Spirit Energy Right Scoping Session

1 Introduction

Spirit Energy requested support from the Wells Task Force to take part in a scrutiny session on the SNS Grove North East appraisal/development well. Expert peers from the industry took part in the session to review and provide feedback on the proposed well design. The opportunity to challenge the programme, to highlight risks and areas to focus on, as well as supporting and reinforcing the well design was valuable and led to positive changes to the programme.

2 Field Overview and Subsurface

The Grove field is located in the Southern North Sea, and the existing development infrastructure consists of a small NUI platform with 4 slots and 1 subsea tieback.

The target of the scrutiny session is the Grove NE concept well design which targets the Grove NE prospect and extract from a previously undeveloped part of the field. There is an appraisal element to the well objectives that requires data gathering to evaluate reservoir conditions. Based on the characteristics of the reservoir at TD, a potential deep OH sidetrack is being considered to access the higher sands.

The chosen high level concept is a shallow sidetrack from an existing well slot and with a relatively high lateral step-out and an extended tangent section at 62deg inclination through the Zechstein. Subsea tieback options were considered to mitigate the requirement for the complex well trajectory but was deemed uneconomical due to the cost of the subsea tieback infrastructure required.

3 The Well Design

The existing G3X well is a 7 string design with 30” conductor, 20” surface casing, 13-3/8” intermediate casing (from the previous motherbore which this well has been sidetracked out of), 9-5/8” production casing, 7” drilling liner and 4-1/2” production liner with an existing 4-1/2” completion.

The P&A and slot recovery operation requires the existing well to be abandoned and the 9 5/8” and 13 3/8” casings to be recovered to allow access for sidetracking below the 20” shoe.

The new well design was a 17 ½ hole with 13 3/8” casing to top Zechstein to case of the Chalk and Bunter and provide a good shoe for drilling the Zechstein. A 12 1/4” hole through the Zechstein to the Werra and a Heavy wall 9 5/8” Liner and tieback will be run and cemented to isolate the Zechstein and allow the mud weight to be reduced for drilling the reservoir section. A long +-/ 3000 ft high inclination 8 ½” hole will be drilled to the Carboniferous. After obtaining reservoir pressures, a 4 ½” Liner (to provide a monobore completion) will be run and cemented.

A 4 ½” completion will be run, Xmas tree installed. The well will be perforated and the well cleaned up and handed over to production.

4 Feedback and Challenge

Donor well and slot recovery – contingency planning, contingency planning, and more contingency planning. Spending the time up front will reap rewards, what can be done in advance, what can be done offline? What can you do less off, what can you leave out? What records do we have, what cement modelling can we do to support our view on the quality of cement in the donor well? Can we abandon with a through tubing cement plug?

Good discussion held over the full hole vs slim hole design. Is there an option to slim down? Full hole will give a contingency hole size. How confident are Spirit that risks have been reduced enough to go down the slim hole route?

16" Section, lots of options for BHA strategy. Pull motor early to get RSS in the hole, push further to eliminate a bit trip. Focus on salt drilling procedures. General consensus that the mud strategy for WBM though the chalk and OBM through the shales was a sensible approach.

12 ¼" Zechstein section, work up contingencies in the event a high pressure kick is taken. Review mud design to ensure mud can tolerate a brine influx. Ensure the rig have robust procedures for drilling salt and actions to be taken in the event of stuck pipe. Review hole cleaning procedure, how will borehole monitoring be managed?

8 ½" Reservoir section, narrow window in reservoir may be able to be increased through wellbore strengthening/stress caging procedures. The current BHA is heavy on LWD, consider making it more simple and acquiring the data later.

Completion base plan was for perforating with multiple CT runs in overbalanced Brine, then cleaning the well up with a rig based well test spread. The challenge was, how can we make this quicker, smarter, how can we eliminate CT? There were some really good examples of perforating on E-Line in high inclination wells using specialist rollers. This would allow the CT to be removed. This has been worked up and is now the base plan, saving several days. Likewise, there was some good examples and experience of using platform donors wells to clean up to. Spirit Energy was encouraged to review this. This works has been done and the plan changed to clean up to a donor well. This has eliminated the need for a rig based well test spread and reduced the AFE.

5 Summary

The Scrutiny session proved to be a very worthwhile exercise. A lesson learned would be that more value would be gained by doing it earlier in the planning cycle.

Main points from the session were:-

- More focus required on contingencies for the slot recovery – a comprehensive set of contingencies were developed ranging from conventional fishing to DHPT, whipstock and pilot milling.
- Review options for through tubing cement plug as part of the P and A of the donor well – This had been a possible option, support from the group assisted with working this up to become the base plan.
- Focus on Wellbore Stability Study in the reservoir and use of wellbore strengthening materials – this was followed up and incorporated in the design.
- Current plan had heavy LWD in reservoir section. Given risks associated (narrow window, faulting, unstable formation), use a simpler BHA to drill, acquire data on separate runs once hole conditions understood.
- Perhaps the biggest change has been the elimination of CT from the completion design – saving several days.
- Eliminating the requirement for a rig based well test spread by focusing on using a platform donor well – again this has enabled significant savings.