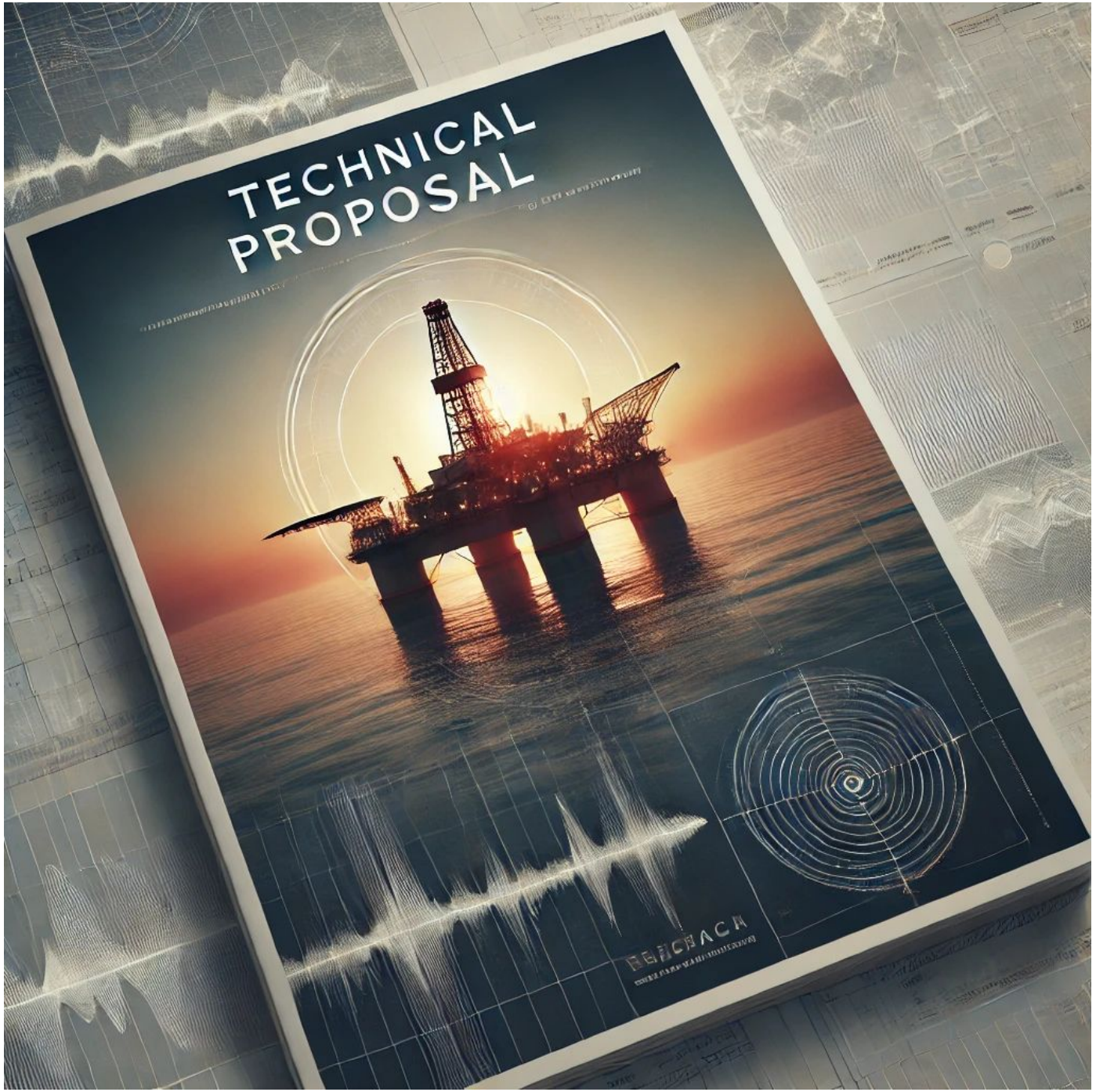

Technical Proposal of Reservoir Management Study for the X Oilfield

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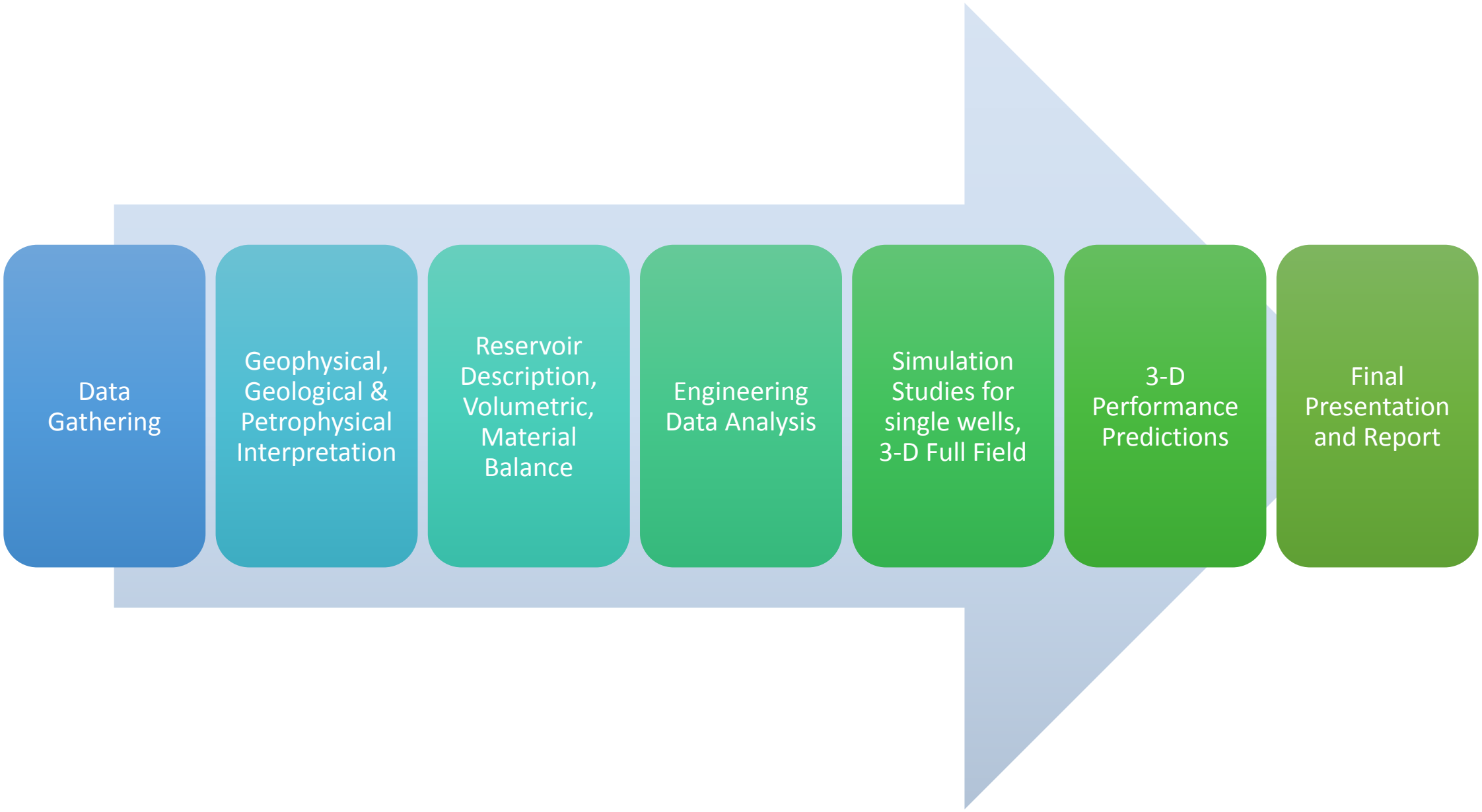
Data Gathering
Geophysical, Geological & Petrophysical Interpretation
Reservoir Description, Volumetric, Material Balance
Engineering Data Analysis
Simulation Studies for single wells, 3-D Full Field
3-D Performance Predictions
Final Presentation and Report

Introduction

- This section outlines the scope of work that X company would undertake to complete the study.
- The project will consist of seven phases in total taking the following approximate duration of **x** weeks.
- These estimates are provisional and are based upon the limited information currently available. After review of the data a more definitive timing and work schedule will be prepared.
- Upon completion of the study a final report will be produced as described in the following sections. Copies of digital data (seismic interpretation, log data, models) will be provided

Phase 1: Data gathering

All **geological, geophysical, drilling, production testing, well logs, core and fluid analysis data** required for study of the X reservoir will be available to X company free of charge. Such material will be the property of client, X company will treat all data and information supplied by client during the study with utmost confidentiality. All such material will be returned to client at the completion of the study. A data review will be conducted to check data quality, consistency and high-grading data that would be used for further analysis.

Phase 2: Geophysical, Geological and Petrophysical Analysis

Geophysical Analysis

Seismic interpretation and structural modeling: Seismic interpretation will be undertaken using a Landmark geophysical workstation. For this proposal it is assumed that a thorough review of the existing **2-D seismic interpretation and structural modeling** is carried out.

The following steps will be taken:

a) Load seismic data and all relevant well data into Landmark works 3D or Kingdom Suite 3D interpretation software;

b) Prepare synthetic seismograms from the well data (assuming the data are of sufficient quality) and verify main horizons of interest using all available information (geological data, information from synthetics, stratigraphic picks, velocity data at wells etc.);

c) Interpret the 4 main horizons and faults;

d) Depth convert time horizons using all available velocity information. Ideally this would include stacking velocities to provide better coverage of the area than well data alone;

e) Produce a set of top structure maps in (two-way time and) depth grids and fault polygons would be required input for any static modeling to be undertaken;

f) In addition to the revised top structure maps for the main horizons, a set of maps illustrating the distribution of the hydrocarbon bearing reservoir sands will also be produced.

Geological Analysis

a) A core description and facies analysis study will be carried out on available core material from the x reservoir

b) A facies and diagenesis model is to be constructed for the reservoir with the help of the above-mentioned core study and petrophysical analysis. The identified lithofacies will be arranged into a facies scheme and a series of facies associations, relating directly to the process and environmental setting during deposition.

c) The facies scheme will be used to subdivide the reservoir intervals into meaningful units or layers, which directly relate to both the depositional setting and are associated with variations in reservoir performance

d) Company will prepare structure and stratigraphic cross sections using the logs and other data and will determine the current and original fluid contacts, the transition zone, faults and lateral facies changes.

e) For the purpose of reservoir description, each reservoir/zone will be subdivided into a number of layers as per the geological model

Petrophysical Analysis

The petrophysical properties of the reservoir will be determined by the analysis of the production, core and quantitative well log data. The objective of this analysis will be to determine the best possible evaluation of porosity, permeability, capillary pressure, relative permeability, irreducible water and residual hydrocarbon saturation and the initial fluids saturation.

Phase 3: Engineering Data Analysis

The following reservoir engineering analysis will be undertaken prior to reservoir simulation modeling:

a) The PVT laboratory analysis reports on fluid samples from the reservoir will be reviewed to derive key PVT properties for input into the material balance and simulation model. It will be investigated if there are any variations in PVT properties, e.g. with depth, and if there are, whether and how to represent these in a simulation model.

b) The rock properties data, in particular special core analysis data, if available on the field, will be reviewed to define relative permeability and capillary pressure curves required for the simulation model

c) Well test data obtained from the wells will be reviewed/analyzed by X company for reservoir parameter estimations and model validation

d) Production data by well and by reservoir will be compiled and reviewed for their completeness and accuracy to be used for simulation history matching and material balance calculations

Phase 4: Reservoir description, Volumetric & Material Balance

A 3-D geological model will be constructed, in Petrel Software, to combine the results of geophysical, geological, petrophysical and reservoir engineering analysis. This model will include the pertinent geological features and geometry of the reservoirs in sufficient detail to allow an adequate description of the reservoir for reservoir simulation purposes. colors-coded maps can be generated from the Petrel model for every reservoir layer or formation, based on the geophysical and petrophysical interpretation.

Phase 5: Reservoir Simulations

a) A 3-D reservoir simulation model will be constructed in ECLIPSE (Schlumberger) based on the Petrel 3D geological model, which has captured the reservoir structure as well as the internal architecture of the geological layering and the petrophysical properties.
b) A 3-phase reservoir simulation model will be constructed. The location of hydrocarbon interfaces, and the variation in reservoir fluid properties, if any, will be investigated and included if possible.

c) The simulation model will be initialized using a gravity capillary pressure initialization procedure based on observed initial hydrocarbon contacts and reservoir pressures. Endpoint scaling will be used to match water saturation data from the petrophysical analysis.
d) Recurrent data will be imported, i.e. well deviation surveys and completion data, as well as historical production data. Perforation data will be checked with the original logs to verify that completions occur in the correct reservoir layers, and the effect of work ovens will be included.

e) Well product will be modeled based on existing DST and extended well test/PI data.
f) Pressure data will be compiled for display against simulated pressures. The Peaceman correction is applied to build-up or fall off data if necessary.

Phase 5: Reservoir Simulations

Single-well and Sector Model Studies

Single-well models may be required to better understand typical individual well behavior. Cross-sectional or sector models may be required to better understand prior to full field modeling. Grid sensitivity, i.e. number and size of active grid blocks will also need to be considered

Full Field History Match

a) History matching runs will be carried out using the most appropriate time steps to maintain the necessary accuracy and model stability. Fully implicit model techniques available in ECLIPSE will be used.

b) The reservoir parameters will be adjusted as necessary (within acceptable limits) in conjunction with feedback from the geoscientists to get a reasonable reservoir and well-by-well history match

c) Layer wise pressure and hydrocarbon saturation maps initially, in between and at the end of history match will be provided to client if required.

At the end of this phase a report will be written on the reservoir simulations (Interim Report 5) and a meeting will be held in X company's office to review the history match and results of the study obtained so far and to define the prediction cases

Phase 6: Performance Predictions

X company will provide the following data in each prediction run:

a) Production and injection profile of existing wells (rates and cumulative);
b) Number of wells, completion strategy, location, artificial lift and drilling schedule;
c) Reservoir pressure, well pressure profile for the life of the producing wells;

d) Time of artificial lift installation and associated hydrocarbon recovery.
e) (A selection of) fluid saturation plots at start and end of prediction period

Phase 7: Final Presentation and Report

Final Presentation

A final study report will be compiled addressing all aspects of the study, and presenting conclusions and recommendations regarding reservoir, production and operating aspects. The recommendations will address immediate practical applications for recovery optimization.

Reporting

Thank You