Upstream Digital Transformation

Alejandro Primera

Reservoir/Production Engineer

Disclaimer

This presentation and its content represent my personal views and opinions and are not made on behalf of, nor do they represent the official position, opinions, or policies of SLB or any of its affiliates. The material provided is for informational purposes only and should not be construed as professional advice or endorsement by the company. SLB has not reviewed or approved the content of this presentation, and any statements or representations made herein are my own responsibility.

All images, graphics, and other materials included in this presentation are intended solely for illustrative purposes and are subject to copyright or usage rights. These materials may not be reproduced, distributed, or used in any other presentation, publication, or media without explicit permission from the owner or creator.

Why Data and AI Matter in Upstream Oil and Gas Today

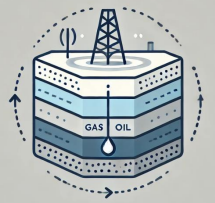
The importance of data and AI in addressing energy sector challenges.

Sustainability and emissions reduction as key priorities.

Data and AI enable smarter, greener operations.

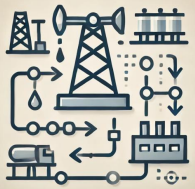
How Every Discipline Leverages Data

Geoscience – Understand subsurface uncertainty. Potential Volumes

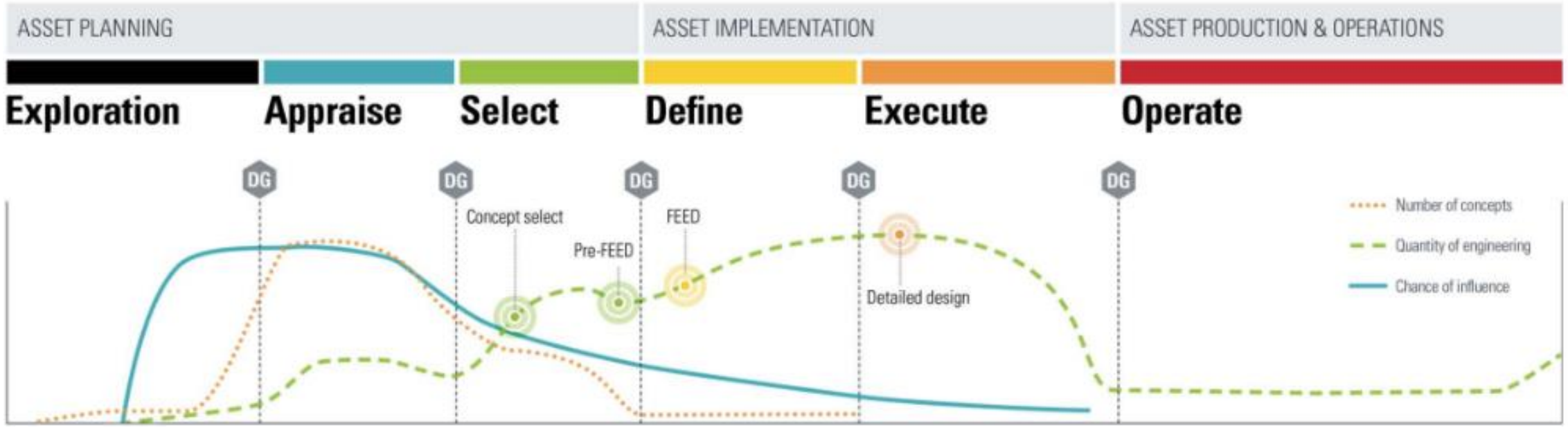


Reservoir - Simulations and production forecasting.

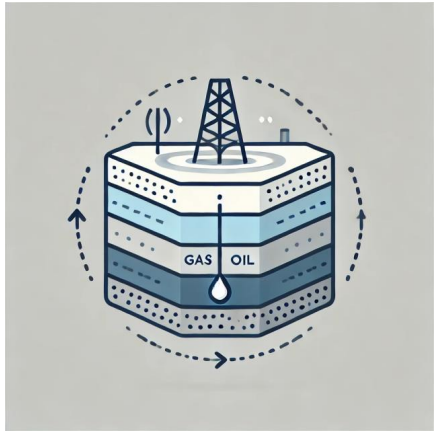
Drilling - Real-time well path optimization. Optimal completion



Production - Facility monitoring and predictive maintenance.



→ Geosciences

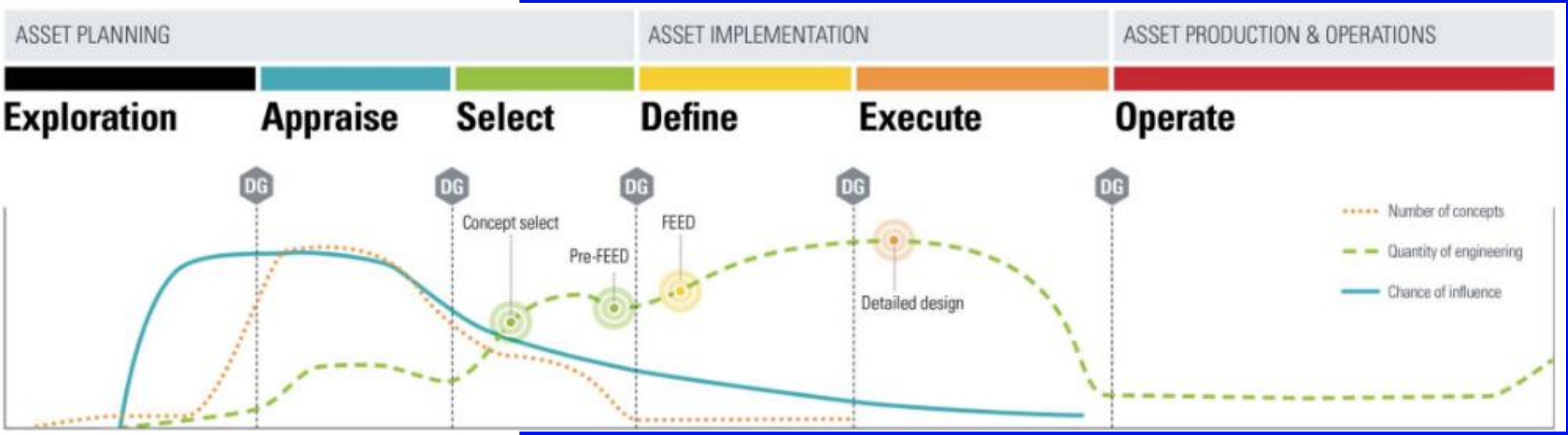


→ Reservoir Engineering

→ Drilling & Completions

→ Production & Operations

→ Economics



In Addition...

Plug and Abandonment (P&A) and Opportunities

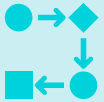
Carbon capture and storage

Data Evolution

Multiple disciplines – multiple formats

Historical evolution - Manual records to IoT systems.

Challenges in mature fields and late digital adoption.

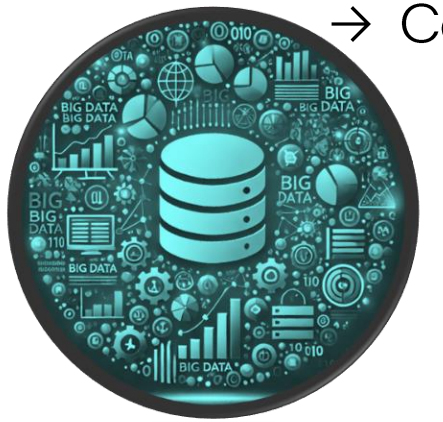


Transition to real-time and predictive systems.

The Data Challenge - Volume, Variety, and Frequency

- → Growing sensor deployments and real-time data streams.
- → Structured vs. unstructured data.
- → Frequency shift - Sporadic to continuous monitoring.

→ Big Data
→ Contextualisation



→ Sensors
→ Transmission
→ Edge computing

→ Cloud Computing

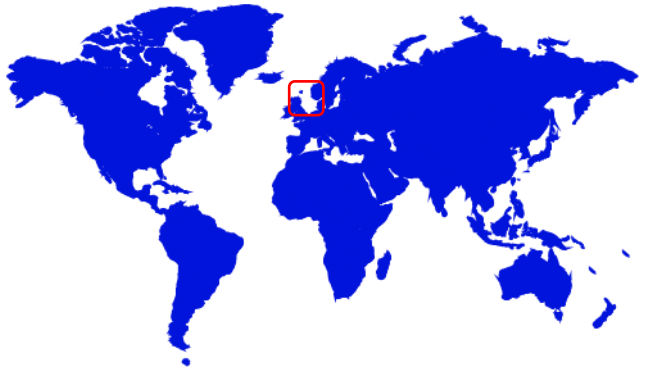
→ AI

→ Generative AI

→ Hybrid AI models

North Sea

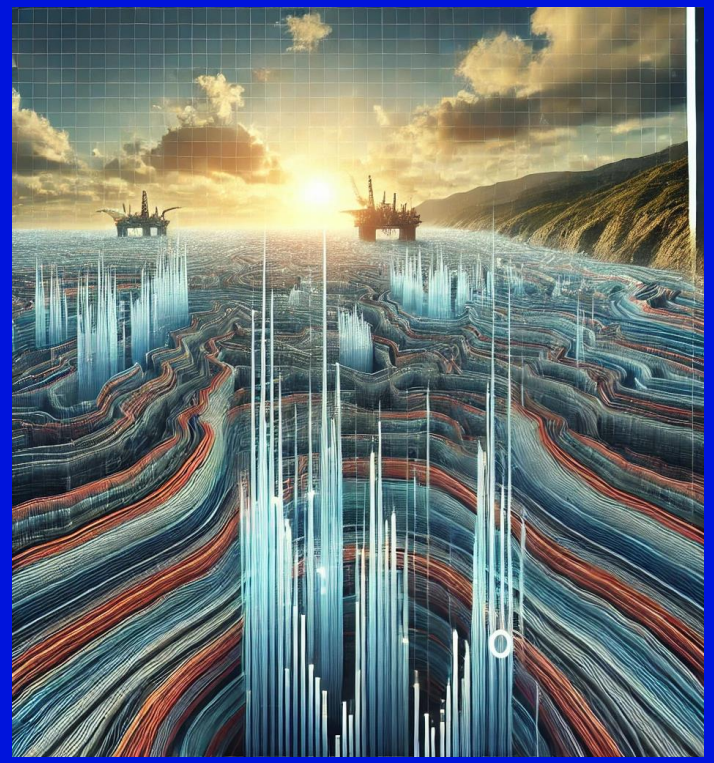
Infrastructure Led Exploration



Challenge

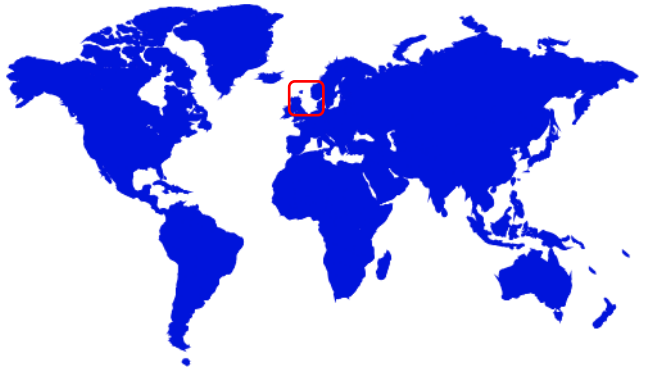
→ Vast volumes of seismic data from different time periods and formats are difficult to integrate and interpret.

→ Lack of a unified platform to combine seismic interpretations with SME insights.



North Sea

Infrastructure-Led Exploration



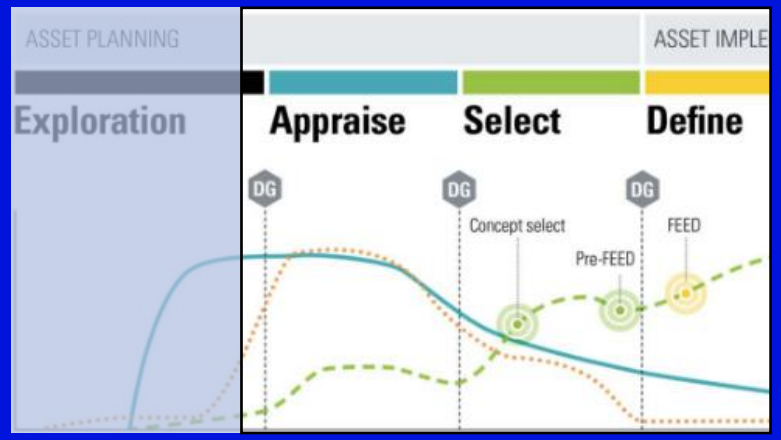
→ Use big data platforms to unify seismic datasets and SME inputs.

→ Employ AI-driven seismic interpretation tools for faster pattern recognition.

→ Utilize cloud-based collaboration platforms to streamline data sharing and team coordination

North Sea FDP

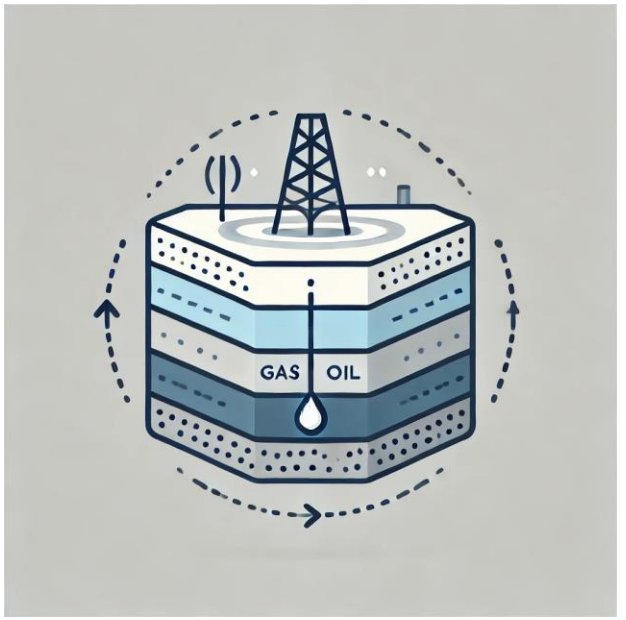
Platform
Subsea
FPSO



Challenge

→ Running simulations for multiple scenarios is computationally expensive and time-intensive.

→ High uncertainty in reservoir behavior and market conditions.



North Sea FDP

Platform
Subsea
FPSO

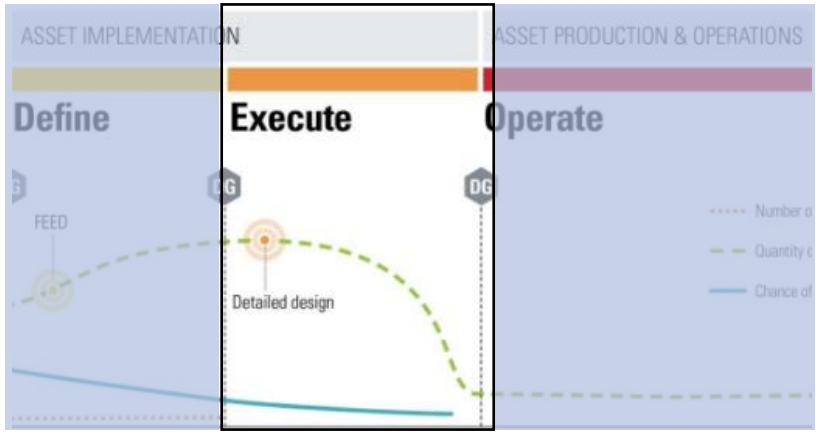
→ Use **cloud computing** to scale up numerical simulations.

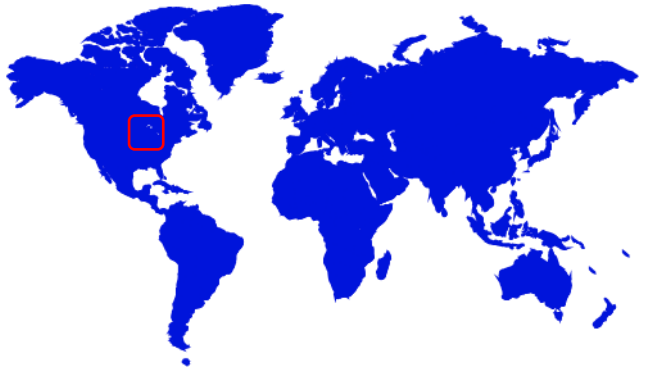
→ Apply **AI-based** scenario analysis to evaluate alternative strategies efficiently.

→ Leverage **GenAI** for automated report generation summarizing insights from simulations.

Unconventional Eagle Ford

Drilling and Execution





Challenge

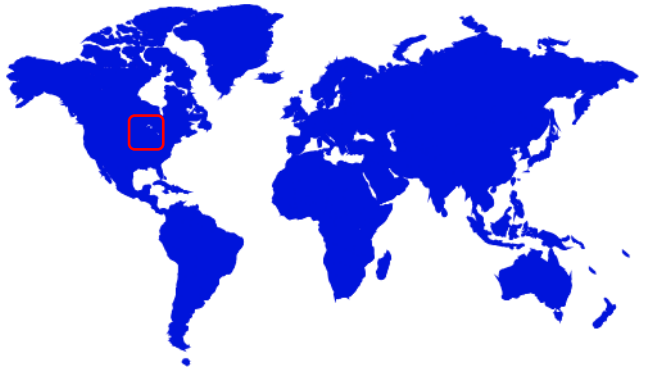
→ Variability in subsurface geology complicates fracture design and execution.

→ High material costs (e.g., proppant, fluids) with limited insight into optimal usage.

→ Difficulty in predicting and preventing completion failures or inefficiencies.

Unconventional Eagle Ford

Drilling and Execution



→ AI models to simulate fracture propagation and optimize stage designs.

→ Deploy **predictive maintenance** tools to avoid equipment failures during completion.

→ Utilize **edge computing** for real-time fracture monitoring in remote locations.

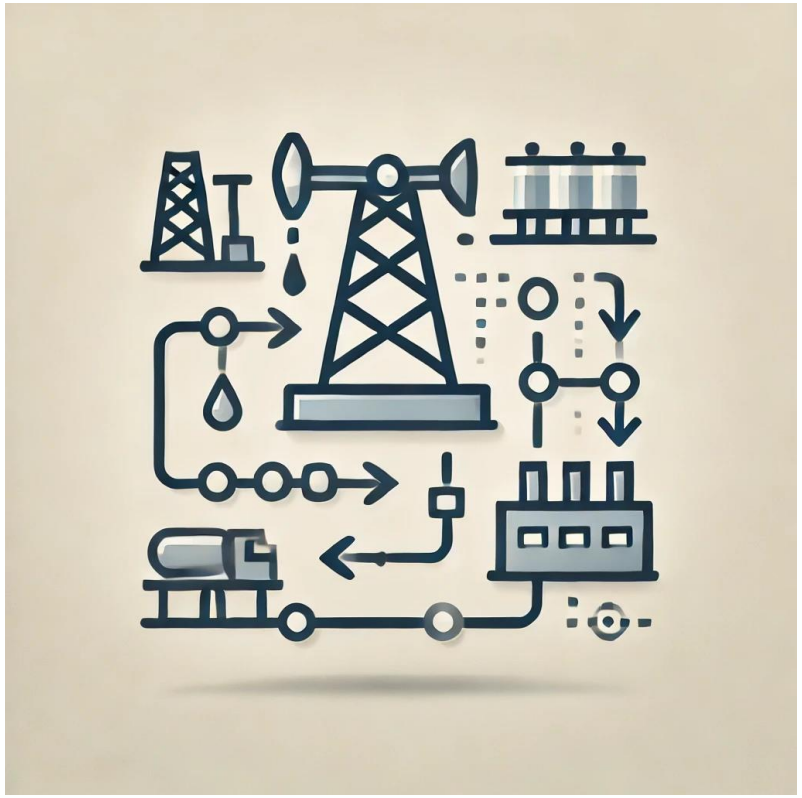
Onshore Brazil

Brownfields Needing Digitalization

Challenge

→ Aging infrastructure with limited monitoring capabilities.

→ Inconsistent production data and lack of real-time optimization.



Onshore Brazil

Brownfields Needing Digitalization

→ Install **IoT sensors** for real-time data acquisition.

→ Apply **AI models** for production optimization.

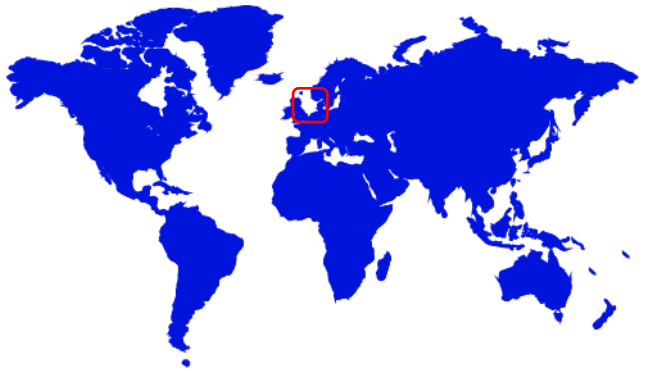
→ Use **edge computing** for local decision-making in remote areas with limited connectivity.

Bridging Physical Models with Real-Time Data

- How AI contextualizes data to enhance decision-making.
- Real-time calibration of simulations using AI.
- Cloud storage for seamless collaboration.
- AI for anomaly detection and data contextualization.

North Sea

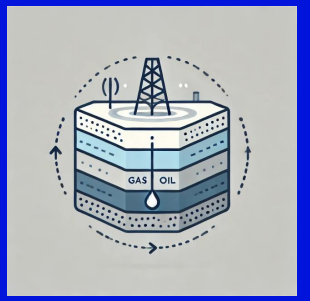
Plug and Abandonment (P&A) and Opportunities



Challenge

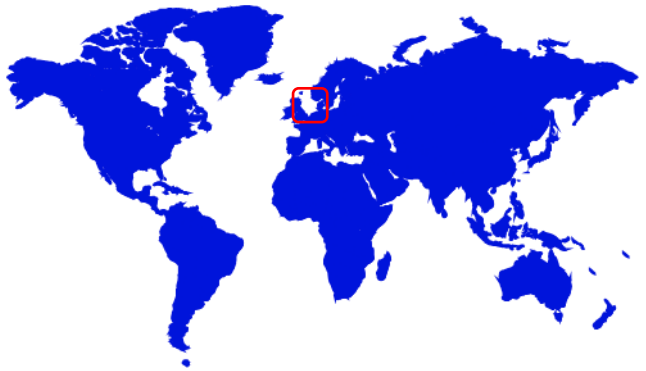
→ Unstructured legacy data makes it hard to plan safe and cost-effective abandonment.

→ Identifying intervention opportunities for well life extension is difficult.



North Sea

Plug and Abandonment (P&A) and Opportunities



→ Use GenAI tools to structure and analyze historical data.

→ Automate Engineering analysis, power with AI.

→ Leverage automation for safe and efficient P&A operations.

Irish Sea

Carbon capture and storage

Challenge

- Impurities in CO_2 streams affect density, flow, and storage efficiency.
- Real-time adjustments to operational parameters are complex without robust models.
- Limited experience in adapting oil and gas operational learnings to CO_2 injection.

Irish Sea

Carbon capture and storage

- → Install **IoT sensors** for real-time data acquisition.
- → Apply **AI models** for production optimization.
- → Use **edge computing** for local decision-making in remote areas with limited connectivity.

AI for Emissions Reduction and New Energy Transitions

- → Supporting sustainability with AI-driven solutions.
- → Real-time flaring detection and emissions tracking.
- → Carbon capture and storage optimization.
- → Integration of renewables with traditional operations.

Thank you

Alejandro Primera

Experienced Petroleum Engineer | FDP, Reservoir Engineering | Practitioner of Data Science, AI & Fullstack Dev | Specialising in Digital Asset Performance, Operations, Midstream, Downstream & Sustainable Energy

London, England, United Kingdom · **Contact info**