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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		TECHNICAL SPECIFICATION FOR SYNCHRONISATION CONTROL AND ANNUNCIATION PANEL (SCAP) RAMAGUNDAM FERTILIZERS & CHEMICALS LIMITED RAMAGUNDAM TELANGANA													
Ref. Doc		<table border="1"> <tr> <td>Revision</td> <td>Prepared</td> <td>Checked</td> <td>Approved</td> <td>Date</td> </tr> <tr> <td>Refer record of revisions</td> <td>K.Venkatesh</td> <td>B.Naveen Kumar</td> <td>J.K. Patnaik</td> <td>26.04.17</td> </tr> </table>				Revision	Prepared	Checked	Approved	Date	Refer record of revisions	K.Venkatesh	B.Naveen Kumar	J.K. Patnaik	26.04.17
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	1. SCOPE This specification shall form the basis for design, engineering, manufacturing, testing, packing, dispatch and supervision of Erection, Testing & Commissioning at site for SCAP. Material codes: <table border="1"> <thead> <tr> <th>Var.No</th> <th>Description</th> <th>Material Code</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>SCAP package for RFCL Ramagundam</td> <td>PY9755254005</td> </tr> <tr> <td>2.</td> <td>Supervision of E&C for SCAP-RFCL Ramagundam</td> <td>PY9855254015</td> </tr> </tbody> </table> 2. CODES AND STANDARDS 2.1 The equipment shall comply with the requirements of latest revision of codes & standards attached or referred with the tender document. In case of any conflict between the various documents, the most stringent one shall be followed and BHEL decision in this regard shall be final and binding. It is contractor's responsibility to bring out any conflicts to the notification of BHEL. 2.2 In case of imported equipment's, codes and standards of the country of origin may be followed if the standards are equivalent or stringent than the applicable Indian standards. 2.3 In addition, the work shall also conform to the requirements of the following: 2.3.1 The Indian Electricity Act/ CEA guidelines and rules framed there under. 2.3.2 The fire insurance Regulations. 2.3.3 Indian Petroleum Rules. 2.3.4 The regulations laid down by Electrical Inspectorate (CEA). 2.3.5 The regulations laid down by the Factory Inspectorate. 2.3.6 Any other regulations laid down by the Central, State or Local Authorities from time to time during the execution of this contract. 2.4 Bidder shall refer following attachments as part of this Specification ▪ Key SLD – Annexure-I ▪ 33kV SLD - Annexure-II ▪ 220kV SLD - Annexure-III ▪ Specification for Relay and control panels - Annexure-IV ▪ Specification for Annunciation panels - Annexure-V ▪ Price Schedule - Annexure-VI ▪ ITP for Relay & Control Panels - Annexure-VII ▪ ITP for Annunciation Panel- Annexure-VIII ▪ BILL OF MATERIAL - Annexure-IX ▪ Commissioning Spares – Annexure-X ▪ Deviation Schedule - Annexure-XI ▪ SCAP IO LIST – Annexure XII ▪ Control room layout – Annexure XIII ▪ Electrical Control Philosophy – Annexure XIV ▪ Electrical control system (ECS) IO LIST - Annexure XV ▪ KEY MEASURING AND PROTECTION DIAGRAM - Annexure XVI ▪ QAP Guidelines - Annexure XVII			Var.No	Description	Material Code	1.	SCAP package for RFCL Ramagundam	PY9755254005	2.	Supervision of E&C for SCAP-RFCL Ramagundam	PY9855254015
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.			3. POWER SYSTEM DESCRIPTION The power plant consists of 1 no. of Gas Turbine Generator (GTG-1), having a capacity of 36.36 MW provided with complete electrical system catering to the power requirements of the petrochemical complex and CPP. Evacuation is done through 33kV Switchgear (SS-01(CPP)). 33kV Generation Switchboard is fed from GTG-1 through 11/34.5 kV Generator transformer (TR-0101). The CPP 33KV Switchgear (SS-01(CPP)) is also hooked up with 220KV grid through 220KV/33KV grid transformers. Synchronization of GTG-1 & 220KV grid are envisaged at 33kV Switchboard (SS01 (CPP)). SCAP & ECS (Customer scope (RFCL/EIL)) are envisaged for synchronizing of GTG-1 & 220KV grid incomers. Synchronization of one future GTG is also envisaged at 33kV level. Further downstream distribution to CPP is done through 6.6kV switchboards. 6.6kV Switchboards are hooked up to 33 kV switchboard (SS-01(CPP)) through 33/6.9kV Station Auxiliary transformers TR-0111 & TR-0112 (SAT-1&2). Emergency power for safe shutdown & Black Start of CPP is envisaged from 6.6kV DG set. 4. FUNCTIONAL REQUIREMENTS SCAP panels shall be simplex and mosaic based in construction. Located in the control room, SCAP shall have Hardwired controls, metering and annunciation. For tentative spacing available for SCAP panel, please refer to the progressive copy of control room layout (Annexure – XIII) provided along with this specification. The control and monitoring for 220KV switchyard, 33kV Isolating panels, 11kV Generators, 33kV Switchboard (Only incomers, Bus couplers & Bus ties only), 11/34.5kV Generator transformers and 220/33kV Grid Transformers are envisaged from SCAP. A common marshalling panel shall be supplied along with the SCAP where common signals are be multiplied and separate terminals are to be provided for usage in Electrical control system (ECS). However, supply of ECS is in the scope of EIL/RFCL scope. Vendor shall refer ECS IO list attached as Annexure-XV for signal exchanges from SCAP to ECS. Actual signal shall be finalized during detailed Engineering of SCAP SCAP shall carry out the metering, synchronization & control and annunciation functions, which shall include but not be limited to the following. <u>220KV SWITCHYARD, 11KV GENERATOR, 33KV SWITCHBOARD, 11/34.5KV GENERATOR TRANSFORMER AND 220/33KV GRID TRANSFORMERS.</u> Control, monitoring and annunciation functions, mentioned below are minimum required and shall be provided on the SCAP. However, signals as required for		
			Ref. Doc		

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company .			synchronization, control, monitoring and annunciation of above equipments/listed feeders shall be provided. Same shall be subject to review during detail engineering. Further the same signals for synchronization control, monitoring and annunciation functions for the GTG shall be multiplied for interface with customer ECS and shall be wired to ECS interface panels via a common <u>dedicated marshalling panel</u> supplied by SCAP vendor. SCAP vendor shall also refer ECS IO list enclosed herewith. Transducers as required for control monitoring and annunciation function shall also be provided in SCAP panel. A. <u>Control functions</u> • Control of 220kV Breakers of switchyard. • Tap changer control of 220/33KV Grid transformers. • Voltage and frequency control of GTG-1 & GTG-2(FUTURE). • Control of the 33kV Isolator breaker panel. • Auto/Manual Synchronization (33kV Incomers, bus couplers & Bus ties), ON/OFF Control and Independent close for following breakers of 33kV Switchgear (SS-01(CPP)) through control of the Generators and ON/OFF control. ○ 8Nos 33kV breakers for incomers (4 Nos) ○ 6Nos 33kV breakers for bus couplers/bus ties (2Nos bus couplers and 1 Nos bus ties) • Selector switches like auto/ manual selector switch for excitation, control ISO/droop selector switch for governor required to meet operating and monitoring functions from SCAP. • Automatic synchronizing device with inputs to governor and excitation control of selected generator(s) for automatic synchronization of the selected breakers. • Manual Synchronization subsystem complete with running and incoming voltmeters, frequency meters, synchroscope, synchroscope ON/OFF switch, check synchronizing, guard relays, switches, lamp etc. • Auto Synchronization trolley complete with running and incoming voltmeters, frequency meters, synchroscope, synchroscope ON/OFF switch, auto synchronizer, check synchronizing, guard relays, switches, lamp, cable etc. • All other controls, as required for control and operation of generators, namely filed breaker control etc. shall also be located on SCAP. • All other controls, as required for control and operation of generators shall also be located on SCAP. • Temperature scanners will be provided on Gen relay Panel and its corresponding annunciation shall be provided in SCAP.		
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company .			B. <u>Monitoring functions</u> Voltage & Frequency of 220 KV incomers, outgoing & buses. Voltage of 33 KV isolating breaker panels. Voltage of 33 KV incomers and buses. Current of each phase of 33 KV incomers and bus couplers/bus tie breakers, 220kV Incomers to 33kV Switchboard. Line and field voltage of each generator. Field current of each generator. Frequency of generator. Power factor of each generator incomer, 220kV Incomers to 33kV Switchboard. MW, MVAR & MVA of each generator incomer, switchyard incomer 33KV Switchgear (SS-01) &220kV incomers from switchyard. MWH, MVARH of each generator incomer & incomers from switchyard. Voltage and frequency recorder of each bus. Null voltmeter of each generator. Tap position indicator for grid transformers. Any other function, which is not mentioned but is essential for operation and safety of equipment and personnel. C. <u>Audio-Visual Annunciation Functions:</u> Annunciation panel shall be part of SCAP Panel. Audio-visual annunciation shall be provided for monitoring the generator, generator transformers, 33kV AIS and other electrical equipment as a minimum, but shall not be limited to the following: Annunciation of Fault status of 220 KV breakers. Annunciation of Fault status of 33kV Incomers and bus couplers/tie breakers in AIS. Operating and fault status of all protective relays and trip alarm of gas turbine generators etc. Complete trip and non-trip alarm annunciation for generator transformer & Grid transformers including alarm of OLTC of grid transformer. Hooter and clock. D. <u>MIMIC diagram</u> ON/OFF/TRIP indications of 220KV breakers, isolators & earth switches. ON/OFF/TRIP indications of 33KV isolator breakers. ON/OFF/TRIP indications of 33KV breakers of incomers, Bus-couplers & Bus ties. Discrepancy type TNC switches for circuit breakers.					
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.			- LED based Semaphore indicators for all circuit breakers, isolators and earth switches. E. Control and Operation Philosophy i) 33 kV Switchgear (SS-01(CPP)) has one local/remote control selector switch. a. When selector switch is selected in local mode, controls will be done from 33kv switchgear (SS-01 (CPP)) control cubicle. Following operations are possible from 33 kV Switchgear (SS-01(CPP)): i. Close of all incomers and bus couplers/Bus tie breakers in feeder/bus earthing mode/test only. ii. Close of any of the outgoing breakers of 33Kv Switchgear in service position. Open of all breakers. b. When selector switch is selected in remote mode, controls are transferred to hard-wired synchronizing panel (SCAP). Hard-wired synchronizing panel (SCAP) is provided with the following major selector switch for operation and control: SW-1 3 position SS (SCAP/OFF/ECS) SW-2 4 position SS (OFF/Dead bus/Manual Synchronizing/Auto synchronizing) for each synchronizing breakers SW-3 4 position SS for selection of generator (OFF/ALL/GTG-1/GTG-2) SW-4 5 position SS (BUS1A/BUS2A/BUS1B/BUS2B/OFF) SW-6 3 position SS for excitation control (Auto/OFF/Manual) SW-7 3 position SS for control ISO/droop (Auto/OFF/Manual) Vendor, based on the requirements of finalized synchronizing scheme shall decide quantities of these selector switches. When selector switch SW-1 is selected in SCAP mode, controls are transferred to SCAP. Following operations are possible from SCAP: - Close all incomers and bus couplers/sectionalizer (Tie) breakers on dead bus condition in service mode (bus coupler/ sectionalizer (Tie) breakers dead bus closing to be checked on either side). - Auto/Manual Synchronize close of all incomer breakers and bus couplers/ sectionalizer (Tie) breakers in service mode. - Open of all breakers. - Required Interlocks for safe operation shall be provided. When selector switch SW-1 in SCAP is selected in ECS mode, controls are transferred to Electrical Control System (ECS) (By customer).	
			Ref. Doc	ii) For control of GTGs, Auto synch/OFF/ Remote synch selection is available in MARK VI, when the selection is made in Auto synch, auto synchronization of GTG is possible from turbine control panel (MARK VI). When the selection

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		is made in Remote Synch, controls are transferred to SCAP, based on further selection of selector Switch SW-1, the controls are enabled either from SCAP or ECS. Auto & manual Synchronization of GTG are possible from SCAP. iii) Control, monitoring and annunciation functions, mentioned above and in this document are minimum required and shall be provided on the SCAP. However Signals as required for synchronization, control, monitoring and annunciation of listed feeders of the project shall be provided. iv) Same signals for synchronization control, monitoring and annunciation functions for the GTG shall also be multiplied for interfaces with customer ECS and shall be wired to ECS interface panels via a common marshalling panel supplied by the SCAP Vendor. ECS IO list is enclosed along with the specification. For more details, Vendor to refer Electrical control philosophy as attached in Annexure-XIV of this specification. Functions of SCAP as defined in approved Electrical philosophy shall be duly considered & implemented in SCAP 5. GENERAL REQUIREMENTS 5.1 All hardware related to SCAP shall be located in the CPP control room. 5.2 The SCAP panel shall be of MOSAIC type. The mosaic grid tiles shall be made of heat and flame retardant, self-extinguishing and non-hygroscopic material with flat matt finish without glare and nonreflecting type. For mounting back up devices on mosaic grid, the size of all these devices/instruments shall be compatible to mosaic grid. The mosaic grid construction should be flexible enough to allow easy shifting at set off any to any other free location without any need of cutting or special equipment/tool. 5.3 Mimic of the panel shall be as per the SLDs enclosed and the scope of SCAP. 5.4 Paint shade of the panel shall be provided during detailed Engineering. 5.5 Panel height shall not exceed 2400mm. 5.6 One digital clock & one cumulative plant generation display is envisaged over the panels. 5.7 Tariff meter for each generator shall be part of SCAP panel. 6. BILL OF MATERIALS: Bidder may refer the following a) BILL OF MATERIAL - Annexure-IX b) SCAP IO List-Annexure-XII Bidder to note that the BOM is indicative only. It is the responsibility of bidder to consider suitable BOM for meeting the functional requirement of SCAP as mentioned in this specification.		
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	8. TESTING & COMMISSIONING: Supervision for Testing and commissioning of the equipment at site shall be in supplier scope and shall be to the satisfactory operation of end user.																																		
	9. MANDATORY SPARES BHEL shall operate unit rates for mandatory spares (if any) requirement to be identified later and the rates submitted are valid till the commissioning of SCAP in all respects.																																		
	10. PRICE SCHEDULE Refer to the price schedule (Annexure VI) enclosed along with the specification.																																		
	11. GUARANTEE All equipment covered in this specification shall be guaranteed for a period of 12 months from the date of commissioning against any defect in design, manufacturing of materials or workmanship.																																		
Ref. Doc	12. DOCUMENTS TO BE SUBMITTED:																																		
	12.1 During Tendering stage:																																		
	12.1.1 No Deviation schedule - 12.1.2 Unprice price schedule 12.1.3 Check list 12.1.4 Load List (DC/UPS/Non -UPS)																																		
	12.2 Documents To Be Submitted After Award Of Contract																																		
	12.2.1 Documents to be submitted during detailed engineering:																																		
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	12.3 Final Handing Over Documentation: In addition to above, final handing over documentation in neatly bound volumes shall be made in 12 sets of hard copies and 3 sets of CDs for the End User. It shall include the following: (a) O&M Manuals for SCAP. (b) "As-Built" Drawings (incorporating site modifications.) (c) Data Sheets (d) Test Certificates (e) Guarantee Certificates (f) Component Catalogues with Makes and Contact Details.																																																																							
	13. PACKAGE EXECUTION MILESTONES/SCHEDULE <table border="1"> <thead> <tr> <th rowspan="2">Sl. No.</th> <th rowspan="2">Event</th> <th colspan="2">Schedule</th> </tr> <tr> <th>For GA & BOM drawings</th> <th>For Scheme Drawings</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Kick Off Meeting / Furnishing revised inputs (if any)</td> <td colspan="2">Within 2 weeks of P.O. / L.O.I. date (Note-1)</td> </tr> <tr> <td>2</td> <td>Drawings submission</td> <td>Within 4 weeks from P.O. date</td> <td>Within 5 weeks from P.O. date</td> </tr> <tr> <td>3</td> <td>BHEL Comments (along with Final/Firm inputs and revisions)</td> <td>Within 2 weeks from receipt of the "Drawings in line with Inputs" (Note-2)</td> <td>Within 3 weeks from receipt of the "Drawings in line with Inputs" (Note-2)</td> </tr> <tr> <td>4</td> <td>Revised Drawings submission</td> <td>Within 2 weeks from BHEL's comments date</td> <td>Within 2 weeks from BHEL's comments date</td> </tr> </tbody> </table>						Sl. No.	Event	Schedule		For GA & BOM drawings	For Scheme Drawings	1	Kick Off Meeting / Furnishing revised inputs (if any)	Within 2 weeks of P.O. / L.O.I. date (Note-1)		2	Drawings submission	Within 4 weeks from P.O. date	Within 5 weeks from P.O. date	3	BHEL Comments (along with Final/Firm inputs and revisions)	Within 2 weeks from receipt of the "Drawings in line with Inputs" (Note-2)	Within 3 weeks from receipt of the "Drawings in line with Inputs" (Note-2)	4	Revised Drawings submission	Within 2 weeks from BHEL's comments date	Within 2 weeks from BHEL's comments date																																												
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<table border="1"> <tr> <td>5</td> <td>BHEL Comments / Approval for Manufacture Clearance</td> <td>Within 2 weeks from receipt of the revised Drawings</td> <td>Within 2 weeks from receipt of the revised Drawings</td> </tr> <tr> <td>6</td> <td>Revised Drawings submission</td> <td>Within 2 weeks from BHEL's comments / Manufacture Clearance date</td> <td>Within 2 weeks from BHEL's comments / Manufacture Clearance date</td> </tr> <tr> <td>7</td> <td>BHEL Approval on Revised Drawings</td> <td>Within 2 weeks from receipt of the revised Drawings</td> <td>Within 2 weeks from receipt of the revised Drawings</td> </tr> <tr> <td>8</td> <td>Manufacturing cycle time, Inspection call & Delivery</td> <td colspan="2">Within 14 weeks from Manufacture clearance date of GA & SLD Drawings (progressively)</td> </tr> <tr> <td>9</td> <td>As-Manufactured Drawings + Commissioning Manuals</td> <td colspan="2">Note-3</td> </tr> </table> Notes: - Kick off Meeting will be held after order placement at BHEL-Hyderabad. It is Vendor's responsibility to call and fix up date for the meeting. It is intended to provide revised inputs (if any) and clarifications on the inputs during the Kick off meeting. It is vendor's responsibility to collect the above within 2 weeks from P.O. / L.O.I. beyond which delays will be to the vendor's account. - It is Vendor's responsibility to submit the Drawings in line with the latest inputs else the drawings will be rejected. Delays on account of this will be attributed to the Vendor. - Two sets of As-Manufactured drawings and Commissioning Manuals shall be dispatched along with the first consignment. For further submission, refer the annexure for "Documents to be submitted after award of contract". - The total delivery time from P.O. / L.O.I. date is 24 weeks progressively. For package execution schedule and accounting of delays, the schedule for GA & SLD drawings shall be taken as reference. 14. GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN: Refer annexure-XVII				5	BHEL Comments / Approval for Manufacture Clearance	Within 2 weeks from receipt of the revised Drawings	Within 2 weeks from receipt of the revised Drawings	6	Revised Drawings submission	Within 2 weeks from BHEL's comments / Manufacture Clearance date	Within 2 weeks from BHEL's comments / Manufacture Clearance date	7	BHEL Approval on Revised Drawings	Within 2 weeks from receipt of the revised Drawings	Within 2 weeks from receipt of the revised Drawings	8	Manufacturing cycle time, Inspection call & Delivery	Within 14 weeks from Manufacture clearance date of GA & SLD Drawings (progressively)		9	As-Manufactured Drawings + Commissioning Manuals	Note-3	
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	15. CHECKLIST FOR BID SUBMISSION (TO BE FILLED BY BIDDER AND SUBMITTED ALONG WITH OFFER)																	
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