HUB TECH IA

Deliverable report 46

AI and IAGEN Application Use Case

Reservoir Modeling for the creation of multiple scenarios realistic subsurface maps that capture the geological complexity of Vaca Dead

Executive Summary – IAGEN Application for Reservoir Modeling in Vaca Dead

This executive summary presents a strategic application of generative artificial intelligence (IAGEN) in the energy sector, specifically focused on modeling unconventional reservoirs. This represents a significant opportunity for Vaca.
Dead, given its potential as a shale gas and oil deposit, allowing
optimize exploitation, reduce uncertainty and improve decision-making through
of emerging technologies.

Use case classification

The report classifies this IAGEN application based on four axes:

1. By main resource: gas (with oil as secondary), in line with the role
   strategic role of LNG in the energy transition.
2. By activity: information management and decision making through
   scenario simulations and predictive analysis.

3. By technology: combined use of generative AI (GANs, VAEs), machine learning (RNNs, Transformers), computer vision (CNNs) and data integration massive.
4. For strategic impact: substantial improvement in decision-making, field planning, well placement and uncertainty analysis.

1. Opportunities for using AI and IAGEN in the sector

Concrete opportunities include the generation of multiple scenarios realistic geological, automated seismic interpretation, simulation of reservoir behavior under different operating schemes and optimization in real-time drilling and completion strategies. AI also enables develop proxy models that reduce simulation time and cost, and improve the petrophysical characterization integrating heterogeneous data sources.

2. Expected benefits

The implementation of IAGEN in reservoir modeling brings benefits such as:

- Improved accuracy of production predictions.
- Reduction of operating and drilling costs.
- Optimization of well design and location.
- Reduction of uncertainty and acceleration in decision-making strategic.
- Improved energy efficiency and sustainability of operations.

3. Application of AI

The proposed architecture integrates different AI technologies into a workflow

Advanced that combines: seismic and well data ingestion, generative modeling subsurface, production simulations, sensitivity analysis, and recommendations optimized using deep learning algorithms. This approach allows replace deterministic models with multiple conditional realizations and dynamic, aligned with real data.

4. Proposed AI Agent

The AI agent proposed in the report is conceived as an autonomous system intelligent, designed to technically assist throughout the entire modeling cycle deposits, from data collection to decision-making. Its architecture combines generative language models with specialized modules for data ingestion and preprocessing (seismic, petrophysics and production), generation of conditioned geological realizations using GANs and VAEs, rapid simulation through proxy models and sensitivity and uncertainty analysis. The agent is designed to operate interactively with platforms such as Petrel or DecisionSpace, and enables informed recommendations, visualizations and automatic executive reports in real time.

A key feature is its no-code/low-code approach, which makes it easy to use by non-technical staff and their integration into existing operating environments. When operating As a "technical co-pilot", the agent does not replace human labor, but rather amplifies its capabilities, accelerating workflows, reducing errors and offering multiple scenarios for strategic decision-making. In addition, being based In agentic flows, you can coordinate tasks with other specialized agents or digital systems, creating a collaborative hybrid environment between humans and machines.

5. Conclusion

The application of IAGEN in Vaca Muerta represents a structural transformation in the way of understanding, simulating and exploiting unconventional deposits. Its adoption allows us to overcome the limitations of traditional techniques, moving towards a

more efficient, profitable and sustainable exploitation, and position Argentina at the
at the forefront of energy innovation. The key is to combine technical capabilities,
Reliable data and specialized talent to implement this technological revolution
in one of the country's strategic resources.