NGS CONCLAVE ON CONSTRUCTION MANAGEMENT

10th & 11th September, 2026,
at GAIL Training Institute (GTI), Noida

Organised by Natural Gas Society (NGS)

Sponsored by

A REPORT

NATURAL GAS SOCIETY: 129, PARC Building, GAIL Training Institute, Plot No. 24, Sector - 16A, Noida 201301
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EXECUTIVE SUMMARY

NGS Conclave on Construction Management 2026

The Natural Gas Society (NGS) organized the **NGS Conclave on Construction Management 2026** on **10–11 September 2026 at GTI, Noida**,

1. Overview

The Natural Gas Society (NGS) organized the third edition of the NGS Conclave on Construction Management on 10–11 September 2026 at GTI, Noida. The Conclave brought together senior industry leaders, project managers, technical experts, consultants and representatives of natural gas and allied industries to exchange practical experience on construction excellence, project execution, innovation, technology adoption, safety, quality and efficient project management.

The program covered natural gas pipelines, City Gas Distribution (CGD), LNG and LCNG facilities, petrochemicals, gas processing, Compressed Biogas (CBG) and emerging energy infrastructure. A central theme was that successful project delivery depends on sound front-end planning, effective leadership, coordination among stakeholders, disciplined execution and the appropriate use of digital technologies.

2. Inaugural Session and Leadership Discussions

The inaugural session featured addresses by Shri D. V. Shastry, Executive Director, NGS; Shri Sukhmal Jain, Former Director (Marketing), BPCL; Shri Pramod Narang, Director (Technical), Petronet LNG Ltd.; and Dr. A. K. Balyan, Former Director, ONGC and Former MD & CEO, Petronet LNG. The speakers highlighted the role of natural gas infrastructure in supporting India's energy objectives and the need to deliver projects safely, efficiently and within planned cost and schedule.

The first Leadership Forum examined "Vision 2040: Building Future-Ready Natural Gas Infrastructure through Construction Excellence, EPC Innovation & Efficient Execution". Discussions covered pipeline expansion, EPC contracting, Right of Use (RoU) management, productivity, safety, quality, digitalization and project governance. Panelists stressed the importance of anticipating constraints early and strengthening project planning and execution controls.

The second Leadership Forum, "Accelerating Future-Ready CGD Infrastructure in India", addressed the challenges of expanding PNG and CNG networks in urban areas. Key issues included congested utility corridors, permissions, coordination with civic agencies, construction productivity and the need for suitable technologies and robust stakeholder engagement.

3. Technical Sessions

Technical presentations shared construction and execution experience from major pipeline projects, including the Mumbai–Nagpur–Jharsuguda Pipeline (MNJPL), the 3.8-km Maha horizontal directional drilling (HDD) crossing of the Mahanadi, and the Ennore-based Gas Pipeline (ETBPL). These examples highlighted the importance of route and site assessment, engineering preparedness, management of difficult crossings, coordination and learning from project experience.

The sessions also explored Artificial Intelligence (AI), digital twins and advanced analytics for project execution and asset integrity. The discussions illustrated how digital tools can improve project visibility, support timely decisions and help identify risks or emerging delays. The day's deliberations linked construction excellence with reliable, safe and sustainable expansion of gas infrastructure.

4. CGD, Mega Projects and Emerging Infrastructure

The second day began with presentations on CGD network construction, including planning, resource deployment, contracting strategies, stakeholder coordination and digital initiatives. The discussions emphasized that timely delivery of city gas projects requires coordination with local authorities and other utility owners, realistic work planning, accurate records and effective management of contractors and resources.

The Leadership Forum on "Leadership & Construction Excellence in Delivering Mega LNG, Petrochemical & Gas Processing Projects" focused on integrated project execution, contractor and vendor coordination, commissioning readiness, project governance, and cost and schedule control. The discussion underlined the importance of front-end engineering and planning, early involvement of operations and maintenance (O&M) teams, clear responsibilities, timely decisions and proactive management of risks and interfaces.

Afternoon presentations covered greenfield and brownfield projects, including GAIL's 60 KTA polypropylene project at Pata, LCNG infrastructure, integration of a large petrochemical complex with an operating refinery, and electrification of a gas turbine drive. The concluding technical session considered small-scale LNG, LNG terminal modernization, offshore LNG infrastructure and CBG development, reflecting the range of projects shaping the sector's future.

5. Key Learnings and Recommendations

- **Strengthen front-end planning:** Resolve site, land, utility, logistics, feedstock, statutory approval and interface issues as early as possible.
- **Adopt integrated project management:** Align the owner, consultant, EPC contractor, vendors and O&M team around shared objectives, responsibilities and delivery milestones.
- **Manage time, cost and quality together:** Maintain realistic schedules and budgets, review critical-path activities regularly and monitor procurement and delivery of critical equipment.
- **Institutionalize risk management:** Maintain project-specific risk registers, identify potential constraints early and prepare alternatives for approvals, equipment, transport and site conditions.
- **Use digital tools purposefully:** Apply integrated dashboards, digital models and AI-enabled tools to improve project visibility, coordination and early identification of bottlenecks.
- **Priorities safety and quality:** Treat safety, quality assurance and quality control as integral requirements throughout construction, testing and commissioning.
- **Improve contractor and stakeholder coordination:** Encourage timely decisions, clear contractual interfaces, constructive issue resolution and shared accountability for overall project outcomes.
- **Build capability and share experience:** Promote learning from completed projects and strengthen the skills of project teams to support new technologies and complex execution environments.

6. Conclusion

The NGS Conclave on Construction Management 2026 provided a valuable platform for industry leaders and practitioners to exchange knowledge, discuss implementation challenges and share practical solutions across the natural gas and allied infrastructure sectors. The deliberations reinforced that construction excellence is achieved through the combined application of strategic leadership, realistic planning, integrated project management, effective risk mitigation, contractor coordination and appropriate technology.

The overall message was clear: projects must be planned comprehensively, managed collaboratively and executed with uncompromising attention to safety, quality, cost and schedule. Continued knowledge-sharing and adoption of proven practices will help strengthen the timely delivery of reliable, efficient and future-ready gas infrastructure. The Conclave concluded on 11 September 2026 with a vote of thanks.

NATURAL GAS SOCIETY (NGS)

About Natural Gas Society (NGS)

The Natural Gas Society (NGS), a registered Society and an independent industry body, serving as the emerging voice of India's Natural Gas sector. It was established with the following objectives:

1. to promote, facilitate and further sustainable growth of Natural Gas Industry in India.
2. to represent the collective interest and promote, facilitate and further sustainable growth of Natural Gas Industry in India (Issue Based Policy Advocacy).
3. to serve as a nodal point for coordination of all efforts at generation & dissemination of information and technology relevant to Natural Gas and to work on the issues of Common interests such as the Technical Standards, Safety Standards, etc. Society is also collaborating with relevant organizations at national & international levels.

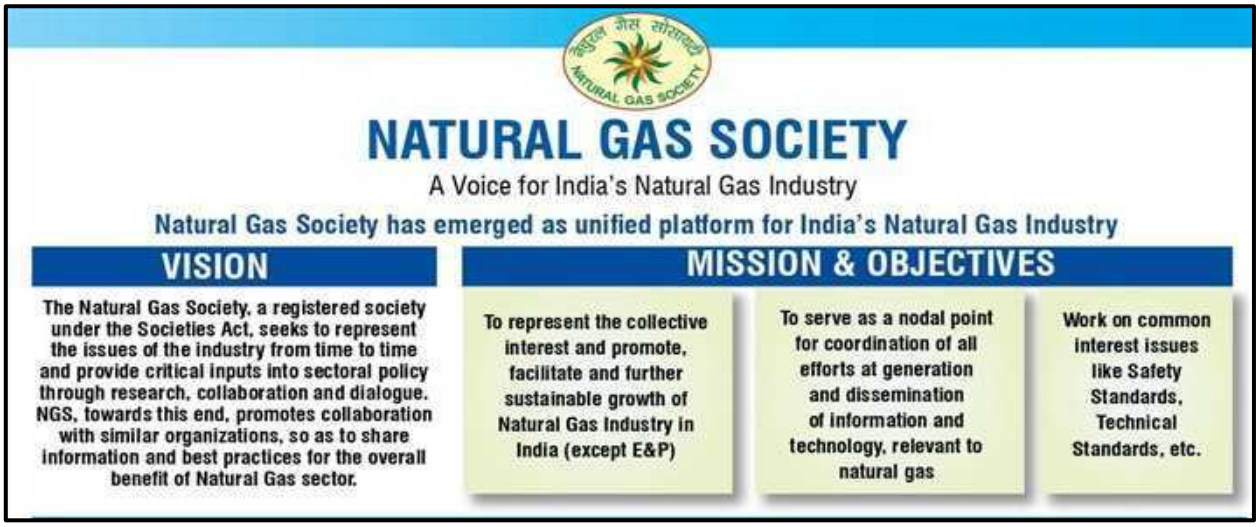
NGS provides a meaningful platform for exchange of ideas and best practices across stakeholders in the Indian gas value chain. Through active engagement, it works to enhance the competitiveness of India's Natural Gas industry in global energy markets while promoting the responsible, safe, and sustainable expansion of gas infrastructure.

A core part of NGS's mission is to champion continual improvement in safety and service standards across the entire Natural Gas chain from transmission pipelines to city-gas distribution networks. NGS supports the adoption and transfer of new technologies and industry best practices, aiming to optimize resources and safeguard stakeholder interests.

Given India's diverse geography and vast population, NGS places special emphasis on the promotion and development of City Gas Distribution (CGD) networks. To conclude, NGS has established a dedicated CGD Forum to foster collaboration among gas utilities and address sector-specific challenges.

In addition to policy advocacy and industry-wide initiatives, NGS actively promotes capacity building and skill development. It aims to organize regular training programs, workshops, and knowledge exchange events enabling stakeholders across the sector to stay updated with evolving technologies, safety norms, and operational excellence standards.

Through its multifaceted role as a think-tank, collaboration platform, and safety- & quality-oriented promoter, NGS seeks to support India's journey towards an increasingly gas-based economy, contributing to energy security, environmental sustainability, and equitable access to clean energy for all



ABOUT THE PROGRAM

NGS CONCLAVE ON CONSTRUCTION MANAGEMENT – 2026

The Natural Gas Society (NGS) organized the 3rd edition of the NGS Conclave on Construction Management on 10th–11th September 2026 at GAIL Training Institute (GTI), Sector-16A, Noida. The Conclave provided a focused platform for senior professionals, project leaders, technical experts, consultants and industry stakeholders to deliberate on construction excellence, project execution, innovation, technology adoption, safety, quality and efficient project management across the Natural Gas and allied infrastructure sector.

The programme commenced with the Inaugural Session, featuring a Welcome Address by Shri D. V. Shastry, Executive Director, NGS, followed by addresses by Shri Sukhmal Jain, Former Director (Marketing), BPCL; Shri Pramod Narang, Director (Technical), Petronet LNG Ltd.; and Dr. A. K. Balyan, Former Director, ONGC / Former MD & CEO, Petronet LNG. This was followed by the first Leadership Forum Panel Discussion on *"Vision 2040: Building Future-Ready Natural Gas Infrastructure through Construction Excellence, EPC Innovation & Efficient Execution towards India's Target of Increasing Natural Gas Share to 15% in the Energy Basket."* The discussion focused on pipeline expansion, EPC contracting, RoU management, safety, quality, productivity, digitalization and future-ready infrastructure.

The technical programme on Day 1 focused on major Natural Gas pipeline projects, construction challenges, innovative practices, new technologies and EPC experience sharing. Presentations covered experience from the Mumbai-Nagpur-Jharsuguda Pipeline (MNJPL), the 3.8-km Maha HDD crossing of the Mahanadi, the Ennore-based Gas Pipeline (ETBPL) and the application of Artificial Intelligence, Digital Twins and advanced analytics for project execution and asset integrity. The day concluded with a second Leadership Forum on *"Accelerating Future-Ready CGD Infrastructure in India"*, addressing urban execution challenges, PNG/CNG expansion, advanced construction technologies and sustainable CGD development.

Day 2 commenced with technical presentations on construction of CGD networks, covering construction planning, resource deployment, contracting strategies, stakeholder coordination, digitalization and innovative project execution practices. A Leadership Forum subsequently deliberated on *"Leadership & Construction Excellence in Delivering Mega LNG, Petrochemical & Gas Processing Projects"*, with emphasis on integrated project execution, contractor coordination, construction planning, commissioning readiness, project governance, cost and schedule management.

The afternoon technical sessions focused on greenfield and brownfield petrochemical and gas processing projects, including GAIL's 60 KTA polypropylene project at Pata, LCNG infrastructure, brownfield integration of a large petrochemical complex with an operating refinery, and electrification of a gas turbine drive. The concluding session covered emerging gas infrastructure projects, including small-scale LNG, LNG terminal modernization, offshore LNG infrastructure and CBG development.

Overall, the two-day Conclave brought together leadership perspectives, technical presentations and practical experience-sharing from the Natural Gas, CGD, LNG, petrochemical, CBG and allied infrastructure sectors. The programme provided valuable insights into innovative construction practices, digital technologies, project planning and execution, safety and quality, commissioning, brownfield challenges and emerging energy infrastructure, thereby contributing to knowledge sharing and the advancement of construction and project execution excellence in the Natural Gas sector.

Delegates from GAIL, GAIL Gas, IGL, MGL, PLL, IOCL, BPCL, Think Gas, HPCL, EIL, CUGL, HMEL, ATGL, KLL and several other leading organizations from the Natural Gas and allied sectors participated in the Conclave with great enthusiasm and actively contributed to the technical deliberations and experience-sharing sessions. The program concluded with the vote of thanks on 11th September 2026, marking the successful conclusion of the two-day Conclave.

MINUTE TO MINUTE PROGRAM SCHEDULE

Organised by

NGS CONCLAVE ON CONSTRUCTION MANAGEMENT

Sponsored by

10th & 11th September, 2026 at GAIL Training Institute (GTI),
Plot No. 24, Sector - 16A, Noida 201301, UP

Programme Schedule - Day 1

DAY 1
10/9/26

Registration (9:00 HRS – 10:00 HRS)

Session – I: Inauguration (10:00 HRS – 11:15 HRS)

Welcome Address	:	**Shri D V Shastry,** Executive Director, Natural Gas Society
Special Address	:	**Shri Sukhmal Jain,** Former Director (Mktg), BPCL
Keynote Address	:	**Shri Pramod Narang,** Director (Tech), PLL
Inaugural Address	:	**Dr. A K Balyan,** Former Director ONGC/Former MD & CEO Petronet LNG
Vote of Thanks	:	**Shri Satish Geda,** Sr. Consultant, Natural Gas Society

TEA BREAK (11:15 HRS –11:30 HRS)

Day-1 SESSION-II (11:30 HRS – 13:00 HRS)

Leadership Forum Panel Discussion: Theme: Vision 2040: Building Future-Ready Natural Gas Infrastructure through Construction Excellence, EPC Innovation & Efficient Execution towards India's Target of Increasing Natural Gas Share to 15% in the Energy

Session Chair: Shri K K Jha, Former Member (Infra), PNGRB and Director (P/L), IOCL

Panellists: 1. Shri A K Tripathi, ED (Projects) GAIL **2. Shri Rouf Khan,** ED (Projects), BPCL **3. Shri Shyamanand Jha,** ED (EPCM & C), IOCL

4. Shri D Jana, Div. Head (Projects), VCS & Former CGM (Projects) EIL **5. Dr. Harsh Sachdev,** Prof. FORE School of Mgt. (former ED, IOCL)

6. Shri Rajeev Chak, Senior General Manager (Projects), EIL

LUNCH BREAK (13:00 HRS -14:00 HRS)

Day-1 SESSION – III: (14:00 HRS – 15:30 HRS)

Project Execution & Technology Presentation Session: Theme: Major Natural Gas Pipeline Projects: Construction Challenges, Innovative Practices, New Technologies & EPC Experience Sharing
Session Chair: Shri Devesh Varshney, ED (Projects), GAIL

Presentation Topics:

• Mumbai-Nagpur-Jharsuguda Pipeline (MNJPL)- Connecting Coasts • Strengthening Energy Security • Transforming Central India	**Shri Hussain Ali,** DGM (Project), GAIL
• Engineering Excellence: Maha HDD (3.8 km) Crossing of the Mighty Mahanadi (An Experience Sharing)	**Shri V Santa Kumar,** DGM (Project), GAIL
• Ennore-based Gas Pipeline (ETBPL) – Challenges & Best Practices	**Pramod Cheeli,** CGM (EPCM), IOCL
• Leveraging Artificial Intelligence, Digital Twins and Advanced Analytics for Enhancing Project Execution, Asset Integrity and Operational Excellence in Energy Infrastructure Projects	**Shri S. Ravishankar,** CEO, Alethe Labs India Pvt. Ltd

TEA BREAK (15:30 HRS – 16:00 HRS)

Day-1 SESSION – IV: (16:00 HRS – 17:30 HRS)

Leadership Forum Panel Discussion: Theme: "Accelerating Future-Ready CGD Infrastructure in India: Construction Excellence, Urban Execution Challenges & Sustainable Expansion towards India's PNG and CNG Growth Targets"
Session Chair: Shri Sandeep Trehan, CEO, Think Gas

Panellists: 1. Shri Sudhir Dixit, COO GAIL Gas Ltd **2. Shri Bhudev Singh,** ED (PNG-O&M), IGL **3. Shri Gurvinder Singh,** Sr VP, MGL

4. Shri Chandramani Tiwari, Chief Project Officer, Adani Total Gas Limited

5. Shri Praveer Kr. Agrawal, ED(Training), GAIL & Chairman, CUGL

High Tea (17:30 HRS Onwards)

End of Day 01

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NGS CONCLAVE ON CONSTRUCTION MANAGEMENT

10th & 11th September, 2026 at GAIL Training Institute (GTI), Noida
Plot No. 24, Sector - 16A, Noida 201301, UP

Programme Schedule - Day 2

DAY 2
11/9/26

DAY-2 SESSION-I (09:30 HRS – 11:00 HRS)

Project Execution & Technology Presentation Session: Theme: Construction of CGD Networks: New Technologies, Innovation & Experience Sharing on Project Execution Excellence
Session Chair: Shri V C Chittoda, Former ED, GAIL & former MD, MGL

Presentation Topics:

• Accelerating PNG Execution at MGL - Leveraging Robust Experience with New Strategies	**Shri Devendra Shastry,** AVP, MGL
• Future-Ready CGD Infrastructure	**Shri Roshan Madame**, CGM (PNG PROJECTS), IGL
• Developing CGD Infrastructure	**Shri Chandramani Tiwari,** Chief Project Officer, ATGL
• Digital Initiatives in City Gas Distribution: GAIL Gas's Perspective	**Shri H C Pant,** GM, GAIL Gas Ltd

TEA BREAK (11:00 HRS –11:30 HRS)

Day-2 SESSION – II: (11:30 HRS – 13:00 HRS)

Leadership Forum Panel Discussion: Theme: "Leadership & Construction Excellence in Delivering Mega LNG, Petrochemical & Gas Processing Projects"

Session Chair: Ms Jayati Ghosh, Former ED, EIL

Panellists: Panellists: **1. Shri Anand Victor,** Head UP Cluster, HPCL **2. Shri Arun Bhardwaj,** VP (Oprn Excellence) HMEL **3. Shri Nishant Patel**, CGM & VP (Projects), PLL **4. Shri S K Dubey,** CGM (Projects), GAIL **5. Shri Santanu Putatunda,** GM (PC-CO), GAIL

LUNCH BREAK (13:00 HRS –14:00 HRS)

Day-2 SESSION – III: (14:00 HRS – 15:30 HRS)

Project Execution & Technology Presentation Session: Theme: "Construction & Commissioning of Greenfield and Brownfield Petrochemical & Gas Processing Facilities: Industry Experience & Lessons Learned"
Session Chair: Shri A N Pandey, MD, MYPG Techno Inspection and Former ED, GAIL

Presentation Topics:

• Construction and commissioning of GAIL's 60 KTA PP Project at Pata	**Shri Vishal Mehta,** SM(PC-CO), GAIL
• Construction of LCNG infrastructure	**Shri Rajendra Sharma, GM &** **Shri Reny Varghese,** GM; M P Engineering
• Brownfield Integration of a World-Scale Petrochemical Complex with an Operating Refinery	**Shri Narendra Verma**, DGM – Process Excellence & Technical Services, HMEL, Bathinda
• Electrification of 3.6MW Gas Turbine Drive for Branch Line-A Gas Compressor, Vijaipur	**Shri Yogeshkumar Hamirbhai Bhola,** Manager (Mech) **Shri Sudhansh Pathak,** Manager (Inst) **Ms Babita Beniwal,** SE (Elect), GAIL

TEA BREAK (15:30 HRS –15:45 HRS)

Day-2 SESSION – IV: (15:45 HRS – 17:15 HRS)

Project Execution & Technology Presentation Session: Theme: "Emerging Gas Infrastructure Projects: Experience Sharing on LNG, Hydrogen, CBG & Advanced Energy Infrastructure Development"
Session Chair: Shri Satish Geda, Former ED, GAIL

Presentation Topics:

• LNG on Wheels: Leveraging Small-Scale LNG for Accelerated CGD Expansion, Market Development, Last-Mile Connectivity and Innovative Gas Supply Models	**Shri Shivank Bholanath,** Sr Manager, PLL
• Recommissioning & Modernization of Legacy LNG Infrastructure at Dabhol Terminal	**Shri Rambabu Kuraganti,** DGM (O&M), **Shri Raju Katravath,** Manager (O&M), KLL
• Construction of Offshore Breakwater for All-Weather LNG Operations at Dabhol LNG Terminal	**Shri Rajesh Kharadi,** DGM (O&M), KLL **Shri Piyush Sanjay Dhage,** Manager (F&S), KLL
• GAIL's 5 TPD CBG Plant at Ranchi (MSW Based)	**Shri Kishore Kumar,** GM (CBG), GAIL

Valedictory Session (17:15 HRS – 17:30 HRS)

End of Day 02

ORGANISING TEAM

NGS TEAM	
Shri D V Shastry – Executive Director, Natural Gas Society (NGS) **Chairman, Indian Society for Training & Development (ISTD), Delhi Chapter** **Member - Technical Committee: India Energy Week (IEW) 2026** **Member, Board of Studies, All India Management Association (AIMA)** **Member, GB, Foundation for Organizational Research & Education (FORE)** **Former Executive Director, GAIL (India) Ltd.** **Former Director, GAIL Gas Ltd.** **Former Director (P), Electronics Corporation of India Ltd. (ECIL)** E: edngs@ngsindia.org M: 9818231652	
Shri Satish Geda – Sr. Consultant Former ED, GAIL E: satishgeda@ngsindia.org M: 9911089320	Shri R P Singh – Sr. Consultant Former CGM, GAIL E: rpsingh@ngsindia.org M: 9414153070
Shri Shatendra Kumar Verma – Consultant Former DGM, GAIL E: shatendra@ngsindia.org M: 9818219887	Shri I C Sharma – Consultant (Administration) Former GAIL E: icsharma@ngsindia.org M: 9958529997

INAUGURAL SESSION

Welcome Address by Shri Satish Geda

Shri Satish Geda, Senior Consultant, Natural Gas Society and former Executive Director, GAIL (India) Limited, warmly welcomed all delegates and participants to the **3rd NGS Conclave on Construction Management**, being held on 10th–11th September 2026. He highlighted that the Conclave covers **Natural Gas, CGD, LNG, midstream, downstream and gas processing projects**, including both **greenfield and brownfield projects**, each presenting distinct requirements and challenges. He informed that the two-day programme would feature **three Leadership Forum Panel Discussions and four technical knowledge-sharing sessions**. He expressed confidence that the Conclave would provide valuable insights and meaningful takeaways for participants. He then welcomed the distinguished dignitaries and requested their felicitation with plant saplings.

Welcome by Shri D V Shastry, ED, NGS

Shri D. V. Shastry *is an M.Tech in Energy Systems Engineering from IIT Bombay and has over* ***40 years of multifarious experience in the Natural Gas Industry****, covering technical and managerial domains including Project Management, Operations & Maintenance of Natural Gas Pipelines and Gas Processing Plants, Learning & Development, HR and HRD.*

Presently, he is the ***Executive Director, Natural Gas Society (NGS)*** *and* ***Regional Vice President (North), ISTD****. He is also a Member of the Board of Studies, All India Management Association (AIMA), and associated with several other professional bodies.*

He has served as ***Director on the Board of GAIL Gas Ltd., Director (Personnel), ECIL, and Executive Director, GAIL (India) Ltd.***

He has received several awards and has participated extensively in ***national and international conferences and seminars*** *across technical and management disciplines.*

He said "Namaste and good morning to all of you. Technology may advance. IT may you know, make our jobs easier to do. But I personally feel that we should always be close to our roots and that's why I started with Namaskar.

Respected Dr. A.K. Balyan, former Director, ONGC and former MD & CEO, Petronet LNG; Shri Sukhmal Jain, former Director (Marketing), BPCL; Shri Pramod Narang, Director (Technical), Petronet LNG; distinguished industry leaders, senior executives, experts, speakers, delegates, colleagues and friends. A very warm and cordial welcome to all of you.

On behalf of the Natural Gas Society (NGS), I extend my heartfelt welcome to this NGS Conclave on Construction Management 2026. India's energy landscape is undergoing a significant transformation. As the economy expands, the demand for reliable, affordable and cleaner energy will continue to grow. Natural Gas has an important role in supporting the country's aspiration of increasing its share in the energy basket from over 6% to 15% by 2030. Achieving this will require rapid expansion and modernization of supporting infrastructure, including pipelines, city gas distribution networks, LNG facilities, Gas Processing, Petrochemicals and other emerging energy projects.

In this context, construction management has become a strategic discipline encompassing engineering excellence, technology adoption, project planning, contracting, risk management, digitalization, safety, sustainability and stakeholder management.

This conclave has been structured to promote practical experience sharing rather than merely theoretical discussions. Sharing experiences enables us to avoid reinventing the wheel and also helps us learn whether solutions adopted for particular challenges can be improved further. I am pleased to see participation from leading organizations including BPCL, GAIL, IOCL, EIL, GAIL Gas, IGL, MGL, Adani Total Gas, CUGL, HPCL, HMEL and others.

About the Natural Gas Society

NGS is a non-profit organization with three key objectives: promoting sustainable growth of the Natural Gas sector; representing the collective interests of the downstream and midstream Natural Gas sector, including LNG; and facilitating the sharing of information, good practices and technological innovations.

NGS has a diverse membership comprising Patron Members such as GAIL, MGL, IGL and PLL, along with primary, associate and non-voting members. It also includes reputed academic institutions, technology providers, vendors, contractors and nearly 150 individual professionals. NGS has established itself as an industry think tank and contributes to sectoral development through research, collaboration and dialogue. It actively interacts with organizations such as PNGRB, PESO and BIS and has also developed international knowledge-sharing relationships.

The Society regularly organizes seminars and conferences on Operations & Maintenance, Construction, Safety and other industry-specific subjects. It has also conducted specialized programmes on gas detection, flow metering and innovation, besides undertaking research studies on emerging gas markets and the impact of electric vehicles on the gas sector.

One of our unique initiatives is **GPS – Gyananubhav Pravah Sahayatra (ज्ञानानुभव प्रवाह सहयात्रा)**, which facilitates learning through direct exposure to the best practices of member organizations. The first edition was conducted with MGL, Mumbai, focusing on safety and operational practices, followed by a visit to THINK Gas, Bhopal, to showcase LNG storage and dispensing facilities. Such initiatives provide valuable "seeing is believing" experiences.

NGS also publishes the quarterly **Gas Statistics Review**, a fortnightly digital news snapshot and daily industry updates through its website.

Concluding Remarks

In keeping with this philosophy, the present conclave is dedicated to meaningful dialogue among industry leaders and practitioners and to encouraging the adoption of best practices, innovative technologies and efficient project execution methodologies. I request all participants to be as interactive as possible so that maximum benefit can be derived from the programme.

I conclude by expressing my sincere gratitude to GAIL (India) Limited, the official sponsor of this event, and particularly to Shri P.K. Agrawal, ED (Training) and Head of GAIL Training Institute, for facilitating this programme.

I also thank all the distinguished participants for their presence and valuable contribution, and extend my sincere appreciation to Dr. A.K. Balyan, Shri Sukhmal Jain and Shri Pramod Narang for gracing the occasion.

Thank you very much.

Special Address by Shri Sukhmal Jain, Former Director, BPCL

Introduction:

Shri Sukhamal Jain is an accomplished energy sector leader with 38 years of cross-functional experience spanning

petroleum, petrochemicals, gas, retail and sustainable energy. He served as director of marketing and board member of BPCL, where he led strategic initiatives, business transformation and large scale growth programs. During his tenure, he strengthened BPCL's market position, expanded the gas and CGG business and advanced clean energy initiatives including ethanol blending, EV charging, hydrogen adoption, and digital transformation. As executive director, gas business, he delivered strong profitability, enabled record CGD capex and drop energy optimization and cost savings. His leadership experience also include retail, LPG, strategy and regional business operations. He has served as chairman and director on boards of IGL, CUGL, GNGL and BRGL. His contributions have been recognized through prestigious industry awards reflecting his expertise in marketing, energy transition, business strategy and sustainable growth. and strengthening India's evolving Natural Gas ecosystem.

Address:

Shri Jain said "Distinguished guests on the dais, Dr. Balyan, Mr. Narang, Mr. Shastry, Mr. Satish, distinguished guests, industry colleagues and delegates, a very good morning to everyone. First of all, I would like to thank Mr. Shastry. After superannuation, it is always wonderful to reconnect with colleagues and return to the industry through such forums. I joined the gas sector relatively late in my career, after spending many years in LPG and retail. Looking at the evolution of the Indian gas industry, it has come a long way. The development of the Hazira–Vijapur–Jagdishpur pipeline created an important foundation, initially supporting fertilizer plants. Subsequently, gas-based power generation gained momentum, followed by the rapid development of City Gas Distribution (CGD).

Today, the gas sector has expanded significantly, with almost the entire country covered under the CGD authorization framework. At the same time, pipeline networks, regasification terminals and domestic gas production are expanding. The industry is still evolving, and some degree of standardization and policy development will naturally take time.

One of the important challenges in the early years was the classic question: should gas come first or infrastructure? Today, the focus has rightly shifted towards creating infrastructure so that gas can be utilized effectively when it becomes available. The infrastructure being created today will support the Natural Gas sector for decades. The experience of organizations such as IGL and MGL demonstrates that investments made many years ago continue to provide value.

This brings us directly to the importance of **construction management**. In my view, construction essentially revolves around three critical parameters: **time, cost and quality**. Project delays and cost overruns remain major challenges globally. The key question for us is how we can improve project execution and complete projects within planned timelines and budgets. Constraints will always exist, but they need to be anticipated during the planning stage and appropriate strategies developed to address them. For successful project execution, **planning and project governance from day one are extremely important**. In large projects, engineering and front-end planning require adequate attention. In smaller projects, particularly CGD, issues relating to rights of way, approvals and clearances need to be anticipated early.

Another important aspect is **contract management**. We must ensure that contracts are properly drafted and, equally importantly, understood by the people executing them. Many disputes arise simply because the parties do not adequately understand or follow the contractual provisions. A well-structured contract, combined with proper contract awareness, can significantly reduce disputes and help control time, cost and quality.

Similarly, timely procurement is critical. Delays in equipment and material can directly affect project schedules. Every construction professional should also understand the **critical path** of the project and identify activities that can influence overall completion.

Safety must remain non-negotiable. A single accident can cause significant setbacks to a project. Therefore, safety should be treated as an integral part of project execution rather than as an additional requirement.

The final area I would emphasize is **technology and digitalization**. The last decade has brought significant technological advancement across every sector, including oil and gas. Construction professionals should remain aware of emerging technologies and adopt those that can create long-term value.

Technologies such as GIS-based monitoring, digital systems for CGD networks, pipeline monitoring and digital twins for process and petrochemical facilities can improve efficiency, monitoring and reliability. While such technologies may initially appear costly, their long-term benefits and payback can be significant.

These are some of the thoughts I wanted to share with you. I hope the deliberations during this conclave will provide valuable insights and practical solutions for improving construction practices across the Natural Gas and allied sectors.

I sincerely thank the Natural Gas Society for inviting me and for providing this opportunity to interact with all of you.

Thank you very much."

Keynote Address by Shri Pramod Narang, Director (Technical)

Introduction:

Sri Pramod Narang *is an accomplished technocrat and industry leader with nearly four decades of distinguished experience in oil and gas sector. He's a mechanical engineer, graduated from NIT Suratkal. He currently serves as Director Technical at Petronet LNG Limited, where he leads project execution, strategic planning and operational excellence. Prior to joining Petronet LNG, November 2020, Sri Narang had an illustricious 35 years career with IOCL, rising to the position of Executive Director and insulating major infrastructure projects including cross country pipelines, crude oil and petroleum products, tank farms, and India's first transnational pipeline to Nepal. At Petronet LNG, he has driven exceptional operational performance at Dahej and Kochi LNG terminals, achieving record capacity utilization and throughput. Under his leadership, the terminal Received consecutive 5 years 5 star rating from British Safety Council. He has also led capacity expansion, LNG storage and emerging petrochemical projects.*

Shri Narang said "Distinguished guests on the dais, colleagues, ladies and gentlemen, It is a privilege to be part of this Conclave on Construction Management, and I sincerely thank the organisers for giving me this opportunity.

Over the years, I have worked on projects of different scales and complexities. One lesson that has consistently stood out is that success in construction is often driven not by complex theories, but by **disciplined execution of simple and practical principles**. I would therefore like to share a few lessons from my experience.

Let me begin with the **tender document**, which is the foundation of successful project execution. The tender should be clear, precise and capable of being interpreted in only one way. While preparing specifications, we often try to combine provisions from several codes and standards, sometimes making the document unnecessarily complicated or even difficult to implement. We should avoid duplication and ensure that requirements are practical and value-adding.

The second important aspect is **payment milestones**. Payment should be linked reasonably to project progress. If too much payment is kept towards the end, contractors may face cash-flow constraints, particularly those executing multiple projects. A stressed contractor ultimately means a stressed project. Therefore, payment milestones should be balanced and commensurate with actual progress.

The third area is **pre-bid meetings**. Genuine bidder queries should be encouraged and examined seriously. In my experience, bidders sometimes identify gaps or inconsistencies that the tender-preparing team may have overlooked. Therefore, pre-bid queries should be treated as an opportunity to improve the tender rather than simply responded to with "tender conditions will prevail."

I recall a case involving a long firefighting header where a bidder questioned the specified size. Instead of dismissing the query, the team reviewed the calculation and found that the size needed to be increased. The issue was corrected before award, thereby avoiding a major problem during construction. This demonstrates the value of carefully considering bidder feedback.

Similarly, **TQ and CQ requirements** should be simple, transparent and unambiguous. We should avoid unnecessarily complicated language. If a particular document or requirement is needed, it should be clearly stated rather than hidden behind elaborate clauses.

Once the contract is awarded, the **Engineer-in-Charge and project team** have an important role. The contractor should be treated as a project partner, not as an adversary. There should be proper handholding at the beginning, with clear communication regarding expectations, responsibilities and deliverables. Ultimately, the contractor and owner are on the same side, while the project is the common objective. Another important lesson is **innovation**. Suggestions from contractors should be evaluated on their merit rather than being rejected merely because they are different from the tender provision. In one LNG tank project, a contractor suggested using UT instead of gamma radiography for weld inspection. After technical evaluation, the alternative was accepted and helped save several months in project execution. Such examples show how practical innovation can directly improve project outcomes.

Similarly, during a petrochemical project, the team reviewed the specified pile-testing quantities and found that they were significantly higher than the code requirement. After technical review, the quantities were rationalized, helping the project progress faster and enabling the team to complete piling activities before the monsoon.

Regular project review meetings are another important tool. Conducting meetings is not enough; the action points must be followed up continuously. ATRs should be reviewed regularly, even between major review meetings, so that decisions taken are actually implemented and issues do not remain pending.

Finally, I would like to touch upon **dispute resolution and arbitration**. Contractual disputes can consume considerable time, money and management attention. Therefore, arbitration should ideally be the last resort. Problems should be identified and resolved at an early stage through dialogue, proper contract administration and timely decision-making. We should depersonalize issues and focus on the larger objective of completing the project successfully.

Friends, as I conclude, let me leave you with one thought: **construction success rarely comes from a single breakthrough. It comes from consistently applying simple principles with discipline, commitment and attention to detail.**

I sincerely compliment the Natural Gas Society for creating this platform for learning, collaboration and exchange of practical experiences. I encourage all participants to actively engage, share experiences and learn from one another during these two days.

May our discussions not only enrich our knowledge but also inspire us to build projects, teams and institutions that stand the test of time.

Thank you once again, and I wish you all a very fruitful and successful Conclave."

<u>Unveiling of the Report of NGS Conclave on Innovation 2026</u>

Before the address by the Chief Guest, **Dr. A. K. Balyan**, the dignitaries on the dais and other senior dignitaries present were invited to unveil the **Report of the NGS Conclave on Innovations 2026**.

The Conclave was held on **6–7 August 2026 at the Civil Services Officers' Institute (CSOI), K.G. Marg, New Delhi**, under the theme **"Innovations & Operational Excellence in Natural Gas Transmission, CGD, LNG & Future-Ready Infrastructure."**

Inaugural Address by Shri A K Balyan, Former Director, ONGC and Former MD & CEO, Petronet LNG Ltd.

Introduction:

Dr. A. K. Balyan *is a distinguished oil & gas professional with over four decades of experience in the energy sector,*

spanning strategic planning, operations, business development, human resources and corporate leadership.

He had a long and distinguished career with ONGC, where he held several senior leadership positions, including Director (Human Resources). In 2010, he was appointed Managing Director & CEO of Petronet LNG Limited (PLL), a position he held until July 2015, during a significant phase of growth in India's LNG infrastructure and market.

Following his tenure at PLL, Dr. Balyan continued to contribute to the oil & gas sector through senior advisory and leadership roles. His extensive experience and deep understanding of the Natural Gas and LNG industry have established him as a respected industry leader.

Address by Dr. A. K. Balyan – Summary

Dr. A. K. Balyan thanked the **Natural Gas Society (NGS)** and particularly Shri D. V. Shastry for inviting him to the Conclave. He appreciated the opportunity to interact with professionals from different organizations and emphasized that **learning is a continuous process**, irrespective of experience or seniority. He observed that everyone attending the Conclave is ultimately part of the **gas business**, whether working in pipeline construction, CGD, project execution or another specialized function. Therefore, decisions should always be viewed from the broader perspective of maximizing the value of gas for the organization and the country.

Dr. Balyan reflected on the evolution of the Natural Gas sector in India. He recalled that during the earlier years of the oil and gas industry, the primary focus was on oil, while several gas discoveries remained underutilized because suitable markets and infrastructure were not available. Associated gas was also flared in significant quantities. Over time, the industry recognized the efficiency and versatility of Natural Gas and the need to develop infrastructure to connect gas resources with consumers.

Sharing his experience from **Tripura**, Dr. Balyan explained that significant quantities of gas had been discovered, but there were initially no adequate consumers. He recalled making several presentations to the concerned authorities to enable the use of the available gas for power generation. This eventually contributed to the development of the

Tripura Power Corporation, allowing the gas resource to be utilized productively. He noted that the experience demonstrated an important principle: **gas resources acquire value only when appropriate infrastructure, markets and end-use applications are developed around them**.

Dr. Balyan emphasized that the development of a robust **Natural Gas pipeline network** has been critical in converting gas resources into useful energy and feedstock. Natural Gas today serves multiple purposes, including fuel, feedstock and power generation. He also highlighted the importance of LNG, which has transformed the gas business by enabling gas to be transported over long distances and across regions where pipeline connectivity is not available.

Discussing the **global and Indian gas scenario**, Dr. Balyan observed that Natural Gas has an important role in the energy transition because of its comparatively lower environmental impact and high efficiency. Although gas is often referred to as a *"bridge fuel,"* he suggested that its role could extend significantly beyond the transition period. In India, the **CGD sector is emerging as a major growth driver for Natural Gas consumption**, while expansion of the pipeline network and LNG infrastructure is creating greater opportunities for supply and distribution.

He pointed out that India's **per-capita gas consumption remains relatively low compared with global levels**, indicating considerable potential for future growth. Dr. Balyan also highlighted the importance of increasing Natural Gas penetration in India's energy mix and referred to the **PNGRB Vision 2040** recommendations, encouraging industry professionals to study the report and understand the opportunities and challenges associated with increasing the share of gas in the country's energy basket.

Dr. Balyan further emphasized the need for **integrated gas infrastructure**, including connecting LNG terminals and other gas sources to the national pipeline grid and strengthening last-mile connectivity. He noted that the availability of LNG import infrastructure provides India with greater flexibility to meet growing gas demand even when domestic gas production is insufficient.

A major part of Dr. Balyan's address focused on **project execution and construction management**. Referring to recent studies, he highlighted the significant level of project delays and cost escalation across the energy sector. He identified several causes, including information gaps between project sites and offices, lack of real-time progress tracking, manual reporting, fragmented project-management systems and reactive rather than predictive scheduling.

He stressed the need for **modern project management practices**. Among the key principles highlighted were establishing a single source of project data, integrating schedules, costs, resources and documents, empowering decision-makers, incorporating risk registers into project schedules and cost estimates, and using **Earned Value Management (EVM)** to provide early warning of schedule and cost deviations.

Dr. Balyan also emphasized that **scope, cost and schedule must be managed together** rather than as separate elements. He recommended preparing exception reports at the completion of projects to capture challenges, solutions and lessons learned. Such learning should be systematically transferred to subsequent projects. He also highlighted the importance of **portfolio management** for organizations executing multiple projects, so that resources can be optimally allocated across projects.

Another important theme of his address was **constructability**. Dr. Balyan explained that construction considerations should be incorporated at the engineering and design stage itself. A technically excellent design may still create major difficulties if it cannot be practically constructed. Early involvement of construction teams can therefore minimize design changes and rework, improve productivity, enhance safety and quality, and help projects meet cost and schedule targets.

Sharing an example from his earlier experience, Dr. Balyan recalled how an architecturally attractive design for a major facility was subsequently found to be extremely difficult to construct. The example demonstrated why **engineering excellence must always be complemented by constructability considerations**.

Looking at the future, Dr. Balyan identified **digitalization, digital twins, artificial intelligence, predictive analytics, modular construction, prefabrication, drones, IoT sensors and satellite imagery** as important tools for improving project execution. These technologies can help in monitoring progress, predicting delays, optimizing procurement, improving asset management and reducing risks at construction sites.

However, Dr. Balyan emphasized that **technology alone cannot guarantee project success**. The most important factor remains the people who plan and execute projects. He advocated developing competent, empowered and accountable project teams and continuously investing in professional development. He encouraged participants to enhance their knowledge of project management, risk management, cost and schedule management, financial analysis and **contract management**.

He particularly stressed the growing importance of contract management and advised professionals to understand contractual provisions thoroughly. Effective contract management, he noted, can help resolve issues at an early stage and reduce the possibility of disputes and arbitration.

Concluding his address, **Dr. A. K. Balyan** urged participants to continue learning, strengthen their professional capabilities and adopt innovative approaches to project execution. He emphasized that professionals engaged in Natural Gas infrastructure have an important role in supporting India's transition towards a **gas-based economy**. He conveyed his best wishes to all participants and thanked NGS once again for providing him the opportunity to share his experience and perspectives at the Conclave.

Vote of Thanks: Vote of thanks for the dignitaries was proposed by shri Satish Geda, Sr Consultant, NGS

A memento was presented to the dignitaries as a token of gratitude and appreciation for their valuable presence and contribution to the event.

Day 1, Session - II (Timing: 11:15 Hrs – 13:00 Hrs)

Panel Discussion: Ist

Topic: ***Vision 2040: Building Future-Ready Natural Gas Infrastructure through Construction Excellence, EPC Innovation & Efficient Execution towards India's Target of Increasing Natural Gas Share to 15% in the Energy***

Panel Moderator: Shri K K Jha, Former Member (Infra), PNGRB and Director (P/L), IOCL

Panellists:

1. Shri Shyamanand Jha, ED (EPCM & C), IOCL
2. Shri Rouf Khan, ED (Projects), BPCL
3. Shri D Jana, Div. Head (Projects), VCS & Former CGM (Projects), EIL
4. Dr. Harsh Sachdev, Prof. FORE School of Management (former ED, IOCL)
5. Sh. Rajeev Chak- Senior General Manager (Projects), EIL
6. Shri Subhdeep Banerjee, CGM (Projects) GAIL

Introduction of the Panel Moderator: Shri K K Jha, Former Member (Infra), PNGRB and Director (P/L), IOCL

Shri. Kiran Kumar Jha, Former Member PNGRB, Former Director Pipeline (IOCL) Kiran Kumar Jha is a seasoned professional with over 40 years of experience in the petroleum and Natural Gas sector. He holds a Bachelor's degree in Mechanical Engineering and is a certified Project Director (IPMA-A).

He served as a Member of the PNGRB from 2012 to 2017, where he played a key role in promoting infrastructure development, ensuring regulatory compliance, and fostering competitive markets in the energy sector. Prior to this, he had a distinguished career at Indian Oil Corporation Ltd. (IOCL), rising to the position of Director (Pipelines) and contributing significantly to the company's growth, profitability, and energy security.

He has presented technical papers at international conferences and is a member of several prestigious professional organizations, including the National Association of Corrosion Engineers (NACE). He also served on the board of Petronet India Limited and contributed to the development of safety standards for Oil Industry

Shri K K Jha Initiated the discussion: -

Opening Remarks by Shri K K Jha, Session Moderator

A warm welcome to the second session of the Conclave. We had an excellent inaugural session covering the broad overview of construction management. In this session, we will focus on **making India's Natural Gas infrastructure future-ready**. India aims to increase the share of Natural Gas in its primary energy mix to **15%**, compared with around **6.7% at present**. Achieving this objective will require substantial development of infrastructure across the Natural Gas value chain.

One of the key priorities is to **accelerate the development of Natural Gas pipeline infrastructure**. While India already has a significant pipeline network, gas demand is expected to grow substantially in the coming decades. Therefore, infrastructure must be planned and created well in advance to meet future requirements. At the same time, optimum utilization of the existing pipeline capacity will also be important.

Another critical area is **excellence in project execution**. We need to reduce project delays and cost overruns through better planning, contract management, stakeholder coordination, digital monitoring and modern construction practices.

Right of Use (RoU) management and statutory clearances also remain important challenges for pipeline and CGD projects. Permissions from municipalities, State Governments and other statutory authorities can significantly influence project timelines. Streamlined processes, early coordination and effective digital platforms can help address these bottlenecks.

The other major area is **digitalization, automation and artificial intelligence**. These technologies have the potential to transform project planning, construction monitoring, asset management, pipeline integrity, predictive maintenance and operational decision-making. We should therefore make effective use of these technologies to improve efficiency, safety and reliability.

At the same time, the energy landscape is evolving with **Compressed Biogas (CBG), hydrogen and other emerging fuels**. CBG can complement the Natural Gas ecosystem, while hydrogen blending requires us to think ahead about pipeline materials, metallurgy, equipment and metering systems.

Therefore, **future readiness must begin today**. The infrastructure being designed and constructed now should not only meet current requirements but also be capable of accommodating future technologies and changing energy needs.

In summary, achieving India's gas-sector objectives will require **accelerated infrastructure development, excellence in project execution, efficient RoU management, Artifical Intellience, digitalization, automation and preparedness for emerging fuels**.

I look forward to an insightful and engaging session and to learning from the valuable experiences of our distinguished speakers and participants.

Indians targeting 15% share of Natural Gas and energy basket. So what are the most important infrastructure priorities for achieving this objective? So if you can highlight those points which we will like to hear from each panelists:

First he invited My. Subhdeep Banarjee by introducing him "***Shri Subhadeep Banerjee*** *is a senior professional in the Natural Gas and pipeline infrastructure sector and is presently serving as Chief General Manager (Projects), GAIL (India) Limited. He is a graduate of Motilal Nehru National Institute of Technology (MNNIT), Allahabad, and has been associated with GAIL for several years, contributing to the development and execution of major Natural Gas infrastructure projects."*

Shri Subhdeep Banerjee, CGM (Projects) GAIL (India) Limited

Thank you, Sir. Thank you very much for giving me this opportunity to speak on such an important subject. At the outset, I extend a warm welcome to all the distinguished delegates, panellists, NGS members and participants.

The subject is extremely important, particularly in the context of India's objective of increasing the share of Natural Gas in the primary energy mix to 15%. Achieving this is certainly a challenging target, and GAIL is playing an important role in developing the infrastructure required to make this objective a reality.

Let me begin with a few numbers. PNGRB has authorized approximately 33,000 km of Natural Gas pipelines to various entities. Of this, GAIL has already commissioned and is operating around 18,700 km of Natural Gas pipelines. Through this network, approximately 122 MMSCMD

of Natural Gas is currently being transported across the country, which accounts for nearly 65% of the total Natural Gas transported in India.

In addition to the existing network, GAIL is currently executing around 1,500 km of additional pipelines, most of which are expected to be completed by the end of the current financial year.

One important example is the Kochi–Koottanad–Bengaluru–Mangaluru Pipeline (KKBMPL). This project demonstrates the challenges involved in large-scale pipeline execution. Construction commenced several years ago, and after addressing various implementation challenges, the project is now approaching completion, with commissioning targeted in the coming months.

Another example is the Dhamra–Haldia pipeline, where Right of Use (RoU) acquisition and coordination with Central and State Government authorities presented significant challenges. Through continuous engagement with the Government and other stakeholders, these issues have progressively been addressed, enabling the project to move forward.

Going forward, GAIL is also focusing on augmentation of the existing pipeline network. Our objective over the next five years is to increase the gas transmission capacity from around 122 MMSCMD to approximately 168 MMSCMD. This will require not only new pipeline construction but also augmentation of existing infrastructure and, importantly, creation of redundancy in the pipeline network.

Redundancy is critical for ensuring reliability and continuity of gas supply. In the event of a disruption or shutdown in one pipeline, an alternative route can continue supplying gas to CGD networks and other customers. This will make the overall transmission system more robust, resilient and reliable.

Therefore, through a combination of new pipeline development, augmentation of existing infrastructure and creation of network redundancy, GAIL is working towards building a stronger and more resilient Natural Gas transmission network.

These initiatives will play an important role in supporting the growth of Natural Gas consumption and, ultimately, in helping India move towards its objective of achieving a 15% share of Natural Gas in the primary energy mix

Thank you very much.

Shri K K Jha, Session Moderator commented:

Thank you, Mr. Banerjee, for highlighting how the 15% target can be achieved through the growth and expansion of gas infrastructure.

Once we talk about infrastructure development, the next important question is **how this infrastructure can be built efficiently, cost-effectively and within the stipulated timelines**. Pipeline projects can be executed through various contracting approaches. One is the conventional model, where procurement is undertaken by the owner and contractors are engaged separately for execution. Another increasingly adopted and efficient approach is the **EPC model**.

It would therefore be interesting to understand how EPC contracting strategies can help improve **cost efficiency, schedule adherence and quality performance** in pipeline projects.

To share his valuable insights and experience on this important aspect, I am pleased to invite our next panellist, **Mr. Rouf M. Khan**, to address the gathering.

Shri Rouf M. Khan *is a senior oil & gas professional with over three decades of experience in projects, marketing, strategy, retail operations, engineering sales and City Gas Distribution (CGD).*

A Civil Engineering graduate from NIT Trichy, he also holds a Post Graduate Diploma in Executive Management from SPJIMR. Since April 2024.

He has been leading CGD-related activities at Bharat Petroleum Corporation Limited (BPCL), with responsibility for advancing the company's gas business initiatives. He joined BPCL in July 1993 and has held progressively responsible assignments across Maharashtra, Uttar Pradesh, Jammu & Kashmir, Punjab and the Northern Region.

His earlier roles included Retail Operations, Engineering Sales, Budget Administration, Territory Management, Retail Sales and Retail Engineering, followed by a Chief Manager – Sales assignment.

His diverse field and managerial experience, combined with his current leadership role in CGD, provides valuable insights into gas-sector growth, customer-focused business development and operational excellence.

Shri Rouf Khan, ED (Projects), BPCL

Mr. Rouf Khan expressed his gratitude to NGS and the panel for the opportunity to participate in the discussion. He highlighted that **EPC contracting is one of the critical backbones for achieving the expansion of the Natural Gas sector from 6% to 15% of India's energy mix**. Given the scale of the pipeline infrastructure required, efficient EPC execution is essential for timely and cost-effective project delivery.

He noted that while a large number of GAs are already connected to the trunk pipeline network, significant connectivity gaps remain. Out of the 309 GAs announced, around **254 have pipeline connectivity, while nearly 55 GAs are still awaiting trunk pipeline connectivity**. With a substantial proportion of projects facing delays, EPC strategy requires greater attention to planning, contracting and execution.

Based on his experience in the CGD sector, he highlighted several important areas:

1. **Select the EPC model based on project complexity:** A well-defined route with predictable scope may be suitable for a lump-sum turnkey EPC model. However, complex projects involving rivers, hills, forests or other specialised requirements may need specialised packages or named specialists within the EPC structure.
2. **Ensure clarity on Right of Way (RoW) and statutory constraints:** Tender documents should clearly disclose known constraints and provide appropriate contractual provisions. Delays in forest approvals,

land access and other statutory clearances can severely affect project schedules if such risks are not addressed upfront.

3. **Design packages around execution and commissioning:** A single EPC package provides better integration but may restrict competition and specialist participation. Multiple packages can enable parallel execution and specialist involvement, but require clearly defined interfaces, responsibilities and coordination mechanisms.
4. **Strengthen contractor and vendor assessment:** Contractor capacity, financial strength, available resources and concurrent commitments should be rigorously evaluated. He emphasised the need for an effective **vendor performance-rating system**, where consistently performing contractors receive appropriate recognition and preference.
5. **Improve cost certainty through benchmarking:** Merely obtaining low tender prices does not guarantee project success. Industry-level benchmarking of rates and better commercial planning are required to achieve realistic cost certainty and avoid subsequent execution difficulties.
6. **Promote collaboration across the gas industry:** Companies should collaborate to address common supply-chain challenges, including material availability and price volatility. Sharing experience and resources among established gas companies can help accelerate infrastructure development.
7. **Create an integrated gas infrastructure ecosystem:** The remaining GAs without pipeline connectivity need focused attention. Private CGD companies can benefit from the experience and expertise of established organisations such as GAIL and other experienced gas companies through partnerships, knowledge sharing and collaborative execution.

The speaker concluded that **successful EPC execution requires appropriate contracting strategies,**

realistic planning, effective risk allocation, capable contractors, stronger performance management and greater collaboration across the gas industry. Addressing these issues will be essential for completing the remaining pipeline infrastructure and enabling the wider growth of the Natural Gas economy.

Shri K K Jha, Session Moderator commented: Shri Jha thanked Mr. Khan for highlighting the important aspects of EPC contracting.

I would also like to emphasise that in any EPC project, proper planning *and clarity of responsibilities between the owner and EPC contractor are extremely important*. The scope of each party should be clearly defined from the beginning. We experienced this during the Kandla–Bhatinda Pipeline project, where the responsibilities of Indian Oil and the EPC contractor were clearly specified. However, several contractual issues arose during execution, including claims and requests for change orders. The experience demonstrated the importance of having a strong team that understands the contract thoroughly and is capable of managing contractual risks effectively.

In large EPC contracts, the contract document should be carefully examined before commencement, with detailed “what-if” analysis and scenario planning to anticipate potential risks and claims. Equally important is deciding what scope should remain with the owner and what should be entrusted to the EPC contractor, depending on the respective capabilities of both parties. Ultimately, effective project planning, clear scope definition, appropriate risk allocation and strong contract management are essential for avoiding cost and schedule overruns.

This brings us to an important question: What changes are required in project planning to reduce delays in major gas infrastructure projects? I would now like to invite Shri Shyanand Jha, Executive Director (EPCM &

Construction), Indian Oil Corporation Limited, to share his views on how project planning should be undertaken for successful and timely execution.

Shri Shyamanand Jha *is a seasoned oil and gas professional with 32 years of extensive experience in the Pipelines Division of Indian Oil Corporation Limited (IOCL). He is B.Sc. Engineering (Civil) graduate, he currently serves as Executive Director (EPCM & Construction), Pipelines Head Office, Noida, overseeing EPCM services and execution of major pipeline projects. Previously, he served as Chief Executive Officer (CEO), IHB Limited, where he played a key leadership role in implementing the Kandla–Gorakhpur LPG Pipeline, the world's longest LPG pipeline.*

During his career, Shri Jha has handled diverse responsibilities across pipeline project construction, civil design of pipeline facilities, operations & maintenance, procurement, and project execution, at station, base, regional and head-office levels.

His extensive experience combines strong technical expertise, project management capabilities and leadership in delivering complex pipeline infrastructure projects with a focus on safety, quality, efficiency and operational excellence.

With his extensive experience in pipeline project execution, I request Shri Jha to kindly share his insights on effective project planning and measures to minimise project delays.

Shri Shyamanand Jha, ED (EPCM & Construction), IOCL

Thank you, Sir. Thank you, Shastry Ji and Geda Ji, for inviting me to this august gathering.

As we heard in the first presentation, several factors contribute to project delays. One of the most important lessons from my experience is that robust planning and execution readiness at the front end can significantly minimize delays.

In many pipeline projects, we undertake basic engineering, award the job to a contractor and then start resolving issues as they emerge in the field. Instead, our approach should be: first make the project execution-ready and then define the contractual timelines.

The first and most important step is route selection. The route should be finalized after considering its actual executability, even if this results in some increase in length. A slightly longer but executable route is preferable to a shorter route with significant implementation challenges.

Once the route is finalized, the execution methodology should also be established in advance. Issues related to HDD, submerged crossings, rock strata and soil conditions frequently lead to disputes when the contractor discovers that the specified methodology is not practical in the field. Detailed geotechnical investigations and verification of ground conditions, including the type and capacity of HDD equipment required, can substantially reduce such problems.

The design and location of sectionalizing valves should also be finalized before contract award. Locations must consider ground conditions, drainage and accessibility; otherwise, valves may become difficult to operate or remain vulnerable to waterlogging.

Another major factor is RoU and statutory clearances. Since pipeline projects are linear in nature, a route should be selected with minimum resistance. A risk register should be prepared from the beginning, identifying locations where additional time and stakeholder coordination may be required.

Project monitoring should also make greater use of GIS-based RoU monitoring, GPS-enabled field reporting and drone surveys. These tools provide real-time visibility of site progress and enable timely decisions regarding contractor mobilization and construction priorities.

The key message is that we should devote greater attention to front-end loading and execution readiness rather than rushing into contractor mobilization.

Finally, project schedules should be based on the actual execution strategy. If PNGRB provides a standard completion period, our planning should consider project length, work fronts and the number of contractors required. For example, in the Kanpur–Gorakhpur pipeline, dividing the project into multiple groups enabled simultaneous working on several fronts and helped accelerate execution, although certain clearance-related issues caused delays.

Therefore, the fundamental principle should be: "**Think about execution readiness first, and contractual milestones thereafter."** This is one of the key lessons I have learned from my experience of more than three decades in the industry. Thank you.

Shri K K Jha, Session Moderator commented:

Thank you, Shri Jha, for highlighting the critical importance of robust project planning, route selection, execution methodology, geotechnical assessment, design preparedness and front-end planning in ensuring successful project execution.

While effective planning provides the foundation for a project, construction excellence ultimately determines the quality, reliability and long-term performance of the infrastructure created. This becomes particularly important in large natural gas pipeline and associated infrastructure projects, where construction quality has a direct bearing on safety, integrity, operational reliability and asset life.

To take this discussion further, I would now like to invite Shri Dipanjan Jana, to share his valuable perspectives on construction excellence in large natural gas pipeline and associated infrastructure projects. With over three decades of experience across project management and construction in the energy and hydrocarbon sectors, Shri Jana brings extensive exposure to the complete project lifecycle, from engineering and procurement through construction, commissioning and handover.

Shri Dipanjan Jana *is a distinguished Project Management and Construction professional with over 37 years of*

experience in executing complex EPC, EPCM, EPCC, BOOT and LSTK projects across the energy and hydrocarbon sectors. His experience covers the complete project lifecycle, from concept and FEED through engineering, procurement, construction, commissioning and handover.

He has extensive exposure to refineries, petrochemical complexes, gas processing facilities, utilities and off-sites, breakwaters, and onshore cross-country pipelines. He is recognized for delivering projects under compressed schedules, challenging brownfield conditions, severe logistical constraints, and stringent HSE and quality requirements.

His core competencies include project management, construction management, contract management and multi-stakeholder coordination for large, high-visibility projects, with a strong focus on safety, quality, cost, schedule and execution excellence.

Shri D Jana, Div. Head (Projects), VCS & Former CGM (Projects), EIL The speaker emphasized that construction excellence is a broad and continuously evolving concept, with no single or fixed definition. In an ideal situation, a project can be considered successful when it is completed within the planned cost and schedule, without safety incidents, and is able to generate revenue for the client as planned. However, large linear projects such as pipelines and associated downstream infrastructure face numerous challenges that can affect these objectives.

A major concern highlighted was Right of Way (RoW) and local stakeholder issues, where resistance and demands from affected communities can lead to delays and significant cost escalation. The speaker suggested that dedicated pipeline corridors and a more centralized mechanism for statutory clearances could help streamline approvals and reduce project execution timelines.

He also emphasized the need for a performance-based contractor selection and rating system across the industry. In addition to commercial considerations, contractor capability, quality and past performance should be given due importance. NGS could consider facilitating a uniform industry-wide performance-rating framework.

Other important measures included upskilling construction workers and supervisors, regular safety and quality awareness programmes, and adopting a collaborative risk-management approach. Contractors should not only be penalized for delays but also incentivized for timely or superior performance.

The speaker further stressed the importance of Make in India, particularly for specialized equipment and metering systems, as domestic manufacturing could substantially reduce procurement lead times. He concluded that construction excellence ultimately depends on professional responsibility, quality consciousness, safety awareness and a collective commitment to developing the country's infrastructure.

Shri K K Jha, Session Moderator commented:

Thank you, Mr. Jana, for highlighting the **salient aspects of construction management and the measures required to enhance project execution and construction excellence**.

We have been discussing the **Vision 2040** and India's objective of increasing the share of natural gas to **15% of the primary energy basket**. Achieving this ambitious target will require not only substantial expansion of gas infrastructure but also a clear understanding of the infrastructure that India will need to develop over the coming decades. This brings us to an important question: **What should India's natural gas infrastructure look like by 2040, and what will be the defining features of a future-ready gas ecosystem?**

To share his perspectives on this important subject, I would now like to invite **Dr. Harsh Sachdeva** to speak on **"Defining Features of India's Gas Infrastructure by 2040."**

Dr. Sachdeva, may I request you to kindly share your views and insights with us.

Dr. Harsh Sachdev *is a seasoned management professional and mentor with over three decades of experience, including a distinguished career with* ***Indian Oil Corporation Limited (IOCL)****, where he served as an* ***Executive Director****. He has extensive expertise in* ***ethics, vigilance, corporate governance, leadership, risk management, petroleum marketing and public-sector management****.*

A ***B.Tech. (Civil) Honours*** *graduate and* ***Ph.D. in Management****, Dr. Sachdev has significant experience in preventive vigilance, fraud-risk management and organizational integrity. He has been actively associated with executive education and management development, collaborating with premier institutions and mentoring senior professionals, particularly from the public sector. He is also an experienced* ***speaker, executive educator, leadership mentor and governance professional****, with a strong focus on promoting ethical leadership, accountability and responsible decision-making. His professional mission is to help organizations build a culture of* ***integrity, transparency, excellence and good governance****.* Over to Dr. Sachdeva for Vision 2040. Thank you.

Dr. Harsh Sachdev, Prof. FORE School of Management (former ED, IOCL)

Dr. Harsh Sachdeva expressed his appreciation to NGS for the opportunity to share his perspectives and noted the

importance of the young and energetic professionals who would play a key role in shaping India's development journey towards **Viksit Bharat 2047**.

Speaking on the future of India's gas infrastructure, he highlighted the significant increase expected in natural gas demand by 2040. Referring to the PNGRB roadmap, he noted that gas demand could rise from the present level of around **185–200 units to approximately 500–630 units by 2040**, indicating the need for substantial expansion of infrastructure.

He emphasized that merely increasing pipeline length would not be sufficient. India would need a **well-connected, resilient and flexible gas transmission**

network, with stronger interconnections and wider geographical coverage. The network should also be capable of responding to disruptions and enabling gas to be supplied from one part of the country to another as required.

He further highlighted the importance of **LNG security**, distinguishing it from simple LNG availability. In his view, energy security would require LNG to remain accessible at reasonable and competitive prices even during global supply disruptions.

Overall, he emphasized that India's 2040 gas infrastructure must focus on **capacity expansion, connectivity, resilience, flexibility and LNG security** to support the country's growing energy requirements.

Shri K K Jha, Session Moderator commented:

Thank you, Dr. Sachdeva, for outlining the **Vision 2040** and highlighting the key requirements for building a resilient, connected and future-ready natural gas infrastructure. Taking this vision to the **micro level**, there are several aspects that merit attention. For instance, in colder regions such as **Ladakh, Srinagar and other parts of the country**, natural gas could potentially play a greater role in meeting heating requirements. While natural gas has been available for commercial use in India for several decades, there remains significant scope to expand its application for household and space-heating requirements, thereby reducing dependence on traditional fuels.

Another important aspect is ensuring that infrastructure development keeps pace with the growth in demand. We have seen rapid development of road infrastructure and expressways, enabling high-speed connectivity across the country. However, the supporting **CNG infrastructure and refuelling capacity** also need to be developed proportionately. Instances of long waiting times at CNG stations highlight the importance of ensuring adequate capacity and accessibility along major transportation corridors.

Therefore, our approach to infrastructure development needs to be **holistic and integrated**, ensuring that transmission, distribution, LNG, CNG and end-use infrastructure develop in tandem. Looking ahead, we must also ensure that today's infrastructure is **future-ready**. With hydrogen blending trials, hydrogen-powered buses and other emerging applications already being explored, it is important to consider the compatibility of existing and upcoming gas infrastructure with future fuels.

With this perspective, I would now like to invite **Shri Rajeev Chak, Senior General Manager (Projects), EIL**, to share his views on **hydrogen blending and the requirements for developing future-ready gas infrastructure**.

Shri Rajeev Chak *is a distinguished oil & gas and energy-infrastructure professional with over 36 years of national and international experience, he has worked extensively across project development, engineering, project execution, operations, pipelines, gas processing and hydrocarbon infrastructure.*

A Mechanical Engineering graduate from NIT Trichy, with postgraduate and MBA qualifications from IIT Delhi, he has held senior positions with Indian Airlines, BHEL, GAIL, Adani Energy, ADNOC/ADOC Abu Dhabi and Engineers India Limited (EIL). He currently serves as Senior General Manager (Projects), Pipeline Project Division, EIL.

A pioneer in India's CNG and City Gas Distribution (CGD) development, he was part of the GAIL team that initiated a pilot project in 1992 to introduce Natural Gas for vehicles and the domestic sector, contributing to India's clean-energy transition. His work with ARAI, VRDE and IIP, along with automobile manufacturers, included development of an innovative NGV/CNG vehicle-parallel fueling system.

Sh. Rajeev Chak- Senior General Manager (Projects), EIL

The speaker highlighted the growing importance of hydrogen blending in natural gas infrastructure and noted

that Engineers India Limited (EIL) is working on developing solutions, operational guidelines and SOPs to support the safe integration of hydrogen into existing and future pipeline systems.

He explained that hydrogen presents specific technical challenges because its small molecular size can contribute to hydrogen embrittlement, potentially affecting the ductility and toughness of pipeline materials. Hydrogen blending can also influence the calorific value and energy-carrying capacity of the gas, requiring careful assessment of its impact on end-use applications.

Two broad challenges were identified: adapting existing pipeline infrastructure and designing future infrastructure for hydrogen compatibility. For existing pipelines, detailed integrity assessment is essential, including evaluation of wall thickness, metal loss, stress levels, operating and design pressures and the condition of the pipeline material. Testing of representative pipeline material under hydrogen-rich conditions is required to determine safe operating pressures and blending limits.

The speaker also emphasized the need for more testing laboratories and commercial testing facilities in India to support hydrogen-readiness assessments. Strategic injection points may need to be identified based on pipeline pressure profiles rather than introducing hydrogen uniformly across the entire system.

For future pipelines, hydrogen considerations should be incorporated from the design stage itself, including blending ratios, material selection, operating conditions and hydrogen availability. He emphasized that these aspects should form part of the Detailed Feasibility Report (DFR) to ensure that new infrastructure is genuinely future-ready.

Shri K K Jha, Session Moderator commented:

Thank you, Mr. Rajeev, for providing valuable insights into both aspects of hydrogen integration—the preparedness of existing infrastructure and the requirements for designing future-ready infrastructure.

We have heard valuable perspectives from all the panelists on infrastructure development, project planning, EPC contracting, construction excellence, future gas demand, network resilience and hydrogen readiness.

Before we conclude the session, I would now like to open the floor for questions and observations from the participants. If you have any questions, please introduce yourself briefly and direct your question to any particular panelist. I invite the participants to share their questions and engage with the distinguished panelists.

The floor is now open for the Q&A session.

Response to Question on Higher-Grade Steel and Hydrogen

In response to the question regarding the use of higher-grade steel, the panelist explained that higher-strength steel can present greater challenges for hydrogen service due to hydrogen penetration and the associated risk of embrittlement. While lower-grade steel may offer better resistance, using it for high-pressure pipelines would require greater wall thickness, resulting in higher steel consumption and increased costs. Since line-pack cost is also a significant component of pipeline economics, a balance is required between material strength, wall thickness, pressure requirements, safety and overall project economics.

Regarding the use of composite materials, it was clarified that EIL primarily works as a consultant, while the development and commercialization of newer materials and technologies largely rests with manufacturers and technology providers. The panelist also indicated that polyethylene pipelines are generally considered suitable for hydrogen applications, while their own specific considerations, such as exposure to ultraviolet radiation, need to be addressed.

Question on PM Gati Shakti

A participant raised a question on the role of the PM Gati Shakti initiative in reducing bottlenecks and delays in pipeline construction.

The panellist explained that once a project is registered under Gati Shakti, it receives high-level monitoring at the Government level. This can help address delays related to RoU, permissions and coordination with State Governments. Such projects are reviewed through the Government's project implementation mechanism, which can facilitate greater accountability and encourage concerned State authorities to resolve pending issues. The initiative was therefore seen as a useful mechanism for improving coordination and supporting timely project implementation.

Concluding Remarks by the Moderator

The moderator, while concluding the session, observed that India has witnessed several landmark transformations, including the Green and White Revolutions, but the contribution of the oil and gas sector in enabling the country's energy security also deserves recognition.

Despite challenges, including global disruptions, the industry has continued to ensure the availability and delivery of oil and gas across the country. This represents the collective contribution of professionals across the oil and gas sector towards national development and energy security.

Summing up the session, he emphasized that achieving India's gas-based economy objectives will require much more than expanding infrastructure. It will require disciplined project planning, timely RoU availability, robust EPC strategies, strong safety and quality systems, and a forward-looking approach towards emerging areas such as CBG and hydrogen. He expressed his appreciation to all the distinguished panellists for their valuable contributions and thanked the Natural Gas Society (NGS) for providing the platform for meaningful industry interaction and knowledge sharing.

Closing Remarks and Felicitation

Shri Satish Geda thanked Shri Jha, for moderating such an insightful and engaging panel discussion.

He said "I believe there were several more questions that could have been taken up, but due to the paucity of time, we will have to conclude the discussion here. We are indeed fortunate to have such an experienced and distinguished panel with us today. I would encourage the participants to continue the interaction with the panellists and seek their guidance and perspectives even beyond this session. I would also like to place on record our sincere appreciation to all the distinguished panellists for sharing their valuable insights and experiences on construction excellence, EPC innovation and efficient project execution, particularly in the context of India's 2040 energy vision."

He thanked session moderator & all the panellists once again for their valuable contributions.

Mementoes were presented by Shri Jha to all the panelists and Shri D V Shastry presented memento to Shri Jha as a token of gratitude.

Day–1 | Session–III (14:00 Hrs – 15:30 Hrs)

Technical Session (Presentations): Ist

Theme: ***Major Natural Gas Pipeline Projects: Construction Challenges, Innovative Practices, New Technologies & EPC Experience Sharing***

Session Chair: Shri Devesh Varshney, ED(Projects), GAIL (India) Limited

Shri Devesh Kumar Varshney is a seasoned energy sector professional with over 32 years of rich and

diversified experience in the oil & gas and petrochemical industry. A Chemical Engineering professional, he joined GAIL in July 1994 as a Graduate Engineer Trainee and has progressed through various leadership positions to his present role as Executive Director.

During his distinguished career, he has handled key assignments at Vijaipur, Vaghodia, Pata, Delhi Corporate Office and Noida, gaining extensive experience in gas processing, petrochemical operations, pipeline infrastructure and project execution. He has led major strategic initiatives including the Mumbai–Nagpur–Jharsuguda Pipeline, Srikakulam–Angul Pipeline, floating solar projects and green hydrogen initiatives involving PEM electrolyzer technology.

His expertise encompasses large-scale project execution, commissioning, operations management, strategic planning and stakeholder coordination. With strong techno-commercial acumen and organizational leadership, Mr. Varshney has made significant contributions to India's Natural Gas and energy infrastructure development.

Shri Varshney chaired the four presentations of this session:

Session: Day-1, Session-III – Technical Session-I

Ist Presentation Topic: **Mumbai-Nagpur-Jharsuguda Pipeline (MNJPL)- Connecting Coasts • Strengthening Energy Security • Transforming Central India (**An Experience Sharing): Pipeline laying along NH Corridor, Opportunities & Challenges vis-à-vis Conventional Pipeline Routing (through PMP Procedure 3.1/6.1 notifications etc.)

Speaker: Shri Hussain Ali, DGM (Project), GAIL

Presentation Brief:

The presentation shared GAIL's execution experience in laying the Mumbai–Nagpur–Jharsuguda Pipeline (MNJPL), particularly the challenges associated with pipeline construction along National Highway corridors and the differences between planned assumptions and actual site conditions.

Project Execution Challenges

A major feature of the presentation was the comparison between the assumptions made during project execution

and the actual conditions encountered at site.

The initial planning assumed availability of graded Right of Use (ROU), a fixed number of crossings, no requirement for forest permissions, a continuous 10–12 metre working strip and completion of pipeline laying before road opening. However, actual execution encountered uneven ROU, rock dumps and altered soil strata. The number of crossings increased substantially because of expressways, interchanges, steep cuts, tunnels, wildlife crossings and road embankments extending to the edge of the ROU. Additional forest permissions were also required, while obtaining a continuous working strip proved difficult. Pipeline access was further restricted in locations where road construction was delayed.

Stakeholder Coordination

The presentation highlighted the importance of coordination with multiple agencies for resolving construction hindrances. Issues associated with rock dumps, utility corridors and forest routes required continuous follow-up with stakeholders, including road authorities and government agencies. The experience demonstrated that pipeline projects executed along highway corridors require close coordination between pipeline construction schedules and highway construction activities.

The major lessons emerging from the presentation were:

- Site conditions should be validated comprehensively before finalizing construction assumptions.
- Highway and expressway interfaces should be identified at an early stage.
- Adequate provisions should be made for unforeseen crossings and route modifications.
- Forest, road and other statutory permissions should be tracked proactively.
- Continuous stakeholder engagement is essential for resolving ROU and construction constraints.
- Construction planning should remain flexible enough to accommodate changing site conditions.

Conclusion

The MNJPL experience demonstrated that successful pipeline construction along highway corridors requires realistic site assessment, flexible execution planning, strong inter-agency coordination and continuous field-level monitoring. The presentation provided valuable practical lessons on managing the gap between planned project assumptions and actual ground realities.

Session: Day-1, Session-III – Technical Session-I

IInd Presentation Topic: **Engineering Excellence: Engineering Excellence: Maha HDD (3.8 km) Crossing of the Mighty Mahanadi (An Experience Sharing) –** Overcoming Construction Challenges and Achieving Productivity & Safety Excellence through Innovative Execution Practices

Speaker: Shri V. Santa Kumar, DGM (Project), GAIL

The presentation shared GAIL's experience in executing a 3.8 km Horizontal Directional Drilling (HDD) crossing beneath

the Mahanadi River as part of the Srikakulam–Angul Pipeline (SAPL). The presentation focused on overcoming severe construction challenges through engineering innovation, effective mud management, productivity improvement and safe execution.

Project & Technical Challenges

The Mahanadi crossing involved installation of a 24-inch pipeline through a 3.8 km HDD crossing using the intersection

method. The project involved challenging geological and site conditions, including stiff clay/sand formations, flood-prone areas, forest patches, marshy land and difficult access conditions.

The HDD process involved pilot drilling followed by successive reaming operations. The presentation described the use of electromagnetic steering and the ParaTrack system to accurately guide the pilot holes from both sides of the river.

Major Construction Problem

A major setback occurred when the 36-inch reamer became stuck during the final clean pass. Failure of threading between a weeper sub and drill rod resulted in disengagement of part of the pilot rods. The situation was further aggravated when mud circulation stopped and the bentonite hardened inside the bore.

Several recovery attempts were made, including use of a DONUT tool, pneumatic hammering and a specially fabricated fishing tool. However, the stuck reamer could not be recovered and the HDD operation had to be re-planned.

Innovative Recovery Strategy

Following detailed brainstorming by the project teams, a revised execution strategy was adopted. It included:

- Revision of the HDD profile and selection of a new bore.
- Improved bentonite/mud management.
- Modification of the reaming sequence by introducing additional intermediate reaming sizes.
- Avoidance of weeper subs wherever possible.
- Conversion of two pipeline strings into a single 3.8 km pipeline string.

The revised approach significantly improved control over pulling forces and reduced the risk associated with hardened drilling fluid.

Productivity & Safety Innovations

Several innovative site practices were adopted. A water-filled trench of approximately 2 km was prepared so that the pipeline could float during pulling, thereby reducing pulling torque. High-volume mud pumps were operated at approximately 800–1000 GPM, helping maintain effective mud circulation.

The final reaming torque was brought down to approximately 45–50 kN-m. Rollers, backhoes and cradles were strategically positioned along the meandering ROU to facilitate smooth movement of the single pipeline string.

A stretch arrestor was designed at site to prevent backward movement of drill rods. Scissor lifts were also deployed in place of backhoes for controlling the pipe over-bend during pulling.

Achievement

The project successfully achieved:

1. 3.8 km HDD crossing of the Mahanadi River, longest in GAIL.
2. Installation of a 24-inch pipeline through the intersection method in 66 days
3. Continuous single-shot pulling of the 3.8 km pipeline in 39 hours

The presentation highlighted three major lessons:

1. Weeper subs should be used only when unavoidable and with appropriate precautions.
2. Multiple pipeline strings should be avoided wherever practical.
3. Bentonite mud management and viscosity control are critical because they directly influence pulling loads and the risk of construction failure.

Conclusion

The Mahanadi HDD project demonstrated resilience, innovation and engineering excellence under extreme construction conditions. The experience provides useful guidance for future long-distance HDD crossings involving rivers, difficult terrain and challenging geological conditions.

Session: Day-1, Session-III – Technical Session-I

IIIrd Presentation Topic: **Ennore-based Gas Pipeline (ETBPL) – Challenges & Best Practices**

Speaker: Shri Pramod Cheeli, CGM (EPCM), IOCL,

The presentation focused on practical challenges encountered during pipeline projects and the best practices adopted for design validation, ROU management, statutory compliance, integrity management and optimization of pipeline facilities. The speaker brought extensive experience covering pipeline construction, O&M, HSE, audits, OISD standards and EPCM activities.

Design & Engineering Challenges

One of the key issues highlighted was the difference between design assumptions and actual field conditions. Site conditions may require rerouting or changes in the originally planned crossing methodology, including conversion from open-cut crossings to HDD/SHDD or other specialized methods. The presentation emphasized the importance of specialist field surveys at the initial stage, validation of actual site conditions and early finalization of the appropriate crossing methodology.

ROU Challenges

Obtaining a completely hindrance-free Right of Way was identified as a major challenge, particularly where land acquisition, crop compensation and other local constraints affect construction progress. The speaker suggested using NH/SH corridors, wherever feasible, and adopting HDD/SHDD techniques in areas with multiple utilities or difficult surface conditions.

OISD & PNGRB Compliance

An important section dealt with audit observations arising from differences between legacy designs and revised standards. The recommended approach was to implement revised requirements during construction wherever technically feasible. Where modification of existing facilities is impracticable, the presentation proposed a structured process of:

Gap Analysis → Risk Assessment → Mitigation Plan → Management Approval → Statutory Submission → Enhanced Monitoring.

Examples included blast-proof walls where required inter-distance could not be achieved and protective measures for critical valve-bonnet flanges.

Pipeline Integrity

For legacy pipeline sections where wall thickness may not meet revised requirements, the presentation proposed formal standards-gap and risk assessments followed by enhanced integrity controls.

For piggable pipelines, strengthened ILI programs, increased inspection frequency and defect assessment/repair were suggested. For non-piggable or difficult sections, external inspection techniques, additional patrolling, QRT preparedness and regular health monitoring were highlighted.

Cost & Time Optimization

The presentation also discussed opportunities to optimize station design and operation through measures such as solar-powered systems, prefabricated buildings and space-efficient station arrangements.

The broader emphasis was on incorporating O&M requirements during the design stage, rather than attempting to address them after construction.

Way Forward

The presentation highlighted emerging practices such as:

- **Use of drones for aerial surveys, inspection and construction progress monitoring.**
- **Greater use of 3D design for O&M accessibility.**
- **Consideration of structural platforms and access provisions during design.**
- **Testing of threaded connections for drains and PT tubing before commissioning.**
- **Environmental initiatives for reducing plastic waste.**

Conclusion

The ETBPL Speaker demonstrated that pipeline construction excellence extends beyond physical execution. Early field validation, regulatory compliance, integrity management, risk-based decision-making and lifecycle-oriented design are essential for safe and sustainable pipeline infrastructure.

Session: Day-1, Session-III – Technical Session-I

IVth Presentation Topic: **Leveraging Artificial Intelligence, Digital Twins and Advanced Analytics for Enhancing Project Execution, Asset Integrity and Operational Excellence in Energy Infrastructure Projects**

Speaker: Shri S. Ravishankar, Alethe Labs Pvt Ltd.

The Speaker examined how Artificial Intelligence, Machine Learning, Digital Twins, advanced analytics and integrated data platforms can transform project execution, asset integrity and operational management in natural gas infrastructure.

Existing Industry Challenges

The presentation identified several limitations affecting conventional gas infrastructure operations, including:

- Fragmented SCADA, metering, inspection and asset data.
- Data silos across different organizational functions.
- Dependence on manual field logs and legacy systems.
- Reactive rather than predictive maintenance.
- Delayed identification of equipment problems.
- Unaccounted-for gas losses.
- Cybersecurity vulnerabilities in OT systems.

The presentation's visual framework showed a transition from these technology and process limitations towards automation, AI/ML, Digital Twins, integrated platforms and OT cybersecurity.

Digital Transformation

The presentation proposed a more integrated approach in which data from SCADA, field/IoT devices, gas composition, process parameters, inspection systems and asset records are brought together.

The proposed future state combines Digital Twin technology with AI/ML and data science for:

- Performance analytics.
- Predictive maintenance.
- Faster fault diagnosis.
- Asset performance monitoring.
- IT–OT convergence.

AI-Enabled Applications

Several technology applications were presented.

RTDMP – Real Time Data Management Platform: - Captures and stores real-time information from SCADA and field/IoT devices and supports data historian, streaming, processing and analytics.

Automated Reconciliation: Provides automated product reconciliation across pipeline networks and sections, with anomaly detection and prediction and near-real-time identification of UAFG.

Digital Twin & Diagnostics: Digital Twins can be developed for pipeline instrumentation, flow computers and compressors to support flow calculations, anomaly detection, configuration-error identification and equipment performance analysis.

IDPM – Integrated Data Platform & Management: Provides a centralized data-lake approach for pipeline information,

including corrosion detection, corrosion-growth analysis and pipeline integrity management.

ORS – Operator Rounds System: Provides a digital e-logbook for field data collection, LLF inspection and workflow management, thereby improving field workforce efficiency.

Future of Gas Infrastructure Operations: The presentation proposed a transition from manual and reactive operations towards predictive, data-driven and integrated infrastructure management.

The combination of Digital Twins, AI/ML and data science was presented as a means of enabling predictive maintenance, instant diagnosis and improved asset performance while supporting greater integration between IT and OT systems.

Cybersecurity

The presentation also recognised that increasing digitalisation must be accompanied by appropriate OT cybersecurity and multi-layer protection, particularly as operational infrastructure becomes increasingly connected.

Conclusion

The presentation demonstrated the potential of AI, Digital Twins and integrated data platforms to transform natural gas infrastructure from reactive asset management to predictive and intelligent operations. The key message was that digital transformation needs to be approached holistically, combining technology, data, processes and operational practices.

NGS thanks the session chair, shri Devesh Varshney & all the speakers for their valuable contributions.

Mementoes were presented by Shri Varshney to all the speakers and Shri D V Shastry presented memento to Shri Varshney as a token of gratitude.

Day 1, Session - IV (Timing: 16:00 Hrs – 17:00 Hrs)

Panel Discussion: IInd

Topic: Accelerating Future-Ready CGD Infrastructure in India: Construction Excellence, Urban Execution Challenges & Sustainable Expansion towards India's PNG and CNG Growth Targets

Panel Moderator: Shri Sandeep Trehan, CEO, Think LNG Investments Pvt Ltd.

Panellists:

1. **Shri Praveer Kr. Agrawal, ED(Trg), GAIL & Chairman, CUGL**
2. **Shri Bhudev Singh, ED (PNG-O&M), IGL**
3. **Shri Gurvinder Singh, Sr VP, MGL**
4. **Shri Chandramani Tiwari, Chief Project Officer, Adani Total Gas Limited**
5. **Shri Sudhir Kumar Dixit, COO GAIL Gas Ltd**

Introduction of the Panel Moderator: Shri Sandeep Trehan, CEO, LNG Investments Pvt Ltd.

Shri Trehan is presently the Chief Executive Officer, THINK LNG Investments Pvt Ltd. He is a distinguished leader in India's energy sector with over four decades of experience in Petroleum, Natural Gas, LNG, Marketing, Business Development, and Energy Infrastructure.

He is also the Founder of THINK LNG Investments Pvt. Ltd. and Co-Founder of THINK Gas Distribution Pvt. Ltd., where he has played a pivotal role in building one of India's leading private City Gas Distribution (CGD) companies. His leadership has been instrumental in expanding natural gas infrastructure, promoting LNG adoption, and driving customer-centric, technology-enabled growth.

Prior to his entrepreneurial journey, Shri Trehan held senior leadership positions with Indian Oil Corporation Ltd. (IOCL), ExxonMobil, Reliance Industries Limited, and the Jay Madhok Group. A Mechanical Engineer with postgraduate qualifications in Thermal Engineering, Systems Management, and Marketing Management, he is a passionate advocate of innovation and sustainable energy solutions for India's gas-based economy.

Introduction of the Panelists:

1. Shri Praveer Kumar Agrawal:

Shri Praveer Kumar Agrawal is Executive Director(Training), GAIL (India) Limited. He has more than three decades of distinguished experience in the Natural Gas and Energy Sector. He has successfully led several strategic initiatives and played a pivotal role in the execution and commissioning of major projects across Natural Gas Marketing, Domestic Gas, City Gas Distribution (CGD), Joint Ventures, Transmission, and Instrumentation & Control.

He currently serves as Chairman of Central U.P. Gas Limited (CUGL), while also leading GAIL's Learning & Development initiatives through the GAIL Training Institute, driving capability building and AI-enabled workforce transformation. An alumnus of IIT Kanpur and IIT Delhi, he also holds an MBA in Marketing Management.

Shri Agrawal has served as a Guest Faculty at IIT Delhi and is widely respected for his contributions to technical excellence, leadership development, and innovation in India's gas sector. He is also Chairman, ISTD (Delhi Chapter).

2. Shri Bhudev Singh:

Shri Bhudev Singh is ED (PNG-O&M), IGL. He is B.E(Mechanical) from prestigious institute MNIT Allahabad and having about 32 years rich experience in oil and gas industries. He has 10 year of experience in cross country pipeline and refineries and 21 years of experience in City Gas Distribution project. He has worked in Engineers India ltd and currently working in Indraprastha Gas Limited as Executive Director. he has contributed in major oil and gas projects namely Kandla Bhatinda Pipeline, Vizag Vijayawada Pipeline, Jamnagar Loni Pipeline, Mangalore Refinery, Numaligarh Refinery and City Gas distribution network of NCT Delhi. He has rich experience in Projects, Operation & Maintenance and Marketing in Indraprastha Gas limited. His area of expertise is Projects, O&M and Marketing.

3. Shri Gurvinder Singh:

Shri Gurvinder Singh is Vice President in Mahanagar Gas Limited (MGL) and is currently the head of Projects and Engineering & Planning departments. He is an accomplished & result-oriented Business Leader with 34 years of extensive experience in Oil & Gas Projects, Business Development, Operations, Planning, Maintenance and Safety.

He is a Mechanical Engineer from PEC - Chandigarh and has PMP certification. Prior to working with MGL, he was associated with Nayara Energy Ltd, Essar Oil Ltd and BPCL in various roles such as Construction, Business Development, Planning, Operations and Safety.

4. Shri Chandramani Tiwari:

Shri Chandramani Tiwari is Chief Project Officer, Adani Total Gas Limited. He is a seasoned Oil & Gas professional with over 33 years of experience, Shri Chandramani Tiwari is a Graduate Mechanical Engineer with a PGDM in Business Administration. He has a proven track record of leading large-scale projects, driving operational excellence, optimizing business performance, and managing diverse stakeholders across the energy sector.

His professional expertise encompasses network planning and expansion, project management, operations & maintenance, asset integrity management, supply chain management, business analytics and decision support. He has also demonstrated strong capabilities in P&L management, cost optimization, value engineering, HSEF, risk management, policy advocacy and strategic stakeholder engagement.

A strong people leader, he brings extensive experience in team leadership, cross-functional coordination and execution of complex initiatives, with a focus on enhancing asset reliability, operational efficiency, safety and sustainable business growth.

5. Shri Sudhir Kumar Dixit:

Shri Sudhir Kumar Dixit is an Electrical Engineer with an MBA in Finance and over 32 years of experience in the oil and gas industry, spanning petrochemicals, major project execution, plant operations, and City Gas Distribution (CGD).

He is currently the Chief Operating Officer (COO) of GAIL Gas Limited. Previously, as CEO of JBF Petrochemicals Ltd. (now GAIL Mangalore Petrochemicals Limited – GMPL), he led major construction activities, revived plant operations, and steered the company towards production readiness. Earlier, he was part of the leadership team at GAIL's Pata Petrochemical Complex, contributing significantly to operational excellence. Shri Dixit has also played an active role in India's clean energy transition, representing GAIL Gas at key industry forums and contributing to initiatives promoting Compressed Biogas (CBG) integration into CGD networks. He has been recognized with the 'Pioneer in Energy Transformation – Energy Brand' award on behalf of GAIL Gas.

Shri Trehan initiated the discussion with following opening remarks:

Good afternoon, everybody. I am pleased to be here for this event, where we are discussing the growth of CGD infrastructure and the journey towards achieving a 15% share of gas in India's energy mix.

The CGD industry has undergone significant transformation over the years. Since the 10th bidding round in 2019, the number of geographical areas has increased from around 230–240 to over 300, covering nearly 748 districts. Population coverage has grown from about 70% to nearly 95–99%. Domestic connections have increased almost threefold, from around 55 lakh to nearly 1.7 crore. CNG stations have grown from about 1,800 to nearly 9,000, while operational pipelines have expanded from around 16,000 km to approximately 25,000 km. Industrial and commercial customers have also increased substantially.

Gas consumption has risen from around 150 MMSCMD to nearly 190 MMSCMD. However, if we aim to reach 300 MMSCMD by 2030 and 500 MMSCMD by 2040, the current annual growth rate of 4–5% will need to increase significantly. This is a major challenge requiring strong commitment and coordinated efforts across the industry.

At the same time, new opportunities are emerging. CBG is becoming an important supply source, LNG is emerging as a transport fuel, and hydrogen is likely to find increasing applications in existing gas networks.

The geographical landscape has also changed—from relatively small urban areas to much larger GAs extending up to 9,000–10,000 sq. km., including rural and Tier-2 and Tier-3 areas. The challenges of infrastructure development therefore vary considerably, and the solutions adopted in Tier-1 cities cannot simply be replicated elsewhere; they must be adapted based on local learnings and conditions.

We are also witnessing increasing competition from EVs and rapid technological developments, including AI, which could significantly transform future CGD network operations and infrastructure planning.

Against this backdrop, I would like to invite my fellow panellists to share what their organisations are doing and planning to expand gas infrastructure and penetration, and their views on the key challenges ahead. To begin, I would request our distinguished panellist to share his perspective and take the discussion forward.

Perspectives by Shri Gurvinder Singh:

First, I would like to thank NGS, Shastry Sir and Satish Sir for giving me this opportunity to share my views on the future of the CGD industry in India.

When we talk about CGD infrastructure, it should not be limited to laying more pipelines. We need to look at the **entire life-cycle economics of the asset**—how effectively the infrastructure is utilised, how close we are to customers and how many customers it can ultimately serve. Every investment must deliver sustainable economic value.

Coming from Mumbai, one of our biggest challenges is working with multiple existing utilities. When a road is opened, we often encounter decades-old water, electrical, telecom and other underground infrastructure. Therefore, we need to think beyond conventional trenching and increasingly adopt technologies such as **HDD and micro-tunnelling** to safely navigate existing utilities.

Planning must also begin at the infrastructure-design stage. Adequate separation between gas pipelines and other utilities is essential for safety. A good example is Mumbai, where MCGM consulted all utilities before concretising roads. MGL worked with the authorities to establish a **dedicated corridor for gas pipelines**, ensuring that gas infrastructure is laid before roads are permanently concretised. This avoids repeated road cutting and allows future requirements to be addressed in advance.

While safety and quality are non-negotiable, we must also focus on **methane management**. Natural gas is a clean fuel only when methane remains within the system. Any leakage contributes to greenhouse-gas emissions. Therefore, future infrastructure must be designed for high reliability, minimum leakage and reduced maintenance, improving overall life-cycle economics.

Digitalisation will also play an important role. The development of **3D digital twins**, integrating GIS data of gas and other underground utilities, can significantly improve planning, construction, repair and maintenance. Initiatives being explored in Mumbai can provide a useful model for other cities.

Similarly, expansion of CNG infrastructure should be based not merely on availability of land but on **future demand and mobility corridors**. Stations should be located close to transport and freight corridors where CNG/LNG vehicles are expected to operate.

Finally, our focus should be on creating **future-ready infrastructure**, capable of accommodating emerging fuels such as CBG and hydrogen. While CBG can potentially be integrated subject to quality specifications, hydrogen blending requires greater clarity on permissible percentages and compatibility of pipelines, compressors, meters, downstream networks and end-use equipment such as boilers.

Therefore, as we develop new CGD networks, we should incorporate future compatibility wherever technically and economically feasible. The objective should be not just more kilometres of pipeline, but **safe, reliable, efficient and future-ready infrastructure**.

Session Moderator invited Shri Chadrmani Tiwari for his perspective:

Thank you very much. Now I press Mr. Chandramani Tiwari okay to just explain how what are the plans that they are organising and especially I would like you to touch upon how safety and quality of the infrastructure is important for our future operations.

Perspectives of Shri Chandramani Tiwari, ATGL

Shri Chandramani Tiwari highlighted that the natural gas and CGD industry is at a **critical stage of transition**

from gas availability to gas accessibility. With PNGRB authorisations covering almost the entire country and a significant expansion planned in the CGD network, the key challenge is to rapidly develop infrastructure and make natural gas accessible to the last-mile customer. He emphasised that the future network must be **smarter, faster, safer, reliable, flexible, digital and sustainable**.

On **faster project execution**, he stressed the need for a practical and collaborative approach between owners and contractors. Overly complex contracts designed primarily to protect the owner's interests can sometimes impede project progress. Contractors should be treated as **partners in project success**, as delays affecting contractors ultimately affect project cost and timelines. He advocated clearly defined scopes, practical contracting approaches, better coordination and a relationship based on mutual understanding. He also emphasised that disputes and arbitration should be avoided through effective collaboration and problem-solving at the project level.

A major area of concern highlighted was **safety**. Shri Tiwari advocated a shift from a **"safety compliance" approach to a "safety culture"**, where safety becomes an integral part of everyday operations. He cited recurring incidents such as excavation cave-ins, unsafe entry into drains and exposure to underground electrical cables as examples where basic safety practices can prevent fatalities. He stressed the importance of understanding and addressing the challenges faced by field teams rather than relying only on instructions and compliance from offices.

He also emphasised the need to develop **flexible and future-ready networks**. Infrastructure planned today should accommodate future requirements such as CBG, hydrogen and other emerging fuels. Adequate

provisions, tie-ins and capacity should therefore be incorporated during the initial design stage, considering future urbanisation and expansion. Such forward planning can reduce the need for hazardous and costly modifications such as hot tapping.

On **sustainability**, Shri Tiwari highlighted the importance of controlling fugitive natural gas emissions, as methane emissions have significant environmental implications. He stressed that engineering and operational practices should progressively minimise both planned and unplanned emissions. He also referred to the use of renewable energy, including solar power, for operating internal devices and infrastructure.

For **faster project implementation**, he pointed out that a significant portion of project delays occurs because pre-construction activities are not completed before project approval and mobilisation. He shared that ATGL/Adani Group is focusing on completing activities such as permissions, engineering, design and contractor alignment in advance so that construction can commence immediately after project approval.

He further highlighted the growing importance of **HDD and other innovative construction technologies** in congested urban areas. While HDD was traditionally used mainly for crossings in cross-country pipelines, its application in CGD is increasing because it can reduce surface disruption and facilitate installation in congested locations. He also stressed the need for more economical and effective solutions for micro-tunnelling, particularly for smaller-diameter pipelines.

Session Moderator invited Shri Sudhir Dixit for his perspective:

Going forward, as we continue to expand the CGD network, the challenges in **urban and rural areas are quite different**. How do you perceive these challenges, particularly in terms of construction and project execution? Also, how can **technology and innovative construction methods** help us address these challenges and, going forward, expedite the growth and expansion of the CGD network

Perspectives of Shri Dixit, GAIL Gas

Shri Sudhir Dixit highlighted that the **CGD sector is expanding rapidly in both urban and rural areas**, but the

challenges and customer behaviour in the two regions are significantly different. While urban customers show strong demand for PNG connections and CNG vehicles, rural areas often require greater customer outreach, awareness and promotional initiatives to generate registrations and demand.

In **urban areas**, one of the major challenges is obtaining permissions from multiple agencies before pipeline construction can begin. These may include municipal authorities, traffic police and local stakeholders. After securing the necessary permissions, laying pipelines in congested areas presents further technical and safety challenges due to the presence of existing sewage lines, electrical cables and other underground utilities.

He particularly emphasised the **safety risks associated with HDD operations** in congested areas. An HDD operation can inadvertently intersect an existing sewage pipeline, potentially allowing gas to enter the sewer network and subsequently migrate into nearby houses. If gas accumulates in an enclosed, poorly ventilated building, it can result in a flash fire. Therefore, continuous monitoring of drilling operations is essential. Even seemingly small changes in drilling pressure or other operating parameters should be

carefully investigated rather than being treated as routine adjustments. Close supervision near the drilling machine can help identify abnormal conditions at an early stage and prevent serious incidents.

Another major issue discussed was the increasing use of **LNG plants as an alternative to long-distance pipeline connectivity** for certain geographical areas. Where laying 75–150 km of pipeline may be economically or technically challenging, LNG-based gasification can provide a practical solution. However, Shri Dixit stressed that the storage and handling of LNG, particularly in facilities located close to populated areas, require stringent safety management.

He emphasised that **safety cannot be compromised in LNG facilities**, but safe operation is achievable through strict adherence to prescribed standards, effective preventive maintenance and trained manpower. Unlike pipeline or connection projects, LNG facilities involve equipment operating continuously, often 24×7, and therefore require systematic inspection and preventive maintenance of every critical component. Even a seemingly minor issue, such as a loose motor terminal, can potentially become an ignition source with serious consequences in an LNG environment.

Drawing from an LNG incident at **Mandideep**, Shri Dixit explained the potential consequences of hose leakage and LNG vapour-cloud formation. Emergency response required area barricading, restriction of vehicle movement and coordination with the district administration until the LNG tank was safely drained and the situation stabilised. He noted that similar risks can arise from leakage of valves, gauges, hoses and other equipment.

With the emerging use of **LNG as a transportation fuel**, additional attention will be required during vehicle-fuelling operations, particularly where multiple LNG trucks may be present simultaneously. He stressed the importance of deploying **well-trained and experienced personnel** who understand equipment maintenance, emergency response and LNG safety requirements.

Conclusion: Shri Sudhir Dixit emphasised that the rapid expansion of CGD infrastructure requires **different strategies for urban and rural markets**, strong coordination with local authorities, close supervision of construction activities and greater use of technology for safe execution. In LNG-based systems, the focus must extend beyond construction to **24×7 operational safety, preventive maintenance, trained manpower and emergency preparedness**. He stressed that LNG and CGD infrastructure can be operated safely when prescribed standards are rigorously followed and safety is embedded into every stage of project execution and operations

Panel Moderator invited Shri Praveer Kumar Agrawal

Another important area is the role of **Compressed Biogas (CBG)** in strengthening India's future gas supply.

As CBG is expected to contribute increasingly to the overall gas mix, its **integration with the existing CGD infrastructure** will be critical. What are the key challenges involved in integrating CBG into CGD networks, particularly in terms of quality, connectivity, infrastructure, commercial viability and operational requirements?

Perspectives of Shri Praveer Kumar Agrawal

Shri Praveer Kumar Agrawal highlighted **Compressed Biogas (CBG) as a major future growth lever for the CGD industry** and emphasised the significant opportunities emerging from its integration into the existing gas ecosystem. He noted that the Government of India has introduced schemes involving substantial financial support for biogas projects, which can accelerate CBG production and its adoption by CGD companies.

He referred to the **CBG-CGD integration mechanism being implemented through GAIL**, under which biogas produced across the country can be procured, subjected to value addition and supplied to city gas companies at prices linked to domestic gas pricing. According to him, CBG available to CGD companies can provide a **significant cost advantage compared with conventional CNG**, thereby improving the economics of CGD operations and creating an attractive business case for companies adopting CBG.

Shri Agrawal emphasised that CBG has a strong advantage because its **feedstock and value chain are largely indigenous**. The process converts locally available biomass and waste into useful energy while simultaneously addressing waste-management challenges. It can therefore create benefits for multiple stakeholders, including farmers, waste generators, CBG producers and CGD companies. He cited the example of CUGL, where a large municipal solid waste-based plant is being developed. Such projects can contribute to city cleanliness while producing gas at a potentially lower cost than conventional CNG.

He further pointed out that there is considerable scope for **innovation in CBG production**, with companies exploring different feedstocks, technologies and decentralised production models. Biomass and organic waste are available in various forms across India, creating opportunities for developing local CBG production clusters and integrating them with nearby CGD networks. In his view, this distributed approach can become an important lever for expanding the gas ecosystem.

Apart from CBG, Shri Agrawal identified **tax rationalisation and declining LNG/natural gas prices** as two additional potential drivers for CGD growth. He suggested that bringing natural gas under a more rational GST framework could significantly improve the competitiveness of natural gas vis-à-vis other fuels. Lower gas prices, combined with improved taxation, could further strengthen the economics of CNG and other natural gas applications.

He also highlighted the potential for **CNG to remain competitive in transportation**, particularly where it offers a favourable fuel-cost advantage and higher vehicle efficiency compared with conventional liquid fuels. While acknowledging the growing presence of electric vehicles, he suggested that a combination of greater CBG availability, lower gas prices and tax rationalisation could support substantial future growth in CNG demand.

Panel Moderator invited Shri Bhudev Singh

We have another important area—the **domestic PNG segment**. At present, we have around **1.07 crore domestic PNG connections**, and the Government has an ambitious target of increasing this to approximately **12 crore connections by 2034**. This represents a significant opportunity for the CGD industry to expand its network, reach more households and strengthen the natural gas ecosystem.

IGL has been a leader in the domestic PNG segment and has added a large number of household connections. **What are the key challenges in achieving this ambitious target, and what strategies, technologies and execution approaches can help the CGD industry significantly accelerate the pace of domestic PNG connections and achieve the 2034 targe.**

Perspectives of Shri Bhudev Singh

Shri Bhudev Singh highlighted the key challenges faced by City Gas Distribution (CGD) companies in

expanding infrastructure and increasing PNG connections, particularly in highly congested metropolitan areas such as Delhi and Mumbai. He emphasized that laying gas pipelines in urban areas is becoming increasingly difficult due to the presence of multiple utilities and limited availability of underground space. Referring to the NDMC area, he explained that although efforts were made to develop a common utility corridor, technical constraints prevented the installation of gas pipelines alongside electrical utilities. Despite prolonged challenges and delays in obtaining permissions, persistent efforts and increasing demand from commercial customers eventually enabled the completion of connections.

He also highlighted the significant gap between **PNG infrastructure created and actual customer conversion**. Although around **1.6–1.7 crore PNG connections** have been targeted/created across the country, a substantial number of potential customers are yet to convert to PNG. According to him, CGD entities have invested heavily in infrastructure, with infrastructure availability significantly exceeding actual connections. Therefore, the focus now needs to shift from merely creating infrastructure to identifying the reasons why customers are not taking PNG connections.

One of the major reasons identified was the continued use of **LPG despite the availability of PNG**, particularly because of LPG subsidies and customer preferences. Although government provisions require customers with PNG connections to surrender LPG connections, effective coordination with Oil Marketing Companies (OMCs) remains a challenge. CGD companies, PNGRB and the Ministry have been continuously engaging with OMCs, but the desired level of conversion has not yet been achieved.

Shri Singh further pointed out that metropolitan areas such as Delhi and Mumbai are approaching saturation in terms of PNG infrastructure, and the industry therefore needs to focus on expanding into other geographical areas while addressing their specific challenges. He cited states such as Rajasthan, where substantial LPG subsidies can discourage customers from shifting to PNG.

He stressed the need for **stronger government intervention and policy support**, including declaring suitable areas as LPG-free zones, rationalising lease rentals and ensuring timely permissions for pipeline construction. He noted that although several enabling measures have already been introduced by the government, their effective implementation at the ground level remains important.

Concluding, Shri Singh stated that CGD companies are already making substantial investments in domestic PNG infrastructure, with **IGL alone investing over ₹1,000 crore in the current year**. However, further growth in PNG connections will require coordinated efforts by CGD entities, government agencies, OMCs and regulators. **A stronger government push, effective policy implementation and resolution of customer-conversion barriers are essential to fully utilise the infrastructure already created and accelerate PNG adoption.**

Question from the Audience

I have one more important question. As we scale up CGD infrastructure, the requirement for **materials as well as skilled manpower** will increase significantly. How are we addressing this challenge? The success of this expansion will largely depend on the availability of adequately skilled manpower. Any shortage could lead to project delays and affect our targeted timelines.

Reply by Praveer Kumar Agrawal:

At GAIL, we are focusing extensively on **skill development and capacity building** to support the future growth of the natural gas and CGD industry. GAIL currently operates **six training institutes**, including GAIL Training Institute (GTI), Noida, and centres at Jaipur, Maigalganj (Lakhimpur Kheri), Amravati, Nagaram and Guna. Four of these function as skill-development centres, where even 10th and 12th pass students are trained for around three months in industry-relevant skills and subsequently supported in finding suitable employment.

GAIL is also conducting specialised training programmes for **CGA officials, PNGRB and other stakeholders**, besides working closely with the **Hydrocarbon Sector Skill Council**. We are also collaborating with academic institutions such as IIT Roorkee, Shiv Nadar University and RGIPT to develop specialised courses, including programmes related to natural gas.

As rightly highlighted, **skilled manpower will be a key enabler for the growth of the CGD industry**. Although India has a large workforce, the industry often faces difficulty in finding appropriately skilled personnel. GAIL is therefore working with the Ministry and other institutions to develop job-oriented courses and create a talent pool specifically suited to the emerging requirements of the energy sector.

Going forward, the demand for skills will also increase in areas such as **CBG, biogas, solar energy and other clean technologies**. GAIL is exploring initiatives to develop skilled manpower for these emerging sectors.

We are also working towards developing **self-sufficient model villages**, where biogas and solar energy can meet local energy requirements, supported by digital connectivity and other modern infrastructure.

Overall, the objective is to develop the **right skills for the right jobs** and create a workforce capable of supporting India's transition towards clean, indigenous and sustainable energy technologies.

Shri Sudhir Dixit added

He highlighted an additional initiative being undertaken to address the **skilled manpower requirement of the CGD sector**. As part of its annual internship programme, GAIL/GAIL Gas engages a significant number of interns, with a requirement of around **150 interns in GAIL Gas**.

A major focus is being placed on selecting **plumbers and other relevant skilled personnel** as interns. The objective is to provide them with **hands-on exposure and structured training in the CGD sector for approximately one year**. This approach will enable them to develop practical skills and gain familiarity with CGD operations and requirements.

Following the training period, these trained personnel can potentially be **absorbed into the organisation or provided employment opportunities within the CGD sector**. This initiative is therefore aimed at creating a

trained pool of skilled manpower while simultaneously providing young professionals and tradespeople with sustainable career opportunities in the rapidly expanding CGD industry.

Shri Bhudev Singh's feedback

The speaker highlighted **IGL's initiatives to address the growing shortage of skilled plumbers** in the CGD sector. IGL has established training facilities, including an ITI, where plumbers and mechanical plumbers are provided structured training and certification. Successful candidates are subsequently absorbed into relevant jobs, creating a direct linkage between **skill development and employment**.

He further shared IGL's experience of conducting a **specialised plumber training camp in Rampur district**, which received a strong response, with around **200–250 candidates** participating. Following a 5–6 day training programme, approximately **70 plumbers were selected** for deployment.

He emphasised that the shortage of skilled plumbers is a common challenge across the CGD industry. Therefore, entities such as **IGL, MGL and other CGD companies need to collectively strengthen plumber training, certification and recruitment programmes** to meet the increasing manpower requirements arising from the rapid expansion of PNG infrastructure and connections.

Shri Gurvinder Singh Added

Shri Gurvinder Singh also highlighted the **acute shortage of skilled plumbers** as one of the major challenges affecting the expansion of the CGD sector, particularly in Mumbai. Traditionally, a large number of plumbers from Odisha, Jharkhand, Bihar and Eastern Uttar Pradesh migrated to Mumbai in search of employment. However, with the rapid expansion of CGD networks across the country, these workers are now finding employment opportunities closer to their hometowns and are therefore less willing to relocate to Mumbai.

He further pointed out that the **high cost of living in Mumbai** makes it difficult for CGD companies to attract and retain skilled manpower. Another important challenge is the wage differential. During interactions with ITI students pursuing plumbing courses, it was observed that plumbers can earn around **₹2,000 per day through platforms such as Urban Company**, whereas CGD jobs may offer comparatively lower remuneration despite involving physically demanding and potentially hazardous work.

Shri Gurvinder stated that this shortage of plumbers is directly affecting the pace of **PNG connection conversion and CGD expansion**. He acknowledged the initiatives taken by GAIL Gas and IGL to address similar manpower challenges and expressed the intention to explore and adopt suitable approaches for MGL. He emphasized the need to make CGD plumbing jobs **more attractive through competitive remuneration, better working conditions and improved skill-development opportunities**.

Shri Chandramani Tiwari

Shri Chandramani Tiwari highlighted the **critical need for strengthening skill development and training infrastructure** to support the rapid expansion of India's natural gas sector. He observed that India currently has only around **50–80 institutes and skill-development centres** offering relevant petroleum and energy-related training, which he considered inadequate for the country's ambitious energy-transition and 2040 vision. He stressed the need for significantly more specialised training institutes covering the entire oil and gas value chain, particularly for **plumbers, field engineers and other technical manpower**.

He also emphasised the responsibility of industry leaders to make **field-based jobs more attractive**. According to him, engineers working in field operations often receive less recognition, career growth and

remuneration compared with those working in corporate or head-office functions. This has resulted in a preference among young engineers for planning, monitoring, scheduling and review roles rather than challenging field assignments.

Shri Tiwari advocated a change in this organisational culture by providing **better career progression, recognition, remuneration and capacity-building opportunities** for field personnel. He also stressed the importance of continuing industry-led training programmes in collaboration with ITIs and other educational institutions, particularly for developing skilled plumbers and technicians. He called upon policymakers and HR leadership to establish more specialised institutions and structured training programmes focused on the **complete oil and gas value chain, from upstream to downstream**, to create the skilled workforce required for future sectoral growth.

Moderator's Request to the Panelists

Mr. Trehan invited **all the panelists** to share, in **one or two sentences each**, their vision for the **CGD sector and infrastructure over the next 5–10 years**. He requested the panelists, who collectively bring several decades of industry experience, to share a brief **word of advice and their vision for the younger professionals in the audience**, beginning with **Shri Sudhir Dixit**.

Shri Sudhir Dixit

He expressed his vision of providing **safe, reliable and uninterrupted PNG and CNG services** to customers. He emphasized that CGD networks should be designed to ensure **100% reliability and 24×7 availability of gas**, enabling customers to receive uninterrupted supply.

Shri Bhudev Singh

The vision is to **expand PNG and CNG connections to the maximum number of domestic, commercial and industrial customers**, along with adequate CNG station infrastructure. However, this expansion should be supported by **safe, high-quality, resilient and digitally adaptable infrastructure**. The network should be designed with a **long-term perspective of 20–30 years**, anticipating future expansion of both the CGD network and other utilities. Greater coordination among utility agencies during planning and construction will be essential to avoid conflicts and repeated excavation, thereby creating a **future-ready and sustainable CGD infrastructure**.

Shri Gurvinder Singh

He highlighted the potential of **natural gas, biogas and green hydrogen** to collectively support India's transition towards a cleaner and greener energy future. Natural gas was described as a clean and efficient fuel, while biogas and green hydrogen can further strengthen the availability of green energy.

He emphasised that biogas can also contribute to **waste management**, including utilisation of waste from cities and villages and reducing the burning of agricultural residue such as *parali*. In his view, the combination of **natural gas, biogas and green hydrogen** can play an important role in improving the environment and supporting the development of **cleaner and greener cities across India**.

Shri Praveer Kumar Agrawal

He viewed Natural Gas as a clean and efficient fuel, while biogas and green hydrogen can contribute towards a greener energy ecosystem. He emphasised that the combination of these fuels can support India's transition towards a cleaner and greener energy future.

He also highlighted the role of biogas in waste management, including the utilisation of waste generated in cities and villages and reducing the burning of agricultural residue such as *parali*. In his view, the combined

use of natural gas, biogas and green hydrogen can contribute to addressing environmental challenges and improving the quality of the urban environment, particularly in polluted cities.

Shri Chandramani Tiwari

The panelist concluded with a vision of building and developing the **CGD network in such a way that the next generation can take pride in the contribution of the natural gas industry to nation-building**. The underlying message was to create infrastructure that is reliable, safe and future-ready, so that the younger generation can proudly say:

"Mera baap desh chalata hai."

This reflects the larger vision of contributing to **India's energy security, infrastructure development and national growth** through the CGD sector.

Summary of Concluding Remarks by Shri Sandeep Trehan, Panel Moderator

In his concluding remarks, Shri Sandeep Trehan thanked the audience, panellists and dignitaries for their patience and participation. He emphasised that **continuous learning and acquisition of new skills will be essential for professional growth over the next 10–15 years**, particularly as technology is rapidly transforming the natural gas and infrastructure sectors.

He highlighted that repetitive and conventional tasks in areas such as **O&M, construction, route surveys and CNG station design** are likely to witness significant automation and technological intervention. Technologies such as **AI, digital tools and data-driven systems** can substantially reduce the time required for activities such as designing CNG station layouts while ensuring compliance with applicable standards.

Shri Trehan advised young professionals not to become complacent with their existing knowledge or skills. He stressed that **continuous upskilling, adaptability and openness to emerging technologies** will be critical to remain relevant and achieve sustained career growth. He concluded by encouraging the younger eneration to continuously learn, adapt and prepare themselves for the changing requirements of the industry.

NGS Conclave on
Construction Management

Day-2: Session – I: Project Execution & Technology Presentation Session (09:30 Hrs – 11:00 Hrs)

Theme: Construction of CGD Networks: New Technologies, Innovation & Experience Sharing on Project Execution Excellence

Session Chair: Shri V C Chittoda, Former MD, MGL, Former ED, GAIL and Former Sr Consultant, NGS

Introduction of Shri V C Chittoda

Shri Vipin C Chittoda is Former Sr Consultant Natural Gas Society, Former MD, MGL & Former, ED, GAIL. Shri Chittoda

is a Business Leader with over 38 years of experience covering all facets of business in Oil & Gas sector – 15 years in leadership role - 7 years with direct P&L responsibility and over 4.5 years in a CEO role.

His Core competencies involve conceptualization, engineering, planning, controlling, implementation, installation, troubleshooting, commissioning & maintenance of large Oil & Gas plants, Petrochemical Plants & Utilities, IT& Instrumentation systems in Oil & Gas projects.

Ist Presentation, Topic: Accelerating PNG Execution at MGL - Leveraging Robust Experience with New Strategies (MGL's Experience on Construction Planning, Resource Deployment, Contracting Strategy, Stakeholder Coordination and Execution Methodologies for Achieving MoPNG & PNGRB Expansion Targets)

Speaker: Shri Devendra Shastry, AVP – COE (O&M), Mahanagar Gas Limited

The presentation focused on accelerating domestic PNG (D-PNG) execution at MGL through stronger planning,

contracting, resource mobilisation, construction controls, safety systems and digital handover to O&M. The approach links network expansion with customer registration, material availability and readiness of downstream infrastructure.

MGL's operating scale and FY 2026–27 plan

MGL presented an extensive existing asset base comprising about 570 km of steel network and 3,500 km of medium-pressure network, serving approximately 22 lakh domestic PNG consumers, 5,600 commercial consumers and 660 industrial consumers. Its CNG infrastructure includes mother-cum-retail outlets, online ROs, DBS and CNG transport vehicles. For FY 2026–27, the D-PNG target is 21,78,570 connections, supported by planned laying of 51 km of steel and 432 km of MP network.

Construction planning and customer readiness

A GIS-based review of the network is used to identify D-PNG potential and prioritise execution. For charged areas, immediate permissions and MP tapping for connection objects are emphasised, while uncharged areas are taken up with a focus on connectivity and priority gasification. PRS locations are prioritised where potential is high and adequate space is available. MGL also proposed aggressive land identification for DRS along the steel network, both to supply PNG and to create loops that improve supply reliability. Marketing is involved in advance so that planned construction areas can be pre-marketed and registrations can keep pace with infrastructure.

Material and contracting strategy

The presentation highlighted the need to align construction planning with material availability. Gas-carrying components remain within MGL's scope, while contractors handle non-gas-carrying components. Use of MLC pipe instead of copper pipe was cited as a productivity measure. An approved vendor list and inspection arrangements support material quality, while MGL also assists contractors in resolving shortages of non-MGL-scope items.

Different SORs and contracting models are used for fresh connections and online conversions. PMC or GI & LMC contracts are selected according to contractor capability, and multiple area-wise contracts enable parallel execution and reduce dependence on individual contractors. A significant focus was placed on manpower shortages. For PE labour, MGL explored onboarding contractors from OFC, electrical and water-utility works, supported tools and technicians, and introduced incentives for exceeding mutually agreed laying targets. For plumbers, productivity incentives, ITI visits, recruitment drives, social-media outreach, call-centre support and engagement with freelance plumber clusters were used.

Execution, safety and digital tools

Construction challenges include statutory permissions, traffic-constrained corridors, narrow roads, local issues during steel/PE laying and labour shortages. Night-time execution in high-traffic corridors is used to improve productivity. MGL also highlighted coordination with mechanised excavation equipment OEMs for equipment customised to CGD requirements and suggested that NGS could help disseminate such solutions across India.

Digital tools support both execution and safety. The MP Commissioning App enables commissioning documentation without requiring joint Projects–O&M involvement within the agreed length limit. Work-at-Height permits are digitally controlled through unique site forms, photographs and approval workflows. The Inside Kitchen App supports self-authorisation, while handheld devices are used for meter job-card submission.

Quality improvement and digital handover

MGL has introduced quarterly recognition for LMC personnel based on installation quality and customer feedback. The digital handover framework includes an online repository for statutory permissions, online MOC approvals linked to GIS, GIS-based porting of steel/PE networks with drawings, soft-copy pre-commissioning records through the MP Commissioning App, SR looping details, SAP-based consumer master data and conversion details, and GIS highlighting of gasified connection objects.

Conclusion

The presentation highlights that accelerated PNG expansion requires integrated planning, efficient contracting, adequate manpower, strong safety and quality systems, and timely digital handover. MGL's approach demonstrates how coordinated execution across these areas can improve construction productivity and readiness for O&M.

IInd Presentation, Topic: Future-Ready CGD Infrastructure: Technology Adoption, Digitalization & Sustainable Urban Gas Network Expansion

Speaker: Shri Roshan Madame, CGM (PNG PROJECTS), IGL

The presentation described IGL's approach to building a future-ready city gas distribution (CGD) system by combining physical infrastructure with digital infrastructure and intelligence. The central message was that expanding urban gas networks requires technology-enabled planning, real-time monitoring, smart metering, field mobility, customer-facing digital services and stronger asset-management systems.

IGL's network scale and expansion

IGL's CGD footprint covers 12 GAs across four states, 32 districts, about 62,472 sq. km and a population of around 60 million, as presented. The infrastructure includes CNG stations and a large D-PNG customer base, with the presentation highlighting continued growth in CNG stations and D-PNG connections. As of 31 July 2026, IGL showed 1,024 CNG stations and 35.2 lakh domestic PNG connections, along with 5,647 industrial and 8,133 commercial connections. The presentation also highlighted the addition of 3.2 lakh D-PNG billed connections in the calendar year up to August 2026.

Why CGD needs to become future-ready

Five drivers were highlighted: increasing urban complexity, expansion into more geographical areas, rising customer expectations for digital services, the need for real-time operational visibility, and the requirement for sustainable and efficient operations. These drivers mean that conventional, largely manual processes are increasingly inadequate for managing a large and geographically dispersed CGD network.

Digitalisation across the complete value chain

The presentation advocated digitalisation from planning and design through network construction, commissioning, customer acquisition, meter installation and conversion, metering and billing, operations and maintenance, and customer service. GIS mapping, digital engineering, SCADA, remote monitoring, field mobility, CRM, analytics and digital payment channels are positioned as interconnected components rather than isolated solutions.

Automation and operational visibility

IGL has implemented SCADA and automation across CNG and PNG operations. For CNG, the presentation showed centralised control-room monitoring, GIS-based station visibility, compressor monitoring and trend analytics. These systems provide real-time operating information, support early alarm detection and improve data-driven decision-making. For PNG, SCADA provides visibility of parameters such as pressure and station performance.

Smart metering and customer services

Smart metering was presented as an important element for improving billing accuracy, real-time monitoring, theft / leak detection and operational efficiency. The model includes AMR/prepaid systems, communication networks, data management and billing/customer-system integration. IGL has also promoted multiple digital payment options for PNG customers, including cards, e-wallets, UPI, Bharat Bill Pay, IGL Smart Card, payment links, WhatsApp and QR-based payments. Self-billing through the IGL Connect application allows customers to submit meter readings digitally, while spot billing enables immediate bill generation at the customer premises.

Field mobility and GIS-based asset management

The Field Mobility Application supports the end-to-end customer process, including new registration, feasibility checks, BP creation, riser installation, ready-for-connection updates, new gas conversion and move-in. The stated benefits include real-time data capture, online/offline functionality, faster turnaround, higher productivity and more secure data.

IGL's GIS system supports asset visualisation, PNGRB compliance, data sharing, maintenance planning and outage management. The presentation indicated that the network is mapped on GIS and that outage management can identify affected networks, valves and customers, generate reports and communicate estimated restoration information.

Future digitalisation and challenges

IGL identified digitalisation challenges and concerns around data integrity, ecosystem stability and stakeholder coordination. Future plans include predictive maintenance and process improvement, IoT-based transmitters and real-time pipeline integrity monitoring. The overall direction is towards an integrated, connected CGD system where physical infrastructure, digital platforms, field teams and customers operate through a common information environment.

Conclusion

The presentation establishes that a future-ready CGD network must integrate physical infrastructure with digital technologies, smart metering, GIS, automation and customer-facing services. IGL's approach aims to create greater operational visibility, faster service delivery and more data-driven management of the expanding CGD network.

IIIrd Presentation, Topic: Developing CGD Infrastructure: New Technologies, Innovation & Experience Sharing on Project Execution Excellence

Speaker: Shri Chandramani Tiwari, Chief Project Officer and Shri Kumar Gaurav, ATGL (Project Management Office).

The presentation examined CGD construction from the perspective of execution excellence, covering growth

imperatives, project lifecycle risks, construction technologies, global practices, mechanisation, utility-congestion management, digital operating systems, project controls, customer experience, safety and quality.

CGD growth and the execution imperative

The presentation noted that 307 geographical areas have been authorised, covering about 98% of India's population, while the share of natural gas in the energy mix is targeted to increase from 6.2% to 15% by 2030. It also cited growth targets of 17 million to more than 120 million PNG households and about 8,900 to more than 18,000 CNG stations. Against this backdrop, execution speed, safety and economics—not authorisation alone—become important determinants of market penetration, MWP compliance and customer acquisition.

Project lifecycle and ground realities

The CGD project lifecycle was presented as feasibility/design, route survey and GIS mapping, permissions and vRoU/RoW, construction, testing, commissioning/charging and customer connections. The presentation stressed that a delay at any stage can cascade into schedule and cost overruns. Front-loaded planning involving GIS, permissions and material readiness was identified as a major lever for improving project velocity.

Major construction challenges include underground utility congestion, traffic and restricted working corridors, approval delays, multi-contractor coordination, skilled manpower and material logistics, aggressive MWP timelines, and road restoration/public acceptance. These issues are particularly significant in dense urban areas.

Execution practices and trenchless technologies

Key success factors include route validation and utility mapping before mobilisation, parallel stakeholder and approval management, dedicated RoU/RoW cells, multi-front execution with advance material readiness, daily progress reviews and structured escalation, and a trenchless-first approach for congested corridors. A case example described the use of GIS and GPR mapping, HDD for arterial crossings, a dedicated authority-coordination desk and digital daily monitoring, resulting in faster commissioning with reduced open-cut disruption.

HDD, micro-tunnelling, pipe thrusting and pipe ramming were presented as important technologies for road, railway, river/canal and dense-city crossings. Their benefits include reduced surface disruption, faster execution, lower restoration requirements and safer placement beneath existing utilities.

Mechanisation, automation and utility management

The presentation proposed mechanised trenching, vacuum excavation, GPS-enabled equipment, automated/orbital welding, prefabricated assemblies and excavator geo-fencing. These technologies can improve productivity, quality and safety while reducing dependence on manual labour. Utility congestion can be addressed through GIS mapping, GPR surveys, trial pits/potholing, joint coordination with utility owners and geo-fencing of excavation equipment.

Digital execution and connected enterprise

ATGL's SOUL digital business operating system was presented as a cloud backbone across geographical areas and districts, integrating SCADA, GIS, AMR metering, CCTV/VTS, SAP and service-management systems. GIS supports route planning, utility conflict detection and digital as-built records, while SAP supports billing, maintenance, materials and service processes. A project control tower combines field data, e-DPRs, geo-tagged quality records and progress indicators for daily decision-making.

Safety, quality and customer experience

Safety measures include permit-to-work, life-saving rules, HIRA, utility-damage prevention, AI-enabled monitoring, contractor certification, HSE audits, toolbox talks and near-miss reporting. Quality practices include approved WPS/PQR, weld traceability, 100% NDT/radiography for steel welds, hydro-testing and digital QA/QC records. Customer-facing initiatives include digital onboarding, digital collections, app-based service, IVRS, digital tickets, self-service kiosks and computer-vision-based BOM capture.

Conclusion

The presentation concluded with an execution excellence framework built around planning excellence, technology adoption, digital monitoring, safety and quality, and stakeholder management. The future direction includes AI-based project controls, predictive analytics, drone monitoring, digital twins, GIS-integrated asset management, IoT-enabled construction and greater standardisation and automation.

IIIrd Presentation, Topic: Digital Initiatives in City Gas Distribution – GAIL Gas's Perspective

Speaker: **HC Pant, GM (CGD), GAIL Gas Ltd**

The presentation focused on the need to move from fragmented digital tools towards an integrated, data-driven operating model for large CGD networks. It positioned digitalisation as a means to improve network visibility, customer management, gas accounting, asset utilisation, safety response and operational decision-making.

Scale and operational context

The presentation described the scale of India's CGD infrastructure and highlighted GAIL Gas's footprint across standalone and joint-venture GAs. GAIL Gas was presented as operating across 13 states and 49 districts, with about 7 lakh PNG customers, around 600 CNG stations, approximately 1,350 km of steel network and 9,000 km of MDPE network. This scale creates a need for reliable visibility across geographically dispersed assets and customer endpoints.

Operational challenges

Four key problems were highlighted in managing a large CGD infrastructure: operational blind spots caused by periodic manual checks of DRS/MRS/steel networks; a revenue trap arising from the gap between achieved and billed PNG connections; unaccounted gas due to periodic manual reconciliation; and reactive safety response that depends heavily on manpower and human reporting. These issues can affect operational efficiency, revenue realisation, safety response and achievement of Minimum Work Programme targets.

From digital tools to digital intelligence

The presentation noted that hardware and software have already been deployed in several operational areas, but many solutions remain siloed. The next stage is therefore not simply adding more devices; it is integrating data and applying analytics. Examples include combining GIS infrastructure data with smart-meter consumption, LCV GPS data and patroller GPS information to identify anomalies, optimise routes, improve asset utilisation and detect possible third-party damage.

Digital roadmap and integrated architecture

The proposed digital roadmap progresses from sensing and capturing data, to connecting and integrating systems, monitoring and analysing information, and finally acting and optimising operations. The four-layer architecture comprises physical assets; IoT and edge sensors; a connectivity ecosystem; and a digital core/applications layer. The objective is to convert the physical CGD network into a continuously visible and controllable digital system.

Integrated dashboard

A major proposal is an integrated command dashboard that consolidates information from applications such as CNG Mitra, PNG Mitra, CP Monitoring and Sahaj. Phase 1 focuses on creating a unified platform; Phase 2 introduces real-time analytics and predictive outage management; and Phase 3 aims at automated reporting, including instantaneous

daily progress reports and asset summaries. The dashboard is intended to provide a single source of truth covering sales, asset utilisation, non-performing and performing assets, unbilled consumers and GA-wise performance.

Digital ecosystem constraints

The presentation identified four broad layers of friction. At the field and asset level, underground attenuation, hazardous-area requirements and power constraints can restrict IoT deployment. At the IT and data-infrastructure level, legacy systems and IT/OT integration challenges can prevent operational data from moving easily into business-intelligence systems. Smart-metering adoption faces non-uniform communication protocols, multiple meter makes, connectivity constraints, lack of regulatory mandate and questions around commercial viability.

Human and organisational factors are equally important. Skills gaps, process misalignment and siloed KPIs can reduce the benefits of digital systems. Customer and regulatory factors include the logistics of upgrading millions of consumer endpoints and the limitations of legacy billing systems in handling high-frequency smart-meter data.

Conclusion

The presentation concluded that digital transformation requires a holistic architectural strategy rather than isolated software or hardware upgrades. The roadmap proposes three broad steps: automate manual data-entry points, integrate isolated systems through APIs and a data platform, and transition workflows from reactive response to proactive, analytics-driven operations. The intended outcome is a complete automated and integrated digital operating model for GAIL Gas.

Remarks by Session Chair, Shri V C Chittoda

The four presentations collectively highlighted that the future growth of City Gas Distribution (CGD) depends not only on expanding physical infrastructure but also on improving the efficiency, safety and intelligence of project execution. The presentations emphasised the importance of front-loaded planning, effective contracting, timely permissions, material and manpower readiness, and strong coordination among stakeholders.

A common theme across the session was the growing role of GIS, digital platforms, SCADA, smart metering, field mobility, analytics and integrated project-control systems in transforming conventional CGD operations. The discussions also demonstrated how HDD and other trenchless technologies, mechanisation and innovative construction practices can help address utility congestion, traffic restrictions and other challenges associated with urban infrastructure development.

The presentations further underlined that safety, quality and asset integrity must remain integral to every stage of construction and operation, rather than being treated as separate activities. Digital handover, accurate asset records and integration between project execution and O&M were also identified as important for achieving long-term reliability.

Overall, the session presented a clear message that future-ready CGD infrastructure will require a combination of execution excellence, technology adoption, digital integration, skilled manpower and continuous innovation. The experiences shared by MGL, IGL, ATGL and GAIL Gas provided valuable practical insights into accelerating CGD expansion while improving operational visibility, customer service, safety and reliability.

Mementoes were presented to all the distinguished speakers by Shri V C Chottoda and the memento was presented to the Session Chair by Shri Satish Geda, Sr. Consultant, NGS as a token of appreciation and gratitude for his valuable contribution.

Day 2, Session - II (Timing: 11:30 Hrs – 13:00 Hrs)

Panel Discussion: IIIrd, Topic: Leadership & Construction Excellence in Delivering Mega LNG, Petrochemical & Gas Processing Projects

Panel Moderator: Ms. Jayati Ghosh, Former ED, EIL

Panellists:

1. **Shri Anand Victor, Head UP Cluster, HPCL**
2. **Shri Arun Bhardwaj, VP (Operation Excellence) HMEL**
3. **Shri Nishant Patel, CGM & VP (Projects), PLL**
4. **Shri S K Dubey, CGM (Projects), GAIL**
5. **Shri Santanu Putatunda, GM (PC-CO), GAIL**

Introduction of the Panel Moderator: Ms. Jayati Ghosh, FORMER ED, EIL

Ms. Jayati Ghosh is a distinguished oil & gas professional with **33+ years of experience** across the complete hydrocarbon value chain. A **B.Tech. in Chemical Engineering** from the University College of Science and Technology, Kolkata. Her extensive expertise spans **conceptualization, design, engineering, project implementation and commissioning** of major projects in Oil & Gas Processing, LNG, Refining, Petrochemicals, Pipelines and Fertilizers across India and overseas.

She has played a key role in implementing the **world's largest single-chain refinery in Nigeria** and **Mongolia's first refinery**, under Government of India Lines of Credit. She has spearheaded initiatives in **digital transformation, decarbonization, green technologies, sustainable solutions and operational excellence**, while contributing to EIL's diversification and internationalization strategies. She has also served on various committees under **MoPNG and MoCF**. She is a recipient of the **PetroFed Best Woman Employee Award** and **Green Technology Award** by Petrotech Society.

Introduction of the Panelists:

Shri Anand Victor, Head UP Cluster, HPCL

Shri Anand Victor P, Head - CGD UP-UK Cluster, Hindustan Petroleum Corporation Limited, 28+ years of
experience Affiliation to ASME, Climate Counsellor — UNFCCC supported Green Revolution Global Certification Program and other professional Institute. His expertise is in Operations & Projects in Cross Country Pipelines and City Gas Distribution. He is Certified in STEM of Corrosion in the Oil and Gas Industry

Shri Arun Bhardwaj, VP (Operation Excellence) HMEL

Mr. Arun Bhardwaj is a Chemical Engineer with a PG Diploma in Management and has over three decades of experience in the petroleum refining sector. He has been associated with HMEL since its inception and
has played a key role in the development and diversification of its integrated refinery and petrochemical complex.
He currently leads Operational Excellence, covering reliability, asset integrity, engineering, technical training, safety and environmental stewardship. His experience includes process engineering, technical services, operations, strategic planning, project development, crude procurement, production planning and Manufacturing Execution Systems (MES).

Shri Nishant Patel, CGM & VP (Projects)

Shri Nishant Patel is a seasoned professional in the **LNG and natural gas sector**, with extensive experience
in **project development, execution, construction management and energy infrastructure**.

In his present role at PLL, he is involved in major project and infrastructure initiatives, focusing on **project delivery, safety, quality, coordination and operational readiness**. He has also contributed to industry initiatives related to **construction safety, inspection practices and project excellence**, including activities associated with OISD.

His expertise in **LNG infrastructure, project management, construction and safety** makes him a valuable professional in the energy sector.

Shri S K Dubey, CGM (Projects), GAIL

An experienced Electrical Engineering professional with extensive expertise in natural gas and LPG infrastructure, project execution, O&M, safety and renewable energy.
He holds a B.Tech. in Electrical Engineering from NIT Bhopal and joined GAIL in 1997 at GAIL Pata. Over 13 years, he was involved in erection, commissioning and O&M of electrical switchyards, GCU, GPU and LPG plants. He subsequently spent nine years with the JLPL Jamnagar–Loni LPG Pipeline, gaining valuable experience in pipeline O&M, in-line inspection, cathodic protection, integrity management and safety. Since 2019, he has been associated with GAIL's Corporate

Projects Department, coordinating major projects including cross-country pipelines, 10 MW ground-mounted and 7.75 MW floating solar projects, CBG plant at Ranchi, LMC/CGD projects and integrity-related O&M initiatives. His diverse experience encompasses project execution, asset integrity, safety, O&M and sustainable energy infrastructure.

Shri Santanu Putatunda, GM (PC-CO), GAIL

Shri Santanu Putatunda is a Chartered Engineer with over 34 years of experience in the hydrocarbon and petrochemical sector, including 15+ years in GAIL's Corporate Petrochemical function. Currently General Manager – Project (Petrochemical), GAIL, He leads the Zero Liquid Discharge (ZLD) project and WWTP revamp at PATA. He has successfully delivered major projects including PATA-1, PATA-2 Gas Cracker Expansion, Metallocene Grade and Polypropylene projects. His expertise spans project execution, commissioning, licensor coordination, EPC/PMC management, engineering review, HAZOP and technology transfer. He also contributed to CNG standards through BIS and pioneered India's first CNG bus-filling station at Vijayawada**.**

Opening Remarks by Ms. Jayati Ghosh for panel discussion

Ms. Jayati Ghosh welcomed the distinguished panel comprising experienced professionals representing different segments of the energy value chain, from upstream and midstream to downstream, with perspectives spanning LNG, natural gas, petrochemicals, CBG and project execution. She noted that the panel brought together professionals with extensive industry experience and, more importantly, valuable lessons learned from executing major energy projects.

She emphasised the enduring importance of hydrocarbons because of their versatility and wide range of applications. While the industry is evolving and diversifying, hydrocarbons will continue to remain relevant, and the focus should be on using them innovatively, efficiently and responsibly.

Introducing the panelists, Ms. Ghosh highlighted their diverse expertise. The panel included professionals associated with midstream and upstream activities, refinery and petrochemical complexes, LNG infrastructure, CBG, natural gas networks and large-scale project execution. She particularly underlined the importance of the experience gained from major projects such as integrated refinery-petrochemical complexes and large LNG and gas infrastructure projects.

She observed that every energy project has its own distinctive challenges and execution strategy. The challenges encountered in Tier-2 cities may differ considerably from those in established urban areas, while LNG facilities, Petrochemical complexes and long-distance pipelines each present different technical, construction, coordination and execution requirements. Therefore, project strategies need to be developed according to the specific characteristics and complexities of each project.

The moderator also stressed the importance of strategic leadership in project execution. With the objective of keeping the discussion focused and meaningful, she requested each panelist to identify two critical areas that, from their experience as project leaders, deserve the greatest attention for successful project execution. The emphasis was on practical experience—what needs to be focused upon, effectively communicated across the project organisation and consistently followed through to achieve efficient, timely and successful project delivery.

She concluded by inviting the panelists to share their experiences, insights and lessons learned, with the aim of enriching the audience with practical knowledge on leadership, construction excellence, project strategy and execution of mega LNG, petrochemical and gas-processing projects.

Initial Key Perspective by Shri Anand Victor, HPCL

The speaker, drawing from his experience in cross-country pipeline projects and the city gas business, emphasised that the scale and complexity of projects may vary significantly, but the fundamental challenge remains the same.

He observed that project teams often focus primarily on cost, scope and technical deliverables, while the most critical element—people—can sometimes receive inadequate attention. In his view, successful project outcomes ultimately depend on effective people management, as project deliverables are achieved through the collective efforts, coordination and performance of the people involved.

He therefore identified people management as a fundamental starting point for successful project execution, based on his own experience of working on large and diverse energy infrastructure projects.

Initial Key Perspective by Shri Arun Bhardwaj, HMEL

The speaker emphasized that successful execution of mega LNG, petrochemical and gas processing projects depends on fast decision-making, careful contractor selection, and effective workforce management. Timely decisions accelerate implementation, while selecting competent contractors helps prevent delays, even if their services involve slightly higher costs. He highlighted the importance of investing in comprehensive project planning, involving all stakeholders from the outset, and establishing clear project objectives. During execution, project leaders must align the goals of the client, consultants, contractors, advisors, safety teams and O&M personnel. Effective leadership, coordination and a shared commitment to project timelines, quality and expectations are essential for achieving construction excellence.

Initial Key Perspective by Shri Santanu Putatunda, GAIL

The panelist highlighted two key measures for achieving excellence in project execution. First, pre-project activities should begin well before formal project approval when approval is anticipated. Companies should empower designated senior executives to authorize preliminary activities, including surveys, geotechnical investigations and statutory permissions, thereby avoiding delays during the initial six months. Second, integrated project management should be established immediately after investment or board approval. This involves coordinated planning, selection of competent teams and experts, appointment of Project Management Consultants (PMCs), and effective contractor management. Proactive preparation and integrated execution can significantly reduce project delays and potentially save six months in the overall project timeline.

Initial Key Perspective by Shri S K Dubey, GAIL

The panelist highlighted two critical factors for successful execution of mega petrochemical projects: strategic coordination and effective expediting. Drawing on experience across multinational, private-sector and public-sector organizations, he noted differences in their emphasis on quality, cost, and systems and procedures. He stressed the need for close coordination between Project Management Consultants (PMCs), vendors and the project owner, particularly in bridging gaps between engineering, equipment supply, erection and commissioning. The owner must ensure that all stakeholders work towards a common objective. He also emphasized proactive monitoring and timely follow-up of equipment deliveries, as delays in even small but critical items, such as wastewater pumps, can postpone entire plant commissioning.

Initial Key Perspective by Shri Nishant Patel, PLL

The speaker emphasized that project-specific strategic planning must begin at the initial stage rather than relying solely on reactive risk mitigation during execution. Each project requires a unique implementation strategy based on local conditions, including skilled manpower availability, transportation logistics, geographical challenges and climatic constraints. Citing projects in Nigeria and Mongolia, he highlighted the importance of assessing logistics and construction feasibility well in advance. In Mongolia, for instance, the

nearest port was approximately 1,000 kilometres away, with extreme temperatures ranging from –35°C to +35°C and severe winter conditions restricting outdoor work. He stressed that such challenges must be anticipated and integrated into project planning and execution strategies.

1. Introduction

This panel discussion highlighted that successful project delivery requires much more than technical expertise and contractual management. It depends on integrated project planning, strategic leadership, effective coordination among stakeholders, proactive risk mitigation, timely decision-making and a strong commitment to safety.

Moderated by Ms. Jayati Ghosh, the session brought together experienced professionals from the oil and gas, LNG, petrochemical and gas infrastructure sectors. The panellists shared their experiences from project execution, brownfield expansion, pipeline construction, LNG terminal operations and large-scale industrial projects. Their deliberations emphasized that the project owner must take overall responsibility for delivery while ensuring that consultants, contractors, vendors and the Operations & Maintenance (O&M) team work towards a common objective.

2. Integrated Project Management: One Team, One Goal

A major theme of the discussion was the need to move beyond departmental and contractual boundaries and adopt an integrated approach to project management.

The panellists observed that projects frequently encounter delays because individual departments O&M, contractors focus only on completing their respective assignments, without adequately considering their interfaces with other activities. Such fragmented working can result in delays in construction, commissioning and final handover.

Shri Santanu Putatunda highlighted the importance of the project owner's involvement in reviewing vendor packages beyond their basic inlet and outlet requirements. Equipment packages may be procured as independent units, but their utilities, interfaces and operating requirements must be examined in the context of the complete facility. This is particularly important in brownfield projects, where new installations must integrate with existing infrastructure. Wherever feasible, existing utilities should be evaluated for reuse to avoid unnecessary duplication and additional expenditure.

Shri Arun Bhardwaj emphasised the concept of working as **one integrated team**, irrespective of whether personnel belong to the owner, engineering consultant or contractor. He shared the experience of close coordination between HMEL, EIL and contractors, including placing engineering personnel in the consultant's office to resolve technical and contractual issues directly. This arrangement facilitated faster decisions and reduced delays arising from prolonged correspondence.

He also highlighted the importance of identifying critical contractors and assigning senior personnel to monitor their progress closely, including regular visits to vendor facilities and manufacturing locations. Early intervention helped address difficulties before they affected the overall project schedule.

Shri Nishant Patel stressed that the owner must drive the project rather than rely entirely on the consultant or contractor. The owner should establish clear objectives, align the expectations of all stakeholders and take timely decisions whenever differences arise. He also referred to the importance of decisive contract management when a contractor's performance or objectives are not aligned with project requirements.

The discussion established that integration is not merely a coordination mechanism; it is a leadership responsibility that must continue from project conception through construction, commissioning and handover.

3. Early Involvement of Operations & Maintenance

The early involvement of the Operations & Maintenance team emerged as another important requirement for construction excellence.

Shri Arun Bhardwaj explained that O&M personnel should participate during the early stages of engineering and

project execution, preferably well before completion. Their involvement in design and 3D model reviews helps ensure that operational requirements, maintainability, accessibility and other practical considerations are addressed before construction is completed.

If operational personnel are involved only at the commissioning stage, they may identify deficiencies that require modifications, resulting in additional costs and delays. Early consultation helps minimise such problems and facilitates a smoother transition from project execution to plant operation.

The panellists also emphasised that the ultimate objective of a project is not simply to complete construction but to deliver a safe, reliable and operable facility that meets the owner's long-term requirements.

4. Strategic Planning and Backward Integration

The discussion highlighted that project planning should begin well before the commencement of construction. Strategic decisions relating to site selection, feedstock availability, logistics, utilities, land and connectivity can significantly influence project schedules and costs.

One panellist explained the importance of backward integration through the example of a petrochemical project dependent on ethane or other feedstock. Site selection should consider proximity to the source or port and the time required to establish reliable feedstock supplies. A delay in feedstock availability can render a completed or nearly completed facility incapable of commencing operations.

Similarly, the availability of land, right-of-use arrangements, statutory permissions, utilities and access infrastructure must be assessed before fixing the execution schedule.

The panelists also stressed the importance of thorough pre-tender preparation. Shri Santanu Putatunda shared an example from a Zero Liquid Discharge (ZLD) project in which extensive technical discussions were conducted with prospective vendors before tender finalization. Five vendors participated without submitting technical deviations, substantially reducing the time otherwise required to resolve deviations after bid submission.

The example demonstrated that investment in front-end preparation can reduce uncertainty during procurement and execution. Realistic project schedules should also be developed in consultation with experienced vendors and contractors rather than relying exclusively on preliminary estimates prepared during the initial planning stage.

5. Robust Project Planning and Dynamic Schedule Management

The panelists agreed that a project schedule should not be treated as a static document prepared at the beginning and subsequently followed without revision. Project conditions change continuously, and planning must respond to emerging constraints and risks.

Shri S. K. Dubey emphasized the need for a **rolling and dynamic project plan**. Activities that initially appear non-critical may become critical as the project progresses. Project teams must therefore regularly review critical-path activities, procurement lead times, site readiness and dependencies between packages.

He cited the importance of arranging materials according to their procurement lead times and initiating procurement sufficiently early. He also highlighted that seemingly minor utility facilities can affect the commissioning of an entire plant. For example, inadequate availability of raw water or demineralized water can prevent the operation of major equipment and delay commissioning, even when the principal process units are ready.

Shri Arun Bhardwaj added that non-critical activities, including utilities and offsites, should not automatically be postponed until the final stages. Completing suitable activities early can reduce peak manpower requirements and prevent the accumulation of unfinished work near commissioning.

The panel's discussion underlined the need to monitor critical-path activities continuously, identify emerging bottlenecks and update schedules in response to actual site conditions. Project reviews should focus on resolving constraints and taking corrective action rather than merely reporting progress against the original baseline.

6. Risk Assessment and Mitigation

Risk management was identified as an integral part of robust project planning. The panellists stressed that every project has uncertainties and that a credible plan must include contingency measures and alternative strategies.

Shri Anand Victor highlighted practical risks in pipeline construction, including restrictions on working hours, seasonal conditions, difficult soil strata and trench instability. For example, pipeline-laying targets may be affected by restrictions imposed by highway authorities or by the time required for excavation and backfilling in challenging ground conditions. Such constraints must be anticipated when determining daily productivity and contractor deployment.

Shri Nishant Patel discussed major risks in cross-country pipeline projects, particularly the availability of right-of-use land, permanent land for station facilities and statutory permissions. Forest and Coastal Regulation Zone (CRZ) clearances can require considerable time. Even a short stretch awaiting approval may prevent completion of an entire pipeline section and delay the transportation of gas or other hydrocarbons.

He also referred to risks associated with Compressed Biogas (CBG) projects, including land availability, municipal waste supply and logistics.

The panellists emphasised that risk registers should identify potential bottlenecks, assess their impact on the critical path and specify mitigation measures, responsible personnel and alternative arrangements. Procurement risks, transportation constraints, statutory approvals and site-specific limitations should be addressed well before they affect execution.

A recurring message was that project teams must **"hope for the best and prepare for the worst."** Effective risk management does not eliminate every uncertainty; it improves the project's ability to respond quickly when unexpected situations arise.

7. Illustrative Experiences from Project Execution

Several practical examples illustrated how advance preparation, coordination and timely decisions can help overcome complex construction challenges.

a. Long-distance pipeline crossing: Shri Nishant Patel referred to a pipeline crossing beneath the Mahanadi River, involving a stretch of approximately 3.8 km. During the operation, the reamer became stuck, creating a major technical challenge that had not been adequately anticipated. The team spent approximately 23 days examining possible solutions, including attempts to retrieve the reamer and consideration of an alternative bore. The experience highlighted the need to consider difficult ground conditions, specialized equipment risks and contingency arrangements in advance.

b. Replacement of LNG unloading arms: An example from an LNG terminal illustrated the importance of integrating equipment limitations, marine logistics and contractor capabilities. During the replacement of unloading arms after a long period of operation, the team encountered limitations in the capacity and positioning of a jack-up barge and crane. By bringing the relevant teams together, reviewing the available resources and reorganising the handling sequence, the work was completed within the stipulated 20-day shutdown period. The example demonstrated the value of collective problem-solving and timely operational decisions.

c. Transportation of heavy equipment: Shri Arun Bhardwaj described the transportation of three heavy equipment units, each weighing approximately 900 tonnes, over a distance exceeding 1,000 km for a project at Bathinda. Advance road surveys and assessments of bridges and bypass requirements were undertaken. However, an unexpected constraint arose when the dimensions of a railway crossing barrier were found to be inadequate for the equipment being transported. The incident illustrated the importance of checking even seemingly minor route constraints and obtaining the necessary permissions well in advance.

d. Procurement and schedule realism: The panellists discussed how delays in critical equipment and associated materials can affect project completion. An example involving a petrochemical extruder illustrated the complications that can arise when materials expected to be available from overseas are delayed and alternative fabrication arrangements must be made at the project site. Additional vendor approvals, labour licensing and access permissions can create further delays. The lesson was to validate vendor delivery commitments, examine alternative arrangements and make decisions based on realistic conditions rather than assumptions.

These examples reinforced the need for detailed preparation, practical risk assessment and prompt decisions supported by multidisciplinary teams.

8. Leadership, Decision-Making and Contractor Management

The discussion repeatedly returned to the role of leadership in resolving project constraints. Even a well-prepared schedule can fail if decisions are delayed or responsibilities are unclear.

The panellists observed that project managers must be empowered to address emerging issues within established governance and approval frameworks. Delayed decisions can turn manageable problems into critical-path disruptions.

The selection and management of contractors also received attention. The panel discussed the need to balance cost, quality, reliability and delivery capability. While procurement rules and evaluation procedures must be respected, technical competence, proven performance, resource availability and the ability to meet demanding schedules are important considerations.

The owner should understand the difficulties faced by consultants and vendors, just as the consultant and contractor should appreciate the owner's operational and commercial objectives. Constructive engagement, clear contractual responsibilities and early resolution of disagreements can help maintain progress without compromising safety or quality.

9. Role of Technology and Digitalisation

The panellists acknowledged the growing role of technology in improving project integration and monitoring. Compared with earlier years, engineering drawings and technical information are now more readily available, enabling regular reviews among internal teams and external agencies.

However, the moderator observed that the availability of digital tools alone does not guarantee effective integration. Different systems and information platforms must communicate with each other, and project teams must use the information to support timely decisions.

In the concluding round, Shri Nishant Patel suggested the use of an **AI-enabled digital twin and project dashboard**. A digital twin could support simulation of project development, while a dashboard could provide visibility into progress, constraints and emerging delays. Such tools could strengthen monitoring and improve the identification of potential bottlenecks.

The discussion also indicated that technology should complement, rather than replace, sound engineering judgement, effective leadership and coordination among stakeholders.

10. Key Takeaways and Recommendations

The panel discussion brought out the following key lessons for improving the delivery of mega LNG, petrochemical and gas processing projects:

1. **Adopt integrated project management:** Align the owner, consultant, contractors, vendors and O&M team around clearly defined project objectives.
2. **Strengthen front-end planning:** Address site selection, feedstock, land, utilities, logistics and statutory approvals before finalising execution commitments.
3. **Involve O&M personnel early:** Incorporate operational requirements during engineering, design reviews and construction.
4. **Maintain a dynamic project plan:** Regularly review critical paths, procurement lead times, interfaces and emerging constraints.
5. **Institutionalise risk management:** Maintain project-specific risk registers and prepare alternative strategies for critical equipment, permissions, transportation and site conditions.
6. **Improve pre-tender preparation:** Resolve technical requirements and minimise avoidable deviations before contract award.
7. **Enable timely decisions:** Empower project leadership to address problems promptly within applicable contractual, financial and governance requirements.
8. **Monitor critical vendors closely:** Assign responsibility for tracking the manufacturing and delivery of critical equipment, including visits to vendor facilities where appropriate.

9. **Prioritise safety:** Protect personnel, equipment and materials throughout execution, recognising safety as a prerequisite for sustainable project performance.
10. **Leverage digital tools:** Use integrated dashboards, digital models and, where appropriate, AI-enabled digital twins to improve visibility and coordination.
11. **Build collective ownership:** Encourage every stakeholder to act as a contributor to the overall project outcome rather than focusing exclusively on individual departmental deliverables.

11. Conclusion

The session concluded that construction excellence in mega LNG, petrochemical and gas processing projects is achieved through the combined application of strategic leadership, integrated project management, realistic planning, proactive risk mitigation and effective coordination among all stakeholders.

The experiences shared by the panellists demonstrated that project challenges may arise from major technical uncertainties as well as apparently minor issues involving permissions, utilities, logistics, equipment interfaces and delayed decisions. Their timely identification and resolution are essential to maintaining project schedules and controlling costs.

The overarching message was that **the project owner must drive integration, the project team must take collective ownership, and leadership must ensure timely decisions without compromising safety, quality or operational requirements.** With stronger front-end preparation, continuous schedule review, effective contractor engagement and appropriate use of technology, project organisations can improve their ability to deliver complex infrastructure within realistic timelines and cost parameters.

The moderator and panellists collectively emphasised a practical guiding principle for project leaders: **"Hope for the best and prepare for the worst."** This captures the importance of anticipating uncertainty, maintaining alternative plans and responding decisively to unforeseen challenges.

A memento was presented to the Paneslists and the session moderator as a token of gratitude and appreciation for their valuable presence and contribution to the event.

NGS Conclave on
Construction Management

Day-2: Session – III: Project Execution & Technology Presentation Session (14:00 Hrs – 15:30 Hrs)

Technical Session (Presentations): Ist

Theme: Construction & Commissioning of Greenfield and Brownfield Petrochemical & Gas Processing Facilities: Industry Experience & Lessons Learned

Session Chair: Shri A N Pandey, MD, MYPG Techno Inspection and Former ED, GAIL

Introduction of Shri A N Pandey

Shri A. N. Pandey is a seasoned Oil & Gas professional with 37+ years of experience. An Electrical Engineer, he joined GAIL as Graduate Engineering Trainee in 1985 and superannuated in 2021 as Executive Director (O&M). During his tenure with GAIL, he was involved in construction, operations and maintenance of 12,000 km of natural gas pipelines, 2,000 km of LPG pipelines and associated facilities, including Gas Processing Units. He spearheaded company-wide initiatives in GIS, Asset Integrity Management, intelligent pigging, cathodic protection and digitization of O&M activities. He also held leadership roles in HRD and Technical Internal Audit, contributing to recruitment, performance management and management systems. He was instrumental in implementing ISO 9001, ISO 14001 and OHSAS 18001 systems.

Presently, he is Managing Director, MYPG Techno Inspection Services Pvt. Ltd., an ISO 17020-accredited Type A Inspection Body.

Ist Presentation, Topic: **Execution of 60 KTA Polypropylene Project at Pata**

Speaker : Shri Vishal Kumar Mehta, Sr. Manager (Petrochemical), GAIL (India) Ltd. (Experience Sharing on Brownfield Project Execution, Interface Management, Construction Planning, Risk Mitigation and Lessons Learned)

The presentation described the complete execution journey of GAIL's 60 KTA Polypropylene (PP) Project at Pata,

covering project planning, engineering, procurement, construction, pre-commissioning and commissioning. The project was implemented with Grace Technologies as Licensor and Engineers India Limited (EIL) as EPCM consultant.

Project Background

The speaker outlined the major milestones of the project, beginning with Board approval in 2019, licensor selection in 2020, environmental clearance,

detailed engineering and eventual commissioning in February 2026. The presentation emphasized that execution of a petrochemical project requires careful integration of technology licensing, EPCM coordination and timely procurement of long-lead equipment.

Execution Strategy

A structured project execution flow was presented, starting from appointment of the EPCM consultant and mobilization of site teams, followed by site enabling works, topographical and geotechnical investigations, layout finalization, environmental clearance, preparation of material requisitions and procurement of long-lead items. Civil and structural works were planned in parallel with detailed engineering to optimize construction schedules.

The speaker highlighted the importance of conducting HAZOP studies, 3D model reviews, customs documentation, logistics planning and coordination with finance and customs authorities before delivery of imported equipment. Adequate planning between civil works and composite mechanical works was identified as a key factor for creating sufficient work fronts and avoiding construction delays.

Construction Challenges

One of the major challenges discussed was the ordering and procurement of Long Lead Items (LLIs). Several critical

packages attracted only single bids, while vendors frequently sought extensions in delivery schedules or modifications in bid qualification criteria. These issues had the potential to affect project timelines and procurement competitiveness.

Best Practices & Learnings, The following several practical measures were recommended:

- Conduct detailed pre-tender meetings to minimise bidder queries.
- Finalise Bid Evaluation Criteria (BEC) through consultation with the tender committee before floating tenders.
- Improve documentation quality to reduce procurement cycle time.
- Maintain close coordination among engineering, procurement and construction teams for timely delivery of equipment.

Conclusion

The Pata PP Project demonstrated that effective project management, integrated procurement planning, rigorous engineering reviews and proactive stakeholder coordination are essential for successful execution of petrochemical facilities. The experience provides valuable guidance for future polymer and process industry projects.

IInd Presentation, Topic: **Construction of LCNG infrastructure:** Experience sharing, construction practices, challenges, innovations and key lessons learned.

Speaker : Shri Rajendra Sharma, GM and Shri Reny Varghese, GM; M P Engineering, Mumbai

The presentation showcased the engineering and construction practices adopted in the development of Liquefied

Natural Gas (LNG) and LCNG infrastructure, with emphasis on turnkey execution, cryogenic systems and commissioning excellence.

Scope of Expertise

The organization presented its integrated capabilities covering:

- LNG & LCNG infrastructure
- Cryogenic storage systems
- Vapour Recovery Units (VRU)
- City Gas Distribution infrastructure
- Oil & Gas EPC projects
- Manufacturing, commissioning and lifecycle O&M support

The speaker emphasized the value of executing projects through a single integrated Engineer–Manufacture–Build–Commission–Support approach.

Why LCNG Construction is Different

A key theme of the presentation was that LCNG projects demand simultaneous control over four critical construction conditions:

1. Cryogenic systems requiring specialized materials, insulation and cleanliness.
2. High-pressure piping demanding rigorous testing and safety controls.
3. Multi-disciplinary interfaces involving civil, piping, electrical, instrumentation and HSE teams.
4. Construction readiness, including testing, punch-point closure and documentation before commissioning.

Technical Highlights

The presentation explained the function of major LCNG equipment, including:

- Vacuum-insulated cryogenic LNG storage tanks
- LNG unloading pump skids
- High-pressure and medium-pressure LNG pumps
- Ambient vaporizers
- Pressure regulating skid (DRS)
- Priority panels
- Odorization systems
- Instrument air compressor systems

Each system was described in terms of its role in ensuring safe LNG handling, vaporization and reliable CNG generation.

Key Learnings, The speaker stressed that successful LCNG execution depends upon:

- Early interface management between disciplines.
- Strict quality control for cryogenic fabrication and piping.
- Comprehensive testing before commissioning.
- Strong HSE culture throughout construction.
- Integrated EPC execution to reduce schedule and coordination risks.

Conclusion

The presentation demonstrated that LCNG infrastructure is significantly more complex than conventional gas installations, requiring specialized engineering, disciplined construction practices and meticulous commissioning to achieve safe and reliable operation.

IIIrd Presentation, Topic: **Brownfield Integration of a World-Scale Petrochemical Complex with an Operating Refinery**

Speaker: Shri Narendra Verma, DGM (Process Excellence & Technical Services), HMEL

The presentation highlighted the challenges and engineering strategies involved in integrating a world-scale petrochemical complex with an operating refinery at HMEL, Bathinda. The project illustrated how brownfield expansion can be executed while maintaining uninterrupted refinery operations.

The speaker introduced HMEL as one of India's most integrated refining and petrochemical complexes, comprising:

- **12.5 MMTPA refinery**
- **1.2 MMTPA polyethylene capacity**
- **MMTPA polypropylene capacity**
- **Integrated biofuel facilities**
- **Extensive crude oil pipeline and marine infrastructure**

Brownfield Integration Challenges, the core discussion centered on integrating new petrochemical units with existing refinery facilities. Major challenges included:

- Working within an operating refinery without disrupting production.
- Integration of utilities and process units.
- Tie-ins with existing piping and control systems.
- Managing shutdown windows for critical connections.
- Maintaining safety while executing simultaneous construction and operations.

Engineering Excellence, HMEL showcased several advanced features supporting successful integration:

- Collaboration with globally reputed licensors and technology providers.

- Extensive digitalization using DCS, MES and advanced process control.
- Automated polymer storage and retrieval systems.
- Environment-friendly technologies including Sulphur recovery, flare recovery and zero liquid discharge systems.

Key Learnings, the speaker emphasized:

- Brownfield projects require much higher coordination than greenfield developments.
- Construction sequencing must align with refinery operational requirements.
- Digital engineering and advanced planning reduce shutdown duration.
- Safety, communication and interdisciplinary collaboration are the foundation of successful integration.

Conclusion

The presentation demonstrated that brownfield petrochemical expansion can be successfully implemented through meticulous planning, digital engineering, phased construction and close coordination between project and operations teams.

IVth Presentation, Topic**: The Journey of GAIL's First Electrification – HVJ Compressor Station, Vijaipur**

Speakers: Shri Yogeshkumar Hamirbhai Bhola, Manager (Mech), Shri Sudhansh Pathak, Manager (Inst) and Ms. Babita Beniwal, SE (Elect), GAIL

The presentation documented GAIL's first electrification project, involving replacement of a gas-turbine-driven compressor with an electric motor drive at the HVJ Compressor Station, Vijaipur. The initiative supports GAIL's long-term Net Zero Action Plan and decarbonization strategy.

Background

The HVJ pipeline is India's backbone natural gas transmission system, extending approximately 1,800 km with multiple compressor stations and 55 gas-turbine-driven compressors. Historically, gas turbines were selected because of limited grid availability, fuel availability and independent power generation capability during the original pipeline design.

Need for Electrification

The presenters explained several factors that prompted the conversion:

- Increasing gas turbine overhaul costs (approximately every six years).
- Long overhaul turnaround periods of 18–24 months.
- Volatility of natural gas prices.
- Obsolescence of ageing turbine technology.
- Low operating efficiency of existing turbines.
- GAIL's commitment towards decarbonization and Net Zero initiatives.

Project Methodology

A pilot project approach was adopted, replacing the gas turbine with a 6.6 kV electric motor coupled through a gearbox while retaining the existing centrifugal compressor. The project progressed through feasibility study, tendering, design approvals, manufacturing, site removal, erection and commissioning within a structured milestone framework.

Construction Execution

The in-house GAIL team executed critical site activities including:

- Removal of existing gas turbine equipment.
- Construction of reinforced civil foundations.
- Installation of motor, gearbox, HT and VFD systems.
- Lube and seal oil system modifications.
- Laying of approximately 1.8 km of power cables.
- Precision alignment of compressor, gearbox and motor.
- Final commissioning and performance validation.

Benefits & Learnings: The electrification project demonstrated several long-term advantages:

- Reduction in greenhouse gas emissions.
- Improved energy efficiency.
- Lower maintenance and overhaul costs.
- Enhanced equipment reliability.
- Reduced dependence on fuel gas.
- Creation of a scalable model for future compressor station electrification across GAIL's network.

Conclusion

The presentation illustrated a significant milestone in GAIL's energy transition journey, showing how existing gas transmission infrastructure can be modernized through electrification while improving sustainability, operational efficiency and lifecycle economics.

Mementoes were presented to all the distinguished speakers by Shri A. N. Pandey. The memento was presented to the Session Chair, Shri A. N. Pandey, by Shri Satish Geda, Sr. Consultant, NGS, as a token of appreciation and gratitude for his valuable contribution.

Session-IV, Technical Session – IV

Theme: "Technical Session – IV: Emerging Gas Infrastructure Projects: Experience Sharing on LNG, Hydrogen, CBG & Advanced Energy Infrastructure Development

Session Chair: Shri Satish Geda, Former Executive Director, GAIL

Mr. Satish Geda has 35 years of leadership in India's Natural Gas sector and retired as Executive Director

(O&M) at GAIL. He led multi-billion-dollar projects across Natural Gas, petrochemicals, LPG/GPU, compressor stations, HRSGs, pipelines, and hydrogen plants. He oversaw administration and asset integrity of NG infrastructure and maintenance bases. With deep expertise in reciprocating compressors and rotating equipment, he worked extensively with global OEMs including Rolls-Royce, GE, Siemens, Burckhardt, Linde, and Dresser-Rand. He served 14 years on BIS committees and strengthened asset integrity and global collaboration across GAIL's networks. He is currently Senior Consultant to the Natural Gas Society.

Ist Presentation Topic: **LNG on Wheels: Leveraging Small-Scale LNG for Accelerated CGD Expansion, Market Development, Last-Mile Connectivity and Innovative Gas Supply Models**

Speaker: Shri **Shri Shivank Bholanath, Sr Manager** – Risk Management, Petronet LNG Ltd., New Delhi.

Objective

The presentation explored the concept of **"LNG on Wheels"** as a means of extending Natural Gas access beyond the

existing pipeline network. It focused on the role of **Small-Scale LNG (SSLNG)** in accelerating CGD expansion, enabling last-mile connectivity and developing new gas markets.

The central proposition was that LNG transported by cryogenic tank trucks can act as an interim or complementary supply mechanism for areas where pipeline connectivity is not yet available or is difficult to establish.

Energy Access Challenge

The presentation highlighted that significant parts of the country remain beyond the immediate reach of the gas pipeline network. At the same time, CGD development may progress ahead of pipeline connectivity, while industries and transportation continue to depend on diesel, furnace oil, LPG and other liquid fuels.

The proposed SSLNG supply chain is:

LNG Terminal → LNG Truck → Satellite LNG Station → Consumer

The presentation identified faster deployment, comparatively lower capital requirements than a dedicated gas pipeline, flexible demand aggregation and the ability to create a market before arrival of a pipeline as key advantages.

SSLNG Ecosystem

The presentation described an integrated SSLNG ecosystem comprising:

- LNG terminals and loading bays
- Cryogenic LNG tank trucks
- Satellite LNG stations
- Small-scale regasification units
- LNG fuelling stations
- LCNG stations

Potential applications include **CGD, manufacturing, LNG-fuelled transportation, mining, marine applications and remote power generation**. The presentation also covered LNG station facilities such as storage, LNG pumps, LCNG pumps and PNG connectivity.

Role in CGD Expansion

One of the important applications discussed was the use of LNG trucking for **last-mile CGD connectivity**.

Remote CGD areas may face challenges such as:

- Delay in pipeline commissioning
- Low initial demand density
- Difficult or uneconomical pipeline connectivity

The presentation proposed LNG trucking as a means of enabling **PNG rollout ahead of pipeline connectivity, commissioning of CNG stations, industrial customer acquisition and revenue generation from the beginning of CGD operations**.

This approach can therefore support faster monetisation of CGD licences while the permanent pipeline infrastructure is being developed.

Industrial Market Development

The presentation identified industries such as **steel, glass, ceramics, cement and chemicals** as potential users of LNG in place of diesel, furnace oil, LDO and LPG.

The reported benefits include lower emissions, stable combustion, reduced maintenance requirements and competitive energy costs.

LNG for Long-Haul Transportation

Another major opportunity discussed was LNG as a fuel for long-haul heavy commercial vehicles. The presentation noted the large size of India's medium and heavy commercial vehicle segment and indicated the potential for LNG to create a substantial transportation fuel market.

It also presented examples of LNG truck manufacturers and highlighted the range capability of LNG-fuelled trucks equipped with large cryogenic fuel tanks.

The comparison of LNG and diesel presented in the slides indicated lower CO_2 emissions, near-zero SOx, lower particulate emissions and lower noise for LNG.

Challenges

The presentation identified several challenges to wider adoption of LNG on Wheels:

- Limited LNG fuelling stations
- Limited terminal loading bays
- Transportation costs
- Higher initial vehicle cost
- LNG price volatility
- Cryogenic handling requirements
- Boil-Off Gas management
- Limited availability of LNG-fuelled vehicles
- Supply-chain disruptions
- Competition from electrification and other emerging fuels
- Methane-emission considerations

Future Enablers

The presentation identified competitive LNG pricing, additional loading bays, fleet incentives, policy support, faster installation of LNG stations and expansion of CGD networks as important enablers.

Potential future applications include:

- LNG trucking
- LNG supply to PNG areas away from the gas grid
- Replacement of LPG
- Marine bunkering
- Mining
- Remote power generation
- Bio-LNG integration
- Small-reserve gas liquefaction
- Cold-energy utilisation

The presentation also referred to ongoing efforts involving CGD area owners, truck fleets, the mining sector and the Government task force working on LNG-fuelled trucking.

Conclusion

The presentation positioned **LNG on Wheels as a strategic connector between the LNG supply system and consumers located beyond the immediate reach of pipelines**. It highlighted the potential of SSLNG to support faster CGD development, industrial fuel switching, LNG-based transportation and broader gas access.

The concluding message was that SSLNG can contribute to the evolution of India's gas infrastructure from a predominantly pipeline-based network towards a **broader nationwide gas-access ecosystem**.

IInd Presentation Topic: **Recommissioning & Modernisation of Legacy LNG Infrastructure at Dabhol Terminal**

Speaker: Shri Rambabu Kuraganti, DGM(O&M) and Raju Katravath, Manager(O&M), Konkan LNG Ltd (KLL)

Objective

The presentation documented the transformation of the **Dabhol LNG Terminal**, from a stalled and preserved legacy asset into a functioning LNG terminal through systematic brownfield rehabilitation, recommissioning, operational learning and subsequent modernisation.

The presentation described this journey as **"Brownfield LNG Infrastructure Revival through Cryogenic Systems Rehabilitation and Terminal Modernization."**

Background

The Dabhol project was originally conceived as an integrated power and LNG import project. Following the suspension of the project in 2001, the facility remained in preservation mode for several years.

RGPPL was subsequently formed in 2005 as part of the revival and restructuring of the Dabhol assets. The inherited facility included a large combined-cycle power station and an integrated **5 MMTPA LNG regasification terminal**.

The presentation subsequently traced the transition from preservation to recommissioning and later modernisation. Its transformation timeline included project stoppage, RGPPL revival, commissioning attempts, successful commissioning, Zero Send-Out implementation, cyclone recovery, truck loading facility development, breakwater completion and terminal modernisation.

Brownfield Restoration Strategy

A particularly important aspect of the presentation was the **five-stage system engineering approach**:

Assess – Establish the actual condition of the facility and identify incomplete works.
Restore – Rehabilitate LNG, marine, process and utility infrastructure.
Revalidate – Re-establish the integrity of jetty, electrical, instrumentation and control systems.
Integrate – Integrate unloading, storage, BOG, regasification, send-out, electrical and safety systems.
Recommission – Complete mechanical, electrical, instrumentation, IT and safety validation followed by operational commissioning.

This approach illustrates the importance of systematic assessment before attempting to restart a long-preserved LNG facility.

Rehabilitation of the LNG Value Chain

The restoration covered the complete LNG value chain, including: LNG unloading facilities, Cryogenic storage tanks, LNG pumps, BOG compressors, Recondenser, LP/HP boosters, Vaporizers, Marine navigation facilities, Electrical and utility systems, Fire water and flare systems, DCS, ESD and Fire & Gas systems, Ship–shore interface systems

Commissioning Challenges & Learning

The first LNG commissioning cargo in March 2012 served as an important **full-scale test of the rehabilitated facility**. The presentation explained that the initial cargo operation was interrupted after only a limited quantity had been discharged, exposing several latent weaknesses. Among the issues identified were marine/fender problems, unloading-arm integrity issues, ESD and electrical reliability problems and failure of ring-main bellows. These issues were progressively addressed through replacement, repair and modifications before the second commissioning attempt.

The presentation therefore highlighted an important brownfield lesson: **initial commissioning can reveal latent weaknesses that may not be evident during individual equipment testing**, and these observations should be systematically converted into engineering improvements.

Successful Commissioning

Following corrective actions and further testing, the terminal achieved successful commissioning in January 2013. The terminal moved to full LNG receiving and regasification capability, including LNG import, cryogenic storage, BOG handling, LNG pumping, vaporization and gas send-out.

Zero Send-Out Philosophy

A major operational innovation described in the presentation was the **Zero Send-Out (ZSO) scheme**.

The absence of a completed breakwater meant that LNG vessels could not safely berth during the monsoon period. Repeated cooling and warming cycles created concerns related to thermal fatigue and asset integrity.

The ZSO approach was adopted to maintain cryogenic conditions in the terminal during shutdown periods, thereby improving asset integrity, safety and restart readiness.

BOG Recovery & Energy Efficiency

The presentation also discussed the challenge of BOG generation during monsoon operations. Installation of a BOG Booster Compressor enabled recovery, compression and reuse of BOG instead of routing the entire quantity to the flare system.

This helped reduce product losses and flaring and improved overall terminal efficiency.

Operational Resilience

The Dabhol journey included several other challenges, including: Power supply disruptions, RGPPL power block stoppage, Increased BOG generation, Cyclone Tauktae, Monsoon operating restrictions, Dependence on external heating systems, Ageing equipment and obsolete control systems

The response included alternative power arrangements, improved BOG management, enhanced monitoring and extensive equipment rehabilitation. The presentation also described successful revival and commissioning of **Tank T-200 in 2021**, restoring the three-tank storage capability and improving operational flexibility and redundancy.

Terminal Modernisation

The modernisation programme subsequently extended beyond simple recommissioning. Major initiatives included: Completion of the breakwater and achievement of all-weather terminal status, Truck Loading Facility commissioned in January 2024, Additional LNG distribution beyond the pipeline network, Heating system development, 60 MW MSETCL power connection, Equipment overhauls, LNG unloading-arm upgrades, Tank gauging and control-system upgrades, Ship-to-shore communication improvements, Weather monitoring and ESD system upgrades, Rooftop solar installation

The presentation also showed the terminal's expansion pathway from **5 MMTPA towards 6.3 MMTPA**.

Key Learnings

The major lessons from the Dabhol experience were:

- Legacy assets can be successfully revived through systematic condition assessment and rehabilitation.
- Commissioning should be treated as an important learning stage rather than merely a project milestone.
- Cryogenic preservation is critical where prolonged shutdowns are unavoidable.
- Brownfield projects require continuous integration between engineering, operations, maintenance and safety teams.
- Modernisation should continue even after successful recommissioning.
- Infrastructure resilience and business continuity need to be incorporated into long-term terminal planning.

Conclusion

The Dabhol case presented a comprehensive example of **brownfield LNG asset revival, engineering rehabilitation, operational learning and continuous modernisation**. The journey demonstrates how a preserved legacy facility can progressively be transformed into a more resilient, flexible and modern LNG infrastructure asset.

IInd Presentation Topic: **Construction of Offshore Breakwater for All-Weather LNG Operations at Dabhol LNG Terminal: Overcoming Marine Infrastructure, Offshore Construction and Monsoon Engineering Challenges**

Speaker: Sh Rajesh Kharadi, DGM (O&M), Konkan LNG Limited-KLL and Shri Piyush Sanjay Dhage, Manager (F&S), Konkan LNG Ltd (KLL)

Objective

The presentation focused specifically on the **construction of the offshore breakwater at Konkan LNG Limited's Dabhol LNG Terminal**, which was undertaken to convert the terminal from a seasonal LNG receiving facility into an **all-weather LNG terminal**.

Background

Construction of the marine facilities at Dabhol commenced in 1999. Approximately **55% of the breakwater and 95% of the LNG jetty** had been completed when the work was abandoned in 2001.

Although the LNG terminal was subsequently commissioned in 2013, the incomplete breakwater restricted LNG vessel operations during the monsoon season.

Need for the Breakwater

The terminal faced significant maritime constraints because LNG carriers could not safely berth during adverse monsoon conditions.

The project therefore involved construction of a **2.3 km offshore breakwater**, located approximately 2.2 km from the shoreline, in water depth of around 18 metres, with the structure extending above Chart Datum.

The objective was to create a protected marine basin and enable year-round LNG cargo movement.

Engineering Concept

The presentation explained that a breakwater is designed to: Dissipate wave energy, reduce coastal erosion, Provide safe harbour conditions, Support marine transportation and port operations,

The Dabhol structure is an **offshore rubble-mound breakwater** rather than a conventional land-connected structure. The presentation highlighted its flexible behavior, sloping profile and use of rough armor units to dissipate wave energy.

Unique Features: The presentation described the Dabhol breakwater as a unique offshore construction project because of its location in open water away from the coastline.

The structure uses: Locally quarried core rock, Secondary armor, Primary armor, Toe blocks, Accropode units.Its flexible rubble-mound configuration allows controlled settlement over the seabed while providing wave-energy dissipation.

Project Configuration

The existing breakwater length was approximately **475 metres**, while **1,825 metres** of additional breakwater was constructed, resulting in a total breakwater length of approximately **2.3 km**.

The breakwater was located approximately 3 km from the load-out jetty.

Statutory & Regulatory Coordination

The project required coordination with multiple authorities and agencies, including: Ministry of Ports, Shipping & Waterways, Ministry of Petroleum & Natural Gas, Indian Coast Guard, Indian Navy, Maharashtra Maritime Board, Maharashtra Pollution Control Board, MoEFCC, Directorate General of Shipping, Local administration

The approvals covered port development, offshore construction, marine fleet deployment, dredging, CRZ/EIA requirements, marine traffic, vessel certification and movement of heavy construction equipment.

Construction Methodology

The construction journey included: Geotechnical investigation, Marine and other survey works, 2D and 3D physical model studies, Construction of access roads, Construction of temporary load-out facilities, Dredging, Core and armour placement, Accropode and toe-block placement, Statutory clearances

The presentation also illustrated the use of **2D and 3D model testing**, including model testing undertaken in Sri Lanka, to validate the breakwater configuration.

Major Construction Challenges

The offshore nature of the project created significant logistical difficulties. Large quantities of construction material had to be transported from quarries to the remote Konkan site and subsequently moved offshore to the construction location.

The remote and undulating terrain required development of dedicated road infrastructure to facilitate transportation of heavy construction material to the temporary load-out jetty.

Local resistance to movement of Accropodes and quarry material created additional transportation and traffic-management challenges.

Marine & Weather Challenges

The presentation highlighted several major execution challenges, including: COVID-19-related suspension of construction activities, Cyclone Tauktae and associated marine damage, Rough sea conditions and heavy swells, Barge instability and sinking incidents, Marine salvage requirements, Difficult underwater placement of armour units, Disorientation/displacement of Accropodes due to underwater currents and poor visibility

The presentation noted that underwater Accropode placement required precise orientation and interlocking. Diving inspections were used to identify displaced units, which were subsequently relocated and re-oriented.

Safety Management

Despite the challenging marine environment and barge-related incidents, the presentation highlighted the maintenance of a **Zero LTI record** through strict marine safety practices. Safety measures included marine safety protocols, self-release hooks and multiple layers of protection for marine operations.

Benefits of the Completed Breakwater

The completed breakwater transformed the terminal's operational capability.

The presentation highlighted the following benefits:

- Year-round LNG unloading
- Safe berthing of LNG carriers during adverse sea conditions

- Improved terminal utilisation
- Ability to schedule LNG deliveries during monsoon months
- Improved energy security for Western India
- Protection of marine terminal infrastructure
- Greater reliability of LNG supply to GAIL's network

The terminal effectively transitioned from seasonal operations to an **all-weather LNG gateway**.

Conclusion

The Dabhol offshore breakwater project represents a significant example of **marine construction excellence applied to LNG infrastructure**. The project required complex engineering, extensive statutory coordination, specialized marine logistics, rigorous safety management and resilience against weather and site-related challenges.

Its successful completion enabled the Dabhol LNG terminal to move towards **365-day LNG operations**, thereby strengthening terminal utilisation, LNG supply reliability and the wider gas infrastructure network.

IVth Presentation Topic: **GAIL's 5 TPD CBG Plant at Ranchi (MSW Based): Experience Sharing on Construction, Commissioning & Operational Readiness**

Speaker: Shri Kishore Kumar, GM(CBG), GAIL

Objective

The presentation shared GAIL's experience in developing and commissioning a 5 TPD Compressed Biogas (CBG) plant at Jhiri, Ranchi, Jharkhand, based primarily on municipal solid waste (MSW). The project provided practical experience covering project development, construction, commissioning, feedstock management and operational readiness.

Project Overview

The plant has a production capacity of approximately 5 MT of CBG per day, with MSW supplied through the Ranchi Municipal Corporation arrangement. The presentation also outlined the plant's raw-material handling and biogas production facilities.

Project Execution

The project involved engineering, procurement, construction, installation and system integration followed by commissioning and commercial operation. The presentation showed that execution of a CBG project involves several interconnected systems, and delays or constraints in one area can affect the overall commissioning and stabilization schedule.

Construction Challenges

Major challenges highlighted included:

- **Restricted approach roads affecting movement of heavy equipment and materials.**
- **Rocky terrain, resulting in additional excavation and foundation-related work.**
- **A prolonged rainy season affecting productive construction days.**
- **Inadequate manpower and resources for simultaneous work fronts.**
- **Cash-flow constraints affecting contractor mobilization.**

- **Delay in critical purification equipment affecting the overall gas-upgradation chain.**

These factors collectively affected construction progress, commissioning and subsequent plant stabilization.

CBG Purification Process

The presentation explained the sequence of gas purification and compression. Raw biogas at approximately 50 mbar is first boosted to around 500 mbar through a gas blower. A low-pressure compressor then raises pressure to approximately 7–8 bar. The gas subsequently passes through a water scrubber, where CO_2 is dissolved in water. Residual moisture is removed through a dryer, while the Skipper Tower facilitates CO_2 stripping from water and water regeneration. Finally, the purified gas is odorized and compressed up to approximately 250 bar.

Operational Challenges

After commissioning, operational performance was influenced by the availability of adequate MSW feedstock. The presentation highlighted that insufficient MSW supply could reduce plant capacity utilisation. Another important downstream issue was the availability/allotment of land for CNG stations, demonstrating that CBG projects require coordination not only with the plant but also with associated gas distribution infrastructure.

Key Learnings

The major project-management lessons included:

- **Detailed assessment of site accessibility before construction.**
- **Planning construction activities around seasonal conditions.**
- **Ensuring adequate manpower and resources.**
- **Maintaining contractor cash flow and mobilisation.**
- **Early procurement of critical equipment.**
- **Ensuring reliable feedstock supply.**
- **Coordinating plant commissioning with downstream CNG infrastructure.**

Conclusion

The Ranchi CBG project demonstrated that successful CBG development depends on the complete value chain—from feedstock availability and plant construction to purification, compression, commercialisation and downstream connectivity. The experience offers practical lessons for scaling up future waste-based CBG projects.

A memento as a token of gratitude was presented to the session chair & all the speakers. Also a Certificate for appreciation was presented to all the speakers:

Welcome to
GAIL
NGS Conclave on

Acknowledgement and Gratitude

The Natural Gas Society (NGS) expressed its sincere gratitude to all the distinguished dignitaries and industry leaders whose presence, guidance and valuable contributions enriched the NGS Conclave on Construction Management – 2026.

Special thanks to **Dr. A. K. Balyan, Shri Pramod Narang, Shri Sukhmal Jain,** and all other eminent dignitaries for sharing their valuable perspectives and experience. NGS also sincerely acknowledges the contributions of all Panel Moderators, Session Chairs, Panelists and Technical Presenters, whose insights, project experiences and technical deliberations added significant value to the Conclave.

NGS places on record its special thanks to **GAIL (India) Limited** for sponsoring the event and to **GAIL Training Institute (GTI)**, Noida, for extending excellent support, facilities and hospitality for hosting the two-day Conclave. Our sincere appreciation also goes to all participating organisations, consultants, contractors, technology providers and delegates for their enthusiastic participation and contribution to the success of the event. Finally, **NGS** acknowledges the dedicated efforts of the **NGS team** and all those working behind the scenes, whose commitment and coordination made the Conclave a successful platform for knowledge sharing, collaboration and exchange of industry best practices.

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NGS CONCLAVE ON CONSTRUCTION MANAGEMENT

10th & 11th September, 2026, at GAIL Training Institute (GTI), Noida

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