The facilities as shown on the section G-3 are required for two sets.

Work not included in this Contract (Schedule 1) The Work not included in this Contract shall be as shown on the drawings and as follows:

1. The stringing work for the connection between the 230 kV substation take-off structures and the dead-end towers of the transmission lines.
2. Supply of the Remote Terminal Unit (RTU), Master Station Unit and Application Software.
3. One 42 inch LED TV : Resolution not less than 1920 x 1080
4. One refrigerator : 9 or 10 cu.ft
5. One water filter : Reverse osmosis system or beam system
6. One microwave oven : Oven capacity not less than 23 litre, microwave power not less than 800 watt.

2. 230 kV Kaeng Khoi Substation (Job.No. TS12-11-S05)

Work included in this Contract (Schedule 2)

The Work included in this Contract to be performed by the Contractor shall be as specified in the Contract Documents and as follows:

Control and Protection System

1. Design, supply, installation, wiring, test and commissioning of complete control and protection system which comprises at least the following equipment:
 - 1.1. Swing-rack type switchboard panel
 - 1.2. Loose equipment as specified in price schedule
 - 1.3. Marshalling panel for the control system is provided for interfacing between control & protection equipment and bkr. no. 80412, 80432 , 80512 and 80532
 - 1.4. 125 VDC distribution boards
 - 1.5. Cables and accessories as well as connection of cables among all of the boards and the associated equipment in order to complete the function of the control and protection system
2. Design, modification, wiring, test and commissioning of the existing control and protection system which comprises at least the following equipment:
 - 2.1. Swing-rack type switchboard panel
 - 2.2. Interposing relay panel and transducer panel
 - 2.3. Marshalling panel for the teleprotection interface
 - 2.4. Marshalling panel for the Remote Terminal Unit
 - 2.5. Marshalling panel for fault recording system
 - 2.6. 125 VDC Power Panel and 230 VAC Distribution Board
3. Design, installation, wiring, test and commissioning of the Remote Terminal Unit (RTU). Existing EGAT main processor unit (MPU) will be replaced by new MPU which is supplied by EGAT as stated in item 2AB38-1. The configuration that include in this contract must be fulfilled under EGAT's supervision.
4. Design of the schematic and wiring diagrams of the additional inputs to the existing Computerized Control System (CCS), including test and commissioning of the complete CCS.
5. Design of the schematic and wiring diagrams of the additional inputs to the existing fault recording system (FRS), including test and commissioning of the complete FRS.
6. The contractor shall be responsible for providing complete schematic and wiring diagrams of the control and protection systems.

7. Any modification and interfacing work to the existing control, metering and protection panels including supply of related accessory equipment which is required for incorporating the new equipment. The modified existing drawings shall be performed by the contractor and submitted to EGAT for approval. The final drawings shall be submitted as ACAD files.
8. Removal of the unused existing cables. The removed cables shall be neatly reeled and kept in a suitable place recommended by EGAT.
9. Removal of the unused existing protection panel (if any). The removed protection panel shall be neatly kept in a suitable place recommended by EGAT.

Work not included in this Contract (Schedule 2) The Work not included in this Contract shall be as shown on the drawings and as follows:

1. Supply of the Egat Remote Terminal Unit (EGAT RTU) EGAT main processor unit (MPU)