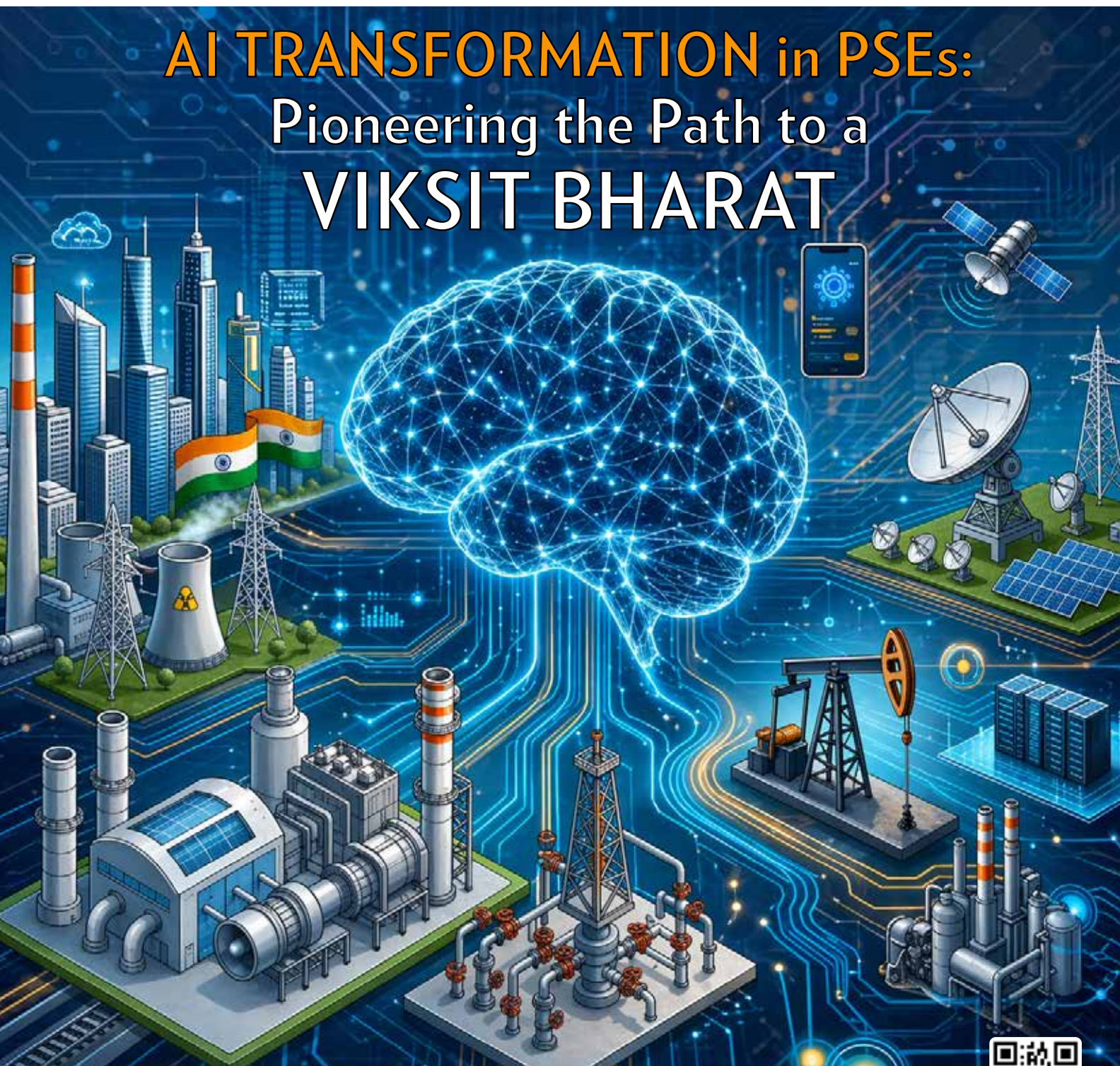


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STANDING CONFERENCE OF PUBLIC ENTERPRISES

AI TRANSFORMATION in PSEs: Pioneering the Path to a VIKSIT BHARAT





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**A Leadership Program for
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&
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Message By Chairman

As the global landscape undergoes a tectonic shift driven by Artificial Intelligence (AI), the role of Public Sector Enterprises (PSEs) has become even more critical. We are no longer just the "commanding heights" of the economy; we are the digital vanguard tasked with architecting a Viksit Bharat by 2047.

SCOPE, as the apex body of PSEs, and as part of its month-long Public Sector Day celebrations, decided to bring out this special issue on **'AI Transformation in Public Sector Enterprises (PSEs): Pioneering the path to a Viksit Bharat.'**

For decades, PSEs, as nation builders, have fortified the socio-economic progress of the country, and with the evolving times, they have integrated AI as a pillar of their business strategy. By integrating AI into the core of their operations, PSEs are ensuring that India's growth is not just rapid, but intelligent, data-driven, and resilient.

Pursuant to our commitment to creating future-ready leadership in PSEs, SCOPE, in collaboration with the Capacity Building Commission (CBC), introduced DAKSH (Development of Aspiration, Knowledge, Succession & Harmony) in 2025. I am happy to share that on 10th April, we initiated the Public Sector Day celebrations with the DAKSH *Dikshant Samaroh*—the convocation ceremony of the inaugural batch.

This convocation was more than a ceremonial milestone; it was a testament to our commitment to human-centric transformation. By empowering our workforce through structured capacity-building programs, we are ensuring that the transition to an AI-first economy is inclusive.

Taking forward our month-long celebrations, SCOPE organized a special interactive lecture on 'Leadership in Uncertain Times' with world-renowned business advisor and bestselling author Prof. Dr. Ram Charan.

While addressing the SCOPE fraternity on the road ahead in these uncertain times, Prof. Ram Charan emphasized that in the age of AI, leaders must do more than just manage—they must transform. His lecture underscored the necessity of aligning AI adoption with leadership accountability—a message that resonates deeply as we navigate this technological frontier.

Through the pages of this issue, I invite our readers to witness the spirit of an empowered Public Sector. Together, let us as PSEs not just adapt to the future; let us be the ones who define it.

Jai Hindi !

K. P. Mahadevaswamy
Chairman, SCOPE



Message By Vice-Chairman

Public Sector Enterprises (PSEs) have long embodied the strategic sinews of India's socio-economic transformation, anchoring the nation's developmental edifice through resilience, scale, and an unwavering sense of national purpose.

Today, that legacy is undergoing a profound and purposeful transformation. We have decisively progressed beyond rudimentary digitization to embedding *Artificial Intelligence* as a central and strategic pillar of our institutional architecture. By integrating intelligent systems across energy, manufacturing, and services, PSEs are ensuring that AI meaningfully redefines the frontiers of productivity, efficiency, and innovation, while simultaneously elevating the role of PSEs beyond conventional paradigms and expectations.

In recognition of this transformative journey, SCOPE takes immense pride in presenting this special issue of *KALEIDOSCOPE: 'AI Transformation in PSEs: Pioneering the Path to a Viksit Bharat.'* It is indeed serendipitous that this edition coincides with the observance of *National Technology Day*, serving as a befitting tribute to the nation's enduring ethos of scientific temper and innovation.

SCOPE remains unwavering in its commitment to showcasing the diverse initiatives of PSEs, while working assiduously towards the systematic capacity building of our human capital. In this context, I am delighted to share that we recently organized the *DAKSH Dikshant Samaroh*—the convocation ceremony of the inaugural cohort of SCOPE and CBC's flagship leadership programme, DAKSH. Building upon the resounding success of this initiative, SCOPE has also conducted the

classroom immersion for the second cohort - DAKSH 2.1 at IIM Indore. As the intellectual and experiential energy of this engagement continues to resonate, the outlook ahead appears exceedingly promising.

SCOPE now stands poised, with a sense of purpose and anticipation, to announce the third cohort of DAKSH, thereby further strengthening the pipeline of future-ready leaders who will steer the nation's developmental trajectory in the years to come. Additionally, amidst the ongoing month-long Public Sector Day celebrations, we had the privilege of hosting the globally acclaimed business advisor and bestselling author, Prof. Dr. Ram Charan. His profound insights offered invaluable perspectives, particularly on the imperative of navigating the technological frontier through a calibrated balance between relentless innovation and steadfast leadership accountability.

As the Public Sector Day celebrations continue, the spirit of excellence and collective purpose across the fraternity is both visible and invigorating. I encourage each one of you to remain an active stakeholder in this shared journey. Kindly continue to share your activities, milestones, and achievements with us, so that together we may celebrate your successes and project the true strength and global relevance of India's Public Sector to the world.

Brajesh Kumar Upadhyay
Vice Chairman, SCOPE

Director General's Desk



As the global industrial landscape undergoes a tectonic shift driven by Artificial Intelligence (AI), the role of Public Sector Enterprises (PSEs) has never been more critical. We are no longer just the building blocks of the economy; we are the digital vanguard tasked with playing an incessant role in architecting a Viksit Bharat by 2047.

As SCOPE, the apex body of PSEs, commemorates the indomitable spirit of Public Sector Enterprises through our month-long Public Sector Day celebrations, we recognize this as a defining moment of reckoning. It is the most opportune time to reflect upon the latest and perhaps most formidable frontier our PSEs are destined to conquer: the vast, uncharted territory of the Digital Era.

SCOPE brings forth this special issue on AI to showcase how our PSEs are no longer just participating in the digital race but are actively embedding Artificial Intelligence into the very bedrock of their operations. I invite our readers to delve into this issue, which documents this historic pivot.

Also, SCOPE's pursuit of creating future-ready leaders has reached a pivotal point. On one side, as we organized DAKSH Dikshant Samaroh- the convocation ceremony of the inaugural batch of DAKSH, SCOPE and CBC's flagship leadership programme; on the other side, the classroom immersion of DAKSH 2.1 (the second batch) was also organized at IIM Indore.

This duality of celebrating a legacy while immediately sparking the next wave of learning, is the hallmark of our mission. Through DAKSH, we aim to create future-focused, empowered leaders with the strategic, behavioral, and transformational competencies required to navigate the complex and evolving challenges of the Public Sector.

Organizations that are led by a workforce that is inclusive, cognitively agile, and profoundly prepared for the challenges of the future.

Taking our Public Sector Day celebrations forward, we were privileged to host an evocative lecture by the world-renowned business advisor and bestselling author Prof. Dr. Ram Charan. His message was clear in an era of uncertainty; leaders must do more than manage—they must transform.

Also, SCOPE and the Department of Public Enterprises (DPE) are working on a study on 'Performance, Competitiveness and Innovation in CPSEs' and I, along with Chairman, SCOPE, and senior officials of SCOPE, met Secretary, DPE for a review meeting of the same. This study aims to create a blueprint that sharpens the competitive edge of CPSEs.

It was a profound honor to be invited to the 'Samarata (Harmony) Diwas' celebration in honor of Dr. B.R. Ambedkar Jayanti, organized by the Akhil Bharatiya Adhivakta Parishad (Supreme Court Unit). This was a unique opportunity to engage with an esteemed legal community and to share the employers' perspective on the new labour codes.

Moving forward, amidst the Public Sector Day celebrations, SCOPE continues to spearhead a unique lineup of activities and programs that are designed to help navigate the complexities of the modern industrial landscape.

In the following pages, you will witness how our Public Sector Enterprises are harnessing the power of Artificial Intelligence to drive innovation. But before that, I would like to thank each of our members, for their continued support, which empowers us all at SCOPE to lead these vital endeavours.

Programmes & Initiatives launched (since last issue of KALEIDOSCOPE)

SCOPE Celebrates Public Sector Day (Month-long celebrations) -10th April onwards

DAKSH Dikshant Samaroh- 10th April 2026

SCOPE - ICF, USA launch unique study for Coaching framework for India- 10th April 2026

SCOPE convenes Leadership Session with Prof. Dr. Ram Charan - 11th April 2026

SCOPE-IISD meeting of SOEs' Practitioners' Network- 15th April 2026

DAKSH Batch 2.1 - Classroom Immersion at IIM Indore- 20th to 25th April 2026

SCOPE as supporting partner in Indian Express's India PSE Summit 2026 - 24th -25th April 2026

Programmes & Initiatives in the offing

SCOPE Academy of Public Enterprises (APSE) Executive Development Program-18th- 23rd May 2026

Launch of DAKSH 3 - 3rd July 2026 (tentative)

SCOPE Eminence Awards 2024-25

Atul Sobti
Director General, SCOPE

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SCOPE organizes DAKSH Dikshant Samaroh on Public Sector Day



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SCOPE presents employers' perspective at Samarasta (Harmony) Diwas



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Fire Service Week 2026: SCOPE Strengthens Safety Culture at SCOPE Minar





Shri Narendra Modi

Hon'ble Prime Minister

speech during
**India AI Impact
Summit 2026**
19th February 2026



Excellencies, Honourable Ministers, Industry Leaders, Innovators, Entrepreneurs, Researchers, Delegates, distinguished guests, ladies and gentlemen – Namaste!

A heartfelt welcome to all of you at the world's largest and historic AI Impact Summit. This summit is being held in India, a nation that represents one-sixth of humanity. India is home to the world's largest youth population, the biggest pool of tech talent, and one of the most expansive tech-enabled ecosystems. India not only creates new technologies but also adopts them at an unprecedented pace. On behalf of 1.4 billion Indians who are eager to embrace innovation, I extend a warm welcome to all Heads of Government, leaders of the global AI ecosystem, and innovators present here. I express my deepest gratitude for your presence.

The fact that this summit is being hosted in India is a matter of pride not only for India but for the entire Global South. The who's who of the AI world are here today. With representation from over 100 countries and distinguished participants from across the globe, this summit is reaching new heights of success. The strong presence of the younger generation instills fresh confidence. Normally, new technologies are met with skepticism in their early stages. Yet, the speed and trust with which the world's youth are embracing AI, taking ownership of it, and using it, is truly extraordinary.

The exhibition at this summit has also generated immense enthusiasm, especially among young talent who have come in large numbers. The solutions presented here – in agriculture, security, assistance for persons with disabilities, and addressing the needs of multilingual populations – are powerful examples of Made in India strength and India's innovative capabilities.

Friends,

In human history, every few centuries a turning point arrives – one that resets the direction of civilization, changes the pace of development, and transforms the paradigms of how we think, understand, and work. The fascinating part is that when we are living through such a transformation, we rarely grasp its true impact. When sparks were first struck from stone, no one imagined that this would become the foundation of civilization. When speech was first turned into script, no one foresaw that written knowledge would become the backbone of future systems. When signals were first transmitted wirelessly, no one could have imagined that one day the entire world would be connected in real time.

Friends,

Artificial Intelligence is such a transformation in human history. What we see today, what we predict today, are only the early signs of its impact.

AI is making machines intelligent, but more importantly, it is multiplying human capability many times over. The difference this time is that both the speed and the scale are unprecedented. Earlier, it took decades for technology to show its impact. Today, the journey from machine learning to learning machines is faster, deeper, and broader. Therefore, our vision must be equally expansive, and our responsibility equally profound. Alongside the present generation, we must also consider what form of AI we will hand over to future generations. The real question is not what Artificial Intelligence can do in the future, but what we choose to do with it today. Humanity has faced such questions before. The most powerful example is nuclear power – we have seen its destructive force, and we have seen its positive contributions. AI too is a transformative power: if directionless, it leads to disruption; if guided rightly, it becomes a solution. How to make AI human-centric rather than machine-centric, sensitive and responsible rather than reckless – this is the core purpose of the Global AI Impact Summit.

Friends,

India's perspective on AI is clearly reflected in the theme of this summit: Sarvajan Hitaya, Sarvajan Sukhaya – Welfare for all, Happiness for all. This is our benchmark. AI must not reduce human beings to mere data points or raw material. Therefore, AI must be democratized. It must become a medium of inclusion and empowerment, especially across the Global South.

Friends,

We must give AI the open sky, but keep the command in our own hands. Just like GPS – it suggests the route, but the final decision of direction is ours. The path we choose for AI today will determine the future we create tomorrow.

Friends,

At the New Delhi AI Impact Summit, I present India's vision for AI – M.A.N.A.V. (MANAV), meaning human. The MANAV vision stands for: M – Moral and Ethical Systems: means AI must be built on ethical guidelines. A – Accountable Governance:

means Transparent rules and robust oversight. N – National Sovereignty: means Data belongs to those who generate it. A – means Accessible and Inclusive: AI must not be a monopoly, but a multiplier. V – means Valid and Legitimate: AI must be lawful and verifiable. India's MANAV Vision will be a vital link for human welfare in the AI-driven world of the 21st century.

Friends,

Decades ago, when the internet began, no one imagined how many jobs it would create. The same is true for AI. Today, it is difficult to predict what kinds of jobs will emerge in this field. The future of work is not pre-defined; it will depend on our decisions and our course of action. I believe the future of work is a new opportunity. This is the era of humans and intelligent systems working together. "We are entering an era where humans and intelligent systems co-create, co-work, and co-evolve." AI will make our work smarter, more efficient, and more impactful. We will design better, build faster, and make stronger decisions. More people will find higher-value, creative, and meaningful roles. This is a great opportunity for innovation, entrepreneurship, and new industries. Therefore, skilling, reskilling, and lifelong learning must become a mass movement.

Friends the future of work will be inclusive, trusted, and human-centric. If we move forward together, Artificial Intelligence will elevate the capacity of humanity to new heights.

Friends,

It is said: "Sunlight is the best disinfectant." means Transparency is the greatest safeguard. Some countries and companies believe AI is a "strategic asset" and must be developed confidentially. But India thinks differently. We believe AI will benefit the world only when it is shared. When codes are open and shared, millions of young minds can make them safer and better. Therefore, let us resolve to develop AI as a Global Common Good.

Friends Another urgent need today is to establish global standards. Deepfakes and fabricated

content are destabilizing open societies. In the physical world, we see nutrition labels on food so we know what we are consuming. Similarly, in the digital world, content must carry authenticity labels so people know what is real and what is AI-generated. As AI produces more text, images, and videos, the need for watermarking and clear source standards grows. That is why trust must be built into technology from the very beginning.

Friends we must become even more vigilant about children's safety. Just as a school syllabus is carefully curated, the AI space too must be child-safe and family-guided.

Friends,

Today, the world is divided into two kinds of people: those who see fear in AI – and speak only of that fear – and those who see fortune in AI.

I say this with responsibility and with pride: India does not see fear in AI. India sees fortune in AI. India sees the future in AI. We have the talent, we have

the energy and capacity, and we have policy clarity. I am delighted to share that during this summit, three Indian companies have launched their own AI models and apps. These models showcase the talent of our youth and reflect the depth and diversity of the solutions India is offering.

Friends,

India is building a resilient ecosystem – from semiconductors and chip-making to quantum computing. Secure data centers, a strong IT backbone, and a dynamic startup ecosystem make India a natural hub for affordable, scalable, and secure AI solutions. India has diversity, demography, and democracy. Any AI model that succeeds in India can be deployed globally. Therefore, I invite all of you: Design and Develop in India. Deliver to the World. Deliver to Humanity. Once again, I extend my warmest wishes to all of you.

Thank you!



Public Sector Enterprises Anchoring India's AI revolution



For decades, the Public Sector Undertakings (PSUs) of India have been referred to as the building blocks of the country's economy. Built on foundations of steel, coal, and heavy engineering, these giants have provided the skeletal strength upon which a young nation stood.

But today, the wind howling through the corridors of power and industry carries a different frequency. We are no longer in the age of steam or simple electricity; we have entered the "AI Decade."

In this high-stakes era, India is not merely adopting technology; it is reimagining the very soul of institutional governance. The transformation of our PSEs from traditional infrastructure providers into data-driven powerhouses represents a seismic shift.

This is the story of how the backbone of India is becoming its brain. This transition is not merely a technical upgrade, it is a strategic reimagining of how a nation's industrial giants can harmonize deep-rooted socio-economic mandates with the volatile, high-speed winds of global technological change.

It is worth noting that today, Artificial Intelligence is often reduced to a buzzword for automation—a way to make machines do human work faster. However, for the Indian Public Sector Enterprises AI is an instrument of institutional transformation. It is the difference between a machine that follows instructions and a system that anticipates a nation's needs.

As these entities integrate advanced intelligence into critical sectors like energy, defense, and

infrastructure, they are pioneering a 'Safe & Trusted AI' framework. This is not just about code; it is about Data Sovereignty.

By leveraging the IndiaAI Mission, these enterprises are deploying sovereign, industry-specific models that prioritize national security and inclusive growth. Following the belief that this digital revolution must not be a storm that displaces many for the benefit of the few; it must be the rising tide that lifts every citizen as it grows.

PSEs on their end are working to ensure that the AI-driven industrial revolution is distributed across the nation's diverse demographic landscape, effectively bridging the digital divide that has long haunted economies.

In the modern global landscape, the old metrics of success have withered. Competitive advantage has shifted from mere scale to a triad of Speed, Intelligence, and Trust. For the Public Sector to maintain its leadership, AI must be elevated from a back-end IT tool to the beating heart of business strategy.

To navigate this transition, a strategic commitment to the SAP Framework—Skilling, Alignment, and Partnerships—is essential.

Skilling: The Human Alchemy

The first pillar, Skilling, demands a radical shift in human capital development. While individual enterprises can host internal training, the future lies in collaborative, cross-enterprise programs. It is about fostering a culture where a mechanical engineer at an oil refinery and a data scientist at a defense lab speak the same language.

Alignment: The Symphony of Objectives

Alignment ensures that AI initiatives are not siloed experiments conducted in dark basements. They must be deeply integrated into the organizational nervous system. Imagine a power grid that predicts its own failures or a logistics network that reroutes itself in real-time to avoid a monsoon's path.

By syncing AI with core functions like predictive maintenance and energy optimization, PSEs are driving efficiency.

Partnerships: Breaking the Monolith

Finally, no organization can master the rapidly evolving AI landscape in isolation. The age of the 'lone wolf organization is over. By collaborating with agile startups, specialized technology firms, and academic institutions, PSEs are injecting cutting-edge innovation into their legacy systems. These strategic alliances allow PSEs to bridge the gap between legacy stability and modern disruption.

The Public Sector is the custodian of India's most sensitive assets—the country's energy security, its defense requirements, and the vast oceans of citizen data. Here, AI is being deployed not just for profit, but for protection.

In the spheres of process and product innovation, PSEs are processing large volumes of sensitive data to make critical decisions. But with this great power comes the absolute responsibility or as we name can call it – a necessity for Perimeter Defense. Beyond simple firewalls, the integration of advanced encryption tools is creating a multi-layered security posture.

A resilient security framework is the bedrock upon which large-scale AI implementation must be built.

But with the AI wave, comes one of the most persistent anxieties of our time, the fear of displacement. To counter this, India's PSEs are adopting a proactive, people-centric approach. Reiterating that AI as an amplifier, not a replacement.

This strategy balances operational efficiency

with workforce inclusivity. Success depends on leadership that demonstrates far-sighted commitment—leaders who see AI not as a way to reduce headcount, but as a way to amplify human potential.

Pursuant to bridging the gap between legacy operations and cutting-edge innovation, PSEs are fostering an indigenous AI ecosystem. By supporting local startups and homegrown research, they are not only augmenting their own capabilities but also enhancing the global competitiveness of the entire Indian industrial landscape.

This dual focus—internal efficiency and external ecosystem growth—ensures that the PSEs remain proactive leaders rather than a passive consumer of technology. PSEs are not just assimilating the future, they are building it in their own labs, with their own data, for their own people.

In this grand mission, organizations like SCOPE, as the apex body of PSEs has a key role to play. As the apex body, SCOPE continues to act as facilitators of this seamless integration, providing a platform for high-level collaboration and policy advocacy.

By engaging with global institutions, SCOPE brings international best practices directly to the PSEs' doorstep. Perhaps most importantly, by working with the government to shape favorable regulatory frameworks, SCOPE ensures that the PSE workforce has the resources to continuously learn, unlearn, and relearn. In the world of AI, knowledge has a shorter half-life than ever before. In today's era, the ability to pivot is the only true survival skill.

As we stand at the precipice of this new era, the vision for India's PSEs is clear. They are no longer just country's backbone; they are also the future-ready custodians of a digital revolution.

By embedding advanced intelligence into the very fabric of the nation—from the deepest mines to the highest satellites—they are ensuring that India's growth is not just fast, but fair. PSEs continue to attest, that large-scale automation can coexist with ethical accountability.

BPCL – AI Transformation in PSEs: Pioneering the Path to a Viksit Bharat



As India marches toward the vision of a **Viksit Bharat** by 2047, BPCL is not just keeping pace; it is setting **new benchmarks for transformation**.

By strategically embedding Artificial Intelligence (AI) and Machine Learning (ML) across the entire energy value chain, from deep-sea exploration to the digital doorstep of the common citizen - BPCL is proving that a Maharatna can be as agile and innovative as a Silicon Valley startup. This is the story of how data is emerging as the new fuel for a developed India.

The Digital Heartbeat: IRIS and the Command Centre

The most visible symbol of BPCL's AI-led revolution is **IRIS**, the company's Digital Nerve Centre. IRIS is a centralized command-and-control hub that processes approximately **2.8 million inputs every minute**. These data points stream in from across BPCL's vast network, including Retail Outlets, Retail Terminals, and LPG Bottling Plants.

IRIS does not merely collect data; it interprets and operationalizes insights in real time to identify and arrest deviations in critical operational parameters such as price, safety, quality, and quantity. The integration of **Video Analytics (VA)** within IRIS allows the system to identify exceptions and anomalies in daily operations that would be impossible for human eyes to track across thousands of locations simultaneously. By leveraging machine learning algorithms, IRIS ensures that the "Pure for Sure" promise is maintained through automated vigilance.

The Intelligence Engine: The Analytics Centre of Excellence (ACOE)

If IRIS is the eyes and ears of the organization, the **Analytics Centre of Excellence (ACOE)** serves as the strategic intelligence engine of the organization. The ACOE serves as the central hub for driving data-driven decision-making and advanced AI/ML adoption across all business units. Its mission is clear: to convert BPCL's enterprise-scale data assets

into measurable business outcomes, such as higher revenue, optimized costs, and enhanced customer satisfaction.

The ACOE has established a sophisticated technology stack, utilizing Microsoft Azure for cloud infrastructure and a variety of tools such as Python, Databricks, and Power BI for advanced data science. This foundation has enabled a diverse array of business use cases.

Safety Reimagined: AI-Driven Vigilance

In the hazardous environment of the oil and gas industry, safety is paramount. BPCL has moved from manual monitoring to a state-of-the-art **AI-driven Personal Safety and Security Monitoring System**.

Traditionally, monitoring Personal Protective Equipment (PPE) was a manual, intermittent task. Today, BPCL utilizes its existing CCTV infrastructure, augmented with AI capabilities, to continuously monitor high-risk areas.

- **PPE Compliance:** The system automatically detects whether a worker is not wearing a safety helmet or a safety belt while working at height. If a violation is detected - such as a worker at a height of more than two meters without a belt for over 15 minutes - an alert is triggered through IRIS.
- **Rapid Hazard Detection:** In LPG plants, AI can detect signs of leakage, smoke, or fire within a mere **60 seconds**, enabling near-instantaneous emergency response.
- **Intrusion Detection:** Unauthorized entry into restricted zones or unusual nighttime activity is flagged by perimeter cameras, preventing security breaches before they escalate.
- **Turnaround Management:** During complex refinery turnarounds, BPCL deploys **drones** for safety surveillance. These drones provide a 360-degree aerial view, identifying hazards and housekeeping violations across massive

areas that are difficult for human inspectors to navigate quickly.

The impact has been quantifiable. By January 2025, these systems had led to an over **50% reduction in safety deviations**. Specifically, LPG operations saw a **61% reduction in safety belt violations** and a **58% drop in leakage and fire alerts**.

- **Connected Worker Solution:** With worker safety and productivity as key priorities, an IIoT based solution for identifying the location of the workers has been taken up for deployment through Real-time location sensing system (RTLS). This enables **workflow optimization through personnel tracking**, enhances productivity using analytics and allow the workers to raise an alert in case of an emergency.
- **Ultra Critical Video Analytics (UCVA):** Refinery environments present complex safety monitoring challenges due to their vast scale, frequent relocation of work sites, limited power and network availability, and strict restrictions on camera use in Zone1 hazardous areas. To overcome these constraints, **UltraCritical Video Analytics (UCVA)** - an industry first, an AI driven solution leveraging **5G Intrinsically Safe mobile devices** for realtime monitoring without permanent infrastructure has been deployed across Refineries. Live video streams are analyzed on a secure cloud platform using AI models to detect safety violations instantly and trigger alerts, enabling rapid preventive action. Integrated seamlessly with the **Work Permit System**, UCVA automates safety enforcement across critical jobs, establishing a new benchmark for proactive, scalable refinery safety and strengthening operational resilience.
- **Intelligent CCTV Network in Refineries:** The Intelligent CCTV Systems in Refineries is a comprehensive surveillance solution designed to enhance safety and security across the facility. The system provides extensive coverage of critical areas across the entire refinery perimeter, ensuring continuous monitoring of sensitive and high-risk zones. The system is equipped with advanced video analytics features such as loitering detection, motion sensing, crowd gathering identification, overcrowding alerts, etc. The intelligent system also supports centralized monitoring,

recording, and retrieval of footage, which aids in incident investigation, compliance, and audit requirements. By integrating smart analytics with wide-area coverage, the CCTV systems strengthen the refinery's overall security framework while improving situational awareness and risk management.

- **ANPR based vehicle tracking solution:** An Automatic Number Plate Recognition (ANPR)-based vehicle tracking solution is being implemented at BPCL Mumbai Refinery to automatically identify and monitor vehicles entering and exiting through all Refinery Gates. The solution aids in regulating the entry and exit of authorized vehicles within the refinery premises. It is integrated with BPCL's vehicle pass management system to retrieve data of authorized vehicles. Additionally, it enables real-time tracking of the number of vehicles present inside the Refinery at any given time.
- **Speed Violation Detection System:** Speed violation detection systems have been deployed across BPCL Refineries. The systems enable accurate real-time monitoring of vehicle speeds across critical zones. It captures violation evidence, including vehicle details and timestamps, for review and enforcement. This ensures effective monitoring and improved compliance with prescribed speed limits within the Refinery premises. **The deployment has resulted in a significant reduction in daily speed violations.**

The Refinery of the Future: Predictive and Immersive

BPCL's refineries are undergoing an **advanced digital transformation** to enhance reliability and efficiency.

1. **AI-Based Predictive Maintenance:** By analyzing sensor data such as vibration, temperature, pressure, and flow trends through advanced ML models, BPCL can now predict potential equipment failures before they occur. This prevents costly downtime and enhances operational uptime for critical rotary equipment.
2. **Virtual Reality (VR) Training:** To handle low-frequency but high-risk scenarios, BPCL has implemented a VR-based immersive training system. Operators can practice emergency handling, equipment malfunctions, and

complex plant operations in a safe, controlled, and simulated environment.

3. **Digital Twins:** The implementation of asset and process twins for crude units allows engineers to digitally simulate and optimize operations before applying changes in the physical world, significantly improving reliability.
4. **Ultra-Critical Video Analytics (UCVA):** Specialized AI monitoring has been deployed for high-risk activities such as welding and grinding to detect safety violations in real time.
 - **Intelligent Interactive 3D Model of Plants/ Digital Twin for Crude Distillation Unit - 3 (CDU-3) :** An interactive 3D Digital Twin for CDU3 has been implemented to provide a unified digital view of plant equipment, piping, layouts, and engineering data. The platform enables accurate asbuilt visualization for MOC execution, turnaround planning, clash detection, and rapid access to asset information. By eliminating design inconsistencies and information gaps, it has reduced rework, project overruns, and downtime while improving safety compliance and operational performance.
 - **Analytics Dashboards:** At Refineries, Integrated dashboards have been developed across Refinery functions to enable real-time monitoring and data-driven decision-making. These dashboards cater to key departments such as Operations, Maintenance, Inspection, Safety, Procurement, Engineering & Construction (E&C) and many more, providing a unified view of critical KPIs.
 - **APC:** Advanced Process Control (APC) is a key pillar of the digital transformation journey across Refineries. It empowers **operations teams** with the latest innovations in technology for prediction, control, and optimization of quality, yield and energy in processing units **thereby enhancing operational reliability, efficiency, and overall unit performance.**

Urja: Humanizing AI for 80 Million Citizens

One of the most impactful digital transformation initiatives is **Urja**, the Indian oil and gas industry's first AI- and NLP-powered chatbot. Launched in December 2020, Urja was born from the challenge

of serving a customer base of over 80 million domestic LPG users across every demographic and level of digital literacy.

Urja is more than just a chatbot; it is a multilingual assistant that speaks **13 languages**, including Hindi, Tamil, Marathi, Bengali, and Assamese. This inclusivity breaks down the digital barriers that often exclude non-English speakers.

- **Performance at Scale:** Urja has facilitated over **96 crore messages** and **30 crore conversational sessions**, and currently handles an average of **46,000 LPG bookings every day.**
- **Business Versatility:** Trained on over 75 use cases, Urja helps B2B customers fetch account balances, track orders, and even generate business leads for lubricants and petrochemicals.
- **Customer Delight:** With a satisfaction rating of **4+ out of 5** from **85% of its users**, Urja has transformed customer service into a 24/7/365 conversational experience.

Exploration and R&D: Deep Data Insights

Even in the deep-earth search for hydrocarbons, AI has become the new compass. **Bharat Petro Resources Limited (BPRL)** has integrated ML into its exploration processes. By analyzing seismic surveys and well logs, ML algorithms recognize patterns to map geological features that were previously invisible.

A standout success occurred in the **Cambay Basin**, where ML helped map a channel system on reprocessed 3D seismic data that had not been luminous in earlier processing. This deeper understanding of reservoir distribution has led to improved prospectivity and significant savings in both cost and time.

Furthermore, BPCL is pioneering **Generative AI** in its R&D and operations. A GenAI-based plant chatbot is currently being piloted to allow staff to query complex refinery data - such as SOPs, engineering drawings, and incident logs - using natural language. This transforms decades of unstructured technical knowledge into an instantly accessible resource.

Green AI and the Path to Sustainability

As a responsible and forward-looking PSE, BPCL is leveraging **Green AI** to minimize its environmental footprint.



Energy Optimization: At the Kochi Refinery, BPCL partnered with an AI startup to deploy “AI Expert” software for real-time continuous monitoring. This initiative has directly reduced steam and energy consumption, leading to more sustainable operations.

Logistics Efficiency: AI-powered coastal movement optimization ensures that products transported across the Indian coastline follow the most fuel-efficient routes, reducing carbon emissions per ton-kilometer.

Upskilling: A Multi-Layered Strategy to Bridge the AI Talent Gap

BPCL recognizes that technology is only as effective as the workforce empowered to harness it. To bridge the AI talent gap, the organization has implemented a comprehensive upskilling strategy driven by the **Bharat Petroleum Learning Centre (BPLC)**, balancing structured institutional training with organic employee interest.

1. **Cultivating Foundational Literacy :** The journey begins with building a common language across the workforce. To ensure broad AI literacy with minimal disruption, BPCL deploys micro-learning nuggets and bite-sized modules focused on Generative AI awareness, ethical usage, and practical business applications. This continuous learning approach is complemented by internal AI productivity tools such as AI-assisted coding and copilots, which accelerate the software development lifecycle while reinforcing skills in real time.
2. **Specialized and Peer-Led Capability Building :** For technical teams, advanced pathways in machine learning, data analytics, cloud computing, and robotic process automation (RPA) are provided. Rather than relying

solely on external theory, BPCL leverages in-house Subject Matter Experts (SMEs) to lead structured workshops centred on real BPCL use cases. This promotes peer learning and empowers internal “AI champions” to drive digital transformation.

3. **Strategic and Industry Partnerships :** To remain at the forefront of the rapidly evolving AI landscape, BPCL complements internal expertise with global knowledge.

External knowledge partnerships with institutions such as the **Economic Times**, **People Matters**, and **CII** bring industry perspectives, governance insights, and best practices tailored to large PSEs.

4. **Sustaining an Innovation-Driven Culture :** The success of these initiatives is reflected in a strong organic pull for AI learning. Currently, four of the top five most-consumed courses on BPCL’s self-paced learning platform are AI-focused. This demand is further channelled into hands-on innovation, encouraging employees to apply their skills through internal proof-of-concept developments that convert theory into tangible business outcomes.

- **Digital Culture Building in Refineries:** To drive a digital culture across refineries, in-house *Digital Express* magazine is published to promote awareness of emerging technologies and share key initiatives. A network of Digital Champions across departments identifies and drives digitalization efforts while ensuring sustainability. Additionally, targeted training programs in collaboration with IITs/NITs and specialized AI courses are conducted to build internal digital capabilities and accelerate the overall transformation journey.

The Future Roadmap: Towards 2047

BPCL’s digital transformation represents a **comprehensive and future-focused enterprise journey** towards embedding AI across every facet of the enterprise. From physical refinery assets to strategic talent management, the roadmap to 2047 is anchored in intelligent, data-driven decision systems.



1. Scaling Industrial and Operational Intelligence

High-precision AI will increasingly drive core operational decision-making to ensure efficiency and resilience.

- **Predictive Operations:** Expanding asset health monitoring across refineries, pipelines, and critical infrastructure to achieve zero-failure operations.
- **Intelligent Supply Chain and Procurement:** Leveraging AI-enabled analytics for dynamic forecasting and automating manual procurement tasks to significantly reduce cycle times and optimize refinery yields through AI-assisted crude selection.
- **GenAI Evolution:** Upgrading platforms such as Urja and internal plant bots into fully integrated generative AI ecosystems connected with CRM systems for seamless human-AI collaboration.

2. Intelligent Decision Systems in HR

The HR Analytics and Innovation (AI) team is driving a shift from process efficiency to intelligent decision-making using ML, NLP, and agentic AI.

- **Talent Review Process (TRP):** The TRP has been significantly enhanced through agentic AI. While dashboards integrate multi-source data, AI agents leverage generative AI to summarize deliberations and capture key outcomes (AOS, AOD) in standardized formats, ensuring consistency, auditability, and significantly accelerated completion times.
- **Recruitment and VerifAI:** The VerifAI platform, built on Azure OpenAI, automates the extraction and validation of thousands of candidate documents. This reduces turnaround time and improves accuracy, with plans to evolve from an internal HR tool to a candidate self-service model.

3. Proactive Governance and Employee Centricity

BPCL is transitioning from lagging indicators toward real-time, proactive interventions.

- **Sentiment and Attrition:** Through **Amber**, a conversational AI platform, BPCL captures real-time employee sentiment at key lifecycle moments. Currently deployed for entry-level officers, the roadmap aims to scale this tool enterprise-wide to proactively predict and mitigate attrition risks.
- **Medical Analytics and Governance:** AI-driven medical claim verification uses ML-based anomaly detection to flag fraud and ensure policy compliance. While currently focused on OPD claims for active management staff, the roadmap includes scaling to all eligible staff and claim categories.

4. A Unified Vision for the Future

Whether optimizing crude selection or predicting employee disengagement, BPCL's AI strategy remains consistent - leveraging advanced technology to enhance decision integrity, boost productivity, and cultivate a culture of continuous innovation on the path to 2047.

Conclusion

BPCL's transformation stands as a powerful testament to what is possible when a national institution combines deep industrial expertise with cutting-edge technology. By integrating the analytical strength of the ACOE, the real-time vigilance of IRIS, and the inclusive outreach of Urja, BPCL is not just fueling India's vehicles - it is powering India's transformation toward a Viksit Bharat. This AI-driven journey is more than a corporate strategy; it is a blueprint for how India's PSEs can pioneer the march toward a **Viksit Bharat**.

Bridging the AI Talent Gap in CPSEs –GAIL’s ‘AITarang’



AI is reshaping how enterprises operate, decide and serve stakeholders. For Central Public Sector Enterprises (CPSEs), success will depend not only on adopting technology, but on equipping people—at scale—to use it responsibly and productively. GAIL’s AITarang demonstrates how a large PSE can democratize AI capability, build internal champions and convert learning into business-relevant application.

Artificial Intelligence (AI) has moved from experimentation to enterprise necessity. It is increasingly central to productivity, decision support, knowledge management and process redesign across sectors—including energy. For CPSEs, AI is not simply another technology upgrade: it is a strategic lever to strengthen public value delivery while improving operational discipline and efficiency. Yet, the most critical constraint is not hardware or software—it is human readiness.

GAIL (India) Limited, as a key player in India’s natural gas value chain, recognized early that sustainable AI transformation depends on building a workforce that is informed, confident and capable of applying AI in everyday work. Accordingly, GAIL launched **AITarang**, an enterprise-wide **AI literacy and capability-building** initiative during FY 2025–26, with the objective of bridging the AI talent gap across roles, functions and locations.

Unlike conventional digital training that targets only technology teams, AITarang was designed as a movement—one that democratizes AI understanding and converts curiosity into practical, role-aligned adoption. Its focus is simple: make AI usable for every function, strengthen responsible use and create a visible pathway from foundational learning to applied prototypes and functional integration.

Why AITarang: The CPSE Talent Gap in One Sentence

CPSEs can adopt AI tools quickly, but realizing value requires building organization-wide capability—especially among non-technical professionals—so

AI becomes a normal part of how decisions are made and work is executed.

Program Philosophy: “People First, Value Always”

AITarang is built on four principles that reflect the PSE context:

1. **Inclusivity at scale:** learning designed for mixed backgrounds—not limited to coders or data scientists.
2. **Application over abstraction:** emphasis on everyday productivity and function-specific use cases.
3. **Responsible adoption:** guardrails around ethical use, confidentiality, and enterprise discipline.
4. **Merit-based progression:** a structured pathway to identify and nurture internal champions.

The initiative is centrally coordinated by the **GAIL Training Institute (GTI), Noida**, ensuring quality, consistency and institutional ownership.

Program Architecture: A 4 Stage Capability Roadmap

AITarang follows a phased, competency-based framework:

Stage 1: AI Fundamentals for All – Baseline literacy and confidence across the enterprise

Stage 2: Advanced Learning & Mentorship – Guided development of use cases and prototypes

Stage 3: Functional Integration – Embedding AI solutions into departmental workflows

Stage 4: AI Domain Experts – Building an internal pool of “AI champions” and consultants

This structure enables a common AI language across the organization while creating a pipeline of talent for deeper transformation work.

Stage 1: Foundational Literacy at Enterprise Scale

Stage 1 focused on demystifying AI and equipping employees to apply it safely and effectively in their routine roles. Implemented through a blended learning design, it combined structured live sessions with self-paced reinforcement via a learning platform.

Key elements included:

- Short pre-reads and demos to anchor learning in real workplace scenarios
- Recorded sessions and micro-quizzes for reinforcement and recall
- Simple assignments encouraging role-aligned application and experimentation
- Flexible participation design suitable for diverse schedules and locations

Importantly, Stage 1 did not aim to create AI engineers. It aimed to create AI-ready professionals—employees who can ask better questions, produce higher-quality drafts faster, summarize information accurately, and identify opportunities for process improvement.

AT A GLANCE – AITarang in Numbers	
Scale	5,000+ employees targeted (Stage-I)
Engagement	~75% active learning participation
Applied ideation	800+ role-aligned use-case ideas submitted
Advanced outputs	400+ prototypes / solution concepts received for evaluation in (Stage-II)
Learning investment	130+ hours of structured learning, workshops & mentorship

From Learning to Doing: Applied Use Cases that Matter

A defining strength of AITarang has been its application-first design. Participants were encouraged to identify business-relevant use cases in their own functions—helping ensure learning translated into tangible work improvements.

Illustrative themes included:

- **Operations & Engineering:** structured logging support, anomaly spotting cues, knowledge retrieval
- **Finance & Commercial:** extraction and summarization of large documents, faster compliance review
- **Human Resources:** employee query enablement, multilingual drafting support, policy communication aids
- **Marketing & BD:** data-backed insights for engagement, faster content and presentation support

The value of this exercise is not only in individual ideas—it is in building an internal repository of opportunities and cultivating a culture where employees actively look for ways to make work simpler, faster and better governed.

“At GAIL, we view digital transformation as a people-led journey. AI can strengthen productivity and decision-making, but only when it is adopted responsibly and applied in real work contexts. AITarang is our commitment to equipping employees across functions with a practical understanding of AI—so that innovation becomes a shared capability. As India advances towards Viksit Bharat, CPSEs must lead by building digitally confident institutions that deliver outcomes with speed, discipline and integrity.”



Deepak Gupta CMD, GAIL (India) Ltd.

Stage 2: Advanced Learning, Mentorship & Prototype Development

Building on Stage 1, Stage 2 is designed to deepen capability among a select, high-engagement cohort. The intent was to move participants from “aware and interested” to “able to design and demonstrate”.

The advanced phase emphasized:

- Understanding modern AI concepts relevant to enterprise adoption (without over-technical depth)
- Evaluating feasibility and impact of use cases—linking ideas to business value
- Advanced prompting and structured outputs for consistent results

- Designing AI-enabled assistants and workflow automations using enterprise-grade tools
- Mentorship-driven refinement from concept to working prototype

Participants collaborated in guided cohorts, benefitting from interactive instruction and practical project support. By early 2026, GAIL received several hundred prototype submissions and solution concepts for evaluation—marking a clear transition from literacy to applied capability.

Governance & Momentum: How Large-Scale Learning Was Sustained

Sustaining engagement in a large enterprise program requires more than content; it requires motivation, visibility, and recognition. AITarang therefore incorporated:

- A structured performance and progression mechanism
- Transparent recognition of learning milestones
- Friendly competition through gamified participation metrics
- Unit-level visibility that encouraged peer-to-peer motivation

This approach helped maintain momentum over multiple weeks while reinforcing accountability and completion behaviour—particularly important in large, distributed organizations.

Leadership Enablement: Aligning the Top with the Field

A key differentiator in AITarang is that capability-building is not limited to the general workforce. A dedicated leadership masterclass supported alignment at the senior level, enabling leaders to:

- Understand AI's strategic relevance and limits
- Ask better questions and evaluate AI's proposals responsibly
- Sponsor functional adoption with appropriate governance
- Encourage culture change without compromising confidentiality or compliance

This alignment matters: when leadership and employees share a common AI vocabulary, pilots move faster, quality improves, and adoption becomes safer and more consistent.

Expected Impact: Productivity, Quality, and Decision Support

AITarang's early outcomes point to clear, measurable impact pathways that align with global benchmarks and internal observations. These include:

1) **Faster, better communication and documentation**

AI-assisted drafting and summarization can reduce time spent on routine writing and improve clarity, enabling professionals to focus on higher-value work.

2) **Improved meeting productivity**

AI-enabled note capture, follow-up structuring, and information synthesis can accelerate closure of action items and reduce cycle times.

3) **Stronger problem framing and use-case identification**

Employees trained to think in "AI opportunities" are more likely to identify repetitive tasks, knowledge bottlenecks, and documentation-heavy workflows suited for improvement.

4) **Better decision support**

Generative AI can assist with rapid scanning of large information sets, structured analysis and summarization—helping managers make faster, better-informed decisions (with human validation).

The larger impact, however, is cultural: AITarang strengthens a mindset of continuous learning and responsible experimentation—critical capabilities for any PSE navigating rapid technological change.

"Bridging the AI talent gap requires more than training—it requires building confidence, relevance and a structured pathway for capability growth. AITarang is designed to empower employees across roles and locations with practical skills while reinforcing responsible usage and governance. Our objective is to create an internal pipeline of AI champions who can help departments embed AI into real workflows. This is how we future-proof talent: by making learning inclusive, progression merit-based, and application central to everyday work."



Ayush Gupta Director (HR), GAIL (India) Ltd.

Roadmap: From Prototypes to Functional Integration

As AITarang advances, the next emphasis is



functional implementation—where selected participants will support the integration of AI assistants and workflow automations into live departmental processes under defined governance.

The forward roadmap focuses on:

- Identifying high-impact, low-risk use cases for early institutionalization
- Strengthening adoption through standardized templates, playbooks, and guardrails
- Building an internal support ecosystem of champions and mentors
- Measuring value through productivity indicators, quality improvements, and cycle-time reduction
- Ensuring confidentiality, compliance, and responsible usage remain central

For CPSEs, this is the sustainable path: scale learning, guide application, implement responsibly, and institutionalize what works.

Conclusion: A Replicable PSE Model for AI Workforce Readiness

AITarang demonstrates that large CPSEs can build AI readiness at scale—without restricting progress to specialist teams. By combining enterprise-wide literacy, applied ideation, advanced mentorship and a merit-based pipeline of champions, GAIL is creating the foundation for responsible AI integration across functions.

In the context of Viksit Bharat, CPSEs have a unique responsibility: to lead transformation while upholding public trust and governance. **AITarang** reflects a practical model for how this can be achieved—by placing people at the center of technology adoption and turning capability-building into a strategic advantage.

This journey from basic literacy to advanced prototype building is more than just training; it is the foundation for GAIL's future in energy and digital excellence. As we progress towards a Viksit Bharat, GAIL stands ready to lead, ensuring that our people remain our greatest security and our most significant competitive advantage in the digital age.



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भारत की अग्रणी रक्षा कंपनी

From Fuel to Intelligence: HPCL's AI Transformation Journey



HPCL is embedding Artificial Intelligence across every dimension of its operations to smart refineries and AI-powered retail networks to citizen-first services and green energy exploration

Picture a refinery that never sleeps, not simply in the physical sense, but intellectually. Sensors stream millions of data points every hour. Algorithms adjust distillation parameters before operator has noticed. A predictive model flagging a pump bearing that will fail in eleven days, giving maintenance teams time for a planned shutdown rather than a crisis. Simultaneously, at a retail outlet thousands of kilometres away, an AI module has already flagged a safety deviation and raised an alert. An LPG transporter has just received an automated compliance call from an AI system that is tracking every vehicle in a fleet of thousands. This is not a vision of some distant, automated future. At Hindustan Petroleum Corporation Limited (HPCL), it is already happening today.

With a refining capacity exceeding 26 million metric tonnes per annum, a retail network of over 24,000 outlets and energy services that reach into the kitchens and vehicles of millions of Indian households, HPCL occupies a position of strategic importance in India's economy. The responsibility that comes with that scale has, become inseparable from a question: how does a company of this size and complexity remain not just efficient, but genuinely intelligent?

The answer HPCL has arrived at is embedded in Artificial Intelligence, not as a buzzword just for an annual report, but as a living, working transformation of how the company operates, innovates and serves the nation. As India presses forward toward the vision of Viksit Bharat, HPCL's

AI journey offers a compelling model of what the PSE can achieve when ambition meets execution

Key AI Initiatives: Transforming Operations Across the Enterprise

HPCL's AI transformation is enterprise-wide spanning the refinery floor and the retail outlet with equal ambition.

In Refinery, the Machine Learning-based Real-Time Optimizer (RTO) is deployed at HPCL's twin refinery complexes, making continuous autonomous adjustments to maximise yield and efficiency. The proprietary RUF Digital Suite, built on a hybrid first-principle and machine learning model, optimises the Residue Upgradation Facility. Online Quality Prediction through Machine Learning soft sensors at Mumbai and Visakh Refineries provide real-time quality predictions, with several running in closed loop for autonomous control. The Process Anomaly Detection System (PADS) adds a further layer of operational intelligence, detecting stuck, sluggish and erratic sensors, contributing directly to Operational Excellence. IoT-enabled Predictive Analytics-Based Maintenance across both refineries feeds real-time equipment health data into machine learning models that predict failures before they occur, converting the maintenance culture from reactive crisis management to structured, planned intervention.

In Marketing, AI-powered video analytics deployed across retail outlets, depots and LPG bottling plants transforms existing CCTV infrastructure into an

active safety and compliance intelligence layer. AI modules process feeds in real time, automatically detecting safety violations, unauthorised access, deviations from standard operating procedures and unsafe behaviours. Alerts are generated instantly, enabling corrective action before a minor breach escalates into a major incident. The system creates a consistent operational and safety culture across the network that stretches from metropolitan hubs to the smallest towns.

Complementing this, HPCL has deployed a Hyperlocal Marketing Solution powered by Generative AI. With over 24,000 outlets, managing customer reviews across platforms like Google at scale is a formidable challenge. GenAI-based sentiment analysis now classifies customer feedback as positive, negative or neutral, enabling quick understanding of brand perception and supporting data-driven marketing decisions across the entire retail network.

For its Lubes business, HPCL has implemented a cloud-based CRM system enhanced with AI capabilities. A Copilot feature enables conversational queries for sales teams, Smart TI optimises visit planning, and AI-driven case management identifies repeat customers and suggests next actions. Customer and lead profiling further supports priority-based field force deployment.

A conversational AI tool trained on primary sales data lets retail officers retrieve outlet-level trends through natural language queries, without manual report generation. An OMC Sales and Competitive Insights engine delivers AI-driven intelligence on HPCL's positioning relative to competitors in real time. A Retail Policies-GPT provides instant, contextual responses to dealership and disciplinary queries, ensuring policy-compliant decisions across the entire field force.

HPCL has also rolled out AI-driven Virtual Assistants and Chatbots across customer touchpoints, offering 24/7 self-service and hyper-personalised engagement. Powered by Natural Language Processing, these chatbots

resolve queries conversationally, while AI-driven recommendation engines deliver contextual and tailored communication.

In LPG SBU, LPG-GPT equips bottling plant teams with instant answers to operations and maintenance queries, trained on manuals, circulars and statutory documents. The Automated LPG Fleet Monitoring system brings AI to the critical challenge of transporter compliance. AI-triggered automated calls are made to LPG fleet operators; their responses are captured and analysed, identifying recurring deviation patterns and enabling proactive intervention. For the Direct Sales business, the Direct Sales Insights AI Agent provides conversational access to SAP Direct Sales(DS) data in real time, while the Customer Data Insights tool provides trade accounts receivable and customer credit risk intelligence enabling DS officers to manage accounts proactively and reduce overdue recovery timelines.

In Pipelines SBU, A GenAI-assisted PIDS Alarm Analytics solution has been piloted to address challenge of false-positive alarms in Pipeline Intrusion Detection Systems (PIDS). The system provides confidence scoring for threat probability, contextual explanations based on historical data, pattern analysis and AI-generated recommended actions helping make faster and more consistent decisions.

Across Corporate Functions, HPCL's on-premises Generative AI platform powers HR-GPT 2.0 (personalised HR support 24x7), Procurement-GPT and the BG Proof Reader (policy compliance and Bank Guarantee verification), Opex AI Agents, Safety-GPT, Vigilance-GPT and many more Gen AI use cases spanning across functions.

Generative AI in R&D: Accelerating the Path to Viksit Bharat

HPCL's Green R&D Centre (HPGRDC) represents the frontier of the company's AI ambitions. HPGRDC has made rapid progress in embedding AI, machine learning and advanced digital simulation tools into core R&D workflows, with measurable and significant results.

The classic R&D cycle is expensive and slow. R&D teams are now compressing those timelines using AI/ML.

The practical impact is measurable. Machine learning models have reduced battery life testing time by 70 to 80 percent. A combined ML and Design of Experiments approach saved approximately 100 days in nickel passivator formulation development. ANN (Artificial Neural Network) based models for the Propane Dewaxing Unit achieve around 98 percent property prediction accuracy in milliseconds.

These are not incremental improvements. They are step-changes in the speed, cost and precision of energy R&D building India's indigenous capability to lead in the technologies that will define the energy transition.

Upskilling the Future Workforce: Bridging the AI Talent Gap

No technology transformation delivers its potential without a workforce capable of driving it. HPCL has rolled out structured, multi-tier capability building programmes covering AI literacy, data analytics, automation tools and digital platforms, reaching employees across functions, geographies and grades.

Introduced Immersive learning through Virtual Reality (VR) and Metaverse-based training modules. This simulation approach reduces training risk, improves knowledge retention and prepares operators for real-world complexities before they encounter them on the ground.

HPCL has also launched a structured programme focused on nurturing leadership-level talent and advancing industry knowledge. The initiative reflects a recognition that AI transformation is not purely a technical undertaking; it requires leaders who understand both the strategic potential and the practical limits of AI and who can champion change within complex, large-scale organisations.

HPCL is building an organisation where AI fluency is a shared trait rather than a specialist skill. This democratisation of technology is both a competitive

advantage and a contribution to India's broader mission of building a digitally skilled workforce.

Green AI: Optimising Energy Consumption and Carbon Footprints

HPCL has committed to Net Zero emissions by 2040 well ahead of India's national target. AI is central enabler to this commitment. Energy Management Solutions and Steam Trap Monitoring use advanced algorithms to identify energy loss in real time. Hydrogen forecasting models for Hydrogen Generation Units prevent wasteful over-production, directly reducing the carbon intensity of refining. Preheat Exchanger Fouling Forecasting allows planned maintenance cycles that maintain thermal efficiency and drive down fuel requirements.

The deployment of Real Time optimizer (RTO) at HPCL's refineries is particularly significant for sustainability. The result is a measurable reduction in energy intensity and a more agile, responsible approach to managing complex industrial systems.

In logistics and distribution, route optimisation is reducing fuel consumption and carbon emissions across HPCL's supply chain, where even marginal efficiency gains, applied across locations, translate into substantial environmental and economic benefits. HPCL Renewable & Green Energy Ltd. (HPRGE), is further extending sustainability ambitions with complexity of multi-energy configurations in real time.

Future Roadmap: Towards a Fully Intelligent Energy Enterprise

HPCL's AI roadmap is anchored by a North Star vision, a fully digitally-equipped enterprise across both its refinery and marketing operations. The near-term horizon is moving towards enterprise-wide AI deployment, ensuring that the intelligence embedded in specific plants, functions or processes becomes a systemic organisational capability. Robust data infrastructure, consistent data governance and interoperability across systems are the foundations on which this scale-up will rest.

Looking further ahead, agentic AI holds

transformative potential. Autonomous systems capable of perceiving operational conditions, reasoning about options and taking action with appropriate human oversight will redefine how HPCL manages its stakeholders. In customer service, agentic AI systems that handle end-to-end LPG transactions, retail interactions and vendor grievances without human intervention will set new standards for efficiency and convenience.

Across R&D, HPGRDC will continue to build its simulation-driven, AI-augmented research ecosystem, with an expanding pipeline of energy transition technologies from advanced battery materials and green hydrogen to next-generation lubricants and specialty chemicals developed at speed and scale that conventional methods cannot match.

Beyond the operational, there is a philosophical dimension to HPCL's AI journey a Maharatna PSU

does not exist solely to generate returns. It exists to serve the nation, to provide energy reliably, affordably and sustainably; to create employment and capability. Every predictive maintenance algorithm that prevents a refinery shutdown, every chatbot interaction that resolves a customer's problem in seconds, every AI model that shortens the path to green hydrogen, these are acts of national service, expressed in code.

India's journey to Viksit Bharat will be shaped by many forces like demographics, policy, infrastructure and capital. But it will also be shaped, increasingly, by intelligence: the ability to take data and turn it into decisions, to take complexity and turn it into clarity. HPCL is building that intelligence, systematically and with genuine conviction. The nation's energy future is not just being powered by oil. Increasingly, it is being powered by AI.

"The fuel for tomorrow's India is not just oil. It is data, intelligence and the human ingenuity to harness them both."



AI Upskilling as a Strategic Imperative: Powering India's Next Growth Curve



"Artificial Intelligence is not just about deploying new tools—it is about reimagining how we think, decide, and deliver value. The real advantage will lie not in access to AI, but in how effectively we embed it into our people, processes, and purpose."

- A. S. Sahney
Chairman, IndianOil

Artificial Intelligence (AI) represents a once-in-a-generation inflection point—akin to the transformative impact of railways, electricity, and the internet. What sets AI apart, however, is its unprecedented ability to democratize advanced capabilities, moving beyond rigid coding frameworks to empower individuals and organizations at scale. Today, AI is not just a technology shift; it is a paradigm shift.

In a world shaped by geo-economic fragmentation, deglobalization, demographic transitions, and rapid urbanization, India stands at a critical juncture. Sustaining high growth and achieving developmental aspirations will require a new engine—one that combines scale with intelligence. AI is uniquely positioned to serve this role, enabling India to leapfrog structural constraints, enhance productivity, and build globally competitive capabilities.

The Hon'ble Prime Minister, Narendra Modi, has aptly described AI as a "transformative opportunity in India's journey towards Viksit Bharat 2047." The M.A.N.A.V vision, introduced by him, as India's foundational framework and vision for artificial intelligence, underscores the strategic centrality of AI—not only in driving economic growth, but also in reshaping governance, industry, and society at large.

From Training to Transformation

At the foundational level lies AI literacy—building awareness, confidence, and a shared understanding across the workforce. The second layer focuses on adoption—embedding AI tools into everyday workflows, decision-making processes, and performance systems. The third and most critical layer is transformation—leveraging domain-specific AI applications to unlock new sources of value and sustainable competitive advantage.

While many organizations have made progress on literacy, far fewer have successfully embedded AI into core operations. Fewer still have translated skills into innovation. It is in this final stage that AI delivers its most significant impact.

IndianOil's Structured Approach to AI Enablement

IndianOil has undertaken AI upskilling as a strategic change initiative to prepare the organization as an AI-augmented future with the nuanced understanding of the three interconnected levels of AI upskilling.

AI literacy is the essential first step in any meaningful AI journey. At IndianOil, we have initiated a cross-divisional, cross-grade AI literacy program to build a shared foundation and reduce

apprehension. As emphasized by The Hon'ble Prime Minister, Narendra Modi at the India AI Impact Summit 2026, "preparation is the best antidote to fear" — a principle that underpins our approach to empowering our workforce for the AI era.

Senior Leadership and Middle Management across division trained through Workshop on strategic AI implications, leadership role in AI adoption, and sector-specific use cases. In IndianOil, Induction programs (e.g. DEEKSHA, DAKSH etc.) are redesigned to include AI orientation from Day 1.

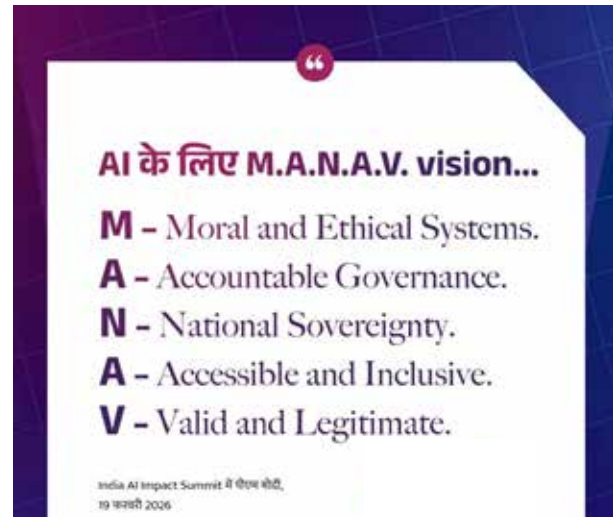
Specialised, role-aligned programmes were designed and delivered for key functions including Finance, Information Systems, HR, Legal, and Sales. These were complemented by certification modules led by experts from the Institute of Chartered Accountants of India (ICAI), covering areas such as Generative AI in audit, machine learning-based fraud detection, and the application of AI in compliance and taxation. The learning experience was further enriched through sessions by domain specialists from IIT Kharagpur, ensuring both academic depth and practical relevance. IndianOil Refineries have conducted hands on programs covering AI/ML applications in problem solving, Python based analytics, and ML fundamentals.

A cohort of 20 Learning & Development officers was trained through a structured 'Train the Trainer' programme, equipping them to serve as internal AI capability builders. This has enabled scalable, in-house delivery of AI learning interventions with minimal reliance on external trainers. Building on this foundation, nearly 4,000 employees across divisions have been trained, fostering widespread awareness and strengthening organizational readiness for AI adoption.

The 2nd layer has been rolled out at IndianOil, to move beyond awareness and begin embedding AI into everyday workflows.

AI-powered Bots Enhancing Employee Productivity: Pilots enabling employees to read and query IndianOil policies through AI bots — reducing time spent on manual policy document navigation. In our IndianOil Intranet Portal, Banyan Tree and XPDF platforms are created for reading PDFs and Policy documents.

In-house Designing of L&D Material: L&D teams now produce visually rich, AI-assisted learning materials using platforms like Canva AI and Synthesia Pro, reducing dependence on external design agencies and accelerating content development.



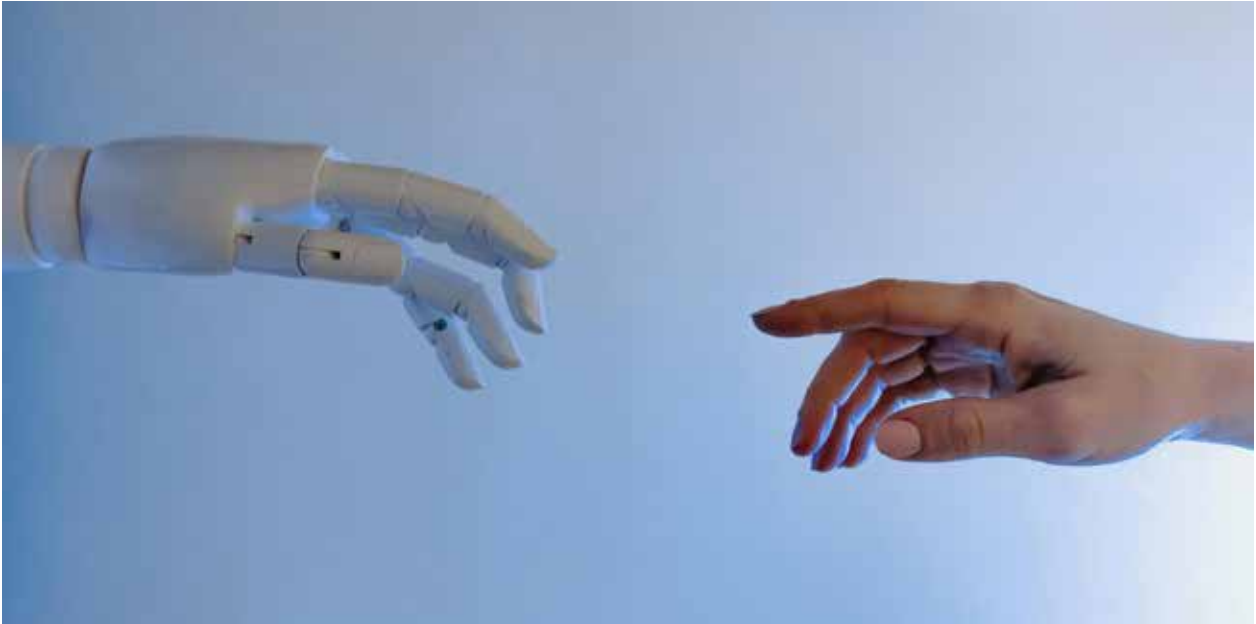
Analytics: In IndianOil, the use of AI powered analysis within Excel (MS Copilot) is accelerating turnaround time for MIS, reporting and business analytics.

AI Centre of Excellence (CoE): A dedicated CoE with strong business ownership and deep data science capabilities to institutionalize AI as a core business function and scale promising pilots to enterprise-wide adoption

Collectively, these initiatives are helping transform AI from a parallel experiment into an operational enabler. Alongside, we have started working to realize the potential that AI holds through domain specific use cases-

AI/ML embedded across businesses: Deployed for FCC yield optimization, heat exchanger predictive maintenance, retail customer segmentation, lube recommenders, and LPG sales optimization—with a plan for a centralized AI platform.

Digital Twin in Refinery: IndianOil's Digital Twin strategy for refineries employs a phased approach—starting small with primary units to prove value and build confidence, then scaling to secondary units—leveraging real-time simulations for process optimization, energy efficiency,



enhanced safety via virtual scenario testing, and reduced downtime/costs.

Safety of Assets: IndianOil has implemented AI-powered Video Analytics at bottling plants to monitor fire, smoke, PPE compliance, and unauthorized intrusions in real time. These proactive measures help prevent accidents and ensure compliance with safety standards, creating a safer work environment for employees and contractors.

Customer Preference Analytics: Advanced AI powered customer analytics empower IndianOil to transition from reactive engagement to predictive, targeted, and personalized interactions by leveraging behavioural data, preferences, and churn risk insights to anticipate needs, undertake hyper local marketing and deliver tailored recommendations, such as lubes product optimizations for upsell/cross-sell.

Approach to customers: AI driven pricing engine is being developed to recommend optimal prices and discount structures for industrial LPG customers, enabling more agile, data backed and market responsive decision making.

This is where the AI journey truly begins – and perhaps the most exciting part of it. Here, we move beyond incremental efficiency gains to fundamentally reimagine what is possible. In

this stage, we are not merely applying AI; we are exploring entirely new vistas of value creation, innovation, and sustainable competitive advantage.

The Road Ahead

AI is both an equalizer and a differentiator. While it lowers entry barriers by democratizing access to advanced capabilities, it disproportionately rewards those who adopt and scale it effectively.

For organizations, the message is clear: AI is no longer optional. It demands a fundamental rethinking of processes, roles, and decision-making frameworks. It calls for robust data ecosystems, agile operating models, and a culture that embraces continuous learning.

For public sector enterprises, AI presents a unique opportunity to bridge the gap with private sector agility while leveraging their inherent strengths of scale, reach, and trust.

Ultimately, the organizations that will lead in the AI era are those that view their workforce not just as participants in the journey, but as its primary drivers. By empowering people with the right skills, tools, and mindset, AI can transform human potential into a decisive strategic advantage.

As India advances towards its vision of Viksit Bharat 2047, AI will not merely support progress – it will define it.



shaping the energy of tomorrow

Bharat Petroleum, a Fortune Global 500 Company and India's second-largest Oil Marketing Company, is a leader in the integrated energy sector.

As a Maharatna enterprise, our refineries boast a combined capacity of 35.3 MMTPA, with a vast network comprising over 24,000 Energy Stations, 6,200 LPG distributorships, and more. Embracing sustainability, we are on a mission to offer electric vehicle charging at 7000 stations.

Committed to a Net Zero Energy future by 2040 in scope 1 & scope 2 emissions, we're not just an energy company; we're shaping a sustainable tomorrow.

Join us in Energising Lives and Building a Greener Planet!

Scan QR to know more



AI Transformation in NTPC Limited

Powering India's Transition to an Intelligent Energy Future Towards Viksit Bharat



For over five decades, NTPC Limited has powered India's growth. Today, we are redefining what it means to be a power utility. Beyond generating nearly a quarter of the nation's electricity from over 85 GW of installed capacity, NTPC is now generating something equally critical intelligence **at scale**.

Artificial Intelligence is not a parallel initiative at NTPC; it is becoming the backbone of how we operate, decide, and innovate. In a system as complex as ours—spanning fuel logistics, asset reliability, grid stability, environmental compliance, and workforce safety—AI enables real-time insight, predictive foresight, and precision decision-making that traditional systems cannot match.

1. AI in Operations: Where the Transformation is Most Visible

The most consequential application of AI in our power stations is predictive maintenance. Using machine learning models trained on vibration sensors, chemistry analysers, control systems, and PI Historian archives, our systems identify early-stage degradation in critical assets — boilers, turbines, pumps, and auxiliaries — before they cause outages.

Our Intelligent Integrated Drone Data Management (IIDD) platform transforms aerial imagery into actionable intelligence for solar plant health monitoring, ash dyke surveillance, and construction progress tracking. Operational across multiple sites including Anantpur, Kayamkulam, Korba, and Talcher, it geo-tags faults and generates

maintenance reports through a unified dashboard, eliminating the lag between observation and decision.

Our in-house innovation, the Boiler Health Monitoring system which is an endeavour to address the single largest cause of forced outages in thermal power stations (40–50% of unplanned shutdowns). Deployed at Dadri, Ramagundam, Kahalgaon, Rihand, and Jhajjar has been granted an Intellectual Property Right. Complementing this, our Advanced Pattern Recognition (APR) programme — one of the most extensive AI/ML deployments in the Indian power sector — continuously scans plant data for anomalies across our thermal, gas, and hydro fleet, enabling a transition from reactive maintenance to Reliability-Centred Maintenance and Asset Performance Management.

AI-powered video analytics are also deployed across plants for real-time safety monitoring — at Wagon Tiplers and Conveyor Belts at Mauda and Dadri, and for road safety surveillance — detecting intrusions, misalignment, and unsafe conditions automatically.

Our internal chatbot 'Jyoti' (NLP/LLM-based) gives every employee a conversational interface to HR data, generation dashboards, and SAP records; Microsoft Copilot, rolled out in April 2025 across Microsoft 365, and approximately 260 AI-driven use cases through the JOULE AI Agent in SAP S/4 HANA, further embed intelligence into enterprise workflows.

2. Generative AI in R&D: Accelerating the Path to Viksit Bharat

Predictive AI makes our operations more reliable; Generative AI is making our thinking faster and innovation more systematic. The 'Jyoti' chatbot operates on a Retrieval-Augmented Generation (RAG) architecture, retrieving and synthesising information from NTPC's institutional archives — technical reports, outage records, and engineering correspondence accumulated over decades. This is being extended into a Centralised Organisational Memory System interfaced with SAP S/4 HANA, making institutional knowledge systematically accessible rather than dependent on individual memory.

In engineering design, Generative AI evaluates thousands of configuration alternatives for boilers, turbines, and solar layouts simultaneously, identifying optimal combinations of efficiency, cost, and emissions in a fraction of traditional review time. Our forthcoming Digital Twin for Cooling Towers will replicate thermal behaviour under varying operational scenarios, enabling engineers to test interventions virtually before implementing them on actual plant — a pilot designed to validate the technology ahead of broader rollout.

In procurement, AI-based tender preparation and bid evaluation — using NLP to analyse historical tenders, specifications, and regulatory requirements — will substantially reduce expert effort in these document-intensive processes. An AI vetting system for Bank Guarantees and Purchase Orders, using OCR and pattern recognition to detect discrepancies and flag irregularities, is progressing through Proof of Concept. For our renewable expansion in solar, wind, battery storage, and green hydrogen, Generative AI compresses site planning and production simulation timelines from months to days.

3. Upskilling the Future Workforce: Bridging the AI Talent Gap

No technology initiative at NTPC is considered complete unless our people can use it, interpret it,

and govern it responsibly. Our structured AI-ML Certification Programme, run in collaboration with IIT Bombay, grounds engineers in machine learning fundamentals, predictive analytics, and the specific limitations of AI in safety-critical environments. The emphasis is not on producing data scientists — it is on producing engineers who know when to trust an AI alert and when to question it, and who understand that human judgement remains the final check in any plant operation.

Broader capability development spans data literacy for plant managers, prompt engineering for knowledge workers, cybersecurity awareness for those in AI-enabled operational technology environments, and practical responsible AI usage — recognising model limitations and escalating recommendations appropriately. Microsoft Copilot adoption programmes ensure AI productivity gains reach all employees, and the Jyoti chatbot democratises access to information across the organisation.

The forthcoming AI Centre of Excellence (CoE), anchored in a Five-Year AI Strategy Roadmap (2025–2035) being developed in consultation with leading management and technology institutions, will institutionalise this commitment: building internal talent pipelines, standardising model governance, creating reusable AI frameworks, and establishing ethical guidelines for accountable AI deployment. The power professional of the next decade will need to understand both the physics of heat transfer and the logic of a machine learning model — we are building programmes to develop exactly that combination.

4. Green AI: Optimising Energy Consumption and Carbon Footprints

For NTPC, sustainability has long been an obligation. AI is making it an operating discipline — measured, optimised, and improved in real time. Our Boiler Health Monitoring system keeps thermal units operating closer to their design parameters, directly reducing fuel consumption and carbon emissions. Even a fractional improvement in heat rate, applied across NTPC's installed capacity,

produces substantial annual fuel savings and a measurable reduction in carbon output at national scale.

In renewable operations, AI-based generation forecasting combined with IIDDM-powered drone inspections ensures every unit of solar and wind capacity performs optimally. Underperforming panels and turbines are identified and remedied quickly; accurate generation schedules reduce dependence on thermal backup, improving the clean energy contribution to the grid without adding capacity. Real-time emissions monitoring across our thermal stations tracks CO₂, SO_x, NO_x, and particulate matter continuously, with anomaly detection triggering immediate investigation to ensure environmental compliance is always maintained rather than verified periodically.

AI is also applied to water and waste management, with cooling water usage, ash handling, and emissions control processes monitored and optimised continuously. In our coal mining operations, drone-based AI analytics support volumetric stockpile analysis, environmental impact assessments, and land use mapping. Advanced analytics dashboards tracking emissions intensity, benchmarking station-level performance, and mapping progress against our net-zero commitments are being developed, building sustainability into the data infrastructure of how we run our plants.

5. Future Roadmap: Towards an AI-Native Utility

The initiatives described represent the first structured phase of a longer transformation. Our AI CoE and Five-Year Strategy Roadmap will serve as the institutional backbone — standardising data platforms, governing model development, incubating new use cases, and ensuring cybersecurity and ethical accountability keep pace with capability expansion.

All AI deployments operate under a Human-in-the-Loop architecture: no algorithm has direct written access to plant control systems, and all AI-generated recommendations require validation

by qualified engineers before action. Physics-informed models are bounded by hard-coded safety limits, aligned with the CEA Cyber Security Guidelines 2021. These principles govern all future deployments as we scale.

Digital Twins, beginning with the Cooling Tower pilot, will extend progressively to other critical plant assets, enabling operational decisions to be tested in simulation before being made. Drone-based AI monitoring is being extended into coal mining operations — topographical survey, environmental assessment, and land mapping — using LiDAR, thermal imaging, and AI-based geotechnical hazard detection. A Safety at Height AI system integrating computer vision and IoT wearables to detect fall risks in real time is moving from design to pilot deployment.

Underlying all of this is the need for unified data infrastructure — a secure enterprise ecosystem integrating operational, maintenance, financial, project, and market data. AI models are only as good as the data they work with; the investment in data architecture is therefore as important as the investment in algorithms.

Conclusion: AI as National Infrastructure

NTPC's AI journey is not just about modernization — it is about responsibility.

Every predictive alert that prevents an outage ensures uninterrupted power for millions.

Every efficiency gain reduces the cost of electricity for households and industries.

Every emission reduction advances India's climate commitments.

AI, therefore, is not merely a technological investment — it is a **strategic enabler of India's vision for Viksit Bharat**.

NTPC stands at the forefront of this transformation — committed to building a power sector that is not only larger, but smarter, cleaner, and more resilient.

AI Transformation at ONGC: Building an Intelligent Energy Enterprise for a Viksit Bharat



Arun Kumar Singh
Chairman & CEO, ONGC

Intelligence as the New Strategic Resource

Artificial Intelligence has moved decisively from the margins of enterprise experimentation to the very core of institutional capability. What was once perceived as a frontier technology is now an essential determinant of competitiveness, resilience, and long-term value creation. In sectors such as oil and gas, characterised by scale, geological complexity, capital intensity, and operational risk, AI is no longer an adjunct to existing systems. It is the very engine that powers insight, sharpens foresight, and enables confident decision-making under conditions of uncertainty.

The nature of energy itself is evolving, and so too must the enterprises that produce it. In a world defined by volatile markets, complex supply chains, and increasing environmental accountability, the ability to interpret data intelligently is emerging as a strategic differentiator. AI allows organisations not merely to process information, but to anticipate outcomes, optimise resources, and respond dynamically to changing conditions.

For ONGC, this transformation is not merely a technological progression; it is both a strategic imperative and a national responsibility. As India advances towards the vision of a Viksit Bharat, the pillars of energy security, operational excellence, and technological self-reliance must converge seamlessly. The energy enterprise of the future must be not only resource-rich but intelligence-driven.

AI provides the connective fabric that enables this convergence. It integrates disparate data streams, aligns operational priorities with strategic

objectives, and creates a unified decision-making environment across the enterprise. It enables ONGC to transition from reactive operations to predictive and, ultimately, prescriptive systems.

Accordingly, our approach has been deliberate, structured, and systemic. We have not viewed AI as a collection of isolated initiatives or pilot programmes. Instead, we have embedded intelligence as an intrinsic element of ONGC's operating model; reshaping how we explore, drill, produce, manage, and govern. This is not transformation at the margins; it is transformation at the core.

From Fragmentation to an Integrated Digital Core

The hydrocarbon value chain generates vast volumes of data across exploration, drilling, production, logistics, and corporate systems. Historically, this data has existed in fragmented silos, each serving specific functions but collectively limiting enterprise-wide visibility. Such fragmentation often resulted in delayed insights, inconsistent decision-making, and suboptimal utilisation of resources.

Recognising this structural constraint, ONGC has embarked on a comprehensive journey to build an integrated digital core; one that unifies data, systems, and intelligence into a cohesive enterprise architecture.

Our vision is clear: to evolve into a fully AI-enabled organisation, leveraging Artificial Intelligence, Machine Learning, and Generative AI across the entire hydrocarbon value chain. This vision is anchored not only in technological advancement but in operational transformation, enhancing

efficiency, optimising production, and elevating the quality and speed of decision-making across all levels.

This transformation is being operationalised through a structured roadmap under Project GATI, which integrates digital platforms, governance frameworks, and human capital into a unified ecosystem. At the heart of this ecosystem lies a Common Data Analytics Platform that harmonises data across exploration, drilling, production, and enterprise functions.

Real-time inputs from SCADA systems, IoT-enabled sensors, and field-level monitoring infrastructure provide continuous situational awareness. This enables faster, more accurate, and more consistent decision-making, reducing latency between data generation and action.

The robustness of this digital backbone is further enhanced through high-performance computing infrastructure developed in collaboration with C-DAC, on-premise GPU-enabled systems, and the AIX platform; ONGC's enterprise AI operating layer, which currently supports over 26 AI applications.

Together, these elements form a scalable, resilient, and future-ready architecture. More importantly, they enable a fundamental shift; from data aggregation to enterprise-wide decision intelligence, from information silos to integrated insight.

AI in Action: Converting Insight into Value

At ONGC, the deployment of AI is guided by a singular and uncompromising principle: the creation of measurable value at scale. Technology, in itself, holds little significance unless it translates into tangible outcomes, enhanced productivity, reduced costs, improved safety, and increased production.

Across our operations, AI-driven analytics have significantly reduced manual data handling while accelerating interpretation across exploration, drilling, and production workflows. This has not only improved efficiency but also enhanced the quality of decision-making by enabling more

precise and data-driven insights.

In drilling operations, predictive models, such as drill pipe stuck prediction and rate of penetration optimisation, are delivering measurable improvements in operational efficiency. By reducing non-productive time and mitigating risks, these models are directly contributing to cost optimisation and operational reliability.

In production, AI-enabled well intervention systems have demonstrated a significant impact, delivering incremental oil gains of approximately 266 metric tonnes per month in implemented cases. This is a clear illustration of how intelligence, when effectively deployed, can directly enhance output and asset performance.

In subsurface workflows, AI-based seismic trace editing has reduced manual effort by nearly 50%, significantly compressing processing timelines while improving the utilisation of expert resources. This allows domain experts to focus on higher-value analytical tasks rather than repetitive manual processes.

Safety, a cornerstone of ONGC's operations, has also been strengthened through AI-powered video analytics deployed across more than 800 surveillance systems. These systems enable proactive identification of safety risks, reinforcing our commitment to protecting people, assets, and the environment.

Beyond core operational domains, AI has also delivered value at the enterprise level. Analytics applied to over 1.27 lakh travel records has enabled data-driven optimisation of corporate expenditure, demonstrating that the impact of AI extends across both operational and administrative functions.

Importantly, ONGC's innovation pipeline has identified 20 high-impact AI use cases, each with an estimated value potential ranging from ₹50 crore to over ₹1,000 crore over a 3–5 year horizon. This pipeline represents not just future potential but a structured pathway for sustained value creation.

These outcomes reflect a consistent and defining principle: at ONGC, AI is not exploratory; it is decisively value-accretive at enterprise scale.

Generative AI: Transforming Knowledge into Strategic Advantage

Generative AI represents a transformative shift in how organisations leverage institutional knowledge. In knowledge-intensive industries such as oil and gas, the ability to access, interpret, and apply information rapidly can significantly influence decision outcomes.

ONGC's *EnerGPT* platform exemplifies this transformation. Designed as a secure, enterprise-grade Generative AI system, *EnerGPT* enables contextual and role-based access to vast repositories of technical and operational knowledge through natural language interaction.

This capability significantly reduces the time required for information discovery and enhances the precision of decision-making. Engineers, geoscientists, and managers can now interact with complex datasets and documentation more intuitively and efficiently.

Applications of *EnerGPT* span technical documentation, engineering decision support, and cross-functional knowledge retrieval. By democratising access to knowledge, it empowers employees across levels to make informed decisions with greater speed and confidence.

In parallel, ONGC is advancing AI-augmented Full Waveform Inversion (FWI) in collaboration with leading academic institutions. This initiative aims to develop in-house subsurface imaging capabilities, reducing reliance on external vendors while enhancing technical self-reliance.

Generative AI, in this context, is evolving beyond a support tool. It is becoming a strategic capability, one that transforms accumulated knowledge into real-time decision advantage.

Institutionalising Capability: From Talent to Transformation

Sustainable transformation cannot be achieved through technology alone. It requires the development of institutional capability, where people, processes, and platforms evolve in tandem.

A key enabler in ONGC's journey has been the establishment of the AI & Analytics Task Force (AIATF), a cross-functional, location-agnostic network of domain experts spanning exploration, drilling, production, and corporate functions.

This structure ensures that AI initiatives are rooted in real operational challenges and aligned with business priorities. It bridges the gap between domain expertise and technological capability, ensuring that solutions are both practical and impactful.

Complementing this is the *Udbhav* innovation programme, which institutionalises bottom-up innovation across the organisation. By encouraging employees to identify challenges and propose solutions, *Udbhav* has created a culture of ownership and innovation at scale.

Together, AIATF, *Udbhav*, and the AIX platform form a closed-loop innovation ecosystem, from problem identification to solution deployment. This integrated approach has enabled ONGC to move beyond pilot-driven experimentation towards scalable, enterprise-wide transformation.

Governance as a Trust Architecture

At enterprise scale, the adoption of AI must be underpinned by robust governance. Trust is not incidental; it must be designed into the system.

ONGC has established a comprehensive Data and AI Governance Framework that addresses data lifecycle management, model validation, security, bias mitigation, and regulatory compliance. This framework ensures that AI systems operate within clearly defined boundaries of accountability and transparency.

Human-in-the-loop validation remains a critical component of this architecture. AI-driven outputs are continuously reviewed and validated by domain experts, ensuring alignment with operational realities and organisational objectives.

This governance-led approach ensures that AI adoption at ONGC is responsible, transparent, and scalable; anchored firmly in trust.



Green AI: Driving Sustainable Energy Futures

AI is not only a driver of efficiency; it is also a catalyst for sustainability.

At ONGC, AI-driven initiatives are enabling predictive maintenance, reservoir optimisation, and operational efficiency, reducing energy losses and lowering emissions intensity. Real-time monitoring systems enhance environmental risk management, enabling proactive intervention and improved compliance.

This integration of AI with sustainability objectives reflects ONGC's commitment to responsible energy production, balancing growth with environmental stewardship.

The Road Ahead: Scaling Enterprise Intelligence

With strong digital foundations in place, ONGC's AI journey is entering its next phase, focused on scale, integration, and sophistication.

The roadmap ahead includes expanding AI adoption across assets, advancing predictive and prescriptive analytics, deepening Generative

AI capabilities, and strengthening ecosystem partnerships.

The trajectory is clear, from data to intelligence to autonomous, decision-driven enterprise systems.

Conclusion: Redefining the Energy Enterprise

The future of energy enterprises will be defined not only by the scale of their physical assets, but by their ability to harness intelligence at scale.

ONGC's AI transformation represents a deliberate and strategic shift; integrating data, embedding intelligence, institutionalising innovation, and delivering measurable value across the enterprise.

As India progresses towards a *Viksit Bharat*, ONGC remains committed to leveraging AI as a force multiplier, enhancing operational excellence, strengthening energy security, and contributing meaningfully to national development.

AI, in this journey, is not merely a technology. It is the foundation upon which a future-ready, intelligent energy enterprise is being built.

"AI is not just transforming ONGC; it is redefining how a national energy enterprise creates enduring value in the digital age."

PG-AMRIT

AI-Based Image Processing Platform for Transmission Asset Management



1. INTRODUCTION & OBJECTIVE

POWERGRID operates one of the world's largest and most complex transmission networks, comprising nearly three lakh towers spread across deserts, forests, hilly terrains, riversides and coastal regions. The health of each tower is as vital to the national power system as the human backbone is to the human body. Every tower carries conductors transporting hundreds of megawatts, forming the structural foundation of the National Grid. Even a single loose bolt, bent tower member, damaged insulator or missing bird guard has the potential to escalate into serious operational hazards such as line tripping, tower collapse, extensive grid disturbances or even risks to public safety. Traditionally, transmission line patrolling/inspection involved capturing thousands of photographs which were manually reviewed by field teams. This method consumed significant time and was prone to human subjectivity, regional inconsistencies and potential oversight of critical anomalies. Maintaining uniform inspection quality across diverse terrains through purely manual methods was extremely challenging.

To address these technological and operational gaps, POWERGRID developed PG-AMRIT an Artificial Intelligence (AI)/ Machine Learning (ML) based platform (Integrated in PG-DARPAN patrolling platform) aimed at replacing subjective, manual image review with automated, accurate and consistent defect identification, thereby significantly reducing inspection time, minimizing errors and improving National Grid reliability.



Figure 1: Login Page of PG-AMRIT

2. BRIEF DESCRIPTION OF THE INITIATIVE

PGAMRIT (POWERGRID Asset Management through Artificial Intelligence in Transmission) was launched in 2024 as an indigenous AI/ML-based platform capable of automatically analysing patrolling photographs from both drone and ground-based inspections. PGAMRIT is equipped with a powerful set of features that significantly enhance the quality and speed of transmission line inspection. The system can automatically detect more than 30 types of defects from both drone based and ground based patrolling images, including tower bolt missing, bird guard missing, damaged or broken insulators, reversed grading rings, bird nests, bent tower members, hanging components and missing joint plates, thereby ensuring comprehensive coverage of all critical structural and electrical anomalies. Its highspeed AI engine is capable of processing nearly 400 photographs per minute with up to 90% accuracy, drastically reducing analysis time when compared to manual review. PGAMRIT leverages GPS based identification, enabling it to automatically determine the exact tower number and transmission line

name from geotagged photographs and generate complete, standardised defect reports including SAP notifications without requiring any manual sorting or tagging. Together, these features make PGAMRIT a highly reliable, efficient and evidence driven asset management tool for strengthening the transmission network.

Instead of engineers spending hours in front of screens, the model identifies abnormalities and marks them with bounding boxes and machine-readable labels. These outputs are not just labels, they form structured digital evidence that seamlessly integrate into POWERGRID's maintenance workflows. Each system-generated defect record triggers a notification or work order, thereby ensuring a direct link between defect detection, maintenance action and eventual closure. This shift has transformed the organisation's maintenance philosophy from experience-based to evidence-based asset management.

3. DEVELOPMENT & IMPLEMENTATION

The development of PG AMRIT involves separate AI models for drone images and ground-level photographs, as defect signatures differ significantly based on camera angle and distance. The data pipeline incorporates robust data curation practices, version control mechanisms and continuous improvement loops, ensuring that model accuracy improves with every new batch of labelled data. Broadly there are 4 development phases of PG-AMRIT as shown in Figure-2 with following features:

(i) Annotation Pipeline

- Annotation through CVAT (Computer Vision Annotation Tool)
- Dataset developed and expanded using feedback from TL experts
- Periodic retraining cycle to enhance defect detection accuracy

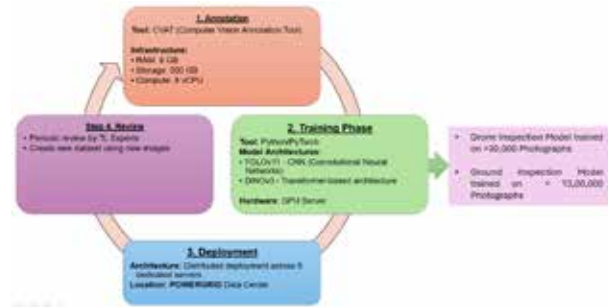


Figure 2: Development phases of PG-AMRIT

(ii) Training of AI/ML Engine

- Built using PyTorch with YOLOv11 (CNN-based) and DINOv3 (Transformer-based) hybrid models.
- Drone Model trained on 30,000+ images
- Ground Patrolling Model trained on 13,00,000+ images
- Uses convolutional neural networks and transformer models for high accuracy.
- Training performed on GPU servers

(iii) Deployment Architecture

- Distributed architecture deployed across POWERGRID Data Centre
- Low latency integration with patrolling web portal and mobile app
- Integrated with SQL database for storing:
 - ⊙ Tower characteristics
 - ⊙ Defect metadata
 - ⊙ User login and approval data
 - ⊙ ERP-linked defect history

(iv) ERP Integration & review

- Auto-creation of maintenance notifications for approved defects
- Updation of defect closure status
- End-to-end traceability of defect, rectification activity and inventory use
- Review of output and create new data set

The IT backbone of PG AMRIT comprises five dedicated servers integrated with the patrolling portal, patrolling mobile app, SQL-based defect repository and ERP backend. This architecture enables frictionless movement of information from image upload to AI detection, to approval workflows, to the issuance of work orders and the final closure updates in the ERP system. The system supports automated email reminders, escalation workflows and analytic dashboards for defect monitoring. Workflow of PG-AMRIT is indicated in Figure-3.



Figure 3: Application workflow for PG-AMRIT

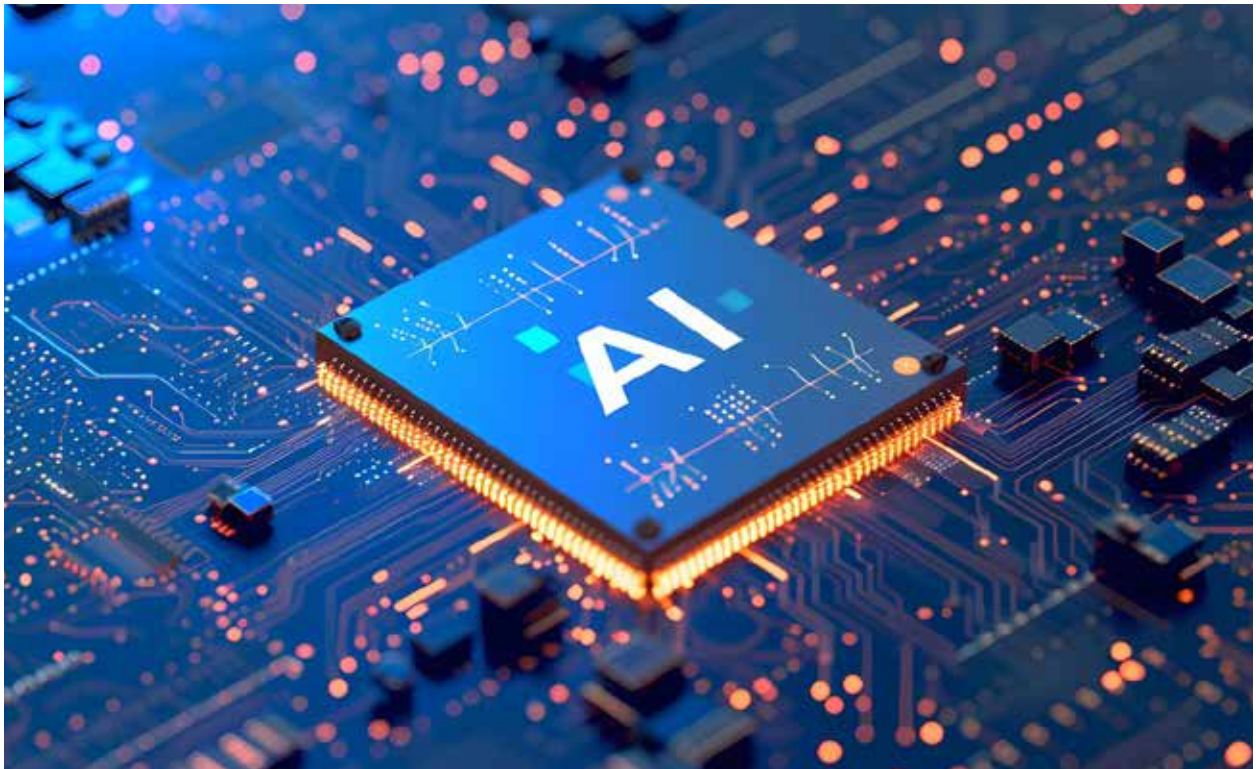
4. IMPACT AND BENEFITS

The impact of PG AMRIT on POWERGRID's operational efficiency has been substantial.

Automated image analysis has drastically reduced the time required for defect detection and significantly improved decision-making speed. Cycle times from detection to work order creation and closure are now tracked digitally and trendlines show a sustained reduction in defect backlog along with better planning of outages. The platform has also enhanced transparency by reducing human bias and ensuring uniform interpretation of defects. The digital traceability created by PG AMRIT links every defect to its associated maintenance action.

5. REPLICABILITY / WAY FORWARD

PG AMRIT's design is scalable and replicable across other transmission utilities, state transmission corporations, distribution networks and other sectors reliant on large-scale visual inspections. Going forward, POWERGRID is working to further improve model accuracy, expand the AI defect library, integrate edge computing for near real-time processing in remote locations and develop predictive analytics for tower health forecasting. By introducing objectivity and traceability into inspection and maintenance, PG AMRIT continues to reinforce POWERGRID's commitment to ensuring a reliable, safe and resilient National Grid.



Electrifying Talent Management: How POWERGRID is Revolutionizing HR with Artificial Intelligence

In the high-stakes world of national power transmission, where a single second of downtime can affect millions of lives, the human element is just as critical as the heavy hardware. Power Grid Corporation of India Limited, a Maharatna PSU and the backbone of the nation's electricity grid, has recognized that a future-ready grid requires a future-ready workforce. By integrating artificial intelligence and machine learning into its human resources framework, the company is moving beyond traditional administration into a new era of proactive talent management supported by cutting-edge technology.

At the heart of this **digital transformation is PRAGYAN**, the company's central digital learning platform. More than just a traditional repository of training materials, PRAGYAN serves as a sophisticated knowledge ecosystem. It utilizes advanced artificial intelligence and machine learning algorithms to offer highly curated courses focused on critical emerging technologies. Through this platform, employees gain access to specialized training in grid automation, digital substations, and cybersecurity, ensuring that the workforce stays ahead of the rapid technological shifts reshaping the global energy sector.

The intelligence of this ecosystem extends deep into the employee development process through an **Artificial Intelligence-based Training Needs Analysis** system. This cutting-edge model automates and enhances the assessment of training requirements across the entire

organization. Instead of relying solely on manual surveys and subjective feedback which can often be slow or biased, the system utilizes predictive gap identification. By analyzing real employee performance data and specific task outcomes, the artificial intelligence can accurately identify precise skill gaps before they ever impact daily operations.

Once these gaps are identified, the system automatically generates individual training plans for the employees. These plans seamlessly suggest relevant courses directly from the PRAGYAN platform, aligning personal career growth with the strategic needs of the organization. This closed-loop system ensures that learning is continuous, relevant, and highly personalized without requiring constant manual intervention from management.

Beyond the digital screen, the company has revolutionized safety training by deploying immersive technologies for its field staff. **Virtual reality and augmented reality modules** are now used to simulate high-risk field scenarios, such as climbing high-voltage towers and performing complex insulator replacements. These immersive tools allow employees to practice dangerous manoeuvre in a completely safe, controlled environment. This approach has significantly improved hazard perception among technicians and has earned the company widespread recognition, including prestigious awards for innovative training practices.

To streamline daily administrative interactions and support employees in real-time, an **internal chatbot named PRABHA** is being deployed. PRABHA is specifically designed to handle a vast array of human resources policy-related queries. By instantly answering questions regarding benefits, leave policies, and organizational guidelines, the chatbot reduces administrative bottlenecks. This allows the human resources team to step away from routine desk queries and focus on higher-value strategic initiatives that foster a

more engaged and empowered workforce.

By blending the precision of artificial intelligence with the practical needs of power sector professionals, the organization is setting a new benchmark for corporate training and development. The seamless integration of predictive analysis, immersive simulations, and automated support systems demonstrates that the most powerful energy shaping the future of the grid is the intelligent empowerment of its people.





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हिन्दुस्तान पेट्रोलियम कॉर्पोरेशन लिमिटेड
Hindustan Petroleum Corporation Limited

AI-Driven Transformation: Powering Intelligent, Sustainable Steelmaking Towards Viksit Bharat



Introduction

There was a time when steelmaking was often described as an art—an intricate craft shaped by experience, intuition, and the seasoned judgment of engineers who had spent decades understanding the behavior of furnaces, raw materials, and metallurgical processes. Much like a sailor reads the sea, these experts could interpret subtle variations in temperature, pressure, and chemical composition through observation and instinct rather than data models.

While this traditional knowledge continues to hold immense value, it is no longer sufficient in isolation. Today's industrial landscape has evolved into a highly complex and interconnected ecosystem. Steel plants operate across geographically dispersed locations, supply chains are global and dynamic, and production processes are tightly coupled with real-time dependencies. In such an environment, even minor inefficiencies can propagate rapidly across the value chain, leading to significant operational and financial impacts.

To navigate this complexity, industries are increasingly adopting a new paradigm—one where human expertise is augmented by intelligent systems powered by Artificial Intelligence (AI), advanced analytics, and digital technologies.

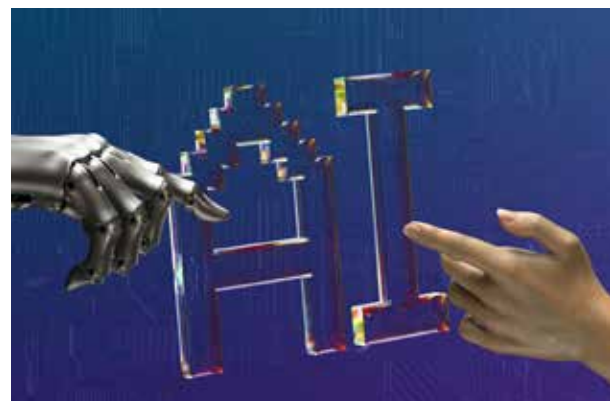
At the forefront of this transformation is Steel Authority of India Limited (SAIL), which is leveraging AI not merely as a technological enhancement but as a strategic enabler. This transformation aligns with India's broader vision of a *Viksit Bharat*—a developed, self-reliant, and

technologically advanced nation. Within this framework, AI is redefining how decisions are made, how operations are optimized, and how knowledge is utilized across the enterprise.

Key AI Initiatives Transforming Operations

SAIL's AI journey is fundamentally rooted in addressing real-world operational challenges across its extensive value chain—from mining and logistics to steelmaking and finishing processes. Rather than deploying AI as isolated pilots, the organization has focused on high-impact use cases that deliver measurable improvements in efficiency, reliability, and responsiveness.

One of the most critical areas of transformation is **AI-driven freight optimization**. The movement of iron ore and other raw materials across mines and plants involves multiple constraints, including fluctuating demand patterns, limited rake availability, route dependencies, and scheduling complexities. Traditional planning approaches often fall short in dynamically adjusting to these variables.



AI models, however, can evaluate thousands of feasible allocation scenarios in real time. By optimizing routing, scheduling, and resource allocation, these systems enable a more agile and resilient logistics network. The result is improved resource utilization, reduced transit delays, and enhanced synchronization between supply and production requirements.

On the shop floor, AI is driving a shift from reactive to **predictive operations**. Advanced monitoring systems continuously capture and analyze equipment and process parameters. Through anomaly detection algorithms, these systems can identify early warning signals of potential failures or deviations, enabling timely interventions.

This predictive capability significantly reduces unplanned downtime, enhances equipment lifespan, and improves process stability. More importantly, it allows operational teams to move from firefighting issues to proactively managing performance.

In parallel, **computer vision-based solutions** are enhancing visibility and precision across production processes. Applications such as heat ladle tracking ensure seamless coordination between different stages of steelmaking, minimizing delays and improving throughput. Similarly, billet length monitoring systems enhance

dimensional accuracy, leading to better yield and reduced material wastage.

Another high-impact initiative is **coke quality prediction**. The quality of coke plays a critical role in blast furnace efficiency and stability. Variations in coke properties can disrupt furnace operations, leading to inefficiencies and increased energy consumption. AI models trained on historical and realtime data can predict coke quality in advance, enabling operators to make proactive adjustments.

Collectively, these initiatives represent a fundamental shift in operational philosophy—from simplifying complexity to intelligently managing it. By embedding AI into core processes, SAIL is achieving higher efficiency, improved reliability, and faster, data-driven decision-making.

Generative AI in R&D: Accelerating Viksit Bharat

Beyond operational improvements, Generative AI is emerging as a transformative force in how knowledge is accessed, processed, and utilized within industrial organizations.

Traditionally, critical industrial knowledge has been embedded in extensive documentation—Standard Operating Procedures (SOPs), Standard Maintenance Practices (SMPs), technical manuals, and historical records. While comprehensive, these documents are often difficult to navigate in



timesensitive situations, limiting their practical usability on the shop floor.

To address this challenge, SAIL has developed **SAIL LENS**, an AI-powered mobile application that transforms static documentation into an interactive and user-friendly knowledge system. By enabling multilingual, conversational access to technical content, the application significantly enhances knowledge accessibility.

Features such as real-time audio instructions and interactive query capabilities allow employees to engage with information dynamically. The “Pause & Ask” functionality, for instance, enables workers to seek clarifications during task execution, reducing errors and improving efficiency.

Complementing this is the deployment of **Retrieval-Augmented Generation (RAG)** systems. These systems integrate enterprise knowledge repositories with AI models, enabling contextual and accurate responses to user queries. Instead of searching through multiple documents, employees can retrieve precise information in real time.

Additionally, **SAIL Sarathi**, a virtual assistant, is enhancing customer engagement by providing prompt and accurate responses to queries, thereby improving service quality and responsiveness.

Looking ahead, Generative AI holds immense potential in **research and development (R&D)**. By enabling faster synthesis of knowledge, supporting simulation-driven experimentation, and reducing dependency on manual analysis, AI can significantly shorten innovation cycles.

This capability is particularly important for a country like India, where industrial innovation plays a crucial role in achieving self-reliance. By accelerating process improvements and product development, AI-driven R&D can contribute meaningfully to the realization of a technologically advanced *Viksit Bharat*.

Upskilling the Workforce: Bridging the AI Talent Gap

Technology transformation is ultimately driven

by people. Recognizing this, SAIL has placed strong emphasis on workforce capability building as a core component of its digital transformation journey. Through its flagship transformation initiative, **Parvartanam**, SAIL is fostering a culture of continuous learning and digital adoption. A key pillar of this effort is **SAMARTH**, the digital capability-building initiative led by the Management Training Institute (MTI), Ranchi.

SAMARTH provides a structured platform for employees to develop both foundational and advanced digital skills. These include areas such as data analytics, machine learning, and digital system implementation, ensuring that employees are equipped to operate in an AI-enabled industrial environment.

Under the Parvartanam program, approximately 200 employees are being targeted for certification-based training over a two-year period. These structured programs ensure the development of specialized talent aligned with emerging technological needs.

In addition to formal training, SAIL is placing strong emphasis on **experiential learning**. Around 500 employees are expected to gain hands-on experience by directly participating in AI model development and deployment projects. This approach bridges the gap between theoretical knowledge and practical application, fostering deeper understanding and skill development.

Importantly, AI tools being deployed across operations are designed with **user accessibility in mind**. Features such as mobile interfaces, multilingual support, and intuitive interactions ensure that employees across different functions and skill levels can effectively engage with these systems.

This integrated approach reduces reliance on a limited pool of specialists and enables capability building at scale. By combining structured training, hands-on experience, and user-friendly tools, SAIL is cultivating a digitally **सक्षम** workforce prepared for the future of industrial operations.

Green AI: Optimizing Energy and Carbon Footprint

Steel production is inherently energy-intensive, making sustainability a critical priority. In this context, AI is playing a significant role in advancing environmental performance through improved efficiency and resource optimization.

Predictive models, such as those used for coke quality forecasting, contribute to more stable and efficient blast furnace operations. This stability reduces fuel consumption and enhances energy efficiency.

Similarly, AI-driven monitoring systems minimize unplanned shutdowns, which are often associated with energy-intensive restarts. By ensuring smoother operations, these systems contribute to overall energy savings.

Precision-focused applications, including computer vision systems, reduce material wastage by improving accuracy and process control. These incremental improvements collectively result in significant reductions in resource consumption.

In SAIL's context, **Green AI** is not limited to reducing computational energy usage—it is deeply embedded in operational excellence. By optimizing processes, reducing waste, and improving efficiency, AI is enabling more sustainable steel production aligned with national environmental goals.

Future Roadmap for AI Integration

The future of AI in SAIL lies in deeper integration, scalability, and enhanced autonomy across operations.

One of the most promising developments is the adoption of **digital twins**—virtual replicas of physical systems that enable simulation of complex industrial scenarios. These models allow decision-makers to evaluate potential outcomes before implementing changes, reducing risk and improving planning accuracy.

Prescriptive analytics represents the next evolution beyond predictive systems. While predictive models forecast outcomes, prescriptive systems recommend optimal actions, enabling more informed and effective decision-making.

The integration of data across mines, plants, and logistics networks will create a **fully interconnected digital ecosystem**. In such a system, information flows seamlessly across the value chain, enabling end-to-end optimization and real-time coordination.

Generative AI is also expected to expand into areas such as **design optimization, process innovation, and advanced problem-solving**, further accelerating industrial transformation.

As these technologies mature, the role of human expertise will evolve. Rather than being replaced, human decision-making will be augmented, allowing personnel to focus on strategic and high-value activities while AI handles routine optimization.

Conclusion

SAIL's AI-driven transformation represents a fundamental reimagining of industrial operations. It is not merely about adopting new technologies but about integrating intelligence into every layer of the enterprise—from logistics and production to knowledge systems and workforce development.

By embedding AI across its value chain, SAIL is enhancing operational efficiency, improving sustainability, and building a future-ready workforce. At the same time, it is demonstrating how Public Sector Enterprises can lead large-scale digital transformation initiatives.

As India moves towards the vision of a *Viksit Bharat*, such efforts highlight the importance of intelligent, adaptive, and inclusive industrial ecosystems. Steel continues to be forged as it always has—but alongside it, a new foundation is emerging—one driven by data, enabled by technology, and powered by intelligence.

AI Transformation at Bharat Electronics Limited: Pioneering the Path to a Viksit Bharat



BEL's AI-First Vision

Artificial Intelligence is no longer a future aspiration for Bharat Electronics Limited - it is an operational imperative, embedded into the fabric of how we design, develop, and deliver for India's defence and civil sectors.

Bharat Electronics Limited (BEL), India's premier Defence Public Sector Undertaking (DPSU), has embarked on a comprehensive AI transformation journey anchored in responsibility, sovereignty, and innovation. With a legacy spanning over seven decades of delivering cutting-edge electronics for national security and public service, BEL is now harnessing Artificial Intelligence to amplify its capabilities across research, operations, manufacturing, and workforce development.

The release of BEL's AI Policy Guidelines for Defence and Civil Applications 2026 marks a decisive institutional commitment - one that aligns with India's IndiaAI Mission and the national vision of a Viksit Bharat. This article outlines the key pillars of BEL's AI transformation agenda, from frontline operational deployments to talent development and green compute governance.

1. Key AI Initiatives: Transforming Operations at BEL

BEL's approach to AI adoption is methodical and impact-driven, guided by a structured framework that categorizes and prioritizes AI use cases across its Strategic Business Units (SBUs) based on business alignment, feasibility, data readiness, and return on investment.

Operational AI in Defence Systems

AI is already embedded in several of BEL's flagship product lines. The most consequential demonstration of BEL's AI capability is Akashteer: India's first fully AI-enabled Air Defence Control and Reporting System. Developed jointly with DRDO and ISRO, Akashteer is a C4ISR system that integrates surveillance assets, radar systems, communication nodes, and command and control

units across the Indian Army's Air Defence networks into a single, unified network. In C4I systems, AI manages data fusion, interpretation, and decision support - domains where real-time analysis of multi-source data exceeds human capacity.

In Radar Systems, EOIR Systems and Sonar Systems, AI-powered modules handle detection and target classification, augmenting classical signal processing and deep learning approaches. In Perimeter Surveillance Systems, computer vision algorithms enable gesture recognition and real-time threat identification. Speech Analysis systems have achieved near-complete AI integration, handling detection, language identification, and speech-to-text conversion with high precision.

Key C4ISR AI capabilities include:

- Adversary Network Analysis Tool (ANANT) for intelligence-driven threat mapping
- AI-enabled target tracking for complex naval scenarios
- Enemy aircraft activity recognition and classification
- AI-based Passive TWS (Track While Scan) System for persistent multi-target surveillance

BEL's anti-drone systems, airport surveillance radars, software-defined radios, and other major platforms are all part of a product portfolio being progressively enhanced with AI-enabled decision support, predictive maintenance, and autonomous capabilities. BEL's AI roadmap projects AI to contribute over 70% to C4I system functionality within five years, and over 90% to cyber security and big data analytics applications.

BEL AI Initiatives for Aatma Nirbhar Bharat

Underpinning BEL's operational AI capabilities is a broad portfolio of indigenously developed AI solutions spanning multiple domains - a direct embodiment of the Aatma Nirbhar Bharat vision.

These initiatives span language intelligence, computer vision, cyber security, and autonomous systems.

Speech Recognition and Natural Language Processing

- AI enabled Language Translation System (AILTS) for multilingual defence communications
- AI-based Spoken Language Identification for Coastal languages, supporting maritime surveillance
- AI enabled Voice Analysis Software (AIVAS) for speaker identification and sentiment analysis
- AI enabled Fake News Detector as part of a Social Media Analytics suite for information warfare defence

Computer Vision

- AI-based Smart Ship Operations integrating vision and onboard sensor data for autonomous maritime Surveillance
- AI enabled Gesture Recognition for perimeter security in defence establishments
- Human Face Recognition for access control and personnel authentication
- Segmentation of satellite panchromatic videos for terrain and activity analysis
- Naval Object Recognition and Tracking using AI for threat detection
- Autonomous Target Detection and Classification in the Infrared Spectrum for all-weather situational awareness
- Target Library matching for recognition and classification of aerial threats
- Animal detection for Railways using EOIR camera to prevent collisions and enhance safety

Blockchain-based Automation and Cyber Security

- Permissive blockchain mechanism for secure, tamper-resistant data sharing across defence networks
- Android Malware Detection Solution for securing mobile devices used in field operations
- AI enabled forensic search for videos to support post-incident intelligence analysis
- AI enabled Automatic Information Extraction and Synthesis from unstructured data sources

Robotics, Safety, and Radar

- Autonomous Fast Intercept Boat for autonomous navigation and collision avoidance.
- Robotic Surveillance Platform for perimeter monitoring with minimal human intervention
- Audio Doppler-based object classification for passive threat detection
- AI-based classifier for FMCW Radar enabling improved target discrimination and range accuracy

Risk-Based AI Deployment

BEL's AI deployment model uses a risk-stratified approach. Systems are classified as High, Medium, or Low Risk, with corresponding levels of human oversight - from Human-in-the-Loop for critical defence decisions, to Human-on-the-Loop for supervisory roles, to autonomous operation for lower-risk applications. This ensures that AI enhances rather than replaces human judgment, particularly in life-critical scenarios.

AI Incubation Centres

BEL has established dedicated AI Incubation Centres in collaboration with the Indian Armed Forces. The Indian Navy Incubation Centre for Artificial Intelligence (INICAI) and the Army AI Research and Incubation Centre (AARIC), both located in Bengaluru, are actively developing AI solutions for naval and army applications. BEL plans to extend this model to other defence services and establish Centres of Excellence for AI at identified locations across India.

Industry and Academia Partnerships

BEL's partnership strategy spans academia, industry, and the startup ecosystem. A formal MoU with the Indian Institute of Science (IISc) signed in October 2022 provides BEL access to foundational AI and Machine Learning research. Partnerships with IITs, NITs, IIITs, and the Defence Institute of Advanced Technology (DIAT) further strengthen the pipeline of talent and applied research. In June 2025, BEL signed a landmark tripartite MoU with Metamind Systems and Persistent Systems to jointly develop AI, ML, Data Analytics, and Cyber Security solutions for aerospace, defence, healthcare, telecommunications, energy, and smart cities. BEL's active participation in iDEX and membership in the Defence Innovation Organization (DIO) further strengthen its startup engagement pipeline

2. Generative AI in R&D: Accelerating the Path to Viksit Bharat

BEL's AI roadmap for 2025–2030 identifies Generative AI as one of the seven priority technology focus areas for the near future. The shift from predictive to generative to agentic AI represents a new paradigm for R&D acceleration.

Large Language Models and Sovereign AI

BEL is investing in the development of Large Language Models (LLMs) from scratch, trained on indigenous infrastructure using proprietary and mission-relevant datasets. This sovereign AI capability ensures that sensitive defence-related data is never processed on foreign cloud servers. The CRYSTAL (Computational Resource for Artificial Intelligence Testing and Learning) facility at INICAI with its 24-GPU compute cluster represents the first operational step in building this indigenous inference and training infrastructure. The broader AI funding allocation of ₹120–145 crore per year over 2025–2030 supports GPU cluster procurement, data lake construction, and sovereign model development.

The Retrieval-Augmented Generation (RAG) framework is being explored to give AI systems real-time access to BEL's internal knowledge repositories - technical manuals, field reports, and project documentation - without requiring expensive model retraining. This approach is expected to significantly reduce the time engineers spend on information retrieval and analysis.

Agentic AI and Digital Twins

BEL is moving towards Agentic AI workflows, where AI systems do not merely respond to queries but autonomously break complex tasks into subtasks, plan action sequences, and interact with external tools and databases. This positions AI as a 'digital co-worker' rather than a search interface, unlocking new possibilities in design optimization, logistics planning, and predictive maintenance scheduling.

Digital Twins - sophisticated virtual replicas of physical systems synchronized with real-time sensor data - represent another frontier. By integrating AI and IoT data, BEL aims to enable remote asset monitoring, scenario simulation, and predictive analytics for complex defence equipment, reducing costly downtime and improving operational readiness.

AI Maturity Assessment: A Framework for DPSUs

BEL has been entrusted by the IndiaAI Mission to develop a standardized AI Maturity Assessment framework for all DPSUs - a critical step towards

benchmarking and accelerating AI adoption across India's public sector. The framework operates at two levels: organizational maturity (covering strategy, data, infrastructure, people, and governance) and project-level maturity (validating AI systems against trustworthiness, legal compliance, and performance benchmarks). This initiative directly supports the creation of a competitive, AI-ready public sector ecosystem aligned with Viksit Bharat goals.

BEL's cumulative IPR portfolio of 882 granted/registered rights (344 patents, 538 copyrights as of 31st March 2026) and 121 technical papers published in FY 2024–25 reflect the depth of its innovation culture that underpins this national role.

3. Upskilling the Future Workforce: Bridging the AI Talent Gap

BEL recognizes that technology transformation without talent transformation is unsustainable. A structured, multi-year Talent and Competency Development plan has been designed to build AI capabilities across all levels of the organization. CMD Manoj Jain has drawn a direct parallel with the 1990s: just as the C programming language was made mandatory for all engineers when he joined BEL, AI/ML literacy must now become universal across the organization. "If the basics of this are understood by each and every engineer in the organization, then only the real impact of AI will be felt," he said.

A Structured Five-Year Training Plan

The training architecture spans formal physical certification programmes (scaling from 4 to 8 person-months annually), online certification courses (growing from 20 to 35 per year), post-graduation sponsorships at premier Indian universities, and active participation in national and international AI conferences and seminars.

The targeted manpower build-up envisions hiring 193 AI professionals over five years, spanning roles including Project Managers, Solution Architects, Data Scientists, Developers, and Testers. The dual-track approach - upskilling existing employees while recruiting specialized talent - ensures that AI capability is distributed across the organization rather than siloed in a single team.

Role-Based Capability Building

BEL's AI Organizational Governance Pyramid defines clear roles and responsibilities across six layers: Board Members, Strategy Makers, Chief Data Officers, Expert Consultants, Middle-

Level Managers, and Developers. Each layer is equipped with domain-specific training, ensuring that strategic decisions are informed by technical understanding and that developers are guided by ethical and governance principles.

- Board Members are trained on AI investment frameworks and risk-return assessment.
- Strategy Makers: Developed the AI roadmap and budget allocations for 2025–2030.
- Developers and Data Scientists: Implement AI algorithms under MLOps practices, with continuous monitoring against performance benchmarks.
- Field operators: Trained under Meaningful Human Control (MHC) doctrine to exercise override authority in AI-assisted scenarios.

Academic collaboration plays a central role in this agenda. BEL's partnerships with IISc, IITs, and NITs include sponsored PhD and M.Tech fellowships focused on defence AI challenges, creating a pipeline of deep domain expertise that will serve BEL's innovation needs over the long term.

4. Green AI: Optimizing Energy Consumption and Carbon Footprints

The energy demands of large-scale AI training and inference are significant and growing. BEL's AI governance framework explicitly addresses environmental responsibility as part of its High-Performance Computing (HPC) policy.

Energy-Efficient Compute Governance

BEL's HPC policy mandates that data centres report Power Usage Effectiveness (PUE) and Carbon Usage Effectiveness (CUE) as standard governance metrics. This ensures that compute infrastructure decisions are evaluated not only on performance but on environmental impact.

Right-Sizing and Edge AI

BEL's policy actively incentivises Small Language Models (SLMs) and efficient neural architectures including quantized models that reduce memory and compute requirements without disproportionate accuracy loss. Edge AI, where inference is performed directly on local IoT sensors, embedded devices, or vehicle-based platforms (such as the vehicle-mounted Akashteer system), is a strategic priority. This approach reduces data transmission overhead, improves privacy, and lowers aggregate energy consumption across distributed defence deployments.

The 'right-sizing' philosophy is embedded into BEL's AI implementation methodology: teams must formally assess whether a submodule requires AI at all before triggering the full AI development pipeline, and must document the percentage of AI contribution relative to total project scope. This avoids over-engineering and ensures compute resources are deployed only where they deliver measurable value.

Responsible Scaling

BEL's approach to model development reflects a deliberate philosophy of 'right-sizing' AI: selecting the smallest model that meets performance requirements rather than defaulting to the largest available. For LLM development, the policy provides clear guidance on model size categories from small models of up to 1 billion parameters deployable on consumer-grade GPUs, to large models of 7 billion parameters or more requiring dedicated infrastructure along with indicative cost estimates to support responsible resource allocation decisions.

BEL's HPC policy advocates for hybrid cloud-HPC models that allow startups and academic partners to access compute resources without massive upfront capital expenditure. This approach concentrates energy-intensive AI workloads in purpose-built, energy-managed facilities rather than dispersing them across less efficient environments, contributing to overall reduction of the sector's carbon footprint.

5. Future Roadmap: BEL's AI Integration Journey

BEL's AI Roadmap 2025–2030 outlines a phased, well-funded trajectory towards becoming an AI-first organization. The total AI funding allocation over the five-year period exceeds ₹650 crore, growing from ₹120 crore in 2025–26 to ₹145 crore in 2029–30, reflecting a 20% cumulative growth target.

Seven Technology Priority Areas

The roadmap identifies seven near-term AI technology priorities:

- GenAIOps and Model Serving: Operationalising LLMs at scale with high-throughput inference infrastructure.
- Digital Twins: Creating living virtual models of physical defence systems for monitoring and simulation.
- RAG and Vector Databases: Grounding AI outputs in BEL's proprietary knowledge base.

- Edge AI: Running optimized models on field-deployed hardware for low-latency, privacy-preserving inference.
- Agentic Workflows: Deploying AI agents that autonomously execute multi-step tasks.
- Ethical AI and Governance Frameworks: Embedding bias detection, explainability, and data lineage tools into every AI pipeline.
- Quantum AI: Preparing for the convergence of quantum computing and AI for cryptography, optimization, and materials science.
- Operational data analytics for Naval platforms, improving fleet readiness and mission planning
- Predictive Maintenance for Gun Fire Control Systems to minimize unexpected failures in critical weaponry
- Automatic Number Plate Recognition for smart cities enabling automated traffic enforcement and vehicle tracking
- AI Enabled Adaptive Traffic Optimization Solution reducing urban congestion and improving mobility in smart cities

Towards AI Sovereignty

A defining theme of BEL's roadmap is sovereign AI capability - the ability to independently create, manage, host, and govern AI systems using Indian infrastructure, Indian data, and Indian talent. This encompasses secure, air-gapped data centres equipped with domestic GPU clusters, indigenous LLM development that captures regional language nuances, and compliance with India's evolving data protection and AI governance frameworks including the Digital Personal Data Protection Act and the forthcoming Digital India Act. The February 2026 inauguration of the Pune CoE-AI by the Raksha Mantri, alongside the launch of the AI Policy Guidelines, signals that this sovereign capability agenda now has the highest levels of institutional backing.

Alignment with National Frameworks

BEL's AI strategy is deeply aligned with India's institutional architecture for defence AI, including the Defence AI Council (DAIC), the Defence AI Project Agency (DAIPA), and the DRDO's Evaluating Trustworthy AI (ETAI) framework. The Joint Doctrine for Cyberspace Operations 2024, released by the Chief of Defence Staff, provides the operational guidelines within which BEL's AI systems for cyber security and defence operations are being developed and validated.

Beyond defence, BEL's AI capabilities are being extended to civil applications including smart city infrastructure, environmental monitoring, infrastructure inspection, and public service automation - each governed by the same principles of trustworthiness, accountability, and human oversight that underpin BEL's defence AI work.

Concrete civil AI applications already underway or in advanced development include:

- AI Based Integrated Weather Support and Disaster Management System for early warning and emergency response coordination
- AI-based Predictive Maintenance of Delhi Metro Rail Equipment to enhance safety and reduce operational downtime
- Digital Agriculture Platform with Automation of FPO Functionalities, empowering Farmer Producer Organizations with data-driven insights

Conclusion

Bharat Electronics Limited's AI transformation is not merely a technology upgrade - it is a strategic repositioning of India's most important defence electronics company as a builder of sovereign, trustworthy, and future-ready AI systems. From Akashteer - India's first AI war-cloud, which proved its mettle in live operational conditions and embedding AI into radar and sonar systems to developing LLMs on indigenous infrastructure, from training a new generation of AI engineers to mandating green compute practices, BEL is demonstrating that responsible AI adoption and national strategic ambition are not in tension - they are mutually reinforcing.

As AI transitions from predictive through generative to agentic intelligence, BEL remains committed to keeping pace with developments without compromising on safety guidelines, guard-rails, or national security requirements — collaborating with academia, startups, national research laboratories, customers, and industry to realize value-enhanced solutions for India.

The path to a Viksit Bharat runs through the responsible, bold, and sovereign adoption of Artificial Intelligence. BEL is proud to lead that journey.

AI-Powered Logistics: CWC's Strategic Blueprint for a Resilient and 'Viksit Bharat'



Santosh Sinha
Managing Director, CWC



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Director (HR), CWC

Introduction: The Dawn of Intelligent Infrastructure

As India marches resolutely toward the vision of 'Viksit Bharat' by 2047, the role of Public Sector Enterprises (PSEs) has transcended beyond mere service delivery to becoming engines of technological sovereignty. In this transformative era, the logistics and warehousing sector serves as the vital circulatory system of the national economy. For a nation to achieve developed status, its supply chain must be characterized by "Invisible Efficiency"—a state where goods move seamlessly, losses are non-existent and data is the primary driver of every decision.

At the Central Warehousing Corporation (CWC), we recognized early that traditional warehousing—essentially the management of "four walls and a roof"—was insufficient for a globalized India. Following our successful journey of Digital Transformation 1.0 (2015–2024), which focused on foundational digitalization, we have now transitioned into Digital Transformation 2.0. This is not merely an upgrade; it is a fundamental pivot toward an AI-powered ecosystem. By integrating Artificial Intelligence (AI), the Internet of Things (IoT) and Robotic Process Automation (RPA), CWC is pioneering a path that optimizes supply chains, ensures food security and redefines the standards of excellence for PSEs in the digital age.

A. Architectural Intelligence: Key AI Initiatives Redefining CWC Operations

Our "Transformation 2.0" is anchored by a unified, AI-powered ERP platform that unifies over 45 legacy e-tools into a single, intelligent umbrella (now this has been coined as Bhandaran 360). With

41 modules and 35+ external integrations, this system has transitioned our 900+ warehouses from passive storage centers to active, data-generating nodes.

1. Frictionless Gate and Weighbridge Automation

Historically, the entry and exit points of warehouses were bottlenecks prone to manual errors and documentation delays. We have addressed this by implementing an AI-driven "Frictionless Gate" system. By leveraging Automated Number Plate Recognition (ANPR) and FASTag integration, coupled with real-time validations from the government's VAHAN and SARATHI databases, we have eliminated manual logbooks. The AI identifies the vehicle, validates the driver's credentials and triggers the weighbridge automation without manual intervention. This has resulted in a staggering reduction of upto 30% in Turnaround Time (TAT), allowing transporters to increase their daily trips and enhancing the overall throughput of the facility.

2. Computer Vision for Precision Inventory: AI Bag Counting

One of the most persistent challenges in bulk warehousing is the accurate counting of inventory during peak receipt and dispatch seasons. Traditional manual counting is susceptible to fatigue-induced errors and manipulation. CWC has deployed AI-powered CCTV Vision equipped with object detection algorithms. As bags are moved from the truck to the godown, the AI counts them in real-time with near-perfect accuracy. These counts are instantly reconciled with the Warehouse Management System (WMS), provisioning an audit-ready trail that protects against pilferage and

ensures that every grain intended for the Public Distribution System (PDS) is accounted for.

3. The Smart Locking and Geo-Fencing Ecosystem

Security in a *'Viksit Bharat'* must be proactive rather than reactive. We have replaced traditional locks with AI / IoT-enabled Smart Locks that utilize biometric and Face-ID activation. These locks are geo-fenced; they can only be operated by authorized personnel. Any attempt to access a godown outside of prescribed hours triggers an immediate deviance alert to the central monitoring dashboard. This system ensures absolute adherence to scientific storage principles, where aeration windows are strictly monitored and logged by AI.

4. Advanced Surveillance and Predictive Safety

Our warehouses are now monitored 24x7 by AI-driven surveillance systems capable of detecting more than just intruders. These *"Cognitive Cameras"* are trained to identify the early signs of smoke or fire, and even the subtle movements of rodents, which pose a significant threat to grain preservation. By catching these threats in their nascent stages, we have moved from *"loss mitigation"* to *"loss prevention,"* embodying the spirit of *"a-food grain-saved-is-a-food grain-produced"*.

B. Generative AI in R&D: Accelerating the Path to *'Viksit Bharat'*

While our current initiatives focus on operational automation, the next frontier for CWC—and indeed for all PSEs—is Generative AI (Gen AI). To achieve the goals of a developed nation, we must shift from being technology adopters to technology innovators. Gen AI provides the tools to accelerate Research and Development (R&D) in ways previously unimagined.

1. Synthetic Supply Chain Simulations

In our R&D initiatives, we are exploring GenAI to build digital twins of the entire logistics network. Unlike traditional models, GenAI can simulate millions of what-if scenarios, from extreme climate disruptions to sudden geopolitical shifts affecting EXIM trade. By generating synthetic data on the likely impact of these disruptions on factors such as grain moisture, storage conditions, and port congestion, we can design pre-emptive logistics

strategies. This will help us develop a more resilient supply chain that is tested against crises before they occur in the real world.

2. Democratizing Technical Expertise: The Gen AI Knowledge Bot

CWC possesses decades of institutional knowledge on the *"Science of Storage."* However, this knowledge is often locked in voluminous technical manuals. We explore to develop an internal Large Language Model (LLM) trained on our technical archives. This Generative AI interface enables field officers in remote locations to obtain instantaneous, scientifically accurate guidance on complex storage issues, such as moisture spikes in specific grain varieties or optimal fumigation strategies under varying humidity levels. By converting high-level technical expertise into actionable, real-time insights, this initiative ensures the systematic decentralization of institutional wisdom, empowering every warehouse manager across our nationwide network with the analytical depth and specialized proficiency of our most experienced subject matter experts.

3. Generative Design for Structural Resilience and Infrastructure Lifecycle

CWC is exploring Gen AI to revolutionize the structural R&D of our physical infrastructure. By utilizing generative design algorithms, we can simulate and create optimized warehouse layouts that account for specific regional environmental stressors—such as seismic activity, extreme heat, or high-humidity coastal conditions. Unlike traditional static designs, Gen AI allows us to iterate thousands of structural configurations to identify those that maximize storage volume while minimizing material use and thermal gain. This AI-driven approach to infrastructure R&D ensures that our locations are not just standardized, but are engineered for maximum longevity and structural resilience, providing a robust and future-proof foundation for the national supply chain.

C. Up skilling the Future Workforce: Bridging the AI Talent Gap in PSEs

A common misconception is that AI will render the PSE workforce obsolete. At CWC, we believe the opposite: AI is a *"Force Multiplier"* for human

potential. However, the transition from manual labour to “*Digital Stewardship*” requires a massive, coordinated up skilling effort.

1. From Data Entry to Data Analysis

In the previous decade, our staff spent hours on manual data entry. Today, with AI automating the capture of data, we have redirected our workforce toward Analytical Roles. Our employees are being trained to interpret the Smart Warehousing & Depot Darpan dashboards, identify operational anomalies, and make data-driven decisions. This shift from clerical work to strategic management is the core of our “*Workforce 2.0*” philosophy.

2. Gamified Learning and the ‘*Digital Literacy*’ Mandate

To bridge the AI talent gap, CWC explores to introduce gamified training modules where employees interact with AI simulations. For instance, our officers will be trained using AI tools that help them identify grain defects through image recognition. This “*Human-AI Collaboration*” ensures that technology enhances their professional judgment rather than replacing it.

3. Cultivating an ‘*AI-First*’ Mind set

The biggest challenge in a PSE is often cultural, not technical. We have fostered an “*AI-First*” culture by incentivizing innovation at the ground level. We’ll be organizing ‘*Internal Hackathons*’ wherein employees will be encouraged to suggest new use-cases for AI in their daily routines. This bottom-up approach ensures that our digital transformation is inclusive and that the “*AI Talent*” is grown from within.

4. Collaborations with Academia

By partnering with premier institutions like IIM-Ahmedabad, we are ensuring that our leadership is well-versed in the ethical and strategic implications of AI governance, ensuring that CWC remains a ‘*Learning Organization*’.

D. *Green AI: Optimizing Energy Consumption and Carbon Footprints*

Environmental sustainability is a non-negotiable pillar of ‘*Viksit Bharat*’. Logistics is traditionally a carbon-intensive sector, but CWC is leveraging

Green AI to decouple our growth from our environmental impact.

1. IoT-Driven Precision Preservation

Traditional grain preservation involves periodic fumigation and aeration, often conducted on fixed schedules regardless of actual need. We have implemented IoT Gas Sensors (monitoring CO₂ and Phosphine) that communicate with AI algorithms to determine the exact moment a godown needs treatment, and the efficacy of such treatment. By optimizing the dosage and timing of chemicals based on real-time pest-activity data, we have significantly reduced chemical runoff and minimized the environmental footprint of our storage operations.

2. Intelligent Space Optimization and Route Decarbonization

AI-driven “*Digital Twin*” visualization of our EXIM yards has led to optimization of warehouse space. In practical terms, better space utilization means fewer handling operations. Every time a forklift moves a container unnecessarily, carbon is emitted. Our AI “*Yard Manager*” in future will calculate the most efficient placement of every container, reducing the movement of heavy machinery and significantly lowering our daily diesel consumption and carbon emissions.

3. Energy-Efficient Cold Chains

For our temperature-sensitive cargo, we will be deploying AI to manage HVAC (Heating, Ventilation and Air Conditioning) systems. The AI monitors external ambient temperatures and internal thermal loads to adjust cooling cycles dynamically. This “*Smart Cooling*” prevents energy waste during cooler night hours or when the warehouse is at low capacity, directly contributing to India’s Net Zero targets.

E. *Future Roadmap: The Horizon of AI Integration*

The journey of AI transformation at CWC is a marathon, not a sprint. Our future roadmap is focused on creating an interconnected, intelligent logistics fabric that extends beyond our own walls.

1. The Unified National Logistics Cloud

CWC aims to lead the integration of warehousing

data with the Unified Logistics Interface Platform (ULIP). By sharing real-time AI-validated inventory data with the Railways, Ports and Customs, we can create a “*National Logistics Dashboard*”. This would allow the government to track the movement of essential commodities across the country in real-time, enabling proactive interventions during shortages.

2. Block chain and AI for Total Provenance

The next step in our roadmap is the fusion of AI with Block chain technology. While AI monitors the quality and quantity of the stock, Block chain will provide an unalterable “Digital Birth Certificate” for every bag of grain. This will provide absolute transparency for farmers, consumers and international trade partners, enhancing the brand value of Indian agricultural exports.

3. Prescriptive Maintenance and Robotics

We are moving from “*Predictive*” to “*Prescriptive*” maintenance. Soon, AI sensors on our warehouse structures and automated equipment will not just tell us when something might break, but will automatically trigger a work order and suggest the most cost-effective repair strategy. Furthermore, we might explore the pilot deployment of Autonomous

Mobile Robots (AMRs) for the related tasks at our warehouses.

Conclusion: A Vision Realized

The transformation of Central Warehousing Corporation is a testament to the fact that with the right vision, a Public Sector Enterprise can lead the technological charge. By leveraging AI, we have not only increased our profits and profit-per-employee, but we have also built a system that is more transparent, more sustainable and more resilient.

Our journey is a microcosm of the larger Indian story. A ‘*Viksit Bharat*’ requires institutions that are not afraid to reinvent themselves. At CWC, we are no longer just storing the nation's harvest; we are harvesting the power of data to secure the nation's future. Through AI, we are pioneering a path that ensures that in the India of 2047, no grain is wasted, no effort is redundant and every citizen is served by a supply chain that is as intelligent as it is reliable.

CWC stands ready to be the digital lighthouse for the Indian warehousing sector, illuminating the path toward a prosperous, technologically sovereign and truly developed India.





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Engineers India Limited

Transforming Engineering Solutions through Artificial Intelligence



The rapid advancement of Artificial Intelligence has ushered in a new era of industrial transformation, enabling organizations to reimagine traditional processes and unlock unprecedented efficiencies. Across sectors, AI is increasingly being leveraged to enhance operational efficiency, strengthen safety compliance, improve quality, and enable predictive maintenance.

As a pioneer in digitalization within the engineering domain, Engineers India Limited (EIL) has been at the forefront of this transformation. By strategically integrating AI into core business functions such as Engineering, Supply Chain Management, Human Resources, and Asset Management, EIL has demonstrated how emerging technologies can deliver tangible, measurable value.

Central to this journey is EIL's commitment to developing in-house, domain-driven AI solutions that go beyond conventional software capabilities. Four groundbreaking AI solutions - **EngAICosting®**, **EngAIDesign™**, **ASKEIL™** and **EngAIPredixon™** exemplify this approach. These solutions not only address long-standing industry challenges but also set new benchmarks in efficiency, accuracy, and scalability.

All the solutions were conceived and built by EIL's in-house Digital Technology Solutions team - AI and ML engineers working alongside domain specialists with an average of over 20 years of experience in engineering design, procurement, Human Resources, and project execution. This is not technology deployed from outside. This is institutional knowledge, encoded in AI, built to serve India's industrial infrastructure.

EngAICosting®: Transforming Cost Engineering with Explainable AI

EngAICosting® is an AI-enabled, in-house

application developed by EIL to support faster and more reliable project cost estimation. Built on EIL's internal equipment and historical cost database, it reduces manual effort while improving consistency and accuracy. With use of explainable AI models, costing engineers can clearly understand how each estimate is derived - ensuring transparency, traceability, and confidence in decision-making.

The Challenge: Complexity and Uncertainty in Cost Estimation

Accurate cost estimation is fundamental to successful project execution and procurement. However, it remains one of the most challenging aspects of engineering due to:

- High variability in design specifications
- Limited availability of comparable historical data
- Dependence on individual expertise and judgment
- Market uncertainties and vendor-specific factors

Traditional estimation approaches are often manual, time-intensive, and prone to inconsistencies. While commercial tools exist, they are typically suited for early-stage estimates and lack the precision required for procurement-grade accuracy.

The Innovation: Data-Driven, Explainable AI-Based Estimation

EngAICosting® is EIL's in-house developed AI-enabled application designed to address these challenges. Built on EIL's internal database of equipment specifications and historical costs, the solution delivers fast, reliable, and data-driven cost predictions.

A key differentiator of EngAICosting® is its use of Explainable AI (XAI), which ensures that every cost estimate is transparent and interpretable. Cost engineers can clearly understand how inputs influence outputs, fostering trust and enabling informed decision-making. In a procurement context where estimates have direct contractual and financial consequences, this explainability is not optional. It is what makes AI adoption possible in a professional engineering environment.

Pilot Implementation: Pressure Vessel Cost Estimation

The solution is initially developed and validated using pressure vessels as a pilot case. The selection was driven by several factors:

- Pressure vessels are engineered in-house by EIL. Procurement of pressure vessels in EIL projects is for engineered vessels. Accordingly, there is no variation between bidders depending on their engineering.
- A substantial internal database is available.
- Approximately 200-300 vessels are procured annually, making estimation effort-intensive and impactful.



Landing page of EngAICosting®

The ML model was trained on historical data and rigorously benchmarked against both awarded costs and traditional manual estimates. Following successful validation, the system was deployed for operational use.

Capabilities and Functional Integration

EngAICosting® supports multiple stages of the procurement lifecycle:

- Pre-bid estimation prior to Earnest Money

Deposit (EMD) - enabling strategic, data-driven bid/ no-bid decisions

- Cost validation and independent benchmarking during bid comparison

Key features include:

- Rapid generation of cost estimates
- Elimination of human bias through data-driven models
- Reduced dependency on individual expertise
- Reference to similar historical equipment data
- Integration of domain knowledge within AI models
- Continuous learning and refinement using new project data

The application is web-based, accessible remotely, and secured with enterprise-grade cybersecurity protocols. Role-based access ensures appropriate control and data governance.

Impact

The solution is deployed as an assistive tool, augmenting the capabilities of cost engineers. This human-AI collaboration ensures optimal outcomes while maintaining professional oversight. The AI-based cost estimation solution offers significant advantages:

- Data-driven, no human bias
- Enhanced speed through automation
- Agnostic to individual skills and experience
- Embedded Subject Matter Expert (SME) expertise
- Provides ready reference to similar historical tags
- Reduced manual errors

Initial results show better performance for AI based solution than manual estimates. The ML model is continuously validated and refined using data from ongoing projects. Based on insights gained, it is planned to extend the solution to other equipment categories, further amplifying its impact across

supply chain and procurement functions.

EngAIDesign™- Cable Schedule: Reinventing Engineering Design through AI

EngAIDesign™ is an AI based engineering solution, implemented for preparation of Instrumentation Cable Schedules. The solution is implemented for in-house use in EIL projects.

The Challenge: Complexity in Instrumentation Cable Engineering

Instrumentation cabling in large process plants is complex and labor-intensive activity. Thousands of instruments are distributed across vast plant areas, each requiring precise connectivity through a network of cables and junction boxes. The process involves:

- Managing large volumes of instrument tags
- Handling complex grouping and routing logic
- Compliance with multiple design and engineering guidelines

Traditional methods rely heavily on manual effort and individual expertise, making them time-consuming, and error-prone. Additionally, suboptimal cable routing and junction box placement can lead to increased capital expenditure.

The Innovation: AI-Driven Intelligent Cable Scheduling

EngAIDesign™ transforms the process of cable schedule preparation. Using AI, instrument tags are intelligently clustered directly from 3D plant model data. Junction boxes are automatically assigned, cable routes optimized, and accurate cable lengths generated.

Advanced Capabilities and Design Intelligence

EngAIDesign™ goes beyond automation by embedding engineering intelligence into the system:

- Comprehensive validation checks minimize data entry errors
- Built-in rules ensure compliance with signal types and cable specifications
- Flexibility to accommodate varying engineering

philosophies across plant units

- Tool-tips and guided workflows enhance usability



Single run cable elimination: A particularly noteworthy feature is its approach to eliminating single run cables, a common challenge in cable design. By applying differentiated strategies for densely and sparsely instrumented areas, the system enhances maintainability and reduces future operational costs.

Intelligent revision management: The platform enables seamless incorporation of design changes with minimal disruption. All revisions are automatically tracked, ensuring transparency and traceability while supporting concurrent engineering.

Key distinguishing features in EngAIDesign™ - Cable Schedule are:

- ML based clustering of instruments optimizing cable lengths and junction boxes
- Flexibility in design and engineering are integrated into the system
- In-built measures to minimize single run cables

Impact

The deployment of EngAIDesign™ has delivered significant and measurable benefits. Comparative analysis with manually prepared cable schedules across multiple projects highlights its effectiveness:

- **Reduced Engineering Manhours:** Automation significantly lowers effort and accelerates project implementation
- **Material Optimization:** Substantial reduction in cable lengths and number of junction boxes.

It optimizes Instrumentation cables by 15-20% on an average, which can result a **saving of approximately Rs.8 crores to Rs.10 crores for a large refinery project.**

Today, EngAIDesign™ is deployed across all new EIL projects, establishing itself as a critical tool for engineering excellence. Its ability to combine AI with domain expertise has redefined cable engineering from a manual task to an intelligent, data-driven process. The cost optimization benefits by the solution are not savings within EIL alone - they directly reduce the capital cost of refineries, petrochemical plants, pipelines, and fertilizer facilities that form the backbone of India's industrial infrastructure.

ASKEIL™: Enhancing Organizational Efficiency through Generative AI

ASKEIL™ platform demonstrates the transformative potential of Generative AI in organizational knowledge management and human resource functions.

The Challenge: Managing Distributed Organizational Knowledge

In large engineering organizations, critical information is often distributed across extensive documentation—policies, procedures, guidelines, and technical manuals. Accessing the right information at the right time can be time-consuming and inefficient.

Across the industries, it is observed in Human Resource (HR) is a potential area where AI solutions can be quickly introduced because of the following.

- Large volumes of structured and semi-structured data
- Repetitive and rule-based processes.
- Frequent employee queries on policies and procedures

These factors make HR an ideal starting point for AI adoption, offering opportunities for quick wins and visible return on investment.

The Solution: A Secure, Domain-Aware GenAI Chatbot

ASKEIL™ is EIL's entirely in-house developed

Generative AI-based chatbot designed to address these challenges. Built as a secure, on-premise, always available solution, it enables employees to interactively query organizational documents and receive precise, context-aware responses within seconds.

Key features include:

- Intelligent search across enterprise knowledge repositories



- Contextual and accurate responses with source references
- 24/7 availability through the intranet
- Domain awareness tailored to organizational needs
- Secure deployment ensuring data confidentiality

The platform currently covers key areas including Delegation of Power, HR Policies and Procedures, and Appraisal & Promotion Rules, with planned expansion across additional organizational domains.

A key design principle of ASKEIL™ is accuracy and traceability - with every response linked to source documents, ensuring reliability for enterprise use.

Impact: Efficiency and a Digital-First Culture

ASKEIL™ significantly enhances employee experience by simplifying access to information. It reduces dependency on manual interventions, freeing up HR resources to focus on strategic initiatives.

For an organization of approximately 2,500 employees, ASKEIL™ serves as the first enterprise-

wide AI touchpoint, handling several hundred queries per month and significantly reducing dependency on manual responses.

- Query resolution time reduced from minutes/ hours to seconds
- Improved awareness of organizational policies and procedures
- Enhanced productivity across employees and HR teams
- Support for document generation and decision-making

Beyond operational efficiency, the platform plays a crucial role in fostering a digital-first culture. By introducing employees to advanced AI tools, it encourages adaptability, innovation, and continuous learning. It also motivates new generation employees by offering exposure to cutting edge digital tools.

Additionally, ASKEIL™ aligns with broader national initiatives such as Digital India and paperless governance, reinforcing EIL's commitment to technological advancement and sustainability.

EngAIPredixon™: Transforming Asset Reliability through Physics-fused AI

One of EIL's most impactful innovations is **EngAIPredixon™**, an AI-powered smart maintenance platform designed for structural integrity monitoring and predictive maintenance of coke drums - one of the most critical assets in refinery operations.

The Challenge: Managing Critical Assets Under Extreme Conditions

Coke drums operate under highly demanding conditions, enduring extreme temperatures approaching 500°C and repeated thermal cycles involving rapid heating and quenching. These cycles, typically occurring every 36 to 48 hours, generate severe thermal and mechanical stresses. Over time, such stresses lead to fatigue damage, particularly at the skirt-shell interface.

In real operations, coke drums rarely follow ideal design cycles. These deviations concentrate fatigue

damage at the skirt-shell junction. Many cracks propagate into the shell - which reduce the life of the coke drum. The intended twenty-year design life is rarely achieved.

Industry surveys reveal that majority of coke drums experience skirt cracking, despite extensive use of widespread instrumentation and inspection regimes.

This results in:

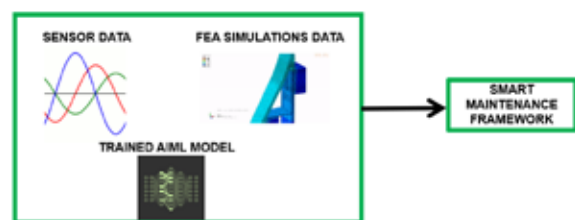
- Increased inspection frequency and associated costs
- Unplanned shutdowns and production losses
- Elevated safety and environmental risks

These challenges underscore the urgent need for a shift from reactive maintenance to predictive, intelligence-driven asset management.

Solution: The Intelligent Shift

EngAIPredixon™ addresses this gap by combining first-principles engineering with advanced AI techniques. The platform integrates real-time sensor data, finite element analysis (FEA), and machine learning models to provide a holistic view of asset health.

The system works by translating plant operating conditions into structural insights. Physics-based simulations identify regions where fatigue damage is most likely to accumulate. Machine learning models are then trained to replicate these complex physical behaviors, enabling rapid and scalable predictions.



Schematic diagram of EngAIPredixon™

This fusion of physics and AI enables:

- Near real-time estimation of stress and fatigue accumulation
- Continuous tracking of damage accumulation

- Accurate estimation of Remaining Useful Life (RUL)

What traditionally required weeks of expert analysis can now be achieved almost instantaneously, making predictive insights accessible to operators in real time. The solution is built as a web-based application with enterprise-grade cybersecurity.

Innovation and Differentiation

- **Physics + AI Integration:** Combines FEA with machine learning for accuracy and speed
- **Domain-Specific Focus:** Tailored for coke drum fatigue — a complex, high-stakes industrial challenge
- **Near Real-Time Capability:** Moves beyond periodic inspection to continuous monitoring
- **Operational Integration:** Directly linked with plant data for actionable insights
- **Indigenous Development:** Developed entirely in-house leveraging EIL's domain expertise

The application of physics-fused AI for real-time fatigue prediction of coke drums remains a niche and emerging area globally, with limited industrial deployment. A patent application has been filed for EngAIPredixon™.

Impact: From Reactive Maintenance to Predictive Operations

The implementation of EngAIPredixon™ marks a

paradigm shift in maintenance philosophy of coke drums. By enabling condition-based monitoring and predictive maintenance, the platform empowers operators to take proactive actions well before failures occur.

Operational Impact

- Early detection of fatigue damage reduces risk of unexpected failures
- Improved visibility into asset condition supports better maintenance planning
- Reduced dependency on manual, multi-day inspections
- Transforms maintenance from a cost center into a strategic function, delivering actionable intelligence that enhances operational resilience

Economic Impact

- Avoidance of unplanned shutdowns (losses running into several crores per day)
- Optimization of maintenance and inspection schedules
- Potential extension of asset operational life beyond historically achieved durations

EngAIPredixon™ is currently in advanced pilot deployment. The platform is scalable and can be extended to other refinery equipment, high-temperature cyclic process systems, and broader asset integrity applications.





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AI and Analytics in Fertilizer Sector - The NFL Perspective



National Fertilizers Limited with Enterprise Resource Planning (ERP) system based on SAP, has established a strong digital foundation by streamlining business processes, improving data availability, and enhancing system integration across various functions.

This digital maturity is expected to act as a catalyst for future adoption of advanced technologies, including AI and data analytics, in a phased and structured manner. The organization is exploring opportunities for leveraging AI in areas such as predictive maintenance, demand forecasting, process automation, and decision support systems, in alignment with the broader vision of achieving operational excellence and contributing to the objective of a Viksit Bharat.



AI Initiatives in NHPC – Building the Future



“At NHPC, we are leveraging Artificial Intelligence to make our energy systems smarter, safer and more resilient-ensuring that innovation drives both sustainability and operational excellence for the future.”

*Bhupender Gupta
CMD-NHPC*

Introduction

NHPC Limited stands as a cornerstone of India’s renewable energy landscape. As a 100% green energy Navratna Central Public Sector Enterprise (CPSE) under the Ministry of Power, Government of India, the organization has played a transformative role in harnessing hydropower resources to support the nation’s growing energy demands. With an installed capacity of 9082.9 MW and projects under construction totaling 9454 MW, NHPC is currently driving nearly 60% of India’s hydroelectric capacity under development. Its ambitious portfolio exceeds 50,000 MW reflecting its long-term commitment to sustainable energy expansion.

Financially robust, NHPC reported standalone assets of ₹ 96,029.38 crore as of December 31, 2025, along with a Profit After Tax (PAT) of ₹ 3,084 crore for FY 2024–25. Looking ahead, the company aims to scale its capacity to 23,000 MW by 2032 and further to 50,000 MW by 2047, aligning with India’s clean energy transition goals.

In recent years, NHPC has embraced Artificial Intelligence (AI) as a strategic enabler, not merely to expand capacity but to optimize existing infrastructure, enhance operational resilience and improve safety. This shift reflects a broader transformation within the energy sector, where digital technologies are becoming central to efficiency, sustainability and risk management.

1. eAabhas: Early Warning System

The Background: The Need for Predictive Safety

In the hydropower sector, the management of dam

and barrage sites involves inherent risks related to fluctuating water levels and discharge rates. Traditional monitoring systems often lack the predictive "lead time" necessary to take proactive measures during extreme weather events or monsoon seasons. NHPC identified a critical need for a system that could transition from simply observing current water levels to accurately forecasting future flood events to safeguard infrastructure and downstream communities.

Innovation:

eAabhas represents a paradigm shift in disaster mitigation through the integration of the Internet of Things (IoT) and machine learning.

- **IoT Monitoring:** The system utilizes a network of IoT-enabled sensors across Gauge and Discharge (G&D) stations for continuous, real-time tracking of water levels.
- **Advanced Forecasting:** NHPC has implemented Machine Learning techniques to process data in order to generate flood and discharge forecasts with actionable lead times.
- **Data Fusion:** The platform achieves high accuracy by integrating external data from premier national agencies, including the IMD, NDMA, and CWC.
- **System Integrity:** The AI includes “Control Room Intelligence” that automatically detects technical anomalies like sensor outages or stale data to ensure the system remains reliable 24x7.

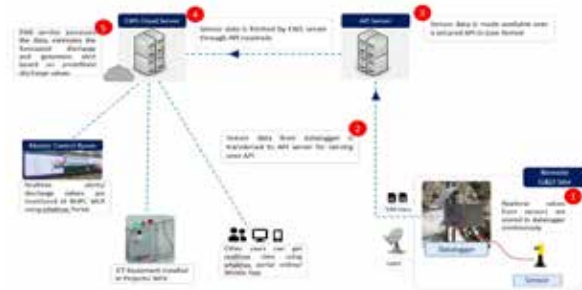
Impact & Benefits: Proactive Risk Mitigation

The primary impact of eAabhas is a significant increase in the accuracy and responsiveness of safety protocols. By providing automated alerts—including color-coded warning lights and hooters at project sites—the system enables proactive dam operations. This reduces risk to vital infrastructure and ensures downstream communities receive timely warnings during critical hydrological events.

Present Status: Nationwide Reach

Project Name	Status	Alerts	Discharge	Reservoir Level	Water Level	Temperature	Humidity	Wind Speed	Wind Direction	Last Update
Project A	Operational	Green	100%	95%	10m	25°C	60%	10 km/h	North	10:30 AM
Project B	Operational	Green	100%	95%	10m	25°C	60%	10 km/h	North	10:30 AM
Project C	Operational	Green	100%	95%	10m	25°C	60%	10 km/h	North	10:30 AM
Project D	Operational	Green	100%	95%	10m	25°C	60%	10 km/h	North	10:30 AM
Project E	Operational	Green	100%	95%	10m	25°C	60%	10 km/h	North	10:30 AM

eAabhas is already operational at scale. As of today, the portal covers 61 project/ power stations—24 operated by NHPC and 37 by other hydro power utilities across India—across 21 hydropower developers. The 24×7 Master Control Room at NHPC Corporate Office in Faridabad maintains continuous oversight of all alerts and discharge readings. This centralized visibility, combined with live feeds from IMD, NDMA, and CWC, gives NHPC a comprehensive national picture of hydrological activity at any given moment.



What is Next: The Road to Smarter Forecasting

The next phase of eAabhas moves beyond traditional statistical models. NHPC plans to train deep learning models on historical dam and

upstream G&D station data to achieve significantly higher forecast accuracy. Alongside this, advanced anomaly detection will proactively flag unusual patterns in both sensor readings and forecast outputs—enabling maintenance teams to act before a failure occurs rather than reacting after. AI-based trend detection will further help operators recognise emerging hydrological patterns early. Data inputs from partner agencies will also be incorporated wherever they add meaningful forecast value.

2. Enterprise AI Personal Assistant

The Background: The Challenge of Information Overload



Modern enterprise environments generate vast amounts of documentation, from complex policy manuals to technical reports. For employees, retrieving specific, context-aware information from these sources can be time-consuming. NHPC recognized the need for a unified digital assistant that could streamline administrative tasks, support bilingual communication, and act as a central repository for institutional knowledge.

Implementation & Innovation: Generative AI for the Enterprise

NHPC developed an in-house AI Personal Assistant leveraging the latest advancements in Large Language Models (LLMs).

- **Modern Architecture:** The platform utilizes Advanced Retrieval-Augmented Generation (RAG) to ensure its answers are grounded in actual organizational documents.
- **High-Performance Hosting:** To ensure speed and

scalability, the assistant is hosted on a dedicated, high-performance GPU infrastructure.

- **Multifunctional Capabilities:** The tool is designed to perform context-aware searches (with source references), summarize lengthy documents, and assist in drafting official letters and emails.
- **Linguistic Inclusion:** It features robust English Hindi translation capabilities to support the implementation of Rajbhasha across the organization.

Impact & Benefits: Enhanced Organizational Productivity

The AI Personal Assistant serves as a force multiplier for employee productivity. By providing faster and more reliable access to institutional data, it significantly reduces the manual effort required for document review and administrative drafting. This allows the workforce to focus on more strategic tasks while ensuring that official communications remain professional and standardized.

Present Status: Live and Accessible

The AI Personal Assistant has been developed entirely with in-house resource. It is accessible to NHPC employees through the organisation's intranet, meaning no external internet connection is required to use it—an important consideration for data privacy and security. The underlying system runs on a dedicated High-Performance Computing (HPC) server equipped with GPU capabilities, ensuring fast and responsive interactions even with large documents.

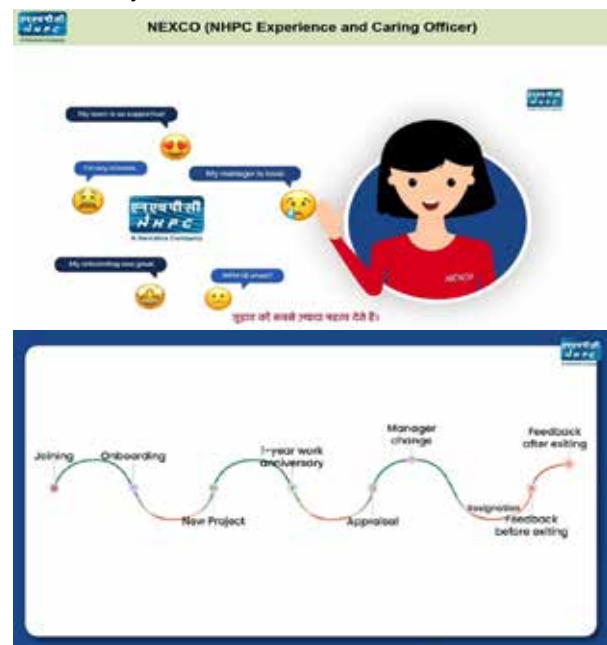
What is Next: From Assistant to Agent

The next evolution of this platform goes well beyond question-and-answer interactions. NHPC is developing an agentic AI capability that will allow the assistant to act—not just respond. Through natural language commands, employees will be able to query multiple organisational databases simultaneously, automatically generate reports and charts, and automate small but time-consuming routine tasks such as password changes, email drafting, and reminder scheduling. This positions the assistant as a true unified knowledge and automation hub, bringing measurable improvements to workforce efficiency and response times across all official workflows.

3. NEXCO: NHPC Experience and Caring Officer

The Background: Evolving Human Resource Engagement

Traditional HR feedback mechanisms often fail to capture the real-time sentiment or the "pulse" of a large workforce. NHPC sought a way to move toward a more "human-centric" framework—one that could continuously listen to employees and identify issues like burnout or process friction before they escalated.



Implementation & Innovation: The Digital Mentor

NEXCO is an AI-enabled interactive mentor designed to bridge the gap between leadership and the workforce.

- **The "Amber" Persona:** Supported by a mascot named "Amber," the system engages employees through familiar, low-friction channels like WhatsApp and Email.
- **Continuous Listening:** Rather than sporadic surveys, NEXCO conducts short, structured conversations to capture real-time experiences.
- **Sophisticated Analytics:** The AI processes these interactions to generate metrics such as engagement scores, mood tracking, and burnout indicators.
- **Actionable HR Intelligence:** The system identifies "Most Loved Processes" and provides

"People to Meet (PTM)" insights via a detailed dashboard for HR leadership.

Impact & Benefits: A Culturally Connected Workplace

NEXCO has transformed qualitative employee feedback into actionable data. By enabling data-driven interventions, HR leadership can proactively address workplace stressors and reinforce positive organizational processes. This "continuous listening" model fosters a culture where employees feel heard and valued.

Future AI Initiatives: The Road Ahead

Building on its current successes, NHPC is charting an ambitious course for further AI integration aimed at asset reliability, cybersecurity, and immersive training.

4. AI-Driven Predictive Maintenance Scheduling

AI-assisted scheduling of maintenance activities in power stations is emerging as a critical tool to minimize generation losses and enhance operational efficiency. By analyzing historical energy generation data alongside inflow and water discharge patterns from the past five years, AI models can accurately identify optimal maintenance windows. These models detect seasonal trends, demand fluctuations, and hydrological variations to recommend specific periods when maintenance will have the least impact on power output. This data-driven approach enables planners to proactively schedule outages, reduce unplanned downtime, and ensure sustained energy availability while maintaining the long-term health and reliability of hydropower assets.

5. AI-Based Cyber Threat Detection & Response

Status & Innovation: A 24x7 Cyber Security Operation Center (CSOC) is already operational in Faridabad. NHPC currently utilizes SIEM tools for unified log collection and anomaly detection across firewalls and endpoints.

The Future Goal: The organization is transitioning toward an AI-driven SOAR (Security Orchestration, Automation, and Response) solution. This will involve real-time risk scoring, automated response playbooks, and continuous learning models that adapt to new threat vectors.

Impact: Advanced AI will ensure swift responses as per the Cyber Crisis Management Plan, strengthening cybersecurity resilience and ensuring uninterrupted IT operations.

6. 3D Metaverse Digital Twin

Innovation: A pioneering R&D project is currently underway to create a 3D Scanning and Metaverse Digital Twin of the Parbati-II Power Station.

Features:

- **High-Fidelity Mapping:** Using LiDAR-based 3D scanning for the dam, powerhouse, and reservoir.
- **Immersive Visualization:** A VR environment allowing users to interact with critical areas like the turbine floor and control room.
- **Advanced Simulation:** HPC-powered modeling of flood scenarios and equipment failures for operator training.

Impact: This initiative will revolutionize workforce training and disaster readiness, providing a lightweight demonstrator for stakeholders at NHPC HQ.

Conclusion- NHPC's adoption of Artificial Intelligence marks a significant milestone in the evolution of India's hydropower sector. By integrating AI across its operations—from early warning systems and predictive analytics to employee engagement and administrative automation—the company is redefining how energy infrastructure is managed and optimized.

The eAabhas system exemplifies how AI can enhance safety and disaster preparedness, while the AI personal assistant and Mentor NEXCO demonstrate the transformative impact of AI on workplace efficiency and organizational culture. Together, these initiatives highlight NHPC's holistic approach to digital transformation.

As the company moves toward its ambitious capacity targets for 2032 and 2047, AI will remain a central pillar of its strategy. By embracing innovation, NHPC is not only generating clean energy but also building a smart, resilient and future-ready energy ecosystem. In doing so, NHPC sets a benchmark for other public sector enterprises and reinforces the critical role of technology in achieving sustainable development goals.

Artificial Intelligence in Mining: NMDC's Digital Transformation Journey



“Technology is most meaningful when it empowers people. At NMDC, our digital transformation is not only about smarter mines and higher efficiency, but about creating safer workplaces, stronger communities, and a future-ready mining ecosystem for India.”

*Amitava Mukherjee
CMD, NMDC*

India's mining sector is undergoing a structural shift driven by digitalization and artificial intelligence. What was once an asset-heavy, manually optimized industry is steadily transforming into a data-driven, predictive, and increasingly autonomous ecosystem. As India's largest iron ore producer and a Navratna PSU, NMDC has positioned artificial intelligence (AI) not as an experimental technology but as a core operational enabler aligned with its **Vision Plan 2030**—to scale iron ore production from existing 53 MTPA to 100 MTPA while simultaneously enhancing efficiency, safety, and sustainability.

NMDC's AI adoption reflects a deliberate, phased digital transformation roadmap grounded in improving operational outcomes, strengthening human capabilities, and advancing India's larger ambition of becoming a technologically empowered and sustainable industrial economy.

1. Key AI Initiatives Improving Operations at NMDC

NMDC's operational AI deployment is best illustrated through three high-impact initiatives that directly influence productivity, cost efficiency, and decision quality across mining operations: Fleet Management Systems, Digitally Enabled Drilling & Blasting, and Realtime Stockpile Management. Together, these initiatives demonstrate how AI is reshaping core mining processes by replacing manual estimation with data-driven precision.

1.1 Fleet Management System: Intelligence in Motion

Fleet operations form the backbone of open-pit mining productivity. Traditionally, limited real-time visibility into haul cycles, idle time, fuel consumption, and equipment health resulted in suboptimal utilization and higher operating costs. NMDC's Fleet Management System addresses these challenges through continuous data capture and intelligent analytics.



NMDC's digitally enabled drilling and blasting optimization platform

Using GPS tracking, onboard sensors, and AI-driven cycle-time analytics, the system provides real-time insights into vehicle movement, loading and dumping efficiency, and utilization patterns. AI algorithms analyze this data to identify bottlenecks, optimize haul routes, and minimize idle time. Predictive models also monitor equipment health, enabling early detection of mechanical issues and reducing unplanned downtime.

Beyond productivity gains, the system improves fuel efficiency by analyzing driving behavior, load

patterns, and route conditions. For large mining fleets, even marginal efficiency improvements translate into significant cost savings and reduced emissions, reinforcing NMDC's twin objectives of operational excellence and sustainability.

In effect, fleet management at NMDC has evolved from reactive supervision to predictive and prescriptive control, where decisions are guided by continuous intelligence rather than postfact analysis.

1.2 Digitally Enabled Drilling & Blasting: Precision at the Source

Drilling and blasting determine the downstream efficiency of almost every mining activity—from excavation and hauling to crushing and beneficiation. Manual drill pattern design and blast planning often lead to inconsistent fragmentation, higher oversize generation, and increased safety and environmental risks.

NMDC's digitally enabled drilling and blasting optimization platform leverages AI and simulation technologies to fundamentally transform this critical process. Historical blast data, rock characteristics, and field parameters are analyzed using machine learning models to recommend optimal drill patterns and explosive charge designs.

AI-based simulations predict blast outcomes before execution, allowing engineers to refine designs to achieve consistent fragmentation while minimizing undesirable effects such as fly rock, ground vibration, and air overpressure. Deep learning models further analyze postblast imagery for fragmentation analysis, creating a continuous learning loop that improves blast design.

The results are multidimensional, improved excavation efficiency, reduced equipment wear, lower fuel consumption, and enhanced safety for personnel and surrounding infrastructure. By embedding intelligence at the very start of the mining value chain, NMDC ensures that downstream operations inherit efficiency rather than compensate for variability.

1.3 Realtime Stockpile Management: Visibility and Trust in Inventory

Stockpile management has traditionally been one of the least visible yet most consequential components of mining operations. Manual measurement methods are time-consuming, prone to errors, and

offer limited realtime visibility into inventory volumes, quality, and movement.

NMDC's AI-driven realtime stockpile management system replaces estimation with accuracy. Using LiDAR, radar, and AI-based 2D/3D modeling, the system continuously monitors stockpile geometry and automatically computes volumes with high precision. These measurements are synchronized with enterprise systems, enabling instant reconciliation between physical stock and digital records.

AI analytics also track material movement across stockpiles, improving traceability and supporting better dispatch planning. By eliminating delays and discrepancies, the system strengthens transparency, auditability, and operational confidence—critical factors for largescale production and sales planning.

Collectively, these three initiatives demonstrate that AI at NMDC is deeply embedded in daytoday operations, delivering tangible improvements in productivity, safety, and decision making.

2. Generative AI in R&D: Accelerating the Path to 'Viksit Bharat'

While operational AI focuses on optimization and automation, the next evolution lies in Generative AI (GenAI) - systems capable of proposing new solutions, designs, and insights. For a resource intensive sector like mining, GenAI has transformative potential in research, planning, and innovation.

In mining R&D, generative AI can synthesize geological data, mine plans, operational constraints, and historical performance to generate optimized production scenarios, alternative process flows, and new exploration hypotheses. Instead of relying solely on sequential trials and expert intuition, engineers can explore thousands of simulated pathways in a fraction of the time.

For us, such capability aligns closely with the national aspiration of Viksit Bharat, where industrial leadership is driven by indigenous innovation rather than technology import. GenAI can convert decades of institutional knowledge into intelligent systems that support faster decision making, shorten innovation cycles, and reduce experimentation risk.

3. Upskilling the Future Workforce: Bridging the AI Talent Gap in PSE

As AI becomes integral to mining operations, the role of the workforce is undergoing a parallel transformation. Operators and engineers increasingly interact with intelligent systems rather than purely mechanical ones. Recognizing this shift, NMDC has embedded workforce upskilling into its digital transformation journey.

AI powered simulators already play a vital role in training Heavy Earth Moving Machinery (HEMM) operators. These simulators recreate dynamic operational scenarios - varying terrain, weather conditions, and equipment responses - allowing operators to build skills in a safe, controlled environment. Performance data generated from these sessions is analyzed using AI to identify skill gaps and recommend focused interventions.

Beyond equipment operation, the future demands broader AI literacy across the workforce. Mining professionals must understand how AI systems make recommendations, what data they rely on, and how to interpret their outputs. Simultaneously, data scientists and technologists must appreciate mining realities, safety imperatives, and operational constraints.

By fostering this hybrid talent pool, NMDC can ensure that AI adoption leads to augmentation rather than displacement, enabling employees to transition from manual execution to analytical supervision and strategic decision making.

4. Green AI: Optimizing Energy Consumption and Carbon Footprints

Sustainability has become a defining imperative for the mining sector. AI offers powerful tools to balance production growth with environmental responsibility—an approach increasingly referred to as Green AI.

At NMDC, AI enabled Smart Metering systems are planned for implementation to analyze energy consumption patterns across operations, forecast demand, and identify inefficiencies or anomalies. These insights support better load balancing, reduce wastage, and lower energy costs while minimizing emissions.

Operational AI also contributes indirectly to sustainability. Optimized blasting reduces rehandling and fuel usage. Efficient fleet routing

lowers diesel consumption. Predictive maintenance extends equipment life, reducing material waste. Digital and autonomous monitoring systems enable proactive environmental compliance by tracking dust, noise, and water parameters in near real time.

As these systems mature, NMDC can move toward carbon aware operational planning, where production schedules and equipment deployment are dynamically optimized to minimize environmental impact - embedding sustainability into everyday decision making rather than treating it as a separate compliance exercise.

5. Future Roadmap for AI Integration within Mining

The future of AI in mining lies in deeper integration, autonomy, and ecosystem collaboration. For NMDC, the roadmap points toward:

- **AI enhanced digital twins** powered by reinforcement learning, enabling autonomous optimization of production, safety, and compliance.
- **Predictive and prescriptive enterprise AI systems** that move beyond dashboards to recommend actionable decisions.
- **Endtoend energy and asset optimization models** spanning mines, plants, and logistics.
- **Collaboration with Indian AI startups** specializing in computer vision, geospatial analytics, industrial IoT, and reinforcement learning-strengthening indigenous innovation.

As AI evolves from a tool into an organizational capability, it will redefine productivity benchmarks, safety standards, and sustainability outcomes across the mining sector.

Conclusion

NMDC's AI driven digital transformation illustrates how a traditional, assetintensive industry can reinvent itself through intelligent technologies. By focusing on highimpact operational initiatives, NMDC is building mines that are not only more productive but also safer, cleaner and future ready.

In doing so, NMDC stands as a compelling example of how responsible and purposeful AI adoption can support India's journey toward a **technologically advanced, selfreliant, and sustainable Viksit Bharat**.

AI Transformation in RINL



RINL has always been in the fore-front of Digitalization and AI adoption. In the year 2021, it established Centre of Entrepreneurship on Industry 4.0, at Ukkunagaram, in association with STPI (Software Technology Parks of India), with funding support of MeitY (Ministry of Electronics and IT).

It is named as Kalpataru Centre of Entrepreneurship (CoE) on Industry 4.0. The CoE covers various domains like Industrial IOT, Industrial Robots, Industrial Drones, Augmented Reality, Virtual Reality, Industrial Automation, 3D Printing, Computer Vision and Machine Learning powered by Artificial Intelligence.

The CoE operates in collaborative manner with the following organizations partnering and supporting the CoE.

1. MeitY – Ministry of Electronics and IT, Govt. of India.
2. Govt. of Andhra Pradesh
3. STPI- Software Technology Parks of India
4. STPINEXT - AIC STPINEXT Initiatives, a section-8 company under STPI
5. RINL – Rashtriya Ispat Nigam Limited, Visakhapatnam
6. HSY – Hindustan Shipyard Limited, Visakhapatnam
7. ITAAP- IT Association of Andhra Pradesh
8. APIS- Andhra Pradesh Innovation Society
9. AU- Andhra University, Visakhapatnam
10. IIMV- Indian Institute of Management, Visakhapatnam
11. EOS- Electro Optical Systems
12. Lotus Wireless, Visakhapatnam

The CoE has been provided with the following labs and incubates startups who work for RINL and other organisations.

1. Drones and Robotics Lab.
2. IIOT – Industrial Internet of Things Lab
3. Automation, AR & VR Lab.
4. A 3D Printer

It provides various services to the startups like Ready-to-Work Plug & Play space, high speed internet, regular mentorship through workshops, seminars, trainings etc.

RINL through Kalpataru CoE is working with total of 12 startups to solve 12 Problem Statements of in various works departments of RINL like RMHP, Sinter Plant, Coke Oven, Blast Furnace, SMS-1, SMS-2, LMMM, SBM etc. One more startup is under selection. The details of Various Projects taken up through the Startups is as given below.

1. Detection and Clearing of Chute Jam in RMHP Area for one Chute. (Project Cost-25 lakhs)- Status- Work in Progress

The Project envisages detecting Chute Jam early, through sensors attached to the external chute body and operate a system of Air-blaster, sending compressed air just-in-time to avoid chute jam and also conserve compressed air, as the compressed air is used just in need and not continues. The system also collects data and using AI can suggest improvements.

The core Digital Technologies used in the product include IIOT (Industrial IoT), AI based predictive analytics, edge computing and smart monitoring systems.

2. Development of Robotics based product/ solution for Hot Repair of Coke-oven batteries.

(Project Cost- 15 lakhs)- Work in Progress

The Project envisages a COBOT (Co-working Robot) which is designed to break refractory walls of the COKEOVEN battery, the use AI to for picking different sizes of bricks and fit them on the wall of COKEOVEN battery.

The core Digital Technologies used in the Product include, Robot fitted with sensors, cameras and precession tools which allow it to perform intricate tasks with high degree of accuracy.

3. Development of drone based product/ solution for inspection and analysis of structures. (Project Cost-12 lakhs)- Work in Progress

The Project envisages a drone and a camera which are used to take the aerial images and use AI to detect various types of defects in the structures.

The aerial images so collected are turned into single complete image called ortho mosaic. Advanced AI and ML algorithms are deployed with neural network with the ability to extract the required intelligence that outperforms the automatic assertive inference of data with trained previous models.

4. Inline Detection of Surface Defects in Garret Line of SBM. (Project Cost- 50 lakhs)- Work in Progress

The Project envisages real time AI based detection for the curved coil surfaces before the Coils (Product) enter the Cooler. This is done by capturing no of images of the defects occurring in the product and then training the camera to predict the defects early and informing the concerned through Mobile Phone, to take early corrective action. This will reduce the production of Defective Product.

The system uses Industrial cameras, lighting systems, Raspberry Pi Processors with software like Python, TensorFlow, OpenCV, cloud storage integration web based interface with SCADA integration, IoT & edge computing.

5. Prevention of collision between Twin Boom Stacker (TBS) and Blender Re-claimer (BRC)

in Sinter Plant. (Project Cost-30 lakhs)- Work Under Progress

The Project envisages using technology including GPS, Sensors etc. and avoid collision between Twin Boom Stacker & Blender Re-claimer in Sinter Plant.

Avoidance of collision involves use of GPS sensors, Gyro sensors, Geo fencing, radar sensors and a robust software system.

6. Heat Weight Standardization at BOF shop of SMS-2. (Project Cost-18 lakhs)-Work Under Progress

The Project envisages integrating high frequency radar technology and preparing a predictive data modelling using AI based on historical process trends, thereby improving the fulfilment of metal demand from Converter to an accuracy of + - 1 ton.

The system collects and processes the RADAR sensor data, temperature readings and process logs from the pouring line. Data is securely transmitted through raspberry Pi controllers, analyzed for deviations and used for predictive control and process standardization.

7. Stock Verification of Bulk Raw Materials in RMHP. (Project Cost-32 lakhs)- Work under Progress

The project envisages LIDAR and AI enabled drone service for volumetric analysis of stock piles in RMHP (Raw Material Handling Plant). The system also offers Interactive Dashboard and AI powered platform for better inventory management.

The hardware used is an Industrial Grade Quad copter with LiAiR x3-h LiDAR, A 4K 3 axis gimbal camera, dual receiver high accuracy RTK, with AI powered software that is capable of converting images of stock piles into 3D point clouds and performing volumetric analysis on the 3D point clouds.

8. Detection of oversize material after screening in sinter making. (Project Cost-12 lakhs)- Startup Selected MoU to be signed

The product/solution envisages using intelligent cameras (using AI) to detect large size sinter particles early and inform operator through computer and mobile phones, so as to take early action. The large size sinter comes to the belt conveyors, when the Vibrating Screen is damaged.

9. Condition monitoring of tuyere based on life cycle study to avoid tuyere failure in Blast Furnace. (Project Cost-76 lakhs)- MoU to be signed

The solution envisages condition monitoring Blast Furnace Tuyeres based upon life cycle study using AI and combination of technological deployments.

10. Silicon prediction model to ascertain the thermal stability of Blast Furnace. (Project Cost-64.5 lakhs)- Startup Selected, MoU to be signed

Silicon in hot metal depends on input raw material chemistry, burden composition and operating parameters like top pressure, blast temperature steam etc. The Startup is required to use AI and other technologies to predict the silicon in hot metal, which is of paramount importance for the thermal stability of Blast Furnace.

Predicting Si trends helps avoid runaway thermal conditions that are expensive to repair, manages coke consumption ratio, and keeps thermal condition of the blast furnace stable for continuous operation.

11. Material Tracking in Billet Mill. (Project Cost-65.19 lakhs)- MoU to be signed

The startup is required to use AI and other technologies as required to track the Heat Number from Charging of Blooms to TWO reheating furnaces to TOCB (Turn over Cooling Bed) and Bar mill.

The proposed solution is designed around automated bloom identification and continuous tracking from the charging grid through to the TOCB, eliminating reliance on manual operator entries. At the charging grid, industrial cameras

capture images of heat numbers written on each bloom as it is staged for furnace entry.

12. Bar counting and chain movements at CP9 (Control Pulpit) and CP10 in Bar Mill. (Project Cost-3.87 lakhs)- MoU to be signed

Exact counting of no. of Bars and communicating the same to the system and finally printing the no. of Bars on the Tags attached to the bundle will improve customer satisfaction of RINL. The startup will use Imaging technology & AI to calculate the no. of bars in the Bundle.

13. Automation of Mould level control in Continuous Casting Shop of Steel Melt Shop-1.- Status – Under Discussion

The startup is required to develop a solution using AI and other technologies to get the feedback on Mould level, so as to automate the Continuous Casting Operation.

Future Roadmap for AI integration & Up-skilling the future workforce.

- As per directives received from Ministry of Steel to Implement Digitalization / AI at RINL :
- A two-tier structure was created as per details as given below:
 - Digitalization/AI Core Committee at Corporate level with 23 members is formed with Director (Operations) as Chairman of the committee.
 - Operational Digitalization Committee at Plant Level with 25 members is formed.
- Trainings are being planned to Up-skill workforce for bridging the AI talent gap.



Digital Transformation: The RITES Way



The road to Viksit Bharat does not revolve around ‘tech for tech’s sake’—it is anchored in the **3Ds: Diversification (adaptability), Digitalisation (data-driven), and Decarbonisation (responsive)**...

The morning sun glints off Bogibeel Bridge, Asia’s second-largest and India’s longest rail-cum-road bridge spanning the mighty Brahmaputra in Assam, as a network of embedded sensors silently records vibrations, loads, and structural responses across its expanse. Miles away, structural health monitoring systems analyse this stream of data in real time, using advanced algorithms to identify anomalies, evaluate structural integrity, and predict potential damage well before it manifests. This is no longer a glimpse of the future—it is the defining reality of modern infrastructure, where cutting-edge technology and human intelligence converge to future-proof the systems that *shape lives*.

Indeed, Artificial Intelligence (AI) is no longer confined to headlines or tech forums—it is quietly, but powerfully, reshaping the way we communicate, build, govern, and deliver public services across the globe. In India, the vision of a Viksit Bharat hinges on more than policies and infrastructure—it depends on the country’s ability to harness these advanced technologies to boost productivity, enhance decision-making, and drive growth that lasts.

At the heart of this transformation are Public Sector Enterprises (PSEs). Traditionally seen as pillars of nation-building, PSEs are now stepping into a new role: engines of innovation. From modernising operations to adopting AI-driven solutions, these enterprises are not just keeping pace with change—they are shaping the country’s development story, one breakthrough at a time. In this journey, technology is not just a tool; it is a catalyst for a future where efficiency, sustainability, and innovation go hand in hand.

Among these trailblazers is RITES Limited, a leading transport infrastructure consultancy and engineering organisation. For over five decades, RITES has been shaping what shapes lives; building bridges, tunnels, railways, highways, and all sorts of critical infrastructure that connect communities and drive progress. Today, the organisation is reimagining the very way infrastructure is conceived, designed, executed, and monitored. By integrating AI and digital technologies into every stage of its projects, RITES is moving beyond conventional engineering. Its systems anticipate challenges, optimise operations, and embed sustainability into the very DNA of projects. Every bridge it spans, every railway it lays, every highway it connects tells a story of innovation, vision, and transformation. The plans it lays today are more than pathways—they are lifelines, connecting the promise of a Viksit Bharat with the reality of intelligent, technology-driven development.

AI-Ready RITES

At RITES, AI is not treated as a mere gadget or standalone tool—it is shaping the very way the organisation operates. Under the AI-Ready initiative, the company is driving a transformation that reaches every corner of its operations, embedding AI into the institutional DNA rather than leaving it confined to isolated experiments.

This transformation rests on three pillars:

- **AI Literacy:** Equipping employees across all levels to understand and apply AI in daily workflows
- **AI Ambassadors:** Driving adoption and acting as change agents across departments
- **Process Integration:** Embedding AI into core business functions for scalable impact

This enterprise-wide approach ensures that AI becomes a sustained driver of efficiency, innovation, and competitiveness—redefining what it means for a public sector enterprise to be truly future-ready.

AI: A Strategic Enabler

For an organisation like RITES, where the quality of planning directly impacts the lifecycle of infrastructure assets, AI is not merely a technological add-on; it is a strategic imperative.

Infrastructure development has long faced challenges such as fragmented planning, limited coordination, and inefficiencies in execution. At the heart of effective project implementation are high-quality Detailed Project Reports (DPRs), which serve as the blueprint for success. Recognising this, RITES has strategically been adopting AI into its consultancy processes to enhance accuracy, reduce subjectivity, and accelerate timelines.

At the core of these initiatives is **SARTHI, a unified digital ecosystem** designed to enable automated review, monitoring, and comprehensive inspection across the Indian Railways network. It replaces fragmented, reactive systems with real-time IoT integration, automated validation processes, and complete end-to-end traceability—from the creation of a purchase order to the final dispatch.

Complementing SARTHI is **'VISTAR', an AI-driven inspection and monitoring system** that leverages advanced analytics and computer vision for intelligent infrastructure assessment. VISTAR enables predictive maintenance and enhances operational safety by detecting anomalies early in critical assets such as rail infrastructure—shifting maintenance strategies from reactive to proactive.

Another such initiative is **'Parakh', an AI-enabled DPR evaluation tool** currently under development. Parakh is designed to enable structured, data-driven appraisal of project reports, enhancing consistency, identifying gaps, and improving the overall robustness of planning. By standardising quality in infrastructure consultancy, it will mark a leap forward in ensuring reliable project outcomes.

Together, these initiatives showcase how RITES is embedding intelligence into infrastructure systems, transforming static assets into dynamic, responsive networks that can anticipate challenges and optimise performance throughout their lifecycle.

Abhikalp: A Centre of Excellence

At the core of RITES' AI-driven transformation is **'Abhikalp', its Centre of Excellence (CoE) for innovation and advanced technologies**. Designed as a hub for experimentation, research, and capability-building, Abhikalp is accelerating the organisation's adoption of Industry 4.0 and AI-enabled solutions.

The CoE integrates a range of cutting-edge technologies—Building Information Modelling (BIM), Digital Twin platforms, Augmented and Virtual Reality (AR/VR), and 3D printing—embedding them into project lifecycles to enhance design precision, enable real-time simulation, and improve collaboration across stakeholders.

Key applications include:

- BIM-based digital models that streamline coordination, reduce design conflicts, and provide a data-driven foundation for AI analysis
- Digital Twins that combine AI and real-time data for predictive monitoring and performance optimisation of infrastructure assets
- AR/VR solutions that enhance visualisation, training, and stakeholder engagement, supporting smarter decision-making
- 3D printing to enable rapid prototyping and iterative validation of design concepts

Beyond technology adoption, Abhikalp acts as a catalyst for internal AI innovation, fostering cross-functional collaboration and creating indigenous digital solutions. By building in-house expertise and nurturing a culture of experimentation, RITES is strengthening its technological self-reliance while transforming its projects into intelligent, data-driven systems.

Generative AI in R&D

The emergence of Generative AI marks a paradigm shift in engineering and consultancy, enabling faster ideation, simulation, and decision-making.

RITES has proactively integrated Generative AI into its operations, supported by large-scale capacity-building initiatives. Training programmes conducted across the organisation have covered over 2,500 employees, creating a strong foundation for AI adoption.

The 'Quotation Sathi' module exemplifies this shift. By automating the preparation of quotation documents and comparative statements, it enhances speed, accuracy, and responsiveness in client engagements.

These applications are not only improving internal efficiencies but also enabling RITES to deliver more agile, innovative, and client-centric solutions.

Bridging the Talent Gap

Technology transformation is ultimately driven by people. Recognising this, RITES has adopted a structured approach to workforce development, ensuring that its employees are equipped to thrive in an AI-enabled environment.

Through the #AIReady programme and AI-enabled workflows, employees gain continuous exposure to emerging technologies. The AI Ambassador network further strengthens adoption through peer learning and localised support. Through this multi-layered approach, RITES is bridging the AI talent gap while fostering a culture of innovation and adaptability.

Green AI

RITES is leveraging AI and new-age technologies to align infrastructure development with environmental goals, driven by its 3D framework — Decarbonisation, Diversification, and Digitalisation.

Under Digitalisation, AI-enabled tools optimise energy use, enable predictive maintenance to reduce resource wastage, and support smart

mobility planning to minimise congestion and emissions. Advanced tools such as GIS, simulation platforms, and Digital Twins are enabling the design of efficient and sustainable transport systems, including metro networks, rail systems, and multimodal logistics solutions.

Through Decarbonisation, RITES is embedding carbon tracking and environmental considerations into planning processes, developing green DPRs that prioritise low-carbon and sustainable infrastructure.

With Diversification, RITES is adapting and integrating eco-conscious practices across its portfolio.

Digital Integration & Platform Thinking

The organisation is transitioning from siloed systems to interconnected digital backbones, integrating ERP systems, asset management platforms, client engagement interfaces, and performance dashboards. This enables real-time coordination, data-driven decision-making, and improved accountability.



In parallel, RITES is exploring opportunities to extend its digital capabilities beyond domestic operations. Collaborations with technology partners and institutions are enabling the development and deployment of IT-enabled solutions for international markets.

Initiatives in digital platforms and trade facilitation, including collaborations for virtual trade corridors, reflect RITES' ambition to leverage AI and digital

technologies to enhance global connectivity and service delivery.

‘Tech Not Just for the Sake of Tech’

RITES envisions a future where AI is seamlessly embedded across all its operations, driving innovation, efficiency, and sustainability at scale. Its vision for AI is clear—technology must serve purpose, not novelty.

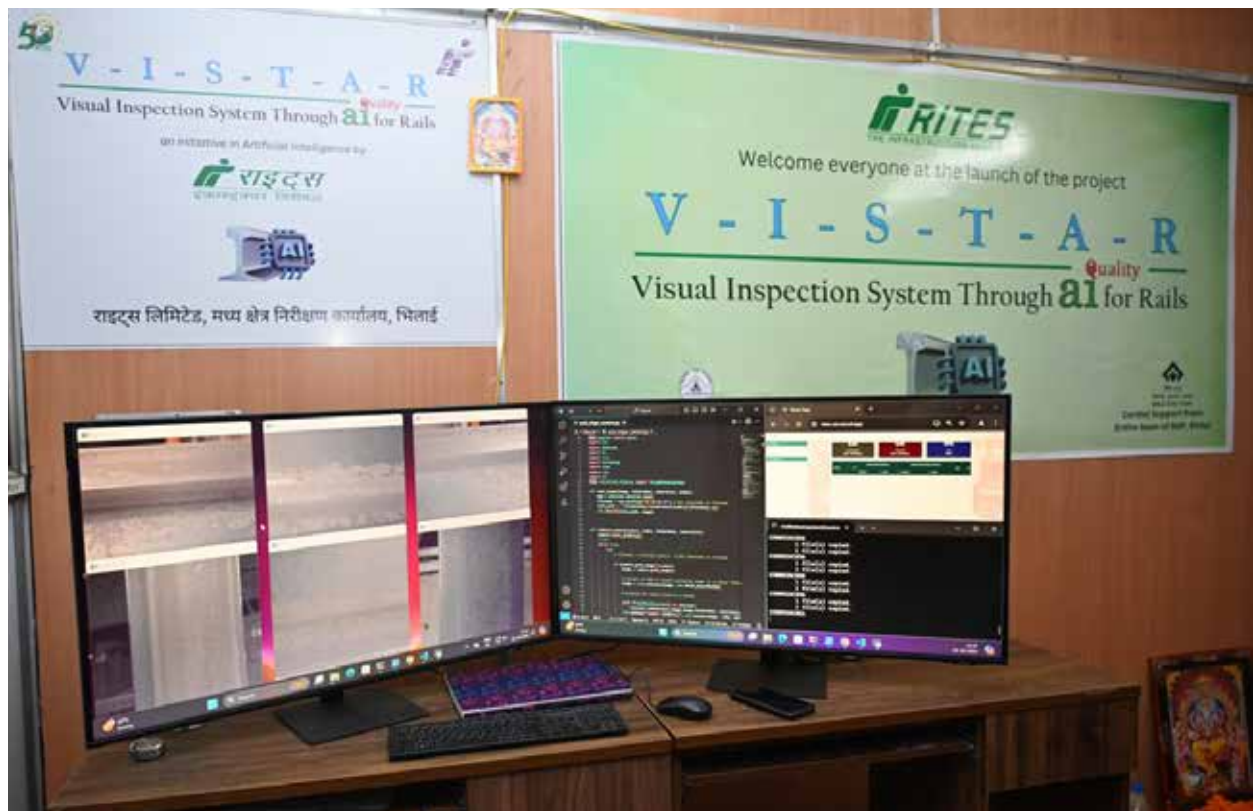
Key priorities include:

1. Scaling AI: Expanding AI and ML applications across consultancy, engineering, exports, and quality assurance functions
2. Advancing capabilities: Deepening the use of Digital Twins, simulation tools, and predictive analytics to enhance project outcomes
3. Innovation via Abhikalp: Expanding the role of Abhikalp as a hub for research, collaboration, and emerging technologies

4. Global expansion: Leveraging AI capabilities to offer technology-driven consultancy services in international markets
5. Embedding sustainability: Integrating Green AI principles across projects to support India’s climate commitments and global sustainability goals

Guided by its 3D framework, RITES ensures that AI adoption steers through three checkpoints: delivering client value, strengthening core capabilities, and enabling scalability across projects and sectors.

By aligning innovation with real-world impact, RITES demonstrates how public sector enterprises can lead technological transformation. It is not merely building infrastructure—it is shaping intelligent, sustainable systems that support India’s journey toward a Viksit Bharat. In doing so, RITES truly lives its philosophy: *We Shape What Shapes Lives.*





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Balmer Lawrie at 160: Reimagining a Legacy Enterprise through AI for a Viksit Bharat



Adhip Nath Palchaudhuri
Chairman & Managing Director
Balmer Lawrie & Co. Ltd.

India stands at a defining juncture in its development journey, where the convergence of technology, governance and enterprise is reshaping the contours of a “Viksit Bharat.” Across the Public Sector landscape, Artificial Intelligence (AI) is no longer a distant promise but an active force driving transformation. From Indian Railways leveraging predictive analytics for asset reliability, to ONGC deploying AI-led seismic intelligence, to State Bank of India scaling AI-driven customer interfaces, and NTPC embedding intelligent systems in energy operations, Public Sector Enterprises (PSEs) are redefining scale with intelligence. Within this evolving ecosystem, PSEs are uniquely positioned to lead India’s AI transformation, owing to their reach, trust and strategic mandate.

At Balmer Lawrie, as we step into our 160th year, we view AI not merely as a technological upgrade but as a strategic lever to enhance governance, improve service delivery, and contribute meaningfully to national priorities such as PM Gati Shakti, the National Logistics Policy and Viksit Bharat 2047.

A Legacy of Adaptation and Innovation

Founded in 1867 in Kolkata, Balmer Lawrie has evolved alongside India’s industrial and economic transformation. Today, as a Miniratna I PSE under the Ministry of Petroleum and Natural Gas, GOI the company operates across Logistics (Services, Infrastructure, Cold Chain), Travel & Vacations, Industrial Packaging, Greases & Lubricants and Chemicals.

While our diversity is a source of strength, it also demands agility and excellence. Over the decades, Balmer Lawrie has consistently adapted to technological and market shifts. The adoption of AI marks the next phase in this journey, one that

builds on the strong digital foundations already established across business verticals; also, one that aligns with national priorities and reinforces our commitment to operational excellence and stakeholder value.

Our approach is deliberate and that is to embed intelligence into systems that already drive scale, ensuring that AI is leveraged to enhance and not disrupt our operational stability.

Before delving into individual initiatives, it is useful to view our AI journey holistically. At Balmer Lawrie, AI is being embedded across four key pillars:

- **Enterprise Resilience:** AI-driven cybersecurity systems for predictive threat detection
- **Operational Excellence:** Data-driven logistics powered by integrated national platforms
- **People Transformation:** AI-enabled HR processes and workforce upskilling
- **Digital Backbone:** Modern ERP, CRM and analytics infrastructure to support scale

Together, these initiatives form a cohesive transformation agenda, one that balances innovation with stability and aligns closely with national development priorities.

Investing in Transformation: People and Technology

A transformation of this scale requires sustained investment not only in technology but also in human capability and institutional readiness.

On the technology front, Balmer Lawrie is investing in next-generation platforms, including SAP S/4HANA, advanced cybersecurity systems, AI-

enabled logistics integration and digital customer interfaces. These investments are aimed at creating interoperable, scalable and secure systems capable of supporting enterprise-wide intelligence.

Equally important is investment in people. AI adoption is only as effective as the workforce that leverages it. Our focus has been on building data literacy, fostering digital skills and nurturing a culture of continuous learning. Structured training programmes, leadership development initiatives and exposure to emerging tools are enabling employees to adapt to new ways of working.

This dual investment strategy in technology and talent ensures that our AI journey is sustainable, inclusive and aligned with long-term organisational goals.

AI in Action: Transforming Cybersecurity

Balmer Lawrie has adopted AI-driven cybersecurity as a strategic priority. The deployment of an advanced Extended Detection and Response (XDR) platform marks a significant shift toward intelligent threat defence. By integrating AI and Machine Learning, the system enables a proactive, predictive and automated security framework. A key capability lies in correlating vast volumes of data across endpoints, servers and networks. Unlike siloed tools, AI-driven engines identify patterns across seemingly unrelated events, uncovering hidden threats. This has transformed our security posture from reactive monitoring to proactive anticipation.

The integration of a Generative AI assistant further enhances efficiency by translating complex alerts into plain language, enabling faster and more informed decision-making. Natural language interfaces simplify threat hunting, allowing analysts to generate queries through simple prompts. At the core is predictive Machine Learning, which analyses behavioural patterns to detect zero-day vulnerabilities and advanced persistent threats. AI-driven risk scoring also addresses alert fatigue by prioritising critical incidents and minimising false positives.

The results are tangible: faster response times, improved visibility and a significantly strengthened cybersecurity framework, which is an essential foundation for a digitally resilient enterprise and for 'Viksit Bharat'.

Data-Driven Logistics: A Flagship AI Use Case

Balmer Lawrie's most mature AI applications lie in its logistics business, an area closely aligned with national priorities. At the heart of this transformation is the integration of our logistics systems with the Unified Logistics Interface Platform (ULIP). This creates a digitally connected ecosystem linking freight operations with critical national databases such as Vahan, Sarathi, GSTN, FASTag, and port systems, that delivers real-time visibility, automated documentation & validation and faster exception handling & compliance. Machine learning and Optical Character Recognition (OCR) tools further enhance efficiency by automating document processing in freight forwarding operations, significantly reducing manual errors and turnaround times.

In parallel, Balmer Lawrie is developing multimodal logistics capabilities through Special Freight Train Operator services and expanding third-party logistics (3PL) infrastructure. These systems supported by digital control towers and API-enabled customer interfaces, provide end-to-end visibility of cargo movement, dwell times and service levels.

Emerging innovations such as drone-based inventory checks, OCR-enabled gate operations and automated warehouse systems are being explored, positioning our logistics platform as a test bed for future-ready AI applications.

This integrated "digital logistics stack" demonstrates how AI can transform governance, transparency and operational efficiency at scale.

Reinventing HR Through AI and Automation

At Balmer Lawrie, AI-enabled systems now automate application screening, reducing timelines from weeks to hours while improving accuracy. Intelligent filters ensure that candidates are shortlisted based on relevant criteria, enhancing both efficiency and fairness.

Interview scheduling has been streamlined through automation, and document management is handled by bots that track submissions, flag gaps and send reminders. The onboarding process has been similarly transformed, with end-to-end automation covering documentation, communication and

logistics. The result is a seamless and professional experience for new employees.

A key strength of this system is its modular design and integration with existing HR platforms, ensuring scalability and adaptability. These initiatives not only improve efficiency but also enhance employee experience.

Building an AI-Ready Enterprise Backbone

AI adoption depends fundamentally on data quality and system integration. Balmer Lawrie is therefore undertaking a comprehensive digital transformation. The transition to SAP S/4HANA, along with expanded e-office and digital document systems, aims to standardise data, enable real-time analytics and create a robust foundation for AI applications.

Advanced Customer Relationship Management (CRM) systems are also being implemented to provide 360-degree customer insights, pipeline tracking and AI-assisted sales analytics.

Together, these initiatives form a cohesive digital backbone, often illustrated as an interconnected architecture of ERP, CRM and analytics layers, ensuring that AI adoption is scalable, secure and aligned with business needs.

AI and R&D: Unlocking Future Potential

Our R&D ecosystem, comprising the Applications Research Laboratory (ARL), Technology & Product Development Centre (T&PD), and Product Development Centre (PDC), plays a critical role in driving product excellence and sustainability.

These centres focus on developing niche lubricants, eco-friendly chemicals and advanced manufacturing technologies, including import substitutes for strategic sectors such as railways and defence. While automation has been integrated into several R&D processes, the application of AI is still in its exploratory phase. As we continue to evaluate use cases, our focus remains on aligning AI adoption with business value and strategic priorities.

Building an AI-Literate Workforce

Our HR Department has been proactively curating L&D initiatives to make the workforce AI-Literate. In FY 2024–25, Balmer Lawrie delivered over

2,000 training days across organisational levels, supported by digital learning modules and leadership development programmes.

Going forward, AI awareness, data literacy and automation skills are being embedded across all training initiatives. Employees are also leveraging platforms such as Microsoft Copilot, participating in national capacity-building initiatives like Mission Karmayogi, and engaging with a wide range of AI-focused courses offered by leading institutions such as IITs, IISc, and industry bodies.

Green AI and Sustainable Operations

Sustainability is an integral part of Balmer Lawrie's strategic vision and as we surge ahead, integrating AI into our ESG framework will be a key area of focus. Our ESG initiatives focus on monitoring energy consumption, reducing carbon footprints and promoting environmentally responsible practices.

The Road Ahead

Balmer Lawrie's AI journey is guided by a clear and pragmatic roadmap. **Our approach is anchored in three core principles: value creation, scalability and alignment with national priorities.**

Future initiatives will explore AI applications in supply chain optimisation, predictive maintenance, customer analytics and R&D acceleration. Importantly, our strategy is aligned with Government of India guidelines and sectoral requirements, ensuring that our efforts contribute meaningfully to the national agenda.

PSEs as Catalysts of AI-Driven Nation Building

The journey toward a Viksit Bharat is not solely about economic growth; it is about building resilient, inclusive and future-ready institutions. PSEs have a pivotal role in this transformation and collaboration is key to jointly establish AI Centres of Excellence enabling shared learning, resource optimisation, enhanced governance and faster adoption across sectors. By embracing this transformation with purpose and responsibility, PSEs can lead the way in shaping a digitally empowered and globally competitive India.

As we celebrate 160 years of our legacy, we remain committed to leveraging AI as a force multiplier — for efficiency, transparency and innovation!

BEML Limited: Harnessing Artificial Intelligence to Pioneer the Path to Viksit Bharat



Shantanu Roy
CMD, BEML

BEML Limited stands as a cornerstone of India's industrial and strategic ecosystem, operating under the Ministry of Defence and contributing significantly to sectors such as mining, construction, railways and defense. Since its establishment in 1964, BEML has evolved into a multi-technology, multi-product enterprise that supports critical national infrastructure and mobility requirements. With a strong legacy of engineering excellence and indigenous manufacturing, the company has consistently aligned its growth with India's broader developmental goals.

In recent years, BEML has been actively embracing digital transformation to enhance operational efficiency, product innovation and service delivery. As India advances toward the vision of a Viksit Bharat, the role of Public Sector Enterprises (PSEs) like BEML is becoming increasingly pivotal, not only in strengthening core industries but also in adopting cutting-edge technologies such as Artificial Intelligence (AI). By integrating AI-driven solutions across its value chain, BEML is exploring new possibilities in predictive maintenance, intelligent manufacturing, supply chain optimization and data-driven decision making.

This article highlights how BEML is leveraging AI as a transformative force to modernize its operations and reinforce its competitive edge. It further explores the company's initiatives in adopting generative AI in research and development, fostering a future ready workforce through upskilling and implementing sustainable "Green AI" practices to reduce environmental impact. As BEML continues to innovate and adapt, it exemplifies how PSEs can

lead the way in harnessing advanced technologies to drive efficiency, sustainability and inclusive growth paving the path toward a technologically empowered and self-reliant India.

Key AI Initiatives: Transforming Operations for the Future

BEML's AI journey is rooted in the conviction that intelligent systems must be embedded across the value chain from design and procurement through manufacturing, quality assurance and after-sales service. The enterprise has embarked on a phased adoption of AI technologies that address real operational challenges while building institutional capacity for deeper integration over time.

Predictive Maintenance and Asset Intelligence:

Across BEML's manufacturing divisions, unplanned equipment downtime has historically represented one of the most significant sources of operational inefficiency. The adoption of AI-driven predictive maintenance frameworks leveraging IoT enabled sensors, machine learning algorithms and real-time analytics is enabling a pivotal shift from reactive to proactive asset management. By continuously analysing vibration patterns, thermal signatures and operational load data, AI models can anticipate component wear and flag maintenance requirements before failures occur. Industry benchmarks indicate that such AI-enabled predictive maintenance implementations yield reductions in unplanned downtime of up to 50%, with positive returns on investment achieved by a substantial majority of deployments. BEML's manufacturing plants are progressively integrating these capabilities as part of a broader digital transformation roadmap.

Supply Chain Optimization and Demand Forecasting :

The complexity of BEML's supply chains spanning indigenous and global vendors across critical sectors, demands intelligent planning tools that can respond dynamically to evolving market conditions, procurement cycles and production schedules. AI-powered demand forecasting systems analyse historical data and seasonal patterns deliver significantly improved forecast accuracy, enabling cleaner inventory management and more resilient supplier relationships. Generative AI tools are further augmenting procurement operations by parsing vendor catalogues, evaluating alternative sourcing options and generating compliance documentation reducing administrative burden and expediting procurement cycles.

Quality Control and Computer Vision:

In precision-critical manufacturing domains such as rail coaches, defence vehicles and mining equipment, quality assurance is non-negotiable. BEML is exploring the integration of computer vision systems powered by deep learning for automated defect detection on production lines. These AI-driven inspection systems offer the advantage of consistent, high-accuracy quality checks at speeds that far surpass manual inspection, enabling early detection of defects and reducing rework costs. Global deployments of such systems have demonstrated defect detection accuracy rates approaching 98–99%, representing a qualitative leap over conventional inspection methods.

Generative AI in R&D: Accelerating the Path to Viksit Bharat

Research and Development is the lifeblood of any organisation aspiring to technological leadership. For BEML, whose products must meet exacting standards in defence readiness, rail safety and industrial reliability, the ability to accelerate innovation cycles without compromising quality is of strategic importance. Generative AI is emerging as a transformative force in engineering R&D one that BEML is actively evaluating for integration into its product development processes.

Generative Design and Digital Twin Technology:

Traditional engineering design is an iterative, resource-intensive process. Generative AI platforms can fundamentally alter this paradigm by autonomously generating thousands of design variants that satisfy predefined structural, material, and manufacturing constraints presenting engineers with optimized options to evaluate rather than requiring each concept to be manually developed. Global case studies in the automotive and aerospace sectors have demonstrated weight reductions of 18–30% in key components through generative design, achieved while maintaining or improving performance standards. For BEML's product lines from metro rail bogies to armoured vehicles and mining dumpers generative design holds the potential to accelerate prototype development, reduce material consumption, and improve lifecycle performance.

Complementing generative design, digital twin technology AI-powered virtual replicas of physical assets enables BEML's engineering teams to simulate and validate product performance under a wide range of operating conditions before physical manufacturing begins. This capability compresses R&D timelines, reduces the cost of physical prototyping and enhances confidence in design decisions. The convergence of generative AI with digital twin platforms represents one of the most consequential technological developments in industrial engineering today, and BEML is positioning itself to leverage this convergence to deliver next-generation products aligned with the Atmanirbhar Bharat vision.

Upskilling the future workforce: Bridging the AI talent gap in PSEs

The most sophisticated AI systems are only as effective as the workforce that operates, interprets and evolves them. As BEML deepens its AI integration, the organisation recognizes that building a future-ready workforce is as critical as the technology investments themselves. The AI talent challenge facing PSEs is multidimensional: it encompasses not only the need for technical specialists in data science and machine learning, but also the broader requirement to cultivate AI literacy

across engineering, operations, procurement, and leadership functions.

Structured Upskilling Programmes:

BEML is committed to investing in structured upskilling pathways that equip Executives & Non-executives at all levels with the competencies required to work effectively in an AI-augmented environment. This encompasses foundational AI literacy programmes for the broader workforce enabling Executives & Non-executives to understand AI outputs, interrogate model recommendations, and identify applications within their functional domains as well as advanced technical training for engineers and IT professionals engaged in AI development and deployment.

Collaborative partnerships with premier technical institutions, industry bodies and the Government of India's National AI initiatives provide a rich ecosystem of learning resources. BEML is actively exploring tie-ups with institutions of national repute to co-design curriculum that reflects the specific skill requirements of advanced manufacturing PSEs including industrial IoT, data engineering, AI model deployment, and cybersecurity.

Green AI: Optimising Energy Consumption and Carbon Footprints

The environmental imperative is inseparable from BEML's vision of sustainable enterprise growth. As AI adoption scales across the organisation, BEML is cognisant of the environmental footprint associated with AI infrastructure including the energy demands of data centres, computational workloads and large-scale model training. The emerging discipline of Green AI offers a principled framework for ensuring that the organisation's AI ambitions are pursued in alignment with its sustainability commitments.

Energy-Efficient AI Deployment

Green AI encompasses a suite of techniques designed to reduce the computational energy consumed by AI systems without compromising their effectiveness. These include model compression methods such as quantisation and pruning, which reduce the computational complexity of AI models as well as the use of energy-efficient hardware such as Tensor



Processing Units (TPUs) and edge computing architectures that process data locally, avoiding energy-intensive transmissions to centralised data centres. BEML's AI deployment strategy will incorporate these energy-efficiency considerations as standard design principles, ensuring that AI infrastructure investments are aligned with the organisation's broader environmental objectives.

AI as an enabler of Environmental Sustainability:

Beyond managing AI's own environmental footprint, AI technologies offer powerful tools for advancing BEML's sustainability goals across its manufacturing operations. AI-powered energy management systems can optimise power consumption across manufacturing facilities in real time, identifying inefficiencies, load-balancing across production lines and predicting peak demand periods to enable proactive energy scheduling.

BEML's Green AI initiatives are directly aligned with the nation's sustainable development trajectory. AI-driven optimisation of logistics networks, production scheduling and raw material utilisation further contributes to reducing the environmental impact of BEML's operations, supporting the organisation's journey towards a lower-carbon footprint.

Carbon Footprint Transparency:

BEML is committed to progressively enhancing the transparency of its AI-related environmental impact through the adoption of emissions measurement frameworks and carbon accounting

tools. As reporting standards for AI's environmental footprint continue to mature globally, BEML will align its disclosures with emerging best practices demonstrating responsible AI stewardship and reinforcing stakeholder confidence in the organisation's sustainability credentials.

Future Roadmap for AI Integration

BEML's AI transformation journey is conceived as a long-term, phased programme of capability building, institutional learning and strategic investment. The organisation's future roadmap is anchored in three horizons of ambition:

- **Near-term (1–3 years):** Consolidation of foundational AI capabilities across manufacturing, supply chain and quality functions; deployment of AI-powered predictive maintenance systems at key production facilities; launch of structured AI literacy programmes for Executives & Non-executives across all grades.
- **Medium-term (3–5 years):** Deeper integration of generative AI into R&D and product development processes; deployment of digital twin platforms for key product families; advanced analytics integration across the supply chain; and progressive rollout of AI copilot tools to frontline operational teams.
- **Long-term (5–10 years):** Aspiration towards AI-native manufacturing operations characterised by a high degree of autonomous decision-making, self-optimising production systems and AI-driven continuous improvement; full integration of Green AI principles across all AI infrastructure; and active participation in the national AI ecosystem through collaborative research, industry partnerships and contribution to policy dialogue.

BEML also recognises that AI transformation is not a journey undertaken in isolation. Collaboration with other PSEs, technology partners, academic institutions and government bodies will be essential to realising the full potential of AI across the public sector ecosystem. By sharing learnings, co-developing solutions and contributing to the national AI discourse, BEML aspires to play an

active role in shaping the future of AI-driven public sector enterprise in India.

As part of its ongoing initiatives, BEML is exploring innovative applications such as AI-based chatbots for equipment and service manuals, intelligent health monitoring systems for machinery, digital twin platforms and the use of Augmented reality (AR) for quality inspection. These efforts reflect the organisation's commitment to leveraging emerging technologies not only to enhance operational excellence but also to redefine the future of engineering and manufacturing in the public sector.

BEML's is focusing on core functional areas where AI can useful in a meaningful way such as,

- **In the procurement cycle, intelligent tools can automate vendor evaluation, demand forecasting and compliance documentation reducing lead times and driving supply chain efficiency.**
- **In HR recruitment, AI-powered screening and onboarding platforms can enable data-informed hiring, reduce bias and help retain top talent across the organization.**
- **In operations management, machine learning can optimizes production scheduling, monitors equipment health in real time, and supports faster, smarter decision-making on the shop floor.**

Conclusion

The path to Viksit Bharat runs through the engine rooms, design studios and digital platforms of India's Public Sector Enterprises. BEML Limited, with its legacy of nation-building and its forward-looking embrace of Artificial Intelligence, is committed to being a transformative force in this national endeavor. Through purposeful AI adoption in operations, R&D, workforce development and sustainable practices, BEML is not only enhancing its own competitiveness and resilience it is actively contributing to the collective mission of building a stronger, smarter and more self-reliant India.

As India approaches its centenary of independence, BEML stands ready to harness the power of AI in service of the nation pioneering the path to Viksit Bharat, one intelligent solution at a time.

AI initiatives at GRSE



Cmde PR Hari, IN (Retd.)
CMD, GRSE

Public Sector Enterprises are evolving from traditional economic pillars into tech-driven powerhouses, leveraging Artificial Intelligence to compete in an increasingly agile global market. By integrating custom-built AI solutions and fostering innovation, these organizations are not just enhancing operational efficiency but are actively pioneering the roadmap toward a Viksit Bharat 2047.

To appreciate the current AI transformation of Public Sector Enterprises (PSEs), one must first look back at the strategic foundations upon which these institutions were built.

At the time of Independence, India had few industries. The numbers were insufficient to meet the requirements of a country looking for economic growth. That is when the concept of public enterprises was born. While those that were newly set up by the government came to be known as PSEs, those that were taken over from the private sector were called PSUs. Their primary role was to provide the country its much-needed economic boost while creating job opportunities. In addition, the PSEs were to protect the country's vital resources, while serving the population.

As the PSEs matured into the country's economic bedrock, their influence extended into pivotal sectors—from ensuring energy and strategic security to spearheading massive infrastructure and defense projects. The PSEs and PSUs have proved more than their worth over time, standing as a wall to protect the country's interests. Their resilience was most evident during the 2007-09

Great Recession. While global market fluctuations severely destabilized the private sector, the public sector acted as a strategic shock absorber, ensuring India remained remarkably stable while other global economies faltered.

As market dynamics shifted, the protective blanket of the state gave way to a mandate for global competitiveness. Today, PSEs match the private sector in performance benchmarks while upholding the sacred duty of transparency to the taxpayers who fund them.

In an era where operational agility defines the winner, PSEs are bridging the flexibility gap by integrating Artificial Intelligence into their core DNA. AI has transitioned from a futuristic luxury to a mission-critical necessity, a shift exemplified by Garden Reach Shipbuilders and Engineers (GRSE). Since its evolution into a DPSU in 1960, this maritime titan has leveraged cutting-edge engineering to deliver a record-breaking fleet to the Indian Navy, Indian Coast Guard and global allies.

GRSE has embedded AI across the entire shipbuilding lifecycle, from initial blueprints to the final hull assembly. By upgrading its Virtual Reality Lab into a world-class immersive facility, the shipyard has pioneered the use of 'Digital Twins.' This allows for a high-fidelity virtual replica to be finalized before a single plate is cut, enabling engineers to project and overlay full-scale digital models directly onto the construction yard for precision assembly.

Shipbuilding, particularly warship building, is a complex process and the final product undergoes

rigorous inspections by classification societies as well as customers. The use of AI negates even minor design flaws, leading to enhanced operational efficiency. GRSE's AI-powered design assistance "Jigyasa" has significantly cut down time taken by young designers in decision making during the design process.

GRSE's digital ecosystem currently features over eight active AI workstreams, optimizing every vertical from Logistics and HR to Design and Quality Control. A standout success is the AI-enabled weld defect identification system; by automating critical inspections, the shipyard has reclaimed six man-hours daily. More impressively, the feedback loop—from initial detection to shop-floor rectification—has been slashed by 50%, dramatically accelerating production throughput.

The implementation of advanced welding simulators has further revolutionized workforce development, slashing welder qualification timelines by 40%. Beyond speed, this technology has driven a 60% reduction in weld consumables, underscoring GRSE's commitment to both operational efficiency and sustainable manufacturing.

The digital employee experience has been reimaged through the HR Chatbot 'Anvesha,' which provides instant access to personal and administrative data. By eliminating the need for physical visits, 'Anvesha' has streamlined HR interactions, allowing personnel to focus on high-value tasks.

To maintain a competitive edge, PSEs must pivot from being passive technology adopters to becoming architects of bespoke industrial solutions. GRSE has pioneered this shift through its flagship GRSE Accelerated Innovation Nurturing Scheme (GAINS). Now in its third successful year, GAINS serves as a high-octane incubator, challenging academia, start-ups, and MSMEs to co-create AI-driven breakthroughs tailored specifically to the intricacies of modern shipbuilding.

GAINS 2023 enabled the shipyard to develop a

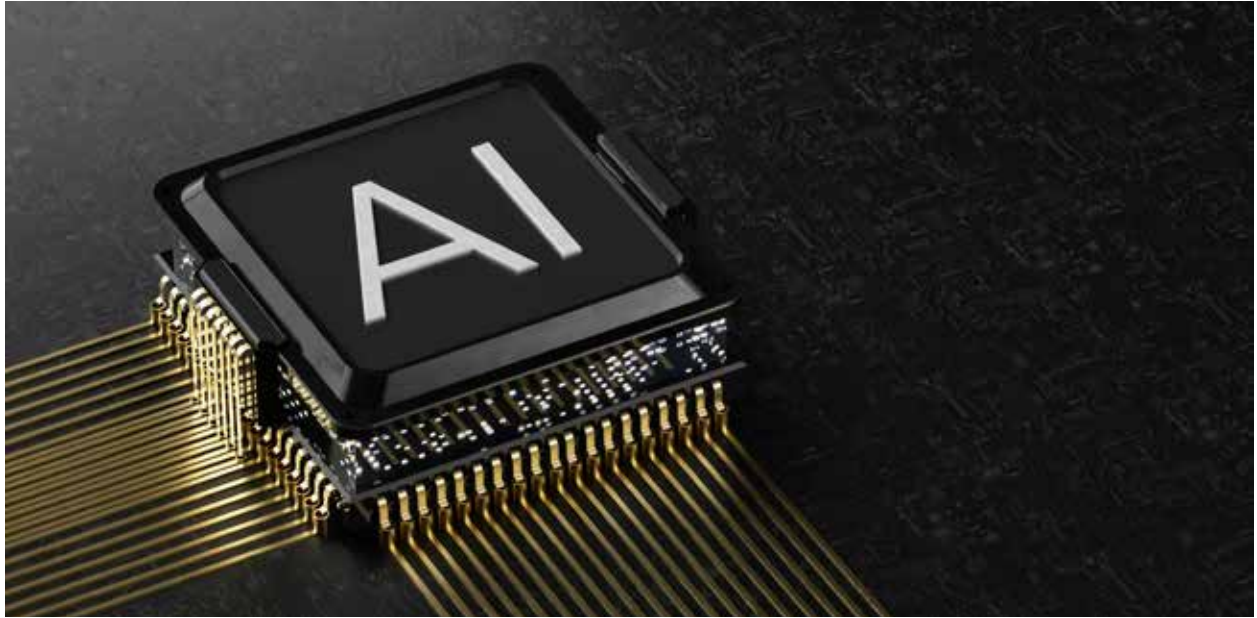
tool that minimises the duplication of inventory and generates seamless material code, thereby saving time and cost. The adoption of the AI-driven SOTR and Tender Generator—a direct outcome of GAINS 2024—marks a significant leap in GRSE's operational agility. This specialized tool leverages Artificial Intelligence to enable automated Bill of Material generation by extracting and structuring content from RFPs/Tenders, formulation of SOTRs for initiating the procurement process and formulating TNC checklist. GAIN 2025 has seen an overwhelming participation from the startup & MSME ecosystem – with over 100 applications.

By integrating Artificial Intelligence into its core engineering philosophy, GRSE has transitioned from a traditional shipbuilder to a pioneer of autonomous maritime ecosystems. This evolution is spearheaded by AI-driven platforms like Jaldoot and Swadheen, a fully autonomous, electric-powered USV capable of navigating open-ocean conditions without human intervention. The shipyard is further pushing the digital frontier through the Neerakshi AUV and the ASV MCM project, where AI algorithms handle complex mine counter-measure strategies and underwater exploration. By mid-2026, this autonomous suite will be bolstered by ship-based drones capable of 24/7 surveillance and automated deck recovery, proving that GRSE is not just building ships, but is architecting a self-evolving, intelligent naval force for the future.

This unique innovation ecosystem has birthed an autonomous robotic system designed to revolutionize exterior hull coating. This has enhanced quality, improved efficiency and ensured cost saving by reducing wastage. Robots are also being used at GRSE for fabrication of ship panels and blasting of exterior hulls, thereby enhancing throughput and quality.

The shipyard has witnessed a phenomenal change after the adoption of AI and related technology.

Ever since it became a DPSU, GRSE has been championing the cause of self-reliance in the field of shipbuilding. It was in 1961 that the shipyard



delivered India's first indigenous warship – INS Ajay – to the Navy and it has not looked back since. Thanks to adoption of the latest technology, the shipyard is now building advanced warships like P17A Advanced Frigates and Next Generation Offshore Patrol Vessels.

Moving away from the legacy of direct nomination, GRSE secured these high-value contracts through rigorous competitive bidding. This transition underscores the shipyard's ability to stand on its own merits, proving its technical prowess and commercial viability against the best in the industry.

While the frigates built by it are the largest ever constructed in the country or handled by the Navy, it is also delivering anti-submarine warfare shallow water crafts to the Navy. These are the largest vessels to be fitted with water-jets to be commissioned into the Navy. GRSE has also delivered four Survey Vessels (Large) to the Navy. These are the largest survey vessels to be built in India or operated by the Navy so far. In a landmark demonstration of industrial capacity, the shipyard achieved a historic 'Triple Delivery' on March 30.

These milestones serve as a definitive proof of concept: the integration of Artificial Intelligence is the primary catalyst for operational agility.

By moving beyond traditional workflows, organizations can achieve a level of efficiency that was previously unimaginable, transforming complex industrial challenges into streamlined successes.

GRSE, today, stands by the country's Atmanirbharta and "Make in India" visions in a major way. It has also started taking a lead in the government's plan to develop India into a major maritime destination. Thanks to the infusion of technology such as AI, the shipyard has bagged multiple international orders already. It now possesses the capacity to build 28 ships of various classes and sizes concurrently.

GRSE is a perfect example of how PSEs and PSUs can contribute in a major way towards a Viksit Bharat 2047, provided they integrate modern technology such as AI in their day-to-day functioning.

Transformation is as much about culture as it is about code. Dispel the myths: AI isn't here to replace the workforce, but to elevate it. By aligning the entire organization around the twin pillars of efficiency and accountability, PSEs can transform AI from a disruptive tool into a strategic safeguard, ensuring their continued leadership in the era of a Viksit Bharat.

Artificial Intelligence in Shipbuilding: Orchestrating a New Maritime Epoch



Brajesh Kumar Upadhyay
CMD, Goa Shipyard Ltd.

The Goa Shipyard Limited Doctrine

Prologue: From Industrial Capability to Cognitive Sovereignty

The contemporary global order is being reconfigured by an unprecedented confluence of **algorithmic intelligence, digital engineering, and sovereign manufacturing imperatives**. Nowhere is this transformation more profound than in the domain of shipbuilding; an industry historically characterised by heavy engineering, linear workflows, and capital-intensive execution, but now undergoing a decisive transition towards **cognitive, self-optimising ecosystems**.

Artificial Intelligence has emerged not merely as an enabling tool, but as a **strategic force multiplier** - one that is redefining how Naval platforms are conceived, engineered, constructed, and sustained across their lifecycle. In this evolving paradigm, shipyards are no longer passive executors of design; they are becoming **intelligent, anticipatory, and adaptive enterprises**, capable of continuous learning and optimisation.

Within this tectonic shift, Goa Shipyard Limited (GSL) has positioned itself as a **luminous exemplar of institutional transformation**, demonstrating how a legacy defence PSU can transcend conventional constraints to emerge as a **digitally sovereign, innovation-driven maritime powerhouse**. Its trajectory is deeply aligned with the national vision of **Atmanirbhar Bharat** and the strategic ambition of **Viksit Bharat**, embodying a transition from dependency to **technological self-determination**.

The Global Inflection: AI as the New Grammar of Shipbuilding

Across advanced maritime nations, Artificial Intelligence is rapidly becoming the **definitive grammar of next-generation shipbuilding**. The shift is neither incremental nor reversible; it is structural and systemic.

AI is catalysing:

- **Generative Engineering Paradigms.** Wherein complex vessel architectures are autonomously synthesised through multi-objective optimisation, balancing hydrodynamics, survivability, maintainability, and mission readiness.
- **Cognitive Lifecycle Management.** Enabling vessels to be continuously monitored, diagnosed, and optimised through predictive and prescriptive analytics
- **Hyper-Connected Digital Twins.** Which replicate physical assets in virtual environments, allowing real-time simulation, validation, and performance forecasting.
- **Autonomous Decision Ecosystems.** Where enterprise-level decisions are augmented by data-driven intelligence, reducing uncertainty and enhancing agility

This transformation marks a departure from deterministic engineering towards **probabilistic, intelligence-led design philosophies**, fundamentally altering the economics, timelines,

and strategic outcomes of shipbuilding programmes.

GSL's Strategic Doctrine: Institutionalising Intelligence

GSL's approach to Artificial Intelligence is distinguished by its **clarity of vision, architectural coherence, and executional rigour**. Rather than pursuing isolated technological interventions, the shipyard has embarked upon a **holistic reconstitution of its operational paradigm**, embedding intelligence across the entire value chain.

A Foundational Triad of Transformation

The AI-led transformation at GSL is anchored in a robust strategic triad:

- **Collaborative Convergence.** Forging deep partnerships with premier research institutions, academia, and technology innovators to create a synergistic innovation ecosystem.
- **Outcome-Driven Technological Infusion.** Ensuring that every AI intervention is anchored in tangible metrics—cycle time reduction, cost optimisation, precision enhancement, and quality augmentation.
- **Scalable Institutionalisation.** Transitioning from proof-of-concept initiatives to enterprise-wide deployment, thereby embedding innovation into organisational DNA

This doctrine ensures that AI at GSL is not an adjunct capability—it is a **core institutional competency**.

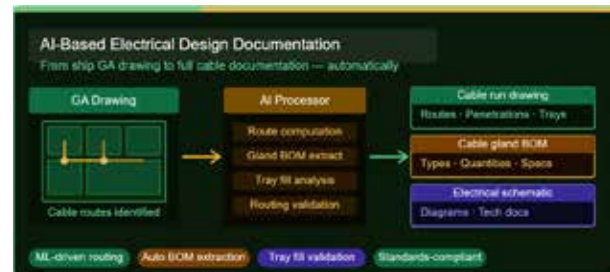
Frontier Applications: Translating Intelligence into Capability

Generative Intelligence in Naval Architecture

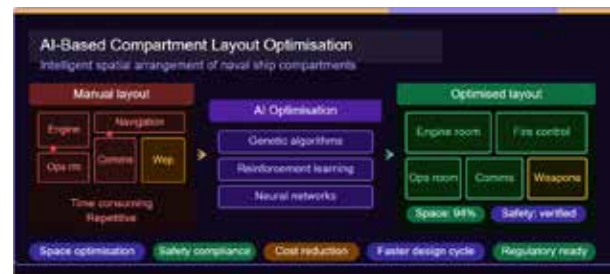
GSL is at the forefront of deploying **Generative AI to reimagine ship design methodologies**,

particularly through national innovation platforms.

- **Autonomous Electrical Design Synthesis.** Advanced AI engines now conceptualise, validate, and iteratively refine complex electrical schematics and cable routing networks. This eliminates manual redundancies, ensures standardisation, and compresses design timelines with unprecedented efficiency.



- **Multi-Objective Spatial Optimisation.** Leveraging sophisticated optimisation algorithms, GSL is addressing the intrinsic complexity of warship design—harmonising competing variables such as stability, survivability, accessibility, and regulatory compliance. The outcome is a **dramatic attenuation of iterative design cycles**, enabling faster convergence to optimal configurations.



Predictive Intelligence: Engineering Foresight into Infrastructure

A seminal initiative under the iDEX framework has been the deployment of **AI-enabled condition monitoring systems** for mission-critical infrastructure such as the ship lift mechanism.

- Integration of **high-resolution sensor arrays** for real-time anomaly detection



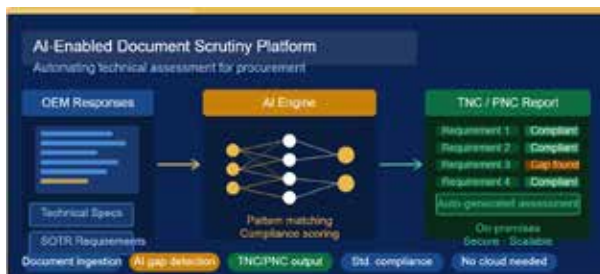
- Deployment of **Machine Learning and Deep Learning frameworks** for predictive diagnostics.
- Validation and certification by the **Indian Register of Shipping (IRS)**

This paradigm shift—from reactive maintenance to predictive intelligence—has profound implications: **enhanced operational reliability, minimised downtime, and significant lifecycle cost rationalisation.**

Cognitive Enterprise: Reimagining Organisational Intelligence

GSL is progressively transitioning towards a **cognitively augmented enterprise architecture**, wherein AI permeates decision-making processes.

- **Automated Technical Evaluation Systems.** Leveraging Natural Language Processing and Large Language Models to scrutinise vendor documentation with speed and precision.



- **Integrated Digital Engineering Ecosystems.** Seamlessly connecting CAD, PLM, ERP, and production systems into a unified data continuum

The result is an organisation that is not merely efficient, but **intelligently self-aware and dynamically responsive.**

Human Capital Transformation: The Bedrock of Sustainable Innovation

GSL's leadership has demonstrated acute strategic foresight in recognising that **technology without talent is inert.** Accordingly, the shipyard has instituted a **multi-layered human capital transformation framework:**

- **Cognitive Familiarisation** across the workforce
- **Functional Application Training** aligned with domain-specific requirements
- **Advanced R&D Capability Building** for deep-tech innovation

A dedicated AI Task Force acts as a catalytic nucleus, ensuring that innovation is **continuously identified, incubated, and scaled.**

Strategic Collaboration: The IIT Hyderabad Nexus

A pivotal dimension of GSL's transformation is its strategic partnership with **IIT Hyderabad**, representing a powerful confluence of **academic excellence and industrial pragmatism.**

A New Innovation Ecosystem - This collaboration is driving:

- Development of **Geospatial Digital Twins** for real-time simulation and monitoring
- Integration of **Generative AI across design and production workflows**
- Advancement of **Industry 4.0 and QA 4.0 paradigms**

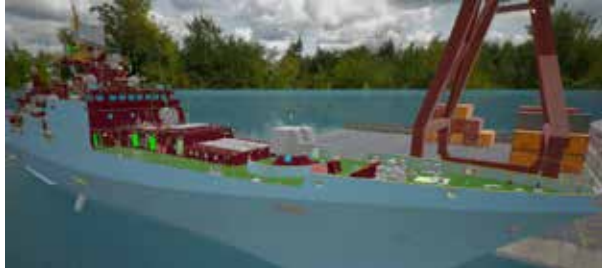
The initiative signifies a transition from isolated innovation to a **systemic, ecosystem-driven model of technological advancement.**

Immersive Engineering: Redefining Design Validation through VR

GSL's state-of-the-art **Virtual Reality Lab**

represents a **quantum leap in engineering validation methodologies**.

From Physical Iteration to Virtual Certainty



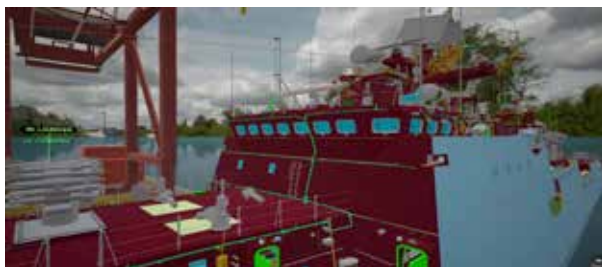
Conventional ship design processes were constrained by:

- Extended validation cycles
- High dependence on physical mock-ups
- Late-stage error detection and rework

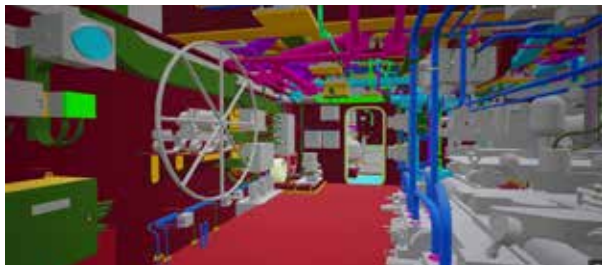
VR as a Transformational Instrument

The VR ecosystem enables:

- **Immersive, full-scale design visualisation**



- **Real-time collision detection and ergonomic validation**



- **Instantaneous iteration and stakeholder concurrence**

This has resulted in **exponential gains in**

efficiency, precision, and collaborative synergy, fundamentally redefining the economics of ship design.



Epilogue: GSL and the Architecture of Maritime Destiny

Goa Shipyard Limited's AI-led transformation is not an isolated institutional success—it is a **strategic articulation of India's technological ascent in the maritime domain**. By embedding intelligence across its operational, engineering, and decision-making architectures, GSL is **redefining the ontology of shipbuilding itself**.

In a geopolitical landscape where maritime capability is synonymous with strategic influence, GSL emerges as a **beacon of indigenous excellence**, demonstrating how public sector enterprises can transcend traditional limitations to become **globally competitive, innovation-centric institutions**.

The shipyard's journey heralds a new doctrine—one where **steel is shaped not only by force, but by foresight**; where vessels are not merely constructed, but **cognitively engineered**; and where industrial capability evolves into **strategic sovereignty**. As India advances towards the horizon of **Viksit Bharat**, the GSL paradigm offers more than inspiration—it offers a **replicable blueprint for national transformation**.

The future of shipbuilding will be defined not by scale alone, but by **intelligence, integration, and imagination**. In that unfolding future, Goa Shipyard Limited does not merely participate; it **architects the trajectory**.

AI in MIDHANI



Dr S.V.S. Narayana Murty
CMD, Mishra Dhatu Nigam Limited
(MIDHANI)

Mishra Dhatu Nigam Limited (MIDHANI) was established in the year 1973 as a Government of India Enterprise under administrative control of Ministry of Defence. The production unit of MIDHANI, located at Kanchanbagh, Hyderabad, was commissioned in the year 1982. MIDHANI was set up with a view to achieve self-reliance in production and supply of various super alloys, special steels, soft magnetic alloys to Defence and other Strategic Sectors such as Energy, Space and Aeronautical applications. The guiding factors for setting up of MIDHANI were the demand for Defence oriented technologies, which come under the national priorities. The materials manufactured by MIDHANI are basically import substitutes and their non-availability would have affected various strategic programs of the country.

With 49 years of glorious past MIDHANI is one of the leading manufacturers of special steels, Superalloys, and the only manufacturer of Titanium alloys in India. Our state-of-the-art facilities are capable of catering to complex and dynamic requirements of critical materials.

Artificial Intelligence has already emerged across many streams of industries such as Finance, Banking, Science, and Technology, and so on. The implementation of AI in streams like Manufacturing, particularly in process industries, requires a unique approach or methodology. In the case of discrete manufacturing, AI implementation can be carried out in various process-related areas such as automation of processes, supply chain optimization, energy management, prediction of demand, and production planning, etc.

However, industries like process-oriented manufacturers such as MIDHANI, which produce critical and strategic alloys for Defence and other sectors such as Energy, Space, and Aeronautical applications, require a unique approach to implement AI in R&D and production streams, involving domain-specific simulations and machine learning algorithms.

Following are key projects taken up by MIDHANI to improvised operations. achieved Internal process improvement/optimization, saving of process time & human effort and reduce quality defects in the manufacturing process.

1) **Predictive Modelling of Maraging Steel VIM Furnace.**

Maraging steel is a special alloy exhibiting excellent combination of ultra-high strength with considerable ductility. Thus, such steel become significant worldwide for strategic sectors (like nuclear, aerospace and defence) where stringent quality standards with respect to chemistry and properties is compulsory. Manufacturing of these steel is extremely difficult, and vacuum induction melting (VIM) furnace plays most significant part as a primary melting unit. There are a large number of processing parameters to manufacture these special alloys and on top of that, these types of vacuum furnaces are connected with various valves, motors, sensors along with safety systems, which lead to involvement of additional interdependent process variables. The data generation and collection

in digital form is a very useful resource of valuable information for meaningful process optimization-related investigation by developing intelligent model from databases. In this perspective, data-driven optimization using evolutionary algorithms is effective tool in order to optimize parameters for VIM 6.5T furnace to improve efficiency and productivity.

2) Alloy Development using Artificial Intelligence.

Modern materials research often requires close integration between computation and experiment to yield a fundamental understanding of the structures and properties of the materials of interest and how they are related to the synthesis and processing procedures. Machine learning is a powerful tool for finding patterns in high-dimensional data; it employs algorithms by which a computer can learn from empirical data by modelling the linear or nonlinear relationships between the properties of materials and related factors. The ability to make full use of extensive data is the key to the application of machine learning to materials science research. In addition, the application of intelligent data analysis methods in materials science research can greatly assist in optimizing the virtual screening space for new materials and speed up the process considerably.

An AI based framework for Alloy Development has derived and implemented on tool steel called H13.

3) AI enabled Quality improvement system for Maraging Steel Melting Process to improve Product UT quality and yield.

A framework for optimizing process of Maraging steel to improve the Quality has been established using Machine Learning and Genetic Algorithms. This framework has given an analysis for minimizing UT defects of Maraging steel. MIDHANI will further use this optimization framework for development of process and products.

4) AI based image analysis system to predict microstructure of alloys (grain size and phase fraction).

AI based image analysis system to predict microstructure of alloys (grain size and phase fraction). This is a Micro structure Image predictor tool with AI model. The data set is from our metallography Lab (Internal Microscopic images).

5) Prediction of mechanical properties based on chemistry and microstructure using artificial neural network.

This is a Multi parameter optimization by systematic approach through Data Mining. The dataset of this project is Machine generated data and log data of furnaces involves in melting of Maraging steel. The aim is to predict critical properties which influence the quality of the product in order to improve the yield.

Future roadmap of AI projects in MIDHANI.

1) Predictive Maintenance of Equipment

Implementation of AI-driven predictive maintenance models to monitor the health and performance of critical equipment. By leveraging historical data, sensor inputs, and machine learning algorithms, the system will enable early detection of potential failures, reduce unplanned downtime, and optimize maintenance schedules, thereby improving overall equipment efficiency and lifecycle management.

2) RAG based customised LLMs for internal Policy Documents.

Development of Retrieval-Augmented Generation (RAG) based customized Large Language Models tailored for MIDHANI's internal policy and procedural documents. This will facilitate intelligent search, contextual query resolution, and quick access to relevant information for employees. Such systems will enhance decision-making, ensure policy compliance, and significantly reduce the time required to interpret and retrieve critical organizational knowledge.

YIL's AI Roadmap: 6 initiatives driving smart manufacturing in India's defence sector



In Yantra India Limited, following initiatives are being undertaken towards AI transformation

1. AI Projects Implemented Across the Group of Factories and Their Benefits.

The major AI initiatives and their benefits are outlined below:

A. AI-Enabled Traceability for Pinaka Pod System

AI-enabled traceability solution has been implemented for the Pinaka Pod System to strengthen end-to-end quality assurance and digital record management.

Key benefits include:

- Elimination of manual errors in traceability records
- Significant reduction in paperwork
- Savings in time and manpower
- Improved reliability and data integrity

This solution strongly supports digital transformation initiatives and significantly enhances quality assurance in defence manufacturing operations.

B. ML/AI Module in Metallurgical Microscope for Defect Detection

An AI/ML-based metallurgical microscope module has been developed for automated defect and microstructure detection. The module has been trained using a large repository of historical photographs covering different defect types and microstructures, which has substantially improved detection accuracy.

Major advantages:

- Reduced human intervention in defect detection
- Faster microstructure analysis
- Improved inspection consistency
- Higher detection accuracy
- Significant time savings in quality control

This streamlined process enables rapid and reliable defect identification, thereby improving metallurgical quality assurance.

C. Web-Based AI-Assisted Application for Forecasting Aluminium Market Prices

A web-based AI-assisted forecasting application has been developed to predict aluminium market prices and support strategic procurement decisions. The application is compatible with Windows-based operating systems, and successful model trials have been conducted at EOCC. The prediction accuracy achieved has been found to be within 2-3% variance, demonstrating high reliability.

Benefits include:

- Improved financial decision-making
- Better procurement planning
- Reduced exposure to market volatility
- Risk mitigation against price fluctuations
- Data-driven budgeting support

This AI-driven solution enables informed commercial decisions and cost optimisation.

D. AI in Predictive Maintenance Using IoT Sensors (Industry 4.0 Initiative)

As part of the Industry 4.0 implementation roadmap, AI is being integrated with IoT sensors for predictive maintenance. Critical machine operational and maintenance parameters are continuously monitored through a centralised dashboard, enabling proactive corrective actions. The sensor and controller data are analyzed using AI/ML algorithms to predict machine health and maintenance needs.

Expected benefits:

- Reduction in unplanned machine breakdowns
- Improved spare inventory management
- Better maintenance scheduling
- Enhanced production planning
- Increased machine uptime and equipment life
- Lower maintenance costs

Following successful validation, the AI module will be scaled across all major machines.

E. AI-Powered Expert Production System (AI-EPS) for 30 mm Steel Cartridge Case

An AI-Powered Expert Production System (AI-EPS) has been developed for the 30 mm Steel Cartridge Case manufacturing line. This system improves both production and maintenance decision-making through intelligent monitoring and analytics.

Key benefits:

- Reduction in unplanned breakdowns
- Lower inspection time
- Reduced human dependency
- Improved spare parts planning and inventory control
- Better maintenance scheduling
- Early alerts for resource allocation
- Enhanced quality consistency and process reliability

- Data-driven continuous process improvement
- Increased productivity and equipment reliability

The system is expected to significantly improve operational excellence and quality assurance standards.

G. Development of AI-Based Radiographic Inspection System

This project involves the development of an AI-enabled visual radiographic inspection system for automatic analysis of radiography images and detection of inherent casting defects. Radiography using gamma rays is employed to assess the internal soundness of castings. The captured internal images are processed through AI models to detect and classify inherent defects.

The machine learning model is being designed to categorize defects in accordance with ASTM standards, ensuring compliance with stringent quality requirements.

Key benefits:

- Faster defect identification
- Reduced dependency on manual interpretation
- Higher inspection accuracy
- Standardized defect classification
- Improved casting quality assurance
- Better compliance with ASTM standards

This initiative is expected to significantly strengthen non-destructive testing (NDT) and casting inspection reliability.

2. Generative AI in R&D: Accelerating the Path to 'Viksit Bharat'

Generative AI relies on the availability of large volumes of reference data generated under varying conditions. For accurate and reliable outcomes, this extensive data-sourced from multiple stakeholders such as the Design Agency, Proofing Agency, field firing records, and manufacturer data bases-must be systematically compiled and integrated.

Once such validated input data is available, Generative AI can be effectively leveraged for design optimization, dynamic proof simulation, and field performance simulation, enabling improved accuracy, faster analysis, and more informed decision-making.

3. Upskilling the Future Workforce: Bridging the AI Talent Gap in PSE:

The AI-driven system is going to be the workforce of the future. Recognising this, YIL has placed strong emphasis on upskilling its human capital to build future-ready AI capabilities across various domains of its operation.

Yantra Institute of Technology and Management, a training institute of YIL is actively conducting program through webinar /physical on Artificial Intelligence, IoT & Industry 4.0. The employees has been trained with essential basic AI knowledge and skills that has fostered awareness and competence in emerging technologies.

Production Units under YIL are continuously working towards establishing partnerships/ collaboration with renowned institutions such as IITs, NITs and other potential vendors. These collaborations aim to bridge the gap between industry requirements and academic expertise, ensuring access to a skilled talent pool and fostering innovation

4. Green AI: Optimising Energy Consumption and Carbon Footprints

YIL has implemented several projects that enabled centralized machine monitoring across critical production sections, integrating furnaces, rolling mills, presses, and auxiliary systems onto a real-time dashboard. This has enabled live process visibility, OEE tracking, condition-based preventive maintenance, and machine-wise energy monitoring. Insights from the system led to multiple energy-saving measures, including optimised furnace power cycles, improved power factor, auto switch-off of idle rolling mill motors, compressor load balancing, and optimum furnace loading. The initiative has significantly reduced energy losses, minimised down-time, improved equipment utilisation, and strengthened Green AI-

driven sustainable manufacturing and operational excellence.

5. Future roadmap for AI integration within YIL sector.

Over the coming years, YIL aims to strategically integrate Artificial Intelligence (AI) across its manufacturing and enterprise functions with the following objectives:

- Automation in operations. (Online continuous measuring feedback and correction).
- Improve quality by employing AI based vision measuring equipment, reduced rejection by SPC/SQC analysis.
- OCR tracking system for products & real-time inventory monitoring
- Support workers by automating repetitive tasks.
- HR tasks- Admin, Personnel, safety, Security, Legal etc.

Step-by-Step Action Plan of YIL.

Step 1: Building the Foundation

- Initiate small-scale pilot projects in key areas such as attendance systems, administrative chatbots, quality control, and material tracking.
- Deploy face-recognition-enabled cameras at factory gates and critical shop-floor locations for secure and automated attendance monitoring.
- Establish basic IT infrastructure, machine connectivity, and sensor systems to enable real-time data collection from equipment.
- Establish an internal AI Task Force and collaborate with technology experts and implementation partners.
- Launch structured manpower training and capacity-building programmes to prepare the workforce for AI-based systems and processes.

Step 2: Expansion and Process Optimisation

- Scale successful Lesson learned pilot across additional operational domains, including

maintenance support chatbots and rejection analysis systems.

- Introduce AI-driven planning and forecasting tools for raw material demand and supply optimisation.
- Implement automated inventory management systems using QR codes, RFID, and AI-enabled tracking solutions.
- Develop integrated digital dashboards for real-time monitoring of plant health, manpower deployment, and production performance.
- Establish an in-house AI development team to progressively reduce dependence on external vendors and build long-term self-reliance.

Step 3: Transition to a Fully Smart Factory

- Achieve a paperless ecosystem for attendance, dak and file movement, reporting, and workflow approvals through AI-enabled systems.

- Integrate machines, inventory, HR, and production systems into a centralised enterprise AI dashboard for unified decision-making.
- Enable predictive maintenance systems to forecast equipment failures, recommend corrective actions, and prevent unplanned shutdowns.
- Deploy AI-based energy management systems for intelligent control of utilities, leading to significant cost optimization and sustainability gains.
- This roadmap will enable YIL's transformation into a future-ready, data-driven, and self-reliant smart manufacturing ecosystem, aligned with the national vision of Aatmanirbhar Bharat and Viksit Bharat 2047.
- This document is issued with.... the approval of competent authority.



India Optel Limited: Strengthening Soldier's Eye through AI



Tushar Tripathi
CMD, India Optel Ltd.

IOL's Vision and the Emerging AI Ecosystem

Today, Artificial Intelligence (AI) is rapidly moving towards strategic relevance. In defence production, AI is about enhancing perception, improving decision-making, and increasing reliability in complex, high-risk environments.

At its core, AI represents an effort to enable systems to perceive, understand, and assist in ways similar to aspects of human cognition. Recent advances in computer vision and natural language technologies have already demonstrated how machines can “see” and “understand” information.

Yet, the most significant opportunity for AI today lies not in general-purpose systems, but in deep, domain-specific intelligence, particularly in critical sectors such as defence or latest example of AI tools for corporate legal teams.

India Optel Limited (IOL), a Defence Public Sector Undertaking, plays a key role in India's armoured vehicle ecosystem. Its electro-optical systems—such as tank sighting systems, thermal imagers, and ballistic computing solutions—enable armoured platforms to detect, identify, and engage targets accurately under diverse operational conditions.

Established as a “Soldier's eye” and enabling sighting of armoured vehicles, IOL's technologies directly influence battlefield awareness, accuracy, and crew safety. As India advances towards greater self-reliance in defence manufacturing, the evolution of such systems through AI becomes

both a strategic necessity and a technological opportunity for Viksit Bharat.

AI at IOL

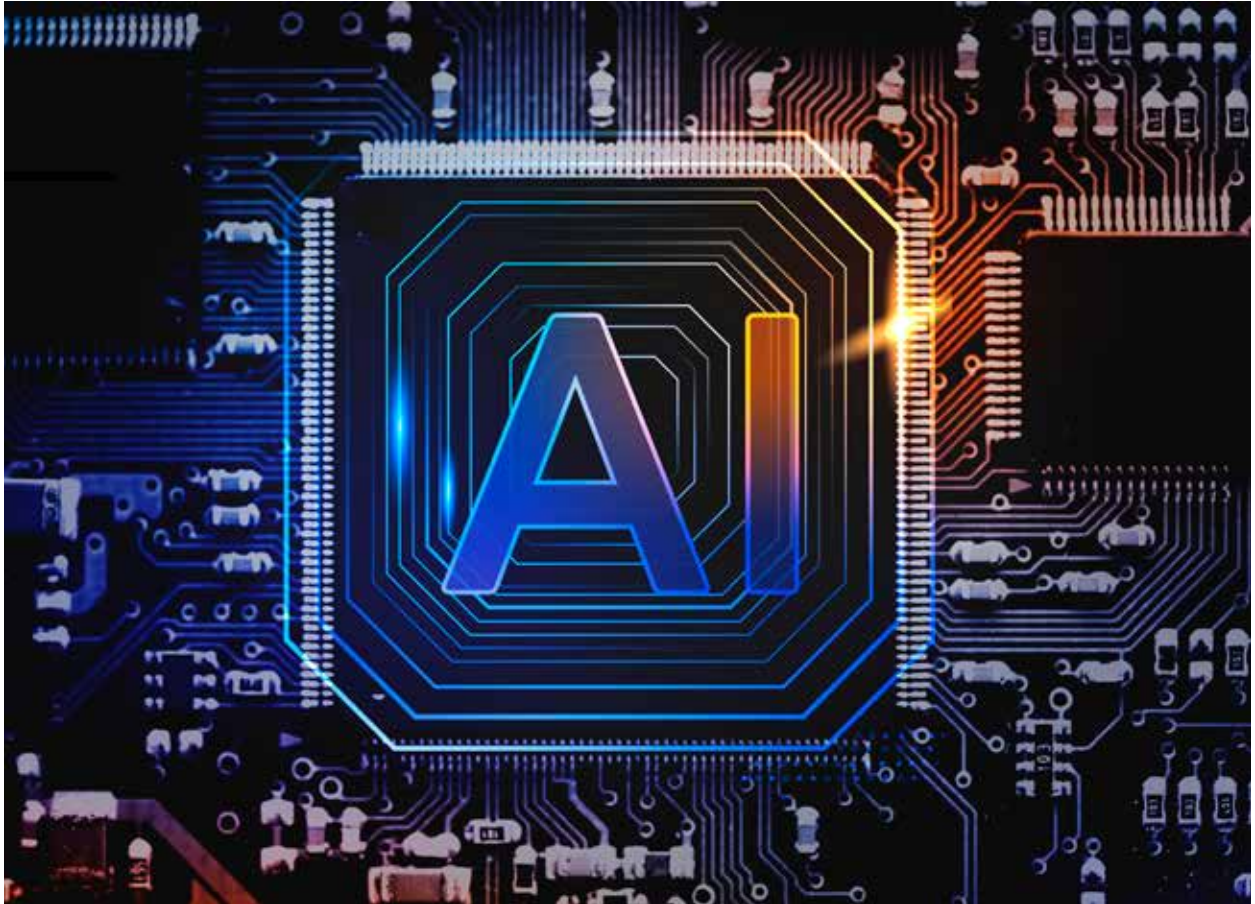
India Optel Limited recognises the strategic importance of Artificial Intelligence, with its development, deployment, and use being closely monitored and emphasised at the highest level of the organisation.

AI initiatives at India Optel Limited are currently at the development stage, with multiple projects under pilot design or early experimentation. These efforts reflect a longer-term vision.

IOL is exploring how AI and computer vision could enhance future generations of opto electronics and fire-control systems, with particular emphasis on situational awareness and operational safety, which include:

- AI-assisted surveillance and sensing, particularly for thermal and day-night imaging systems
- Improved target recognition and tracking, aimed at reducing operator workload
- Concepts of manned-unmanned teaming, where armoured platforms cooperate with unmanned aerial systems to extend battlefield visibility.

These systems are under development and trial/evaluation.



IOL is also exploring the potential application of AI within its internal processes.

Potential areas of application include:

- AI-supported decision & analytics within ERP systems.
- Computer vision for quality inspection and manufacturing consistency
- Use of generative AI tools to assist with large documentation, analysis, and routine workflows

AI-Augmented Battlefield Vision Systems

One of the most significant ideas under consideration at IOL is the development of AI-augmented battlefield vision systems for armoured platforms.

This concept envisions future opto electronics systems that could:

- Assist operators in detecting and tracking targets in complex environments
- Fuse information from multiple sensors.
- Provide contextual alerts and decision cues, while retaining a human-in-the-loop architecture.

While still at the developmental stage, such systems represent an evolution of IOL's core competencies in this field.

Although many AI initiatives are still under development, the direction is clear. With the indigenous infrastructure and a collaborative ecosystem, IOL can position itself as a leader in AI-enabled defence manufacturing.

PERSONALIA



Shri Ravi K.
takes over as
CMD, HAL



Shri Varun Kumar Shukla
takes over as CMD, Hindustan Salts
Ltd. & Sambhar Salts Ltd.



Shri Manish Patil
Director (HR), ONGC and
Member, SCOPE Executive Board
assumes additional charge as
Director (Finance), ONGC



Shri Rajesh Kumar Agarwal
takes over as Director (Finance),
PFC



Shri Vivek Gupta
takes over as Director (Finance),
CONCOR

ANNOUNCEMENT

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SCOPE News

SCOPE organizes DAKSH Dikshant Samaroh on Public Sector Day



(L-R) Shri Amit Khera, Senior Partner, McKinsey & Company; Shri Atul Sobti, Director General, SCOPE; Dr. K.P. Mahadevaswamy, Chairman, SCOPE; Shri Ajit Seth, Former Cabinet Secretary and Chief Guest; Shri Adil Zainulbhai, Former Chairperson, CBC; Ms. Alka Mittal, Member, CBC; and Prof. Bharat Bhasker, Director, IIM Ahmedabad, at the Inaugural ceremony of DAKSH Dikshant Samaroh

SCOPE organized DAKSH Dikshant Samaroh, convocation for the inaugural batch of its flagship senior leadership program with Capacity Building Commission (CBC), Govt. of India on 10th April 2026 at SCOPE Convention Centre, New Delhi. Shri Ajit Seth, Former Cabinet Secretary and Former Chairman, PESB along with Shri K. P. Mahadevaswamy, Chairman, SCOPE & CMD, NBCC; Shri Atul Sobti, DG, SCOPE; Shri Adil Zainulbhai, Former Chairperson, CBC; Ms. Alka Mittal, Member, CBC; Prof. Bharat Bhasker, Director, IIM Ahmedabad; and Shri Amit Khera, Senior Partner, McKinsey & Company addressed the ceremony.

Marking the beginning of month-long Public Sector Day celebrations, the event witnessed the Launch of Public Sector Day film and latest issue of SCOPE's journal KALEIDOSCOPE. Dignitaries from Ministries; Govt. Departments; senior officials from PSEs and knowledge and academic partners McKinsey & IIM Ahmedabad and family members of graduating participants. During the program certificates were presented to more than 70 successful participants while Awards to top three teams of DAKSH's Live Action Learning Projects (LALP) were also conferred.

DAKSH (Development of Aspiration, Knowledge,

Succession & Harmony) is a 12-month immersive learning journey, meticulously designed to be future-focused, empowering participants with the strategic, behavioral, and transformational competencies required to navigate the complex and evolving challenges of the public sector.

Chief Guest Shri Ajit Seth emphasized that future-ready leaders must blend national pride with expertise to navigate stakeholder complexity. Commending SCOPE and CBC for bridging functional gaps, he urged a shift toward modernization, stressing that executives must master global imperatives by balancing



Dr. K.P. Mahadevaswamy, Chairman, SCOPE, and CMD, NBCC: presenting a memento to Shri Ajit Seth, Former Cabinet Secretary and Chief Guest, at the DAKSH Dikshant Samaroh

efficiency, innovation, and resilience.

Shri K.P. Mahadevaswamy noted that the SCOPE-CBC collaboration has created a distinctive journey for future leaders, emphasizing that the transition from functional to enterprise leadership requires a mindset shift supported by structural interventions like DAKSH.

Shri Atul Sobti in his address said that DAKSH flagship program was designed to transform functional experts into visionary leaders for a Viksit Bharat. Highlighting the culmination of a rigorous 12-month leadership journey, he noted that the initiative has already produced 73 “future fluent leaders” and urged the graduates to view their completion not as an end, but as a beginning for embracing broader roles and the higher expectations.

Shri Adil Zainulbhai lauded the participants, challenging them to introspect on their evolution as both individuals and leaders. He urged them to catalyse organizational change and contribute to a Viksit Bharat by adopting a mission-driven

mindset geared toward national excellence.

Ms. Alka Mittal in her address reiterated the program’s mission as fostering leadership through mutual learning and lifelong networking and urged participants to remain committed to continuous self-development.

Prof. Bharat Bhasker said that Public Sector leadership carries a unique complexity, as it must answer to a vast array of stakeholders and to be truly effective, leaders must deeply understand and navigate their organization’s inherent culture to drive meaningful progress.

Shri Amit Khara lauded the graduates for a pivotal mindset

shift—moving from mere knowledge acquisition to a lifelong commitment to learning. He also urged them to embrace a spirit of service toward their organizations.

The seamless transition from the culmination of Batch 1, to the active engagement of Batch 2 and the formal announcement of Batch 3 underscores the DAKSH leadership program’s emerging role as a cornerstone of institutional growth.

The program has successfully moved beyond its foundational phase, demonstrating both scalability and relevance in a dynamic professional landscape. By maintaining this trajectory, DAKSH is well-positioned to cultivate a self-sustaining ecosystem of leaders who possess a unified strategic vision and the tactical agility required for future challenges.

Moving forward, the focus will remain on integrating the insights gained from the inaugural cohort to further refine the curriculum, ensuring that the “DAKSH Standard” remains synonymous with excellence and transformative leadership.



Shri Ajit Seth, Former Cabinet Secretary, addressing the gathering at the DAKSH Dikshant Samaroh organised by SCOPE at SCOPE Convention Centre, New Delhi, on 10th April 2026

SCOPE - DPE Comprehensive study on Performance, Competitiveness and Innovation in CPSEs

Central Public Sector Enterprises (CPSEs) have been at the forefront of India's economic development for decades but as India moves towards a developed economy, there is a need for CPSEs to align with international standards of strategies and governance.

In this regard, Department of Public Enterprises (DPE), Ministry of Finance, Government of India, has entrusted SCOPE to commission an evidence-based, comprehensive assessment of "Performance, Competitiveness and Innovation in Central Public Sector Enterprises (CPSEs)" with an aim to make informed decision-making on future strategy and direction. The study aims to evaluate and analyse various aspects of 38 Public Sector

Enterprises (PSEs) to understand what they are doing and how the strategic drivers can elevate their global standing going forward.

In this regard, Shri K. Moses Chalai, Secretary, DPE, held a review meeting on the progress of the study. The meeting was attended by Shri K.P. Mahadevaswamy, Chairman SCOPE, Shri Atul Sobti, DG, SCOPE and other senior officers from DPE and SCOPE.

During the meeting, presentation was made on the report structure, chapter wise coverage, selection of 38 PSEs for detailed analysis and also what aspects should be focused in the study. Secretary, DPE was also apprised of the various parameters of the

primary research which would entail engaging with PSEs for various data and information.

This Study is being hailed as a historic milestone, envisioned as both a futuristic roadmap and a "living repository" of the historical genesis of PSEs for generations to come. By blending retrospective insights with a focus on innovation and competitiveness document aims to suggest a sustainable path forward for PSEs. As the data collection phase kicks off, SCOPE has solicited the full cooperation of the 38 enterprises, emphasizing that their contribution is vital to crafting a document of lasting strategic significance for the nation.



Dr. K.P. Mahadevaswamy Chairman, SCOPE & CMD, NBCC; Shri Atul Sobti, DG SCOPE and senior officials from Deloitte and SCOPE met Shri K. Moses Chalai, Secretary DPE and senior officials of DPE, Ministry of Finance for review meeting on SCOPE-DPE study on 'Performance, Competitiveness and Innovation in CPSEs'

GLIMPSES OF DAKSH DIKSHAT SAMAROH - CONVOCATION CEREMONY OF DAKSH INAUGURAL BATCH HELD ON PUBLIC SECTOR DAY AT SCOPE CONVENTION CENTRE, NEW DELHI



SCOPE Convenes Leadership Session with world-renowned business advisor and bestselling author Prof. Dr. Ram Charan



(L-R) Shri Atul Sobti, Director General, SCOPE; Prof. Dr. Ram Charan, Business Advisor and Author; and Dr. K.P. Mahadevaswamy, Chairman, SCOPE, at the lecture on 'Leadership during Uncertain Times' organised as part of Public Sector Day

SCOPE organized lecture on 'Leadership in Uncertain Times' with Prof. Dr. Ram Charan, world-renowned business advisor and bestselling author on 11th April 2026 at SCOPE Convention Centre, New Delhi. The session organized as part of Public Sector Day celebrations was held in the presence of Shri K.P. Mahadevaswamy, Chairman, SCOPE & CMD, NBCC & Shri Atul Sobti DG, SCOPE. Drawing a diverse crowd of attendees, the session was participated by distinguished guests including Members, PESB; Senior Officials from various Ministries and Government Departments including DPE, SCOPE Executive

Board Members and CMDs, Directors of Public Sector. On the lines of a masterclass for leaders, the discourse by Prof. Dr. Ram Charan equipped leaders with the foresight needed to transform global economic shifts into long-term success.

Global leadership expert Prof. Dr. Ram Charan shared his blueprint for thriving in volatility and advised leaders to cultivate acumen for analyzing right questions during situations of uncertainty like who is driving the change? uncertainty, why the change uncertainty is being driven? and what is the pattern of the change/ uncertainty is.

He also interacted with the audience answering their questions on strengthening human resource identification, dealing with perceptions, creating adaptive leadership and the need for continuous learning.

Shri Atul Sobti DG, SCOPE welcoming Prof. Ram Charan said that it was a privilege to be joined by someone who has shaped the thinking of some of the most influential organizations and leaders across the world. He also added that this program was part of SCOPE's commitment to create future fluent leaders who possess the foresight to navigate a volatile global economy.

SCOPE presents employers' perspective at Samarasta (Harmony) Diwas

Shri Atul Sobti, DG, SCOPE was invited to participate in the "Samarasta (Harmony) Diwas," organized by the Akhil Bharatiya Adhivakta Parishad on 16th April 2026. He joined distinguished guests, including Hon'ble Mr. Justice Sanjay Karol and Hon'ble Mr. Justice (Retd.) N. Nagaresh in a program themed "Dr. B. R. Ambedkar: Architect of Indian Labour Laws," to celebrate the legacy of Babasaheb. The event also marked the release of a comprehensive four-volume series on the New Labour Codes by Advocate C. K. Saji Narayanan, which serves as a vital roadmap for the evolving industrial landscape. During the session, DG, SCOPE offered employer's perspective on the transition from 29 archaic, complex statutes into four streamlined Labour Codes. He highlighted that this historic consolidation is more than just

a simplification of paperwork; it is a move toward global competitiveness and industrial harmony. By aligning India's domestic framework with the International Labour Organisation's (ILO) fundamental principles, these reforms ensure that economic growth is coupled with equity, transparency, and robust social security for all.

Reflecting on the evolution of Indian industry, DG, SCOPE emphasized that Dr. B.R. Ambedkar remains the original architect of labour welfare. His vision, embedded in the Preamble and Directive Principles, continues to provide the bedrock for workers' dignity.



DG,SCOPE and other dignitaries during Samarasta Diwas- Dr B.R. Ambedkar Jayanti celebration,organised by the Akhil Bharatiya Adhivakta Parishad (Supreme Court Unit) in New Delhi

The new codes—covering Wages, Industrial Relations, Social Security, and OHS—mirror Babasaheb's core belief that the interests of employers and employees are not inherently opposed, but fundamentally interdependent, fostering an inclusive ecosystem where both can thrive in the modern world of work.

Fire Service Week 2026: SCOPE Strengthens Safety Culture at SCOPE Minar

In a dedicated push to enhance institutional safety, the Standing Conference of Public Enterprises (SCOPE) observed Fire Service Week from 14th April to 20th April 2026 at its premises at SCOPE Minar, Laxmi Nagar. This year's campaign, themed "Safe School, Safe Hospital & Fire Safety Aware Society - Together for Fire Prevention," focused on enhancing safety awareness and instilling a proactive culture of vigilance across the community.

The initiative reinforces SCOPE's commitment to maintaining



Personnel from the Delhi Fire Service and CISF with SCOPE Minar staff during a fire safety drill organised at SCOPE Minar, Laxmi Nagar, New Delhi, as part of Fire Service Week 2026, observed from 14th to 20th April 2026.

safe and vigilant infrastructure by extending rigorous safety protocols. Through bilingual outreach and targeted awareness programmes, the campaign

aimed to empower citizens and organisations alike to prioritise fire prevention, ensuring that the premises remain secure through collective responsibility.

SCOPE CONVENES LEADERSHIP SESSION WITH WORLD-RENOWNED BUSINESS ADVISOR BESTSELLING AUTHOR PROF. DR. RAM CHARAN



INTERFACE WITH STAKEHOLDERS



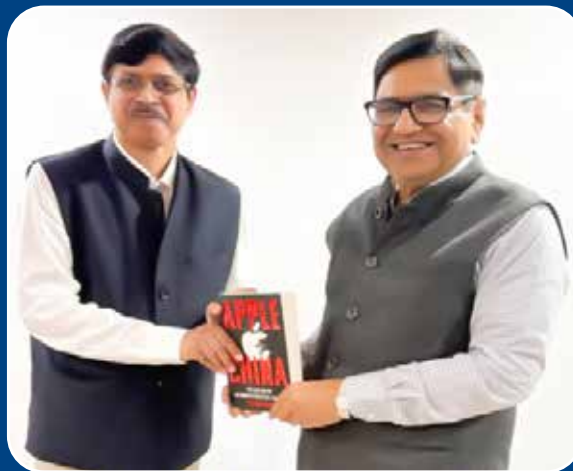
Shri Atul Sobti, DG, SCOPE; Dr. Alka Mittal, Member, CBC; Prof. Ranjeet Nambudri, Dean (Faculty), IIM Indore meeting with Prof. Himanshu Rai, Director IIM Indore during DAKSH Immersion program at IIM Indore



Shri Shantanu Roy CMD, BEML calls upon DG, SCOPE at SCOPE premises



DG, SCOPE called upon Justice T.S.Thakur, Former Chief Justice of India apprising him of SCOPE's endeavours



Dr. Ganesh Singh, Professor & Programme Director, New Age Courses, Centre for Management Education, AIMA called upon DG, SCOPE at SCOPE office

SCOPE in Media

COVERAGE REPORT

SCOPE organizes DAKSH Dikshant Samaroh on Public Sector Day

Date: 12.4.2026



SCOPE hosts DAKSH convocation on Public Sector Day:

The Standing Conference of Public Enterprises (SCOPE) organised the DAKSH Dikshant Samaroh, marking the convocation of its flagship leadership programme in collaboration with the Capacity Building Commission (CBC), Chief Guest. Air Tech highlighted the need for future ready leaders balancing innovation and resilience. Over 70 participants received certificates, while awards for Live Action Learning Projects were conferred. The event also marked the launch of Public Sector Day celebrations and SCOPE's journal Kaleidoscope, with participation from senior officials, academia, and industry partners.

FREE PRESS

Date: 13.04.2026

SCOPE organizes DAKSH Dikshant Samaroh on Public Sector Day



SCOPE organized DAKSH Dikshant Samaroh, convocation for the inaugural batch of its flagship senior leadership program with Capacity Building Commission (CBC), Govt. of India. Air Tech, former Cabinet Secretary and former Chairman, PESB alongside K. V. Mahalingam, Chairman, SCOPE & CMD, NBCC; Raju Joshi, Director General, SCOPE; Ashu Zambhoni, former Chairman, CBC; Mr. Anil Mehta, Member, CBC; Prof. Shashi Shankar, Director, IIM Ahmedabad, and Anil Khanna, Senior Partner, McKinsey & Company addressed the ceremony. Marking the beginning of month-long Public Sector Day celebrations, the event witnessed the Launch of Public Sector Day site and latest issue of SCOPE's journal KALEIDOSCOPE. Dignitaries from Ministries, Govt. Departments, senior officials from PSUs and Knowledge and Academic partners McKinsey & IIM Ahmedabad and family members of graduating participants. During the program, certificates were presented to more than 70 successful participants while Awards to winners of SCOPE's Live Action Learning Projects (LALP) were also conferred.

PSUWATCH

Date: 13th April 2026

SCOPE hosts DAKSH Dikshant Samaroh, kicks off Public Sector Day celebrations



SCOPE organized DAKSH Dikshant Samaroh, convocation for the inaugural batch of its flagship senior leadership program with Capacity Building Commission (CBC), Govt. of India. Air Tech, former Cabinet Secretary and former Chairman, PESB alongside K. V. Mahalingam, Chairman, SCOPE & CMD, NBCC; Raju Joshi, Director General, SCOPE; Ashu Zambhoni, former Chairman, CBC; Mr. Anil Mehta, Member, CBC; Prof. Shashi Shankar, Director, IIM Ahmedabad, and Anil Khanna, Senior Partner, McKinsey & Company addressed the ceremony. Marking the beginning of month-long Public Sector Day celebrations, the event witnessed the Launch of Public Sector Day site and latest issue of SCOPE's journal KALEIDOSCOPE. Dignitaries from Ministries, Govt. Departments, senior officials from PSUs and Knowledge and Academic partners McKinsey & IIM Ahmedabad and family members of graduating participants. During the program, certificates were presented to more than 70 successful participants while Awards to winners of SCOPE's Live Action Learning Projects (LALP) were also conferred.

THE TIMES OF INDIA

SCOPE's leadership session

SCOPE organised a lecture and interaction on 'Leadership in Uncertain Times' with Prof. Dr. Ravi Charan, world renowned business advisor and bestselling author in the presence of KP Mahadovaswamy, Chairman, SCOPE & CMD.



NBCC & Atul Sobti DG, SCOPE. The session organised as part of Public Sector Day celebrations was attended by distinguished guests including Members, PESB, Senior

Officials from various Ministries and Government Departments including DPE, SCOPE Executive Board Members and CMDs, Directors of Public Sector. The session addressed the complexities of the modern economy for leaders and empowered participants with insights on leveraging uncertainty as a catalyst for institutional growth and success.

समय जगत

Date: 12th April 2026

हिन्दी मित्रता

स्कोप ने किया दीक्षांत समारोह का आयोजन

SCOPE organized DAKSH Dikshant Samaroh, convocation for the inaugural batch of its flagship senior leadership program with Capacity Building Commission (CBC), Govt. of India. Air Tech, former Cabinet Secretary and former Chairman, PESB alongside K. V. Mahalingam, Chairman, SCOPE & CMD, NBCC; Raju Joshi, Director General, SCOPE; Ashu Zambhoni, former Chairman, CBC; Mr. Anil Mehta, Member, CBC; Prof. Shashi Shankar, Director, IIM Ahmedabad, and Anil Khanna, Senior Partner, McKinsey & Company addressed the ceremony. Marking the beginning of month-long Public Sector Day celebrations, the event witnessed the Launch of Public Sector Day site and latest issue of SCOPE's journal KALEIDOSCOPE. Dignitaries from Ministries, Govt. Departments, senior officials from PSUs and Knowledge and Academic partners McKinsey & IIM Ahmedabad and family members of graduating participants. During the program, certificates were presented to more than 70 successful participants while Awards to winners of SCOPE's Live Action Learning Projects (LALP) were also conferred.

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IM Indian Masterminds

Date: 13 April 2026

SCOPE Hosts DAKSH Dikshant Samaroh for First Senior Leadership Batch, Marks Public Sector Day Celebrations

SCOPE marks convocation graduation of 70+ students under CEO programme in collaboration with Capacity Building Commission, marking an milestone public sector leadership for first batch.



SCOPE organized DAKSH Dikshant Samaroh, convocation for the inaugural batch of its flagship senior leadership program with Capacity Building Commission (CBC), Govt. of India. Air Tech, former Cabinet Secretary and former Chairman, PESB alongside K. V. Mahalingam, Chairman, SCOPE & CMD, NBCC; Raju Joshi, Director General, SCOPE; Ashu Zambhoni, former Chairman, CBC; Mr. Anil Mehta, Member, CBC; Prof. Shashi Shankar, Director, IIM Ahmedabad, and Anil Khanna, Senior Partner, McKinsey & Company addressed the ceremony. Marking the beginning of month-long Public Sector Day celebrations, the event witnessed the Launch of Public Sector Day site and latest issue of SCOPE's journal KALEIDOSCOPE. Dignitaries from Ministries, Govt. Departments, senior officials from PSUs and Knowledge and Academic partners McKinsey & IIM Ahmedabad and family members of graduating participants. During the program, certificates were presented to more than 70 successful participants while Awards to winners of SCOPE's Live Action Learning Projects (LALP) were also conferred.

SCOPE - ICF, USA launch unique study for Coaching framework for Indian PSEs



SCOPE and International Coaching Federation (ICF), USA launched first of its kind comprehensive study on "State of Coaching in Indian PSEs" to understand the current coaching landscape and organizational culture. It aims to develop a unique framework for the Indian Public Sector to integrate coaching and develop internal coaching capabilities within PSEs. The study will follow both primary and secondary data collection techniques to lead to an evidence-based strategic framework for coaching. Leveraging the collective expertise of SCOPE, the apex body of PSEs and ICF, the world's leading association for the advancement of coaching performance, this evidence-based study aims to redefine leadership excellence in Indian PSEs, with focus on building internal coaching capabilities and specialized tools. A landmark step in SCOPE's commitment to organizational excellence, this study focuses on quantifying the tangible impact of coaching while ensuring that leadership growth is directly linked to sustainable business results.



Date: 12th April 2026

The SCOPE-ICF partnership has been instrumental in developing transformative leadership, said K.P. Mahalingam



SCOPE organized DAKSH Dikshant Samaroh, convocation for the inaugural batch of its flagship senior leadership program with Capacity Building Commission (CBC), Govt. of India. Air Tech, former Cabinet Secretary and former Chairman, PESB alongside K. V. Mahalingam, Chairman, SCOPE & CMD, NBCC; Raju Joshi, Director General, SCOPE; Ashu Zambhoni, former Chairman, CBC; Mr. Anil Mehta, Member, CBC; Prof. Shashi Shankar, Director, IIM Ahmedabad, and Anil Khanna, Senior Partner, McKinsey & Company addressed the ceremony. Marking the beginning of month-long Public Sector Day celebrations, the event witnessed the Launch of Public Sector Day site and latest issue of SCOPE's journal KALEIDOSCOPE. Dignitaries from Ministries, Govt. Departments, senior officials from PSUs and Knowledge and Academic partners McKinsey & IIM Ahmedabad and family members of graduating participants. During the program, certificates were presented to more than 70 successful participants while Awards to winners of SCOPE's Live Action Learning Projects (LALP) were also conferred.

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PSUWATCH

Date: 13th April 2026

SCOPE, CBC launch DAKSH 2.1 classroom immersion programme at IIM Indore

SCOPE and Capacity Building Commission (CBC) launched DAKSH 2.1 classroom immersion programme at IIM Indore.



SCOPE organized DAKSH Dikshant Samaroh, convocation for the inaugural batch of its flagship senior leadership program with Capacity Building Commission (CBC), Govt. of India. Air Tech, former Cabinet Secretary and former Chairman, PESB alongside K. V. Mahalingam, Chairman, SCOPE & CMD, NBCC; Raju Joshi, Director General, SCOPE; Ashu Zambhoni, former Chairman, CBC; Mr. Anil Mehta, Member, CBC; Prof. Shashi Shankar, Director, IIM Ahmedabad, and Anil Khanna, Senior Partner, McKinsey & Company addressed the ceremony. Marking the beginning of month-long Public Sector Day celebrations, the event witnessed the Launch of Public Sector Day site and latest issue of SCOPE's journal KALEIDOSCOPE. Dignitaries from Ministries, Govt. Departments, senior officials from PSUs and Knowledge and Academic partners McKinsey & IIM Ahmedabad and family members of graduating participants. During the program, certificates were presented to more than 70 successful participants while Awards to winners of SCOPE's Live Action Learning Projects (LALP) were also conferred.



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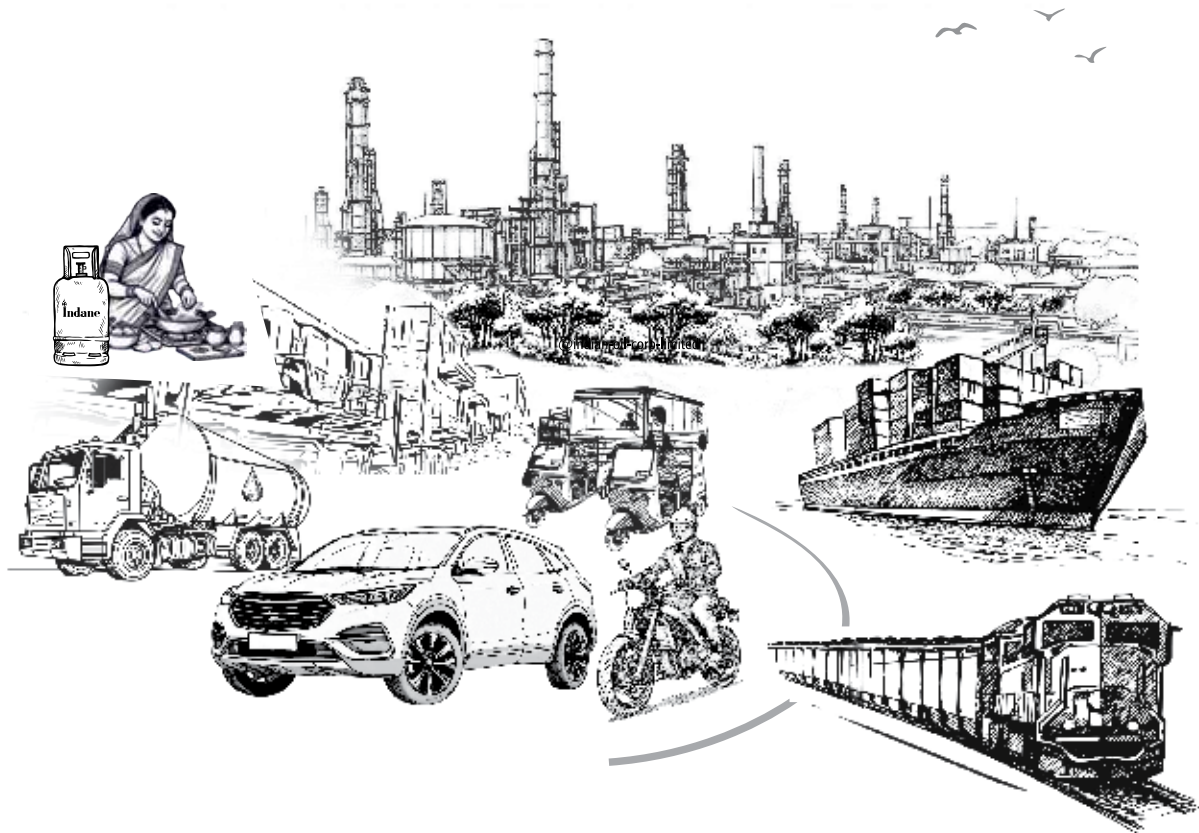
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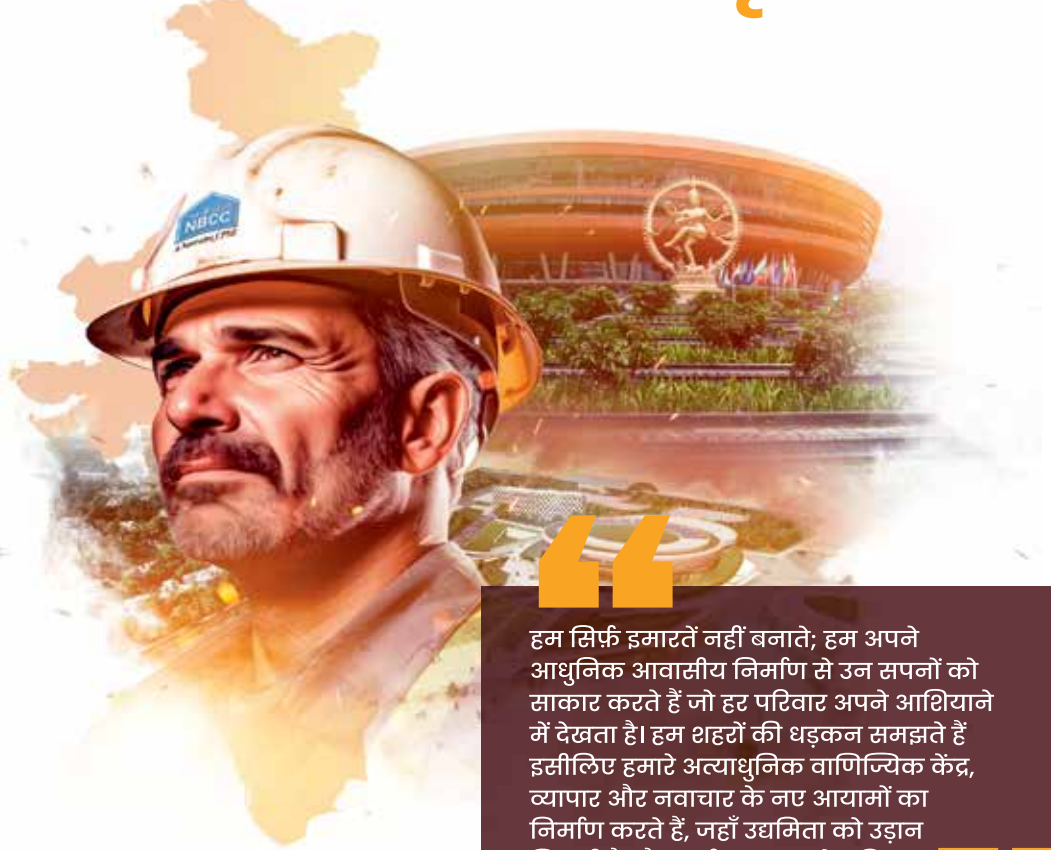
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हम सिर्फ़ इमारतें नहीं बनाते; हम अपने आधुनिक आवासीय निर्माण से उन सपनों को साकार करते हैं जो हर परिवार अपने आशियाने में देखता है। हम शहरों की धड़कन समझते हैं इसलिए हमारे अत्याधुनिक वाणिज्यिक केंद्र, व्यापार और नवाचार के नए आयामों का निर्माण करते हैं, जहाँ उद्यमिता को उड़ान मिलती है और अर्थव्यवस्था को गति।

देश की प्रगति की रफ्तार को बनाए रखने के लिए,
हम रणनीतिक बुनियादी ढाँचा तैयार करते हैं।
हम हर निर्माण में देश की मजबूत धमनियों का सृजन करते हैं,
जो विकास को हर कोने तक पहुँचाती हैं।

हम हैं एन बी सी सी इंडिया

एनबीसीसी (इंडिया) लिमिटेड

(भारत सरकार का उद्यम)

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