

ELECTRICITY GENERATING AUTHORITY OF THAILAND

**Supplemental Notice No. 2**

**Invitation to Bid No. TS12-DSS-05**

**Supply of Digital Substation Protection and Automation System**

**Transmission System Expansion Project No. 12**

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The attached Supplemental Notice shall be considered as part of the bidding documents No. TS12-DSS-05.

As acknowledgement of receipt that all additions, deletions and revisions contained in this Supplemental Notice are incorporated into the above bidding documents, Bidder is requested to sign and return this acknowledgement via email address : [pasakorn.piy@egat.co.th](mailto:pasakorn.piy@egat.co.th) within three (3) days from the date of the announcement of this Supplemental Notice on <http://www4.egat.co.th/fprocurement/biddingeng/>.

The original acknowledgement which is manually signed in ink by a person or persons duly authorized shall be included in the proposal to be submitted on the bid opening date.

ELECTRICITY GENERATING AUTHORITY OF THAILAND

June 27, 2023

**ACKNOWLEDGEMENT**

This undersigned Bidder hereby certifies that the additions, deletions and revisions set forth in this Supplemental Notice to Invitation to Bid No. TS12-DSS-05 are incorporated as part of the above bidding documents and will be fully included in any bids which he may submit.

Signed \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Date \_\_\_\_\_

## ELECTRICITY GENERATING AUTHORITY OF THAILAND

## SUPPLEMENTAL NOTICE NO. 2

## INVITATION TO BID NO. TS12-DSS-05

SUPPLY OF DIGITAL SUBSTATION PROTECTION  
AND AUTOMATION SYSTEM

## TRANSMISSION SYSTEM EXPANSION PROJECT NO.12

The following supplemental information is hereby given for the above described Invitation:

## 1. Section A : Invitation to Bid

Postpone the bid opening date from June 20, 2023 to **July 5, 2023**.

## 2. Section C : Proposal

Revise Price Schedule (Bill of Materials for Schedule 1 (Page 4) and Schedule 2 (Page 4)) with the revised excel files of Price Schedule attached.

## 3. Section J : Drawings

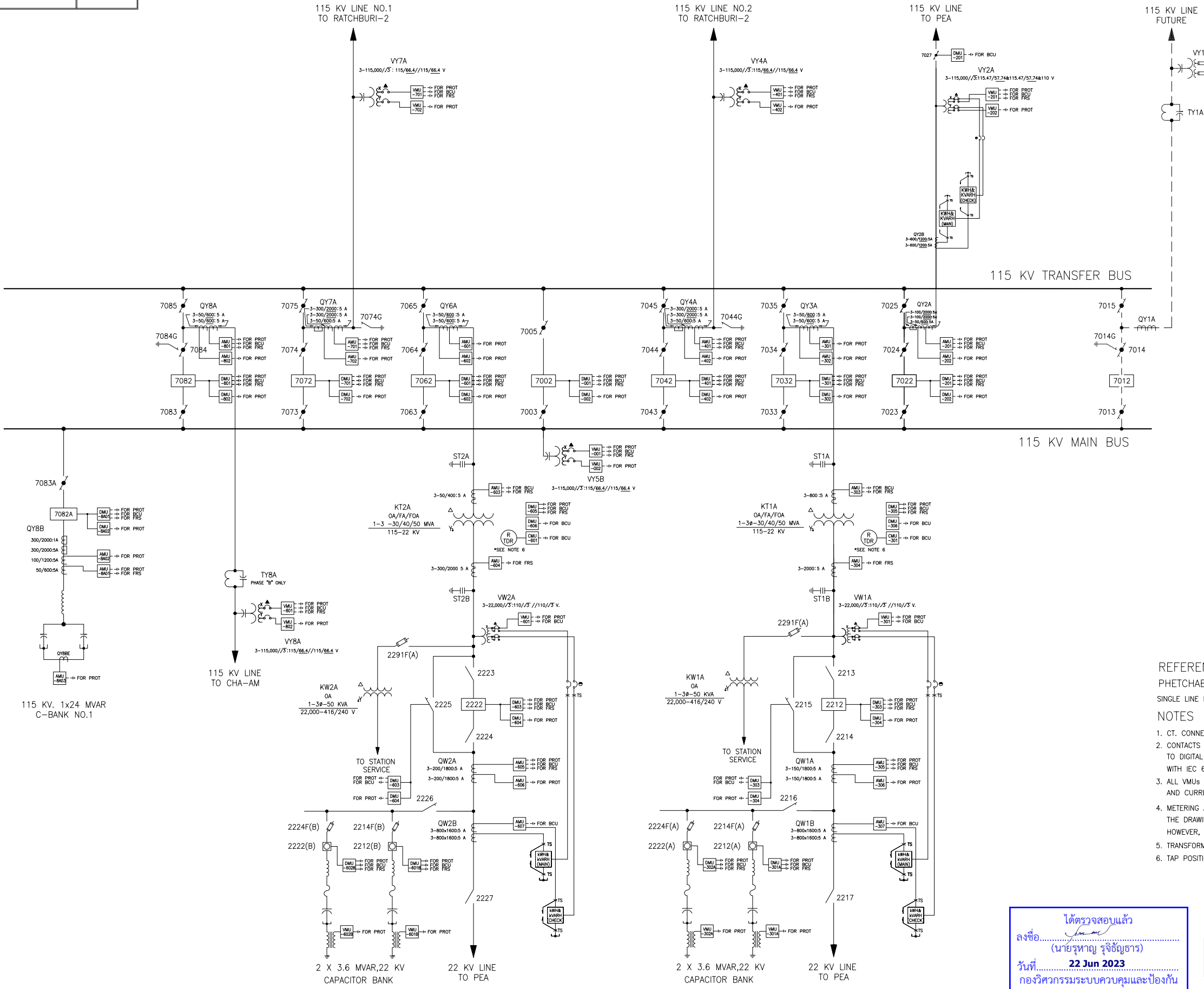
Delete and substitute as follows :

| <u>Deleted Dwg. No.</u>  | <u>Substitute with Attached Dwg.No</u> |
|--------------------------|----------------------------------------|
| <u>Design Drawings</u>   |                                        |
| 1. PB-E-1 sh.1/2 Rev.2   | PB-E-1 sh.1/2 Rev.3                    |
| 2. PB-E-1 sh.2/2 Rev.2   | PB-E-1 sh.2/2 Rev.3                    |
| 3. KP-E-1.1 sh.1/2 Rev.2 | KP-E-1.1 sh.1/2 Rev.3                  |
| 4. KP-E-1.1 sh.2/2 Rev.2 | KP-E-1.1 sh.2/2 Rev.3                  |
| <u>Standard Drawing</u>  |                                        |
| 5. TP-E-20.1 sh.- Rev.3  | TP-E-20.1 sh.- Rev.4                   |

Bid submitted must be in accordance with this Notice. Receipt of this Notice shall be acknowledged by the Bidder on the proposal included in the Bidding Documents in the space provided on page C2, Article C-5 Supplemental Notices.

ELECTRICITY GENERATING  
AUTHORITY OF THAILAND

.....June 27, 2023.....



| LEGEND    | DESCRIPTION                               |
|-----------|-------------------------------------------|
| 87B       | BUSBAR DIFFERENTIAL PROTECTION            |
| 95B       | BUS WIRE SUPERVISION PROTECTION           |
| 21P, 21BU | DISTANCE PROTECTION                       |
| 67N       | DIRECTIONAL EARTH FAULT RELAY             |
| 67/67N    | DIRECTIONAL OVERCURRENT RELAY             |
| 87L       | CURRENT DIFFERENTIAL PROTECTION           |
| 51T/51TG  | TRANSFORMER OVERCURRENT RELAY             |
| 51/51G    | OVERCURRENT RELAY                         |
| 81        | UNDER-FREQUENCY RELAY                     |
| 27        | UNDERVOLTAGE RELAY                        |
| 25        | SYNCHRO-CHECK RELAY                       |
| 79        | AUTORECLOSURE DEVICE                      |
| 50BF      | BREAKER FAILURE PROTECTION                |
| PTT       | PERMISSIVE TRANSFER TRIP                  |
| DEF       | DIRECTIONAL EARTH FAULT                   |
| DTT       | DIRECT TRANSFER TRIP                      |
| E1        | E1 INTERFACE                              |
| TELE      | TELE PROTECTION                           |
| FRS       | FAULT RECORDING SYSTEM                    |
| AMU       | CURRENT MERGING UNIT                      |
| VMU       | VOLTAGE MERGING UNIT                      |
| DMU       | DIGITAL MERGING UNIT                      |
| CMU       | CONDITION MONITORING UNIT                 |
| BCU       | BAY CONTROL UNIT                          |
| PROT      | PROTECTIVE IED                            |
| BO        | BINARY OUTPUT                             |
| BI        | BINARY INPUT                              |
| I         | INCOMING VOLTAGE                          |
| R         | RUNNING VOLTAGE                           |
| KWH&KVARH | KILOWATT HOUR AND KILOVAR HOUR COMBIMETER |
| ○         | INDICATING PROTECTION FUNCTION            |
| —         | WYE CONNECTED CURRENT TRANSFORMER         |
| —         | DELTA CONNECTED CURRENT TRANSFORMER       |
| —         | CURRENT TEST SWITCH                       |
| —         | POTENTIAL TEST SWITCH                     |
| —         | MCB LOCATED AT SWITCHYARD                 |
| —         | MCB LOCATED AT THE ASSOCIATED BOARD       |
| —         | COPPER-WIRED CONNECTION                   |
| —         | FIBER OPTIC CONNECTION                    |
| —         | OPTICAL CURRENT TRANSFORMER               |

REFERENCE DRAWING  
PHETCHABURI SUBSTATION

SINGLE LINE DIAGRAM ..... DWG.NO. PB-S-1

NOTES

- CT. CONNECTED RATIO SHALL BE AS SHOWN ON THIS DRAWING.
- CONTACTS AND ALARM FROM SWITCHYARD DEVICES SHALL BE CONNECTED TO DIGITAL MERGING UNITS AND SHALL BE SENT TO PROCESS BUS IN COMPLIANCE WITH IEC 61850-9-2 STANDARD.
- ALL VMUs AND AMUs SHALL BE EQUIPPED WITH POTENTIAL AND CURRENT TEST SWITCHES RESPECTIVELY.
- METERING AND RELAYING DIAGRAM ON THIS DWG. IS USED AS A GUIDELINE. THE DRAWING CAN BE MODIFIED BY THE CONTRACTOR. HOWEVER, IT SHALL BE SUBMITTED TO EGAT FOR APPROVAL.
- TRANSFORMER DIFFERENTIAL RELAY (87K) SHALL BE 3-RESTRAINT MODEL TYPE.
- TAP POSITION TRANSDUCER SHALL BE PROVIDED TO CONNECT WITH CMU.

ได้ตรวจสอบแล้ว  
ลงชื่อ.....  
(นายรพีพร รุจิธัญญ์)  
วันที่..... 22 Jun 2023  
กองวิศวกรรมระบบควบคุมและป้องกัน

FOR BIDDING ONLY

| REV.NO. | JOB NO.      | JOB DESCRIPTION                     | DRAWN | DESIGNED | VERIFIED | VALIDATED | RECOMMENDED | CONCURRED | APPROVED | DATE |
|---------|--------------|-------------------------------------|-------|----------|----------|-----------|-------------|-----------|----------|------|
| 3       | TS12-16-S221 | RENOVATED 115 kV DIGITAL SUBSTATION | -     | -        | -        | -         | -           | -         | -        | -    |

ELECTRICITY GENERATING AUTHORITY OF THAILAND

|          |           |             |                                                                |                               |                                      |
|----------|-----------|-------------|----------------------------------------------------------------|-------------------------------|--------------------------------------|
| DRAWN    | C.KANITHA | VALIDATED   | CHIEF, CONTROL AND PROTECTION SYSTEM ENGINEERING DEPARTMENT    | DRAWING NAME                  | PHETCHABURI SUBSTATION               |
| DESIGNED | C.KANITHA | RECOMMENDED | ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION-1 | DESCRIPTION OF DETAIL DRAWING | 115 kV METERING AND RELAYING DIAGRAM |
| VERIFIED |           | CONCURRED   | DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION             | JOB NO.                       | TS12-16-S221                         |
| APPROVED |           |             | ASSISTANT GOVERNOR - TRANSMISSION SYSTEM DEVELOPMENT           | REPLACING DWG.NO.             | -                                    |
|          |           |             |                                                                | DWG.NO.                       | PB-E-1                               |
|          |           |             |                                                                |                               | 1 REV.                               |
|          |           |             |                                                                |                               | 2 3                                  |

| LIST OF PROTECTIVE IED (115 & 22 kV)<br>*SEE NOTE 5 |                                                                                                                                         |                                                                                                    |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| FEEDER                                              | MU                                                                                                                                      | PROTECTION FUNCTION                                                                                |
| 115 kV BUS                                          | AMU201 DMU001<br>AMU301 DMU201<br>AMU401 DMU301<br>AMU601 DMU401<br>AMU701 DMU601<br>AMU801 DMU701<br>AMU8A01 DMU801<br>AMU8A01 DMU8A01 | Primary Protection IED (87B) (95B) LOW IMPEDANCE<br>LOW IMPEDANCE FOR 12 FEEDERS NO SWITCHING ZONE |
|                                                     | AMU202 DMU002<br>AMU302 DMU202<br>AMU402 DMU302<br>AMU602 DMU402<br>AMU702 DMU602<br>AMU802 DMU702<br>AMU8A02 DMU802<br>AMU8A02 DMU8A02 | Secondary Protection IED (87B) (95B) LOW IMPEDANCE                                                 |
| 115 kV C-BANK NO.1                                  | AMU8A01 DMU8A01<br>AMU8A03 VMU001                                                                                                       | Primary Protection IED (60C) (51C 51CG) (59C) (27C) (50BF)                                         |
|                                                     | AMU8A02 DMU8A02<br>AMU8A03 VMU002                                                                                                       | Secondary Protection IED (60C) (51C 51CG) (59C) (27C) (50BF)                                       |

| LIST OF PROTECTIVE IED (115 & 22 kV)<br>*SEE NOTE 5 |                                           |                                                                                    |
|-----------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------|
| FEEDER                                              | MU                                        | PROTECTION FUNCTION                                                                |
| 115 kV LINE TO PEA (SIR<4)                          | AMU201 VMU201 DMU201 VMU001               | Primary Protection IED (21P) (67N) (67 67N) (81) (27) (50BF) (79) (25) TELE TELE   |
|                                                     | AMU202 VMU202 DMU202 VMU002               | Secondary Protection IED (21P) (67N) (67 67N) (81) (27) (50BF) (79) (25) TELE TELE |
| 115/22 kV KT1A                                      | AMU301 AMU305 DMU301 DMU303 DMU305 VMU001 | Primary Protection IED (87K) (95K) (51T 51TG) (50BF) (51 51G) (81) (27)            |
|                                                     | AMU302 AMU306 DMU302 DMU304 DMU306 VMU002 | Secondary Protection IED (87K) (95K) (51T 51TG) (50BF) (51 51G) (81) (27)          |
| 22kV C-Bank No.1A                                   | VMU301A VMU301 DMU301A                    | Feeder Protection IED (60CH) (60CL) (59C) + (BCU)                                  |
| 22kV C-Bank No.2A                                   | VMU302A VMU302 DMU302A                    | Feeder Protection IED (60CH) (60CL) (59C) + (BCU)                                  |
| 115 kV LINE NO.2 TO RATCHABURI-2 (SIR<4)            | AMU401 VMU401 DMU401 VMU001               | Primary Protection IED (87L) (95L) (21BU) (67 67N) (50BF) (79) (25) E1 TELE        |
|                                                     | AMU402 VMU402 DMU402 VMU002               | Secondary Protection IED (21P) (67N) (67 67N) (50BF) (79) (25) TELE TELE TELE      |
| 115/22 kV KT2A                                      | AMU601 AMU605 DMU601 DMU603 DMU605 VMU001 | Primary Protection IED (87K) (95K) (51T 51TG) (50BF) (51 51G) (81) (27)            |
|                                                     | AMU602 AMU606 DMU602 DMU604 DMU606 VMU002 | Secondary Protection IED (87K) (95K) (51T 51TG) (50BF) (51 51G) (81) (27)          |
| 22kV C-Bank No.1B                                   | VMU601B VMU601 DMU601B                    | Feeder Protection IED (60CH) (60CL) (59C) + (BCU)                                  |
| 22kV C-Bank No.2B                                   | VMU602B VMU602 DMU602B                    | Feeder Protection IED (60CH) (60CL) (59C) + (BCU)                                  |
| 115 kV LINE NO.1 TO RATCHABURI-2 (SIR<4)            | AMU701 VMU701 DMU701 VMU001               | Primary Protection IED (87L) (95L) (21BU) (67 67N) (50BF) (79) (25) E1 TELE        |
|                                                     | AMU702 VMU702 DMU702 VMU002               | Secondary Protection IED (21P) (67N) (67 67N) (50BF) (79) (25) TELE TELE TELE      |
| 115 kV LINE TO CHA-AM (SIR<4)                       | AMU801 VMU801 DMU801 VMU001               | Primary Protection IED (87L) (95L) (21BU) (67 67N) (50BF) (79) (25) E1 TELE        |
|                                                     | AMU802 VMU802 DMU802 VMU002               | Secondary Protection IED (21P) (67N) (67 67N) (50BF) (79) (25) TELE TELE TELE      |

| LEGEND    | DESCRIPTION                               |
|-----------|-------------------------------------------|
| 87B       | BUSBAR DIFFERENTIAL PROTECTION            |
| 95B       | BUS WIRE SUPERVISION PROTECTION           |
| 21P, 21BU | DISTANCE PROTECTION                       |
| 67N       | DIRECTIONAL EARTH FAULT RELAY             |
| 67/67N    | DIRECTIONAL OVERCURRENT RELAY             |
| 87L       | CURRENT DIFFERENTIAL PROTECTION           |
| 51T/51TG  | TRANSFORMER OVERCURRENT RELAY             |
| 51/51G    | OVERCURRENT RELAY                         |
| 81        | UNDER-FREQUENCY RELAY                     |
| 27        | UNDERVOLTAGE RELAY                        |
| 25        | SYNCHRO-CHECK RELAY                       |
| 79        | AUTORECLOSURE DEVICE                      |
| 50BF      | BREAKER FAILURE PROTECTION                |
| PTT       | PERMISSIVE TRANSFER TRIP                  |
| DEF       | DIRECTIONAL EARTH FAULT                   |
| DTT       | DIRECT TRANSFER TRIP                      |
| E1        | E1 INTERFACE                              |
| TELE      | TELE PROTECTION                           |
| FRS       | FAULT RECORDING SYSTEM                    |
| AMU       | CURRENT MERGING UNIT                      |
| VMU       | VOLTAGE MERGING UNIT                      |
| DMU       | DIGITAL MERGING UNIT                      |
| CMU       | CONDITION MONITORING UNIT                 |
| BCU       | BAY CONTROL UNIT                          |
| PROT      | PROTECTIVE IED                            |
| BO        | BINARY OUTPUT                             |
| BI        | BINARY INPUT                              |
| I         | INCOMING VOLTAGE                          |
| R         | RUNNING VOLTAGE                           |
| KWH&KVARH | KILOWATT HOUR AND KILOVAR HOUR COMBIMETER |
| ○         | INDICATING PROTECTION FUNCTION            |
|           | WYE CONNECTED CURRENT TRANSFORMER         |
|           | DELTA CONNECTED CURRENT TRANSFORMER       |
|           | CURRENT TEST SWITCH                       |
|           | POTENTIAL TEST SWITCH                     |
|           | MCB LOCATED AT SWITCHYARD                 |
|           | MCB LOCATED AT THE ASSOCIATED BOARD       |
|           | COPPER-WIRED CONNECTION                   |
|           | FIBER OPTIC CONNECTION                    |
|           | OPTICAL CURRENT TRANSFORMER               |

REFERENCE DRAWING  
PHETCHABURI SUBSTATION  
SINGLE LINE DIAGRAM ..... DWG.NO. PB-S-1

- NOTES
- CONTACTS AND ALARM FROM SWITCHYARD DEVICES SHALL BE CONNECTED TO DIGITAL MERGING UNITS AND SHALL BE SENT TO PROCESS BUS IN COMPLIANCE WITH IEC 61850-9-2 STANDARD.
  - ALL VMUs AND AMUs SHALL BE EQUIPPED WITH POTENTIAL AND CURRENT TEST SWITCHES RESPECTIVELY.
  - METERING AND RELAYING DIAGRAM ON THIS DWG. IS USED AS A GUIDELINE. THE DRAWING CAN BE MODIFIED BY THE CONTRACTOR. HOWEVER, IT SHALL BE SUBMITTED TO EGAT FOR APPROVAL.
  - TRANSFORMER DIFFERENTIAL RELAY (87K) SHALL BE 6-RESTRAINT MODEL TYPE FOR 230/115 kV TIE TRANSFORMER AND 3-RESTRAINT MODEL TYPE FOR 115/22 kV LOADING TRANSFORMER.
  - THE PROPOSED MULTIFUNCTION PROTECTIVE IEDs SHALL BE OF ANY TYPE/MODEL SPECIFIED IN "EGAT ACCEPTED MULTIFUNCTION RELAY LIST". HOWEVER, IN CASE OF THE UNCERTIFIED FUNCTIONS, DO AS FOLLOWS:
    - AT BIDDING STAGE, INDIVIDUAL TEST REPORTS OF THE ADDITIONAL FUNCTIONS SHALL BE SUBMITTED FOR APPROVAL BY EGAT.
    - AFTER LOA, THOSE IEDs SHALL BE MULTIFUNCTION TESTED IN EGAT'S LABORATORY. FAILURE TO COMPLY WITH EGAT'S REQUIREMENTS, THE CONTRACTOR SHALL REPLACE THE SAID IEDs WITH NO ADDITIONAL COST AND TIME EXTENSION.

ได้ตรวจสอบแล้ว  
ลงชื่อ.....  
(นายรณพล รุจิอุทธาร)  
วันที่..... 22 Jun 2023  
กองวิศวกรรมระบบควบคุมและป้องกัน

FOR BIDDING ONLY



TSE-TSP : 2008



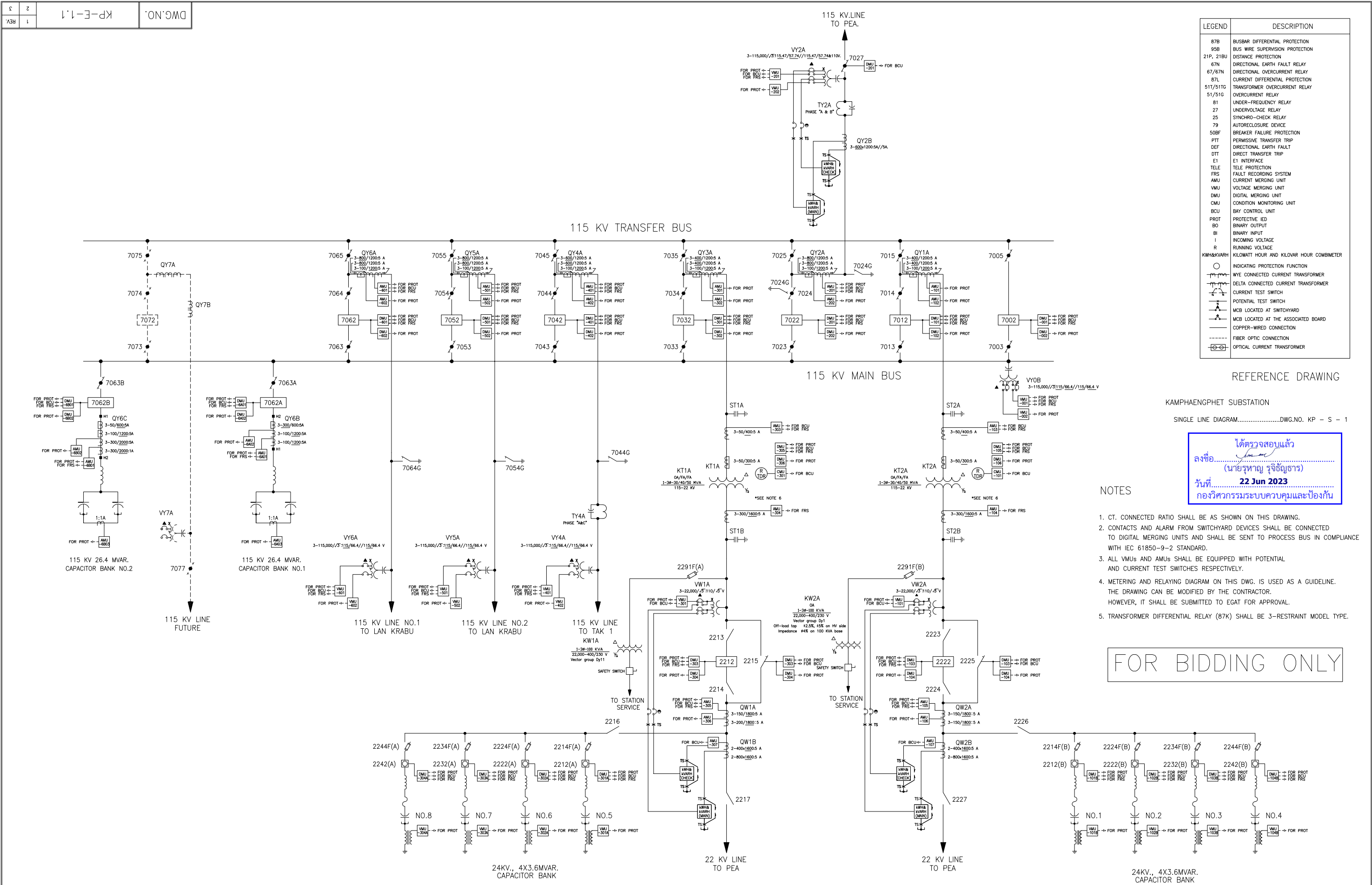
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Date  
Name

|         |         |                 |                                     |       |          |          |           |             |           |          |      |
|---------|---------|-----------------|-------------------------------------|-------|----------|----------|-----------|-------------|-----------|----------|------|
|         |         |                 |                                     |       |          |          |           |             |           |          |      |
|         |         |                 |                                     |       |          |          |           |             |           |          |      |
|         |         |                 |                                     |       |          |          |           |             |           |          |      |
|         | 3       | TS12-16-S221    | RENOVATED 115 kV DIGITAL SUBSTATION | -     | -        | -        | -         | -           | -         | -        | -    |
| REV.NO. | JOB NO. | JOB DESCRIPTION |                                     | DRAWN | DESIGNED | VERIFIED | VALIDATED | RECOMMENDED | CONCURRED | APPROVED | DATE |

ELECTRICITY GENERATING AUTHORITY OF THAILAND

|          |           |             |                                                                |                               |                                           |                   |
|----------|-----------|-------------|----------------------------------------------------------------|-------------------------------|-------------------------------------------|-------------------|
| DRAWN    | C.KANITHA | VALIDATED   | CHIEF, CONTROL AND PROTECTION SYSTEM ENGINEERING DEPARTMENT    | DRAWING NAME                  | PHETCHABURI SUBSTATION                    |                   |
| DESIGNED | C.KANITHA | RECOMMENDED | ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION-1 | DESCRIPTION OF DETAIL DRAWING | LIST OF PROTECTIVE IED AND SIGNAL DIAGRAM |                   |
| VERIFIED |           | CONCURRED   | DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION             | JOB NO.                       | TS12-16-S221                              | REPLACING DWG.NO. |
| APPROVED |           |             | ASSISTANT GOVERNOR - TRANSMISSION SYSTEM DEVELOPMENT           | DATE                          |                                           | DWG.NO.           |
|          |           |             |                                                                |                               | PB-E-1                                    | 2                 |
|          |           |             |                                                                |                               |                                           | 3                 |



| LIST OF PROTECTIVE IED (115 & 22 kV)<br>*SEE NOTE 5 |                                                                                        |                                                                                                      |
|-----------------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| FEEDER                                              | MU                                                                                     | PROTECTION FUNCTION                                                                                  |
| 115 kV BUS                                          | DMU001<br>DMU101<br>DMU201<br>DMU301<br>DMU401<br>DMU501<br>DMU601<br>DMU601<br>DMU601 | Primary Protection IED<br>LOW IMPEDANCE<br>87B 95B<br>LOW IMPEDANCE FOR 12 FEEDERS NO SWITCHING ZONE |
|                                                     | DMU002<br>DMU102<br>DMU202<br>DMU302<br>DMU402<br>DMU502<br>DMU602<br>DMU602<br>DMU602 | Secondary Protection IED<br>LOW IMPEDANCE<br>87B 95B                                                 |
| 115 kV C-BANK NO.1                                  | AMU6A01<br>AMU6A01<br>VMU001                                                           | Primary Protection IED<br>80C 51C 510C 59C 27C 50BF                                                  |
|                                                     | AMU6A02<br>AMU6A02<br>VMU002                                                           | Secondary Protection IED<br>80C 51C 510C 59C 27C 50BF                                                |
| 115 kV C-BANK NO.2                                  | AMU6B01<br>AMU6B01<br>VMU001                                                           | Primary Protection IED<br>80C 51C 510C 59C 27C 50BF                                                  |
|                                                     | AMU6B02<br>AMU6B02<br>VMU002                                                           | Secondary Protection IED<br>80C 51C 510C 59C 27C 50BF                                                |
| 24 kV C-BANK NO.1                                   | VMU101B<br>DMU101B                                                                     | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |
| 24 kV C-BANK NO.2                                   | VMU102B<br>DMU102B                                                                     | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |
| 24 kV C-BANK NO.3                                   | VMU103<br>DMU103B                                                                      | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |
| 24 kV C-BANK NO.4                                   | VMU104B<br>DMU104B                                                                     | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |
| 24 kV C-BANK NO.5                                   | VMU301<br>VMU301A<br>DMU301A                                                           | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |
| 24 kV C-BANK NO.6                                   | VMU301<br>VMU302A<br>DMU302A                                                           | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |
| 24 kV C-BANK NO.7                                   | VMU301<br>VMU303A<br>DMU303A                                                           | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |
| 24 kV C-BANK NO.8                                   | VMU301<br>VMU304A<br>DMU304A                                                           | Primary Protection IED<br>60CH 59C 60CL + 6CU                                                        |

| LIST OF PROTECTIVE IED (115 & 22 kV)<br>*SEE NOTE 5 |                                                          |                                                                           |
|-----------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|
| FEEDER                                              | MU                                                       | PROTECTION FUNCTION                                                       |
| 115 kV LINE TO PEA (SIR<4)                          | AMU201<br>VMU201<br>DMU201                               | Primary Protection IED<br>21P 67N 67N 67N 81 27 50BF 79 25<br>TELE TELE   |
|                                                     | AMU202<br>VMU202<br>DMU202                               | Secondary Protection IED<br>21P 67N 67N 67N 81 27 50BF 79 25<br>TELE TELE |
| 115/22 kV KT1A                                      | AMU101<br>AMU105<br>DMU101<br>DMU103<br>DMU105<br>VMU001 | Primary Protection IED<br>87K 89K 51T 51T 50BF 51 81 27<br>51T 51T        |
|                                                     | AMU102<br>AMU106<br>DMU102<br>DMU104<br>DMU106<br>VMU002 | Secondary Protection IED<br>87K 89K 51T 51T 50BF 51 81 27<br>51T 51T      |
| 115/22 kV KT2A                                      | AMU301<br>AMU305<br>DMU301<br>DMU303<br>DMU305<br>VMU001 | Primary Protection IED<br>87K 89K 51T 51T 50BF 51 81 27<br>51T 51T        |
|                                                     | AMU302<br>AMU306<br>DMU302<br>DMU304<br>DMU306<br>VMU002 | Secondary Protection IED<br>87K 89K 51T 51T 50BF 51 81 27<br>51T 51T      |
| 115 kV LINE TO TAK (SIR<4)                          | AMU401<br>VMU401<br>DMU401                               | Primary Protection IED<br>87L 95L 21BU 67 67N 50BF 79 25<br>E1 TELE       |
|                                                     | AMU402<br>VMU402<br>DMU402                               | Secondary Protection IED<br>21P 67N 67N 67N 79 25<br>TELE TELE TELE       |
| 115 kV LINE NO.2 TO LAN KRABU (SIR<4)               | AMU501<br>VMU501<br>DMU501                               | Primary Protection IED<br>87L 95L 21BU 67 67N 50BF 79 25<br>E1 TELE       |
|                                                     | AMU502<br>VMU502<br>DMU502                               | Secondary Protection IED<br>21P 67N 67N 67N 79 25<br>TELE TELE TELE       |
| 115 kV LINE NO.1 TO LAN KRABU (SIR<4)               | AMU601<br>VMU601<br>DMU601                               | Primary Protection IED<br>87L 95L 21BU 67 67N 50BF 79 25<br>E1 TELE       |
|                                                     | AMU602<br>VMU602<br>DMU602                               | Secondary Protection IED<br>21P 67N 67N 67N 79 25<br>TELE TELE TELE       |

| LEGEND    | DESCRIPTION                               |
|-----------|-------------------------------------------|
| 87B       | BUSBAR DIFFERENTIAL PROTECTION            |
| 95B       | BUS WIRE SUPERVISION PROTECTION           |
| 21P, 21BU | DISTANCE PROTECTION                       |
| 67N       | DIRECTIONAL EARTH FAULT RELAY             |
| 67/67N    | DIRECTIONAL OVERCURRENT RELAY             |
| 87L       | CURRENT DIFFERENTIAL PROTECTION           |
| 51T/51TG  | TRANSFORMER OVERCURRENT RELAY             |
| 51/51G    | OVERCURRENT RELAY                         |
| 81        | UNDER-FREQUENCY RELAY                     |
| 27        | UNDERVOLTAGE RELAY                        |
| 25        | SYNCHRO-CHECK RELAY                       |
| 79        | AUTORECLOSURE DEVICE                      |
| 50BF      | BREAKER FAILURE PROTECTION                |
| PTT       | PERMISSIVE TRANSFER TRIP                  |
| DEF       | DIRECTIONAL EARTH FAULT                   |
| DTT       | DIRECT TRANSFER TRIP                      |
| E1        | E1 INTERFACE                              |
| TELE      | TELE PROTECTION                           |
| FRS       | FAULT RECORDING SYSTEM                    |
| AMU       | CURRENT MERGING UNIT                      |
| VMU       | VOLTAGE MERGING UNIT                      |
| DMU       | DIGITAL MERGING UNIT                      |
| CMU       | CONDITION MONITORING UNIT                 |
| BCU       | BAY CONTROL UNIT                          |
| PROT      | PROTECTIVE IED                            |
| BO        | BINARY OUTPUT                             |
| BI        | BINARY INPUT                              |
| I         | INCOMING VOLTAGE                          |
| R         | RUNNING VOLTAGE                           |
| KWH&KVARH | KILOWATT HOUR AND KILOVAR HOUR COMBIMETER |
| ○         | INDICATING PROTECTION FUNCTION            |
|           | WYE CONNECTED CURRENT TRANSFORMER         |
|           | DELTA CONNECTED CURRENT TRANSFORMER       |
|           | CURRENT TEST SWITCH                       |
|           | POTENTIAL TEST SWITCH                     |
|           | MCB LOCATED AT SWITCHYARD                 |
|           | MCB LOCATED AT THE ASSOCIATED BOARD       |
|           | COPPER-WIRED CONNECTION                   |
|           | FIBER OPTIC CONNECTION                    |
|           | OPTICAL CURRENT TRANSFORMER               |

REFERENCE DRAWING

  RANOT SUBSTATION  
  SINGLE LINE DIAGRAM.....DWG.NO. KP – S – 1

NOTES

1. CONTACTS AND ALARM FROM SWITCHYARD DEVICES SHALL BE CONNECTED TO DIGITAL MERGING UNITS AND SHALL BE SENT TO PROCESS BUS IN COMPLIANCE WITH IEC 61850–9–2 STANDARD.
2. ALL VMUs AND AMUs SHALL BE EQUIPPED WITH POTENTIAL AND CURRENT TEST SWITCHES RESPECTIVELY.
3. METERING AND RELAYING DIAGRAM ON THIS DWG. IS USED AS A GUIDELINE. THE DRAWING CAN BE MODIFIED BY THE CONTRACTOR. HOWEVER, IT SHALL BE SUBMITTED TO EGAT FOR APPROVAL.
4. TRANSFORMER DIFFERENTIAL RELAY (87K) SHALL BE 6–RESTRAINT MODEL TYPE FOR 230/115 kV TIE TRANSFORMER AND 3–RESTRAINT MODEL TYPE FOR 115/22 kV LOADING TRANSFORMER.
5. THE PROPOSED MULTIFUNCTION PROTECTIVE IEDs SHALL BE OF ANY TYPE/MODEL SPECIFIED IN "EGAT ACCEPTED MULTIFUNCTION RELAY LIST". HOWEVER, IN CASE OF THE UNCERTIFIED FUNCTIONS, DO AS FOLLOWS:

– AT BIDDING STAGE, INDIVIDUAL TEST REPORTS OF THE ADDITIONAL FUNCTIONS SHALL BE SUBMITTED FOR APPROVAL BY EGAT.

– AFTER LOA, THOSE IEDs SHALL BE MULTIFUNCTION TESTED IN EGAT’S LABORATORY. FAILURE TO COMPLY WITH EGAT’S REQUIREMENTS, THE CONTRACTOR SHALL REPLACE THE SAID IEDs WITH NO ADDITIONAL COST AND TIME EXTENSION.

ได้ตรวจสอบแล้ว  
ลงชื่อ.....  
(นายรพีพร รุจิธัญธาร)  
วันที่.....22 Jun 2023  
กองวิศวกรรมระบบควบคุมและป้องกัน

FOR BIDDING ONLY

ELECTRICITY GENERATING AUTHORITY OF THAILAND

|          |                                                      |             |                                                                |                               |                   |  |         |  |                                           |      |  |
|----------|------------------------------------------------------|-------------|----------------------------------------------------------------|-------------------------------|-------------------|--|---------|--|-------------------------------------------|------|--|
| DRAWN    | S.PHATHARAPON                                        | VALIDATED   | CHEF, CONTROL AND PROTECTION SYSTEM ENGINEERING DEPARTMENT     | DRAWING NAME                  |                   |  |         |  | KAMPHAENGPHET SUBSTATION                  |      |  |
| DESIGNED | S.PHATHARAPON                                        | RECOMMENDED | ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION-1 | DESCRIPTION OF DETAIL DRAWING |                   |  |         |  | LIST OF PROTECTIVE IED AND SIGNAL DIAGRAM |      |  |
| VERIFIED |                                                      | CONCURRED   | DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION             | JOB NO.                       | REPLACING DWG.NO. |  | DWG.NO. |  | 2                                         | REV. |  |
| APPROVED | ASSISTANT GOVERNOR – TRANSMISSION SYSTEM DEVELOPMENT |             |                                                                | DATE .....                    | TS12-16-S222      |  | -       |  | KP-E-1.1                                  |      |  |
|          |                                                      |             |                                                                |                               |                   |  |         |  | 2                                         | 3    |  |



115 kV CONTROL & PROTECTION DESIGN CRITERIA

| 115 kV BUS PROTECTION |                                         |
|-----------------------|-----------------------------------------|
| Primary Protection    | 87B 95B<br><small>LOW IMPEDANCE</small> |
| Secondary Protection  | 87B 95B<br><small>LOW IMPEDANCE</small> |
|                       |                                         |

| 115 kV LINE TO EGAT<br>SIR < 4 |                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------|
| Primary Protection             | 87L 95L 21BU 67 67N 50BF 79 25<br><small>E1 INTERFACE TELE PROTECTION</small>                   |
| Secondary Protection           | 21P 67N 67 67N 50BF 79 25 51S<br><small>TELE PROTECTION TELE PROTECTION TELE PROTECTION</small> |
| BCU                            | 25                                                                                              |

| 115 kV LINE TO EGAT<br>SIR >= 4 |                                                                               |
|---------------------------------|-------------------------------------------------------------------------------|
| Primary Protection              | 87L 95L 21BU 67 67N 50BF 79 25<br><small>E1 INTERFACE TELE PROTECTION</small> |
| Secondary Protection            | 87L 95L 21BU 67 67N 50BF 79 25<br><small>E1 INTERFACE TELE PROTECTION</small> |
| BCU                             | 25                                                                            |

| 115/22 kV OR 115/33 kV<br>TRANSFORMER |                                    |
|---------------------------------------|------------------------------------|
| Primary Protection                    | 87K 95K 51T 51TG 50BF 51 51G 81 27 |
| Secondary Protection                  | 87K 95K 51T 51TG 50BF 51 51G 81 27 |
| BCU                                   | 25                                 |

| 115 kV LINE TO PEA<br>SIR < 4 |                                                                                                       |
|-------------------------------|-------------------------------------------------------------------------------------------------------|
| Primary Protection            | 21P 67N 67 67N 81 27 50BF 79 25 51S<br><small>TELE PROTECTION TELE PROTECTION TELE PROTECTION</small> |
| Secondary Protection          | 21P 67N 67 67N 81 27 50BF 79 25 51S<br><small>TELE PROTECTION TELE PROTECTION TELE PROTECTION</small> |
| BCU                           | 25                                                                                                    |

| 115 kV LINE TO PEA<br>SIR >= 4 |                                                                                           |
|--------------------------------|-------------------------------------------------------------------------------------------|
| Primary Protection             | 87L 95L 21BU 67 67N 81 27 50BF 79 25<br><small>DIRECT FIBER OPTIC TELE PROTECTION</small> |
| Secondary Protection           | 87L 95L 21BU 67 67N 81 27 50BF 79 25<br><small>DIRECT FIBER OPTIC TELE PROTECTION</small> |
| BCU                            | 25                                                                                        |

| 69 kV or 115 kV<br>C-BANK |                           |
|---------------------------|---------------------------|
| Primary Protection        | 60C 51C 51CG 59C 27C 50BF |
| Secondary Protection      | 60C 51C 51CG 59C 27C 50BF |
| BCU                       |                           |

| 22 kV or 33 kV<br>C-BANK |                     |
|--------------------------|---------------------|
| Primary Protection       | 60CH 60CL 59C + BCU |

C-BANK FEEDER DESIGN CRITERIA

| C-BANK FEEDER        |                       |
|----------------------|-----------------------|
| Primary Protection   | 87C 95C 51C 51CG 50BF |
| Secondary Protection | 87C 95C 51C 51CG 50BF |
| BCU                  |                       |

230 kV CONTROL & PROTECTION DESIGN CRITERIA

| 230 kV BUS PROTECTION |                                         |
|-----------------------|-----------------------------------------|
| Primary Protection    | 87B 95B<br><small>LOW IMPEDANCE</small> |
| Secondary Protection  | 87B 95B<br><small>LOW IMPEDANCE</small> |
|                       |                                         |

| 230 kV LINE TO EGAT<br>SIR < 4 |                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------|
| Primary Protection             | 87L 95L 21BU 67 67N 50BF 79 25<br><small>E1 INTERFACE TELE PROTECTION</small>                   |
| Secondary Protection           | 21P 67N 67 67N 50BF 79 25 51S<br><small>TELE PROTECTION TELE PROTECTION TELE PROTECTION</small> |
| BCU                            | 25                                                                                              |

| 230 kV LINE TO EGAT<br>SIR >= 4 |                                                                               |
|---------------------------------|-------------------------------------------------------------------------------|
| Primary Protection              | 87L 95L 21BU 67 67N 50BF 79 25<br><small>E1 INTERFACE TELE PROTECTION</small> |
| Secondary Protection            | 87L 95L 21BU 67 67N 50BF 79 25<br><small>E1 INTERFACE TELE PROTECTION</small> |
| BCU                             | 25                                                                            |

| 230/115 kV<br>TRANSFORMER |                                                     |
|---------------------------|-----------------------------------------------------|
| Primary Protection        | 87K 95K 51T 51TG 51 51G 51GB1 51GB2 59N 50BF 51 51G |
| Secondary Protection      | 87K 95K 51T 51TG 51 51G 51GB1 51GB2 59N 50BF 51 51G |
| BCU                       | 25                                                  |

| 230 kV<br>C-BANK     |                       |
|----------------------|-----------------------|
| Primary Protection   | 60C 51C 51CG 59C 50BF |
| Secondary Protection | 60C 51C 51CG 59C 50BF |
| BCU                  |                       |

NOTES  
1. SEE SPECIFICATION NO.1008 FOR DETAILS OF PROTECTION FUNCTION.

ได้ตรวจสอบแล้ว  
ลงชื่อ.....  
(นายรพีพร รุจิธัญธาร)  
วันที่ 22 Jun 2023  
กองวิศวกรรมระบบควบคุมและป้องกัน

|         |         |                                                                     |       |          |          |           |             |           |          |      |
|---------|---------|---------------------------------------------------------------------|-------|----------|----------|-----------|-------------|-----------|----------|------|
| 4       | -       | REVISE PROTECTION FOR 230, 115kV LINE TO EGAT AND 115kV LINE TO PEA | -     | -        | -        | -         | -           | -         | -        | -    |
| 3       | -       | ADDITIONAL TELE PROTECTION (50BF) FOR 115 kV LINE TO EGAT           | -     | -        | -        | -         | -           | -         | -        | -    |
| 2       | -       | REVISE BUS PROTECTION, PROTECTIVE IEDS AND BCU CRITERIA             | -     | -        | -        | -         | -           | -         | -        | -    |
| 1       | -       | REVISE SECONDARY PROTECTION FOR 115kV LINE TO PEA                   | -     | -        | -        | -         | -           | -         | -        | -    |
| -       | -       | DIGITAL SUBSTATION SYSTEM PROTECTION DESIGN CRITERIA                | -     | -        | -        | -         | -           | -         | -        | -    |
| REV.NO. | JOB NO. | JOB DESCRIPTION                                                     | DRAWN | DESIGNED | VERIFIED | VALIDATED | RECOMMENDED | CONCURRED | APPROVED | DATE |

ELECTRICITY GENERATING AUTHORITY OF THAILAND

|                                                      |             |             |                                                                |                               |                                                      |
|------------------------------------------------------|-------------|-------------|----------------------------------------------------------------|-------------------------------|------------------------------------------------------|
| DRAWN                                                | P.ACHITAPOL | VALIDATED   | CHEF, CONTROL AND PROTECTION SYSTEM ENGINEERING DEPARTMENT     | DRAWING NAME                  | TYPICAL DRAWING                                      |
| DESIGNED                                             | P.ACHITAPOL | RECOMMENDED | ASSISTANT DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION-1 | DESCRIPTION OF DETAIL DRAWING | DIGITAL SUBSTATION SYSTEM PROTECTION DESIGN CRITERIA |
| VERIFIED                                             |             | CONCURRED   | DIRECTOR, TRANSMISSION SYSTEM ENGINEERING DIVISION             | JOB NO.                       | REPLACING DWG.NO.                                    |
| APPROVED                                             |             |             |                                                                | DWG.NO.                       | TP-E-20.1                                            |
| ASSISTANT GOVERNOR - TRANSMISSION SYSTEM DEVELOPMENT |             |             |                                                                |                               |                                                      |