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2026-1725-A - TECHNICAL OFFER

“Supply of a system for eddy current testing, ultrasonic inspection, and the installation and removal of mechanical plugs on the heat exchanging tubes of ПГБ-1000M-type steam generators”

CALL FOR MARKET CONSULTATION No. 58728

ORIGINAL

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PREPARED BY

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1. EXECUTIVE SUMMARY

INETEC - Institute for Nuclear Technology Ltd. submits this Technical Offer in response to Call for Market Consultation No. 58728 issued by Kozloduy NPP EAD for the supply of a system for automated remote eddy current testing, ultrasonic inspection, and installation and removal of mechanical plugs on the heat exchanging tubes of PGV-1000M-type steam generators.

INETEC proposes the CASTOR platform as the core robotic system. CASTOR is an existing remote-controlled manipulator platform developed for VVER steam-generator applications and designed for eddy current tube inspection, ultrasonic examination of collector welds and tube plugging and unplugging. The proposed delivery combines CASTOR manipulators and modules with INETEC eddy current and ultrasonic instruments, probes, software, workstations, spare parts, training and outage support into one integrated inspection and repair system.

The compliance matrices in this offer address the complete technical specification. Unless explicitly stated otherwise, COMPLY means that the requirement is included in the offered CASTOR configuration and will be incorporated into the final contractual technical baseline, manufacturing documentation and acceptance test programme.

Area	Proposed INETEC solution	Compliance
VVER steam-generator robotic platform	CASTOR remote-controlled modular manipulator system for PGV-1000M steam generators	COMPLY
Eddy current tube inspection	CASTOR ET modules and pushers with FALCON D II instrumentation, INETEC probes and EddyOne software	COMPLY
Collector material EC inspection	CASTOR collector EC module using PNV-2/PNV-3 or equivalent / INETEC rotating probe configuration	COMPLY
Collector weld UT inspection	CASTOR UT weld module with DOLPHIN 128/128PR and SignyOne software	COMPLY
Tube plugging and plug removal	CASTOR mechanical plugging and removal modules configured for Kozloduy mechanical plug requirements	COMPLY
Inspection data workflow	EddyOne acquisition/analysis/review workflow with project-specific callboard/APTS and inspection database functions	COMPLY
Delivery and lifecycle support	360-day delivery, training, commissioning, 24-month warranty and two-outage technical support basis	COMPLY

2. INETEC AND CASTOR SOLUTION OVERVIEW

2.1 COMPANY AND RELEVANT VVER STEAM GENERATOR EXPERIENCE

INETEC is a nuclear technology and engineering company with more than 35 years of experience in non-destructive examination, robotics, instrumentation, probes, software, manufacturing, system integration, testing, training and field support. INETEC provides eddy current and ultrasonic inspection solutions for PWR, VVER and CANDU steam generators and has delivered robotic inspection technology for international nuclear customers.

The proposed solution is based on INETEC technology already used for VVER steam-generator inspection: CASTOR robotics, FALCON eddy current instrumentation, DOLPHIN ultrasonic instrumentation, EddyOne eddy current software, SignyOne ultrasonic software, INETEC eddy current probes and associated inspection-management functions.

2.2 CASTOR PLATFORM

CASTOR is a remote-controlled manipulator designed for inspection of VVER steam-generator tubes with eddy current probes, ultrasonic examination of collector welds and tube plugging. The platform is modular and supports rapid exchange of ET, UT and plugging modules. It is designed for installation without personnel entering the steam generator collector and incorporates machine vision, distributed control, real-time positioning and automated inspection functions.

Area	Proposed INETEC solution	Compliance
Application	VVER steam generators, including PGV-1000M configuration	COMPLY
Architecture	Modular ET, UT, plugging and plug-removal tooling on common CASTOR manipulator platform	COMPLY
Motion	Independent vertical and rotational positioning; automated tube-sheet positioning	COMPLY
Positioning	Integrated encoders/machine vision; CASTOR platform positioning accuracy up to +/- 0.1 mm	COMPLY
Protection	Configuration provides required IP protection up to IP68 in wetted areas	COMPLY
Power / controls	110/220 VAC supply basis, 48 V operating architecture, integrated distributed control system	COMPLY
ET probe handling	Two independent pusher units; bobbin, rotating and array probe capability	COMPLY
UT module	Collector-weld UT module supporting circumferential and axial scanning	COMPLY
Plugging	Mechanical plugging module with plug-removal capability and controlled process recording	COMPLY

2.3 PROPOSED SYSTEM ARCHITECTURE

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
2.3-1	Robotics	4 x CASTOR manipulators with motion and pneumatic control units	COMPLY
2.3-2	Probe movement	8 x CASTOR probe pusher devices plus 2 spare pusher devices	COMPLY
2.3-3	EC collector inspection	2 x modular collector EC inspection modules, compatible across manipulators	COMPLY
2.3-4	UT collector weld inspection	1 x modular UT inspection module for weld 35/Z, compatible across manipulators	COMPLY
2.3-5	Tube plugging	1 x mechanical plugging module with hydraulic pulling interface	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
2.3-6	Plug removal	1 x mechanical plug removal module	COMPLY
2.3-7	EC instrumentation	5 x FALCON D II or project-configured equivalent eddy current flaw detectors	COMPLY
2.3-8	UT instrumentation	2 x DOLPHIN 128/128PR or project-configured equivalent multichannel PAUT instruments	COMPLY
2.3-9	ET software	EddyOne Acquisition, Analysis, Resolution/Review and inspection-management functions	COMPLY
2.3-10	UT software	SignyOne acquisition and analysis software	COMPLY
2.3-11	Inspection management	Project-specific callboard/APTS and database configuration, integrated with inspection workflow	COMPLY
2.3-12	Workstations	Acquisition, analysis, review and database workstations in RFQ quantities and minimum hardware configuration	COMPLY
2.3-13	Spares / tools	Complete RFQ spare component package, maintenance tools and controller configuration hardware/software	COMPLY

3. SCOPE OF SUPPLY COMPLIANCE MATRIX

The quantities offered below follow the Scope of Supply and Spare Components sections of the Technical Specification. Commercial pricing is provided separately from this Technical Offer.

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
SOS-01	Manipulator providing vertical and horizontal (rotational) movement relative to the tube sheet - 4 (four) units.	COMPLY. Four CASTOR manipulators will be supplied, each providing vertical and horizontal/rotational positioning relative to the tube sheet.	COMPLY
SOS-02	Device for moving the probes along the length of the heat exchanging tubes - 8 (eight) units.	COMPLY. Eight independent probe pusher devices will be supplied as operating equipment.	COMPLY
SOS-03	Module for eddy current testing of the ПГБ-1000M-type steam generator collector material using a ПНВ-2/ПНВ-3 or equivalent probe - 2 units (the modules shall be compatible with any manipulator).	COMPLY. Two collector-material EC modules will be supplied. Modules will be compatible with each CASTOR manipulator and configured for PNV-2/PNV-3 or equivalent probe application.	COMPLY
SOS-04	Ultrasonic inspection module (shall be compatible with any manipulator) for welded joints No. 35/Z (between the collector flange and the tube sheet, and between the tube sheet and DN 850) of the ПГБ-1000M-type steam generator collector - 1 unit.	COMPLY. One interchangeable UT module for weld 35/Z will be supplied and configured for use on any CASTOR manipulator.	COMPLY
SOS-05	Module for installing mechanical plugs on heat exchanging tubes (the module shall be compatible with any manipulator) via hydraulic pulling - 1 unit (Specification 2).	COMPLY. One CASTOR mechanical plugging module will be supplied with the required hydraulic pulling interface.	COMPLY
SOS-06	Module for removing mechanical plugs (the module shall be compatible with any manipulator) from heat exchanging tubes - 1 unit (Specification 3).	COMPLY. One CASTOR mechanical plug removal module will be supplied.	COMPLY
SOS-07	Eddy current flaw detector - 5 units.	COMPLY. Five FALCON D II or project-configured equivalent eddy current flaw detectors will be supplied.	COMPLY
SOS-08	Multichannel ultrasonic flaw detector - 2 units.	COMPLY. Two DOLPHIN 128/128PR or project-configured equivalent multichannel ultrasonic flaw detectors will be supplied.	COMPLY
SOS-09	Motion control unit - 4 units.	COMPLY. Four motion control units will be supplied as part of the CASTOR control architecture.	COMPLY
SOS-10	Pneumatic system control unit - 4 units.	COMPLY. Four pneumatic system control units will be supplied.	COMPLY
SOS-11	Workstation with a software for manipulator control/positioning, software for probe movement, and software for acquisition of eddy current testing data - 5 units.	COMPLY. Five workstations will be supplied with manipulator positioning, pusher control and ET data acquisition software.	COMPLY
SOS-12	Workstation with a software for acquisition of ultrasonic inspection data - 1 unit.	COMPLY. One portable workstation will be supplied for UT data acquisition.	COMPLY
SOS-13	Workstation with a software for manipulator control/positioning, software for installing mechanical plugs, and software for removing mechanical plugs - 1 unit.	COMPLY. One workstation will be supplied for manipulator positioning and plug installation/removal control.	COMPLY
SOS-14	Workstation with a software for analysis of eddy current testing data - 12 units.	COMPLY. Twelve ET data analysis workstations will be supplied.	COMPLY
SOS-15	Workstation with a software for analysis of ultrasonic inspection data - 1 unit.	COMPLY. One UT data analysis workstation will be supplied.	COMPLY
SOS-16	Workstation with a software for resolution/review of the analysis results - 1 unit.	COMPLY. One ET resolution/review workstation will be supplied.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
SOS-17	Workstation with a software for the management of testing/inspection results (database) - 1 unit.	COMPLY. One inspection-results management/database workstation will be supplied.	COMPLY
SOS-18	Five licences for the software for acquisition of eddy current testing data.	COMPLY. Five perpetual hardkey licences for ET acquisition software will be supplied.	COMPLY
SOS-19	Two licences for the software for acquisition and analysis of ultrasonic inspection data.	COMPLY. Two perpetual hardkey licences for UT acquisition/analysis software will be supplied.	COMPLY
SOS-20	One licence for the software for installation of mechanical plugs, and the software for removal of mechanical plugs.	COMPLY. One perpetual hardkey licence set for plug installation and removal software will be supplied.	COMPLY
SOS-21	Twelve licences for the software for analysis of eddy current testing data.	COMPLY. Twelve perpetual hardkey licences for ET analysis software will be supplied.	COMPLY
SOS-22	One licence for the software for resolution (review) of eddy current testing results.	COMPLY. One perpetual hardkey licence for ET resolution/review software will be supplied.	COMPLY
SOS-23	One licence for the software for eddy current testing data management (database).	COMPLY. One perpetual hardkey licence for the inspection data management/database software will be supplied.	COMPLY
SOS-24	Staff training on the operation and maintenance of the supplied equipment and software.	COMPLY. Operation, maintenance and software training will be included in accordance with the specified participant numbers and Bulgarian-language requirement.	COMPLY
SOS-25	Spare parts and tools.	COMPLY. Complete spare parts and specialised maintenance tools will be included.	COMPLY
SOS-26	Participation of Contractor's personnel in the annual refuelling outage.	COMPLY. INETEC personnel participation during annual refuelling outages will be included as specified in the Contractor requirements.	COMPLY

3.1 SPARE COMPONENTS FOR MANIPULATORS

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
SP-01	Four electric motors of each type.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-02	Four pneumatic cylinders of each type.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-03	Device for moving the probes along the length of the heat exchanging tubes - 2 units.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-04	Data transmission devices (4-pin slip ring) - 6 units.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-05	Data transmission devices (36-pin slip ring) - 4 units.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-06	Video surveillance cameras for the guide tubes - 4 units.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-07	Electrical connectors - 4 sets.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-08	Pneumatic connectors - 4 sets.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-09	Rubber rollers - 20 sets.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-10	Bearings for the pushers - 20 sets.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
SP-11	Probe drums - 8 units.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-12	Specialised maintenance tools - 4 sets.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-13	Pusher and manipulator motor controllers - 4 sets.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY
SP-14	Hardware and software for controller configuration and adjustment - 1 set.	COMPLY. Included in the CASTOR spare parts package in the quantity specified by the RFQ.	COMPLY

4. GENERAL AND CONTRACT REQUIREMENTS COMPLIANCE MATRIX

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
C-01	The equipment shall be delivered not later than 360 calendar days from contract award.	COMPLY. INETEC confirms delivery not later than 360 calendar days from contract award, subject to timely receipt of agreed interface information and access required for execution.	COMPLY
C-02	The Contractor shall be a manufacturer or an authorised representative of the manufacturer of systems for eddy current testing, ultrasonic inspection, and installation of mechanical plugs on the heat exchanging tubes of ПГБ-1000M steam generators.	COMPLY. INETEC is the manufacturer of CASTOR and associated INETEC inspection equipment for VVER steam-generator applications.	COMPLY
C-03	The Contractor shall provide technical assistance by supplying at least 3 specialists in mechanics, electronics, and software to maintain the equipment for a period of 14 calendar days during each annual refuelling outage for 2 (two) consecutive years. The specialists shall be certified to work in ionizing radiation environments.	COMPLY. INETEC will provide at least three specialists covering mechanics, electronics/controls and software for 14 calendar days during each annual outage for two consecutive years; personnel will hold the required radiation-work certification.	COMPLY
C-04	The Contractor shall ensure updates to the supplied software in the event of a change or update to the operating system for a period of at least 5 years.	COMPLY. Software maintenance will include compatibility updates required by supported operating-system changes for at least five years.	COMPLY
C-05	The licences for the supplied software shall be hardware keys.	COMPLY. Required software licences will be supplied as hardware keys.	COMPLY
C-06	The supplied software shall have a perpetual licence.	COMPLY. Supplied software licences will be perpetual.	COMPLY
ENV-01	Operation in working environments with an air temperature of: 20 - 40 °C.	COMPLY. The offered equipment is suitable for operation within the specified 20-40 degC ambient range.	COMPLY
ENV-02	Relative air humidity within the range of: 35 - 60%.	COMPLY. The offered equipment is suitable for the specified 35-60% relative-humidity range.	COMPLY
PHY-01	In accordance with Specification 1, Specification 2, and Specification 3.	COMPLY. Physical properties and dimensions will comply with Specifications 1, 2 and 3 and the confirmed PGV-1000M interface data.	COMPLY
MAT-01	The materials used in the manufacture of the manipulators and their modules shall be corrosion-resistant and designed for operation in ionizing radiation environments.	COMPLY. Manipulator and module materials will be corrosion-resistant and selected for ionising-radiation service.	COMPLY
MAT-02	The equipment design shall allow for decontamination.	COMPLY. External surfaces and equipment arrangement will support decontamination.	COMPLY
MAT-03	The design of the equipment and its handling shall prevent any adverse effects on the workers.	COMPLY. Equipment design, handling provisions, interlocks and remote operation will be arranged to prevent adverse effects on personnel.	COMPLY
PROP-01	In accordance with Specification 1, Specification 2, and Specification 3.	COMPLY. Chemical, mechanical, metallurgical and other relevant properties will comply with Specifications 1, 2 and 3.	COMPLY
RAD-01	In accordance with Specification 1, Specification 2, and Specification 3.	COMPLY. Components and materials will be selected and documented for operation in the specified ionising-radiation environment.	COMPLY
DOC-01	The equipment shall be manufactured in accordance with the manufacturer's regulations and technical specifications for the type of equipment, for which a valid certificate shall be provided.	COMPLY. Equipment will be manufactured under INETEC controlled manufacturer specifications and technical documentation; applicable certificates will be supplied.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
LIFE-01	The delivered equipment shall be new, unused, with a service life of no less than 5 years from the date of receipt. Components with a shorter service life shall be replaced.	COMPLY. Delivered equipment will be new and unused, with a minimum service-life basis of five years; shorter-life components will be replaceable.	COMPLY
WAR-01	The warranty period for the delivered equipment shall be 24 months from the date of signing the Specialised Receiving Inspection Report finding no discrepancies.	COMPLY. A 24-month equipment warranty will apply from the discrepancy-free Specialised Receiving Inspection Report.	COMPLY
WAR-02	The warranty period for spare parts shall be 24 months from the date of signing the Specialised Receiving Inspection Report finding no discrepancies in respect of the relevant spare part.	COMPLY. Spare parts will carry the specified 24-month warranty from the relevant discrepancy-free receiving report.	COMPLY
SERV-01	The Contractor shall provide for repair and metrological inspection services for the delivered eddy current and ultrasonic flaw detectors for a period of at least 5 years from the date of receiving inspection finding no discrepancies.	COMPLY. Repair and metrological inspection support for delivered EC and UT instruments will be available for at least five years.	COMPLY
MFG-01	The systems for eddy current testing, ultrasonic inspection, and the installation/removal of mechanical plugs shall comply with the manufacturer's regulations and technical specifications for the type of equipment.	COMPLY. ET, UT and plugging/removal systems will be manufactured in accordance with INETEC controlled technical specifications.	COMPLY
MFG-02	The materials used in the manufacture of the equipment shall be tested against the manufacturer's regulations and technical specifications.	COMPLY. Materials will be controlled and tested in accordance with the applicable manufacturer specifications and quality plan.	COMPLY
MFG-03	The equipment external surface shall allow for decontamination.	COMPLY. External equipment surfaces will be designed for decontamination.	COMPLY
DELDOC-01	Manufacturer's technical specification;	COMPLY. The specified document will be included in the final delivery / installation / commissioning documentation package.	COMPLY
DELDOC-02	Product operation manual;	COMPLY. The specified document will be included in the final delivery / installation / commissioning documentation package.	COMPLY
DELDOC-03	Comprehensive manuals for the maintenance and repair of the equipment and control systems;	COMPLY. The specified document will be included in the final delivery / installation / commissioning documentation package.	COMPLY
DELDOC-04	Mechanical design drawings and assembly drawings;	COMPLY. The specified document will be included in the final delivery / installation / commissioning documentation package.	COMPLY
DELDOC-05	Diagrams of the electrical connections between the control system and connectors, block diagrams, terminal blocks, terminals, cables, operational designations, and labelled mnemonic diagrams; availability of a neutral busbar; absence of exposed live parts; and other limiting conditions for operation. Specifications of connectors and network connectivity;	COMPLY. The specified document will be included in the final delivery / installation / commissioning documentation package.	COMPLY
DELDOC-06	Diagrams of pneumatic lines, manifolds, and actuators;	COMPLY. The specified document will be included in the final delivery / installation / commissioning documentation package.	COMPLY
DELDOC-07	A training program developed by the Contractor and approved by the Contracting Authority. The Programme shall be submitted not later than 60 calendar days prior to the training date;	COMPLY. The specified document will be included in the final delivery / installation / commissioning documentation package.	COMPLY
QA-01	The delivered systems for eddy current testing and ultrasonic inspection shall be manufactured under a quality management system compliant with BDS EN ISO 9001:2015 and verified by a copy of a valid certificate or other equivalent proof of compliance.	COMPLY. Manufacturing will be performed under INETEC ISO 9001-compliant quality management controls; valid certification will be provided.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
QA-02	The required training on the use of the systems for eddy current testing, ultrasonic inspection, and installation/removal of mechanical plugs shall be conducted in accordance with a specific programme prepared by the Contractor and approved in advance by the Contracting Authority.	COMPLY. Training will follow a dedicated programme prepared by INETEC and approved in advance by Kozloduy NPP.	COMPLY
QA-03	The Contractor shall submit valid metrological inspection reports issued by an accredited body for the delivered ultrasonic and eddy current flaw detectors.	COMPLY. Valid metrological inspection reports from an accredited body will be provided for the delivered EC and UT flaw detectors.	COMPLY
TRN-01	The Contractor shall conduct training for specialists from Kozloduy NPP EAD: - Equipment operation - at least 8 persons - Equipment maintenance - at least 10 persons - Equipment periodic servicing - at least 10 persons - Spare part configuration and adjustment - at least 10 persons - Using the software for eddy current and ultrasonic data acquisition - at least 10 persons - Using the software for eddy current and ultrasonic data analysis - at least 10 persons - Using the software for resolution (review) of eddy current testing data - at least 2 persons - Using the software for eddy current testing data management (database) - at least 2 persons - Using the modules for installation and removal of mechanical plugs - at least 10 persons.	COMPLY. INETEC will provide training for all listed disciplines and participant quantities, including equipment operation, maintenance, servicing, spare-part configuration, ET/UT acquisition and analysis, ET resolution/database functions and plug installation/removal.	COMPLY
TRN-02	The training shall be conducted in Bulgarian at the Contracting Authority's premises.	COMPLY. Training will be conducted in Bulgarian at the Contracting Authority premises, using qualified Bulgarian-language delivery/support.	COMPLY

5. SPECIFICATION 1 COMPLIANCE MATRIX

Specification 1 requirements are grouped by functional subsystem. All individual requirements listed in the RFQ are reproduced within the corresponding matrix row.

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S1-01	CASTOR manipulator - probe handling and performance - Operate with two bobbin probes simultaneously - Move the probes simultaneously up to and including AVB3 (anti-vibration bar 3) - Provide for sufficiently powerful motors to move the probes up to and including AVB3 (anti-vibration bar 3) - Provide for linear control of the probe travel speed of a minimum increment of 1 mm/sec within the range of 3-1,000 mm/sec - Be compatible with a '+Point' probe - Be compatible with an RPC Pancake probe of the ПНВ-2/ПНВ-3 type - Be compatible with a matrix probe (Array and X-Probe) - Be capable of operating with a ПНВ-2/ПНВ-3 probe or equivalent when installed on a module which is integrated into this system	COMPLY. The CASTOR ET configuration provides two independent pusher units and supports bobbin, rotating and array probes. The offered pusher/control configuration will provide the required AVB3 reach, motor capacity and 3-1,000 mm/s controlled operating range with the specified setpoint resolution.	COMPLY
S1-02	CASTOR manipulator - installation, access and calibration - Provide for installation of the manipulator in the ПГВ-1000M steam generator collector by two specialists using a crane - Provide for access to all tubes in the bundle and collector openings after the manipulator has been installed in the ПГВ-1000M steam generator collector - The installation and securing of the manipulator to the ПГВ-1000M steam generator shall ensure the manipulator and probe structural integrity and stability during operation - Provide for the attachment of two eddy current testing calibration units to the manipulator, one for each probe. - The calibration units shall not be part of the manipulator's guide tubes.	COMPLY. CASTOR is designed for remote installation and stable operation in VVER steam-generator collectors. The offered configuration will support two-person crane-assisted installation, full tube-sheet access and two dedicated calibration units.	COMPLY
S1-03	CASTOR manipulator - replaceable modules/components - Provide for the replacement of the following components without being dismantled from the ПГВ-1000M steam generator collector: - probes - wear parts (rollers) - calibration units - Bobbin-type probe module(s) - ПНВ-2/ПНВ-3 rotary probe (or equivalent) module - module for ultrasonic inspection of weld 35/z - tube plugging module.	COMPLY. CASTOR modular architecture permits replacement/exchange of probes, wear parts, calibration units, bobbin/rotating modules, the weld UT module and plugging module without dismantling the manipulator from the collector.	COMPLY
S1-04	Manipulator video surveillance - There shall be a system for video surveillance of the manipulators comprising the following components: - two video cameras monitoring the probe-tube alignment with a resolution of at least 1920x1080 equipped with lighting, with a remote software control of focus, aperture, and zoom for monitoring relevant section of the tube sheet - a panoramic camera for overhead monitoring of the probe drums, moving in tandem with the manipulator's probe module (positioning cart) - the intensity of the camera lighting shall be adjustable in stages, or individual stages of the light source shall be able to be turned on and off	COMPLY. CASTOR machine-vision package will include two 1920x1080 alignment cameras and the specified panoramic camera, lighting and remote camera controls.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S1-05	FME, signal integrity, collector protection, IP and power - Be equipped with a device mounted on its lower part to protect against or prevent foreign material ingress into the collector of the ПГБ-1000М steam generator - The movement of the manipulator and the probe module (positioning cart) shall not cause electrical or mechanical interference of the eddy current or ultrasonic signal in the process of data acquisition - Installation of the manipulator on the collector shall not damage the collector sealing surface - Be protected against the ingress of dust and water (IP53 for manipulator components above the collector flange and IP68 for components below the level of the collector flange) - The manipulator's power supply module shall be a switch mode power supply rated for 220V ± 10%. The length of the power supply cable shall be at least 40 m. - The power supply module shall not cause electrical interference of the eddy current and ultrasonic signals - The manipulator control system and its modules shall be located in the upper part of the manipulator which shall be outside the collector	COMPLY. The offered CASTOR configuration will include FME protection, non-damaging collector interfaces, EMC/noise controls, IP53/IP68 protection as specified, a 220 V +/-10% switch-mode power module and minimum 40 m power cable.	COMPLY
S1-06	ET module control functions - The eddy current testing module control system shall enable: - vertical and horizontal movement of the module relative to the tube sheet - folding and unfolding of the guide tubes - control of the probe movement mechanism - control of the manipulator pneumatic system - calibration of encoders and transducers - Control the Bobbin-type probe module - Control the ПНБ-2/ПНБ-3 (or equivalent) probe module - The signal from the installed probe movement sensors shall stop the probes movement as per operator-set limits - Record the signal from the probe(s) during retrieval, as well as during insertion of the probe(s) into a tube	COMPLY. CASTOR DCS/EddyOne Control will provide the required manipulator/pusher/pneumatic functions, encoder calibration, bobbin and PNV-2/PNV-3 module control, motion limits and bidirectional probe data recording.	COMPLY
S1-07	UT trigger, fail-safe protection, communications and E-stop - The ultrasonic inspection module control system shall provide an output channel for trigger signals from quadrature encoders for communication with a multichannel ultrasonic flaw detector. The scanning rates, and trigger signals respectively, shall be uniform for radial and axial scanning. No A-scan image loss shall be allowed during ultrasonic data acquisition. - The manipulator control system shall ensure hardware protection of the integrity of the probe(s) and the manipulator in the event of a loss of power supply by reliably locking the motors and actuators - Communication between the manipulator control system and the data acquisition workstation shall be carried out via a local area network, type Ethernet 1000Base-T, using RJ-45 interface cables and connectors that are moisture- and dust-resistant with an IP68 protection rating. The length of the communication/interface cable between the control system and the Ethernet switch shall be at least 40 m - Emergency stop button	COMPLY. The UT interface will provide quadrature-encoder trigger output and uniform radial/axial triggering; CASTOR control includes fail-safe motion protection, Gigabit Ethernet communication and emergency stop functions.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S1-08	Local control panel and diagnostics - A control panel with touch buttons and/or a touch screen shall be provided and installed as part of the manipulator control system allowing for manual control of the relevant functions. The control panel shall enable the following commands and checks: - vertical and radial movement - opening/closing of the probe holders - controlling the probe movement devices - forward/backward movement - opening/closing of the rollers - folding/unfolding of the guide tubes - shifting the installed transducers' mode between on, off and test - scanning position of the ultrasonic transducer arrays relative to the collector - rotating the ultrasonic transducer arrays by 90° - displaying diagnostic information (voltage, current, temperature, pressure).	COMPLY. The supplied control panel will provide the specified manual motion, holder/roller, pusher, guide-tube, transducer and UT-array commands together with voltage/current/temperature/pressure diagnostics.	COMPLY
S1-09	Cabling, connectors, maintenance documentation and spares - The cables required to control the manipulator shall be moisture-resistant and shall not generate noise in the eddy current and ultrasonic signals during data acquisition - All electrical cables and pneumatic hoses shall be routed together in a single cable sleeve - A clamp shall be provided to secure the main cable and pneumatic lines from the manipulator to the respective power supply and air supply points - All types of electrical connections, all electrical soldered connections, and mechanical connections of connectors and other similar components on the individual modules shall be of appropriate quality and designed for frequent on/off cycles, as well as for frequent connection/disconnection with high wear resistance in ionising radiation environments - Complete and accurate diagrams of all electrical circuits and pneumatic lines shall be provided, as well as a manual containing clear and precise instructions for the maintenance and repair of the manipulators - Devices for adjusting the sensitivity of the probe motion sensors shall be installed in the manipulator's control system enclosure - The manipulators shall be supported by a complete set of spare parts for the electronic, electrical, mechanical, and pneumatic components of the manipulators - The provided additional securing and auxiliary equipment, such as textile ropes, slings, and other similar items, shall comply with the relevant requirements and procedures for their use in ionising radiation environments.	COMPLY. The supplied system will use moisture-resistant low-noise cabling, common sleeves and line restraints; qualified connections for repeated use; complete electrical/pneumatic diagrams, maintenance instructions, sensor adjustments, spares and radiation-suitable auxiliary equipment.	COMPLY
S1-10	Collector material EC module - The eddy current testing module for the heat exchanging tube openings of the ПГБ-1000M steam generator, equipped with a ПНБ-2/ПНБ-3 or equivalent probe, shall move the probe along the entire length of the collector (171 mm) - The mounting location (clamp, mounting bracket, etc.) for the ПНБ-2/ПНБ-3 or equivalent probe shall enable additional movement of ± 50 mm, vertically and horizontally, to inspect openings that are not perpendicular to the tangent of the collector.	COMPLY. Two interchangeable CASTOR collector EC modules will be configured for PNV-2/PNV-3 or equivalent probes, 171 mm collector travel and the required ± 50 mm additional vertical/horizontal adjustment.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S1-11	Ultrasonic module for weld 35/Z - The ultrasonic inspection module for welded joint No. 35/z connecting the collector flange to the tube sheet shall provide for: - axial and radial scanning with two ultrasonic transducer arrays positioned at 180° - pressure control relative to a diameter of 834 mm - 90° rotation of the ultrasonic transducer arrays during radial scanning - the ultrasonic transducer array shall be equipped with four holders, for transducers measuring 30x30 mm - the holders shall provide for independent pressing of the individual ultrasonic transducers against the contact surface to ensure reliable coupling without spontaneous detachment and loss of contact.	COMPLY. The CASTOR UT collector-weld module will provide axial and radial scanning, two 180-degree opposed arrays, control relative to the 834 mm diameter, 90-degree probe rotation and four independently spring-loaded 30x30 mm probe holders.	COMPLY
S1-12	Eddy current flaw detector - Fully digital technology - Operating frequencies from 1 kHz to 1 MHz - Maximum sampling rate of at least 3,000 samples/sec - Operation supporting up to four frequencies in the following modes: multiplex, simultaneous, and mixed - Adjustability of the voltage applied to a probe coil - Controllability of the voltage applied to the probe in use - up to actual 30 V, rather than a coefficient of the applied voltage. - Gain adjustability (up to 35 dB) - Compatibility with the following types of probes: - Bobbin - RPC Pancake - ПНВ-2/ПНВ-3 type RPC Pancake - RPC "+Point" - 8x1 pancake array probe - 8x1 '+Point' array probe - X-Probe routed via a multiplexer - Simultaneous operation with two bobbin probes - Drive-pickup excitation modes. - Operation without an external reference probe - At least two types of encoders - pulse/incremental - Power grid and environmental interference shall not affect the signal in a way that interferes with the detection or evaluation of flaws - Operating temperatures ranging from 0° to 50°C - Full configuration and control of the eddy current flaw detector, as well as - data transfer, shall be managed by the data acquisition workstation - Communication between the workstation and the flaw detector shall be via a 1000Base-T Ethernet local area network. - Functioning (data acquisition) shall be independent of the manipulator - Suitable for laboratory use - Operation in ionising radiation environments and fully protected against aerosol ingress - Equipped with adapters for the probes listed in item 4.8: - Compliance with the requirements specified in the following document: ASME, Section V, Article 8, II-830-II-860, or an equivalent document. - Capability to adjust motor speed when operating the rotary probes.	COMPLY. FALCON D II / offered EC instrument configuration satisfies the listed digital EC requirements, including the required frequency range, multi-frequency operation, up to 30 V probe excitation, multiple probe types, two-bobbin operation, drive-pickup modes, encoder inputs, noise performance, Ethernet control and ASME Section V Article 8 inspection basis.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S1-13	Multichannel ultrasonic flaw detector - Operation with UT and PAUT transducers - Number of phase channels: 128/128 - Additional ultrasonic (UT) channels: at least 4 connectors, Lemo 00 type (excluding IPEX/Hypertronics (CAGE 50541 0206 NPJV19/16PMS/T)) - Sampling frequency of at least 100 MHz - A/D conversion modes: 8-bit and 16-bit - Frequency range coverage (-3 dB) from 0.25 MHz to 20 MHz - Pulse generation voltage adjustment up to and including 100 V - Real-time data compression - Low-pass and high-pass filtering - Full control from a portable PC workstation - High-speed LAN card for communication - Three inputs from quadrature encoders - Power supply, 220V - At least 1 PA connector (IPEX and/or Hypertronics (CAGE 50541 0206 NPJV19/16PMS/T)) for use with conventional and phase ultrasonic transducers. - The delivery shall include one IPEX/ Hypertronics male connector (CAGE 50541 0206 NPJV19/16PMS/T) to 32xBNC female connector with coaxial cables of up to 50 cm in length between the connector and the BNC, with channels arranged from 1 to 32 (numbered) - The delivery shall include one cable with a length of 2 to 3 m for connecting external encoders, featuring an FGG.1K.307.CLAC60 connector on one end and a connector compatible with the flaw detector on the other end - The delivery shall also include one spare connector for connecting external encoders, compatible with the flaw detector's connector - The weight of the flaw detector shall not exceed 7 kg.	COMPLY. DOLPHIN 128/128PR / offered UT instrument configuration will provide 128/128 PA capability, >=100 MHz sampling, UT/PAUT operation, required frequency/pulse controls, filtering/compression, LAN/encoder interfaces and the specified connector/cable package in a portable configuration meeting the weight requirement.	COMPLY
S1-14	ET data-acquisition workstation - At least 2GB DDR5 RAM - AMD Ryzen 7/ INTEL Core i7 or more powerful processor - 1TB SSD or more - The GPU shall be with at least 6 GB VRAM or more, and shall support two monitors in Full HD mode or higher resolution via a digital interface (DVI, HDMI or DPort) - Widescreen monitor with a matte, curved screen measuring diagonally 38" or more with a resolution of 1920x1080, or a larger screen with a higher resolution, and a 60Hz or higher refresh rate. - Licensed Windows 11 OS or a newer version. It could be an open-source operating system - The computer shall be capable of smoothly running the operating system, the installed data acquisition software, and other applications required for the operation of the workstation.	COMPLY. Five acquisition workstations will meet or exceed the specified processor, memory, SSD, GPU, display and operating-system requirements and will be sized for EddyOne Acquisition and CASTOR control.	COMPLY
S1-15	UT data-acquisition workstation - The portable PC workstation shall deliver high performance when analysing data and processing large files (larger than 1GB). - The minimum configuration requirements are: AMD Ryzen 7/INTEL Core i7 series processor or a processor with more cores, at least 32GB DDR5 RAM, high-speed 1TB SSD, GPU (graphics card) with at least 8GB VRAM, 17" IPS matte screen with a minimum resolution of 1920x1080 (Full HD), refresh rate of at least 120Hz - The portable PC workstation shall come with a licensed WINDOWS operating system, compatible with the software for data management, acquisition and analysis.	COMPLY. The offered portable UT workstation will meet or exceed the specified CPU, 32 GB DDR5, 1 TB SSD, >=8 GB VRAM, 17-inch FHD/120 Hz display and licensed Windows requirements.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S1-16	ET data-analysis workstation - 32GB RAM DDR5 or more/faster - AMD Ryzen 7/INTEL Core i7 processor or a processor with more cores - 1TB SSD or more - The GPU shall be with at least 6 GB VRAM or more, and shall support one monitor in Full HD mode or higher resolution via a digital interface (DVI, HDMI or DPort) - Two matte widescreen monitors with a diagonal of 24" or more, a resolution of 1920x1080 or higher, and a 60Hz or higher refresh rate - Licensed Windows 11 OS or a newer version. It could be an open-source operating system - The computer shall ensure the smooth running of the operating system, the installed data analysis software, and other applications needed for the operation of the workstation.	COMPLY. Twelve ET analysis workstations will meet or exceed the listed CPU, 32 GB DDR5, 1 TB SSD, >=6 GB VRAM, dual-monitor and operating-system requirements.	COMPLY
S1-17	UT data-analysis workstation - The portable PC workstation shall deliver high performance when analysing data and processing large files (larger than 1GB). - The minimum configuration requirements are: AMD Ryzen 7/INTEL Core i7 series processor or a processor with more cores, at least 32GB DDR5 RAM, high-speed 1TB SSD, GPU (graphics card) with at least 8GB VRAM, 17" IPS matte screen with a minimum resolution of 1920x1080 (Full HD), refresh rate of at least 120Hz - The portable PC workstation shall come with a licensed WINDOWS operating system, compatible with the software for data management, acquisition and analysis.	COMPLY. The offered portable UT analysis workstation will meet or exceed the specified high-performance hardware and licensed Windows requirements.	COMPLY
S1-18	ET resolution/review workstation - 32GB DDR5 RAM or more/faster - AMD Ryzen 7/ INTEL Core i7 or more powerful processor - 1TB SSD or more - The GPU shall be with at least 6 GB VRAM or more, and shall support one monitor in Full HD mode or higher resolution via a digital interface (DVI, HDMI or DPort) - Two widescreen monitors with a diagonal of 24" or more and a resolution of 1920x1080 or a larger screen with a higher resolution, and a 60Hz or higher refresh rate. - Licensed Windows 11 OS or a newer version. It could be an open-source operating system - The computer shall ensure the smooth running of the operating system, the installed data resolution software, and other applications needed for the operation of the workstation.	COMPLY. The review workstation will meet or exceed the specified CPU, memory, SSD, GPU, dual-monitor and operating-system configuration.	COMPLY
S1-19	Inspection database workstation - 32GB DDR5 RAM or more/faster - AMD Ryzen 7/ INTEL Core i7 or more powerful processor - 10TB SSD or more - The GPU shall be with at least 6 GB VRAM or more, and shall support two monitors in Full HD mode or higher resolution via a digital interface (DVI, HDMI or DPort) - Two matte widescreen monitors with a diagonal of 27" or more, a resolution of at least 1920x1080 or higher, and a 60Hz or higher refresh rate - Licensed Windows 11 OS or a newer version. It could be an open-source operating system - The computer shall ensure the smooth running of the operating system, the installed database software, and other applications needed for the operation of the workstation.	COMPLY. The database workstation will meet or exceed the specified CPU, 32 GB DDR5, 10 TB SSD, >=6 GB VRAM, dual-monitor and operating-system configuration.	COMPLY

S1-20	ET data-acquisition software - Run on the operating system specified in the requirements for the respective workstation(s) - Come with 5 licenses - Support and control all functions of the eddy current flaw detector - Allow for data acquisition/recording with two 'bobbin' probes. - Collect data as the probe moves forward and backward and shall be compatible with the probes and methods listed in item 4.8: - Allow for selection of file formats for data recording, with the MIZ-30 format being mandatory for the following probes and methods: - Bobbin - RPC Pancake - RPC Pancake type ПНВ-2/ПНВ-3 - RPC "+Point" - 8x1 pancake array probe - 8x1 '+Point' array probe - Enable selection of file formats for data recording, with the MIZ-85 format being mandatory for the probes and methods listed in 4.8: - Visualise the signal from randomly selected channels in real time - Allow for setting and retaining of the visualisation: - position of the control/visualisation screens - scale of the control/visualisation screens - Allow for reviewing the recorded signal after the data recording process has been stopped - The software for the manipulator movement shall allow for calibration of the guiding tubes relative to the tube sheet, and after setting up the position (calibration), the software shall allow for automatic positioning of the manipulator guiding tubes against the respective (chosen by the operator) tube sheet openings - Allow for operating mode selection: - automatic mode after setting (calibration). After the software is calibrated by the operator, it shall read a list (plan) of tubes to be tested and the testing scope along the tube length from a specific file, chosen by the operator - free (manual) mode The following actions shall be performed in free/manual mode (which is configured/set by the operator): - positioning - moving the probe to a preliminary defined scope, - extracting the probe with the recorded data - stopping the extraction and the record - inserting the probe with the recorded data - The type of the specified file with the list/plan for testing can be: a text file (csv, xml) or a Microsoft Access table - The software shall allow the operator to choose different rates (determined by the operator) in different sections along the tube length, when moving the probe in automatic mode - The software shall allow the operator to set software restrictions for the manipulator movement for: - vertical movement (from position to position) - horizontal movements against the tube sheet (from position to position) - limiting the probe movement (from position to position) - The software shall allow the operator to display a number of control parameters (selected by the operator) on the screen such as: - control parameters of the probe pushers - control parameters of the manipulator - location of the screens showing the selected parameters by the operator on the monitor - The software shall display: - motor parameters - encoder values	COMPLY. EddyOne Acquisition and CASTOR control will be supplied with five licences and configured for all listed acquisition, probe, file-format, visualisation, tube-plan, automatic/manual movement, variable-speed, movement-limit, diagnostic and data-quality functions, including required MIZ-30/MIZ-85 compatibility.	COMPLY
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Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
	- sensor readings for the purpose of diagnosing system issues and malfunctions - Allow for setting parameters and criteria for checking recording speed and signal quality		
S1-21	UT data-acquisition software - Be fully compatible with the multi-channel flaw detector. - Control the multi-channel flaw detector parameters in real time from a portable workstation, which meets the requirements specified in item 7 of this Specification - Support multi-channel UT and PAUT operating modes - Allow for automatic setting of the 'Velocity' and 'Delay' features in different operating modes - Feature TCG/DAC methods - Include a control calculator in PA transducers and ultrasonic simulation mode and the option to set parameters for the object to be tested. - Support TOFD operating mode - Allow for the collection of ultrasound data in files larger than 2GB - Support a data analysis mode - Support basic and additional measurement tools in data acquisition and analysis modes - Run the following file formats: *.RDT, *.DAT, *.UVDData, *.UVSetup - One operating license, provided as a 'hardkey'.	COMPLY. SignyOne / offered UT acquisition software will be fully integrated with the multichannel UT instrument and configured for UT/PAUT/TOFD, TCG/DAC, PA calculation/simulation, large-file acquisition, analysis tools, specified file formats and hardkey licensing.	COMPLY
S1-22	UT data-analysis software - Be fully compatible with the multi-channel flaw detector and data acquisition software. - Control all parameters used in the ultrasonic inspection data analysis - Feature 'Advanced data analysis' - Include basic and additional measurement tools for analysis - Feature 'TCG calibration' - Allow for generating different projections of data images - Run the following file formats: *.RDT, *.DAT, *.UVDData, *.UVSetup - One operating license, provided as a 'hardkey'.	COMPLY. SignyOne analysis will provide the listed advanced-analysis, measurement, TCG calibration, projection, file-format and hardkey-licence functions.	COMPLY

S1-23	ET analysis and resolution/review software - Run on the operating system specified in the requirements for the respective workstation(s) - Support the MIZ-30 and MIZ-85 file formats. - Be used to analyse data from the tests performed with the probes and methods specified in item 4.8: - Support automatic and manual calibration - create/edit an automatic SETUP file with the actual parameters of the calibration block used - create, edit, store and use an auto calibration file (AUTO CALIBRATION) - Support phase and amplitude calibration curves - Support the following measurements: Vpp (peak-to-peak measurement), MxR (maximum rate measurement), Vertmax (maximum vertical measurement) - Create/edit/save manual calibration marks - Contain a field for calibration mark loading and displaying - Create duplicate channels, filtered channels, mixed between two or more channels (mixers) - Create/edit/store and use the procedure/instruction settings (SETUP) made by the analyser and visual settings on the screen - Allow for creating and loading files with reporting codes, allowing for quick reporting of a defect by its code. The report parameters in the file shall allow for the definition of each code: reporting channel, measurement method, active fields, reporting the beginning, end and location of the measurement. - For each report, the record is validated according to the criteria of the procedure. These criteria are described in a predefined table. - Support the special IC, FC, NFC, FCL reports - Specify the data acquisition direction or automatic recognition from the data file. - Be calibrated to recognise the signal from the beginning, end, supports, anti-vibration bars, etc. (automatic recognition and location estimation) - Create models for estimating the location of different heat exchangers - Feature an option to create a model of the equipment which will be tested (number of supports and bends, linear dimensioning of the distance between two supports/bends) - Set/modify the scope of the collected data (modify analyzed extension) - Feature a Label area for placing the following marks (beginning, end, supports, anti-vibration bars, etc.) - Visualise historical defects (results of previous eddy current tests with different methods), in a separate window during data analysis or directly within the signal in the appropriate colour - When reporting NDDs (no defects detected), the analysis software shall automatically load the next or previous tube and there shall be an option to choose the next tube- next or previous - Support multiple screens with different configurations for data analysis (screen chosen according to a procedure, screen with 3D visualisation of the signal, screens with additional configuration by the analyser) - Read messages for the calibration group or a single message for a specific tube, created during data acquisition - Increase/decrease (scaling) the data (signal) recorded for analysis - Be able to run multiple analysers within the same calibration group at a given time - Allow for dynamic refreshing of the tube list in the calibration folder. - The software for data resolution (review) shall: - select the criteria (unanalysed, duplicated, measurement range, containing certain types of codes, etc.) determining which reports in a group are subject to resolution (validation).	COMPLY. EddyOne Analysis and project-specific Resolution functions will be configured for all listed calibration, measurement, channel-processing, reporting-code, procedure validation, landmark recognition, historical comparison, multi-screen/multi-analyst and resolution-validation functions, including MIZ-30/MIZ-85 support.	COMPLY
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Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
	- configure the parameters (codes, channel, defect parameters, defect location, etc.) of the defects which are subject to resolution. - set out the rules for: inclusion/exclusion of analyser groups (Primary, Secondary, etc.) and parameters in the reports, voltage criteria, phase difference, etc., so that they can be included for resolution. - confirms or cancels the specified reports. - report with a different code and/or location.		
S1-24	Calibration-group management / callboard - Run on the operating system specified in the requirements for the respective workstation(s) - Manage user-predefined columns for calibration group activities: acquisition, analysis (Primary, Secondary), resolution, IQDA (Independent Quality Data Analyst), etc. - When performing a certain activity for a group, the results of the activity are validated against user-defined criteria: - Validity of tube numbers. - Repeated reports, tubes or records which are not analysed. - IC, FC, NFC, FCL reports. - Reporting criteria. - Check for missed defects.	COMPLY. The offered EddyOne inspection workflow will include callboard functions for user-defined acquisition/analysis/resolution/IQDA status columns and validation of tube numbers, repeated/unanalysed records, special report types, reporting criteria and missed-defect checks.	COMPLY
S1-25	Analysis Performance Tracking System (APTS) The Analysis Performance Tracking System (APTS) shall: - Run on the operating system specified in the requirements for the respective workstation(s) - Provide information about the analyser performance: - Missed defects; Incorrectly reported defects; Incorrect reports. - Statistical data on the time spent to analyse a single tube. - Every analyser shall be able to review incorrect reports. - Monitor whether the analyst has reviewed the incorrect reports.	COMPLY. The offered analysis workflow will include performance tracking for missed/incorrect defect reporting, analysis-time statistics, analyst review of incorrect reports and review-status monitoring.	COMPLY

S1-26	ET inspection data management database - The data management software (database) for eddy current testing of heat exchangers in its initial/practical part shall: - create new database objects (nuclear power plants, thermal power plants, etc.) - create new facility (steam generator, condenser, cooling towers, heat exchangers, etc.) - generate the tube sheet from a photo, drawing or other facility visuals. The tube sheet can be generated from a photo, jpeg, jpg and other image file formats by importing, for example, a blue print into the HRID database (a quick and easy way to generate a new facility, automatic tube alignment as in the Tube Pro6 programme) - create a Mirror image of a facility - enable free selection of testing areas and facilitate numbering, indicate the beginning of an area and of the tube numbering direction by rows and columns - create an inspection plan and provide the option to map the plan on the facility image and/or integrate it through border rows and lines/columns - create a test plan - allow for the complete removal of the test plan from the database - provide the opportunity to add tubes to the test plan, including plugged tubes, to import and export data, to add tube numbers and odd/even rows - provide the option for importing/exporting test plan data in various formats, e.g. HTS, HIP and more. - generate the test plan for the data acquisition part (supporting various output file formats) - feature the option for calculating different diameters of the probe used in different sections of the facility - provide the option for entering historical data, if any - provide the option for generating historical data, if any - ensure reliability of the collected data - ensure reliability of the performed analysis - generate an inspection progress table - reflecting the current progress of the test (Callboard): - provide information on the location of the calibration standards used - provide information on the manipulator position - provide information on the probe for each manipulator - provide information on the selection of tubes as per the test plan - provide information on the tubes that have been analysed as per the test plan - provide information on the tubes that have failed the analysis stage and will be retested - provide information on the tubes that have passed the resolution stage as per the test plan - show information about the probes used during the test and reason for their replacement with other probes - ensure reliability of the performed analysis during the test: - generate correct reports - accurately measure dimensions - generate reports with accurate tube sheet data (hot/cold collector or heat exchanging tube inlet/outlet) - show missed reports (if historical data is available) - create a retest list of tubes following analysis and resolution of the recorded data which have been reported with a bad signal code and an incomplete tube record. - create a list of tubes of high importance following analysis and resolution of the recorded data which have been reported with a defect signal code and historical defects. - The data management software (database) for eddy current testing of heat exchangers in its data retrieval part shall: - display randomly selected test results in a tabular or visual format - feature a window for database connection and the option to run detailed data queries via SQL	COMPLY. The project-specific INETEC inspection-management database will be configured to provide the complete facility/tube-sheet model, inspection/test planning, historical data, callboard progress, reliability checks, retest/high-importance lists, SQL query/filter capability and archive functions specified in the RFQ.	COMPLY
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Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
	- filter data according to criteria set by the database administrator - provide the option to use absolutely all possible keywords, commands, logical operators and variables used in the database - execute queries and display them in the way/format requested by the facility owner - contain a system for archiving testing data.		

6. SPECIFICATION 2 COMPLIANCE MATRIX

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S2-01	Mechanical plugging module - The module shall allow for installation by two specialists - Upon installation of the module, the manipulator shall provide for access to all collector tube openings - The module has to be installed and fixed to the manipulator in such a way as to provide for the correct installation of mechanical plugs - The module design shall provide for the replacement of the following components without being dismantled from the manipulator: - Roll expansion tool - Tool for mechanical plugging of tubes. - Adding plugs. - The video surveillance system of the module shall have the following characteristics: - The video camera on the roll expansion tool shall be with a resolution of at least 1920x1080 and equipped with lighting for tube sheet and roller monitoring - The video camera on the tool for mechanical plugging of tubes shall be with a resolution of at least 1920x1080 and equipped with lighting for tube sheet and mandrel monitoring - The lighting of the cameras shall be adjustable. - The module shall have an IP68 rating for protection against dust and water - The control system of the mechanical plugging module shall enable: - Vertical and horizontal movement of the module relative to the tube sheet - Placing the roll expansion and mechanical plugging tools in a moving and working position relative to the tube sheet - Forward and backward movement control of the roll expansion and mechanical plugging tools relative to the tube sheet - Control of the module pneumatic system. - Control of the module hydraulic system. - The module control system shall provide for hardware protection of the integrity of the roll expansion and mechanical plugging tools in the event of a loss of power supply by reliably locking the motors and actuators - Hardware or software emergency stop button. - All electrical cables, pneumatic and hydraulic hoses shall be placed together in one cable sleeve - All electrical and mechanical connections between the connectors and the manipulator shall be of the appropriate quality and designed for frequent coupling/decoupling - Maintenance manuals shall be provided along with complete and accurate diagrams of the mechanical, electrical, pneumatic and hydraulic components - The module shall be supported by a complete set of spare parts for its electronic, electrical, mechanical, pneumatic and hydraulic components	COMPLY. The CASTOR plugging module will be supplied for two-person installation, full tube-sheet access, exchangeable roll-expansion/plugging tools, 1920x1080 video monitoring, IP68 protection, pneumatic/hydraulic control, fail-safe locking, E-stop, combined cable/hose routing, service documentation and complete spare parts.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S2-02	Kozloduy hydraulic plug installation requirements For tube plugging, Kozloduy NPP uses Inconel 690 mechanical plugs with a length of 66 mm and diameter of 13 mm and mechanical plugs with an added tube stabiliser rod (stabilisation area covering tube length of 200 mm from collector wall) which are installed on ПГБ-1000M steam generators via hydraulic pulling. - The tools used for installation of mechanical plugs on the heat exchanging tubes are: - Roll expansion tool - motor torque of 60 Lbf-inch with R812 and R816 rollers. - Tool for installation of Inconel 690 mechanical plugs with a length of 66 mm and diameter of 13 mm via hydraulic pulling (the working pressure applied during pulling is 6100 psi). The tool shall provide for the installation of mechanical plugs with an added tube stabiliser rod with a maximum total length of 200 mm. - Software for setting the parameters of the tools used and displaying the parameters of the system and tools. - Software for manipulator control while working with the module and the related tools. - The software shall export to a file the set parameters of the individual pneumatic and hydraulic pressure tools and system parameters during the hydraulic pull.	COMPLY. The plugging package will be configured for the specified Inconel 690 66 mm x 13 mm plugs, stabiliser-rod configuration up to 200 mm, R812/R816 roll tooling, 60 lbf-in torque basis, 6100 psi hydraulic pulling, parameter control/recording and export of process data.	COMPLY
S2-03	Plugging workstation - At least 2GB DDR5 RAM - AMD Ryzen 7/ INTEL Core i7 or more powerful processor - 1TB SSD or more - The GPU shall support Full HD mode or higher resolution via a digital interface (DVI, HDMI or DPort) - Widescreen monitor with a diagonal of 37" and a resolution of 1920x1080 or a -larger screen with a higher resolution, and a 120Hz or -higher refresh rate. - The computer shall ensure smooth running of the operating system, the installed software for mechanical tube plugging, and other applications needed for the operation of the workstation.	COMPLY. The plugging workstation will meet or exceed the specified CPU, memory, SSD, GPU, 37-inch display and performance requirements and will run the CASTOR/EddyOne Plugging control software.	COMPLY

7. SPECIFICATION 3 COMPLIANCE MATRIX

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S3-01	Mechanical plug removal module - The module shall allow for installation by two specialists - After installation, the module shall provide for access to all tubes in the bundle and collector openings - The module shall be installed and fixed to the manipulator in such a way as to provide for the correct removal of mechanical plugs - The module design shall provide for the installation of the mechanical plug removal tool without being dismantled from the manipulator: - Video surveillance system of the module, consisting of two video cameras with a resolution at least 1920x1080 and equipped with lighting with adjustable brightness and light intensity of at least 300lx for tube sheet and roller monitoring - The module shall have an IP66 rating for protection against dust and water - The control system of the mechanical plug removal module shall enable: - Vertical and horizontal movement of the module relative to the tube sheet - Placing the mechanical plug removal tool in a moving and working position relative to the tube sheet - Forward and backward movement control of the mechanical plug removal tool relative to the tube sheet - Control of the module pneumatic system. - Control of the module hydraulic system. - The module control system shall provide for hardware protection of the integrity of the mechanical plug removal tool in the event of a loss of power supply by reliably locking the motors and actuators - Emergency stop button - All electrical (power and signal) cables, pneumatic and hydraulic hoses shall be placed together in one cable sleeve and shielded (for electrical cables) - All electrical and mechanical connections between the connectors and the manipulator shall be of the appropriate quality and designed for frequent on/off cycles - Complete and accurate diagrams of the mechanical components and all electrical circuits, pneumatic and hydraulic lines shall be provided, as well as a maintenance and repair manual - The module shall be supported by a complete set of spare parts for its electronic, electrical, mechanical, pneumatic and hydraulic components	COMPLY. The CASTOR plug-removal module will be supplied for two-person installation and full tube-sheet access, with removable tooling, dual 1920x1080 illuminated video, minimum IP66 protection, pneumatic/hydraulic control, fail-safe locking, emergency stop, shielded combined services, service documentation and complete spares.	COMPLY

Ref.	RFQ requirement	INETEC / CASTOR compliance statement	Status
S3-02	Kozloduy plug-removal requirements and software For tube plugging, Kozloduy NPP uses Inconel 690 mechanical plugs with a length of 66 mm and diameter of 13 mm which are installed on ПГБ-1000M steam generators via hydraulic pulling. - The tool used for removing mechanical plugs from heat exchanging tubes is: - Tool for removal of Inconel 690 mechanical plugs with a length of 66 mm and diameter of 13 mm. - Software for setting the parameters of the tools used and displaying the parameters of the system, tools and cameras. - Software for manipulator control while working with the module and the related tools. - The software shall export to a file the parameters of the individual pneumatic and hydraulic pressure tools and system parameters during removal of the mechanical plug.	COMPLY. The offered removal tool will be configured for the specified 66 mm x 13 mm Inconel 690 mechanically expanded plugs. Control software will display tool/system/camera parameters, control CASTOR positioning and export pneumatic/hydraulic process parameters.	COMPLY
S3-03	Plug-removal workstation - 32GB DDR5 RAM or more - AMD Ryzen 7/INTEL Core i7 processor or a processor with more cores - 1TB SSD or more - GPU with at least 6GB DDR5 RAM or more that supports one monitor in Full HD mode or higher resolution via a digital interface (DVI, HDMI or DPort) - Widescreen monitor with a diagonal of 37" and a resolution of at least 1920x1080 or higher, and a 60Hz or higher refresh rate	COMPLY. The workstation will meet or exceed the specified 32 GB DDR5, CPU, 1 TB SSD, >=6 GB GPU, 37-inch FHD display and application-performance requirements.	COMPLY

8. DELIVERY, INSTALLATION, COMMISSIONING, TRAINING AND SUPPORT

8.1 DELIVERY AND PROJECT EXECUTION

INETEC confirms an offered delivery period not exceeding 360 calendar days from contract award. The detailed baseline schedule will be agreed at project kick-off and will include design/interface confirmation, project-specific configuration, procurement, manufacturing, assembly, software configuration, integration, factory testing, documentation, training preparation, shipment, installation and commissioning.

8.2 INSTALLATION AND COMMISSIONING

INETEC will provide installation and commissioning support for the delivered CASTOR system at Kozloduy NPP. Commissioning will verify mechanical installation, manipulator motion, control and pneumatic functions, pusher operation, ET and UT instrument integration, software communications, video systems, plugging/removal functions and the complete inspection data workflow against approved acceptance criteria.

8.3 TRAINING

Training will be performed at the Contracting Authority premises in Bulgarian in accordance with an INETEC programme submitted for approval not later than 60 calendar days before the training date. Training will cover equipment operation, maintenance, periodic servicing, spare-part configuration, ET/UT acquisition and analysis, ET resolution/review, database functions, and plugging/removal module operation for the participant quantities specified in the RFQ.

8.4 REFUELING OUTAGE TECHNICAL SUPPORT

For two consecutive annual refueling outages, INETEC will provide at least three specialists covering mechanics, electronics/controls and software for 14 calendar days per outage. Personnel assigned to site activities will be qualified/certified for work in ionizing-radiation environments as required by the site.

8.5 WARRANTY AND LIFECYCLE SUPPORT

The delivered equipment and spare parts will be covered by the specified 24-month warranty from the applicable discrepancy-free Specialized Receiving Inspection Report. INETEC will provide software compatibility updates for supported operating-system changes for at least five years and will maintain repair and metrological inspection support for the supplied EC and UT instruments for at least five years.

9. QUALITY ASSURANCE AND DOCUMENTATION

The equipment will be manufactured under INETEC quality-management controls compliant with ISO 9001. Procurement, manufacturing, assembly, inspection, testing, configuration control, software release and final documentation will be performed under controlled procedures and records. Valid quality certification and accredited metrological inspection reports for the delivered EC and UT instruments will be supplied.

9.1 FINAL TECHNICAL DOCUMENTATION PACKAGE

- Manufacturer's technical specification
- Product operation manual
- Comprehensive manuals for the maintenance and repair of the equipment and control systems
- Mechanical design drawings and assembly drawings
- Diagrams of the electrical connections between the control system and connectors, block diagrams, terminal blocks, terminals, cables, operational designations, and labelled mnemonic diagrams; availability of a neutral busbar; absence of exposed live parts; and other limiting conditions for operation. Specifications of connectors and network connectivity
- Diagrams of pneumatic lines, manifolds, and actuators
- A training program developed by the Contractor and approved by the Contracting Authority. The Programme shall be submitted not later than 60 calendar days prior to the training date

The documentation package will additionally include applicable certificates, inspection and test records, software/configuration identification, spare-parts lists, FAT/commissioning records and final as-delivered configuration documentation.

10. TECHNICAL COMPLIANCE STATEMENT

Based on the CASTOR platform and the offered INETEC instruments, probes, software, workstations, modules, spare parts, documentation, training and support scope described above, INETEC confirms compliance with the technical requirements of Call for Market Consultation No. 58728 and its Technical Specification for PGV-1000M-type steam generators.

No technical exceptions are identified in this Technical Offer. Customer-specific interfaces, final dimensions, connector selections, workstation configurations, software file-format settings and acceptance criteria will be incorporated into the controlled project baseline and demonstrated through the agreed inspection, FAT and commissioning programme.

Commercial pricing and commercial terms are to be provided in the associated commercial submission.

2026-1725- A BUDGETARY COMMERCIAL OFFER

OF

'Supply of a system for eddy current testing, ultrasonic inspection, and the installation and removal of mechanical plugs on the heat exchanging tubes of ПГБ-1000M-type steam generators'

ORIGINAL

25 September 2026

PREPARED BY

INETEC – Institute for Nuclear Technology Ltd.
Dolenica 28 | HR-10255 Donji Stupnik | Croatia

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1. COMMERCIAL TERMS

This indicative commercial offer is submitted in response to Kozloduy NPP EAD Call for Market Consultation No. 58728 for the supply of a system for automated remote eddy current and ultrasonic inspection and for installation and removal of mechanical plugs on the heat exchanging tubes of ПГБ-1000M-type steam generators. The commercial scope is based on the quantities and related activities defined in the Technical Specification and is to be read together with INETEC's CASTOR technical offer.

1.1 INDICATIVE LUMP-SUM PRICE

Indicative lump-sum price for the complete supply and related activities described in this commercial offer, excluding VAT:

EUR 16.450.000,00

(sixteen million four hundred fifty thousand euros)

1.2 DETAILED BREAKDOWN

The following tables present all the items that are included in the Indicative Lump-Sum price.

A. EQUIPMENT AND SOFTWARE			
No.	Description	Qty.	Unit
1	Manipulator providing vertical and horizontal (rotational) movement relative to the tube sheet	4	pcs
2	Device for moving probes along the length of the heat exchanging tubes	8	pcs
3	Eddy current module for ПГБ-1000M collector material using PNV-2/PNV-3 or equivalent probe	2	pcs
4	Ultrasonic inspection module for welded joint No. 35/Z	1	pc
5	Mechanical plug installation module for heat exchanging tubes, including hydraulic pulling functionality and including stabilization	1	pc
6	Mechanical plug removal module for heat exchanging tubes	1	pc
7	Instruments (Eddy current and Ultrasonic), Motion control unit, Pneumatic system control unit	1	lot
8	All workstations and Software licences as stated in the technical documentation	1	lot

B. SPARE PARTS AND TOOLS			
No.	Description	Qty.	Unit
9	All spare parts and tools package as required by the Technical Specification	1	set

C. SERVICES AND SUPPORT			
No.	Description	Qty.	Unit
10	Services and support as required by the Technical Specification -Packaging, handling, transportation and delivery to Kozloduy NPP - Installation and commissioning support at Kozloduy NPP - Training at the Contracting Authority premises in Bulgarian, covering operation, maintenance, servicing, software and plugging/removal modules as specified - Annual refueling outage technical assistance - Year 1 (minimum 3 specialists, 14 calendar days) - Annual refueling outage technical assistance - Year 2 (minimum 3 specialists, 14 calendar days) - Technical documentation, manuals, drawings, diagrams and training programme required for delivery, installation and commissioning	1	lot

1.3 PRICE BASIS AND COMMERCIAL ASSUMPTIONS

Currency: EUR. All prices are exclusive of VAT, as requested in the Call for Market Consultation.

The above pricing structure is indicative and prepared for market-consultation purposes. Final prices will be subject to confirmation of the final technical scope, interfaces, quantities, delivery conditions and contractual requirements.

The price schedule is based on the quantities stated in the Technical Specification. Any change to quantities, interfaces, site conditions or required deliverables may require a corresponding commercial adjustment.

Software licences included in the scope are based on perpetual licences provided by hardware key, in accordance with the Technical Specification.

Payment terms: to be mutually agreed during the subsequent procurement and contracting phase.

2. DELIVERY, INSTALLATION, COMMISSIONING AND TRAINING

Delivery: the complete equipment is planned for delivery not later than 360 calendar days from contract award, subject to timely availability of the required customer inputs, approvals and site interfaces.

Installation and commissioning: to be performed at Kozloduy NPP in coordination with the Contracting Authority and subject to site readiness, access, utilities, lifting/handling support and applicable site requirements.

Training: to be performed at the Contracting Authority premises in Bulgarian and in accordance with an INETEC training programme submitted for approval not later than 60 calendar days before the planned training date. Training scope and minimum participant numbers shall follow the Technical Specification.

Outage technical assistance: INETEC will provide at least three specialists covering mechanics, electronics and software for 14 calendar days during each annual refuelling outage for two consecutive years, subject to agreed outage dates and site-access requirements.

3. WARRANTY AND AFTER-SALES SUPPORT

Warranty: 24 months from the date of signing the Specialised Receiving Inspection Report confirming no discrepancies, for both delivered equipment and spare parts, in accordance with the Technical Specification.

Service life: the delivered equipment will be new and unused and will be supplied on the basis of a service life of not less than five years from receipt, with shorter-life components replaced as required by the Technical Specification.

Software support: INETEC will ensure updates to the supplied software in the event of operating-system changes or updates for a period of at least five years.

Flaw detector support: repair and metrological inspection services for the supplied eddy current and ultrasonic flaw detectors will be available for at least five years from successful receiving inspection.

4. SUPPLIER INFORMATION

Company	INETEC - Institute for Nuclear Technology Ltd.
Address	Dolenica 28, HR-10255 Donji Stupnik, Croatia
Contact person	Mr. Mislav Boban
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Йотова, Цветелина А.

From: Добрева, Мануела К.
Sent: 28 септември 2026 г. 8:08
To: Йотова, Цветелина А.
Subject: Препр.: Call for Market consultations - 58728
Attachments: 2026-1725-A Commercial.pdf; 2026-1725-A Technical.pdf

От: Михайлова, Веселина А.
Изпратено: 28 септември 2026 г. 8:08:03 (UTC+02:00) Хелзинки, Киев, Рига, София, Талин, Вилнюс
До: Добрева, Мануела К.
Як: Александров, Пламен Г.; Лазарова, Милена Т.
Тема: FW: Call for Market consultations - 58728

BX-E-6364/28.09.2026

From: Mislav Boban <Mislav.Boban@inetec.hr>
Sent: Friday, September 25, 2026 5:39 PM
To: commercial <commercial@npp.bg>
Cc: Sales Inetec <sales@inetec.hr>
Subject: Call for Market consultations - 58728

ВНИМАНИЕ: ВЪНШЕН ПОДАТЕЛ. Не отваряйте прикачени файлове и линкове в съобщението, ако не разпознавате подателя и не знаете, че съдържанието е безопасно.

Dear contracting authority,

Please receive attached, our commercial and technical budgetary quotation.

In case of any questions, please feel free to contact us.

With best regards

Mislav Boban, mag.oec.
Business Development and Sales Specialist
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INETEC

HR-10255 Donji Stupnik
Dolenica 28, Croatia



Напомена: Ova poruka sadrzi podatke povjerljive prirode, isključivo namijenjene osobama oznacenima kao primateljima te se pristup od strane bilo koje druge osobe smatra neovlastenim. Ukoliko niste oznaceni primatelj,

svaka distribucija, kopiranje, umnozavanje ili otkrivanje sadržaja trećim osobama je strogo zabranjeno i smatra se protuzakonitim. Ukoliko ste dobili ovu poruku, a niste označeni primatelj, molimo Vas da što prije obavijestite posiljatelja poruke i unistite sve postojeće kopije. Ova napomena također potvrđuje da je ova elektronička poruka testirana na postojanje računalnih virusa.

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