Business intelligence, reporting and data management

CP BUS 7.03 - BI BW - Jan2020 - Public

Regulatory proposal 2021–2026

Contents

1 Overview

Business	CitiPower, Powercor & United Energy
Title	Business intelligence, reporting and data management
Project ID	CP BUS 7.03 - BI BW - Jan2020 - Public
Category	IT Capital Expenditure - recurrent
Identified need	Data management and reporting is currently underpinned by multiple systems with multiple reporting capabilities. This landscape leads to increased risks, increased costs and reduced flexibility.
	There is a need to address the current data quality, duplication and corruption issues. The future solution must provide a strong capability to derive insights through our dataset. It should be a flexible solution that reduces business dependency on IT technical resource to enable reporting and analytics.
Recommended option	Option 2: consolidate to a single shared Enterprise Data Warehouse with integrated reporting across businesses
Proposed start date	2021/22
Proposed finish date	2025/26
Supporting documents	1. CP MOD 7.04 - BI BW - Jan2020 - Public

We use our BIBW business intelligence and reporting system for producing a range of reports across our business including for regulatory, financial, network and customer service reporting. Our BI/BW systems enable us to manage data and develop reports which underpin our business operations. Without BI/BW systems we would need to undertake manual data management and reporting which would increase labour resourcing leading to increased costs to customers.

Data management and reporting is currently underpinned by multiple data warehouse and reporting systems, including self-service reporting. The data warehouses are legacy solutions and limit the ability to analyse data and derive insights. The existing self-service reporting capability is also limited serving only a section of our business.

We need to address the current issues with data quality, duplication and corruption. The capability to derive insights from both structured and unstructured data should be extended to all of our business. There should also be increased flexibility which will in turn reduce the dependency of our internal business units on our IT department. Currently IT support resources are required to introduce new data elements, update and develop reports and derive necessary insights.

Currently the CitiPower/Powercor and United Energy business intelligence functions are supported by separate presentation layers and are underpinned by multiple data warehouses. There is an opportunity to consolidate the data warehouses used by CitiPower/Powercor and United Energy to reduce total costs to our customers.

We considered three options for managing our business intelligence, reporting and data management capabilities during the 2021-2026 regulatory period, as shown in table 1 below.

Table 1   Options analysis summary, total capital expenditure 2021–2026 regulatory period, $m June 2021

Options	Description	Capex
Option 0 - do nothing	Leave the existing data warehouse and reporting solutions as they are currently without any upgrade.	0.0
Option 1 - maintain currency of existing landscape with multiple applications	Retain the current respective data landscapes at CitiPower, Powercor and United Energy. Undertake periodic upgrades of Data Warehouses and Reporting applications.	6.8
Option 2 - consolidate to a single shared application landscape across businesses	Consolidate all existing data warehouses to have a shared data warehouse used by all businesses, and increase the scope of self-service reporting capability to support needs of all our businesses.	5.9
Option 3- consolidate applications for each business	Consolidate the Data Warehouse Platforms to have a single data warehouse for each business: one for CitiPower, Powercor and one for United Energy.	8.3

Source: CitiPower
Note: Costs allocated to network based on customer numbers

Based on the options analysis, we propose option 2, to consolidate to a single shared application landscape across CitiPower, Powercor and United Energy and increase the scope of our self-service reporting capabilities.

This option is the lowest cost and provides the flexibility to adopt relevant new technologies in the future with comparatively lower effort and costs.

2 Background

We collect a host of data, which has traditionally been collated in a siloed manner distributed across a number of systems-be it metering data managed using a meter data management system, technical data from business applications (e.g. SAP) and customer data.

We can also access unstructured data that can be harvested to develop meaningful insights-be it through analysis of the textual service order notes or of the information from social media platforms e.g. to identify and manage network issues through analysis of twitter feeds.

The ability to collate and derive insights from structured and unstructured data is rapidly gaining importance, and supports objective decision making and proactive addressing of issues. The core technology that supports this data management capability are the data warehouses and analytical and reporting tools that collect data from various source systems and provide insights (e.g. through report, visuals etc.)

We use our BIBW business intelligence and reporting system for producing a range of reports across our business including for regulatory, financial, network and customer service reporting. Our BI/BW systems enable us to manage data and develop reports which underpin our business operations. Without BI/BW systems we would need to undertake manual data management and reporting which would increase labour resourcing leading to increased costs to customers. Attachment B provides a non-exhaustive list of how we currently use BI/BW reporting across our businesses.

2.1   Current landscape

Our current data management and reporting tools (also known as Business Warehouse/Business Intelligence, or **BI/BW**), enable us to provide safe and reliable electricity to our customers by organising and harnessing important information to trigger appropriate actions, for example:

- automated system action (e.g. outage notifications to customers or network controllers, or programmed safety interventions on network equipment)

- reporting that informs and empowers our people to take action to meet safety and reliability standards (e.g. assessing root causes of outages using geospatial information, to shorten repair turnaround times).
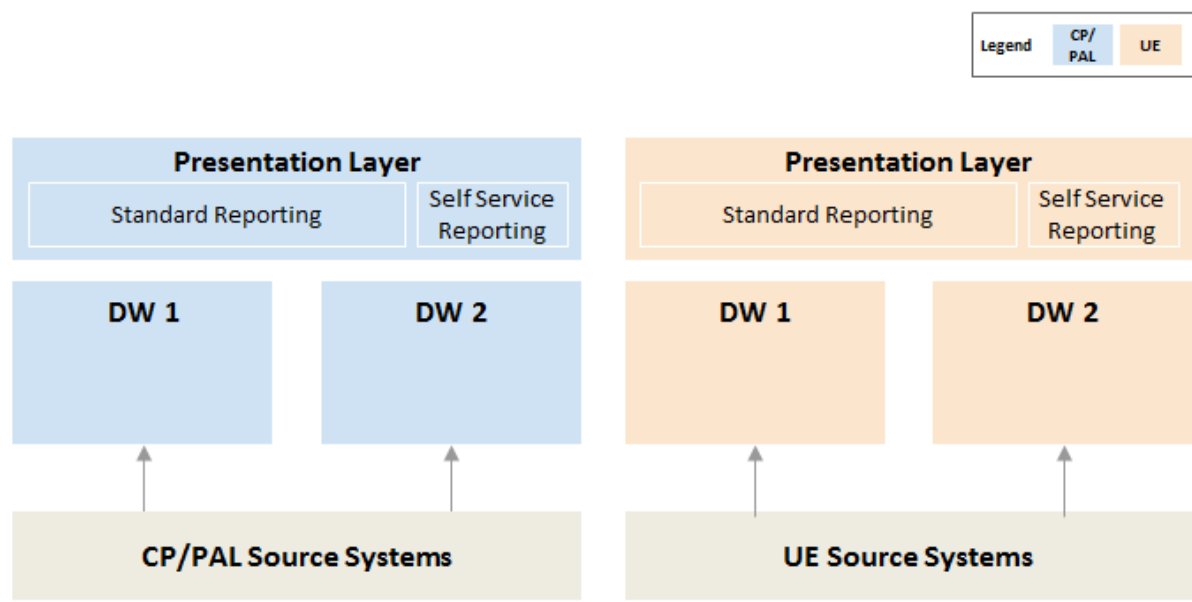
The ability to organise, analyse and act on data in a timely manner is central to meeting our customers' expectations for safe and reliable electricity supply, and, in doing so, ensures the business meets a wide variety of compliance obligations.

Our current data management and reporting tools consist of three layers:

- **Source Systems:** operations systems and business applications that collect critical organisational and network data and form the source of data for reporting and insights.

- **Data Warehouse** (incl. Staging Area): a central repository of integrated data from one or more disparate sources, storing current and historical data in one place and used for reporting and data analysis throughout the organisation. This includes the staging area, which is an intermediate storage area used for data processing, and resides between data source(s) and targets such as data warehouse. The staging area is primarily used to minimise the impact of data source systems. The staging area can be broadly defined to include structured, formatted data as well as raw, unstructured and unfiltered data.

- **Presentation Layer**: this includes standard reports (incl. charts, spreadsheets, tables) and self-service reporting.

Currently each business, CiitiPower/Powercor and United Energy, have multiple data warehouses and presentation layers which are supported by different vendors, as represented in figure 1 and table 2.

Source: CitiPower

Table 2   Data management vendors

	Data warehouse capability	Presentation layer
CitiPower/Powercor	SAP HANA and Oracle Exadata.	SAP BEx.
United Energy	SAP Native HANA and IBM Cognos Datastage on Oracle.	Cognos and Tableau (self-service reporting).

Source: CitiPower

3 Identified need

3.1 Problem statement

Data management and reporting is currently underpinned by multiple systems with multiple reporting capabilities, including self-service. The data warehouses are legacy solutions (e.g. Oracle Exadata is a monolithic 20 year old solution) and impact the ability to analyse data and derive insights. This is further exacerbated by the challenges due to data duplication and data quality issues, which have built over time due to the fragmented nature of systems and tools. Overall, this landscape leads to issues across three areas:

- **Risks:** technical and cyber risks exist due to legacy solution with ageing hardware and issues related to security patching (cyber security). This leads to business risks for the corresponding capabilities supported by these data warehouse solutions e.g. increased decision times due to inability to develop relevant reports and draw insights.

- **Costs**: changes are often required to multiple data warehouses to support altered business data analysis and reporting needs. This results in additional corresponding costs - resources, vendors etc.

- **Flexibility**: considering current macro trends around customer preferences (e.g. real-time usage, anytime/anywhere access) and continuous evolution of emerging technologies (e.g. distributed energy resources, automated vehicles) there is a need for active data management supported by a flexible technology solution. Legacy, monolithic and fragmented solutions impede flexibility and therefore are not suitable for future requirements.

3.2 Current state

The existing self-service reporting capability for both platforms is limited, serving only a section of our business. Each business currently has independent data management and reporting environments which do not intersect.

A set of five key issues exist with this current state, as shown in table 3. These issues combine to create a situation that negatively impacts agility and scalability and therefore introduce risks. Further, it limits the business' ability to generate data-driven insights which can improve network operations, including bushfire mitigation works and the detection (and rapid, automated resolution) of other network safety issues.

The need to modernise the data platform is therefore a function of increasing risks, potential cost avoidance and inability of solutions to support evolving business needs.

Table 3   Current issues with data reporting and management

Ref	Issue	Result	Example
1	Duplicated data, repositories and reports, due to multiple data warehouse and reporting solutions.	Duplicated data, analytics, reporting and repositories, resulting in increased costs for storage and maintenance, as well as missed opportunities for insights across networks.	CitiPower/Powercor Data Warehouse capability is provided by SAP HANA and Oracle Exadata platforms. This is in distinct to the United Energy data warehouse capability provided by SAP Native HANA and IBM Cognos Datastage on Oracle.
2	The Data Warehouses have limited flexibility and are unable to support the growing need for complex analytics.	The current Data Warehouses have limited flexibility, requiring significant investments, to address the usage requirements for ever increasing volumes of unstructured & semi-structured data. Also, only a small subset of such data is currently available to the business.	There is no way for us to assess, analyse and act on customer priorities using trending content in either social media feeds or real time meter operations data.
3	The current Data Warehouses are primarily designed to support centralised, standardised reporting, rather than self-service reporting.	Users are unable to create their own reports based on changing business needs, and are reliant on IT technical resources to make the required changes. This has lead times and dependencies for delivery with potential impacts to business outcomes and risks (e.g. due to missing insights).	Contact Centre teams seeking new combinations of meter data and faults data for improved customer insights to newly posed questions.
4	Limited data is currently held in Data Warehouse (data stage layer).	Constrained ability to analyse data, report insights and take corresponding actions, limiting the outcomes of our organisation such as within network and business planning, and monitoring and management.	5 minute interval meter data analysis represents opportunities to manage network safety and reliability, including the detection of neutral faults and load balancing. LIDAR survey data analysis is increasingly relied upon for bushfire mitigation work.
5	Not all relevant raw data is available within production (e.g. data in the Data Lake).	Currently an amount of raw data is only available to selected areas of the organisation and does not operate under a central IT support model. Also there is negligible capability to collate and analyse unstructured data.	Issues with data systems' performance and availability may not be resolved in a timely manner.

Source: CitiPower

3.3   Desired future state

There are a number of aspects that the future state will need to deliver considering the above issues and the growing importance of data management, analytics and objective decision-making to improve customer and business impact.

The future state needs to address the current issues with data quality, duplication and corruption. Consolidation of multiple systems into a single one will necessitate the relevant data cleaning exercises while building the desired future state of having a single source for developing reports and insights.

Considering the exploding volumes of unstructured data, a strong capability to derive insights through this dataset should be developed. The current existing capability should therefore be extended to the whole of our business.

It is also highly likely that new and additional data elements will be required from time to time to develop insights. The future state needs to be a flexible solution that enables minimal dependency on IT technical support resources to customise/build reporting capabilities, therefore extending the existing self-service capabilities.
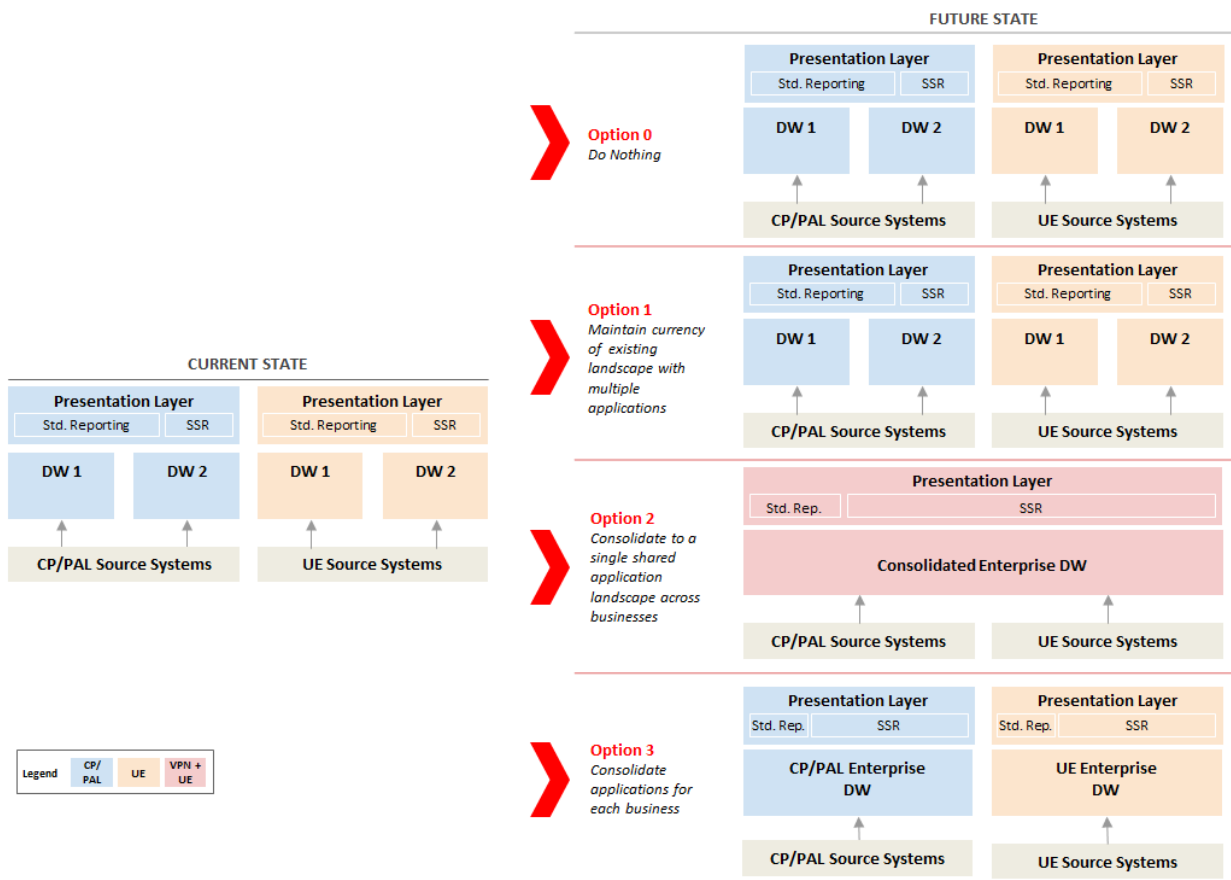
4 Options analysis

4.1 Options

A structured approach that takes into consideration the current state issues was used to develop a set of future state options. These options were developed with a focus on protecting existing data quality, and seamlessly maintaining existing uses of that data, particularly as they relate to safety and compliance.

Four data landscape options were identified to be viable and the description, scope and costs for each of these options are outlined in figure 2:

Figure 2   **Options considered**

Source: CitiPower

Table 4   Summary of options, $m 2021

#	Option	Description	Cost $m
0	Do-nothing	Leave existing as-is data warehouse systems (i.e. do not upgrade or conduct maintenance activities)	0.0
1	Maintain currency of existing landscape with multiple applications	Upgrade/maintain existing CitiPower/Powercor and United Energy data warehouse systems following vendors recommended patching cycle to ensure currency	6.8
2	Consolidate to a single shared application landscape across businesses	Consolidate existing 4 data warehouse systems into a single Enterprise data warehouse system with a common staging layer and integrated with the single reporting platform	5.9
3	Consolidate applications for each business	Consolidate data warehouse systems for each entity with its own staging layer and reporting platform	8.3

Source: CitiPower

4.2   Option 0: do nothing

The 'do nothing' option proposes that we leave the existing data warehouse and reporting solutions as they are currently, without any upgrade as it reaches the end of its lifecycle or requires security patching. In other words, the 'do nothing' scenario assumes no capital expenditure on our data management solutions during the regulatory period.

When a software product is out of support, the vendor will not provide software patches to resolve any issues which arise. The failure to perform vendor provided patching will lead to security vulnerabilities and data integrity issues. Fixes for broken vendor code will need to be performed in-house. This approach poses an unacceptable risk to the business, as it places the organisation outside the protections of vendor support. It is a certainty that some issues could not be resolved by in-house patching alone, at which point the vendor will likely force an upgrade to the latest product version. This will lead to significant additional costs.

Upgrades bring new functionality as part of the standard product. The inability to benefit from the advances associated with new technologies would lead to increased operating expenditure. Where there is a business need for the functionality which would have been provided by an upgrade, in house development may be required. The development of custom code/solutions introduces other risks/costs during future upgrades due to complexities around migrating this code to the new environment. Therefore, in house development would lead to both increased operating expenditure and risk.

In choosing not to perform vendor recommended software upgrades, we fall behind on critical security patching which will lead to increased vulnerability risks. The risk of an external party getting access is increased. The impact is further reaching than just the Data Warehouse or the presentation layer. If a system residing within our network was compromised by an unauthorised individual, it potentially opens up a gateway to access other critical systems sitting within the same network.

 Table 5 summarise the advantages and disadvantages of this option.

Table 5   Option 0: advantages and disadvantages

Category	Advantages	Disadvantages
Business enablement (flexible)	Lowest organisational change impact	Software faults and bugs will not be rectified by the vendor resulting in increased disruption to our business units.
		Constrained ability to develop new reports and insights as the business will be dependent on IT technical resources for development.
		Impacts ability to accommodate new, emerging future technologies due to the legacy nature of the environment.
Business risk (safe & dependable).		Product currency is not maintained leading to system instability.
		Software warranty is not protected once version end of life is reached.
		Improved software security associated with upgrades is not received resulting in increased vulnerability risks.
		Risks to business in proactively addressing issues due to limitations of current landscape such as subset of data being available in our DWs, data quality issues, and the limited ability for self-service reporting.
Commercial (affordable).	Zero capital expenditure.	Inability to benefit from the technical advances associated with new technologies, leading to increased operating expenditure over time.

Source: CitiPower

4.3   Option 1: maintain currency of existing landscape with multiple applications

Retain the current respective data landscapes at CitiPower/Powercor and United Energy and undertake periodic upgrades of data warehouses and reporting applications to remain aligned with recommended vendor roadmaps and maintain system currency and reliability. Upgrades to SAP BW are undertaken every two years. Upgrades to Self Service Reporting are undertaken every five years.

Upgrades bring new functionality as part of the standard product. The inability to benefit from the technical advances associated with new technologies would lead to increased costs. Where there is a business need for the functionality which would have been provided by an upgrade, in house development may be required. The development of custom code/solutions introduces other risks/costs during future upgrades due to complexities around migrating this code to the new environment. In house development would lead to increased operating expenditure.

This option will lead to additional costs over the long term compared to the option of having consolidated systems, as upgrades are required for each network's respective Data Warehouse and reporting systems.

Table 6　　Option 1: advantages and disadvantages

Category	Advantages	Disadvantages
Business enablement (flexible)	Upgrades provide improved software security. Lower organisational change impact than option 2.	Constrained ability to develop new reports and insights as the business will be dependent on IT technical resources for development. Impacts ability to accommodate new, emerging future technologies due to the legacy nature of the environment.
Business risk (safe & dependable)	Product currency is maintained ensuring system stability. Software warranty is protected. Software faults and bugs are rectified by the vendor resulting in reduced disruption to our business units. Lower Risk of Incidents and outages when compared to option 0: modernised infrastructure and applications, if deployed as per best practices, reduce the risk of failures, technical issues and support challenges.	Potential data quality risks due to data duplication. For example, in the situation where the source system is a converged single source system, data must be loaded into the two separate data warehouses. This can create data redundancies and lead to data integrity issues i.e. data from the consolidated SAP S/4 HANA database to BI/BW. Due to the multiple systems, there is a need for comparatively complex governance arrangements to manage system changes.
Commercial (affordable)	Eliminates the need for future removal of in house developments and costly migration back to core product in order to return to vendor support.	Increased costs due to the requirement to update multiple systems in both the CitiPower/Powercor and United Energy environment (e.g. mandatory upgrades of SAP BW and self-service reporting systems need to be performed for CitiPower, Powercor, and also for United Energy). Higher data management and data support costs due to duplicated data and produces potential data quality risks.

Source: CitiPower

4.4　Option 2: consolidate applications for each business

Description

Consolidate all data warehouses to have a shared data warehouse used by all three businesses.

An integrated common Data Lake platform acting as a foundation to a consolidated Enterprise Data Warehouse & Analytics platform is the recommended approach. This target state landscape is essential for ensuring CitiPower, Powercor and United Energy continue to meet the current and emerging needs of all areas of the business, and keep pace with the changing nature of analytics and reporting.

Although analytics and self-service reporting may optimise some existing processes, this capability primarily unlocks the unknowns within untapped data sets. This generates new, automated solutions to problems that were previously unseen, but will now have evidenced priority. This is applicable in the monitoring of safety conditions, tracking the rates of asset utilisation and the linking and trend analysis across various data sets (including usage information, asset condition information, financial and geospatial information).

Category	Advantages	Disadvantages
Business enablement (flexible)	Most suitable at adoption of changing user requirements around data accessibility, new data types, and new methods of data discovery and self-service reporting.	
Business risk (safe & dependable)	Lower risk of incidents and outages: modernised infrastructure and applications, if deployed as per best practices, reduce the risk of failures, technical issues and support challenges. Reduced data quality risk due to more efficiency in data management and data support. Comparatively simple governance arrangements to manage system changes due to single system supporting the landscape.	There is a business risk due to the nature of being a single core data warehouse system.
Commercial (affordable)	Reduced costs as updates required to a single systems (e.g. mandatory upgrades of SAP BW and self-service reporting systems are only required for the consolidated system, rather than for each network).	

Source: CitiPower

4.5   Option 3: consolidate to a single shared application landscape across businesses

Option 3 involves consolidating the data warehouse platforms to have a single data warehouse for each business: one for CitiPower/Powercor and one for United Energy.

Whilst this allows each network to tailor their own solution to meet the specific needs of their users and networks, this comes with a large upfront and ongoing cost.

Table 8 below summarises the advantages and disadvantages of option 3.

Table 8   Option 3: advantages and disadvantages

Category	Advantages	Disadvantages
Business enablement (flexible)	Each network can independently elect to implement bespoke choices in software, and independently time their respective implementations. Ability to support changing user requirements around data accessibility, new data types, and new methods of data discovery and self-service reporting.	Inability to deploy new business applications, as they will be relying on more modern base IT platform than we will be running.
Business risk (safe & dependable)	Lower risk of incidents and outages: modernised infrastructure and applications, if deployed as per best practices, reduce the risk of failures, technical issues and support challenges. A system failure will not affect both the networks.	Potential for data quality risk (lower compared to option 1) due to two systems supporting the data management capabilities. Due to the multiple systems, there is a need for comparatively complex governance arrangements to manage system changes.
Commercial (affordable)		Significant costs of duplicated consolidation activities. Additional ongoing costs due to the existence of two separate systems.

Source: CitiPower

5 Recommendation

We propose option 2, consolidating to a single shared application landscape across businesses over the 2021-2026 regulatory control period.

This option is the lowest cost for customers and provides unquantified benefits of increased flexibility and improved ongoing data quality. This option will also enable increasing usage of unstructured data and reduce dependency of the business on the IT department to build new or change existing reports.

Option 0 (do nothing) has been discarded due to the extremely high business and customer impact risk profile and lack of strategic business and customer alignment.

Option 1 and 3 are not recommended because, both options:

- result in higher costs than option 2

- continue to have additional overhead costs due to requirement to update multiple systems

- will need more complex governance arrangements than option 2 due to the environment containing multiple data warehouses and presentations layers.
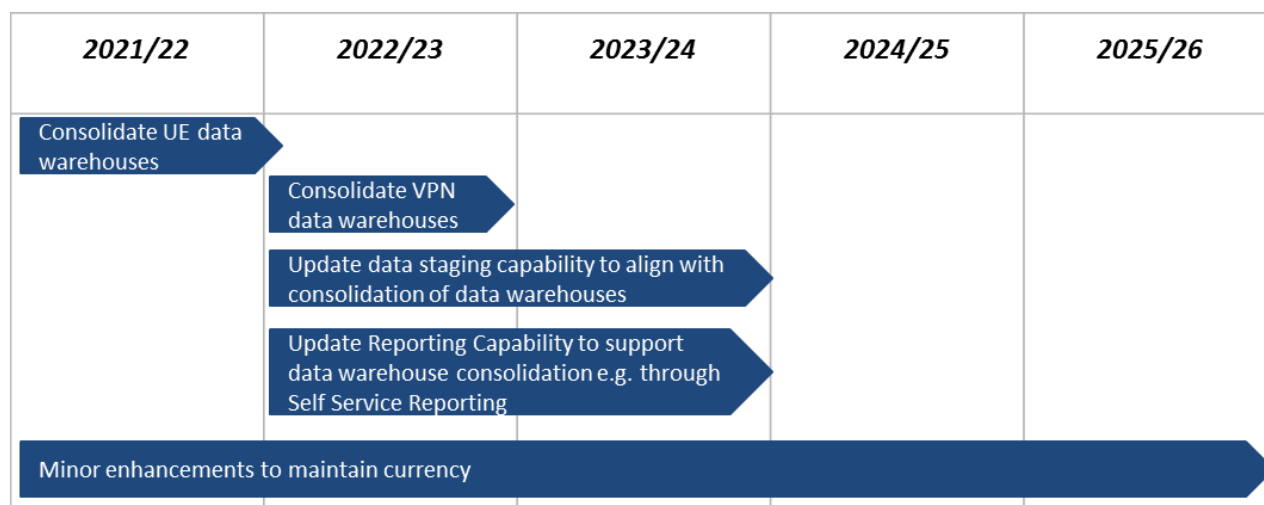
Table 9   **Recommended option, capital expenditure 2021-2026 regulatory period, $m June 2021**

Expenditure forecast, $m 2020	2021/22	2022/23	2023/24	2024/25	2025/26	Total
CitiPower	0.1	0.7	0.2	0.1	0.1	1.1
Powercor	0.1	1.6	0.5	0.1	0.1	2.5
United Energy	0.5	1.1	0.5	0.1	0.1	2.3
Total	**0.7**	**3.4**	**1.2**	**0.3**	**0.3**	**5.9**

Source: CitiPower

A high level, indicative roadmap for implementing our recommended option 2 is provided in figure 3.

Figure 3   **Recommended option roadmap**

Source: CitiPower

A Risk monetisation summary

Table 10   IT Risk monetisation summary for recommended option

Risk Category	Risk Type	Description of Risk
IT Risks	Outage	An outage within our data warehouse or reporting capabilities would mean we were unable to generate reports for various areas of the business including network, regulatory or customer service functions. Consolidating our warehouse and streamlining reporting under our preferred option means we can expect low risk levels similar to that experienced today.
	Suitability	Suitability issues occur as a result of external changes to reporting requirements meaning that while a system continues to work, it is no longer suitable to perform required functions. We perform changes to our reporting on a regular basis to ensure we can continue to meet business requirements.
	System Sustainability	System sustainability issues (defects) can occur from time to time. Without correcting them, they grow over time resulting bugs and lost staff productivity and other sub-optimal outcomes through incorrect reporting. By maintaining currency, system sustainability issues are rectified by the vendor.
Business Risks	Reliability Impact	Our planning teams require the BI/BW interface for SAP-enabled activities on a daily basis, including map insights and energy work bench. A prolonged lack of access to BI/BW would require us training all relevant team members to write SQL or to source customer lists from systems (like CIS or GIS) and extract the interval data straight from IEE and aggregate it manually in excel. There is a risk under the achievability of this without error, which could have wider reliability impacts, which we have not yet quantified.
	Compliance Risk	We meet compliance requirements through our data warehouse or reporting capabilities, such as our RIN requirements. Reverting to manual processes may impact our ability to deliver them in a timely manner. By consolidating and ensuring the currency of our systems, we can instead ensure we continue to meet our reporting-driven compliance requirements.
	Safety Risk	NA
	Bushfire Risk	NA

Risk Category	Risk Type	Description of Risk
	Financial Loss	Significant costs would be incurred from engaging FTE to manually process this data and generate reports generated in our Network, Finance, Regulatory and Customer Services areas.

If we did not invest in our data management and reporting tools, there is an almost certain risk of we would ultimately have to hire a number of FTE (over 50 across CitiPower, Powercor and United Energy) in order to ensure the same reporting information was available as below.

This financial risk significantly outweighs the cost of implementing our preferred option (by at least 4 FTE on average).

In addition, inaccuracy in our reporting (such as our accrual report and Embedded Generation report impacting DUoS and PFiT) may result in audit issues, impacting our ability to receive funding from investors. |

Source: CitiPower

B BIBW reporting

Table 19   **BIBW-enabled CitiPower Powercor Reporting categories**

Brief Description	Use cases		
RIN Reporting	**Regulatory**	**Compliance**	**Customer**
Reports focusing on supply reliability and quality indexes including System Average supply Duration Index (**SAIDI**), System Average Interruption Frequency Index (**SAIFI**), Momentary Average Interruption Frequency Index (**MAIFI**) and outages.		●	
Vegetation management reports focusing on the Inspections and Trimming being carried out for Bush fire Mitigation	●	●	
AER Regulatory reporting	●		
Reporting on the inspections and work execution of Poles, Cross Arms equipment	●	●	
Network Reliability Reporting			
TUoS/NuoS Summer maximum demand	●	●	
Solar Capacity & demand planning	●	●	
Embedded generation analysis	●	●	
AMI Benefits Analysis	●	●	
Annual RIN assessments	●	●	
CSG Reporting			
Customer Survey details by customer type, suburb, etc.			●
Guaranteed Service levels and Worst Served Customer Index		●	●
Quality of reads for NMI sent to AEMO		●	

Table 19   BIBW-enabled United Energy Reporting categories

Brief Description	Use cases		
RIN Reporting	**Regulatory**	**Compliance**	**Customer**
Supply Points / Connection Objects Data Quality Dashboard	●		
Transformers Data Quality Dashboard	●		
Poles - Data Quality Dashboard	●		
New Life Support Customers with house number corrections required	●		
Network Reliability Reporting			
Maintenance Dashboard - HBRA		●	●
Neutral Fault Scorecard			●
NLM Forecast - Long Term and Short Term		●	●
Audit Dashboard		●	
CSG Reporting			
Supply Guarantee Dashboard			●
UE - CMO KPI Dashboard			●

Source: CitiPower