

Strategic Scope Totem Expansion 2020-25

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Contents

1. Project Summary Information	1
2. Existing Arrangements / Background.....	1
3. Rationale / Benefits	2
4. Drivers	2
5. Scope	3
6. Assumptions.....	3
7. Project / Program Dependencies	3
8. Supporting Information	3
9. Options Considered.....	3
9.1 Option One - Do nothing impact	3
9.2 Option Two - Standalone Systems for Each New Device Type.....	4
9.3 Option Three - Expand TOTEM.....	4
10. Risk Assessment.....	4
10.1 Network Risk Evaluation Matrices	4
10.2 Risk Assessment Outcome.....	5
11. Delivery Timeframe	5
12. Project Cost Summary.....	5
Appendix A. Definitions, Abbreviations and Acronyms	6

1. Project Summary Information

PROJECT SUMMARY INFORMATION			
Work Request Description	Totem Expansion		
Work Request Number	1352339	Work Request Required by Date	
Initiating Work Group	Intelligent Grid Solutions	Strategic Scope Contact	
Business Owner	AS&P		
Direct Value:	\$2.0M		

NOTE: – This document does not constitute approval of any funds or financial delegation. It is used to provide a high level description and justification of an allocation of funds in future years. The direct value is represented in \$18/19 direct dollars.

2. Existing Arrangements / Background

This initiative is based upon the strategies defined in the Future Grid Roadmap and the Intelligent Grid Technology Plan. From these strategies, a technology solution and its associated costing and benefits have been described below.

Currently, Totem is used by the Ergon Energy network to collect and manage data across a wide range of devices (PQ, Batteries, Power Transformer Condition Monitoring). The current license is limited to a fixed device count. As more devices are added to the network on scale, Totem will need to be expanded.

Totem is also used by the Energex network for pilots and trials outside of the substation as it is currently the lowest cost option for those trials.

Totem is based upon OSISoft's PI solution, along with a number of other technologies. This has been standardised for data collection in both OT and IT environments for time series data and is expected to be the data collection solution for the growth in low voltage network data across both networks.

Based upon the current technology trials and the Low Voltage Network Safety Strategy, it can be expected that Energex and Ergon Energy will have real time data streaming from a number of customer and 3rd party sensors as well as calculated via State Estimation. This will mean that the equivalent of power quality and capacity information will be available at each pole in Energex and Ergon's networks. Realistically this will mean Totem will need to support over 1,000,000 real and virtual collection points.

Examples of 3rd party data include any IoT device installed in the LV network and could include NBN equipment, Telstra, Optus and others' 4G and 5G equipment, Council and Main Roads owned smart street lighting, as well railway and traffic light intersections, and customer owned devices (such as inverters/PV/Batteries via Reposit, Watt Watchers, etc...).

3. Rationale / Benefits

Totem has become a significant productivity tool for the business in the way data is managed for devices not in the traditional SCADA/DMS/Control Systems area. It allows live data streaming for condition monitoring information, as well as support for detailed power quality analysis. Totem has already contributed benefits to Ergon by simplifying the operation, maintenance and support of the GUSS units and the LV Statcom units.

Totem was implemented based upon the justification in the Ergon Energy 2015-20 AER submission for an “Alternative Data Acquisition System” (ADAS) that was more cost effective than either expanding the existing HV SCADA system or building standalone systems based upon IED class. The ADAS Strategy is still valid as it predicted that over 200,000 devices would reside in the system by 2025 however at that stage it was expected that DNSPs would have a separate smart meter system for customer related real time data. Based upon Energex and Ergon’s IoT strategy it is reasonable to assume a significant portion of that customer (or pole) centric data will now go into Totem meaning an expansion to over 1,000,000 end points.

Energex has also benefited by being able to use Totem for the LV Regulator trial, the Eagle Farm Tesla Battery Trial, and Solar Enablement Initiative projects. Totem provided effectively a “free” secure data collection and device management platform as well as significantly improving the time to implement the trials. This is because there wasn’t a need to develop a separate operational system for data collection and device management.

As devices and data streams are added to both low voltage networks, the most cost effective solution will be to expand Totem and provide the same benefits to new devices added to the network.

The Totem system is scalable and as such only needs to be expanded incrementally as capacity is needed. This provides the most cost efficient method to scale data collection.

As per the Intelligent Grid Enablement program, this data will be used in the business to assist in actively managing the LV network for improved hosting capacity without additional power network augmentation.

From a customer perspective, continuing to expand Totem will provide the following benefits:

- Faster trial, pilot and deployment of low voltage regulating devices, and other equipment to improve hosting capacity for the network. This allows customers to maximise their DER investment and for non-DER customers to have a better quality service (power quality).
- Improved information for outages and faster fault restoration times as additional IEDs and sensors in the network will be part of the situational awareness framework instead of operating in a data silo.
- Information about network performance – data that customers (and their retailers or VPP) can use to help optimise their offering.

4. Drivers

A key element of the Electricity Network Transformation Roadmap is Intelligent Networks and Markets. The expectation is that in the 2020-2025 period, Energex and Ergon have enhanced system monitoring to inform advanced (real-time) forecasting and planning.

The Future Grid Roadmap makes a compelling case that the growth in real time information from the customer end of the network will be critical to enabling network hosting capacity and allowing customers the best choice around flexibility and cost for their DER investment.

5. Scope

The scope includes expansion of the existing Totem licensing structure (software) and associated capacity to support the growth in devices. The scope is split into two components based upon data growth.

Specifically, it includes:

- Phase 1 (2020-21) – Expand Totem to accommodate 250,000 end points.
 - Purchase additional licenses.
 - Implement software and associated capacity requirements (eg storage).
- Phase 2 (2024-25) – Expand Totem to accommodate 1,000,000 end points.
 - Purchase additional licenses.
 - Implement software and associated capacity requirements (eg storage).

6. Assumptions

Assumptions include:

- Based upon current Totem configuration (OSISoft PI and CISCO Hyperflex¹).

7. Project / Program Dependencies

Dependencies include:

- Relies on the organisation continuing to standardise on the OSISoft suite of products.

8. Supporting Information

This initiative forms part of Energy Queensland's response to meeting the requirements of the ENA/CSIRO Electricity Network Transformation Roadmap.

9. Options Considered

9.1 Option One - Do nothing impact

New devices that are added to the network will only have a local impact as the data will not be available for others to use.

¹ Computing platform using hyperconverged architecture

This means that initiatives such as Intelligent Grid Enablement program will be less effective as they won't have access to the sensor data that is available without significant cost and security risk.

The "Do Nothing" has a direct and negative impact on customers.

- Extremely slow deployment of new technology in the network, limiting customer's ability to maximise their DER capability.
- Inability to actively manage the hosting capacity which will extremely limit customers by not allowing export.
- Inability to actively manages the hosting capacity which will lead to increased voltage issues affecting all customers on that network segment.

9.2 Option Two - Standalone Systems for Each New Device Type

This is not preferred as the longer-term support costs are higher than a centralised solution like Totem. This has been proven with the operation of Totem in the Ergon network in the last 3 years and its use in the Energex technology trials. A significant amount has been expended in the establishment of Totem, so it is very economical to extent its usage as per the proposed option. Alternative products would result in higher costs and would not provide any functional advantages.

This option is not advantageous for customers as the higher implementation and support costs will be passed on to all customers.

9.3 Option Three - Expand TOTEM

Expand the TOTEM implementation as per the scope above providing a single repository for device data. This will provide the benefits identified above.

10. Risk Assessment

The network (business) risk the organisation would be exposed to if the project was not undertaken:

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
Failure to increase license capacity for Totem leads to increased costs for new projects potentially making them unviable (e.g. R&D trials). New capability does not occur in the network, resulting in failure to deliver strategic initiatives and additional costs >\$5 million.	Business Impact	5	5	25	2022

Table 1 – Risk Assessment

10.1 Network Risk Evaluation Matrices

- [Consequence and Likelihood Table](#)
- [Tolerability Scale](#)

The preferred option (Totem Expansion) is the right option to reduce this risk, as it provides the additional capacity at the lowest cost to prove network technology trials and the most cost effective scaling of rollout of technology when it is standardised. This has been demonstrated with the technology trials in the Energex network using Totem, and the rollout of LV Statcoms as a standard solution in the Ergon network.

10.2 Risk Assessment Outcome

The network (business) risk the organisation would be exposed to if the project was not undertaken is not deemed to be as low as reasonably practicable (ALARP). Addressing the risks as detailed above through implementation of the preferred option will reduce Energy Queensland's risk exposure.

11. Delivery Timeframe

It will be delivered as a two-stage project:

- 2020-21 – Phase 1 – increase capacity to 250,000 devices
- 2023-24 – Phase 2 – increase capacity to 1,000,000 devices

12. Project Cost Summary

	FY 2020/21	FY 2021/22	FY 2022/23	FY 2023/24	FY 2024/25
Labour	\$200,000			\$200,000	
Material	\$800,000			\$800,000	
Grand Total:	\$1,000,000			\$1,000,000	

Table 2 – Cost Summary

NOTE: The above cost summary is presented in \$18/19 direct dollars.

Appendix A. Definitions, Abbreviations and Acronyms

BESS	Battery Energy Storage System
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DER	Distributed Energy Resource
DSO	Distribution System Operator
ENA	Energy Networks Association
ENTR	Electricity Network Transformation Roadmap
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
HV	High Voltage (35kV – 230kV AC)
IS	Isolated System
LV	Low Voltage (50V – 1 000V AC)
MEGU	Micro Embedded Generating Units
MV	Medium Voltage (1kV – 35kV AC)
NER	National Electricity Rules
PQ	Power Quality (of the network)
PV	(Solar) Photovoltaic System
QoS	Quality of Supply (to a customer)
SCADA	Supervisory Control and Data Acquisition
ZS	Zone Substation