CASE STUDY

Reshaping Reservoir Economics

Devon Energy's Efficiency Journey with ShaleIQ

Unleashing a new era of efficiency and innovation

The energy industry is at a critical point where there is a constant juggling act to meet demand, maintain capital efficiency and debt reduction, while moving towards sustainability. This leaves organizations with shale assets facing a particular challenge given the high decline rate and short life span of many of their unconventional wells.

To mitigate these issues and ensure optimal recovery, companies often explore infill (or child) wells. This strategy utilizes existing facilities, reduces surface disruption, and can improve production by accessing reserves that were otherwise inaccessible.

However, infill wells can also interfere with existing (or parent) wells, resulting in parent-child interference, potentially impacting the production from both infill and existing parent wells.

Being able to model and predict optimal well locations and density becomes critical and is where predictive modelling is necessary. Organizations need a method that is both accurate and fast, two items that are often mutually exclusive in the modelling world. Until now.

Speed versus accuracy – The dichotomy of modelling and simulation

Predicting primary and infill well performance has always been a critical process for unconventional assets and organizations often have to trade off accuracy for speed (or vice versa). Physics-based numerical methods are more accurate and robust but require time to generate and tune. On the contrary, analytical, and empirical methods are relatively quick but lack the ability to capture important effects like well-to-well interference.

This is where CMG's data analytics solution comes in. ShaleIQ constructs physics-based type well profiles using AI models trained with numerical reservoir simulations. This improves on traditional approaches by delivering the accuracy and robustness of physics-based models in a fraction of the time.We tested ShaleIQ's capabilities using a real-life case study with Devon Energy, who was looking to optimize well spacing and density placement for one of their most active areas in the Permian Basin.

A real-life test

Devon Energy wanted to determine an infill strategy that would provide the best return on their investment. Using existing information about the primary wells drilled and completed from 2019 to 2021, we sought to test the robustness of ShaleIQ predictions in a blind test. ShaleIQ's models were verified with near by well field data to gauge the predictive capabilities without prior exposure. Following this blind test phase, the models were trained using historical data to further refine the results.

Two scenarios were presented as shown in Figure 1 and Figure 2.

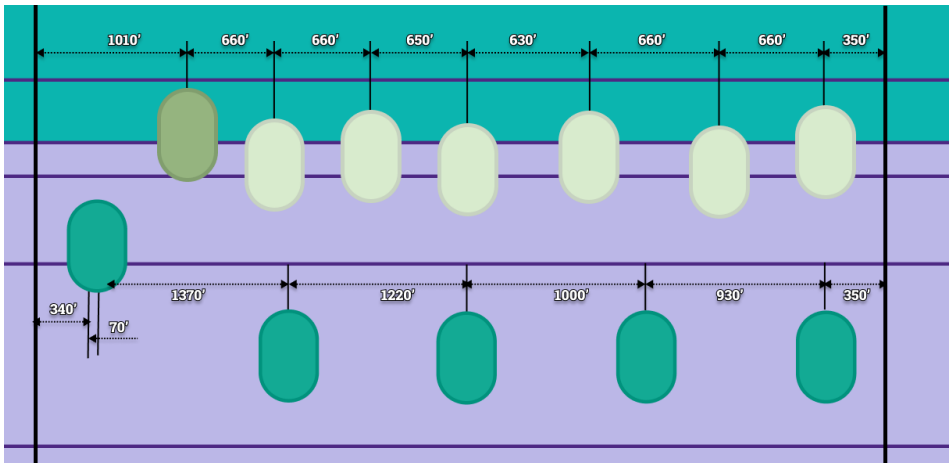


Figure 1: Evaluating six new infill wells in 2024

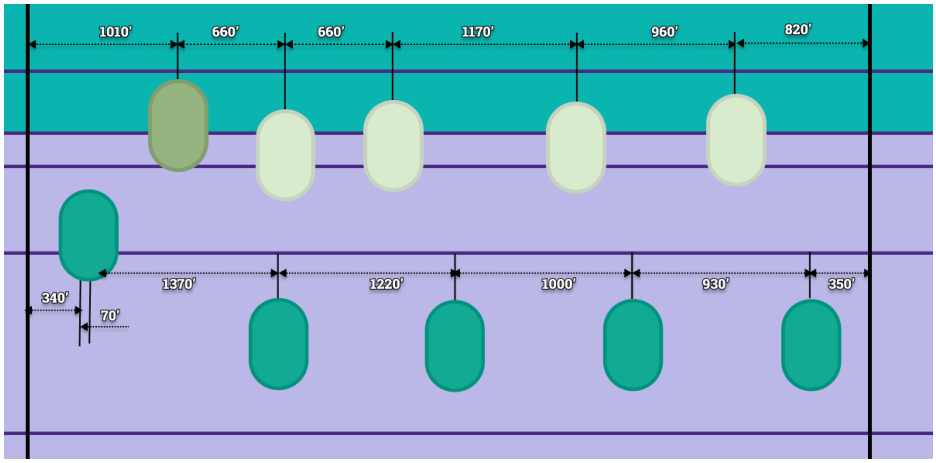


Figure 1: Evaluating four new infill wells in 2024

Infill 2024 wells

Infill 2026 well (upside)

Primary 2019 - 2021 wells

Insights for primary and infill wells within hours

ShaleIQ was able to quickly match field production history for every existing well. This resulted in a set of subsurface parameters that is representative of the reservoir, as well as valuable insights about existing well interference and pressure depletion.

To estimate key production drivers for undeveloped existing well benches in the lease, a nearby lease with established production history was used. The same workflow was applied to understand reservoir performance for these upper benches.

Combining key learnings from blind testing and history matching existing well formations, we evaluated several outcomes from low risk to high risk to determine whether to place four or six new wells in the area for maximum economic returns. The four main scenarios used to capture potential outcomes and reduce uncertainty related to fracture growth toward depletion are:

- **Low fracture half lengths** – From history matching an offset well (long production history, older completion)
- **Fracture growth toward depletion** – Switching fracture height to depletion (downward)
- **Regular history matching** – Ranges from all three wells, frac heights more upward trending as usual
- **Severe depletion** – Switching fracture height to well depletion downward and increasing depletion factor by an order of magnitude.

Figure 3 showcases the average incremental recovery of all four forecasting scenarios when comparing four wells versus six wells. With an average risked gain of 203,000 barrels of oil between four new wells and six new wells, we determined that placing four new wells at specified spacing would be the optimal density for the section.

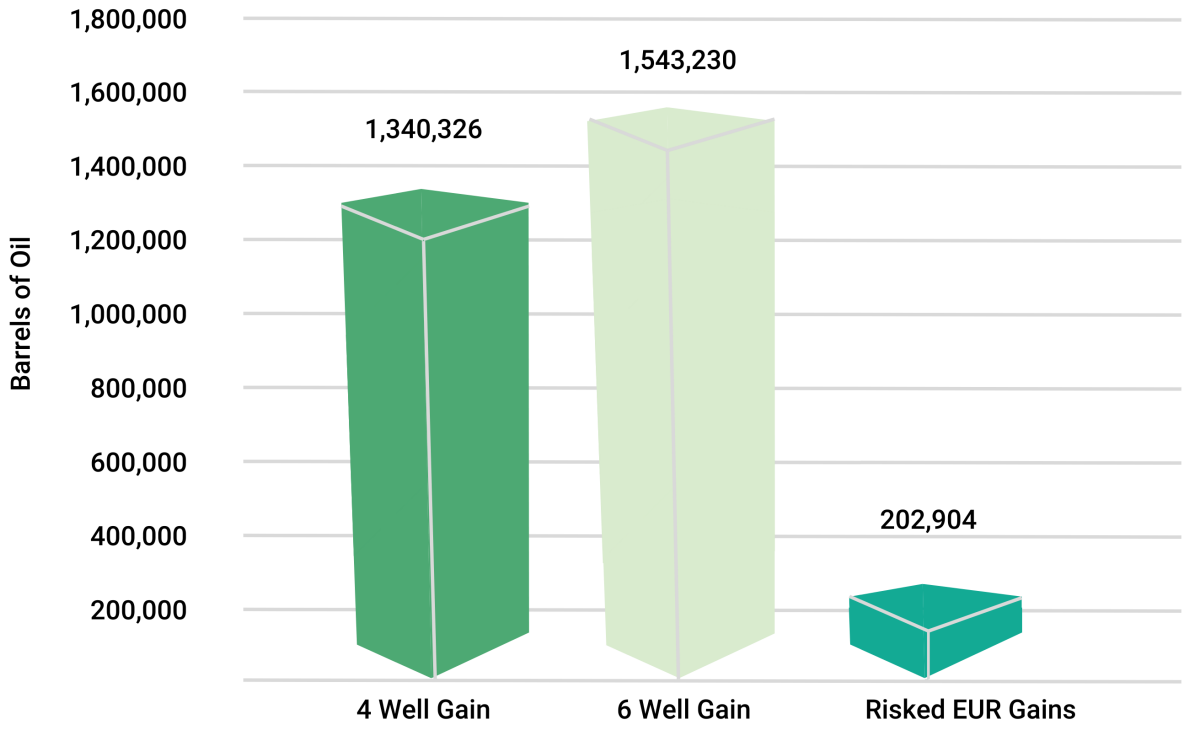


Figure 3: Total new oil production (risked BO) from two infill drilling senarios

Save Time

AI-based analytics reduces data-intensive input, and quickly estimates the upside value of undeveloped drilling locations using a physics-based approach.

Operators can run sensitivities on thousands of wells in minutes for field development optimization with high accuracy.

Scale Effectively & Accurately

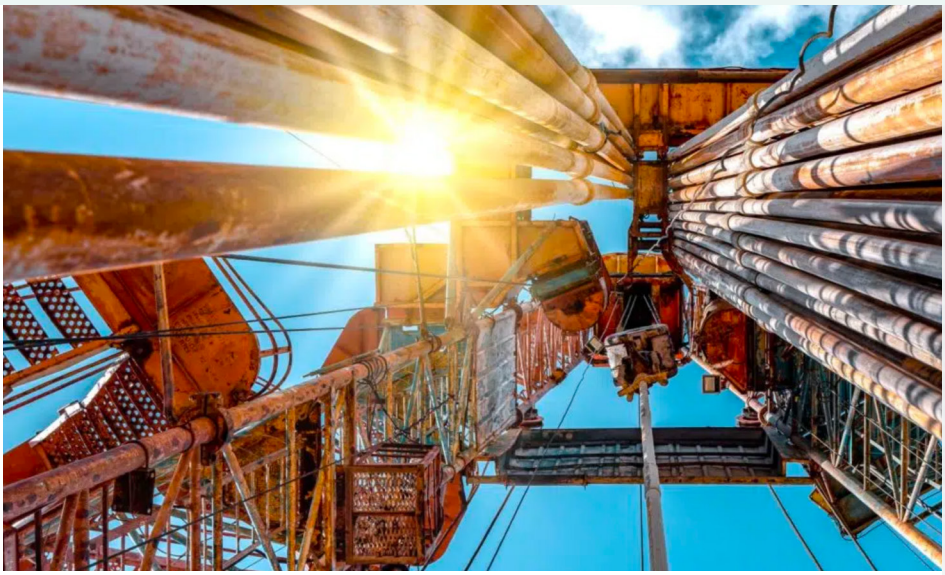
Stay ahead in the industry and unlock the full potential of unconventional resources with high-speed capabilities.

Provides quality and integrity in reserves reporting and addresses reservoir engineering challenges for unconventional reservoirs.

Improve Economics

Make informed decisions quickly through rapid data analysis and physics-driven insights, maximizing infill well economic returns.

Facilitates well density studies and capital deployment evaluation to maximize new well economics.



Value and Highlights

The combination of physics and AI-driven forecasting within ShaleIQ empowered Devon Energy to make quick decisions with remarkable efficiency. With an accurate and insightful model developed in hours, they were able to confidently weigh the outcomes and risks associated with expansion.

They used ShaleIQ results to analyze the parent-child interactions in their shale asset and determine appropriate strategies aimed at achieving the most cost-effective infill scenarios. Informative and accurate data, coupled with the time savings of getting quick insights into business-critical decisions, allowed ShaleIQ to add immediate value to Devon Energy's operational strategy.

By utilizing ShaleIQ, organizations with shale assets are no longer forced to decide between speed and accuracy. Instead, companies can benefit from the best of both worlds: the accuracy and robustness of physics-based numerical methods and the speed and efficiency of analytical and empirical methods.

Now organizations can quickly make impactful decisions and maximize their return on investment through a scalable and fast solution that provides valuable insights on their unconventional reservoir.