Intelligent engineering

UE BUS 7.07 - Intelligent engineering - Jan2020 - Public

Regulatory proposal 2021–2026

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Contents

1 Overview

Business	United Energy
Title	Intelligent engineering
Project ID	UE BUS 7.07 - Intelligent engineering - Jan2020 - Public
Category	IT capital expenditure—non-recurrent
Identified need	We have identified an opportunity to reduce safety risks, reduce the cost of asset damage, deliver operational savings internally and to third parties, and ensure better asset information exchange with the Government and its stakeholders, by: • conflating our GIS records to the physical earth • introducing a master data management system • enhancing Map Insights • improving DBYD accuracy and access to information.
Recommended option	Option 2—base intelligent engineering capability plus DBYD mobile application
Proposed start date	2021/22
Proposed commission date	2024/25
Supporting documents	1. UE MOD 7.11 - Intelligent engineering - Jan2020 - Public 2. UE MOD 12.02 - Quoted services labour rate - Jan2020 - Public

The majority of our network assets are mapped in a geospatial information system (**GIS**), including mapping of coordinates between assets. We use the geographical representation of our assets to ensure safety and efficiency of asset management and planning by visualising, predicting and pre-empting changes over time including:

- the condition of network assets, for example the rate of change of a leaning pole
- conditions surrounding assets, for example the rate and extent of vegetation changes.

While our GIS coordinates between assets are correct and do not change, the assets are not correctly mapped against the physical earth, or the Global Positioning System (**GPS**). This discrepancy can result in:

- higher risk of safety incidents for employees and third parties working around our underground assets (less accuracy in Dial Before You Dig (**DBYD**) data)
- higher cost of managing the network if assets are damaged accidently due to wrong coordinates
- inefficient management of works around and on our underground assets, by our employees and third parties, resulting in higher cost to our customers and those of third parties.

We have identified an opportunity to reduce safety risks, reduce the cost of asset damage, deliver operational savings internally and to third parties, and ensure better asset information exchange with the Victorian Government and its stakeholders, by:

- conflating our GIS records to the physical earth—reconciling our assets with GPS coordinates and property boundaries, using new LiDAR aerial technology and updated data from relevant authorities
- introducing a master data management system—aligning all asset data to a 'single source of truth', including intelligent capability to share and receive 3D files
- enhancing Map Insights—opening the Map Insights application to more third parties to share information on inspections and vegetation management, as a faster way to inform customers when we will be in the area and allow them to better manage their works
- improving DBYD accuracy and access to information—building a DBYD mobile device application to allow users to view their requested boundary box on their device and show subsurface electrical assets overlaid on both satellite view and map view, including a capability to send and receive 3D files.

We considered three options for addressing the identified need, as shown in table 1.

Table 1 Options analysis summary, total capital expenditure during 2021–2026 regulatory period ($ million, 2021)

	Option	IT capital expenditure
0	Do nothing—do not make any changes or improvements to GIS and asset data management	0
1	Base intelligent engineering capability	4.73
2	Base intelligent engineering capability plus DBYD mobile application	5.41

Source: United Energy

We recommend option 2—base intelligent engineering capability plus DBYD mobile application. While this is the highest-cost option, it offers customer and third party benefits that outweigh the efficient cost of delivering them.

The estimated net economic benefit of option 2 is set out in table 2. The net economic benefit reflects the difference in the net present value (**NPV**) of costs and benefits over a 10 year period starting 2021/22.

Table 2 Recommended option: NPV of costs and benefit for the 2021–2031 period ($ million, 2021)

	NPV IT capital expenditure	NPV economic benefit	Net economic benefit
Net economic benefit	7.18	14.47	7.29

Source: United Energy

2 Background

2.1 Our GIS

Majority of our network assets are mapped in GIS, including mapping of coordinates between assets. GIS is a system that records the location of physical assets and their geographical, topological and physical characteristics. We use the topological representation of our assets to ensure safety and efficiency of asset management and planning by visualising, predicting and pre-empting changes over time including:

- the condition of network assets, for example the rate of change of a leaning pole
- conditions surrounding assets, for example the rate and extent of vegetation changes.

GIS has important links to many internal systems (e.g. outage management, network control, asset management and billing systems), as well as external data sources (e.g. land division and ownership information).

2.1.1 Limitations of our GIS

The GIS records the location of our assets relevant to each other and relevant to property boundaries defined by the Victorian Government's digital cadastre. The digital cadastre was created in the 1990s, with some errors and inaccurate locations of boundaries. As such, our GIS system inherits these inaccuracies relevant to the physical earth, which reflect the inaccuracies in the Government's current cadastre.

Additionally, the GIS data includes static location information recorded at the time of the development of the World Geodetic System 1984 (**WGS84**)—the reference frame used by the Global Positioning System (**GPS**). However, due to the movement of tectonic plates and continents, there are changes in GPS coordinates that are not captured in our GIS system. According to Intergovernmental Committee on Surveying and Mapping, Australia has moved more than 1.5 metres northwest since 1994.[1]

There are a number of Government initiatives currently underway that are likely to lead to more inaccuracies in our GIS systems if we do not keep up with the pace of change:

- The Permanent Committee on Geodesy is upgrading Australia's Geospatial Reference System, including the 'static' datum, from Geocentric Datum of Australia 1994 (**GDA94**) to GDA2020. A 'static' datum means that the positions of features (e.g. roads, buildings and property boundaries), will be updated to expected coordinates in 2020.[2] Currently, our asset locations in our GIS system can be inaccurate from 2 to 500 meters. There may be an even larger discrepancy after GDA2020.
- In February 2019, the Victorian Government introduced the Victorian Digital Asset Strategy (**VDAS**). As part of the VDAS, the Government aims to improve the graphical display and visualisation of infrastructure data, to facilitate a digital exchange of data between asset owners and construction companies, including a move to 3D drawings. The VDAS promotes the use of an Australian common coordinate reference system and a transition to GDA2020.[3] As custodians of Victoria's electricity assets, we will be encouraged to support these new standards to align our GIS and digital capabilities with VDAS and industry best practice.
- In August 2019, the Victorian Government committed to upgrading its digital cadastre to improve its accuracy and accessibility, through the Digital Cadastre Modernisation Project.[4] The project is expected to run over the next three to five years and will result in some changes to recorded land boundaries,

[1] Intergovernmental Committee on Surveying and Mapping, www.icsm.gov.au

[2] Ibid

[3] Office of Projects Victoria, Victorian Digital Asset Strategy Strategic Framework, February 2019, p.17

[4] www2.delwp.vic.gov.au/maps/digital-cadastre-modernisation-project/digital-cadastre-modernisation-project

particularly in rural Victoria. Once the cadastre is updated, the locations of our assets in our GIS system may be up to 50 metres displaced (unless the GIS system is updated), which can have a significant impact on our operations and our asset management practices.

2.2 Dial Before You Dig (DBYD)

DBYD is a free national community service designed to assist in preventing damage and disruption to Australia's underground infrastructure. Members of the public make requests online or via telephone to DBYD, a third party operator, regarding location of underground assets. DBYD forward the requests to us, allowing us 48 hours to respond. We typically respond providing asset information in PDF format within 30 minutes.

The key limitation of the existing DBYD service is that we cannot provide accurate information of the underground assets due to limitations of the Victorian cadastre and our GIS system. As such, to reduce potential safety incidents from accidental asset damage, we do not allow digging up to 30 meters around our asset location as reflected in the GIS. This can create limitations to construction customers' works that may not be initially envisaged.

Another limitation is the PDF format of the information requests can be difficult to interpret on a mobile device, leading to inconvenience and costs to parties working around our assets.

2.3 Map Insights

Map Insights is a mapping platform that allows our staff and third party contractors to visualise the detail and location of our assets and the topology in relation to their real-world location. Map Insight relies on our GIS data with overlays of data from the Victorian cadastre, Emergency Management Victoria (**EMV**), Country Fire Authority (**CFA**) and Bureau of Meteorology (**BOM**). Due to lack of accuracy between our GIS and other external mapping sources, we are unable to extend our platform to a wider range of stakeholders at present.

3 Identified need

Our GIS asset records are not aligned with the physical earth, or GPS. This discrepancy can result in:

- higher risk of safety incidents for our employees and third parties working around our underground assets
- higher cost of managing the network if assets are damaged accidently due to wrong coordinates
- inefficient management of works around and on our underground assets, by our employees and third parties, resulting in higher cost to our customers and those of third parties.

Australia's Geospatial Reference System GDA2020 is likely to result in an even larger discrepancy between our GIS records and GPS. Equally, as the Victorian Government aligns its assets to GDA2020 as part of VDAS and improves its cadastre the growing disparity between our GIS records and the Government's own records will result in further heightening of safety risks and inefficiently higher costs in works around underground assets.

We have identified an opportunity to reduce safety risks, reduce the cost of asset damage, deliver operational savings internally and to third parties, and ensure better asset information exchange with the Victorian Government and its stakeholders, by:

- conflating our GIS records to the physical earth—reconciling our assets with GPS coordinates and property boundaries, using new LiDAR areal technology and updated data from relevant authorities, including the updated Victorian cadastre
- introducing a master data management system—aligning all asset data to a 'single source of truth', including intelligent capability to share and receive 3D files
- enhancing Map Insights—opening the Map Insights application to more third parties to share information on inspections and vegetation management, as a faster way to inform customers when we will be in the area and allow them to better manage their works
- improving DBYD accuracy and access to information—building a DBYD mobile device application to allow users to view their requested boundary box on their device and show subsurface electrical assets overlaid on both satellite view and map view, including a capability to send and receive 3D files.

The expected customer and operation benefits from these initiatives are:

- saved time and effort of commercial customers and major infrastructure construction projects in accessing DBYD
- reduction in delay of projects for commercial customers, and to our operational costs, from fewer required inspections
- faster and more accurate responses to customers supply requests
- savings from fewer accidental damages to our underground assets.

4 Options analysis

Table 3 provides a summary of the total capital expenditure and net economic benefit over the 2021–2031 period for each of the identified options.

Table 3 Options analysis summary: costs and benefits during 2021–2031 ($ million, 2021)

	Option	NPV capital expenditure	NPV economic benefit	Net NPV economic benefit
0	Do nothing—do not make any changes or improvements to GIS and asset data management	0	0	0
1	Base intelligent engineering capability—GIS conflation, master data management and enhanced Map Insights	6.31	6.64	0.32
2	Base intelligent engineering capability plus DBYD mobile application—GIS conflation, master data management, enhanced Map Insights and DBYD mobile application	7.18	14.47	7.29

Source: United Energy

4.1 Option 0—do nothing

This option involves maintaining the existing GIS asset mapping and existing asset information location (and other relevant information) sharing. The advantages and disadvantages of this option are set out in table 4.

Table 4 Advantages and disadvantages of option 0

Option	Advantages	Disadvantages
No GIS conflation	Low upfront cost to customers	Continued issues with inaccurate topological representation of assets, resulting in: • heightened safety risks • more accidental asset damage • higher long-term costs to consumers due to inefficient works around underground assets, by our staff and third parties
No improvement in asset data management	Low upfront cost to customers	
No change to Map Insights	Low upfront cost to customers	Wasted time for third parties that need to find out if it is safe to work in certain areas around our assets, by having to call us to find out if we are working in the area. This can result in delay of works and ultimately higher costs to their customers
No change to DBYD information sharing	Low upfront cost to customers	No change in the accuracy of DBYD, resulting in heightened safety risks and higher long-term costs to consumers due to inefficient works around underground assets Wasted time for third parties in having to register requests for DBYD information. This can result in delay of works and ultimately higher costs to their customers

Source: United Energy

4.2 Option 1—base intelligent engineering capability

Under this option, we would conflate GIS asset data, consolidate all asset data into a master data management system with more intelligent capabilities, and share the Map Insights capabilities with third parties to inform them faster of works in the area. The following are the initiatives of option 1:

- align GIS data to industry best practice by reconfiguring data foundation requirements and scope and the optimum level of granularity, including additional low voltage (**LV**) assets to GIS
- align network asset data in GIS to the true geospatial location relative to property boundaries and GPS, using software to digitally combine geographic information from multiple sources including new LiDAR areal technology and census data (among others)
- develop 'business as usual' GIS system updates and processes to sustain accuracy over time
- develop a 'master data management' system that integrates all asset data from different sources, including GIS and Outage Management System/Demand Management System, including better coordinates matching and asset condition data
- develop the capability for the master data management system to share and receive building information model (**BIM**) 3D design files
- expand the Map Insights capability to provide real-time information to customers and third parties through secure access to additional systems.
- The advantages and disadvantages of this option are set out in table 5.

Table 5 Advantages and disadvantages of option 1

Option	Advantages	Disadvantages
GIS conflation	Lower cost to our customers from: • reduced time spent on design works by our designers, by reducing the need to manually align GIS data to customers' needs and to GPS • reduced need for inspections of third party works with more accurate asset information sharing • faster updates to asset data, and ongoing data capture, including by uploading 3D files • faster access to asset data, and interpretation of asset data, through the master data management system with 3D capabilities, saving time in asset investigation and related works • reduced number, and cost of, accidental damage to our underground assets. Faster completion of works and lower costs to third parties from: • reduced time and effort spent by third parties locating our underground assets, resulting in faster completion of works and ultimately lower cost to their customers • reduced delays in works by third parties caused by accidental damage to underground assets and the time required to rectify the damage	Upfront capital cost with ongoing maintenance costs
Master data management system with intelligent capabilities		
New Map Insights capabilities	Reduced time and effort in third parties finding out if it is safe to work in certain areas and around our assets, reducing potential delays of works	Upfront capital cost with ongoing maintenance costs

Source: United Energy

4.2.1 Quantification of benefits of option 1

Our customers and third parties working around our assets will benefit from saved time and effort from more accurate information on our underground assets, and by being better informed as to the location of our assets in relative to their works. Our estimate of benefits to customers and third parties is based on reduction in delay of projects for commercial customers from fewer required inspections when works are required.

There will also be operating efficiencies from this investment. The savings will come from fewer inspections, faster and more accurate responses to customers supply requests and savings from reduced damage to our underground assets.

For details on our benefit analysis refer to CODE IT COST MODEL.

The total net economic benefit from option 1 is shown in table 6. This includes customer and third party benefits and the operating efficiencies that will result in lower cost and network prices in the future. The net economic benefit reflects the difference in the NPV of costs and benefits over the 10 year period starting 2021/22.

Table 6 Net economic benefits from option 1 for the 2021–2031 period ($ million, 2021)

	Net economic benefit
Total net economic benefit from option 1	0.32

Source: United Energy

4.3 Option 2—base intelligent engineering capability plus DBYD mobile application

This option includes the initiatives in option 1 as well as the development of a mobile device application that would allow third party users to visualise the spatial data, pan and zoom, identify asset by category, and take measurements while using a reliable base map.

- The advantages and disadvantages of this option, over and above option 1 are set out in table 7.

Table 7 Advantages and disadvantages of option 2

Category	Advantages	Disadvantages
DBYD mobile device application	Significant benefits come from the east of use of digital formats rather than PDF. Digital maps can be integrated into a wide range of software and used on common hardware.	Upfront capital cost for application and ongoing maintenance costs

Source: United Energy

4.3.1 Quantification of benefits of option 2

The operational efficiencies would be the same under option 1. However, customers and third parties are expected to save even more time and effort with easy access to DBYD data and 3D visualisation, by not having to access and log into the online portal to get the information and by taking less time to interpret the results. Our estimate of the customer and third party benefits under option 2 is explained in CODE IT COST MODEL.

The total net economic benefit from option 2 is shown in table 8. This includes the customer and third party benefits and the operating efficiencies that will result in lower cost and network prices in the future. The net economic benefit reflects the difference in the NPV of costs and benefits over the 10 year period starting 2021/22.

Table 8 Net economic benefits from option 2 for the 2021–2031 period ($ million, 2021)

	Net economic benefit
Total net economic benefit from option 2	7.29

Source: United Energy

5 Recommendation

We recommend option 2—base intelligent engineering capability plus DBYD mobile application. While this is the highest-cost option, it offers the highest customer and third party benefits that outweigh the efficient cost of delivering them.

Option 0—do nothing, is not recommended as it is not in the long-term interest of customers and third parties and it does not deliver any benefits.

Option 1—base intelligent engineering capability, is not recommended as it does not maximise on the opportunity to improve customer and third party outcomes and increase long-term benefits.

Table 9 summarises the expenditure proposal for our recommended option 2.

Table 9 Recommended option: IT capital expenditure for 2021–2026 regulatory period ($ million, 2021)

IT capital expenditure	2021/22	2022/23	2023/24	2024/25	2025/26	2021–2026
IT capital expenditure	0	1.44	3.12	0.85	0	5.41

Source: United Energy