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|                                       |                              | Technical Specification       |  |   |  |  |
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| Project <b>CONTOURGLOBAL MARITSA EAST 3 TPP</b>  |                              |                               |  |   |  | Code   |
| Description <b>MIGRATION OF SPPA-T2000 (DCS TELEPERM XP) TO SPPA-T3000/R3000&amp;E3000<br/>TECHNICAL SPECIFICATION</b> |                              |                               |  |   |  |  |
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## 1. SCOPE OF THE WORK

The scope of the works includes full migration of the Control system for technological processes and protections in ContourGlobal Maritsa East 3 TPP SPPA-T2000 (Teleperm XP) Siemens to SPPA-T3000 with complete preservation of the existing functionality. The works also include migration of Turbine regulators (Simadyn D) to SPPA-R3000 and control systems for excitation of the Generators (THYRIPOL) to SPPA-E3000. For this purpose, the following activities shall be necessary: Detailed investigation of the existing situation, migration of the data base; design and manufacture of cabinets with equipment, network components and servers; dismantling and installation; check on the signals; commissioning; functional checks and tests.

## 2. GENERAL PARAMETERS OF THE POWER STATION

The general project and work parameters of the power station are as follows:


ContourGlobal Maritsa East 3 is situated at approximately 60 km to the Southeast of the town of Stara Zagora, 10 km to the southeast of Galabovo and 2 km to the north of Mednikarovo, Haskovo District, in proximity to Troyanovo 3 open mine.

The reference values of the ambient conditions are as follows:

- Average atmospheric pressure: 1004.5 hPa
- Minimal Ambient Air temperature: -28.5 °C
- Maximal Ambient Air temperature: 45 °C
- Average annual minimal temperature: 6.6 °C
- Average annual maximal temperature: 18.4 °C
- Minimal relative humidity: 14 %
- Maximal relative humidity: 100 %
- Average annual minimal humidity: 35 %
- Average annual maximal humidity: 73 %
- Altitude: 138 m

### 2.1 WORKING ENVIRONMENT IN CENTRAL CONTROL ROOMS

- Air temperature 18-25 °C
- Relative humidity of the air 30-75 %
- Velocity of the air < 0.2 m/s
- Vibrations (r.m.s. value of the vibration acceleration m/s<sup>2</sup>) < 0.5 (t=480 min)

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## 2.2 PARAMETERS OF THE POWER SUPPLY IN THE POWER STATION

The power supply used is 0,4 kV – three phases. The possible deviations are  $\pm 10\%$  for prolonged operational regime. For a period of 25 s it is possible to reach even -25%. The frequency of the power supply network is 50 Hz with possible deviations from 49,5 to 50,5 Hz. For short periods the value of 47 Hz.  $\cos \varphi = 0,6 \div 1$  can also be reached.

## 2.3 PARAMETERS OF THE POWER SUPPLY IN THE DCS

The power supply of the controllers (automating processors) shall be redundant. Two lines 24VDC, respectively L1 and L2 shall be formed by paired stabilized rectifiers with the following parameters, indicated in the table below:

|   |  |
|---|--|
| Description                               | D24/250 WBrug-WGS-U                              |
| Power supply                              | 8 kW   |
| AC mains input                            |  |
| Voltage                                   | 3x400 V +10% - 10%, 3-phase. PE                  |
| Frequency                                 | 45-63 Hz   |
| Nominal Current consumption               | 2x13 A (bei Ua 26.8 V)                           |
| Maximal consumption                       | 3x15.5 A   |
| Power Factor                              | > 0.95 (10-100% load)                            |
| DC output                                 |  |
| 3 parameters per charge                   | Externally set                                   |
| Rated voltage                             | 24 V   |
| Established range for each characteristic | 22.5-33 V  |
| Set value, charging characteristic 1:     | 24.7 V   |
| charging characteristic 2:                | 26.8 V   |
| charging characteristic 3:                | 28.8 V   |
| Accuracy of the output current            | $\pm 1\%$  |
| Output current                            | 0-250A (up to 32 V output voltage)               |
| Current restriction                       | 125-250 A Can be set                             |
| Charging characteristics                  | Constant current, constant voltage               |
| Characteristics at short circuit          | Proved checked                                   |
| AC in output                              |  |
| Interface voltage                         | $\leq 1\%$ rms                                   |
| Psophometric noise voltage                | $\leq 1\%$ , frequency-weighted (ITU-T A filter) |


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### 3. DESCRIPTION AND MAIN TECHNICAL DATA OF THE CONTROL SYSTEM OF THE TECHNOLOGICAL PROCESSES AND PROTECTIONS SPPA-T2000 (TELEPERM XP)


The control system for technological processes and protection in ContourGlobal Maritsa East 3 TPP was manufactured by the company of Siemens. The old, trade title of the system was Teleperm XP and the new one is SPPA-T2000.

#### 3.1 COMPUTER CONFIGURATIONS WITHIN THE SCOPE OF SPPA-T2000

| OmKomp name | Function of OM650                         |
|-------------|---|
| ma12ot01    | COT. Operator station with three displays |
| ma12ot02    | COT. Operator station with three displays |
| ma12ot04    | WEB_HMI - server                          |
| ma12pu1a    | PU – PROCESS UNIT 1                       |
| ma12pu1b    | PU – PROCESS UNIT 1                       |
| ma22pu1a    | PU – PROCESS UNIT 2                       |
| ma22pu1b    | PU – PROCESS UNIT 2                       |
| ma52pu1a    | PU – PROCESS UNIT FGD                     |
| ma52pu1b    | PU –PROCESS UNIT FGD                      |
| ma12su1a    | SU –SERVER UNIT Project „maritzes”        |
| ma12su1b    | SU –SERVER UNIT Project „maritzes”        |
| ma12ot03    | COT. Operator station with one display    |
| ma22ot01    | COT. Operator station with three displays |
| ma22ot02    | COT. Operator station with three displays |
| ma22ot04    | WEB_HMI - server                          |
| ma12it01    | WEB_HMI – server (office usage)           |
| ma52ot01    | COT. Operator station with three displays |
| ma52ot02    | COT. Operator station with three displays |
| ma22ot03    | COT. Operator station with one display    |
| ma32ot01    | COT. Operator station with three displays |
| ma32ot02    | COT. Operator station with three displays |
| ma32ot03    | COT. Operator station with one display    |
| ma32ot04    | WEB_HMI - server                          |
| ma32it01    | WEB_HMI – server (office usage)           |
| ma32pu1a    | PU – PROCESS UNIT 3                       |


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|--|--|
| ma32pu1b                                   | PU –PROCESS UNIT 3   |
| ma42pu1a                                   | PU – PROCESS UNIT 4  |
| ma42pu1b                                   | PU – PROCESS UNIT 4  |
| ma62pu1a                                   | PU - PROCESS UNIT GDP  |
| ma62pu1b                                   | PU - PROCESS UNIT GDP  |
| ma32su1a                                   | SU – SERVER UNIT project „mari34es”                                |
| ma32su1b                                   | SU – SERVER UNITproject „mari34es”                                 |
| ma42ot01                                   | COT. Operator station with three displays                          |
| ma42ot02                                   | COT. Operator station with three displays                          |
| ma42ot04                                   | WEB_HMI – server   |
| ma62ot01                                   | COT. Operator station with three displays                          |
| ma12opc1                                   | OPC server for project “maritzes”                                  |
| ma32opc1                                   | OPC server for project “mari34es”                                  |
| ma12es01                                   | ES680 master with two projects “maritzes” and “mari34es”           |
| ma12pr01                                   | Network hardcopy color printer in Control room 1                   |
| ma32pr01                                   | Network hardcopy color printer in Control room 2                   |
| ma52pr01                                   | Network hardcopy color printer in Control room in FGD Control room |
| <b>Automating processors (Controllers)</b> |  |
| AP01                                       | Automating processor 1   |
| AP04                                       | Automating processor 4   |
| AP11                                       | Automating processor 11  |
| AP12                                       | Automating processor 12  |
| AP13                                       | Automating processor 13  |
| AP14                                       | Automating processor 14  |
| AP15                                       | Automating processor 15  |
| AP16                                       | Automating processor 16  |
| AP17                                       | Automating processor 17  |
| AP18                                       | Automating processor 18  |
| AP21                                       | Automating processor 21  |
| AP22                                       | Automating processor 22  |
| AP23                                       | Automating processor 23  |
| AP24                                       | Automating processor 24  |
| AP25                                       | Automating processor 25  |
| AP26                                       | Automating processor 26  |

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|------|-------------------------|
| AP27 | Automating processor 27 |
| AP28 | Automating processor 28 |
| AP31 | Automating processor 31 |
| AP32 | Automating processor 32 |
| AP33 | Automating processor 33 |
| AP34 | Automating processor 34 |
| AP35 | Automating processor 35 |
| AP36 | Automating processor 36 |
| AP37 | Automating processor 37 |
| AP38 | Automating processor 38 |
| AP41 | Automating processor 41 |
| AP42 | Automating processor 42 |
| AP43 | Automating processor 43 |
| AP44 | Automating processor 44 |
| AP45 | Automating processor 45 |
| AP46 | Automating processor 46 |
| AP47 | Automating processor 47 |
| AP48 | Automating processor 48 |
| AP51 | Automating processor 51 |
| AP52 | Automating processor 52 |
| AP53 | Automating processor 53 |
| AP54 | Automating processor 54 |
| AP61 | Automating processor 61 |




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### 3.2 DETAILED DESCRIPTION OF THE COMPUTER CONFIGURATIONS AND THE AUTOMATED PROCESSORS


| OM Component | Description, intended use  |
|--------------|--|
| ma12es01     | Engineering station, contains database of the two projects.  |
| ma12ot01     | COT Operator station with three displays – Main operator terminal for control on the technological processes of Boiler Unit 1  |
| ma12ot02     | COT Operator station with three displays – Main operator terminal for control on the technological processes of Turbine Unit 1   |
| ma12ot03     | Operator station for control on the Electrical part Unit 1, Unit 2 and Common Auxiliary.   |
| ma12ot04     | WEB_HMI - server, used for control on the technological processes from additional operator station type “thin client” and video wall Unit 1.   |
| ma12pu1a     | Process server; maintains the process images of the signals from the functional complexes, pertaining to Unit 1 and fulfills the function of short time archive. Calculating functions were realized in the server.    |
| ma12pu1b     | Process server; maintains the process images of the signals from the functional complexes, pertaining to Unit 1 and fulfills the function of short time archive. Calculating functions were realized in the server.    |
| ma12su1a     | Server for long term archive of the project maritzes. Archives data from Unit 1, Unit 2 and FGD.   |
| ma12su1b     | Server for long term archive of the project maritzes. Archives data from Unit 1, Unit 2 and FGD  |
| ma52pu1a     | Process server; maintains the process images of the signals from the functional complexes, pertaining to FGD and fulfills the function of short time archive. Calculating functions were realized in the server.       |
| ma52pu1b     | Process server; maintains the process images of the signals from the functional complexes, pertaining to FGD and fulfills the function of short time archive. Calculating functions were realized in the server.       |
| ma22pu1a     | Process server, maintains the process images of the signals from the functional complexes pertaining to Unit 2 and carries out the function of a short time archive. Calculation functions are realized in the server. |
| ma22pu1b     | Process server, maintains the process images of the signals from the functional complexes pertaining to Unit 2 and carries out the function of a short time archive. Calculation functions are realized in the server. |

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| ma22ot01  | COT - Operator station with three displays – Main operator terminal for control on the technological processes of Boiler of Unit 2.  |
| ma22ot02  | COT - Operator station with three displays – Main operator terminal for control on the technological processes of Turbine of Unit 2.   |
| ma22ot04  | WEB_HMI - server, used for control of the technological processes from additional operators stations type Thin client and video display wall, Unit 2.  |
| ma12it01  | WEB_HMI - server, used by the office, only for observation of the technological processes of Unit1, Unit 2 and FGD.  |
| ma52ot01  | COT - Operator station with three displays – Main operator terminal for control on the technological processes of Absorber 12.   |
| ma52ot02  | COT - Operator station with three displays – Main operator terminal for control on the technological processes of Absorber 34.   |
| ma22ot03  | WEB_HMI - server, used for control over the technological processes of FGD, CW pump station, Heavy fuel oil plant.   |
| ma32ot01+ | COT - Operator station with three displays – Main operator terminal for control on the technological processes of Boiler Unit 3  |
| ma32ot02  | COT - Operator station with three displays – Main operator terminal for control on the technological processes of Turbine Unit 3   |
| ma32ot03  | WEB_HMI - server, – Operator station for control over the Electrical part of Unit 3 and Unit 4.  |
| ma32ot04  | WEB_HMI - server, used for management of the technological processes from additional operator stations type “thin” client and Video display wall, Unit 3.  |
| ma32pu1a  | Process server, maintains process images of the signals from the functional complexes, pertaining to Unit 3 which carries out the function of a short-time archive. Calculating functions are realized in the server.      |
| ma32pu1b  | Process server, maintains process images of the signals from the functional complexes, pertaining to Unit 3 which carries out the function of a short-time archive. Calculating functions are realized in the server.      |
| ma32su1a  | Server for long-term archive of mari34es. It archives data from Unit 3, Unit 4 and GDP.  |
| ma32su1b  | Server for long-term archive of mari34es. It archives data from Unit 3, Unit 4 and GDP.  |
| ma42pu1a  | Process server, it maintains the process images of the signals from the functional complexes pertaining to Unit 4 and carries out the function of a short-term archive. Calculating functions were realized in the server. |
| ma42pu1b  | Process server, it maintains the process images of the signals from the functional complexes pertaining to Unit 4 and carries out the function of a  |

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|                  |   |
|------------------|---|
|                  | short-term archive. Calculating functions were realized in the server.  |
| ma42ot01         | COT - Operator station with three displays – Main operator terminal for control on the technological processes of Boiler, Unit 2.   |
| ma42ot02         | COT - Operator station with three displays – Main operator terminal for control on the technological processes Turbine, Unit 2.   |
| ma42ot04         | WEB_HMI - server, used to exercise control over the technological processes from additional operating stations type „thin client“ and video display wall of Unit 4.   |
| ma62pu1a         | Process server, it maintains the process images of the signals from the functional complexes pertaining to GDP and carries out the function of a short-term archive. Calculating functions were realized in the server. |
| ma62pu1b         | Process server, it maintains the process images of the signals from the functional complexes pertaining to GDP and carries out the function of a short-term archive. Calculating functions were realized in the server. |
| ma62ot01         | COT - Operator station with three displays – Main operator terminal for control on the technological processes of GDP.  |
| ma32it01         | WEB_HMI - server, used by the office only for monitoring the technological processes of Unit3, Unit 4 and GDP.  |
| ma12opc1         | OPC server for the project mari34es, used for system integration.   |
| ma32opc1         | OPC server for the project mari34es, used for system integration.   |
| AS620 components |   |
| AP1              | Automating processor 1 contains common auxiliaries signals from UNIT facilities, electrical signals from Transformers 20T и 30T.  |
| AP4              | Automating processor 4 contains common auxiliary signals from CW pump station and heavy fuel oil plant.   |
| AP11             | Automating processor 11 contains signals from Boiler 1 – ID Fans, ESP, FD Fans, Feedwater pump and Gas-Air Tract.   |
| AP12             | Automating processor 12 contains signals from WATER-STEAM cycle – Drum, Deaerator , Main steam, Re-heater, Pressure reducing system.  |
| AP13, APF 1,2,4  | Automating processor 13 contains signals from Boiler 1 – Coal mills, Heavy fuel oil burners and Boiler Protections.   |
| AP14             | Automating processor 14 contains signals from Electrical part of Unit 1 – Transformers, Generator, Generator Distillate System, Generator Oil sealing system, Generator Temperature control.                            |
| AP15             | Automating processor 15 contains signals from Turbine 1 – Turbine protections 1, Turbine temperature control 1, Sealing steam and Vibrations.   |
| AP16             | Automating processor 16 contains signals from Turbine 1– LP heater, HP  |

|   |   |   |
|---|---|---|
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|                 |   |
|-----------------|---|
|                 | heater, Drainages of the Turbine, Oil system of the Turbine.  |
| AP17            | Automating processor 17 contains signals from Turbine CONTROLLER Simadyn D – Turbine control.   |
| AP18            | Automating processor 18 contains status signals from Electrical part of Unit 1 and NOx project.   |
| AP21            | Automating processor 21 contains signals from Boiler 2 – ID Fans, FD Fans, Feedwater pumps and Gas-Air Tract.   |
| AP22            | Automating processor 22 contains signals from WATER-STEAM cycle – Drum, Deaerator , Main steam, Re-heater, POY.   |
| AP23, APF 1,2,4 | Automating processor 23 contains signals from Boiler 2 – Coal mills, Heavy fuel oil burners and Boiler protections.   |
| AP24            | Automating processor 24 contains signals from Electrical systems, Unit 2 – Transformers, Generator, Generator Distillate system, Generator Oil sealing system, Generator Temperature control. |
| AP25            | Automating processor 25 contains signals from Turbine 2 – Turbine protections 2, Turbine temperature control 2, Sealing steam and Vibrations.   |
| AP26            | Automating processor 26 contains signals from Turbine 2 – LP heater, HP heater, Drainages of the Turbine, Oil system of the Turbine.  |
| AP27            | Automating processor 27 contains signals from Turbine CONTROLLER Simadyn D – Turbine Control.   |
| AP28            | Automating processor 28 contains status signals from Electrical part of Unit 2 and NOx project.   |
| AP31            | Automating processor 31 contains signals from Boiler 3 – ID Fans, FD Fans, Feedwater pumps and Gas-Air Tract.   |
| AP32            | Automating processor 32 contains signals from WATER-STEAM cycle – Drum, Deaerator , Main steam, Reheater, Pressure reducing system.   |
| AP33, APF 1,2,4 | Automating processor 33 contains signals from Boiler 3 – Coal mills, Heavy fuel oil burners and Boiler Protections.   |
| AP34            | Automating processor 34 contains signals from Electrical part Unit 3 – Transformers, Generator, Generator Distillate System, Generator Oil sealing system, Generator Temperature control .    |
| AP35            | Automating processor 35 contains signals from Turbine 3 –Turbine protections 3, Turbine temperature control 3, Sealing steam and Vibrations.  |
| AP36            | Automating processor 36 contains signals from Turbine 3 – LP heater, HP heater, Drainages of the Turbine, Oil system of the Turbine.  |
| AP37            | Automating processor 37 contains signals from Turbine CONTROLLER Simadyn D – Turbine Control.   |

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|                 |   |
|-----------------|---|
| AP38            | Automating processor 38 contains status signals from Electrical part of Unit 3 and NOx project  |
| AP41            | Automating processor 41 contains signals from Boiler 4 – ID Fans, FD Fans, Feedwater pumps and Gas-Air Tract.   |
| AP42            | Automating processor 42 contains signals from WATER-STEAM cycle – Drum, Deaerator, Main steam, Re-heater, Pressure reducing system.   |
| AP43, APF 1,2,4 | Automating processor 43 contains signals from Boiler 4 – Coal mills, Heavy fuel oil burners and Boiler Protections.   |
| AP44            | Automating processor 44 contains signals from Electrical part of Unit 4 – Transformers, Generator, Generator Distillate System, Generator Oil sealing system, Generator Temperature control |
| AP45            | Automating processor 45 contains signals from Turbine 4 – Turbine protections 4, Turbine temperature control 4, Sealing steam and Vibrations.   |
| AP46            | Automating processor 46 contains signals from Turbine 4 – LP heater, HP heater, Drainages of the Turbine, Oil system of the Turbine.  |
| AP47            | Automating processor 47 contains signals from Turbine CONTROLLER Simadyn D – Turbine Control.   |
| AP48            | Automating processor 48 contains status signals from Electrical part of Unit 4 and NOx project.   |
| AP51            | Automating processor 51 contains signals from FGD Common Auxiliaries – Makeup water pumps, Breakers, Oxyblowers.  |
| AP52            | Automating processor 52 contains signals from FGD Common Auxiliaries, Ball mill plant - Ball mills, Hydrocyclones, Belt conveyers, Crushers, limestone stacking and reclaiming equipment.   |
| AP53            | Automating processor 53 contains signals from Absorber 12 – Gas analyzers, Recirculation pumps, Gypsum pumps, Demisters.  |
| AP54            | Automating processor 54 contains signals from Absorber 34 – Gas analyzers, Recirculation pumps, Gypsum pumps, Demisters.  |
| AP61            | Automating processor 61 contains signals from Gypsum Dewatering plant.  |

### 3.3 DATA BASES (PROJECTS) WITHIN SPPA-T2000

Two Ingress configuration data bases are installed in the engineering station ma12es01. Their functionalities are listed in the table below.

|   |   |   |
|---|---|---|
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| DB name (project name) | Intended for   |
|------------------------|--|
| maritzes               | Unit 1<br>Unit 2<br>CW Pump station and Cooling water<br>Heavy Fuel oil plant<br>TPP Common Auxiliaries<br>FGD 12<br>FGD 34<br>Common Auxiliaries and installation FGD |
| mari34es               | Unit 3<br>Unit 4<br>GDP  |


|   |   |   |
|---|---|---|
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### 3.4 FUNCTIONAL COMPLEXES (FC) FOR PROJECTS MARITZES AND MARI34ES

| FC# | Description                 |
|-----|-----------------------------|
| 21  | Boiler 2                    |
| 22  | Steam-water cycle Unit 2    |
| 23  | Turbine 2 & Generator 2     |
| 24  | Power supply Unit 2         |
| 6   | Auxiliary systems           |
| 9   | System buffer Unit 1        |
| 11  | Boiler 1                    |
| 12  | Steam-water cycle Unit 1    |
| 13  | Turbine 1 & Generator 1     |
| 14  | Power supply Unit 1         |
| 50  | FGD common auxiliaries      |
| 60  | Absorber 12                 |
| 70  | Absorber 34                 |
| 99  | OM operation and monitoring |
| 10  | System buffer Unit 2        |
| 7   | GDP                         |
| 39  | System buffer Unit 3        |
| 49  | System buffer Unit 4        |
| 31  | Boiler 3                    |
| 32  | Steam-water cycle Unit 3    |
| 33  | Turbine 3 & Generator 3     |
| 34  | Power supply Unit 3         |
| 41  | Boiler 4                    |
| 42  | Steam-water cycle Unit 4    |
| 43  | turbine 4 & Generator 4     |
| 44  | Power supply Unit 4         |
| 98  | OM                          |

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All field signals, group controls, automatic regulators, logics conditions Interlocks and protections are assigned in functional complexes in conformity with their technological intended use. The table below states the main aggregates and technological systems which are listed in each separate complex

| FC №  | Technological equipment within the complex   |
|-------|--|
| FC 21 | ID Fans, ESP, FD Fans, Coal mills, Heavy fuel oil burners, Gas Air tract and Boiler protections.   |
| FC 22 | Feedwater pump, Drum, Deaerator, Main steam, Reheater, STEAM LINE Reducing system, SAMPLE station Unit 2.  |
| FC 23 | Turbine protections, Temperature control in the turbine, sealing steam, vibrations, LP Heater, HP heater, Turbine drainages, Oil system in turbine; Distillate system of Generator, Oil sealing system of generator, Temperature of generator;     |
| FC 24 | Transformer, Generator, Electrical switchgear 6KV/0.4 KV.  |
| FC 6  | CW Pump station, Heavy fuel oil plant, Electrical part   |
| FC 9  | System messages for Unit 1   |
| FC 11 | ID Fans, ESP, FD Fans, Coal mills, Heavy fuel oil burners, Gas Air tract and Boiler protections.   |
| FC 12 | Feedwater pump, Drum, Deaerator, Main steam, Re-heater, STEAM LINE reducing system, SAMPLE station Unit 1.   |
| FC 13 | Turbine protections, Turbine temperature control, Sealing steam, Vibrations, LP heater, HP heater, Drainages of the Turbine, Oil system of the Turbine; Generator Distillate System, Generator Oil sealing system, Generator Temperature control ; |
| FC 14 | Transformers, Generator, Electrical switchgear 6KV/0.4 KV  |
| FC 50 | FGD – Common Auxiliaries electrical part, Oxyblowers, Make-up water pumps, LIMESTONE plant   |
| FC 60 | Absorber 12 gas analyzers, Recirculation pumps, Gypsum pumps, Demisters, Electrical part Absorber 12.  |
| FC 70 | Absorber 34 Gas Analyzers, Recirculation pumps, Gypsum pumps, Demisters, Electrical part Absorber 34   |
| FC 99 | System messages about the status of the OM components.   |
| FC 10 | System messages about Unit 2.  |
| FC 7  | GDP  |
| FC 39 | System messages about Unit 3.  |
| FC 49 | System messages about Unit 4.  |
| FC 31 | ID Fans, ESP, FD Fans, Coal mills , Heavy fuel oil burners, Gas-Air Tract and  |


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|       |  |
|-------|--|
|       | Boiler Protections.  |
| FC 32 | Feedwater pump, Drum, Deaerator , Main steam, RE-HEATER, STEAM LINE reducing station, SAMPLE station Unit 3.   |
| FC 33 | Turbine protections, Turbine temperature control, Sealing steam, Vibrations, LP heater, HP heater, Drainages of the Turbine, Oil system of the Turbine; Generator Distillate System, Generator Oil sealing system, Generator Temperature control;          |
| FC 34 | Transformers, Generator, Electrical switchgear 6KV/0.4 KV  |
| FC 41 | ID Fans, ESP, FD Fans, Coal mills , Heavy fuel oil burners, Gas-Air Tract and Boiler Protections.  |
| FC 42 | Feedwater pump, Drum, Deaerator, Main steam, Re-heater, STEAM LINE reducing system, SAMPLE station Unit 4.   |
| FC 43 | Turbine protections, Turbine temperature control, Sealing steam, Vibrations, LP heater, HP Heater, Drainages of the Turbine, Oil system of the Turbine; Distillate system of Generator, Oil sealing system of Generator, Temperature control of Generator; |
| FC 44 | Transformers, Generator, Electrical switchgear 6KV/0.4 KV  |
| FC 99 | System messages about the status of OM components.   |

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### 3.5 CALCULATING FUNCTIONS

A number of calculating functions are realized in SPPA-T2000. These are functions aimed at showing value (average or total) and calculated compensation till the end of the operating interval, with which to achieve the set point (which is usually a set value) within the calculating period. The table below shows the most widely used calculations.

|   |
|---|
| Average hourly values of NOx and CO of the Generating Units   |
| Average hourly values of Electricity load of the Generating Units   |
| Total amount of used heavy fuel oil per Generating Unit for the current shift and for the previous shift. |
| Total amount of demineralized water per generating unit for the current shift and for the previous shift. |
| Total quantity of used limestone in FGD for the current shift and for the previous shift.                 |
| Hourly schedule for Net Electricity load of a Generating Unit and compensation within the hour.           |


Another type of User's calculating functions which operate in DCS's process servers are Hours of operation of aggregates and cycles of switching on of breakers, serving main facilities. The table below presents some of the typical representatives of this class.

|                             |
|-----------------------------|
| ID Fans and its auxiliaries |
| FD Fans                     |
| Coal mills                  |
| Feedwater pumps             |
| Condensate pumps II stage   |
| Transformers 6/0.4 KV FGD   |
| Breakers and UPS FGD        |


|   |   |   |
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### 3.6 CALCULATING FUNCTIONS – DISTRIBUTION ON PU SERVERS


| Unit | PU#21 (PUa/b)   |
|------|---|
| 1    | Active power net  |
|      | Calculating average values of NOX/CO of Unit - 30 min, per 24 h periods and calculated compensation for the period. |
|      | Modification of Net schedule  |
|      | Total amount Flowrate of demiwater per Unit per shift and for previous period                                       |
|      | Total consumption of heavy fuel oil   |
|      | Hours of operation of Unit 1  |
|      | Active power Unit 1   |
|      | Reference value of Auxiliary power consumption  |
|      | Reference value of Auxiliary power losses   |
|      | Reference value of % of Heat  |
|      | Reference value of Demineralized water  |
|      | Losses Boiler 1   |
|      | Reference value of Combustion Air after Air heaters   |
|      | Reference value of Air after FD Fans  |
|      | Reference value of % O <sub>2</sub>   |
|      | Reference value of T of Flue Gas  |
|      | Losses Steam Air Cycle  |
|      | Reference value of T inlet ECO  |
|      | Reference value of T Main Steam   |
|      | Reference value of T Cold reheat  |
|      | Reference value of T main condensate after Condensate pump 2 <sup>nd</sup> stage                                    |
|      | Reference value of T of Main Condensate after LP Heater 4   |
|      | Reference value of Losses Turbine 1   |
|      | Reference value of P Condenser  |
|      | Income  |
|      | Reference value of T of Cooling water   |

|   |   |   |
|---|---|---|
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|      |   |
|------|---|
|      | Reference value of % share of Heat from Fuel  |
|      | Hours of operation of Electrical motor of ID Fans and its auxiliaries, namely:<br>1. Oil pumps;<br>2. Cooling Fans;<br>3. Sealing Air Fans; |
|      | FD Fans   |
|      | Coal mills  |
|      | Feed water pumps  |
|      | Condensate pumps 2 <sup>nd</sup> stage  |
|      | Hot Air Recirculation Fans  |
| Unit | PU#22 (PUa/b)   |
| 2    | Active Power Net  |
|      | Calculating average values of NOX/CO of a Generating Unit - 30 min, each 24 h.  |
|      | Modification of Net schedule  |
|      | Total amount of Flowrate of demiwater per Generating Unit per shift and per expired period.   |
|      | Total consumption of Heavy Fuel Oil.  |
|      | Hours of operation of Generating Unit 2   |
|      | Active power Unit 2   |
|      | Reference value of Auxiliary power consumption  |
|      | Reference value of Auxiliary power losses   |
|      | Reference value of % of Heat  |
|      | Reference value of Demineralized water  |
|      | Reference value of Losses of Boiler 2   |
|      | Reference value of Combustion Air after Steam Air heaters   |
|      | Reference value of Air after FD Fans  |
|      | Reference value of % O <sub>2</sub>   |
|      | Reference value of T of Flue Gas  |
|      | Losses in Steam-water cycle   |
|      | Reference value of T inlet ECO  |

|   |   |                                       |
|---|---|---------------------------------------|
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|      |  |
|------|--|
|      | Reference value of T of Main steam   |
|      | Reference value of T of Cold Reheat line   |
|      | Reference value of T Main Condensate after Convective Pumps 2 <sup>nd</sup> stage.   |
|      | Reference value of T Main condensate after LP Heater 4   |
|      | Reference value of Losses Turbine 2  |
|      | Reference value of P Condenser   |
|      | Reference value of income  |
|      | Reference value of T of Cooling water  |
|      | Reference value of % share of heat from Fuel   |
|      | Hours of operation of Electrical Motor of ID Fans and its main auxiliaries:<br>1. Oil Pumps;<br>2. Cooling Fans;<br>3. Sealing Air Fans; |
|      | Hours of operation of FD Fans  |
|      | Hours of operation of Coal mills   |
|      | Hours of operation of Feedwater pumps  |
|      | Hours of operation of Condensate pumps 2nd stage   |
|      | Hours of operation of Hot Air Recirculation Fans   |
| Unit | PU#23 (PUa/b)  |
| 3    | Active Power Net   |
|      | Calculation of average Values of NOX/CO of Generating Unit - 30 min, each 24 h.  |
|      | Modification Net Schedule  |
|      | Total amount F demineralized water per shift and per previous period   |
|      | Total consumption of Heavy fuel oil  |
|      | Hours of operation of Generating Unit 3  |
|      | Active power Generating Unit 3   |
|      | Reference value of Auxiliary power consumption   |
|      | Reference value of Auxiliary power losses  |
|      | Reference value of % share of heat   |

|   |   |   |
|---|---|---|
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|      |  |
|------|--|
|      | Reference value of Demineralized water   |
|      | Reference value of Losses Boiler 3   |
|      | Reference value of Combustion Air after steam air heaters  |
|      | Reference value of Air after FD Fans   |
|      | Reference value of % O <sub>2</sub>  |
|      | Reference value of T of Flue gas   |
|      | Losses of Steam-Air cycle  |
|      | Reference value of T inlet ECO   |
|      | Reference value of T Main steam  |
|      | Reference value of T Cold reheat line  |
|      | Reference value of T Main condensate after condensate pumps 2 <sup>nd</sup> stage.   |
|      | Reference value of T Main condensate after Cold Reheat line 4  |
|      | Reference value of Losses Turbine 3  |
|      | Reference value of P Condenser   |
|      | Income   |
|      | Reference value of T of cooling water  |
|      | Reference value of % share heat Fuel   |
|      | Hours of operation of Electrical motor of ID Fans and its main auxiliaries:<br>1. Oil pumps;<br>2. Cooling Fans;<br>3. Sealing Air Fans; |
|      | Hours of operation of FD Fans  |
|      | Hours of operation of Coal mills   |
|      | Hours of operation of Feedwater pumps  |
|      | Hours of operation of condensate pumps 2 <sup>nd</sup> stage   |
|      | Hours of operation of Hot Air Recirculation Fans   |
| Unit | PU#24 (PUa/b)  |
| 4    | Active power Net   |
|      | Calculation of average values of NOX/CO of Unit - 30 min, at 24 h.   |
|      | Modification schedule Net power  |


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|  |  |
|--|--|
|  | Total quantity F of demiwater per shift and for previous period.   |
|  | Total consumption of demiwater   |
|  | Hours of operation of Unit 4   |
|  | Active power Unit 4  |
|  | Reference value of Auxiliary power consumption   |
|  | Reference value of Auxiliary power losses iht7   |
|  | Reference value of % of Heat   |
|  | Reference value of Demiwater   |
|  | Reference value of % losses from heat Boiler 4   |
|  | Reference value of combustion Air after Steam Air Heaters  |
|  | Reference value of Air after FD Fans   |
|  | Reference value of % O <sub>2</sub>  |
|  | Reference value of T of Flue gas   |
|  | Reference value of Losses from Air-water cycle   |
|  | Reference value of T Inlet ECO   |
|  | Reference value of T Main Steam  |
|  | Reference value of T of Cold Reheat line   |
|  | Reference value of T of Main condensate after condensate pumps 2 <sup>nd</sup> stage   |
|  | Reference value of T of main condensate after PL Heater 4  |
|  | Losses Turbine 4   |
|  | Reference value of P Condenser   |
|  | Reference value of Income  |
|  | Reference value of T of Cooling water  |
|  | Reference value of % Heat from Fuel  |
|  | Hours of operation of Electrical motor of ID Fans and its main auxiliaries, namely:<br>1.Oil pumps;<br>2.Cooling fans;<br>3. Sealing air fans; |
|  | Hours of operation of FD Fans  |


|   |   |   |
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|      |   |
|------|---|
|      | Hours of operation of Coal mills  |
|      | Hours of operation of Feedwater pumps   |
|      | Hours of operation of Condensate pumps 2nd stage  |
|      | Hours of operation of Hot Air Recirculation Fans  |
| Unit | PU#25 (PUa/b)   |
| COI  | Hours of operation of 6KV breaker   |
|      | Hours of operation of Transformer 6/0.4 KV  |
|      | Hours of operation of Transformer 6/0.4 KV  |
|      | Hours of operation of Transformer 6/0.4 KV  |
|      | Hours of operation of Transformer 6/0.4 KV  |
|      | Hours of operation of Transformer 6/0.4 KV  |
|      | Hours of operation of Transformer 6/0.4 KV  |
|      | Hours of operation of Ball Mill 1   |
|      | Hours of operation of Ball Mill 2   |
|      | Hours of operation of Ball Mill 3   |
|      | Hours of operation of Oxyblower 1   |
|      | Hours of operation of Oxyblower 2   |
|      | Hours of operation of Oxyblower 3   |
|      | Hours of operation of Breaker 00BRS   |
|      | Total consumption of limestone, Belt conveyer 6 Belt conveyer   |
|      | Total consumption of limestone, Belt conveyer 7   |
|      | Total consumption of limestone, Belt conveyer 8   |
|      | Total consumption of limestone, Belt conveyer 9   |
|      | Total consumption of limestone, Belt conveyer 10  |
|      | Hours of operation of Power supply from UPS   |
|      | Hours of operation of 00BUR   |
|      | Hours of operation of Transformer 15/6 KV   |
|      | Calculation of average values of % of scrubbing of SO <sub>2</sub> of Absorber 12 and calculated compensation for the period of 1 h, 12 hrs and 24 hrs. |



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|      |   |
|------|---|
|      | Calculation of average values of % of scrubbing of SO <sub>2</sub> of Absorber 34 and calculated compensation for the period of 1 h, 12 hrs and 24 hrs. |
| Unit | PU#26 (PUa/b)   |
| GDP  | Hours of operation of Compressor 1  |
|      | Hours of operation of Compressor 2  |
|      | Hours of operation of Belt conveyer 1   |
|      | Hours of operation of Belt conveyer 2   |
|      | Hours of operation of Vacuum filter 1   |
|      | Hours of operation of Vacuum filter 2   |
|      | Hours of operation of Vacuum filter 3   |
|      | Hours of operation of Vacuum filter 4   |
|      | Hours of operation of Vacuum Pump 1   |
|      | Hours of operation of Vacuum Pump 2   |
|      | Hours of operation of Vacuum Pump 3   |
|      | Hours of operation of Vacuum Pump 4   |
|      | Hours of operation of Filtrate pump 1   |
|      | Hours of operation of Filtrate pump 2   |
|      | Hours of operation of Filtrate pump 3   |
|      | Hours of operation of Gypsum pump 1   |
|      | Hours of operation of Gypsum pump 2   |
|      | Hours of operation of Gypsum agitator   |
|      | Hours of operation of Agitator for filtrate tank  |
|      | Hours of operation of Agitator for auxiliary filtrate tank  |

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### 3.7 AP-AP COMMUNICATION AT PLANT BUS LEVEL

As stated earlier in the text the DCS system is divided into two projects **maritzes** (Unit 1, Unit 2 and FGD Plant) and **mari34es** (Unit 3, Unit 4 and the Gypsum Dewatering Plant). In order to effect technological interlocks between two installations of the two projects an intraproject signal addressing system has been created at the level of automation processors. This cyclic interchange of signals is always effected between two automation processors (AP), one of which appertains to the infrastructure of the one project and the other is respectively part of the second project. The following table shows information about all specific cases of such communication.

| AP - AP  | Cause. Use  |
|--|---|
| Gypsum Dewatering plant (AP61) and Absorber 12(AP53) | Existing interlocks between valves on filtrate circle.  |
| Gypsum Dewatering plant (AP61) and Absorber 34(AP54) | Existing interlocks between valves on filtrate circle.  |
| Absorber 34(AP54) and Unit 3(AP31)                   | Replicated signals from gas analysers at inlet and outlet of Absorber 34 at Unit 3.   |
| Unit 3(AP31) and Absorber 34(AP54)                   | Replicated signals from the Step program of Unit 3 flue gases to the Step program of Absorber 34 flue gases.                                  |
| Unit 3(AP41) and Absorber 34(AP54)                   | Replicated signals from the Step program of Unit 4 flue gases to the Step program of Absorber 34 flue gases.                                  |
| Absorber 34(AP54) and Unit 3(AP31)                   | Replicated signals from the Step program of Absorber 34 flue gases to the Step program of Unit 3 flue gases.                                  |
| Unit 3(AP31) and Absorber 34(AP54)                   | Replication of status signals from Bypass valve of Unit 3 stack and Absorber 34.  |
| Unit 4(AP41) and Absorber 34(AP54)                   | Replication of status signals from Bypass valve of Unit 4 Stack and Absorber 34.  |
| Unit 3(AP31) and Absorber 34(AP54)                   | Replication of status signals from Valve to FGD plant of Unit 3 and Absorber 34.  |
| Unit 4(AP41) and Absorber 34(AP54)                   | Replication of status signals from Valve to FGD plant of Unit 4 and Absorber 34.  |
| Unit 3(AP31) and Absorber 34(AP54)                   | Replicated signals for total consumption of flue gases of Unit 3 ID Fan used to calculate the total consumption of flue gases to Absorber 34. |
| Unit 4(AP41) and Absorber 34(AP54)                   | Replicated signals for total consumption of flue gases of Unit 4 ID Fan used to calculate the total consumption of flue gases to Absorber 34. |
| Absorber 34 (AP54) and Unit 3(AP31)                  | Replicated signal from Protection of Absorber 34 to Unit 3.   |

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### 3.8 REPLICATED INTERPROJECT SIGNALS AT TERMINAL BUS LEVEL

Equipment which is common for the TPP such as the CW Pump Station and Fuel Oil Plant functionally appertains to the project maritzes. Absorber 34, scrubbing sulphur in flue gases of Boilers 3 and 4 also belongs to the project maritzes. The gypsum dewatering plant for its part from the point of view of the DCS is found in the project mari34es.

For information and management purposes a number of process variables are replicated in the second project mari34es, and vice versa. Typically entire mnemoscheme:mnemo schemes of Unit 1, Unit 2, FGD Plant, Common Auxiliaries, CW Pump Station and Fuel Oil Plant, functionally appertaining to the project maritzes are replicated in the second project mari34es. An example of reverse replication are the schemes of Unit 3 and Unit 4, which are duplicated in the project maritzes and are used by the operational staff of FGD Plants and Gypsum Dewatering Plant.

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#### 4. DETAILED DESCRIPTION OF THE WORKS

The works comprise all necessary steps and actions for full migration of the control system to the new modern system of Siemens SPPA-T3000, with entire preservation of the existing functionality to date. Turbine controllers (Simadyn D) will also be migrated to SPPA-R3000, and Generator excitation controller systems (THYRIPOL) will likewise be migrated to SPPA-E3000.

The following is required in order for the project to obtain the desired results:

##### 4.1 DETAILED EXAMINATION OF THE STATUS QUO

Detailed examination of the status quo, inclusive of examination of the network and server infrastructures. Examination of the existing functions of protections and interlocks of equipment. Examination of functional group controls (step programs). Examination of automatic switchover functions. Studying the existing diagrams/circuits for autocontrol of processing parameters, including the manners of creating setpoints and control mode management. Examination of Human-Machine Interface (HMI), the hierarchy of mnemoschemes and trend groups. Detailed introduction to existing calculation functions, logs and reports


##### 4.2 MIGRATION OF DATABASES TO A COMMON ENGINEERING DATABASE

The migration of databases (see system description i. 2.3) to a common engineering database is the foundation of the configuration of the new control system. What is meant here are the two engineering configuration databases containing the entire information about the signals, parameters, functions, connections, logics and interlocks which are currently in operation in the system automation processors (AP) and/or in process units (PU).

**Upon migration of the database to the new system, a mandatory requirement of the Client is for the language of the existing system to preserved – Bulgarian language.**

##### 4.3 DESIGN AND MANUFACTURE OF RACK CPU MODULES, CABINETS CONTAINING EQUIPMENT, NETWORK SEGMENTS AND SERVERS

The design should take account of the overall size of racks and cabinets which will be dismantled in order to be replaced quickly and to preclude the necessity for the manufacture of

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new foundations, frames and other fixtures and fittings. It should take account of the safety devices for the electric power supply network internal to the cabinets with 24VDC and when required the safety devices shall be replaced with new ones to preserve selectivity.

The design of the network system infrastructure shall take into account redundancy – it is not allowed for optical cables from the network virtual ring to be laid in one and the same cable tray and to have a common cable way. The servers shall be selected in accordance with the functions they will be backing up with sufficient host memory reserve and computing power. They shall be placed in purpose-made cabinets providing ease of servicing and maintenance. Redundancy of servers is assumed.

All software and communication licenses shall be provided to and handed in to the Client unlimited to term (lifetime license).


#### **4.4 FACTORY ACCEPTANCE TESTING OF THE SYSTEM, SYSTEM COMPONENTS AND NEW CABINETS.**

The Client shall accept the new system and permit its being introduced into the power plant only if they are convinced that all their requirements have been complied with and all existing user functions have been immaculately replicated/migrated. The operation of the protections and interlocks for all units shall remain unchanged, as a logical sequence, response retention/waiting/delay times, etc. Autocontrol (Controllers) shall work in the same manner as before the migration. Operation with modes of automatic controllers shall be effected in the same way as known to the operational staff before migration. It is mandatory that the existing colour encoding of fluids, the colour encoding of unit statuses and alarm strategy be kept unchanged. It is mandatory that the hierarchy of mimic diagrams (mnemocircuits), their internal organization, such as: location of symbol management elements; location of symbol information elements; indicators of process values; layout of regulating units and automatic controllers; set pointers; static components be 100% identical.

All this shall be confirmed well before the system has been introduced into the power plant. The tests for suitability shall be carried out in Contractor's laboratory or production environment. The program for carrying out the factory testing shall be agreed at a later stage. Due to the limited duration of inspections, it is not possible to carry out 100% testing, but it must be underlined that at least one function type, a real function in the DCS, shall be inspected. The function types are detailed further below.

It is not intended for cabinets containing base automation processors to be dismantled and replaced, therefore at the time of testing the Contractor shall provide provisional cabinets for the purpose of inspections. Depending on the proposed strategy for migration of APF components, respectively involving entire replacement of the cabinet or partial replacement and re-arrangement of racks, modules and terminals, the Contractor perform factory testing in a way which does not question the obtained test results. The Clients sets likewise requirements for the other two sub-systems: SPPA-R3000 and SPPA-E3000.

In conclusion to this item we will add that during factory testing the Contractor shall show and prove to the Client their readiness to migrate the existing control system by keeping all the parameters of the current Technical Specification. All necessary additional materials, computer

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systems, laboratory instruments, cabinets, racks, electronic cards, control and power supply cables required for the purposes of factory testing shall be the responsibility of the Contractor.

#### 4.5 DISMANTLING AND INSTALLATION

Dismantling shall be carried out with care and raised attention to preserve the integrity of components which are to remain in operation after completion of the migration and prevent them from damage. This requirement is valid also for the instances of dismantling an entire cabinet in view of the fact that adjacent cabinets shall and will be used after the migration. The requirements for dismantling involve compliance with existing standards for carrying out installation activities and relevant best practices. These activities shall be approved by the Client under cover of an inspection report permitting subsequent activities such as cable installation and connection of cable cores. All control cables which according to the project shall be subject to dismounting and subsequent connecting to new racks or terminals shall first be properly disconnected and dismantled and after that duly arranged, numbered, connected and reinforced with cable connections. It is not allowed for control cables from this group to be cut so that there can be a maximum remainder of cable length. Control cables shall be separately earthed to a supporting plank (if there is such) or to earthing terminals. The front and rear panels of each one of the new cabinets shall bear its name under the KKS project.


After completion of the installation works signs / of form, size, material and text as agreed with the Client / bearing the KKS Number of each piece of equipment shall be attached accordingly at locations of maximum visibility.

As early as the design stage, the Contractor shall decide on the migration strategy to apply in each separate case. (protections, turbine controller, excitation). The keeping of a cabinet/cabinets to be re-assembled is preferred to their being replaced entirely, because the entire separation of the cabinet from control and power supply cables is time-consuming and risky to the success of their connection afterwards.

#### 4.1 VERIFICATION OF SIGNALS

It is a mandatory requirement, which the Client insists on and will duly inspect, that all signals located in dismantled and subsequently re-assembled control cables be checked for correctness from the field (i.e. Loop check). For each and every such signal the Contractor shall issue a report signed by the persons involved in the inspection thereof. The physical scope and alarm margins of signals which fall in this group shall also be inspected and entered in this report.


#### 4.2 VERIFICATION OF FUNCTIONS OPERATING IN AUTOMATION PROCESSORS

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Following the upgrade of base automation processors (AP) the new compiled control programs will be uploaded into them. For this type of cabinets the migration involves only a replacement of the processor rack as well as replacement of the communication cards of internal bus. No connection of control cables to the field is designed and these shall not be disconnected (dismantled) nor replaced. Therefore they are not intended to undergo a loop check. However, it is necessary that the new processor work exactly as the old ones, i.e. 100% repetition of functionality is required. This test is carried out by way of random selection of at least one representative function and its full verification. The main function types are detailed in the table below.

| No | Function type               | Description  |
|----|-----------------------------|--|
| 1  | SLC                         | Software key with two positions                        |
| 2  | Selector 1oo2/1oo3          | Software key for selection 1of2 or 1of3                |
| 3  | ASO                         | Automatic switchover                                   |
| 4  | LVM                         | Limit Value Monitor                                    |
| 5  | GC, Step program            | Group Control  |
| 6  | DCM solenoid drive          | Drive Control Module – solenoid                        |
| 7  | DCM motor                   | Drive Control Module – motor                           |
| 8  | DCM actuator                | Drive Control Module – valve                           |
| 9  | DCM control drive           | Drive Control Module – control valve                   |
| 10 | DCM reverse drive           | Drive Control Module – reversing motor                 |
| 11 | CC continuous control drive | Drive Control Module with an AO (analog output)        |
| 12 | SCON AP                     | Relay controller operating in an Automation Processor  |
| 13 | SCON FUM                    | Relay controller operating in a functional module      |
| 14 | CCON AP                     | Analog controller operating in an Automation Processor |
| 15 | CCON FUM                    | Analog controller operating in a functional module     |
| 16 | SPC                         | Setpoint control module                                |

It is only normal that a number of automation processors lack some of the aforementioned function types. In this case the verification shall include only the functions which have been loaded and available. The Contractor shall propose a list of functions (types) for verification, but this does not restrict the Client from adding others, more important and more significant ones at their discretion. Verifications shall be completed by way of the issuance of a bilateral report stating the assurance of the parties that the functionality of the cabinet is proved confirmed. The report concerning a specifically numbered automation processor shall mandatorily contain information about which functions exactly were tested (FUP KKS name of plan/plans) and the conditions under

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which these tests were carried out (what was simulated and which signal was imitated by way of a calibrator or otherwise).

#### **4.3 SPECIAL VERIFICATIONS OF FUNCTIONS OPERATING IN APF (FAIL SAFE) IN CONTROL/ADJUSTMENT OF FUEL OIL AND COAL BURNERS. VERIFICATION OF BOILER AND UNIT PROTECTIONS**

The entire hardware in the composition of existing APF cabinets shall be replaced with control equipment of the family S7 fail safe. In addition the control cables shall be temporarily uncoupled and re-arranged. These are always circumstances calling for a decision to make 100% verification of signals, logics, algorithms and block equations. In other words all functions operating into the APF cabinets shall be tested, and generally these are:


- Individual control and protection of Fuel Oil Burners from 1 to 8;
- Individual control and protection of Coal Burners from 1 to 8;
- Technological Boiler protection and connections “from/to” with Unit protections;
- Software module “Fire in Furnace Existing” and protection from twowall fire missing ;
- Software module “Preliminary ventilation” and release for start-up for first burner;
- Software module “Free way of flue gases”

#### **4.4 SPECIAL VERIFICATIONS OF FUNCTIONS OPERATING IN TURBINE CONTROLLER**

Considering the fact that the turbine controller processors will be replaced by new ones after the migration, we believe it is expedient that, apart from standard tests and verification of signals, we add the following volume of verifications:

- Turbine run-up;
- Speed Maintaining;
- Over speed Protection Test;
- Synchronization with the grid system;
- Load Rejection Tests;
- Load shedding function;
- Settings and tests of turbine protections and interlocks;
- Settings and tests of pressure controller;
- Settings and tests of load controller;
- Launch and operation of the turbine controller in Island Mode maintaining a frequency of 50 Hz;
- Discontinuing the Island Mode after restoration of power supply.



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#### 4.5 SPECIAL VERIFICATIONS OF FUNCTIONS IN SPPA-E3000 (EXCITATION)

The reasons for extended testing of these cabinets are the same as the ones for testing the turbine controller and the APF control and protection system – a new processor and disconnection/connection of new control cables. As regards excitation of the generator the following shall be verified as well:

- Preliminary tests and checks with idle machinery, inclusive of: Connection to power supply from external sources to AC and DC circuits, Verification of internal circuits, Loading/installing of software and list of parameters, Verification of input/output signals from the side of the field, Programming of converters, Inspection of Voltage transformers and Current transformers, etc.;
  - Generator Short Circuit Test;
  - No Load Tests;
  - Load Tests;
- The Generator Short Circuit and No Load Run Tests shall be possible to carry out through control from selector keys and DCS without any simulations whatsoever in the software and/or bridging in the hardware of the new excitation system and shall be described in detail in a testing procedure.

#### 4.6 GENERAL FUNCTIONAL TRIALS AND TESTS PRIOR TO UNIT START-UP WITH THE NEW MIGRATED CONTROL SYSTEM

##### Functional trials

Under functional trials and tests the Client means to carry out of the following tests prior to unit start-up:


- Verification of protections and interlocks of Feed Water Electrical Pump;
- Verification of protections and interlocks of Turbine and Turning Gear Device;
- Verification of protections and interlocks of Boiler, inclusive of flue gas way route control;
- Verification of protections and interlocks of power unit.

This is a standard scope of functional trials always carried out during preparation to synchronize a power unit with the grid after completion of an annual intermediate or capital repair. The results shall be documented in a standard report which shall be signed in confirmation of the truthfulness of the stated data.

##### Test and check reports

At the time of the testing the Client shall draft at least the following types of reports:

- Functional Test Report of functional trials with the manufacturer of the equipment proving it is suitable.
- Test reports of testing prior to commissioning. The Contractor shall present a plan (plans) for single tests in the pre-startup stage and the complete test in the stage of commissioning. The report shall be subject to approval by the Client.

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- Reports of completed and approved installation;
- Reports of verifications of cables and signals.

The materials used in the manufacture of the equipment and spare parts shall be accompanied by all types of regulation documents under the standards provided for in the design of the Contractor.

#### 4.7 PROJECT PHASES

Every year the operations and maintenance schedule of the power plant is agreed with the Client – NEK. This year the maintenance campaign provided for the complete shutdown of the entire power plant in order to have the common auxiliaries maintained and repaired. The 10-year plan provides for the next such complete shutdown to take place in 2022. On the other hand the introduction of migration of the DCS is impossible with plant and equipment in operation (power units, FGD Plants and Gypsum Dewatering Plant). This calls for the project to be implemented step by step. In our opinion it would require at least two stages, phases practicable – in two consecutive calendar years. It is reasonable that the stages be separated in accordance with the functional division of databases. In other words Unit 1, Unit 2, Common Auxiliaries and FGD Plants should be grouped in one stage, whereas Unit 3, Unit 4 and the Gypsum Dewatering plant – in another stage. The Contractor, based on information about 2018 and 2019 MRO Programs supplied by the Client, shall make a careful estimate of the required resources and process times for: study and design; manufacture and testing of equipment and shall come up with an optimal price in view of restrictions.

#### 4.8 SPARE PARTS


The Contractor shall submit to the Client a list of required ID data /drawing no, type – Manufacturer, characteristics, etc./ necessary for the trouble-free operation of the system over a 10-year period with additional information about terms of delivery.

Based on the proposed list the Client shall make a decision as to what part of the items they will purchase/order additionally.

In the event of a damage by their own fault the Contractor shall provide all spare parts, materials, elements and consumables throughout the entire period of working on the Boiler and by the end of the testing period prior to commissioning of the equipment and obtaining the required permit.

After approval by the Client, the Contractor shall provide all spare parts for all every type of equipment and installations, recommended in the operation and maintenance instructions for regular, planned maintenance and anticipated, required work replacements, for the purposes of ensuring the stated technological availability for a period of 2 (two) years from putting the equipment in operation.

**The Contractor should declare ability to supply spare parts for a period of at least 15 years starting from the commercial operation date of the equipment.**

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## 5. GENERAL REQUIREMENTS AND DOCUMENTATION

### 5.1 GENERAL REQUIREMENTS

#### Quality management system

To cover the scope of activities, subject to this technical specification, the Contractor shall meet the requirements of the systems:

- БДC EN ISO 9001:2000 - Quality management systems - Requirements (ISO 9001:2000)
- **EN ISO 14001:2004** – Environment management systems
- **BS OHSAS 18001:2007 - Occupational health and safety management systems**, as well as to present written evidence for their correct implementation

#### Subcontractors management system

As indicated in **Management systems**, for each equipment, materials or services which shall be purchased /or a contract for sub contracting the activities from the scope, subject to this Technical specification, is concluded, the contractor shall select a suitable Management system model, applicable to the specific case.

The Contractor shall issue prescriptions and to inspect the execution of the selected models for Subcontractors management systems, as well as to guarantee the application of the selected models.

#### Quality control audits under the Quality management system

The Owner shall be entitled to carry out audits for checks on the application of the management systems by the Contractor (as well as by subcontractors) by means of a suitable form of inspections and audits.

The Owner shall inform the personnel executing certain activity about the shortcomings, if there are any and required respective corrective actions.


The contractor shall carry out at their own expense all corrective actions in order to provide conformity with the required activity with the standards in force.

#### Control on supplies by the side of the Owner

The Assignor shall retain the right to carry out control with respect to all type of work, which is carried out by the Contractor or their subcontractors for activities from the scope of this Technical specification.

The Owner shall carry out control on the supplies in the following ways:

- Attendance of periodical meetings during the design, manufacture, installation and putting into operation;
- Review and approval of documents and drawings;
- Direct observation of the activities for manufacture, installation, commissioning, carried out in the Contractor's manufacturing facilities or those of subcontractors or locally, on site.
- Execution of tests and inspections.

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### Tests and inspections

The equipment and materials are inspected and tested in conformity with the methodology, stated in the Specification of the Contractor and in the Quality plan. Such documents shall be subject to preliminary approval by the Client. All inspections and tests required under Bulgarian and European norms and Standards are carried out.

The inspection and the tests in the production facilities, carried out by the Contractor or their subcontractor shall be at their own expense.


The tests on the installed equipment shall be carried out in the presence of the Owner, under procedures and at time coordinated with the owner; they shall be at the expense of the Contractor.

## 5.2 TENDER DOCUMENTATION

The technical proposal of the candidate for contractor should contain a detailed description of the activities related to the implementation of the subject of the contract and shall include at least the following documentation:

| Document  |
|---|
| <b>General documents</b>  |
| Contractor Engineering Plan and Schedule (CEPS) - Item 2 of the List with appendices to the Technical Specification, Matrix for generation of KKS № |
| Activity schedule (engineering, manufacturing, erection, test and inspection) <sup>1</sup>  |
| Subcontractor list /plan and schedule/  |
| Functional specifications: Description of the design process, Description of main management principles   |
| Technical specification of the equipment  |
| Topology of the system  |
| Scheme of communications and interface connections  |
| References for accomplished projects on the subject of the contract   |
| <b>Quality documentation</b>  |

<sup>1</sup> The Activity schedule shall set out a schedule of the estimated partial Facility Outages, if any, that may be required by the performance of the Works or the Tests for Completion. The Client shall have the right to approve any Facility Outages set out in the Activity schedule (such approval not to be unreasonably withheld or delayed).

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|   |
|---|
| <b>Document</b>                           |
| Quality plan                              |
| Tests and inspections plans               |
| Test procedures for acceptance on site    |
| Certificates for quality and origin       |
| Other relevant documents and certificates |
|   |

### 5.3 DOCUMENTATION, SUBMITTED BY THE CONTRACTOR AFTER ASSIGNING THE ORDER.

The contractor will perform the entire base technical and working engineering for all components included in the scope of the works, to ensure the achievement of the set target.

After receiving the order the Contractor shall prepare its own list of documentation, which will describe in details every single document

The documents shall be send for approval to the Owner.

The Contractor shall promptly update the list of documentation in case of any change.

Any documents returned to the Contractor with comments issued by the Owner shall be revised (by the Contractor) and submitted again to the Owner until final approval is obtained.

The document approval by the Owner does not relieve the Contractor from any technical or other responsibility, which arise during the design and execution of the works, as well as with respect to any possible mistakes, omissions and other.

All documents by the Contractor which have been developed for or with respect to the project described in this technical specification, if they are not subject to other clauses in the contract and are not subject to other agreements with the Owner, shall be prepared without stating information about copyright and shall be considered property of the Owner. The Owner has the right to use the above mentioned documents without the Contractor may bring any claims on them.


All documents shall include all the information about design, construction, standards for confirmation of the execution, codes and others.

The Contractor shall use in the drawings and documents which creates standard frames, tables and title pages, provided by the Owner (see the list with attachments to the Technical specification), and the conventions, accepted by ContourGlobal Martisa East 3 at the drawings design.

Each document shall be provided with a standard title page, with a standard table containing designation, KKS number of the document and information in all obligatory fields. The technical details for the documentation layout are subject of approval with the Owner. The Contractor shall submit the documentation and the drawings on paper and electronically - in original editable format for the drawings

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and documents, as well as scanned files, with reference to the documents verified with signatures and stamps such as certificates, protocols from tests and others.

#### 5.4 CONTRACTOR ENGINEERING PLAN AND SCHEDULE (CEPS)

Contractor Engineering Plan and Schedule (CEPS) is linked, through the supply schedule, with the management of the protect as well as with the respective payments.

All documents described in CEPS will allow the Contractor to manage properly the activities included in it, meeting the deadlines and the requirements and the prescribed method of supplies.

Basically, the activities which shall be carried out by the contractor are as follows:

- Coordination of entire scope of work in accordance with the schedule of the plant - attached maintenance schedule in Chapter 11 - Appendices
- Designer supervision of the supplies and installation works
- Determining and Design of the interfaces /connections/
- Quality control on all activities under each stages described in p. 4

For each activity all required documents shall be presented, namely:

- For coordination of all the activities: plans and time schedules for the activities ( for engineering, manufacture, supply, installation and others)
- For verification of the correspondence of the characteristics of the supply with the Technical Specification requirements: a list of equipment and instruments, technical specifications, schemes, MSDS, installation and detailed drawings and others.
- For quality control during the activities in manufacturing plant: Specifications, production procedures for general and specific activities, quality control plans, inspections and testing procedures, etc.
- For installation and commissioning: assembly drawings of all components, technical documentation, related to the assembly activities, hookup, alignment, including detailed installation procedures and checks, installation technical specifications, technical specifications for tests and inspections, which will be carried out during installation, detailed schedule and sequence of installation, etc.
- For operation and maintenance: Instruction manuals, spare parts list, etc.

#### 5.5 LIST OF DOCUMENTS


Contractor Engineering Plan and Schedule (CEPS) of the Contractor shall include not less than the documentation described below.

The time for supply shall be understood in calendar days, starting from the date of the signing the order or of the receiving the notification for start of the works.

| Document<br>Документ | Purpose<br>Предназначение | Delivery time<br>Време на доставка, дни |
|----------------------|---------------------------|---|
| General documents    |                           |   |

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| Document<br>Документ  | Purpose<br>Предназначение | Delivery time<br>Време на доставка, дни |
|---|---------------------------|---|
| Contractor Engineering Plan and Schedule (CEPS) - Item 2 of the List with appendices to the Technical Specification, Matrix for generation of KKS №             | A                         | 30 days                                 |
| Activity schedule (engineering, manufacturing, erection, test and inspection)   | A                         | 30 days                                 |
| Subcontractor list /plan and schedule/  | A                         | 21 days                                 |
| Functional specifications: Description of the design project, Description of main management principles.  | A                         | 30 days                                 |
| Purchase technical specification, manufacturing and installation  | A                         | 30 days                                 |
| Scheme of communications and interface connections  | A                         | 60 days                                 |
| Health and safety plan. Method statement  | A                         | (1)                                     |
| <b>Quality / safety documents</b>   |                           |   |
| Quality plan  | A                         | 30 days                                 |
| Tests and inspections plans   | A                         | 30 days                                 |
| Acceptance test procedures (in accordance with section 6 from Technical specification)  | A                         | (1)                                     |
| Training plan (in accordance with section 8 of Technical specification).  | A                         | (2)                                     |
| A program with the topics and duration of the program in hours for theoretical and operating training (in accordance with section 8 of Technical specification) | A                         | (2)                                     |
| <b>I&amp;C documents</b>  |                           |   |
| Single line diagrams for power distribution of I&C  | I                         | 60 days                                 |
| Installation drawings (equipment dimensioning and loads)  | I                         | 60 days                                 |
| Functional control logic diagrams (including regulation and interlocks)   | I                         | 60 days                                 |
| Functional specification of the equipment and description (open loops, interlocks, closed loops, etc.)  | I                         | 60 days                                 |
| Completed I/O list  | I                         | 60 days                                 |
| Wiring diagrams (J/B, local panels and connection diagrams of terminal strips of interim cabinets)  | I                         | 60 days                                 |
| List of equipment and cabinets  | I                         | 60 days                                 |
| Specification for operators interface (mimic diagrams)  | I                         | 60 days                                 |
| Single-line diagrams of a closed loop according to DIN  | I                         | 40 days                                 |

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| Document<br>Документ   | Purpose<br>Предназначение | Delivery time<br>Време на доставка, дни |
|--|---------------------------|---|
| Settings list  | I                         | 90 days                                 |
| <b>Electrical</b>  |                           |   |
| Single line diagrams   | A                         | 60 days                                 |
| List of el. consumers  | A                         | 60 days                                 |
| General situation of the equipment   | A                         | 60 days                                 |
| Single line diagrams of electrical panels  | I                         | 60 days                                 |
| Cable routes drawings  | I                         | 60 days                                 |
| List of cables - power and I&C   | I                         | 60 days                                 |
| Wiring and connection diagrams   | I                         | 60 days                                 |
| <b>Miscellaneous</b>   |                           |   |
| Permanent licenses to all software products and communications   | P                         | (4)                                     |
| Spare parts list   | I                         | 120 days                                |
| Procedure for commissioning activities and settings at first start (acc. Paragraphs from 4.8 to 4.11 of the Technical specification) | I                         | 120 days                                |
| Operation and Maintenance manuals  | I                         | 120 days                                |

Comment:

A - for approval

I - for information

P - document subject to penalty for submittal delay

Note 1: At least 45 days before the start of activities.

Note 2: At least 30 days prior of the Electrical Steam Generator (ESG) start up

Note 3: 15 days after final test

Note 4: After finishing of installation works and prior of the Electrical Steam Generator (ESG) start up.


## 5.6 INFORMATION ABOUT THE OWNER'S DATABASE

For all supplied facilities and equipment, apparatuses, parts and components the Contractor shall prepare a list of main data and information which is necessary to identify and describe each component.

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The main characteristic of the component shall be collected by the Contractor as per its standard and shall include not less than:

- Description, type, catalog number of the item
- Technical parameters
- Instruction manual
- Notes about location and functioning of the component
- Name and address of the manufacturer.

#### **5.7 RECOMMENDATIONS WITH REFERENCE TO THE FORMATS AND STANDARDS:**

When documents containing large number of pages are prepared, then A4 and A3, series ISO-A, sheets sizes shall be chosen.

The drawings shall be prepared according to the following standards:

- EN ISO 5457 – The sizes and the layout of the drawing sheets is approved as standard for drawings
- EN ISO 7200 – fields with data in title blocks and headers (upper field of the page) of documents
- EN ISO 128-20 – technical drawings – main principles for submission
- EN ISO 216 – writing paper and some types of printing paper

For electronic submission the following file formats shall be used:

- MS Office (.doc, .xls, .ppt)
- AutoCad (.dwg, .dxf)

The following conversion tools shall be used to convert the document into non editable format:

- Adobe Acrobat (.pdf)
- AutoCad (.dwf)


The following software tools/ formats are preferred for scanning documentation on paper:

- Adobe Acrobat (.pdf)

#### **5.8 DRAWINGS AND DOCUMENTS CONTENT**

All documents of the project are to meet the requirements of Bulgarian and European standards and Ordinances, referring to such type of activities, which concern the minimal scope of information which shall be included in the drawings, so that the method of each drawing could be identical with that of all the power station, as well as to reduce as much as possible the number of drawings which have to be reviewed to discover specific information, namely:

- All sizes shall be written in SI units of measurement.
- Additional Units of measurement shall be allowed with prior explicit authorization by the Client, and have to be written in brackets after those in SI.
- Each drawing shall include cross references to other drawings, containing information which thematically could be included in the drawing, such as:
  - General layout:
  - The respective P&I diagram or other main design drawings;

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- Structural drawings (when they are required) for information with reference to the structure or referring to such;
- Detailed documents, such as installation instructions and procedures or other similar.
- Lists of equipment, drawing of the components class, collecting the respective


drawings and others.

All numbers for information entered in the drawings shall be referred to the Owner KKS numbers.

Appendixes with detail instruction on the minimal content of the drawing, criteria for numbering and others; it shall be understood as contract requirement.

If some of the given rules are not applied during the construction of the project without authorization by the Owner, the Owner retains the right the additional costs, generated by the unforeseen extension of the project and the engineering activities to be restored to it.

The Numbers/ KKS № / of all documents and facilities shall be created by the Client, after a P&ID has been submitted to it and a full list of Document as per the attached table №2 is section 9, and they will be submitted to the Contractor.

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## 6. TESTING

The system shall be handed over with a bilaterally signed protocol for execution of 120 h tests under real working conditions following a program, prepared in advance and coordinated by the Contracting authority and the Contractor.

The generating units shall not suffer any negative effects during the execution of the tests.

## 7. WARRANTY

### WARRANTY FOR SUPPLIES AND WORKS

The Contractor shall guarantee that all pieces of equipment within the scope of supply are without any deviations from the design or factory parameters, at the phase of handing over to the Contractor, respectively, the Client and shall guarantee uninterrupted operation during the warranty period. The warranty periods shall be as follows:


The warranty periods are described in the Contractor's Technical Offer.

Additionally, the Contractor shall guarantee:

- That the works or whichever part of them do not have deviations from the design or factory parameters (characteristics) with respect to the design, materials, manufacture and installation within the scope of supply;
- A full set of documentation;
- Should the presented documentation turn out to be incorrect or incomplete and if this leads to additional damage to the facilities of the Owner, the Contractor shall carry out repairs on these facilities at their own expense and shall implement corrections or provide the missing documentation;
- Any defects shall be timely remedied;
- That the spares used to repair the defects shall be supplied and installed by the Contractor, at no additional cost.

## 8. TRAINING

Upon realization of the first stage of the project and **prior to** the start of the Generating Unit with the migrated Control system, the Contractor shall provide a training for the operational personnel during

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four consecutive days, during the normal working hours (from 8.00 a.m. To 16.00.p.m.) The training shall be provided in Bulgarian and with it the Operation shall be familiarized with the new Human-machine interface. The training shall spare time to inform the operators with the new system functions, which are not typical of the migrated SPPA-T2000.

The training shall be carried out in Bulgarian, and shall be provided at two levels - theoretical and operational.

In accordance with the CEPS, provided in P. 3.1.2, the following documents shall be submitted in advance for coordination and approval:

- The training plan shall be submitted to the Owner for approval. The training shall be carried out within the period/time and scope, in accordance with the training plan, approved by the Owner.
- A program with the topics and duration of the program in hours for theoretical and operating training.

#### **TRAINING MATERIALS**

The training materials for the main training shall be arranged in files and shall follow closely the training program, which shall be subject to prior approval by the Owner. The training material can be prepared on the basis of the operating and maintenance instructions for the facilities and subsystems.

The training materials shall be presented in Bulgarian and in English in paper copies /folders/ as well as electronically. They shall include, but shall not be limited to the following:

- Main drawings of the new system;
- P&I diagram of the new system;
- Technological process and functioning of the various components and subsystems;
- Operations and maintenance manuals for the new system.
- Other materials connected to migration and excitation.


#### **Types of training:**

The theoretical training is the initial level and shall be provided to the following main target groups of personnel:

- Operations personnel;
- Maintenance personnel;


**Operational training** is foreseen for operations personnel who have completed the theoretical training course.

The training provided to the Operations personnel shall be carried out in real conditions and during the execution of the functional tests and preparation for a start up of the Generating unit as well as with one working Generating unit (activities during startup, shut down, restriction, exceptions and emergencies).

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The training for the **Control systems maintenance personnel** shall be provided on completion of the first stage of the project, i.e. on completion of the 120 h tests on the migrated system parts.

This part of the Contractor /or their subcontractors/ obligations shall be completed with signing a Protocol, jointly with the Owner, about acquired knowledge and competencies, which guarantee the level of knowledge on the system, its operation and maintenance.

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## 9. OBLIGATIONS, LIMITATIONS AND EXCEPTIONS

### 9.1 CONTRACTOR

The Contractor shall meet the requirements of Bulgarian legal framework, Laws and other provisions of bylaws or regulations.

The contractor shall present and maintain the required documentation, in accordance with the above Regulations.

In case Subcontractors are hired for execution of the works by the Contractor, it shall be quite clear that it is an obligation of the Contractor to ensure their awareness and conformity with the legal framework in each respect.

After putting the facility in operation, the access to it is given as per the Owner's Permit to work system. The contractor's access to the operational area for execution of the works, assigned under the Contract, shall be granted with a written permission by the Owner.

Prior to assigning the Public tender, the Contractor shall carry out a joint inspection with the Owner to familiarize themselves with the site and the scope of the activities to be executed. During the inspection, (investigation), all unclear points referring to the quantities, time for execution and issues referring to environment protection and occupational health and safety as well as everything else required for detailed introduction of the Contractor to the works shall be clarified.

The Contractor shall be held responsible and sanctions and fines may be imposed for any damages caused and non fulfillment of obligations. ContourGlobal Maritsa East 3 TPP is entitled to compensation for non- performance under the contractual terms.

#### 9.1.1 Activities


The Contractor's scope of activities include the following:

The scope of the activities shall include full migration of the Technological processes control system and protections in ContourGlobal Maritsa East 3 SPPA-T2000 (Teleperm XP) Siemens for SPPA-T3000 with full preservation of the existing functionality. The works also include migration of Turbine regulators (Simadyn D) to SPPA-R3000 control systems for excitation of the Generators (THYRIPOL) to SPPA-E3000. For this purpose it shall be necessary: To investigate in detail the existing situation; migration of the data base; project and manufacture of cabinets with instrumentation, network components and servers; dismantling and installation; checks on the systems; commissioning; functional checks and tests and all activities described in section 4.

#### 9.1.2 Working hours

The Contractor may work at shifts since the commencement of the works; the activities may be organized at 24/7 shift schedules, (during the weekends and official holidays and so on), in order to meet the deadline for completion of the activities on site.

The contractor shall be timely informed should there be a change in the date for commencement of the works. An eventual change in the date for commencement does not entitle the Contractor to claims for payment of additional expenses.

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Works outside the fixed working hours shall be allowed after fulfillment of the additional requirements of the Owner addressing access to site.

#### 9.1.3 Work Schedule

The Contractor, within 30 /thirty/ days since the date of concluding the contract, shall have to present a detailed program for approval by the Owner (GANNT schedule) illustrating all activities, required for execution of the works within their sequence, description, duration and interdependency. The program has to take into consideration the set limitation for execution and the initial data for commencement of the works on the facilities. The program shall present the periods of execution of the activities, expressed as calendar days, since the commencement of execution of the activities (without fixed dates).

The schedule for the activities, especially the part On-site activities (executed on the territory of the Power station) has to follow strictly the approved annual maintenance program. It shall be presented to the Contractor by the Contracting Authority after its agreement with the Client and its further improvement. The main circumstances, which the Contractor needs to take into consideration during the phase of planning of the works on site are:


- The control system cannot be shut down and handed over for dismantling immediately, during the first hours after a Generating Unit has been stopped for an annual maintenance. A number of Unit subsystems, which are controlled by DCS shall remain into operation until all facilities are brought smoothly into an inactive state (cooling). The Contracting Authority shall do everything possible within its powers to shorten this period of time, but in the best of cases this period shall be with duration of 3,5÷4 days.
- The migrated, new control system shall be fully operational, functionally tested and operable at least three days prior to the closing date for completion of the maintenance activities. The reason for this requirement is the necessity all repaired equipment (pumps, raw coal feeders, row coal dosers and so on) to be tested in detail without a fluid and to be in operation idle for a certain period of time.

#### 9.1.4 Catering

There are no catering facilities provided on site. If such are required for the personnel, the Contractor shall provide them at its owns expense.

#### 9.1.5 Bringing in or out of site of stocks and materials

Bringing in or out of site of stocks and materials, spares, aggregates, instruments, property of external companies in contractual obligations with the Power station shall be carried out with the form "List of stocks and materials brought in or out of TPP site" – stocks and materials, spares, aggregates, instruments, property of external companies in contractual obligations with the Power station. Such list shall be prepared in 2 copies, one for each of the respective checkpoints (they shall be kept in a separate folder) and one for the company which enters property on site.

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#### 9.1.6 Safety

Works shall be carried out in conformity with Bulgarian regulations for occupational health and safety, as well as with those in force on site, which regulate the general obligations of all participants in the working processes in their capacity of employers, subcontractors and those bearing responsibility for the premises, where the works shall be carried out.

There are risks, connected to the site as well as to the nature of the works carried out. Some of them are constant and others - periodical or can exist while the Contractor or Subcontractors carry out their works, as well as when the project is under commissioning.

Prior to the beginning of the works, the location of the nearest telephone shall be clarified. Such telephone can be used in case of emergency. Each employee shall know how to use it to seek help.

Prior to the beginning of the works, a representative of the Owner (ContourGlobal) shall inform the Contractor about the following:

- Specific risks, connected to environment protection.
- Risks, associated with other activities, executed in the same area.

There will be other contractors, working at the same time in the area. Coordination meetings with Contractors shall be organized to minimize the risks.

The Owner's H&S representative shall bear responsibility for the coordination with the other contractors' safety representatives, aimed at prevention of risks, associated with the works of the Contractor and its respective subcontractors. He/she shall also be responsible for the timely risk assessment and the activities required for risk elimination.

The Contractor's occupational health and safety responsible on site shall coordinate his/her activities with CGOB H&S responsible, so as to timely evaluate and eliminate the risks which might occur during the execution of the works.

To achieve this, a constant uninterrupted communication and interconnection between the Occupational Health and Safety representatives is required. No breach of safety rules shall be tolerated.

Prior to whatever work, the Contractor shall obtain Permit to Work, as per the Owner procedure.

The Contractor shall present a Method Statement, describing the organization of the works, the used equipment, the safety measures for prevention of injuries and everything else, required for detailed information of the Safety manager, as well as operation manager, by the side of the Owner, in order to issue a permit to work for operation.


Weekly safety coordination meetings shall be conducted by the Owner's OH&S manager; they shall be attended by the Contractor's safety representative.

#### PPE Personal Protective Equipment

Prior to the start of the works, the safety equipment and the First Aid means shall be checked for serviceability.

The contractor shall provide all PPE required for execution of the works. When this equipment is subject to obligatory inspections, the Contractor shall have copies from reports for executed inspection.



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When there is a risk from drowning, the Contractor has to provide safety ropes and the personnel shall carry the required PPE such as safety harnesses and ropes. Rescue personnel shall be provided during the execution of the works.

Safety clothing and PPE such as hard hats, eye protection, dust masks, safety footwear have to be worn all the times on site.

The contractor shall always conform to the safety rules, endorsed by the Owner, which include, but are not limited to, those connected to safety and operation.

When the high levels of noise cannot be reduced at its source, wearing hearing protection is mandatory - i.e. at noise levels exceeding 85 dB(A). When hearing protection is used, it shall be possible to warn the respective personnel about the presence of other hazards.

#### **General safety rules for use of manual tools**

The workers at height shall put their tools in special bags or boxes, to prevent their fall.

The portable electrical instruments shall be suitable for the type of the executed activity, in a good state of repair and arranged in sets in accordance with the operating instruction of their manufacturer, used in a correct way by persons knowledgeable about the type of the executed activity. They shall be used only for their purpose and maintained in a good state of repair.

The manufacturing class of the manual electrical tools and equipment as well as the portable electrical light and the portable transformers shall conform to the environment of their purpose. Operation with manual electrical instruments, portable lights and transformers, which do not meet the requirements for the respective working environment, shall never be used in an environment with high risk of electricity injury, fire and explosion hazard.

#### **It is strictly forbidden:**

- to work with substandard or faulty electrical instruments, portable electrical lights and electrical transformers, as well as with equipment which has not been periodically checked;
- the use of defective or substandard plug and socket joints and extensions.


The manual electrical tools, portable electrical lights or portable transformers shall be entrusted to persons of the personnel, who are held responsible for their storage.

The persons, who work with electrical instruments, portable lights and transformers with protection class I against electricity damage, (by means of neutral earthing, protective tripping or protective earthing), shall be in possession of 1st qualification group under "Regulation on health and safety during work in electrical switchgear of electrical and heat power station and electrical networks.

Depending on the characteristics of the working environment, associated with electricity injuries, rated voltage of the used portable lights shall be not higher than:

- for environment of normal level of hazard - 42 V;
- for environment with raised and special hazard, including outside the premises - 24 V;
- in metal tanks, boilers, tunnels, wells and others - 12 V.

The use of protectively insulated portable lights (from class II) for rated voltage of 220 V in an environment with raised or special level of hazard is admissible, if the length of the power supply cable does not exceed 10 m.

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Depending on the characteristics of the working environment, associated with electricity injuries, rated voltage of the used electrical equipment and portable transformers shall be not higher than:

- For environment with normal level of hazard - 220 V for one phase and 380 V for three phase;
- for environment with raised and special hazard, including environment outside the premises - 42 V;
- in metal tanks, boilers, tunnels, wells and others - 24 V.

Operation with manual electrical equipment with 1st class of protection against injuries from electrical current with rated voltage not higher than 380 V in premises with raised and special hazards and outside the premises is admissible, when protective tripping or protective segregation is used.

The rated voltage for electrical equipment and portable transformers of protection class II against electricity injuries (protectively isolated) can be 220 V for one phase and 380 V for three phase ones, no matter what the characteristics of the environment might be.

Before the beginning of the works in fire hazardous environment with manual electrical tools or potable transformers, the organization of the works shall be agreed with the Regional Fire safety and protection of population service, with their written permission - welding works act.

The length of the power supply cables for manual electrical equipment is restricted to 6 m. Length of up to 30 m is admissible should protective tripping be used. The length of outgoing cables of transformers for protective separation and safe extra low voltage shall not exceed 30 m.

During work with manual and portable equipment, lights and transformers, no impacts shall be permitted on their power supply cables, such as: extensive squeezing, folding, stretching, touching heated surfaces, subjecting to the action of chemical substances and admixtures - acids, basis, oils, gasoline and others

Operation with manual electrical instruments, portable lights or portable transformers in fire explosive environment is forbidden if they are not with the respective explosion-proof execution.


Work outside the premises with portable and manual electrical equipment when it is raining or snowing shall be forbidden, unless it is supplied with power of up to 12V. Such equipment shall not be used in case of active atmospheric activity /lightning/.

On completion of the work or in case of interruption of the power supply, the instrument is switched off the power supply network.

If a defect is found during operation, which could create danger for electric current injury, the work shall be interrupted immediately, the power supply shall be disconnected and the line manager shall be immediately informed. The electric tool is repaired or discarded and measures for prevention of its use are implemented. Such measures shall be in force until conformity of the equipment is restored.

### **General safety rules during construction and dismantling of scaffolding**

The construction and the dismantling of scaffoldings is needed for the purpose to ensure access for repair and/or masonry and all kinds of maintenance works on equipment. The scaffoldings have to be built according to the existing standards (BDS EN 1004, BDS EN 12810-1 and 2, BDS EN 12811-1, BDS EN 12812 и BDS EN 1298) by experienced and certified workers in the presence of a specialist (responsible person) who is thoroughly familiar with the requirements for safe work on scaffolding and its usage. All materials used have to be tested and labelled according to the standard. Each built scaffolding construction has to be accompanied by a document for conformity and technical parameters for the carrying capacity, serviceability date till next inspection etc. The scaffoldings could be constructed with components of various type (façade scaffolding (framework), tube scaffolding, modular scaffolding). It has to be

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mentioned here that the various types of scaffolding cannot be combined with each other in horizontal projections on the same level (except the reinforcement). It has to be considered that the scaffolding is a very important part of the maintenance of the equipment and its construction and dismantling have to be made for a short time under conditions meeting entirely the requirements of the Client for safe work and usage. For detailed descriptions, legalization, usage and dismantling of scaffoldings, please refer to document 00\$5\$00-GB404-1.


| Table with loading classes of tube scaffoldings |  |                 |                                    |  |                                    |                    |                                |                               |                                 |
|---|--|-----------------|------------------------------------|--|------------------------------------|--------------------|--------------------------------|-------------------------------|---------------------------------|
| 1   | 2  | 3               | 4                                  | 5  | 6                                  | 7                  | 8                              | 9                             | 10                              |
| Class   | Designation                                    | Durability      | Usage                              | U.D.L.<br>/Uniformly distributed load on platform /kN/m2 | Maximum number of platforms in use | Maximal bay length | Maximum spacing board transoms | Maximum number of boards      | Width class                     |
| 1   | 2  | 3               | 4                                  | 5  | 6                                  | 7                  | 8                              | 9                             | 10                              |
| 1   | 1-3-0  | Very light duty | Inspection, painting, cleaning     | 0,75   | One full /0,75/ and one /0,35/     | 2,7 m              | 1200 mm                        | 3                             | W06                             |
| 2   | 2-4-0  | Light duty      | Plastering, glazing, putting signs | 1,50   | One full /1,50/ and one /0,75/     | 2,4 m              | 1200 mm                        | 4                             | W09                             |
| 3   | 3-5-0<br>3-4-1<br>3-4-2<br>3-5-1<br>3-5-2      | General purpose | General Construction work          | 2,00 inside boards<br>0,75                               | One full /2,00/ and one /1,00/     | 2,1 m              | 1200 mm                        | 5<br>4+1<br>4+2<br>5+1<br>5+2 | W09<br>W09<br>W12<br>W12<br>W12 |
| 3   | 3-5-0S<br>3-4-1S<br>3-4-2S<br>3-5-1S<br>3-5-2S | General purpose | General Construction work          | 2,00 inside boards<br>0,75                               | One full /2,00/ and one /1,00/     | 1,8 m              | 1200 mm                        | 5<br>4+1<br>4+2<br>5+1<br>5+2 | W09<br>W09<br>W12<br>W12<br>W12 |
| 4   | 4-5-0<br>4-4-1<br>4-4-2<br>4-5-1<br>4-5-2      | Heavy Duty      | Heavy Masonry work                 | 3,00 Heavy Masonry work<br>0,75                          | One full /3,00/ and one /1,5/      | 1,8 m              | 900 m                          | 5<br>4+1<br>4+2<br>5+1<br>5+2 | W09<br>W09<br>W12<br>W12<br>W12 |

### General rules for ensuring fire and emergency safety when performing hot works

The performing of hot works starts after issuing an act for hot works. A conclusion for the possibility to perform hot works is given in the protocol. The external contactors should appoint a supervisor of the hot works who:

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- ensures the cleaning of the area from combustible materials within a range of 5 m and also from inflammable and explosive materials within a range of 20 m;
- ensures the protection of combustible objects which cannot be removed with proper fire resistant barriers;
- ensures the necessary fire extinguishing equipment at the workplace;
- does not allow sparks and melted metal to fall over combustible materials in the course of the work;
- switches off the power supply of the welding machines or stops the feeding with welding gases when the work is finished;
- organizes the gathering of the equipment;
- informs the person issuing the act and the permit to work for the completion of the work.
- in case of fire, stops the work immediately, gives a signal to the Fire service and organizes extinguishing activity with the present means.

The hot works can be started only after the supervisor of the hot works together with a representative of the Regional Service for Fire Safety and Protection of Population exercises control on the measures foreseen for ensuring fire safety. At the discretion of a representative of the Regional Service for Fire Safety and Protection of Population, the readiness of the service to cooperate in emergency situations will be ensured.

Only qualified persons are allowed to perform hot works. The persons performing hot works and their supervisors should go through periodical fire safety induction. Prior to each performing of hot works the people who will carry out the works should go through extraordinary induction.

The inductions are made by the supervisor of the hot works of the contractor with the participation of a representative of the fire and emergency safety service.

When performing hot works at fire or explosion risk areas, the person issuing the act informs the Regional Service for Fire Safety and Protection of Population and may require duty with the fire truck. When hot works are performed on the sites, the compulsory specific requirements which are set depending on the type of the performed work as per the regulatory requirements should be observed.


### **General safety rules during arc and gas welding and cutting**

Works related to arc and gas welding and cutting can be performed only by people who have the relevant qualification.

The welders should have not lower than second qualification group under the Regulations for Health and Safety at Work in electrical installations of electrical and heating power plants and grids.

Only equipment in a good working order should be used. If irregularities are found out, the work should be immediately stopped and the line manager should be informed.

When planning arc and gas welding or cutting at places without ensured ventilation or are not in the open, fire risk premises according to the classification made in the power plant as well as at the permanent workplaces appointed in an order of the employer, an act for hot works should be enclosed to the open permit to work which is registered in a logbook as per the appendixes of Ordinance I-209 and the present instruction. It is compulsory to provide fire extinguishers at the workplaces where the works are carried out.

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It is forbidden workers to perform welding works on metals with materials contaminated with solvents, fuels or lubricants or with oxygenated clothes, shoes, gloves etc. The same refers to people assisting or being in the immediate vicinity to the places where the welding is performed.

In addition to the personal protective equipment standard for the power plant, the welders are obliged to use proper work clothing (an overall, sleeve-protectors, gaiters or protective suit) for welders made of fire retardant materials.

When repairing vessels made of inflammable materials, the following safety measures should be taken: the vessels should be washed in advance with hot water or steam, ammonia etc. The welding is carried out after drying and airing out.

Welding works are not performed close by (not less than 10 m) inflammable materials and liquids. The workplace should be well lit.

When working at height or on several levels, measures should be taken against sparks or melted metal falling over people or combustible materials being under the place where the welding or the cutting is performed or fire blankets are used.

When the works are carried out at height more than 1.5 m, the welders and the people assisting them should use safety harness.

When working in confined spaces, the requirements of OI\_2\_04\_016 „Work in confined spaces” should be observed.

When working with gas equipment, the requirements of OI\_2\_04\_022 „Work with gas cylinders” should be observed.

### **General safety rules when performing arc welding and cutting of metals**


Prior to starting the work, the arc welder is obliged to get the workplace ready (to collect and sort out the details and the waste impeding the normal work, to fence the workplace with portable enclosures) and to check:

- The earthing of the electric welding machine and the connection of the earthing conductor.
- The working order of the isolation of the power lines and the density of the contacts.
- The good working order of the electrode support and the strength of the insulation of the connection between the conductor and the handle.

The installation and the maintenance of the electric welding machine or the unit can be only done by people having the necessary qualification.

It is compulsory all live parts, especially the casing of the generator or the transformer and the start-up rheostat, to be earthed. The earthing of movable installations should be made prior to starting the work and should not be removed prior to finishing work. The earthing is made by means of copper wires equipped with clamps ensuring the contact. It is also compulsory to earth the object which is being welded.

All wires should be well insulated and their diameter should meet the admissible minimum (the direct current should be considered for normal current). The wires from the generator or the transformer to the board should be protected against mechanical damage and the wires leading from the device to the handle of the electrode and to the mass of the welded object should be cables i.e multicore and soft cables with flexible armour. It is not allowed to use wires longer than 10 m for the connection between the electric welding machine and the distribution board.

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Insulated flexible wires put into protected hoses should be used for conducting the current to the electrode. If using less flexible wires, they should be connected with the electrode support through an extension to a flexible hose conductor or through a cable, long not less than 3 m.

The handle of the electrode support should be made of insulating fire-proof material.

The generators and the transformers of the electric welding machines, all their auxiliary tools and devices used while working in the open should be placed indoors or at a place with moisture resistant insulation. The equipment should be placed under shelters made of incombustible material.

Portable lamps with maximum voltage 12 V are to be used for lighting while working. The change of the electrodes should be made when the power supply is switched off as the used ends should be collected and removed from the workplaces when the work is completed.

Prior to placing and tightening the electrode to the electrode support, the latter should be cleaned from oxide and lubricant.

When performing welding works at humid places, the welder should be on a dry, rubber mat.

When working in confined spaces (tanks, boilers, cisterns etc.), it is necessary:

- To use insulation mats in order to prevent the body from touching the metal surfaces;
- To use a helmet protecting the back of the neck from getting in contact with the metal surfaces.

The welding machines and the start-up devices are cleaned every day after completing the work.

The electric welding equipment is repaired according to the established rules and terms for repair.

When welding in a closed room without ventilation, nitrogen oxides dangerous for the health are emitted and because of that mechanical ventilation is required.

Every time the welder leaves the workplace, he is obliged to switch off the power supply of the welding machine.

When welding, the welder is obliged to request preliminary preparation of the edges of the welded details.

The cleaning of the slag at the places of the welding seam should be carried out with safety glasses.


It is not allowed to use safety glasses made of ordinary glass and painted. When performing arc welding and cutting, it is compulsory to use protective shield or mask protecting the entire face of the worker. It is allowed when using protective shield to be without safety helmet, however, when the welding work is completed and immediately after taking the shield off, the worker should put the safety helmet on.

The assistant of the welder and the workers working in the immediate vicinity to the place of the welding should be equipped with protective equipment as well as the welder (shield or helmet, glasses, gloves etc.).

It is strictly forbidden:

- To perform whatsoever repair or maintenance of electrical installation.
- To touch electrical wires and safety devices with bare hands;
- To remove the casing and the cover of start-up devices;
- To switch a circuit breaker on when there is a sign on it: "Do not switch on!";
- To lay bare or poorly insulated wires as well as to use reinforced fuses with enlarged section which do not meet the power of the welding current;
- To perform maintenance on live transformers of electric welding machines and units;
- To work in the open when raining or when there are thunders;
- To leave the electric welding machine or the unit live after the work is completed;



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- To perform welding with an electric welding machine when the casing of the generator or the transformer and the start-up rheostat as well as the object being welded have not been earthed;
- To work with unearthed wire;
- To work without protective equipment and glasses and also with such of poor condition;
- To perform welding nearby flammable and combustible materials.

The distance from them should be at least 10 meters;

- To weld devices and installations under pressure;
- The working person to connect or to repair the transformer and the electric installation alone;
- To store and keep gas, petrol and other flammable substances in the welding premises;
- It is strictly forbidden to weld cisterns and other vessels used for transportation or storage of inflammable materials without preliminary cleaning, washing, drying and airing out.

#### **General safety rules when performing gas welding and cutting**

The main components of the gas welding equipment are the following:

- Gas cylinders containing oxygen and flammable gas (propane or acetylene);
- Reducing valves installed closed to the closing valve of the cylinder;
- Manometers;
- A spark catcher to protect the cylinder against inflammation;
- Flexible hoses leading the gases to the burner;
- Safety relief valves installed on the burner preventing against leakage of flammable gas into the oxygen line and vice versa;
- The burner in which the flammable gas is mixed with the oxygen and ignites.

Prior to starting the work, the working person is obliged to prepare and to check the condition of all components and to get the workplace ready (to collect and sort out the details and the waste impeding the normal work). Work is not allowed when any of the components is missing or is out-of-order. The units are cleaned every day when the work is completed.


The hoses are placed away from the workplace with the purpose to avoid contact with the flame, a spark, high temperature or heated surface, and to protect against fire.

When repairing vessels or packages of various flammable materials, the following protective measures should be taken: preliminary washing of the vessels with hot water or steam, ammonia and other. The welding is performed after drying and ventilation are made.

It is compulsory the welder and the people assisting him (when there is a risk of exposition) to use safety glasses.

#### **It is strictly forbidden:**

- To work with non-sealed hoses, valves or other parts of the equipment or with missing safety relief valves on the burner and the reducing valve;
- To work with out-of-order reducing valves or broken glasses on the manometers;
- To work on the oxygen part of installation with oily hands or tools;

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- To work without the PPE necessary for that purpose.
- To place a flammable gas cylinder in the immediate vicinity to an oxygen cylinder. They should be placed at a distance of at least 5 m between each other;
- To leave a burner flaming when the work is stopped;
- To hold with hand the piece which is being welded;
- To use protective glasses made of ordinary glass and painted.
- To weld cisterns and other tanks used for transportation or storage of inflammable materials without preliminary cleaning, washing out, drying and ventilation.

The workplaces are equipped with tools, equipment and means of fire extinguishing. The type and the quantity of the tools, equipment and means of fire extinguishing are specified in accordance with the effective fire safety regulations and their positioning and labelling is made in compliance with the effective standards.

When the work requires closing of particular sections of roads on the territory of the TPP which prevents the passage of specialized vehicles, this should to be coordinated in advance with the Fire Safety and Protection of Population Service and the Medical Service.

The type and the means of fire extinguishing which will be provided should be declared!

#### **Safety, labels and warning signs**

Permanent or temporary enclosures (handrails, covers, nets, screens etc.) are used for making the worksite safe. They may be used on shafts, stairs, balconies, platforms, bridges, trestles, pedestrian walkways, protruding parts and parts with sharp edges and ends, moving machines and equipment, half-finished materials, liquids which can be sprayed or spilled, flying particles, metal shavings, filings and other.

Passages, access and entry points of the worksite which are within the dangerous areas of the operating equipment are to be secured not less than 1,0 m outside their dimensions with solid and stable covers (safety flooring, awnings and other) according to the particular conditions.

Openings in building and constructive elements (walls, floor slabs, roofs and other) which create risks of falling from a height:

- are made safe by means of handrails, fences or solid cover which could bear the relevant load;
- are marked and/or signal in a proper way.

For temporary worksites, the type and the quantity of signs, signals and fences are specified by the person issuing the work permit. When the work at the temporary worksite is completed and the work permit is closed, all temporary signs, labels and fences should be removed.

#### **9.1.7 Other**

The prices proposed in the price offer should include:

- Site inspections

Expenses for site visits, including preliminary inspections, working visits etc.

- Transport and transportation of materials


Expenses for transport of Contractor's personnel to and from the power plant, including consumables. In case of delivery of materials – the transportation "from-to" warehouses for storing the materials, the transportation of the waste material to the places specified for that purpose.

- Rent

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Renting of tools, transport vehicles, movable platforms, hoists, cranes, scaffolding etc.

- Storage

Temporary storage of materials and equipment within the scope of the Contract, tools etc.

- Dismantling and installation

The temporary dismantling of equipment, constructions, systems or components of them as part of the scope of work. In particular, the dismantled equipment is to be installed again and handed over to the Client in the same condition as received.

The condition of the equipment subject to dismantling is to be established by means of preliminary joint inspection with both parties. A joint inspection with the two parties is to be made after the works on the inverse installation are completed in order to check whether the equipment has been entirely restored.

In case of breakdown or incomplete restoration, a penalty could be required. The amount of the penalty will be specified in the Main Contract.

- Workers

The services, the activities and the deliveries include also the workers who will be necessary for the entirely execution of the scope of work under the Contract.

- Delivery of other materials

The delivery of supporting materials, consumables, accessories within the scope of work which are necessary for the entirely execution of the activities under the Contract.

## 10.REFERENCE DOCUMENTS

BDS EN ISO 5457:2004 – Technical product documentation. Sizes and layouts of drawing sheets (ISO 5457:1999)

BDS EN ISO 7200:2004 – Technical product documentation. Data fields in title blocks and document headers (ISO 7200:2004)


BDS EN ISO 128-20:2005 – Technical drawings – General principles of presentation - Part 20: Basic conventions for lines (ISO 128-20:1996)

BDS EN ISO 216:2007 – Writing paper and certain classes of printed matter – Trimmed sizes – A and B series, and indication of machine direction (ISO 216:2007)

Regulation No 3 dated 09.06.2004 for the structure of electrical installations and transmission lines

Regulatory requirements for fire safety and emergency response.

REGULATION No 13-1971 dated 29.10.2009 for construction and technical rules and norms for ensuring fire safety


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- Regulations for Health and Safety at Work in electrical installations of electrical and heating power plants and grids.
- Regulations for safe work in non-electrical installations of electrical and heating power plants as well as on heating networks and water-engineering equipment.
- Regulation No 9/ 09.06.2004 for technical operation of electrical power plants and grids.

Procedures of ContourGlobal Maritsa East 3 related to:

- 00&&&00-GB404-1 Procedure for construction and control of scaffolding
- OI\_2\_04\_016 „Work in confined spaces”
- OI\_2\_04\_022 „Work with gas cylinders”
- 00&&&00-QK401 “Procedure for welding, heat treatment and non-destructive testing of welds on pipelines”
- Access control system – Health and Safety and Security Department
- Environment – Environmental Department
- Health and Safety – Health and Safety and Security Department

The familiarization with these procedures should be made prior to starting the works at ContourGlobal Maritsa East 3 TPP in the indicated departments.

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## 11. ATTACHMENTS

| No | Description<br>Описание  | File name<br>Име на файла                              |
|----|--|--|
| 1  | Indicative Time Schedule For Migration   | 170519_DCS Migration Schedule                          |
| 2  | Titlepage Template   | No1-Titlepage_Template_CGME3.doc                       |
| 3  | Matrix for generating KKS № - ППП / [CompanyName]_[ProjectName]_CEPS-[Revision Number] | [CompanyName]_[ProjectName]_CEPS-[Revision Number].xls |
| 4  | Document matrix/HEAD_CGME3   | HEAD_CGME3.dwg   |
| 5  | Type of documents  | 00&&&00-DT401-5.pdf                                    |
| 6  | Legend for used symbols in P&IDDiagrams  | 00&&&00-DG001-3.dwf                                    |
| 7  | [CompanyName]_[ProjectName]_DT-dd.mm.yyyy  | [CompanyName]_[ProjectName]_DT-dd.mm.yyyy.xls          |
| 8  | Daily progress report_Register_EN  | Daily progress report_Register_EN.xls                  |
| 9  | Daily Progress report_Measurement Booklet_EN   | Daily Progress report_Measurement Booklet_EN.xls       |
| 10 | Material_Status_dd.mm.yyyy   | Material_Status_dd.mm.yyyy.xls                         |
| 11 | WPR-(company name)-CGME3-dd.mm.yyyy  | WPR-(company name)-CGME3-dd.mm.yyyy.xls                |

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