

Technical Pre-Qualifying Requirements (PQR)

REF: Replacement of CNC Controller, Digital Drives and their Installation, Customization, Adaptation & Commissioning on CNC 5-Axis Machining Cell (HX-151) Plan No. 3-017, NBS, HEEP, BHEL, Haridwar

Sl. No	Description	Accepted (Yes/No)	Deviation	Remarks
1.	<u>QUALIFYING CONDITIONS</u>			
1.1	a) The Vendor must have successfully commissioned two numbers of the CNC machines with Siemens 840D / 840D-SL CNC system with three or more CNC controlled feed axes during last seven years ending 28th February 2018. b) The above commissioned machines should be running satisfactorily for at least 6 months prior to 28th February 2018. 6 months period will be calculated on the basis of commissioning certificates/ performance certificates provided. c) Vendor to provide P.O. / W.O copies and commissioning/ performance certificates for satisfactory operation of the above machines along with name, address & contact details including e-mail IDs, telephone numbers of their customer. d) BHEL reserves the right to verify the information provided. All the papers must be self-attested by the vendor along with company seal.			<u>Bidder to provide details & comply</u>

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Scope for Replacement of CNC Controller, Digital Drives and their Installation, Customization, Adaptation & Commissioning on CNC 5-Axis Machining Cell (HX-151) Plan No. 3-017, NBS, HEEP, BHEL, Haridwar

Brief About Machine:

The machine comprises of X, Y, Z, A & B axes with a high speed integral motor spindle, Tool changer & Workpiece changer. Tool changer & Workpiece changer includes two CNC axes (TM, TGX) in tool changer & one CNC axes (WM) in workpiece changer. These 3 axes are controlled in channel 2 of CNC controller; other auxiliary functions are pneumatically & hydraulic controlled. All axes, tool changer, workpiece changer and spindle are CNC controlled. Existing CNC System is SIEMENS Sinumerik 840D with MMC 103 which has to be replaced with SIEMENS Sinumerik 840D SL System with PCU50.5 or higher along with operator panel OP015A or higher. Existing NCU is NCU 573.3 and has to be replaced. Existing drives are Siemens make Simodrive 611D which have to be replaced. Existing Siemens make AC Servomotors, PLC & electrical logic have to be retained. The operational screens, menus & sub-menus shall remain similar to original screens. Existing internal PLC S7 300, ET200S modules, external PLC S7 400, IFM Master & IFM slaves connected with external PLC through profibus have to be retained, as far as possible.

Sl. No	Description	Quantity	Accepted (Yes/No)	Deviation	Remarks
1.	MATERIAL SUPPLY INCLUDING SCOPE OF WORK				
1.1	<u>CNC SYSTEM:</u>	01 No.			<u>Bidder to provide details & comply</u>
1.1.1	SIEMENS 840D SL (With Milling Technology package SINUMERIK MDynamics 5 axes, 6FC5800-0AS33-0YB0 S33) with all the existing features of installed 840D power-line system.				<u>Bidder to provide details & comply</u>
1.1.2	NCU 720.3B PN or higher for supplied 840D SL system having all existing features (with BOP), with integrated PLC 317-3 PN/DP, CNC User memory 22MB or higher. Numerical control extension NX15.3 or higher (if needed)	01 No.			<u>Bidder to provide details & comply</u>
1.1.3	PC Card, 840D SL for CU for 5-axes operation. The system software should have the following features: i. CNC Software Standard Version only (Not export). ii. License for 8-Axis and 1-spindle. iii. License for 2 channels. iv. License for Technology Package Milling MDYNAMICS 5-AXIS	01 No.			<u>Bidder to provide details & comply</u>

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	including Multi-Axis Interpolation i.e. 5-Axis Interpolation. v. License for Multiple MODE actions. vi. License for SAG Compensation Multi-Dimensional. vii. License for RUN MYSCREENS.				
1.1.4	HMI-PCU 50.5 or higher installed with Windows WIN7 Ultimate or higher having License for SINUMERIK Operating System.	01 Set			<u>Bidder to provide details & comply</u>
1.1.5	Machine control panel (MCP) 483C PN or higher. MCP for supplied 840D SL system should be able to carry out identical functions as in the existing MCP.	01 No.			<u>Bidder to provide details & comply</u>
1.1.6	15 inch Operator panel OP015A or higher.	01 No.			<u>Bidder to provide details & comply</u>
1.1.7	External PLC (S7-400) is integrated with internal PLC (S7-300 in NCU) which has to be retained without any modification in original PLC program as far as possible.				<u>Information to the Bidder</u>
1.1.8	All necessary Hardware & Software to establish networking with remote PC on the new HMI (PCU-50.5 or higher) with features as available on the existing MMC103. The CNC Controller should be capable to transfer programs from/to machine across the network in CNC mode from the CNC system. Machine is already provided with SINDNC option.	01 Set			<u>Bidder to comply</u>
1.1.9	Existing PLC & electrical logic has to be retained.				<u>Bidder to comply</u>
1.1.10	Installation and commissioning of Hardware & Software on the HMI & NCU.				<u>Bidder to comply</u>
1.1.11	Any modification necessary for mounting & installation of the HMI shall be part of the scope of work.				<u>Bidder to comply</u>
1.1.12	The operational screens, menus & sub-menus shall remain similar to original screens.				<u>Bidder to comply</u>
1.1.13	Party shall supply all clamps, fixtures and fasteners required to complete the work.				<u>Bidder to comply</u>
1.1.14	All licensed Softwares along with communication cables for complete data back-up & restoration are to be provided.	01 Set			<u>Bidder to comply</u>
1.1.15	All Profibus / interface connectors, DRIVE-CLiQ cables as required for successful commissioning shall be in the scope of supply.	01 Set			<u>Bidder to comply</u>
1.1.16	Existing operator panel/CNC system cabinet (Size: Height: 55.4 cm,	01 No.			<u>Bidder to comply</u>

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	Width: 53.85 cm, Depth: 28.5 cm) is to be replaced with Rittal make operator panel/ cabinet as per requirement. In the existing condition, all the cables of the operator panel passes through a pipe and the same needs to be maintained with no loose/ external wiring/ cabling. The operator panel/ cabinet should be dust and vermin proof, aesthetic & with the following features: a) OP, PCU, MCP & ET200S modules are to be mounted in the supplied operator panel/cabinet. b) Mounting dimensions of the new operator panel/cabinet should be as per the requirement. c) Fitted with side mounted/rear door mounted suitable air conditioner as per requirement. d) Connectors mounted on the existing cabinet for enabling switch & Hand-held unit are to be retained. These connectors are to be mounted in the supplied operator panel/cabinet. e) Swivel of minimum 180 degrees. f) Front side should have handles for rotating by hand. g) The rear door should be on hinges and not screw mounted. h) 220 VAC/ 5 Amp 3-pin service socket and switch.				
1.1.17	All existing pushbutton & pushbutton indicating lamps shall be replaced with the SIEMENS make pushbutton/LED illuminated pushbutton. Existing indicating lamps are Rafix make 28V, 0.04A, Type: 21125/HR85.	01 Set			<u>Bidder to comply</u>
1.1.18	All existing part programs (working with the existing MMC103 & NCU) are to be retained and should be able to work with the new HMI and NCU (i.e with supplied 840D SL system).				<u>Bidder to comply</u>
1.1.19	All existing in-process & post process job measurement programs including calibration programs (working with the existing MMC103 & NCU) are to be retained and should be able to work with the supplied 840D SL system.				<u>Bidder to comply</u>
1.1.20	Any other material not mentioned above but found necessary to complete the job, shall be in party's scope of supply.				<u>Bidder to comply</u>
1.2	AC MOTOR SPINDLE & SERVO MOTORS: All the existing AC motor spindle (1 No.) & servomotors (08 Nos.) used for CNC Controlled axes have to be retained. Existing motor spindle/servomotors details are as under:				<u>Information to bidder</u>

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1.2.1	MOTOR SPINDLE DETAILS: No. of Motor poles-4; Rated Output-27 kW; Rated Speed-2900 rpm; Rated Torque-90Nm; Max. Voltage-400V; Max. Speed-15000 rpm; Max. frequency-500Hz, Clamping force-20kN, Encoder system-Lenord & Bauer MiniCoder GEL 2443 (Type no.: GEL 2443 KNRG 5K050-E)				Information to bidder
1.2.2	SERVO MOTOR DETAILS:				
1.2.2.1	1FT6 Siemens AC servo motor for X axis, Siemens Part No.: 1FT6084-1AF71-1EG1				Information to bidder
1.2.2.2	1FT6 Siemens AC servo motor for Y axis, Siemens Part No.: 1FT6084-1AF71-1EG1				Information to bidder
1.2.2.3	1FT6 Siemens AC servo motor for Z axis with holding brake, Siemens Part No.: 1FT6084-1AF71-2EH1				Information to bidder
1.2.2.4	1FT6 Siemens AC servo motor for A axis, Siemens Part No.: 1FT6105-1AC71-1EG1				Information to bidder
1.2.2.5	1FT6 Siemens AC servo motor for B axis, Siemens Part No.: 1FT6084-1AF71-1EG1				Information to bidder
1.2.2.6	1FT6 Siemens AC servo motor for TGX axis with holding brake, Siemens Part No.: 1FT6041-4AF71-4EH1				Information to bidder
1.2.2.7	1FT6 Siemens AC servo motor for TM axis, Siemens Part No.: 1FT6041-4AF71-4EG1-Z				Information to bidder
1.2.2.8	1FT6 Siemens AC servo motor for WM axis with holding brake, Siemens Part No.: 1FT6062-1AF71-4EH1				Information to bidder
1.3	AC SPINDLE DRIVE & SERVO DRIVES: Maximum ratings of existing motor spindle/servomotors to be taken into account for calculating the ratings of the Modules.				
1.3.1	SIEMENS make SINAMICS AC Servo drive for Feed motors' control with input voltage of 415VAC (+/- 10%), 3 phase 3 wire system.	01 Set			Bidder to provide details & comply
1.3.2	SIEMENS make SINAMICS AC drive for Spindle motor control with input voltage of 415VAC (+/- 10%), 3 phase 3 wire system.	01 Set			Bidder to provide details & comply
1.3.3	Vendor to include input transformer/ HF commutating choke (if required)	01 No.			Bidder to provide details & comply
1.3.4	Servo drives to be connected through Drive bus & DRIVE-CLiQ to the NCU.				Bidder to provide details & comply

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1.3.5	Active Line module of 80 KW or more.	01 No.		Bidder to provide details & comply
1.3.6	Active Interface module for active line module of 80 KW or more.	01 No.		Bidder to provide details & comply
1.3.7	Control Supply Module (CSM) as per requirement.	01 No.		Bidder to provide details & comply
1.3.8	Single motor module of 132A or more for motor spindle.	01 No.		Bidder to provide details & comply
1.3.9	Single motor module of 18A or more for X, Y, Z & B axis motors.	01 Set		Bidder to provide details & comply
1.3.10	Single motor module of 30A or more for A axis motor.	01 No.		Bidder to provide details & comply
1.3.11	Single motor module of 5A or more for WM axis motor.	01 No.		Bidder to provide details & comply
1.3.12	Double motor module of 3A or more for TGX & TM axis motors.	01 No.		Bidder to provide details & comply
1.3.13	Pre-assembled Encoder cables 10 meters or above for 1FT6 motors as per requirement. All motor encoder cables to be replaced.	01 Set		Bidder to provide details & comply
1.3.14	Pre-assembled Encoder cable 15 meters or above for motor spindle as per requirement.	01 No.		Bidder to provide details & comply
1.3.15	Power cable 15 meters or above (for X, Y, A, B & TM axis) as per requirement. All motor power cables to be replaced.	01 Set		Bidder to provide details & comply
1.3.16	Power cable with brake 15 meters or above (for Z, TGX & WM axis) as per requirement. All motor power cables to be replaced.	01 Set		Bidder to provide details & comply
1.3.17	Power cable 15 meters or above (for motor spindle) as per requirement.	01 No.		Bidder to provide details & comply
1.3.18	SMC 20 or latest for interfacing encoder signals with control unit through DRIVE-CLiQ cable (for all axis/spindle).	01 Set		Bidder to provide details & comply
1.3.19	DRIVE-CLiQ cable for all axis/spindle modules as per requirement.	01 Set		Bidder to provide details & comply
1.3.20	SITOP Power DC-UPS Module (with USB interface) of 40 Amp rating with AKKU module to ensure automatic unattended shutdown of the CNC system in case of power failure or even in normal machine shutdown.	02 Set		Bidder to provide details & comply
1.3.21	Shield terminal plates/gland plates and earthing schematic for all the modules.	01 Set		Bidder to provide details & comply

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1.3.22	The AC Servo drive will have a common enable for the DC Link section and individual enables for the feed drives.				<u>Bidder to provide details & comply</u>
1.3.23	The AC Servo drive should provide potential free contacts for possible alarms, drive ready for individual axes for interfacing with the CNC control as per requirement.				<u>Bidder to provide details & comply</u>
1.3.24	Terminal boxes, screwed terminal blocks, bus bars, transformers etc. as required per the new electrical scheme should be provided of reputed makes viz. Wago, Phoenix contact etc.	01 Set			<u>Bidder to provide details & comply</u>
1.3.25	Wires for rewiring (wherever required) including Control, signal & Power cabling.	01 Set			<u>Bidder to provide details & comply</u>
1.3.26	Pre-assembled communication cable to connect laptop with the drives for commissioning and diagnostic purposes.	01 No.			<u>Bidder to provide details & comply</u>
1.3.27	Licensed Drives commissioning software on CD/ DVD/USB drive.	01Set			<u>Bidder to provide details & comply</u>
2.	FINAL ACCEPTANCE:				
2.1.	Party shall undertake commissioning of all the supplied components at HEPP, BHEL, Haridwar. All material required for commissioning of the system with the machine shall be arranged by the party free of cost and obligation. All commissioning materials shall be arranged by party for successful running of the machine.				<u>Bidder to comply</u>
2.2	Existing machine logic, PLC, Electrical logic and technological processes have to be retained.				<u>Bidder to comply</u>
2.3	Final Acceptance shall be at HEPP, BHEL, Haridwar after: a) Upon completion of the scope of supply and scope of work at BHEL. b) Final acceptance shall include clearance of all pending issues. c) Demonstration of various cycles and control functions as envisaged in the technical scope. Party shall demonstrate operation of all parts of the system supplied along with all the features as specified above. d) Successful machining of presently being machined components as mentioned below: i. LG5R, 58K; Drawing No. 01074758005 (Qty-5 Nos.) ii. LM5L, 58K; Drawing No. 01030658005 (Qty-5 Nos.) iii. The raw material, tooling, fixture and proven part programs for				<u>Bidder to comply</u>

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	machining of the blades will be provided by BHEL. e) The prove-out blades as mentioned at d) i & ii above will be machined prior to start of replacement as envisaged and 3D CMM reports shall be provided with existing programs. Bidder to ensure that the prove-out blades after completion of work should have same or better accuracy and dimensional parameters with the same existing programs (as per point no. 1.1.18). f) Bidder to demonstrate in-process & post process measurement of prove-out blades with the same existing programs (as per point no. 1.1.19). g) The prove-out blades as mentioned at d) i & ii above will be measured. After settlement of all pending issues related to the purchase order, a certificate for Completion of works in all respect shall be released within 15 days by Production and Maintenance personnel of BHEL which will be the referred document for Final Acceptance and final payment to the Bidder.				
3.	<u>DELIVERY: (IF DELIVERY PERIOD IS NOT OFFERED/ ACCEPTABLE, OFFER WILL BE REJECTED)</u>				
3.1	<u>Material:</u> 6 months from date of purchase order. <u>Work:</u> 75 days from date of release of machine for work. The delivery period of work for the purpose of LD shall be considered from the date of handing over of the machine to vendor for start of work to the date of successfully completion of the first prove-out component after carrying out the work.				<u>Bidder to comply</u>
4	<u>LATE DELIVERY PENALTY (LD) CLAUSE:-</u>				<u>Bidder to comply</u>
4.1	As per clause no. 9 of standard "General Instructions and Standard Terms & Conditions for bidding against Tender Enquiry (GISTC)". LD will be applicable for delay in deliveries for material and work (as per clause no. 3 above).				<u>Bidder to comply</u>
5.	<u>DOCUMENTATION</u>				
	Following documents shall be supplied by the Party:				

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5.1	CNC system manuals in hard copy comprising of Installation & Start-up guide, Connecting conditions, Configuration guide, Diagnostics guide, Commissioning guide.	01 Set			<u>Bidder to comply</u>
5.2	Commissioning and service manuals of the AC servo drives & Spindle drive in hard copy.	01 Set			<u>Bidder to comply</u>
5.3	New electrical schematic of the interfacing of new CNC 840Dsl System, NCU, HMI and drives with the machine (including wiring diagrams) in hard copy as well as in soft copy.	03 Sets			<u>Bidder to comply</u>
5.4	Programming Manuals.	01 Set			<u>Bidder to comply</u>
5.5	Instructions for data back-up & restoration for CNC, PLC, Feed drives & Spindle drive.	03 Sets			<u>Bidder to comply</u>
5.6	Complete list of bill of materials including make/manufacturer.	01 Set			<u>Bidder to comply</u>
5.7	All documentation (soft copies) mentioned at clauses no. 5.1 to 5.6 above, ghost backup / Image of CNC system, CNC, Spindle & Feed Drive parameters, NC & HMI Data back-up should be provided on Portable hard disk (min. 2 TB).	01 Set			<u>Bidder to comply</u>
5.8	Additional required Softwares for machine maintenance on CD/DVD in installable format.	01 No			<u>Bidder to comply</u>
5.9	Latest Siemens documentation on CD/DVD/USB device viz. DOCON CD/DOCON DVD etc.	02 Nos.			<u>Bidder to comply</u>
6	<u>SPARES: (TO BE COMPULSORILY QUOTED OTHERWISE OFFER WILL BE REJECTED) :</u>				
	Party shall compulsorily quote following spare parts:				
6.1	Active Line module of 80 KW or more with active interface module.	01 Set as used on machine.			<u>Bidder to comply</u>
6.2	Control Supply Module (CSM) as commissioned on machine.	01 No.			<u>Bidder to comply</u>
6.3	Single motor module for motor spindle.	01 No. as used on machine.			<u>Bidder to comply</u>
6.4	Single motor module for X, Y, Z, A, B & WM axis motors.	01 No. of each type as			<u>Bidder to comply</u>

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		used on machine.			
6.5	Double motor module for TGX & TM axis motors.	01 No. of each type as used on machine.			<u>Bidder to comply</u>
6.6	NCU 720.3B PN or higher with Numerical control extension NX15.3 or higher (As commissioned on machine).	01 Set			<u>Bidder to comply</u>
6.7	PCU 50.5 or higher (As commissioned on machine).	01 No.			<u>Bidder to comply</u>
6.8	Illuminated Push button with LED.	05 Nos. of each type as used on machine.			<u>Bidder to comply</u>
7.	<u>WARRANTY:</u>				
7.1	Party shall stand warranty for all the supplied material and work executed for a period of one year from the date of successful hand-over after completion of work (Ref. Clause no. 2) at BHEL, Haridwar.				<u>Bidder to comply</u>
8.	<u>TRAINING:</u>				
8.1	Party shall impart training to BHEL staff, for operation & maintenance of the system supplied by them during installation & commissioning.				<u>Bidder to comply</u>
8.2	Vendor to arrange one week training for one person for Maintenance & commissioning of CNC system, two persons for operating & one person for programming at CNC System manufacturer's works. Expenses for Boarding & Lodging of BHEL personnel during training shall be borne by BHEL.				<u>Bidder to comply</u>
9.	<u>VENDOR'S OBLIGATION:</u>				
9.1	The vendor shall bring all tools, tackles and testing equipment with them for successful installation & commissioning of supplied system.				<u>Bidder to comply</u>
10.	<u>PRE-DISPATCH INSPECTION</u>				<u>Bidder to comply</u>
10.1	Pre-dispatch inspection of all the items covered under Scope of Supply at Para (1) shall be carried out by BHEL personnel at party's works.				<u>Bidder to comply</u>
10.2	Supplier shall invite BHEL for carrying out pre- inspection.				<u>Bidder to comply</u>

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10.3	Deputed BHEL persons shall do pre acceptance of material under scope of supply at vendor works and give dispatch clearance.				<u>Bidder to comply</u>
10.4	Expenses of Boarding and lodging of BHEL personnel during PDI shall be borne by BHEL.				<u>Bidder to comply</u>
11.	<u>GENERAL CONDITIONS:</u>				
11.1	A point wise compliance statement shall be submitted by the party with reference to the above scope of supply against each clause/ sub-clause with relevant details & comments. Non-compliance to any of the clauses & quoting inadequate quantity can lead to dis-qualification of the offer.				<u>Bidder to comply</u>
11.2	The Vendor is advised to inspect the machine to ascertain all the relevant details required for successful completion of the work.				<u>Bidder to comply</u>
11.3	The proposed electrical schematic & Bill of Material for the machine shall be provided by the vendor prior to pre dispatch inspection.				<u>Bidder to comply</u>
11.4	Complete specifications such as part no./Model/Type of NCU, PCU, Drives & HMI of CNC System shall be stated in the offer by the party. Ordering brochure/catalogue should be attached wherever necessary.				<u>Bidder to comply</u>
11.5	Vendor must compulsorily quote the quantity exactly as per the Scope of supply. No reduction in quantity as per the above Scope of supply is permissible.				<u>Bidder to comply</u>
11.6	Vendor must note that all the replacement work as envisaged in technical scope has to be carried out at BHEL works only. In any case, vendor will not be allowed to transport any part of machine or major assemblies outside BHEL works. Therefore, vendor is advised to inspect the machine before bidding to collect & ascertain all the relevant details required for successful completion of work.				<u>Bidder to comply</u>
12.	<u>BHEL'S OBLIGATION:</u>				
12.1	Existing electrical schematic of the machine shall be provided by BHEL to the vendor.				<u>Bidder to comply</u>
12.2	Crane facility along with lifting tackles, trolleys etc. will be made available free of charge while working in BHEL premises only.				<u>Bidder to comply</u>
12.3	Facilities of minor welding, brazing, minor machining limited to fitting work				<u>Bidder to comply</u>

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	/rework etc. will be made available free of cost inside BHEL premises subject to availability.				
12.4	Any civil work required for the erection of panel shall be done by BHEL.				<u>Bidder to comply</u>
12.5	Consumables like lubricants, kerosene oil, cotton waste etc. will be supplied free of cost by BHEL during execution of works inside BHEL premises. Vendor should make his own arrangements for all types of hand tools including pneumatic/electrical drill machines, grinders, scraping tools along with the general purpose measuring instruments, straight edges etc.				<u>Bidder to comply</u>
13.	INTELLECTUAL PROPERTY RIGHTS:				
13.1	Each Party shall retain its unrestricted rights, title, ownership and interest in its Intellectual Property. Nothing in this work shall be construed to grant to the other Party any right or license in the Intellectual Property rights of the other Party.				<u>Bidder to comply</u>
14.	NON-DISCLOSURE AGREEMENT:				
14.1	All Drawing and Technical Documents relating to the product or it's manufacture submitted by one party to the other, prior or subsequent to the formation of contract, shall remain property of the submitting party. Drawing, technical documents or other technical information received by one party, shall not without the consent of the other party, be used for any other purpose than that, for which they were provided. Such technical information shall not without the consent of the submitting party, otherwise be used or copied, reproduced, transmitted or communicated to a third party. Patterns supplied by BHEL will remain BHEL's property which shall be returned by the bidder on demand to BHEL. Bidder shall in no way share or use such intellectual property of BHEL to promote his own business with others. BHEL reserves the right to claim damages from the bidder, or take appropriate penal action as deemed fit against the bidder, for any infringement of the provisions contained herein.				<u>Bidder to comply</u>

Sanjeev
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Manager (NBS)

Ramvaros
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