



*POLAR TECHNOLOGY FOR DECARBONIZING ANTARCTIC  
OPERATIONS: FUEL APPLICATIONS AND WASTE MANAGEMENT*  
**MAITRI, INDIAN ANTARCTIC RESEARCH STATION**



Presented by  
Sriram S  
Gowtham Kumar D

- 01 BOOT STRAP PHASE
- 02 ACCLIMATIZATION PHASE
- 03 45<sup>th</sup> ISEA: ON-BOARDING PHASE
- 04 TECHNICAL ASSESSMENT PHASE
- 05 DE-INDUCTION PHASE



# BOOTSTRAP PHASE



From: Shailendra Saini <shailendra@ncpor.res.in>

Sent: 25 June 2025 14:19

To: Chairman Managing Director HPCL <cmd@hpcl.in>

Cc: Bharathan S ( एस. भट्टन ) <sbharathan@hpcl.in>; V K Maheshwari ( महेश्वरी वी के ) <VMaheshwari@hpcl.in>; Rajesh Mehtani ( राजेश महतानी ) <rmehtani@hpcl.in>; Sriram S ( श्रीराम एस ) <ssriram@hpcl.in>; Tandon Amit ( अमित अमित ) <amittandon@hpcl.in>; Nedungadi Gokul Krishnan ( नेदुंगडी गोकुल कृष्णन ) <ngokul@hpcl.in>; N Thirunavukkarasu ( एन थिरुनवुककरसु ) <nthiru@hpcl.in>; "योगेश राय | Yogesh Ray" <yogesh@ncpor.res.in>; Anand Singh <aks@ncpor.res.in>

Subject: Sustainability Project for Antarctica: Collaboration with HPCL

**Warning: External email, "Please open with Caution. Do not click on suspicious attachments or links".**

Dear Sir

The National Centre for Polar and Ocean Research (NCPOR) is a premier Indian institution specializing in polar and ocean research, under the Ministry of Earth Sciences (MoES). Initially established to support India's Antarctic Expeditions, which commenced in 1981, NCPOR's primary focus was Antarctic logistics. Over time, it evolved into a leading research institution, expanding its scope to include oceanography, cryosphere studies, Arctic research, and Himalayan studies. This diversification led to its rebranding as the National Centre for Antarctic and Ocean Research (NCAOR), before being renamed in 2018 as the National Centre for Polar and Ocean Research to reflect its broader mission.

After discussing emission reduction strategies with HPCL's Aviation team, exploring fuel additives and Sustainable Aviation Fuels (SAF). A visit to HP Green R&D Centre in Bengaluru introduced us to innovative solutions, including Compressed Biogas (CBG) and SAF, that could support India's decarbonization efforts in Antarctica. Building on this, a project proposal on decarbonizing Indian Antarctic Operations was defended and which was well-received by the National Antarctic Project Review Committee. The committee recommended the project for the 2025-26 season with two berth's. This is going to be a significant initiative for sustainability study in one of the world's most challenging environments by one of the three oil major organisation of India. This project will be a firsthand experience, with HPGR&D members conducting a sustainability study for CBG and testing decarbonisation and emission reduction techniques in Antarctica. This is the Government of India funded expedition managed by MoES-NCPOR, Goa.

In this regard, we look forward to collaborate with HPGR&D to move forward with India's decarbonization initiatives and scientific development programs by leveraging the Antarctic's extreme conditions as a testing ground for innovative and sustainable technologies.

With best regards

Shailendra



राष्ट्रीय ध्रुवीय एवं समुद्री अनुसंधान केन्द्र

पृथ्वी प्रणाली विज्ञान संगठन

पृथ्वी विज्ञान मंत्रालय (भारत सरकार)

हेडलैण्ड सडा, वास्को-डा-गामा, गोवा-४०३ ८०४, भारत

NATIONAL CENTRE FOR POLAR AND OCEAN RESEARCH

Earth System Science Organisation

Ministry of Earth Sciences, (Government of India)

Headland Sada, Vasco-da-Gama, Goa - 403 804, INDIA



DR. YOGESH RAY, Scientist E  
(Antarctic Expedition Logistics &  
Antarctic Science Co-ordination)

Tel: 0091-832-2525520  
email: yogesh@ncpor.res.in

No. NCPOR/14(159)/25

Dated: 14 July 2025

To  
Shri. Sriram S.,  
Head – R&D Technology Development  
Hindustan Petroleum Corporation Limited  
HP Green R&D Centre, KIADB Industrial Area  
Tarabanahalli, Devanagundi  
Hoskote Taluk, Bengaluru – 560067.

Sub:- Schedule for Medical Examination & Pre-Antarctic Snow- Ice Acclimatisation training for the members of 45<sup>th</sup> Indian Scientific Expedition to Antarctica (ISEA).

Dear Sir/Madam

Kindly find enclosed herewith the schedule for medical examination and Pre-Antarctic snow ice acclimatization training for the member(s) of 45<sup>th</sup> Indian Scientific Expedition to Antarctica as detailed below:-

**Batch First : 31 July 2025 – 23 August 2025**

1. Mr. Sriram Sundararaman	2. Mr. Dadi Gowtham Kumar
3. Mr. Vinav Kumar Kunde	

**Batch Second : 13 August 2025 – 6 September 2025**

4. Mr. Jose N	5. Mr. Bennet Chelliahn
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Member(s) are advised to attend the medical/psychological examination at All India Institutes of Medical Sciences (AIIMS), New Delhi and pre-antarctic snow-ice acclimatisation training at Indo-Tibetan Border Police (ITBP), Auli. Please note that the participation of the members in 45<sup>th</sup> ISEA is subject to approval of National Committee on Polar Program (NCPPI).

You are requested to convey the schedule to the above member(s) accordingly. The member(s) may be advised to comply with the following:-

- Report to Dr. Lal PathLabs – Patient Service & Radiology Centre, C-49, Main Vikas Marg, Preet Vihar, New Delhi – 110092 on the scheduled date assigned to the batches for radiological/pathological examination. Ensure that you arrive with at least 12 hours of fasting —with empty stomach without having breakfast, tea, coffee or any eatables.

Contd...2/-



**From Green R&D to the White Continent – HPCL in Antarctica**

# ACCLIMATIZATION PHASE @ ITBP - AULI



**DAY 1-5**

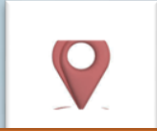
**Acclimatization @ 9000 feet**

**Trekking practice and training at 9500  
and 11,000 feet**

**[Gorson Peak of Garhwal Himalayas]**

**Training of Knots &  
Anchoring Techniques**





## GORSON PEAK





## DAY 6-10

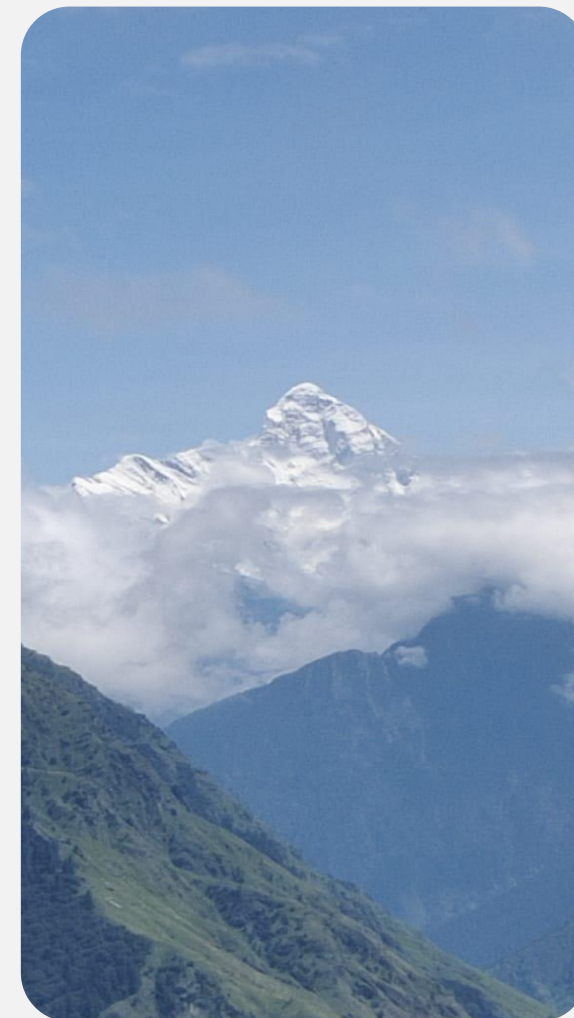
**Trek to Vasudhara Falls for  
acclimatization at 11,500 feet**

**Camping at Vasudhara falls, Trek to  
Alakanada glacier for Ice-wall training**

**Training on Tyrolean traverse**

**Class room sessions on Rescue  
operations**

**Interaction IG/Principal –  
M&SI, Closing ceremony**





## VASUDHARA FALLS





# ACCLIMATIZATION PHASE @ ITBP – AULI (cont...)



# ONBOARDING PHASE



## Abstract:

A study which examines strategic avenues for potential decarbonization at the Maitri Indian Antarctic Research Station. Focus is on the current scientific & non-scientific activities and their support systems wherein possible carbon foot print can be reduced and suggest few recommendations for consideration. These considerations shall be useful for the proposed Maitri II facilities.





# TECHNICAL ASSESSMENT PHASE (CONT...)



**MAITRI**



# TECHNICAL ASSESSMENT PHASE (CONT...)



Water Treatment Plant



Boiler Room



Incinerator

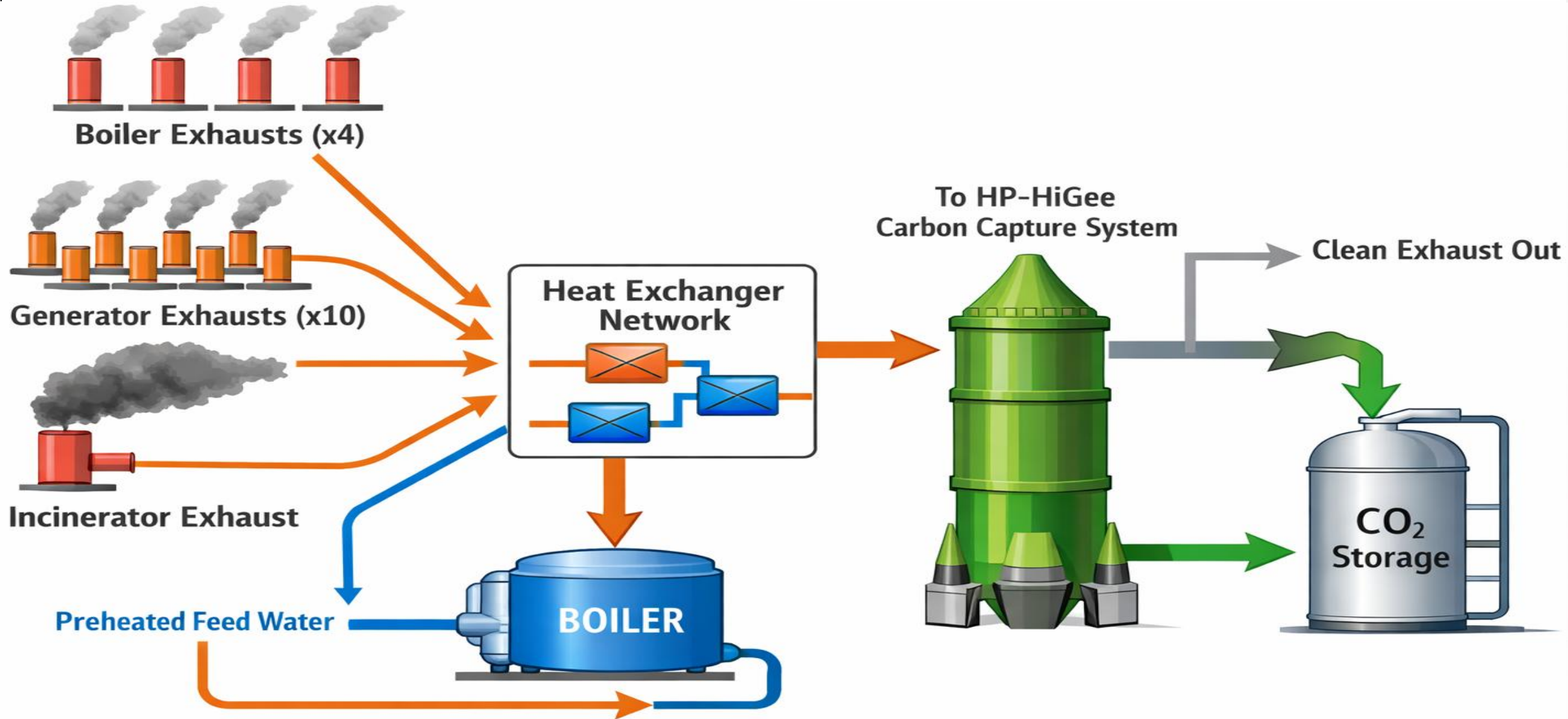


Kitchen & Pump House



Generator Room







## DECARBONIZATION & WASTE MANAGEMENT STUDIES @ MAITRI, INDIAN ANTARCTIC RESEARCH STATION

### ABSTRACT

Reference the approval from National Committee on Polar Program (NCP) for the proposal: 'Polar technology for Decarbonizing Antarctic Operations: Sustainable Fuel Applications and Waste Management' at Maitri Station. This study report examines strategic avenues for potential decarbonization, waste management and areas of energy efficiency improvement at the Maitri Indian Antarctic Research Station. Focus is on the current scientific & non-scientific activities and their support systems wherein possible carbon foot print can be reduced and suggest few recommendations for consideration. These considerations shall be useful for the proposed Maitri II facilities.

Sriram S (श्रीराम एस) & Dadi Gowtham Kumar (दादी गौतम कुमार) - HPCL Green R&D Centre, Bengaluru



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### 8. Avenues of Energy Efficiency Improvement & Decarbonisation:

Reference the various operational and management activities, the following areas have the potential for energy efficiency improvement and decarbonization window. For certain items there are challenges which can be taken up as trial before taking the plunge:

Table 6: Avenues of Energy Efficiency improvement & Decarbonisation

Category No.	Category Title	Objective	Avenues
1	<b>Waste to Energy &amp; Resource recovery</b>	<ul style="list-style-type: none"> <li>Convert organic waste to energy</li> <li>Reuse waste resources after refinement</li> </ul>	<ol style="list-style-type: none"> <li>Canteen waste to biogas instead of incineration</li> <li>Human Bio-waste to biogas instead of incineration</li> <li>Re-refining of waste lube oil for reuse</li> <li>In-situ treatment of urine to reduce disposal costs and Stabilisation and treatment of urine</li> </ol>
2	<b>Circular water Economy</b>	Reuse waste water after treatment	<ol style="list-style-type: none"> <li>Reuse of treated water; Suggest – segregation of urinal routing to current waste water treatment</li> <li>Treat hand wash and bath water from Summer Camp in ETP. Use the treated water for reuse.</li> <li>Treat and reuse the water drain from Washing Machines.</li> </ol>
3	<b>Renewable &amp; Clean energy transition</b>	Alternate to fossil-fuel-based energy with renewable and low-carbon alternatives	<ol style="list-style-type: none"> <li>In house hydrogen through electrolysis for IMD balloon launch instead of purchasing hydrogen cylinders.</li> <li>Consideration of Sustainable Aviation Fuel (replacement to existing Jet-1 fuel) in the existing Generators.</li> <li>Consideration of Fuel Cell powered Generator to the present ATF fueled Generators. Reduces CO2 emissions appreciably. Technically</li> </ol>

## DAILY MEETING





# TECHNICAL ASSESSMENT PHASE (CONT...)



Re: Completion of the Decarbonization @Maitri Assignment : 45th Indian Scientific Expedition to Antarctica (ISEA)



शैलेंद्र सैनी | Shailendra Saini <shailendra@ncpor.res.in>

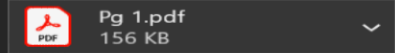
To Sriram S ( श्रीराम एस )

Cc Dadi Gowtham Kumar ( दादी गौतम कुमार ); Reena Naik; "योगेश राय | Yogesh Ray"; Brijesh Desai; Shreya Morjekar

Reply Reply All Forward

Thu 22-01-2026 16:17

If there are problems with how this message is displayed, click here to view it in a web browser.



**Warning: External email, "Please open with Caution. Do not click on suspicious attachments or links".**

Dear Sir

Thank you for the preliminary report.

In stage 1 of our project, you have given us clear guidelines; most of the points were incorporated in Bharati and rest we will propose for the new upcoming projects.

As per page 4 of your report, we are thinking of initiating the solution for Category 1 (A1 and A2) as HP-RAMP with PSA. We request if you could add approximate timelines to develop that system for Antarctica by HPCL GRD; that would help us. If we can get this module by 10 September 2026, we can mobilise it and try to install it in January 2027.

JB

Javed Beg <javed.beg@gmail.com>

To Sriram S ( श्रीराम एस )

Cc Dr. Shailendra Saini; Dadi Gowtham Kumar ( दादी गौतम कुमार )

Reply Reply All Forward

Fri 26-12-2025 22:13

If there are problems with how this message is displayed, click here to view it in a web browser.

**Warning: External email, "Please open with Caution. Do not click on suspicious attachments or links".**

Dear Sriram Saab,

At the outset, I would like to compliment you and Mr Kumar on a very comprehensive and well-compiled report. The effort put into consolidating scattered information and presenting it in a structured manner is clearly evident and highly appreciated. Having reviewed the report, please find below my observations and suggestions for your kind consideration.

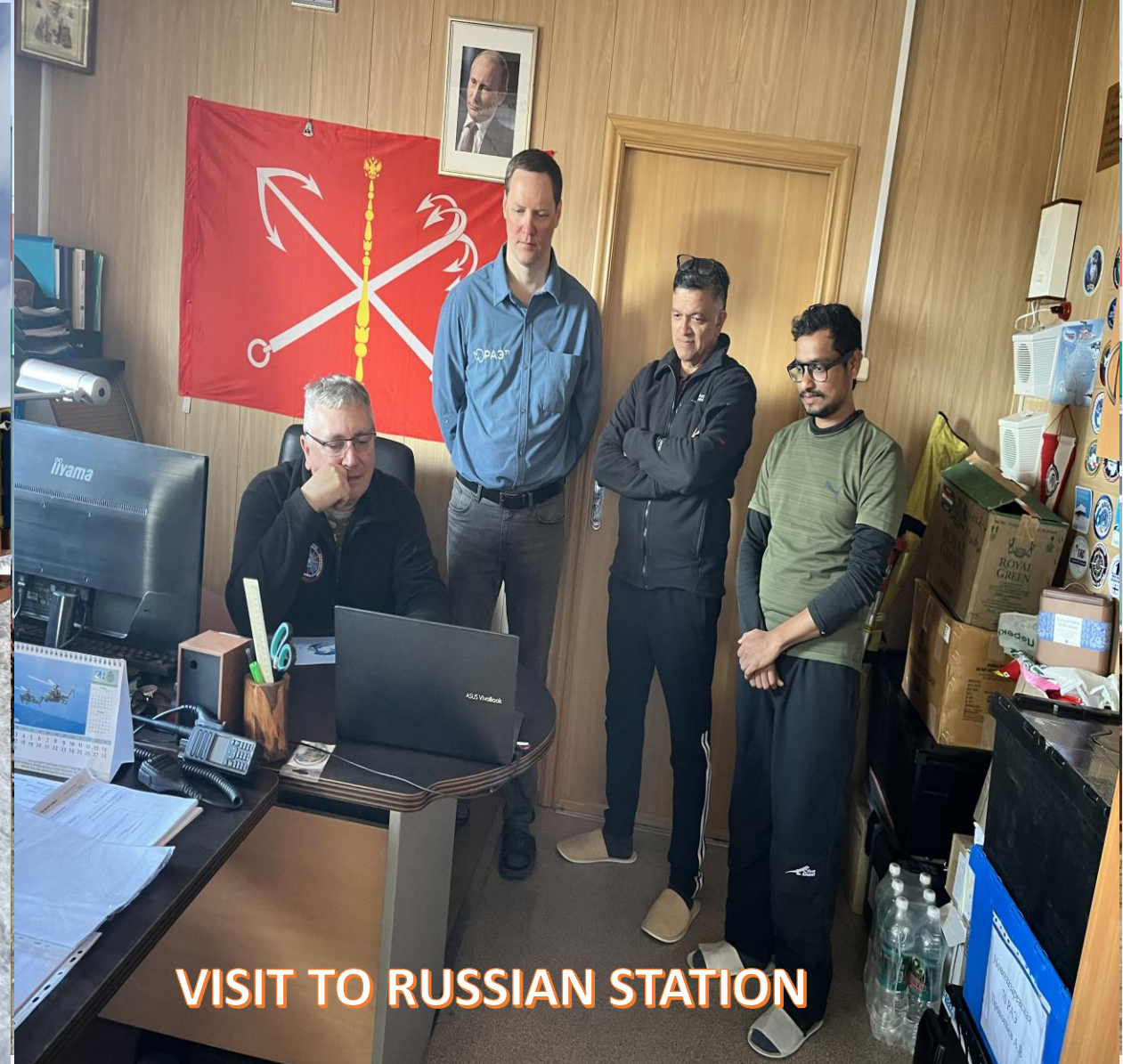
Once again, thank you for the thoughtful and detailed report. I hope you will find these observations useful. For any further discussion or clarification, we may connect over a WhatsApp voice call, which would allow for quicker and more effective interaction.

Best Regards,

Javed

## HP – Aviation: Promotional Activities

HP – Aviation: Promotional Activities



## VISIT TO RUSSIAN STATION





# Maitri: Where Ice Meets Infinity



# Maitri: Where Ice Meets Infinity



**PistenBully**



**Crane (50-ton)**



**Tracked Trailer**



**Excavator**



**Pickup Truck**



**Skidoo**



**Wheel Loader**



Any  
Question

Q&A



THANK YOU