



AI and IAGEN Application Use Case

Water and Energy Optimization in Fracturing Using IAGEN in Vaca Dead, Neuquén

Executive Summary – IAGEN Application for Water and Energy Optimization in Fracking in Vaca Muerta

This executive summary presents an application of Generative Artificial Intelligence (IAGEN) in the energy sector, specifically in the optimization of water use and energy during hydraulic fracturing in the Vaca Muerta formation, in Neuquén.

This application represents a strategic opportunity to improve efficiency, reduce costs and increase the sustainability of operations in one of the the country's most important unconventional deposits.

The report classifies this use case according to four key axes:

- 1) main resource: water and energy.
- 2) Activity in Vaca Muerta: energy efficiency and sustainability.
- 3) Type of technology used: generative AI, machine learning and platforms (Big Data)
- 4) strategic impact: sustainability and reduction of environmental impact.

1. Opportunities for using AI and IAGEN in the sector

AI and IAGEN enable the transformation of the traditional approach to fracturing by automatic and customized adjustments of operating parameters, based on analysis real-time geological, environmental and operational data. Among the Key opportunities include: reducing resource consumption, compliance

regulatory, adaptation to the variability of deposits, and increase in productivity through simulation-based decision-making.

2. Benefits

The use of IAGEN brings multiple operational and strategic benefits: it allows for a intelligent management of water and energy consumption, improves environmental sustainability, minimizes human errors, optimizes fracture design, reduces operating costs and strengthens the competitive positioning of companies in the sector compared to regulations and efficiency requirements.

3. Application of AI

The solution is based on an architecture that integrates IoT sensors, predictive analytics, generative models and Big Data platforms. Algorithms such as networks are applied deep neural networks, decision trees and gradient boosting to anticipate the operational behavior and generate real-time optimization recommendations.

4. Proposed IAGEN agent and its main function

The report proposes a system of five intelligent agents that operate in a coordinated to optimize in real time the use of water and energy during the hydraulic fracturing. These agents are:

- Sensing: collects real-time data from sensors installed in the well and teams.
- Analysis: identifies inefficiencies and predicts future behaviors through AI algorithms.
- Simulation: Model alternative scenarios to find configurations optimal.
- Recommendation: Generate precise operational adjustments to optimize resources.
- Monitoring: supervises execution and provides feedback to the system for improvement continues.

The main function of the system is to automate and dynamically adjust the operating parameters, allowing for more efficient, sustainable fracturing aligned with regulatory requirements. Its main benefit is achieving a more efficient operation intelligent, adaptable and with a lower environmental impact.

5. Conclusion

The IAGEN represents a disruptive tool for the Argentine energy sector. Its Implementation in Vaca Muerta allows addressing environmental, operational and regulatory of the present, while opening the way to a more smart and responsible use of unconventional resources. Its potential scalability positions this technology as a strategic ally to transform the industry national energy towards a more efficient and sustainable future.