

CASE STUDY

Safety System Lifecycle Design Planning

Scottish and Southern Energy (SSE) embarked on a project to build an underground natural gas storage facility at Aldborough, and appointed AMEC to develop the topside process design, including an integrated control and safety system. In keeping with its policy to use 'Current Best Practice' design, AMEC based the process emergency shutdown (ESD) and fire & gas (F&G) systems design on IEC 61508 (Functional safety of electrical/electronic/programmable electronic safety-related systems). By using the IEC 61508 lifecycle design approach, AMEC fulfilled the requirements of SSE, their representative design contractor (Jacobs Engineering) and the Regulator (the Health and Safety Executive - HSE) for safety system design.

The Challenge

The complex nature of the project necessitated the implementation of the topside process design by AMEC whilst SSE and its sub-contractors concurrently prepared the underground natural gas storage caverns, leached out from the subsurface salt strata. AMEC mobilised a large multi-disciplined project team to undertake the topside detail design in accordance with the project execution plan developed by the project management group. The Control & Instrumentation team progressed the design of the safety systems in parallel with the overall project execution plan. The challenge came in coordinating the two activities in a way that minimised disruption to the project schedule but at the same time, achieving the overall objectives of the safety systems design.

The Solution

From the beginning of the project AMEC set up a functional safety management plan, identifying the key activities and sequence of execution. The Control &

KEY BENEFITS

- REGULATORY COMPLIANCE WITH CURRENT BEST PRACTICE
- REDUCTION IN SYSTEMATIC ERROR
- AUDITABLE DESIGN
- FOUNDATION FOR FUTURE OPERATION AND MAINTENANCE

Instrumentation team then worked to link the sequence of activities to the overall project execution plan to achieve a work flow with as few disruptions as possible and minimal re-work, which inevitably has an impact on cost and schedule.

A functional safety management plan is a formal and structured approach to safety system design. Although its purpose is to reduce systematic errors during implementation, it also provides the opportunity to check the validity of the design at several key points by conducting a series of functional safety

assessments. The plan remains a live document for the lifetime of the safety system and is periodically reviewed and updated to reflect any significant changes in operating conditions. In this new age of 'fast track' projects and the ever present drive to reduce costs, this formal approach to safety system design is all the more important.

In the latter stages of the overall process design, SSE and its design contractors took part in an on-site meeting with the HSE to review the plant safety systems design and the measures SSE had put in place to operate and maintain the plant in a safe manner. SSE and AMEC used the functional safety management plan to demonstrate that a credible design process had been undertaken and that the safety systems design was proportionate to the risk posed by the identified hazards.

Results / Benefits

Following completion of the project and start-up, AMEC handed over the functional safety management plan to SSE for them to take forward into the operation, maintenance and modification phase of the safety system design lifecycle. This information enabled SSE to develop a range of procedures to manage the safety systems going forward and to develop a maintenance database to record failure data for future analysis. Accurate plant data is essential for developing a 'Prior Use' case to justify the continued use of components in the safety systems. Plant data is also useful to feed back into previous safety integrity level (SIL) assessments to check the validity of the assessments and to verify test frequencies.

SSE used the functional safety management plan as a basis for training its technical staff on operation and maintenance of the systems. SSE found

that when staff understood the purpose of the safety systems design lifecycle approach, they were able to appreciate the importance of their contribution to the operation and maintenance of the safety systems, which encouraged a culture of ownership.

SSE recognise the value and importance of the safety systems lifecycle design in assuring the continued integrity of the systems and as a means of demonstrating to the Regulator that identified hazards and risks are being effectively managed.

About AMEC

AMEC are a multi-disciplined global design contractor providing consultancy, engineering, project management, operations and construction services and project delivery to the process, utilities and energy industries.

About SSE

SSE is a British company involved in the generation, transmission, distribution and supply of electricity. It is also involved in the production, storage, distribution and supply of natural gas and other energy services.



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