Independent Review of System Security Operability Costs – Option 1 Review v1.2

30/09/2025

DGA Consulting Pty Limited
Sydney | Melbourne | Brisbane

Customer Details

Customer Name:	Transgrid
Customer Address:	200 Old Wallgrove Road Wallgrove NSW 2766

About this Document

Title:	Independent Review of System Security Operability Costs – Option 1 Review v1.2
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1. Executive Summary

Background

Transgrid is conducting a Regulatory Investment Test (RIT-T) to improve their Operational Technology for better management of a complex network. They have identified two options: Option 1 provides a reactive capability with 9 project initiatives, while Option 2 builds on this with a total of 13 initiatives for proactive network operation.

Both options deliver net economic benefits with Option 2 being the preferred option as it maximises the economic benefits. The business case is dependent on assumptions on the costs and benefits of each of the options. In order to provide increased confidence on the costs, an Independent Review of the System Security Operability Costs has been commissioned. This report reviews Option 1, with a separate assessment undertaken for Option 2.

Project Costs

Transgrid have determined that the best way to deliver the broad scope of interdependent projects in the timeframe required is to adopt a SI Approach and to retain, but upgrade, the recently commissioned GEV EMS. The SI would be responsible for management of the GEV relationship as part of the project, which minimises delivery risk.

An RFI was issued to all GEV approved Australian based SIs. The two SIs with the highest technical compliance have worked with Transgrid over the last 9 months to provide Rough Order of Magnitude costings (with confidence ranges of +25% and -10%) for the scope of work. This has been an iterative process with refinement of scope and costs during the RFI process. An average of their costs in April 2025 was applied in the Project Assessment Draft Report calculation and combined with internal costs and a Contingency (P50 Confidence Level) to derive the total project capex costs. These costs are shown in the table below.

Cost Category	Value	Explanation
SI Costs	$79.9m	This figure was an average of the two SIs costs for delivering the specified projects.
Internal Costs	$30.1m	This is the sum of labour, equipment and materials cost including already expended cost for alarms.
Contingency (P50 Confidence Level)	$6.8m	SI and internal costs were calculated without contingency for risks. This contingency provides for a 50% probability of the total project cost not being exceeded based on Transgrid’s review of identified risks.
CPA Costs[1]	$6.2m	Costs for the CPA Submission.
Total Project Cost	$122.9m[2]	

Table 1 Summary of Capex Costs

[1] DGA have noted the inclusion of CPA costs, but not reviewed this cost item. This is a sunk cost and should not impact any decision on how to proceed with this investment.
[2] There is a small difference ($0.2m) between the cost table in the PADR and the calculations in the RIT-T spreadsheet. This assessment has used the calculation in the RIT-T Spreadsheet.

DGA Approach

DGA are a specialist power utility operations and OT consultancy company and has been commissioned to provide this independent cost review covering both capex and opex costs. Our approach encompasses the following steps:

- Review and assessment of the scope of the project.
- Review of Project Schedule to assess impacts on costs.
- Review of capex by cost category.
- Review of opex and refresh Costs.

An overview of each step is provided below.

Review and Assessment of Scope of Project

The cost and schedule assessment review was conducted using a framework that DGA developed, solely for the purposes of the cost assessment. This framework, shown in the diagram below, groups the projects within the capability uplift suite to reflect inter-relationships and project (referred to as initiatives in the PARC) scopes for various broader enterprise/operational projects and EMS solutions.

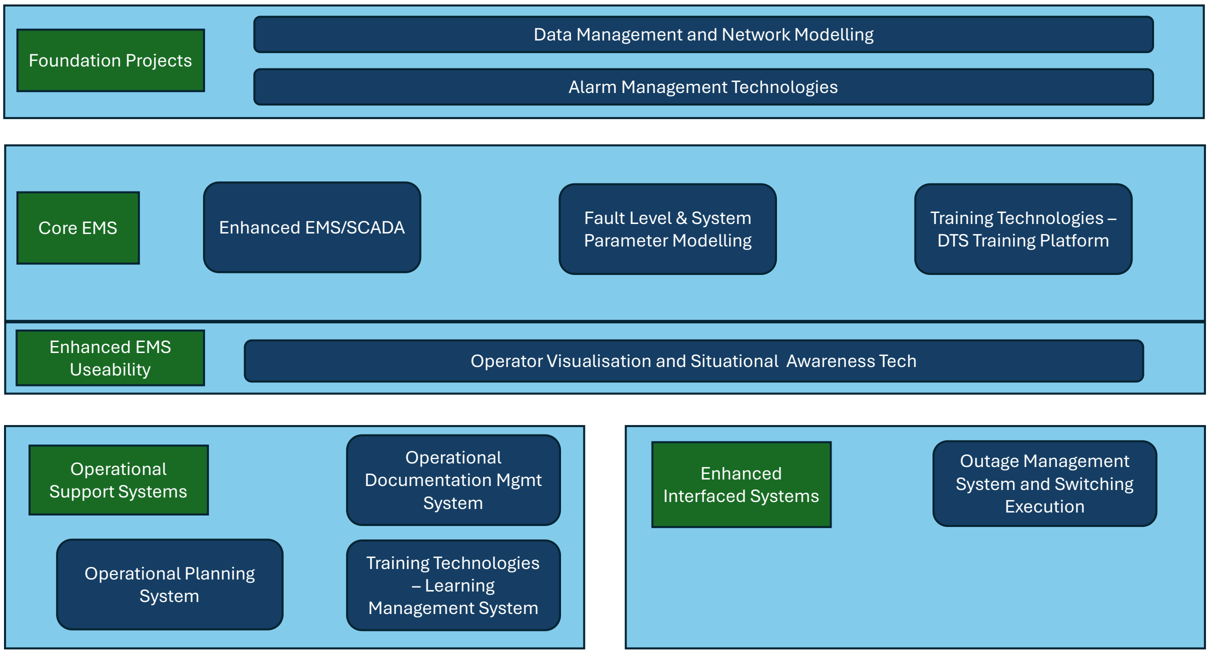

Figure 1 Overview of DGA Review Approach to System Security Roadmap Projects[3]

Project Schedule

The review commenced with an assessment of the project schedule. The timetable extends just over 3 years which DGA believes is feasible for project delivery after the SI is engaged. However, whilst project procurement activities and resource mobilisation can begin from the commencement

[3] Some of these initiatives have been renamed in the PACR to better reflect the nature of initiatives. Enhanced EMS/SCADA has been renamed SCADA/AEMS system, outage management system and switching execution has been renamed outage management, and wide area and high speed monitoring has been renamed wide area monitoring.

date of January 2026, it will take at least 6-9 months to establish the contract with the SI. Other key schedule recommendations, which could impact cost include:

- Assessment and probable extension of timeline and duration for the Data Management and Network Modelling project.
- Consideration of an earlier start for the Operator Visualisation project which is complex and has inter-dependencies.
- Assessment of inter-dependencies between Foundation Projects and Enhanced EMS/SCADA to, where possible, improve the scheduling between these projects; and
- Improvements in timing and implementation flow of the Core EMS Projects.

These schedule observations were considered in the assessment of capex and opex/refresh costs.

Review of Capex Cost

DGA reviewed each of the capex costs categories using these project groupings. The review covered both the approach to the costing and whether the amount was efficient. The key findings are set out in the table below:

Category	Key Findings
SI Costs	1) Approach of early market engagement with SIs was reasonable and provided a strong basis for cost estimates. An RFI process is common for indicative costing for Operational Technology solutions as a full RFP would be impractical at this stage in a project lifecycle. 2) Concern on the level of comparable experience of the SIs with implementing the GEV solution in Australia which impacts on the robustness of the estimates. 3) Limited justification for the significant cost difference between 2 SIs suggests that an approach of just averaging the two may not be optimal. A revised estimate from one SI in June 2025 resulted in a total cost difference of over 70% between SIs. 4) The Core EMS costs from the 2 SIs seemed excessive at an average of $34.6m. A more efficient level is likely to be around $10m lower. 5) Two Foundation projects and the Visualisation project contain higher levels of complexity and risk, although this has been reduced compared to Option 2. Despite the lower scope there are still challenges with the data management project and confirmation should be made that these complexities have been fully assessed. Some of the average cost figures contain significant divergence between the 2 SIs for a similar scope and these differences should be explored further. 6) The costs of Operational Support Systems projects show a large divergence between SIs. One SI is double the cost with no obvious rationale. It is recommended to review this difference and/or apply a heavier weighting to the lower cost SI.
Internal Costs	1) Overall approach seemed reasonable with clearly identified resources, equipment, material and expenses. 2) Need to ensure no overlap with the SI resources; and

Category	Key Findings
	3) Some additional scope costs need to be reviewed and added into the project. The overall impact is expected to be a small increase in internal costs.
Contingency (P50 Confidence Level)	1) Approach aligns with the expectation of the AER. 2) Overall contingency allowance is low at 6.2% for a project of this duration and complexity; and 3) There are two specific risks that would benefit from review of the input parameters, which may increase the contingency allowance slightly.

Table 2 DGA Findings on Capex Costs

Review of Opex and Refresh Costs

DGA reviewed the opex costs and refresh costs presented in the PADR. Our key findings are set out in the table below:

Category	Key Findings
Opex Cost	1) Opex cost is based on bottom-up calculation of cost of additional personnel or systems support and is transparent. 2) Timing of opex costs needs further analysis for both revised schedule and timing for when GEV support should commence. 3) Need to confirm there is no overlap between capex from SI and opex budgets. 4) Need to confirm Operational Planning System Licence costs; and 5) Further information is required to justify number of additional resource roles for SCADA/EMS Maintenance and increased Operational planners.
Refresh Costs	1) Refresh costs are overly conservative as they assume a refresh will repeat the full cost of initial implementation. 2) Need to review timing of commencement of refresh costs to reflect: • Changes to the schedule with start and completion dates; and • Timing of refresh projects which should have shorter durations. 3) Should review individual projects to consider a realistic but conservative cost for any project refresh; and 4) Total refresh costs should be recalculated based on revised timing and individual project costs.

Table 3 DGA Key Findings on Opex and Refresh Costs

Review of Updates to Cost Since Initial Review

Approach Taken

Transgrid has updated its cost estimates since the PADR to incorporate the feedback from the initial review of costs. Key changes include:

- Revised Schedule to account for upfront procurement work, project sequencing as well as revised project durations.

- SI Cost refinements to avoid internal overlaps, align releases, update licensing and support requirements. This also included a Transgrid adjustment to the SI costs of the Core EMS to align with DGA's expectations.
- Internal Cost updates to reflect scope additions and eliminate overlap with the SIs.
- Improved P50 assessments conducted for each project.
- Opex costs revisions for timing changes and updated scope; and
- Refresh cost reductions to reflect Evergreen support and lower refresh percentage costs.

Impact on Schedule

The primary adjustment to the project schedule involves allocating additional time for requirements definition and the procurement of services from a SI prior to full project initiation. While facilities and operational planning activities commence early, the principal EMS and foundation projects are scheduled to start in January or February 2027. The overall core project's duration is consistent with the earlier estimates but with enhanced sequencing and scheduling of the EMS-focused initiatives.

The updated schedule is depicted in the diagram below. DGA considers this to be a demanding yet feasible timeline for delivering this comprehensive set of projects.

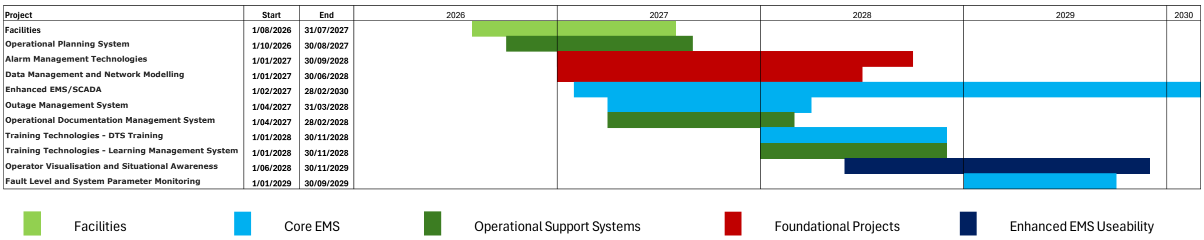

Figure 2 Revised Schedule for OT Capability Uplift Projects

Capex Cost Changes

A summary of the revised capex cost and changes since the PADR are shown in the table below.

Category	*Sept $m*	PADR $m	Difference $m
Foundation Projects	$36.5	$38.1	-$1.6
Core EMS	$37.2	$55.6	-$18.3
Enhanced EMS Useability	$11.0	$10.5	$0.5
Operational Support Systems	$10.6	$10.8	-$0.2
Enhanced Interfaced Systems	$1.5	$1.8	-$0.3
Facilities and Project Management	$19.7		$19.7
Total	**$116.5**	**$116.8**	**-$0.3**

Table 4 Summary of Revised Project Costs

The overall revised capex cost is almost identical to the PADR. The savings recognised in the SI Costs estimates ($11.2m) are offset by the additional internal scope ($7.6m) and increase in revised P50 estimate ($3.3m).

DGA support the September set of capex cost estimates as representing an efficient level of costs to deliver the scope of the proposed capability. This recognises the constraints of the timetable, limited availability of Transgrid internal resources and the resultant approach to utilise SI services to deliver the program outcomes.

Opex and Refresh Cost Changes

Compared to the PADR, the Opex costs have decreased significantly in the early years partly due to later commencement, but also improved consistency with the capex costs. There is an increase in opex cost once the system is fully operational due to higher software licence costs, hardware maintenance and increased resources. A summary of the annual cost is shown in the table below.

Opex Review $m	26/27	27/28	28/29	29/30	30/31	31/32
Sept 2025	$0.00	$0.79	$2.94	$5.27	$8.04	$8.20
PADR	$3.30	$5.90	$5.90	$6.50	$6.80	$7.00

Table 5 Summary of Opex Cost Changes

DGA has reviewed the updated opex estimates and endorse these costs as reasonable. They represent a more accurate estimate for operating with improved capability and an Evergreen solution.

The refresh costs have reduced from $143m in the PADR to $84m in September 2025. This reflects the Evergreen solution for support, timing adjustments and lower costs of a refresh (80%) compared to the original project cost. DGA believes the refresh costs are still conservative.

2. Background

2.1. Background to the Project

The electricity network in NSW is undergoing transformation, transitioning from a few large thermal generators to numerous small distributed variable generator connections and storage resources. This shift presents complex operational challenges for Transgrid, the owner and operator of the NSW/ACT transmission network. Without intervention, the increasing complexity may lead to more frequent constraints on power system operations in NSW and a higher likelihood of outages with Unserved Energy.

The AER recognised the increased complexity and accepted the System Security Roadmap Operational Technology Project as a contingent project for Transgrid's 2023-28 regulatory period. This is subject to the completion of early works and the fulfilment of specific trigger events. These trigger events include the successful completion of the Regulatory Investment Test for Transmission (RIT-T) covering options for Transgrid's System Security Roadmap Operational Technology Contingent Project.

As part of the RIT-T process Transgrid issued a Project Specific Consultation Report (PSCR) in October 2024. This considered three options for enhancing capability as shown in the picture below.

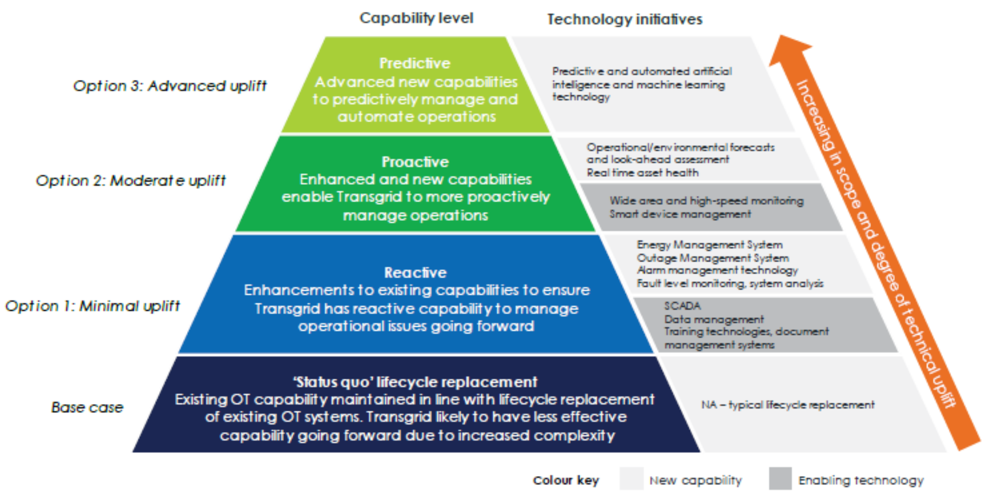

Figure 3 Capability Enhancement Options Considered by Transgrid in PSCR

In parallel with the consultation period for the PSCR, an RFI was issued to System Integrators. The feedback from the RFI led to a decision to remove Option 3 from the PADR as this option presented significant risks with technologies that are not yet available and had high degrees of cost and functional uncertainty. Option 3 builds on Option 2, so Transgrid could choose to scale and take advantage of new functionality sought within Option 3 at a later date.

Transgrid published the Project Assessment Draft Report (PADR) on the 12th of May 2025. This set out the costs and benefits of Option 1 – Reactive Capability and Option 2 – Proactive Capability. Option 2 includes all the initiatives and capabilities of Option 1, typically at a higher level of technical uplift. The review found both options were expected to deliver significant net economic benefit, with Option 2 being the preferred options as it maximises the NPV of the economic benefit. This outcome is dependent on the level of costs and benefits and Transgrid have therefore committed to doing an independent review of these costs.

2.2. Scope of the Assignment

The scope of this assessment is to provide an independent review of the costs for Option 1 of the project.

The PADR anticipated that a System Integrator (SI) model would be used to deliver the project. The was based on an expectation that the SI model would offer cost efficiencies by reducing redundancies when delivering a program of technologies and reducing delivery risk through ensuring all components function together smoothly with a focus on data and integration.

The cost assumptions in the PADR utilise the RFI responses from SI and internal information on costs. The independent review of the efficiency of costs needed to cover all inputs including:

- System Integrator Capex Costs.
- Transgrid Internal Costs.
- Risk Costs.
- Opex Costs; and
- Refresh Costs.

3. Experience and Qualifications of DGA Consulting

3.1. Overview of DGA Consulting

DGA Consulting (DGA) is a specialist Power System Operations, Operational Technology (OT) and management consulting company. Our key differentiator is the depth of subject matter expertise in SCADA, EMS, GMS, ADMS, Utility Control rooms and power system operations. DGA applies this knowledge with proven consulting skills to advise electricity and gas companies on the best use of these operational technologies with projects throughout Australia and in South-East Asia.

3.2. Experience in Control Room Technology and Network Operations

The DGA Consultants delivering this project have been leading contributors to the successful implementation of EMS across Australia and Asia for over 30 years. The role of the project team varies for each implementation but includes:

- RoadMap/Strategy/Business Case development
- Requirements Specification and Conceptual Architecture
- Procurement Support; and
- Implementation and Change Mgmt.

Example assignments from the Consultants engaged for this project are shown in the table below.

Project	Client	Date	Description of DGA Consulting Project Roles
SCADA/EMS Upgrade Acceptance Testing	Power and Water Corporation	2024-25	PWC commissioned DGA to review the upgrade project scope and to carry out a detailed review of their acceptance testing regime and test procedures, followed by managing the conduct of, and participating in, both Factory Acceptance and Site Acceptance Tests.
Outage and Switch Order Management Review	CLPP	2023-24	CLPP commissioned DGA to undertake an extensive study into the industry practices performed by world-leading TNSPs, as well as research the product functional capabilities available from leading EMS solution providers. DGA's role included reviewing the current systems and process with CLPP before conducting interviews with TNSPs from NZ, Singapore, Australia and NZ as well as the four major global EMS Vendors. DGA's report was used as an input into CLPP's decision making on their EMS Upgrade Strategy.
EMS Project	Confidential	2023	DGA was engaged as EMS Subject Matter Expert to advise a potential Owner/Operator for a new Renewable Energy Zone (REZ) on the specification and procurement of an EMS. The EMS Solution needed to allow the client to fulfil the obligations of a TNSP as well as maximise the potential applications of the EMS for its existing assets.
Consultancy Services for	Meridian Energy	2023-2024	A first project focused on reviewing the RFI/RFP process for Meridian Energy's SCADA/GCS replacement and the proposed solution of the pre-selected vendor. Focus

Project	Client	Date	Description of DGA Consulting Project Roles
SCADA/GCS Platform Replacement Project			areas were migration of custom applications, architecture, support and proposed project schedule. DGA was later engaged to review the outcomes of Meridian's response to addressing the recommendations of the first report. Meridian had adjusted the scope of the solution, adopted a more standard product approach (as compared to the initial bespoke Generation Control application) and focused on a delivery in stages to validate solution feasibility.
OT Architecture Review	Acciona	2022-23	DGA reviewed strategic opportunities to improve the current-state OT architecture. This included operational and physical architecture, data and security architecture and a converged reference architecture to create a prioritised list of recommendations. DGA then undertook a Cyber Security Uplift Program as a critical priority.
Market Assessment of Future OT Options	APA	2021-22	DGA was commissioned to investigate APA's options for the replacement of its SCADA solution. To assist with this assessment, DGA developed an RFI for future OT solutions covering power and gas assets. DGA reviewed the vendor responses and performed customer interviews to assess the appropriate OT solutions, which were collated in a market assessment report for APA.
ADMS Project	Ausgrid	2017-Present	Engaged as ADMS Subject Matter Expert to advise and assist Ausgrid in their ADMS project. The scope of this assignment has included guiding Ausgrid's ADMS procurement strategy, then transitioning to a role of expert advisor throughout the phased implementation project – including business case updates, detailed design review, PM advice, acceptance testing and commissioning.
SCADA/ EMS/ Upgrade Project	Sabah Electricity Sdn Bhd	2015-Present	Working as SCADA/EMS Subject Matter Expert with SESB to define and then implement the strategy for Operational Systems (SCADA/EMS & DTS) to help drive modernization and to transition to a market framework for power system operations for the Malaysian State of Sabah. DGA led the development of procurement documents, the selection of SCADA/EMS Supplier and then management of the implementation project from design review through to system commissioning and acceptance. DGA continues to support SESB after go-live.

Project	Client	Date	Description of DGA Consulting Project Roles
ADMS 2.0 Project	Meralco (Philippines)	2021	DGA assisted Meralco in their strategy and procurement of ADMS 2.0. This included visioning workshops, business requirement workshops and development of a detailed RFP for the ADMS/EMS. DGA also developed the SCADA business case and ADMS Roadmap to ensure that a robust strategy and design informed the RFP
Strategy and Roadmap for Future OT Environment	APA	2020-21	DGA provided a review of the Technology & Transformation Group's current state and formulated a strategy and roadmap for their future OT environment. This strategy was followed by an assessment of the business and functional requirements for APA's core OT platforms with assessment of the vendor's solution against business requirements, and a recommendation on the future solutions.
ADMS Upgrade Review	Evoenergy	2017-18	Evoenergy required an external organisation to provide independent oversight of the ADMS Upgrade design process. DGA's role included review of design documents and traceability to technical requirements.

Table 6 Overview of Recent Projects Delivered by DGA's Consultants

3.3. Experience of Project Team

The expertise of the DGA Project Team is described below.

3.3.1. Don Bonnitcha

Don is a Senior Principal Consultant at DGA Consulting. He is an electrical engineer with over 40 years of experience in SCADA/EMS/DMS and other operational technologies. Don has consulting experience throughout Australia, NZ and SE Asia including nearly two decades of leading an Australian Energy Consultancy.

Recent relevant project experience includes:

- Project Manager of the industry market study for CLPP. Don participated in the industry interviews and was a key contributor on the report. This included reviewing how management of planned and unplanned outages was undertaken by other transmission companies and the tools available from EMS vendors.
- Assisting a confidential client to develop their EMS requirements with a focus in the RFI and requirements on Planned outage management.
- Assisting Ausgrid on their ADMS Procurement and phased implementation since 2017. This has included delivery of a revised outage management solution and electronic switching and logging in the control room.
- Currently working for PowerWater Corporation with detailed review of testing approach for significant SCADA/EMS upgrade

Don holds a M.Eng.Sc (Power System Control), B.E (Electrical Engineering) and a B.Sc (Mathematics) all from the University of Sydney.

3.3.2. Dave Lenton

Dave has been the Managing Director of DGA Consulting for a decade and prior to this was a principal consultant at KEMA Consulting in both the UK and Australia for 10 years. He focuses primarily on the electricity network sector having worked for network operators in almost every state in Australia along with high profile clients such as the Nuclear Fuel Cycle Royal Commission. Experience covers business cases, regulatory submissions, market rules and strategy.

Relevant recent project experience includes:

- Produced and continues to maintain a business case and regulatory report for Ausgrid on the societal benefits of the ADMS.
- Worked with a confidential client to assess the potential benefits from an EMS across both existing assets and future opportunities for Renewable Energy Zones.
- Assisted on development of an RFP for a SCADA/DMS/EMS solution for a South-East Asian utility including leading development of the SCADA replacement business case.

Dave holds an Executive MBA (Distinction) from Warwick Business School, an MSc in Technology and Innovation Managements from Science Policy Research Unit in Sussex and a BSc in Economics from Warwick University.

3.3.3. Darren Geake

Darren is a Principal Consultant at DGA Consulting. He is an electrical engineer with over 30 years of experience in electricity utility operations and the application of operational technologies. He has consulting experience throughout Australia, NZ, Middle East and SE Asia and was the National SCADA Practice Manager at Logica / CGI and the Regional Manager M/East in SCADA/EMS for Leeds & Northrup / Foxboro.

Recent relevant project experience includes:

- Lead author of the industry market study for CLPP. Darren led the industry interviews and drafted the report on how key functions, including management of planned and unplanned outages, were undertaken by other transmission companies and the tools available from global EMS vendors.
- Assisting Ausgrid in their ADMS procurement and phased project implementation since 2017. This has included delivery of an integrated outage management solution and electronic switch-writing and execution in the control room.
- Currently working for PowerWater Corporation with detailed review of testing approach for significant SCADA/EMS upgrade and management of, and participation in, testing their upgraded EMS solution.

Darren holds a Master of Engineering (Res.) and Bachelor of Engineering (Hons) degrees in Electrical Engineering, both from the University of Sydney and has RPEQ certification.

3.4. DGA Consulting Approach

All due care and diligence has been taken by DGA in the preparation of this report within the time constraints allowed.

In reaching its conclusions, DGA has relied upon information provided by Transgrid, the RFI respondents and GEV, as well as knowledge derived from the DGA Consultants' expertise and experience in EMS and Operational Technology Projects worldwide. The provided information was supplemented by a process of discovery with Transgrid's representative and the RFI respondents.

DGA's experience with and recorded/unrecorded knowledge of other EMS/OT projects and the individual knowledge of the consultants performing the assignment formed the basis of DGA's assessment. This experience includes over 4 decades of detailed involvement with the specification, procurement and implementation of complex OT projects, covering SCADA/EMS deliveries from all major suppliers into Australia, New Zealand and SE Asia, plus associated projects involving enterprise network model management systems. Included in this are roles in over 20 SCADA/EMS projects, covering a period from the late 1970s to the current day.

In making our assessment we have considered the scope and constraints of the project being implemented by Transgrid including:

- Scope and scale of the project with a full and extensive EMS implementation upgrade as well as several other major projects such as Alarm Management, Data Management and Network Modelling and Operator Visualisation.
- Limited internal resources available at Transgrid and therefore utilisation of SI option to address resource gaps.
- Scope of EMS upgrade including revised software architecture of GEV solution
- Potential cost impacts of sole source EMS Contract with GEV given recently commissioned solution
- Expectation that all offshore SI resources would work on site in Australia
- Potentially high levels of configuration work with commissioning additional EMS applications and achieving situational awareness with GEV Vision project
- Potential for SIs and GEV to have allowed for a 3-sided management regime of the project (PM, Risk, Co-ordination etc); and
- Desired timetable for delivery.

Some of these scope elements and constraints are different from other EMS/OT projects, and this has been considered in undertaking our review of the expected Rough Order of Magnitude cost.

4. Summary of Transgrid's Project Scope and Capex

4.1. Scope of the Project

The scope of Option 1 for the uplift in capability includes the 9 initiatives listed below.

- Data Management and Network Modelling
- Enhanced EMS/SCADA
- Outage Management System and Switching Execution
- Fault Level and System Parameter Monitoring
- Alarm Management Technologies
- Operator Visualisation and Situational Awareness Technology
- Training Technologies
- Operational Documentation Management System
- Operational Planning System

4.2. Key Implementation Decisions

Transgrid have set a challenging timescale for delivery of the full suite of capability uplift projects. To assist in meeting this timetable, Transgrid have made two key implementation decisions.

1) **System Integrator Approach** – Transgrid will work with a SI, rather than contracting directly with the EMS vendor and managing their own suite of inter-related projects. Transgrid expect this to offer cost efficiencies by reducing redundancies when delivering a program of technologies and reducing delivery risk through ensuring all components function together smoothly with a focus on data and integration.
2) **Retention of Existing EMS** – Transgrid commissioned their EMS in 2022. Transgrid have decided that it would not be efficient to consider replacement with alternate technology. All of project scope and costing is based on an upgrade to the existing GEV EMS.

4.3. Project Timeline

The project timeline is detailed per project in the BOE[4] and applied in the PADR Calculation. The timeline is shown in Figure 4 Overview Project Plan for System Security Projects. The implementation project starts in January 2026 with the Enhanced EMS/SCADA, Data Management and Network Modelling and Alarm Management Projects with OMS shortly afterwards. The Enhanced EMS/SCADA project lasts from commencement to project completion in January 2029. A second set of projects covering Training Technologies, Operational Documentation Management and the Operational Planning System begin in November 2026 with completion by mid-2027.

There are two EMS enhancements starting in December 2027 and January 2028. This covers the Operator Visualisation and Situational Awareness Technology and Fault Level and System Parameter Modelling.

[4] BOE OFS-N2761 System Security Roadmap – Option A and B Basis of Estimate (BoE) - Rev 0

Project	Start	End	2026	2027	2028	2029
Enhanced EMS/SCADA	07/01/2026	26/01/2029				
Alarm Management Technologies	07/01/2026	26/01/2029				
Data Management and Network Modelling	07/01/2026	22/06/2027				
Outage Management System	01/04/2026	30/03/2027				
Training Technologies	04/11/2026	29/06/2027				
Operational Documentation Management System	04/11/2026	29/06/2027				
Operational Planning System	04/11/2026	27/04/2027				
Operator Visualisation and Situational Awareness Technology	06/12/2027	26/01/2029				
Fault Level and System Parameter Monitoring	31/01/2028	22/09/2028				

Figure 4 Overview Project Plan for System Security Projects (re-ordered for project start date)

4.4. Capex Costs for the Project

4.4.1. SI Costs

Transgrid have applied a market testing approach to the discovery of the costs with SIs providing Rough Order of Magnitude (ROM) costs. To undertake this market test, Transgrid developed an RFI document that contained a set of requirements for each initiative (or project). These requirements were aligned with the PSCR and broken down by Option 1-3 depending on the level of capability enhancement each function provided. Option 1 had 66 requirements, Option 2 had 127 requirements and Option 3 a total of 148 requirements. The SIs needed to commit to compliant, partially compliant or non-compliant for each requirement alongside a description of their solution and ROM Costing for each project[5].

Initially six SIs were invited to participate in the RFI process. These six SIs were all approved solution provider partners of the GEV EMS-SCADA System and broad technology system integrators for the 13 technology areas. GEV were not invited to respond directly as they had indicated they were unable to deliver on all 13 technology areas. In addition, the RFI was intended to assess the degree of use of GEV solutions for an optimal and efficient solution.

Four of the SIs were able to participate with two self-excluding for Auditor conflicts. The review of the SI solutions found that two of the SIs (SI A and SI B) provided suitable solutions across all technologies. Transgrid chose to continue the RFI process with these two vendors (noting this would not preclude any SIs being invited to participate in any future RFP).

The responses from all the SIs indicated that the broadest Option (Option 3) contained significant risks with technologies that are not yet available and a consequent high cost. This option was removed from future assessment. Two refinements were also made to the scope of Option 2 and Option 1. Revision 1 was to remove 'non-mandatory' features or unproven solutions that did not result in Operational Benefits by 2030. Revision 2 was to remove identified GEV cost duplication across initiatives. The adjustments included:

- Maintaining only high-impact functionalities directly benefiting control room operators.
- Deferring non-critical improvements.
- Removing from scope market solutions which are not yet mature.
- Removing duplicated licence costs

This resulted in 41 requirements being deleted from Option 1 and 2.

The scope refinements and discussions with SIs and GEV resulted in significant cost reductions from the first submissions by the SIs to the final estimates used in the PADR. There does remain significant differences in the costs of the two SIs, despite both using GEV labour and licences for part of the project. Transgrid have therefore used an average of the SIs cost to derive an expected cost for the SI proportion of the work effort.

The average cost of the two SIs reduced from $110m for the option 1 scope at the start of the process to $81m for the RFI Evaluation Report as shown in the chart below. There were some refinements resulting in a further reduction to $79.9m that was applied in the PADR.

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[5] Taken from RFI Evaluation Report – Executive Summary – RFI Results for System Security Operational Technology Upgrades – 20th May 2025

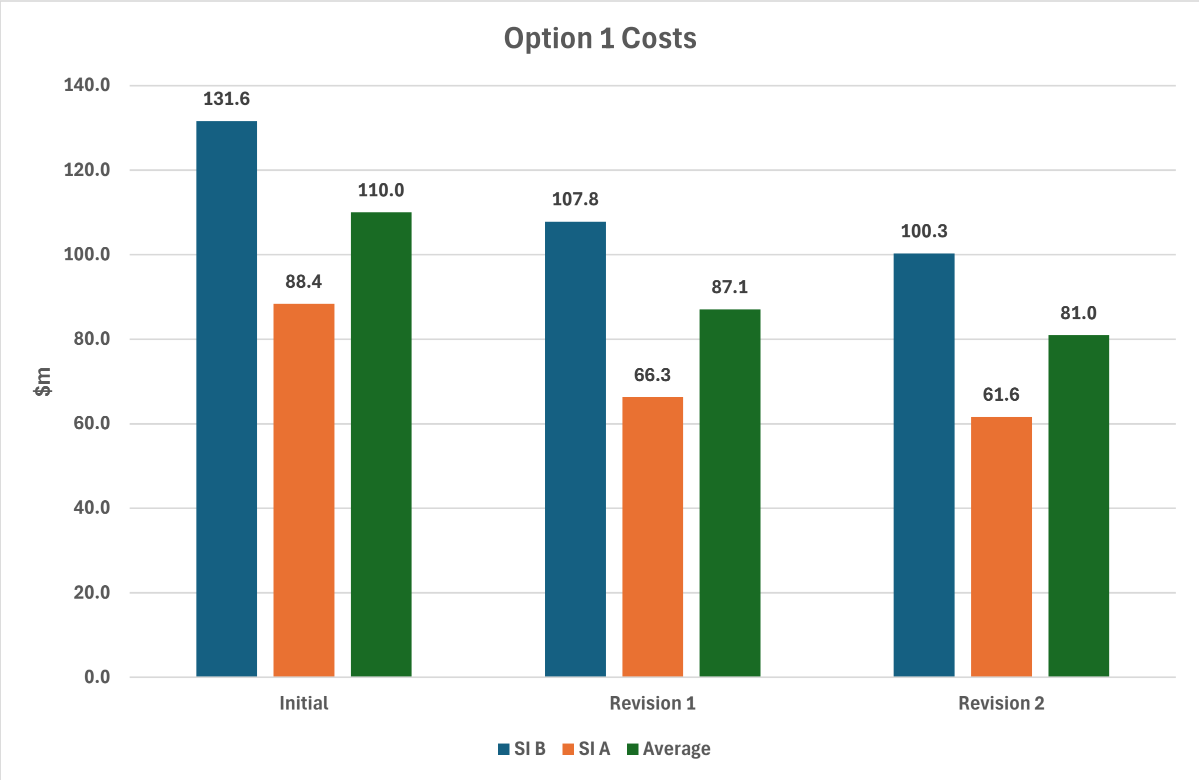

Figure 5 Option 1 Costs with Scope Revisions

4.4.2. Internal Costs

The internal costs have been built up using individual roles assigned across the expected three year duration of the project. The internal costs are made up of the following categories[6]:

Category	Cost	Category	Cost
Project Management	$6.2m	Change Management	$1.4m
Testing	$1.9m	Control Centre	$5.5m
Technology Architecture	$1.5m	Data Management	$1.7m
HSE	$0.04m	Outage Management	$0.7m
Close Out	$0.4m	SCADA Dual Homing	$2.1m

Table 7 Internal Project Costs

There was a total estimate of $21.4m of labour costs across all the projects (nominal).

As well as internal labour costs there is around $7.4m of equipment, materials and expenses (nominal). This is itemized in the Internal Labour Estimation (Option A) as:

[6] Cost as listed in the BOE OFS-N2761 System Security Roadmap – Option A and B Basis of Estimate (BoE) - Rev 0

- $900k for 6 high spec servers for operational planning
- $1m for Newcastle Date Centre Expansion
- $2.9m for SCADA Dual Homing
- $2.65m of expenses including $2.2m already spent on Alarm Management and CPA Preparation.

One other additional cost in the RIT-T spreadsheet, but not specified in the BOE System Security Roadmap, is an additional $2.99m that has already been spent on Alarm Management. This results in a nominal cost of $31.86 in the RIT-T Spreadsheet. Once converted into Real $24/25 this results in a total internal cost of $30.07m.

A small number of the costs specifically relate to a project. The remaining costs have been allocated across projects according to a percentage split associated with the use of a range of general activities including project management, testing, technology architecture, HSE and the Control Centre.

4.4.3. Contingency (P50 Confidence Level)

Transgrid's have identified a series of 12 risks for the projects with each having a likelihood of occurrence as well as a best case, most likely case and worst case scenario. The P50 contingency estimate is reflective of the way the SI and Transgrid internal cost estimates had been constructed with bottom up estimates and no contingency included with these forecasts. Given this lack of contingency in the base estimates it is important that a cost allowance is included separately within the overall project budget.

The P50 contingency estimates were evaluated with an @RISK assessment completed to consider the risk inputs. This resulted in an additional $7.3m (nominal) being added to the base estimate. The estimate is spread out across projects using the same percentage split applied to the Internal Transgrid costs. This is a nominal amount incurred for just over 3 years, so is a lower number when converting back to real $24/25.

4.5. Total Capex Costs

The costs reviewed are presented below by capex category and as a per project capex cost.

4.5.1. Capex Category Costs

An overview of the initial capex costs reviewed is shown in the table below.

Cost Category	Value[7]	Explanation
SI Costs	$79.9m	This figure was an average of the two SIs costs for delivering the specified projects.
Internal Costs	$30.1m	This is the sum of labour, equipment and materials cost including already expended cost for alarms.
Contingency (P50 Confidence Level)	$6.8m	Whilst the P50 contingency estimate was $7.3m this was a nominal figure and adjusted in the RIT-T calculations.

[7] All costs are in $2024/25. These are values from the RIT-T spreadsheet that have a small difference ($0.2m) to the numbers in the PADR

Cost Category	Value[7]	Explanation
CPA Submission	$6.2m	Costs for the CPA Submission[8].
Total Project Cost	$122.9m	

Table 8 Overview of Capex Costs included in the RIT-T Spreadsheet

4.5.2. Cost per Project

The cost per project split between SI costs, Internal Cost and Contingency (P50 Confidence Level) is shown below.

Project Activities	SI	Transgrid	Contingency	Total
Data Management and Network Modelling	$15.9	$3.0	$0.7	$19.5
Enhanced EMS/SCADA	$26.2	$16.5	$3.3	$46.1
Outage Management System and Switching execution	$0	$1.5	$0.3	$1.8
Fault level and system parameter monitoring	$5.3	$0.5	$0.2	$6.1
Alarm Management technologies	$11.5	$5.8	$1.2	$18.5
Operator Visualisation and Situational Awareness technology	$8.4	$1.5	$0.6	$10.5
Training technologies	$6.2	$0.5	$0.2	$6.9
Operational Documentation Management System	$1.8	$0.5	$0.2	$2.6
Operational Planning System	$4.6	$0.1	$0.1	$4.8
Total	**$79.9**	**$30.1**	**$6.8**	**$116.8**

Table 9 Capex Cost Split per Project $m 24/25

[8] DGA have not reviewed the cost of the CPA submission as we have focused on project costs.

5. DGA Review Approach

5.1. Overview of DGA Review Framework

To assist the review of both costs and timelines, DGA has proposed a framework in which the projects are grouped to reflect the relationships between initiatives. The grouping is shown in the diagram below, with further detail of each group of projects in the following sections.

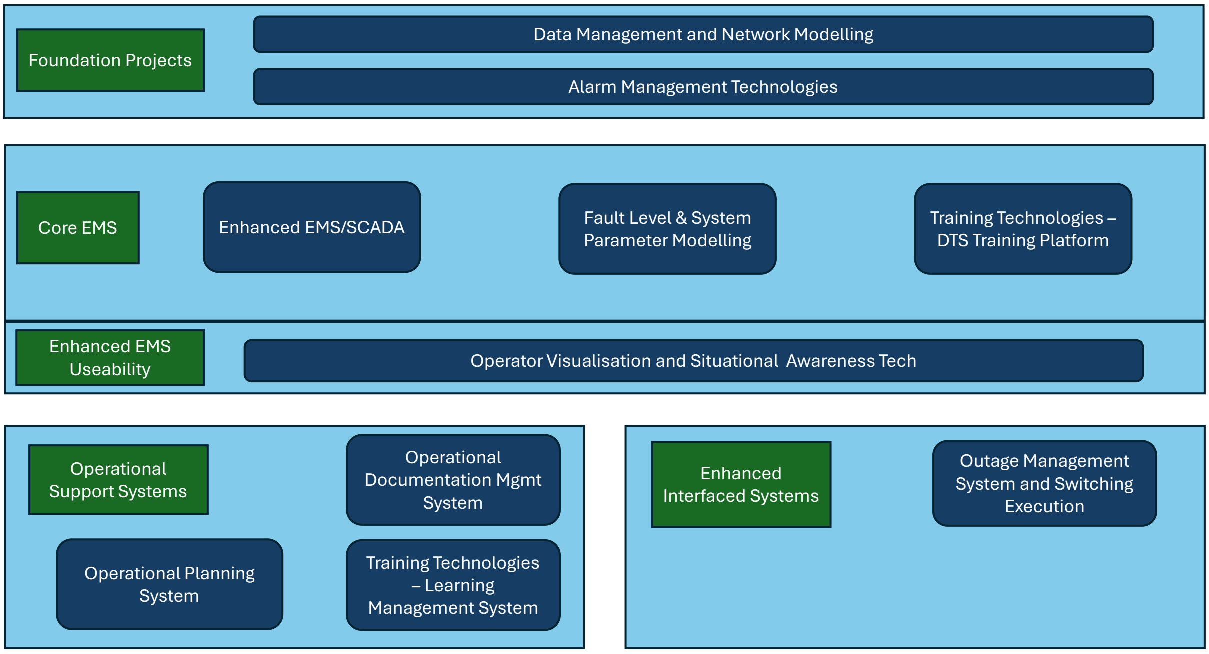

Figure 6 Overview of DGA Review Approach to System Security Roadmap Projects[9]

5.2. Framework Components for Cost Analysis

5.2.1. Foundation Projects

There are two foundational projects that are broad in their scope and impact as Transgrid endeavours to establish a Single Version of Truth for network asset data attributes and improved enterprise-wide alarm management. These are:

- **Data Management and Network Modelling** – The creation of a Single Version of the Truth network model management solution is a clear, but complex, goal for many transmission and distribution network businesses. Once created this solution would then be responsible for providing data with other systems using CIM data exchange. There is significant work in this foundation initiative in aligning business processes, aligning asset hierarchy and nomenclature and ensuring the ability to send, receive and process CIM models into different solutions.
- **Alarm Management Technologies** – Implementation of an Alarm Management Lifecycle to deliver Transgrid's Alarm Philosophy requires significant requirements definition, development, configuration, integrations and then testing. This is a critical part of the

[9] Some of these initiatives have been renamed in the PACR to better reflect the nature of initiatives. Enhanced EMS/SCADA has been renamed SCADA/AEMS system, outage management system and switching execution has been renamed outage management, and wide area and high speed monitoring has been renamed wide area monitoring.

solution with provision of data for alarm settings across multiple platforms and to aid the goal of rationalisation and reduction in alarms. The initiative will deliver significant benefits to Transgrid.

These two solutions cover challenging areas for utilities and may have more uncertainties than the other project areas.

5.2.2. Core EMS Projects

There is a group of projects that are considered "Core EMS", as they are functions that are delivered by EMS-based applications, are focused on delivering capability to EMS users, and would fit into a relatively "standard" delivery for an overall EMS solution. This group incorporates the following projects:

- Enhanced EMS/SCADA.
- Fault Level and System Parameter Modelling. and
- Training Technologies (Dispatcher Training Simulator)[10]

In DGA's view these capabilities are delivered as standard or common deliverables of most current-day EMS implementations, by the broad group of the EMS industry's technology suppliers, including GEV. It would be a common expectation across the industry that these capabilities were included in any new EMS implementation. While these solutions may be considered an enhancement to Transgrid's current EMS, they are now standard product offerings in many implementations worldwide and will provide Transgrid with many of the facilities already available to transmission operators internationally. This includes better modelling of renewables sources, improved state estimation, improved forecasting, look ahead and contingency analysis, fault level monitoring and an improved DTS.

As Core EMS capabilities these projects are seen as those that would fit into the typical minimum scope of an EMS implementation or upgrade. A wider, but still standard scope, is considered in option 2. **This means that typical EMS budget and timeline assumptions derived from our experience can be applied to the analysis of cost**.

5.2.3. Enhanced EMS Useability Project

EMS systems have powerful tools for displaying information about the power system. However, these tools have very traditional development roots that date back to when computer-based graphics were in their infancy. This often results in less-than-optimal use of currently available display technologies and contributes to concerns about lack of situational awareness in control rooms – particularly when coupled with the ever-increasing amount of raw data that is available to the Control Room. This is a project, based upon new GEV product capability (Vision), with aspirations to get all Operator information on a single pane of glass. The project itself is EMS-Centric but based upon relatively new EMS tools and therefore not Base EMS capability. These new tools are possibly immature and potentially complex. A significant level of user engagement will also be required to determine best use of available capability to meet goals

5.2.4. Operational Support Systems Projects

The Operational Support Systems are a set of three initiatives that are related to the Transgrid's operational environments and capabilities, but not closely related to the EMS. They cover:

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[10] This project is split in our approach with 50% of the costs allocated to Core EMS (to reflect the DTS) and 50% to Operational Technologies. This may be an underestimate of the Core EMS percentage, but any difference is not expected to alter our conclusions.

- **Operational Documentation Management System –** This is a system to capture and maintain operational knowledge with enhancements allowing improved access to operational manuals.
- **Operational Planning System –** Covers licences for Plexos (with an updated model), PSCAD and hardware as well as automating the production of planning scenario for PSSE OPDMS snapshots.
- **Training Technologies** – **Learning Management System** – This project was split in our approach between the uplift to the DTS (which is core EMS) and uplift in the Enterprise learning management system to document, track, report and deliver educational courses.

This is a relatively low risk set of improvements, which is reflected in the limited time (8 months) anticipated for implementation.

5.2.5. Enhanced Interfaced Systems Projects

In option 1 there is only a single project in this category. This is:

- **Outage Management System and Switching Execution** – There is already an existing project for a refresh of the lifecycle outage management system. The scope of this System Stability OMS project is for additional functions that are outside the current project. The requirements for this project will all be delivered by Transgrid as the current OMS solution is inhouse and Transgrid have the IP and skillset to deliver the project.

6. Project Timescales

6.1. Overall Project Timescale Risks

The project timescales have been reviewed with respect to their potential impact on the project costs. The project retains a broad scope despite reductions after discussions with the SIs. Reflective of this broad scope, DGA support basing the project timing on the SI B approach of a phased delivery of several clusters of functionality, which is a more achievable and lower risk approach than a single delivery for the full project scope.

The numbers and scope of activities is still challenging in the proposed timescales even with a cluster approach to delivery. We note the intention to reduce the risk by passing on much of the responsibility for delivery to a SI who are likely to have access to more resources than Transgrid. This will assist in faster mobilisation of a team and provides a single point of responsibility for the project. It does though create contractual risks/delays as well as challenges for project commencement that are outlined in Section 6.2. Risks on the sequencing of projects are discussed in section 6.3 with risk to the individual projects considered in Section 6.4.

6.2. Project Commencement

The PADR timetable was based on a 1 Jan 2026 start. Given the likely decision date on the CPA, and the subsequent activities before projects can commence, this date is no longer realistic. The length of the delay before commencement may depend on the contracting approach with the SI, which itself could create additional risk to the level of cost. Further detail on this timescale risk from contracting approach (and other schedule risks) are outlined below:

- **Commencement Timescale with Full RFT** – Ideally, to minimise Transgrid's delivery risk, a detailed contract with the SI would be agreed before project commencement. Achieving this outcome would require several activities including:
    - Comprehensive specification of requirements (across 9 projects this will take many months)
    - Procurement process (likely to involve SI response time, detailed evaluation, negotiation and potentially Joint Solution Design work)
    - Contracting and final negotiations.

  In our experience procurement timescales for solely an EMS Solution from requirements definition to contract award can take 9-15 months, or longer. Whilst this is an upgrade to deliver an enhanced EMS, rather than an EMS Procurement, there are many sub-projects, and it is likely the procurement timescale could be similar if a detailed contract award approach is required. This would imply an earliest project start of 9-12 months from commencement of development of the comprehensive specification of requirements.
- **Commencement with Alternative Form of SI Contracting –** One potential timescale accelerator that is being considered is having a form of umbrella contract with the preferred SI and then individual Contracts for each project as they are required. This would shorten the initial period of specification of requirements and the procurement process, but it does bring several risks:
    - Less Competitive Pressure for later projects.
    - Risks of lack of clear responsibility should the SI change; and
    - Reduced ability to plan projects in parallel with resulting efficiency savings.

An additional complexity is the current schedule has the largest projects (Enhanced EMS/SCADA, Alarm Management and Data Management and Network Modelling) commencing on the first day of the project. These projects are likely to require the most comprehensive specification so the saving from not having the full specification for all systems may be limited. It will be important to consider and mitigate the risks outlined above if this form of contracting approach is applied.

The impact of the change in start date to costs may not be that material for the overall cost if it allows for a better planned and procured project and Transgrid can accept a later delivery date for all deliverables. It may predominantly result in the time shifting of activities and costs, rather than any change in the quantum of cost. However, an increase in costs could arise if project resources start being deployed before the project is ready to commence the implementation phase. A cost allowance also needs to be included for the activities required in the procurement process.

One further risk arises if the project end dates become critical, requiring acceleration of the projects. This could lead to increased project costs as a less efficient ordering of projects may be required to hit a target delivery date.

6.3. Project Scheduling

The chart below shows the project scheduling split by project groupings as defined in DGA's review framework.

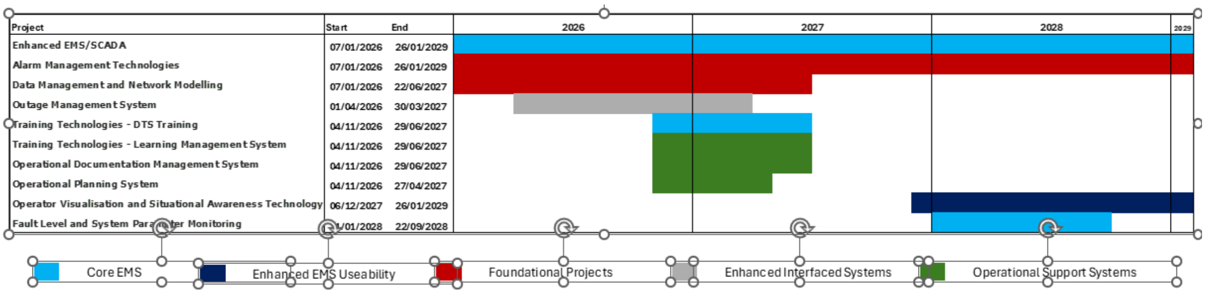

Figure 7 Project Timeline used in PADR Split by Project Groupings

There are a few observations from this schedule.

- The impact of the two Foundation projects on the EMS project needs to be clearly understood as there are significant inter-dependencies – although this is not as pronounced within the SI B approach using GEV's native Network Model Management tool. The EMS project can commence as a "standalone" upgrade project where the current EMS data sets (both network model and alarm configuration) are migrated as the base for the upgraded system. Preliminary work for the Foundation projects (defining data models, identifying data sources and adjusting work processes around building and updating the data repositories) would commence in parallel. The EMS would then be expected to become one of the existing data sources that will be used to populate the new Foundation data models. At a later point, the new Foundation data sets would then be used to re-build the EMS data sets, as they are the new "versions of truth" – supplanting the original EMS data sets and requiring re-validation. The overall process may be quite a complex one. This would not normally be part of a simple EMS upgrade and it should be confirmed whether the impact on costs from interdependencies has been fully considered in SI estimates.

- There is a period during the second half of 2027 when there is relatively little project activity on the Core EMS delivery. This incurs a risk of ramp up and ramp down on the projects with associated costs and difficulty retaining key project members.
- This lack of continuity of timing and implementation flow with Core EMS Projects may not be optimal. An EMS supplier would not normally choose to implement a core EMS implementation in such a fragmented way. Instead, they would plan a relatively efficient sequencing and paralleling of activities and a logical ordering of pre-dependent and post dependent sub-projects. A DTS, for instance would normally be sequenced at a time when all functional components required for network simulation have been implemented.
- The outcome of the Visualisation project is likely to impact on the Enhanced EMS/SCADA project. Ideally the revised visualisation approach should commence much earlier.
- The schedule assumes very tight timescales for all the Operational Support systems, with no obvious driver for a the mid-2027 end date. Consideration should be given to whether a longer timescale allow for more continuity of resources across projects.
- Whilst this is based on SI B approach (shown below) there are several differences and the justification for these should be clarified.

[redacted]

Figure 8 SI B Integrated Project Plan

6.4. Individual Project Timescale Risks

The table in Appendix A – Review of Project Timetables provides a review of each of the projects and our view on whether the project timetable is appropriate. Key observations are:

- **Data Management and Network Modelling Timescales (18 months)** – This timescale is tight given the challenges of engaging multiple Transgrid stakeholders, but the scope is reduced compared to Option 2. It requires defining an over-arching network data model, identifying all key data sources, aligning data models, cleansing data, adjusting work processes of multiple work groups, populating the new model and implementing CIM data flows between all target user systems.

- **Alarm Management (37 Months)** – This project has a realistic timeframe (same time as larger scope Option 2) and some of the asset naming convention work has already been undertaken successfully.
- **Core EMS Projects (37 Months)** – Some individual projects (e.g. DTS in 8 months) would have challenging timeframes, but when reviewed as a set these seem achievable.
- **Operator Visualisation and Situational Awareness Technology (13 Months)** – The project utilises relatively new GEV capabilities to present the information and there will be effort in understanding these capabilities and how they can be implemented to the satisfaction of the control room. Given the need for consultation, it may be better to have a longer timeframe during the Core EMS project timeline to allow delivery of this solution. This should not impact the overall project schedule.
- **Operational Support Systems (6-8 months)** - Well understood set of operational support systems and not highly inter-dependent. The timescales seem achievable and increased consultation could be included if timescale isn't critical.
- **Enhanced Interfaced Systems (5-12 months)** – These projects have limited activities and therefore a correspondingly small scope and budget. The timescales are appropriate.

6.5. Conclusion on Project Schedule

There are a number of recommended changes to the project schedule that have been identified in this review and should be assessed by Transgrid. This includes:

- Update start date for project commencement (with probable impact on the overall schedule).
- Assessment and probable extension of timeline for Data Management.
- Earlier Start for the visualisation project.
- Assessment of inter-dependencies between Foundation Projects and Enhanced EMS/SCADA and where possible improve the scheduling between these projects.
- Improve timing and implementation flow of the suite of the EMS Projects. Consultation with GEV would be useful to determine the optimal approach to scheduling.
- Consider Longer Duration for Operational Support Systems projects to improve internal consultation.
- Confirm that timetable can align with SI delivery timetables.

Any changes to the schedule need to feed back into the costing to ensure that the implementation plan and the costs align.

7. Capex Cost Review

7.1. Vendor/SI Costs

7.1.1. Review of SI Approach

Transgrid are seeking an SI model for the delivery of the project. This approach assists with two project objectives:

1) **Ability to Deliver Complex Project Scope in Short Timescales**– The choice to use an SI to deliver the suite of projects overcomes the challenges of trying to manage multiple sub projects with many interactions in a short timeframe. A large SI should have the ability to quick scale up/down resourcing levels and acts as a single responsible entity that can commit to the required timescales. The SI should reduce risk by sourcing a team of SMEs and project experts and provide a coordinated approach across a complex program of work. This should assist with timely delivery and prudent project spending and minimise the impact on Transgrid's business as usual operations.
2) **Market Sounding for RIT-T Assessment –** Using an SI allows Transgrid to undertake market sounding of the ROM costs with the SIs. The AER require cost estimates to have a strong basis and expect these to be accompanied by supporting evidence. The RFI process allows Transgrid to demonstrate the rationale for its major cost element.

The RFI process provided a number of benefits for the scoping and estimating of the program:

- **Opportunity to refine requirements** – The SIs have experience and an understanding of market trends and developments in the industry. These insights have informed Transgrid's options with a significant refinement from the original RFI. This has led to a more deliverable program of work and reduction in cost.
- **Innovation of Solutions** – The RFI allowed for options for delivery of the requirements. Whilst predominantly consistent solutions were proposed, the SI do have differing approaches and alternative solutions, which can be explored in more detail in the RFP process.
- **Understanding of Likely Cost** – The scope of work in this project hasn't previously been delivered in Australia. The RFI process has provided the opportunity to gain cost and risk information from the SIs, which has influenced expectations. This has been reflected in the de-scoping of options 2 and 3.
- **Facilitate Competition** – The RFI process has signalled to the market the opportunity for SIs. There were four respondents to the RFI and although only two were used to refine requirements and cost expectations, all SIs could be invited to a formal RFP. There was strong interest from the SIs.

There are limitations in this process applied by Transgrid including:

- **Need to use GEV Solutions** - The GEV EMS is a proven solution that has only recently become operational at Transgrid. Both SI approaches will need to work with this EMS platform. This may restrict the level of innovation and any competitive pressure for the GEV proportion of the project.
- **Limited Comparable Experience of the SIs** – The inputs for the process primarily came from 2 SIs. [redacted]

[redacted]. These limitations reduce the confidence of the estimates from both SIs.

- **Need to Further Refine Solutions/Costs** - A longer and more interactive process would be required to fully understand the proposed solutions, including alternative products. There are significant cost differences between the SIs that appear to reflect more than the level of divergence in proposed solutions and DGA retain some concern on potential overlap between the roles of GEV/SI and Transgrid. The review process would benefit from further work with the preferred SIs. This level of detail may be more appropriate for an RFP and/or a Joint Solution Design activity. The current level of interaction with the SIs has been appropriate for, and to some degree in more detail than, an RFI process. Further interaction may impact on the competitive nature of the RFP process.
- **Non-Binding High Level Costs -** This process utilised an RFI where estimates are non-binding. There is a risk these costs will change during the RFP process. The RFI estimates were intended to be ROM, with an Upper estimate of +25%, and lower estimate of -10%, which is a relatively large range. Whilst there is a risk that these costs change when subject to a binding proposal, it is in the SIs interest, when responding to the RFI, to provide realistic estimates to ensure there is sufficient budget for the procurement process and that the business case is viable.

The process followed has delivered indicative SI pricing for Transgrid and provided refinement of the solutions to reflect industry experience. There are significant gaps in the indicative costs of the proposed options between the two SIs. This requires caution in how they are applied. Given the cost differences between the 2 SIs, it may not be appropriate to simply average the costs provided.

Given the constraints of the timetable, scope of the proposed capability uplift, Transgrid's relative inexperience with the current EMS and level of internal resources available, an SI approach appears practical. An important benefit is that it provides a single contracting entity that can be held responsible for delivery of the projects including any sub-contractors. Managing multiple contracts with multiple suppliers is not recommended due to the risk to full functional delivery and/or timely completion with a potential conflict around responsibility. Should any of these constraints or justifications for using an SI change, then an alternative delivery approach should be considered.

The decision to continue with the GEV EMS also seems reasonable given it represents one of the leading EMS products in use in Australia and has only recently been commissioned. The alternative option to potentially use a different vendor's solution could come at a higher cost, as well as introducing a major disruption to the business through its implementation.

7.1.2. Review of SI Costs

This review considers both the comparative level of the SI Costs for each project area as well as a review of the quantum of each cost against the project group specified.

The costs originally reviewed were SI B Costs of $100.3m, which were 63% higher than the SI A cost of $61.6m. These costs include all GEV Costs as the SI is responsible for management of all GEV interactions. A comparison of the SI Costs using the grouping of projects is shown in the chart below.

This chart shows the breakdown of the SI A/SI B costs as presented at the end of April 2025. The SI A costs were slightly higher than the amount used in the PADR. This resulted in an average SI Cost of $81.0m compared to the $80.0m in the PADR. This difference does not materially impact any of our conclusions. The chart shows significant cost differences for the Core EMS project as well as some material differences in other project areas.

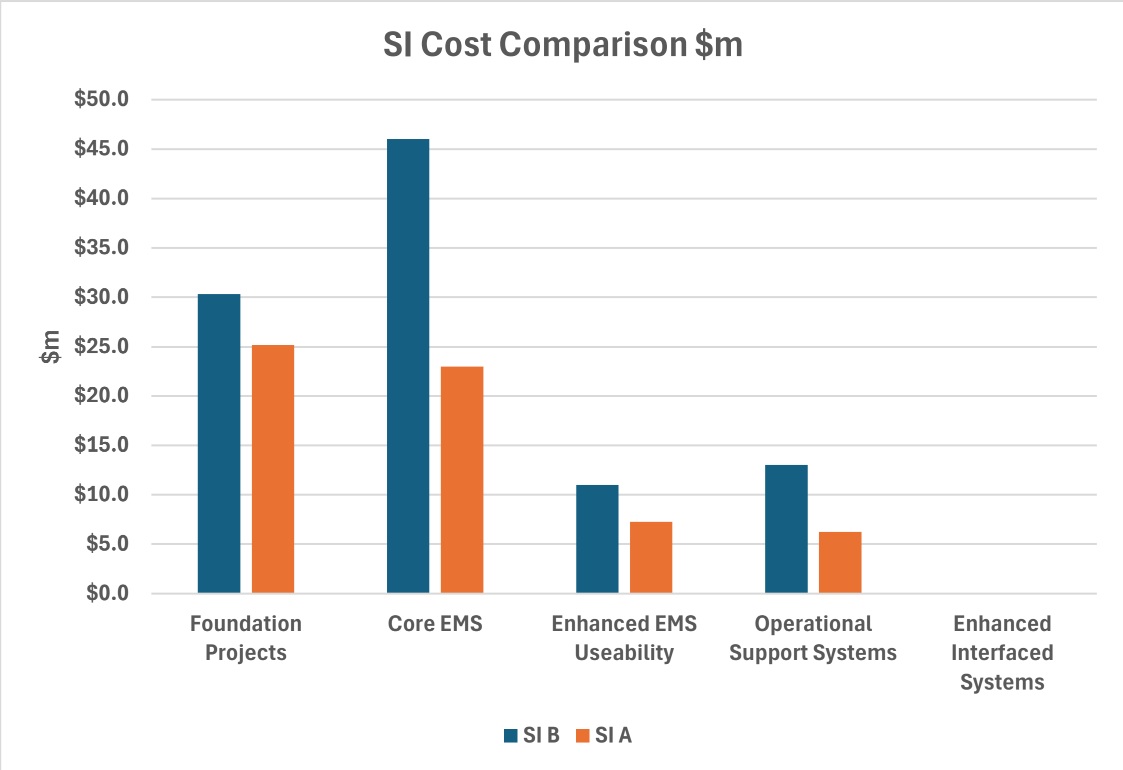

Figure 9 SI Original Cost Comparison from April 2025

As part of the cost review, DGA have worked with the SIs to understand how they have allocated the GEV costs. SI A realised they had used a superseded version of the GEV Costs, which were $[redacted]m compared to the final version of $[redacted]m[11].

SI A updated their costs in June 2025 to reflect these changes. SI A reduced their GEV costs by $[redacted]m, but also made a small amendment to their Enhanced EMS/SCADA costs which increased those costs by $[redacted]m, with a net reduction of $[redacted]m. This resulted in a revised cost estimate from SI A of $58.7m. A comparison of the SI A and SI B costs after the revision are shown in the chart below. This latest update shows SI B costs being over 70% higher than the SI A costs[redacted]

Cost	PADR Costs	April 2025 Costs	Costs June 2025
SI A	$59.5m	$61.6m	$58.7m
SI B	$100.3m	$100.3m	$100.3m
Average	$79.9m[12]	$81.0m	$79.5m

[11] Some of the original (April 2025) GEV numbers had to be estimated from SI A totals. The June 2025 numbers are based on a clearer breakdown from GEV.
[12] This is the number used in the RIT-T spreadsheet that were used for the PADR Calculations.

Table 10 Comparative Table of SI B and SI A Costs

The most significant difference between the SI B Costs and June 2025 SI A costs is in the Core EMS area where the SI B costs were $22.7m higher. A proportion of this difference would reflect hardware costs which for SI A are lower and split over several project areas with around $3m allocated to the Core EMS, as against an $11.1m SI B hardware cost for Enhanced EMS/SCADA. Removing the hardware costs, there remains a large difference approaching $15m for a similar scope of services to deliver the Core EMS. SI A also included significantly lower costs for the Foundation Projects ($6.7m lower) and Operational Support Systems, which were less than half of the cost of SI B at $6.0m to $13.0m.

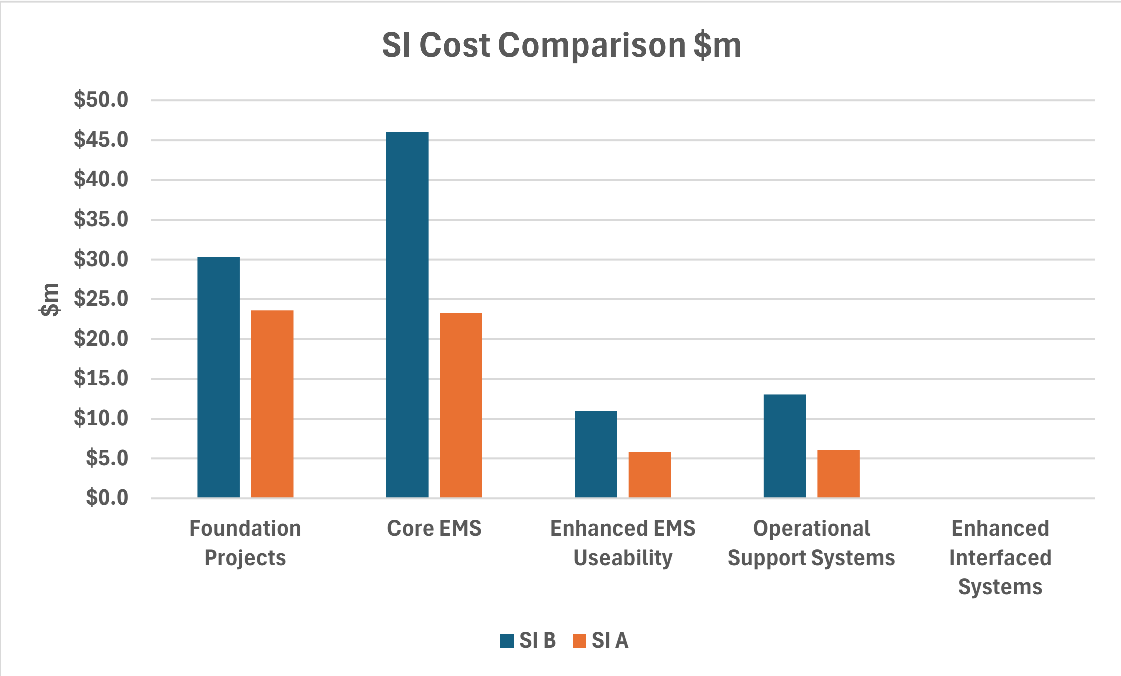

Figure 10 SI Revised Cost Comparison

A more detailed review of the cost for each project area is provided in the table below.

Category	SI Costs	Commentary
Foundation Projects	SI A[13] -$23.6m SI B -$30.3m GEV $[redacted]m (included in both SI costs) Avg- $27.0m PADR - $27.3m	For the Data Management and Network Modelling projects both SIs aim to establish enterprise-wide data sources that will be considered reliable single versions of the truth for use by multiple target systems, including the EMS. The proposed solutions have a similar cost of $15.4m-$16.1m involving substantial software license costs and significant GEV configuration efforts ($[redacted]m). The restriction to Option 1 scope has removed some of the integration effort, but there remains a broad set of stakeholders to be engaged with the challenge to agree data sources, models and attributes to support a common model.

[13] SI A costs are the latest cost provided in June 2025 update.

Category	SI Costs	Commentary
		The Alarm Management functionality is focussed on alarm rules, improved grouping, suppression of alarms etc to improve the Control Room's ability to process alarms. This contrasts with Option 2 where correlation of data from multiple external sources is required and where greater levels of risk are foreseen. Whilst the average SI Alarm Management costs seem realistic, it is difficult to understand why one SI is double the cost. The overall SI Costs for the Foundation projects seem low with a concern on whether the Data Management costs are sufficient for the level of difficulty of the project.
Core EMS	SI A -$23.3m SI B -$46.0m GEV - $[redacted]m[14] (included in both SI costs) Avg- $34.6m PADR - $34.6m	"Core EMS" encompasses three "projects" and aligns with the functionality DGA would typically expect to see in a standard EMS project. GEV implementation costs are $[redacted]m and do not include any hardware supply. The total GEV cost ($[redacted]m) is comprised of software license upgrades (existing licenses are perpetual) and software implementation. Even considering the migration to Grid OS and the possibility that the current EMS may not have implemented some of these functions, these upgrade-only costs are relatively high. The additional SI-only costs are $[redacted]m. Acknowledging that the SI will be responsible for a number of external interfaces, these costs seem high. Considered in combination with GEV costs, DGA considers the total estimated cost for the Core EMS to be high. This assessment recognizes that Transgrid has limited resources that are familiar with the GEV EMS and are therefore dependent on the SIs to fill those resource gaps. There is a risk of SI/GEV duplication of effort and/or excessive risk allowances. This is illustrated by both SIs using the same underlying GEV cost estimates, yet describing quite different expectations of GEV's delivery responsibilities. One of the SIs indicated that GEV provided a price not a plan and that has made it harder to fully understand the allocation of effort.
Enhanced EMS Useability	SI A -$5.8m SI B -$11.0m	The Operator Visualisation and Situational Awareness project is aimed at achieving vastly improved capability in data presentation, information navigation and "drill-down"

[14] Assumes that all the GEV costs for training technologies relate to core EMS.

Category	SI Costs	Commentary
	GEV- $[redacted]m (included in both SI costs) Avg- $8.4m PADR -$8.4m	methods to enable the Control Room to more quickly and accurately assess complex scenarios as they occur in the power system. The approach will be built around a relatively new software release of a product called GEV Vision. GEV has allowed a relatively low level of effort in their costing. In DGA's assessment there will be significant effort required by SI users to understand the capabilities of this new product and become familiar with the way in which it can be best configured and utilized. This will need to be supported by GEV product experts. Prototypes will then need to be developed in consultation with Control Room users and socialized with broader user groups. Related work processes may require analysis and/or re-engineering. Finally, a significant (probably largely manual) effort is needed to fully implement the solution. DGA considers that the estimates for this sub-project are lower than required.
Operational Support Systems	SI A -$6.0m SI B -$13.0m GEV - $[redacted]m Avg- $9.5m PADR - $9.5m	The primary difference between the SIs in this cost category was the Operational Planning System cost with a SI B cost of $6.5m compared to an SI A cost of $2.7m. For labour, SI B's cost is $3.9m and only $0.6m for SI A. Considering that both SIs indicated compliance with all requirements, the significant disparity in costs is challenging to justify. SI B presents a higher cost option for other operational support systems. The method of averaging the system integrator costs appears to result in a comparatively high expense for this set of projects.
Enhanced Interfaced Systems	SI A -$0.0m SI B -$0.0m GEV -$[redacted]m Avg- $0.0m PADR -$0.0m	The SIs have no roles in these projects for option 1.

Table 11 Costs Review per Project Grouping

7.1.3. SI Cost Conclusions

For the purposes of an overall review of SI costs, DGA has considered the projects in two main groups (described below) and one smaller group of Operational Support Systems and Enhanced Interfaced System projects.

The first main group consists of the Core EMS projects. This group of projects will be executed with significant input of both product and domain knowledge from GEV and are considered lower risk.

The second main group of projects consists of the two Foundation Projects (Data Management and Network Modelling and Alarm Management) and the Operator Visualisation and Situational

Awareness project. The full scope (Option 1 and 2) for this group of projects are considered to have high impact, need broad engagement with the business and higher risk. The assessment considers both the Option 1 scope and how risk has been reduced from the fuller scope proposed in Option 2.

DGA has the following observations:

Core EMS Projects

- DGA believes the SI B Core EMS cost estimate of $46m is excessive. SI A's cost for Core EMS projects ($23.3m) appears more reasonable noting there is a limited scope of delivery compared to Option 2.
- Given the cost difference DGA does not believe that it is a valid exercise to simply average the costs for the group of Core EMS projects.
- A cost estimate for the SIs representing the upper end of a more efficient Core EMS delivery would be around $10m lower than the average of the 2 SIs ($34.6) including all hardware costs.

Foundation and Visualisation Projects (Higher Risk Project Group)

- DGA considers that both SI's estimates for Data Management and Network Modelling are low, given other utility's experiences with designing and populating "Single Versions of the Truth" which are intended to feed adequate, accurate and fit-for-purpose data sets to multiple disparate groups within a network business. Whilst the restriction to Option 1 has removed some of the integration activities, there is a broad set of stakeholders to be engaged and a challenge to agree data sources, models and attributes in a common model.
- DGA do have concerns on the risks of the Alarm Management project covering Option 1 and Option 2. Option 2 included more pro-active requirements with correlated data from multiple external sources and linking alarms to events. Option 1 is more focussed on alarm rules, improved grouping, suppression etc to improve the Control Room's ability to process high alarm volumes and ensure managed risk and effective decision making. This split of activities means there is less risk and uncertainty with the Option 1 scope. The average of SI costs ($11.5m) would appear to reflect the complexity of the tasks for Option 1. However, DGA are concerned by the difference of the two SIs cost with one estimate of $15.4m and one $7.6m. These differences should be explored more with the SIs.
- The Visualisation project for Option 1 is focussed on migration/improved presentation of existing data to include a Single pane of glass view to replace the network single line overview screen. It is based on a relatively immature GEV product and will require significant effort to design, prototype and deliver an acceptable result. However, the restriction to predominantly displaying existing data rather than a wider expansion in the integration capability of the EMS/SCADA does limit the risk. In DGA's view the average of two SI prices for Option 1 ($8.4m) appears low. It is driven by a much higher SI B Cost ($11.0m) compared to SI A cost ($5.8m) and these differences should be explored with the SIs.
- Each of these projects is more innovative in nature, compared to Core EMS, and each carries a higher risk as a consequence. However, the restriction to only Option 1 has reduced the risk level for two of these projects compared to the Option 2 solutions. The scope of the data management project still contains many challenges, and a further assessment should be made of whether there is sufficient allowance for these challenges within the project budget.

Operational Support Systems and Enhanced Interfaced Systems Projects

- These set of projects are relatively low cost, but the SI B costs ($13.0m) are double those of SI A ($6.0m). There is no obvious driver for this difference. Considering the experience of the SIs, it is recommended to apply a heavier weighing towards the SI A costs rather than a straight average of the SI Costs.

7.2. Internal Costs

7.2.1. Review of Internal Cost Approach

The approach to internal cost is outlined in the document 'Internal Labour Estimation (Option A)'. This contains a breakdown of labour usage as well as equipment, materials and expenses that are required, but not provided by the SI. The document has been reviewed in conjunction with the application of the calculation applied in Operational Tool RIT-T Cost Inputs (Final1.0).

In our view the approach is appropriate and breaks down each role according to when the resources are required with a start and finish date for each project. Our review of approach does highlight 4 areas for potential revision:

- Overlap with SI Resources
- Cost Assumptions for Labour and Materials
- Real and Nominal Calculations in the BOE System Security Roadmap; and
- Additional Scope Costs

Overlap with SI Resources

The internal labour estimate specifies that inputs to the calculations include RFI responses from the SIs. The SI B response indicates a consistent Transgrid headcount resourcing of less than 10 FTEs involved at any point in the program[15] even with the assumption that the original Option 3 was required alongside the full scope Option 2. In contrast the average Transgrid resourcing, even after the descoping of Option 1, is over 15 FTEs across the duration of the program.

Potential resource overlaps have been reviewed with Transgrid and the SIs. Two areas identified for potential overlap were project management and architecture. The review with Transgrid indicated a desire to maintain some redundancy in key roles such as project managers, to mitigate the impact on the project should the SI engagement end before the end of the overall program. Transgrid require internal involvement in key areas such as architecture to ensure long term ownership of the solution design and provide timely reviews and approvals of vendors designs.

Transgrid's grouped allocation includes a total of $6.2m of project management resources across the program, equivalent to $2m pa. A list of the role activities suggests that some of the roles allocated to other categories also primarily reflecting 'Project Management' activities so this budget could be even higher. Given that the project management role involves managing a responsible SI, this remains a significant cost and should be considered in addition to the SI's own Project Managers/Project Directors.

[15] Vendor B System Security Operational Technology Upgrade – Part 2 RFI Submission – 29 Nov 2024 Supporting Document Project 26308 – Transgrid - Slide 27

The SIs have agreed to review how Transgrid resources could be incorporated within their project cost calculations. SI B have identified areas where Transgrid resources could substitute for SI resources, but no cost re-calculation has been applied. This approach should reduce the risk of overlap and result in a

small SI Cost reduction.

Cost Assumptions for Labour and Materials

The labour rates that have been used account for the temporary nature of these hires (or temporary backfill labour) required to meet project demands. The overall mean average rate is slightly above $230 per hour, with rates ranging from $180 per hour to $374 per hour for a Level 4 Manager, who has a relatively low number of hours.

The rates all seem consistent with the market rates. The one rate that may require challenge is the Senior Project Manager at $322 per hour as a full-time position over 3 years. Given the duration of the position, it may be possible to negotiate some reduction in this cost particularly as the SI will want to have their own Project Director and this will diminish the scope of this role.

Apart from the labour costs, there is $7.4m for equipment, materials and expenses (nominal). The materials ($3.9m) are all itemized and all the equipment, material and expenses seem appropriate for this type of project. Clarification is needed on the inclusion of the already committed costs for Alarms ($3m) and the Alarm Management/CPA cost ($2.2m included in expenses). Are these separate costs, or is there any double counting between these amounts?

Real and Nominal Calculations in the BOE System Security Roadmap[16]

The BOE System Security Roadmap details an internal expenditure of $28.9 million, which contributes to a Project Raw Cost of $108.8 million prior to the application of Risk Management and CPA. However, this amount does not account for the separate cost of completed work on Alarm Management, which amounts to $2.99 million. Consequently, the actual internal cost exceeds $31.8 million (nominal). This figure is included in the RIT-T spreadsheet and thus factored into the PADR calculation.

The calculations presented in the BOE Roadmap table are misleading as they sum nominal and real values. It is recommended that the BOE document's table convert all figures to real dollars.

Additional Scope Costs

Discussions with Transgrid as part of our review have identified a number of additional internal costs that need to be included. These include:

- **Costs for RFP Development and Contract Negotiation** – There will be costs in the time and resources needed to develop a detailed RFP and then agree the requirements with the preferred vendor. Ensuring that time is spent in developing a clear unambiguous contract specification will provide benefits in reduced contract variations during the project.
- **Costs for Contractor/Employee Recruitment** – There will be a cost incurred to recruit the specialist resources either directly for the project team or for backfill roles. There is an additional benefit in that some of these resources may also be required for on-going roles after the project is delivered.

[16] Cost as listed in the BOE OFS-N2761 System Security Roadmap – Option A and B Basis of Estimate (BoE) - Rev 0

- **Control Room Facility Costs** – There are likely to be facility costs to accommodate enhanced visualisation (monitor, video wall etc). These facility costs do not include any structural changes or address control room growth or improvements to buildings.
- **Testing approach for multi-phase delivery** – The project approach has a multi-phase delivery with several clusters. These clusters are all likely to have significant testing with Pre-FAT, FAT, SAT, UAT, all of which are likely to involve Transgrid resourcing to undertake and witness the tests. The current testing budget of $1.9m is unlikely to be sufficient for the breadth of the projects and this should be reassessed.
- **Change Management Approach for multi-phase delivery** - A change management budget of $1.4m may not be sufficient for the required level of change, particularly with the Foundation/Visualisation projects and multi-phase delivery. This needs to cover the broad engagement with multiple stakeholders needed to gain agreement and support for the Foundation projects. A similar revalidation as the testing cost should be done for Change Management costs.

7.2.2. Review of Internal Costs

The review of the approach has highlighted potential changes that need to be assessed, but the overall quantum seems reasonable given the project scope. There may also be refinements to reflect any project scheduling revisions once the ordering and duration of projects is updated. The current costs are shown in the table below. The additional $6.2m of CPA costs has been excluded from the assessment as they will represent a sunk cost.

Category	Nominal	Real 24/25
Labour Costs	$21.4m	$20.0
Equipment, Material and Expenses	$7.4m	$7.1m
Already Incurred Alarm Costs	$3.0m	$3.0m
Total	**$31.9m**	**$30.1m**

Table 12 Breakdown of Internal Costs in Nominal and Real $24/25

One further consideration relates to the allocation of costs between projects. The majority of internal costs are grouped and then allocated using a Transgrid percentage to projects that are being implemented. This includes Project Management $6.2m, Testing $1.9m, Technology Architecture $1.5m, HSE <$0.1m, Control Centre $5.5m and Change Management $1.4m.

There were also costs allocated to specific projects which include (by project grouping)

- **Core EMS Costs** - Includes all the cost of Equipment, materials and expenses $7.4m, SCADA Dual Homing $2.1m and Close out Costs $0.4m; and
- **Foundational Projects** – Includes $3.0m spent on Alarms and $1.7m identified as data management.

The results of this allocation are shown in the chart below. This results in around 58% of costs being associated with the Core EMS implementation.

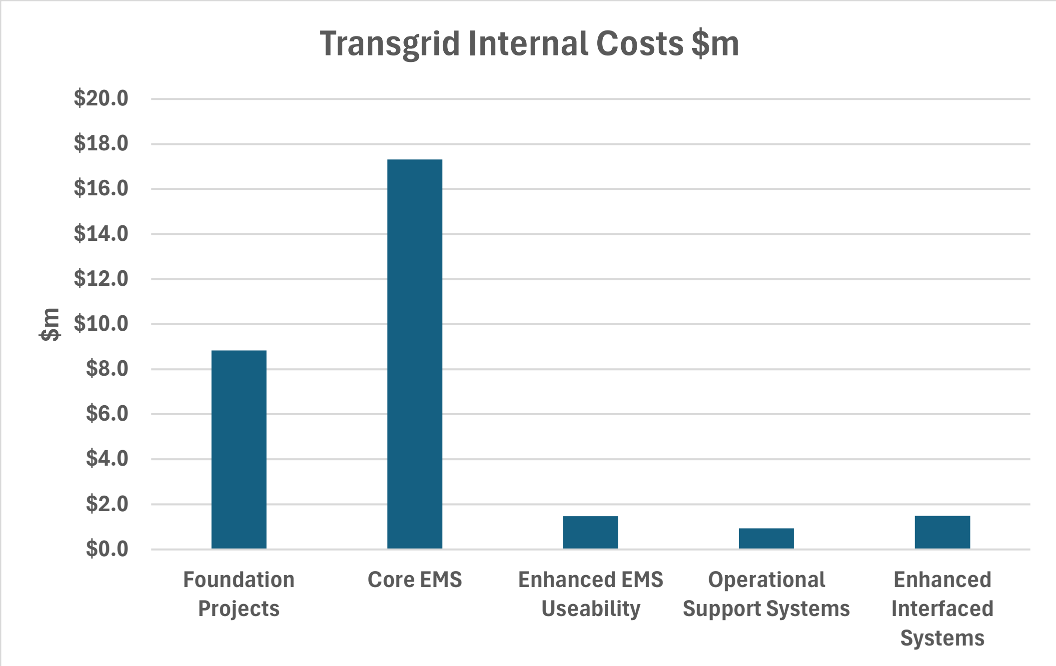

Figure 11 Allocation of Transgrid Internal Costs

A review of the internal resource requirements of each project group is provided as Appendix B – Project Cost Allocation for Internal Costs. Key observations are:

- Core EMS with around 58% of the internal costs has an allocation that is too high.
- Foundation projects, which requires extensive stakeholder engagement, change management and testing, has an allocation that is too low; and
- Visualisation project requires close consultation with Operators, change management and testing and may require a longer duration. The allocation of internal budget is too low.

This allocation of internal costs may be an issue should the AER/Transgrid decide to only proceed with a subset of projects. However, the integrated nature of the program with shared resources does mean that removal of individual initiatives will not simply allow the reduction of the allocated internal costs.

7.2.3. Internal Cost Conclusions

The internal costs approach and numbers appear robust. However, there is a need to update the internal costs in order to:

- Reduce any overlap with SI costs. During the RFP process Transgrid could provide guidance to the SIs on internal resourcing.
- Add additional scope costs highlighted in section 7.2.1
- Confirm no double counting of alarm costs and ensure clarity on real and nominal inputs used in the cost calculation; and
- Refinement of the allocation of costs between projects

It is expected that these changes will lead to an increase in internal costs. Further details on the additional costs (particularly the control room upgrade) are needed to derive the exact amount, but it is expected to be in the region of $5m.

7.3. Contingency (P50 Confidence Level)

7.3.1. Review of Approach to P50 Contingency Estimates

The AER specify that they '*expect TNSPs to comprehensively and transparently identify and assess the different project risks for which it is seeking a cost allowance*'[17]*.* Transgrid have taken this approach and separately reviewed each of the potential risks and within their cost assessment included the potential cost impacts using a best case, most likely and worst case scenario multiplied by the likelihood of the risk occurring.

Transgrid have sought to be as transparent as possible in presenting its costs and have built up the internal cost estimates in a bottom up manner without allowing contingency for risks. In line with this approach the SI Costs estimates have also excluded contingency. However, there is a need to have a mechanism to account for the potential for cost increase for risks that exist, without a funding allowance, in a 4 year program. Transgrid have therefore documented the set of risks along with a probability and likelihood. The overall estimate is calculated using a P50 confidence level, meaning there remains a 50% change it may be exceeded.

This approach is well set out for each of the 12 identified risks and whilst we have comments on the input parameters for the major risks, several of which seem too low, the overall approach seems robust. Some of these risks could be managed through the contract, but this itself may result in a higher cost for the SI and not an overall efficient level of cost for the project.

There is a question on whether all the risks need to be evaluated given that only a subset are material. Removal of some risks could simplify the process and improve the targeting of effort towards the main priorities. DGA do also have a concern on the application of a mixture of real and nominal dollars, and this is documented in section 7.3.2.

One observation on the set of risks identified is that they are dominated by two risks with high value and high probability. Given the scale of these two risks, it would be appropriate to undertake further analysis to try and mitigate the risk of the worst-case scenario emerging and ensure the input parameters are set at a realistic level. An analysis of these larger risks is undertaken in section 7.3.2.

A minor concern is that DGA has not been able to replicate the @risk calculations when running the risks in Crystal Ball. Our analysis resulted in a slightly higher expected risk cost for the P50 and P90 calculations. This is likely to be a reflection of different software solutions.

7.3.2. Review of Contingency (P50 Confidence Level) Estimate

Our review of the estimation process breaks down into four areas.

- Review of Total P50 Contingency Estimate
- Nominal and Real Cost Calculations
- Review of individual Risks; and
- Contingency Allocation across Projects

Review of Total P50 Estimate

The P50 contingency estimate included for this project is $7.3m in nominal terms and $6.8m in real $24/25. With a cost estimate before contingency of $108.8m, this represents a contingency allowance of 6.2% This is low for this type of project particularly for the level of uncertainty that exists with the Foundation Projects and the Operator Visibility projects. We note that SI B

[17] AER – Guidance Note – Regulation of actionable ISP projects – March 2021

recommend an additional 15% of the total project value for contingency[18], which is significantly higher than the current contingency estimate.

DGA have reviewed the key input parameters for risk and provided suggestions on potential changes. This may increase the contingency allowance slightly but still maintain a relatively low overall level.

Nominal and Real Cost Calculations

The P50 contingency estimate appears to merge real and nominal numbers. As an example, if the risk is expected to be a percentage of an SI's cost (which is real $24/25) then the P50 contingency value should also be in real $24/25. However, all risk values are treated as if they are nominal amounts and occur over the same years as the internal Transgrid project costs.

In our view, given the majority of the risk value relate to the SI Costs, it would be better if all calculations were undertaken in real $24/25.

Review of Individual Risks

There are only 4 risks that have a most likely value multiplied by likelihood above $300k. The assessment has therefore focused on these risks. Key observations are:

- The most significant concern is the impact values applied to the contract variation risk. These are currently 0.5%, 2% and 5% of SI Contract Value and seem much too low for a project with this duration and level of uncertainty. These need to be reassessed and are likely to see a significant increase in this risk.
- The risks are based on an SI cost of $100m and the values should be updated to reflect the final expected SI cost.
- The monthly value of risk for internal resourcing may be too low, but the overall risk when considering likelihood is probably appropriate.

Contingency Allocation across Projects Groupings

One final area of concern is the appropriateness of the contingency allocation with internal costs. Our assessment indicates that the 2 Foundation Projects and the EMS Usability project exhibit the highest level of risk. However, this is not adequately represented in the contingency allocation, either as a percentage or as a total amount. Almost 50% of the contingency allocation is dedicated to the Core EMS, which has a longer duration and involves the implementation of proven components. This is shown in Figure 12 below.

[18] Vendor B Response to Returnable Schedule 11 states - Vendor B pricing does not currently account for any project contingency. Vendor B recommends an additional 15% of the total project value be factored in for contingency related matters.

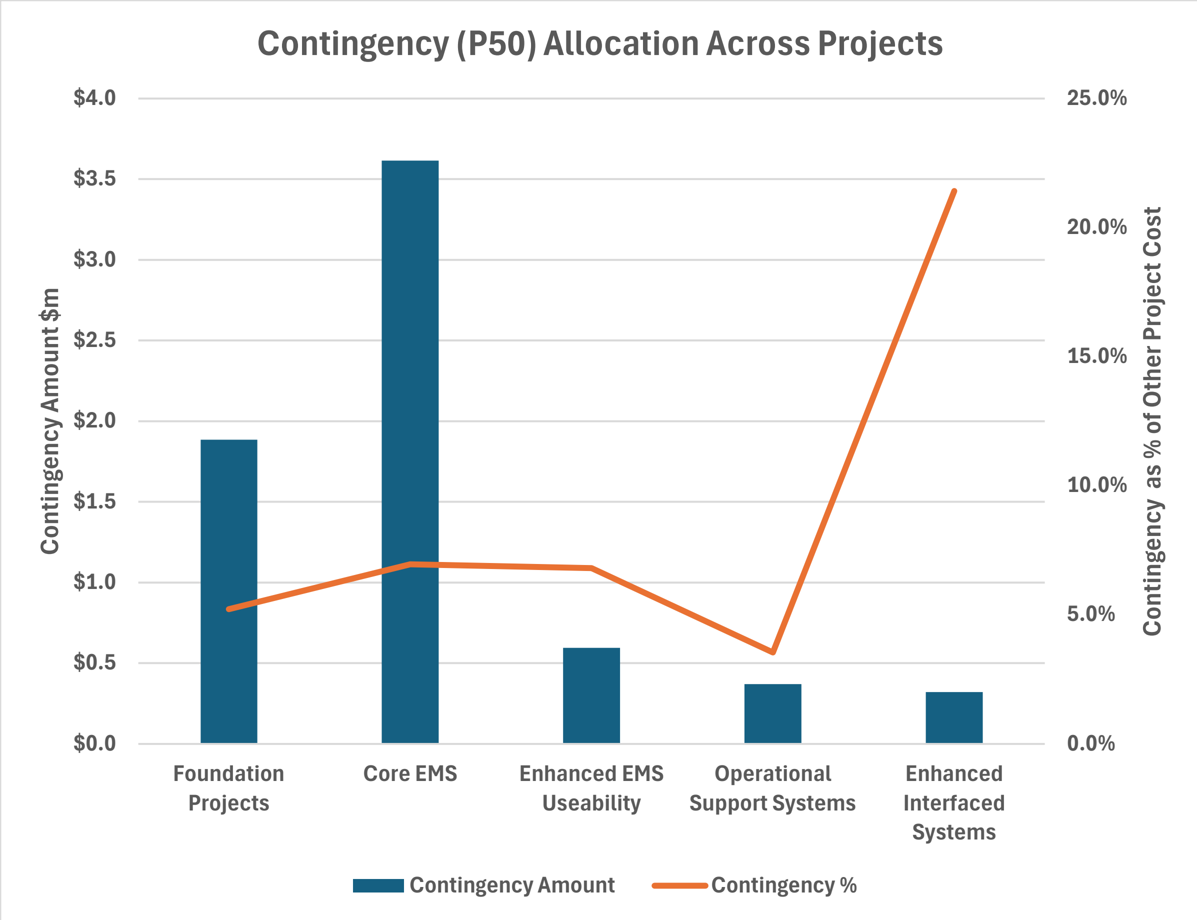

Figure 12 Contingency (P50) Allocation Across Projects

It is advisable to consider whether an alternative approach could be used to evaluate the risk associated with each project and allocate the contingency budget accordingly.

7.3.3. Contingency (P50 Confidence Level) Conclusions

The P50 contingency estimation approach aligns with the AER's expectations, although the overall contingency estimate appears low. Recommended actions are:

1) Review the individual risks highlighted to consider whether the input parameters can be improved. We expect these to move in different directions. Some assessment should also be made on whether the current set of 12 risks all needs to continue to be assessed.
2) Review risks and calculate in either real or nominal terms. It is recommended that these are done in real $24/25 in line with the SI Costs.
3) Create a contingency allocation between projects that reflects the risks associated with each project.

The net impact on the contingency estimate will depend on the review of the individual risks and how this is calculated using the @risk software. Our expectation is that there will be a small increase in the overall P50 contingency estimate.

8. Opex and Refresh Cost Review

8.1. Opex Costs

8.1.1. Overview of Opex Costs

The opex costs for Option 1 are set out in the table below. These are incremental to the current opex costs for operating the EMS.

Category	25/26	26/27	27/28	28/29	29/30	30/31	31/32
SCADA/EMS System	$0	$1.0	$1.0	$1.0	$1.0	$1.1	$1.1
Operational Planning System	$0	$0.0	$0.9	$0.8	$1.2	$1.2	$1.3
Internal Staff - SCADA/EMS System	$0.1	$0.5	$1.5	$1.5	$1.5	$1.5	$1.5
Internal Staff – Planning Operations	$0	$0.8	$1.0	$1.0	$1.0	$1.0	$1.0
Total	**$0.1**	**$2.2**	**$4.3**	**$4.3**	**$4.7**	**$4.7**	**$4.9**

Table 13 Annual Breakdown of Option 1 Opex Cost from the PADR $m real 24/25

Further details explaining the justification for each additional area of expenditure are provided in section 8.1.3 below. Before assessing the individual cost items, a review of the approach to determining the costs is provided in section 8.1.2.

8.1.2. Review of Opex Cost Approach

The overall approach to opex costs is based on a bottom-up calculation of the numbers and cost of additional personnel or systems/licences required to operate with the capability uplift. This is a practical approach that provides transparency for the overall number.

The planned investment introduces new capabilities and allows the delivery of enhanced services that with Transgrid's current state solutions are unattainable. The limitations of the current solutions means that it is not feasible (even with additional resources) to provide these services in the timeframes that would be required by Operators to assist with their decision making. As these are new services there is an opex cost in providing these services, rather than any efficiency gain from the system enhancement making these activities more efficient.

Two of the additional opex costs are due to the increasing number of internal staff. The internal costs for personnel are based on an expected cost of $250k for each FTE per annum, reflecting the required skill level and market scarcity. DGA agree that these cost rates seem appropriate for the CPA and have focussed our review on the number of additional resources.

There are three areas of the approach which DGA believe need review. These are:

- Timing of opex Costs.
- Overlap with SI capex; and
- Consistency with SI opex

Timing of Opex Costs

One concern on the approach is the timing of commencement of opex costs. The PADR was based on a project start date of January 2026, which as indicated earlier is no longer feasible. Opex costs should therefore be adjusted to reflect the delay in commencement of the project and the consequential delay in completion date of the project activities.

[redacted]

[redacted]

A similar timing review is needed for support and maintenance for other systems such as Plexos and PSCAD.

Overlap with SI Capex

The Vendor A and SI B SI costs include a support component post-license delivery. Initially, this was anticipated to cover hypercare. However, the allocated amount of $1.019 million corresponds precisely to one year of support for all GEV systems. If this support pertains to the first year of system operation, the increased opex costs should only commence after the completion of this support period. Consequently, this would further delay the onset of opex costs.

Consistency with SI Opex Costs

There is inconsistency in opex Costs suggested by the SI ROM calculations. The table below shows the SI A and SI B costs, which are assumed to start in 25/26.   These are all shown in nominal costs, which are how they are presented in SI Submissions

Category	25/26	26/27	27/28	28/29	29/30	30/31	31/32
PADR Costs (Systems Only)	$1.02	$2.00	$2.05	$2.53	$2.62	$2.89	$2.80
SI B Cost	$1.02	$2.00	$2.05	$2.53	$2.62	$2.89	$2.80
SI A Cost (Original)	$2.93	$3.07	$4.83	$5.07	$5.32	$5.59	$5.87
SI A Cost (Updated)	$1.02	$1.07	$2.92	$3.07	$3.22	$3.38	$3.55

Table 14 Option 1 Opex Costs in the PADR and from SI ROM Submissions – Nominal $m

The PADR costs were based on SI B costs and hence these align. The SI A costs (even with the updated version from June 2025) are higher than the PADR Costs. SI A state that the GEV opex costs commence in year 1 and their opex costs are just the GEV cost along with any additional vendor costs with no SI A cost included. The cost breakdown should be clarified and considered in any procurement decision on what additional systems need to be implemented alongside the EMS.

8.1.3. Review of Opex Costs

The table below provides a review of the justification for the individual opex costs. The review is focused on the full cost by 2031/32.

Category	Cost 31/32	Rationale	Review
SCADA/EMS System	$1.1m	The RIT-T spreadsheet indicated these came from SI B provided costs from their ROM Costing.	The initial amounts align with GEV's updated input parameters provided in April 2025[19]. [redacted]
Operational Planning System	$1.3m	The RIT-T calculations indicated that these costs were from SI B	According to the SI B Returnable Schedule 11, [redacted] The figures appear to be taken from row 6 of ROM Cost per Year Estimation worksheet in SI B's Returnable Schedule. There is no further explanation for the number within this workbook.
Internal Staff - SCADA/EMS System	$1.5m	This is six new roles covering 1 x DTS engineer, 4x maintain SCADA/EMS evergreen, 1 x SCADA Engineer (alarm business rules management and visualisation management).	Maintenance of the Enhanced SCADA/EMS including additional applications will require additional resources. Currently there are 7 SCADA Maintenance engineers and 2 EMS engineers, and these changes would grow the internal support team from 9 to 15.

[19] GEV Transgrid Future Control Room – RFI Input Parameters and Price Revalidation – 2/4/2025

Category	Cost 31/32	Rationale	Review
			The justification for the DTS engineer and SCADA engineer has been defined. Additional evidence is required to confirm whether the proposed increase of four SCADA/EMS engineers is appropriate. This is the same resourcing impact as Option 2, and it should be confirmed whether the lower scope will allow operation with less resources.
Internal Staff – Planning Operations	$1.5m	This is four new roles covering maintenance of data and operational planners to assist the control room.	A more complex network requires more Operational Planners to help the control room operate proactively rather than conservatively. This should assist in reducing curtailment of growing levels of renewable generation expected to connect to the network. The studies and analysis are not presently being conducted. This is due to the lower complexity of the current network and the absence of available EMS-based tools that would facilitate such analysis. Additional resources are needed for this new capability. Further evidence is required to determine if four additional resources is the appropriate number. The resourcing is distinct from the resourcing of the current studies/analysis that Transgrid undertake. These should continue to be provided with the existing resources.
Total	**$4.9m**		

Table 15 Individual Opex Cost Calculations

8.1.4. Opex Cost Conclusions

There are several recommended actions to finalise the opex costs.

1) Review timing of commencement of opex Costs. This needs to reflect:
   - Changes to the Schedule with start and completion dates of individual projects; and

- Confirmation of timing for when GEV Support and Maintenance Costs should commence.

2) Review any overlap of GEV capex allowance with Opex commencement.
3) Review breakdown of SI A opex to confirm Transgrid are not missing opex costs.
4) Confirm Operational Planning System licence costs.
5) Review requirements for number of additional resource roles for:
   - Increased SCADA/EMS Maintenance
   - Increased Operational Planners

The overall impact on forecast change in opex is expected to be limited with a potential for a short-term decrease.

8.2. Refresh Costs

8.2.1. Overview of Refresh Costs

The RIT-T has applied a 15-year assessment period. It is therefore essential to includes refresh costs as the project technologies are assumed to have an economic life of only between 5 and 7 years (varying per project). The PADR states:

We have assumed indicative refresh costs for each of the initiatives at the end of their economic life in both the base case and option cases. There is significant uncertainty for the value of any refresh costs. For the purposes of this RIT-T, Transgrid has conservatively assumed equal costs of replacement in real terms at the end of the economic life of the assets.

A summary of the indicative refresh costs in $24/25 is shown in the table below (as grouped in the PADR).

Technology Initiative	Indicative Refresh Cost
Outage Management System	$3.6m
Alarm Management, Visualisation and Situation Awareness Enhancement	$26.0m
Fault Level and System Parameter Monitoring and Power System Analysis Capability	$6.1m
EMS/SCADA System Enhancements	$46.2m
Data Management and Network Modelling System	$39.1m
Training Technologies, Operational Document Management System and Operational Planning Systems	$21.7m
Total	**$142.6m**

Table 16 Option 1 Refresh Costs Included in the PADR ($m 2024/25)

The indicative refresh costs exceeded the initial capital expenditure because certain technologies have an economic lifespan of five years and are expected to undergo two replacements within the assessment period specified in the PADR.

8.2.2. Review of Refresh Cost Approach

The PADR approach has recognised the need for refresh costs, but is overly conservative in the level of these costs. A significant proportion of the costs in the first phase of work will be for requirements gathering, design, data cleansing, interfaces, change management, extensive testing and a contingency for a new solution. These activities and therefore costs will be significantly lower during a refresh.

The PADR's timing and refresh cost duration, especially for longer projects, is problematic. For instance, the Enhanced EMS/SCADA project, scheduled to complete in 2030, starts its refresh in 2033 and lasts until 2036 with identical costs and timeline as the original project. A more realistic timeframe should align the refresh duration with anticipated effort. In this example, if an EMS refresh is required by 2036, and takes 2 years, it could start in 2035 and finish in 2036.

A mitigating factor for the impact of refresh cost on the NPV is the application of terminal values. The refresh costs will retain material value at the end of the assessment period. The application of a terminal value will reduce the impact of an overly conservative refresh cost on the business case.

One potentially significant impact on the refresh costs of the GEV EMS would be a move to an evergreen support model, rather than infrequent updates. This could potentially avoid the need for a standalone project to upgrade the EMS software elements of the solution. To be conservative at this stage the modelling should continue to apply an assumption that regular refreshes are required. However, the potential upside of an evergreen approach should be noted.

8.2.3. Review of Refresh Costs

The refresh costs of $142.6 million are considered excessive, as they include activities that will be significantly less intensive in any system upgrade.

A like-for-like refresh requires limited testing, acceptance, and will be lower risk. There is no single percentage figure that can be applied to the refresh costs per project. Some costs such as hardware will be the same level as the original cost, while other elements like requirements gathering, design and data cleansing may be minimal. Each project's costs should be individually reviewed to allow a more realistic percentage to be applied.

Refresh costs should consider any updated project completion schedule and the expected duration of the refresh.

8.2.4. Refresh Cost Conclusions

The recommended actions are:

1) Review timing of commencement of refresh costs. This needs to reflect:
   - Changes to the schedule with start and completion dates of individual projects
   - Timing of refresh projects with shorter durations than the original projects and therefore a later start date to meet refresh deadlines.
2) Review individual projects to consider a realistic but conservative percentage of the cost required for any project refresh.
3) Recalculate the total refresh costs based on revised timing and project cost.

The overall impact on refresh cost is expected to be a large reduction. In the NPV calculation this will be partly offset by a reduced terminal value.

9. Recommended Actions

9.1. Approach to Recommended Actions

The conclusion sections for each area of cost included recommended actions to improve the accuracy of the forecast costs. Undertaking these actions should allow for refinement and a more efficient forecast of the total level of costs for delivery of the uplift in capability.

This section summarises these actions and divides them into two categories

1) Material Actions – Actions with a material impact on the level of costs that need to be addressed; and
2) Desirable Actions - Actions which will improve the confidence in the level or allocation of costs, but are likely to have a less material impact on total costs.

9.2. Material Actions

The material actions are summarised in the table below

No	Issue	Actions
1	Timing for Project Commencement	Revise the project scheduling to allow time to establish SI Contract and project resourcing.
2	Core EMS costs appear high	Review the costs of the Core EMS Solution elements with the SI. Consider if there is duplication in the roles of GEV and the SI and whether there is a consistent understanding of the scope of the SI activities.
3	Data Management and Network Modelling costs seem low for risks involved	Review with the SI whether the Data Management and Network Modelling project has fully considered the risks and complexity in delivery of the projects.
4	Divergence in SI cost for Alarm Management	Review with SIs the reason for divergence in costs and why one SI is double the cost.
5	Divergence in SI cost for Operational Support Systems	Review with SIs the reason for divergence in costs. Ideally understand (and/or reduce difference) and if this isn't possible then apply a heavier weighting to lower cost SI.
6	Overlap between SI and Transgrid Resources	Transgrid to reduce internal resourcing where there is deemed to be an overlap with SI resources.
7	Additional Scope items to include for internal costs	Review and quantify the additional internal scope costs identified in section 7.2.
8	CPA/Alarm Costs in Expenses	Confirm whether the alarm management/CPA part of expenses is a separate cost, or if there is any double counting of costs.

9	Need to update risk assessment input parameters	Review and update the risk assessment input parameters identified in section 7.3 to better reflect potential risks.
10	Timing of Opex Costs	Review timing of commencement of opex costs. This includes changing the schedule for start and completion date of individual projects and confirmation of timing for commencement of GEV support and maintenance costs.
11	Overlap between SI Capex and Opex	Review SI opex and capex costs to ensure no overlap with GEV Support and maintenance costs being captured in two places.
12	Refresh Cost Amounts	Update refresh cost amounts to reflect reduction of effort for a refresh compared to original implementation.
13	Timing for Refresh Costs	Update refresh timing to reflect duration needed for a refresh compared to original implementation.

Table 17 List of Material Actions

9.3. Desirable Actions

The desirable actions are summarised in the table below

No	Issue	Actions
1	Individual Project Duration and Commencement	Review and update ordering and timing of activities in line with recommendations in Section 6. Confirm no additional impact on cost from interdependencies
2	Presentation of Real and Nominal Internal costs	Confirm that all Internal Costs are presented in Real terms to avoid confusion.
3	Allocation of Internal Costs between Projects	Review the allocation of internal costs between projects to better reflect resourcing required.
4	Rates for Senior Project Manager	Review whether the rate for Senior Project Manager is too high with the SI having a Project Director role.
5	Allocation of Contingency between Projects	Review the allocation of the contingency between projects. Currently contingency primarily resides with Core EMS project, whereas other projects appear to have higher level of uncertainty and risk.
6	Real and Nominal Risk Calculations	Update risk calculations so they are all undertaken in real dollars.

7	Insufficient information on external licence costs (Pi licences)	Additional evidence should be presented to confirm the additional licence costs.
8	Insufficient information to justify additional resources for SCADA/EMS Maintenance and Operational Planners	Additional evidence should be presented to confirm the appropriate numbers of additional resources for these activities.
9	Cost build up for SI A Opex costs	Review SI A breakdown of opex costs to confirm no costs missing from Transgrid's estimates.
10	Operational Planning System Licence Costs	Confirm operational planning system licence costs.

Table 18 List of Desirable Actions

10. Revised Costs Estimates

10.1. Transgrid Approach to Recommended Actions

Transgrid has updated its cost estimates based on feedback from the initial review. Key changes include:

- Revised Schedule to account for upfront procurement work, project sequencing as well as revised project durations.
- SI Cost refinements to avoid internal overlaps, align releases, update licensing and support requirements and adjust for efficient cost expectations.
- Internal Cost updates to reflect scope additions and eliminate overlap with the SIs.
- Improved P50 assessments conducted for each project.
- Opex costs revisions for timing changes and updated scope. and
- Refresh cost reductions to reflect Evergreen support and lower refresh percentage costs.

The following sections review these changes using DGA's previously established framework.

10.2. Revised Schedule

The primary adjustment to the project schedule involves allocating additional time for requirement definition and the procurement of services from a SI prior to full project initiation. While facilities and operational planning activities commence early, the principal EMS and foundation projects are scheduled to start in January or February 2027. The overall core project's duration is consistent with the earlier estimates but with enhanced sequencing and scheduling of the EMS-focused initiatives.

One higher complexity project for Operator Visualisation has been extended by four months. This revised timespan more accurately reflects the complexity and uncertainties associated with this project. There is also a change to the Alarm Management technologies project with the duration reduced from 3 years to 21 months, which may be a challenging timetable. However, this is not a critical path item so could be extended without impacting the schedule.

The updated schedule is depicted in the diagram below. DGA considers this to be a demanding yet feasible timeline for delivering this comprehensive set of projects.

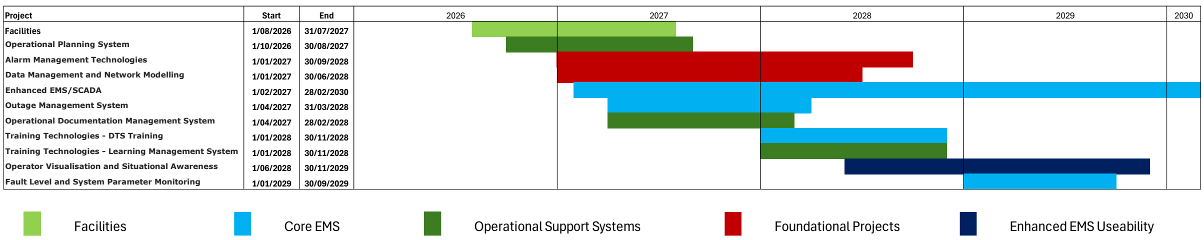

Figure 13 Revised Schedule for OT Capability Uplift Projects

10.3. SI Costs

The key initial areas of concern from the cost review included the alignment of the SI cost estimates and the level of Core EMS Costs. Transgrid have worked with the SIs since these issues have been raised to address these concerns with key changes including:

- SI B cost review removed overlap with Transgrid in testing, architecture, infrastructure and cybersecurity.

- SIs reviewed their estimates to reflect increased complexity in Foundation Projects and Operator Visualisation and Situational Awareness Technology.
- Exclusion of Support and licence costs post go-live to avoid opex overlap.
- Some double-counted licence costs across both SIs have been removed.

The final sets of SI costs are shown in the table below grouped in terms of our assessment

Category	SI A $m		SI B $m		Average $m	
	Sept	June	*Sept*	June	*Sept*	June
Foundation Projects	$27.2	$23.6	*$24.1*	$30.3	$25.6	$27.0
Core EMS	$23.0	$23.3	*$38.1*	$46.0	$30.6	$34.6
Enhanced EMS Useability	$6.3	$5.8	*$10.6*	$11.0	$8.4	$8.4
Operational Support Systems	$4.8	$6.0	*$10.3*	$13.0	$7.6	$9.5
Enhanced Interfaced Systems	$0.0	$0.0	*$0.0*	$0.0	$0.0	$0.0
Total	**$61.2**	**$58.7**	***$83.2***	**$100.3**	**$72.2**	**$79.5**

Table 19 Revised SI Costs for September 2025

These changes aligned SI Costs more closely with the amounts anticipated in the initial cost review. However, Core EMS Costs remained higher than the anticipated efficient cost levels. Transgrid acknowledged this variance and adjusted their projections of SI Costs for the Core EMS Projects, resulting in values that are closer to expected levels. The table below illustrates these figures.

Category	Initial Average Cost $m	Transgrid Cost Reduction $m	Final Average SI Cost $m
Core EMS	$30.6	$3.2	$27.4

Table 20 Revised SI Cost Estimates with Transgrid Adjustment

There were several smaller concerns raised in the initial reviewing including:

- Whether complexity (and therefore Cost) of Foundation and Visualisation projects had been properly assessed. This was raised and reviewed with the SIs and current costs now reflect their latest perception of complexity. In addition, the internal costs now include some additional resources that can assist on these projects and an allowance for custom code changes in these areas.
- SI Cost differences with the operational support system. - An additional adjustment was made to apply Transgrid's current licence cost for Plexos/PSCAD resulting in final costs of $10.4m for SI A and $4.1m for SI B. This remains a surprising difference, but the reductions as part of the review process makes this a less material cost.

The final average SI cost was $68.7m, which is around 15% below the level presented in the PADR. DGA's view is that the current level of the SI costs (including the Transgrid adjustment) represents an efficient level of costs.

10.4. Internal Costs

The internal cost review highlighted the necessity of avoiding resource overlaps with the SI team and incorporating additional scope items. The following adjustments have since been made:

- Duplicate roles such as Project Manager and Change Analyst, which overlap with SI resources, have been removed.
- A project initiation phase has been introduced to facilitate the contract tendering process, including the addition of a Procurement Specialist role.
- Implementation of a Test Automation tool has been included to mitigate risks associated with testing.
- Additional roles have been specified, including:
  - OT Data Steward
  - Network Control Manager SME
  - Test Developer
- Provisions have been made for updates to control room facilities and operator consoles to enhance visualisation capabilities. The scope also includes supplementary DC inverters for the Wallgrove Datacentre.
- Allowance for anticipated SCADA customisations

Transgrid separated its costs into vendor and internal categories. Vendor costs included:

- **Facilities**: $5.0m for Newcastle and Wallgrove control rooms ($1m previously included).
- **Customer Code Changes**: $1.25m for alarm management and visualisation. This is an allowance for services to ensure the new GEV implementation retains the same "look and feel" as the current GEV system for some important functions required by control room users.
- **High Spec Server**: $0.9m for operational planning servers (previously an internal costs).

The table below shows the net impact of these changes.

Cost Category	Sept 2025	PADR
Internal Cost	*$30.5m*	$30.1
Vendor Costs	*$7.2m*	Included in above
Total	***$37.7m***	**$30.1m**

Table 21 Revised Internal Costs

The cost has increased by $7.6m, mainly driven by $5.3m in extra vendor expenses for facilities and customer code changes since the PADR. The remaining amount covers required scope items and project initiation. DGA finds these revised costs reasonable.

10.5. Contingency (P50 Confidence Level) Estimates

In the initial review, DGA were concerned whether some of the P50 input parameters were set at the appropriate level and that the overall P50 contingency estimate seemed low for a complex project of this duration and complexity.

Transgrid has refined its methodology by conducting risk reviews at the individual project level rather than for the program as a whole. This targeted approach has led to improved and more suitable input parameter values, which are now considered to more accurately represent both the likelihood and impact associated with each project. Additionally, the focus has shifted to a subset of high-value risks, as opposed to the twelve previously identified project risks. This includes removal of the internal risks where Transgrid have a greater capacity to mitigate. The revised set of risks is shown in Appendix C. In addition, two new program-level risks have also been recognised and incorporated into the assessment.

An overview of the impact of this change is shown in the table below.

Risk	Sept 2025	PADR
Contingency (P50 Confidence Level)	*$10.1m*	$6.8m
Contingency Allowance (P50)	*10.1%*	6.2%

Table 22 Revised Program Risks

DGA believes the revision better reflects project risk, given the approach of excluding contingency in the build-up of internal and SI cost estimates. We believe these estimates are prudent and efficient.

10.6. Opex Costs

The updates to the opex costs reflects several changes described in the table below:

Change	Justification	Impact
Later project commencement	Schedule includes time for upfront procurement effort	Delays start time for some opex costs
Alignment between capex and opex for licence and support	Prevent double counting of costs	Avoids opex costs for licence charges before go-live on a project
Inclusion of Data Management Software licence	Required for Data Management and Network Modelling	Increase in annual opex charges as not previously included
Reduction in Plexos/PSCAD licence costs	Reflect current licence charges for Transgrid,	Reduction in cost compared to previous SI estimates
Inclusion of Training Time Cost	Include cost of time for training	Small increase in cost before go-live
Inclusion of hardware maintenance	Not previously included but required to support hardware	Additional opex costs for hardware maintenance

Change	Justification	Impact
Increase in Operational Planning Team from 4 to 6 extra FTEs	GHD report recommended 7 extra FTEs. Transgrid are assuming one less.[20]	Additional 2 FTE now included

Table 23 Changes to Opex Scope from the PADR

As part of the opex refinement process, Transgrid also provided additional supporting material to justify the increased control room and operational planning resources. This included supporting information from GEV and the report from GHD on future planning needs. The overall financial impact is a decrease in the opex Costs during the early years of the assessment period, but an increase after the system is fully operational. This is shown in the table below.

Opex Review $m	26/27	27/28	28/29	29/30	30/31	31/32
Sept 2025	$0.0	$0.8	$2.5	$4.1	$6.0	$6.0
PADR	$2.2	$4.3	$4.3	$4.7	$4.7	$4.9

Table 24 Opex Costs

The main opex change from the PADR is the inclusion of hardware maintenance, which adds $1m p/a that had previously been omitted. DGA have reviewed the set of opex changes and agree these are reasonable.

10.7. Refresh Costs

There have been several factors that have combined to result in a material change to the Refresh costs, which are:

- Evergreen support for EMS components: GEV is adopting Evergreen support for EMS, eliminating most upgrade needs except for hardware.
- Reduced Refresh costs: The cost has dropped from 100% to 80% of the initial amount.
- Asset life adjustments: Data Management, Outage Management, and operational support systems now have a 4-year asset life (previously 5 years), EMS hardware is set to 4 years, and all other solutions are at 10 years, mainly reflecting EMS's transition to Evergreen support.

Overall, these changes have resulted in substantially lower refresh costs, as shown in the table below.

Category	*Sept $m*	PADR $m	Difference $m
Foundation Projects	$33.7	$54.6	-$20.9
Core EMS (includes hardware)	$22.2	$55.6	-$33.3

[20] GHD Advisory – Review of Future Planning Needs – Report to support Contingent Project Application 20th August 2024

Category	*Sept $m*	PADR $m	Difference $m
Enhanced EMS Useability	$0.0	$10.5	-$10.5
Operational Support Systems	$11.7	$18.2	-$6.6
Enhanced Interfaced Systems	$2.4	$3.6	-$1.3
Facilities and Project Management	$13.7		$13.7
Total	**$83.7**	**$142.5**	**-$58.8**

Table 25 Revised Refresh Costs

DGA previously considered the original refresh costs too high. Outside the EMS, the refresh costs are still on the conservative side with a general approach of 80% of the original cost with some very short refresh periods.

The major change is the removal of EMS refresh costs, which will be dependent on the Evergreen solution. DGA consider that this does still represents a risk as this approach is not currently deployed on GEV's EMS. However, it is an approach currently being delivered on other GEV products and is part of GEV's strategy.

DGA believe that the revised refresh costs are reasonable, but with the potential for further small reductions for the solutions with an asset life of 4 years.

10.8. Conclusions

10.8.1. Capex Cost

A summary of the revised capex cost and changes since the PADR are shown in the table below.

Category	*Sept $m*	PADR $m	Difference $m
Foundation Projects	$36.5	$38.1	-$1.6
Core EMS	$37.2	$55.6	-$18.3
Enhanced EMS Useability	$11.0	$10.5	$0.5
Operational Support Systems	$10.6	$10.8	-$0.2
Enhanced Interfaced Systems	$1.5	$1.8	-$0.3
Facilities and Project Management	$19.7		$19.7
Total	**$116.5**	**$116.8**	**-$0.3**

Table 26 Summary of Revised Project Costs

The overall revised capex cost is almost identical to the PADR. The savings realised in the SI Costs estimates ($11.2m) are offset by the additional internal scope ($7.6m) and increase in revised P50 estimate ($3.3m).

DGA support the September set of capex cost estimates as representing an efficient level of costs to deliver the scope of the proposed capability. This recognises the constraints of the timetable, limited availability of Transgrid internal resources and the resultant approach to utilise SI services to deliver the program outcomes.

10.8.2. Opex and Refresh Cost

Compared to the PADR, the opex costs have decreased significantly in the early years partly due to later commencement, but also improved consistency between the opex and capex costs. There is an increase in opex cost once the system is fully operational due to higher software licence costs, hardware maintenance, and increased resources.

DGA has reviewed the updated opex estimates and endorse these costs as reasonable. They represent a more accurate estimate for operating with improved capability and an Evergreen solution.

The refresh costs have reduced from $143m in the PADR to $84m in September 2025. This reflects the Evergreen solution for support, timing adjustments and lower costs of a refresh (80%) compared to the original project cost. DGA believes the refresh costs are still conservative.

Appendix A – Review of Project Timetables

The table below provides a review of each of the current project timetables.

Category	Timeline	Commentary
Foundation Projects	Data Management and Network Modelling – 18 Months	The creation and application of a single version of truth is a key aspiration for many network businesses. The 18 month timescale for implementation and making interoperable seems unusually tight given the challenges of engaging multiple Transgrid stakeholders and defining an over-arching network data model, identifying all key data sources, aligning data models, cleansing data, adjusting work processes of multiple work groups, populating the new model (from the agreed sources) and implementing CIM data flows between all target user systems. The experience we have with other users of solutions such as ODMS is that it can take a period of years to have these solutions working properly. We would suggest that the timescale for this project is reviewed and probably extended.
	Alarm Management Technologies – 37 Months	We note that some of the asset naming convention work has already been commenced by Transgrid with respect to the Alarm Management project. As with the Network Model Management project, this is an enterprise-wide initiative and there will be a number of stakeholders and significant effort in aligning work processes and data sources, in addition to significant configuration work and the implementation of data feeds to target systems. While the timescale is probably realistic (depending on resources available for the project) it should be recognized that this type of project can have a significant risk of timescale increase.
EMS Core	Enhanced EMS/SCADA – 37 Months	DGA views the scope of this project as an upgrade of the supplier's base product being installed on new target hardware (i.e. without the complexity of any impact on the existing EMS, other than the ultimate switchover of RTU communications traffic). It does introduce new enhanced features (such as the capability to handle new generation sources) but the changes are incremental. The data migrations will be of proven operational SCADA and EMS data sets, in the first instance. As long as GEV product experts are engaged with the upgrade and migration, the timeline is not considered a major risk.

Category	Timeline	Commentary
	Fault Level and System Parameter Modelling – 9 Months	Fault Level Calculations (FLC) is standard EMS functionality and FLC licences were delivered with the current EMS, but it has not been fully commissioned. This appears partly to be related to an incomplete network model data set (FLC requires additional network impedance data, data on protection settings and device fault withstand data). Transgrid will need to provide augmented data and there may be inter-dependencies with the Network Model Management project. As a standalone exercise 9 months would probably be insufficient to implement FLC, but this project should be delivered as an integrated sub-project of the overall EMS upgrade, with a suitable timing within the 37-month schedule. It is not considered a risk to overall cost.
	Training Technologies (Dispatcher Training Simulator) – 8 Months	A Dispatcher Training Simulator (DTS) is standard EMS functionality and a DTS was delivered with the current EMS. It is partly operational, but based only on a few scenarios. Some of Transgrid's requirements (e.g. Black Start simulation) are common current day needs for a DTS, being delivered by a combination of rudimentary simulation and test scenario manipulation. The core functions of a DTS are relatively straightforward to implement – once the network model is established (and Transgrid has a base network model already). However, fully establishing a DTS to function as a key training accelerator will require significant input as training scenarios need to be developed. As a standalone exercise, 8 months would probably be insufficient to implement a DTS, but this project should be delivered as an integrated sub-project of the overall EMS upgrade, with a suitable timing within the 37-month schedule. It is not considered a risk to overall cost.
EMS Enhanced Useability	Operator Visualisation and Situational Awareness Technology – 13 Months	This project utilises relatively new GEV capabilities to implement new and innovative approaches to displaying data and alarms in the EMS with the goal of improving "situational awareness" for the Control Room. DGA believes there will be significant effort in understanding the capabilities of the VISION software and then understanding the way that it can be configured to get maximum clarity for the users. Both these aspects will require extensive engagement with GEV product experts. Following that there needs to be

Category	Timeline	Commentary
		extensive engagement with dedicated team members from the user group itself to consider capabilities and to explore prototyping new data presentation methods. Only then can building the agreed approaches commence, and this is expected to require extensive manual configuration. DGA is strongly of the belief that 13 months is insufficient time allowance and that the work on developing and implementing the visualization approach should commence as early as feasibly possible in the overall schedule.
Operational Support Systems	Operational Planning System – 6 Months	Relatively well understood set of operational improvements and not highly inter-dependent. The timescales seem achievable. Increased consultation within the business could expand the timescales, which is an option if these are not on the critical path. This could increase duration but not necessarily the level of resources required and therefore cost.
	Operational Documentation Management System – 8 Months	Relatively well understood set of operational improvements and not highly inter-dependent. The timescales seem achievable. Increased consultation within the business could expand the timescales, which is an option if these are not on the critical path. This could increase duration but not necessarily the level of resources required and therefore cost.
	Training Technologies – 8 Months	Relatively well understood set of operational improvements and not highly inter-dependent. The timescales seem achievable. Increased consultation within the business could expand the timescales, which is an option if these are not on the critical path. This could increase duration but not necessarily the level of resources required and therefore cost.
	Outage Management System and Switching Execution – 12 Months	These have relatively limited inputs from this set of projects and therefore a correspondingly small scope and budget. The timescales are therefore appropriate.

Table 27 Review of Project Timescales

Appendix B – Project Cost Allocation for Internal Costs

The table below provides a review of the internal cost allocation for each group of projects.

Category	Internal Costs	Comments
Foundational Projects	$8.8m	The allocation includes $3m for already undertaken alarm management work as well as $1.7m(nominal) of directly allocated data management cost. The remaining $4.1m is the allocation of shared costs with around $2.8m for Alarm Management and $1.3m for the Data Management project. The majority of the shared costs are for Alarm Management which has a much longer project duration of just over 3 years compared to 18 months for the Data Management project. There is a risk that the data management project could extend beyond the 18 months planned given the complexity of the project. These 2 projects are also likely to require a higher amount of change management and project management given the wider sphere of stakeholders that are impacted.
Core EMS	$17.3m	These costs are high due to the allocation of several specific costs to this category as well as the long duration resulting in a high level of the shared costs being applied. The additional costs account for $9.9m (nominal) of the total internal costs. Most of the fixed cost allocation seems sensible but the $2.2m of CPA/Alarm costs could be at least partly allocated to Alarm Management. The remaining cost represents the allocation shared costs. During the majority of the project over 50% of all shared costs are allocated to just the Enhanced EMS/SCADA project. It would be sensible to review whether this allocation is proportionate given the level of other costs already directly allocated to the Enhanced EMS/SCADA Project and lower levels of wider stakeholder engagement compared to other projects.
Enhanced EMS Useability	$1.5m	This is a visionary project to deliver a single pane of glass view to Operators. There are a number of challenges to delivering this to the satisfaction of Operators and it will require close consultation with Operators, change management and testing and we expect may require a longer duration. The allocation of internal budget may therefore be too conservative.
Operational Support Systems	$0.9m	The operational support systems are a well-defined and standalone set of improvements. They have a relatively small allocation of the shared cost as they are implemented in less than 8 months.

Enhanced Interfaced Systems	$1.5m	This is a relatively small OMS enhancement that all is delivered by internal resources. This budget represents the majority of the cost (with the remaining cost being the risk premium).

Table 28 Internal Cost Allocation by Project Grouping

Appendix C Risk Assessment Summary Tables

Summary tables of the project and program risks are provided below.

Risk	Calculation Basis	Projects Impacted	Likeli-hood	BC	ML	WC
Vendor Cost Increase (before contract commences)	Based on % of SI cost for each project	9	32%-40%	0%	15%	30%
Vendor Contract Scope Variation	Based on % of SI cost for each project	9	24% - 30%	5%-10%	10%-20%	15% - 30%[21]
Technology – Technical Solution Proves Inadequate	Cost of the OMS Project	1	30%	10%	15%	25%
Testing Requires More Resources and Rework	Multiples of $150k p/m for burn rate of delay in testing	8	24%-32%	1	2-3	3-6[22]
Data Quality Issues	Additional resources (60-120 days) + internal burn rate $150k and 50% of vendor burn rate (which varies)	4	24%-32%	1	1-3	2-6[23]
3rd Party Contracts in Place	Additional time for contracting, internal labour and testing - $110k in total per generator	1	30%	0	10	20
Facilities Requiring Upgrade	Potential additional cost for Comms link upgrade	1	16%	0	$1m	$2m

Table 29 Project Risk Assessment

[21] Standard range is 5%, 10% and 15%, but Operator Visualisation project has higher percentages.
[22] Standard range is 1,2 and 3 months for BC, ML and WC. Some projects have 1,3 and 6 months.
[23] Most projects have 1,1,2 range with the exception being the Operational forecasts and look-ahead Contingency Assessment.

Risk	Calculation Basis	Projects Impacted	Likeli-hood	BC	ML	WC
System Integrator Contract Termination	Project retender cost, transition cost and re-work cost all based on cost per month of impact	All – Program Risk	24%	80% of 4,2,3[24]	80% of 8,4,6	80% of 12,8,16
System Module Interoperability Risk	Months for review and redesign work and cost of implementation change	All – Program Risk	24%	1.6,Small projects[25]	3.2, Medium Projects	7.2, Large Projects

Table 30 Program Risk Assessment

[24] Order is months for retender, months of transition, months of re-work.
[25] Review/Redesign work cost in months, implementation Change is 20% variation on average of small, medium and large projects.