Konkan LNG Limited-Dabhol
a Wholley owned subsidiary of Gail (India) limited

Recommissioning and Modernisation of Legacy LNG Infrastructure at Dabhol Terminal

Genesis : Konkan LNG Limited

Enron Corporation , USA entered India in 1992 and initiated development of the Dabhol Power Project in Maharashtra.

ENRON ⇨ Dabhol Power Company (2015 MW Power + 5 MMTPA LNG) ⇨ RGPPL ⇨ कोंकण एलएनजी लिमिटेड Konkan LNG Limited (गेल (इंडिया) लिमिटेड की सहायक कंपनी) (Subsidiary of GAIL (India) Limited) (5 MMTPA LNG - Nameplate Capacity)

Konkan LNG Limited becomes a Wholley owned subsidiary of Gail (India) limited wef 06.07.2026

Dabhol was conceived not merely as a power plant, but as an integrated import-fuel-to-power project, with LNG planned as the long-term fuel source.

Genesis : Konkan LNG Limited

Dabhol Power Project in Maharashtra has been suspended due to bankruptcy of Enron in year 2001.

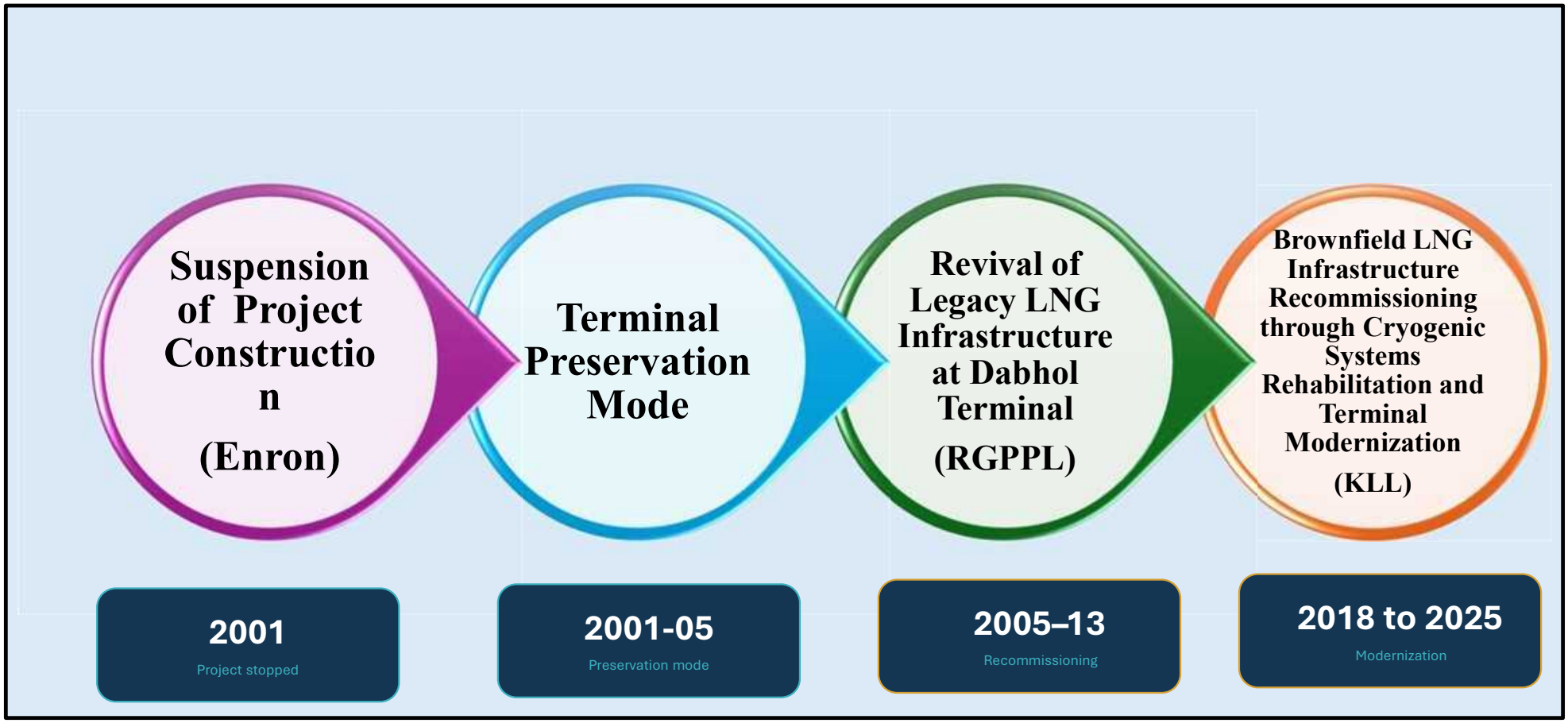
Major Controversies and Shutdown

Cost Disputes: World Bank questioned the economic viability of the project, noting that the electricity generated would be extremely expensive compared to local sources.

Political & Environmental Backlash: The project faced intense protests over land acquisition, high tariffs.

Collapse: Payment disputes with MSEB

PHASES OF KLL EVOLUTION



KLL Transformation Journey

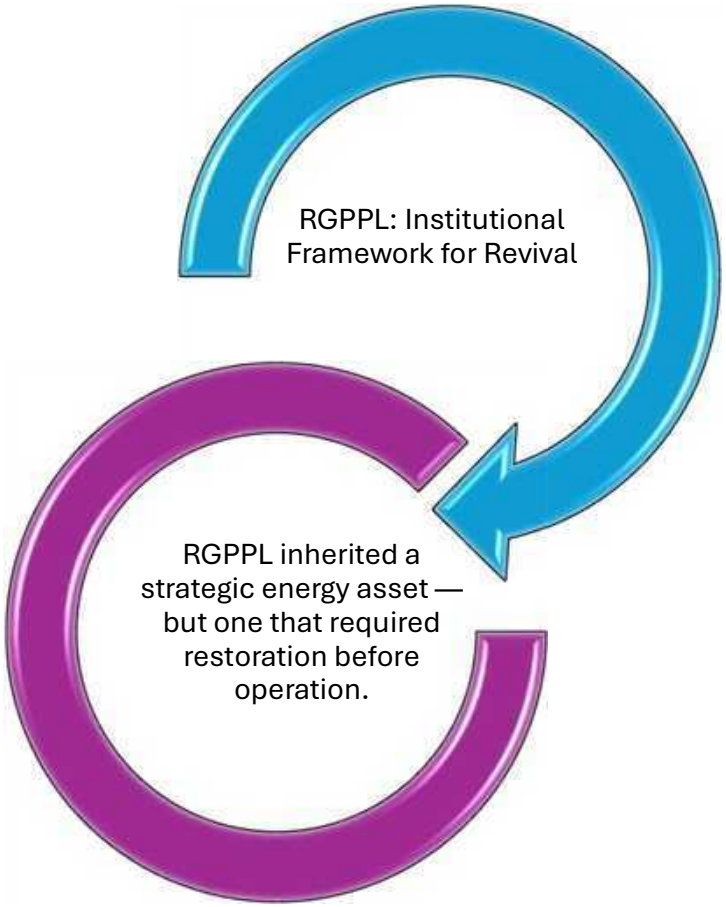
1. Major Historical Challenges
2. Revival of Aging Brownfield Infrastructure
3. Tank-200 Commissioning
4. Power Crisis & Business Continuity
5. Cryogenic Systems Preservation through Zero Send-Out Philosophy
6. Flare Reduction & Energy Efficiency Program - Hired BBC
7. Absence of Breakwater & Monsoon Shutdown Challenge
8. Cyclone Tauktae: Infrastructure Resilience Test
9. Overcoming RGPPL Heating System Dependencies
10. Terminal Modernization Program
11. Installation of Truck Loading Facility (TLF)
12. Major Turnarounds, Maintenance & Overhauls

2001–2005 Preservation of the Legacy Asset

A Long-Preserved, Non-Operational Facility

- Following the stoppage, the project entered a preservation phase rather than commercial operation.
- During this period, the project remained an incomplete legacy asset, awaiting a viable institutional and commercial mechanism for revival.

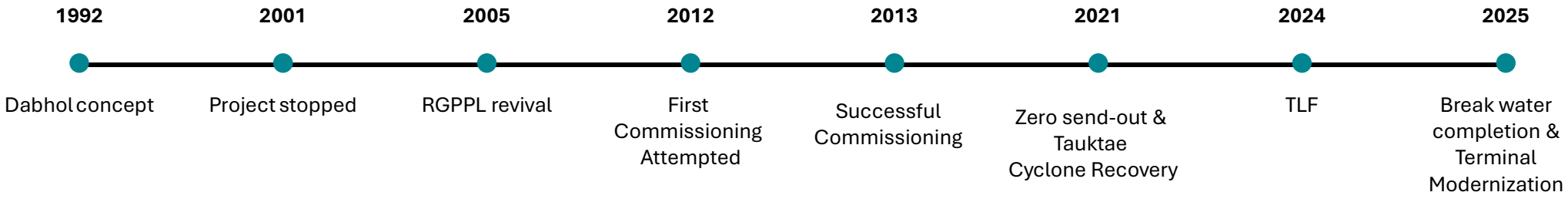
July–October 2005 | RGPPL Revival



- **RGPPL was formed on 8 July 2005** by NTPC, GAIL, various Indian financial institutions and MSEB Holding as part of the revival and restructuring of Dabhol assets.
- On **6 October 2005**, RGPPL took over the assets of Dabhol Power Company through the **Bombay High Court consent route**.
- RGPPL's inherited assets comprised a **1,967 MW combined-cycle power station and an integrated 5 MMTPA LNG regasification terminal** at Anjanwel.

TRANSFORMATION JOURNEY

From project disruption to brownfield revival and modernization



- The transformation is a combination of institutional transition, preservation, engineering rehabilitation, commissioning learning and continuous modernization.

2005–2013 | BROWNFIELD RESTORATION & RECOMMISSIONING

Five-stage system engineering approach

1

ASSESS

Establish actual condition and identify incomplete works.

2

RESTORE

Rehabilitate LNG, marine, process and utility infrastructure and Restore.

3

REVALIDATE

Re-establish Jetty Infra , electrical, instrumentation and control integrity.

4

INTEGRATE

Integrate unloading, storage, BOG, regasification, send-out, electrical and safety systems.

5

RECOMMISSION

Mech /Ele/Inst /IT

Static / Dynamic

ESD/F&G (Safety)

Operation

WHAT HAD TO BE RESTORED?

The entire LNG value chain

1.8 km
Jetty

4
Unloading arms

0.3 × 8 KM
Marine Channel

3 × 160 km³
Double Wall Storage tanks

2 × 32"
Ring main Transfer lines

- Process: LNG pumps, BOG compressors, recondenser, LP/HP boosters and vaporizers.
- Marine Navigational Channel.
- Utilities: electrical, nitrogen, instrument air, fire water and flare.
- Control & safety: DCS, ESD, Fire & Gas, interlocks and ship–shore interface.

2012 | CHALLENGE BEFORE FIRST CARGO : MARINE ACCESS & DREDGING

- **Challenge**
  - The Available channel depth was not sufficient for bringing LNG vessel.
  - This became one of the key marine constraints on commissioning.

- **Corrective Action**
  - Capital dredging was ultimately awarded in July 2011.
  - Dredging subsequently achieved the required approximately 14.5 m channel draft.

MARCH 2012 | FIRST LNG COMMISSIONING CARGO

The first full-scale test exposed latent weaknesses before commercial operation

~138,000 m^3
Cargo size

5–10%
Initially discharged

- Cargo arrived on LNG carrier Excelerate in March 2012.
- Sourced from Statoil's Snohvit LNG facility in Norway.
- Unloading tested the ship–shore interface, jetty, unloading arms, cryogenic systems and terminal controls.
- Operations were interrupted after only around 5–10% discharge, enabling corrective work before final commissioning.

YEAR 2012 | FOUR CRITICAL COMMISSIONING CHALLENGES

Marine / Fender

>50% fender compression; damage at 3 of 4 breasting dolphins.

Response: Replacement and re-berthing

Unloading Arms

Bearing loss and ineffective seals on identified equipment.

Response: Repairs and replacement

ESD / Inst / Mech / Ele

Stuck ESD diaphragm and jetty UPS failure.

Response: Rectification before continuation

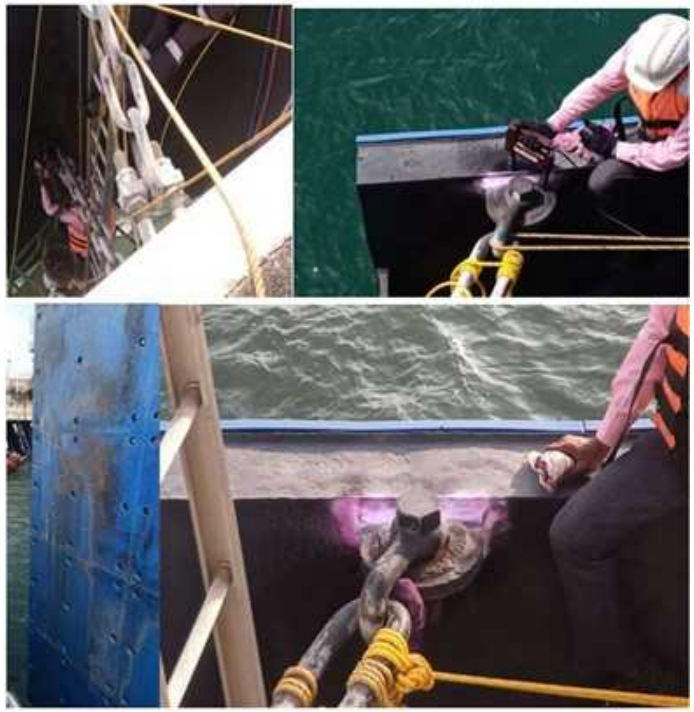
Ring Main Bellows

Bellow Failure due prolonged un usage

Response: Repair & Change in operational philosophy

2012 | CHALLENGE 1: MARINE / FENDER FAILURE

- The terminal's breakwater was not yet complete, leaving the LNG carrier exposed to open-sea swell and wind.
- The vessel experienced significant vertical and horizontal movement while alongside the jetty.
- Fender compression exceeded 50%, and fenders at three of the four breasting dolphins were damaged.
- Original Bridgestone replacements could not be supplied within the required timeframe.
- Equivalent fenders were **diverted to Dabhol on war foot basis within couple of days**
- Replacement fenders were installed and the vessel was subsequently re-berthed.



2012 | CHALLENGE 2: UNLOADING ARM INTEGRITY

- During functional checks of the LNG unloading arms:
  - Loss of structural ball bearings was observed from one inboard unloading arm.
  - Not all arm seals were functioning at 100% effectiveness.
  - Continued unloading was therefore discontinued to permit comprehensive repairs.

- The first cargo was used to identify latent weaknesses before full commercial operation.

2012 | CHALLENGE 3: ESD & ELECTRICAL RELIABILITY

- **ESD Issue**
  - An ESD valve diaphragm became stuck, rendering the ESD system inoperable during the operation.
  - The issue was identified and rectified before proceeding.

2012 | CHALLENGE 4: RING MAIN BELLOWS REPAIR & Op.Ph CHANGE

Cooling was terminated midway, resulting in uneven temperature distribution with LNG liquid in the lower section and vapour in the upper section of the ring main.

Thermal stresses caused damage to 6 ring main bellows which required replacement and restoration.

During initial terminal commissioning in year 2012, failure of a bellows interrupted LNG ring main cooling and unloading operations and as per the expert opinion the ring mail operating philosophy has changed.

March 2012 - Bellows Failure → Cooling Interrupted Uneven Cooling → 6 Bellows Damaged → Replacement & Restoration → Jan 2013 Recommissioned

Key Achievement
- Successfully replaced all 6 damaged bellows
- Restored integrity of LNG ring main system

Benefits
- Reliable LNG unloading operations
- Safe cooldown and commissioning
- Improved operational readiness

DEC 2012- JAN 2013 | SECOND COMMISSIONING ATTEMPT

- **GAIL arranged a second commissioning LNG cargo from Gazprom, Russia, scheduled for 28 December 2012.**

Before the second attempt:

- **Fenders were replaced**
- **New bellows were installed**
- **Identified equipment repairs were completed**
- **Further commissioning checks were undertaken**

JANUARY 2013 | SUCCESSFUL COMMISSIONING

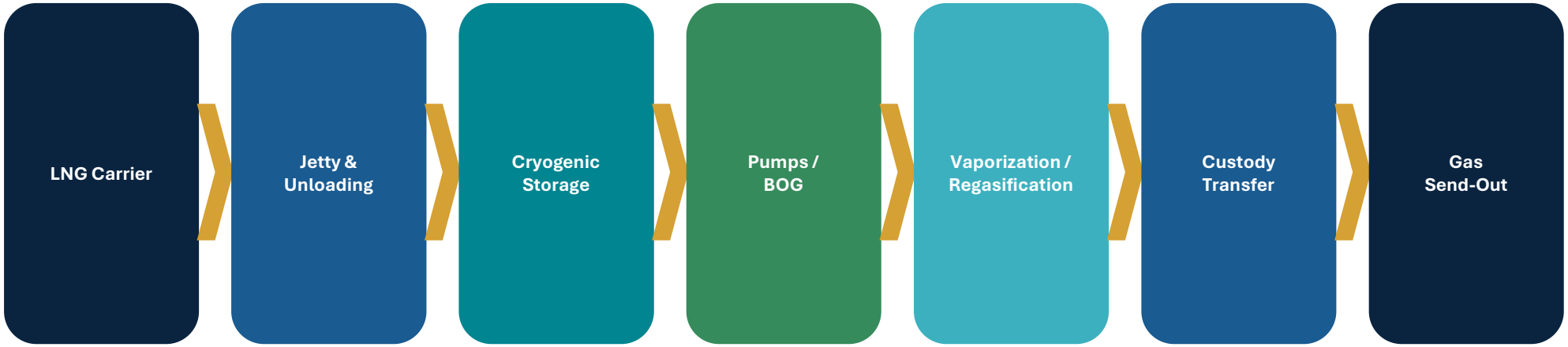
The terminal moved to full LNG receiving and regasification capability

5 MMTPA	3 × 160k m^3	2013
Terminal capacity	Storage	Commissioned

- The chain included LNG import, cryogenic storage, BOG handling, LNG pumping, vaporisation and gas send-out.
- Progressive system-wise completion supported testing, protection validation, drying/inerting and cooldown.
- The source records successful commissioning after rehabilitation, marine/terminal health assessment and modifications.

LNG TERMINAL OPERATING CHAIN

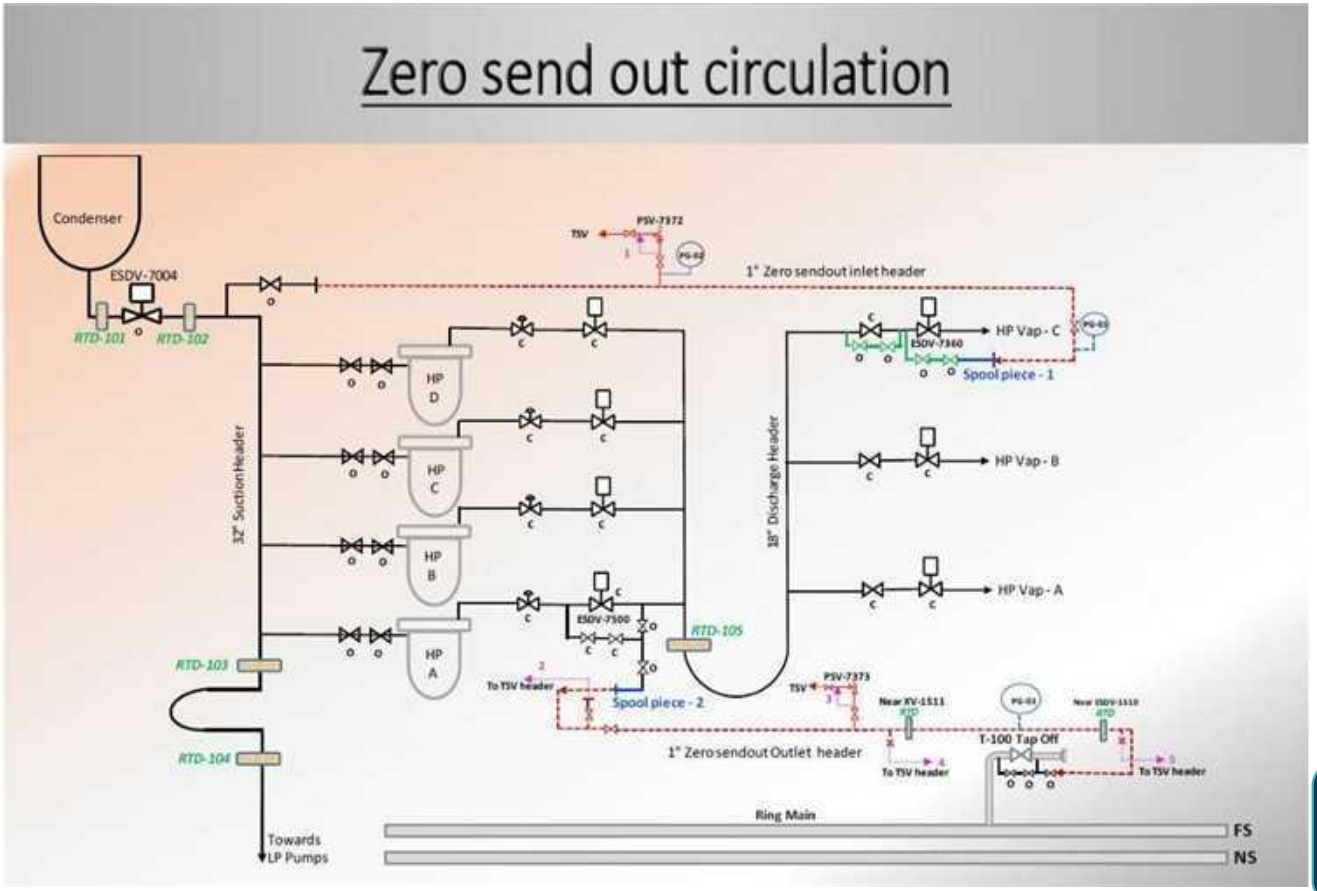
Simplified management-level view of the restored value chain



• The source process flow diagram includes LNG shipping, three LNG tanks, BOG compressors, booster compressors, recondenser, vaporizers, custody transfer and return lines.

2021 | ZERO SEND-OUT SCHEME
AFTER MONSOON PLANT OPERATIONAL CHALLENGE

Engineering solution to preserve cryogenic conditions during monsoon shutdowns



- **Without a breakwater, LNG vessels could not safely berth during monsoon and the terminal was decommissioned.**
- **Annual cool-down / warm-up cycles created thermal fatigue and safety concerns.**
- **Zero Send-Out maintains cryogenic conditions during shutdown periods.**

Problem : Repeated shutdowns caused thermal fatigue and safety concerns.

Solution : Implemented **Zero Send-Out (ZSO)** to maintain cryogenic conditions during shutdowns

Benefit: Improved asset integrity, enhanced safety, and enabled faster restart

2021
Scheme introduced

1" LNG line
Circulation path

YEAR 2019-20 | BOG BOOSTER COMPRESSOR
MONSOON PLANT OPERATIONAL CHALLENGE
BOIL-OFF GAS (BOG) RECOVERY & FLARE REDUCTION

Challenge

- LNG storage tanks generate approximately **0.4 MMSCM / day of Boil-Off Gas (BOG)**.
- Prior to installation of the **BOG Booster Compressor (BBC)**, the entire BOG generated during **monsoon operations** was routed to the flare system.
- This resulted in **product loss, increased flaring, and higher emissions**.

Interim Measure

- A **BOG Compressor Package** was deployed to recover and utilize BOG, reducing dependence on flaring.

Permanent Solution

- Installation and commissioning of a **Permanent BOG Compressor (BOGC)** system.
- Enabled effective recovery, compression, and reuse of BOG within the process system.

2021 | POWER CRISIS & INDEPENDENT POWER CONNECTION

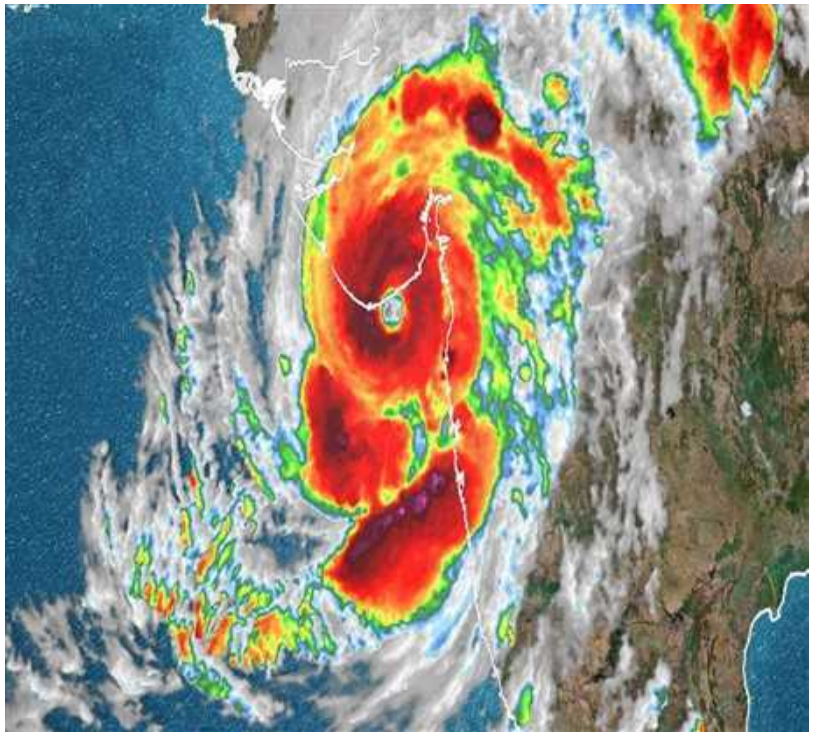
Business continuity required an alternative electrical supply pathway

22 Jul 2021
Application to MSEDCL

8 MW
Sanctioned Load

- RGPPL informed KLL reg. stoppage of power supply in July 2021.
- Challenges to secure separate power connection.
- KLL pursued continuous follow-up to secure a power connection of 8 MW.
- **Interim power arrangement with Rental DEG set up & same was started immediately after power disconnection from RGPPL.**

MAY 2021 | CYCLONE TAUKTAE: INFRASTRUCTURE RESILIENCE TEST



34 m/s
Max wind speed

80 m
Jetty grating

- Cyclone impacted the Dabhol coast during 15–17 May 2021.

- The event tested brownfield infrastructure resilience and repair capability.

YEAR 2023 | HEAT CRISIS DUE TO RGPPL POWER BLOCK STOPPAGE

Year 2023

Partial Heat duty stopped

205 MW heatduty

Reduced to

30 MW heatduty

SITUATION
- RGPPL Power Block stoppage in 2023
- Loss of major heat sink
- Increased heat accumulation across terminal systems

MITIGATION
- Optimized LNG send-out
- Maximized BOG compressors
- Enhanced pressure & temperature monitoring
- Close coordination with RGPPL

KEY CHALLENGES
- Higher BOG generation
- Limited gas consumption avenues
- Risk of flaring and product losses
- Safe operation during outage

OUTCOME
- ✓ Safe operations maintained
- ✓ Controlled BOG management
- ✓ Minimized LNG losses
- ✓ No major safety incidents

RGPPL Outage → Increased BOG → Mitigation Measures → Stable Operations

KEY LEARNING

The event highlighted the importance of integrated LNG utilization infrastructure and robust BOG recovery systems for sustaining terminal operations during prolonged power block outages.

SUCCESSFUL REVIVAL & COMMISSIONING OF LNG STORAGE TANK T-200

Revival Initiative

With breakwater construction commencing in 2020, KLL initiated recommissioning activities with expert teams

Successful Outcome

After complete repair and restoration, Tank T-200 was successfully commissioned in 2021 and continues to support terminal operations.

Expert Advice & Rehabilitation → **Commissioned 2021** → **Operating Successfully Till Date**

Key Benefits

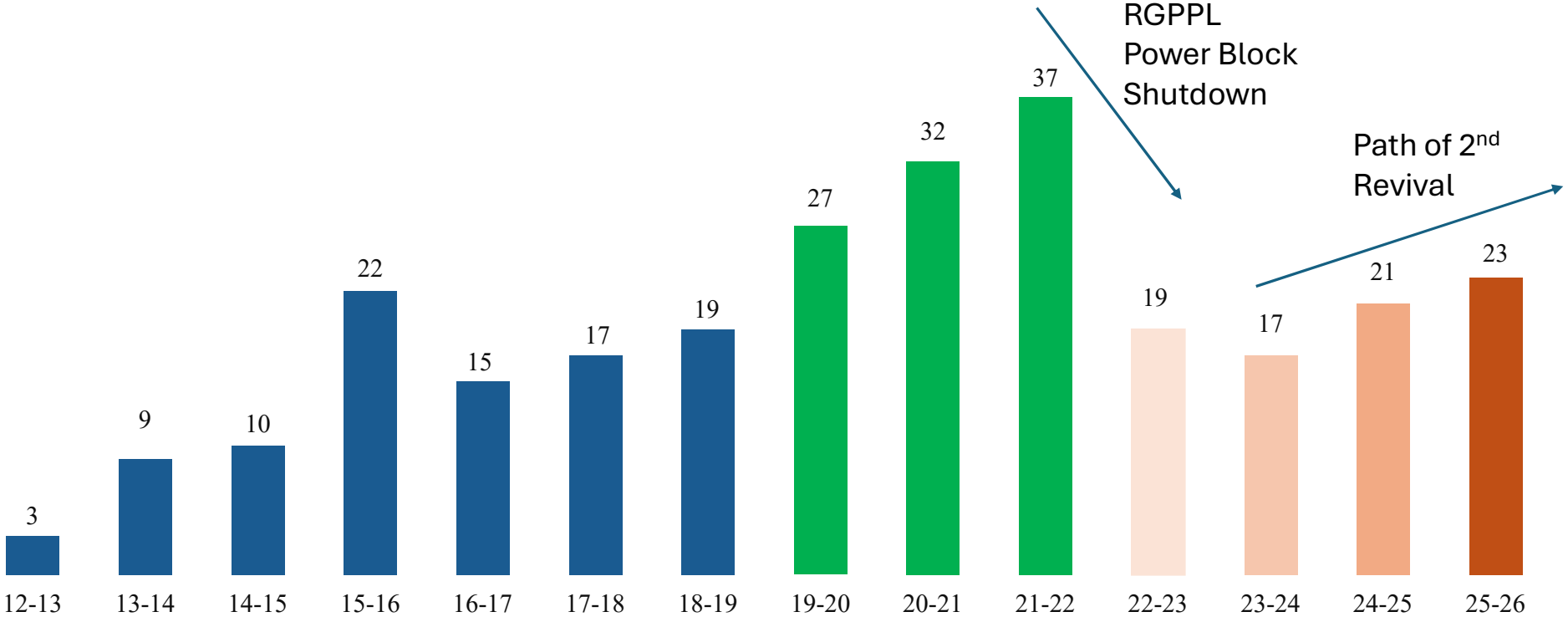
- Restored full 3-tank storage capability
- Improved operational flexibility
- Enhanced LNG inventory management
- Increased terminal reliability and redundancy

A major asset revival milestone that strengthened KLL's LNG storage infrastructure and long-term operational reliability.

YEAR-WISE LNG CARGOES UNLOADED

FY2012-13 to FY2025-26

Number of LNG cargoes unloaded

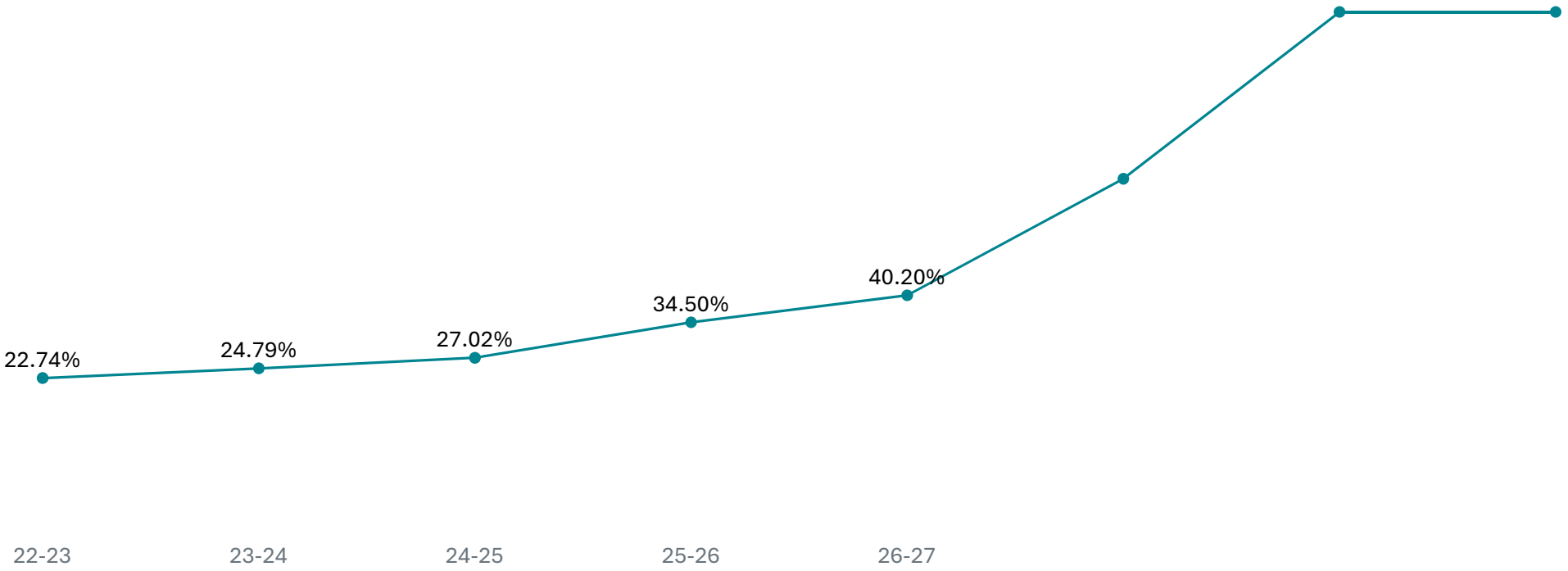


- Peak in the supplied series: 37 cargoes in FY2021-22.
- Cargo count increased from 3 in FY2012-13 to 23 in FY2025-26.

CAPACITY UTILIZATION TRAJECTORY

Actual performance through FY2025-26; projected thereafter

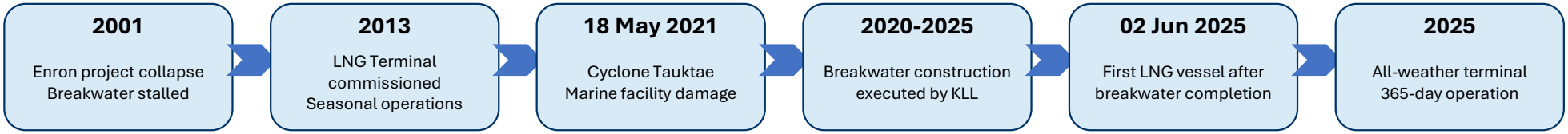
Capacity utilization



- Actual: FY2022-23 to FY2025-26; projected: FY2026-27 onward.
- 100% utilization at 5 MMTPA in FY2028-29 and 100% at 6.3 MMTPA in FY2029-30 (Projected).

Terminal Modernization & Major Milestones in Recent Past

KLL DABHOL BREAKWATER JOURNEY (2001-2025)



Major Challenges

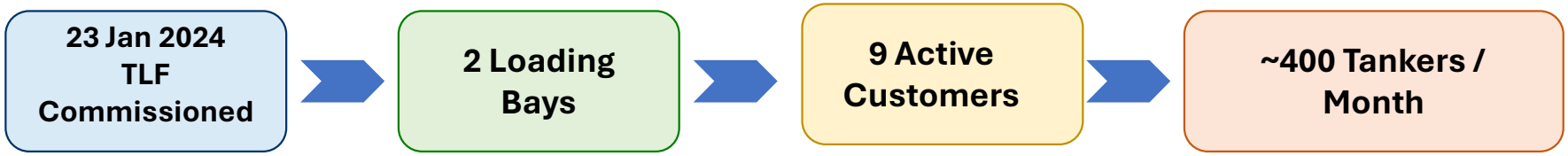
- Funding & ownership transitions
- Monsoon operational restrictions
- Cyclone Tauktae damage (2021)
- Harsh Arabian Sea conditions
- Complex marine construction
- Acropode issues with Local
- Covid -19

Key Benefits

- Year-round LNG operations
- Improved vessel safety
- Better terminal utilization
- Enhanced energy security
- Platform for future expansion

2.3 km Island Rubble Mound Breakwater | >15,500 ACCROPODE units | All-Weather LNG Gateway

KLL TRUCK LOADING FACILITY (TLF) - COMMISSIONING & GROWTH



Key Achievements

- LNG distribution beyond pipeline network
- Reliable supply to industrial customers
- Expansion of LNG market reach
- Increased terminal utilization
- Cleaner fuel adoption

Business Impact

- Commercial operations since Jan 2024
- Growing customer base
- Flexible LNG transportation
- Strengthened KLL market presence
- Supports future LNG demand growth

Additional Two bays project is Under Progress

Expanding LNG Reach Beyond Pipelines

HEATING SYSTEM (AAHS) PROJECT

- 5 Heater Trains
- Capacity support up to 6.3 MMTPA
- 60% construction completed
- Independent heating source for KLL
- Improved reliability and flexibility

Key Benefits

- Supports terminal expansion
- Enhances operational sustainability
- Strengthens LNG send-out reliability

KLL 60 MW POWER PROJECT (MSETCL GRID CONNECTION)

PROJECT OVERVIEW
- KLL has secured a 60 MW power connection from MSETCL
- Strategic infrastructure for long-term terminal expansion

MSETCL Grid Connection → 60 MW Power Availability → Terminal Expansion Support → Enhanced Reliability

KEY BENEFITS
- Dedicated power source
- Improved operational reliability
- Supports future infrastructure projects
- Reduced dependency on external arrangements

STRATEGIC IMPACT
- Enables expansion projects
- Supports increased regasification capacity
- Strengthens long-term energy security
- Enhances business continuity

60 MW MSETCL Power Connection: A Key Enabler for KLL Future Expansion and Growth

KLL TERMINAL EXPANSION PROGRAM

Strengthening KLL for Future LNG & Ethane Growth

Phase-I Expansion

Capacity Increase: 5.0 MMTPA → 6.3 MMTPA

- Debottlenecking of existing terminal

Phase-II Expansion

Further Capacity Expansion

- Major infrastructure augmentation
- Supports future market demand

Expansion Roadmap

Current Capacity 5 MMTPA → **Phase-I 6.3 MMTPA** → **Phase-II** → **Future Energy Hub**

Transforming KLL into a Next-Generation LNG & Other Hydrocarbons Import Terminal

MAJOR ACTIVITIES/ACHIEVEMENTS IN LAST TWO YEARS

- Completion of breakwater and achievement of all-weather port status.
- Handling of 7 cargoes during monsoon season
- Approval for 60 MW Extra High Voltage (EHV) power connection from MSETCL
- Overhauling of BOG compressor and associated motor
- Overhauling of jetty firewater pumps
- Procurement of articulated arm assemblies of LNG unloading arms and upgradation of control system
- Upgradation of various obsolete eqpt: tank gauging system of tank-200 & DAS of all 3 nos. lng storage tanks, ship to shore communication system, weather monitoring system, ESD Plc system at jetty etc
- Green energy initiative: installation of 195 kwp roof top solar system has been installed

KEY TAKEAWAYS | WHAT THE DABHOL JOURNEY DEMONSTRATES

Brownfield revival

A preserved legacy asset can be restored through disciplined assessment, rehabilitation, revalidation and staged commissioning.

Commissioning as learning

The 2012 first cargo converted hidden weaknesses into actionable engineering improvements.

Cryogenic preservation

Zero send-out reduced repeated thermal cycling during unavoidable monsoon shutdowns.

Resilience & continuity

Cyclone recovery, power-supply work and marine upgrades strengthened continuity.

Modernization beyond restart

TLF, equipment overhauls, control upgrades and solar extend the value of the revived asset.

Scale-up pathway

The source projects progression toward 5 MMTPA to 6.3 MMTPA.

SAFETY & OPERATIONAL EXCELLENCE

Recognition supports the safety narrative of the modernization journey

- Silver Trophy – Shreshtha Suraksha Puraskar, hosted by the National Safety Council.
- International Safety Award by the British Safety Council.
- The source attributes the recognition to safety, teamwork and operational excellence.

THANK YOU