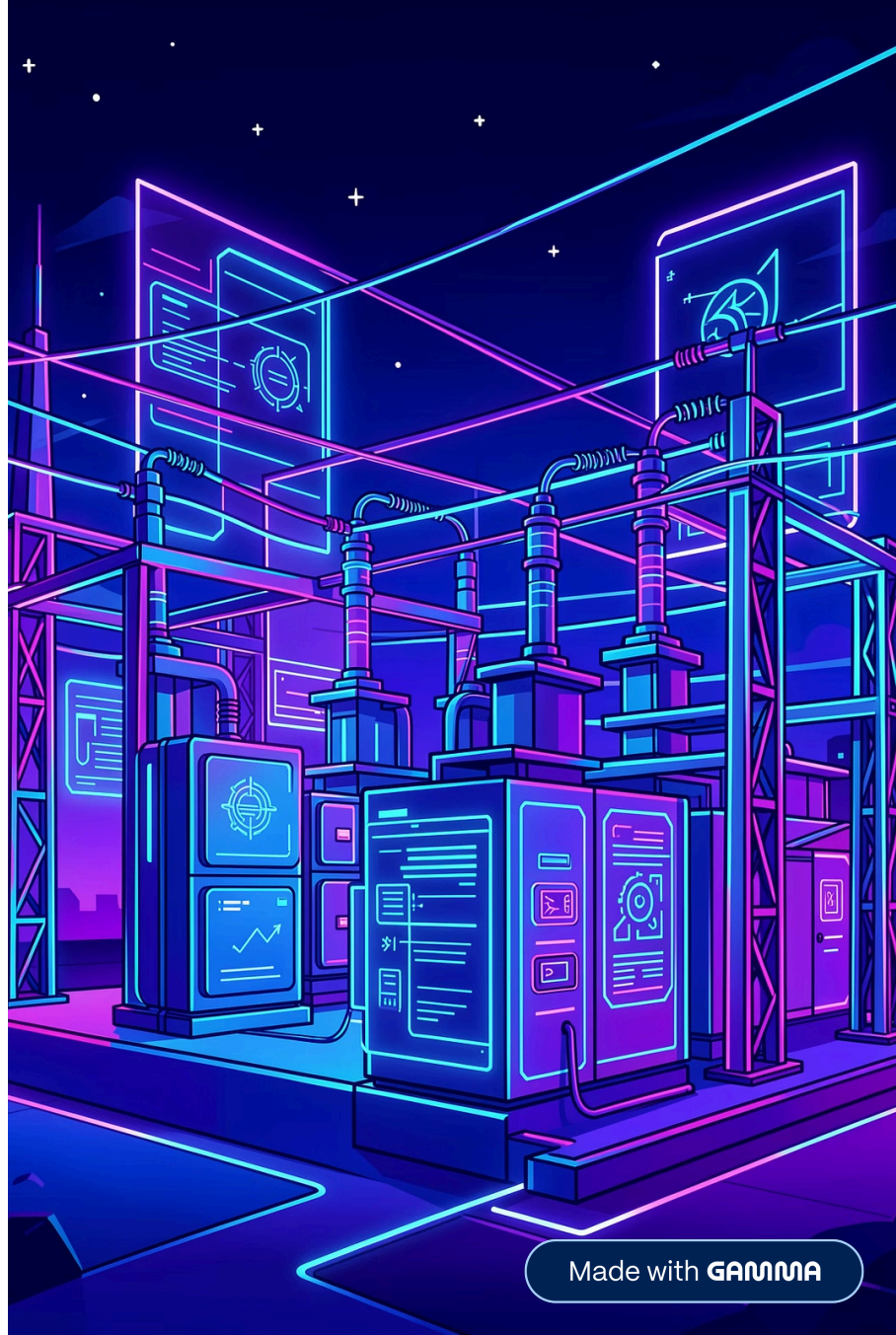
Operations Copilot

An AI-Driven Multi-Agent Platform for Electrical Distribution



Empowering Operations with AI

A Trusted Partner for Field Teams

We're empowering electricity engineers and technicians with a reliable AI assistant they can trust. This intelligent companion helps teams quickly uncover vital insights, enabling faster and more confident decision-making to keep our electricity flowing safely and efficiently.

The Expert Gap: Why We Need AI Copilots

Information Overload

Technical manuals exceed hundreds of pages. Critical information buried across these documents becomes impossible to search efficiently.

Visual Inspection Failures

Field inspections rely on human judgment alone. Critical warning signs—rust corrosion, overheating components, arcing damage—are easily missed under time pressure.

Knowledge Silos

Expert knowledge lives in individual heads. When senior engineers retire, critical troubleshooting experience disappears with them.

From Static Data to Active Reasoning

Traditional SCADA

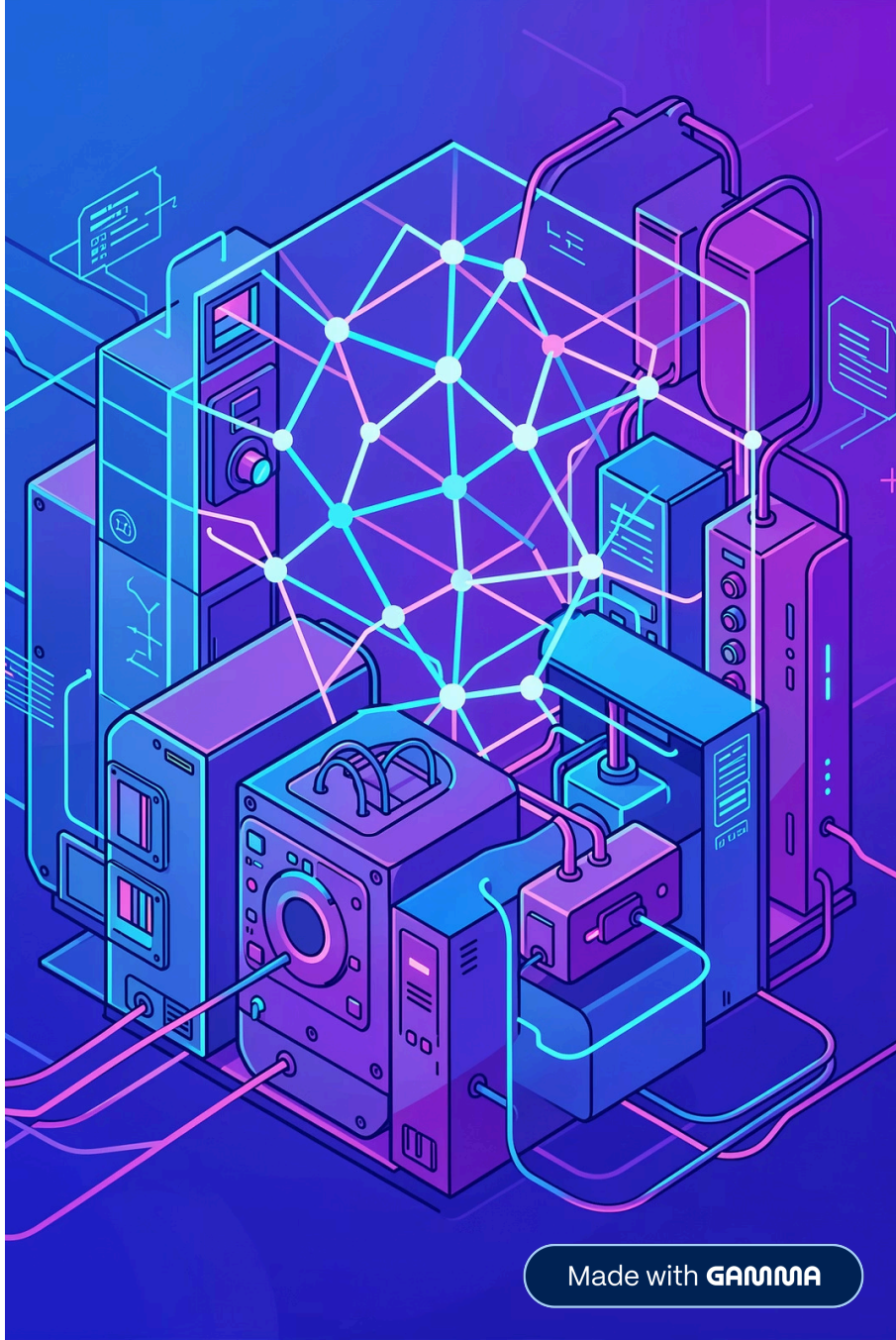
Data dashboards showing lists of sensor readings without context or interpretation

PDF Repositories

Static PDF databases requiring manual keyword searches across thousands of pages

Generative AI Agents

Autonomous agents that reason through problems, connect visual evidence with technical documentation, and generate actionable insights



User Requirements

Functional

- **Instant Technical Queries**

  Retrieve exact documentation sections with complete citation chains to source manuals

- **AI-Powered Image Analysis**

  Vision AI identifies equipment defects and safety hazards from field photographs

- **Real-Time Risk Dashboard**

  Dynamic risk scoring tracks equipment health and safety violations across multiple locations

- **Multimodal Interaction**

  Accept queries as text and images.

Non-Functional

- **Low Latency**

  Sub-2-second response time for image analysis and document retrieval

- **Secure Sessions**

  Encrypted authentication tokens with automatic expiration prevent unauthorized access

- **Dark Mode Interface**

  Low-glare displays optimized for nighttime field inspections and control room operations

Proposed Solution

Technical Stack

- **Django Framework**: Python-based web platform with ORM for database management
- **PostgreSQL**: Relational database storing equipment metadata and maintenance logs
- **CrewAI**: Multi-agent orchestration coordinating Technical, Safety, and Risk agents
- **LangChain**: Document retrieval and RAG pipeline for technical manual processing

System Architecture: The Three-Module Brain

Knowledge Module

RAG pipeline ingests PDF/DOCX technical manuals. Vector embeddings enable semantic search across thousands of pages. Returns cited excerpts with source locations.

Vision Module

Multimodal LLM analyzes equipment photos using Groq or OpenAI models. Identifies physical defects, compares against documentation, and tags safety violations.

Orchestration Module

CrewAI sequences agent workflow: Technical agent queries docs, Safety agent analyzes images, Risk agent synthesizes threat assessment.

Results & Evaluation

2s

Response Time

For image analysis and document retrieval combined

High

Accuracy

Due to tests

90%

Reduction

Faster troubleshooting compared to manual searches

Future Directions & Acknowledgments

Autonomous Inspections

Integrate drone fleets for automated aerial surveys of transmission lines and substations

WhatsApp Integration

Field technicians report issues via WhatsApp. System processes text and images, generating maintenance tickets

Voice Interface

Hands-free operation using voice commands for equipment status queries and emergency reporting

Thank You

Questions & discussion welcome