



CEEAMA *Live Wire* E-NEWSLETTER

Published by Consulting Electrical Engineers Association of Maharashtra



Topic for July 2026
FORCE MAJEURE

Before immersing yourselves in this month's topic, revisit the last issue—
take the quiz at the end and see how much you remember.

Electrical Consultants Newsletter
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July 2026

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Chief Editor - CEEAMA LIVEWIRE

From the Editors Desk,

Industries often face losses and breakdown due to variety of reasons. While certain problems or issues such as raw material quality, skilled resources, labour strike, cash-flow, profitability dynamics, market value, etc. can be attributed to mismanagement, there are problems which are external and outside the company's control. We saw in our May 2026 LiveWire issue, how to be "Monsoon Prepared". Such and many other natural calamities cannot be always prepared for and that is called "FORCE MAJEURE"!

Force Majeure refers to unforeseeable events—natural disasters, pandemics, wars, or government actions—that prevent contractual obligations from being fulfilled.

In Maharashtra's industrial ecosystem, electrical projects often rely on imported equipment (transformers, switchgear, SCADA systems). Force Majeure clauses safeguard contractors and clients when disruptions occur.

Key Implications:

- Delays in commissioning substations and renewable energy projects.
- Supply chain interruptions for critical electrical components.
- Cybersecurity risks in smart grid operations.

Let's deep dive into this subject with some of our articles in this Newsletter!

Maharashtra's Current Economic Scenario is quite positive. The economy is projected to grow at **7.9% in 2025–26**, with industry contributing **5.7% growth**. The state remains India's largest contributor to GDP (14% share). Consumer Price Index inflation averaged **2% in rural areas and 1.5% in urban areas** during 2025, keeping input costs relatively stable.

Read more: अर्थ व सांख्यिकी संचालनालय [//mahades.maharashtra.gov.in/files/noticeboard/highlights_eng.pdf](https://mahades.maharashtra.gov.in/files/noticeboard/highlights_eng.pdf)

The impact on Electrical Industry is remarkable viz. Rising demand for infrastructure and energy projects (metro systems, industrial corridors, renewable energy). This in turn makes our industry vulnerable to global supply chain shocks (e.g., semiconductor shortages, geopolitical trade disputes) and thus knowing legality of Force Majeure is highly crucial.

Force Majeure in Practice - Recent Examples:

- COVID-19 pandemic disrupted transformer imports and delayed grid modernization.
- Floods in Western Maharashtra affected substation construction timelines.
- Global shipping bottlenecks slowed delivery of high-voltage equipment.
- Cyberattacks on industrial control systems are emerging as modern Force Majeure scenarios.

Contractual Safeguards: Engineers and project managers must ensure contracts clearly define Force Majeure events, notification obligations, and mitigation strategies.

Probably luck matters! Thus, wishing you all a **SAFE**, and Lucky period ahead.



Subhash L. Bahulekar
Chief Editor – CEEAMA

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From the President's desk:

This month we focus on 'force majeure clauses in the contracts and how they affect the projects. A Force Majeure clause is one of the most critical risk-management tools in any commercial contract. Without this clause, parties are bound by a strict legal standard where they must perform their duties or face massive financial penalties even if a catastrophic, unavoidable event makes performance completely impossible.

A force majeure clause in electrical projects excuses parties from liability when unforeseeable, uncontrollable events (e.g., natural disasters, grid failures, or sweeping government orders) prevent them from fulfilling contractual duties. It acts as a vital safety valve to manage project delays and allocate critical risk. Since energy and electrical installations involve tightly linked agreements, a clear force majeure provision ensures that if one part of the supply chain collapses, related liabilities (like penalties for failing to deliver power) are properly managed. The clause is designed to operate as a self-executing mechanism between the parties. However, if the parties disagree on whether the clause applies, an arbitrator or a court becomes necessary to resolve the dispute. Courts interpret these clauses strictly. The event must make performance impossible, not just more expensive or difficult (e.g., a simple spike in the cost of copper or silicon, upto the threshold point, does not qualify as force majeure unless it affects the entire).

In India, landmark cases, such as Energy Watchdog v. CERC and subsequent Central Electricity Regulatory Commission orders, establish that standard price escalations do not constitute force majeure. Conversely, state-level Appellate Tribunal for Electricity (APTEL) rulings have validated that unreasonable governmental or administrative delays can validly trigger force majeure protections for power developers especially, the Solar Power developers. As a case study, in 2016, the Appellate Tribunal for Electricity (APTEL) has ruled that utilities and nodal agencies cannot deny force majeure relief to renewable energy developers merely on technical grounds of delayed or defective notices when they were already fully aware of the underlying disruption and had actively participated in efforts to resolve it. The ruling came in a batch of appeals filed by Punjab Energy Development Agency (PEDA) challenging Punjab State Electricity Regulatory Commission's (PSERC) orders granting extension of scheduled commissioning dates (SCOD) to solar projects under Punjab's 2015 solar tender programme.

The Supreme Court in India rules that if a contract can be completed via an alternate mode or route (even if much more expensive), the force majeure clause cannot be invoked, making the issue trickier. It is advised to consult experts having deep knowledge of Contracts and Contract Management to invoke this clause. Readers are advised to use prudence in such matters.

Moving on, we once again earnestly request all CEEAMA members to please share your experience by using the LiveWire platform. Every day we come across many professional challenges. Documenting them helps in honing our reporting skills as well as help the fraternity to learn from your experience. I am sure people will benefit by shared learning. I also request our Associate Members to kindly indicate whether we can have a factory visit conducted at your premises. We could decide based on mutually convenient dates and plan logistics accordingly.

Hope you all are safe in the fury of the monsoon this year. Rains, rains, pains and no gains have an effect on the electrical 'mains' which may boil your blood in veins.

Guru Purnima falls on July 29th this year. I would like to take this opportunity to extend my sincere gratitude to the mentors who have shaped my career and professional growth. I look forward to your continued guidance.

With warm regards,



Mr. Chidambar Joshi
Hon. President

From the Secretary's desk:

Dear Esteemed Members,

Dear Esteemed Members,

As we enter the month of July 2026, it is a privilege to connect with you all once again through our association platform. The engineering landscape is evolving at a breathless pace, and our role as consulting electrical engineers has never been more critical in shaping a sustainable future.

I want to take this opportunity to highlight the remarkable milestone India has recently achieved in its energy transition journey. According to the latest data released by the Central Electricity Authority (CEA), India's total installed power generation capacity reached a monumental 537.26 GW as of April 30, 2026.

Most notably, non-fossil fuel sources now account for a dominant 53.61% of the total capacity mix. Within this ecosystem, renewable energy sources—encompassing solar, wind, biomass, waste-to-energy, and small hydro—together contribute a staggering 227.59 GW. Large hydro and nuclear capacities stand strong at 51.66 GW and 8.78 GW, respectively.

Driving this clean energy infrastructure expansion are solar and wind capacities, which have surged to 154.24 GW and 56.44 GW respectively, reflecting profound progress toward India's long-term energy transition and net-zero targets.

Closer to home, these macro trends are heavily influencing our immediate operating environment. As consulting engineers, we must align our current project designs with the critical state policy updates recently enacted in Maharashtra:

The Maharashtra Electricity Regulatory Commission (MERC) has modified its multi-year tariff framework, restricting banked energy drawals to the same or lower tariff slots. A 15% rebate applies during solar hours (09:00 to 17:00) from April to September, while peak-hour consumption attracts a 20% premium. Furthermore, MERC has locked the surplus rooftop solar export tariff at ₹2.82/kWh for FY 2026–27.

In a major procedural update, MSEDCL has implemented system-level portal blocks that restrict residential rooftop solar approvals. Sanctioned capacity must now align strictly with the consumer's past 12 months of historical electricity consumption rather than projected future loads.

The residential sector continues to see aggressive deployment backed by the central PM Surya Ghar Muft Bijli Yojana, offering a maximum financial subsidy of ₹78,000 for systems of 3 kW and above. This is tightly paired with state initiatives like the Maghel Tyala Saur Krushi Pump Yojana to solarise agricultural feeders.

The high penetration of intermittent renewables coupled with rigid time-of-day banking rules demands greater expertise from us in grid stability, advanced energy storage solutions, and smart distribution technologies.

I encourage all our members to leverage these insights, upgrade our engineering methodologies, and continue leading the charge toward an energy-efficient Maharashtra.

Thank you for your unwavering commitment to excellence and innovation.

Warm regards,



Ulhas Vajre
Honorary Secretary

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Force Majeure: When Acts of God Meet Acts of Law

1. Abstract:

Force majeure is a crucial contractual safeguard that protects parties when unforeseen events disrupt performance. Originating in civil law and later adopted into common law, it functions as a riskallocation mechanism, excusing liability when obligations become impossible, unlawful, or impracticable. Typical events include natural disasters, wars, pandemics, government actions, and technological failures.

Recent global crises-such as COVID19, supply chain disruptions, and regulatory interventions-have heightened the importance and interpretation of force majeure clauses. Courts increasingly demand precise drafting and clear proof of causation, underscoring the need for careful contractual language.

This Article explores the concept, essential elements, and classification of force majeure events, while analyzing judicial trends, practical applications, and modern challenges.

2. Introduction:

Contracts represent the foundation of commercial certainty; however, they operate within an unpredictable environment. Events such as floods, wars, pandemics, or regulatory bans may intervene, disrupting obligations that were otherwise feasible at the time of agreement. Force majeure clauses provide relief in such circumstances by reallocating contractual risks and excusing performance when extraordinary events intervene.

Force majeure, meaning “superior force,” refers to events that are:

- Unforeseeable
- External
- Unavoidable

These events must prevent contractual performance, rather than merely making it difficult or expensive.

In common law jurisdictions such as India, the United Kingdom, and the United States, force majeure is contractual in nature, requiring explicit inclusion. In its absence, relief may be sought under doctrines such as frustration or impossibility.



3. Essential Elements:

A valid force majeure claim generally requires:

1. Unpredictability of the event
2. External nature (beyond control)
3. Impossibility or illegality of performance
4. Direct causal connection
5. Absence of fault
6. Mitigation efforts by the affected party

4. Classification of Force Majeure Events

Force majeure events are extraordinary, unforeseen circumstances beyond a party's control that prevent or hinder contractual performance, including natural disasters, human actions, and systemic disruptions.

1. Natural Events

These are often referred to as “acts of God” and include events that are extreme and unpredictable:

- Earthquakes, floods, hurricanes, and tornadoes that physically prevent performance
- Severe weather events such as blizzards or wildfires that disrupt operations



2. Human-Caused Events

These involve actions or disruptions caused by people that are beyond the control of the contracting parties:

- Wars, armed conflicts, and terrorist attacks that make performance unsafe or illegal
- Civil unrest, riots, or strikes, which can block access to facilities or labor

- Government actions, including new laws, regulations, or mandatory shutdowns that prevent contractual obligations



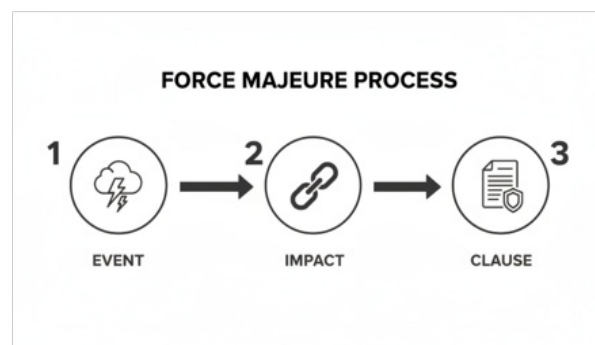
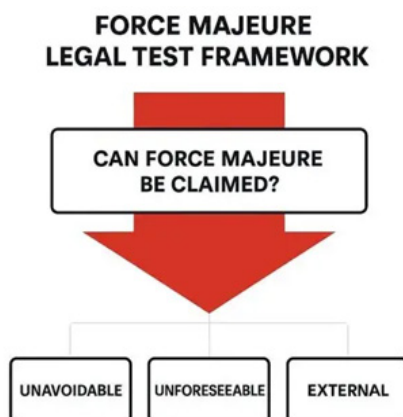
3. Systemic or Operational Disruptions

These are broader events affecting infrastructure or supply chains:

- Industrial strikes or labor disputes that halt production or delivery
- Supply chain interruptions, such as port closures or critical facility shutdowns
- Technological or utility failures, like major power outages or cyberattacks, if explicitly included in the contract

4. Public Health Emergencies

- Epidemics and pandemics, including COVID19
- Quarantine restrictions and lockdowns causing operational shutdown



5. Judicial Interpretation:

Judicial interpretation of force majeure plays a decisive role in determining whether a contractual obligation is excused due to unforeseen events. Courts across jurisdictions follow a strict, principle-based approach, focusing primarily on contractual wording, causation, and the nature of the supervening event.

Courts consistently interpret force majeure clauses narrowly. Relief is granted only when:

- The event is explicitly covered in the contract, or
- Falls within a clearly defined category

In Indian law, the judicial interpretation of force majeure events is governed by the Indian

Contract Act, 1872, specifically Sections 32 and 56.

- **Section 32** deals with contingent contracts: contracts to do or not to do something if an uncertain future event happens. Where performance is contingent on an event that becomes impossible, the contract becomes void. This provision underpins force majeure in Indian law to some extent, but it applies to contracts where performance is conditional on an event occurring, not to contracts where performance has begun and is interrupted by an event.
- **Section 56** is the doctrine of frustration: where an act that is contracted to be done becomes impossible, or by reason of some event which the promisor could not prevent, unlawful, the contract becomes void. The doctrine of frustration discharges both parties from all remaining obligations when a supervening event makes performance impossible or fundamentally different from what was agreed.

Indian courts interpret force majeure clauses strictly. Events must specifically fall within the language of the clause or be clearly within its scope to qualify.

- In *Energy Watchdog v. Central Electricity Regulatory Commission* (2017), the Supreme Court of India held that a force majeure event must be one that makes performance impossible, not merely more difficult or more expensive. Price increases, regulatory changes that make performance more costly, and supply chain difficulties that make performance harder but not impossible generally do not qualify as force majeure under the Indian strict interpretation standard. This has a direct practical implication: the events listed in the force majeure clause



need to be specific enough to cover the events the parties are concerned about, and broad enough to capture genuinely unprecedented events without relying on vague catch-all language that courts may not interpret generously.

6. COVID-19 & Force Majeure:

COVID-19 is widely recognized as a force majeure event, allowing parties to suspend or terminate contractual obligations due to its unforeseen and uncontrollable nature.

COVID-19 as a Force Majeure Event

Legal Recognition: COVID-19 has been classified as a force majeure event in many jurisdictions, particularly when the contract explicitly includes terms like “pandemic,” “epidemic,” or “disease.” If such terms are not included, broader catch-all provisions may still apply, covering events like “acts of God” or “national emergencies”.

Impact on Contracts: The pandemic has disrupted supply chains, led to government-imposed restrictions, and caused significant operational challenges for businesses. As a result, many companies are invoking force majeure clauses to excuse non-performance or delays in fulfilling contractual obligations.

Contractual Obligations: To successfully claim force majeure due to COVID-19, parties must typically demonstrate that they took reasonable steps to mitigate the impact of the pandemic and that performance became impossible, not merely burdensome. Courts will closely examine the specific wording of the force majeure clause and the circumstances surrounding the contract.

Practical Steps for Businesses

Review Contracts: Businesses should carefully review their contracts for force majeure provisions and determine if COVID-19 is explicitly mentioned or can be interpreted as a qualifying event.

Notify Counterparties: If a business is unable to perform due to COVID-19, it should promptly notify the other party, following any notice requirements outlined in the contract.

Document Efforts: Companies should document their efforts to mitigate the impact of COVID-19 on their operations, as this may be necessary to support a force majeure claim.

COVID-19 is generally recognized as a force majeure event, allowing parties to suspend or terminate contracts under specific conditions. The interpretation and application of force majeure clauses will depend on the contract’s language and the governing law. Businesses should seek legal advice to navigate these complex issues effectively.

Post-COVID Judicial Trends (India)

Courts examined:

- Whether pandemic was explicitly mentioned
- Whether lockdown caused actual impossibility

Indian courts maintained strict standards even during COVID19 but showed Broader acceptance where Government orders directly prevented performance.

7. Situations Where Courts Reject Force Majeure Claims:

Courts typically reject force majeure claims when the event causing the claim is not unforeseeable, beyond control, or not of sufficient severity to make performance impossible or illegal.

Mere Commercial Hardship: Courts generally do not consider mere economic hardship or loss of profit as sufficient grounds for a force majeure claim.

Failure to Prove Event: If a party cannot provide cogent evidence to support the existence of a force majeure event, the claim may be rejected.

Failure to Meet Contractual Requirements: If the event does not meet the specific criteria outlined in the contract's force majeure clause, the claim may be dismissed.

Pre-existing Conditions: If the event was known to the parties at the time of contract formation and could have been reasonably anticipated, it may not qualify as a force majeure event.

Proximity to Performance: Events that occur after the performance of the contract may not be considered force majeure, as they are not directly related to the performance of the contract.

8. Emerging Judicial Trends

The judicial trends for force majeure in India have evolved significantly in response to the COVID-19 pandemic and other global disruptions.

Wider Recognition of Pandemic-Related Disruptions: The Government of India declared COVID-19 as a force majeure event for public procurement contracts, reflecting a policy shift towards broader recognition of pandemic-related disruptions.

Judicial Acknowledgment of Contractual Impact: Courts have acknowledged the impact of the pandemic on contracts, granting temporary relief to contractors unable to perform due to lockdowns.

Equitable Risk Allocation: The judicial approach increasingly emphasizes equitable allocation and appropriate risk mitigation, revisiting traditional risk-sharing agreements and refining contracts.

Flexibility in Force Majeure Clauses: Force majeure clauses provide additional circumstantially specific relief to parties, such as suspending obligations, granting time extensions, or offering limited compensation.

These trends indicate a shift towards a more flexible and equitable approach to force majeure claims, reflecting the changing nature of commercial contracts and the need for adaptability in response to unforeseen circumstances.

9. Common pitfalls in force majeure clauses:

Overly generic wording

One of the most frequent issues is the use of vague catch-all phrases such as “acts of God” or “any event beyond the control of the parties.” Such language offers little protection, particularly in jurisdictions that interpret contract terms strictly. Courts increasingly expect parties to clearly define which events qualify as force majeure.

Lack of specific event listings

If the clause does not explicitly mention risks such as pandemics, sanctions, cyberattacks, or environmental disasters, a party may be denied relief, even if the event is truly extraordinary. Modern force majeure provisions must reflect today's realities: global viral threats, geopolitical instability, climate risk, and cyber incidents. Clauses should include a detailed and industry-relevant list of potential triggering events.

Failure to include notification procedures

Many clauses lack a clear protocol for what to do when a force majeure event occurs, such as deadlines for notification, the required form, and supporting documentation. This legal ambiguity can result in a party losing its right to invoke the clause. We strongly recommend including a provision requiring written notice within a specific period (e.g., five business days from the occurrence of the event).

No distinction between suspension and termination

Another critical omission is the failure to specify the consequences of a force majeure event: whether performance is temporarily suspended, partially adjusted, or permanently terminated. Without these distinctions, parties may not know how to proceed, and courts may struggle to interpret intent. For

example, if the contract lacks a partial delivery clause, one party may suspend all performance, even if most obligations could still be fulfilled.

10. Consequences of Force Majeure

The specific consequences of invoking force majeure depend on the contract's terms. Typically, these consequences may include:

1. **Suspension of Performance:** The contract may be suspended temporarily while the force majeure event persists.
2. **Termination of the Contract:** If the force majeure event lasts beyond a certain time, the parties may agree to terminate the contract without liability.
3. **Waiver of Penalties:** Often, the force majeure clause provides that the party invoking the clause is not liable for penalties or damages arising from the delay.
4. **Restitution:** If the contract is frustrated, restitution may apply, which means the benefits received by one party must be returned to the other.



Conclusion:

Judicial interpretation of force majeure reflects a balance between contractual certainty and fairness in exceptional circumstances. Courts consistently uphold the principle that force majeure is not a general escape clause but a precise contractual mechanism. Relief is granted only when the event meets strict legal standards of unforeseeability, impossibility, and causation, as interpreted through the exact wording of the contract.

Contributed by:



Sunil Parmar - Associate Engineer – Plant Engineering (Chemicals)



Introduction

In this article the term Force Majeure refers to extraordinary events or circumstances that are beyond human control and prevent an organization, contractor, supplier, or service provider from fulfilling contractual or operational obligations. Force Majeure may include events such as natural calamities, war-like situations, strikes, riots, major disruptions, or other uncontrollable events, provided such events are covered in the contract. However, Force Majeure is not a blanket excuse for every delay or failure. The reference clearly indicates that such a clause generally suspends obligations only for the duration of the event, and obligations revive once the Force Majeure period is over.

Force Majeure events are generally grouped into three categories: natural events such as floods, earthquakes, and pandemics; government actions like sanctions, embargoes, or policy changes; and infrastructure failures. These events become especially important in industrial facilities because electricity is the lifeline of almost every operation. Disruption in the power system can quickly affect production, safety, and business continuity, leading to considerable financial and operational losses. For this reason, organizations should move beyond simply invoking Force Majeure after an incident occurs and instead focus on building resilient systems through better engineering, preventive planning, and proactive risk management. Therefore, the modern approach should not be limited to claiming Force Majeure after failure but should focus on smart prevention through effective engineering.

Force Majeure clause by Indian Government:

The Indian legal framework for force majeure clauses is primarily governed by Section 56 of the Indian Contract Act, 1872. The purpose is that it temporarily suspends obligations, allows time extension, and avoids penalties, but duties resume once the event ends some of the clauses- Section 32, Indian Contract Act, 1872, Section 56, Indian Contract Act, 1872, Government Procurement Manuals.

How Force Majeure Can Affect the Power System?

In a plant, electrical power is interconnected with production, utilities, automation, safety systems, and emergency services. Depending on the severity, a force majeure event management team has concluded a real time analysis data in which they claim it can cause partial power interruption of 20 – 40%, major plant load loss of 50 - 70%, or complete blackout of 90 –100% if incomers, transformers, or main switchboards are affected.

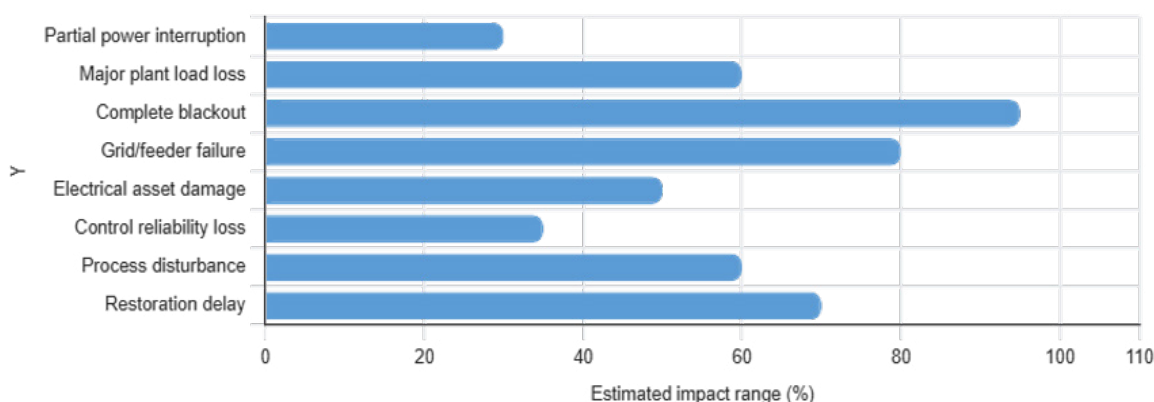


Fig-1: Indicative Force Majeure Impact on Plant Power System

Importance of Power Systems in Plants/Industries:

- Ensures continuous plant operation: Reliable power supply keeps motors, pumps, compressors, MCCs, PCCs, lighting, HVAC, and utility systems running without interruption.
- Supports automation and control systems: PLC, DCS, SCADA, VFDs, instruments, analyzers, and

communication panels require stable voltage and clean power for accurate control.

- Protects equipment and personnel safety: Proper relay coordination.

Hence, the plant power system must be designed with proper reliability, redundancy, protection coordination, power quality, and emergency restoration philosophy.

Power System Resilience as a Smart Prevention Strategy Against Force Majeure:

1. Key Elements of Power System Resilience:

This report identifies several important components that collectively improve power system resilience. These elements are not isolated; they work together to create a strong defense mechanism for plant's electrical infrastructure.

Planning and risk assessment, Robustness of infrastructure, Rapid recovery capability, Smart grid technology, Microgrids and distributed energy resources, Communication and coordination, Preparedness & training, and Regulation & standards.

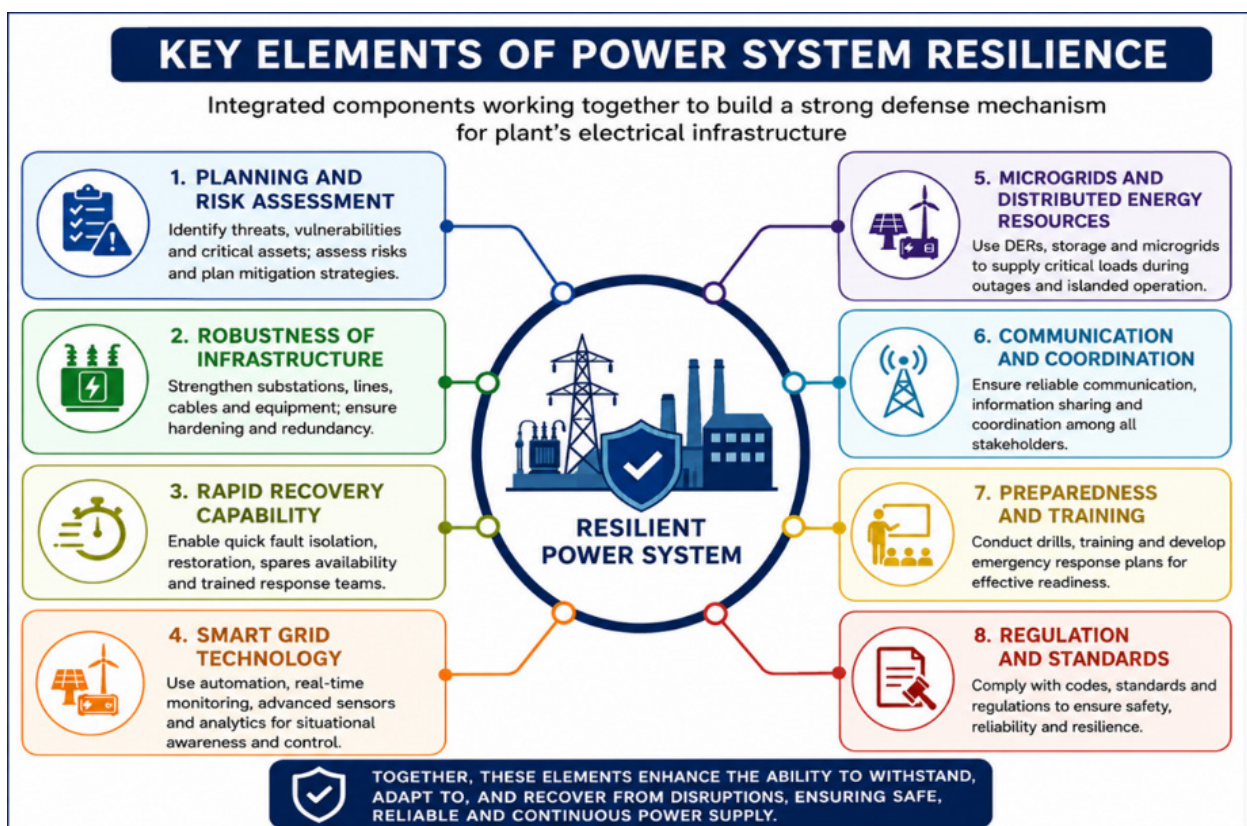


Fig-2: Power system resilience Model

2. Resilience Enhancement Stages for Power Systems:

Step-by-step process for resilient enhancement stages involving - preparation, response, recovery, and continuous improvement.

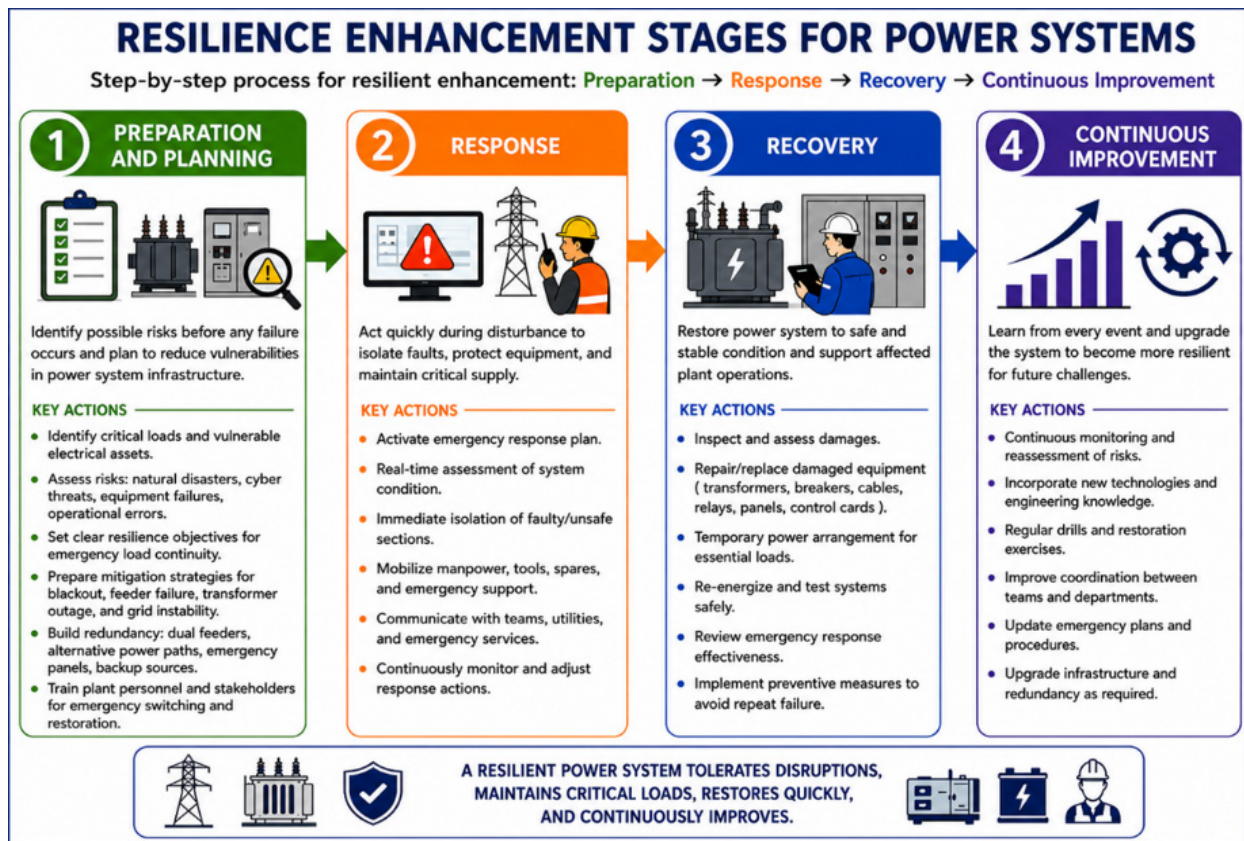


Fig-3: Resilient enhance stage for power systems

3. Infrastructure Upgradation for Force Majeure Prevention

Area of Upgradation	Purpose / Application
Modernization of ageing assets	Replace ageing switchgear, transformers, relays, and cables with higher-rated, condition-monitored equipment.
Flood protection measures	Elevate electrical rooms, transformers, and cable trenches in flood-prone areas to prevent water ingress and insulation failure.
Strengthening of outdoor infrastructure	Reinforce gantries, poles, lightning masts, and transmission towers to withstand storms, cyclones, and external disturbances.
Smart monitoring and protection	Use numerical relays, online monitoring, thermal sensors, and cable health monitoring for early fault detection and faster response.
Automation and power segregation	Apply automated changeover schemes, bus transfer systems, and proper segregation of normal, emergency, and essential power distribution.

4. Role of Smart Grid, Monitoring, and Automation:

Smart grid, monitoring, and automation improve grid visibility, fault detection speed, control accuracy, and real-time decision-making in plant power systems. They reduce manual fault identification and help the plant team act within minutes through sensors, SCADA, analytics, and automated restoration.

Smart grid in effect:

- Use SCADA monitoring for incomers, feeders, transformers, and critical loads.

- Track voltage, current, frequency, power factor, load, and fault data in real time.
- Apply automated fault detection, isolation, restoration, and intelligent load shedding.
- Improve reliability through predictive maintenance, remote monitoring, relay records, trip logs, and disturbance analysis.

5. **Microgrids and Distributed Energy Resources as Resilience Tools:**

Microgrids improve plant resilience by disconnecting from the main grid during emergencies and operating independently with DG, UPS, battery storage, and renewable sources. They help maintain critical power during outages and reconnect safely once grid conditions become normal.

- Support critical process loads during external grid failure.
- Feed emergency lighting, fire pumps, safety systems, and control rooms.
- Provide backup for PLC, DCS, SCADA, instrumentation, UPS, and battery-based systems.
- Integrate solar/wind/hybrid sources and BESS to reduce blackout risk and improve voltage-frequency stability.

6. **Sustainability Link with Resilient Power Infrastructure:**

Resilient power infrastructure supports sustainability by making the electrical network reliable, durable, adaptable, and capable of handling force majeure events and future plant needs. It combines renewable energy, battery storage, grid modernization, decarbonization, energy efficiency, policy support, community engagement, and sustainable planning.

- Integrate renewable energy with grid and captive power systems.
- Use battery energy storage for peak shaving and emergency backup.
- Apply energy-efficient motors, drives, transformers, and lighting systems.
- Improve resilience through load optimization, low-carbon power, infrastructure modernization, and risk-based planning for flood, heat, cyclone, fire, and grid disturbances.

Real-Life Force Majeure Events worldwide:

Following are some real-life examples of force majeure already took place earlier and their consequences globally:

- Texas Winter Storm 2021: ~4.5 million consumers without power; ~20,000 MW load shedding.
- Cyclone Amphan 2020: Power-grid damage in Odisha ~₹3.2 billion / US\$42 million.
- Chennai Floods 2015: Floodwater entered around 25 substations, causing major safety power shutdowns.
- 2003 Northeast Blackout: ~50 million people affected; economic loss ~US\$6 billion.
- Fukushima 2011: ~2719 MWe nuclear capacity written off after tsunami-related power failure.

REAL-LIFE FORCE MAJEURE EVENTS IN POWER SYSTEMS			
1. TEXAS WINTER STORM URI, USA – 2021  • Extreme cold caused generation failures and fuel shortages. • ~4.5 million people lost power. • ~20,000 MW load shed to prevent grid collapse.	2. CYCLONE AMPHAN, INDIA – 2020  • Cyclone damaged lines, transformers, substations & distribution network. • Power grid damage in Odisha ~₹3.2 billion (US\$42 million). • Large-scale outages and restoration challenges.	3. CHENNAI FLOODS, INDIA – 2015  • Floodwater entered substations and electrical equipment. • Power shutdowns done for safety. • Supply restored only after water receded.	4. FUKUSHIMA DISASTER, JAPAN – 2011  • Earthquake & tsunami cut off external and backup power. • Cooling failure led to reactor meltdowns. • Highlights need for redundant and protected power systems.

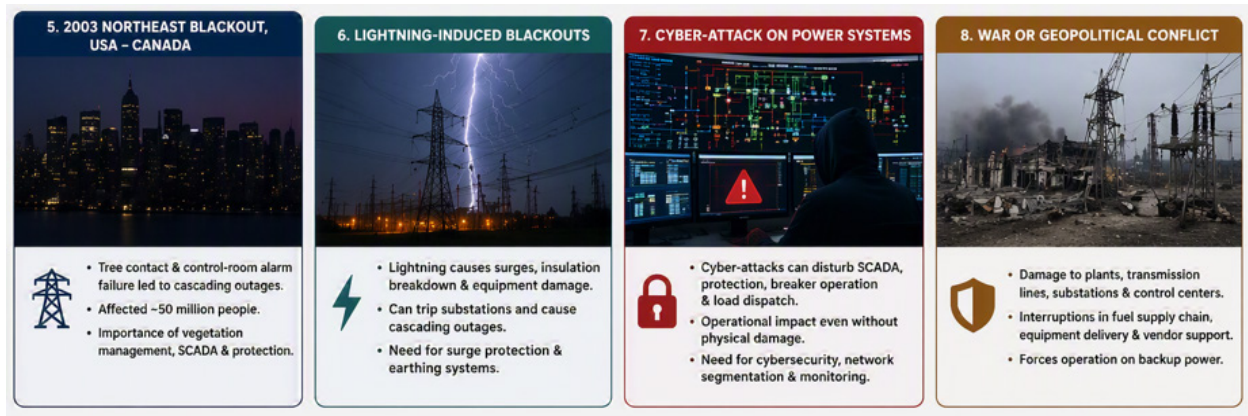


Fig-4: Force Majeure worldwide

Conclusion

Force majeure must be treated not only as a contractual clause but as a technical design input for power system resilience. Extreme events cannot always be prevented, but their impact can be reduced through robust infrastructure, redundancy, UPS/DG backup, smart monitoring, and protected cable/electrical rooms. The aim is to make the system damage-tolerant, quickly recoverable, operationally flexible, and continuously improved. A resilient power system maintains critical loads, isolates faults faster, supports restoration, and protects the plant from prolonged shutdown.

Contributed by:



VAIDEHI KHADSE





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- # Digital media marketing



- # People Networking
- # Marketing
- # Business Development
- # Team Building and management



- # Graphic designing
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When Nature Strikes, Engineering Answers: Force Majeure and the Resilience of Industrial Plants

1. Introduction: When the Unexpected Becomes the Inevitable

Imagine a coastal refinery running at 95% capacity when a Category 4 hurricane makes an unexpected landfall. Within hours, storm surge floods three pump houses, a lightning strike trips the main substation, and crude oil supply pipelines are shut in by the upstream operator. The control room, now running on emergency lighting, sees alarm floods across every process unit. Operators scramble to execute emergency shutdown procedures while HSE coordinates an orderly evacuation of non-essential personnel.

Was this an operational failure? A maintenance oversight? Or was it something else entirely — an event so far beyond the control of the plant owner that no amount of engineering preparation could have fully prevented it?

This scenario describes a Force Majeure event. And while most engineers first encounter the term buried in the fine print of a procurement contract, it is far more than a legal construct. Force Majeure is an engineering reality — one that tests every discipline simultaneously: process, mechanical, electrical, instrumentation, operations, and HSE. Understanding it is not optional for the modern plant engineer. It is a professional imperative.

"Force Majeure events do not test your equipment — they test your engineering culture."

— Senior Process Engineer, Gulf Coast Refinery

2. What is Force Majeure?

Legal Definition

Derived from French — literally 'superior force' — Force Majeure refers to extraordinary events or circumstances beyond the control of the contracting parties that prevent or delay contractual performance. Legally, it typically requires three elements: the event must be external, unforeseeable, and unavoidable. Common triggers include natural disasters (earthquakes, hurricanes, floods), acts of war, pandemics, civil unrest, and government-imposed embargoes.

Engineering Interpretation

For engineers, Force Majeure is any event originating outside the process boundary that causes unplanned, uncontrolled disruption to plant operations — one that could not have been mitigated by good engineering practice, proper maintenance, or reasonable operational planning. It is the intersection of natural science and industrial vulnerability.

The critical distinction is this: a pump seal failing because of poor lubrication practice is a maintenance failure. That same pump failing because a once-in-a-century flood submerged the pump house is Force Majeure.

Force Majeure vs. Equipment Failure vs. Negligence

The following table illustrates how Force-Majeure differs common industrial disruption scenarios:

Category	Force Majeure	Equipment Failure	Negligence
Cause	External, unforeseeable event	Internal mechanical/process issue	Human error or omission
Foreseeability	None — beyond all control	Partially foreseeable	Preventable
Liability	Contract party relieved	Operator/owner responsible	Full liability applies
Insurance	Typically covered	May or may not be covered	Usually excluded
Examples	Earthquake, hurricane, war	Pump seal failure, valve leak	Skipped inspection, wrong procedure

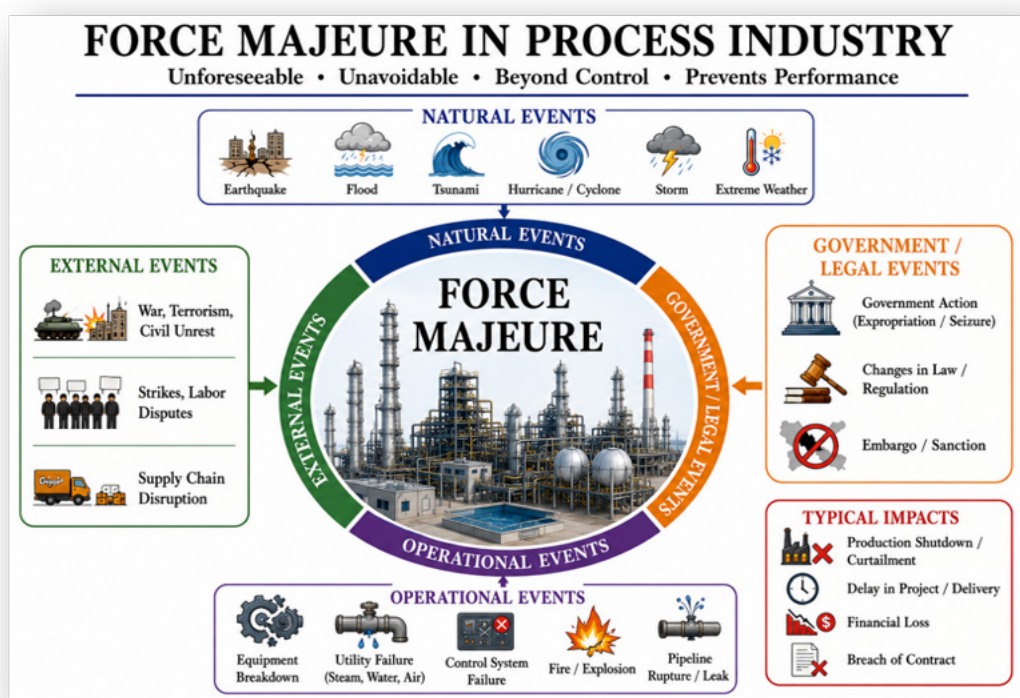
Why does this distinction matter to engineers? Because the response strategy, investigation approach, insurance claim, contractual obligation, and regulatory reporting all depend on correctly categorizing the event. Engineers who can make this distinction clearly — and document it rigorously — protect their organizations from significant legal and financial exposure.

3. Force Majeure Through the Eyes of a Process Engineer

No engineering discipline feels the impact of Force Majeure more immediately or more broadly than Process Engineering. The process engineer is, in effect, the guardian of the plant's thermodynamic and chemical integrity. When a Force Majeure event strikes, that guardian faces a cascade of simultaneous challenges.

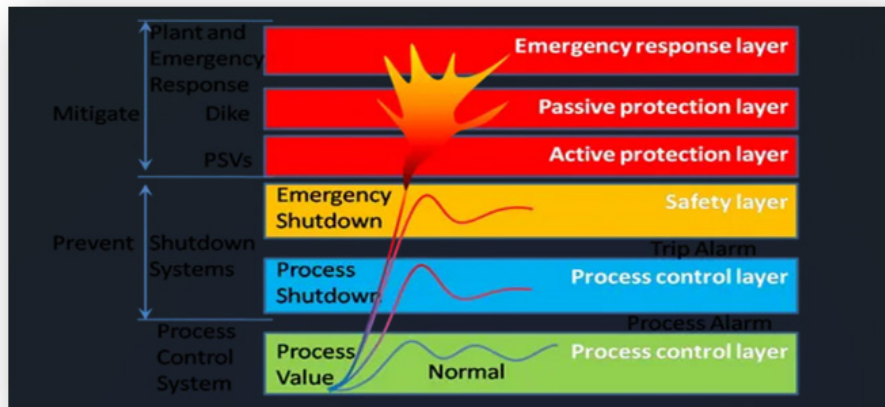
Process Upsets: The Cascade Effect

Industrial processes are designed to operate within defined parameters — temperature, pressure, flow, composition. Force Majeure events introduce disturbances at a rate and magnitude that process control systems alone cannot absorb. A sudden loss of cooling water (caused by a flood disabling cooling tower pumps) in an exothermic reactor can trigger a runaway reaction. Loss of instrument air (from a compressor



house submerged by storm surge) causes pneumatic control valves to fail — and if not properly specified, they may fail in the wrong direction.

The Safe Shutdown Philosophy



Modern process plants are designed around a hierarchy of protection layers, as codified in IEC 61511 and the CCPS Layer of Protection Analysis (LOPA) methodology. In a Force Majeure scenario, the process engineer must rapidly assess which protection layers remain functional and which have been compromised.

A well-designed Emergency Shutdown (ESD) system operates independently of the Distributed Control System (DCS). When Force Majeure strikes, the ESD philosophy must take the plant from its current operating state to a safe, stable condition — the ‘safe park’ state — using the minimum number of actions and with the minimum energy release possible. This is not a theoretical exercise. At the 2005 Texas City Refinery explosion, loss of process control during a restart sequence led to a catastrophic outcome. Force Majeure preparedness demands that process engineers rehearse these sequences until they are instinctive.

Unit-by-Unit Impact Analysis

Reactors

Continuous reactors — whether fixed-bed catalytic, CSTR, or tubular — are acutely vulnerable to feed loss, coolant loss, and catalyst temperature excursions. In a Force Majeure power outage, agitators stop, coolant pumps fail, and the reaction mass may continue generating heat with no means of removal. Emergency quench systems, emergency cooling water loops on independent power, and automatic feed isolation are essential design provisions.



Distillation Columns

Distillation is an energy-intensive, continuous process highly sensitive to utility disruptions. Loss of reboiler heating (steam failure) or condenser cooling (cooling water loss) throws the column into an unsteady state. Accumulation of light ends in the base or heavy components flooding the overhead can create pressure excursions, relief valve activations, and flare loading. Process engineers must pre-calculate the time-to-upset from the moment utilities fail — this ‘safe window’ defines the urgency of the

shutdown sequence.

Heat Exchangers

Loss of cooling medium in heat exchangers can cause thermal shock, tube bundle failure, and process fluid releases to the environment. Shell-and-tube exchangers handling toxic or flammable materials must have emergency isolation valves that close automatically on loss of cooling flow. Force Majeure events that cause debris-laden floodwaters to enter cooling circuits can block tubes, reduce heat transfer coefficients drastically, and lead to overtemperature alarms across multiple units simultaneously.

Pumps and Compressors

Centrifugal pumps are particularly sensitive to power fluctuations. A sudden voltage dip — common in grid disturbances that precede a total blackout — can trip multiple pumps simultaneously, causing immediate loss of flow to reactors, cooling circuits, and reflux systems. Reciprocating compressors and centrifugal compressors with active surge control are vulnerable to rapid pressure transients when the downstream system is suddenly isolated.

Backup systems — steam-driven pumps, diesel-driven fire water pumps, and bladder-tank emergency instrument air — represent the process engineer's insurance policy against Force Majeure. They must be sized for full demand, maintained as rigorously as primary equipment, and tested regularly under simulated emergency conditions.

Boilers and Fired Heaters

Loss of combustion air, fuel gas pressure fluctuations, or emergency fuel system isolation can extinguish flames in boilers and fired heaters unexpectedly. A flame-out followed by re-ignition without proper purging is a major explosion risk, governed by NFPA 85 (Boiler and Combustion System Hazards). Emergency purge procedures and automated burner management systems (BMS) are non-negotiable safety layers in any Force Majeure scenario.

Cooling Towers and Utility Systems

Cooling towers are often the first casualties in a Force Majeure flood event. As makeup water supply becomes contaminated or unavailable, and fan motors become submerged, the entire plant cooling network degrades rapidly. Process engineers must maintain a 'cooling priority list' — a pre-agreed sequence determining which process units retain cooling water first when supply is curtailed — and this list must be communicated, documented, and drilled across all operating shifts.

Storage Tanks and Pipelines

Above-ground storage tanks in flood-prone areas face buoyancy challenges. A tank that is less than approximately 70% full may float off its foundation during a significant flood event, rupturing pipe connections and releasing product — a scenario witnessed during Hurricane Harvey in 2017 across the Texas Gulf Coast. Force Majeure planning for storage areas must include flood barrier design, tank anchoring calculations, and pre-event inventory management protocols.

Pipelines are equally vulnerable: ground subsidence, river crossings during flood events, and seismic ground movement can cause pipe failures at fittings and welds. Automated pipeline isolation valves, triggered by abnormal flow or pressure signatures, are critical in minimizing release volumes.

4. Cross-Department Coordination: Engineering as a Team Sport

Force Majeure events do not respect organizational charts. They arrive simultaneously in every department's inbox. The plant's ability to respond effectively depends entirely on how well the departments have coordinated before the event — not during it.

The following responsibility matrix illustrates cross-functional roles across the three phases of a Force Majeure event:

Phase / Team	Process	Mechanical	Electrical	Instr & Control	HSE
Before (Preparedness)	HAZOP, SOP review	Integrity audit	Grid redundancy	SIS validation	Emergency drills
During (Response)	Safe ESD execution	Emergency isolation	Switch to backup power	Monitor fail-safes	Evacuation, HAZMAT
After (Recovery)	Restart procedure	Damage assessment	Black-start sequence	Loop checks	Incident investigation

Effective coordination requires a pre-established Emergency Response Team (ERT) with clearly defined roles, authority, and communication protocols. The Incident Command System (ICS), adapted from emergency management practice, provides a scalable structure for plant emergency response. Every member of the ERT should be trained in ICS principles and in their specific role under Force Majeure conditions.



5. Real Industrial Case Studies: Engineering Under Pressure

Case Study 1: Texas Winter Storm Uri (February 2021)

When an unprecedented cold snap hit Texas in February 2021, temperatures plummeted to levels never before recorded in the region's modern history. Hundreds of industrial plants — refineries, petrochemical plants, LNG terminals — experienced simultaneous process upsets as instrument lines froze, heat tracing circuits failed, and natural gas supply for fired heaters collapsed under enormous demand. The engineering lesson: climate resilience design standards must reflect the tail of the probability distribution, not just historical averages. Following this event, the Texas Commission on Environmental Quality and FERC instituted new winterization requirements for critical energy infrastructure.

Case Study 2: Hurricane Harvey (2017)

As noted above, Harvey brought record-breaking rainfall to the Texas Gulf Coast. Beyond the direct physical damage, Harvey exposed a systemic gap in Force Majeure preparedness: the inability to safely manage facilities when the operating team cannot reach the site due to flooded roads. Several facilities attempted remote emergency shutdowns with incomplete success. The post-Harvey industry standard has moved toward requiring unmanned, automatic emergency shutdown capability for at least 72 hours without operator intervention.

▲ Lessons Learned — Hurricane Harvey (2017)

When Hurricane Harvey made landfall near Rockport, Texas and subsequently stalled over Houston, more than 50 industrial facilities reported

releases of pollutants totalling thousands of pounds. Several facilities reported inability to safely shutdown due to concurrent loss of power,

personnel evacuation, and flooding of critical equipment. Key engineering lessons:

- Pre-event inventory drawdown in storage tanks reduces buoyancy risk and spill volume.
- Flood barriers around control rooms and critical electrical infrastructure are not optional in coastal facilities.
- Emergency shutdown systems must be designed to operate unattended for a minimum of 72 hours.

Case Study 3: Fukushima Daiichi (2011)

The Fukushima disaster remains the defining case study for Force Majeure in the energy industry. The earthquake itself caused only limited process damage — the plant's design largely withstood the seismic event. It was the subsequent tsunami, and critically the flooding of the emergency diesel generators, that initiated the cascade to core meltdown. The root lesson for process engineers is the concept of defense-in-depth: no single system, however well-designed, should be the last line of defense.

6. Building Resilient Plants: From Reactive to Anticipatory

The response to Force Majeure events has evolved over the past three decades from reactive damage control to systematic resilience engineering. Modern process plants are designed with explicit Force Majeure scenarios built into the risk assessment process from the earliest project phases.



Risk Assessment: HAZOP and LOPA

HAZOP (Hazard and Operability Study) and LOPA (Layer of Protection Analysis) are the industry's primary tools for identifying how process deviations — including those triggered by Force Majeure events — can propagate to hazardous consequences. A well-executed Force Majeure HAZOP considers external initiating events: utility failure, grid outage, extreme weather, and seismic events. Every identified hazard scenario should have at least two independent protection layers, per IEC 61511 requirements.

Digital Twins and AI-Based Monitoring

The process industry is rapidly adopting digital twin technology — real-time, physics-based models of process units that run in parallel with the physical plant. During a Force Majeure event, a digital twin can predict process behavior under abnormal conditions, guide operators in their response decisions, and identify the fastest path to a safe shutdown. AI-based process monitoring platforms can detect early signs of process deviation — often 30–60 minutes before traditional alarm systems activate — providing the precious time needed for an orderly response.

i Engineering Insight — Climate Resilience

ASCE 7-22 (Minimum Design Loads for Buildings and Structures) has incorporated updated wind speed and flood design criteria reflecting current

climate data. Engineers designing new process facilities should consider a 500-year return period for critical structures, not the traditional

100-year flood and wind design basis. The gap between these two standards can be the difference between a plant that rides out a storm

and one that becomes a case study.

Recommended Codes, Standards & References

Process Safety & Risk Assessment

- API RP 14C — Recommended Practice for Analysis, Design, Installation and Testing of Basic Surface Safety Systems for Offshore Production Platforms
- CCPS — Guidelines for Chemical Process Quantitative Risk Analysis (CPQRA), 2nd Edition
- CCPS — Layer of Protection Analysis: Simplified Process Risk Assessment (LOPA)

Mechanical & Structural Integrity

- API 510 — Pressure Vessel Inspection Code
- API 570 — Piping Inspection Code
- API 653 — Tank Inspection, Repair, Alteration and Reconstruction
- ASME B31.3 — Process Piping
- ASCE 7-22 — Minimum Design Loads and Associated Criteria for Buildings and Other Structures

Electrical Safety

- NFPA 70 — National Electrical Code (NEC)
- NFPA 110 — Standard for Emergency and Standby Power Systems
- IEEE 1100 — Recommended Practice for Powering and Grounding Electronic Equipment

Process Safety Management

- OSHA 29 CFR 1910.119 — Process Safety Management of Highly Hazardous Chemicals
- EPA 40 CFR Part 68 — Chemical Accident Prevention Provisions (Risk Management Program)

Industry References

- AICHe / CCPS — Guidelines for Risk Based Process Safety (RBPS)

"The plants that survive Force Majeure events are the ones where preparation was taken more seriously than luck."

— Plant Manager, 35 years in the petrochemical industry

Contributed By:



Sattwik Sharma





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“Beyond Design Limits: Force Majeure”

Force majeure a French term meaning “superior force” is one of the most critical yet misunderstood clauses in contracts. It’s not just a legal escape hatch; it’s a practical safeguard for businesses when the uncontrollable becomes reality.

Industrial plants are engineered for stability, efficiency, and control. Yet, there are situations where this control is completely overridden by external forces, events that lie beyond design assumptions and operational planning. These force majeure events redefine how plants behave, often pushing systems into conditions they were never intended to handle.

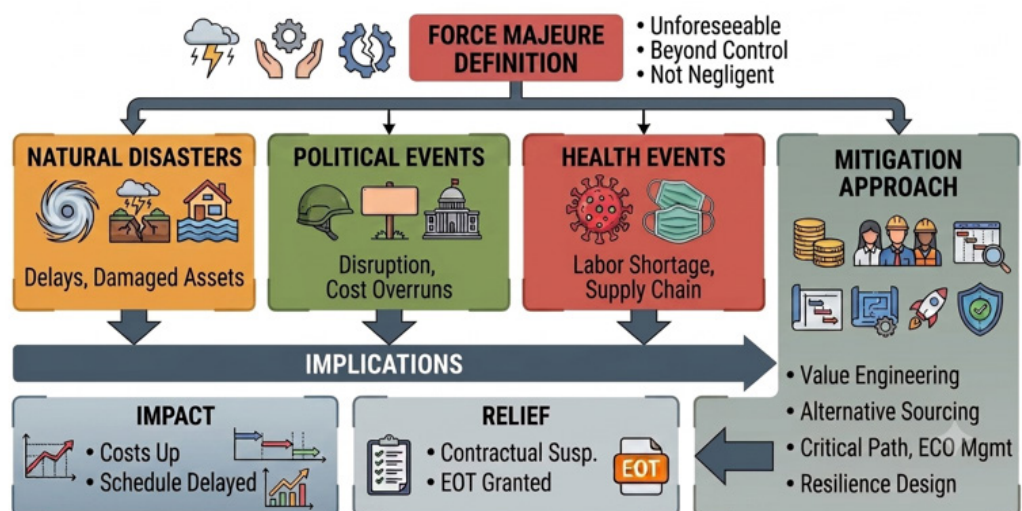
In such moments, engineering is no longer about optimization, but about survival, safety, and recovery.



What is Force Majeure

Force majeure is an external, uncontrollable event that force plant shutdown or disturb normal operation.

It is commonly used in law, business, insurance, construction, international trade, and engineering to describe situations that could not have been reasonably predicted, prevented, or controlled. Force majeure represents the reality that there are limits to human planning and control. No matter how well individuals, businesses, or governments prepare, certain events can arise that disrupt normal life and require adaptation rather than prevention.



The concept recognizes that there are circumstances where normal rules, plans, and commitments cannot be reasonably maintained because of forces far greater than those affected by them.

These events may arise from natural disasters, political disturbances, health emergencies, utility failures, or supply chain disruptions. Such incidents can cause asset damage, production losses, schedule delays, increased costs, and safety challenges. Since force majeure events are beyond an organization's control, contracts often provide relief through extensions of time or suspension of obligations.

To minimize their impact, industries adopt resilient plant design, backup systems, emergency shutdown procedures, alternative sourcing strategies, and effective risk management practices.

Typical causes include:

1) Natural disasters (floods, earthquakes)



Natural disasters such as floods, earthquakes, cyclones, and extreme weather events can severely damage plant infrastructure, equipment, and utilities. These events often create unsafe operating conditions, forcing partial or complete plant shutdown until repairs and safety checks are completed.



2) Utility failure

Process plants depend on utilities such as electricity, steam, cooling water, instrument air, and fuel gas for continuous operation. Failure of any critical utility can disrupt production, compromise safety systems, and lead to emergency shutdowns.

3) Supply chain disruption

Supply chain disruptions occur when raw materials, spare parts, catalysts, or other essential resources cannot reach the plant due to transportation issues, supplier failures, port closures, or other external factors. This can reduce production rates or halt operations entirely.

4) Political or external restrictions

Political events such as wars, trade sanctions, government regulations, civil unrest, or import/export restrictions can prevent normal plant operations. These external actions may limit access to materials, workforce mobility, or product distribution, resulting in operational delays or shutdowns.

5) Cyberattack or IT System Failure

Modern process plants rely heavily on digital control systems, SCADA, DCS, and communication networks. Cyberattacks, ransomware incidents, or major IT system failures can disrupt monitoring and control functions, affecting production, safety, and operational reliability. In severe cases, plants may need to shut down operations until systems are restored and secured.

6) Pandemic or Public Health Emergency

Large-scale public health emergencies, such as pandemics or disease outbreaks, can significantly impact plant operations by causing workforce shortages, travel restrictions, quarantine requirements, and disruptions to supply chains. These conditions can reduce plant productivity or force temporary shutdowns to ensure employee safety and regulatory compliance.

Impact on Industry



1. Design Limitation

Process plants are designed based on expected operating and environmental conditions. However, force majeure events such as major floods, earthquakes, or prolonged utility failures can exceed these design assumptions and push equipment beyond safe operating limits, increasing the risk of damage or shutdown.

2. Need for Resilience

Since force majeure events cannot be prevented, modern plants incorporate resilience measures to minimize their impact. These include backup power and utility systems, emergency shutdown systems, and flexible plant layouts that allow safer operation and faster recovery during disruptions.

3. Sudden Shutdown

Unexpected loss of utilities such as electricity, steam, or cooling water can force an immediate plant shutdown. This may result in pressure imbalances, temperature fluctuations, and process instability, creating operational and safety concerns.

4. Startup and Shutdown Risk

Emergency shutdowns and subsequent startups are often more hazardous than normal operation. Frequent transitions can subject equipment to thermal and mechanical stress, increase wear and tear, and raise the likelihood of operational errors.

5. Raw Material Disruption

When raw materials, catalysts, or spare parts are unavailable due to supply chain issues, plant operations may be interrupted. This can lead to reduced production efficiency, process stoppages, and off-specification product quality.

Impact on Plant Operations

- **Production Loss:** Reduced production rates or complete plant shutdown leading to revenue loss.
- **Safety Challenges:** Increased risk during emergency conditions, shutdowns, and restarts.
- **Supply Issues:** Delays in raw material supply and product delivery affecting business continuity.
- **Maintenance Load:** Additional inspection, repair, and equipment maintenance activities after the disruption.

Engineering Approach



Force majeure events cannot be prevented because they are external and beyond the plant's control. However, their impact can be minimized through proper engineering, safety measures, and operational planning.

- Design

Plants are designed using a risk-based approach to withstand potential external disruptions. Backup systems such as emergency generators, redundant pumps, alternative utility sources, and robust infrastructure help maintain safe operation during unexpected events and improve plant resilience.

- Process Safety

Process safety systems protect personnel, equipment, and the environment during emergencies. Relief valves, flare systems, safety instrumented systems (SIS), and emergency shutdown (ESD) systems help safely control process upsets and prevent escalation when force majeure events occur.

- Operations

Operational preparedness focuses on reducing business interruption. Flexible production planning, maintaining safety stock of critical raw materials and spare parts, multiple supplier arrangements, and emergency response procedures help plants continue or quickly restore operations after disruptions.

- Asset Integrity & Reliability

Maintaining the health and reliability of critical equipment is essential during uncertain operating conditions. Regular inspection programs, preventive maintenance, corrosion monitoring, condition-based maintenance, and reliability assessments help reduce unexpected equipment failures, improve plant availability, and support faster recovery after force majeure events.

- Digitalization & Real-Time Monitoring

Advanced digital technologies improve plant resilience by providing greater visibility into operations. Real-time monitoring systems, predictive analytics, digital twins, and remote operation capabilities help identify emerging risks, support faster decision-making, and enable proactive responses to disruptions before they escalate into major operational issues.

- Emergency Preparedness & Business Continuity

Effective emergency preparedness ensures that plants can respond quickly and safely during disruptive events. Business continuity plans, crisis management procedures, regular emergency drills, communication protocols, and recovery strategies help minimize downtime, protect personnel, and restore operations efficiently following force majeure incidents.



Future Outlook: Building Resilient Plants

The frequency and impact of force majeure events are increasing due to climate change, global supply chain interdependencies, cybersecurity threats, and geopolitical uncertainties. As a result, the focus of industrial plant

design is shifting from simply achieving operational efficiency to ensuring long-term resilience. Future plants will increasingly incorporate digital technologies, predictive analytics, intelligent automation, remote operations, and integrated risk management systems to anticipate disruptions and respond more effectively. Organizations that prioritize resilience alongside productivity will be better positioned to withstand unexpected challenges and maintain safe, reliable, and sustainable operations.

Conclusion

Force majeure events remind us that not all risks can be eliminated through engineering design or operational excellence.

Natural disasters, utility failures, supply chain disruptions, political instability, and health emergencies can rapidly transform stable operations into crisis situations, testing both plant resilience and organizational preparedness. While these events are beyond human control, their consequences can be effectively managed through robust design, strong process safety systems, contingency planning, and flexible operational strategies.

In today's increasingly interconnected and uncertain world, industries must move beyond designing solely for efficiency and also design for resilience. The ability to withstand disruptions, protect people and assets, recover quickly, and maintain business continuity has become a critical measure of engineering success. Ultimately, force majeure is not just a contractual concept, it is a reminder that resilient engineering, proactive risk management, and preparedness are essential for sustaining safe and reliable plant operations in the face of the unexpected.

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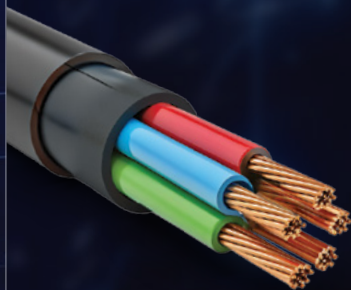
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MANAGING UNFORESEEN EVENTS IN CONTRACTS AND PROJECTS

INTRODUCTION:

In any contract or agreement, both parties are expected to perform their duties as per the agreed terms and timelines. However, in real-life situations, certain unexpected events may occur that are completely beyond the control of the parties and prevent them from fulfilling their obligations. These situations are referred to as Force Majeure.

The term Force Majeure originates from the French language, meaning “superior force.” It is used to describe extraordinary events such as natural disasters, pandemics, war, or government restrictions that cannot be predicted or avoided.

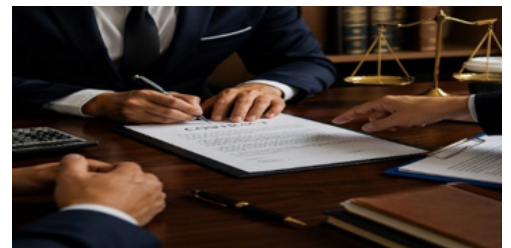
In contracts and agreements, Force Majeure plays an important role by providing protection and fairness to both parties. It ensures that no party is held liable or penalized when performance is affected due to such uncontrollable events. By including a Force Majeure clause, contracts become more flexible and better equipped to handle uncertainties, thereby reducing disputes and maintaining a balanced relationship between the parties.

IMPORTANCE OF FORCE MAJEURE:

Force Majeure is an essential part of contracts because it helps manage risks and ensures fairness when unexpected events occur. Its importance can be explained through the following key points

1. Protection from Liability

Contracts include Force Majeure clauses to protect parties from legal liability when unforeseen events prevent performance.



2. Ensures Fairness

Force Majeure ensures fairness by maintaining balance between parties when obligations cannot be fulfilled due to uncontrollable events.



3. Provides Time Relief

Unforeseen events can delay construction activities, and Force Majeure allows extension of project timelines without penalties.



4. Reduces Disputes

Clear documentation and defined procedures in contracts help reduce conflicts and legal disputes when unforeseen events occur under Force Majeure.



5. Supports Risk Management

Severe building damage caused by an earthquake highlights the need for risk management measures like Force Majeure to handle unforeseen and uncontrollable events in contracts.



6. Enables Continuity of Contracts

Industrial workers inspecting a refinery illustrate how projects can resume after disruptions, showing how Force Majeure helps ensure continuity of contracts once normal conditions return.



TYPES OF FORCE MAJEURE EVENTS:

1. Natural Events

These events arise from natural phenomena and are beyond human control. They are the most commonly recognized form of Force Majeure.

Characteristics

- Completely natural in origin
- Cannot be predicted with accuracy
- Cannot be prevented or controlled

2. Man-Made / Human-Induced Events

These events are caused by human activities or socio-political conditions and are still beyond the control of contract parties.

Characteristics

- Originates from human actions
- Often large-scale and uncontrollable
- Can disrupt operations and logistics

3. Legal / Regulatory Events

These events arise due to government or legal authority actions that directly affect the feasibility of contract execution

Characteristics

- Imposed by authorities or legal systems
- Mandatory compliance required
- May suddenly alter project conditions

4. Economic / Commercial Events

These events relate to financial or market conditions and are not always accepted as Force Majeure unless explicitly mentioned.

Characteristics

- Affect economic feasibility
- May not always qualify unless severe

IMPACT OF FORCE MAJEURE

Force Majeure events can significantly affect contracts, projects, and business operations. Their impact is mainly observed in terms of time, cost, resources, and contractual obligations. The key impacts are:



1. Delay in Project Execution

- Work activities may be temporarily halted or slowed down
- Project milestones and deadlines are affected
- Requires Extension of Time (EOT)

2. Increase In Project Cost

- Additional costs due to delays, demobilization, and remobilization
- Increase in material prices and logistics expenses
- Extra costs for safety and recovery measures

3. Resource Unavailability

- Shortage of manpower due to lockdowns or safety issues
- Equipment or utility interruptions (power, water, etc.)
- Reduced productivity

4. Financial Impact

- Cash flow issues due to delayed payments
- Increased financial burden on contractors
- Possible revenue loss

5. Risk of Contract Termination

- If the event continues for a long duration
- Parties may mutually terminate the contract
- Leads to project cancellation or re-tendering

6. Impact on Safety and Operations

- Unsafe working conditions due to disasters
- Shutdown of plant operations
- Increased risk to personnel and equipment

CONCLUSION

Force Majeure is an important concept in contracts that helps deal with unexpected events beyond the control of the parties involved. It ensures that when such situations occur, no party is unfairly blamed or penalized for not fulfilling their obligations.

In general, Force Majeure provides protection, fairness, and flexibility in agreements. It helps manage risks, reduce disputes, and allows contracts to continue or adjust even during difficult circumstances. By including this provision, contracts become more practical and adaptable to real-life uncertainties.

Overall, Force Majeure plays a key role in maintaining balance and ensuring smooth functioning of agreements, even when faced with unforeseen challenges.

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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.



Carry out Third Party Inspections of HV/EHV Transformers, Circuit Breakers, GIS Sub stations, Cables, Motors, PCCs, MCCs etc. and Green Building Certifications" by ASSOCHAM GEM Certifications.

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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
C.ENG.(I), DEE, MIE, BE, FIV, FISLE, CEM, CEA, MIIE, FIAEMP, GEM CP, CESE.
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**DIRECTORATE OF ECONOMICS AND STATISTICS,
PLANNING DEPARTMENT, GOVERNMENT OF MAHARASHTRA,
MUMBAI**

Dated : 5th March 2026

Note : Marathi and English version of 'Economic Survey of Maharashtra 2025-26' is available on

(1) <https://mls.org.in>

(3) <https://www.finance.maharashtra.gov.in>

(2) <https://www.maharashtra.gov.in>

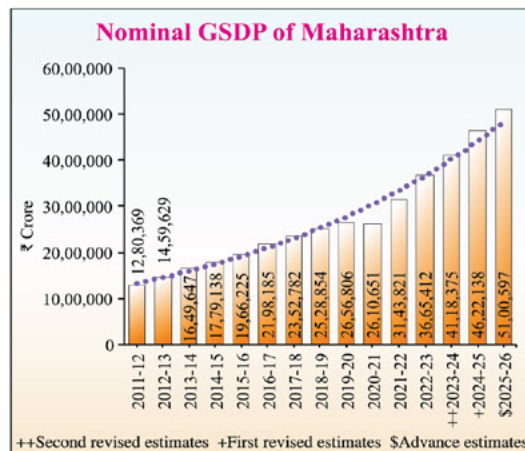
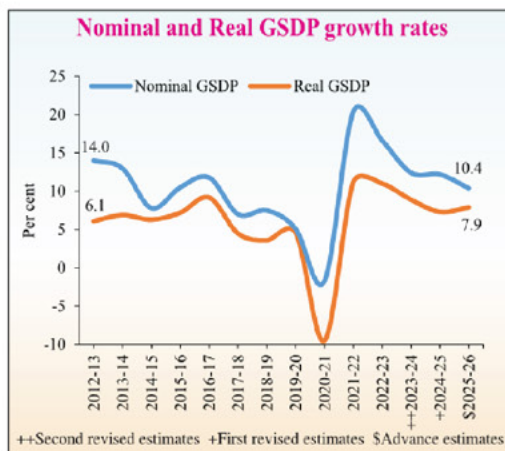
(4) <https://mahades.maharashtra.gov.in>

ECONOMIC SURVEY OF MAHARASHTRA 2025-26

HIGHLIGHTS

State Economy

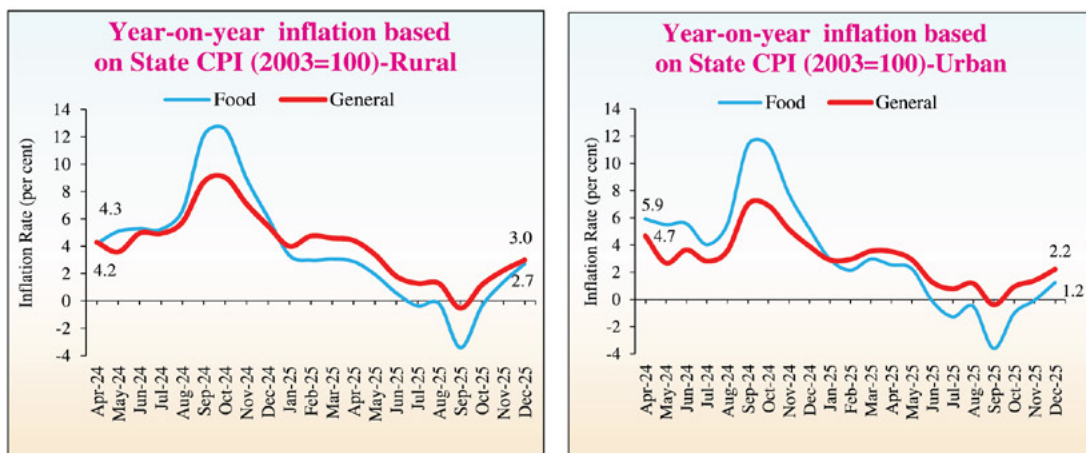
- Maharashtra remains one of the most robust and dynamic economies in India, supported by a well-diversified structure spanning agriculture, industry and services sectors
- The State has witnessed accelerated infrastructure development in recent years, driven by substantial investments in roads, metro systems, ports, airports, industrial corridors and logistics networks
- Reforms aimed at improving the ease of doing business, promoting digital governance and encouraging sector-specific growth have enhanced Maharashtra's competitive edge
- The State economy is projected to sustain its growth momentum for the fifth consecutive year, registering an estimated growth rate of 7.9 per cent in the current financial year
- As per the Advance Estimates (AE) of 2025-26, the State economy is expected to grow at 7.9 per cent over 2024-25
- During 2025-26, real Gross State Value Added of 'Agriculture & allied activities', 'Industry' and 'Services' sectors is expected to grow at 3.4 per cent, 5.7 per cent and 9.0 per cent respectively
- As per the AE, nominal (at current prices) Gross State Domestic Product (GSDP) for 2025-26 is estimated at ₹ 51,00,597 crore and real GSDP (at constant 2011-12 prices) is estimated at ₹ 28,82,699 crore



- As per the First Revised Estimates (FRE), the share of the State's nominal GSDP in All-India nominal GDP is highest (14.0 per cent) during 2024-25
- As per the AE, the Per Capita State Income for 2025-26 has been estimated at ₹ 3,47,903 as against ₹ 2,19,575 Per Capita National Income
- As per the FRE, nominal GSDP for 2024-25 is estimated at ₹ 46,22,138 crore as against ₹ 41,18,375 crore for 2023-24 (as per SRE)
- Real GSDP is estimated at ₹ 26,71,361 crore for 2024-25 as against ₹ 24,88,560 crore for 2023-24

Price Situation

- From April to December 2025, the average Consumer Price Index (CPI) (Base year 2003=100) compiled for rural and urban areas in the State was 401.8 and 376.7 respectively, as against 394.1 and 371.1 during the same period of previous year
- The year-on-year inflation during this period was 2.0 per cent for rural and 1.5 per cent for urban areas
- Revision of GST rates in September 2025 has positively impacted the prices of essential commodities
- From June to November 2025, the food inflation remained almost negative in urban areas of the State
- The average food inflation in the State remained below one per cent during April to December 2025 for both urban and rural areas of the State



Public Distribution System

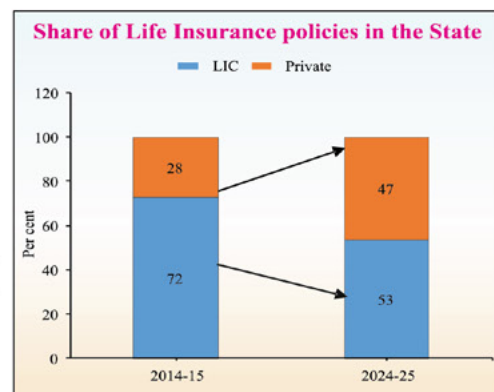
- As of December 2025, there were in all 270.84 lakh (58.68 lakh yellow, 190.15 lakh saffron and 22.01 lakh white) ration card holders in the State
- As on 31st October 2025, there were 51,636 functional Fair Price Shops across the State
- Up to October 2025, about 1.55 crore families availed ration with *Aadhar*-based biometric authentication
- At the end of November 2025, there were 1,874 *Shivbhojan* centers functioning in the State. During 2025-26 up to November, in all 4.09 crore *Shivbhojan Thalīs* were distributed
- Since inception of the 'One Nation, One Ration Card' scheme, up to October 2025, in all 1.40 lakh ration card holders from Maharashtra have lifted food grains from other states and 18.97 lakh ration card holders from other states have lifted food grains from Maharashtra

Public Finance

- GST is the most important source of revenue for the State as it contributes a larger share to the State's own tax revenue and total revenue receipts
- The revenue receipts of the State have remained more than nine per cent of GSDP in the last four years
- As per the Budget Estimates (BE), the revenue receipts of the State are expected to be ₹ 5,60,964 crore for 2025-26 as against ₹ 5,36,463 crore for 2024-25 Revised Estimates (RE)
- The tax and non-tax revenue for 2025-26 (BE) are expected to be ₹ 4,77,400 crore and ₹ 33,052 crore respectively
- The Grants-in-Aid from Central Government are expected to be ₹ 50,511 crore
- Actual revenue receipts during 2025-26 up to December were ₹ 3,71,575 crore (66.2 per cent of BE)
- The revenue expenditure of the State is expected to be ₹ 6,06,855 crore as per 2025-26 (BE) as against ₹ 5,62,999 crore in 2024-25 (RE)
- During 2025-26 up to December, actual revenue expenditure was ₹ 3,64,412 crore (60.0 per cent of BE)
- As per 2025-26 (BE), the share of capital receipts in total receipts and the share of capital expenditure in total expenditure are expected to be 25.9 per cent and 19.9 per cent respectively
- As per the recommendations of the 16th Finance Commission, the State is entitled to receive a share of 6.441 per cent in total central taxes during the award period (2026-27 to 2030-31)
- The State is also expected to receive ₹ 1,09,239 crore as grants-in-aid for local bodies and disaster management during the five-year award period of the 16th Finance Commission
- The government has taken all the efforts to maintain fiscal deficit within the limit of three per cent of GSDP (as prescribed in 'Maharashtra FRBM Rules, 2006') for more than last ten years.
- The debts of the State have remained in the range of 17 to 18 per cent to GSDP
- As per 2025-26 (BE), the proportion of fiscal deficit, revenue deficit and debt stock to GSDP is expected to be 2.7 per cent, 0.9 per cent and 18.3 per cent respectively

Institutional Finance

- As on 30th September 2025, aggregate bank deposits and gross credit of scheduled commercial banks in the State were ₹ 53.40 lakh crore and ₹ 52.39 lakh crore respectively
- Credit-Deposit Ratio of the State was 98.1 per cent
- Annual Credit Plan size for Priority sector of the State for 2025-26 is ₹ 8.06 lakh crore of which, the share of 'Agriculture' sector is 24.9 per cent and that of 'Micro, Small, Medium Enterprises' (MSME) sector was 66.1 per cent



- As on 30th September 2025, the State has the highest share in aggregate deposits (22.7 per cent) and gross credit (27.8 per cent) of scheduled commercial banks at the All-India level
- Per capita deposits and per capita credits of SCBs (excluding RRBs) in the State were recorded ₹ 4,16,099 and ₹ 4,08,261 respectively
- The share of private sector in Life Insurance policies has increased from 28.0 per cent in 2014-15 to 47.0 per cent in 2024-25
- During 2024-25 the Non-Life Insurance sector in the State recorded 12.0 per cent growth over the previous year

Agriculture

- The State received 109.1 per cent of the normal rainfall during the monsoon of 2025
- In the State, 149 talukas received excess rainfall, 181 received normal rainfall and 25 received deficient rainfall
- As per provisional figures of Agriculture Census 2021-22, the number of operational holdings in the State is about 171.11 lakh and the average size of operational holdings is 1.23 ha
- During the *kharif* season of 2025-26, sowing was completed on 157.27 lakh ha area. The production of cereals, sugarcane and cotton is expected to increase by 10.6 per cent, 22.0 per cent and 7.0 per cent respectively, whereas production of pulses and oilseeds is expected to decrease by 28.2 and 47.4 per cent respectively over the previous year
- During the *rabi* season of 2025-26, sowing was completed on 66.98 lakh ha area. The production of cereals and pulses is expected to increase by 28.3 per cent and 29.7 per cent respectively, whereas the production of oilseeds is expected to decrease by 16.2 per cent over the previous year
- During 2024-25, the area under horticulture crops is expected to be 25.19 lakh ha and the production is expected to be 339.77 lakh MT
- Irrigation potential created up to 30th June 2024 by major, medium and minor irrigation (State sector) projects was 57.16 lakh ha
- During 2024-25, the irrigation potential utilised was 40.55 lakh ha (Provisional)
- As on 15th October 2024, live storage in the major, medium & minor irrigation (State sector) reservoirs taken together was 37,597 million cubic metres, which was 88.5 per cent of the total storage capacity
- During 2025-26 up to September, crop loans of ₹ 43,894 crore and agricultural term loans of ₹ 68,314 crore were disbursed through Scheduled Commercial Banks, Regional Rural Banks and District Central Co-operative Banks
- Compensation of ₹ 337.42 crore was sanctioned to four lakh farmers for 1.87 lakh ha affected area for loss due to untimely rains and hailstorms during the period of January to May 2025
- A compensation of ₹ 9,022.38 crore was sanctioned to 116.40 lakh farmers for 94.82 lakh ha affected area for loss due to heavy rainfall and flood occurred during June to September 2025
- Up to December 2025 in all there were 7,37,092 solar agricultural pumps installed in the State under various Solar Agricultural Pump schemes

Allied Activities

- As per the Livestock Census 2019, the State ranks seventh at All India level with total livestock of about 3.31 crore
- The State ranks fifth at All India level with about 7.43 crore poultry birds
- During 2025-26 up to December, the average daily collection of milk by co-operative dairies was 42.87 lakh litre
- During 2025-26 up to December, marine and inland fish production was 2.93 lakh MT and 1.47 lakh MT respectively whereas during 2024-25, it was 4.63 lakh MT and 2.69 lakh MT respectively
- As per Basic Animal Husbandry Statistics-2025, during 2024-25,
 - The State ranks third in the country in meat production with 11.6 per cent share
 - Per capita availability of meat in the State is 9.5 kg per annum
 - The State ranks fifth in the country in milk production with 6.7 per cent share
 - Per capita availability of milk in the State is 358 grams per day
 - The State ranks seventh in the country in egg production, with 5.5 per cent share
 - Per capita availability of eggs in the State is 65 eggs per annum
- The forest area of the State at the end of March 2025 was more than 62 thousand sq km representing 20.2 per cent of the total geographical area
- As per the India State Forest Report 2023, the State ranks first at the national level with tree cover of 14,525 sq km (4.7 per cent of the total geographical area)
- The State has a total mangrove cover of 315.09 sq km, accounting for 6.3 per cent of the country's total mangrove cover

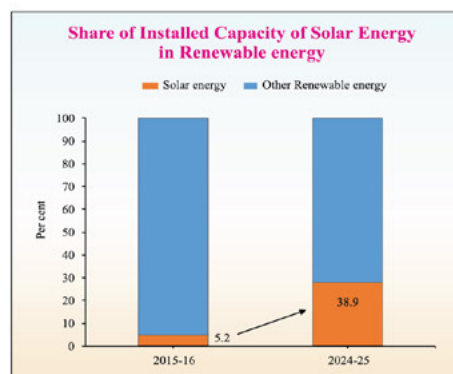
Industry

- Maharashtra Industries, Investment & Services Policy 2025 has been declared with a vision that centres on establishing Maharashtra as a premier global business destination, aiming to attract substantial investment, foster innovation and accelerate technology adoption
- In the State total number of MSMEs registered on *Udyam* registration portal up to December 2025 were 63.85 lakh (62.11 lakh micro, 1.55 lakh small and 0.18 lakh medium) with 252.84 lakh total employment therein
- During 2024-25, exports from the State contributed 15.0 per cent in the total exports from India
- During current year, up to January 2026 the software exports in the State was ₹ 1,74,798 crore
- Since inception of IT & ITeS Policy 2023, up to December 2025, 37 public IT parks with an investment of about ₹ 18,595 crore and about 2.7 lakh employment
- As on 10th February 2026, the State has the highest share (17.0 per cent) in the startups at all India level
- From October 2019 to March 2025 the State has remained at the top position in FDI inflows in India with 31.0 per cent share
- National One District One Product Awards (ODOP) 2024:
 - State received National Gold Award under ODOP initiative
 - Gold Award to Ratnagiri in Agriculture for world-famous Alphonso Mangoes

- As per the 'India Tourism Data Compendium 2025' (ITDC) report, the State recorded 88.66 lakh domestic tourist visits and 1.07 lakh foreign tourist visits during 2024-25, to centrally protected and ticketed Archeological Survey of India monuments
- According to ITDC 2025 report, the State ranked first in foreign tourist visits and sixth in domestic tourist visits during 2024

Energy

- As on 31st March 2025, total installed capacity of electricity generation in the State was 41,019 Mega Watt (MW), of which the share of thermal, renewable, hydro and natural gas was 51.3 per cent, 34.4 per cent, 7.5 per cent and 6.8 per cent respectively
- During 2024-25, the total electricity generated in the State was 1,40,171 Million Units (MU), along with this electricity received from central sector was 45,009 MU and total consumption of electricity was 1,66,224 MU
- During 2024-25, the average peak demand for electricity was 23,374 MW and supply at that time was 24,335 MW
- During 2024-25, transmission losses of MAHATRANSCO were 3.26 per cent. The distribution losses and 'Aggregate Technical & Commercial' (AT & C) losses of MAHADISCOM for 2024-25 were 15.1 per cent and 15.2 per cent respectively
- The State ranks third in India after Rajasthan and Gujarat in terms of installed capacity of renewable energy
- The total installed capacity of renewable energy in the State increased more than twofold, from 6,978 MW in 2015-16 to 14,113 MW in 2024-25
- Share of installed capacity of solar energy has increased from 5.2 per cent in 2015-16 to 38.9 per cent in 2024-25



Transport and Communication

- At the end of March 2025, the total road length in the State maintained by National Highways Authority of India, PWD and ZP was about 3.45 lakh km
- Total number of vehicles on road in the State as on 1st January 2026 was 528 lakh (153 vehicles per km road length) as against 488 lakh (149 vehicles per km road length) on 1st January 2025
- Number of Battery Electric Vehicles registered in the State up to December 2025 was 9,27,061 as against 6,44,779 up to December 2024
- During 2025-26 up to December, Maharashtra State Road Transport Corporation (MSRTC) has effectively operated on an average 14,926 buses per day and carried 55.90 lakh passengers per day
- *Hindu Hruday Samrat Balasaheb Thackeray Maharashtra Samruddhi Mahamarg* (about 701 km) Mumbai to Nagpur opened to traffic from June 2025
- Mumbai Metro Rail Project- Metro Line 3 (Colaba - Bandra - SEEPZ) (33.5 km length)
 - Entire corridor opened to traffic from October 2025
 - During 2025-26, an average number of passengers travelling per day was 78,943

- During 2024-25, total cargo traffic handled by major and non-major ports in the State was 2,312.56 lakh MT as against 2,299.49 lakh MT during 2023-24
- During 2024-25, the passenger traffic from domestic and international airports in the State was 548.61 lakh and 159.57 lakh respectively, whereas the corresponding figures for 2023-24 were 524.70 lakh and 146.03 lakh respectively.
- Navi Mumbai International Airport started flight operations from December 2025
- During 2024-25, domestic and international cargo handled by airports in the State was 2.88 lakh MT and 6.59 lakh MT respectively whereas the corresponding figures for 2023-24 were 2.79 lakh MT and 5.92 lakh MT respectively.
- As on 30th September 2025, there were 11.36 crore internet subscribers, 12.71 crore cell phone connections, 5,272 public Wi-Fi hotspots and 24,267 access points in the State.

Education

- In the State, as on 30th September 2024, the number of primary schools (class I to VIII) were 1,04,526 with a total enrollment of 145 lakh and the number of secondary & higher secondary schools (class IX to XII) was 29,641 with total enrollment of 63.6 lakh
- As on 30th September 2024, Gender Parity Index -
 - 0.93 for Primary and 0.90 for Upper Primary education
 - 0.87 for Secondary and 0.92 for Higher Secondary education
 - 0.88 for Higher education
- PARAKH (Performance Assessment, Review and Analysis of Knowledge for Holistic Development) *Rashtriya Sarvekshan* 2024 conducted by Ministry of Education, GoI to evaluate, analyse and enrich students' competencies at the end of the foundational, preparatory and middle stages of education.
- As per PARAKH *Rashtriya Sarvekshan* 2024, grade-wise scores (per cent) across subjects are

	Maharashtra	India
• Grade III :		
✓ Language	69	64
✓ Mathematics	64	60
• Grade VI :		
✓ Language	62	57
✓ Mathematics	51	46
✓ The World Around Us	55	49
• Grade IX :		
✓ Language	59	54
✓ Mathematics	38	37
✓ Science	42	40
✓ Social Science	43	40
- As per All-India Survey of Higher Education 2023-24, there were 87 universities, 5,579 colleges and 2,426 stand-alone institutions in the State with 45.31 lakh enrollment therein

Public Health

- As on 31st December 2025 there were 10,788 Sub-Centers, 1,953 PHCs and 374 CHCs
- Up to December 2025, there were 2,13,551 allopathic doctors, 1,05,966 ayurveda doctors, 9,462 unani doctors and 90,006 homeopathy doctors registered in the State.

- Under Integrated *Mahatma Jyotirao Phule Jan Arogya Yojana* and *Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana*, the number of beneficiaries were about 6.50 lakh and expenditure incurred was ₹ 2,797.43 crore during 2025-26 up to December, 2025

- As per Sample Registration System the important demographic parameters during 2023 were:

	Maharashtra	India
• Crude Birth Rate	14	18.4
• Crude Death Rate	6.1	6.4
• Infant Mortality Rate	14	25
• Neonatal Mortality Rate	11	19
• Under-Five Mortality Rate	16	29
• Total Fertility Rate	1.4	1.9

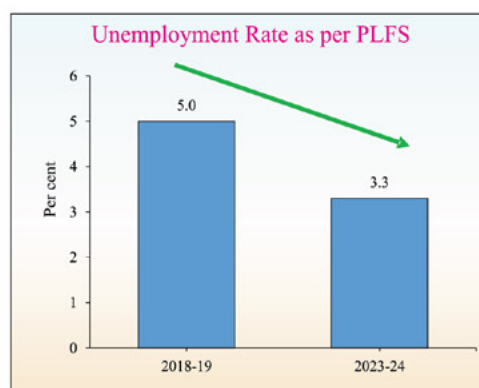
- The Maternal Mortality Ratio during 2021-23 was 36 for Maharashtra, whereas for India it was 88

Employment

- As on 31st January 2026, number of workers from the State registered on e-*Shram* portal was 1.83 crore, of which 55.8 per cent were female

- As per PLFS 2023-24, for persons aged 15 years and above,

- The Labour Force Participation Rate (LFPR) - 59.0 per cent (53.3 per cent in 2018-19)
- Female LFPR- 40.1 per cent (31.6 per cent in 2018-19)
- The Worker Population Ratio (WPR) - 57.0 per cent (50.6 per cent in 2018-19)
- Unemployment Rate- 3.3 per cent (5.0 per cent in 2018-19)
- Male Unemployment Rate- 3.7 per cent (4.9 per cent in 2018-19)
- Female Unemployment Rate- 2.7 per cent (5.4 per cent in 2018-19)



Social Sector

- Under PMAY-U, up to December 2025, in all 8.75 lakh dwelling units are completed
- Under PMAY-G, up to December 2025, in all 16.05 lakh dwelling units are completed
- Under the *Jal Jeevan* Mission in the State up to January 2026, Functional Household Tap Connections were provided to 90.3 per cent households, 98.5 per cent schools, 81.3 per cent *grampanchayat* buildings, 83.5 per cent health centers and 91.6 per cent *anganwadis*.
- Out of 40,247 villages in the State, 34,584 villages have been declared ODF+ under *Swachh Bharat* Mission (*Gramin*).
- Under *Swachh* Maharashtra Mission (Urban), 42 cities have been declared as ODF, 82 cities as ODF+, 257 cities as ODF++ and 30 cities as Water+ up to December 2025.
- During 2024-25, MPCB has authorised 314 industries having environment friendly technology for dismantling and recycling of e-waste with total capacity of 6,54,062 MT per year.

* * * * *

A festive background featuring a white surface covered with colorful confetti in shades of red, blue, yellow, and green. At the top, there is a dark blue horizontal banner with a subtle circuit-like pattern.

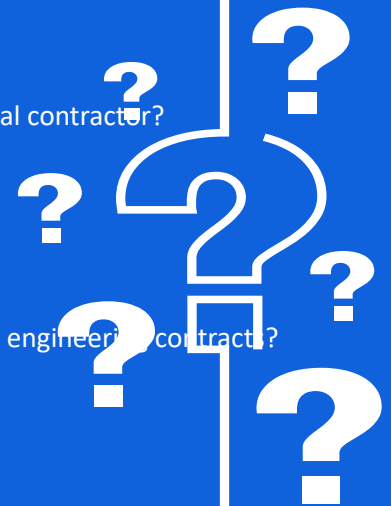
WINNERS OF QUIZ JUNE 2026

MAHESH GHARAT
MITESH GOSRANI

Congratulations

QUIZ - JULY 2026

1. In an electrical EPC (Engineering, Procurement, Construction) contract, Force Majeure protects contractors from delays caused by:
 - a) Transformer overheating due to poor design
 - b) Floods disrupting supply of switchgear
 - c) Incorrect wiring by technicians
 - d) Missed inspection schedules
2. Which of the following events would most likely trigger Force Majeure in a power plant project?
 - a) Lightning strike damaging transmission lines
 - b) Routine maintenance shutdown
 - c) Delay in drawing approvals
 - d) Contractor's mismanagement of workforce
3. Force Majeure clauses in electrical contracts are critical because:
 - a) Electrical systems are immune to natural disasters
 - b) Electrical projects often depend on global supply chains
 - c) They eliminate the need for insurance
 - d) They guarantee zero downtime
4. During a Force Majeure event, what is the usual obligation of an electrical contractor?
 - a) Stop all work permanently
 - b) Notify the client promptly and seek extensions
 - c) Increase manpower immediately
 - d) Ignore the disruption
5. Which of the following is NOT covered under Force Majeure in electrical engineering contracts?
 - a) Earthquake damaging substations
 - b) Government embargo on imports of electrical equipment
 - c) Contractor's poor cable management
 - d) Pandemic delaying transformer shipments
6. In HV (High Voltage) transmission projects, Force Majeure may lead to:
 - a) Extension of commissioning timelines
 - b) Reduction in insulation standards
 - c) Automatic cancellation of contracts
 - d) Elimination of testing requirements
7. Which man-made event could invoke Force Majeure in an electrical project?
 - a) Civil unrest halting site access
 - b) Routine calibration errors
 - c) Poor project scheduling
 - d) Employee resignation
8. Force Majeure clauses are particularly important in renewable energy projects because:
 - a) Solar panels are unaffected by weather
 - b) Wind farms depend on stable climate conditions
 - c) Hydropower plants are immune to floods
 - d) Electrical engineers don't face risks



9. In electrical procurement contracts, Force Majeure may impact:
 - a) Delivery of imported circuit breakers
 - b) Routine cable testing
 - c) Internal design reviews
 - d) Employee training schedules

10. Which global event highlighted Force Majeure in electrical supply chains?
 - a) COVID-19 pandemic disrupting transformer imports
 - b) Launch of smart grids
 - c) Rise of electric vehicles
 - d) Routine ISO audits

Rules for the QUIZ:

- The Quiz will be open for 10 days from the date of EMAIL.
- Each correct answer received on DAY 1 will get 100 points
- Next days the points will reduce as 90 – 80 – 70 and on 10th day points will be ZERO even if the answer is correct.
- All participants will receive E certificate signed by CEEAMA President with the points earned mentioned on the same.

Please use following google form link to participate in this month's QUIZ.

<https://forms.gle/ZwTBGQbPbKfPmXuQ6>

“Thank you all for the overwhelming response to the E-NEWS in general and E-Quiz in particular. MCQ based quiz is always tricky and surprisingly can take us aback when we realise our conceptions (misconceptions) about the subject / system / product.

The aim of the feature was to create inquisitiveness in your mind and help you check your technical quotient quickly. The response will also help us to present articles and webinars on subjects which are important, but which lack enough awareness / knowledge in general.

It can open a pandora box for our discussions and arguments and probable solutions. Engineering evolves with conception. It gets fuelled with community discussions and capitalist actions. All stakeholders start realising the need to take a closer look and help improve standards as we have seen in the past century. Surely it makes the world a better place.

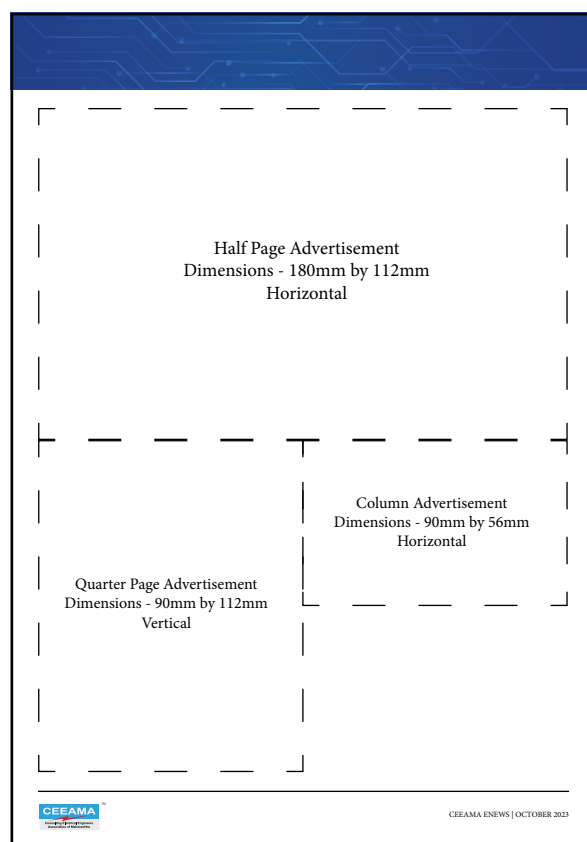
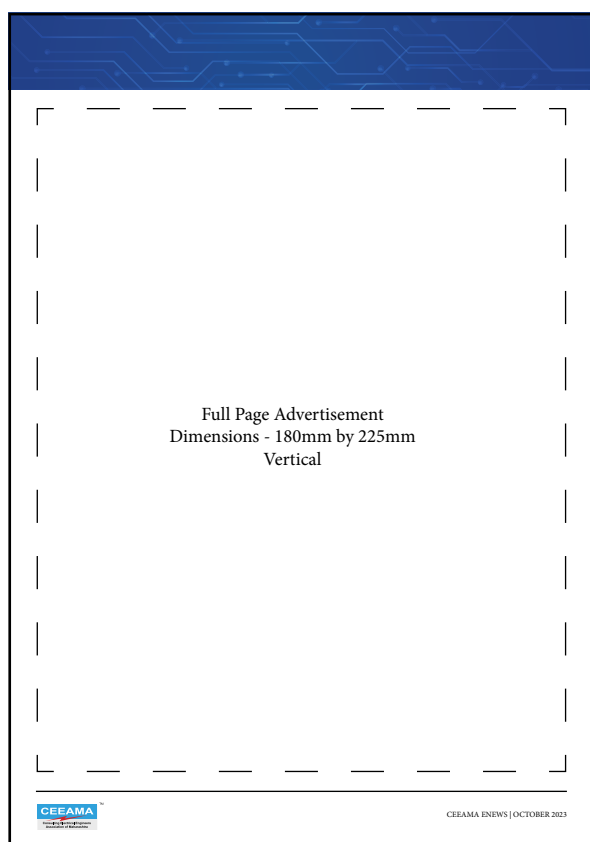
Wish you all a better luck this time.

Do spread the word.

June 2026 Quiz Answers

1. b) Predictive maintenance and fault detection
2. a) Neural network-based design suggestions
3. c) Reinforcement Learning
4. b) Unauthorized access to control systems
5. b) Demand-side management using machine learning
6. b) Real-time sensor data and patterns
7. b) AI models require high-quality training data
8. b) Simulating and monitoring real-time system performance
9. d) Support Vector Machines (SVM)
10. b) Optimizing dynamic control strategies in power systems

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