

CEEAMA *Live Wire* E-NEWSLETTER

Published by Consulting Electrical Engineers Association of Maharashtra



Topic for September 2026
PROCUREMENT

Turn the Pages... Then Take the Challenge! Explore this month's theme and check your knowledge skills by solving the quiz inside.

CEEAMA is gearing up for

 **CEEAMATECH**
2026

Saturday 24th October 2026, The Fern, Lonavala

Details for Delegate Registration
given inside

Electrical Consultants Newsletter
Volume No. 4 Issue #63
September 2026

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Chief Editor - CEEAMA LIVEWIRE

From the Editors Desk,

In engineering and infrastructure projects, procurement is often viewed as a support function. It is one of the most critical determinants of project success. The right procurement strategy can accelerate schedules, optimize costs, ensure quality, and significantly reduce project risks.

Today's project environment is characterized by supply chain uncertainties, long manufacturing lead times, fluctuating commodity prices, and increasing sustainability expectations. Consequently, procurement has evolved from simple purchasing to a strategic discipline that influences every stage of a project's lifecycle.

For electrical and industrial projects, timely procurement of long-lead equipment such as transformers, switchgear, motors, UPS systems, drives, and automation packages is essential. Delays in these critical items can affect engineering completion, construction activities, commissioning schedules, and ultimately project delivery. Digital technologies are further transforming procurement practices. Data analytics, AI-driven forecasting, supplier performance monitoring, and integrated digital platforms enabling better decision-making, improved transparency, and enhanced supply chain resilience. Simultaneously, organizations are increasingly evaluating suppliers not only on cost and delivery, but also on sustainability, energy efficiency, ethical sourcing, and ESG compliance.

The future belongs to organizations that build strong supplier partnerships, proactively manage risks, and integrate procurement planning from the earliest stages of project development. Procurement is no longer measured by the price negotiated on a purchase order; it is measured by the value delivered throughout the project lifecycle.

As consulting engineers and project professionals, we must continue to promote procurement excellence as a key pillar of successful project execution. By combining technical expertise with strategic procurement practices, we can deliver projects that are efficient, resilient, sustainable, and future-ready.

"Procurement is not about buying equipment; it is about enabling project success through value, reliability, and foresight."



Subhash L. Bahulekar
Chief Editor – CEEAMA



CEEAMA *LiveWire*

About the publication

The Consulting Electrical Engineers Association of Maharashtra (CEEAMA) is a professional organisation that brings together consulting electrical engineers, manufacturers, industry experts, and allied professionals on a common platform to exchange knowledge, share experiences, discuss emerging developments, and collectively contribute to the growth of the electrical engineering fraternity. As part of this vision, CEEAMA publishes its monthly E-Newsletter, CEEAMA LiveWire, which serves as a dedicated platform for professionals to present technical articles, professional studies, research, opinions, innovations, case studies, and industry perspectives. Through the collective contribution of experts and practitioners, LiveWire aims to encourage meaningful dialogue, inspire continuous learning, promote professional collaboration, and strengthen the exchange of ideas that drive progress in the field of electrical engineering.

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From the President's desk:

We all know that unmistakable WhatsApp forward that lands in our inbox the second it hits September 1st. The iconic "Come September" theme is built on a magnificent crescendo, starting with a playful, tiptoeing rhythm before exploding into a glorious, celebratory brass fanfare.

The world map just changed on 4th September. It switched from a Mercator map to an Equal Area map. Greenland suddenly looks like a normal island, and Africa gets its massive, well-deserved comeback! While the world cares about Equal Area maps because they give Africa its true size, we electrical engineers care about the Equal Area Criterion in power systems because if our transient stability area isn't perfectly balanced, the generator turns into a giant, expensive spinning top!

This month, in the CEEAMA LiveWire, we focus on Procurement Management. Procurement management is the process of finding, buying, and managing external goods and services that a company needs to operate. It acts like a bridge between a company and its external suppliers to keep the business running smoothly. The primary goal is to get the best value for money while ensuring high quality and on-time delivery. It involves a structured cycle of identifying needs, choosing vendors, negotiating contracts, and tracking performance. Good procurement management reduces financial waste and helps a business save money. It also protects companies from supply chain risks, like a supplier suddenly running out of stock. Modern procurement relies heavily on software as well as Artificial Intelligence to automate purchase orders and track shipments in real-time. Effective procurement management increases a company's efficiency and boosts its overall profits.

A technical consultant in procurement management acts as the vital bridge between the business purchasing team and the technical experts on a project. While the procurement team handles the money, contracts, and legalities, the technical consultant ensures that the company actually buys the right technology and equipment that fits the project's exact technical needs. For example, the National Building Code (NBC) 2016 has been officially superseded by NBCS 2026 (National Building Construction Standard), published by BIS as SP 7:2026. Moving from a "Code" to an enforceable "Construction Standard" brings massive updates for electrical engineers, contractors, and project managers which translates into changes in procurement management.

Friends, we will be meeting on 12th Sept for the AGM in Navi Mumbai. Do share your views and thoughts on how to take CEEAAMA initiatives ahead. The much-awaited CEEAMATECH 2026 events flier is out, and you may have seen it already. CEEAMATECH events will focus on latest technologies such as Artificial Intelligence (AI), Battery Energy Storage Systems (BESS), latest news on PE Bill and changes in Standards that impact our work as well as the business place. Please book your seat at the earliest.

We celebrate many festivals this month:

- Shri Krishna Janmashtami on 4th September
- Teachers Day on 5th September
- Ganesh Chaturthi from 14th September to 25th September (Anant Chaturdashi)
- Vishwakarma Puja on 17th September
- Parivartini Ekadashi on 22nd September

Let us all pray Lord Ganesh to remove troubles and hardships in all our projects.

Ganpati Bappa Moraya
Mangal Murti Moraya ...!!

Jai Hind!



Mr. Chidambar Joshi
Hon. President

From the Secretary's desk:

Dear Members, Patrons, and Industry Colleagues,
Greetings as we enter the month of September 2026.

As practicing electrical consultants and engineering professionals, we find ourselves at the centre of one of the most transformative periods in Maharashtra's power sector. The state's rapid industrial expansion has placed immense pressure on our electrical infrastructure. While generation capacity remains robust on paper, the operational ground reality presents a highly dynamic and demanding scenario for electrical engineers.

Over the past few months, we have observed a stark paradox in our power economy. While total electricity availability is high, our localized distribution networks—particularly across urban hotspots like the Mumbai Metropolitan Region (MMR) and Pune—are running heavily overloaded. Spikes in temperature and surging industrial and data centre demands have pushed the existing distribution infrastructure to its upper limits, occasionally risking grid stability.

Furthermore, industrial consumers continue to absorb high commercial tariffs to offset structural inefficiencies. As consultants, our primary focus must pivot sharply toward optimising energy efficiency, power factor management, and system resilience for our clients to buffer these high operational costs.

The implementation of Maharashtra's path-breaking Renewable Energy and Energy Storage Policy is shifting the paradigm of project design. The mandatory integration of Battery Energy Storage Systems (BESS) for all new Commercial and Industrial (C&I) rooftop solar or open-access projects above 100 kW is now strictly enforced.

Every new installation requires storage capacity equal to at least 50% of the solar capacity for a minimum 2-hour duration. This mandate, paired with revised Time-of-Day (ToD) tariffs that offer daytime solar concessions, makes it imperative for CEEAMA members to design smarter, storage-backed, and grid-interactive power systems. We are no longer just designing electrical systems; we are architecting distributed, localized micro-grids.

To ensure our fraternity stays ahead of these technical and regulatory shifts, I am pleased to announce that CEEAMA has finalized the schedule for two major one-day technical workshops. Both high-value learning and networking sessions will be hosted at a centralized venue perfect for collaborative discussions:

Venue for Both Events: Hotel The Fern, Lonavala

1st Technical Workshop – 24th October 2026: This session will deep-dive into practical AI in energy management systems, AI in predictive maintenance, BESS, etc.

2nd Technical Workshop – 9th January 2027: This workshop will focus on Modern trends in electrical Distribution Systems.

Official brochures, registration links, will be shared with all members via email shortly. Due to limited seating at the venue hall, I encourage you to register early to secure your spot.

Let us use this month to sharpen our skill sets, prepare for these extensive workshops, and continue engineering a safer, more efficient Maharashtra.

"Engineering today for a resilient and energy-secure tomorrow."

Warm regards

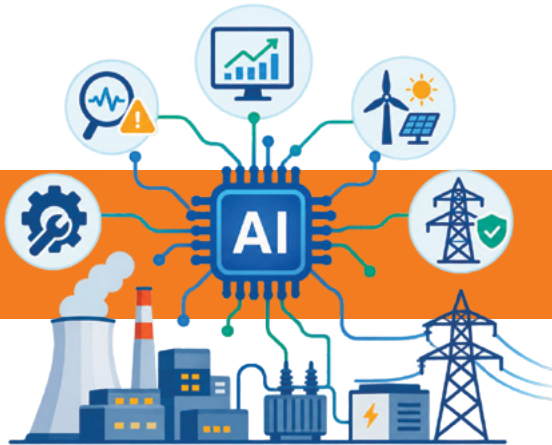


Ulhas Vajre
Honorary Secretary

DISCLAIMER

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Understanding need of hour to create awareness about electrical safety and ensuring the same at all levels of project execution - design, manufacturing, installation, and operation, CEEAMA is taking training sessions on various subjects.



AI IN POWER SYSTEMS

24th October 2026

VENUE  **THE FERN,**
LONAVALA

ABOUT THE CONFERENCE

The power system of today already has elements of AI and tomorrow will be more complex with higher analysis of data, prediction of events, detection of faults and optimisation of operations. From load forecasting and predictive maintenance to renewable integration and smart grids, AI is transforming conventional power system planning, electricity distribution philosophies and operation. For electrical consultants and designers, understanding these developments is becoming essential to harness AI effectively while ensuring reliability, safety and seamless integration with existing systems.

CEEAMATECH 2026, in this October, will focus on:

- AI in energy management systems
- Intelligence in Transmission and Distribution and cost of energy
- Intelligence in Electrical Safety
- Advances in Renewables and AI
- CEA Regulations on Renewables

CEEAMA is proud to announce 2 more events in the coming future:

Saturday 9th Jan 2027 : 'Modern Trends in Electrical Distribution Systems'

Saturday 6th March 2027 : 'Electrical Standards and Practices'

CEEAMATECH 2026 DELEGATE FEES AND PAYMENT

Membership type	Fees amount INR
Life Fellow / Patron Member	1500/- + 18%GST
Associate Members	2500/- + 18%GST
Non Members	3000/- + 18%GST

Scan or open the link to register



https://ceeama.org/CeeamaTech_2026.aspx

Limited seats only to be allotted on early registration basis. The sessions will also be accompanied by a small exhibition of relevant products with presence of technical staff from respective exhibitors to answer your queries.

CEEAMA is organising Pick-up and Drop service from Pune and Mumbai for all delegates who register 15 days before the events.

Tel: +91 9765150066 / 9822916302 (Prabha Enterprises) | Email: admin@ceeama.org

PROCUREMENT

Right quality | Right cost | Right time | Right source

Abstract

Procurement in Plant Engineering is a systematic project function through which technical requirements are converted into purchase orders, manufactured equipment, inspected materials, and verified deliveries at the project site. It connects engineering, project controls, quality, construction, commissioning, finance, logistics, and suppliers. Effective procurement is not limited to buying at the lowest price. It requires the correct technical specification, a capable vendor, an achievable delivery schedule, controlled documentation, acceptable quality, and complete traceability. In process plants, refineries, petrochemical facilities, power plants, and manufacturing projects, weaknesses in procurement can cause late construction fronts, costly rework, nonconforming materials, commissioning delays, and long-term reliability problems. This article explains the purpose, workflow, coordination requirements, challenges, and practical application of procurement in plant engineering.

Objectives

The objectives of this article are to explain the importance of procurement in plant engineering, describe how engineering requirements are converted into vendor enquiries and purchase orders, clarify the responsibilities of engineering and procurement professionals, and demonstrate the relationship between technical evaluation, commercial evaluation, vendor document review, quality surveillance, expediting, logistics, and material receipt. The article also aims to show how disciplined procurement improves safety, project cost, schedule performance, construction readiness, and operating reliability.

Scope

The scope covers project procurement for engineered equipment, packaged units, bulk piping materials, valves, electrical equipment, instrumentation, structural items, and related services. It addresses activities from procurement planning and material requisition through request for quotation, bid evaluation, purchase order placement, vendor document control, inspection, expediting, logistics, site receipt, and order close-out. The discussion focuses on engineering and project execution aspects and does not provide detailed legal, taxation, financing, or corporate purchasing policy guidance.

Introduction

Plant engineering produces specifications, calculations, datasheets, material take-offs, drawings, and requisitions, but the plant can only be constructed when those requirements are transformed into physical assets. Procurement performs this transformation. The function must balance technical compliance, cost, schedule, quality, availability, maintainability, standardization, warranty, and lifecycle support. Because many items are interdependent, a delay in one critical package can affect foundations, piping interfaces, cable routing, control-system integration, pre-commissioning, and startup. Procurement must therefore begin early, follow a prioritized plan, and remain closely integrated with the engineering schedule and construction sequence.

Strategic Importance of Procurement

Procurement influences the entire project's life cycle. During design, vendor information confirms equipment dimensions, nozzle orientations, loads, utility consumption, electrical demand, control philosophy, and maintenance requirements. During execution, purchase order milestones determine when foundations, structures, pipe racks, cable trays, and installation resources are required. During operation, the selected equipment affects availability, energy consumption, spare-parts strategy, maintainability, and technical support. A sound procurement decision considers total value rather than initial price alone, because a low-priced item can become expensive if it has poor efficiency, weak reliability, long spare-part lead times, or limited-service support.

Integrated Procurement Lifecycle

The following diagram presents the controlled flow of procurement information and materials. Review gates are positioned before purchasing order award; manufacturing release, dispatch, and final close-out so that technical, commercial, quality, and schedule risks are addressed before the project becomes committed.

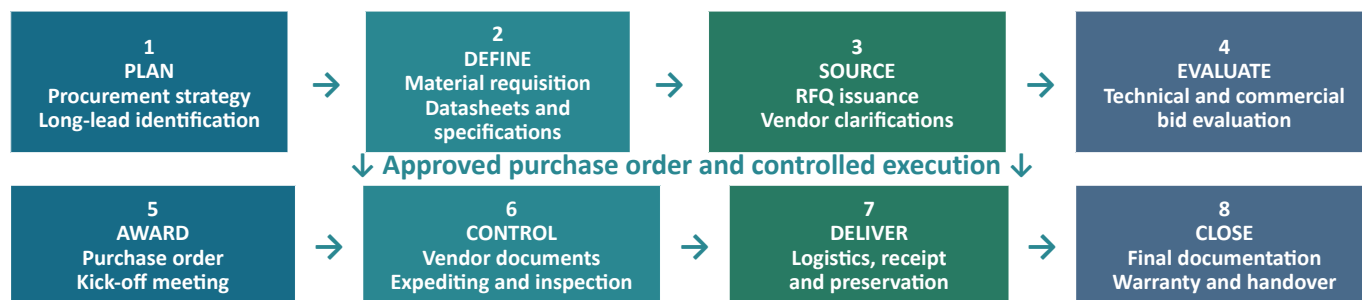


Figure 1. Integrated procurement lifecycle for plant engineering projects.

Typical Procurement Process

The process begins with procurement planning, during which the project team develops a procurement register, identifies long-lead items, assigns package priorities, defines required-on-site dates, and aligns enquiry and award milestones with the engineering and construction schedules. Engineering then prepares the material requisition, which normally includes the scope of supply, datasheets, specifications, applicable codes and standards, inspection requirements, document requirements, spare parts, interfaces, and quantities. Procurement checks the requisition for completeness and issues the request for quotation to technically capable and commercially acceptable vendors. After receipt of offers, engineering performs the technical bid evaluation. Each proposal is checked against process duty, mechanical design, materials of construction, electrical requirements, instrumentation, interfaces, testing, documentation, and deviations. Clarifications are closed in writing so that all bidders are evaluated on a common basis. Procurement and commercial teams then compare price, delivery, payment terms, warranty, taxes, freight, contractual conditions, and overall risk. The recommended vendor is selected through a combined technical and commercial assessment, after which the purchase order is issued with a clear scope, approved deviations, document schedule, inspection plan, delivery milestones, and contractual obligations.

Following award, a purchase order kick-off meeting establishes communication channels, document numbering, engineering interfaces, quality requirements, progress reporting, and key dates. Vendor drawings and calculations are reviewed by the relevant disciplines before manufacturing proceeds at risk. Inspection and test plans define hold, witness, review, and surveillance points. Expediting verifies engineering, purchasing, fabrication, assembly, testing, packing, and dispatch progress. Once the item is released, logistics manages transport, customs where applicable, route restrictions, lifting requirements, and delivery to site. At receipt, the project confirms quantity, condition, documentation, preservation, and storage before handing the material to construction or commissioning. The order is closed only after final documentation; punch-point resolution, spares, warranty records, and commercial obligations are complete.

Multidisciplinary Coordination

Procurement succeeds when discipline interfaces are identified early and managed through a single coordinated package. Process engineering defines operating cases, performance guarantees, utilities, and process safety requirements. Mechanical engineering defines equipment design, materials, fabrication, testing, and maintainability. Piping engineering addresses nozzles, piping classes, loads, valves, supports, and inspection interfaces. Electrical engineering defines power supply, motor data, starting philosophy, earthing, hazardous-area suitability, and cable interfaces. Instrumentation and control engineering define instruments, control panels, shutdown logic, communication protocols, and integration with plant systems. Civil and structural engineering uses vendor loads, dimensions, anchor-bolt details, and dynamic requirements. Quality, HSE, construction, commissioning, document control, logistics, and operations provide additional controls so that the delivered package can be safely installed, started, operated, and maintained.

Example Scenario: Procurement of a Centrifugal Compressor Package

Consider the procurement of a centrifugal compressor package for a gas processing facility. Because the package is technically complex and usually has a long manufacturing period, the project identifies it as a long-lead item and releases the requisition early. Process engineering defines suction and discharge conditions, gas composition, normal and rated flow, turndown, performance guarantees, and operating cases. Mechanical engineering specifies the compressor standard, materials, driver, auxiliaries, seals, lubrication system, baseplate, vibration requirements, and testing. Electrical and instrumentation teams define the motor, protection, local control panel, anti-surge control, transmitters, shutdown signals, communication interface, and hazardous area requirements.

During technical evaluation, the project compares vendor performance curves, power consumption, operating

range, metallurgy, seal arrangement, auxiliary-system design, reliability history, deviations, and delivery schedule. A technically acceptable offer is not automatically the best choice; the team also considers lifecycle energy cost, spares, service capability, warranty, and execution risk. After purchasing order placement, vendor data is used to finalize foundations, piping layout, nozzle loads, electrical feeders, instrument connections, maintenance access, and lifting studies. Manufacturing is monitored through scheduled progress reports and inspections. Mechanical running tests, performance tests where specified, control-panel tests, and documentation reviews are completed before dispatching. At the site, the package is checked for transport damage, stored under the preservation plan, installed using approved procedures, and supported by the vendor during commissioning. This coordinated approach protects the project schedule and reduces the risk of late design changes or startup problems.

Key Challenges and Control Measures

Typical procurement challenges include incomplete requisitions, late engineering inputs, unclear scope boundaries, insufficient vendor competition, unclosed deviations, unrealistic delivery commitments, delayed vendor documents, manufacturing nonconformities, raw-material shortages, logistics constraints, and poor preservation at site. These risks are controlled through a procurement register, responsibility matrix, approved vendor list, structured bid clarification process, deviation register, vendor document schedule, inspection and test plan, expediting reports, manufacturing progress curves, logistics plan, material receiving inspection, and formal close-out checklist. Changes after purchase order award should be processed through an approved change mechanism so that cost, schedule, technical, and documentation impacts are understood before instructions are issued to the vendor.



Digital Procurement in Modern Plant Engineering

Modern projects increasingly use integrated digital systems to connect material requisitions, vendor enquiries, bid evaluations, purchase orders, document reviews, inspection records, expediting status, logistics milestones, and site material control. Dashboards can highlight overdue documents, delayed manufacturing activities, open technical queries, inspection release status, and required-on-site dates. Standardized equipment tags, material codes, and document metadata improve traceability between engineering systems, enterprise resource planning platforms, document management systems, and construction records. Digital tools improve visibility, but they do not replace engineering judgement, clear specifications, competent vendor assessment, or disciplined approval of workflows.

Key Learning Points

Procurement is a lifecycle control function rather than a simple purchasing activity. It must start with complete and coordinated engineering requirements, evaluate vendors on technical compliance and total value, and maintain control after award through vendor document review, inspection, expediting, logistics, and site receipt. Long-lead items require early planning and close linkage with engineering and construction priorities. Written closure of deviations and interfaces prevents future disputes and design mismatches. Effective collaboration

among engineering, procurement, quality, project controls, logistics, construction, commissioning, and operations improves safety, cost certainty, schedule reliability, and plant performance.

Conclusion

Procurement in Plant Engineering converts engineering intent into safe, reliable, and operable plant assets. Its effectiveness depends on the quality of the material requisition, the competence of the selected vendor, the clarity of contractual and technical requirements, and the discipline applied throughout document review, manufacturing, inspection, delivery, and close-out. A mature procurement process does not focus only on the purchase price. It protects the complete project outcome by balancing performance, quality, lifecycle cost, delivery, risk, and support. When procurement is fully integrated with engineering and construction, the project gains better visibility, fewer surprises, improved installation readiness, and a stronger foundation for successful commissioning and long-term operation.

“Effective procurement transforms approved engineering requirements into reliable plant assets, delivered with the required quality, cost, and schedule control.”

Contributed by:

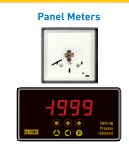


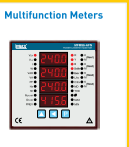
Jayraj Godhani - Associate Engineer (Process)

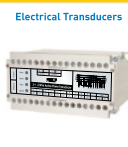




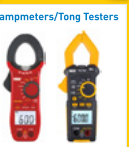
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APPLICATIONS

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- Motor Control Central
- Coordination and safety
- Service continuity

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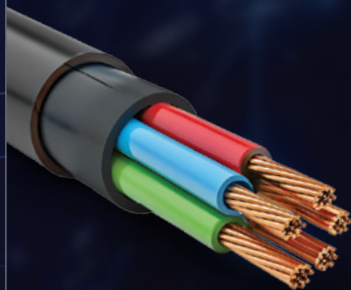
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PRODUCT FEATURES

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- PVC
- FRLS
- LSZH
- Copper
- XLPE
- HR
- TPE
- Aluminium
- XLPO
- ZHFR
- TPU



APPLICATIONS



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PROCUREMENT : THE BACKBONE OF BUSINESS OPERATIONS

ABSTRACT :

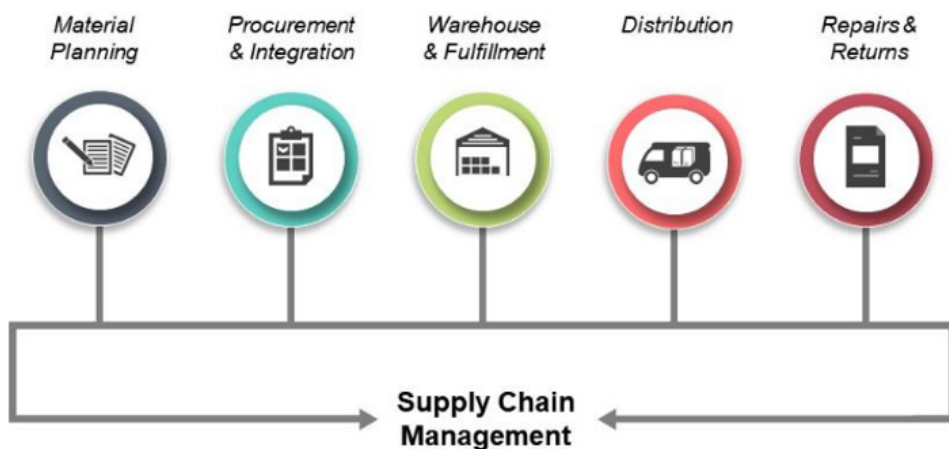
Procurement is the process of acquiring goods, services, and resources needed by an organization to support its operations and achieve its objectives. It involves a series of activities including identifying requirements, selecting suppliers, obtaining quotations, negotiating terms, purchasing materials, and ensuring timely delivery. Procurement plays a crucial role in maintaining business continuity by ensuring that the required products and services are available at the right quality, quantity, cost, and time. Effective procurement helps organizations optimize costs, improve operational efficiency, maintain quality standards, and build strong relationships with suppliers. It also contributes to risk reduction by ensuring reliable sourcing and compliance with organizational policies and regulatory requirements. In today's competitive business environment, procurement is considered a strategic function that supports organizational growth and sustainability. With increasing globalization and technological advancements, procurement practices have evolved to include digital procurement systems, supplier performance management, and data-driven decision-making. These developments enable organizations to improve transparency, enhance supply chain efficiency, and respond effectively to changing market conditions. Therefore, procurement remains an essential component of modern business management, contributing significantly to overall organizational success and long-term value creation.

INTRODUCTION TO PROCUREMENT :

Procurement is a fundamental business function that involves the systematic process of acquiring goods, services, equipment, and resources required for an organization's operations and projects. It ensures that the necessary materials and services are available at the right quality, quantity, price, source, and time to support organizational objectives effectively. Procurement is not limited to purchasing activities alone; it includes planning, sourcing, supplier selection, contract negotiation, order management, logistics coordination, and supplier performance evaluation. In today's competitive business environment, procurement plays a strategic role in enhancing operational efficiency, controlling costs, maintaining quality standards, and ensuring uninterrupted supply of resources. Organizations across various sectors, including manufacturing, healthcare, information technology, construction, and retail, rely on effective procurement practices to achieve their business goals and maintain a competitive advantage.

ROLE IN SUPPLY CHAIN MANAGEMENT :

Procurement And Supply Chain Management Process



Procurement is a key function in supply chain management that ensures the availability of the right materials and services at the right time, cost, and quality. It helps organizations maintain a smooth flow of operations by

selecting reliable suppliers, managing purchasing activities, controlling costs, and reducing supply chain risks. Effective procurement improves inventory management, strengthens supplier relationships, and contributes to overall business efficiency and customer satisfaction.

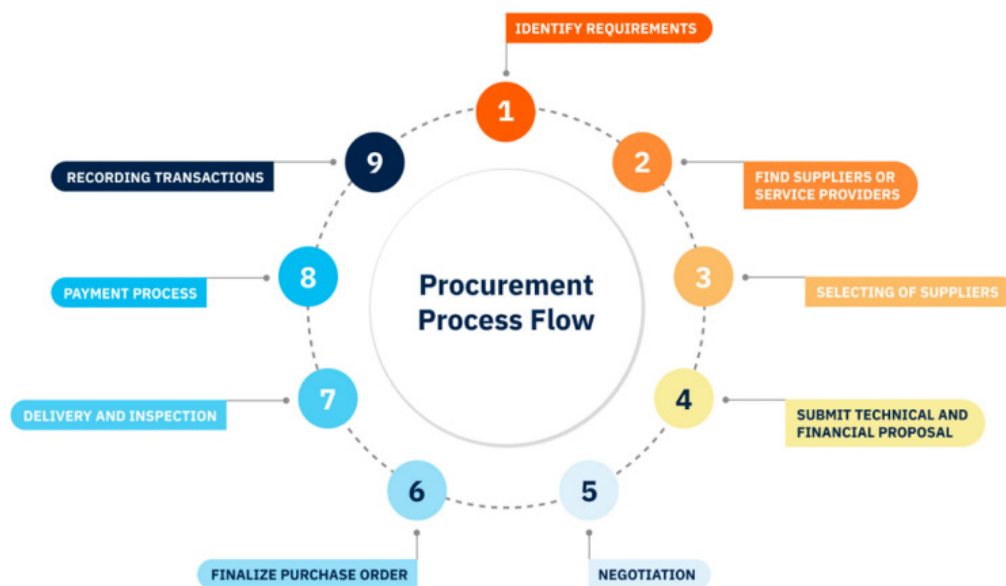
OBJECTIVES OF PROCUREMENT :

The primary objective of procurement is to obtain the right goods and services that meet organizational requirements while ensuring optimum cost, quality, and timely delivery. Effective procurement supports smooth business operations and contributes to organizational success.

Key Objectives

- **Cost Optimization:** Acquire goods and services at the best possible value.
- **Quality Assurance:** Ensure purchased items meet required specifications and standards.
- **Timely Availability:** Ensure materials and services are available when needed.
- **Supplier Management:** Develop and maintain reliable supplier relationships.
- **Risk Reduction:** Minimize risks related to supply shortages, delays, and quality issues.
- **Operational Efficiency:** Support uninterrupted business and project activities.
- **Compliance and Sustainability:** Adhere to regulatory, ethical, and organizational requirements.

PROCUREMENT PROCESS :



The procurement process is a structured sequence of activities used to acquire goods and services required by an organization. It ensures that materials are procured efficiently, economically, and in compliance with quality and delivery requirements.

KEY STEPS IN THE PROCUREMENT PROCESS :

1. **Requirement Identification**
 - Determine the need for goods or services.
2. **Supplier Sourcing**
 - Identify and shortlist potential suppliers.
3. **Request for Quotation (RFQ)**
 - Invite suppliers to submit quotations or proposals.

4. Bid Evaluation

- Evaluate supplier offers based on technical, commercial, and quality requirements.

5. Supplier Selection

- Select the most suitable supplier.

6. Purchase Order (PO) Issuance

- Issue a formal purchase order outlining requirements, price, and delivery terms.

7. Order Fulfillment and Delivery

- Supplier provides the goods or services as agreed.

8. Inspection and Acceptance

- Verify quantity, quality, and compliance with specifications.

9. Payment Processing

- Process payment according to contractual terms.

10. Performance Evaluation

- Assess supplier performance for future procurement decisions.

TECHNICAL AND COMMERCIAL BID EVALUATION :

Technical and Commercial Bid Evaluation is a crucial step in the procurement process used to assess and compare supplier proposals before selecting a vendor. The evaluation is generally carried out in two stages to ensure that the supplier meets both the technical requirements and commercial expectations of the organization. In the first stage, known as Technical Bid Evaluation (TBE), the vendor's offer is reviewed against project specifications, datasheets, quality requirements, applicable standards, delivery commitments, and technical capabilities. This evaluation determines whether the proposed product or service is suitable for the intended application and complies with all project requirements. Any deviations from the specifications are identified and assessed before acceptance.

Once a vendor is found technically acceptable, the proposal proceeds to the Commercial Bid Evaluation (CBE) stage. This evaluation focuses on commercial aspects such as price, payment terms, delivery conditions, taxes and duties, warranty provisions, after-sales support, and contractual terms. The purpose is to determine the overall cost-effectiveness of the offer and ensure that the commercial conditions are favorable to the organization. By comparing all qualified vendor offers on a common basis, procurement teams can identify the best value proposition.

Together, Technical and Commercial Bid Evaluation ensures a transparent and systematic vendor selection process. It helps organizations procure high-quality products and services at competitive prices, minimize project risks, maintain compliance with specifications, and achieve successful project execution.

CHALLENGES AND RISK MANAGEMENT IN PROCUREMENT :



Procurement activities are often exposed to various challenges that can affect cost, quality, delivery schedules, and overall business operations. Organizations must effectively identify and manage these challenges to ensure a reliable and efficient supply chain. Common procurement challenges include supply chain disruptions, fluctuations in material prices, supplier reliability issues, quality non-conformance, delivery delays, and changing regulatory requirements. Factors such as global market uncertainties, transportation constraints, and limited supplier availability can further complicate procurement activities and impact project execution.

To address these challenges, organizations implement risk management strategies aimed at minimizing potential disruptions and ensuring continuity of supply. Risk management in procurement involves evaluating supplier capabilities, conducting thorough vendor assessments, diversifying supplier sources, establishing contingency plans, and continuously monitoring supplier performance. Organizations also use contractual safeguards, inventory management practices, market analysis, and digital procurement tools to identify and mitigate procurement-related risks. Effective risk management helps reduce uncertainties, improve supplier reliability, control costs, maintain quality standards, and ensure the timely availability of goods and services.

By proactively addressing procurement challenges and implementing robust risk management practices, organizations can enhance supply chain resilience, improve operational efficiency, and achieve successful project and business outcomes.

CONCLUSION:

Procurement is a vital function that enables organizations to acquire the goods and services necessary for efficient operations and successful project execution. It involves a systematic process of identifying requirements, selecting suppliers, evaluating bids, purchasing materials, and ensuring timely delivery while maintaining desired quality and cost objectives. Effective procurement contributes to operational efficiency, cost optimization, quality assurance, and supply chain reliability.

In today's dynamic business environment, organizations face various procurement challenges, including supply chain disruptions, market fluctuations, and supplier-related risks. Therefore, adopting effective procurement strategies and risk management practices is essential for ensuring business continuity and achieving organizational goals. With the increasing adoption of digital technologies and data-driven decision-making, procurement has evolved into a strategic function that supports sustainable growth and competitive advantage. Ultimately, a well-managed procurement system enhances organizational performance, strengthens supplier relationships, and creates long-term value for businesses across all industries.

CONTRIBUTED BY



PAVITHRAA J

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Procurement: Driving Value Beyond Purchasing

Introduction

Procurement is the systematic process of identifying organizational needs and sourcing, acquiring, managing, and delivering the goods, services, and works required to achieve business objectives.

It encompasses the entire lifecycle from requirement identification and supplier selection to contract management, delivery, performance monitoring, and supplier relationship management.

In today's interconnected and fast-paced global economy, procurement plays a pivotal role in ensuring organizational success. Beyond simply purchasing goods and services, procurement is a strategic function that enables organizations to acquire the right resources, from the right suppliers, at the right quality, cost, and time. It directly influences operational efficiency, project execution, profitability, supply chain resilience, and long-term business sustainability.

Whether in manufacturing, infrastructure, energy, pharmaceuticals, information technology, or EPC/EPCM projects, procurement serves as the bridge between organizational requirements and market capabilities. By ensuring the seamless flow of materials, equipment, and services, it supports timely project delivery, operational continuity, and sustainable growth.



➤ Objectives of Procurement

- Ensure timely availability of goods and services.
- Obtain the best value for money.
- Maintain required quality standards.
- Reduce procurement and supply chain risks.
- Develop strong supplier relationships.
- Support project and business objectives.
- Promote sustainability and ethical sourcing practices

Procurement Lifecycle in EPCM Projects

The Procurement Lifecycle is a structured, end-to-end process that governs how materials, equipment, and

services are sourced, purchased, delivered, and managed throughout a project's lifecycle. In an EPCM (Engineering, Procurement, and Construction Management) project, procurement serves as the critical link between engineering design and construction execution, ensuring that the right materials and equipment are available at the right time, cost, quality, and location.

Since procurement can account for 50-70% of the total project cost in many EPCM projects, its effectiveness directly influences project schedule, budget, quality, and overall success.



1. Plan: Identify Need

- The procurement process begins when a project need is identified based on engineering deliverables, project scope, and client requirements.
 - Review project requirements
 - Identify material and equipment needs
 - Determine procurement priorities
 - Develop procurement strategy

2. Collaborate: Define Product or Service and Verify Budget

- Engineering, procurement, project controls, and stakeholders collaborate to define technical and commercial requirements.
- Clear requirements reduce ambiguity and prevent costly changes later in the project.
 - Define specifications
 - Finalize scope of supply
 - Confirm budget availability
 - Align stakeholder expectations

3. Strategize: Ask Procurement for Advice /Identify Procurement Pathway

- The procurement team determines the most effective sourcing strategy based on project requirements and market conditions.
 - Market analysis
 - Supplier identification
 - Procurement route selection
 - Risk assessment

4. Manage: Conduct Solicitation

- Formal inquiries are issued to potential suppliers to obtain technical and commercial proposals.
 - Issue RFQs/RFPs
 - Manage bidder queries
 - Receive supplier quotations
 - Collect supporting documentation

5. Analyze: Select Best Value

- Supplier proposals are evaluated based on technical compliance, commercial competitiveness, delivery commitments, and lifecycle value.
 - Technical compliance
 - Cost
 - Quality
 - Delivery schedule
 - Supplier capability
 - Risk profile

6. Negotiate Agreement

- Price negotiation
- Delivery commitments
- Warranty conditions
- Commercial terms
- Risk allocation

7. Contract Execution

- Following successful negotiations, contracts or purchase orders are formally executed.
 - Contract award
 - Purchase Order issuance
 - Vendor onboarding
 - Performance monitoring initiation

Strategic Importance of Procurement

In EPCM (Engineering, Procurement, and Construction Management) projects, procurement is far more than a purchasing function. It is a strategic project management discipline that directly influences project cost, schedule, quality, safety, and overall project success. Since procurement often represents a significant portion of the total project budget, its effectiveness can determine whether a project is delivered on time, within budget, and according to client expectations.

- Cost Optimization
 - Controls project expenditure through strategic sourcing and negotiations.
 - Focuses on best value, not just lowest cost.
- Schedule Assurance
 - Ensures timely availability of equipment and materials.
 - Minimizes project delays, especially for long-lead items.
- Quality Assurance
 - Ensures compliance with specifications, codes, and standards.

- Reduces rework and improves plant reliability.
- Risk Management
 - Mitigates supply chain disruptions, material shortages, and market volatility.
 - Improves project resilience and predictability.
- Supplier Relationship Management
 - Builds long-term partnerships with key suppliers.
 - Enhances collaboration, innovation, and delivery performance.
- Engineering & Construction Support
 - Aligns procurement activities with engineering and construction needs.
 - Ensures smooth project execution and resource availability.
- Contract & Commercial Management
 - Establishes clear contractual obligations and responsibilities.
 - Reduces commercial risks and disputes.
- Sustainability & ESG Compliance
 - Promotes responsible sourcing and environmental stewardship.
 - Supports organizational sustainability goals.
- Digital Transformation
 - Leverages AI, analytics, automation, and digital procurement tools.
 - Improves efficiency, visibility, and decision-making.

Sustainable Procurement

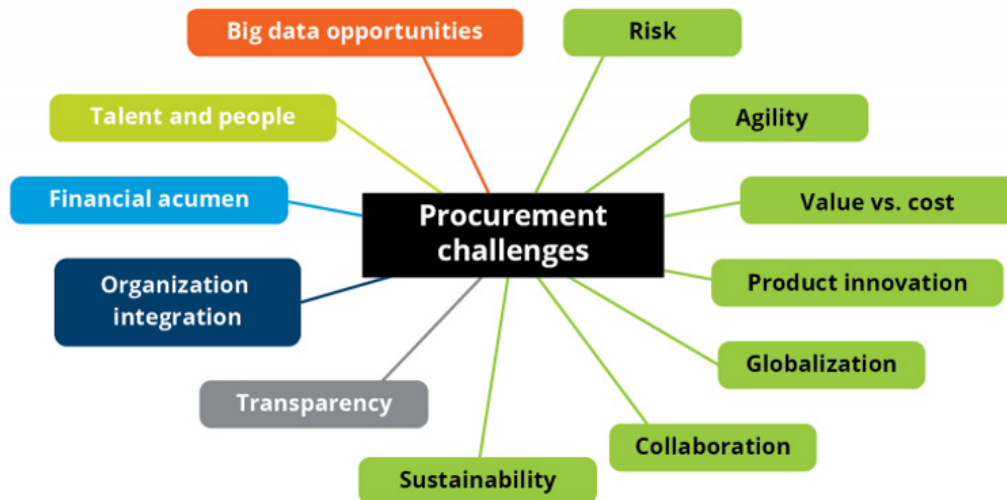
Sustainable Procurement is the process of acquiring goods, materials, equipment, and services in a way that



delivers long-term economic value while minimizing environmental impact and promoting social responsibility. In EPCM projects, it ensures that procurement decisions consider not only cost and quality but also sustainability, ethical practices, regulatory compliance, and lifecycle performance.

Procurement Challenges

In today's interconnected world, procurement teams in EPCM projects operate in a highly dynamic environment



influenced by global supply chains, economic conditions, geopolitical events, technological advancements, and sustainability requirements. These factors create procurement challenges that can significantly impact project cost, schedule, quality, and risk.

Digital Transformation in Procurement

Digital Transformation in Procurement refers to the adoption of digital technologies, automation, data analytics, and intelligent systems to streamline and enhance procurement activities. In EPCM projects, digital procurement enables organizations to improve efficiency, increase transparency, reduce risks, and make faster, data-driven decisions across the procurement lifecycle.

EPCM projects involve thousands of procurement transactions, multiple stakeholders, global suppliers, and large volumes of technical and commercial data. Managing these activities manually can lead to delays, errors, and reduced visibility.

Digital technologies help procurement teams:

- Automate routine activities
- Improve supplier collaboration
- Track procurement status in real time
- Enhance decision-making
- Reduce procurement cycle times
- Improve project predictability



Conclusion

Procurement has evolved from a purchasing function into a strategic driver of project success. In EPCM projects, effective procurement ensures the timely delivery of quality materials and services while optimizing costs, managing risks, fostering sustainability, and strengthening supply chain resilience. By embracing digital innovation and strategic supplier partnerships, organizations can create lasting value and achieve successful project outcomes in an increasingly dynamic global environment.

Contributed by:



Sunil Parmar

Associate Engineer – Plant Engineering (Chemicals)





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Comply with the PESO requirements by Testing and Certification of Hazardous Storage facilities and Classification of Hazardous Areas, as per Petroleum and Explosives Safety Organisation, PESO" guidelines.



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NAVI MUMBAI – 410206, MAHARASHTRA, INDIA.
Tel.: 022 27462016, Mobile: 9821672242, E-mail: ulhasvajre@gmail.com
Web: <https://www.sumitengineeringservices.com>

Contact Person: Ulhas Vajre
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Electrical Equipment Procurement Lifecycle

Chemical industries and infrastructure projects | Right equipment • Right quality • Right time • Right cost

A Purpose

- Convert project requirements into compliant, safe and maintainable electrical assets.
- Integrate engineering, procurement, quality, logistics, construction and commissioning.
- Protect schedule by identifying long-lead equipment during FEED and early detail engineering.

B Five governance gates

- Gate 1: Approved enquiry package
- Gate 2: Technically acceptable bidder list
- Gate 3: Client-approved award recommendation
- Gate 4: Inspection release and dispatch clearance
- Gate 5: Final acceptance and DLP closure

C Lifecycle at a glance

- Pre-award: define, enquire, clarify and evaluate
- Award: negotiate, approve and place purchase order
- Post-award: review documents, manufacture and expedite
- Acceptance: FAT, delivery, installation, SAT and commissioning
- Closeout: warranty, defect rectification and final records

PHASE 1

Project Definition and Enquiry Preparation

Build a complete, coordinated and commercially usable RFQ package

1 Project definition

- Project scope and battery limits
- Design basis, feasibility, budget and milestone schedule
- Applicable codes, statutory requirements and client standards
- Site conditions, hazardous-area classification and interfaces

2 Engineering deliverables

- Electrical load list and single-line diagrams
- Equipment sizing calculations and system studies
- Layouts, cable philosophy, earthing and lightning protection basis
- Package interfaces, quantities and preliminary delivery priorities

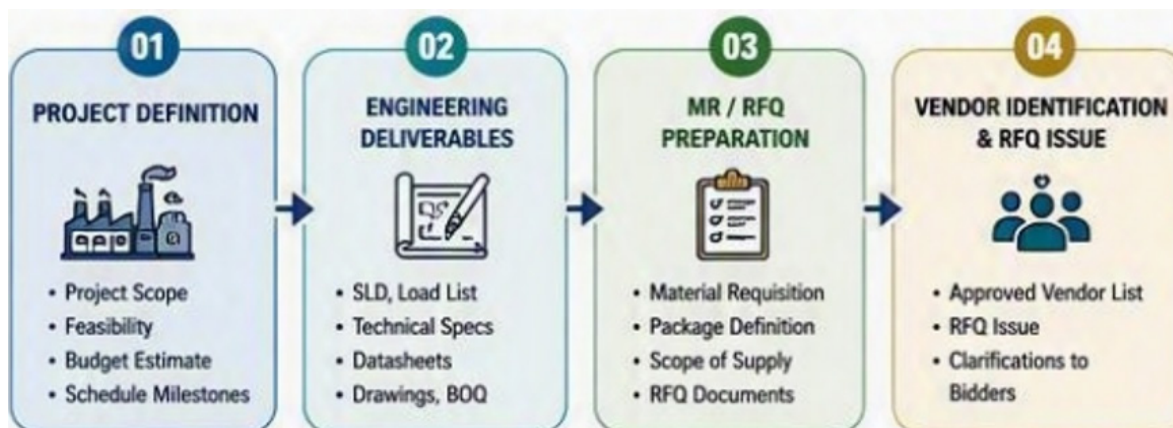
3 Material Requisition / RFQ package

- Technical specification and equipment datasheets
- Scope of supply, battery limits and exclusion schedule
- Drawings, BOQ, inspection and testing requirements
- Vendor document requirements and approved-vendor requirements

4

RFQ issue and bidder alignment

- Issue enquiry to prequalified bidders
- Conduct pre-bid meeting where required
- Record clarifications in a common bidder bulletin
- Control bid due date, validity and acknowledgement



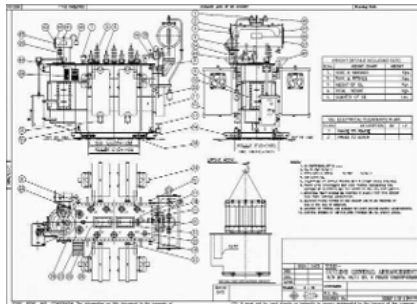
ENQUIRY PACKAGE

Documents That Must Accompany the RFQ

A complete enquiry minimizes assumptions, deviations and post-award change

#	Document	Minimum content
1	Technical specification	Scope, codes, ratings, construction, environment, performance, accessories
2	Datasheets	Guaranteed parameters, service conditions, interfaces and project-specific selections
3	Drawings	SLD, layouts, schematics, cable entry, interfaces and reference arrangements
4	BOQ / price schedule	Itemized quantities, mandatory spares, commissioning spares and optional items
5	Scope matrix	Vendor, purchaser, erection contractor and package-vendor responsibilities
6	ITP / QAP	Hold, witness, review and surveillance points; records and acceptance criteria
7	VDR schedule	Document list, submission dates, review cycles, formats and final dossiers
8	Commercial terms	Price basis, taxes, freight, insurance, payment, security and retention
9	Contract conditions	Delivery, LD, warranty, DLP, performance guarantees and change control
10	HSE / statutory	Area classification, certification, permits, sustainability and compliance

S	Quantity	Value	Unit
1	Rated power	40	MVA
2	Rated frequency	50	Hz
3	Primary voltage	66000	V
4	Secondary voltage	11000	V
5	Rated primary current	349.91	AMP
6	Rated secondary current	2099.46	AMP
7	No. of primary turns	1200	Turns
8	No. of secondary turns	200	Turns
9	Primary winding resistance	0.3365	Ω
10	Secondary winding resistance	0.00831	Ω
11	Connection	Dyn11	---
12	Temperature rise of coil	65	$^{\circ}\text{C}$
13	Total full load losses	167	K.W
14	Impedance	12.5	%
15	Core cross section diameter	560	m.m
16	Cooling mode	ONAF	---
17	Ambient temperature	30	$^{\circ}\text{C}$
18	Top oil rise over ambient	45	$^{\circ}\text{C}$
19	Hot spot factor	1.3	---
20	Rated circuit breaker current of primary side	600	AMP
21	Rated circuit breaker current of secondary side	2500	AMP



Scope of Work and Technical Specifications for 66M "Sound Road"

3.4 Technical Specifications of Transformers

3.5.1 Applicable Codes and Standards for Transformer

The equipment covered by this specification is, unless otherwise stated, to be designed, constructed and tested in accordance with latest versions of relevant Indian standards/IEC publications.

Table 3: Codes and Standards for Transformers

Sl. No.	Standard Code	Description
1.	IS 1571	Classification of Insulating Materials
2.	IS 2028	Power Transformers (Part - I)
3.	IS 2029	Guidelines for Altering Voltages above 1000V
4.	IS 2705	Current Transformers
5.	IS 3002	Code of practice for climate proofing
6.	IS 3039	Power transformer fittings and accessories
7.	IS 4257	Power transformer bushings
8.	IS 11171	Dry type Transformer
9.	IS 9479	Application guide for tap-changers
10.	IS 10028	Code of practice for selection, installation and maintenance of transformers

3.5.2 General Design Features

- The transformers shall be of the latest design, dry type Cast Resin.
- The type of cooling is Natural Air cooled (NAC) and the corresponding voltage for each transformer shall be provided to the customers.
- Each transformer is suitable for operation at full rated power on all tapings without exceeding the design temperature rise.
- It is possible to operate the transformer satisfactorily, with the loading Guide specified in IS 6002. There is no limitation imposed by loadings, Tap-changers, and auxiliary equipment to meet this requirement.
- The transformers are designed to be capable of withstanding, without damage, the thermal and mechanical effects of short-circuits between phases or between phase and earth at the terminals of any winding with full voltage applied across the other winding for periods given in relevant standards.
- The transformers of load tap links are able to meet the short-circuit level specified (as mentioned in technical specifications without permanent damage).
- Each transformer is designed for minimum no-load and load losses within the economic limit and is able to have minimum rise of oil level at 100°C.
- All electrical connections and contacts are of ample cross section for carrying the rated current.

Division 3 of Building Document for 66M "Sound Road"

Page 10 of 40

CE		ABB	
Type TNOSCT-100/11PNS UNI			
No. 1LPL525913		Year of manufacture 2014	
Rated power 100 kV-A		No. of phases 3	
TRANSFORMER to specification EN (IEC) 60076-1			
Rated voltage [V]		Current [A]	
HV 11000 ±2x2.5%		5.25 I75 AC28	
LV 415		139.10 AC3	
Tap no.		Connection symbol	
1 11550		Dyn 11	
2 11275		Cooling	
3 11000		ONAN	
4 10725		Rated frequency	
5 10450		50 Hz	
Ambient temp. 40°C		Short-circuit imp.	
Temperature rise of:		3.88 %	
Windings 60K		Load losses	
Oil 55K		1750 W	
Windings material HV/LV: Al/Al		No-load losses	
Mass of windings: 53kg		145 W	
		Total mass	
		463 kg	
		Mass of active part	
		279 kg	
		Mass of oil	
		100 kg	
		Type of oil	
		Mineral Nyltro Taurus	
		Oil to	
		IEC 60296	
Windings material HV/LV: Al/Al		Core material: grain-oriented electrical steel	
Mass of windings: 53kg		Mass of core: 159kg	

INSPECTION AND TEST PLAN	Subcontractor's ITP No.	NCC-ITP-EL-06	Rev. A	DISCIPLINE: Dry type Transformer Installation	
ELECTRIC WORKS	Contractor's ITP No.				
PROJECT TITLE: RABIGH IPP, SEPCO III	DATE: 10-Jun-25	Owner: RABIGH IPP	Consultant: SEPCO III	Contractor: SEPCO III	Subcontractor: NCC

ITEM NO.	PROJECT PHASE	TASK / ACTIVITY	REFERENCE DOCUMENT	INSPECTION FREQUENCY	ACCEPTANCE CRITERIA	INSPECTION RESPONSIBILITY ASSIGNMENT			QUALITY RECORD	REMARKS
						NCC	SEPCO III	RABIGH		
3.0 DOCUMENT APPROVAL										
3.1	Approval of method of statement for Transformer installation					H	H	R		
3.2	Submit material certificates: accredited company	Approved drawings			Checking of certificates	H	H	R		
3.0 MATERIAL RECEIVING										
3.1	Receiving of material on site	Approved drawings		100%	As per Approved technical data	H	W	W		

SCHEDULE DRIVERS

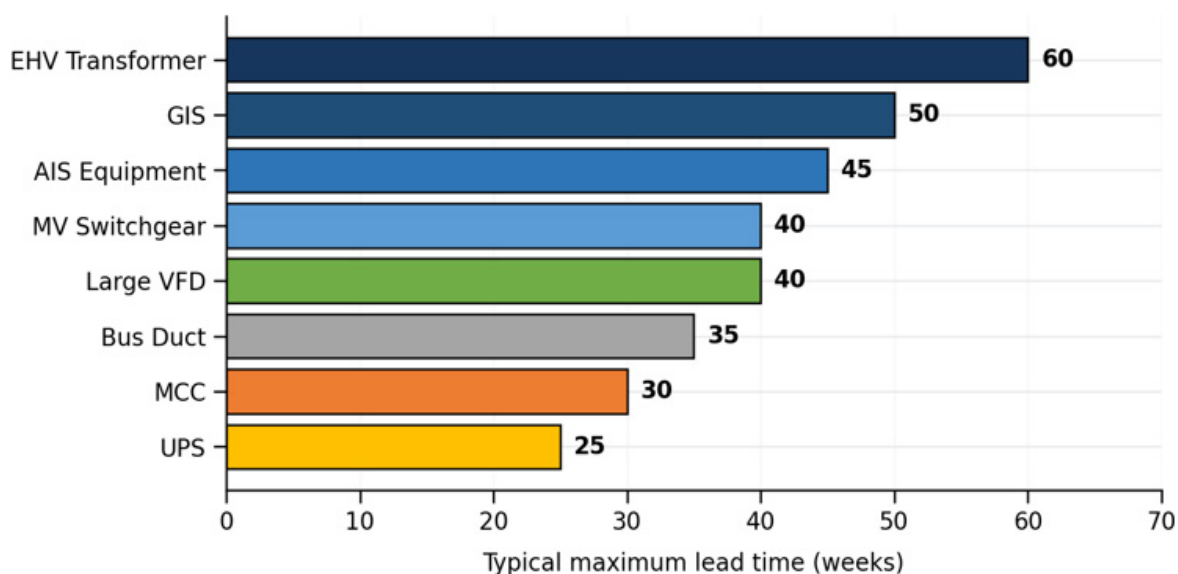
Long-Lead Electrical Equipment

Plan enquiry and award dates backward from required-at-site dates

#	Equipment	Typical description	Indicative lead time
1	EHV power transformer	132/33 kV or 220/33 kV	40–60 weeks
2	Gas-insulated switchgear	EHV/HV GIS	35–50 weeks
3	AIS switchyard equipment	Breakers, CTs, PTs, isolators	30–45 weeks
4	MV switchgear	11/33 kV metal-clad	24–40 weeks
5	Generator and synchronizing system	DG set and control panels	24–40 weeks
6	Large UPS system	Centralized UPS	20–32 weeks
7	Motor control centres	Draw-out / fixed type	20–30 weeks
8	Large VFD	Above 500 kW, MV/HV	24–40 weeks
9	Bus duct	LV bus duct or isolated phase bus	20–35 weeks
10	Hazardous-area analyzer package	Gas, flame or process package	20–40 weeks

Planning note: Lead times are indicative and must be confirmed in each vendor quotation

Indicative Long-Lead Equipment Comparison



MATERIAL STRATEGY

Bulk Electrical Materials and Lead-Time Profile

Aggregate quantities early and control approved makes, interfaces and site release sequence

#	Bulk material
1	Power cables
2	Control cables
3	Instrument cables
4	Cable trays
5	Cable ladder systems
6	Earthing conductors
7	Earthing rods
8	Junction boxes
9	Lighting fixtures
10	Conduits and accessories

Bulk procurement controls

- Freeze cable schedules and routing quantities by area
- Apply project-approved makes and hazardous-area certifications
- Define drum lengths, packing, tagging and sequential delivery
- Maintain surplus allowance and reconcile issued versus installed quantities





PHASE 2

Bid Review, TQ, TBE and Award

Separate technical acceptability from commercial ranking

5 Quotation receipt and completeness check

- Log technical and commercial submissions
- Check bid validity, bid security and acknowledgement of addenda
- Identify exclusions, deviations, missing data and alternate offers

6 Technical Queries (TQ)

- Issue consolidated, numbered clarifications
- Provide equal technical information to all active bidders
- Record vendor response, client decision and closure status

7 Technical Bid Evaluation (TBE)

- Compare scope, ratings, performance, standards and certifications
- Evaluate delivery, documentation, testing, spares and service support
- Classify deviations as acceptable, conditional or unacceptable
- Shortlist only technically acceptable bidders

8**Commercial evaluation and negotiation**

- Compare evaluated price on a common basis
- Normalize freight, taxes, options, spares and lifecycle impacts
- Confirm payment, LD, warranty, securities and delivery commitment

9**Vendor recommendation and client approval**

- Issue techno-commercial recommendation with residual risks
- Obtain client approval and close pre-award conditions
- Maintain auditable deviation and approval records

10**Purchase Order placement**

- Incorporate specifications, accepted offer and clarification register
- Freeze scope, price, milestones, deliverables and contractual priority
- Schedule a post-order kick-off meeting

PHASE 3**Post-Order Engineering and Vendor Progress**

Convert the purchase order into approved documents, manufactured equipment and verified quality

11**Kick-off and baseline controls**

- Confirm communication matrix and responsibilities
- Approve document register and manufacturing schedule
- Align ITP, FAT procedure, sub-vendor list and inspection agency
- Establish progress measurement and reporting rules

12**Vendor Document Review (VDR)**

- Review GA, SLD, schematics, protection logic and terminal plans
- Verify calculations, datasheets, material certificates and interfaces
- Track comments by revision until Approved / Approved with comments
- Secure final as-built drawings, manuals and test records

13**Progress follow-up and expediting**

- Monitor engineering, raw material, fabrication, assembly and testing
- Use procurement monitoring chart and milestone look-ahead
- Escalate critical slippage with recovery plan, owner and due date
- Coordinate inspection calls, shipping readiness and site priorities

14**Factory Acceptance Test (FAT)**

- Use an approved procedure and calibrated instruments
- Verify contractual, functional and safety requirements
- Record observations and punch points with closure evidence
- Issue inspection release only after acceptance conditions are met

15**Packing, shipment and delivery**

- Verify preservation, packing list, release note and shipping documents
- Manage freight, insurance, customs and abnormal-load requirements
- Inspect receipt condition; record shortages, damage and storage needs

TYPICAL PROGRESS MILESTONES

Design	Material	Fabrication	Assembly	Testing	Dispatch
20%	40%	70%	85%	95%	100%

PHASE 4

Delivery, SAT, Commissioning and DLP Closure

Protect equipment condition, prove site integration and close every contractual obligation

16 Site Acceptance Test (SAT)

- Verify installation, earthing, wiring and mechanical completion
- Perform insulation, continuity, functional, loop and interlock checks
- Demonstrate integration with protection, control, SCADA and plant systems
- Close SAT punch points and issue accepted test record

17 Commissioning and handover

- Cold commissioning and pre-energization checks
- Controlled energization and hot commissioning
- Load trial, performance verification and operator training
- Handover approved manuals, drawings, spares and certificates

18 Warranty and Defect Liability Period (DLP)

- Log defects and response times against contractual obligations
- Complete failure analysis, repairs, replacements and performance monitoring
- Close outstanding punch points and submit final corrective evidence
- Issue DLP completion / final acceptance certificate

✓ Closeout dossier

- Purchase order and amendments
- Approved vendor drawings and calculations
- FAT/SAT reports and calibration certificates
- As-built drawings, O&M manuals and spare-parts records
- Warranty certificates, punch-list closure and final acceptance

Compiled and contributed by:



Subhash L. Bahulekar – Head (Electricals) – L&T Tech. Services



THE PER UNIT SYSTEM

A SIMPLE. NORMALIZED. POWERFUL TOOL FOR POWER SYSTEM ANALYSIS



WHAT IS THE PER UNIT SYSTEM?



Per unit system expresses all electrical quantities as a fraction of chosen base values, making calculation across different voltages and ratings simple and normalized.



It is just a way of expressing electrical quantities as reference of some fraction value, instead of using volts, amps, ohms, or watt directly.

WHY DO WE USE IT?

- ✓ Electrical system have different voltage levels, and equipment ratings (generators, transformers, motors etc).
- ✓ Comparing actual voltages, currents, and impedances is messy.
- ✓ Using per unit system everything is become dimensionless and normalized.
- ✓ Make calculations easy especially in power system analysis.

HOW IT WORKS

Pick a base value (reference) for:

- | | | | |
|------------------------------|-------------------------------|---------------------------------------|---------------------------------|
| i) Voltage
V_{base}
 | ii) Current
I_{base}
 | iii) Apparent Power
S_{base}
 | iv) Impedance
Z_{base}
 |
|------------------------------|-------------------------------|---------------------------------------|---------------------------------|

Then any actual value is expressed as:

Per unit value = Actual value / Base value

$$V_{pu} = \frac{V_{actual}}{V_{base}} \quad I_{pu} = \frac{I_{actual}}{I_{base}} \quad S_{pu} = \frac{S_{actual}}{S_{base}} \quad Z_{pu} = \frac{Z_{actual}}{Z_{base}} \quad \text{etc.}$$

IMPORTANT RELATIONS

Current base:

$$I_{base} = \frac{S_{base}}{\sqrt{3} V_{L,base}}$$

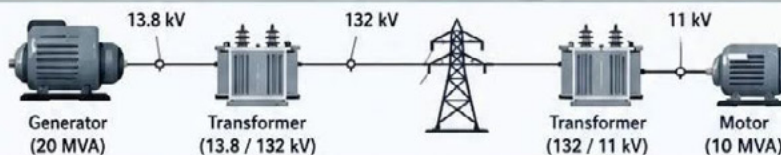
Impedance base:

$$Z_{base} = \frac{V_{base}^2}{S_{base}}$$

Note:

S in VA (or MVA), V in volts (line-to-line), Z in ohms.

All per unit quantities (V_{pu} , I_{pu} , Z_{pu} , S_{pu}) are dimensionless.



Per unit system allows us to analyze the entire system together on a common base, regardless of different voltage levels and ratings.

PER UNIT SYSTEM IN CASE OF TRANSFORMER



CHANGE OF BASE: Different transformers and generators come with their impedance in per unit (or percent) value based on their own ratings. To analyze the whole system together, all impedances and voltages must be converted into a common base.

1. CONVERTING VOLTAGES

$$V_{base,secondary} = V_{base,primary} \times \frac{V_{rated,secondary}}{V_{rated,primary}}$$



2. CONVERTING IMPEDANCES

$$Z_{pu,new} = Z_{pu,old} \times \left(\frac{V_{base,new}^2}{S_{base,new}} \right) / \left(\frac{V_{base,old}^2}{S_{base,old}} \right)$$

If the voltages doesn't change (i.e., $V_{base,new} = V_{base,old}$) then

$$Z_{pu,new} = Z_{pu,old} \times \frac{S_{base,old}}{S_{base,new}}$$



KEY TAKEAWAY

- ✓ Choose a common base (S_{base} , V_{base}) for the entire system.
- ✓ Convert all quantities to that base.
- ✓ Do calculations in per unit.
- ✓ Convert back to actual values if needed.



Per unit system = Simplify calculations. Normalize system. Analyze with confidence.

A decorative border of colorful confetti (red, blue, yellow, green, pink) is scattered across the top and sides of the page.

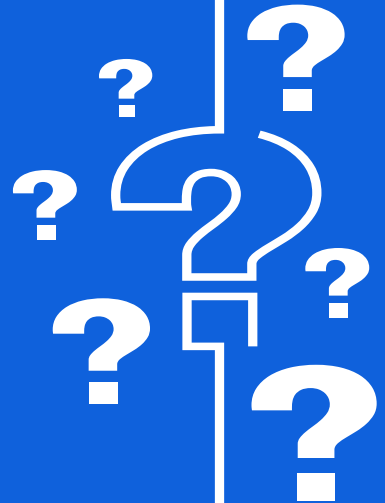
WINNERS OF QUIZ AUGUST 2026

VINAY YADAV
SHRIKANT GAVATE
JAYWANT THORAT
MAHESH GHARAT

Congratulations

QUIZ - SEPTEMBER 2026

1. Which document forms the technical basis for issuing an RFQ (Request for Quotation) for a power transformer?
A. Purchase Order
B. Technical Specification
C. Dispatch Clearance
D. Invoice
2. Which parameter is most critical while procuring a medium-voltage switchgear panel?
A. Panel color
B. Fault level withstand capability
C. Vendor location
D. Shipping weight
3. What is typically the longest lead item in a large electrical substation project?
A. Junction Boxes
B. Cable Trays
C. Power Transformer
D. Lighting Fixtures
4. For procurement of motors used in hazardous areas, compliance with which certification is essential?
A. ISO 9001
B. IECEX/ATEX
C. LEED
D. CEAMA
5. Which cable parameter directly influences voltage drop calculations?
A. Sheath Color
B. Conductor Cross-Sectional Area
C. Drum Length D. Packing Type
6. What is the key purpose of a Technical Bid Evaluation (TBE)?
A. Compare suppliers' tax structures
B. Assess technical compliance with specifications
C. Audit manufacturing facilities
D. Finalize payment terms
7. IEC 61850 is primarily associated with procurement of:
A. Power Cables
B. Earthing Systems
C. Substation Automation Systems
D. Lighting Systems
8. What is the primary purpose of a Vendor Data Requirement Schedule (VDRS)?
A. Define inspection costs
B. Specify engineering documents to be submitted
C. Track transportation
D. Manage customs duties



9. For a 132/33 kV power transformer, which routine test is mandatory?

- A. Paint Adhesion Test
- B. Ratio Test
- C. Fire Resistance Test
- D. Acoustic Test

10. While evaluating bids for LV switchboards, Form 4b refers to:

- A. Painting Standard
- B. Degree of Internal Separation
- C. Cable Entry Arrangement
- D. Packaging Method

- The quiz will be open for the following month.
- Each question carries 10 marks.
- Please use following google form link to participate in this month's QUIZ - <https://forms.gle/Y3fLyrTQRgGMA4EE7>

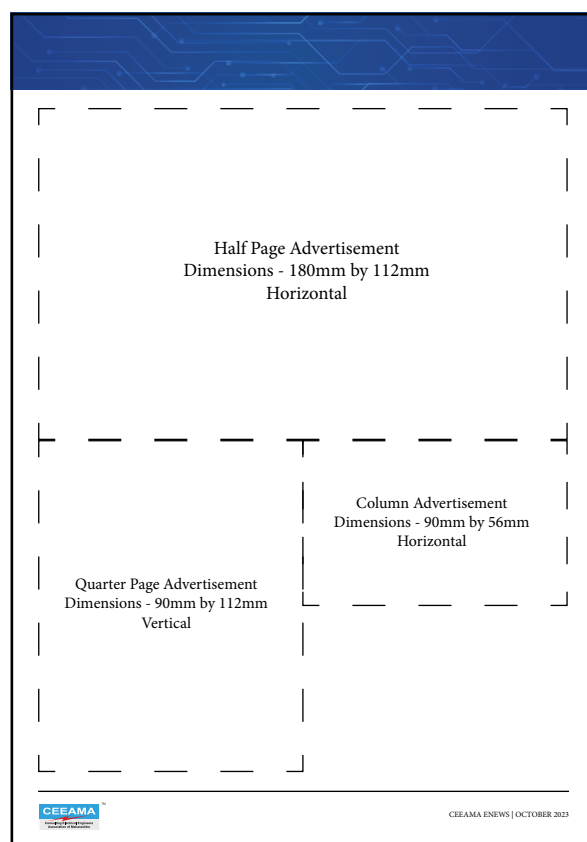
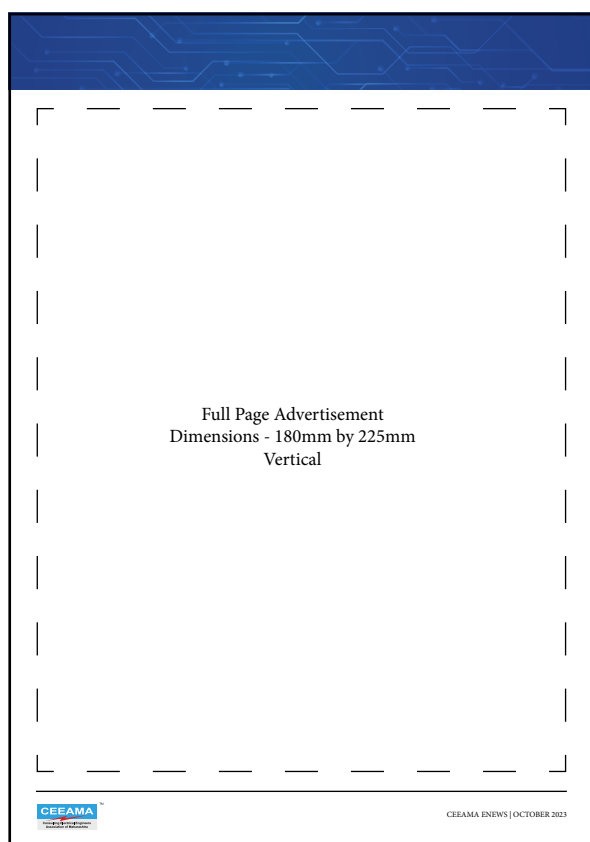
Thank you for the overwhelming response to the E-NEWS, especially the E-Quiz. MCQ-based quizzes often challenge our understanding and encourage us to think more deeply about technical concepts. Our aim is to spark curiosity, help you assess your technical awareness, and identify topics that deserve greater discussion and learning.

Wishing you the very best for this round — keep participating and spread the word!

August 2026 Quiz Answers

1. B. Verification of connected load and power system study assumptions
2. C. Impact assessment across all disciplines before implementation
3. D. Process Simulation Software Licensing
4. B. BIM / Revit-based 3D Model
5. C. Construction rework and schedule delay
6. B. Energy security and resilience
7. C. Flooding affecting substation construction
8. C. Early detection of rework risks
9. C. Earthing layout drawing
10. C. Balance flexibility with engineering discipline

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A-103. Sanpada Railway Station Building, 1st floor Sanpada East, Navi Mumbai – 400705
Email: admin@ceeama.org
