Proposal for Digital Core Logger for the establishment of Digital Core Library in Geological Survey of India under NMET

(Instrument for scientific infrastructure and capacity development)

By

Geological Survey of India

Place: Nagpur

Date: 18.04.2024

Summary of the proposal

Features	Details
Exploration Agency	Geological Survey of India
Completion Period with entire Time schedule to complete the project	Two years approx.
Objectives	Procurement of Digital Core Logger for the establishment of Digital Core Library at three location of GSI i.e at Hyderabad, Jaipur and Nagpur
Whether the work will be carried out by the proposed agency or through outsourcing and details thereof. Components to be outsourced and name of the outsource agency	The Digital Core Logger will be procured through NMET Fund wherein office of NMH-II will be the provide the procurement indent.
Location	GSI, Hyderabad, Bandlaguda GSI, Jaipur, Jalana GSI, Nagpur, Seminary Hills
Availability of Data	Presently 2,17,642.20 m of drill cores (Approx) available in different core libraries of GSI
Justification	Drill cores are Geological Reference Materials. The preserved cores allow future geoscientific studies during need, obviating the need to re-drill in the already explored area; and even for purposes other than for which the drilling was done. The drill core samples, combined with indirect methods like geophysics and geochemistry may provide glimpse of the bedrock for a substantial area and may limit the need for additional / unwanted drilling. The preserved cores may be useful to re-evaluate the mineral prospect in light of the changing economics and geological concepts. The advancements in mining and metallurgical technology and rise in prices of metals may render some deposits presently un-economic or sub economic to become economically more viable in coming days and it may be needed to restudy the sub-surface data and reanalyse the core samples of the explored deposit / prospect. Thus, through preservation of drill cores as geological reference material, we are also preserving geological information as well as its source material for: 1.Sub-surface information of Indian Geology

	2. Source material using which a mineral deposit was established 3. Stratigraphic information 4. Scientific information on palaeontology, petrology, fluid inclusion etc. In short, core libraries facilitate contributing to the global geological knowledge repository by making available glimpses of Indian subsurface geological material. The core library information can be efficiently preserved and disseminated by deploying Information Technology tools hand-in-hand with physical core libraries. Thus, establishment of Digital Core Library opens new vistas of information dissemination which is even more than just complementary to physical core library. It not only exhibits the core photographs, but also important physical, mineralogical, chemical and spectral characteristics of the core material without the need of visiting the library. Digital core libraries are virtual in a sense a user can explore digital core libraries distributed across the country from the same interface sitting anywhere in the world.

Detailed description of the proposal.

Drilling operations are employed extensively for collecting subsurface lithological, structural and mineralization information to ascertain 3D geometry of geological domains. The drill cores are source of valuable data on geological set up and, therefore, is a treasure of immense information that can be used for establishing a generalized stratigraphic sequence of the area as well as solving stratigraphic problems; searching for mineralization and establishing 3D model of ore deposits; paleontological studies; geohazard studies; for feasibility studies before engineering construction like dams, tunnels, roads etc.

Drill Cores available at present in GSI

Each region in GSI has a regional core library in addition to semi-permanent structures built in camps of GSI for preservation of drill cores,

Sr. N.	**Region**	**Location**	**Area/ Dimension of established core Library of GSI**	**Total length of core library (in metre) Approx.**	**Remarks**
1	Western	Jaipur	36x12 meter 16.5x13.75 m area	4219 m core preserved in 811 boxes.	Includes drill cores obtained till FSP 2021-22
		Akwali, Jhunjhunu district.	180x40 feet and 174x20 feet area.	38 km core preserved in 9584 boxes	
		Lakhasar, Bikaner district	of 92x23 feet and 26.6x28 feet area	12900 m core preserved in 5225 boxes	
			Total	61,500 m	
2	Eastern	Bhubaneshwar	1 Acre	49136.7 (13,936.86)-2768 boxes	do
3	Southern	Hyderabad	42m in length and 12m in width	39820 in 5500 core boxes	do
4	Central	Nagpur	1000 sq.km 40m x 25 m	48317 (33644 m.) in 1130 boxes	do
5	Northern	Lucknow	48 mx32 m dimensions	16558 in 6281 core boxes	do
6	North Eastern Region	Guwahati	30 x20 feet	2311.2 m core kept in411 boxes	
Total				**2,17,642.20**	

Salient points

(1) Different sizes mean core diameters obtained by using core barrels in PQ, HQ, NQ, respectively 86mm, 66mm and 66 mm sizes

(2) The length of drill cores in each of regions , as mentioned above, pertains to those lying in the core library only

In total approximately 180km length of core pertaining to about 350 number of projects are preserved in different core libraries of Geological Survey of India.

Requirement of Digital Core Logger with complete specification

DIGITAL CORE LOGGER

Following are minimum technical specification required

1. RGB Photography
    a. Spatial Resolution: 20µm
    b. Color depth: 24bit or more
    c. Sensor Type: Line scan
2. 3D Profiling
    a. Spatial resolution < 1 mm
    b. Height resolution < 0.01mm
3. IR sensor
    a. Spatial Resolution: 250 µm
    b. Spectral Per meter: 960,000
    c. spectral bandwidth resolution of approximately 10 nm
    d. The scanning should be able to capture visible and near-infrared (VNIR) (VNIR 0.4-1.0 µm), short-wavelength infrared (SWIR) (SWIR 1.0-2.5 µm). and long-wavelength (LWIR) spectral images as well as a high-resolution optical RGB image, all in a single scan, directly in the drill core box covering more than 400 bands
4. Should have integrated
    a. XRF
    b. LIBS
    c. Geophysical Characterization tools like Density,
5. Software be able to
    a. generates 3D visualization of the drill core's interior, revealing planar structures (foliations, beddings, veins, and faults) and linear structures.
    b. Mineral classification and quantification, USGS MICA mineral mapping
    c. Spectral interactive machine learning & AI tools for supervised and unsupervised classification also should be able to do quantification
6. General
    a. Core tray length : 1.50 Mtrs.
    b. Core tray width : 700 mm
    c. Scanning Speed : 25 mm per second

Break-up of expenditure

Sl.No	Description of Stores	Required Quantity	Estimate Cost With F.E., if any	Country of Origin/ Probable Supplier
1	**DIGITAL CORE LOGGER** Following are minimum technical specification required 1. RGB Photography a. Spatial Resolution: 20µm b. Color depth: 24bit or more c. Sensor Type: Line scan 2. 3D Profiling a. Spatial resolution < 1 mm b. Height resolution < 0.01mm 3. IR sensor a. Spatial Resolution: 250 µm b. Spectral Per meter: 960,000 c. spectral bandwidth resolution of approximately 10 nm d. The scanning should be able to capture visible and near-infrared (VNIR) (VNIR 0.4-1.0 µm), short-wavelength infrared (SWIR) (SWIR 1.0-2.5 µm). and long-wavelength (LWIR) spectral images as well as a high-resolution optical RGB image, all in a single scan, directly in the drill core box covering more than 400 bands 4. Should have integrated a. XRF b. LIBS c. Geophysical Characterization tools like Density, 5. Software be able to a. generates 3D visualization of the drill core's interior, revealing planar structures (foliations, beddings, veins, and faults) and linear structures. b. Mineral classification and quantification, USGS MICA mineral mapping	**3 No**	a) Digital Core Logger (US$ 20,00,000)- Rs. 17,00,00,000/- b) Shipping and other aspects- Rs. 25,00,000/- c) Installation and commissioning- Rs. 2,20,00,000/- d) Software and Training at three locations of GSI in India for 10 days each at one location- Rs. 2,20,00,000/- e) Technical support (CAMC) and implementation for 5 years- Rs. 15,00,00,000/- **Sub Total-** Rs 36,65,00,000/- **approximately** GST @18%- Rs. 6,59,70,000 /-	Australia/UK/ Canada

	c. Spectral interactive machine learning & AI tools for supervised and unsupervised classification also should be able to do quantification d. Integrated computer/laptop (inside instrument) – intel i7 with Window 10 Pro, 32 GB RAM, 1 TB SSD M.2,24" LCD Monitor, keyboard and mouse subject to change with current model offered. e. Tower computer intel i9 12th generation with windows 10 Pro, 128 GB RAM, 4TH SSD M.2, subject to change with current model offered 6. General a. Core tray length : 1.50 Mtrs b. Core tray width : 700 mm c. Scanning Speed : 25 mm per second		**Grand Total-** Rs. 43,24,70,000/- ***The above cost is for single unit**	

Minutes of the 30th CPC meeting regarding Procurement of three number of Digital Core Loggers in Geological Survey of India

The 30th CPC meeting regarding procurement of three number of Digital Core Loggers in GSI was held under the chairmanship of Shri Janardan Prasad, DG, GSI in presence of other committee members Dr Joydeep Guha, ADG(F) & HOD, Shri Ajay Agrawal, Chief Engineer and Dr Shailendra Singh, DDG STSS. Member from the indenting division Shri Dinesh Ganvir ADG & NMH-II attended the meeting online. As per the discussions and suggestions of the members of CPC a modified proposal was submitted by O/O NMH-II. The modified proposal was discussed at length.

Justification for the proposal is as follows:

Geological Survey of India requires the procurement of 03 No. Digital Core Logger for the establishment of Digital Core Library at three locations of GSI i.e at Hyderabad, Jaipur and Nagpur with fund approved and sanctioned by NMET. The time duration of the procurement will be approximately two years. The office of NMH-II, GSI, CR, Nagpur will be the indenting division.

Drill cores are Geological Reference Materials. The preserved cores allow future geoscientific studies during need, obviating the need to re-drill in the already explored area; and even for purposes other than for which the drilling was done. The drill core samples, combined with indirect methods like geophysics and geochemistry may provide glimpse of the bedrock for a substantial area and may limit the need for additional / unwanted drilling. The preserved cores may be useful to re-evaluate the mineral prospect in light of the changing economics and geological concepts. The advancements in mining and metallurgical technology and rise in prices of metals may render some deposits presently un-economic or sub economic to become economically more viable in coming days and it may be needed to restudy the sub-surface data and reanalyse the core samples of the explored deposit / prospect. Thus, through preservation of drill cores as geological reference material, we are also preserving geological information as well as its source material for:

1. Sub-surface information of Indian Geology
2. Source material using which a mineral deposit was established
3. Stratigraphic information
4. Scientific information on palaeontology, petrology, fluid inclusion etc.

In short, core libraries facilitate contributing to the global geological knowledge repository by making available glimpses of Indian subsurface geological material.

The core library information can be efficiently preserved and disseminated by deploying Information Technology tools hand-in-hand with physical core libraries. Thus, establishment of Digital Core Library opens new vistas of information dissemination which is even more than just complementary to physical core library. It not only exhibits the core photographs, but also important physical, mineralogical, chemical and spectral characteristics of the core material without the need of visiting the library. Digital core libraries are virtual in a sense a user can explore digital core libraries distributed across the country from the same interface sitting anywhere in the world.

Drill Cores available at present in GSI

Each region in GSI has a regional core library in addition to semi-permanent structures built in camps of GSI for preservation of drill cores. In GSI ddifferent sizes of mean core diameters are obtained by using core barrels in PQ, HQ, NQ categories with 86mm, 66mm and 66 mm sizes respectively. The length

of drill cores in each of regions lying in the core library totals to approximately 180km length of core pertaining to about 350 number of projects and are preserved in different core libraries of Geological Survey of India amounting to a cumulative length of **2,17,642.20 meters**

The CPC did not accessed the technical specifications at this stage as Technical evaluation of the instruments will be done as per the tendering protocol in TEC(Tech.)

Break-up of expenditure

Sl.No	Description of Stores	Required Quantity	Estimate Cost With F.E., if any	Country of Origin/ Probable Supplier
1	**DIGITAL CORE LOGGER** Following are minimum technical specification required 1. RGB Photography a. Spatial Resolution: 20µm b. Color depth: 24bit or more c. Sensor Type: Line scan 2. 3D Profiling a. Spatial resolution < 1 mm b. Height resolution < 0.01mm 3. IR sensor a. Spatial Resolution: 250 µm b. Spectral Per meter: 960,000 c. spectral bandwidth resolution of approximately 10 nm d. The scanning should be able to capture visible and near-infrared (VNIR) (VNIR 0.4-1.0 µm), short-wavelength infrared (SWIR) (SWIR 1.0-2.5 µm). and long-wavelength (LWIR) spectral images as well as a high-resolution optical RGB image, all in a single scan, directly in the drill core box covering more than 400 bands 4. Should have integrated a. XRF b. LIBS c. Geophysical Characterization tools like Density, 5. Software be able to a. generates 3D visualization of the drill core's interior, revealing planar structures (foliations, beddings, veins, and faults) and linear structures. b. Mineral classification and quantification, USGS MICA mineral mapping	**3 No**	a) Digital Core Logger (US$ 20,00,000)- Rs. 17,00,00,000/- b) Shipping and other aspects- Rs. 25,00,000/- c) Installation and commissioning- Rs. 2,20,00,000/- d) Software and Training at three locations of GSI in India for 10 days each at one location- Rs. 2,20,00,000/- e) Technical support (CAMC) and implementation for 5 years- Rs. 15,00,00,000/- **Sub Total-** Rs 36,65,00,000/- **approximately** GST @18%- Rs. 6,59,70,000 /- **Grand Total-** Rs. 43,24,70,000/-	Australia/UK /Canada/ Germany

	c. Spectral interactive machine learning & AI tools for supervised and unsupervised classification also should be able to do quantification d. Integrated computer/laptop (inside instrument) – intel i7 with Window 10 Pro, 32 GB RAM, 1 TB SSD M.2,24" LCD Monitor, keyboard and mouse subject to change with current model offered. e. Tower computer intel i9 12th generation with windows 10 Pro, 128 GB RAM, 4TH SSD M.2, subject to change with current model offered 6. General a. Core tray length : 1.50 Mtrs b. Core tray width : 700 mm c. Scanning Speed : 25 mm per second		***The above cost is for single unit**	

Reasonability of cost:

- As per the information available from MECL, Nagpur, it has recently got the approval for the procurement of Digital Core Logger through NMET Fund. The proposal along with the specification, cost etc. has been checked and it is estimated that, cost of instruments proposed by GSI for Hyperspectral Core scanner with XRF, LIBS & Geophysical Characterizer is of Rs. 30.65 CR (As per the initial proposal submitted to STSS), whereas cost of instrument given by MECL for Hyperspectral Core scanner with XRF and Hyperspectral Core scanner with LIBS is of Rs. 29.78CR without contingency cost and CAMC. Further in GSI part Software includes training in the cost, whereas in MECL part only software is mentioned.

Time line for completion of Procurement:

It was informed to the committee members that as per discussion and mail communication made with different manufactures of core logger system, the minimum time period of 6 to 9 months is required for supply and installation. Based on the discussions with vendors the following timeline has been proposed.

Time Line for procurement*:

		FY 2024-25										
	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March
Proposal submission to NMET												
Approval by NMET, Receipt of A/A and F/S from Competent authority												
Tendering Phase – I												
MII Exemption Approval												
Global Exemption Approval if required												
Tendering Phase II & issue of PO												
Manufacturing phase												
	FY 2025-26											
	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March
Manufacturing phase												
Supply & Commissioning												
Payment after commissioning												
	CAMC cost payment will start w.e.f. FY 2029-2030 onwards till FY 2034-2035. Considering Two year warranty and Five year CAMC											

***Installation timeline subject to completion of Installation sites at Jaipur, Nagpur and Hyderabad**

Availability of Global / Indian Manufacturers

As per the interaction with the manufactures of core logger system globally through mail communication as well as search made in internet, the following list of vendors has been identified.

Sl. No	Global Vendor/manufacturer/country	Domestic supplier
1.	CORESCAN Pty Ltd 1/127 Grandstand Road, Ascot, WA, 6104, Australia T: +61 8 9277 2355	Not Available
2.	Geotek Limited, 4 Sopwith Way, Daventry Northamptonshire, NN11 8PB United Kingdom	Pan India Consultants Pvt. Ltd. 105, Phase-IV, Udyog Vihar, Gurgaon - 122 015 (Haryana), India

3.	DMT GmbH & Co. KG · Am TÜV 1 · 45307 Essen, Germany · Phone:+49 201 172-1970 · www.corescan.de · info.corescan@dmt-group.com ANCORELOG – Analytical Core Logging System, a Multi-Sensor based Drill Core analytical system from DMT, Germany.	DMT Consulting Private Ltd. India Unit No-ESNT3B0203, Block 3B, Ecospace Business Park, Premises No-IIF/11, Action Area II, New Town, Rajarhat Kolkata 700156, India, Tel +91 33 2324 0096, Fax +91 33 2324 7826 india(at)dmt-group.com Electrotek Instruments (P) Ltd., 19. C.V.Raman Road, Alwarpet, Chennai – 600018, India Ph: 044 – 24996743, Email: geo@electrotekintl.com, www.electrotekintl.com
4.	GeologicAI, 7745 66th Street SE, Calgary, AB T2C 5S9, 35 McCaul St Toronto, ON M5T 1V7 Av. El Golf 40, 12th Floor, 7550108, Santiago, CHILE 11223 99 Ave Edmonton, AB T5K 0G9	Not available
5.	ELEMISSION Inc. 3410 Boulevard Thimens Saint-Laurent, QC Tel: (514) 998-3713	Naimex House A-8, NH 19, Mohan Co-oprative Industrial Estate, Sarita Vihar, New Delhi-110044 supriyo pradhan@aimil.com civilmum@aimil.com nagpur@aimil.com

Time line of Validity of NMET Sanction:

The validity of approvals from NMET will be 02 years from NMET as the delivery period is 01 year after issue of PO. So, no extensions of approvals will be required further.

Recommendations of CPC-

The Digital Core Logger is a necessary instrument as it facilitates full RGB Photography,3D Profiling, IR scanning facility, XRF analysis & LIBS facilities and has Geophysical Characterization tools and softwares for comprehensive and robust analysis of the drill cores. Justifications provided in the form of Necessity of the equipment, Drill cores available, Requirement of funds and its breakup, Reasonability of cost, Time-line for completion of procurement, and Availability of global / Indian manufacturers were discussed at length. Based on the above observations, detail discussions and importance of Digital Core Loggers, the Central Procurement Committee approved the procurement proposals for Western, Central and South Regions of GSI of three number (03 Nos.) of Digital Core Loggers with an estimated cost of Rs. **129.7410000** crores for GSI, Jaipur, GSI Nagpur, GSI Hyderabad.

The following are the estimated cost details for one instrument

a) Digital Core Logger (US$ 20,00,000)- Rs 17,00,00,000/-

b) Shipping and other aspects- Rs 25,00,000/-

c) Installation and commissioning- Rs 2,20,00,000/-

d) Software and Training at three locations of GSI in India for 10 days each at one location- Rs 2,20,00,000/-

e) Technical support (CAMC) and implementation for 5 years- Rs 15,00,00,000/-

Sub Total- Rs 36,65,00,000/- approximately

GST @18%- Rs. 6,59,70,000 /-

Cost of One Instrument = Rs. 43,24,70,000/- (including a, b, c, d, e above and 18% GST)

Cost of three (03) digital core logger = Rs 43,24,70,000x 3 = Rs.129,74,10,000/-

The sanction power of DG, GSI is 20 crores only it is therefore the committee recommends to request NMET to approve the proposal of procurement of 3 nos. of Digital Core Logger and provide financial sanction of Rs. 129.7410000 crores with a timeline of validity of NMET approval for 02 years

18/04/2024
(Dr Shailendra Singh)
DDG (STSS)
(Member Secretary)

18/4/24
(Shri Ajay Agrawal)
Chief Engineer & Head
Engineering
Member

18/04/2024
(Shri Dinesh Ganvir)
ADG & NMH-II
(Member from Indenting Division)

18/04/2024
(Dr Joydeep Guha)
ADG(F)
Member

18/04/24
(Shri Janardan Prasad)
Director General
Chairman

Annexure-II

Comparative chart of proposal of Digital Core Logger by GSI & MECL (Approved by NMET)

GSI	MECL
Technical Specification- RGB Photography 3D Profiling IR Sensor (it scan visible & near infrared, 1.0 to 2.5 µm) Integrated XRF, LIBS & Geophysical Characterization tool like Density	**Technical Specification-** RGB camera **3D Profiling not available in the document** Hyperspectral Camera (IR sensor) (it scan nearly 50 micro meter) Not available in the document
It has the integrated Hyperspectral core scanner with XRF, LIBS and Geophysical characterization tools like Density meter	**It has details for** Hyperspectral core scanner with XRF and LIBS. Geophysical characterization not available in the document
Software The basic related software is given with **3D visualization** of the drill core. The Spectral interactive machine learning & AI tools for supervised and unsupervised classification also should be able to do	**Software** The basic related software is given with **2D mapping** of the selected elements This is not available in the document
Cost of instrument with GST (Hyperspectral Core scanner with XRF, LIBS & Geophysics Characterizer) Cost – Rs. 30.65CR (per unit) Contingency cost- Rs. 1.53CR (per unit) GST- Rs. 5.79CR (per unit) **Total- Rs. 37.97CR (per unit)***	**Cost of instrument with GST** a) Hyperspectral Core scanner with XRF- Rs. 12.62CR (per unit) b) Hyperspectral Core scanner with LIBS- Rs. 22.04CR (per unit) **Total- Rs. 34.66 CR (per unit)**
Cost of instrument without GST (Hyperspectral Core scanner with XRF, LIBS & Geophysics Characterizer) **Cost- Rs. 30.60 CR (per unit) ***	**Cost of instrument without GST** a) Hyperspectral Core scanner with XRF- Rs. 11.10CR (per unit) b) Hyperspectral Core scanner with LIBS- Rs. 18.68CR (per unit) **Total- Rs. 29.78CR (per unit)**
Delivery Time - -	**Delivery Time –** 32-36 weeks
CAMC for 3 years	a. Warranty for 1 year for both XRF & LIBS. b. AMC for Hyperspectral Core scanner with XRF - 5 years (no CAMC) c. AMC/CAMC for Hyperspectral Core scanner with LIBS **not mentioned**
Software & Training – At 03 locations (Jaipur, Nagpur & Hyderabad) in the GSI for 10 days	**Software & Training –** Not available in the document

***cost as per the initial proposal submitted to STSS**

Note-

i. Cost of instruments proposed by GSI for Hyperspectral Core scanner with XRF, LIBS & Geophysical Characterizer is of Rs. **30.65 CR**, whereas cost of instrument given by MECL for Hyperspectral Core scanner with XRF and Hyperspectral Core scanner with LIBS is of Rs. **29.78CR** without contingency cost and CAMC.

ii. In GSI part Software includes training in the cost, whereas in MECL part only software is mentioned.