

The Case for an ESI (Energy Systems Integrator) for Energy Management Systems

Prepared for:

Company: Main Contractor or Alliance



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1 Preamble

This document has been produced at the request of xxxxxxxx, Project Manager, xxxxx Company for various projects at the xxxxx facility. Recent projects (xxxx, yyyy, zzzz, etc.) have highlighted the inefficiencies associated with WAGES (Water Air Gas Electricity and Steam) systems being treated as an afterthought. With the massive xxxxxx series of projects in their infancy, now is the time to develop a set of processes to improve the outcomes for all stakeholders in this area.

This “brief” covers, the issues, stakeholders, costs, etc. as well as presenting recommendations for improvement.

2 Business Drivers

A raft of Government and legislative initiatives are driving businesses to implement systems to reduce the consumption of energy and to reduce their carbon footprints. These activities must be independently verifiable, auditable and reported to various levels of Government in prescribed formats. Severe penalties (both financial and jail terms) are applicable to CEOs and Directors for non-compliance. Some of the main initiatives include: EEO, EEGO, NGER, ETS, etc. The reporting periods for some of these schemes have already started and many companies do not yet have satisfactory systems in place.

3 General System requirements

- Metering (WAGES)
- Communications (online data collection) – fibre optics, wires, wireless.
- Supervisory Monitoring (SCADA) Systems
- Load control
- Power quality
- Reporting
- Web access
- Manual inputs for non-metered information
- Historical storage & archiving
- Auditability
- Data security
- Network management
- Integrate all sources of WAGES, sustainability and carbon footprint info

4 Elements in a Typical System

- Meters (WAGES)
- Comms networks such as the ESN (Engineering Services Network) – fibre optics, wires, wireless, routers, converters, and connectors.
- SCADA
- Database
- BMS
- WAGES Automatic Meter Reading (AMR) system e.g. RUMS, ION Enterprise
- PQ equipment e.g. PFC, Harmonic filters
- Intelligent circuit breakers
- Intelligent electrical protection equipment

5 Typical Contract Structure

- Principal, owner, Defence (out of Canberra) - local Defence personnel are basically outside this structure
- Managing Contractor – final responsibility, but little knowledge or direct control over WAGES matters
- Electrical Contractor – may supply energy meters? SCADA, WAGES, management system, intelligent devices, comms connections?
- Electrical Board Builder – often supplies meters in boards, not comms
- Mechanical Contractor – BMS, gas meters?
- Hydraulics Contractor – water meters, comms for water meters?
- Communications Contractor – comms backbone, not connectors
- Engineering Consultants – design often constrained by their own and their client's knowledge of requirements and available specialist solutions.

Other Stakeholders that are outside the contract structure:

- Local Defence personnel - Gallipoli barracks, e.g. the Energy and Sustainability Manager
- CMC (Comprehensive Maintenance Contractor) - (Facilities Manager) - currently Spotless
- Specialist contractor to Spotless for maintenance of Energy Management system – currently VRT Systems

Currently the involvement of these other stakeholders is informal, opportunistic, outside of formal contract structure and often late in the process.

6 Typical Gaps/ Problem Areas

- Power meters instead of energy meters
- Meters without comms
- Water and gas meters not being considered as part of a WAGES system
- BMS may (or may not) have some metering – generally not designed for integration with central WAGES system
- Connections of metering control and other intelligent devices to the network
- Network management (lack of operations management, ownership/demarcation issues)
- Omission of services to configure meters, software, reports, etc.
- Data security
- Knowledge of the legislated reporting requirements

Issue: A lot of technologies involved – changing and growing quite rapidly

7 The Longwall Mining Analogy

To date VRT has implemented 8 longwall/punchwall systems that share many of the technical and contractual characteristics of commercial building projects. Some of those relevant to this discussion are presented below.

The text that follows in italics was prepared around a year ago to justify the appointment of VRT Systems to the OSI (Overall Systems Integrator) role for the new BHPB Mt Arthur North longwall mine. VRT had previously filled this role for several Anglo Coal mines (Grasstree, Bundoora, Acquila) and for BMA's Broadmeadow mine. We were also appointed to the OSI role for Mt Arthur (MAU).

- *Capital intensive equipment*
- *Complex to operate*
- *Supplied by a variety of OEMs operating independently*
- *The mix of suppliers is getting broader, e.g. add CSIRO and specialist package solution providers to the equipment suppliers*
- *These OEMs work hard to protect their independence for reasons of IP protection and commercial advantage*
- *The continuing drive for higher productivity and safety is resulting in higher levels of automation and complexity*
- *These same business drivers are also requiring tighter integration between the independently supplied OEM automation systems, the overall mine monitoring (SCADA) system and the mines operations reporting systems*
- *The standard method of procurement and management for LW projects is to select, purchase and install various items of LW equipment independently, i.e. without an overall system view*
- *From both technical and commercial standpoints, reasonable levels of integration are very difficult to achieve after purchasing decisions have been made and integration requirements have not been specified and enforced in the contracts*
- *The benefits from integration are substantial in the areas of productivity, project risk mitigation and safety/health.*

As the level of automation increases in the mines, the problem of incompatibility is exacerbated.

However, the drive for increased safety and productivity are powerful incentives for improved integration between all of these disparate systems. One of the biggest barriers to achieving this is the lack of any consistent set of standards or a framework within which different system providers can work to maximise compatibility of their systems. This is the genesis of VRT's LongView product. It provides a proven set of standards and a useable framework.

Through the process of involvement in many LW projects and through the development of LongView, VRT has built good relationships with many of the popular LW equipment providers, greatly assisting in providing the cooperation needed to ensure successful integration.

The MAU project is in the enviable position of being able to get in early enough to take all of these requirements into account before it's too late. Perhaps even more importantly, the current tender spec witnesses the understanding and willingness of the relevant MAU staff to head down this path.

Some of the tasks undertaken by VRT in the OSI role:

- Development of control system strategy, technical standards and functional specifications
- Facilitating distribution of specs and standards to OEMs for tendering
- Assist evaluation of tenders for compliance with integration aspects of their systems
- On some occasions, the Principal compelled the supplier to have VRT do the software development and integration to ensure quality and integration compliance
- Rework of some OEM products when not up to standard
- Direct involvement in FAT and SAT processes
- Assistance with commissioning
- System components not directly part of an OEM package were developed directly by VRT, e.g. central monitoring system, environmental and gas monitoring systems, some ancillary equipment, etc.
- Review (and rework) of OEM supplied documentation
- Training of mine operations staff in the integrated systems

8 The Queensland Transport Brisbane Busway Analogy

The Brisbane Busway has been developed over approximately 10 years through many project

stages, implemented via several D&C contracts. The current system comprises approximately 21 bus stations and 12 tunnels, as well as the central control and communications facility. VRT Systems is the sole systems integrator that has been involved in all project stages and has been responsible for the central SCADA facility and for the maintenance of standards associated with the connection of all equipment to this central facility.

A comprehensive list of subsystems and devices has been integrated under VRT's direction, including:

- Central SCADA system (MacroView)
- PLCs in stations and tunnels
- Lighting controls
- Ventilation systems
- Gas monitoring
- Access control
- Energy metering
- CCTV
- Audio/telephone
- VMS (Variable Message Signs)

Typically these specialist subsystems are supplied by specialist suppliers or subcontractors. VRT worked variously for the main contractor, e.g. Leighton, or an electrical contractor, e.g. Stowe.

VRT's role as the overall systems integrator (and standards overseer) has contributed in a major way to the present seamless operation and maintainability of the entire Busway.

9 Role of an Energy Systems Integrator (ESI) for projects like ELF2B

- Maintain existing standards and develop new standards and specifications where they don't yet exist
- Represent local owners and operators (Defence Gallipoli and Spotless)
- Assist engineering consultant company with design of Energy Management matters, e.g. whether to break into the ESN fibre optics ring, add a spur or extend a spur
- Liaise with all parties in matters related to energy management systems
- Implement specialist aspects of the energy management system where clearly outside the area of expertise of the regular contractors, particularly network connections and all software aspects.
- Maintain documentation systems e.g. asset registers, on line (live) systems, as-built drawings, etc.

10 Recommendations

- Managing contractor employs a specialist ESI, independent of but at the same time as, the starting engineering consultant. In the case of the ELF2B project, this is ASAP as the consultant (AECOM) has already started.
- ESI reports to managing contractor through all project phases: design, procurement, implementation and commissioning.
- Electrical contractor free issues power meters and other intelligent devices to board builders

11 Consequences of not adopting Recommendations

- Projects continue to deliver inappropriate and/ or inadequate systems, exposing stakeholders to litigation and penalties
- Interconnection (integration) of components is "clunky", ineffective and difficult to maintain

- Local operators and maintainers needs not met
- Miss the opportunity for evolutionary improvement in systems and processes
- Continued retrofits – added cost, reduced quality and reduced fit for purpose
- Undocumented systems and assets

12 Summary

This has been kept intentionally brief, but hopefully covers the key issues. It covers an area that has very quickly risen in prominence in the last few years and which no industry, to my knowledge, has yet come to grips with properly. The need to get effective processes, such as those recommended, in place quickly, will only grow in importance as the ETS (Emissions Trading Scheme) and other related legislation is passed into law over the next few months.
