SPE Workshop: Adaptive Approach in Integrated Reservoir Modelling and Simulation in the Age of Digitalisation

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Optimizing Project Delivery: Adaptive Modelling Approach for Efficiency with Limited Resources

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Presentation Outline

1. Introduction
2. Challenges
3. Key Solutions
4. Summary

Introduction

- ✓ Field K in Sabah
- ✓ Next drilling campaign in 2026
- ✓ Three potential target reservoirs:

Reservoir Group	Sub layer	STOIIP	Production data	No. of wells	Prediction scenario	Active cells
A	A1, A2	Lowest	<10 years	<5	Infill	~0.5 million
B	B1, B2, B3, B4	Medium	<10 years	<5	Infill	~0.5 million
C	C1, C2, C3, C4	Highest	>25 years	>15	Water inj., ESP & Infill	>1 million

Challenges

Volatile job market while many projects coming in / company expansion

- Limited manpower resource / people movement
- Limited software license

  Especially specific module related to HM
  Sharing with other ongoing projects across Hibiscus
- Workstation performance

  Old spec PC with low spec graphic card
- Given project timeline

  Project sequencing – Sabah project masterplan
- Marginal volume and challenging economic – multiple development scenario to be evaluated

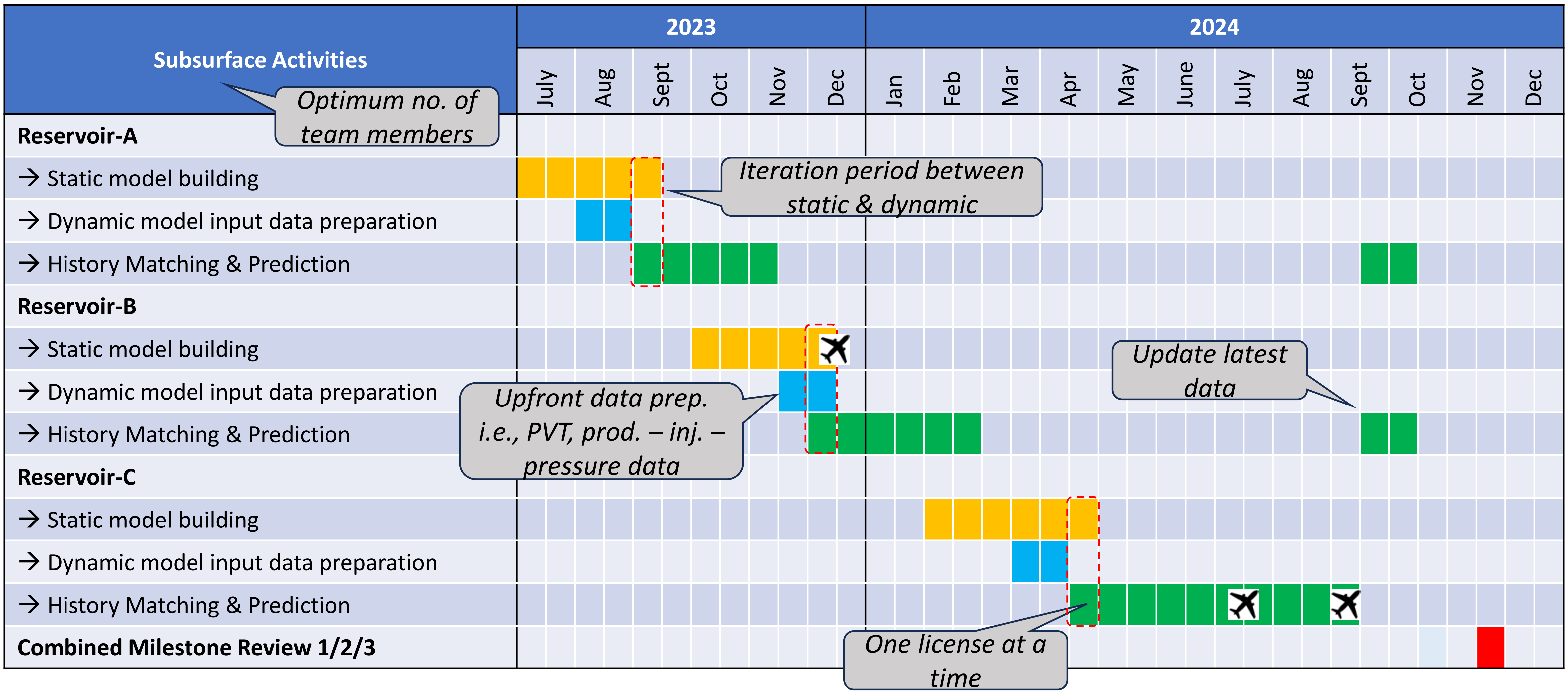
  Lower recoverable with higher risk & uncertainty, and challenging well design

Key Solutions

- ✓ Phased modelling approach *Optimized project manpower & license usage*
- ✓ Probabilistic History Matching *Enhanced workflow & accelerate HM process*
- ✓ Workstation upgrade *With better CPU & GPU which provide faster run time*
- ✓ Iterative workflow within Subsurface and with other disciplines i.e., Drilling & Completion and Facilities *Improve project efficiency*

Phased Modelling Approach

Staff departure



Defining Uncertainty Parameters

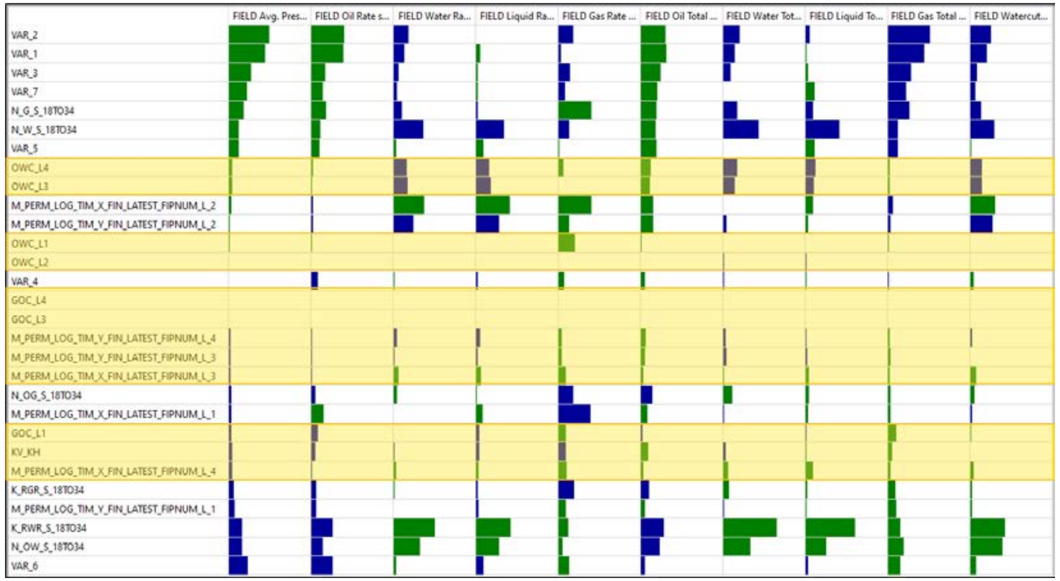
→ Once model is initialized and passed QC i.e., Sw matching, STOIIP consistency and stabilization run

Based on hard data, the upper and lower values are defined – and used as reference across other reservoirs

Parameter	Initial value	Lower limit	Upper limit
Perm. Mult.	1	0.4	3.0
Krwr	0.3	0.2	0.5
Nog	3	2	4
OWC	Half-way	ODT	WUT

Observed consistent trend of bigger Perm-Y global multiplier than Perm-X across all three reservoirs – consistent with paleo-current of depositional history (northeast – southwest direction)

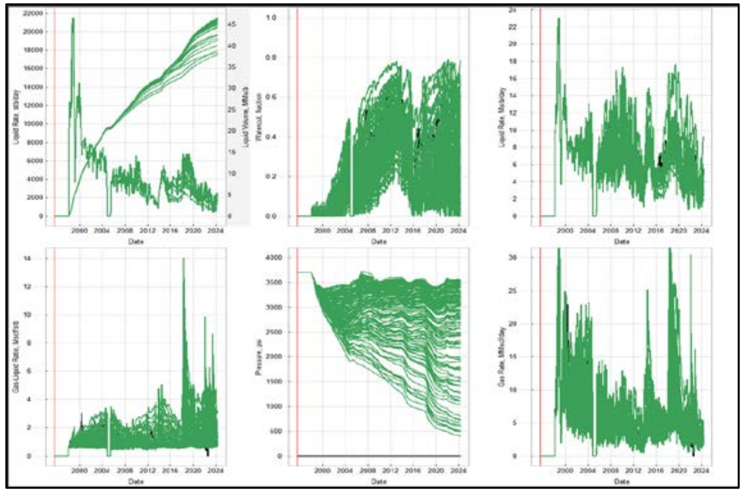
Run Tornado (one variable at a time) – select only sensitive parameters for Monte Carlo



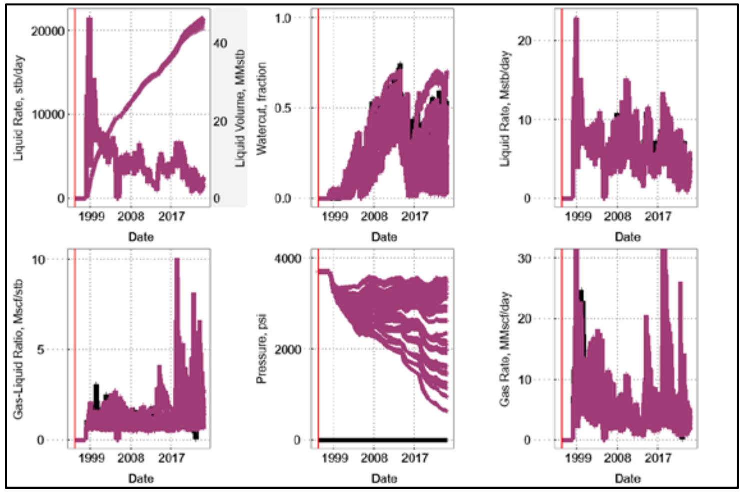
Parameters excluded from Monte Carlo

Performing Probabilistic HM

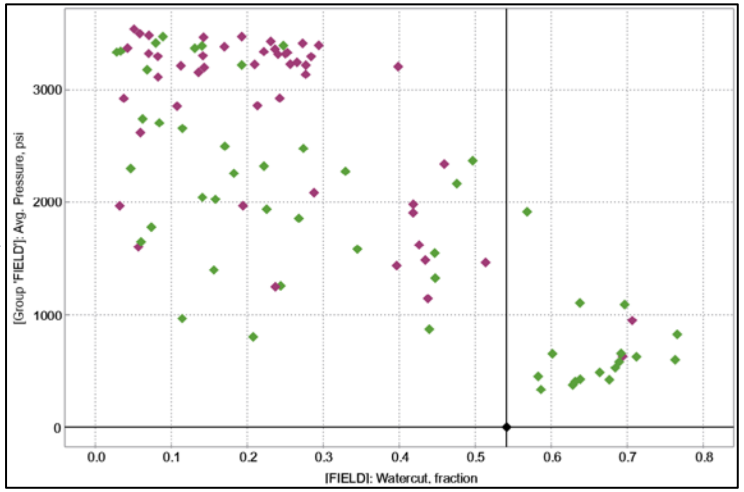
Average HM run time Reservoir C
75 minutes per case



Running Monte Carlo (>150 cases) & ensure selected uncertainty parameters cover the observed data

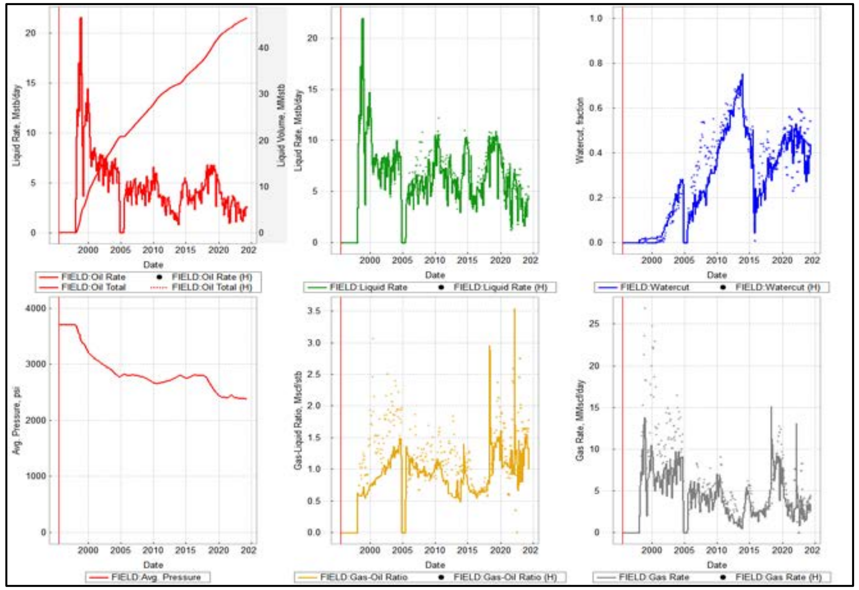


Run optimization & define objective functions – Qoil, SBHP, WC & Qgas – more weightage on key wells

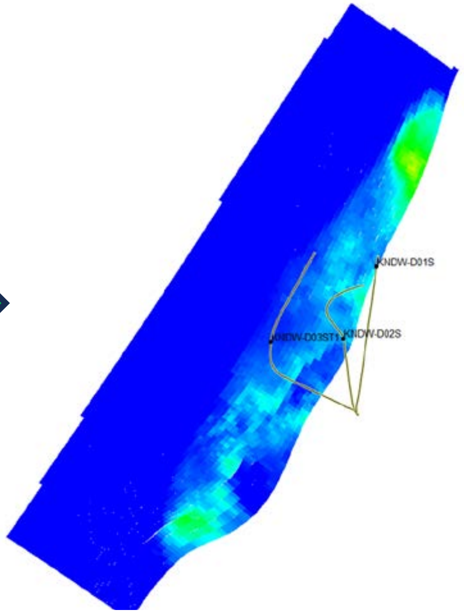


Select the best HM – utilize available tool to assist in determining best HM case

Finalizing HM Model & Performing Prediction



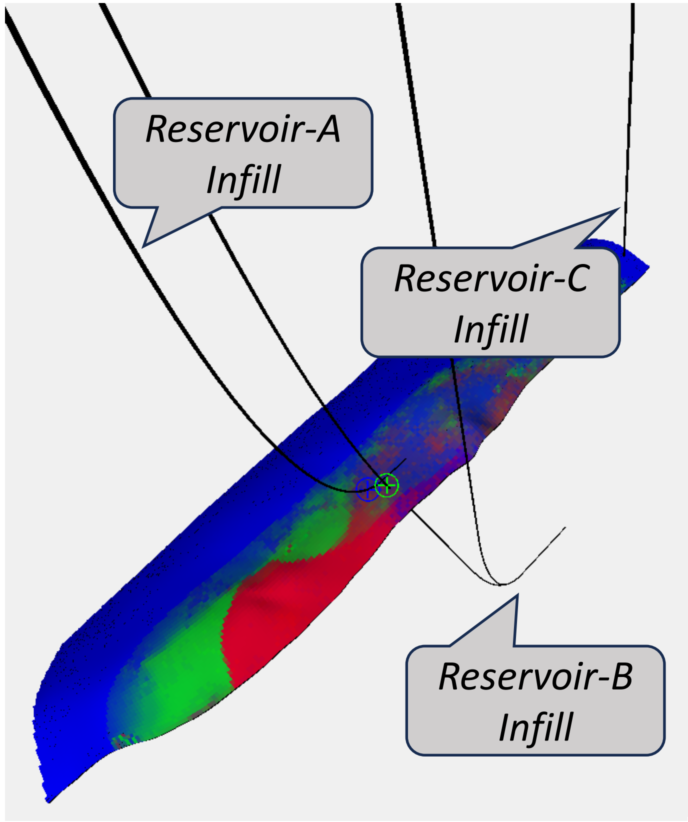
Apply minimal required local adjustment to refine matching at field & well level



Optimize NFA → Identify sweet spots for infill placement → Construct creaming curve → Optimize Infill

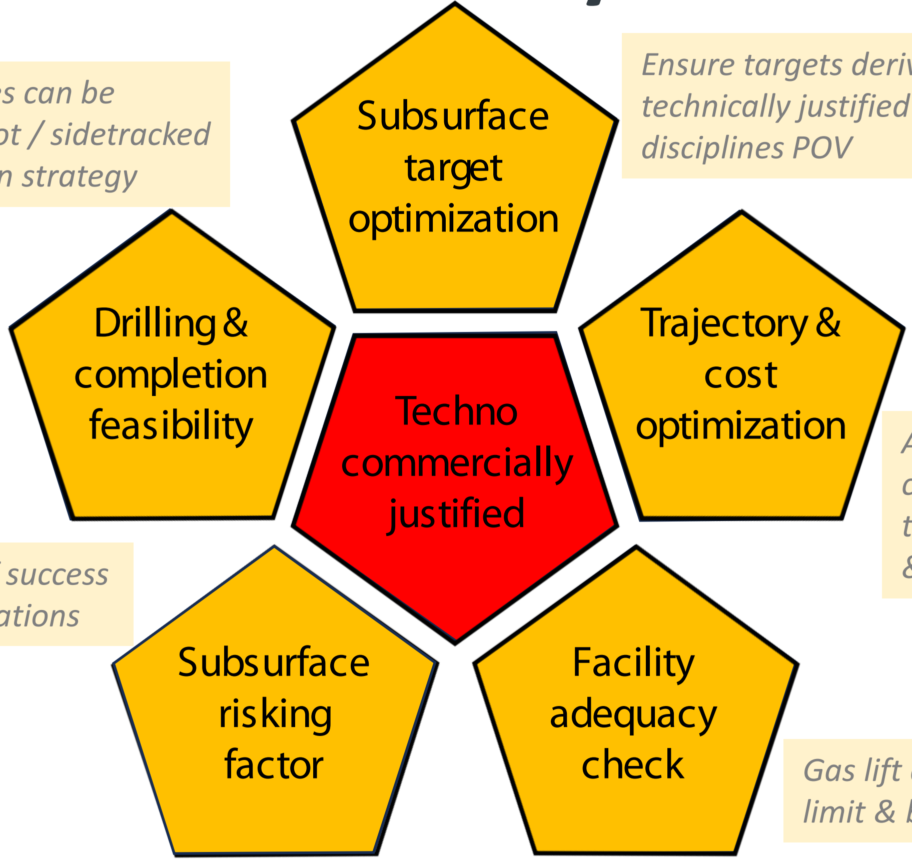
Average prediction run time Reservoir C 20 minutes per case

Multidiscipline Iterative Workflow & Study Outcomes



Ensure given coordinates can be reached via available slot / sidetracked candidates & completion strategy

Ensure targets derived from model are technically justified from all subsurface disciplines POV



Determine possibility of success associated to target locations

Assess option to combine multiple targets in one well & material selection

Gas lift availability, flaring limit & backpressure issue

Objective	Timeliness	Value
Meet subsurface deliverables	On schedule	Meet minimum economic threshold

Summary

1. The assisted history matching workflow streamlined the assessment of uncertainty parameters, and together with suitable workstation specification, expedite project timelines
2. Sequential phasing of dynamic modeling optimized manpower and license usage, crucial given limited resources and competing demands across other assets / projects
3. This study underscores the feasibility of achieving subsurface objectives under resource constraints