Landfall Valve Installation (LVI)

Statement of Evidence

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Qualifications and Experience

1. My name is John Gurden and I am a Senior Project Manager with J P Kenny Ltd. My responsibilities comprise overall management and control of individual engineering and design projects undertaken by J P Kenny.

2. I am a graduate engineer BSc Eng and a member of the Institute of Engineering and Technology. I have over thirty years experience in the International Oil and Gas industry with particular emphasis towards onshore pipelines and facilities.

3. As an experienced Senior Project Manager I have undertaken many projects on behalf of major Oil & Gas companies in a number of countries including the United Kingdom, Russia and within the Middle East.

4. These multi-discipline projects have included all stages of implementation from initial feasibility studies, through design and procurement to final commissioning and hand-over.

Knowledge of the Corrib Onshore Pipeline Project

5. I have worked on the Corrib Field Gas Development Project since 2005 and for the last two years I have focused on the detailed engineering and design of the Landfall Valve Installation at Glengad,

Scope of Evidence

6. Inspector, today I will present to you the engineering and design of the Glengad Landfall Valve Installation, or LVI.

7. I will explain

    The reason why the LVI is required.

    How the LVI is an integral part of the onshore pipeline over pressurisation protection system.

    How the LVI safety shutdown system operates.

   and

    What are the other main features of the LVI.

8. Design details regarding the LVI are included in the Corrib Pipeline EIS, Volume 1 Section 4 and Volume 2 Appendix Q3.

The reason why the LVI is required.

9. Why is the LVI required?

10. As stated in the EIS Volume 1 Section 2.1.1; in 2005 the then Department of Communications, Marine and Natural Resources, now the DCENR, established the Corrib Technical Advisory Group (TAG) who administered an independent safety review of the Corrib Onshore Pipeline which was published in 2006.

11. The review identified a number of recommendations which included the following points:

    a. "The beachhead isolation valve should be designed to incorporate a pressure limitation feature set to prevent pressure exceeding 144 bar in the onshore section of the pipeline".

    b. "The beachhead isolation valve be modified to be capable of remote (as well as local) operation, and to be "fail-safe" (i.e. the valve closes in the absence of a control signal keeping it open)".

    c. The design codes for the onshore pipeline will be I.S EN 14161 supplemented with I.S. 328 and BS PD 8010.

12. SEPIL accepted all these recommendations and initiated changes to the design of the previous beachhead isolation valve in order to comply with the onshore pipeline design codes stated by TAG.

13. Of particular relevance is the requirement within the onshore pipeline design code, I.S. EN14161, which states that where there is a change in design pressure, in this case from 345 bar to 144 bar, then safeguards must be included in the design to prevent the pressure in the onshore pipeline exceeding the design pressure of 144 bar. This is necessary to meet health and public safety requirements.

14. To implement the required safeguards, SEPIL initiated a detailed evaluation to establish a robust and secure over-pressurisation protection system for the gas pipeline transportation system from the subsea wellheads through to the Gas Terminal. This is further discussed in EIS Volume 1 Section 3.5.1.

15. The conclusion of this evaluation established a structured safeguarding system comprising multiple layers of pressure protection for the onshore pipeline.

16. The evaluation also defined the basis for a secure and reliable shutdown system to be implemented at the landfall between the offshore and onshore pipeline sections. This replaced the single locally operated beach valve with two high integrity shutdown valves, installed in series, to be located in a Landfall Valve Installation.

How the LVI is an integral part of the onshore pipeline over pressurisation protection system

17. I will now describe how the LVI forms an integral part of the Over Pressurisation Protection System for the onshore pipeline.

18. During daily operation of the Corrib gas pipeline, the Operator at the Terminal will routinely control the operation of the Corrib Gas Pipeline system by regulating the flow of gas from the offshore wells to meet the nominated demand into the Bord Gáis transmission network.

19. A typical pressure profile of the Corrib gas transportation pipeline is illustrated in Slide 1.

20. From the subsea manifold, the pressure ranges from around 140 to 120 bar and steadily reduces as the gas flows through the pipeline towards the Gas Terminal where the receiving pressure is around 110 to 90 bar. At the landfall, the gas pressure will be 1 to 2 bar higher than the pressure at the Terminal.

21. Thus during daily operation, the pressure of the gas in the onshore pipeline is well below the design pressure of 144 bar and the Operator has sufficient time to make any operational adjustments.

22. Should the pressure in the gas transportation pipeline increase; then normal intervention will be for the Operator to remotely regulate the gas flow into the pipeline by reducing flow from the offshore wells.

23. In this scenario, if there is no Operator intervention, then the over-pressurisation protection system will be activated. As the increasing pressure is detected at the Terminal and at the subsea facilities, various subsea valves are closed automatically to isolate the pipeline system from the increasing gas pressure.

24. If the pressure at the LVI reaches 136 bar then the local independent pressure protection system at the LVI will automatically close the two Shutdown Valves. This will result in automatic shut-in of the pipeline system and prevent the pressure in the onshore pipeline exceeding 144 bar.

How the LVI safety shutdown system operates

25. I will now describe the shutdown system at the LVI in more detail using Slide 2. This is also described in the EIS Volume 2 Appendix Q3 Section 4.

26. All the process piping and valves at the LVI as shown in Slide 2 are buried below ground with only the valve actuators and instruments situated above ground.

27. Normal flow of gas through the LVI is indicated by the red arrows and starts from the offshore pipeline on the left, through the bypass pipework and the two Shutdown Valves V3 and V4, then flowing to the onshore pipeline on the right.

28. Each Shutdown Valve V3 and V4 is maintained in the open position by hydraulic pressure pushing against a spring. Once the hydraulic pressure is released, the spring forces the Shutdown Valve to the closed position.

29. The two Valves V2 and V5 are normally open and are only used for maintenance. The mainline valve V1 is locked closed and is only opened when the offshore and onshore pipelines are to be internally inspected during pipeline pigging.

30. Pressure in the onshore pipeline is measured using three independent pressure transmitters located downstream of Valve V5. These are marked PT in Slide 2.

31. The independent safety shutdown system at the LVI comprises the three pressure measurements, the duplicated Shutdown Valves V3 and V4 and a high reliability solid state electronic Control Unit.

32. The Control Unit continuously reads the three pressure measurements and determines if the pressure in the onshore pipeline has increased above a defined limit of 136 bar.

33. If the increased pressure is confirmed by 2 out of 3 of the pressure measurements then the Control Unit will immediately close the two shutdown valves. Closure of either of these Shutdown valves will prevent the pressure in the onshore pipeline exceeding the design pressure of 144 bar.

34. These valves cannot be opened remotely. Therefore once closed, the Operator must go to the LVI and physically re-open the two Shutdown Valves V3 and V4. If at any time the onshore pipeline pressure at the LVI exceeds 136 bar, then the Shutdown valves will immediately close again.

35. The Operator can close the LVI Shutdown valves remotely from the Gas Terminal via the signal cable and a push-button situated in the control room.

36. The Safety Shutdown Valves can also be closed manually at the LVI.

37. The LVI Safety Shutdown System is designed so that

- should the Control Unit fail then both Safety Shutdown Valves will close.
- should an actuator fail then the respective Safety Shutdown Valve will close.
- should two or more pressure measurements fail then both Safety Shutdown valves will close.
- should both circuits in the signal cable fail then the Safety Shutdown Valves will close.

38. Other points regarding the LVI pipework are:

1 The pipework within the LVI cannot be pigged and therefore the design of the bypass piping and valves includes additional corrosion protection by use of Corrosion Resistant Alloys (CRA) such as duplex stainless steel and internally clad carbon steel.

2 The smaller pipework around Valve V5 is only used infrequently to equalise the pressures between the offshore and onshore pipelines if the Shutdown Valves have closed and the flow of gas has to be restarted.

3 During restart following closure of the shutdown valves, methanol from the umbilical line is injected at the LVI to mitigate formation of hydrates in the onshore pipeline.

What are the other main features of the LVI

39. I will now present the overall layout of the LVI and highlight its various features which are detailed in EIS Volume 1 Section 4.3.4.

40. The visible features of the LVI can be seen in the two scaled models located in the room.

41. As shown in Slide 3, the LVI is located as close as possible to the landfall of the offshore pipeline. The LVI is positioned some 50 m from the edge of the cliffs at Glengad which provides an acceptable level of stability and no risk due to cliff regression over the design life of the project.

42. Access to the LVI will be from local road L1202. Entry to the LVI site will be strictly controlled under the Gas Terminal Permit to Work system with entrance to the LVI compound monitored by a security system.

43. A cross section of the LVI illustrating the lowered ground profile is provided in Slide 4. Locating the LVI compound in the dished area minimises the visual impact of the LVI from the surrounding area. This slide also shows the buried, below ground valves and pipework.

44. The overall layout of the LVI site can be seen in Slide 5 and is described in the EIS Volume 1 Section 4.3.4.

45. The main equipment comprising the LVI is located within a 2.8 metre high fenced compound, approximately 22 m by 20m marked in blue on the Slide. The compound is positioned in the bottom of the lowered area which extends around 40 m by 50 m to a depth of approximately 3m. Vehicle and pedestrian access to the compound is via the access ramp with a hard standing turning area just outside the main gate of the compound.

46. At normal ground level the overall site is enclosed by a 1.35 metre high stock proof fence similar in style to existing fencing in the Glengad area.

47. Within the compound is the valve area where the buried, below ground valves and pipework are located. Metal cages are placed over the valve actuators and various instruments. The Instrument Cabin houses the shutdown system control unit together with other instrumentation and electrical equipment.

48. The treated surface water outfall pipeline from the Gas Terminal and the umbilical cable to the subsea facilities are also routed through the LVI compound.

49. The compound is equipped with low-level site lighting which is normally switched off. The lighting will be mainly used in the event that access is required during the hours of darkness. The lighting can be also operated remotely from the Gas Terminal as well as locally. The LVI site will be monitored from the Gas Terminal Closed Circuit Television (CCTV).

50. Minimum site signage will be located on the stock proof fence to meet safety requirements.

51. Electrical power is required at the LVI and this will be sourced from the Electrical Supply Board (ESB) local grid. The design of the electrical system at the LVI will comply with the requirements of the ESB.

52. To ensure a reliable electrical supply at the LVI, a battery back-up power supply will feed the essential services at the LVI; for example these include the shutdown system and the communications equipment.

53. If the local electricity supply is not available for a prolonged period, then a portable diesel generator will be brought from the Gas Terminal to the LVI. This will provide back-up electrical power to the LVI until the ESB electrical supply is restored.

54. If there is no electricity available at the site after the back-up batteries have discharged, then the two LVI Shutdown Valves will close.

55. The status and condition of the equipment and various operating data at the LVI is continuously gathered and transferred to the Gas Terminal for display to the Operator. Communication will be via a fibre optic cable running parallel to the onshore gas pipeline.

56. The LVI is designed to function as a normally unmanned site with the Operator undertaking weekly check visits. From time to time additional visits to the LVI will be required for general maintenance. More extensive maintenance required at the LVI will be timed to coincide with periods of planned shutdown of the Gas Terminal.

57. During operation the noise levels at the LVI will be negligible, as dealt with in the statement of evidence of Mr Daragh Kingston. Also, there is no venting of gas at the LVI during operation.

Summary

58. In Summary;

59. The LVI at Glengad is required

- to comply with the TAG recommendations from the 2006 Independent Safety Review,
- to comply with the requirements of the pipeline design codes recommended by TAG.

and

- to meet health and public safety requirements.

60. The LVI is an integral part of an over pressurisation protection system which alerts the Operator and initiates automatic corrective actions if the pressure in the onshore pipeline starts to increase above preset limits.

61. The Safety Shutdown facilities at the LVI will reliably and independently limit the pressure of the onshore pipeline below its design pressure of 144 bar.

62. The LVI has been developed as a compact facility designed to minimise the visual impact at Glengad. The site is normally unmanned and during operation there is no venting of gas and no noise.

63. Finally Inspector, established industry practice has been applied for the design of the LVI safety shutdown system.

64. Furthermore the LVI has been engineered and designed to established and agreed industry codes and standards.