

利用一体化生产系统模型释放资产潜力

Leveraging Integrated Production Systems Models for Unlocking Asset Potential

15%

increase in production

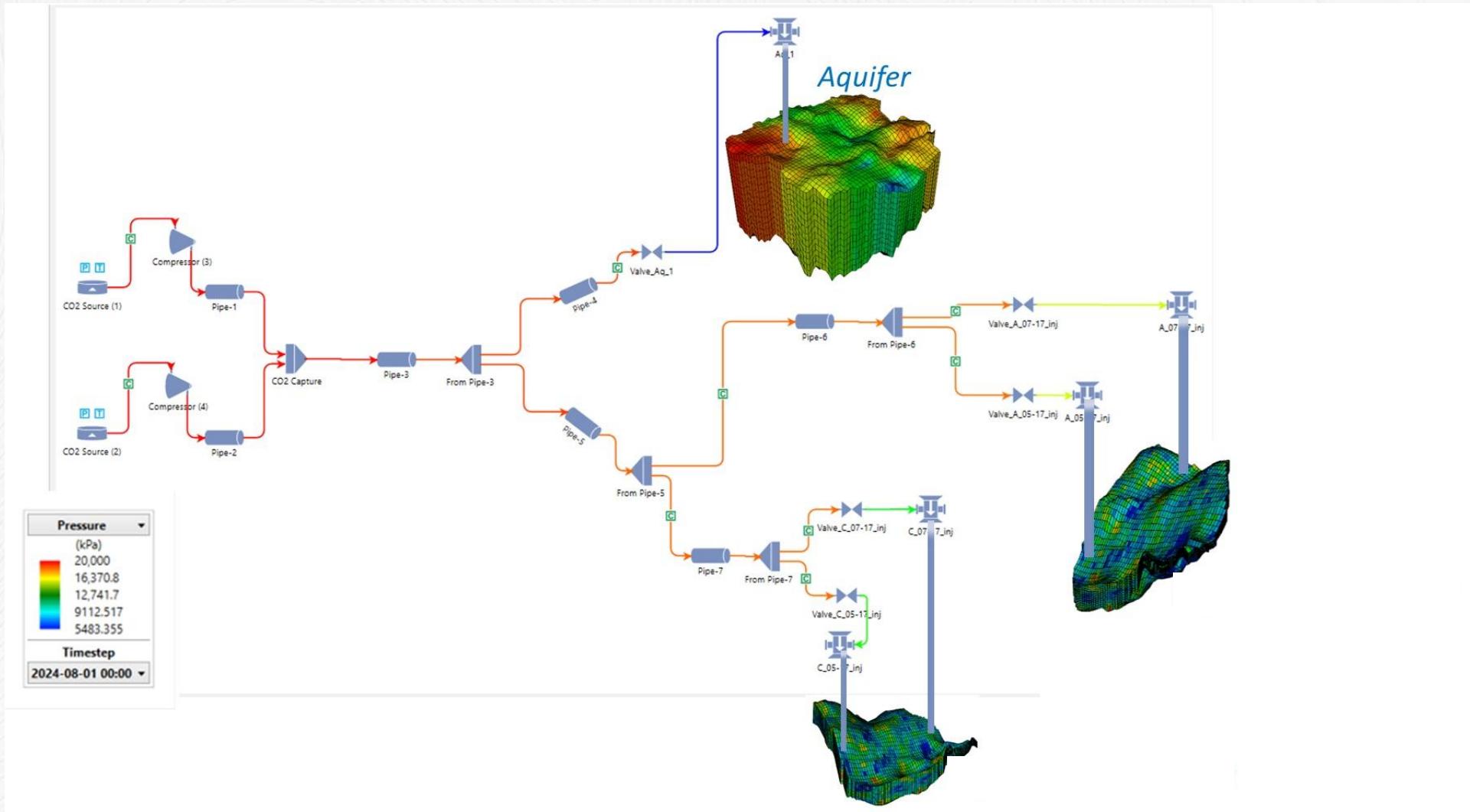
Let's take just 5%. That's **+\$127M**
revenue per year (from a few hundred K
investment)

* At 100,000 barrels/day at \$70/barrel

CMG

97% of Asset Managers &
Engineers acknowledge facing
some level of uncertainty about
the assets they manage.

— what if we could change that?



Siloed Workflows

- + Multiple assets
- + Multiple tools

= missed opportunities, slower
and suboptimal decisions,
(and, a lot of dollars lost)

Oil price is low. Pressure is high.

Operators are being asked to:

- ✓ Maximize recovery
- ✓ Minimize CapEx
- ✓ Move fast, and operate efficiently

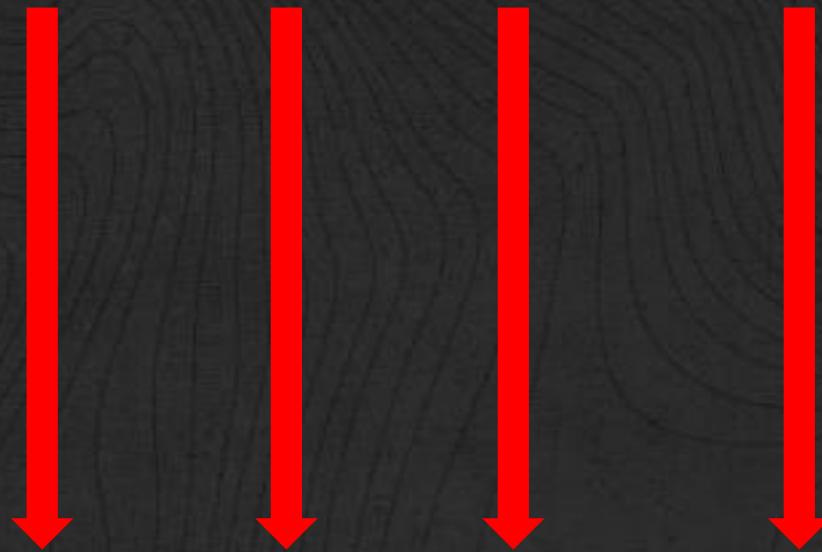
The only way forward?

Fully integrated modelling—
from pore to point of delivery.

From Fragmented Silos to Unified Insights

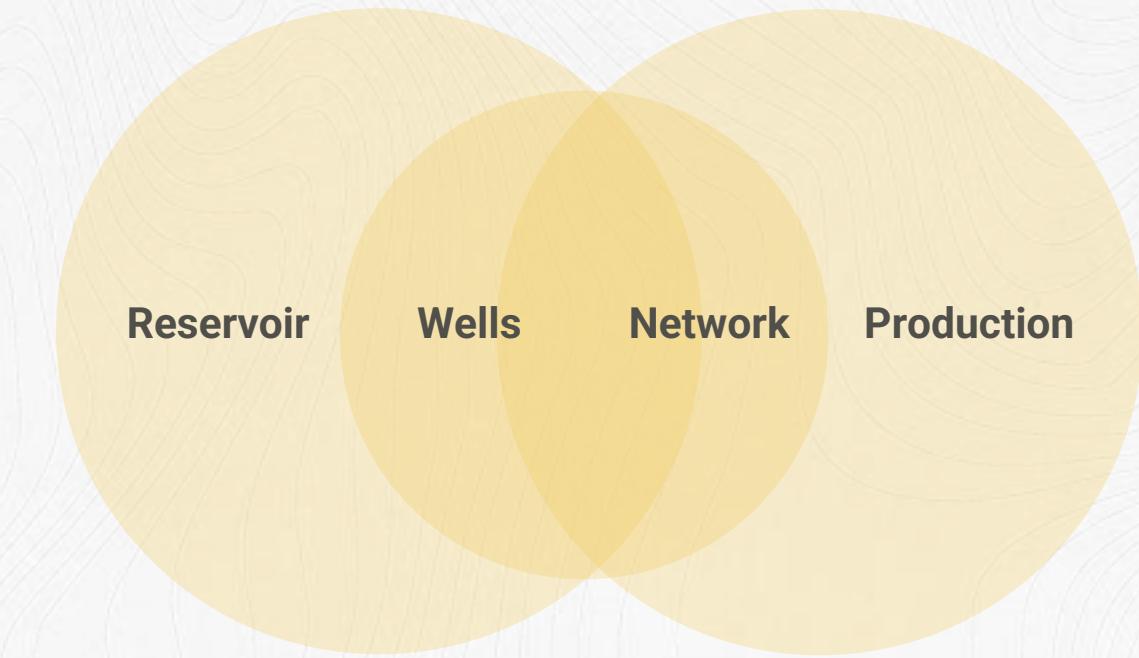
Traditional, Fragmented Workflow

Reservoir | Wells | Network | Production



- Inaccurate forecasts
- Slow communication
- Lost opportunities

CoFlow Integrated Workflow



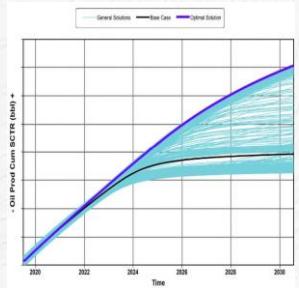
[Seamless integration subsurface to surface]

- Real-time collaboration
- Single source of truth
- End-to-end optimization

Asset Development Challenges

All of these challenges may exist in a single asset – One part of the system affects the other.

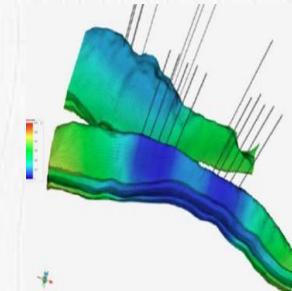
ONE asset / ONE team / ONE SOLUTION



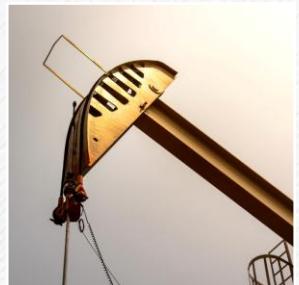
Predict & Plan for Workovers



Facility Sizing & Design, System debottlenecking



Multi-Reservoir Pressure Management, Optimize Water/Gas Injection



What Artificial Lift and When? How to Optimize it?



Extend Asset Life: Phased development, Evolve Recovery Strategy



Long-term Flow Assurance: Corrosion prediction, hydrate onset,...



Top CoFlow Applications

Multi-field development timing/scope

Debottleneck the system

Artificial Lift Optimization

Water management

Economically Scheduling Workovers

Flow Assurance

Extend Asset Life

Evolve Recovery Strategy

Corrosion Modelling

FPSO sizing

Offshore & Onshore Assets + CCS Projects + much more

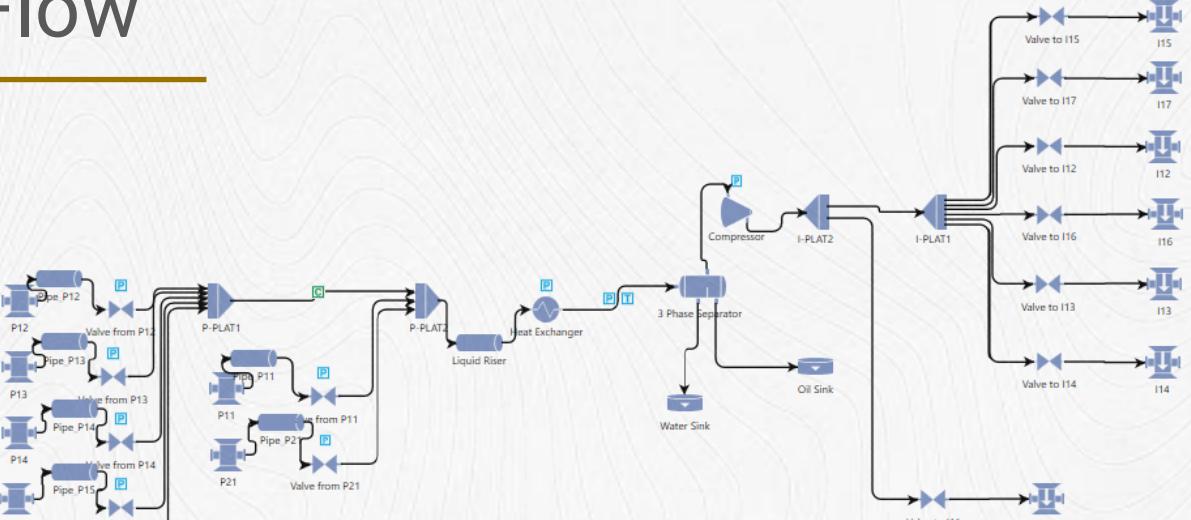
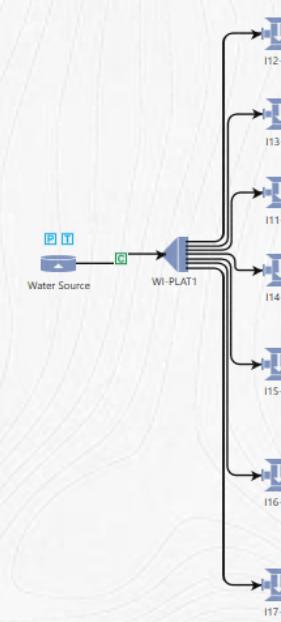
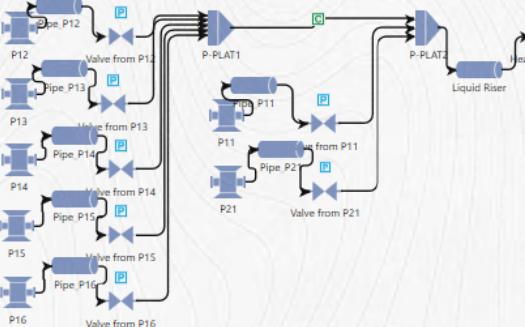
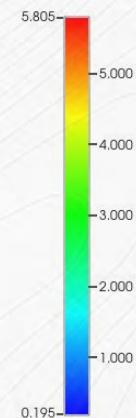
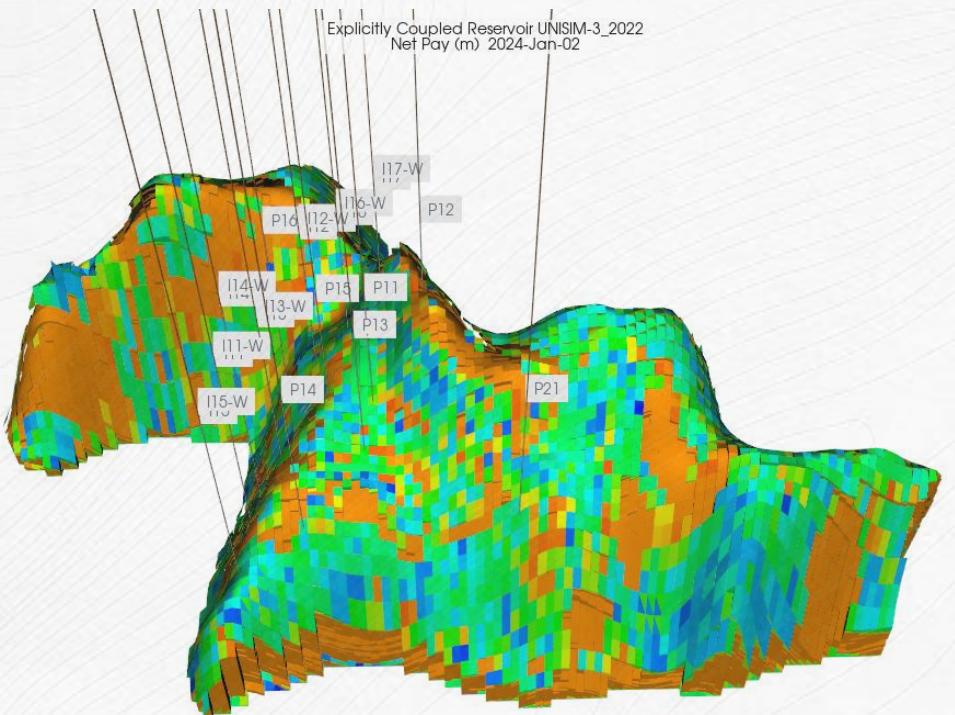
Active use in 25+ assets





Top Applications of CoFlow

Onshore & Offshore Assets

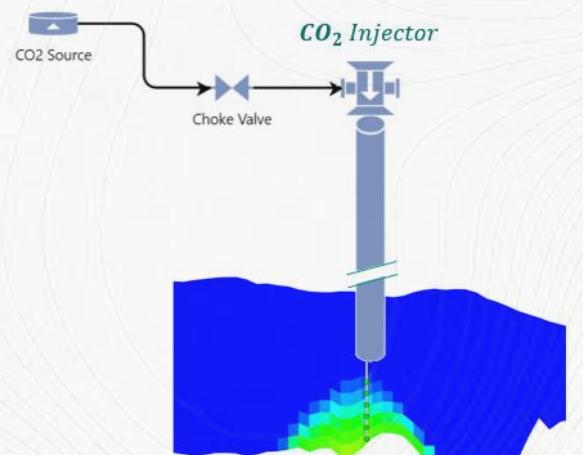
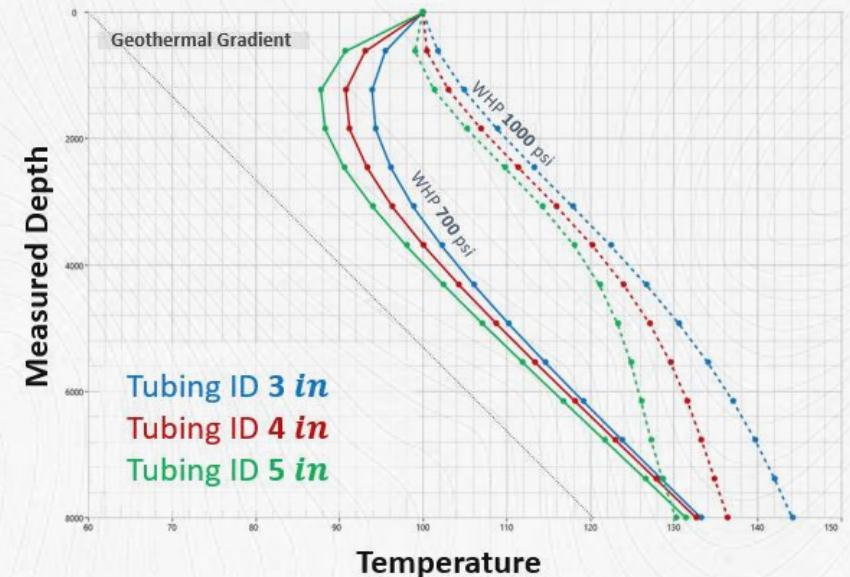
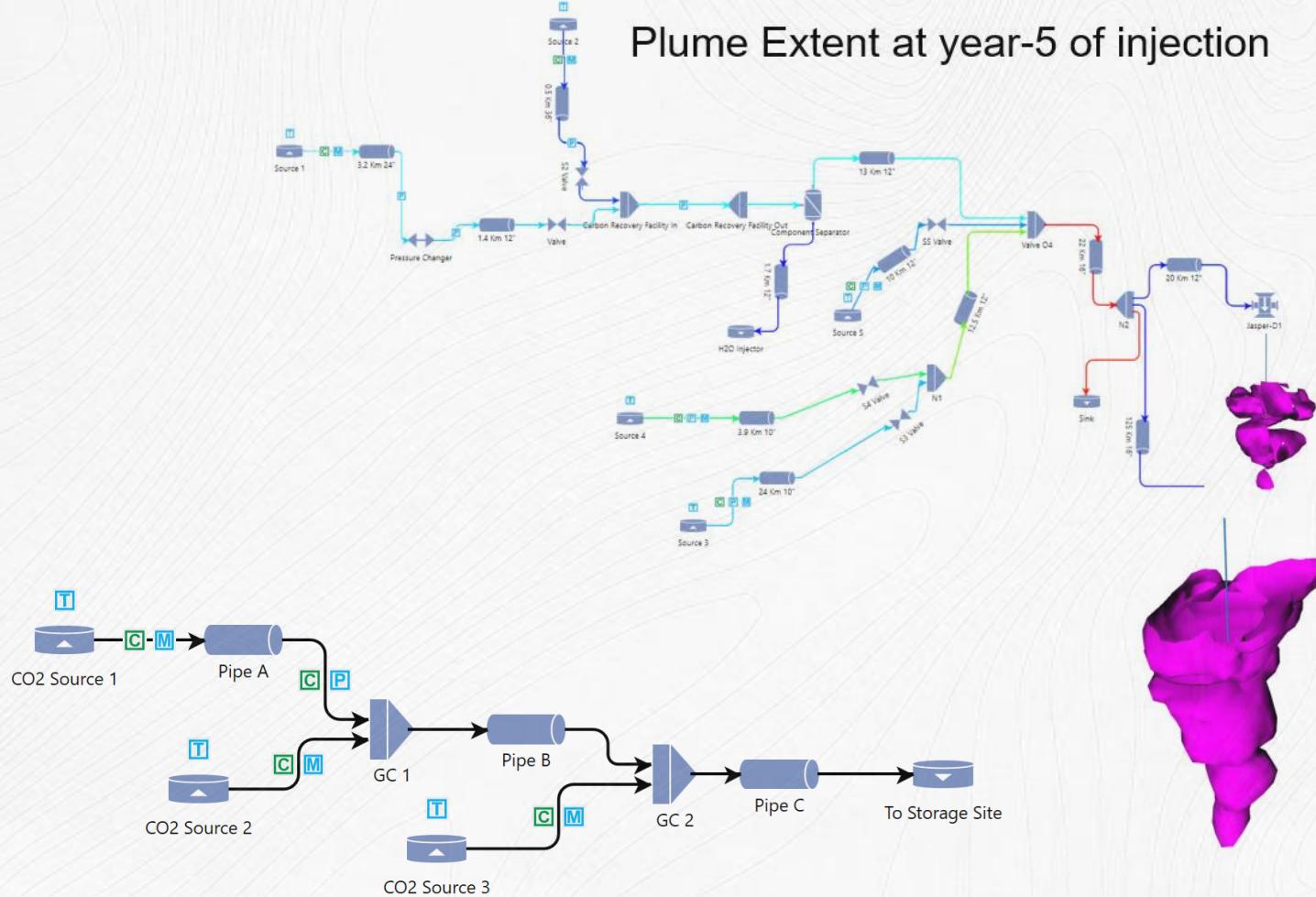




Top Applications of CoFlow

Carbon Capture & Storage (CCS) Projects

Plume Extent at year-5 of injection



Greater Birba, Oman

The biggest gas injection project in Oman's history

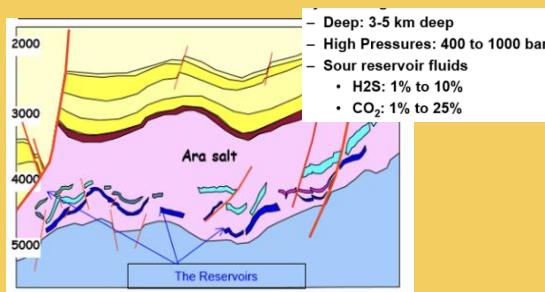
The asset

Reservoir processes: Miscible gas injection, pressure maintenance, condensate dropout

→ 17 reservoir system

→ High sour gas content

→ Fluid PVT



3months > 3 weeks

Program build workflow

50%

Faster scenario analysis and investment decision

Key challenges

1 Increase production & asset value

Multiple reservoirs, and apportionment of injection gas

2 Closed-loop gas balance & processing

No CO₂ & H₂S leaves the system. Gas sweetening & sweet gas export & contracts

3 Development planning

Assess impact of subsurface uncertainties for short/long term forecasting

How we solved it

1 Fluid blending multiple fluid systems

2 17 reservoir system coupled to facility

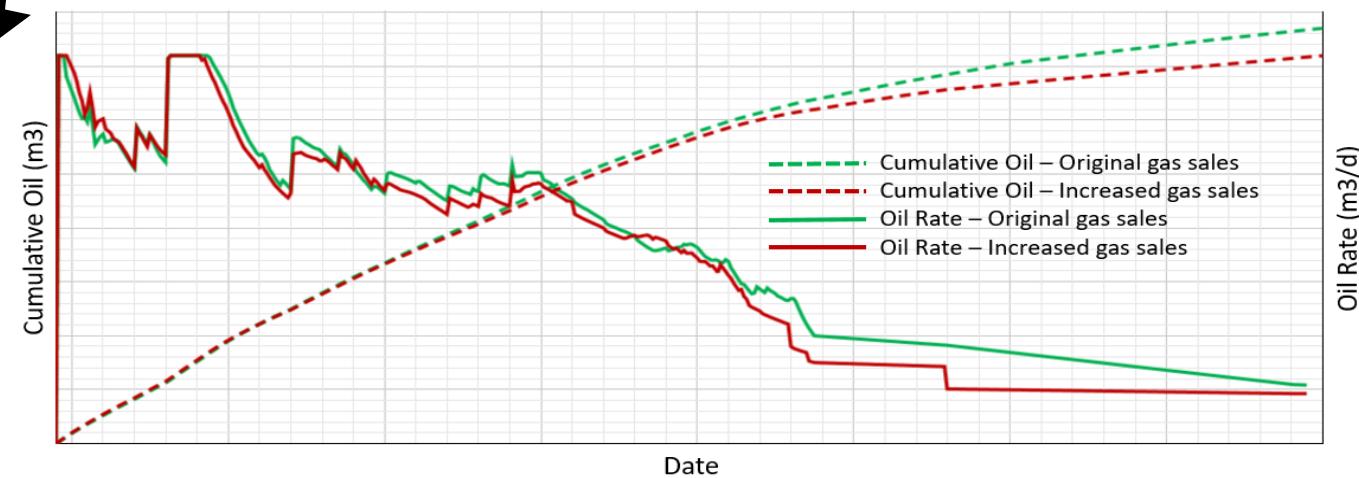
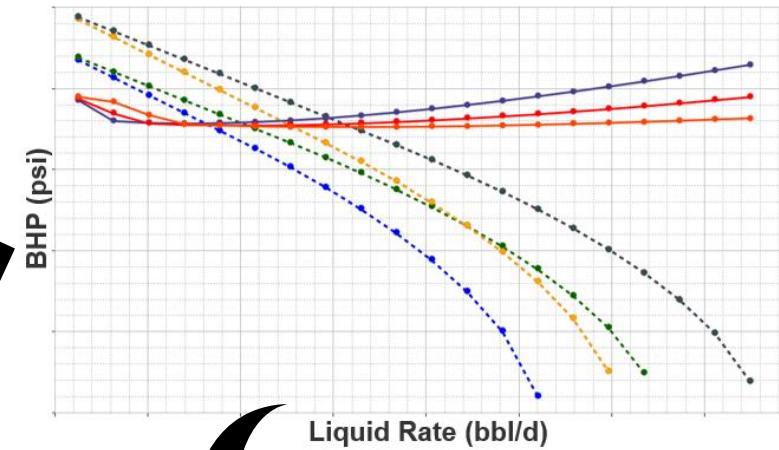
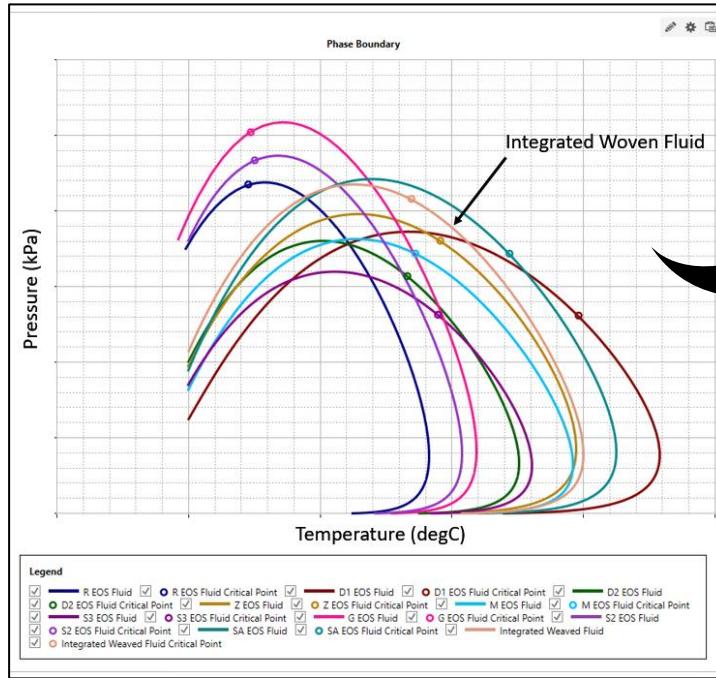
Insert a short description

3 Scenario analysis

For yearly operational planning and reserve estimation

Greater Bibra, Oman

Data-driven, physics based completion and facility design



Network Property	% change in UR
Cumulative Oil - 'Station-H'	-6.6
Cumulative Oil - 'Station-R'	-1.1
Cumulative Oil - Net	-5.6
Cumulative Sales Gas - 'Station-H'	+17.5
Cumulative Sales Gas - 'Station-R'	+3.7
Cumulative Sales Gas - Net	+8.3

PROVEN SUCCESS

CMG software supports optimization of multi-field development timing/scope

CHALLENGE:

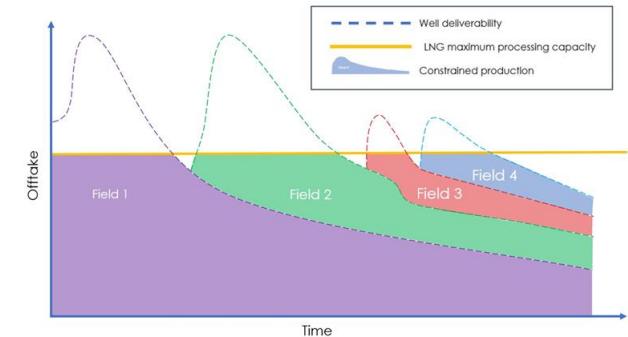
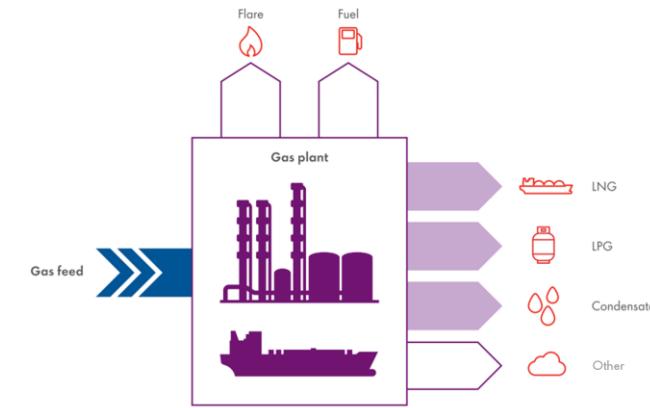
Assess different field sequencing (backfill) options to supply a LNG production facility, with required gas feed and predict LNG plant's products under various operating scenarios & subsurface uncertainties.

SOLUTION:

The integrated subsurface–facility model (IPSM) built in **CoFlow** enabled the generation of production forecasts for different sequence options with tracking of product streams. The tool allows back-allocation to determine each field's contribution for enabling sequence optimization. The technology has successfully provided field sequencing options.

Applicability:

LNG production facilities with or without back fill (e.g. Australia, Middle East,)



PROVEN SUCCESS

Zama Field Development Optimization:

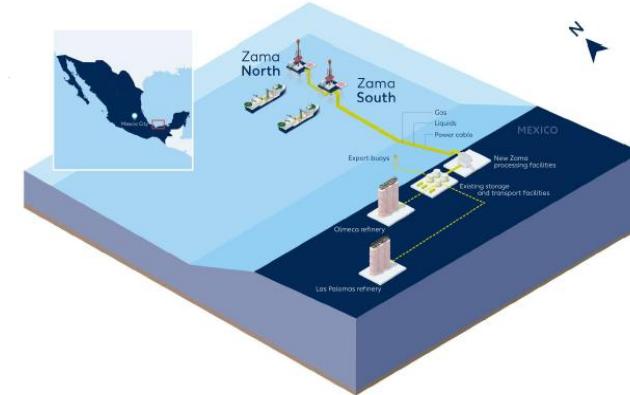
Harbour Energy

One of the biggest shallow-water oil discoveries in past 20 years with recoverable resources ~700 MMBOE. 66 km offshore Mexico; Thick pay, conventional 28° API oil, geothermal gradient with Seawater injection from the onset of production. Development plan includes 2 platforms, 28 producers & 18 injectors

Challenges:

- Fully thermal IPS: Need reliable long-term forecasting with optimization opportunities
- Waterflood performance prediction
 - Seawater interaction with reservoir hydrocarbons & formation brine
 - Thermal effects with propagation of cold seawater front

1. Well completion design
 - Vertical lift performance – natural flow vs. ESPs
 - ESP design and timing
 - Tubing design
2. Optimal facility sizing
 - Pipe diameters & thermal conductivities
 - Production optimization and well/reservoir management strategies



PROVEN SUCCESS

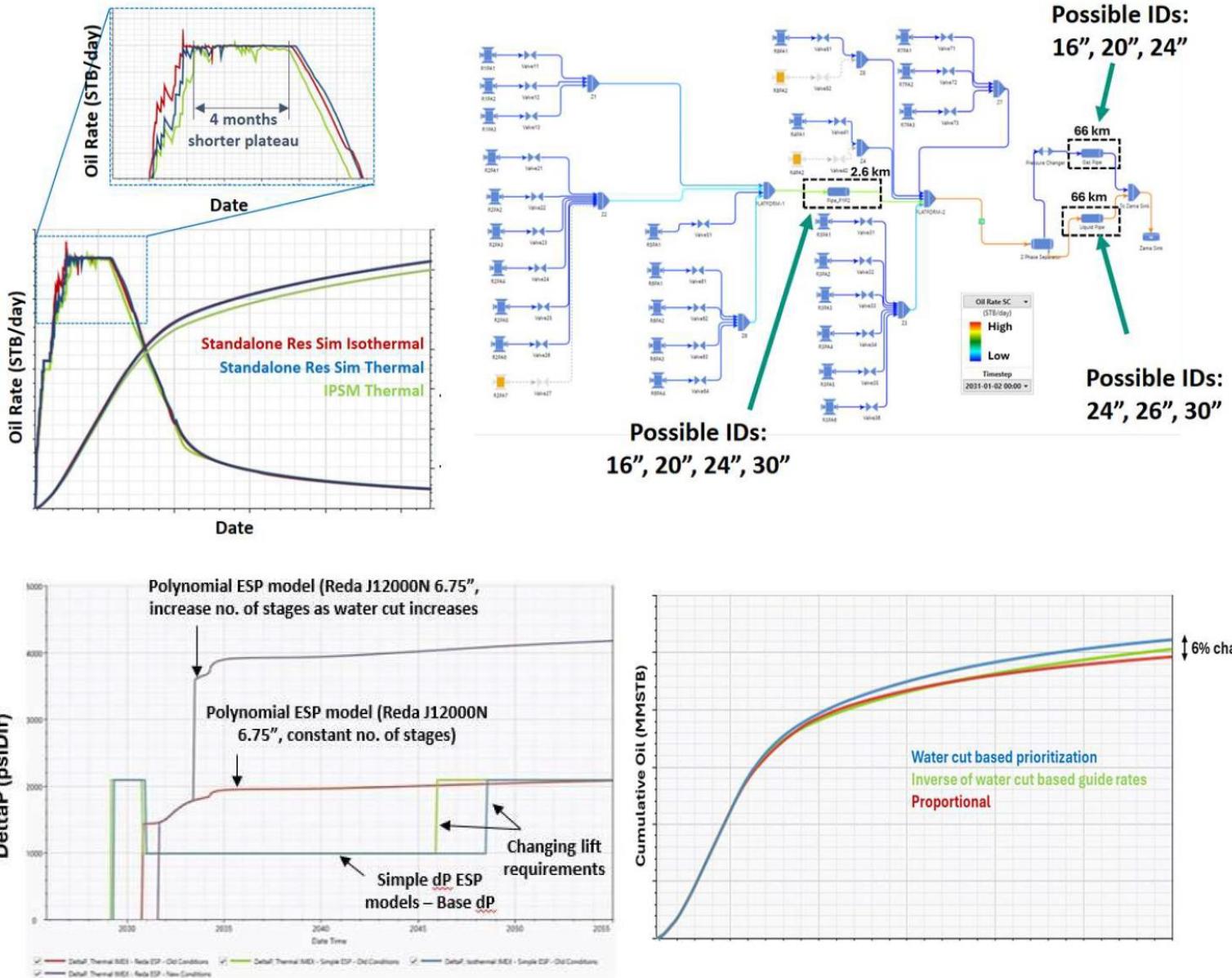
Zama Field Development Optimization: Harbour Energy

Impact: IPSM thermal model vs. a standalone reservoir model

- 4% less oil with IPSM
- 15% less water with IPSM
- Opportunity to test available options before field investment decisions
 - Pipe Sizing
 - ESP Design
- Identify & rectify system bottlenecks
- Production optimization with well-reservoir management strategies

Wells & Facilities Modeling

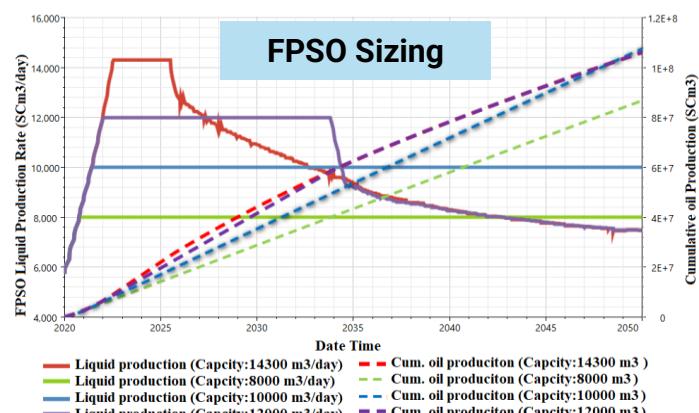
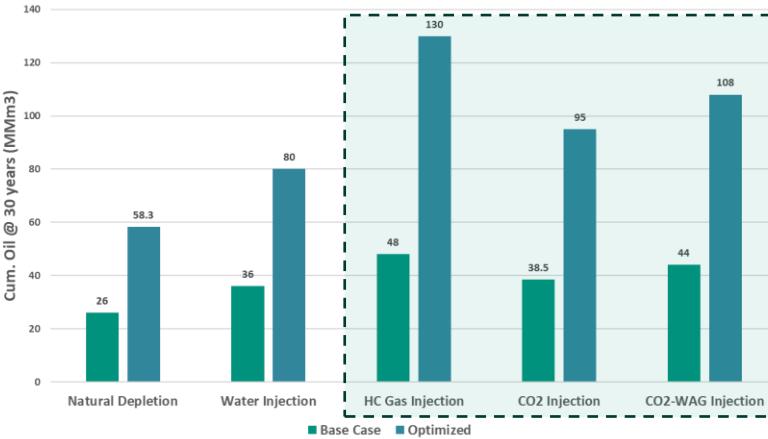
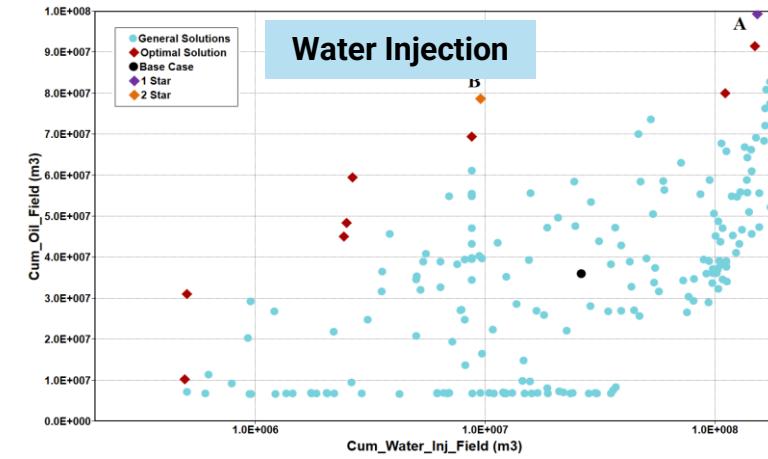
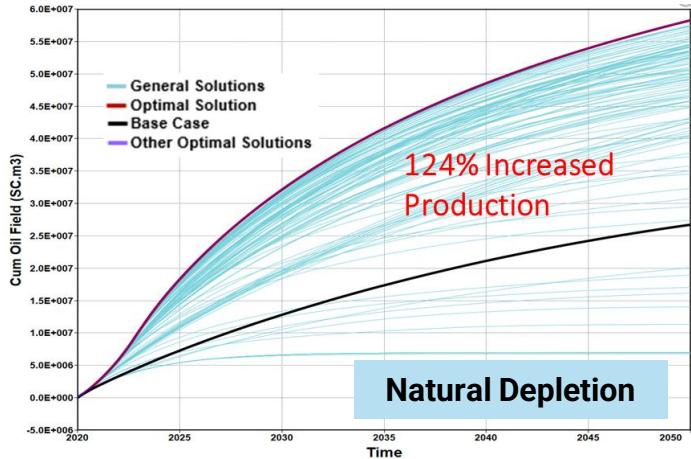
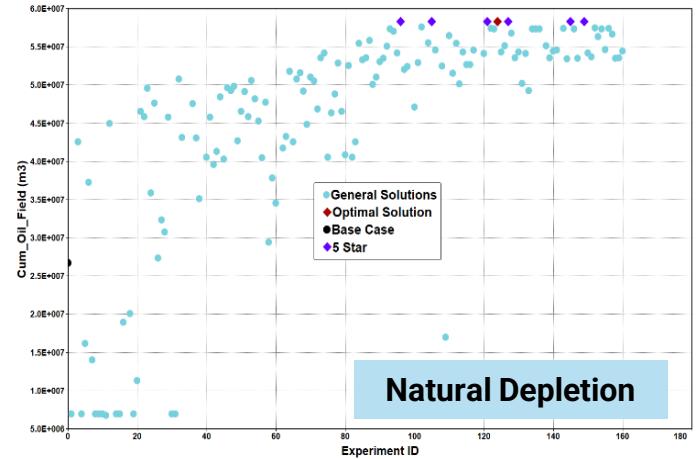
CMC



PROVEN SUCCESS

Offshore Brazil, GoM, Malaysia, ...

- De-risking of investment decisions
- Optimization of recovery schemes: Always +5% → +\$127M additional revenue for a 100 kboepd asset
- +\$1B savings possible with appropriate facility sizing





IPSM: CoFlow

Platform for enabling faster & reliable decisions

- Multi-disciplinary collaboration for fast-tracking development ideas → **5X faster workflows!**
- Full integration → **Correct answers & better insights**
- Uncertainty management & Robust Optimization → **+127M additional revenue on a 100 kboepd asset**
- Optimize operations to reduce OPEX
- CAPEX decisions aligned with long term reservoir performance → **+\$1B savings possible**

