

Independent Third-Party Verification of Design and Validation of Electrical Installations in Australia



Although the cost assigned for engineering phase of a project is about 5% of the cost considered for purchasing equipment, construction and commissioning, engaging a right team and delivering an accurate engineering services has direct impact on the total cost of the project. Being expert in all aspects of design and having in-depth knowledge of national and international standards and local regulations, in providing engineering services, would avoid project startup delays and unexpected costly modifications occur during installation and commissioning of electrical systems.

Instances described below are showing huge consequences of technical discrepancies raised and caused costly modifications and startup delays.

- Commissioning team was dealing with an issue caused by an undersized cable feeding the stacker in a cement plant. They wasted resources on implementing some technical solutions like adding capacitor into the end of the line to improve the power factor (PF), and to reduce the cable heat dissipation, all to avoid the costly exercise of laying a new underground cable in parallel with the main cable. End of the day, they could not achieve the power quality requirements and had to pull a parallel cable. The reason which caused all these efforts and expenses, was a simple mistake in main cable sizing made by the team delivered engineering in early stage of project.
- Inevitable modifications in PCS code in an advance waste treatment plant project, caused commissioning delay for more than six months. The company, who was trying to save money by not engaging a senior application engineer in early stage of project, and had relied merely on a graduate engineer to deliver the job, had to hire three control system (PCS) experts and one safety system (SIS) expert to implement the required modifications. The contractor company had to keep those experts in project team for more than one year and pay for their services just to avoid more commissioning delays.
- During commissioning stage of the same project, the validation team found out number of instruments, installed in hazardous areas, are not proper explosion-protection type and therefore not suitable for that application. Engineers familiar with EEHA procedures can realize how expensive is practice of ordering new instruments, expediting the shipment, fitting new instruments



in place and accomplish all EEHA inspections. Plant had been energized and gas had been introduced to the system at the time of modifications. Therefore, all site activities had to be implemented under strict hot-work permits. The cost impacted by all these activities; cost of the team involved in modifications and cost of startup delays, is not comparable with the cost of a competent EEHA Ex-pert if he was involved in early stage of project to check design and check the equipment conformity as a third-party verification.

- While handing over a system by construction team to commissioning team in a LNG plant project, number of installed flow switches caused holding the hand-over task as they were not complying with technical requirements obligated by local regulations. The engineering team had neglected the fact that some Ex certifications are not acceptable in Australia. Great efforts made in project management and even in company management levels to expedite the shipment of new ordered instruments to avoid commissioning delays.

Experienced and well organized team possessing both theoretical and practical knowledge is required to deliver accurate engineering services. Engineering team dealing with electrical installations, must have thorough knowledge of power quality parameters, energy saving and efficiency, with keen eye on quality and safety standards. Power studies and design verification must be delivered to assure balance of the active and the reactive power in electrical systems which has direct impact on the voltage and frequency stabilities. **Competency** and **Expertise** are essential when it comes to safety and vital subjects of **Functional Safety** requirements and **EEHA conformities** (Electrical Equipment installed in Hazardous Areas). Finally, preparation and delivery of accurate documentation package is as important as design itself.

ELSE Engineering Company Pty Ltd acts as **Independent Third-Party Organization**, delivers **Verification of Design and Validation of Electrical Installations**, to give clients the confidence to develop and implement the solutions meet their project technical requirements and financial restrictions. ELSE provides high standard Engineering Services, Technical Supports and Contract Resources to Oil and Gas and Mining industries in Australia. we assist with project improvement and continuing development, to assure compliance with specifications and Australian standards. We support your project team with valuable inputs and **Constructability Reviews** to identify **Cost Savings Situations** or **Alternative Designs**. We assure subsystems commissioning compliance in accordance to project specifications and collaborate with **Subsystem Completion** and **Turnover** practices. With keen eye on **Quality, Schedule** and **Safety standards**, we manage development and implementation of Electrical Systems (Power), Control Systems (PCS, PLC), Safety Instrumented Systems (SIS), Fire and Gas Systems (FGS) and Instrumentation. Our services encompass design, implementation and commissioning, through to operations support.



HOW WE ADD VALUE

Expertise, Logic, Safety and Ethics (ELSE) are our core values. At ELSE we are committed to the health and safety of our employees and everyone who works in our facilities and lives in the communities where we operate.

HOW WE ADD VALUE

- Keen eye on **Quality, Schedule and Safety** standards
- **Complete life-cycle services**; engineering, implementation, maintenance, and decommissioning
- In-depth knowledge of relevant national and international codes and standards (IEC, AUS/NZ)
- In-depth knowledge and experience of testing, commissioning, start-up, operation and turnover practices
- Effective coordination and communication with client technical and commercial teams
- Taking initiative and managing time to meet deadlines
- Support in estimating, creating and implementing budgets



PROJECTS INVOLVED

Shenton Park Advanced Waste Treatment (AWT) plant

The WMRC Project involved the design, construction and commissioning of a 60,000 tpa AnaerCo™ Plant at the JFR McGeough Resource Recovery Facility (RRF) in Shenton Park, WA. ELSE Engineering Company directly involved in this project delivered Modification, Commissioning, FAT and SAT of Process Control System (ABB 800xA) and Safety Instrumented System (PILZ PSS 4000). ELSE as an Independent Third-Party Entity also had responsibility of **Verification of Design** and **Validation of Modifications** to assure compliance with specifications and Australian standards. We assisted with project improvement and continuing development and delivered annual Proof Test Procedures.

Based on design nature of plant, during processing a batch of organics in vessels, process phase change requirements were causing introduction of different gas combinations to the system. Process transitions were including four separate phases; Aerobic, Transient to Anaerobic, Anaerobic, Transition to Aerobic. Each phase had its own process conditions and definitions. Therefore, Integration of Process Control System (PCS) and Safety Instrumented System (SIS) was a vital requirement and must have been controlled under the process predefined procedures, and through the PCS-DCS-Handshaking sequence. PCS-DCS Integration gave capability to process system to transit between different phases while assuring all functional safety requirements are in place.



ICSS Cyber Security Studies for WoodSide Operated Gas Plants – WEL OT Governance Project

Performed **Cyber Security Risk Assessment** for integrated control and safeguarding systems (ICSS) for Woodside operated gas plant facilities. The ICSS is integrated process control functions within a common automation infrastructure which comprise of three (3) main subsystems; i.e., Process Control System (PCS), Safety Instrumented Systems (SIS), and Fire and Gas System (FGS). The outcome of risk assessment was cyber Security Level (SL) requirements for each system from SL1 to SL4 based on IEC 62443. The security levels are determined based on the probability of cause and the extend of consequences (safety, environmental, commercial, ...). High risk integrated control and safeguarding systems are considered as critical systems. **ICSS Critical System Recovery Plans** delivered for critical systems, documented actions must be taken and procedures must be followed in the case of incident of cyber-attack. In addition, **Continuity Plans** delivered for all systems addressed actions required to keep system integrity.





Altura Mining Limited - Pilgangoora Lithium Project

Altura Mining Pilgangoora Lithium Project is located at Pilgangoora WA. It is planned to develop infrastructure to commence mining and processing of 1.4Mtpa of ore to produce approximately 215,000 tonnes of lithium spodumene concentrate per annum. ELSE engineering company involved in end-to-end implementation and development of Process Control System (PCS) based on Schneider Modicon 580 PLCs. Five number of PLCs have been implemented to cover project technical requirements. Wonderware software utilized for SCADA system, and used for creating HMI pages.

Wheatstone LNG Gas Plant Project

The Wheatstone Project includes an onshore facility located at Ashburton North Strategic Industrial Area, 12 kilometres west of Onslow in WA's Pilbara region. The foundation project includes two LNG trains with a combined capacity of 8.9 million tonnes per annum and a domestic gas plant. As part of an integrated Chevron and Bechtel commissioning start-up (CSU) team, delivered verification of design and validation of installation and commissioning of Integrated Control and Safeguarding System (ICSS) to support Completion and hand over to Operations. Functional safety validation is action of checking and verifying process requirements, design, purchased equipment, installation ITRs and commissioning ITRs, for all critical components of Safety Instrumented Functions (SIFs), to assure installation compliance in accordance to project specifications, national and international standards, local regulations and safety requirements. FS Validation and Assessment is a pre-requirement for system completion and turn-over exercise.



TECHNICAL QUERUES

ELSE supports Technical Queries (TQ's) resolution/proposal in the field of electrical engineering, integrated control and safeguarding systems (ICSS), functional safety, and electrical equipment installed in hazardous areas (EEHA). We support all technical queries in front end studies (FEED), detail design, construction and commissioning.

Our team welcomes your technical queries (TQ's) via

tq@else-engineering.com.au.

ELSE Engineering Company is committed to ensuring the clients are completely satisfied with the quality of the services. Our commitment is to provide the clients with the best technical solution meeting the project financial restrictions and technical requirements.

[**www.ELSE-engineering.com.au**](http://www.ELSE-engineering.com.au)

ELSE Engineering

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Technical Queries

ELSE supports Technical Queries (TQ's) resolution/proposal in the field of elec safety, and electrical equipment installed in hazardous areas (EEHA). We support commissioning. Our team welcomes your technical queries (TQ's) via tq@else-e

Frequently raised technical queries are presented in links below and are categori subject. Please contact ELSE Engineering for any specific technical query, third-)

Electrical Installations

- [Power Quality & Generation](#)
- [Short Circuit Faults](#)
- [Earthing](#)
- [HV Substations & Installations](#)
- [Electrical Panels](#)
- [Lightning Protection](#)
- [Protection](#)

