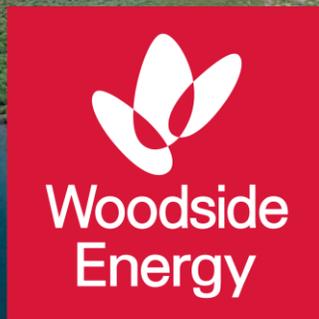


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FDPLAN

An Enabler to transform
decision making in late life
producing assets

Brendan McMullan | 2022 Digital Forum

INTRODUCTION

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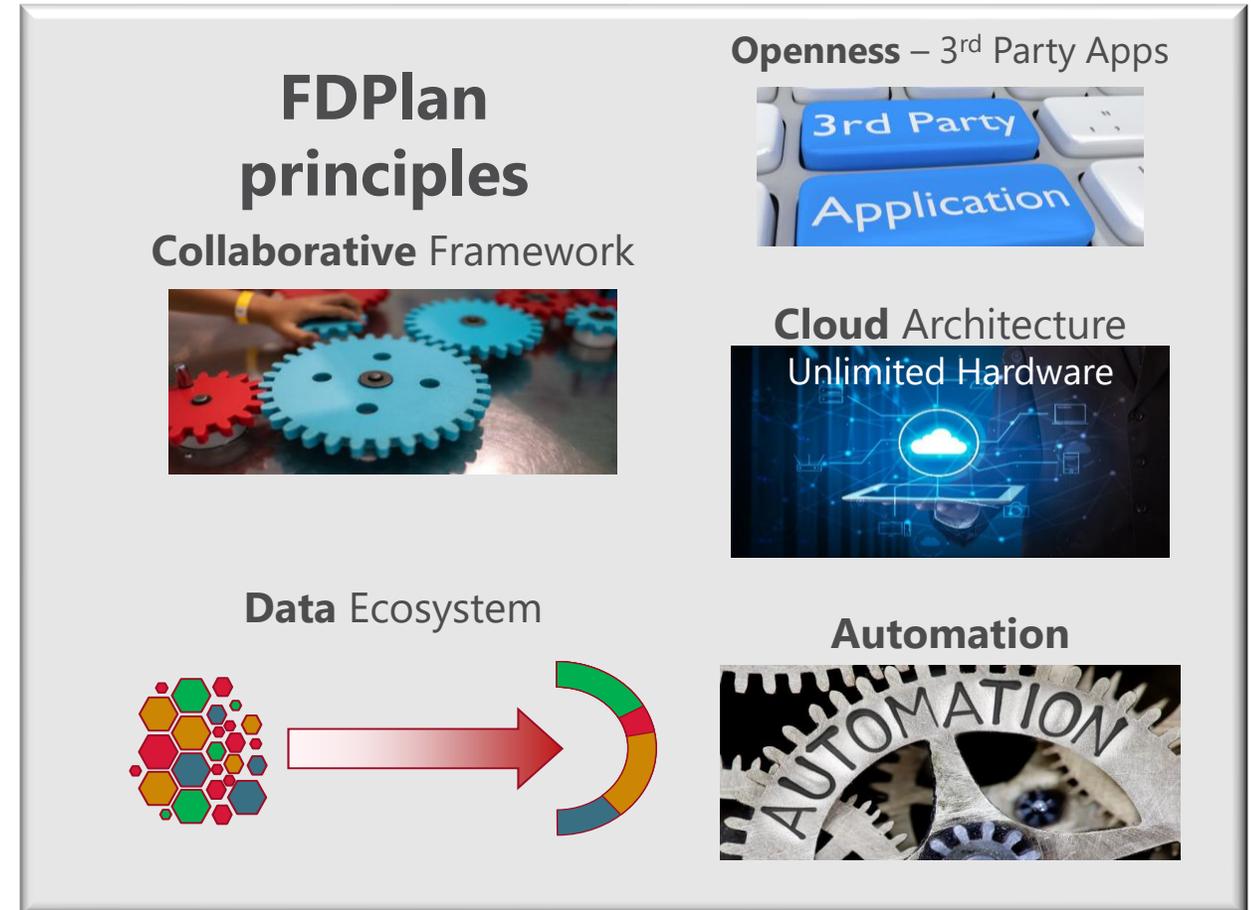
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Overview

- FDPlan as a collaboration tool at Woodside
 - Proven Minimum Viable Product (MVP)
 - Demonstrated Integration with Petex IPM
- Challenges of mature assets
- Phased implementation of FDPlan to mature assets – three use cases
- What have we learnt?



Mature Asset Decision Making



Key Drivers

- Maximise production
- Minimise costs
- Increase efficiency
- Minimise disruption to current workflows



Developments

- Relatively small incremental volumes can justify additional development CAPEX
- Impacts of new projects on the existing production must be understood



Challenges

- Multiple phases of past development and brownfield modifications increase system complexity
- Requires input from a broad range of expertise



FDPlan Implementation

A three-phase process was used to integrate the FDPlan MVP into a producing asset workflow:

1. Standardise
2. Visualise
3. Automate



FDPlan

Automated and open to 3rd Party apps

Fast analytics and intuitive user analysis

Collaborative and accessible

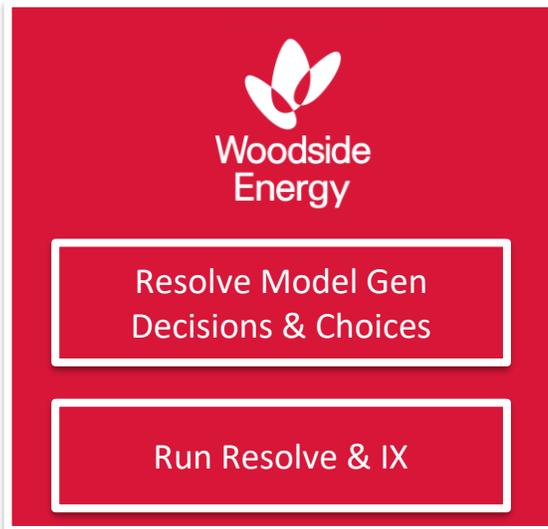
Phase 1: Standardise

Standardise IPSM workflows

- Provide systematic instruction to Resolve models to execute forecasts consistent with the decisions and choices defined in FDPlan
- Take advantage of Petex Openserver commands and custom workflows within Resolve to execute changes in the IPSM consistent with a given scenario
- Instructions are provided by users, not FDPlan

Payoffs

- Improved the productivity of teams via an innovative and systematic approach to forecast case construction
- Built in a concept of decisions and choices that can be consistently applied across different assets – allows for collaboration
- Test the functionality of the workflows within Resolve independently of FDPlan → Allows for simpler troubleshooting and testing



Study Decisions		
D1 Reservoir	D2 LNGPlantRate	D3 CutOff
C1.1 Low	C2.1 750	C3.1 Early
C1.2 Mid	C2.2 1000	C3.2 Late
C1.3 High		

Decisions

Choices

Phase 1 focus	
Constraint Name	Value
Reservoir	Mid
LNGPlantRate	1000
CutOff	Early
Downtime	Mid
W5Infill	1/1/2021

FDPLAN AS THE ENABLER

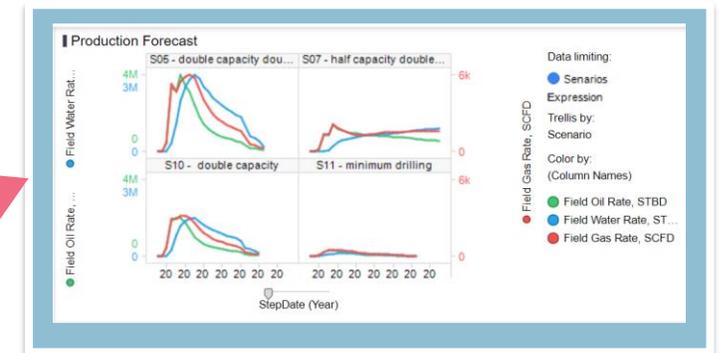
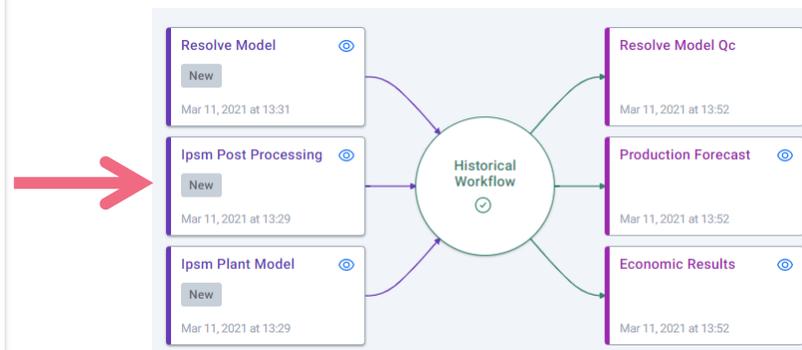
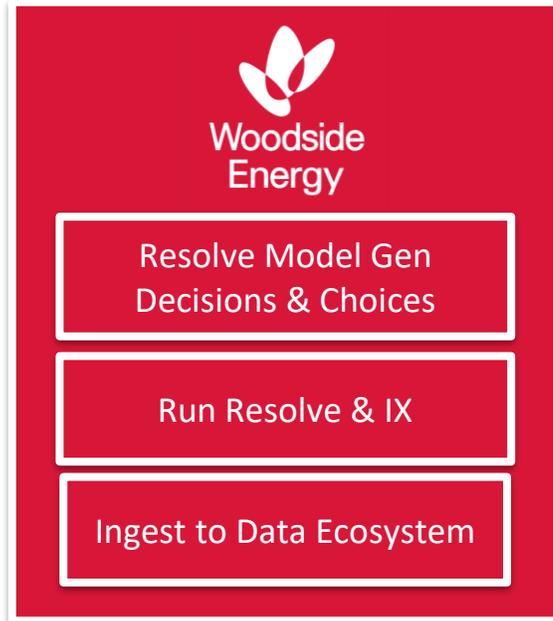
Phase 2: Visualise

Enable visualisation and output computes

- A *historical workflow* was created in FDPlan.
- Enables reservoir engineers to use the visualisation features in FDPlan for forecast models that had been executed prior to FDPlan being used to run cases.

Payoffs

- Displace existing spreadsheet based comparison tools, which are time consuming to maintain and use.
- Familiarise engineers with the enhanced capability in analysis, quickly compare multiple scenarios and multiple vectors to determine cause and effect.
- Enhance existing workflows with minimal impact or change risk



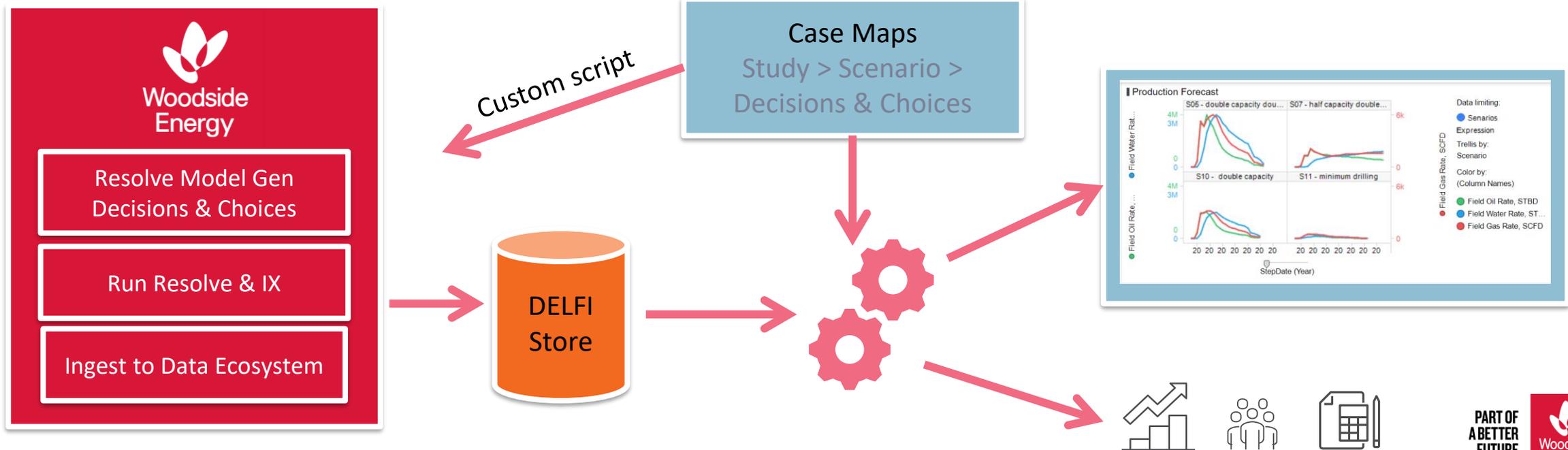
Phase 3: Automate

FDPlan standalone compute

- Enable the communication between the scenarios and decisions in FDPlan to the resolve model
- A custom compute is used to provide the instruction from FDPlan to the IPSM for each of the required cases

Payoffs

- Realise automated casemapping and forecast modelling
- Visualisation of results with cases
- Automated outputs for use in the next step in the workflow



CASE STUDY 2

FPSO oil development: Waterflood Optimisation

Background

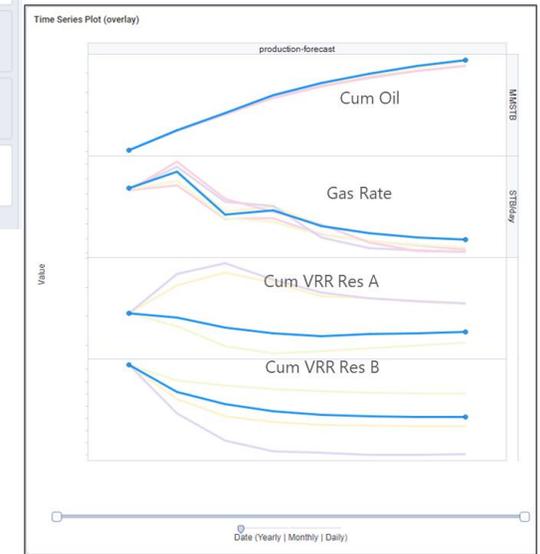
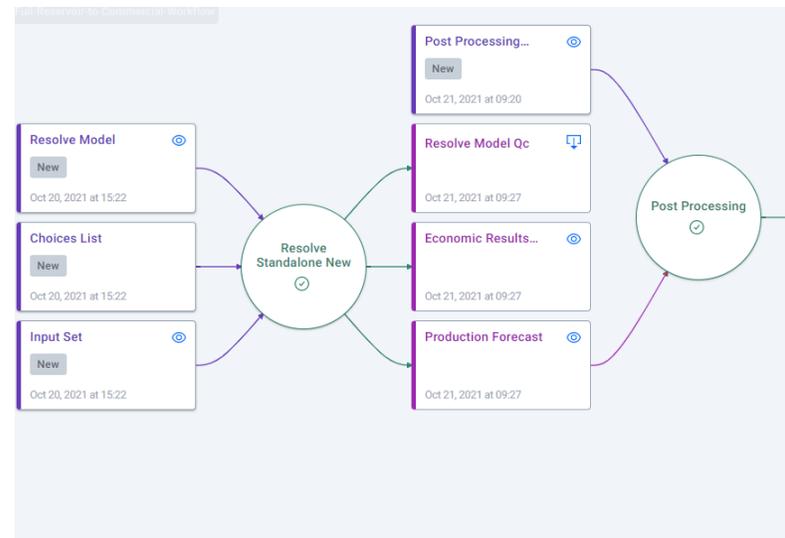
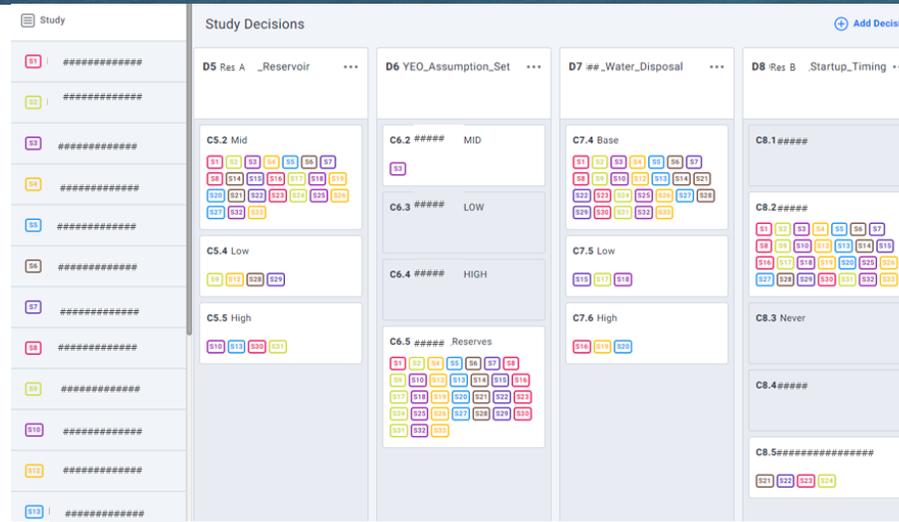
- Oil fields require waterflood for pressure maintenance and sweep
- Study to investigate impact of water injection capacity, optimum waterflooding strategy in event of reduced water injection capacity
- Resolve model running a IX-GAP IPSM

FDPlan Enables

- Easily set up, run and compare cases – no manual exports and copy/paste to spreadsheets
- Assess cases on range of parameters w/ different drivers
 - E.g., UR vs oil rate vs fuel gas deficiency
- Auditable inputs/assumptions, which can be easily updated
- Connection to economics tool

Outcome

- Provide value-based recommendations to the decision makers
- Improved understanding and communication of risk and uncertainty.
- Investigate broader solution space and tested production strategies on both facility and subsurface outcomes



CASE STUDY 3

FPSO oil development: Improve Reserves Understanding

Background

- Forecasting requires an Intersect connected Integrated Production System Models (IPSM) due to combined constraints and interdependencies of water disposal, and water injection
- To understand the total range of reservoir uncertainty, a significant number of forecasts were required
- Resolve model running an IX-GAP IPSM, runtimes >3h and require manual data transfer to initiate

FDPlan Enables

- Multi-way parallel forecast simulation on the cloud
 - ~80 forecasts run in 2 days to support the Reserves study
 - Significant time saving in forecast runtime
- On-demand visualisation of results directly from the cloud
 - Significant time saving from a reduction in data handling and assurance.
 - Clear, auditable trail of inputs for comparison to other deliverables

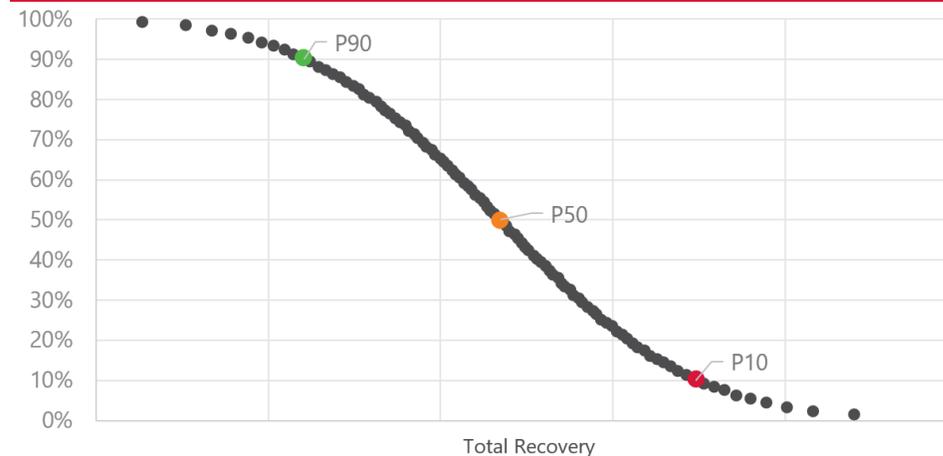
Outcome

- Reduction in time taken to deliver forecasts
- Improved technical understanding of the asset through simulating multiple scenarios
- Improved the quality of the insights provided to the business

Simulation Results



Probabilistic Result



Key Messages and Learnings

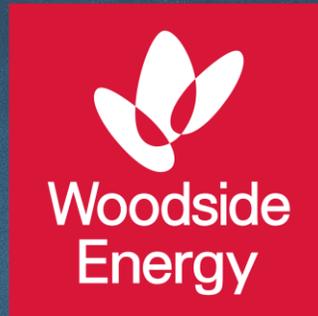
Implementation of FDPlan has helped to:

- Increase the speed of forecasts leading to faster decision making
- Increase the envelope of what parameters can be tested, driving new insights
- Share data collaboratively across multiple disciplines and removing barriers between teams

Learnings

- Significant value and improved user experience came from organising our data and workflows for FDPlan
- The improvements in visualisation provided by FDPlan became a driver for increased uptake of FDPlan.
- The Historical Workflow step wasn't in the original plan, however it became one of the most used workflows.
- Incremental changes minimized downtime impacts during roll out.
- Greater success and outcomes were realized in assets that had a stable IPSM and a repetitive workflow

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QUESTIONS?

Presenting Author

Brendan McMullan

Co-Authors

Aiden Wilkins

Jenny Howie