

Modernizing Nuclear Power with AI

The Importance of Strategy

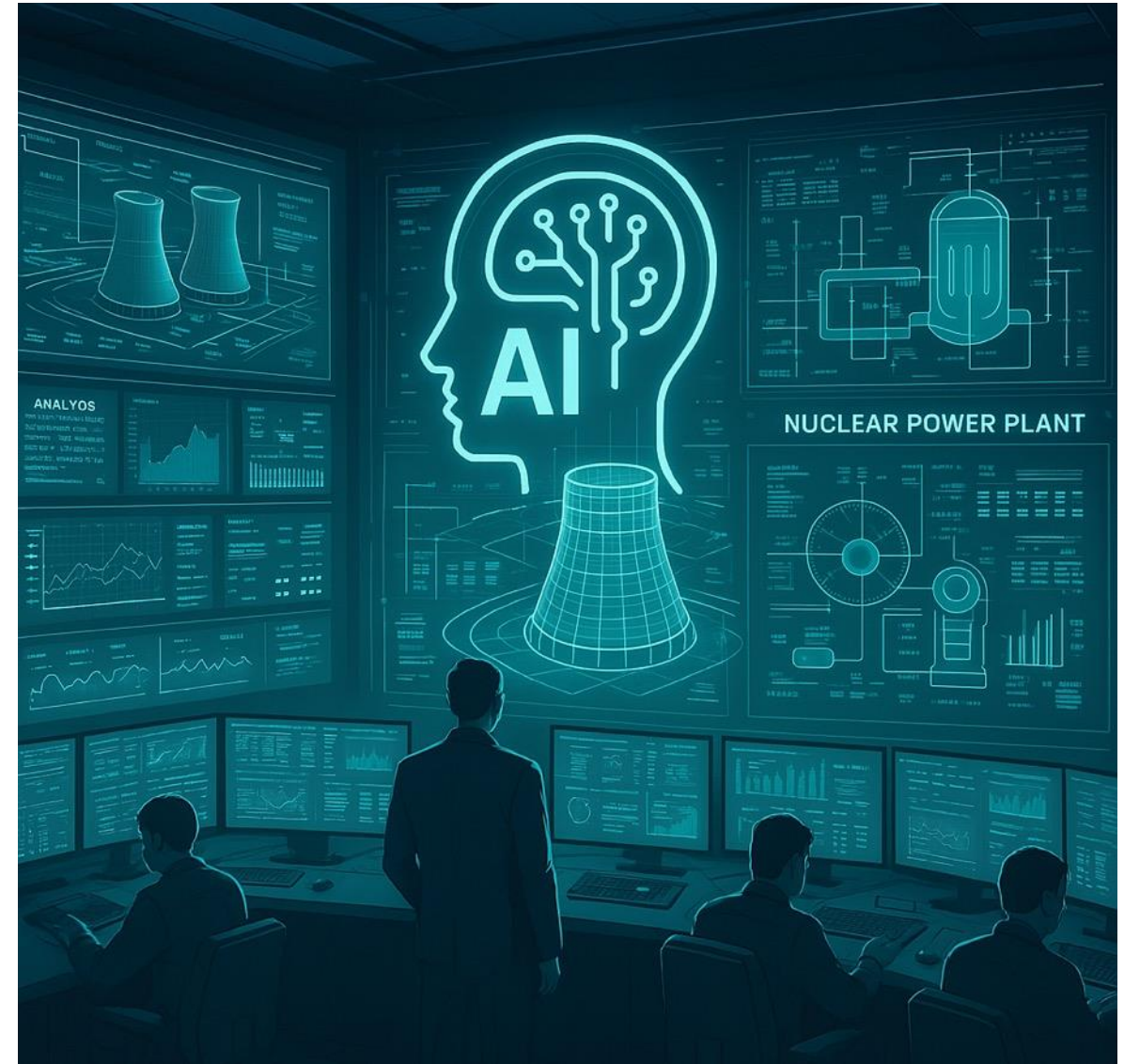


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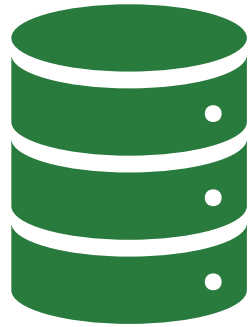
ICAPP 2025

Introduction

- AI integration in Nuclear Power Plants (NPPs) enhances safety, reliability, and efficiency.
- EPRI's Plant Modernization and Digital Transformation (DX) frameworks guide effective AI deployment.



Your Project With & Without A Strategy

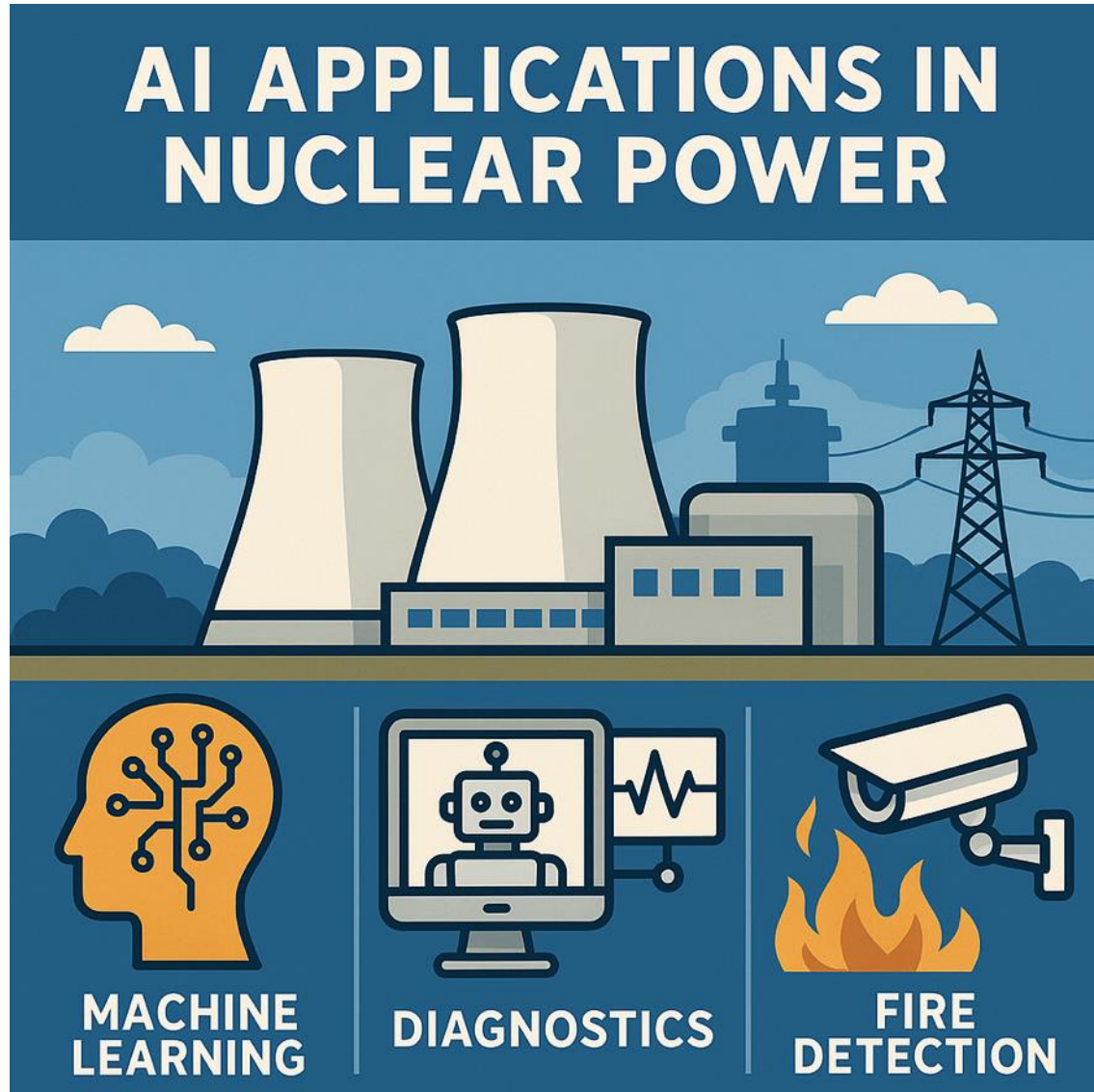


With Strategy: AI gauge reader
deployed efficiently using existing
infrastructure



Without Strategy: Same project
stalls due to unresolved
infrastructure and policy issues

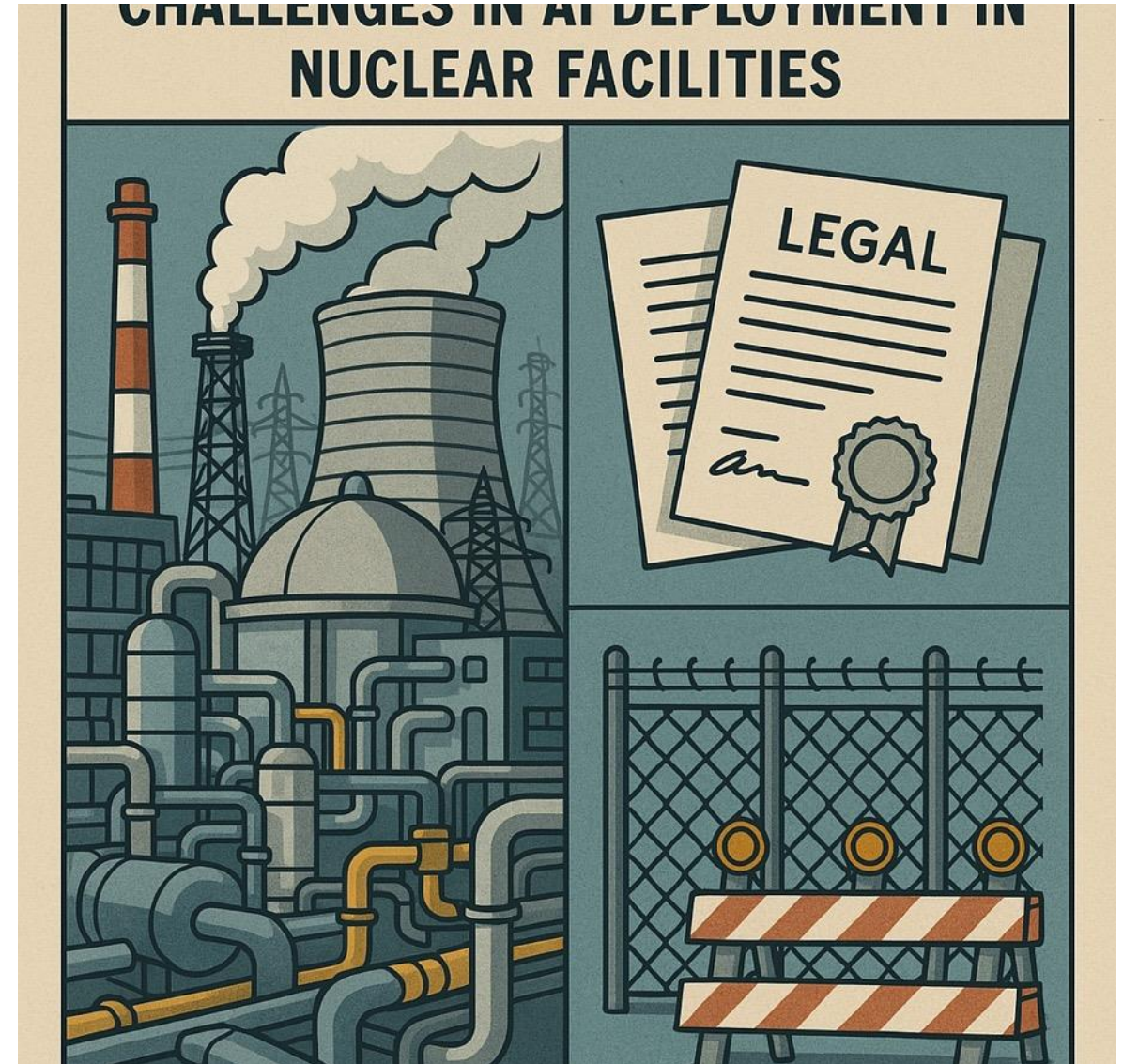
AI Applications in Nuclear Power



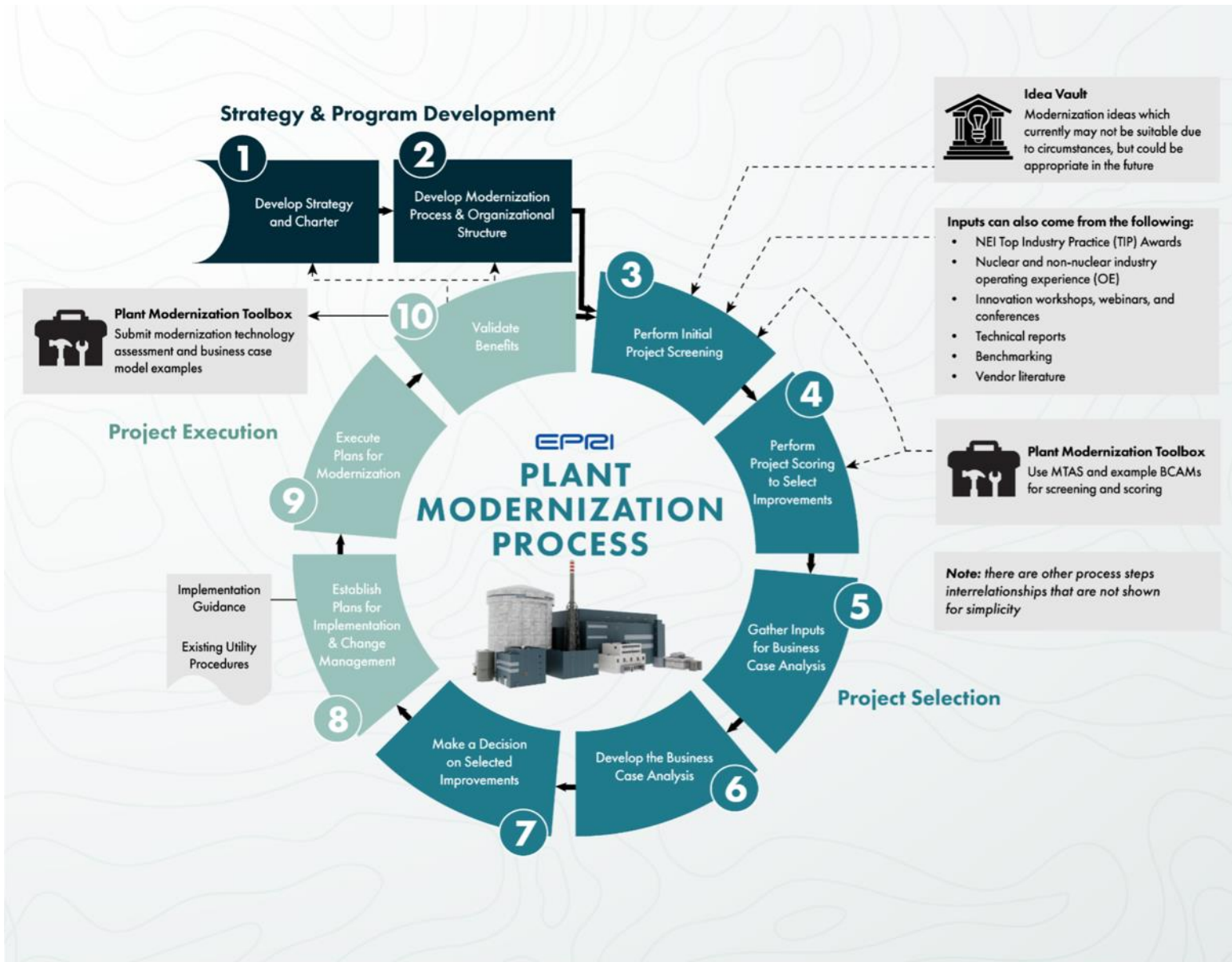
- Machine learning for monitoring and diagnostics
- AI-assisted corrective action screening
- Document text suggestions and NDE data reduction
- Emerging uses: fire detection, security, and plant condition analysis

Challenges in AI Deployment

- High deployment costs and organizational complexity
- Need for transparent project selection
- Infrastructure, legal, and security considerations
- Importance of cross-functional collaboration



EPRI's 10-Step Modernization Process



1. Develop strategy and charter
2. Integrate into plant processes
- 3-4. Screen candidate projects
- 5-7. Analyze and build business cases
- 8-10. Implement and validate benefits

<https://nuclearplantmod.epri.com>

Strategic Project Selection



- Use scoring metrics: cost, readiness, benefits, complexity



- Maintain an 'idea vault' for future opportunities



- Focus on scalable and high-impact projects

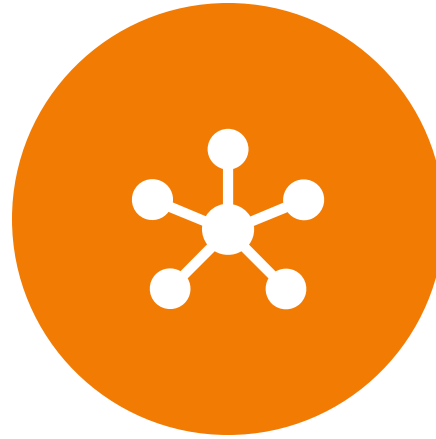
Digital Transformation Framework

Elements by impact and order	Phase 1: Diagnostic				Phase 2: Engagement				
	Enterprise Strategy	DX Strategy Recognition	DX Theme Development	DX Assessment	DX Strategy	DX Value Validation	DX Solution Design	DX Solution Implementation	DX Sustainment
	Mission	C-suite recognition of the value of DX	Explore digital transformation themes	Complete DX maturity assessment	Create focus areas	Initiative development	Use case confirmation (tech feasibility)	Implement process changes	Make operating model updates
	Vision								
	Values								
	Strategic Directives	Relationship to enterprise strategy	Define themes for impact	Benchmark peers	Commit to foundational investments	Assess value proposition	Create implementation plan for each initiative	Organizational change management	Periodic review and adjustment
		Enhancement of enterprise strategy	Develop simple visual image to help communicate themes	Perform practical testing	Create enabling initiatives	Perform financial diagnostics	Deploy technology		Develop KPIs
				Complete workload analysis			Establish implementation teams		
		Generate new go-forward operating model		Develop DX SWOT	Generate high level plan		Create five-year implementation plan		Ideate additional initiatives
				Generate gap analysis					
Step	0	1	2	3	4	5	6	7	8
Lead	Corporate Strategy	Corporate Strategy	Transformation	Transformation	Transformation Business Unit	Business Unit	Business Unit	Projects & Implementation Teams	Transformation Business Unit

Digital Transformation - Role of Shared Infrastructure



- COMMON IT STANDARDS
REDUCE REDUNDANT COSTS



- SUPPORTS MULTIPLE
MODERNIZATION INITIATIVES



- ENABLES SCALABLE AI
DEPLOYMENT

Digital Transformation – The Benefit of Shared Infrastructure



- Strategic frameworks are essential for successful AI integration



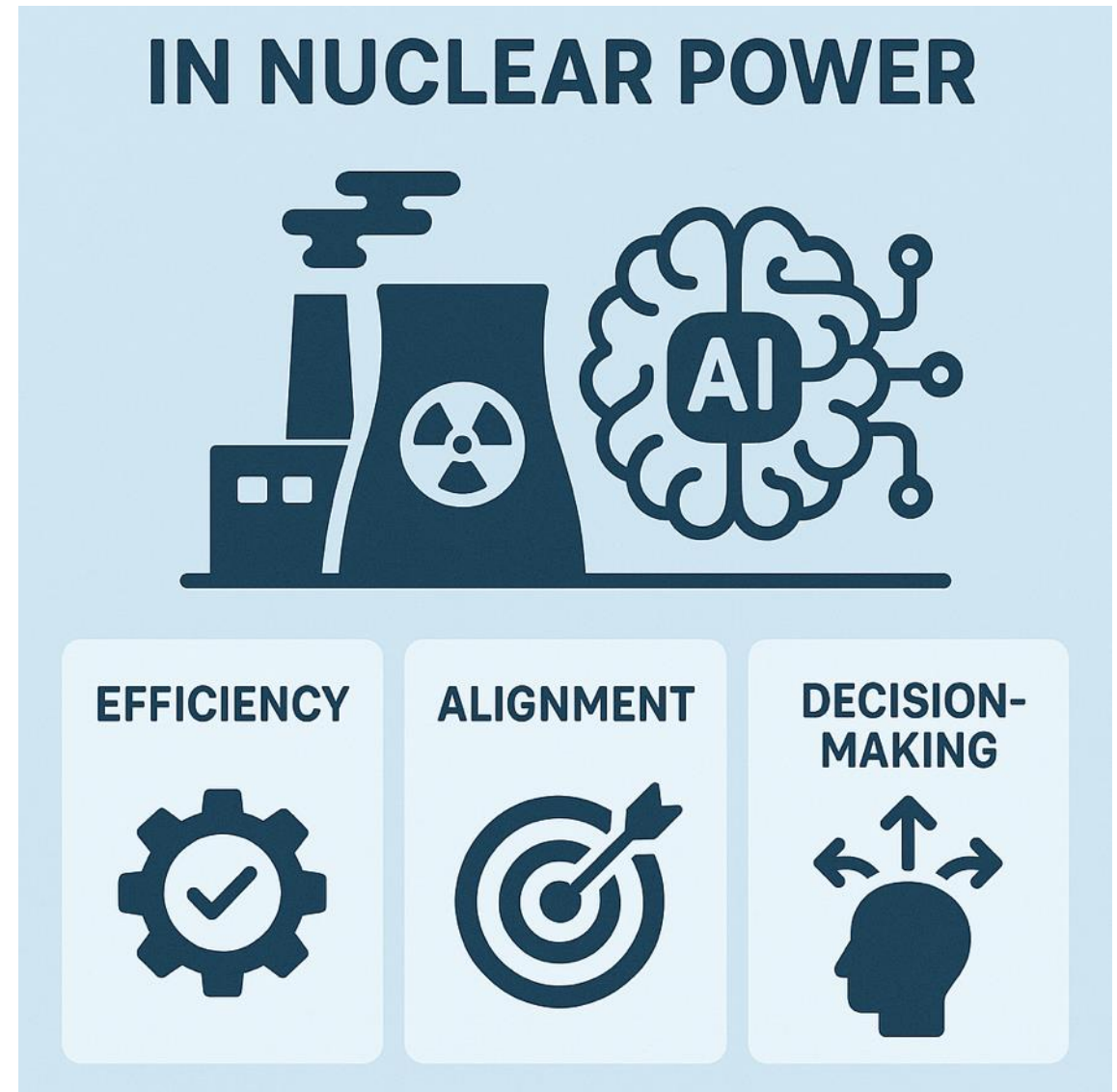
- Cross-functional alignment maximizes value



- EPRI's approach empowers informed, cost-effective decisions

Inspiration for the Future

- Engineers and scientists have the power to transform nuclear energy.
- With vision, strategy, and collaboration, AI can revolutionize plant operations.
- Let's lead the way into a smarter, safer energy future.



References

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