Risk governance in procurement – getting it right for future fuels

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Why pay attention?

- Successful transition to a zero carbon industry will involve substantial procurement.
- As an industry, we often get procurement risk management right, but there have been significant exceptions.
- The coming transition introduces significant innovation and hence uncertainties which increase inherent risk.
- Just one bad outcome for us would really ruin our credibility in the eyes of the public, the regulators, and the investment community.
- Let’s take advantage of our collective experience and learn the lessons now!

The Research

Questions, Methodology and Outcomes

Research questions

- Why have recent significant procurement failures in the gas industry and elsewhere occurred? What can be learned from them?
- What are the risks associated with the procurement process in the gas industry and what risk governance practices can be used to prevent the recurrence of procurement failures in the context of future fuels?
- What does a robust procurement risk governance framework look like in a future fuels environment?

Research methodology and stages

Literature review → **Study current procurement practices** → **Develop a risk governance framework**

- Formal investigation reports
- Royal Commissions
- Coronial inquiries
- Published journal articles about failures and risk governance
- Books about failure events
- Books about major project failures
- Auditor-General reports
- News media coverage

- Fieldwork (Interviews with 56 stakeholders)

- Perspectives toward a procurement risk governance framework
- Risk governance framework and risk mitigation strategies

FUTURE FUELS CRC

	Incident
1	Lacrosse apartment fire (2014)
2	Grenfell tower fire (2017)
3	Hyatt Regency walkway collapse (1981)
4	Opal Tower cracking (2018)
5	Channel Tunnel (1985-1994)
6	Demolition of the Royal Canberra Hospital (1997)
7	I-90 Tunnel ceiling collapse (2007)
8	Berlin-Brandenburg Airport project delays (2011-2020)
9	NSW public transport failures
10	The CBD and South East Light Rail project in Sydney
11	Loss of Space Shuttle Challenger (1986)
12	Boeing 737 Max failure (2018-2019)
13	The Myki ticketing system failure (2005-2014)
14	HMAS Westralia ship fire (1998)
15	South Korean nuclear reactor shutdown (2013)
16	Xcel Energy Company Hydroelectric Tunnel Fire (2007)
17	Explosion at Shell in Moerdijk (2014)
18	Donaldson Fireworks Disassembly Explosion and Fire (2011)
19	Buncefield explosion and fire (2005)

Incidents
(two pages)

Sector: Aerospace

Loss of Space Shuttle Challenger

Description

When Challenger mission 51L finally launched on 28 January 1986, the vehicle exploded after only 73 seconds and killed the crew of seven astronauts. The loss resulted from failure of o-ring seals in a joint on the solid rocket motor that allowed hot gases to escape, which impinged on the fuel tank, caused structural failure and then led to the shuttle breaking apart. The o-rings themselves failed due to the cold weather on the morning of the launch, but the safety of the design of the joints that required these seals and the impact of weather on the o-ring performance had been the subject of discussion within the project team for some time.

The loss of Challenger highlights procurement issues with the shuttle components and with the relationship between Morton Thiokol (MT), the contractor responsible for the solid rocket boosters, and National Aeronautical Space Administration (NASA).

The decision to launch

NASA had in place a formal process to decide whether it was safe to go ahead with each mission. The Flight Readiness Review was a four-stage process starting with contractors formally certifying in writing the flight readiness of the elements for which they were responsible. Approvals trickled up through the system to a conference of senior NASA representatives who made the final decision to go ahead.

Solid Rocket motor o-rings were defined as a 'criticality 1' feature because failure could cause loss of life or loss of the shuttle. The reliability of the o-rings was therefore critical and yet the operating history of the space shuttle program indicated that o-rings were sometimes being eroded. Of particular concern to some MT engineers was the apparent correlation between low temperature and o-ring erosion. Following observed damage to o-rings in other low temperature launches, this issue had been raised on multiple occasions, but the formal advice was waived by a NASA middle manager, and the concerns were never communicated to higher levels of management.

Regarding launch approval for flight 51-L specifically, weather forecasts suggested that the launch temperature on 28 January would be well below the experience base of the operating data. MT engineers raised specific concerns regarding the integrity of the o-rings given the very cold temperature forecast for the morning of the launch. They presented this data to NASA engineers on the evening before the launch with a recommendation not to launch. NASA disputed the analysis done by the MT engineers and famously demanded that the MT manager present 'take off his engineering hat and put on his management hat'. Under further pressure from NASA, he gave MT's approval for the launch to proceed. Only MT's final signoff on the readiness of the solid rocket motors for launch trickled up through the system.

Space shuttle and 7 astronauts lost

History of technical problems

Each launch was 'Russian Roulette'

Procurement of the solid rocket motor

Going back even further into the history of the shuttle design reveals earlier procurement issues linked to contractor selection, experience and expertise and quality assurance. The initial tender evaluation placed MT last in terms of design capability, but NASA noted that their jointed casing design would lead to the lowest costs, so MT were chosen as the successful tenderer.

The innovative jointed design was problematic from the beginning and exhibited problems during the test and certification stage. Performance issues with the o-rings were known by NASA from 1977 with some NASA engineers expressing the view at that time that the design itself was unsafe and the joints requiring o-rings should be eliminated or redesigned. Despite this, the design was accepted for flight in 1980. Once in operation, persistent o-ring problems were seen with six consecutive launch constraint wavers issued prior to the 51-L mission.

The Rogers Commission also noted that reductions in NASA's safety, reliability and quality assurance workforce had seriously limited capacity in these areas and further that the remaining personnel had been placed under the supervision of those whose activities they were supposed to check. As a result, the o-ring problems were not communicated to management until after the fatal flight.

Procurement lessons to be learned

1. Ensure chosen suppliers have sufficient technical skills for the job at hand. If in doubt, put additional oversight in place.
2. Ensure integrity and performance tests mimic operational conditions as far as possible.
3. Act on quality assurance and quality control test results. In the end, it is better to make hard decisions when testing indicates problems rather than continue and hope for the best.
4. Encourage technical experts to speak up and to ensure that concerns are treated seriously.
5. Link evidence of risk management failures to high-level decision making. Project risk management linked to real world evidence of failures is important.
6. Incentivise contractors to report problems rather than hide them.
7. Provide sufficient skilled people for safety and quality assurance, and give them sufficient authority for their voices to be heard at decision making levels of the organisation.

More information

Rogers, W., 1986. *Report to the President by the Presidential Commission On the Space Shuttle Challenger Accident*. https://history.nasa.gov/rogersrep/genindex.htm.

Vaughan, D., 1996. *The Challenger Launch Decision: Risky Technology, Culture and Deviance at NASA*. University of Chicago Press, Chicago.

Top Five Lessons Learned

1) **Ensure that a selected contractor or supplier has the technical capability to do the work**

   Prequalify suppliers who are competent. Extra inspection/supervision is required.

2) **Clearly define responsibilities and supervision**

   This requires a high level of project team experience and effective oversight.

3) **Value QA/QC and make it <u>independent</u>**

   The work of suppliers and contractors must be independently checked or inspected.

   Problems identified must be corrected in the short term; …..leaving for later gets harder.

4) **Embed operational requirements into procurement decision-making**

   Ensure that the right operational requirements are adequately considered the preparation of specifications and in making decisions to avoid failure.

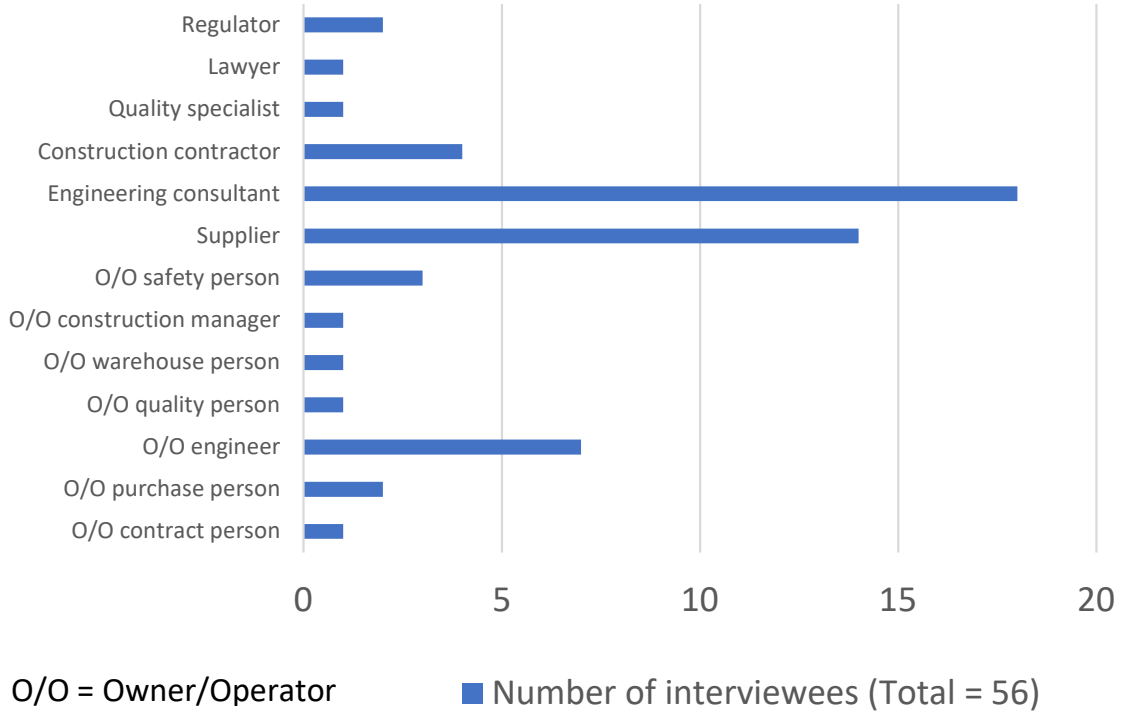
5) **Establish common organizational goals** - For complex projects, 'partnering' style contracts are preferred; for better alignment of goals and sharing of risk and reward.

Step Two – Industry Interviews

We gained unfettered access to critical knowledge and experience:

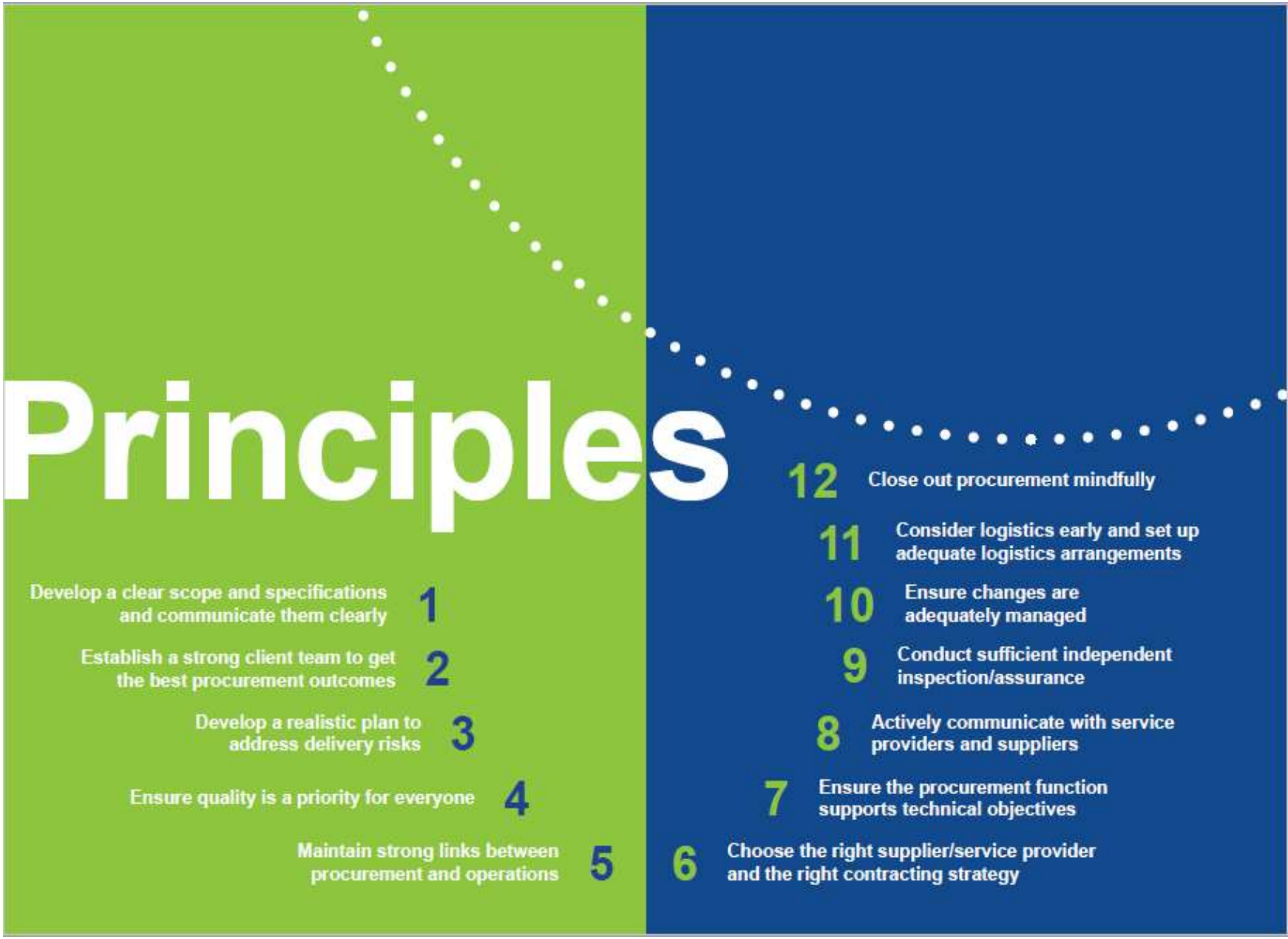
- Recruitment by “snowballing”
- Fully voluntary and anonymous
- Recorded, transcribed, analysed
- Data saturation

- Many examples of poor practice, but also many good practices!



Step 3 - The Framework Principles Booklet

Risk governance framework



Principle 1

Develop a clear scope and specifications and communicate them clearly

Successful procurement starts with a clear understanding of the overall scope of what is to be procured and a robust specification of individual items to be purchased. Having the scope and specifications clear at an early stage sets a project up for success. On the other hand, the record of procurement failures shows that many problems can be tracked back to detailed work commencing before the scope was clear and/or orders being placed based on incomplete specifications.

Time spent in the early stages of procurement to get these aspects right is well invested and is likely to be recovered many times over as purchasing proceeds more smoothly without the need for rework.

In the context of future fuels, rapidly developing technology and few suppliers mean that uncertainty is high and changes (in standards, legislation, and technology) are likely as procurement proceeds.

Default practices

1. Allocate sufficient time and resources to understand the detailed nature of the work and associated requirements and constraints (technical, logistical, financial, and resourcing).
2. Involve the right expertise in writing specifications.
3. Clearly and precisely communicate needs, requirements and the end goal to suppliers/service providers.

Key considerations – Purchasers

- Are the project description, scope and requirements clearly articulated for the target audience?
- Are we aware of the uncertainties inherent in the procurement scope and key specifications?
- Have we sought out and considered lessons learned from past procurement successes and failures?
- Are responsibilities (for completing work, and for identifying and acting on problems) clearly set out and understood by all parties?
- Have all likely operating conditions been considered for this material/item in both specification and testing requirements?
- How much 'cut and paste' from past projects have we done in preparing specifications? Are we sure that what we have specified is right for this project?
- Have legislative and standard compliance issues been considered?
- Have we standardised the design as much as feasible and minimised our reliance on bespoke items?
- Are we sure any overseas manufacturer/supplier is familiar with Australian standards that have been specified?

Key considerations – Suppliers/Service providers

- Is there enough information to clearly understand what the client wants?
- Is it clear which parties are supposed to do what in meeting these requirements?
- Have we run into difficulty in the past trying to meet similar requirements? How can we prevent past problems recurring?
- Can we undertake or arrange for all necessary testing to demonstrate both quality and compliance with the specifications?
- Is the client open to consideration of a slight change in the specification to better accommodate a standard design product which we can offer more cost-effectively?
- Does the client understand what we can offer? How can we better communicate this?
- Have we clearly communicated client's requirements about the scope and specifications to sub-suppliers/ subcontractors?
- Do we have a realistic understanding of the capacity of sub-suppliers/subcontractors to meet the client's requirements?
- Are we sure all our sub-suppliers are familiar with the Australian standards that have been specified and can deliver compliant products?

Special considerations for future fuels

- Have we thought about how our past procurement practices, knowledge and experience apply to the needs of future fuels procurement?
- Have we considered current relevant research in developing our scope and specifications? Is there a process in place to keep in touch with new research as the project progresses?
- Have we adequately considered requirements around safety and controls, particularly for bespoke items, in the absence of relevant standards?
- How do we minimise risks related to meeting technical requirements under existing legislation and standards that are still being developed or updated?
- Have the scope of work and requirements been clearly defined and well understood by overseas manufacturers who may not be used to working in the gas sector?

The Framework in practice

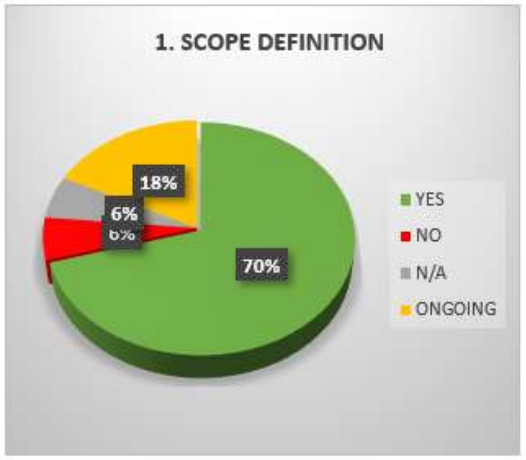
Enscope’s experience so far

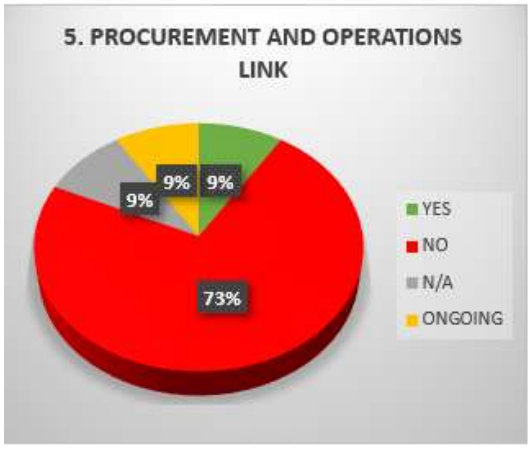
ENSCOPE PROCUREMENT DASHBOARD

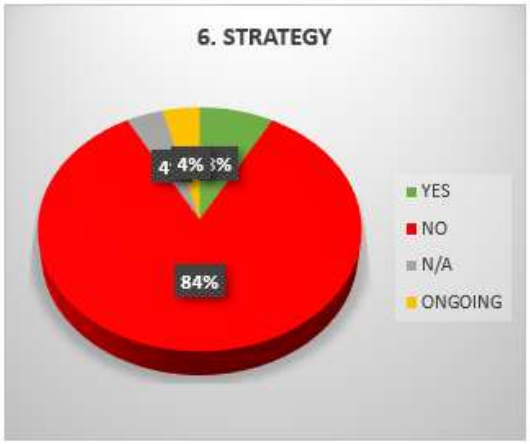
Enscope's Response to the Research

- The 12 key principles are considered at the appropriate time in the project lifecycle
- The questions are adopted in various ways:
  - Questions,
  - Processes
  - Approvals (Sign offs)
- The responses are recorded and updated on our system
- The visualisation is the Dashboard
- Visualisation can be customised to suit (e.g., histograms instead of piecharts as required)

Procurement 12 Key Principles
Purchasing Percentage Complete Dashboard







ENSCOPE
A QUANTA SERVICES COMPANY

Q2 – TEAM ESTABLISHMENT - BACKGROUND DATA

		Ongoing	RACI Ownership					
Item Ref	Responsibility	Item Complete?	Responsible	Action	Consult	Inform	Date Completed	Notes / Comments
2	**ESTABLISH A STRONG TEAM TO GET THE BEST PROCUREMENT OUTCOMES**							
2.1	Ensure that the team has the necessary resources and expertise for procurement oversight and interface management.	YES	GM/CCM	GM/CCM	SMT	TEAM	27/07/2023	
2.2	Do we have the right knowledge to effectively manage all aspects of procurement, including possible supply chain disruptions?	YES	GM/CCM	GM/CCM	SMT	TEAM	27/07/2023	
2.3	Do we have sufficient resources to make decisions in a timely and decisive manner?	N/A	GM/CCM	GM/CCM	SMT	TEAM	27/07/2023	
2.4	Should we appoint an interface coordinator to focus specifically on interface coordination and management, e.g., checking activities undertaken at the interfaces and verifying information shared between interfaces?	N/A	GM/CCM	GM/CCM	SMT	TEAM	27/07/2023	
2.5	Should we develop a program of independent review? At what points would independent reviews provide useful feedback?	ONGOING	GM/CCM	GM/CCM	SMT	TEAM	27/07/2023	
2.6	Are we aware of the new technologies and operational nuances of future fuels? How will we keep up to date on these topics as the project progresses?	YES	GM	GM	SMT	TEAM	27/07/2023	
2.7	Are we alert to unknown unknowns when making decisions in the future fuels context?	YES	GM	GM	SMT	TEAM	27/07/2023	
2.8	Have we developed a collaborative mentality within our team for devising ideas and resolving problems when dealing with new technologies in the future fuels context?	N/A	GM/CCM	GM/CCM	SMT	TEAM	27/07/2023	
2.9	Are we well networked with other similar projects (both locally and internationally), or should we put more effort into networking and benchmarking?	YES	GM	GM	SMT	TEAM	27/07/2023	
2.10	Are there strategies in place to upskill our team for adopting the new technologies?	YES	GM	GM	SMT	TEAM	27/07/2023	

Enscope's Learnings

- Implementing the 12 key principles helps to ensure that we start projects when we're Fit to Start, the Dashboard acts as a gate for Senior Management to be kept informed at all times
- Our processes need to embody Risk Governance in Procurement
- Our systems need to be robust to support our people
- There is too much information and too many lessons to expect people to keep it all in their heads. With our systems configured to manage the mundane tasks, our team can focus on governance and the "smarts" (finding and keeping the right supply chain)
- Information needs to be provided to relevant stakeholders in real time, and
- Systems need to be updated regularly.

SNAPSHOT OF IMPROVED PROCESSES

Enscope has incorporated our procedures and templates for Procurement into simple iterative workflows

- Efficiencies realized;
  - Time
  - Correct information to market
  - Managed returnables – ensuring safety and quality
  - Protects Budgets

PROCUREMENT PACKAGE MATRIX

Conventional Project

Table A.1 - Services

A.1 Define Procurement Complexity → Procurement Complexity Guide

A.2 Estimate Service Value (AUD)

A.3 Enter with that input into **Table A.1** to define which Procurement Document Use

» Procurement Complexity

Package Profile	Minor ≤ $ 100k	Medium up to $250k	Major ≥ $ 250k
Strategic	Long Form RFQ	RFT	RFT
Leverage	Long Form RFQ	Long Form RFQ	RFT
Bottleneck	RFQ	RFQ	Long Form RFQ
Standard Items	RFQ	RFQ	Long Form RFQ

Complex Project

Table A.2 - Services

A.1 Define Procurement Complexity → Procurement Complexity Guide

A.2 Estimate Service Value (AUD)

A.3 Enter with that input into **Table A.2** to define which Procurem

Procurement Complexity

Package Profile	Minor ≤ $ 100k	Medium up to $500k	Major ≥ $ 500k
Strategic	Long Form RFQ	RFT	RFT
Leverage	Long Form RFQ	Long Form RFQ	RFT
Bottleneck	RFQ	RFQ	Long Form RFQ
Standard It	RFQ	RFQ	Long Form RFQ

Conventional Project

Table B.1 - Goods

B.1 Define Critically Level → QMS-FRM-0005 CRA Form

B.2 Estimate Goods Value (AUD)

B.3 Enter with that input into **Table B.1** to define which Procurement Document Use

» Critically Rating Assesment (

Package / CRA	Minor ≤ $ 100k	Medium up to $250k	Major ≥ $ 250k
Level 5	Long Form RFQ	Long Form RFQ	RFT
Level 4	Long Form RFQ	Long Form RFQ	RFT
Level 3	MINOR	Long Form RFQ	Long Form RFQ
Level 2	RFQ	RFQ	Long Form RFQ
Level 1	RFQ	RFQ	Long Form RFQ

Complex Project

Table B.2 - Goods

B.1 Define Critically Level → QMS-FRM-0005 CRA Form

B.2 Estimate Goods Value (AUD)

B.3 Enter with that input into **Table B.2** to define which Procurem

» Critically Rating Assesment (

Package / CRA	Minor ≤ $ 250k	Medium up to $500k	Major ≥ $ 500k
Level 5	Long Form RFQ	Long Form RFQ	RFT
Level 4	Long Form RFQ	Long Form RFQ	RFT
Level 3	RFQ	Long Form RFQ	Long Form RFQ
Level 2	RFQ	RFQ	Long Form RFQ
Level 1	RFQ	RFQ	Long Form RFQ

Enscope's View - Lessons Learnt Broadly

- The Lessons Learnt process should not wait until the end of the project – by then it's too late for that project. Risk Governance in Procurement should not be isolated to one box in the business – typically Compliance. It should work in tandem with Business Strategy – future planning, Risk Management etc.,

- Implement lessons learnt processes throughout the lifecycle of the project to avoid painful lessons at the end of the project

- The process needs to be managed by trained and competent people

Acknowledgements and Appreciation

- FFCRC
- APGA and RSC
- RMIT and the Researchers
- My fellow volunteer Industry Advisors
- Many energy industry organisations who participated
- Even more energy industry personnel who were interviewed

….and to you, the audience ……thanks for listening today

Enabling the decarbonisation of Australia's energy networks

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Australian Government
Department of Industry, Science, Energy and Resources

AusIndustry
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Lessons learned

Framework

Australian Government
Department of Industry, Science, Energy and Resources

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