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GenAI & AgenticAI in the BANI Era

ESTEP SPRING DISSEMINATION EVENT

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The BANI Reality: A New Operating Environment

The steel industry operates in a BANI environment: brittle, anxious, nonlinear, and incomprehensible.

Volatility is faster, more interconnected, and harder to interpret.

Resilience now means anticipating change and evaluating alternatives quickly despite uncertainty.

Brittle	Anxious	Nonlinear	Incomprehensible
Small disruptions can destabilize an entire plan that once appeared solid.	Decisions needed with incomplete information	Minor changes can trigger disproportionate and unexpected consequences.	The system's complexity makes it difficult to clearly understand what is happening and why.

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BANI in Daily Steelmaking Operations

Brittle

- Single disruption breaks entire plan
- Cascades: charge mix, scheduling, quality risk

Anxious

- Intraday energy price spikes
- Quick decisions with incomplete info
- Constant time pressure

Nonlinear

- Small input changes → big impacts
- Energy, yield, quality affected
- Disproportionate effects

Incomprehensible

- Too many interacting variables
- Delivery, constraints, logistics, cost, CO_2
- Manual reasoning too slow

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What's Not Working Today

Current Problems

Slow Decision Cycles

Current disruptions outpace response capacity, extending planning and execution cycles.

Functional Silos

Lack of connection between procurement, production, quality, and logistics prevents integrated visibility.

Reactive Mode

Operations remain in firefighting mode, reacting rather than anticipating challenges.

Lack of Robust Options

When assumptions break, there's no capacity to rapidly generate solid, adapted alternatives.

The Gap We Face

Between What We Have and What We Need

Traditional tools are insufficient for BANI complexity, lacking the agility needed for changing scenarios.

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Why Generative AI + Agentic AI?

GenAI and Agentic AI are complementary capabilities that bridge the gap between insight and action, keeping humans in control.

Generative AI

Turns complex, multi-source information into clear understanding.

Combines structured operational data with unstructured knowledge and external signals to generate insights, explain root causes, and evaluate scenarios.
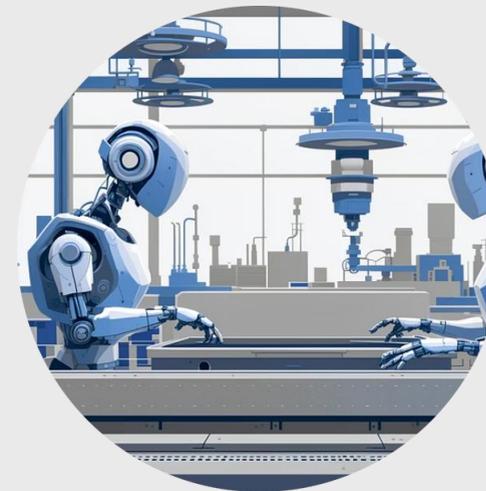
Agentic AI

Transforms insights into guided execution.

Orchestrates next-best actions, runs workflows across tools and systems, and tracks outcomes, while operators validate and approve decisions.

📋 **Together: GenAI supports understanding and scenario reasoning, while Agentic AI reduces decision cycle time by guiding users from insight to action, proposing next-best steps, orchestrating workflows, and keeping humans in control.**

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What the Solution Must Do

The solution we envision is not "a chatbot," but a scenario-driven decision support layer with industrial-grade controls.

01

Multi-Source Data Fusion

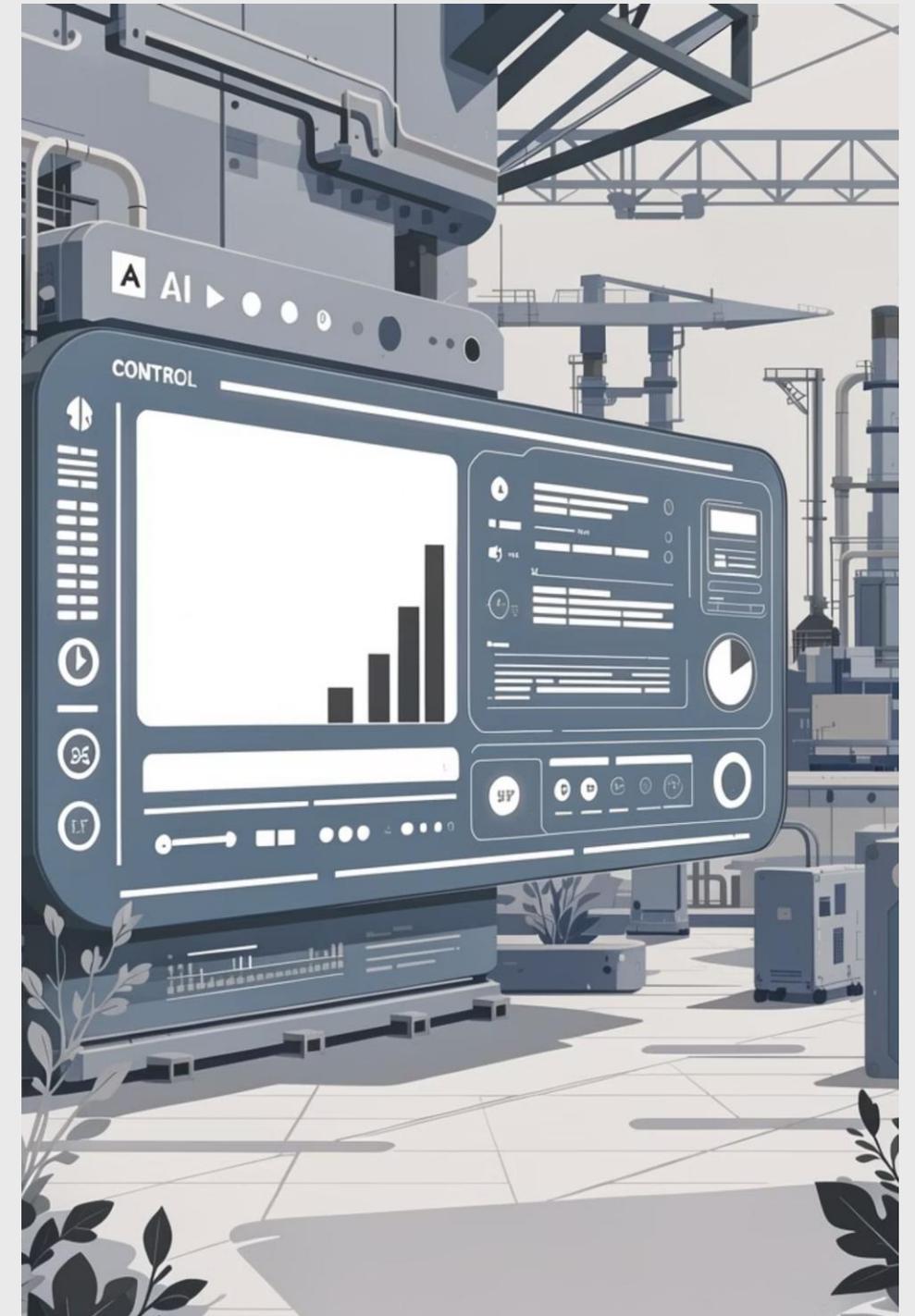Structured + unstructured + external signals combined intelligently

02

Natural Language Interaction

Make insights accessible to non-technical users

03

Scenario Generation at Scale

Generate thousands of "what-if" scenarios evaluating cost, energy, yield, quality risk, delivery, and CO_2

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Key Benefits for Steelmakers

Cross-Functional Alignment

Constraint-aware decisions across procurement, production, quality, and logistics. ptimized together, not in silos.

Empower Workforce & Knowledge Management

Enable teams with better decision support and institutional knowledge for enhanced performance.

Reasoning & Justification

Every recommendation includes clear reasoning and references, enabling operators to understand and trust the AI-driven decisions.

KPI-Driven Scenarios

Scenario-based decision making gives steelmakers the capability to rapidly reconfigure operational strategy around the most critical KPI at the time, turning shifting priorities into a competitive advantage.

The combination of these benefits delivers = Resilience

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Plug-and-Play Integration Layer

Industrial value comes from integrating AI safely into existing operations. In steel plants, replacing core systems is not realistic, so we need a plug-and-play layer that connects on top of what we already use.

Middleware Layer

Standardized connectors around existing ERP, MES, and process historians to integrate use cases incrementally.

Controlled APIs (Safe read/write)

Read operational data and enable restricted, approved actions where permitted (alerts, tickets, workflow tasks, parameter proposals).

Workflow Orchestration (Human-in-the-Loop)

Turn recommendations into controlled actions via approval gates and audit logs (tickets, tasks, permitted updates).

Plug-and-play integration: scale use cases without rebuilding the core stack.

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Data Foundation & Hybrid Architecture

Unified Data Foundation

Steelmaking decisions depend on both structured operational data and unstructured information. We need a data lake / data fabric approach with strong metadata management and document indexing.

- Structured: ERP/MES/historical data
- Unstructured: procedures, incident reports, communications, certificates
- External: logistics status, market/price indicators

Hybrid Edge + Cloud

- Edge deployment: Low-latency, resilient access to operational signals for time-sensitive decisions
- Cloud deployment: Heavy computation for large-scale scenario simulation, training, and cross-site optimization

Architecture must define what runs where with robust fallback behavior.

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RIVER (RFCS Big Ticket)

Resilient Intelligence for Versatile and Evolving Responses in the Steel Industry using AI

From industrial needs to an EU demonstrator

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Thanks!

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