



## **Deliverable report 49**

### **AI and IAGEN Application Use Case**

#### **Predictive maintenance, cycle optimization, cost reduction Operations and Increased Availability in the Vaca Hydraulic Sector Killed by Generative Artificial Intelligence**

##### **Executive Summary – IAGEN Application for Hydraulic System Management in Dead Cow**

This executive summary presents a strategic application of artificial intelligence generative (IAGEN) in the hydraulic sector, specifically aimed at improving the predictive maintenance, optimize operating cycles, reduce costs and increase availability of water resources in the Vaca Muerta Formation. This is a significant opportunity to increase the efficiency and sustainability of operations related to water, a critical input in the hydraulic fracturing process.

##### **Use case classification**

The report classifies this IAGEN application based on four axes:

1. By main resource: Water + energy
2. By activity: Energy efficiency and sustainability
3. By technology: Generative AI models, machine learning, agents  
smart, big data platforms, natural language processing
4. By strategic impact: Sustainability and reduction of environmental impact

### 1. Opportunities for using AI and IAGEN in the sector

Specific opportunities include water consumption prediction, optimization logistics in water transportation and storage, predictive maintenance of pumps, valves and pipelines, as well as water quality and condition monitoring real-time operations. Integration with IoT sensors, machine vision, and twins Digital technologies enhance these capabilities, generating automated decisions with immediate operational impact.

### 2. Expected benefits

The implementation of these technologies allows reducing water consumption, minimize maintenance costs, improve hydraulic system availability, reduce CO<sub>2</sub> emissions and anticipate failures to avoid operational interruptions. Overall security is also increased and technical decision-making is optimized. through automatic data processing.

### 3. Application of AI

AI is implemented through an ecosystem that includes generative algorithms to prediction, machine learning for early diagnosis, automated workflows for logistics optimization and natural language processing for generation of reports and recommendations. All of this is complemented by interaction with digital twins that allow simulating operational scenarios before implementing them.

### 4. Proposed AI Agent

The report proposes the design of an intelligent agent based on IAGEN that acts as autonomously within the hydraulic system. This agent integrates IoT sensors to constant monitoring, generative models for predictive analysis, and components of planning to run automatic adjustments to the distribution and storage of water.

Its main function is to identify anomalies before they become failures, optimizing resources and ensuring operational continuity. Through business flows agentic work, the system learns from the environment and coordinates actions in real time,

providing a layer of advanced automation. The main benefit of this The focus lies in its ability to reduce operational contingencies and increase efficiency. without the need for constant human intervention and scale to different operations with low implementation cost.

## 5. Conclusion

The adoption of IAGEN in the Vaca Muerta hydraulic sector represents a profound transformation that moves from a reactive scheme to a proactive one and automated. Beyond the economic benefits, this technology contributes to a sustainable management of water, an increasingly strategic and regulated resource. Its proper implementation, accompanied by data infrastructure and training, can position Vaca Muerta as a benchmark for innovation and sustainability in the energy industry.