Notice to Bidder

To comply with the ENGINEER ACT, B.E. 2542

FOR THE CONSTRUCTION WORK RELATED TO DESIGN OR CONSTRUCTION SUPERVISION WORK

The Contractors should be aware of the following:

1. The Contractor who is a juristic person is required to obtain a License to Practice the Controlled Engineering Profession issued by the Council of Engineers Thailand.
2. Where the Contractor is a joint venture or consortium, the Contractor shall comply with the following requirements: -
    1) In case of a joint venture, the joint venture is required to obtain a License to Practice the Controlled Engineering Profession issued by the Council of Engineers Thailand.
    2) In case of a consortium, only the member of the consortium who will be responsible for the Design or Construction Supervision Work is required to obtain a License to Practice the Controlled Engineering Profession issued by the Council of Engineers Thailand.

NOTE : If you have any questions, please contact COUNCIL OF ENGINEERS THAILAND.
Address : 1616/1 Ladprao, Wangthonglang, Bangkok, Thailand 10310
Telephone : 1303
Email : coe@saraban.mail.go.th

ประชาสัมพันธ์ผู้ประกอบการเพื่อทราบ

เพื่อให้การดำเนินงานสำหรับงานจ้างก่อสร้างที่มีลักษณะงานด้านการออกแบบหรือควบคุมงานก่อสร้าง สอดคล้องกับพระราชบัญญัติวิศวกร พ.ศ. 2542 จึงขอแจ้งแนวทางในการดำเนินงาน ดังนี้

1. ผู้รับจ้างที่เป็นนิติบุคคล ต้องเป็นผู้ที่ได้รับใบอนุญาตประกอบวิชาชีพวิศวกรรมควบคุมสำหรับนิติบุคคลจากสภาวิศวกร

2. ผู้รับจ้างที่ดำเนินการในรูปแบบของ “กิจการร่วมค้า”

(1) กรณีที่กิจการร่วมค้าได้จดทะเบียนเป็นนิติบุคคลใหม่ กิจการร่วมค้านั้นต้องเป็นผู้ที่ได้รับใบอนุญาตประกอบวิชาชีพวิศวกรรมควบคุมสำหรับนิติบุคคลจากสภาวิศวกร

(2) กรณีที่กิจการร่วมค้าไม่ได้จดทะเบียนเป็นนิติบุคคลใหม่ เฉพาะนิติบุคคลที่มีหน้าที่เป็นผู้รับผิดชอบงานวิศวกรรมออกแบบหรือควบคุม ต้องเป็นผู้ที่ได้รับใบอนุญาตประกอบวิชาชีพวิศวกรรมควบคุมสำหรับนิติบุคคลจากสภาวิศวกร

หมายเหตุ หากมีข้อสงสัย โปรดติดต่อ สภาวิศวกร

ที่อยู่ : 1616/1 ถนนลาดพร้าว แขวงวังทองหลาง เขตวังทองหลาง กรุงเทพมหานคร 10310

เบอร์ติดต่อ : 1303

อีเมล : coe@saraban.mail.go.th

EGAT's Privacy Notice on Procurement, Inventory Management and Contract Administration

Electricity Generating Authority of Thailand (EGAT) has performed the protection of the Personal Data regarding procurement, inventory management and contract administration to be in accordance with **the Personal Data Protection Act B.E. 2562** (the "2019 PDPA"), which comes into effect on June 1, 2022.

Details about EGAT's Privacy Notice on Procurement, Inventory Management and Contract Administration are available for you at https://www.egat.co.th/privacy-notice-procurement_en.html or the below QR Code.

The Redaction of Sensitive Personal Data

EGAT has announced the Privacy Notice on Procurement, Inventory Management and Contract Administration for the collection, use or disclosure of Personal Data, excluding the Sensitive Personal Data.

Should the documents you wish to submit to EGAT contain the Sensitive Personal Data as defined in Section 26 of the 2019 PDPA, pertaining to racial, ethnic origin, political opinions, cult, religious or philosophical beliefs, sexual behavior, criminal records, health data, disability, trade union information, genetic data, biometric data, or of any data which may affect you in the same manner, you shall redact or conceal such data before submitting to EGAT.

ประกาศความเป็นส่วนตัว (Privacy Notice) สำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญาของ กฟผ.

การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย (กฟผ.) ได้ดำเนินการคุ้มครองข้อมูลส่วนบุคคลสำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญา เพื่อให้เป็นไปตาม**พระราชบัญญัติคุ้มครองข้อมูลส่วนบุคคลของประเทศไทย พ.ศ. 2562** (PDPA) ซึ่งมีผลบังคับใช้อย่างครบถ้วน ตั้งแต่วันที่ 1 มิถุนายน 2565 ทั้งนี้ ท่านสามารถศึกษารายละเอียดประกาศความเป็นส่วนตัว (Privacy Notice) สำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญา ได้ที่ https://www.egat.co.th/privacy-notice-procurement.html หรือที่ QR Code ด้านล่าง

การขีดฆ่าข้อมูลส่วนบุคคลอ่อนไหว

กฟผ. มีประกาศความเป็นส่วนตัว (Privacy Notice) สำหรับการจัดซื้อจัดจ้าง การบริหารพัสดุ และการบริหารสัญญา เพื่อใช้ในการเก็บรวบรวม ใช้ หรือเปิดเผย ข้อมูลส่วนบุคคล แต่ไม่เก็บข้อมูลส่วนบุคคลอ่อนไหว หากเอกสารของท่านที่ต้องส่งมอบให้ กฟผ. มีข้อมูลส่วนบุคคลอ่อนไหวตามที่ถูกบัญญัติไว้ในมาตรา 26 ของ PDPA ดังนี้ เชื้อชาติ เผ่าพันธุ์ ความคิดเห็นทางการเมือง ความเชื่อในลัทธิ ศาสนาหรือปรัชญา พฤติกรรมทางเพศ ประวัติอาชญากรรม ข้อมูลสุขภาพ ความพิการ ข้อมูลสหภาพแรงงาน ข้อมูลพันธุกรรม ข้อมูลชีวภาพ หรือข้อมูลอื่นใด ซึ่งกระทบต่อเจ้าของข้อมูลส่วนบุคคลในทำนองเดียวกันรวมอยู่ด้วย ขอให้ท่านขีดฆ่า หรือปกปิดข้อมูลดังกล่าว ก่อนส่งมอบให้แก่ กฟผ.

Notice to Bidder

Subject : Online Payment for Purchase of Bidding Documents

Please be informed of the online payment for purchase of biding documents as follows:

1) Download the Registration Form and fill out all necessary information by typing. (Complete data is required.)

2) Payment shall be made by bank transfer or telegraphic transfer to EGAT's 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.

3) Submit the fill-out Registration Form and the proof of payment from 1) to the email address of the in-charge officer and procurement.tse@egat.co.th in the CC. before 15.00 hrs. Bangkok Standard Time.

4) After the payment has been verified for approximately 3 working days, the in-charge officer will send the link for downloading the bidding documents together with the receipt to the purchaser's email address in the Registration Form.

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Registration Form

Invitation to Bid No. TIWS-S-06
Supply and Construction of Static Synchronous Compensator
at 230 kV Khlong Ngae Substation
Transmission System Improvement Project in Western and Southern Regions
to Enhance System Security

Available Duration for Purchasing : October 31, 2023 - November 30, 2023

Price of Bidding Documents : USD 500.- or THB 15,000.-

Instructions

1) Fill out this Registration Form in English by typing. (Complete data is required.)
2) Payment shall be made by bank transfer or telegraphic transfer to EGAT's account no. 109-6-01958-2 (swift code : KRTHTHBK), Krung Thai Bank Public Company Limited, Bangkruai Branch, Nonthaburi.
3) Submit the filled-out Registration Form and the proof of payment to the in-charge officer via email aradee.s@egat.co.th (with cc. procurement.tse@egat.co.th) before 15.00 hrs. Bangkok Standard Time.
4) The in-charge officer will send the link for downloading the bidding documents together with the receipt to the purchaser's email address in the Registration Form, which will take approximately 3 working days.

For Purchaser				TAX ID :
No.		Receipt No. :	Date :	
Bidder's Name				
Address				
				Country :
Name of Contact Person :			Tel.	Mobile No.
Email Address :				
Local Representative				
Address				
				Tax ID :
Name of Contact Person :			Tel.	Mobile No.
Email Address :				
For Procurement Officer		Change of Bidder's Name		TAX ID :
Bidder's Letter No. :				Dated :
New Bidder's Name				
Address				
			Country :	
Name of Contact Person :			Tel.	Mobile No.
Email Address :				

Contact Information of In-charge Officer	
Name	Miss Aradee Srisomon
Email address	Aradee.s@egat.co.th
Telephone No.	66 2436 3342
Mobile No.	6696 186 5269

(Revision 2)

Invitation to Bid No. TIWS-S-06
Supply and Construction of Static Synchronous Compensator
at 230 kV Khlong Ngae Substation
Transmission System Improvement Project in Western and Southern Regions
to Enhance System Security
Two-Envelope

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 : Khlong Ngae Substation

Medium Cost (including Value Added Tax and other expenses) : THB 1,500,000,000.-

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 Permanent Secretary, Ministry of Finance, and/or in the Debarment List and/or in the List of Work Abandoners declared by EGAT.
2. 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.
3. 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.
4. 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.
5. 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 are available for online purchase during 8:00 hrs. to 15:00 hrs., Bangkok Standard Time, as from October 31, 2023 to November 30, 2023 at USD 500.- or THB 15,000.- per copy, non-refundable.

Please find more details for online purchasing process at http://www4.egat.co.th/fprocurement/biddingeng/ or contact for further information at telephone no. 66 2436 0342 or procurement.tse@egat.co.th.

Delivery of Bids

Price and Technical Proposal Submission Date and Technical Proposal Opening Date is postponed from April 25, 2024 to May 28, 2024. Bids shall be submitted at Bidding Room, 1st Floor, Tor 082 Building during 09:30 hrs. to 10:00 hrs., Bangkok Standard Time, January 4, 2024 and Technical Proposal will be opened publicly at 10:00 hrs.

ELECTRICITY GENERATING AUTHORITY OF THAILAND

March 8, 2024

Wallapa Chwdh

(Miss Wallapa Chewadhnakorlkul)
Administrative Officer Level 10
International Procurement Department - Transmission Segment

(ฉบับแก้ไข ครั้งที่ 2)

ประกาศการไฟฟ้าฝ่ายผลิตแห่งประเทศไทย
เรื่อง ประกวดราคาจ้าง เลขที่ TIWS-S-06
ประกวดราคา 2 ซอง

การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย (กฟผ.) มีความประสงค์จัดซื้อและจ้างก่อสร้าง Static Synchronous Compensator ที่สถานีไฟฟ้าแรงสูง 230 kV คลองแงะ สำหรับโครงการปรับปรุงระบบส่งไฟฟ้าบริเวณภาคตะวันตกและภาคใต้เพื่อเสริมความมั่นคงระบบไฟฟ้า โดยทำสัญญาแบบปรับราคาได้ (ค่า k) โดยใช้งบประมาณ กฟผ.

สถานที่ก่อสร้าง : สถานีไฟฟ้าแรงสูงคลองแงะ

ราคากลาง (รวมภาษีมูลค่าเพิ่มและค่าใช้จ่ายอื่นๆ) : 1,500,000,000.- บาท

คุณสมบัติของผู้เสนอราคา

1. ต้องเป็นนิติบุคคลผู้มีอาชีพรับจ้างตามประกวดราคาจ้างดังกล่าว และต้องไม่เป็นผู้ทิ้งงานซึ่งปลัดกระทรวงการคลังได้แจ้งเวียนชื่อไว้ หรือต้องไม่เป็นผู้ที่ กฟผ. ห้ามติดต่อหรือห้ามเข้าเสนอราคา หรือต้องไม่เป็นผู้ที่ได้รับผลของการสั่งให้นิติบุคคลหรือบุคคลอื่นเป็นผู้ทิ้งงานตามคำสั่ง กฟผ.
2. ต้องไม่เป็นผู้มีผลประโยชน์ร่วมกันกับผู้เสนอราคารายอื่น ณ วันประกาศประกวดราคาครั้งนี้เป็นต้นไป หรือต้องไม่เป็นผู้กระทำการอันเป็นการขัดขวางการแข่งขันราคาอย่างเป็นธรรมในการดำเนินการประกวดราคาครั้งนี้
3. ต้องไม่เป็นที่ปรึกษาของ กฟผ. หรือมีส่วนร่วมในบริษัทที่ปรึกษาของ กฟผ. ในงานนี้ หรือต้องไม่มีผู้ปฏิบัติงาน กฟผ. เข้าไปมีส่วนร่วมในกิจการของผู้เสนอราคา ไม่ว่าจะในฐานะผู้ถือหุ้นที่มีสิทธิควบคุมการจัดการ กรรมการ ผู้อำนวยการ ผู้จัดการ พนักงาน ลูกจ้าง ตัวแทน หรือที่ปรึกษา ยกเว้น ในกรณีที่ผู้ปฏิบัติงานได้รับคำสั่งอย่างเป็นทางการจาก กฟผ. ให้ไปปฏิบัติงานหรือเข้าร่วมในกิจการของผู้เสนอราคา
4. ต้องไม่เป็นผู้ได้รับเอกสิทธิ์หรือความคุ้มกัน ซึ่งอาจปฏิเสธไม่ยอมขึ้นศาลไทย เว้นแต่รัฐบาลของผู้เสนอราคาได้มีคำสั่งให้สละสิทธิ์และความคุ้มกันเช่นว่านั้น
5. ผู้ประสงค์เข้าประกวดราคาในนามของกิจการร่วมค้าหรือกิจการค้าร่วม (Joint Venture or Consortium) จะต้องดำเนินการทุกขั้นตอนของการประกวดราคาในนามของกิจการร่วมค้าหรือกิจการค้าร่วม ตั้งแต่การเสนอราคาจนสิ้นสุดข้อผูกพันกับ กฟผ.

การขายเอกสารประกวดราคา

ผู้สนใจติดต่อซื้อเอกสารประกวดราคา ในราคาชุดละ 15,000.- บาท ในวันทำการระหว่างเวลา 08:00 น. ถึง 15:00 น. ตั้งแต่วันที่ 31 ตุลาคม 2566 ถึงวันที่ 30 พฤศจิกายน 2566 ทั้งนี้ สามารถดูรายละเอียดการซื้อเอกสารประกวดราคาได้ที่เว็บไซต์ http://www4.egat.co.th/fprocurement/biddingeng/ หรือสอบถามข้อมูลเพิ่มเติมได้ทางโทรศัพท์ หมายเลข 0 2436 0342 หรืออีเมล procurement.tse@egat.co.th

การยื่นซองประกวดราคา

กำหนดยื่นซองประกวดราคา ***เลื่อนจากวันที่ 25 เมษายน 2567 เป็นวันที่ 28 พฤษภาคม 2567*** เวลา 09:30 น. ถึง 10:00 น. และเปิดซองข้อเสนอด้านเทคนิคเวลา 10:00 น. ณ ห้องประกวดราคา ชั้น 1 อาคารฝ่ายจัดซื้อจัดจ้างและบริหารพัสดุ ท.082 การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย เชิงสะพานพระราม 7 จังหวัดนนทบุรี

ประกาศ ณ วันที่ *8 มีนาคม 2567*

(นางสาววัลลภา ชีวธนากรณ์กุล)
วิทยากรระดับ 10
หัวหน้ากองจัดซื้อจัดจ้างต่างประเทศสายงานระบบส่ง

ตารางแสดงวงเงินงบประมาณที่ได้รับจัดสรรและราคากลาง(ราคาอ้างอิง)
ในการจัดซื้อจัดจ้างที่มิใช่งานก่อสร้าง

1. **ชื่อโครงการ** Bid No. TIWS-S-06
การจัดซื้อและจ้างก่อสร้าง Static Synchronous Compensator ที่สถานีไฟฟ้าแรงสูง 230 kV คลองแงะ
โครงการปรับปรุงระบบส่งไฟฟ้าบริเวณภาคตะวันตกและภาคใต้เพื่อเสริมความมั่นคงระบบไฟฟ้า
/หน่วยงานเจ้าของโครงการ ฝ่ายแผนงานและโครงการระบบส่ง การไฟฟ้าฝ่ายผลิตแห่งประเทศไทย

2. **วงเงินงบประมาณที่ได้รับจัดสรร**
โครงการปรับปรุงระบบส่งไฟฟ้าบริเวณภาคตะวันตกและภาคใต้เพื่อเสริมความมั่นคงระบบไฟฟ้า
งบประมาณ 63,200 ล้านบาท

3. **วันที่กำหนดราคากลาง** 22 สิงหาคม 2566 (วันที่ รวส. อนุมัติ)
ราคารวมภาษีมูลค่าเพิ่มและค่าใช้จ่ายอื่นๆ เป็นเงิน 1,500,000,000.00 บาท **ราคา/หน่วย** ตามเอกสารแนบ

4. **แหล่งที่มาของราคากลาง**
หลักเกณฑ์การกำหนดราคากลางการจัดซื้อและจัดจ้างงานก่อสร้างระบบส่งไฟฟ้าของสายงานระบบส่ง

5. **รายชื่อเจ้าหน้าที่ผู้กำหนดราคากลาง**

5.1 นายฉัตรชัย	เชาวนาธิคม	หมฟ-ส. กวอ-ส.
5.2 นายธิติวัฒน์	เบญจวงศ์รัตน์	หสก-ส. กวอ-ส.
5.3 นายภานุวัฒน์	ลิขิตผลผดุง	หอต-ส. กวอ-ส.
5.4 นางสาวจารุวรรณ	พิพัฒน์มงคลพร	หวอ-ส. กวอ-ส.
5.5 นายรุหาญ	รุจิธัญธาร	กวป-ส.
5.6 นายสุวัฒน์	ศักดิ์สมกุลอุทัย	กวธ-ส.

<u>หมายเหตุ</u> ค่าใช้จ่ายอื่นๆ ได้แก่ ค่าใช้จ่ายที่ กฟผ. ต้องจ่ายตามวิธีการพิจารณาเปรียบเทียบราคาที่กำหนดไว้ในเอกสารประกวดราคา เช่น อากรขาเข้า เป็นต้น

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

SUMMARY OF BID PRICE

SUPPLY AND CONSTRUCTION OF STATIC SYNCHRONOUS COMPENSATOR AT 230 KV KHLONG NGAE SUBSTATION

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

SCOPE OF WORK :

DESCRIPTION	**PRICE (INCLUDING OTHER EXPENSES and VAT) BATH**
SCHEDULE 1 : 230 KV KHLONG NGAE SUBSTATION	32,442,350.28
SCHEDULE 2 : STATIC SYNCHRONOUS COMPENSATOR (STATCOM)	1,463,420,000.00
TOTAL PRICE	**1,495,862,350.28**
TOTAL PRICE (ROUND)	**1,500,000,000.00**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

SUMMARY OF BID PRICE

SUPPLY AND CONSTRUCTION OF STATIC SYNCHRONOUS COMPENSATOR AT 230 KV KHLONG NGAE SUBSTATION

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Schedule	Description	Currency	Supply of Equipment		Local Currency	Local Transportation	Local Transportation, Construction and Installation
			Foreign Supply	Local Supply			
			CIF Thai Port	Ex-works Price (excluding VAT) Baht	(excluding VAT) Baht	(excluding VAT) Baht	(excluding VAT) Baht
			Amount	Amount	Amount	Amount	Amount
1	230 KV KHLONG NGAE SUBSTATION	THB	4,833,146.31				
				10,733,016.59	10,282,915.34	35,201.00	4,339,011.36
BID PRICE		THB	4,833,146.31	Baht 10,733,016.59	Baht 10,282,915.34	Baht 35,201.00	Baht 4,339,011.36
OTHER EXPENSE		THB	96,662.93	Baht	Baht	Baht	Baht
VAT		THB	345,086.65	Baht 751,311.16	Baht 719,804.07	Baht 2,464.07	Baht 303,730.80
SUMMARY OF BID PRICE		THB	5,274,895.89	Baht 11,484,327.75	Baht 11,002,719.41	Baht 37,665.07	Baht 4,642,742.16
TOTAL MEDIUM COST FOR SCH.1			32,442,350.28				

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

SCHEDULE 1 : 230 KV KHLONG NGAE SUBSTATION

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Description	Currency	Supply of Equipment		Local Currency	Local Transportation	Local Transportation, Construction and Installation
		Foreign Supply	Local Supply			
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	(excluding VAT) Baht	(excluding VAT) Baht	(excluding VAT) Baht
		Amount	Amount	Amount	Amount	Amount
PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT	THB	4,537,146.31	10,253,314.59			4,339,011.36
PART 1C : CIVIL WORK				10,282,915.34		
PART 1D : SUPPLY OF SPARE PARTS	THB	296,000.00	479,702.00		35,201.00	
TOTAL PRICE	**THB**	**4,833,146.31**	**Baht 10,733,016.59**	**Baht 10,282,915.34**	**Baht 35,201.00**	**Baht 4,339,011.36**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

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	Amount
Schedule 1AB5 : Current Transformer and Junction Box	THB	1,188,000.00	307,000.00	224,250.00
Schedule 1AB6 : Coupling Capacitor Voltage Transformer, Coupling Capacitor, Voltage Transformer and Junction Box	THB	888,000.00	207,000.00	164,250.00
Schedule 1AB9 : Power Circuit Breaker	THB	1,558,131.00		233,719.65
Schedule 1AB10 : Disconnecting Switch	THB	411,408.00	132,559.00	81,595.05

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

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	Amount
Schedule 1AB12 : AC&DC Distribution Board and Termination Box			161,499.00	24,224.85
Schedule 1AB14 : Substation Steel Structure			3,842,110.90	1,440,791.59
Schedule 1AB15 : Insulator				200,828.10
Schedule 1AB18 : Low Voltage Cable and Conductor			2,062,942.20	644,669.44

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

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	Amount
Schedule 1AB19 : Switchyard Lighting Fixtures			834,130.00	312,798.75
Schedule 1AB20 : Aluminum Tube, Connector and Miscellaneous Hardware			236,841.86	74,013.08
Schedule 1AB21 : Bus Fitting	THB	181,436.11		56,698.78
Schedule 1AB22 : Grounding Material	THB	272,295.12	123,581.75	123,711.52

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

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	Amount
Schedule 1AB23 : Substation Miscellaneous	THB	37,876.08	287,024.88	101,531.55
Schedule 1AB24 : Control and Protection System			2,058,625.00	483,229.00
Schedule 1AB25 : Fault Recording System				57,000.00
Schedule 1AB38 : Remote Terminal Unit				55,700.00

นางสาวอาสยา ช่างวิทยาการ
หจตส-ท.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

PART 1AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

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	Amount
Schedule 1AB39 : Commissioning				
Schedule 1AB40 : Installation of Equipment and Steel Structure Supplied by EGAT				60,000.00
PART 1AB	**THB**	**4,537,146.31**	**Baht 10,253,314.59**	**Baht 4,339,011.36**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

PART 1C : CIVIL WORK

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Description	**Local Currency** (excluding VAT) Baht Amount
Schedule 1C1 : Foundation Work	1,972,655.00
Schedule 1C2 : Cable Trench	7,281,516.00
Schedule 1C7 : Special Construction Works	549,711.54
Schedule 1C9 : Fire Protection System	479,032.80
PART 1C	**Baht** **10,282,915.34**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ท.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

PART 1D : SUPPLY OF SPARE PARTS

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Description	Currency	Supply of Equipment		Local Transportation
		Foreign Supply	Local Supply	
		CIF Thai Port	Ex-works Price (excluding VAT) Baht	(excluding VAT) Baht
		Amount	Amount	Amount
Schedule 1D6 : Spare Parts for Coupling Capacitor Voltage Transformer, Coupling Capacitor, Voltage Transformer and Junction Box	THB	296,000.00	53,000.00	17,450.00
Schedule 1D24 : Spare Parts for Control and Protection System			426,702.00	17,751.00
PART 1D	**THB**	**296,000.00**	**Baht 479,702.00**	**Baht 35,201.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB5 : Current Transformer and Junction Box

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB5-1	230 kV CT, 900 kV BIL, 300/-/2000:5//5//5//5//5 A, 50 kA oil filled as per Rating and Features RF CT88F2	3		THB	396,000.00	1,188,000.00			XXXXX	XXXXX
1AB5-2	Steel Supporting Structure for CT88F2 (for item no.1AB5-1), H = 5.50 m. as per Dwg. No. ST-CT-4-01 and SD-AB-0-01	3					85,000.00	255,000.00	XXXXX	XXXXX
1AB5-3	Junction Box type CT6 (for Item No. 1AB5-1) as per Dwg. No. TP-E-18.2 and TP-E-18.4	1					52,000.00	52,000.00	XXXXX	XXXXX
1AB5-4	Cost of Local Transportation, Construction and Installation for Item No. 1AB5-1 thru 1AB5-3	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	224,250.00	224,250.00
Total Price for Schedule 1AB5				**THB**		**1,188,000.00**	**Baht**	**307,000.00**	**Baht**	**224,250.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB6 : Coupling Capacitor Voltage Transformer, Coupling Capacitor, Voltage Transformer and Junction Box

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB6-1	230 kV voltage transformer, 950 kV BIL, 230000/√3 : 115.47/57.74 & 115.47/57.74 & 110 V oil filled as per ratings and features RF VT8011	3		THB	296,000.00	888,000.00			XXXXX	XXXXX
1AB6-2	Steel Supporting Structure for VT8011 (for Item No. 1AB6-1), H=5.50 m as per Dwg. No. ST-VT-4-01 and SD-AB-0-01	3					53,000.00	159,000.00	XXXXX	XXXXX
1AB6-3	Junction Box type PT14 (for Item No. 1AB6-1) as per Dwg. No. TP-E-18.1-3/4, 4/4 and TP-E-18.4	1					48,000.00	48,000.00	XXXXX	XXXXX
1AB6-4	Cost of Local Transportation, Construction and Installation for Item No. 1AB6-1 thru 1AB6-3	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	164,250.00	164,250.00
Total Price for Schedule 1AB6				**THB**		**888,000.00**	**Baht**	**207,000.00**	**Baht**	**164,250.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB9 : Power Circuit Breaker

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB9-1	245 kV 4000 A 50 kA GCB 3 pole trip as per Ratings and Features RF CB8955(IEC)	1		THB	1,432,899.00	1,432,899.00			XXXXX	XXXXX
1AB9-2	Steel Supporting Structure for CB8955(IEC)*	1		THB	125,232.00	125,232.00			XXXXX	XXXXX
1AB9-3	Cost of Local Transportation, Construction and Installation for Item No. 1AB9-1 thru 1AB9-2	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	233,719.65	233,719.65
Total Price for Schedule 1AB9				**THB**		**1,558,131.00**	**Baht**		**Baht**	**233,719.65**

*The design of supporting structures of circuit breaker shall be verified by circuit breaker manufacturer.

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB10 : Disconnecting Switch

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB10-1	245 kV 4000A air switch (high creepage) manually gang operated as per Ratings and Features RF DS89BH(IEC) (Phase spacing = 3.50 m)	1		THB	411,408.00	411,408.00			XXXXX	XXXXX
1AB10-2	Steel Supporting Structure for DS89BH (IEC) as per EGAT's Dwg. No. ST-DS-4-01 and SD-AB-0-01, H = 6.00 m	1					132,559.00	132,559.00	XXXXX	XXXXX
1AB10-3	Cost of Local Transportation, Construction and Installation for Item No. 1AB10-1 thru 1AB10-2	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	81,595.05	81,595.05
Total Price for Schedule 1AB10				**THB**		**411,408.00**	**Baht**	**132,559.00**	**Baht**	**81,595.05**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB12 : AC&DC Distribution Board and Termination Box

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB12-1	Termination Box type TB1 as per Dwg No. LT-TB-0-01	8					3,236.00	25,888.00	XXXXX	XXXXX
1AB12-2	Outdoor Receptacle Box type ORB1 as per Dwg. No. SE-ORB-0-01	1					22,965.00	22,965.00	XXXXX	XXXXX
1AB12-3	Outdoor Receptacle Box type ORB2 as per Dwg. No. SE-ORB-0-01	1					38,046.00	38,046.00	XXXXX	XXXXX
1AB12-4	Common cubicle for maintenance type 1 as per Dwg. No. SE-CCM-0-01	1					74,600.00	74,600.00	XXXXX	XXXXX
1AB12-5	Cost of Local Transportation, Construction and Installation for Item No. 1AB12-1 thru 1AB12-4	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	24,224.85	24,224.85
Total Price for Schedule 1AB12							**Baht**	**161,499.00**	**Baht**	**24,224.85**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB14 : Substation Steel Structure

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB14-1	230 kV take-off structure (TS801) as per Dwg. No. ST-TS-8-01	8					363,673.08	2,909,384.64	XXXXX	XXXXX
1AB14-2	230 kV beam (BB801) as per Dwg. No. ST-BB-8-01	4					157,291.11	629,164.44	XXXXX	XXXXX
1AB14-3	230 kV bus pole structure (BP803) as per Dwg. No. ST-BP-8-01	4					24,044.50	96,178.00	XXXXX	XXXXX
1AB14-4	22 kV bus support structure (BS203) as per Dwg. No. ST-BS-2-03	2					84,656.68	169,313.36	XXXXX	XXXXX
1AB14-5	Junction box support structure (JB003) as per Dwg. No. ST-JB-0-03 (Installed with ORB1)	1					8,515.76	8,515.76	XXXXX	XXXXX
1AB14-6	Junction box support structure (JB003) as per Dwg. No. ST-JB-0-03 (Installed with ORB2)	1					8,515.76	8,515.76	XXXXX	XXXXX
1AB14-7	Junction box support structure (JB003) as per Dwg. No. ST-JB-0-03 (Installed with CCM Type 1)	1					8,515.76	8,515.76	XXXXX	XXXXX

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB14 : Substation Steel Structure

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB14-8	Disconnecting switch operating platform (OP002) as per Dwg. No. ST-OP-0-02	1					12,523.18	12,523.18	XXXXX	XXXXX
1AB14-9	Cost of Local Transportation, Construction and Installation for Item No. 1AB14-1 thru 1AB14-8	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	1,440,791.59	1,440,791.59
Total Price for Schedule 1AB14							**Baht**	**3,842,110.90**	**Baht**	**1,440,791.59**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB15 : Insulator

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB15-1	Suspension insulator fog type (17" minimum leakage distance and 18,000 lb minimum combined M&E strength) as per Specification attached	Lump sum	Lump sum		supplied by EGAT	supplied by EGAT	supplied by EGAT	supplied by EGAT	XXXXX	XXXXX
1AB15-2	230 kV station post insulator ANSI TR. No. 308, high creepage distance of not less than 6,050 mm. as per Specification attached	Lump sum	Lump sum		supplied by EGAT	supplied by EGAT	supplied by EGAT	supplied by EGAT	XXXXX	XXXXX
1AB15-3	33 kV station post insulator ANSI TR. No. 210 as per Specification attached	Lump sum	Lump sum		supplied by EGAT	supplied by EGAT	supplied by EGAT	supplied by EGAT	XXXXX	XXXXX
1AB15-4	Cost of Local Transportation, Construction and Installation for Item No. 1AB15-1 thru 1AB15-3	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	200,828.10	200,828.10
Total Price for Schedule 1AB15							**Baht**		**Baht**	**200,828.10**

นางสาวอาสยา ชางวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB18 : Low Voltage Cable and Conductor

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB18-1	750 V power cable as per Specification attached	Lump sum	Lump sum				51,810.00	51,810.00	XXXXX	XXXXX
1AB18-2	600 V control cable with PVC insulation as per Specification attached	Lump sum	Lump sum				613,008.00	613,008.00	XXXXX	XXXXX
1AB18-3	750 V lighting cable (THW) as per Specification attached	Lump sum	Lump sum				6,336.00	6,336.00	XXXXX	XXXXX
1AB18-4	750 V lighting cable (NYY) as per Specification attached	Lump sum	Lump sum				130,680.00	130,680.00	XXXXX	XXXXX
1AB18-5	Annealed copper ground wire as per Specification attached	Lump sum	Lump sum				931,926.60	931,926.60	XXXXX	XXXXX
1AB18-6	Overhead ground wire as per Specification attached	Lump sum	Lump sum				32,736.00	32,736.00	XXXXX	XXXXX
1AB18-7	Aluminum conductor as per Specification attached	Lump sum	Lump sum				296,445.60	296,445.60	XXXXX	XXXXX
1AB18-8	Cost of Local Transportation, Construction and Installation for Item No. 1AB18-1 thru 1AB18-7	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	644,669.44	644,669.44
Total Price for Schedule 1AB18							**Baht**	**2,062,942.20**	**Baht**	**644,669.44**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB19 : Switchyard Lighting Fixtures

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB19-1	Flood lighting fixture, LED lamp, 10000 lumen, wide-beam, complete with control gear as per Specification attached	16					13,505.80	216,092.80	XXXXX	XXXXX
1AB19-2	Street lighting fixture, LED lamp, 5000 lumen, wide beam, complete with control gear as per Specification attached	18					13,505.80	243,104.40	XXXXX	XXXXX
1AB19-3	Tapered galvanized steel lamp post H=5000 mm. complete with 5 A 250 V plug fuse, 20 A 500 V terminal block for accepting 4 sq.mm. of incoming and outgoing cables and anchor bolts as per Dwg. No. ST-LP-0-03 and SD-AB-0-01	18					20,829.60	374,932.80	XXXXX	XXXXX
1AB19-4	Cost of Local Transportation, Construction and Installation for Item No. 1AB19-1 thru 1AB19-3	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	312,798.75	312,798.75
Total Price for Schedule 1AB19							**Baht**	**834,130.00**	**Baht**	**312,798.75**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB20 : Aluminum Tube, Connector and Miscellaneous Hardware

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB20-1	Aluminum tube as per Specification attached for 33 kV Complete Station Service of STATCOM System (KW3A & KW4A)	Lump sum	Lump sum				23,039.28	23,039.28	XXXXX	XXXXX
1AB20-2	230 kV and below Compression connector as per Specification attached	Lump sum	Lump sum				97,534.80	97,534.80	XXXXX	XXXXX
1AB20-3	230 kV and below Miscellaneous hardware as per Specification attached	Lump sum	Lump sum				116,267.78	116,267.78	XXXXX	XXXXX
1AB20-4	Cost of Local Transportation, Construction and Installation for Item No. 1AB20-1 thru 1AB20-3	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	74,013.08	74,013.08
Total Price for Schedule 1AB20							**Baht**	**236,841.86**	**Baht**	**74,013.08**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB21 : Bus Fitting

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB21-1	230 kV and below Bus fitting as per Specification attached	Lump sum	Lump sum	THB	181,436.11	181,436.11			XXXXX	XXXXX
1AB21-2	Cost of Local Transportation, Construction and Installation for Item No. 1AB21-1	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	56,698.78	56,698.78
Total Price for Schedule 1AB21				**THB**		**181,436.11**	**Baht**		**Baht**	**56,698.78**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB22 : Grounding Material

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB22-1	Ground rod as per Specification attached	Lump sum	Lump sum	THB	99,432.00	99,432.00			XXXXX	XXXXX
1AB22-2	Thermite welding material as per Specification attached	Lump sum	Lump sum				123,581.75	123,581.75	XXXXX	XXXXX
1AB22-3	Grounding hardware as per Specification attached	Lump sum	Lump sum	THB	172,863.12	172,863.12			XXXXX	XXXXX
1AB22-4	Cost of Local Transportation, Construction and Installation for Item No. 1AB22-1 thru 1AB22-3	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	123,711.52	123,711.52
Total Price for Schedule 1AB22				**THB**		**272,295.12**	**Baht**	**123,581.75**	**Baht**	**123,711.52**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB23 : Substation Miscellaneous

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB23-1	Rigid steel conduit as per Specification attached	Lump sum	Lump sum				58,784.88	58,784.88	XXXXX	XXXXX
1AB23-2	Fitting for rigid steel conduit as per Specification attached	Lump sum	Lump sum	THB	37,876.08	37,876.08			XXXXX	XXXXX
1AB23-3	HDPE conduit and fitting as per Specification attached	Lump sum	Lump sum				4,896.00	4,896.00	XXXXX	XXXXX
1AB23-4	Identification and danger notice plate as per drawing attached	Lump sum	Lump sum				223,344.00	223,344.00	XXXXX	XXXXX
1AB23-5	Cost of Local Transportation, Construction and Installation for Item No. 1AB23-1 thru 1AB23-4	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	101,531.55	101,531.55
Total Price for Schedule 1AB23				**THB**		**37,876.08**	**Baht**	**287,024.88**	**Baht**	**101,531.55**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB24 : Control and Protection System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	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			
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB24-1	230 kV LINE STUB PROTECTION (1-STUB, 1-BF)	Panel No. 605R, to be installed at relay building 6. Specification No. 1002. DWG. Nos. KNE-E-1.1, KNE-E-2, KNE-E-3.1 and TP-E-10.1. Scope of work.	1	EA				871,661.00	871,661.00	XXXXX	XXXXX
1AB24-2	GPS RECEIVER PANEL	Panel No. GPS6-1, to be installed at relay building 6. Specification Nos. 1002 and SD-FOT-P22. DWG. Nos. KNE-E-1.1, KNE-E-2, KNE-E-3.1, TP-E-10.15 and TP-E-10.19. Scope of work.	1	EA				699,432.00	699,432.00	XXXXX	XXXXX

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB24 : Control and Protection System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	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			
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB24-3	TRIPPING RELAY (94P, 94BU, 51X, 79X)	To be used as 94 (10 NO with flush-mounted high burden type), and be installed in the existing panel as follows: - four (4) for 94 in the panel no. 603R - four (4) for 94 in the panel no. 604R. Specification No. 1002. DWG Nos. KNE-E-1.1, KNE-E-2 and KNE-E-3.1. Scope of work.	8	EA				32,758.00	262,064.00	XXXXX	XXXXX
1AB24-4	WATT AND VAR TRANSDUCER (W&VAR-TDR)	VAR-TDR (3-phase type), to be installed in the existinig transducer panel. Specification No. 1002. DWG. No. TP-E-21.1. Scope of work.	1	EA				46,198.00	46,198.00	XXXXX	XXXXX

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB24 : Control and Protection System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	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			
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB24-5	CURRENT TRANSDUCER (A-TDR 3 PH)	3-phase type, to be installed in the existing transducer panel. Specification No. 1002. DWG. No. TP-E-21.1. Scope of work.	1	EA				47,538.00	47,538.00	XXXXX	XXXXX
1AB24-6	VOLTAGE TRANSDUCER (V-TDR 3 PH)	3-phase type, to be installed in the existing transducer panel. Specification No. 1002. Selectable 115 & 66.4 V for voltage input. DWG. No. TP-E-21.1. Scope of work.	1	EA				47,538.00	47,538.00	XXXXX	XXXXX
1AB24-7	TEMPERATURE TRANSDUCER (T-TDR)	To be installed in the existing transducer panel. Specification No. 1002. DWG. No. TP-E-21.1. Scope of work.	1	EA				44,030.00	44,030.00	XXXXX	XXXXX

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB24 : Control and Protection System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	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			
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB24-8	TEST SWITCH (FOR METERING)	Used for VAR-TDR, to be installed in the existing transducer panel. Specification No. 1002. Scope of work.	1	EA				29,677.00	29,677.00	XXXXX	XXXXX
1AB24-9	MCB, 0.5A, 3 POLE FOR PT	- one (1) is used for V-TDR, to be installed in the existing transducer panel - one (1) is used for PT circuit, to be installed in the existing MP-FRS. Specification No. 1002. Scope of work.	2	EA				3,034.00	6,068.00	XXXXX	XXXXX
1AB24-10	MCB, 6A, 2 POLE FOR DC SUPPLY	Used for DC supply for TDR, to be installed in the existing transducer panel. Specification No. 1002. Scope of work.	1	EA				4,419.00	4,419.00	XXXXX	XXXXX

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB24 : Control and Protection System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	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			
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB24-11	MODIFICATION TO THE EXISTING CONTROL AND PROTECTION SYSTEM	DWG. Nos. KNE-E-1.1, KNE-E-2, KNE-E-3.1 and TP-E-21.1. Scope of work.	LOT	SET		XXXXX	XXXXX	XXXXX	XXXXX	209,200.00	209,200.00
1AB24-12	COST OF LOCAL TRANSPORTATION, CONSTRUCTION AND INSTALLATION FOR ITEM NOS. 1AB24-1 THRU 1AB24-10	Scope of work.	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	274,029.00	274,029.00
Total Price for Schedule 1AB24								**Baht**	**2,058,625.00**	**Baht**	**483,229.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB25 : Fault Recording System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	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			
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB25-1	MODIFICATION TO THE EXISTING FAULT RECORDING SYSTEM	DWG. Nos. KNE-E-1.1, KNE-E-2, KNE-E-3.1 and TP-E-21.1. Scope of work.	LOT	SET		XXXXX	XXXXX	XXXXX	XXXXX	57,000.00	57,000.00
Total Price for Schedule 1AB25								**Baht**		**Baht**	**57,000.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB38 : Remote Terminal Unit

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	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			
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB38-1	MODIFICATION TO THE EXISTING COMPUTERIZED SUBSTATION CONTROL SYSTEM	DWG. Nos. KNE-E-1.1, KNE-E-2, KNE-E-3.1 and TP-E-21.1. Scope of work.	LOT	SET		XXXXX	XXXXX	XXXXX	XXXXX	55,700.00	55,700.00
Total Price for Schedule 1AB38								**Baht**		**Baht**	**55,700.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ท.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1AB39 : Commissioning

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB39-1	Commissioning	Lump Sum	Lump Sum		XXXXX	XXXXX	XXXXX	XXXXX	included in 2AB39	included in 2AB39
Total Price for Schedule 1AB39							**Baht**		**Baht**	

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1AB40 : Installation of Equipment and Steel Structure Supplied by EGAT

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	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			
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1AB40-1	Dismantlement (See details in scope of work)	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	60,000.00	60,000.00
Total Price for Schedule 1AB40							**Baht**		**Baht**	**60,000.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1C1 : Foundation Work

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	Local Currency (excluding VAT) Baht	
					Unit Price	Amount
1C1-1	230 kV Take off Structure Foundation (TS801) Pile Type (Pile, Dowel bar, Pile cut off and Pile shoe are included)	FD-TS-8-04 01/01, SD-PL-0-01, See Scope of work	8	set	150,926.00	1,207,408.00
1C1-2	230 kV Circuit breaker foundation (CBT801) Pad Type	FD-CB-8-34 01/01	1	set	181,660.00	181,660.00
1C1-3	230 kV Disconnecting Switch Support foundation (DS802,DS802A,DS802B,DS803,DS804) Pile , Bored pile Type (DS802 only) (Pile, Dowel bar, Pile cut off and Pile shoe are included)	FD-DS-8-04 01/01, SD-PL-0-01, See Scope of work	1	set	74,902.00	74,902.00
1C1-4	115/230 kV General equipment support structure foundation (BP701,BP801,CC704,CT702,CT802,VT703,VT803,	FD-GE-0-01 01/01	3	set	15,633.00	46,899.00
1C1-5	115/230 kV General equipment support structure foundation (BP701,BP801, CC704,CT702,CT802,VT703,VT803, LA401, LA402, LA801, LA802) Short Pile Type (BP801 only) (Pile, Dowel bar, Pile cut off and Pile shoe are included)	FD-GE-0-03 01/01, SD-PL-0-01, See Scope of work	4	set	13,677.00	54,708.00
1C1-6	22 kV Bus support structure foundation (BS201,BS202,BS203,BS204) Pad Type (BS203 only)	FD-BS-2-01 01/01	2	set	25,987.00	51,974.00

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

MEDIUM COST FOR BID NO. TIWS-S-06

1C1 : Foundation Work

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	Local Currency (excluding VAT) Baht	
					Unit Price	Amount
1C1-7	230 kV Coupling Capacitor Voltage Transformer Foundation (VT803) Pad Type (VT803X only)	Designed by Contractor, FD-GE-0-01 01/01, See Scope of work	3	set	15,633.00	46,899.00
1C1-8	Junction Box Structure foundation (JB003) Pad Type	FD-JB-0-05 01/01	3	set	8,075.00	24,225.00
1C1-9	Disconnecting Switch Operating Platform foundation (OP002)	FD-OP-0-02 01/01	1	set	2,996.00	2,996.00
1C1-10	Lamp post for fence and access road lighting foudation (LP3) (LED type) Pad Type & Pile Type (Pad Type)	FD-LP-0-05 01/01	18	set	14,654.00	263,772.00
1C1-11	Lamp Post for Fence and Access Road Lighting foundation (LP) Pad Type & Pile Type (Existing to be removed)	FD-LP-0-03 01/01	13	set	1,324.00	17,212.00
Total Price for Schedule 1C1					**Baht**	**1,972,655.00**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1C2 : Cable Trench

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	**Local Currency** (excluding VAT) Baht	
					Unit Price	Amount
1C2-1	Standard cable trench, steel cover included (Type"A")	SD-CE-0-02 01/02 - 02/02	Lump Sum	Lump Sum	1,676,988.00	1,676,988.00
1C2-2	Standard cable trench, steel cover included (Type"B")	SD-CE-0-02 01/02 - 02/02	Lump Sum	Lump Sum	108,408.00	108,408.00
1C2-3	Cable trench type "A" including RC cover for XLPE system	Designed by Contractor	Lump Sum	Lump Sum	4,610,040.00	4,610,040.00
1C2-4	Cable trench type "B" including RC cover for XLPE system	Designed by Contractor	Lump Sum	Lump Sum	886,080.00	886,080.00
Total Price for Schedule 1C2					**Baht**	**7,281,516.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1C7 : Special Construction Works

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	**Local Currency** (excluding VAT) Baht	
					Unit Price	Amount
1C7-1	Test and commissioning for fire protection system in switchyard		Lump Sum	Lump Sum	120,000.00	120,000.00
1C7-2	Fire Protection design work		Lump Sum	Lump Sum	9,415.30	9,415.30
1C7-3	Architectural and Civil engineering design work		Lump Sum	Lump Sum	360,296.24	360,296.24
1C7-4	Dynamic Pile load test		Lump Sum	Lump Sum	60,000.00	60,000.00
Total Price for Schedule 1C7					**Baht**	**549,711.54**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1C9 : Fire Protection System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	Local Currency (excluding VAT) Baht	
					Unit Price	Amount
1C9-1	Fire Protection System for switchyard	Designed by Contractor	Lump Sum	Lump Sum	470,764.80	470,764.80
1C9-2	Fire fighting pipe diameter 10" Black steel pipe (Seamless) ASTM A53 Grade B SCH.40 (External coating with petrolatum tape and petroleum wax tape conforming to AWWA C-217 standard) (Existing to be removed)		70	m	80.00	5,600.00
1C9-3	Fire hydrant (Existing to be removed)		1	set	1,334.00	1,334.00
1C9-4	Fire hose cabinet (Existing to be removed)		1	set	1,334.00	1,334.00
Total Price for Schedule 1C9					**Baht**	**479,032.80**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1D6 : Spare Parts for Coupling Capacitor Voltage Transformer, Coupling Capacitor, Voltage Transformer and Junction Box

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Qty.	Unit	Currency	Supply of Equipment				Local Transportation	
					Foreign Supply		Local Supply			
					CIF Thai Port		Ex-works Price (excluding VAT) Baht		(excluding VAT) Baht	
					Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1D6-1	230 kV voltage transformer, 950 kV BIL, 230000/√3 : 115.47/57.74 & 115.47/57.74 & 110 V oil filled as per ratings and features RF VT8011	1		THB	296,000.00	296,000.00			XXXXX	XXXXX
1D6-2	Steel Supporting Structure for VT8011 (for Item No. 1D6-1), H=5.50 m as per Dwg. No. ST-VT-4-01 and SD-AB-0-01	1					53,000.00	53,000.00	XXXXX	XXXXX
1D6-3	Cost of Local Transportation for Item No. 1D6-1 Thru 1D6-2	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	17,450.00	17,450.00
Total Price for Schedule 1D6				**THB**		**296,000.00**	**Baht**	**53,000.00**	**Baht**	**17,450.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

1D24 : Spare Parts for Control and Protection System

SUPPLY, CONSTRUCTION AND MODIFICATION WORK FOR CONNECTION BETWEEN THE EXISTING KHLONG NGAE SUBSTATION AND THE NEW STATIC SYNCHRONOUS COMPENSATOR (STATCOM)

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

Item No.	Description	Drawing No. / Reference No.	Qty.	Unit	Currency	Supply of Equipment				Local Transportation	
						Foreign Supply		Local Supply			
						CIF Thai Port		Ex-works Price (excluding VAT) Baht		(excluding VAT) Baht	
						Unit Price	Amount	Unit Price	Amount	Unit Price	Amount
1D24-1	TRANSFORMER OVERCURRENT RELAY (51T/51TG, 51L/51LG,51/51G,51S/51SG,51C/51CG)	Supply as spare part (same type as supplied for item no. 1AB24-1). 5 A for current input. Specification No. 1002.	1	EA				205,469.00	205,469.00	XXXXX	XXXXX
1D24-2	BREAKER FAILURE RELAY (50BF+62BF)	Supply as spare part (same type as supplied for item no. 1AB24-1). 5 A for current input. Specification No. 1002.	1	EA				221,233.00	221,233.00	XXXXX	XXXXX
1D24-3	COST OF LOCAL TRANSPORTATION FOR ITEM NOS. 1D24-1 THRU 1D24-2	Scope of work.	Lump sum	Lump sum		XXXXX	XXXXX	XXXXX	XXXXX	17,751.00	17,751.00
Total Price for Schedule 1D24								**Baht**	**426,702.00**	**Baht**	**17,751.00**

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

MEDIUM COST FOR BID NO. TIWS-S-06

SUPPLY AND CONSTRUCTION OF STATIC SYNCHRONOUS COMPENSATOR AT 230 KV KHLONG NGAE SUBSTATION

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

SCHEDULE 2 : STATIC SYNCHRONOUS COMPENSATOR (STATCOM)
SCOPE OF WORK :

DESCRIPTION	PRICE (INCLUDING OTHER EXPENSES and VAT) BATH
PART 2AB : SUPPLY AND INSTALLATION OF SUBSTATION EQUIPMENT	1,463,420,000
PART 2C : CIVIL WORK	INCLUDED
PART 2D : SUPPLY OF SPARE PARTS	INCLUDED
TOTAL MEDUIM COST FOR SCH.2	**1,463,420,000**

นายประวิทย์ เลิศโกวิทย์
ผู้อำนวยการฝ่ายวิศวกรรมระบบส่ง
23 Aug 2023

นางสาวอาสยา ช่างวิทยาการ
หจตส-ห.
31 ต.ค. 66

Important Information

for

Invitation to Bid No. TIWS-S-06

The purpose of this section is to inform the Bidders to **carefully study** the details of the revised terms and conditions in the bidding documents. The following provisions have been **recently revised** as stated hereunder:

Additional Regulation

Information to be submitted with Bid as required in Item 3.2 has been revised.

The following paragraph in Remarks Item 4. of page 11 of Additional Regulation has been deleted :-

"In case that any Major Shareholder(s) of the Bidder is (are) juristic person(s), and such juristic person(s) has (have) Major Shareholder(s) who is (are) juristic person(s), the Bidder shall submit the list of the Major Shareholder(s)/ the Names of Manager/ Managing Partner/ Managing Director/ Executive/ Person Who Is Authorized to Manage the Business/ Partner/ Partner with Unlimited Liability/ of such juristic person(s) as per page 10-11 of this Additional Regulation. The requirement of submission of list of the Major Shareholder(s)/ the Names of Manager/ Managing Partner/ Managing Director/ Executive/ Person Who Is Authorized to Manage the Business/ Partner/ Partner with Unlimited Liability/ of such juristic person(s) shall apply to 2 tiers of Major Shareholder(s) who is(are) juristic person(s)."

Article A-3. Eligibility of Bidders: General Requirements and Article B-8. Information to be Submitted with Bid

Bidders shall provide written anti-corruption policies and guidelines as specified in Data Sheet.

Article B-3. Bid Security

Terms and conditions regarding the forms of bid security have been revised.

Article E-15. Performance Security and Specimen of Performance Security

Terms and conditions regarding the forms and the amount of performance security have been revised.

Article E-16. Inspection and Tests

Terms and conditions regarding inspection and tests have been revised.

Article E-35. Advance Payment Security

Terms and conditions regarding the forms of advance payment security have been revised.

Article F-8. Drawings and Documents to be Furnished by the Contractor

Terms and conditions regarding EGAT's document management system in item a. have been added. The number of copies of the drawings and documents in Print and CD-ROM has been revised and Item c. Reproducible Drawings has been deleted.

Details in Drawings and Documents Required for Each Particular Equipment at the end of section F have been revised.

Article F-15. Liquidated Damages for Late Completion and Late Delivery

The total amount of liquidated damages shall not exceed ten (10) per cent of the total Contract Price, thereafter EGAT shall have the right, at its sole discretion, to terminate the Contract.

Article F-18. Maintenance Guarantee and Article F-19. Maintenance Security

In case all obligations on the part of the Contractor for the work under separated guarantee period under the Contract have been fulfilled, the Contractor is entitled to request EGAT to return the maintenance security guaranteed for such work regardless of the non-issuance of the Final Acceptance Certificate.

Article F-19. Maintenance Security and Specimen of Maintenance Guarantee

Terms and conditions regarding the forms and the amount of maintenance security have been revised.

Article G-5. Safety of Personnel and Third Parties and Prevention of Accidents

Safety terms and conditions have been revised. The Contractor shall observe and comply with the revised terms and conditions including Table 1. Safety Criteria and Conditions, Table 2. Contractor's Safety Information, and Table 3. Contractor Safety Evaluation Checklist which have been added at the end of Section G.

DATA SHEET

for

Invitation to Bid No. TIWS-S-06

(Two-envelope)

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

Article A-3. Eligibility of Bidders: General Requirements

The following requirement shall be added to item I.:

"j. Bidders shall provide written anti-corruption policies and guidelines with respect to procurement and supplies according to the Notification of the Anti-Corruption Co-Operation Committee Concerning Minimum Standards of the Anti-Corruption Policies and Guidelines in Relation to Procurement and Supplies Required to be Implemented by the Business Operator, Section 19 of the Government Procurement and Supplies Management Act B.E. 2560 (A.D. 2017)."

Article B-3. Bid Security

The amount of bid security shall be USD 2,290,950.- or THB 79,750,000.-.

Article B-4. Validity of Bids

The validity of the bid shall be for three hundred (300) Days from the date specified for opening of technical proposals.

Article B-8. Information to be Submitted with Bid

The following document shall be added to Article B-8. Information to be Submitted with Bid:

s. Bidder's anti-corruption policies and guidelines in relation to procurement and supplies together with the completely filled out Anti-Corruption Compliance Checklist as provided.

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 1 : 230 kV Khlong Ngae Substation or Schedule 2 : Static Synchronous Compensator (STATCOM), the liquidated damages shall be at the rate of one-tenth of one (0.10) per cent of the total Contract Price for Schedule 1 : 230 kV Khlong Ngae Substation and Schedule 2 : Static Synchronous Compensator (STATCOM) for each Day of delay. This sum is payable regardless of the actual loss and/or damages incurred.

Maintenance Guarantee Period

For 230 kV Substation, 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:

Equipment	Period of Guarantee (Year)
- Fault Recording System	2
- Control and Protection System	2

For 230 kV Static Synchronous Compensator (STATCOM), the Contractor shall guarantee as follows:

- The proper functioning of the Work for a period of three (3) Years except Power Transformer of STATCOM for a period of five (5) Years. The guarantee period will start after 2 months burn-in period.
- The availability warranty for a period of three (3) Years. The evaluation of availability of 230 kV STATCOM will start after 2 months burn-in period. The burn-in period will start after the first energization. During this burn-in period the availability will not be counted. If the availability of 230 kV STATCOM could not be fulfilled during the guarantee period, the guarantee period shall be extended as specified in Maintenance Guarantee in section F.
- Completion date will be on the first energization.

Defective Equipment to be replaced with the whole new set

For Power Transformer of STATCOM, in case EGAT, at its sole discretion, requires the Contractor to replace any defected Equipment, the Contractor shall replace the Equipment with the whole new set as specified in Failure to Meet Requirements in section E and Maintenance Guarantee in section F.

Anti-Corruption Compliance Checklist

(Consortium)

Bidders shall provide written anti-corruption policies and guidelines with respect to procurement and supplies pursuant to the Notification of the Anti-Corruption Co-Operation Committee Concerning Minimum Standards of the Anti-Corruption Policies and Guidelines in Relation to Procurement and Supplies Required to be Implemented by the Business Operator, in accordance with Section 19 of the Government Procurement and Supplies Management Act B.E. 2560 (A.D. 2017). This checklist shall be submitted with Bids.

Project : .....

State Agency: Electricity Generating Authority of Thailand

Member No. ... of the consortium:

.....

Item	Yes	No	Reference (Please specify Article)
1. Bidders have any written anti-corruption policies and guidelines which have been communicated to all levels of employees.			
2. Bidders impose penalty or regulations against corruption.			
3. Bidders have accessible channels or systems to report any suspicions or queries related to corruption.			
4. Bidders have internal personnel or unit explicitly responsible for the prevention of corruption.			

We hereby confirm that all above statements are true and correct.

Signed

_____

(Name of Bidder)

(Authorized person)

Stamp company seal (if any)

Anti-Corruption Compliance Checklist

(Individual Company / Joint Venture)

Bidders shall provide written anti-corruption policies and guidelines with respect to procurement and supplies pursuant to the Notification of the Anti-Corruption Co-Operation Committee Concerning Minimum Standards of the Anti-Corruption Policies and Guidelines in Relation to Procurement and Supplies Required to be Implemented by the Business Operator, in accordance with Section 19 of the Government Procurement and Supplies Management Act B.E. 2560 (A.D. 2017). This checklist shall be submitted with Bids.

Project : .....

State Agency: Electricity Generating Authority of Thailand

Bidder Name : .....

Item	Yes	No	Reference (Please specify Article)
1. Bidders have any written anti-corruption policies and guidelines which have been communicated to all levels of employees.			
2. Bidders impose penalty or regulations against corruption.			
3. Bidders have accessible channels or systems to report any suspicions or queries related to corruption.			
4. Bidders have internal personnel or unit explicitly responsible for the prevention of corruption.			

We hereby confirm that all above statements are true and correct.

Signed

_____

(Name of Bidder)

(Authorized person)

Stamp company seal (if any)

ELECTRICITY GENERATING AUTHORITY OF THAILAND

Nonthaburi
Thailand

INVITATION TO BID NO. TIWS-S-06

SUPPLY AND CONSTRUCTION OF STATIC SYNCHRONOUS COMPENSATOR AT 230 kV KHLONG NGAE SUBSTATION

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

(TWO-ENVELOPE)

A-1. Invitation

The Electricity Generating Authority of Thailand (EGAT) hereby invites sealed bids for supply and construction of Static Synchronous Compensator at 230 kV Khlong Ngae Substation under Transmission System Improvement Project in Western and Southern Regions to enhance System Security as described herein in accordance with terms, conditions and Specifications described in these Bidding Documents.

A-2. Work Description

The supply and construction of Static Synchronous Compensator at 230 kV Khlong Ngae 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.

A-3. Eligibility of Bidders: General Requirements

I. 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 Permanent Secretary, Ministry of Finance and/or in the Debarment List and/or in the List of Work Abandoners declared by EGAT.

e. 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.

f. 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.

g. 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.

h. 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.

i. ***The Bidder must have purchased the bidding documents from EGAT. For a joint venture or a consortium, only one (1) member of the joint venture or consortium is required to purchase the bidding documents.***

In case the Bidder's name is not exactly the same as the purchaser's name, the purchaser shall notify EGAT of the name of the Bidder in writing prior to the bid opening time.

II. 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.

A-4. 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) contract as contractor (not as subcontractor) for supply and construction of a complete 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, installation and commissioning 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, installation and commissioning 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 only one (1) System Integrator and 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 and the system integrator 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 to I.d.7 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. The System integrator for Transmission STATCOM shall have an excellent reputation and adequate technical knowledge and practical experience on design, construction, installation and commission of Transmission STATCOM as a whole system and shall have an

experience as described in Item I.d.5.1. The Equipment for Transmission STATCOM shall be manufactured by the qualified manufacturers who shall fulfill as described in Item I.d.5.1 to I.d.5.2;

5.1 Having one of the following qualifications:

5.1.1 Having a supply record at least two (2) complete Transmission STATCOM projects of **the type proposed** (MMC STATCOM) at nominal system voltage of 110 kV or above, ±70 MVAR or above of the complete Transmission STATCOM, with at least three (3) consecutive years of successful operation/use in an overseas country (not his own country).

OR

5.1.2 Having a supply record at least one (1) complete Transmission STATCOM project of **the type proposed** (MMC STATCOM) at nominal system voltage of 110 kV or above, ±70 MVAR or above of the complete Transmission STATCOM, with at least one (1) year of successful operation/use in an overseas country (not his own country).

AND

Having a supply record at least two (2) complete Transmission STATCOM projects at nominal system voltage of 110 kV or above, ±70 MVAR or above of the complete Transmission STATCOM, with at least two (2) consecutive years of successful operation/use.

The record in each above paragraph cannot be repeatedly counted.

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 Power Transformer of Transmission STATCOM. The Equipment shall be manufactured by the qualified manufacturers who shall fulfill the following requirements. The proposed Transformer shall be the similar Transformers as the definition in Specification No. 101: Power Transformer

6.1 Having one of the following qualifications:

6.1.1 Having experience in manufacturing of at least two (2) units of Transmission Static Var Compensator

(SVC) or STATCOM transformers having the minimum capacity of 250 MVA (three phase), 220 kV or above with at least three (3) consecutive years of successful operation/use in an overseas country (not his own country).

OR

6.1.2 Having experience in manufacturing of at least six (6) units of Transmission SVC or STATCOM transformers having the minimum capacity of 83.33 MVA (single phase), 220 kV or above with at least three (3) consecutive years of successful operation/use in an overseas country (not his own country)

OR

6.1.3 Having experience in manufacturing of a combination of at least one (1) unit of the three-phase Transmission SVC or STATCOM transformer of item I.d.6.1.1 and at least three (3) units of the single-phase Transmission SVC or STATCOM transformers of item I.d.6.1.2 with at least three (3) consecutive years of successful operation/use in an overseas country (not his own country).

6.2 Having one of the following qualifications:

6.2.1 Having a short circuit test record of the power transformer of 200 MVA, 220 kV or above. The level of occurring stress in the winding shall be similar to the proposed unit. The short circuit test record shall be performed at international reference laboratory/institute/Transmission as follows: KEMA, EDF, CESI and IREQ.

OR

6.2.2 Further to I.d.6.1 mentioned above, the level of occurring stress in the winding of Transmission SVC or STATCOM transformers at least one (1) unit shall conform to EGAT's specification. The level of occurring stress in the winding shall be similar to the proposed unit.

7. For Control and Protection System of Transmission STATCOM. The Equipment, design, and the Functional/Dynamic Performance Testing Laboratory of Control and Protection System (FPT/DPT) shall be manufactured performed respectively and qualified with following requirements:

7.1 Having one of the following qualifications:

7.1.1 Having a supply record at least two (2) projects of **the type proposed** (MMC STATCOM) control and protection system at nominal system voltage of 110 kV or above, ±70 MVAR or above, of Transmission STATCOM, with at least three (3) consecutive years of successful operation/use in an overseas country (not his own country).

OR

7.1.2 Having a supply record at least one (1) project of **the type proposed** (MMC STATCOM) control and protection system at nominal system voltage of 110 kV or above, ±70 MVAR or above, of Transmission STATCOM, with at least one (1) year of successful operation/use in an overseas country (not his own country).

AND

Having a supply record at least two (2) projects of control and protection system at nominal system voltage of 110 kV or above, ±70 MVAR or above of the complete Transmission STATCOM, with at least two (2) consecutive years of successful operation/use.

The record in each above paragraph cannot be repeatedly counted.

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.19 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 230/115 kV Ratings of Power Circuit Breaker, Disconnecting Switch and 115 kV Compact Switchgear 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 Power Circuit Breaker and Disconnecting Switch:

      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, Disconnecting Switch and Compact Switchgear:

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.

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 following Equipment: Instrument Transformer and Surge Arrester. These Equipment 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 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.

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 52 kV and below ratings of following Equipment: Metal-Clad SF_6 Gas Insulated Switchgear, Power Circuit Breaker, Instrument Transformer, Reactors, Disconnecting Switch and Surge Arrester

Having one of the following qualifications:

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

OR

7.2 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.

8. For Insulated Gate Bipolar Transistor (IGBT)

   Having one of the following qualifications:

   8.1 Proposing the Equipment of the type and rating which has already been accepted by EGAT.

   OR

   8.2 Having a supply record of Equipment of the type and similar ratings proposed with operation/use of at least three (3) consecutive years in an overseas country (not his own country) and at least 1,000 units. 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 operation/use of at least one (1) year in an overseas country (not his own country) and at least 1,000 units. 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.

9. For Transmission STATCOM Voltage Source Converter Sub Module (VSC Sub module) based on the proposed converter technology

9.1 Having a supply record of Equipment of the type (Full bridge VSC-Converter) and similar ratings proposed with operation/use of at least one (1) year in an overseas country (not his own country). The ratings and features of Equipment shall be the same or similar rating as EGAT specifies.

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

10. 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, Aluminum Conductor for medium voltage of STATCOM, Aluminum Tube, Aluminum Tube for medium voltage of STATCOM, Compression Connector, Compression Connector for medium voltage of STATCOM and Miscellaneous Hardware, Bus Fittings, Ground Rod, Thermite Welding Material, Grounding Hardware, Conduit and Conduit Fittings

10.1 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.

10.2 Having been granted a license 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.

10.3 Having one of the following qualifications:

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

OR

10.3.2 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).

11. For Insulator

Having one of the following qualifications:

11.1 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:

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

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

OR

11.2 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).

12. For Stationary Battery

Having one of the following qualifications:

12.1 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

12.2 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).

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

Having one of the following qualifications:

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

OR

13.2 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.

14. For 230 kV XLPE Power Cable

Having one of the following qualifications:

14.1 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

14.2 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).

15. For 230 kV Control and Protection Panel and below, having the following qualifications:

15.1 Being local manufacturer.

15.2 Having one of the following qualifications:

15.2.1 Having a letter of acceptance for manufacturing of Control and Protection Boards and/or fabrication of the specific Equipment issued by EGAT within the scope specified therein.

OR

15.2.2 Being listed in EGAT ACCEPTED MANUFACTURER LIST FOR CONTROL AND PROTECTION PANEL (LOCAL MANUFACTURER) attached at the end of Section A. Invitation to Bid.

16. Proposing the protective relays from the manufacturers as listed in EGAT ACCEPTED MANUFACTURER LIST FOR PROTECTIVE RELAY attached at the end of Section A. Invitation to Bid and shall be in compliance with the details specified in EGAT's Specifications. Type/Model of the protective relays proposed shall be as specified in EGAT ACCEPTED MULTIFUNCTION RELAY LIST attached at the end of Section A. Invitation to Bid.

17. For Fault Recording System (FRS).

17.1 Having one of the following qualifications:

17.1.1 The cabinet and all equipment are completely wired by the FRS manufacturer before shipping to Thailand.

OR

17.1.2 The cabinet and the Equipment are wired in Thailand by the local cabinet manufacturer who has one of the following qualifications:

17.1.2.1 Having a letter of acceptance for manufacturing of Control and Protection Boards and/or fabrication of the specific Equipment issued by EGAT within the scope specified therein.

OR

17.1.2.2 Being listed in EGAT ACCEPTED MANUFACTURER LIST FOR CONTROL AND PROTECTION PANEL (LOCAL MANUFACTURER) attached at the end of Section A. Invitation to Bid.

The design and engineering shall be performed by the FRS manufacturer. The assembly, factory test and commissioning shall be in accordance with the FRS manufacturer's standard and shall be performed under the FRS manufacturer's supervisor.

17.2 Proposing the Fault Recording System (FRS) from the manufacturers as listed in EGAT ACCEPTED MANUFACTURER LIST FOR FAULT RECORDING SYSTEM attached at the end of Section A. Invitation to Bid

and shall be in compliance with the details specified in EGAT's Specifications. 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.

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

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

19.1 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.

19.2 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.

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

19.3.1 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

19.3.2 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.

19.4 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.

Definitions:

Complete substation:	New substation or Extension of the existing substation which comprise of at least one transformer circuit and one line circuit. All above scope may not be necessary to include the building construction and the civil works by themselves. However, the design, supervision, and execution of the buildings and the civil works shall be required.
Year(s) of operation/use:	The period of operation Completion date or Commissioning date or Taking over date or Operation date or Put in service date stated in End User Certificate or the sufficient documentary evidence before bid opening.
The complete Transmission STATCOM :	The new complete or the complete refurbishment of a whole Transmission STATCOM with excellent reputation and adequate technical knowledge and practical experience in the design, construction, installation and commission of Transmission STATCOM as a whole system. This may not include the supply scope of Power Transformer of Transmission STATCOM; however, the parameter design of the Power Transformer shall be included to successful control and operation at the high voltage Point of Common Coupling (PCC).
Project:	The Project shall be the experience records complied with one of the follows; 1. The different substations or locations, even though these are in the same Contract. 2. The different Contracts, even though these are in the same substations or locations.

A-5. Joint Venture or Consortium

In the event that the successful Bidder is a joint venture or a consortium formed of two or more companies, EGAT requires that the parties to the joint venture or the consortium accept joint and several liability for all obligations under the Contract.

A-6. Preparation and Delivery of Bids

Bids shall be prepared in accordance with the Instructions to Bidders contained in the Bidding Documents in one (1) original and three (3) hard copies, in English, on the bid forms included for this purpose and shall be accompanied with a bid security as required under Article B-3. Bid Security.

The original and each copy of the proposal shall be placed in two (2) separate sealed envelopes:

Envelope I which shall contain a sealed technical proposal, and
Envelope II which shall contain a sealed price proposal.

Envelope I

Technical proposal will be placed in separate sealed envelope marked in capital letters in the lower left-hand corner as follows:

INVITATION TO BID NO. TIWS-S-06

SUPPLY AND CONSTRUCTION OF STATIC SYNCHRONOUS COMPENSATOR AT 230 kV KHLONG NGAE SUBSTATION

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

TECHNICAL PROPOSAL

The Envelope for the technical proposal shall contain the following :

a. the completed Proposal Data Forms of the proposed proposal(s)

b. reference documents pertaining to Bidder's qualification and experience under Article A-3. Eligibility of Bidders: General Requirements, A-4. Eligibility of Bidders: Technical Requirements, and Article B-8. Information to be submitted with Bid

c. delivery date guaranteed by Bidders

d. any minor deviations on Technical Specifications

e. any other technical information and drawings the Bidder deems to be adequate to explain his bid

f. Confirmation Form of not being a Jointly Interested Bidder with other Bidders and not being a person who undertakes any actions as an Obstruction of Fair Price Competition, and Registration/Non-registration with the Revenue Department as a VAT registrant

If the Bidder has registered as a VAT registrant, he shall submit EGAT an evidence of VAT registration. On the contrary, if the Bidder is not registered as a VAT registrant, he shall inform EGAT whether he will register as a VAT registrant or not.

In case the Bidder is a consortium, each member of the consortium shall fill in the Confirmation Form provided for consortium Bidders.

g. Filled-in Documentary List and documents required according to Additional Regulation

Strictly no prices or reference to price shall be made in the documentation contained in this Envelope. Violation of this requirement will be reason for rejection of the bid.

Envelope II

Price proposal will be placed in separate sealed envelope marked in capital letters in the lower left-hand corner as follows:

INVITATION TO BID NO. TIWS-S-06

SUPPLY AND CONSTRUCTION OF STATIC SYNCHRONOUS COMPENSATOR AT 230 kV KHLONG NGAE SUBSTATION

TRANSMISSION SYSTEM IMPROVEMENT PROJECT IN WESTERN AND SOUTHERN REGIONS TO ENHANCE SYSTEM SECURITY

PRICE PROPOSAL

The Envelope for the price proposal shall contain the following :

a. price schedules according to Section C

b. price schedules data CD in Microsoft Excel format

c. Discount Form

The bid security in accordance with Article B-3. Bid Security shall be submitted in a separate envelope.

The original and three (3) hard copies of the technical proposal and the price proposal shall be addressed and delivered to :

International Procurement Department - Transmission Segment
Procurement and Inventory Management Division
Electricity Generating Authority of Thailand
Bangkruai, Nonthaburi 11130
Thailand

on or before 10:00 a.m., Bangkok Standard Time, see Tentative Schedule

If the envelope(s) is not sealed, marked and addressed as required above, EGAT will assume no responsibility for the bid misplacement or premature opening.

Technical proposals will be opened publicly at ***Bidding Room, 1st floor, Tor 082 Building*** and at the time specified above.

Bids received after the time stipulated herein shall be rejected and returned unopened.

The technical proposals will be reviewed to determine their responsiveness to the Specifications and requirements.

The price proposals of the responsive technical proposals will be opened publicly at the place and time which will be specified at a later date, which will not be later than 150 Days after the technical proposal opening.

A-7. Availability of Bidding Documents

The Bidding Documents in CD-ROM are available for examination and can be obtained from EGAT at the hereunder address upon payment to EGAT, non-refundable, in the amount of USD 500.- or Baht 15,000.-; these prices include the value added tax.

International Procurement Department - Transmission Segment
Procurement and Inventory Management Division
Electricity Generating Authority of Thailand
Bangkruai, Nonthaburi 11130
Thailand

Note : At the time of bidding, EGAT's Specifications and all Drawings need not be submitted, although they are considered as part of the Bidding Documents.

EGAT Accepted Multifunction Relay List

Manufacturer	Model	87L			21P			21BU			25			79			67			51			50BF			50EF			27/59			81			24			87K/87R/87C			87B (H)			87B (L)			60C (V)			60C (I)			Remark
		500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	
ABB	RED670 (*)	■	■	■																											■	■	■																	
	REL670 (*)				■	■	■	■	■	■	■	■	■	■	■	■							■	■	■							■	■	■															
	RET670 (*)																																		■	■	■													
	RET650 (**)																																		*	*	*													* 3-restraint
	REB650 (**)																																					■	■	■									
	REB670 (*)																																								■	■	■						
	REB500																																								■	■	■						
	REQ650 (**)										*	*	*	■	■	■	■	■	■	■	■	■			■																										* Only product version 2.1 is accepted.
GE	P543 (**)	■	■	■																																													
	L90 (*)	■	■	■																																													
	P443 (*)				■	■	■	■	■	■																																								
	D30									■																																								
	D60 (*)					■	■		■	■																																								
	ALPSDA1				■	■	■	■	■	■																																							
	P64x (*)																																		*	*	*													* Only P643, P645
	T35																																			■	■												
	T60 (*)																																			■	■												
	P746																																								■	■	■						
	P740 (*)																																								■	■	■						
	P747																																								■	■	■						
	B90 (**)																																								■	■	■						
	B30																																								*	*	*							* Only for breaker and a half, double bus double breaker or main and transfer bus arrangement
	P14Nx																			■	■	■	■	■	■																									
	P14Dx (**)																■	■	■	■	■	■																											
	P841										■	■	■	■	■	■	■	■	■	■	■	■																											
	P141 (**)																			■	■	■			■																									
	C60																								■																									
	F60										■	■								■	■	■			■																									
	F650 (**)										■	■								■	■	■																											
	SR350																			■	■	■																											

Dec 2022

EGAT Accepted Multifunction Relay List

Manufacturer	Model	87L			21P			21BU			25			79			67			51			50BF			50EF			27/59			81			24			87K/87R/87C			87B (H)			87B (L)			60C (V)			60C (I)			Remark
		500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	
GE	DRS															■																																			
	P94Vx																															■	■	■															
	MIV																													■	■		■	■															
	P94V																												*	*	*																				* None of VT input (open delta connection) for 59N.
	P143 (**)																■	■	■	■	■	■																												
SEL	SEL-311L	■	■	■																																														
	SEL-411L (*)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■															
	SEL-421 (*)				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■															
	SEL-311C									■																																								
	SEL-387																																				■	■												* 4-restraint
	SEL-487E (*)																			■	■	■							■	■	■	■	■				■	■													
	SEL-587																																					■												* 2-restraint
	SEL-787 (**)																					■																	■												* 4-restraint
	SEL-587Z																																							■	■	■								
	SEL-487B (*)																																									■	■	■						
	SEL-501																						■	■	■																		■	■	■						
	SEL-351A										■	■	■				■	■	■	■	■	■							■	■	■	■	■	■																	
	SEL-451 (*)										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						■	■	■	■																	
	SEL-751 (**)										■	■	■				■	■	■	■	■	■							■	■	■	■	■	■																	
	SEL-551																			■	■	■																													
	SEL-751A										■	■	■							■	■	■							■	■	■	■	■	■																	
Siemens	7SD52 (**)	■	■	■																																													
	7SA522 (**)				■	■	■	■	■	■																																							
	7SA6 Series (**)				■	■	■	■	■	■																																							
	7SA87 (*)				■	■	■	■	■	■																																							
	Duobias (**)																																				■	■											
	7UT6 (**)																																				*	*	*											* 5-restraint
	7UT82 (**)																																				*	*	*											* 2-restraint
	7UT86 (*)																																				*	*	*											* 3-restraint
	7SS52 (**)																																										■	■	■						
	7SS60																																										*	*	*						* Only for breaker and a half, double bus double breaker and main&transfer bus arrangement

Dec 2022

EGAT Accepted Multifunction Relay List

Manufacturer	Model	87L			21P			21BU			25			79			67			51			50BF			50EF			27/59			81			24			87K/87R/87C			87B (H)			87B (L)			60C (V)			60C (I)			Remark
		500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	
Siemens	7SS85 (*)																																																
	7VK6 Series (**)																						■	■	■																								
	7SJ62 (**)																■	■	■	■	■	■							■	■	■																			
	7SJ85 (*)										■	■	■				■	■	■	■	■	■							■	■	■	■	■	■															
	7SJ61 (**)																			■	■	■																											
	7SJ82 (**)										■	■	■			■	■	■	■	■	■	■			■				■	■	■	■	■	■															
	7VK61 (**)										■	■	■	■	■	■																																	
	7SL82 (**)			■																																													
	7SL87 (*)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■															
	7RW80 (**)																																		■	■	■													
	7SA82 (**)						■			■																																									
Schneider Electric	P543 (*)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							■	■	■																			
	P443 (*)				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							■	■	■																			
	P645 (*)																			■	■	■															■	■	■										
	P746 (*)																			■	■	■																		■	■	■								
	P740 (**)																																						■	■	■								
	P821																						*	*																									* Only firmware version 1.F is accepted
	P141 (**)																■	■	■	■	■	■	■	■	■				■	■	■																			
	P143 (**)										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				■	■	■																			
	P120																			■	■	■																											
	P122																			■	■	■																											
Ingeteam	EF-LD (*)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							■	■	■				*	*	*							**	**	**	■	■	■	* Only 2-step overfluxing relay ** Only for open delta connection
	EF-ZT (*)				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■							■	■	■													*	*	*	■	■	■	* Only for open delta connection
	EF-TD (*)																■	■	■	■	■	■							■	■	■							*	*	*					**	**	**	■	■	■	* 3-restraint ** Only for open delta connection
	EF-MD (*)										■	■	■				■	■	■	■	■	■							■	■	■													*	*	*	■	■	■	* Only for open delta connection
	DA-PT (**)																■	■	■	■	■	■							■	■	■													*	*	*	■	■	■	* Only for open delta connection

Dec 2022

EGAT Accepted Multifunction Relay List

Manufacturer	Model	87L			21P			21BU			25			79			67			51			50BF			50EF			27/59			81			24			87K/87R/87C			87B (H)			87B (L)			60C (V)			60C (I)			Remark
		500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	500 kV	230 kV	115 kV	
NR Electric	PCS-931 (*)	■	■	■																																														
	PCS-902 (*)				■	■	■	■	■	■																																								
	PCS-978 (*)																																		■	■	■														
	PCS-9611 (*)										■	■	■			■			*			■			■					**	**		■	■	■																* None of line fault locator, only use with 33&22 kV feeder. ** Only for c-bank protection.
Toshiba	GRZ200 (*)					■	■		■	■																										■	■	■													
	GRT200 (*)																																		■	■	■													
	GRD200 (*)										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				■	■	■		■	■	■															
	GRE140										■	■	■			■	■	■	■	■	■	■							■	■	■																			
	GRB200 (*)																																								■	■	■							
ZIV	ZLV					■	■		■	■																																							
	IDV																																		■	■	■													
	IRL																■	■	■	■	■	■			■				■	■	■	■	■	■									■	■	■	■	■	■			
	IRV																	■	■		■	■							■	■																				
Mitsubishi	MRD-HA (**)																																				*														* 3-restraint
	MBP-H1A (**)																																									*	*								* In case of double bus single breaker arrangement, maximum 8 feeders with 1 bus coupler and 2 bus sections are allowed.
Protecta	DTIVA-E3																■	■	■	■	■	■																												
	DTVA-E1					■			■							■														■																				
	DTRV-E2																					■			■					■			■					■												

Remarks

(*) Applicable to IEC 61850 for both station bus and process bus with the certification issued by the third party laboratory and specifying that the said relay conforms to "IEC 61850 edition 2 parts 6, 7-1, 7-2, 7-3, 7-4, and 8-1".

(**) Applicable to IEC 61850 only for station bus with the certification issued by the third party laboratory and specifying that the said relay conforms to "IEC 61850 edition 2 parts 6, 7-1, 7-2, 7-3, 7-4, and 8-1".

Notes

1. The procedures for being listed in EGAT ACCEPTED MULTIFUNCTION RELAY LIST are specified in the EGAT's Pre-Qualification (PQ) process, of which the details can be provided by Transmission System Engineering Division on request.
2. If any types of relay in the list are planned to discontinue the manufacturing, the manufacturer or the representative is responsible for informing EGAT at least 1 year before the unavailable date.
3. The relays shall be configured to comply with all EGAT's required functions.

Dec 2022

EGAT ACCEPTED FAULT RECORDING SYSTEM LIST

Accepted Type	Manufacturer
IDM+	Qualitrol
M871	GE
7KE85 (*)	Siemens
TESLA 4000 (*)	ERL Phase
TR 2100	Rochester (RIS)
TR 3000 (**)	

Remarks

(*) Applicable to IEC 61850 for both station bus and process bus with the certification issued by the third party laboratory and specifying that the said FRS conforms to "IEC 61850 edition 2 parts 6, 7-1, 7-2, 7-3, 7-4, and 8-1".

(**) Applicable to IEC 61850 only for station bus with the certification issued by the third party laboratory and specifying that the said FRS conforms to "IEC 61850 edition 2 parts 6, 7-1, 7-2, 7-3, 7-4, and 8-1".

Notes

1. The procedures for being listed in EGAT ACCEPTED FAULT RECORDING SYSTEM LIST are specified in the EGAT's Pre-Qualification (PQ) process, of which the details can be provided by Transmission System Engineering Division on request.

2. If any types of FRS in the list are planned to discontinue the manufacturing, the manufacturer or the representative is responsible for informing EGAT at least 1 year before the unavailable date.

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, UK
	Toshiba / Japan, Vietnam
	Schneider Electric / France, UK
	ZIV / Spain
	INGETEAM / Spain
	NR Electric / China
	Mitsubishi / Japan
	Protecta / Hungary
	Arcteq / Finland

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

EGAT ACCEPTED MANUFACTURER LIST FOR

CONTROL AND PROTECTION PANEL (LOCAL MANUFACTURER)

Description	Manufacturer	Designed by
500 kV Control and Protection Panel	Hitachi Energy (Thailand) Limited	Hitachi Energy (Thailand) Limited
	Precise System and Project Co., Ltd.	Precise System and Project Co., Ltd.
	U-tah Industry Limited Partnership	U-tah Industry Limited Partnership
	SCI Electric Public Company Limited	Siemens Limited
230 kV and below Control and Protection Panel	Hitachi Energy (Thailand) Limited	Hitachi Energy (Thailand) Limited
	C&T Metal Products Co., Ltd.	Easun Reyrolle Limited, India
	Precise System and Project Co., Ltd.	Precise System and Project Co., Ltd.
	U-tah Industry Limited Partnership	U-tah Industry Limited Partnership
	SCI Electric Public Company Limited	SCI Electric Public Company Limited
	Timpano Electrical Co., Ltd.	Timpano Electrical Co., Ltd.
	Mantra Switchgear Co., Ltd.	Siemens Limited

Notes

1. The procedures for being listed in EGAT ACCEPTED MANUFACTURER LIST FOR CONTROL AND PROTECTION PANEL (LOCAL MANUFACTURER) can be provided by Transmission System Planning and Project Division on request.
2. The control and protection panel shall be manufactured and designed by the manufacturer/company written in the same row.

SCOPE OF WORK

H-1. General

1. 230 KV KHLONG NGAE SUBSTATION

GENERAL

The work for Khlong Ngae Substation includes design, supply and construction of a Static Synchronous Compensator (STATCOM), the voltage level at the point of connection for the STATCOM is 230kV. The STATCOM shall consist of all necessary equipment. Other specific requirements associated with this STATCOM are described in details in the Specification.

The Scope of work comprises of two schedules as follows:

Schedule 1: 230 KV KHLONG NGAE SUBSTATION

Design, supply, construction and modification work for connection between the existing Khlong Ngae Air Insulated Substation (AIS) and the new STATCOM as follows:

- One (1) 230kV feeder and related equipment for connection from 230kV air insulated substation of EGAT to STATCOM +200Mvar
- Modification the existing of 33kV system for supplying the power to station service transformer for STATCOM building (KW3A & KW4A)

Schedule 2: STATIC SYNCHRONOUS COMPAENSATOR (STATCOM)

Design, supply, and construction of new STATCOM. The nominal continuous rating of the STATCOM is 200Mvar inductive and 200Mvar capacitive at 1.0p.u. Voltage.

The Contractor shall design, supply and construct an extension of one (1) 230kV feeder with Breaker-and-a-half bus arrangement at 230kV Khlong Ngae Substation for the installation of a STATCOM system.

The Contractor's scope of work includes the engineering, designing, furnishing of all equipment, delivery, installation, test, and commissioning of the STATCOM at Khlong Ngae Substation, rated 230kV, 50Hz, three-phase, that is performed under strict quality control standards using the highest quality of materials and workmanship.

All specified equipment, studies, designs, materials and installation shall be the Contractor's responsibility in providing complete, tested and fully functional 230kV STATCOM installation.

All work necessary for a complete installation ready for commercial operation shall be performed and included in the Contractor's prices for the work hereunder.

Additionally, the Contractor shall also furnish all detailed engineering design work, calculation, drawing preparation, backup data, test report, and instruction books.

1. As stated elsewhere in the Bidding Documents, the drawings included in the Bidding Documents except drawings marked "For Construction" are for bidding purposes only and shall not be used for execution of the work.
2. The drawings furnished by the Contractor shall provide detailed descriptions of Equipment, installation methods, and requirement. Provided that the furnished

drawings are perceived inadequately, EGAT retains the right to request additional details.

3. Calculation, backup data, and documentation are required for all parts of the design. All furnished data shall be verified to ensure that such data is accurate and adequate for the purpose of execution.

ELECTRICAL PART

Schedule 1 and 2

Work included in this Contract.

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

Existing Substation and STATCOM

1. Design, supply, and installation of all equipment and related accessories required for a connection between the 230kV extension feeder with breaker and a half bus arrangement and STATCOM.
2. Design, supply, and installation of all equipment required for the complete STATCOM system.
3. Design, supply, and installation of one (1) set of a three-phase ≥200MVA, 230-xxkV STATCOM transformer. In addition, the Contractor shall supply one (1) set of a three-phase ≥200MVA, 230-xxkV STATCOM transformer for a spare unit. Note that the secondary voltage of the STATCOM transformer shall be determined by the Contractor to meet EGAT's requirements and to optimize the cost of the STATCOM.
4. Design, supply, and installation of surge capacitors, if required to limit the overvoltage caused by the surge transference to the secondary side of the STATCOM transformer. The calculation for selecting the ratings of the surge capacitors shall conform to IEC or IEEE standards and be submitted to EGAT for approval.
5. The data of the existing system for STATCOM Design:

   5.1 The voltage unbalance at Khlong Ngae Substation (measured by VT, VZ8C) is 0.29% of the nominal voltage of 230kV.

   5.2 Total Harmonic Distortion Voltage (Measured from VT, VZ8C) as follows:

	Phase A	Phase B	Phase C
%THDv	0.74%	0.67%	0.78%

Table 1: Total voltage Harmonic Distortion (THDv) in the percent of the nominal voltage of 230kV

5.3 The Voltage harmonic distortion in percent of the nominal voltage of 230kV from 2^{nd} to 50^{th} harmonic orders as follow

Harmonic Order	(%)V Phase A	(%)V Phase B	(%)V Phase C
2	0.01	0.01	0.01
3	0.11	0.17	0.33
4	0.01	0.02	0.02
5	0.63	0.51	0.44

6	0.01	0.01	0.01
7	0.56	0.46	0.51
8	0.01	0.01	0.02
9	0.05	0.04	0.05
10	0.00	0.00	0.00
11	0.39	0.39	0.38
12	0.00	0.00	0.00
13	0.09	0.09	0.09
14	0.00	0.00	0.00
15	0.01	0.01	0.02
16	0.00	0.00	0.00
17	0.03	0.04	0.03
18	0.01	0.02	0.01
19	0.05	0.04	0.04
20	0.01	0.01	0.01
21	0.01	0.01	0.01
22	0.00	0.00	0.00
23	0.07	0.07	0.08
24	0.00	0.00	0.00
25	0.07	0.07	0.08
26	0.01	0.01	0.01
27	0.02	0.03	0.03
28	0.01	0.01	0.00
29	0.06	0.02	0.01
30	0.01	0.00	0.00
31	0.01	0.01	0.01
32	0.00	0.00	0.00
33	0.00	0.00	0.00
34	0.00	0.00	0.00

35	0.01	0.01	0.01
36	0.00	0.00	0.00
37	0.01	0.01	0.01
38	0.00	0.00	0.00
39	0.00	0.00	0.00
40	0.00	0.00	0.00
41	0.00	0.01	0.01
42	0.00	0.00	0.00
43	0.00	0.00	0.00
44	0.00	0.00	0.00
45	0.00	0.00	0.00
46	0.00	0.00	0.00
47	0.01	0.03	0.04
48	0.00	0.00	0.00
49	0.01	0.02	0.03
50	0.00	0.00	0.00

Table 2: The Voltage harmonic distortion in percent of the nominal voltage of 230kV from 2nd to 50th harmonic orders

6. Design, supply, and installation of a substation lighting system completed with all integral accessories required for providing a complete operation. The lighting system shall mainly consist of equipment lighting, fence lighting, terminal boxes, lighting relay panel, raceways, and cable for lighting circuits. The lamps for the lighting system of the STATCOM area shall be **LED** type with all integral accessories. The lighting cable shall be single core conductor. The intensity of the lighting installation shall be as follows:

Area	Lux
STATCOM Area	50
Transformer Area	50
STATCOM Station Fence	10

Table 3: The intensity requirement for outdoor area

7. Design, supply, and installation of the rigid bus made of an aluminum tube. The main bus and branch bus shall be designed as one tube per phase. The design and calculation of the rigid bus shall conform to IEEE or other internationally accepted standards and be submitted to EGAT for approval.
   For continuous current rating calculation, the following criteria shall be used:
   - The temperature rise of 30°C for the thermal capacity of all buses and bus fittings
   - The ambient temperature of 45°C
   - Total solar and sky radiation heat not less than 1,000 W/m^2
   - The latitude and longitude of Khlong Ngae Substation are 6°42'51.6"N and 100°27'14.0"E respectively.

8. Design, supply and installation of a complete 33kV XLPE cable system running from KT4A & KT5A to KW3A & KW4A (near STATCOM Building for STATCOM station). Design, supply and installation of all equipment, accessories, hardware and civil work required for completion of the 33kV XLPE cable system. They include but not limited to the following items:
   - 33kV XLPE cable - a single-core cable with copper conductor. The cross-sectional area of the cable shall be determined by the Contractor to meet the ampacity requirement.
   - Cable trenches with concrete trench covers. The Contractor shall design the cable trench taking into account the minimum bending radius of the cable and cable installation.
   - Cable supporting structures, cable cleats, cable terminations, cable termination supporting structures, miscellaneous hardware, grounding hardware, link box, SVL (if applicable) and all related equipment.

   The 33kV XLPE cable shall be laid in a **trefoil** formation with cable cleats as shown in the Figure below.

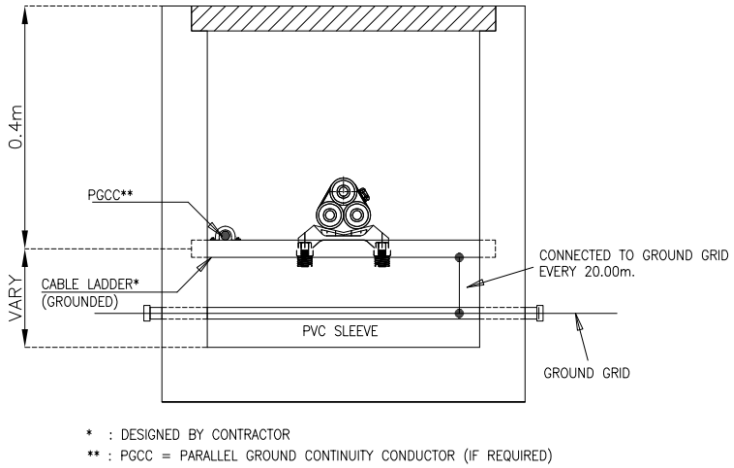


Figure 1: Trefoil Formation

The design and calculation of the 33kV cable system shall conform to IEC or IEEE standards.

The Contractor shall design the 33kV cable system to meet the ampacity requirement for the rated load current with a proper design margin, e.g. 25%, given that the ambient temperature is not less than 45°C and the effect of solar heat shall be considered. The other parameters used in the design shall be practical, reasonable, and operational and conform to IEC or IEEE standards. The calculated continuous current rating shall be shown in the single-line diagram.

The Contractor shall design and select the type of metallic screen bonding. The induced voltage measured in every point of the metallic screen of the 33kV XLPE cables shall be less than **60V** or shall conform to the IEC or IEEE standards.

If the single-point bonding is used, the Contractor shall design, supply and install the parallel grounding continuity cable (PGCC), if necessary. The type, insulation level and cross-sectional area of the PGCC shall be determined by the Contractor.

If the single-point bonding is used, Sheath voltage limiter (SVL) should be used to limit the voltage of the cable shields/sheaths during transient overvoltage conditions such as Lightning, Fault and Switching. The selection of the SVL rating shall be studied and submitted to EGAT for approval. The Contractor shall supply and install related hardware such as link box, cable required for the SVL installation.

9. The calculation of sag and tension of the phase conductors and overhead ground wires (OHGW) shall conform to IEC standards or other internationally accepted standards and shall be submitted to EGAT for approval. The ambient temperature of 45°C shall be used for the calculation.
10. The voltage fluctuation in the AC power supply voltage for STATCOM shall be controlled in the range +/-10%
11. Design, supply, and installation of the operating platform for safety during operating the grounding switch and during the manual operation and maintenance of the main disconnecting switch. The platform shall also be connected to the main switch, motor operating mechanism housing and the main blade operating pipe.
12. Design, supply, and installation of weatherproof instrument transformer junction boxes with terminal blocks, circuit breaker, and other equipment required for the termination of cables from CT’s and VT’s.
13. Design, supply, and installation of marshalling cubicle for the STATCOM transformers.
14. Design, supply, and installation of all hardware for post and suspension insulator assembly.
15. Design, supply, and installation of miscellaneous hardware and conductor required for the complete installation.
16. The spare part of hardware for reactor of STATCOM system shall be supplied by the Contractor.

STATCOM arrangement and access of equipment

17. Design, supply, and installation of the following:
    - Identification plates
    - Danger notice plates
    - "No pacemaker" plates
    - "No access for persons with metallic implants" plates
    - Other plates if necessary
18. Design, supply, and installation of fences for STATCOM area. The Contractor shall sectionalize the fence for STATCOM area every 15.0 meter (if necessary).
19. The minimum phase spacing of main bus and branch bus shall be as follows:

    - STATCOM voltage less than **11kV,** the phase spacing shall be **0.70 m.** (center-to-center) (minimum). In addition, electrical clearance surface to surface shall comply with IEEE standard.

    - STATCOM voltage **at 11kV up to 33kV,** the phase spacing shall be **1.00 m.** (center-to-center) (minimum). In addition, electrical clearance surface to surface shall comply with IEEE standard.
20. The service roads for STATCOM maintenance shall be provided and designed by the Contractor. They shall include but not limited to the following:
    - The service road beside STATCOM with the minimum width of 4.00 m.

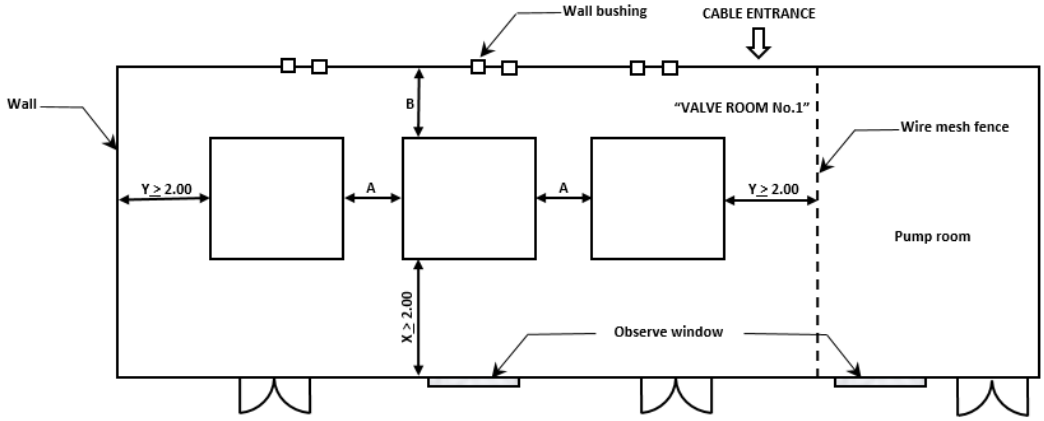
    The locations of the service roads as mentioned above previously will be approved by EGAT. The contractor shall submit the clarification document explaining in details how to access for maintenance and working in the STATCOM area to make sure that the locations of service roads are suitable in terms of safety, engineering practice and maintenance. If found later that the service road it is not appropriate, the bidders shall be responsible for the correction work without additional cost and time.
21. The minimum height of the conductors or bus bars crossing the service road shall be **5.00** m. for the STATCOM area.
22. The minimum distance between the surface of the reactor and fence shall be designed to meet the requirement as per EGAT specification.
23. The asphalt shall be provided at the STATCOM area to prevent unwanted weeds from growing. The top of the asphalt shall be at the same level as the finished grade of soil, and then shall be finished by a layer of 0.10 meter thick crushed rocks.
24. Cable laying at the ground floor of the STATCOM building shall be in cable trenches. Cable ladders shall not be used.
25. The Contractor shall design the key interlocking system that is suitable for maintenance, safety and engineering practice. The contractor shall submit Interlocking system report to EGAT for approval after Contract awarded.
26. The Contractor shall supply humidity and temperature sensor in the control room and valve

room.

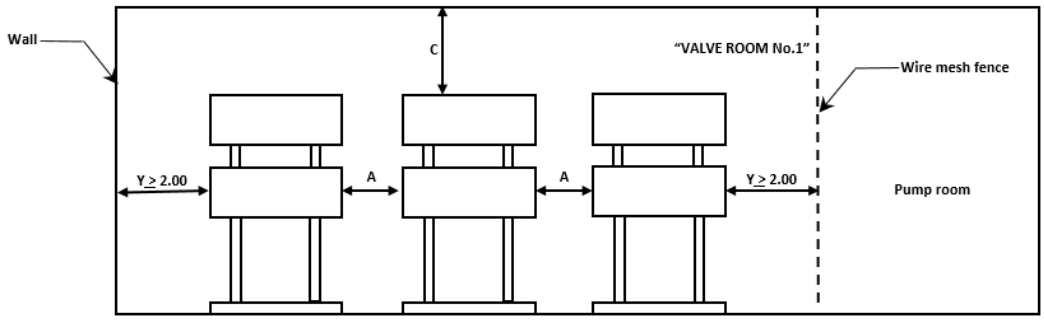
27. The voltage level of the insulator for STATCOM bus bar and disconnecting switch of the STATCOM equipment shall be at least 33 kV

28. The Contractor shall design STATCOM bus system by considering short circuit force, maintenance access, equipment installation and working space.

29. The maintenance area for pump room shall be designed to be suitable for maintenance and be able to dismantle without any difficulty. And the contractor shall design maintenance area in the valve room as following;



TOP VIEW



SECTION VIEW

NOTES

1. THE DIMENSION "A" AND "B" SHALL BE RECOMMENDED AND DESIGNED BY THE CONTRACTOR. THESE AREAS SHALL BE CONSIDERED FOR MAINTENANCE AREA AND WORKING SPACE.
2. BOTH "X" AND "Y" SHALL BE AT LEAST 2.00 METERS.
3. THE HEIGHT OF CEILING SHALL BE PROPERLY DESIGNED TO BE SUITABLE FOR MAINTENANCE. THE HIGHEST EQUIPMENT SHALL BE ABLE TO BE DISMANTLED WITHOUT ANY DIFFICULTY.
4. ANY EQUIPMENT AND COOLING PIPE SHALL BE DESIGNED PROPERLY SUCH THAT THEY DO NOT OBSTRUCT THE ACCESS AND MAINTENANCE AREA.

Design study and performance

30. The Contractor shall submit all reports on the system studies, engineering and design, and shall satisfy EGAT as to the completeness and accuracy of the studies to be carried out in

accordance with the Contract. The Contractor shall also carry out all studies which are necessary for completion of the design and engineering.

The studies shall include but not limited to the following:

- Studies for deciding the design and rating points, operational strategy and limits of the STATCOM system.
- Study of Current and voltage stresses during both steady-state and transient conditions.
- Study of Harmonic performance and ratings.
- Studies on overvoltage protection and insulation coordination for all equipment under the Contractor's scope of supply, studies for integration of the STATCOM system to the existing system, and studies to ensure the proper coordination of the metal oxide surge arresters supplied with those located in the AC system where other surge arresters are used.
- Control and control interaction study.
- Studies to ensure and demonstrate that the existing HVDC, 230kV mechanically-switched capacitor banks (MSCs) at Khlong Ngae Substation and nearby generators shall not be adversely affected by the operation of the STATCOM system, particularly with regard to sub-synchronous oscillations and sub-synchronous resonances, harmonic injection and voltage and current stresses.
- Studies that mentioned in this scope of work shall be submitted to EGAT at bidding stage.

31. The study on Harmonic performance and rating shall be based on values of components, component tolerances, detuning effects, and harmonic currents, which the Contractor shall determine. The harmonic performance and component rating calculation shall be submitted with the proposal on the Bidding stage.

32. The STATCOM system at Khlong Ngae Substation shall be operated without hunting with the other Static Var Systems at Bang Saphan 2 and Phuket 3 substation. The hunting study shall be submitted to EGAT for approval.

33. The maximum current and short circuit current for each branch of STATCOM shall be determined and clearly shown in the STATCOM design study. The study shall consider and show the manufacturing tolerances of the equipment. In addition, the short circuit study shall be submitted to EGAT for approval at bidding stage.

34. The Contractor shall determine the fundamental voltage and current stresses on the STATCOM components. The values of the following variables for all key operating points in the V-I curve shall be shown in the STATCOM design study and submitted with the proposal on the Bidding stage.

    The variables of interest include but not limited to the following:

    - Primary side voltage in p.u. and kV (V_1)
    - Secondary side voltage in p.u. and kV (V_2)
    - Reactive power at the primary side in Mvar (Q_1)
    - Reactive power at the secondary side in Mvar (Q_2)
    - Current of STATCOM branch in Ampere(A) ($I_{STATCOM}$)

35. The network impedance data provided by EGAT in the Bidding stage given in Table 4:

	Year	*Load condition*	*File/Folder name:*
1.	*2027*	*Region peak*	*Khlong_Ngae_Rev.1.zip*
2.	*2027*	*System light*	*Khlong_Ngae_Rev.1.zip*
3.	*2027*	*System light winter*	*Khlong_Ngae_Rev.1.zip*
4.	*2032*	*Peak load*	*Khlong_Ngae_Rev.1.zip*
5.	*2032*	*Light load*	*Khlong_Ngae_Rev.1.zip*

Table 4: The name and detail of cases for harmonic impedance data that EGAT will provide to Bidders

Note: All cases of the network impedance do not include the existing HVDC system and MSCs at Khlong Ngae Substation.

36. EGAT will provide the following data required for the Real Time Digital Simulation (RTDS) to be performed during Factory acceptance test of the STATCOM control system. They will be provided after Contract awarded;
    - **Four** AC reduced networks for the **both functional and dynamic performance test**, and **POD performance test** to be implemented in real time digital simulator (RTDS).
    - Maximum **ten** scenarios for functional and dynamic performance test per each AC reduced networks above.
    - Maximum **ten** scenarios for POD performance test per each AC reduced networks above.

HVDC data at Khlong Ngae substation

37. The Description of the existing HVDC at Khlong Ngae Substation

    DC power

    Rated 300MW

    Min 30MW

    Max 450MW (10-min overload)

    DC voltage

    Rated 300kV

    Reduced DC voltage operation 70% of the rated DC voltage

    DC current

    Rated 1000A (at rated DC power and DC voltage)

    Operation mode

    Monopolar

    HVDC AC filters

The HVDC AC filters consist of 2 banks with 3 types of sub-banks as shown in Figure 2.

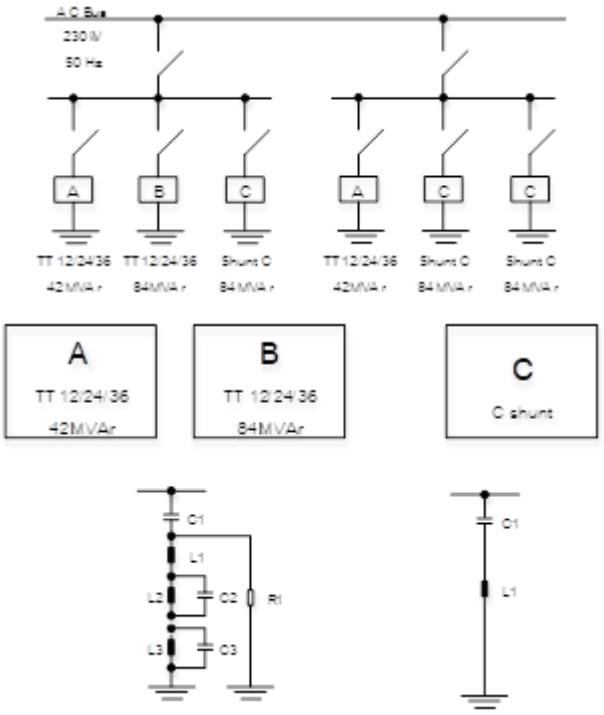


Figure. 2 Schematic Arrangement Filters / Shunts

Type	Description
A	230 kV Filter sub-bank:Triple tuned 12/24/36 harmonic,42 MVAr
B	230 kV Filter sub-bank:Triple tuned 12/24/36 harmonic,84 MVAr
C	230 kV Capacitor sub-bank,84 MVAr

38. The ratings of capacitor units, resistors, and reactors are given in Tables 5-9 as follow:

Filter Bank	TT 12/24/36 42 Mvar		
	C1	C2	C3
Total Voltage(kV)	175.2	38.22	25.55
Total Output(Mvar)	24.54	1.89	1.08
Capacitance(20ºC)(μF)	2.54	4.11	5.29
Capacitance(Operation)(μF)	2.51	4.06	5.23

Table 5: The rating for capacitors (TT Filter 42 Mvar)

Filter Bank	TT 12/24/36 84 Mvar			C-Shunt
	C1	C2	C3	C1
Total Voltage(kV)	175.2	39.5	29.04	175.2
Total Output(Mvar)	49.08	3.64	2.23	49.28
Capacitance(20ºC)(μF)	5.09	7.43	8.44	5.11
Capacitance(Operation)(μF)	5.03	7.34	8.34	5.05

Table 6: The rating for capacitors (TT Filter 84 Mvar and C-Shunt)

Filter Bank	TT 12/24/36 42 Mvar		
	L1	L2	L3
Total Voltage(kV)	11.2	10.2	4.1
Rated Power Frequency Voltage(kV)	0.392	0.299	0.073
Total Output(kVA)	43.1	32.9	8.1
Inductance(mH)	11.35	8.63	2.12
Total Current(A)	134	159.6	176.3

Table 7: The rating for reactor (TT Filter 42 Mvar)

Filter Bank	TT 12/24/36 84 Mvar			C-Shunt
	L1	L2	L3	L1
Total Voltage(kV)	11.4	13.3	4.1	1.24
Rated Power Frequency Voltage(kV)	0.412	0.3	0.094	0.068
Total Output(kVA)	90.7	66.1	20.7	16.4
Inductance(mH)	5.97	4.33	1.36	0.91
Total Current(A)	281.6	380	406.6	245.1

Table 8: The rating for reactor (TT Filter 84 Mvar and C-Shunt)

Filter Bank	TT 12/24/36 42 Mvar	TT 12/24/36 84 Mvar
	R1	R2
Resistance(Ω)	320	200
Total Losses(kW)	97.2	169.6

Table 9: The rating for resistor(TT Filter 42 and 84 Mvar)

39. The maximum harmonic currents in A (RMS) at the 230kV AC bus at different load levels from 10% to 120% of the rated DC current are listed in Tables 10-13.

N	10%	25%	40%	55%	70%	85%	100%	120%	Imax
1	78.63	198.57	320.91	445.85	572.99	702.49	825.72	989.3	989.3
2	0.03	0.06	0.09	0.12	0.15	0.18	0.19	0.2	0.2
3	1.58	1.61	1.66	1.74	1.85	2	2.2	2.6	2.6
4	0.03	0.06	0.09	0.12	0.15	0.18	0.19	0.18	0.19
5	0.01	0.03	0.07	0.12	0.18	0.25	0.34	0.48	0.48
6	0.04	0.09	0.13	0.17	0.2	0.24	0.24	0.23	0.24
7	0.01	0.03	0.07	0.13	0.19	0.27	0.36	0.48	0.48
8	0.03	0.06	0.09	0.12	0.14	0.16	0.16	0.14	0.16
9	0.19	0.19	0.2	0.26	0.35	0.46	0.59	0.78	0.78
10	0.03	0.06	0.09	0.11	0.13	0.14	0.14	0.11	0.14
11	10.66	19.21	27.7	35.46	42.22	47.96	49.44	47.1	49.44
12	0.07	0.16	0.24	0.29	0.33	0.36	0.33	0.23	0.36
13	10.13	16.43	23.01	28.74	33.21	36.47	35.4	30.37	36.47
14	0.05	0.12	0.16	0.2	0.22	0.23	0.19	0.11	0.23
15	0.24	0.25	0.31	0.43	0.57	0.73	0.87	1	1
16	0.05	0.11	0.15	0.18	0.19	0.19	0.14	0.05	0.19
17	0.01	0.06	0.13	0.21	0.29	0.37	0.42	0.46	0.46
18	0.07	0.15	0.2	0.23	0.23	0.21	0.12	0.01	0.23
19	0.01	0.06	0.13	0.2	0.27	0.33	0.36	0.38	0.38
20	0.05	0.11	0.14	0.15	0.14	0.11	0.05	0.04	0.15
21	0.1	0.13	0.23	0.34	0.44	0.53	0.56	0.6	0.6
22	0.05	0.10	0.13	0.13	0.11	0.08	0.01	0.07	0.13
23	3.85	7.25	9.11	9.36	8.23	6.37	4.64	8.64	9.36
24	0.07	0.14	0.17	0.15	0.12	0.06	0.04	0.12	0.17
25	3.57	6.52	7.82	7.51	6.06	4.56	5.44	8.98	8.98
26	0.05	0.10	0.11	0.1	0.06	0.02	0.06	0.09	0.11
27	0.07	0.12	0.2	0.27	0.32	0.36	0.38	0.5	0.5
28	0.05	0.09	0.10	0.07	0.03	0.02	0.07	0.08	0.10
29	0.01	0.05	0.10	0.13	0.16	0.17	0.20	0.27	0.27
30	0.07	0.12	0.12	0.07	0.01	0.06	0.12	0.09	0.12
31	0.01	0.05	0.09	0.12	0.14	0.16	0.19	0.25	0.25
32	0.05	0.08	0.07	0.04	0.01	0.06	0.09	0.05	0.09
33	0.05	0.10	0.16	0.20	0.23	0.27	0.34	0.42	0.42
34	0.05	0.08	0.06	0.02	0.03	0.07	0.08	0.02	0.08
35	2.22	3.58	3	1.65	2.44	4.1	4.64	2.4	4.64
36	0.07	0.11	0.08	0.01	0.06	0.11	0.10	0	0.11
37	2.1	3.24	2.47	1.51	2.88	4.28	4.02	2.44	4.28
38	0.05	0.07	0.05	0.01	0.06	0.09	0.07	0.02	0.09
39	0.05	0.09	0.13	0.15	0.18	0.24	0.30	0.33	0.33
40	0.05	0.07	0.03	0.02	0.06	0.08	0.04	0.04	0.08
41	0.01	0.04	0.07	0.08	0.10	0.13	0.16	0.18	0.18
42	0.07	0.09	0.03	0.04	0.09	0.10	0.03	0.07	0.1
43	0.01	0.04	0.06	0.07	0.10	0.13	0.15	0.17	0.17
44	0.05	0.06	0.01	0.04	0.07	0.06	0.01	0.05	0.07
45	0.04	0.08	0.11	0.13	0.17	0.23	0.25	0.3	0.3
46	0.04	0.05	0.01	0.04	0.06	0.05	0.01	0.05	0.06
47	1.04	1.21	0.51	1.31	1.75	1.4	0.96	1.66	1.75
48	0.06	0.07	0.01	0.07	0.09	0.06	0.04	0.06	0.09
49	0.96	1.05	0.34	1.36	1.61	1.02	1.17	1.38	1.61
50	0.05	0.05	0.01	0.06	0.06	0.03	0.04	0.04	0.06

Table 10: Maximum ac harmonic currents at different loads in Arms, - at 230kV ac bus, Rectifier operation, 100% dc voltage (in term of percentage of rated dc current)

N	10%	25%	40%	55%	70%	85%	100%	120%	Imax
1	80.32	200.72	324.44	445.91	573.23	695.6	826.45	990.68	990.68
2	0.03	0.06	0.10	0.13	0.16	0.19	0.22	0.25	0.25
3	1.64	1.64	1.69	1.73	1.82	1.94	2.12	2.43	2.43
4	0.03	0.06	0.10	0.13	0.16	0.18	0.21	0.24	0.24
5	0	0.03	0.06	0.11	0.17	0.24	0.31	0.44	0.44
6	0.04	0.09	0.14	0.18	0.22	0.25	0.29	0.31	0.31
7	0	0.03	0.07	0.12	0.18	0.25	0.33	0.45	0.45
8	0.03	0.06	0.10	0.12	0.15	0.17	0.19	0.20	0.20
9	0.17	0.17	0.17	0.24	0.32	0.44	0.56	0.75	0.75
10	0.03	0.06	0.09	0.12	0.14	0.15	0.17	0.17	0.17
11	10.98	19.27	28.21	36.1	43.78	48.84	54.76	57.28	57.28
12	0.08	0.18	0.26	0.32	0.37	0.39	0.42	0.39	0.42
13	9.78	16.45	23.63	29.48	34.9	37.57	41.08	40.39	41.08
14	0.05	0.12	0.18	0.22	0.25	0.25	0.27	0.23	0.27
15	0.22	0.22	0.27	0.4	0.55	0.72	0.88	1.06	1.06
16	0.05	0.12	0.17	0.20	0.22	0.21	0.21	0.15	0.22
17	0.01	0.06	0.12	0.20	0.29	0.37	0.44	0.51	0.51
18	0.08	0.17	0.23	0.26	0.28	0.24	0.22	0.12	0.28
19	0.01	0.05	0.12	0.19	0.27	0.33	0.39	0.43	0.43
20	0.05	0.12	0.16	0.17	0.17	0.14	0.12	0.04	0.17
21	0.08	0.12	0.22	0.33	0.45	0.53	0.61	0.65	0.65
22	0.05	0.11	0.15	0.15	0.14	0.10	0.07	0.01	0.15
23	3.54	7.6	10.45	10.77	10.51	7.65	5.6	4.71	10.77
24	0.08	0.16	0.20	0.19	0.17	0.09	0.04	0.08	0.20
25	3.27	6.87	9.19	8.96	8.27	5.41	3.84	6.39	9.19
26	0.05	0.11	0.14	0.12	0.10	0.04	0.01	0.09	0.14
27	0.07	0.11	0.19	0.27	0.34	0.37	0.40	0.45	0.45
28	0.05	0.10	0.13	0.10	0.07	0	0.04	0.10	0.13
29	0.01	0.05	0.10	0.14	0.17	0.18	0.20	0.25	0.25
30	0.07	0.14	0.16	0.11	0.06	0.04	0.09	0.15	0.16
31	0.01	0.05	0.09	0.13	0.15	0.16	0.18	0.24	0.24
32	0.05	0.10	0.11	0.06	0.02	0.05	0.08	0.11	0.11
33	0.05	0.10	0.17	0.21	0.24	0.26	0.31	0.42	0.42
34	0.05	0.09	0.09	0.05	0.01	0.06	0.09	0.09	0.09
35	2.21	4.16	4.35	2.35	1.29	3.59	5.14	5.03	5.14
36	0.07	0.13	0.12	0.05	0.03	0.10	0.014	0.11	0.14
37	2.09	3.83	3.79	1.79	1.76	3.96	5.13	4.1	5.13
38	0.05	0.09	0.08	0.02	0.03	0.08	0.10	0.07	0.10
39	0.05	0.09	0.14	0.16	0.18	0.23	0.29	0.36	0.36
40	0.05	0.08	0.07	0	0.05	0.08	0.09	0.04	0.09
41	0.01	0.04	0.07	0.08	0.10	0.13	0.16	0.19	0.19
42	0.07	0.11	0.08	0.02	0.08	0.11	0.11	0.01	0.11
43	0.01	0.04	0.07	0.07	0.09	0.12	0.15	0.17	0.17
44	0.05	0.07	0.05	0.02	0.07	0.08	0.06	0.02	0.08
45	0.04	0.08	0.12	0.13	0.16	0.22	0.27	0.29	0.29
46	0.05	0.07	0.04	0.03	0.07	0.07	0.05	0.03	0.07
47	1.13	1.61	0.84	0.97	1.87	1.78	1.11	1.44	1.87
48	0.07	0.09	0.04	0.06	0.10	0.08	0.04	0.07	0.10
49	1.04	1.42	0.60	1.11	1.82	1.43	0.74	1.68	1.82
50	0.05	0.06	0.02	0.05	0.08	0.05	0.02	0.07	0.08

Table 11: Maximum ac harmonic currents at different loads in Arms, - at 230kV ac bus, Inverter operation, 100% dc voltage (in term of percentage of rated dc current)

N	10%	25%	40%	55%	70%	85%	100%	Imax
1	74.54	186.28	298	409.76	521.58	633.51	744.51	744.51
2	0.03	0.07	0.1	0.14	0.17	0.21	0.24	0.24
3	1.42	1.42	1.42	1.44	1.47	1.54	1.64	1.64
4	0.03	0.06	0.1	0.14	0.17	0.21	0.24	0.24
5	0	0.01	0.04	0.07	0.11	0.16	0.22	0.22
6	0.04	0.09	0.14	0.19	0.24	0.29	0.33	0.33
7	0	0.02	0.04	0.07	0.12	0.17	0.23	0.23
8	0.03	0.06	0.1	0.14	0.17	0.20	0.22	0.22
9	0.17	0.17	0.18	0.20	0.25	0.32	0.41	0.41
10	0.03	0.06	0.1	0.13	0.16	0.19	0.21	0.21
11	17.99	23.35	30.63	38.33	45.76	52.56	58.33	58.33
12	0.07	0.18	0.28	0.37	0.45	0.52	0.57	0.57
13	18.97	22.51	27.65	33.24	38.59	43.3	46.95	46.95
14	0.05	0.13	0.20	0.26	0.32	0.36	0.38	0.38
15	0.22	0.22	0.24	0.31	0.42	0.56	0.71	0.71
16	0.05	0.13	0.20	0.25	0.30	0.33	0.34	0.34
17	0	0.03	0.07	0.14	0.21	0.29	0.37	0.37
18	0.07	0.18	0.27	0.35	0.40	0.43	0.43	0.43
19	0	0.03	0.07	0.13	0.20	0.28	0.35	0.35
20	0.05	0.13	0.19	0.24	0.27	0.28	0.28	0.28
21	0.10	0.11	0.15	0.24	0.35	0.47	0.58	0.58
22	0.05	0.12	0.18	0.23	0.25	0.25	0.23	0.25
23	5.66	8.82	12.08	14.57	15.94	16.02	14.72	16.02
24	0.07	0.18	0.26	0.31	0.34	0.33	0.29	0.34
25	5.55	8.25	11.04	13.04	13.87	13.41	11.6	13.87
26	0.05	0.12	0.18	0.22	0.23	0.22	0.18	0.23
27	0.08	0.08	0.14	0.22	0.31	0.39	0.45	0.45
28	0.05	0.12	0.18	0.20	0.21	0.18	0.13	0.21
29	0	0.03	0.07	0.12	0.17	0.20	0.23	0.23
30	0.07	0.17	0.24	0.27	0.26	0.21	0.13	0.27
31	0	0.03	0.07	0.11	0.16	0.19	0.20	0.20
32	0.05	0.12	0.17	0.18	0.17	0.13	0.06	0.18
33	0.04	0.07	0.13	0.20	0.27	0.31	0.33	0.33
34	0.05	0.12	0.16	0.17	0.15	0.10	0.04	0.17
35	3.02	5.12	6.63	6.96	6.02	4.07	2.08	6.96
36	0.07	0.17	0.22	0.23	0.19	0.11	0	0.23
37	2.94	4.84	6.15	6.26	5.10	3.13	2.18	6.26
38	0.05	0.12	0.16	0.16	0.12	0.06	0.03	0.16
39	0.04	0.06	0.12	0.18	0.22	0.23	0.24	0.24
40	0.05	0.11	0.15	0.14	0.10	0.03	0.05	0.15
41	0	0.03	0.06	0.09	0.11	0.12	0.12	0.12
42	0.07	0.16	0.20	0.18	0.11	0.01	0.10	0.20
43	0	0.03	0.06	0.09	0.11	0.11	0.12	0.12
44	0.05	0.11	0.14	0.12	0.06	0.02	0.09	0.14
45	0.03	0.06	0.11	0.15	0.18	0.18	0.20	0.20
46	0.05	0.11	0.13	0.10	0.05	0.03	0.09	0.13
47	1.41	2.4	2.73	2.2	1.11	1.21	2.24	2.73
48	0.07	0.15	0.17	0.13	0.04	0.07	0.14	0.17
49	1.03	2.19	2.5	1.82	0.45	1.25	2.32	2.5
50	0.05	0.11	0.12	0.09	0.02	0.06	0.11	0.12

Table 12: Maximum ac harmonic currents at different loads in Arms – at 230kV ac bus, Rectifier operation, 70% dc voltage (in term of percentage of rated dc current)

N	10%	25%	40%	55%	70%	85%	100%	Imax
1	74.53	186.46	298.1	409.59	521.77	633.14	744.38	744.38
2	0.03	0.07	0.10	0.14	0.18	0.21	0.24	0.24
3	1.41	1.42	1.42	1.43	1.47	1.53	1.62	1.62
4	0.03	0.06	0.10	0.14	0.17	0.21	0.24	0.24
5	0	0.01	0.04	0.07	0.11	0.15	0.21	0.21
6	0.04	0.09	0.14	0.19	0.24	0.29	0.33	0.33
7	0	0.02	0.04	0.07	0.11	0.16	0.22	0.22
8	0.03	0.06	0.10	0.14	0.17	0.20	0.23	0.23
9	0.17	0.17	0.17	0.19	0.24	0.31	0.40	0.40
10	0.03	0.06	0.10	0.13	0.16	0.19	0.21	0.21
11	17.98	23.32	30.49	38.10	45.58	52.46	58.6	58.6
12	0.07	0.18	0.28	0.37	0.46	0.52	0.58	0.58
13	18.94	22.31	27.24	32.73	38.17	43.08	47.2	47.2
14	0.05	0.13	0.20	0.26	0.32	0.36	0.40	0.40
15	0.22	0.22	0.24	0.30	0.40	0.54	0.69	0.69
16	0.05	0.13	0.20	0.25	0.30	0.34	0.36	0.36
17	0	0.03	0.07	0.13	0.21	0.29	0.37	0.37
18	0.07	0.18	0.27	0.35	0.41	0.44	0.45	0.45
19	0	0.03	0.07	0.13	0.20	0.27	0.35	0.35
20	0.05	0.13	0.19	0.24	0.28	0.29	0.29	0.29
21	0.10	0.10	0.14	0.24	0.35	0.47	0.58	0.58
22	0.05	0.12	0.19	0.23	0.26	0.26	0.25	0.26
23	5.63	8.73	11.98	14.58	16.24	16.68	15.89	16.68
24	0.07	0.18	0.26	0.32	0.35	0.34	0.31	0.35
25	5.51	8.12	10.91	13.04	14.19	14.11	12.87	14.19
26	0.05	0.13	0.18	0.22	0.24	0.23	0.20	0.24
27	0.06	0.08	0.14	0.22	0.31	0.39	0.45	0.45
28	0.05	0.12	0.18	0.21	0.21	0.19	0.15	0.21
29	0	0.03	0.07	0.12	0.16	0.20	0.23	0.23
30	0.07	0.17	0.24	0.28	0.27	0.23	0.16	0.28
31	0	0.03	0.07	0.11	0.16	0.19	0.21	0.21
32	0.05	0.12	0.17	0.19	0.18	0.14	0.08	0.19
33	0.04	0.07	0.12	0.20	0.27	0.31	0.34	0.34
34	0.05	0.12	0.16	0.17	0.16	0.11	0.05	0.17
35	3	5.06	6.64	7.15	6.47	4.64	2.21	7.15
36	0.07	0.17	0.22	0.23	0.20	0.13	0.03	0.23
37	2.91	4.78	6.16	6.45	5.59	3.69	1.75	6.45
38	0.05	0.12	0.16	0.16	0.13	0.07	0.01	0.16
39	0.04	0.06	0.12	0.18	0.22	0.24	0.24	0.24
40	0.05	0.12	0.15	0.14	0.11	0.04	0.04	0.15
41	0	0.03	0.06	0.09	0.12	0.12	0.13	0.13
42	0.07	0.16	0.20	0.18	0.12	0.02	0.08	0.20
43	0	0.03	0.06	0.09	0.11	0.11	0.12	0.12
44	0.05	0.11	0.14	0.12	0.07	0.01	0.08	0.14
45	0.03	0.06	0.11	0.15	0.18	0.19	0.20	0.20
46	0.05	0.11	0.13	0.11	0.06	0.02	0.08	0.13
47	1.39	2.38	2.79	2.34	1.23	0.83	2.06	2.79
48	0.07	0.15	0.18	0.14	0.05	0.05	0.13	0.18
49	1.03	2.21	2.54	1.93	0.64	1.04	2.21	2.54
50	0.05	0.11	0.13	0.09	0.03	0.05	0.11	0.13

Table 13 : Maximum ac harmonic currents at different loads in Arms – at 230kV ac bus, Inverter operation, 70% dc voltage (in term of percentage of rated dc current)

40. The 6 HVDC filter switching combination corresponding to different levels of the DC current, HVDC operating voltage and mode shown in Table 14.

Filter Combination	Normal current limit I_{dc} at Normal DC Voltage		Normal current limit I_{dc} at 70% DC Voltage	
	Rectifier	Inverter	Rectifier	Inverter
1A 0B 0C or 0A 1B 0C	< 350 A	< 350 A	< 215 A	< 215 A
1A 0B 0C	350 A	350 A	215 A	215 A
2A 0B 0C	1050 A	900 A	700 A	680 A
0A 1B 0C	1050 A	1050 A	700 A	680 A
2A 0B 1C	1250 A	1200 A	810 A	785 A
2A 0B 2C	1650 A	1650 A	900 A	850 A
2A 0B 3C	1650 A	1650 A	1000 A	1000 A
1A 1B 0C	1650 A	1650 A	1000 A	1000 A

Table 14: DC current limits for different filter combinations

41. There are 3 sets of 230kV, 72Mvar mechanically-switched capacitor banks (MSCs) at Khlong Ngae Substation. Their description of the existing MSCs is summarized in Table 15. The configuration is shown in Figure 3.

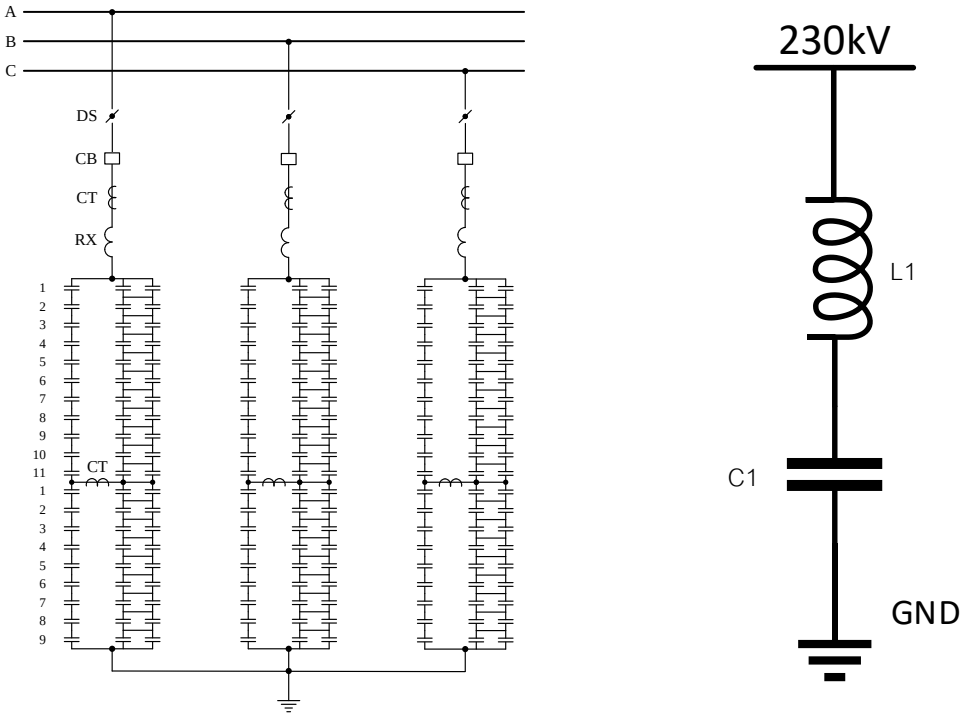


Figure 3: Configuration of 230 kV 72 Mvar

Description	Rated
Inrush Current Limiting Reactor(L1)	
- Rated current (A)	250
- Rated Power (Mvar)	0.02
- Inductance (mH)	1
Capacitors (C1)	
- Rated voltage (kV)	239.2
- Rated Power (Mvar)	72
Capacitance (μF)	4.011

Table 15 : The component and rating of 230 kV mechanically-switched capacitor banks

Note: The maximum voltage for the capacitor banks and reactor of 72 Mvar MSCs are 110% rated rms voltage and 120% of rated peak voltage.

42. The existing HVDC AC filter banks and MSCs at Khlong Ngae Substation shall be considered in the STATCOM design study. The study shall consider all relevant HVDC operation modes and conditions including the implemented stability functions and also detuning effect. The study shall examine and clearly show that the steady-state and transient stresses on the existing components of the HVDC AC filter banks and MSCs do not exceed their ratings or posed any damage when STATCOM is operated at 230kV bus Khlong Ngae substation. The Contractor shall show the restricted operation case of the stress study on the existing components of the HVDC AC filter banks and MSCs.

    The stresses study of existing equipment (HVDC AC filters and three sets of 230kV MSCs) shall be submitted with the proposal on the Bidding stage. In case that, the HVDC AC-filter banks and MSCs at the substation are over stressed and damaged by any operation combination of HVDC, STATCOM and MSCs. Contractor shall show the operating condition/strategy or restricted operation in the stress study or calculation.

43. For the safe design, the Contractor shall consider both harmonic current injection from the HVDC at all operating points and the background harmonic when determining the component rating of the STATCOM. Furthermore, the contractor shall consider the background harmonic voltage source, the harmonic current from HVDC at all operating points and modes of the HVDC and the harmonic current from STATCOM in the calculation of the stresses study which will affect to the HVDC AC-filter banks and MSCs (existing equipment) at the Khlong Ngae substation. Note that, background harmonic in the Table 2, HVDC was operated at the minimum power 30 MW with 42 Mvar TT filter switched on.

GROUNDING

44. Design, supply and installation of the grounding system, grounding equipment and miscellaneous hardware of the following:
    - 230kV Air insulated substation (AIS)
    - 33kV system and 33kV cable system
    - Equipment/Cubicle/Structure grounding within the existing control building and relay building

- STATCOM area

45. The ground grid conductors spacing under the building area shall be the same as the Switchyard.

46. The contractor shall evaluate the price of ground grid based on the specified design for price reference as below:
    - The maximum ground grid conductor spacing (D_0) shall be 10 meters.
    - The number of ground rod shall be 100 pieces.

47. The Contractor shall conduct the soil resistivity measurement and the result shall be submitted to EGAT for approval.

48. The Contractor shall design a grounding grid based on the measured soil resistivity by manual calculation using the equations in IEEE-80 standard and shall submit the calculation to EGAT for Approval at bidding stage. The parameters for grounding system calculation shall be used as follows;
    - The symmetrical fault current (rms) = 50 kA
    - Time duration of fault =1 sec
    - The fault current division factor (Sf) shall be equal to one (1), that is, the fault current only dissipates in the Khlong Ngae Substation's grounding system and is not divided to other substations.
    - X/R ratio = 20

    These parameters shall be used for determine the size of grounding conductor for the substation grounding system. However, the **2 x 4/0 AWG** bare copper wires shall be used for ground grid and for grounding of all equipment. In addition, If the ground conductor spacing calculated with manual method (D_1) is less than the grounding conductor spacing for reference (D_0), the Contractor shall design a grounding grid by using the software. The certification of software shall be acceptable for commercial use.

49. The Contractor shall connect the grounding system of the STATCOM to the existing grounding system of substation.

50. Each supporting steel structure shall provide a 1.60 x 1.60 m. square loop of 4/0 AWG. Conductors around its foundation.

51. In the area where grounding conductors are located within the magnetic clearance of some equipment, the grounding system shall be designed and installed without having a closed loop. The Contractor shall show the magnetic field plot of the reactor in the grounding system drawing.

52. All substation metal parts such as structure, equipment, cable trays in STATCOM station, and fence of the STATCOM area shall be connected to the grounding system by exothermic connection.

53. The design of the grounding system for the STATCOM building shall follow the recommendations made by the STATCOM manufacturer.

LIGHTNING PROTECTION

54. Design, supply, and installation of the substation lightning protection system completed

with all related equipment including lightning protection wires or masts. This includes proper system insulation coordination, overhead ground wire, and surge arresters. 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 following values shall be used in the design:

- BIL of 900kV for 230kV substation
- BIL rating of the STATCOM equipment for the STATCOM area

55. For the design of lightning protection system for the STATCOM building the lightning protection level (LPL) shall be used level 1 for calculation and the overhead ground wire is not permitted. Air terminal rods installed at the roof shall be used instead. The contractor shall provide the aluminum test boxes for STATCOM building.

56. Lightning protection system shall be designed to meet IEC, NEMA and E.I.T. standards or internationally-accepted standards.

STATION SERVICE

57. Design, supply, and installation of the station service system complete with integral accessories required for providing a complete operation of the STATCOM system. The abnormal condition which occurs from the design and installation of the station service system for example ferroresonance etc. shall be responsible by Contractor. The station service system shall mainly consist of the following:

57.1 XXX kVA, 33,000-400/230 V station service transformers (KW3A)

57.2 XXX kVA, 33,000-400/230 V station service transformers (KW4A)

57.3 Automatic Transfer switch Board (ATS)

- The drawing No.SE-ATS-7-03-01-01 shall be used for reference only. The contractor shall be redesign all circuit breaker ampere-trip to meet with STATCOM load required.
- Design, supply, and installation of Kilowatt-Hour meter 3-phase, 4-wire, 50Hz, flush-mounted cyclo register type, 3 current element, for CT ratio XXX:5, $400/\sqrt{3}:115\sqrt{3}$, and complete with maximum demand, integrating period 30 minute, maximum demand scale 0-XXX kW LANDIS and GYR type.

57.4 33kV drop-out fuse

57.5 33kV Load break switch

57.6 600V, XXX A Safety switch

57.7 33kV Equipment, AC & DC distribution board, stationary batteries, battery chargers, power cables, and all related Equipment required for the complete operation.

57.8 Modification the existing of 33kV system that connected from tertiary winding of Power Transformer (KT4A & KT5A) for supplying the power to station service transformer (KW3A & KW4A).

58. 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 and emergency lighting for at least 3 hours as shown in figure 4, if normal station service fails. 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 feeder as shown on the attached Bidding Document Drawing. The calculation shall be submitted to EGAT for approval.

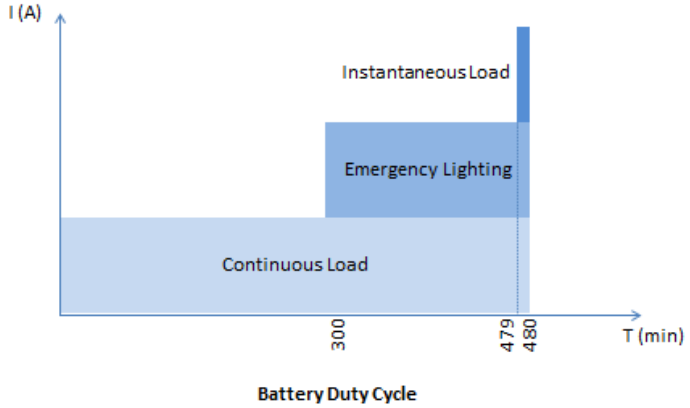


Figure 4: Battery Duty Cycle

59. Design, supply, and installation of the UPS for backup power. The size of the UPS shall be designed by the Contractor to be capable of supplying power to the STATCOM cooling system and other essential load for the STATCOM operation for at least 3 minutes. The UPS shall be located in the electrical room. If the battery of the UPS cannot be contained in the same enclosure, the battery of UPS shall be installed in the battery room.

FACILITY SYSTEM

60. The STATCOM building shall consist of control room, electrical room, meeting room (minimum size of 3m x 5m), battery room, valve and pump room, storage room, inert gas room, toilet room, and other rooms if necessary.

61. The valve room and pump room shall have the observe windows. The observe windows shall be designed by the Contractor with the minimum size of 1m x 1m. All equipment within the valve room and pump room should be clearly seen via the observe windows.

62. The valve room and pump room are within the same room. They are separated by wire mesh fences. The entrance of the valve room and pump room shall be isolated.

63. Design, supply, and installation of electrical system, air ventilation system, air conditioning system, lighting system, and fire alarm system for the STATCOM Building. Recommendations for the aforesaid systems are as follows:

63.1 All cable wiring systems shall conform to NEC and IEC standards or other internationally accepted standards.

63.2 The lamps for the lighting system of the STATCOM building 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. The required intensity of the lighting installation shall be as Table 16:

AREA	LUX	REMARK
Around STATCOM building	50	weatherproof type
Control room	500	-
Meeting room	500	-
Electrical room	300	-
Battery room	300	Explosion proof type
Valve and pump room	300	Explosion proof type
Storage room	200	-
Inert gas room	200	-
Toilet room	200	-

Table 16: The intensity requirements for STATCOM building

63.3 The following areas of the STATCOM control building shall be with the emergency lighting:

- Control room
- Electrical room
- Battery room
- Stairway
- All exits

Emergency lighting system shall be installed at the STATCOM building in case of normal station service fails. The said emergency lighting system shall be activated and capable of generating illumination level of at least 150 lux for at least 3 hours.

63.4 As for the air ventilation system, the Contractor shall design and install the air ventilation system to serve the following areas:

- Battery room
- Valve & pump room
- Meeting Room
- Control Room
- Electrical Room
- Storage Room
- Toilet Room
- Inert gas room

Only the battery room shall be ventilated 24 hours a day continuously by 2 (two) categories of the explosion-proof exhaust fans operating alternately.

63.5 As for the air conditioning system, the Contractor shall design and install the air conditioning system to serve the following areas:

- Control Room
- Electrical Room
- Valve & Pump Room

- Meeting Room

The temperature inside the room shall not exceed 25ºC. The air conditioning system in the control room, the electrical room, and the valve & pump room shall operate 24 hours a day continuously and consist of 2 (two) categories of air conditioners for alternate operation.

63.6 As for the fire protection system, the Contractor shall design the fire protection system which mainly consists of a fire alarm control panel, smoke detectors for all rooms and under the raised floor, optic beam smoke detectors, heat detectors, annunciator, fire exit signs, line-typed heat detectors, and other related accessories required for a complete operation. The fire protection system shall conform to NEPA or other internationally accepted standards. A summary of the type and quantity of fire extinguishers required for the specified areas are given in the Table 17.

Area	Fire Extinguisher	
	Dry	Carbon
Control Room	-	4
Electrical Room	-	2
Valve & Pump Room	-	4
Storage Room	2	-
Around the building	2	-

Table 17 : The type and quantity of fire extinguishers for STATCOM building

63.7 As for the indoor electrical system and communication system, the Contractor shall use standardized and cutting-edge equipment. The lighting fixture and installation detail shall conform to SE-FX-4-01. The indoor electrical system and communication system shall serve the following areas:

AREA	Receptacle (QTY)		duplex RJ45 outlet (QTY)	
	Duplex	Floor	FOR LAN	FOR
Control Room	6	4	1	1
Meeting Room	2	-	1	1
Electrical Room	2	-	-	1
Valve & Pump Room	3	-	1	1
Storage Room	2	-	-	-
Inert gas Room	2	-	-	-

Table 18: The quantity of receptacle and outlet for STATCOM building

63.8 All steel accessories e.g. lip-channel, conduit, conduit fittings, conduit accessories, box and cover shall be hot-dip galvanized.

63.9 Inverter for emergency lighting in the STATCOM building shall meet the requirement as shown in Table 19. Contractor shall be responsible for inverter sizing calculation and the calculation shall be submitted to EGAT for approval.

No.	Description	Requirement data	Unit	No.	Description	Requirement data	Unit
1	Environmental Condition			6	Control button		
	1.1 Minimum ambient temperature	0	Celsius		6.1 Inverter START and STOP	YES	
	1.2 Maximum ambient temperature	40	Celsius		6.2 Acknowledge alarm silent	YES	
	1.3 Relative Humidity	0-95	%		6.3 Lamp test	YES	
	1.4 Tropicalization	YES	-				
	1.5 Altitude	<1000	meters	7	Measurement scale 90 degree		
					7.1 AC output voltage cls 1.5	YES	
2	Cabinet						
	2.1 Protection Level	IP 20		8	Protection		
	2.2 Mounting	Removable			8.1 Overload shutdown	YES	
	2.3 Epoxy painting color	RAL7032			8.2 Low DC voltage shutdown (<105 V)	YES	
	2.4 Convection ventilation	Forced air			8.3 AC output fuse to prevent short circuit current and overload	YES	
	2.5 Steel sheet thickness	1.5	mm.		8.4 Overload temperature shut down	YES	
					8.5 Thermistor fan controlled (Inverter will shut down when temperature exceed 70 Celsius)	YES	
3	Main supply Voltage						
	3.1 Nominal Voltage	125	V.		8.6 DC circuit breaker	YES	
	3.2 Voltage variation	100-150	V.		8.7 AC circuit breaker	YES	
	3.3 Permissible ripple voltage on DC	< 5	% Vp-p		8.8 DC input fuse to prevent short circuit current and overload	YES	
	3.4 Self-precharge	YES					
				9	Monitor		
4	Output AC Voltage				9.1 Input DC voltmeter	YES	
	4.1 Nominal voltage	220	V.		9.2 Output AC voltmeter	YES	
	4.2 Supply system	1 ph+N					
	4.3 Static voltage regulation at 0-100% load variation and power factor 1.0	+/- 2	%	10	Alarm and LED lamp status Indicator		
	4.4 Dynamic voltage regulation -At AC input fluctuation +/- 10 %	+/- 5	%		10.1 Inverter ON/OFF	YES	
					10.2 DC input status	YES	
	4.5 harmonic distortion	< 5	% THD		10.3 Load on inverter	YES	
	4.6 Output frequency	50	Hz		10.4 LED lamp alarm indicators (Alarm noise shall not less than 75 db)	YES	
	4.7 Frequency variable	+/- 0.5	%		10.5 AC output status	YES	
	4.8 Synchronized frequency	+/- 1	Hz		(LED shall blink when Under/Over voltage +/- 10 %)		
5	Output capacity			11	Cable entry		
	5.1 Output continuous capacity	xx	kVA		11.1 DC incoming	YES	
	Note xx : Design by Contractor				11.2 AC Outgoing	YES	
	5.2 Overload capacity 100 % continuous	YES			11.3 Terminal (With removeable cover)	INSIDE	
	5.3 Overload capacity 125 %	10	min				
	5.4 Overload capacity 150 %	1	min				
	5.5 Efficiency at rated load and 1.0 power factor	> 85	%				

Table 19: Requirement of Inverter

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

65. The voltage drop from the safety switch to the AC boards and from the AC boards to the load shall not exceed 2% and 3% respectively.

66. The contractor shall refer to DWG.no. SD-RB-8-01-L and SD-RB-8-0-01-M for guideline to design facility system of the STATCOM building.

67. Removal of all debris, construction materials, and other works as required after the project is completed so that the site is in a clean and orderly condition acceptable to EGAT.

OTHER WORK

68. Test and commissioning of all equipment as required for ensuring the proper functioning of the substation.

69. Modification of Junction box supporting structure (JB003 and JB001) for the installation of outdoor receptacle box (ORB1 & ORB2) and safety switch.

70. The bidders shall submit these documents to EGAT for technical evaluation during Bid proposal review as follows;

    70.1 Basic design report. The following topics shall be included but not limited to;
    - STATCOM basic design data
    - Single line diagram
    - V-I Characteristic (Primary and Secondary side of transformer)
    - Short circuit study
    - Summary of the data of STATCOM components used in the basic design report
    - Operating points summary table
    - Tolerances summary table for each operating points
    - Operating diagram of STATCOM
    - Summary table of normal and degraded modes (if applicable)
    - Fundamental rating study
    - Harmonic study including both harmonic performance and component rating
    - Current and voltage stresses (e.g. overvoltages)
    - Insulation coordination study

    70.2 Drawings
    - Single line diagram (e.g. DWG. NO. KNE-S-1-01-03) showing all components and their ratings
    - General layout of the substation (e.g. DWG.NO KNE-S-7-01-04,02-04,03-04)
    - Layout of the STATCOM area including (service road, cable trench and etc.)
    - Layout of the STATCOM building (clearly showing the dimension and clearance to be checked with EGAT requirements)

    70.3 Noise analysis report

    70.4 Stress on the existing component report
    - Operating restriction shall be shown in this report (if any)
    - See scope of work for details

    The bidders acknowledge that the bidders shall properly design the layout of STATCOM considering engineering practice and the maintenance of STATCOM components, when accessing to and taking component(s) in or out. If found later that it is not appropriate, the bidders shall be responsible for the correction work without additional cost and time.

    The documents and drawings shall be prepared with high quality printing and the paper size shall be suitable for approval by EGAT.

CONTROL AND PROTECTION PART

Schedule 1

Work included in this Contract

1. Design, supply, installation, wiring, test and commissioning of the complete 230 kV control and protection system which comprises the following equipment:
   - Protective relay panel (swing-rack type).
   - GPS receiver & ethernet switch panel.
   - Auxiliary tripping relays and accessories for panel nos. 603R & 604R.
   - Transducers and accessories
   - Miniature circuit breaker for panel no. MP-FRS
   - Related accessory equipment which is required for interfacing between the new equipment and the existing equipment.
   - 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 230 kV control and protection system.
2. Design, modification, wiring, test and commissioning of the existing 230 kV control and protection system which comprises at least the following equipment in order to incorporate the new equipment:
   - Protective relay panels (swing-rack type).
   - Capacitor bank control and protection panels
   - Interposing relay panel.
   - Transducer panel.
   - Marshalling panel for the remote terminal unit.
   - Marshalling panel for the fault recording system.
   - Marshalling panel for control system.
   - Fault recording system panel.
   - Remote terminal unit panels.
   - 400/230 VAC board and 125 VDC power panel.
3. Design of both schematic and wiring diagrams as well as wiring of the additional inputs and outputs to the existing Computerized Control System (CCS), including test and commissioning of the completed CCS.
4. Design of both schematic and wiring diagrams as well as wiring of the additional inputs to the existing Fault Recording System (FRS), including test and commissioning of the completed FRS.
5. The Contractor shall be responsible for providing complete schematic and wiring diagrams of the control and protection system including ACAD files of the said drawings.

6. 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. In addition, the ACAD files of the final drawings shall be submitted.

7. For removal of the unused existing cables, the removed cables shall be neatly reeled and kept in a suitable place recommended by EGAT.

8. The Contractor shall provide the draftsman working at the site during the commissioning stage in order to be in charge of writing the as-built drawings of control and protection system.

Schedule 2

Work included in this Contract

1. Design, supply, installation, wiring, test and commissioning of the complete STATCOM control and protection system which comprises at least the following equipment:
   - STATCOM protection, metering and major control equipment, local control system, remote control system and protection relay panels.
   - A digital fault recording system with its own GPS system and marshalling panel for digital fault recording system.
   - 400/230 VAC, 125 VDC distribution board and 125 VDC power panel.
   - Temperature transducer (T-TDR) for STATCOM building.
   - Interfacing panels installed at the existing control and relay buildings in order to conveniently interface as well as related accessory equipment which is required for interfacing between the STATCOM control and protection system and the existing control and protection system.
   - 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 STATCOM control and protection system.
2. The FRS installed at STATCOM building shall have its own complete GPS system including outdoor antenna as well as GPS receiver and accessories which is used as a reference time base to FRS system.
3. The STATCOM system shall be capable of interfacing to EGAT's SCADA system which consists of local SCADA and remote SCADA. In addition, remote SCADA shall comprise at least National Control Center (NCC), Backup National Control Center (BNCC), Regional Control Center (RCC) and Group Control Center (GCC). However, only one (1) control center shall be active at any one time.
4. A smooth energizing of the STATCOM shall be achieved and shall not affect EGAT's customers or cause any malfunctions to the existing HVDC and nearby power plants. In addition, the proposed STATCOM design shall demonstrate that it fulfills the said requirements.
5. The STATCOM control system shall be designed with the optimized parameters and functions in order to fulfill all conditions under the given short circuit level.
6. The real time status of the STATCOM configuration including the related existing 230 kV configuration shall be shown on both STATCOM local HMI and remote HMI.
7. The Contractor shall be responsible for providing, installing as well as wiring the necessary cables and equipment which are required to fulfill the STATCOM Power Oscillation Damping (POD) function. Moreover, the POD function shall be provided on both STATCOM local HMI and remote HMI, and shall also be enabled/disabled via SCADA.

8. The control coordination between the STATCOM and three (3) sets of the 72 MVAr existing capacitor bank (MSC) at the 230 kV busbar shall at least fulfill the following requirements:

   - The voltage change shall not exceed 2-3% according to IEEE Std 1036.
   - The proposed coordination shall be completely achieved through both the STATCOM local HMI and remote HMI, and shall also be enabled/disabled via SCADA.
   - The proposed coordination shall operate in accordance with the STATCOM output and shall not cause any damages to substation equipment.
   - The proposed coordination shall have two (2) logics by means of two (2) reactive power setting values for both slow and fast responses (delayed time setting) with regard to switch ON and switch OFF MSCs. Moreover, the reactive power setting values shall be recommended by the Contractor.
   - The sequence of MSCs to be switched shall be selectable in order to avoid the capacitor bank limitation. Moreover, the switch counter of each MSC shall be shown on both the STATCOM local HMI and remote HMI.
   - Each MSC shall have the capability to be controlled in manual mode.
   - The interface signals between the STATCOM control system and each MSC shall at least be as follows:

Input signals (from MSC to STATCOM)	Output signals (from STATCOM to MSC)
- MSC status ON - MSC status OFF - MSC available	- ON command - OFF command

   - The control and protection equipment for the existing MSCs shall be modified in order to fulfill the said requirements. The Contractor shall be responsible for providing and installing additional control equipment as well as providing and wiring all interface cables between the existing MSCs and the STATCOM control system.

   The following data are for information:

   - Voltage of each capacitor unit: 6.9 kV
   - Discharged time of each capacitor unit: < 50 V within 5 minutes
   - Rated operating sequence of MSC breaker: O + 0.3s + CO + 15s + CO

   In addition, the design concept of the proposed coordination shall be submitted to EGAT during Bidding stage.

9. The interface signals (both digital inputs and digital outputs) between the STATCOM and the existing HVDC shall be sufficiently provided for control and protection interaction. In addition, the interface signal list shall be submitted to EGAT during Bidding stage.

10. The Contractor shall develop the STATCOM digital model ***with the latest released version of DIgSILENT PowerFactory.*** The said STATCOM digital model shall comprise as follows:

    - The STATCOM model in Root Mean Square (RMS) time domain simulation: this model is at least used for the STATCOM dynamic behavior studies.
    - The STATCOM model in ElectroMagnetic Transients (EMT) time domain simulation: this model is at least used for harmonic studies and the STATCOM dynamic behavior studies during transient phenomena e.g. switching, fault, etc.

    The said STATCOM digital model shall at least include the complete data for the main circuit components, configurations, function block diagrams along with the parameters, input and output variables of each function block along with their scale factors as well as flow charts and logic diagrams of the entire control features. The control and protection functions shall at least be as follows:

    - All control functions which are required for both RMS and EMT investigations.
    - AC undervoltage/overvoltage protection.

    Moreover, the necessary parameters for the said STATCOM control and protection functions to input the STATCOM operating point as well as the necessary parameters for the external grid e.g. short circuit level, nominal voltage, nominal frequency, etc. shall be accessible and adjustable.

    The performance of the said STATCOM digital model for both step test and scenario test shall be verified by comparing to the corresponding Factory Acceptance Test (FAT) results from Real Time Digital Simulator (RTDS) which shall be the responsibility of the Contractor. The said comparison report shall be submitted to EGAT for approval before commissioning. The scenarios which will be provided after the Award of Contract are as follows:

    - For the STATCOM model in RMS time domain simulation, maximum ten (10) scenarios on one (1) AC reduced network which has minimum short circuit level.
    - For the STATCOM model in EMT time domain simulation, maximum ten (10) scenarios on one (1) AC reduced network which has minimum short circuit level.

    Five (5) copies of portable data storage device containing the said final STATCOM digital model and the details of the modified parameters in case there are some improvements during commissioning shall be delivered to EGAT at the completion.

11. The studies of control interaction between STATCOM control system with coordinated MSCs and the existing HVDC shall prove that there is no negative result to EGAT's system. EGAT shall have access to all data necessary for complete understanding of the studies as well as the validity of the results.

Unless otherwise specified, the said control interaction studies shall be done by the offline simulation and shall be studied based on the following existing HVDC model data which will be provided after the Award of Contract:

- HVDC model in PSCAD transient version 4
- HVDC model in PSS/E version 32
- HVDC model design reports of RMS time domain simulations
- Four (4) AC reduced networks in DIgSILENT PowerFactory format.

In case there are different formats between the data used in the studies and the given data, the verification reports shall be done by the Contractor and submitted to EGAT for approval. In addition, maximum three (3) scenarios will be provided after the Award of Contract.

Moreover, the STATCOM voltage reference range of continuous operation as shown on Ratings and Features shall be comprehensively considered in the said control interaction studies.

The study reports shall at least clearly show the following details:

- Study cases.
- All used data such as parameters, equations, standards, tools, and etc.
- Study methods.
- Study results such as interested variables shown in time-domain simulation.
- Conclusion.

The study cases shall include but not be limited to the following case:

- All HVDC sub-bank switching combinations as shown in Table 1 at the minimum short circuit level.
  - Type A: 230 kV filter sub-bank, triple tuned 12/24/36 harmonic, 42 MVAr
  - Type B: 230 kV filter sub-bank, triple tuned 12/24/36 harmonic, 84 MVAr
  - Type C: 230 kV capacitor sub-bank, 84 MVAr

Filter combination	Normal current limits I_{DC} at Normal DC voltage		Normal current limits I_{DC} at 70% DC voltage	
	Rectifier	Inverter	Rectifier	Inverter
1A 0B 0C	350 A	350 A	215 A	215 A
2A 0B 0C	1050 A	900 A	700 A	680 A
0A 1B 0C	1050 A	1050 A	700 A	680 A
2A 0B 1C	1250 A	1200 A	810 A	785 A
2A 0B 2C	1650 A	1650 A	900 A	850 A
2A 0B 3C	1650 A	1650 A	1000 A	1000 A
1A 1B 0C	1650 A	1650 A	1000 A	1000 A

Table 1 : DC current limits for different filter combinations.

This study shall include but not be limited to the following issues:

- Transient overvoltage: this issue shall be divided into two (2) parts; the changes of instantaneous voltage and the changes of root mean square (rms) voltage. The purpose is to examine the voltage stress due to the transient overvoltage on the equipment including both the existing equipment and the STATCOM equipment. The transient overvoltage shall be within practical acceptable range, i.e., not causing equipment damage.

  In case there is damage on the equipment which is caused by the STATCOM interaction, the Contractor shall be responsible for providing the corrective measures in order to mitigate the transient overvoltage imposed on both the existing equipment and the STATCOM equipment.

  On the other hand, in case there is damage on the equipment which is not caused by the STATCOM interaction, the Contractor shall recommend the mitigation and mark as the operating restriction.

- STATCOM output: this issue is to demonstrate that there shall be the proper cooperation among them. The STATCOM with coordinated MSCs shall not cause any restrictions to the HVDC filter combination. This includes determining the necessary parameters such as STATCOM reactive power output, voltage at the point of connection, and etc.

- HVDC Reactive Power Control (RPC) function which consists of reactive power control (Q-mode) and AC voltage control (U-mode).

  This study is to find out the proper setting values of the existing HVDC RPC function which shall allow the STATCOM with coordinated MSCs to operate initially and continuously until they nearly reach the maximum capability. Then, the RPC function will operate for both undervoltage and overvoltage conditions (dynamic performance).

- The following HVDC stability functions:

  - power run-up function
  - power run-back function
  - frequency limit control function

  This study is to ensure that the STATCOM with coordinated MSCs shall not conflict with the HVDC stability functions.

- POD function

  This study is to design the STATCOM POD controller and find out the proper setting values for which the effects of the HVDC Power Swing Damping (PSD) function, the POD controller of other FACTS devices and other power system stabilizer of nearby generators are properly considered. The study shall be conducted for both enabled and disabled HVDC PSD function. The STATCOM POD function and its performance shall be tested and verified using RTDS during FAT. In addition, the maximum ten (10) scenarios per each AC reduced network for the study will be provided after the Award

of Contract.

The concept of all studies including the Contractor's required data shall be submitted to EGAT during Bidding stage. However, the preliminary result of the POD function study shall be submitted to EGAT before FAT. The final results of all studies shall be submitted to EGAT for approval before commissioning.

12. For STATCOM system, the Contractor can follow their own cable identification standard. However, the cables for the following circuits shall be named with additional EGAT subscriptions for safety during maintenance.

    - Q for current circuits
    - V for voltage circuits
    - DC for DC supply circuits
    - AC for AC supply circuits

    In addition, the Contractor's cable identification standard shall be described in the interconnection wiring diagram. For the connection between the existing 230 kV system and the STATCOM system, the cable identification shall follow EGAT standard.

13. The Contractor shall be responsible for providing complete schematic and wiring diagrams of the control and protection system including ACAD files of the said drawings.

14. 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. In addition, the ACAD files of the final drawings shall be submitted.

15. For removal of the unused existing cables, the removed cables shall be neatly reeled and kept in a suitable place recommended by EGAT.

16. The Contractor shall provide the draftsman working at the site during the commissioning stage in order to be in charge of writing the as-built drawings of control and protection system.

Remark :

1. Metering and relaying diagram on drawings nos. KNE-E-1.1 and TP-E-21.1 are used as guideline. The said drawings can be modified by the Contractor. However, they shall be submitted to EGAT for approval.

2. Two (2) cores of the CT QZ12A is supplied by EGAT for the STATCOM control and protection system.

CIVIL AND ARCHITECTURAL PART

Schedule 1

Work included in this Contract

WATER SUPPLY AND FIRE PROTECTION SYSTEM

1. Design and construction of
    1.1 Replace existing fire fighting black steel pipe with HDPE pipe.

CIVIL WORK

2. Design and construction of
    2.1 Steel structure and foundations for Specified equipment and the others not shown in “For Construction drawings” and / or EGAT’s specification.
        2.1.1 XLPE Cable with cable cleat and steel cover.
        2.1.2 Voltage transformer structure foundation.
    2.2 Drainage system for cable trench.
3. Construction of
    3.1 Steel structure foundation.
    3.2 Take-off foundation.
    3.3 Equipment structure foundation with sub trench (if required).
    3.4 Cable trench.
    3.5 Lamp post for fence and access road lighting LED type foundation.
4. The drawings and calculation of all buildings shall be verified with adequate details for intended application and submitted to EGAT for approval.
5. All design works and the fabrication drawings for all steel structures shall be submitted to EGAT for approval.
6. All design, construction and testing shall be in accordance with Specification No.3001 : Civil and Architectural Work.
7. 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.
8. 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.
9. 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.
10. 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.

11. Seismic load test (sonic integrity test) according to ASTM D5882-96 shall be applied to all bored piles (if bored pile type is required).
12. Plate bearing test according to ASTM D1194-94 shall be submitted to EGAT for approval. (if pad type foundation is required).
13. 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.

Schedule 2

Work included in this Contract

ARCHITECTURAL WORK

1. Design and construction of

1.1 Static Synchronous Compensator (STATCOM) Building.

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

1.1.2 RC and/or steel structure for roof.

1.1.3 Fire protection for steel structure shall conform to legal provision, EGAT's specifications and scope of work.

1.1.4 Architecture of the whole building.

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

1.1.6 STATCOM Building shall be designed with reference to Khlong ngae Substation (Dwg.No.KNE-SVS-0-01A 01/05-05/05) But equipment layouts and cable block out shall conform to electrical drawing Dwg.No.KNE-S-2 and Dwg.No.KNE-S-6. Other facilities layouts shall conform to requirements with reference to architectural drawings and scope of work. The floor of STATCOM Building shall be elevated for 2.50 meters from the original ground level.

1.1.7 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.

1.1.8 For exterior surface of the building, there shall be at least 20% of total building area which uses yellow color that represents corporate image of EGAT.

1.1.9 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.
- Hoist crane, for loading area, of lifting capacity not less than 2 metric tons and wireless crane remote control.
- Furniture as specified in Architectural Drawings not included in this contract.
- Signboard on building and room name sign on each room.
- Warning sign provided in accordance with EIT Standard or Quality and Safety Development Division Standard (EGAT).

2. Design and construction of

2.1 Fire protection system for Static Synchronous Compensator (STATCOM) Building.

2.1.1 Static Synchronous Compensator (STATCOM) Building shall consist of Total Flood Clean Agent Fire Suppression System with heat detector, addressable type smoke detector and aspirated smoke detector.

2.1.2 Total Flood Clean Agent Fire Suppression System shall be installed in Thyristor Valve Room, Control Room, Electrical Room, Battery Room and Inert Gas Room.

2.1.3 Fire protection system of Static Synchronous Compensator (STATCOM) 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 an existing Control Building. The installation practice shall be in accordance with the last edition of NFPA 72.

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

2.1.5 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 (If Required);
Zone 4: Battery Room ;
Zone 5: Cable Room (If required) ;
Zone 6: Inert Gas Room ;
Zone 7: Thyristor Valve Room

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.

2.1.6 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 for all cabinet shall be omitted.

(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.

2.1.7 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.
- 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

2.1.8 There shall be one control panel for fire detection system and IG-100 fire suppression system for one building.

2.1.9 There shall be a protective clear polycarbonate cover which can be immediately lifted or opened for all IG-100 manual release stations.

2.2 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.

2.3 Fire protection system for the Transformer: The Foam-water spray system shall comply with the following;

2.3.1 Foam-water spray system: NFPA 13, NFPA16 & NFPA 850

2.3.2 Bladder tank vessel construction standards : Carbon steel to ASME code section VIII for unfired pressure vessel.

2.3.3 Nozzles : NFPA 16 and as per Manufacturer's Recommendation

2.3.4 Detection system : Air Expansion Linear Heat Detection System (LHB)

2.3.5 Equipment for system : FM approved, UL Listings , Vds

2.3.6 Foam-water spray system provided for Transformer shall be designed for a density of 10.2 litre/min-sq.m over the exposed surface at the Transformer.

2.3.7 There shall be one linear heat detector box for each.

2.3.8 There shall be one control panel for fire detection and foam/water spray system which controls all foam/water spray system of all protected transformers.

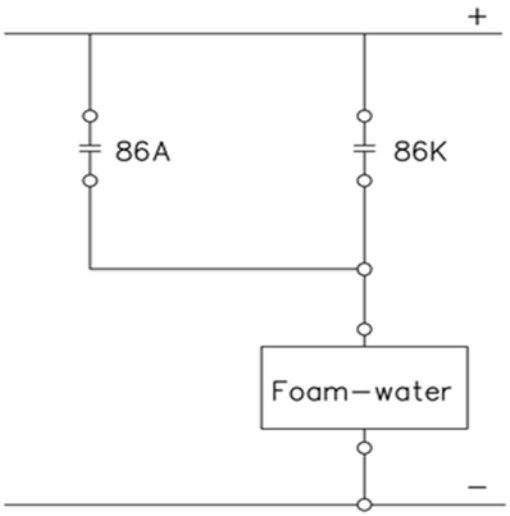
2.4 There shall be one fire alarm system graphic annunciator at each building to enable responding personnel to identify the location of a fire accurately and to indicate the status of emergency equipment or fire safety functions.

2.5 There shall be one graphic annunciator which displays alarm, discharge and trouble signals of fire alarm system of other buildings, (fire pump houses, transformers, shunt reactors) at the building where control room locates.

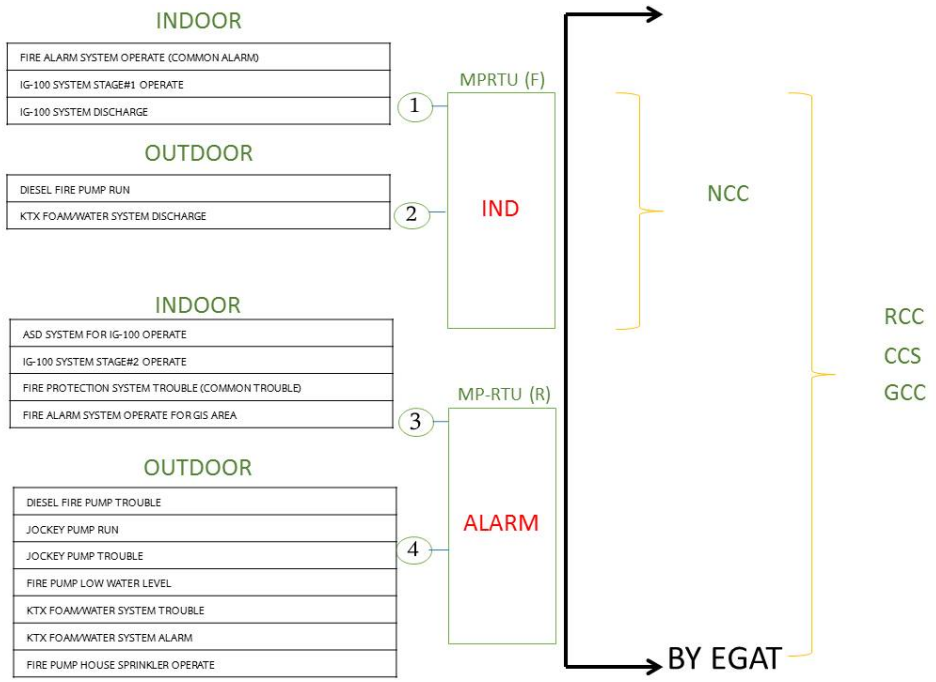
2.6 Fire protection system circuits for buildings and switchyards: notification appliance circuits , and signaling line circuits , shall be class A circuit. Initiating device circuits can be class B circuit.

2.7 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 ;



2.8 For fire protection system monitoring system, contractor shall be responsible for procuring and installing a system comprising of monitoring and automatic alarm equipment; and for connecting the system to EGAT SCADA using Protocol Modbus or other Protocols that EGAT supports via TCP/IP port RJ45. When detectors detect smoke or heat, or equipment abnormality occurs, or fire protection system operates, the monitoring system will send alarm signals and record the even location, event date, start time, end time, and other necessary information. The event log must be appropriate for analyzing the cause of the event. The signals shall be verificable and sent through (CCS) RTU and EGAT SCADA to NCC (National Control Center). The equipment shall be installed in control building or other location specified by EGAT. 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;



2.9 There shall be only one subcontractor engaging in design, supply and installation of Fire Protection System for Buildings and Switchyard.

2.10 Water supply system.

2.11 All building wall openings for fire protection dampers shall be provided with stainless steel louvers and insect screens to install inside of building.

2.12 For portable fire extinguisher as shown on specification 3001- 10.13.3 shall be changed to the new details as followings :

- The fire extinguishers shall be conformed to latest TIS standards. The portable and mobile fire extinguishers shall be carbon dioxide (CO2) conforming to TIS 881 and/or dry chemical conforming to TIS 332 , capacity 10 lbs/set. The fitting accessories shall be provided.

- The portable fire extinguishers shall be installed according to the latest NFPA 10.

2.13 There shall be safety signs for fire extinguisher, manual release station and fire alarm device.

2.14 Contractor shall warranty the fire protection system for one full year starting the date after contract final completion. Fire protection system shall be inspected and maintained for 2 years, not less than 4 times per year and not less than manufacturers' recommendation, at contractor's cost and expense.

2.15 Notwithstanding the expiration of any warranty period described in this contract, the warranty period for any fire protection system or equipment and maintenance period shall be extended by a period equal to the sum of any periods during the warranty period when such system or equipment cannot be used for the purposes for which they were intended or the delays in maintenance, starting from the date EGAT has given contractor notice.

2.16 There shall be a set of computer desk with chair, a set of CPU which suitable for fire protection system software and operate 24 hours a day and a set of 24" LED monitor which show the status of fire protection system in control room in Control Building. One set of laser jet printer shall be provided.

2.17 Consumable materials for fire protection system, for example, filters, liquids, and seals shall be provided according to manufacturer's instructions for a period of two years.

2.18 For all buildings, piping or cable penetrating the wall/floor and block out at wall/floor shall be enclosed with fire stop material. Fire stop material shall be approved by UL Listed/FM Approved and comply with NFPA 80 (Standard for Fire Doors and Other Opening Protectives) and other relevant standards. The installer shall be certified by manufacturer and have experience in installation of material for at least 5 years, of at least 10 projects.

2.19 Fire detection devices in substation shall be as table below.

Protected Area	Detector
1. Control, Relay and Telecommunication Rooms, Thyristor valve room	ASD and SD
2. Under-Raised Floor	ASD and SD
3. Feeder Sections and Switchgear areas	ASD and SD
4. Electrical Room	ASD and SD
5. Battery room	
5.1 Battery room Vented Type	HD
5.2 Battery room Dry Type	HD
6. GIS Area	OBSD
7. Inert Gas Room	SD

8. Other Room such as Shops, Office, Warehouse and Pantry	HD or SD
9.Emergency Diesel generator room or Emergency Generator Set House	HD
10. Transformer, Shunt Reactor	LHD
11.Cable Spreading Rooms and Cable Tunnels	▪ SD when environmental condition is acceptable. ▪ LHD when environmental condition is out of range for SD ▪ ASD in high risk area and required early response.
12. Main Cable Trench of GIS Area	LHD

Abbreviations

1. Heat detector, HD
2. Addressable Spot-Type Photoelectric Smoke detector, SD
3. Linear Heat Detector, LHD
4. Aspirated smoke detectors, ASD
5. Optical beam smoke detector, OBSD

2.20 Pipe coating system shall conform to ASME A13.1 standard and ANSI-A13.1

2.21 Underground water piping shall have indicator sign.

2.22 For Fire protection system design shall be conformed to NFPA 101 (Life Safety Code).

2.23 All junction boxes or electrical equipment in rooms on ground floor shall be 1.2 m higher from room floor elevation.

2.24 All firestops shall be pre-formed block firestop / pillow firestop / sleeve firestop / pathway firestop, being able to be removed and reinstalled conveniently. Foam and sealant firestops shall not be used unless approved by EGAT.

3. Construction of

3.1 Foam house.
3.2 Cabinets with 2x50 lbs wheel fire extinguisher.

CIVIL WORK

4. Design and construction of

4.1 Steel structure and foundations for Specified equipment and the others not shown in “For Construction drawings” and / or EGAT’s specification.

4.1.1 Transformer foundation with oil containing pit.

4.1.2 Cable tray for transformer, underground cable in HDPE duct.

4.1.3 XLPE Cable with cable cleat and steel cover.

4.1.4 Distribution transformer support structure foundation.

4.1.5 Outdoor marshalling control cubicle foundation.

4.1.6 Load break switch foundation.

4.2 Equipment structure foundation with sub trench (if required).

4.3 Road and drainage system.

4.4 Water supply system.

4.5 Fire protection system.

4.6 Cable trench.

4.7 Wire mesh fence.

4.8 RC. Road.

4.9 Transformer loading.

4.10 Oil separator.

4.11 Oil containing pit with steel grating and black steel spiral-seam pipes (TIS 427-2531) with protection method according to AWWA C217, C205.

(Design sizing for oil drain system only)

4.12 For STATCOM Area, all reinforcement concrete structure and foundation shall be designed and constructed to avoid the magnetic field which may damage the reinforcement concrete structure.

4.13 For foundation in STATCOM Area. All material reinforcement should prevent effect from the magnetic induces that can heating the material reinforcement which may damage the RC structure. Alternatively, all material reinforcement in foundation and/or structure should be non-close loop.

4.14 All steel structure should be non-close loop to avoid the magnetic induces which may damage structure.

4.15 For STATCOM Area, Switchyard should be RC slab instead of soil expose. (All material reinforcement should be non-close loop to avoid the magnetic induces which may damage structure.)

5. Construction of

5.1 Steel structure foundation.
5.2 RC. Road
5.3 Cable trench
5.4 Crushed rock surfacing.
5.5 Site office.
5.6 Removed existing concrete fence.

6. The drawings and calculation of all buildings shall be verified with adequate details for intended application and submitted to EGAT for approval.
7. All design works and the fabrication drawings for all steel structures shall be submitted to EGAT for approval.
8. All design, construction and testing shall be in accordance with Specification No.3001 : Civil and Architectural Work.
9. 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.
10. 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.
11. 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.
12. The Contractor shall perform a static load test for STATCOM Building foundations in accordance with ASTM D1143 (if pile type foundation is required).
13. 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.
14. Seismic load test (sonic integrity test) according to ASTM D5882-96 shall be applied to all bored piles (if bored pile type is required).
15. Plate bearing test according to ASTM D1194-94 shall be submitted to EGAT for approval. (if pad type foundation is required).
16. 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.
17. 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 sq.m for office area, 24 sq.m for conference room which shall both be air-conditioned and 4 sq.m for toilet. The facilities as shown on the section G-3 are required for 2 sets.