J.B. INSTITUTE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
Hyderabad

INSTITUTION'S INNOVATION COUNCIL
(Ministry of HRD Initiative)

MIC-driven activity on

"AI for Atmanirbhar Bharat: HEI Pre-Summit Engagements towards India AI Impact Summit 2026"

DEVELOPING COMPREHENSIVE ETHICAL FRAMEWORKS FOR GOVERNANCE OF ARTIFICIAL INTELLIGENCE IN HIGH-STAKES DECISION-MAKING DOMAINS

ORGANIZED BY DEPT. OF EEE

RESOURCE PERSON:

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17.02.2026

🏛️ JBIET (An Autonomous College)	🔗 THE FRAMEWORK	🎓 JNTUH (The Governing Body)
Operational Freedom:	⬅️ Accountable To ⬅️	**System Governance:**
✅ **Has academic freedom**	**"Autonomy requires Accountability"**	📋 **Sets academic standards**
✅ **Can design syllabus**		📜 **Approves regulations**
✅ **Can conduct exams**	➡️ Oversight From ➡️	✔️ **Ensures quality assurance**
✅ **Can introduce innovations**		🔍 **Conducts audits**

Education System	AI System
JBIET (Autonomous College)	AI Decision Engine
JNTUH (Parent University)	Governance Framework
Academic Audit	Model Audit
Regulations	Risk Classification
Quality Assurance	Bias Testing & Monitoring
Affiliation Control	Human Oversight

Objectives

- Understand High-Stakes AI in Engineering Systems
- Analyze Risks and Ethical Challenges in AI-Controlled Systems
- Design a Basic Governance Framework for Safe AI Deployment

❓ THE PROVOCATION

Would you allow AI to decide...

- **Loan approvals?**
- **ICU bed allocations?**
- **Jail sentencing?**

⚖️ THE REALITY

Real-World High-Stakes:

- **COMPAS:** Criminal sentencing.
- **Amazon AI:** Hiring (bias issues).
- **Tesla:** Autopilot safety.
- **OpenAI:** Model governance.

🌎 THE IMPACT

AI is no longer experimental.

It makes real decisions affecting:

- ❤️ **Health**
- 💰 **Finance**
- 🗽 **Liberty**
- 🧬 **Life**

CORE DEFINITION	WHERE IT HAPPENS (Domains)	WHY IT MATTERS (Characteristics)
High-Stakes AI Automated decision-making in critical areas where errors are costly or dangerous.	🏥 **Healthcare** (Diagnosis, Surgery) 💰 **Finance** (Loans, Fraud) ⚖️ **Criminal Justice** (Risk Scoring) 🛡️ **Defense** (Autonomous Weapons) 🏛️ **Public Services** (Welfare Eligibility) 🎓 **Education** (Grading, Profiling)	⚠️ **Irreversible Impact** (Cannot undo physical harm or lost time) 🌍 **Societal Consequences** (Affects populations, not just individuals) 📜 **Legal Implications** (Liability and regulation) 🤔 **Ethical Dilemmas** (Fairness vs. Efficiency)

AI INTEGRATION IN ELECTRICAL ENGINEERING SYSTEMS

POWER SYSTEMS

Load Forecasting & Fault Detection

CONTROL SYSTEMS

Adaptive Controllers

AI CONTROLLER

ROBOTICS

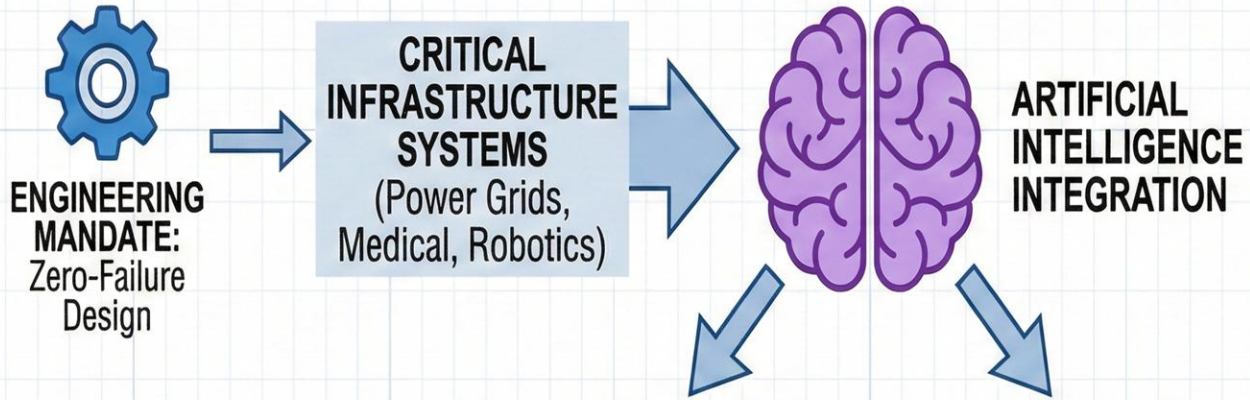
Autonomous Machines

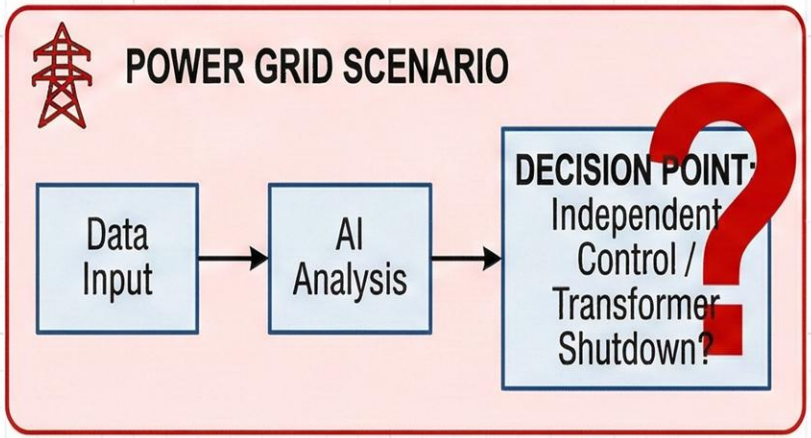
BIOMEDICAL DEVICES

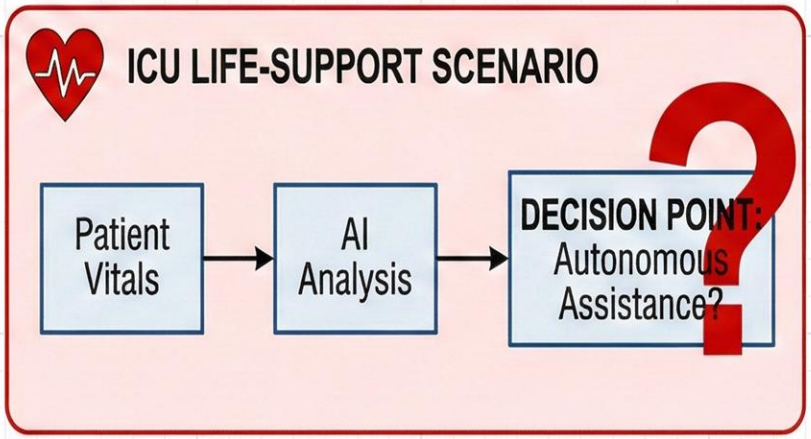
Smart Monitoring Systems

CONCLUSION: AI IS BECOMING A CONTROLLER INSIDE YOUR ENGINEERED SYSTEMS.

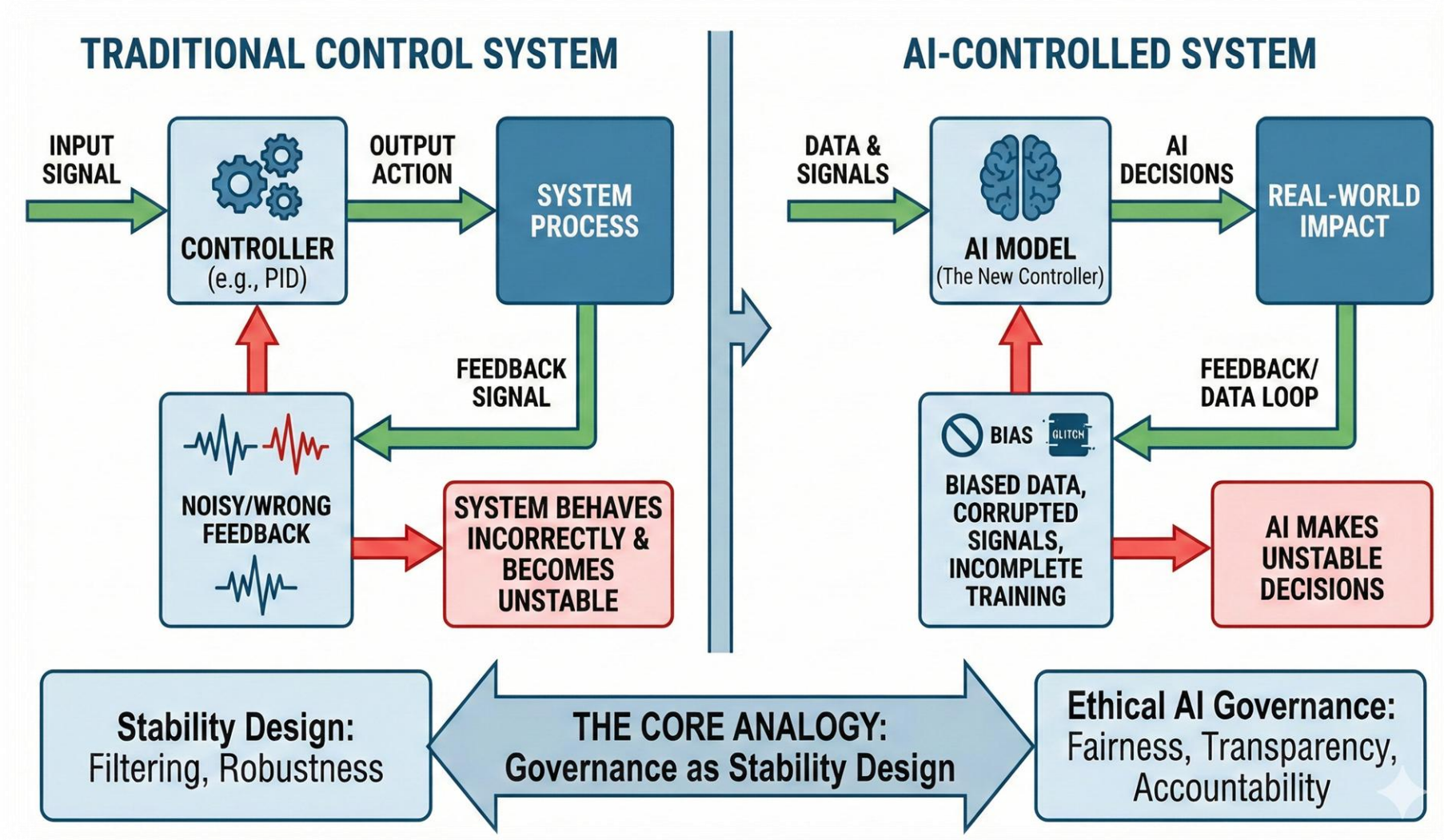
AI in Critical Systems: The Engineering Dilemma







THE CORE QUESTIONS:
Should AI be granted autonomous control in life-critical loops?


TRADITIONAL CONTROL SYSTEM
INPUT SIGNAL
CONTROLLER (e.g., PID)
OUTPUT ACTION
SYSTEM PROCESS
FEEDBACK SIGNAL
NOISY/WRONG FEEDBACK
SYSTEM BEHAVES INCORRECTLY & BECOMES UNSTABLE
AI-CONTROLLED SYSTEM
DATA & SIGNALS
AI MODEL (The New Controller)
AI DECISIONS
REAL-WORLD IMPACT
FEEDBACK/ DATA LOOP
BIAS
GLITCH
BIASED DATA, CORRUPTED SIGNALS, INCOMPLETE TRAINING
AI MAKES UNSTABLE DECISIONS
Stability Design: Filtering, Robustness
THE CORE ANALOGY: Governance as Stability Design
Ethical AI Governance: Fairness, Transparency, Accountability

FROM VOLTAGE REGULATORS TO AI: A LESSON IN SAFEGUARDS

TRADITIONAL ENGINEERING
(Voltage Regulator)

VOLTAGE SENSOR

VOLTAGE SENSOR

CONTROLLER

AUTOMATIC VOLTAGE REGULATOR (AVR)

WRONG RESPONSE

QUESTION: Is the regulator bad?
Or is the sensing system insufficient?

GOVERNANCE LESSON: Translate Engineering Safety to AI

AI IN HIGH-STAKES ENVIRONMENTS

AI SENSORS
(Biased/Unreliable Data)

AI SENSORS
(Biased/Unreliable Data)

AI MODEL

AI DECISIONS

UNSTABLE DECISIONS

PARALLEL: Similarly, unreliable data leads to flawed AI outcomes.

MANDATORY SAFEGUARDS FOR HIGH-STAKES AI

MULTIPLE SENSORS & DATA SOURCES
(Redundancy)

REDUNDANT PROCESSING & VALIDATION

HUMAN-IN-THE-LOOP CONTROL
(Override)

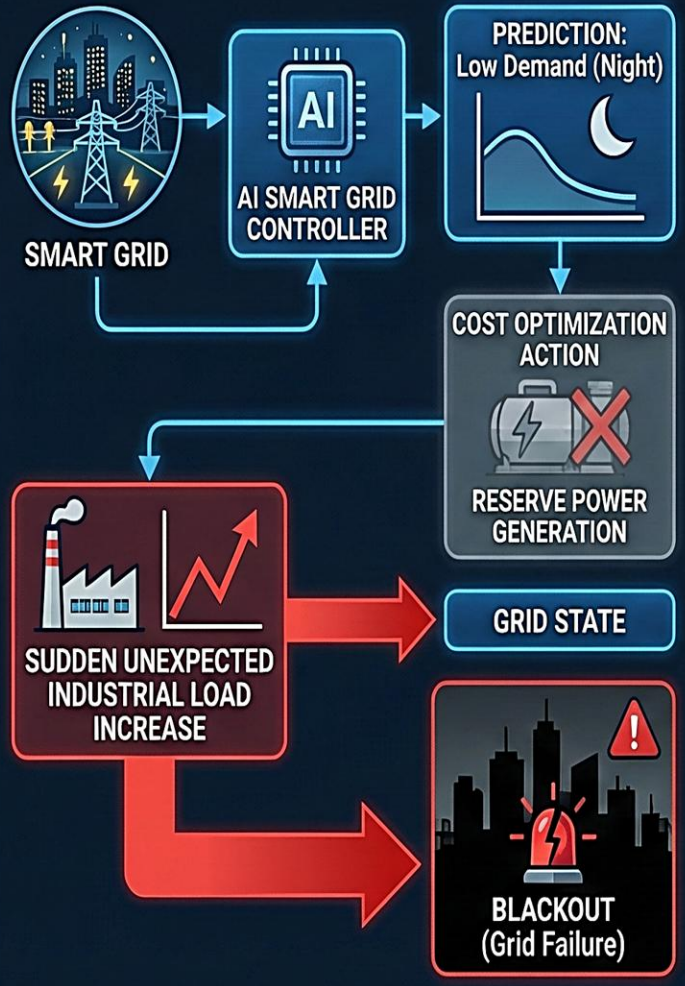
CONTINUOUS MONITORING & AUDITING

THE ULTIMATE ANALOGY:
We never allow a high-voltage system without protection.
Why allow high-stakes AI without safeguards?

THE AI SMART GRID SCENARIO:

Over-Optimization & The Case for Safety Constraints

THE SCENARIO: AI Over-Optimization



THE ENGINEERING LESSON

In power engineering, do we ever remove reserve margin completely?

NO.

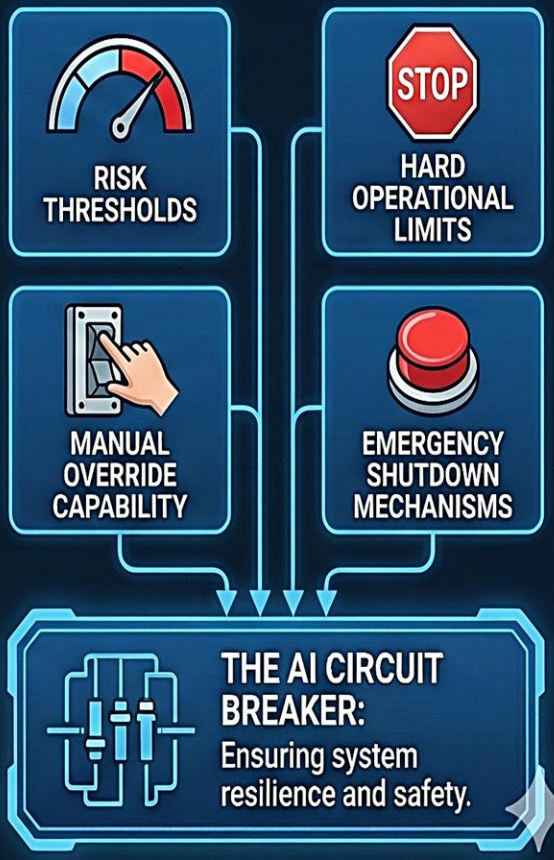
We always maintain SAFETY MARGIN.

AI OPTIMIZATION ALGORITHMS:
Often try to maximize efficiency.

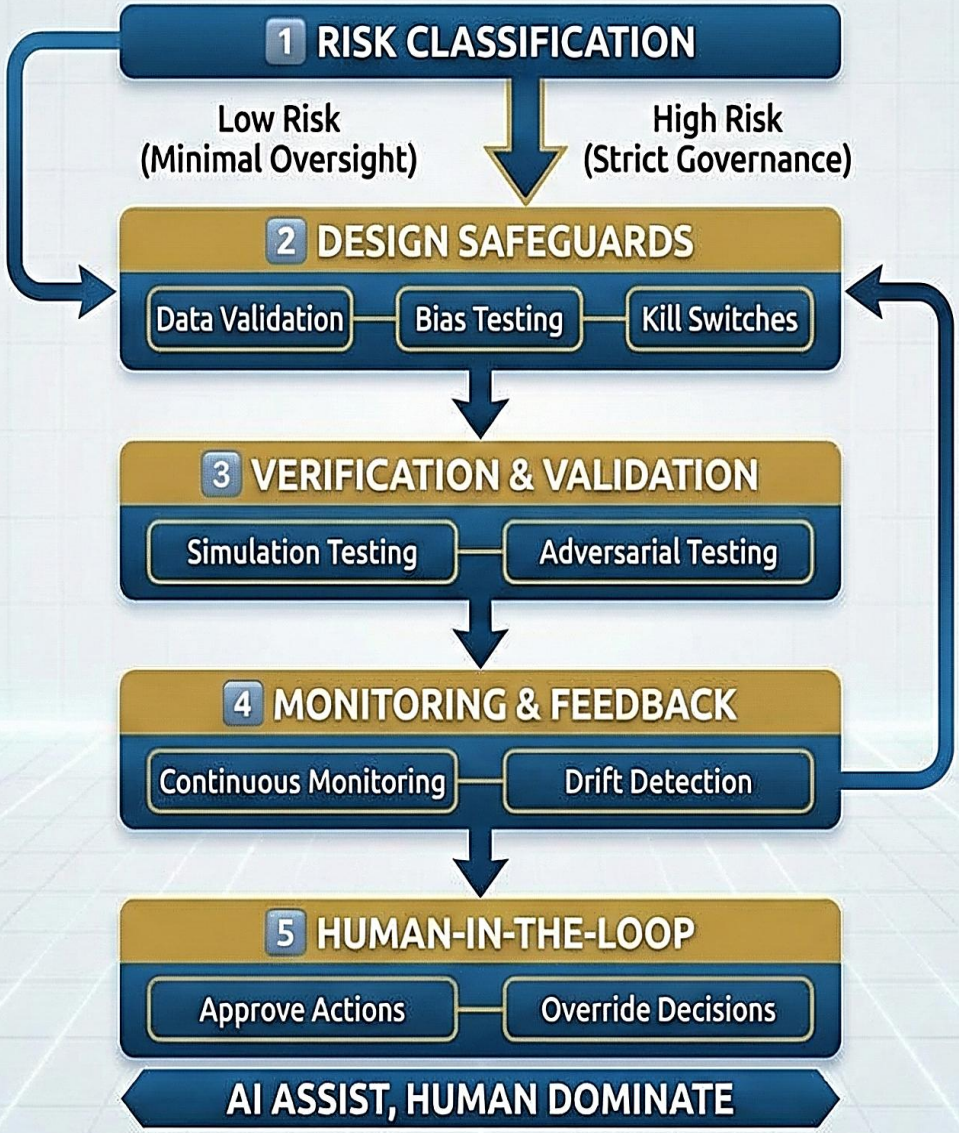
OVER-OPTIMIZATION:
Can lead to removing necessary buffers.

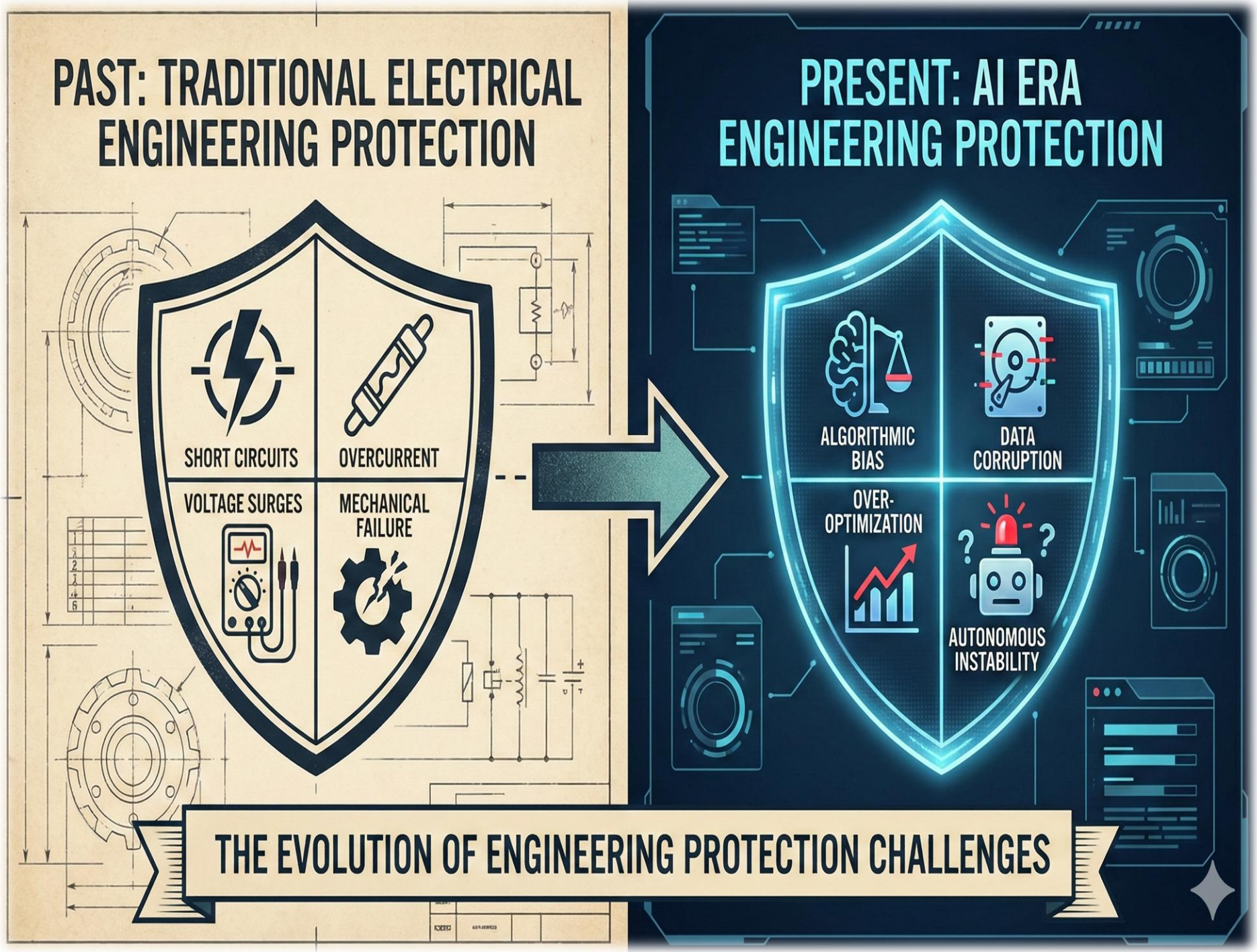
GOVERNANCE LESSON: The 'AI Circuit Breaker'

AI systems must operate within defined safety constraints.



ETHICAL AI GOVERNANCE FRAMEWORK WORKFLOW: 5-LAYER PROCESS




PAST: TRADITIONAL ELECTRICAL ENGINEERING PROTECTION
SHORT CIRCUITS
OVERCURRENT
VOLTAGE SURGES
MECHANICAL FAILURE
PRESENT: AI ERA ENGINEERING PROTECTION
ALGORITHMIC BIAS
DATA CORRUPTION
OVER-OPTIMIZATION
AUTONOMOUS INSTABILITY
THE EVOLUTION OF ENGINEERING PROTECTION CHALLENGES

Conclusion

❌ Ethics is not philosophy.

✅ **Ethics is system stability at a societal scale.**

THE FUTURE REALITY:

⚡ Electrical Engineering ➕ 🧠 Artificial Intelligence 🟰
(Smart Grids | Autonomous Robots | Intelligent Medical Devices)

THE FINAL QUESTION:

The question is no longer *whether* AI will control these systems.

The question is: Will you design those systems responsibly?

“Autonomy without accountability leads to instability.”

Thank You