Autonomous Operations in Practice:
Scaling AI with Edge Computing for Optimizing Gas Lift Wells

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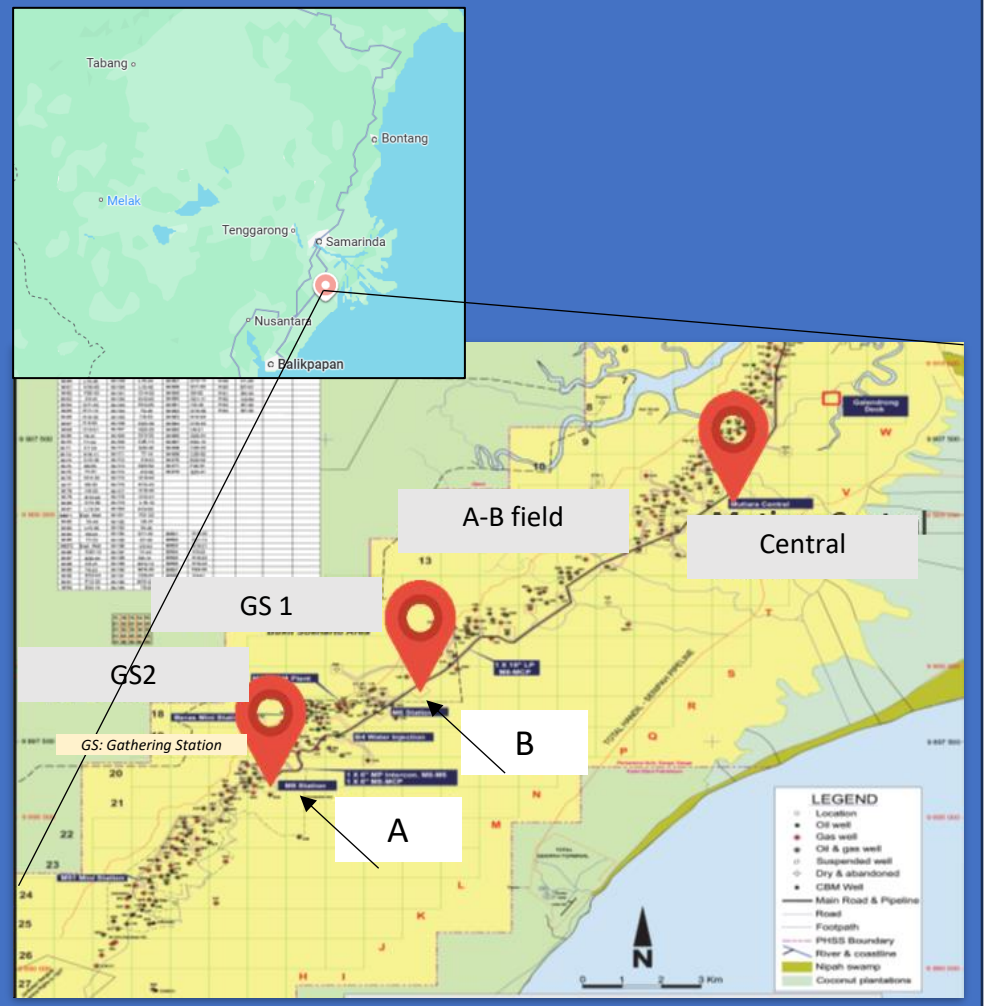
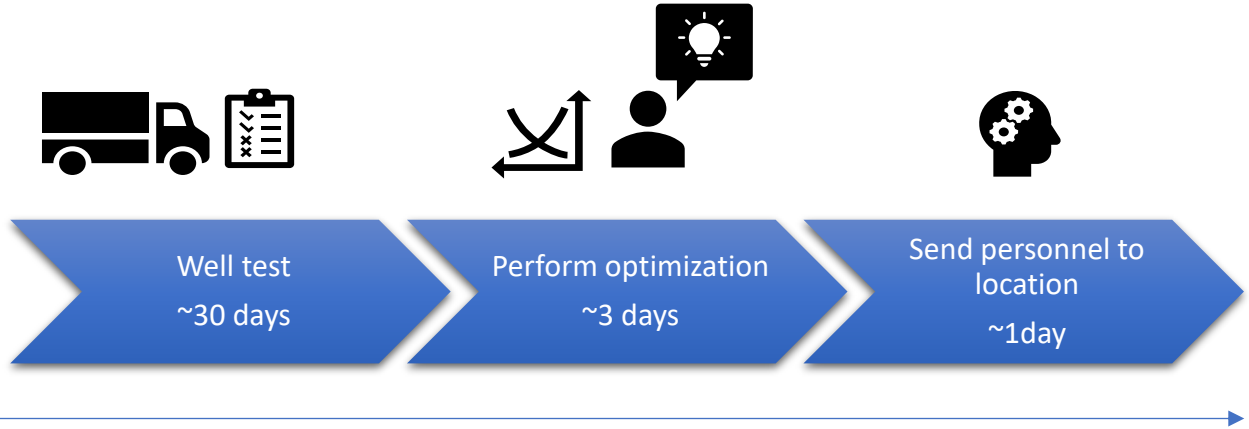
Background





- ~34 days of non-optimized flow
- Inherent delays in critical decision data

Kalimantan (Sanga Sanga)

- 2 wells selected as pilot project:
- Well A:
  - Limited accessibility due to road path and unpredictable weather
  - Fully dependance on gas lift injection
  - Average Production 2024 (~50 BOPD)
- Well B:
  - Producing naturally in 2020 (~557 BOPD)
  - Start producing with gas lift 2022
  - Average production 2024 (~200 BOPD)
  - Flow assurance issue, injecting chemical injection: PPD (Pour Point Depressant)

Challenges

Time consuming

Domain Expertise

- Well test (6-8 hours)
- Well test update (1 day)
- Well optimization (1 day)

Smart Hardware

Remote location

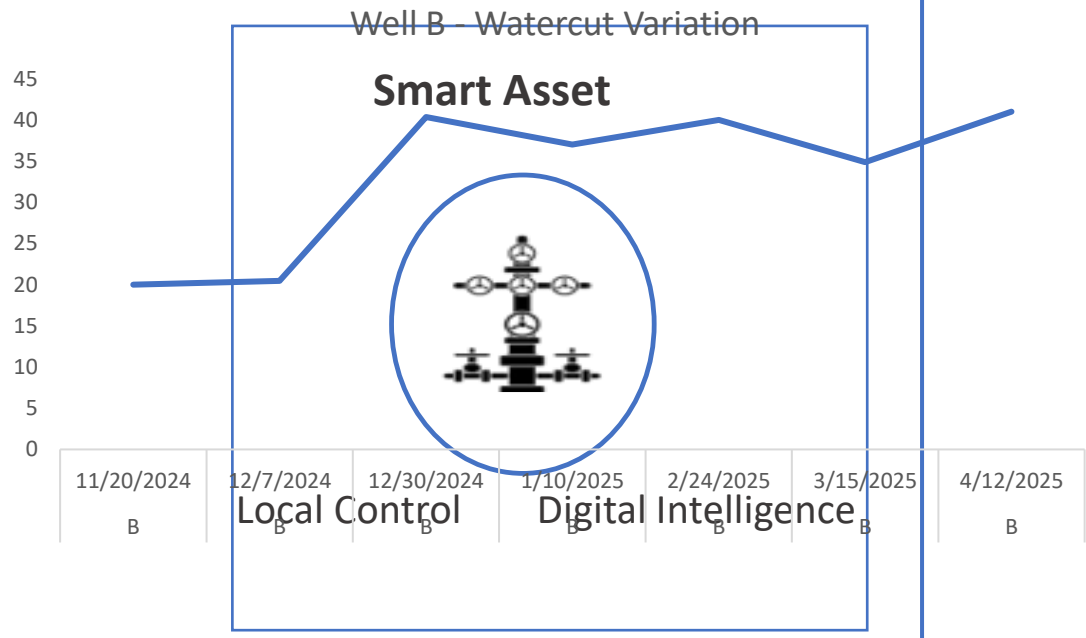
Digital Solutions

- HSE Risks and Emissions
- Limited logistic and personal access to well

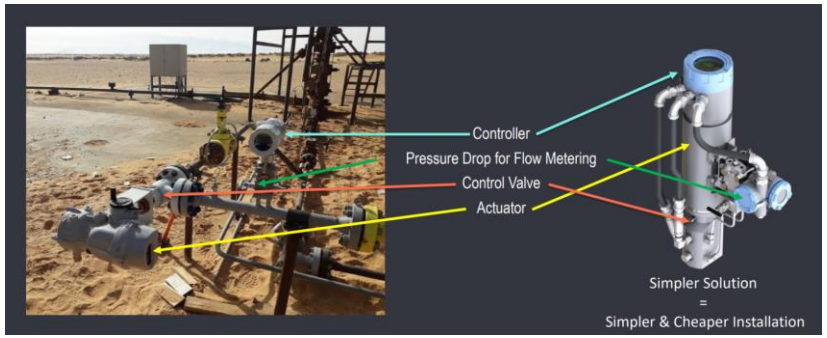
24/7 Surveillance

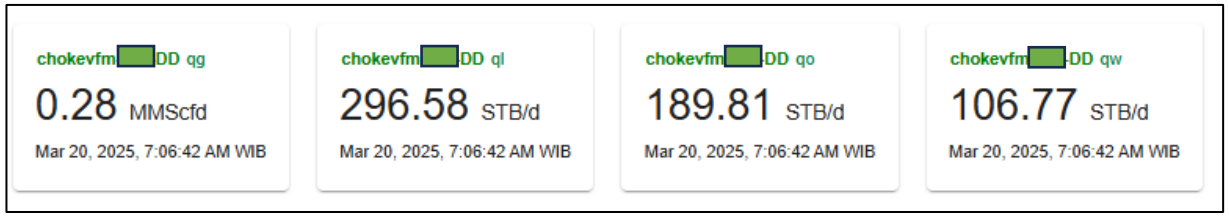
Field Deployment

- Unstable water cut
- Chemical injection dependence



Workflow





Smart hardware

- Smart valve
- RTU
- Edge gateway

Smart Well test

- VFM Application
- GLO Application

Digital Algorithms

- Autonomous operation
- Production surveillance

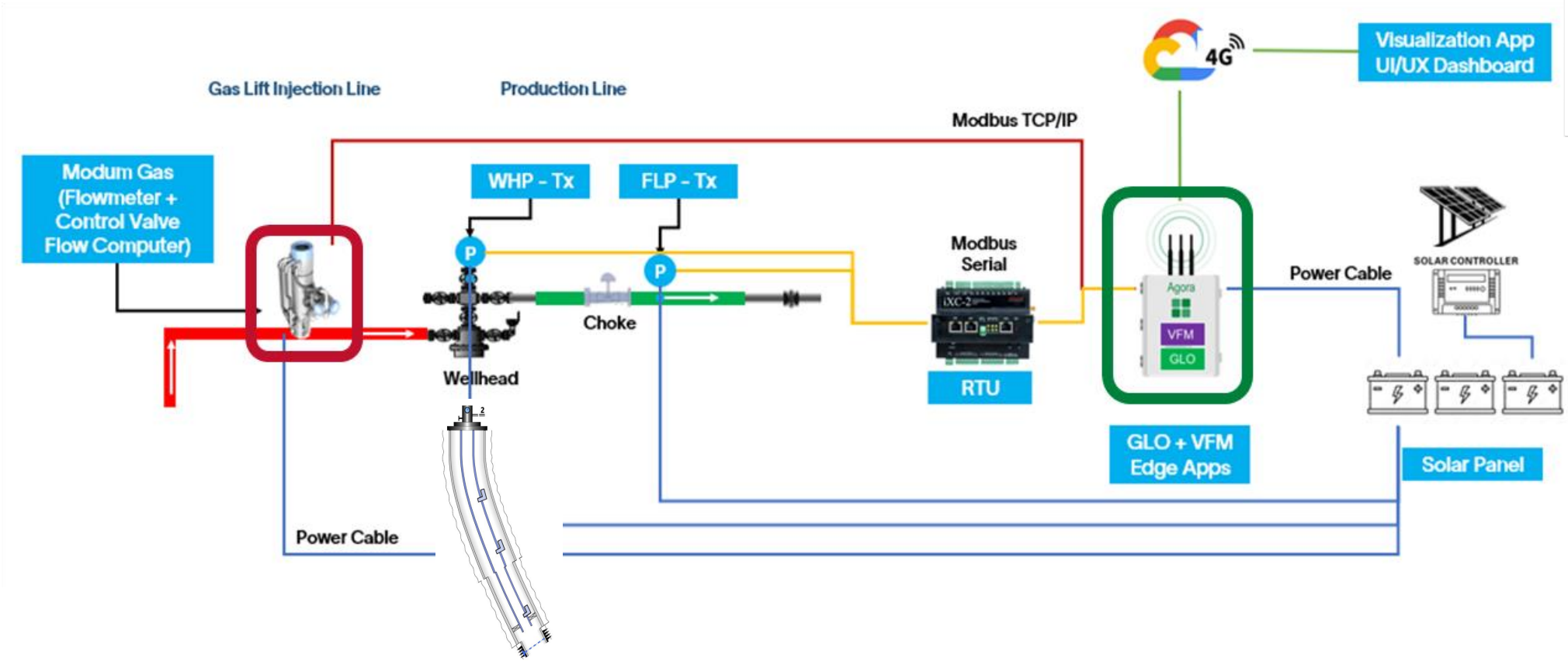
Daily optimization cycle ~16hours

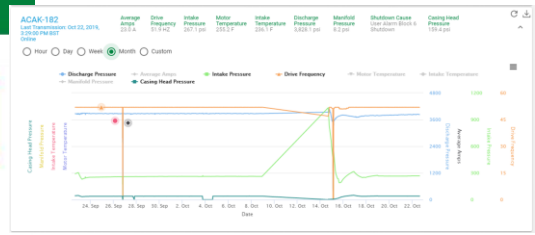
Solution Architecture

Smart Gas Valve + Sensor

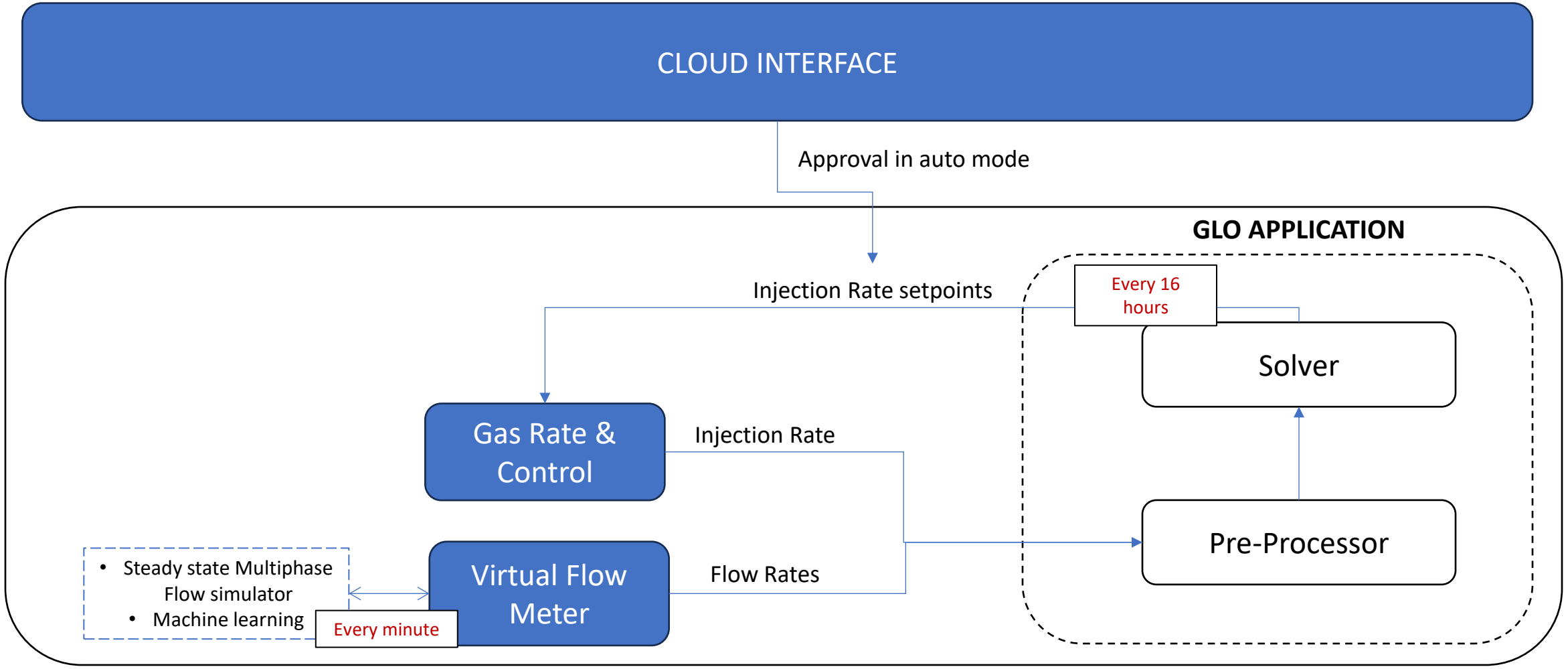
Existing Infrastructure

Edge Computing

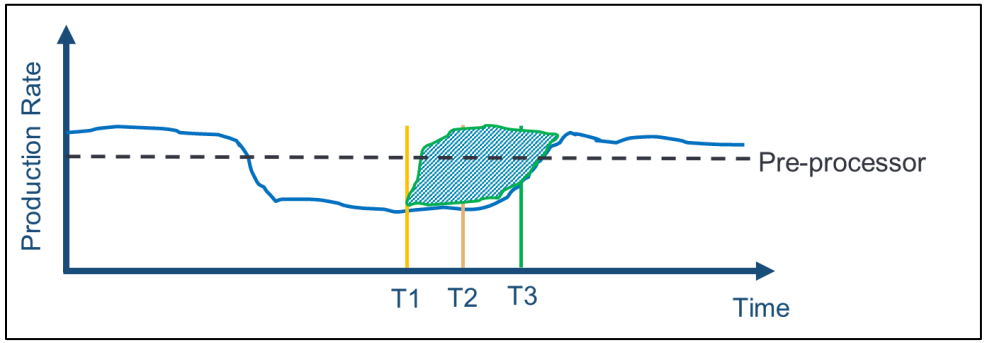


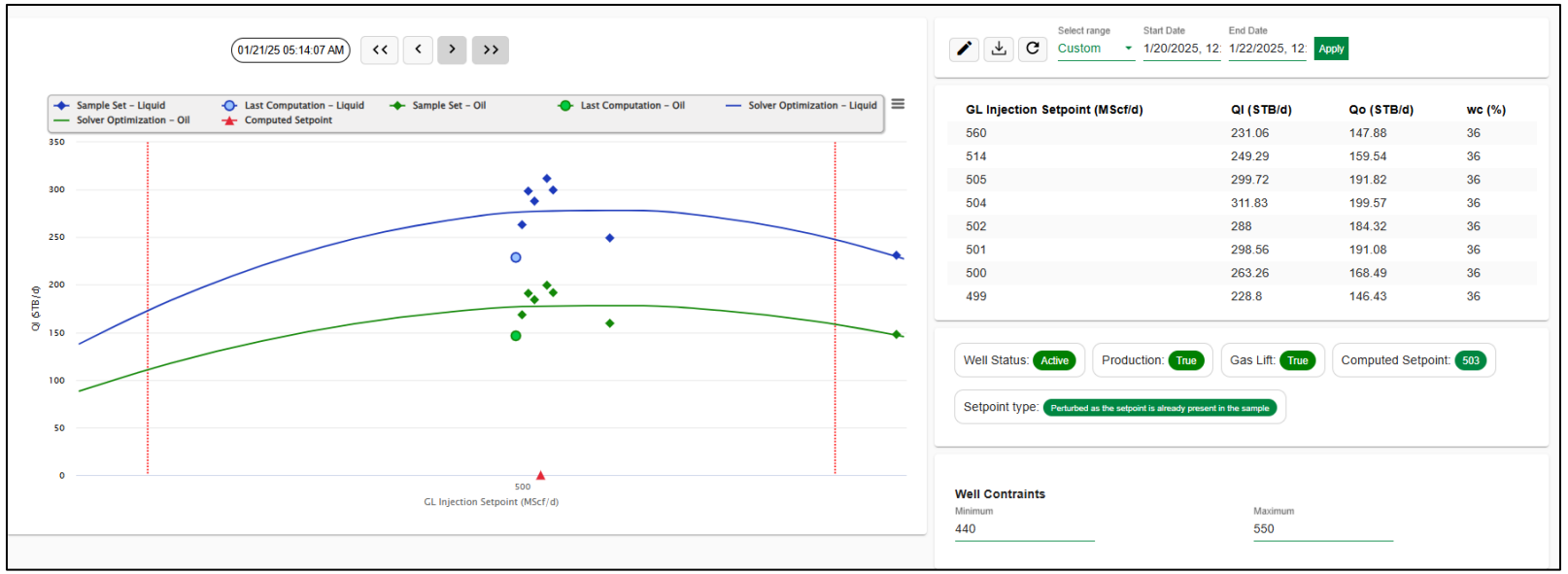


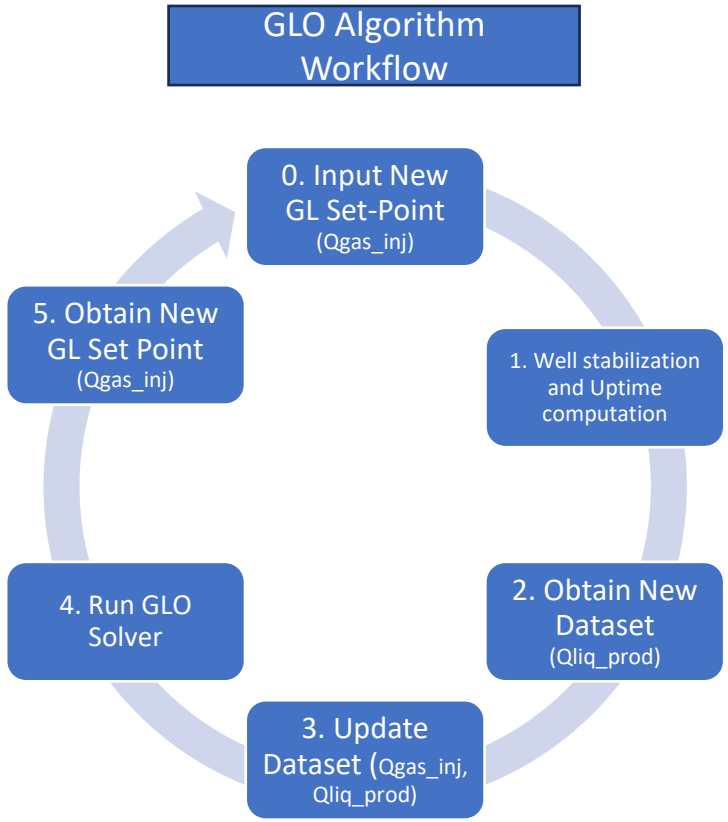
Application Architecture



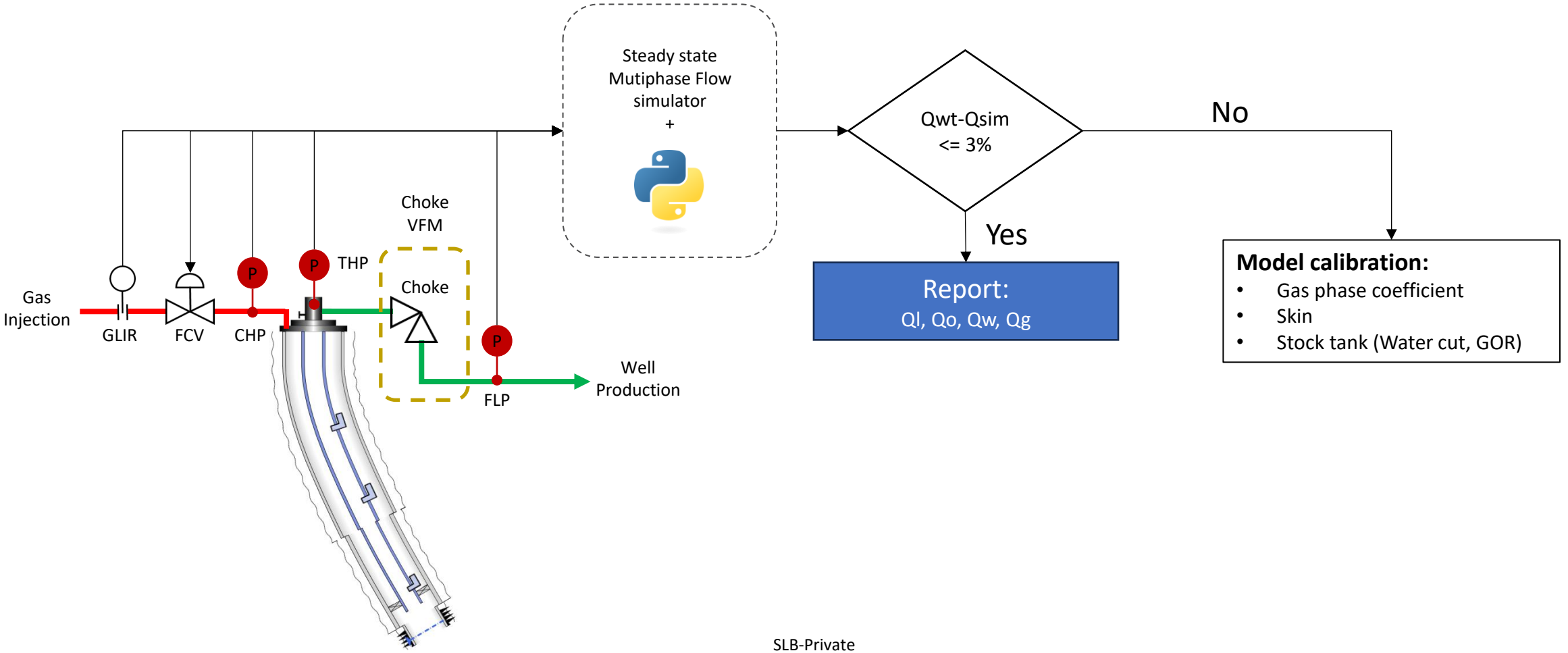
Methodology – GLO Application







Methodology – VFM Data driven



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Solution Edge Intelligence

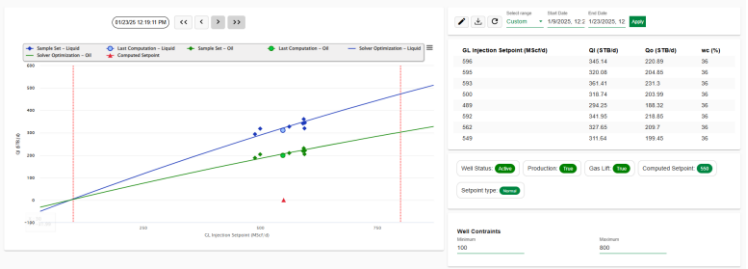
Data Driven Gas Lift Optimization (n-Wells)

GLIR

Well Rate
(Oil, gas, water)

Trending Data

Solver



GL Optimizer

Determine new
Set Points

*Calibration-free model

Know Your Flow

Trending Data

GLIR

THP

FLP

Sporadic Data

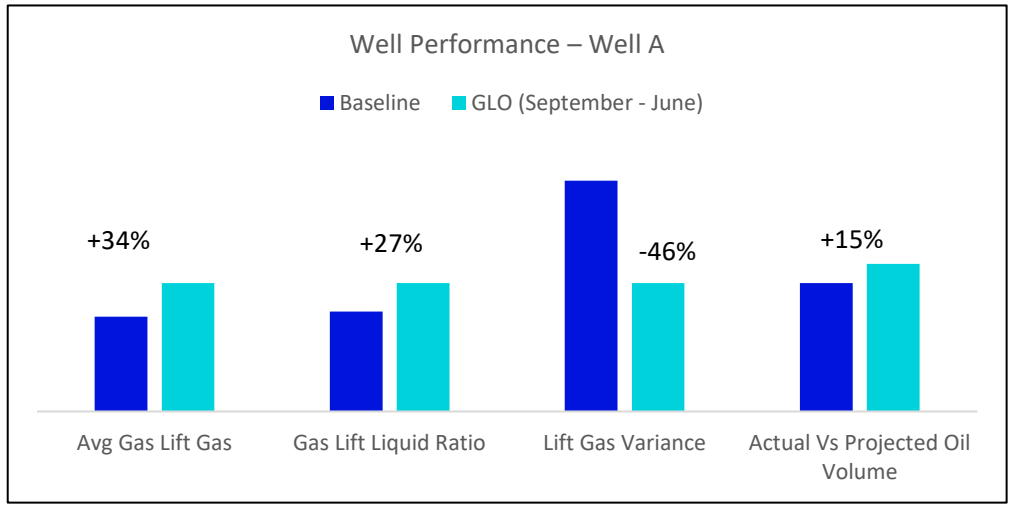
VFM

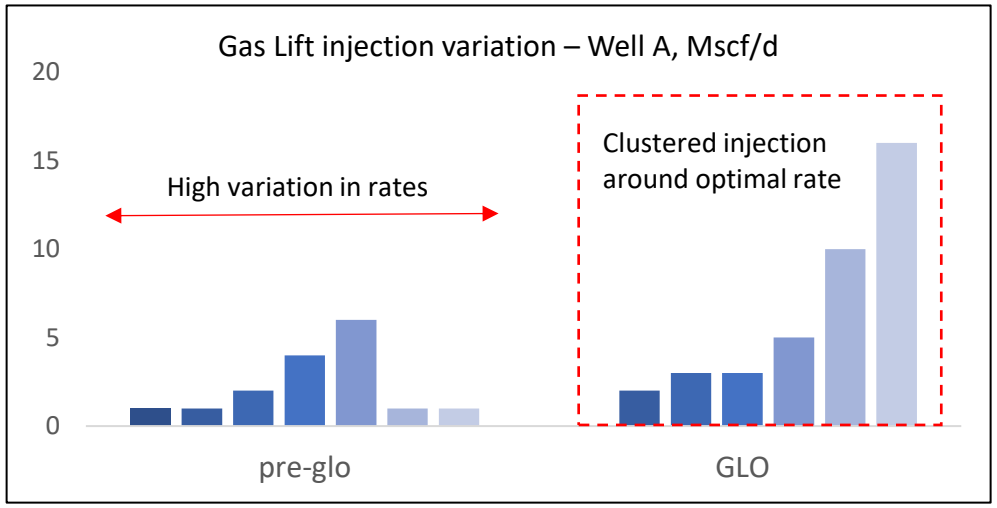
Welltest

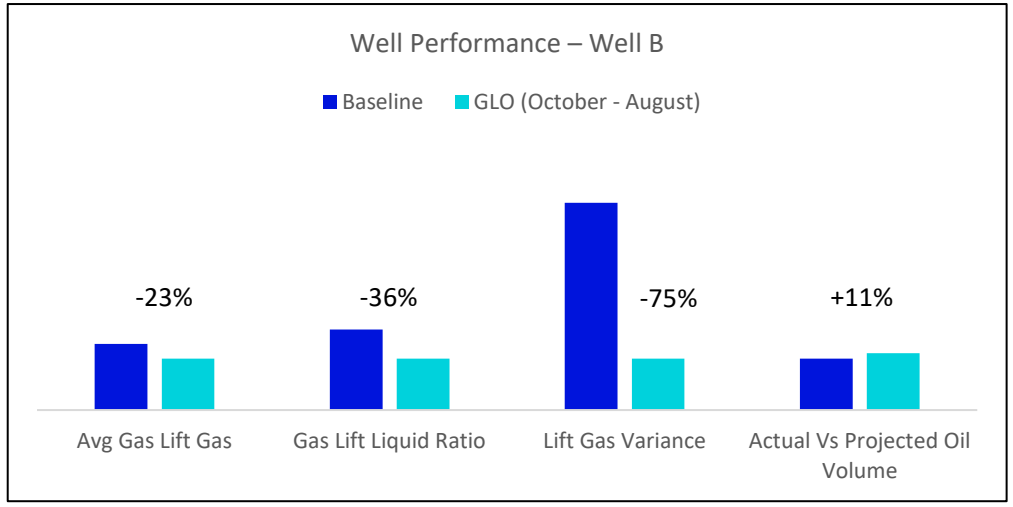
Well Rate
(Oil, gas, water)

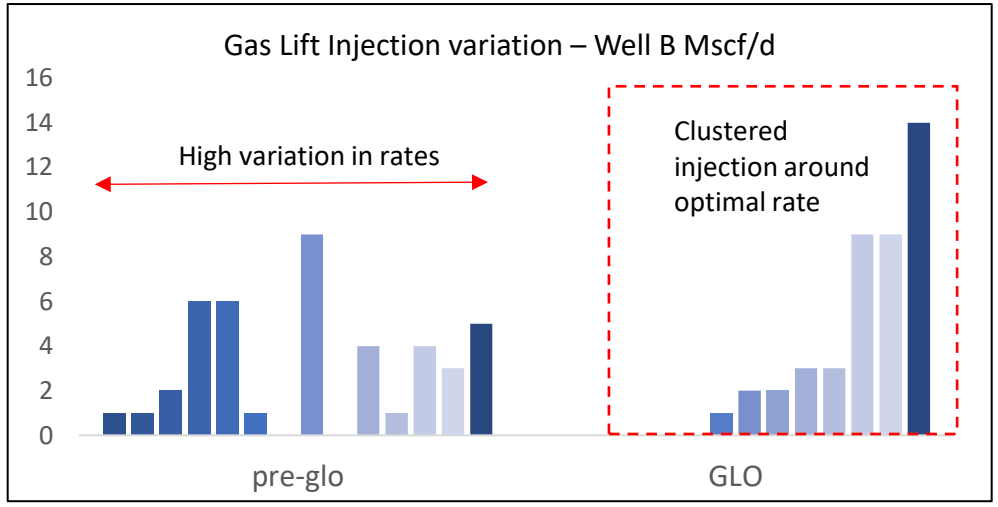
*Autonomous calibration based on validated welltest

Pilot evaluation









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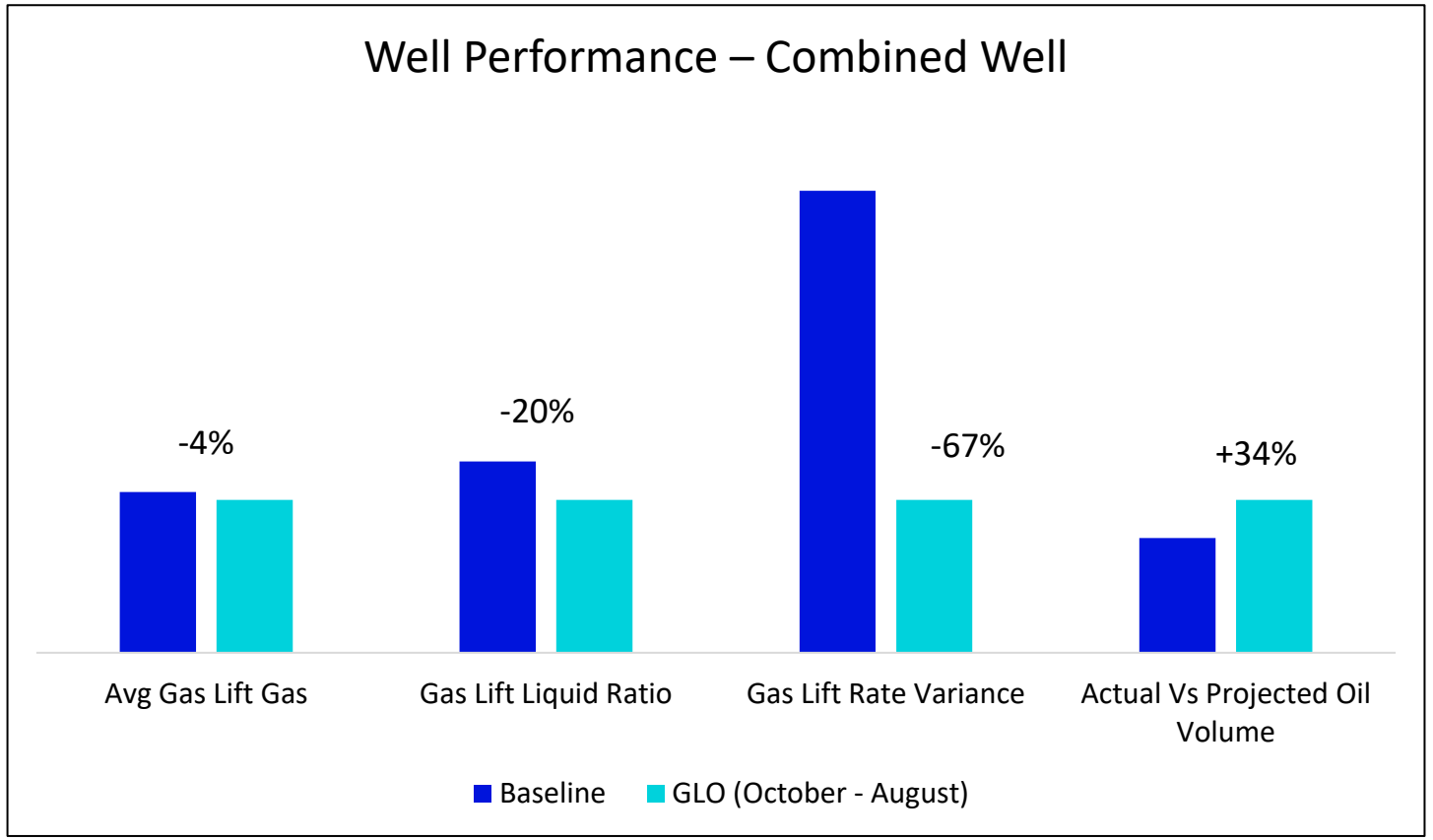
Pilot evaluation



Best practices & Lesson learned

Best Practices

Starlink Deployment
Stable connectivity in remote locations

VFM Calibration
Not necessary for each well test as it restarts the algorithm of GLO App

Quarterly well test still required
Update Water cut and GOR to enhance accuracy of the VFM Choke model

Lessons Learned

Issue using mobile signal line
Optimize starlink deployment to mitigate latency issues

Gateway Location Sensitivity
Conduct thorough site surveys to avoid obstructions/ distance issue

Gateway hardware
Insulate equipment, maintain optimal operating conditions, ensure caps are enclosed properly as standard guidelines

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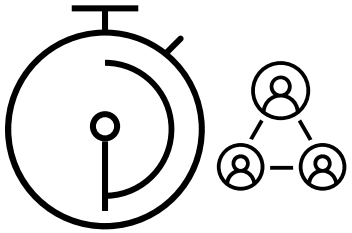
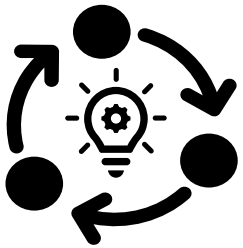
Conclusion



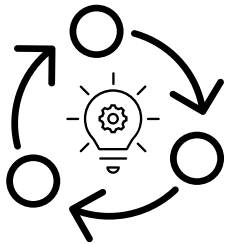
80%↑

Response time Optimization (Remote)



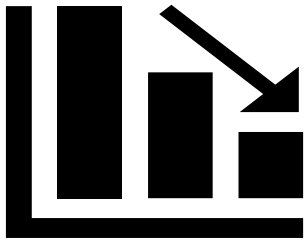
~30 ⇨ ~2

Days of optimization cycle *Days of optimization cycle*



24/7

Surveillance (real data)



11%↓

Gas injection efficiency

20km ⇨ 0km

Reduce people exposure risk

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Shifting priorities in operations

Produce “more” with “lesser” resources

Cost & Operations Integrity

ROI for Digital investment in Operations

Adoption / Management of Change

Implementation of use-cases

Scale vs Proof points

Managed AI, data, connectivity and cyber security

Technology Integration

Let's Collaborate!

*based on experience with previou projects

- People Productivity
- Production Efficiency
- Capital Performance
- Safety Sustainability

impact

VALUE

solutions

Valve/Choke Failure prediction	Reduce Downtime	66% Annual Maintenance checks
Well Surveillance	Production Optimisation	1.5% Year 1 company-wide production
Automated ESP Optimisation	Reduced manual operations	40% Carbon footprint
Forecasting Analysis and Insights	Improved planning	90% Forecasting accuracy

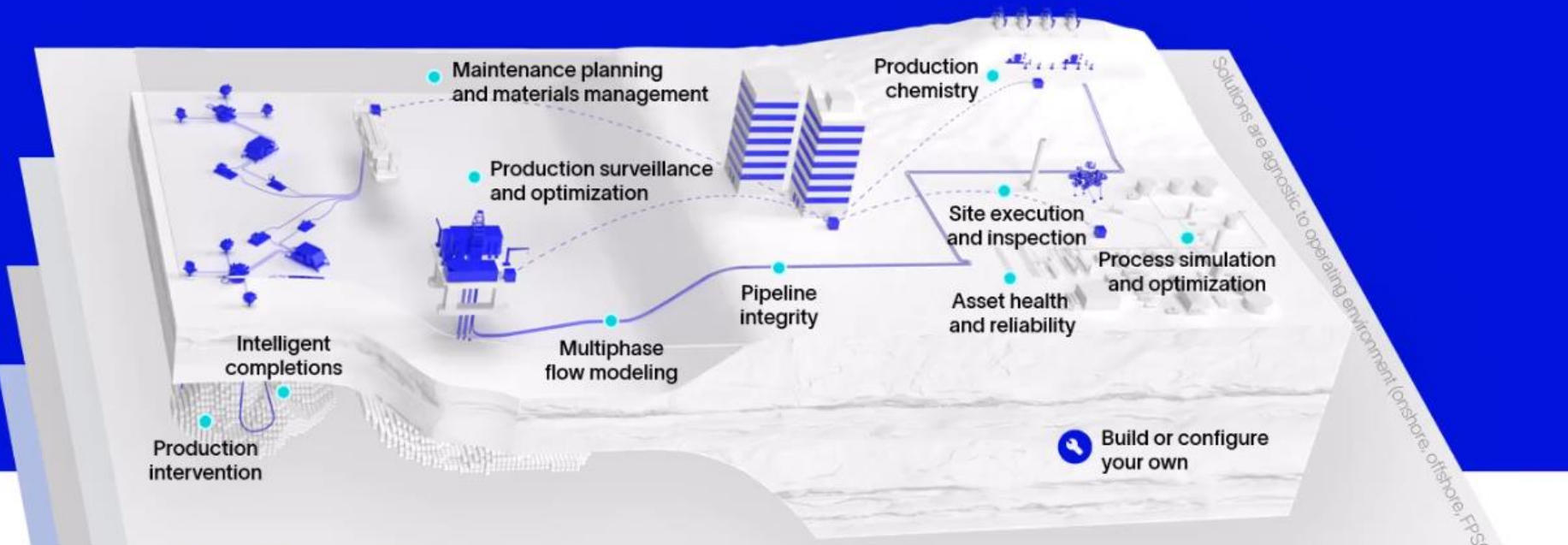
There is a tremendous opportunity to

→ **improve decision making enabled by science and AI**
→ **improve asset performance by accessing siloed data**
→ **achieve safe and sustainable operations with field automation**

Private. In/External use only.

Enabled through integrated platforms—cloud and edge

Digital production solutions



An ecosystem of configurable, scalable and secure solutions.

Infused with domain AI.

Designed for fast deployment and value realization.

Modular solutions OptiFlow™ Production assurance solutions OptiSite™ Facility, equipment, and pipeline solutions	Unified solutions for real-time optimization and predictive intelligence across the production system
Data and AI foundation Lumi™ data and AI platform	Contextualized data and evergreen data-driven, physics, and AI models
Edge operations Agora™ edge AI and IoT	Real-time intelligence at source, enabling autonomous operations
Automation and controls Smarten™ automation and controls	Automated instrumentation and control, reducing manual intervention

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