

REVIEW OF ECONOMIC ASSESSMENTS

AER BRIEFING

Classification: Internal

8 June 2017

AGENDA

- General Issues – VCR, fire start risk
- Project Specific Issues:
 - EC.12115 Telecommunications Unit Asset Replacement
 - EC.12330 One IP Substation Network
 - EC14034 Isolator Unit Asset Replacement
 - EC.14071 Robertstown CB Arrangement Upgrade
 - EC.14085 Gawler East Connection Point
 - EC.14105 Brinkworth-Waterloo Bearer Replacement
 - EC.14209 Substation Improvements for System Black
 - EC.14145 and EC.14137 Eyre Peninsula Line Conductor & Earthwire Refurbishment
 - EC.14081 Line Insulator Systems
- Other Project Issues (AEMO Review) - Leigh Creek South, Mannum, Blyth West and Para Reactors
- Risk assessments including worked example

- All VCR values are sourced from AEMO (November 2014) – being \$38,090/MWh (excl. direct connects) or \$34,060/MWh (incl. direct connects)
- Inconsistent values were inadvertently applied across economic and IRT assessments, including escalation treatment
- A consistent mixed load VCR (incl. direct connects) of \$35,898/MWh (\$2017-18) is now being applied across all economic and risk assessments
- We are in the process of updating the economic and IRT assessments for completeness
- However, the impacts of changes are well within the range of sensitivities tested – there is no change in outcomes

EC.12115 TELECOMMUNICATIONS UNIT ASSET REPLACEMENT

- There are key drivers which increase reactive replacement costs including:
 - **Lack of spares** - hardware and technology near end of life that is no longer manufactured
 - **Assets carry multiple services** - impacts are significant with multiple workarounds required to maintain services during replacement
 - **Labour costs** - significantly more labour input is required for a reactive replacement when compared to a planned replacement including site investigation, temporary protection setting changes etc.
- Estimate of additional costs to reactively repair three types of faults
 - **Radio fault**, multiple services affected with emergency cranes and rigging required – 100%
 - **Multiplexer fault**, multiple services affected – 100%
 - **Non-service impacting fault** (e.g. DC systems, alarm cards, telephones, etc) – 50%
- As this project focuses on mixed assets a conservative average reactive cost loading of 75% has been applied
- Additional call out and emergency response costs are included in the reactive replacement uplift, so this additional input has been removed
- Rounding up of the forecast number of asset failures has been modified to more accurately capture the escalating rate of asset failures over time
- These adjustments do not impact on the outcomes of the assessment

EC.12330 ONE IP SUBSTATION NETWORK

- There are key drivers which increase reactive replacement costs including:
 - **Lack of spares** - hardware and technology near end of life and is no longer manufactured
 - **Assets carry multiple services** - impacts are significant with multiple workarounds required to maintain services during replacement
 - **Labour costs** - significantly more labour input is required for a reactive replacement when compared to a planned replacement including site investigation, temporary protection setting changes etc.
- Estimate of additional costs to reactively repair two types of faults
 - **Multiplexer fault**, multiple services affected – 100%
 - **Non-service impacting fault** (e.g. DC systems, alarm cards, telephones, etc) – 50%
- Whilst predominantly multiplexer related, a conservative average reactive cost loading of 75% has been applied
- Additional call out and emergency response costs are included in the reactive replacement uplift, so this additional input has been removed
- These adjustments do not impact on the outcomes of the assessment

EC.14034 ISOLATOR UNIT ASSET REPLACEMENT

- The figure of [REDACTED] for the replacement of a damaged isolator (emergency repair) used in the risk assessment (refer IRT memo) was an approximation based on the planned replacement of [REDACTED] isolators at an estimated cost of [REDACTED], rounded to an average unit cost of [REDACTED]
- The unit cost replacement figure of [REDACTED] applied in the economic model represents a more detailed and accurate estimate of the stand-alone costs involved in asset emergency replacement
- Consistently applying a cost estimate of [REDACTED] in the risk assessment results in a minor increase in the risk cost reduction figure, but does not materially alter the outcomes of the assessment

EC.14071 ROBERTSTOWN CB ARRANGEMENT UPGRADE

- The secondary benefits of the most economic option are as follows:
 - Environmental benefit – a number of drainage and erosion issues need to be addressed on the site. The extension of the site and civil works associated with the preferred option avoids the need for this expenditure of approximately \$1m
 - Expandability benefit – extension of the site through the preferred option preserves future expandability of this key nodal substation for future potential developments (e.g. future interconnector and/or Riverland reinforcement). This avoids the future cost of relocation of these assets in the event of site expansion of approximately \$2.9m (PV). This approach was endorsed as a preferred option by AEMO.
- The benefit of relocating the CB was incorrectly included in the base case. Removing the benefit adds around \$2.9m to the net benefit of both Options 1 and 2. This has been corrected in the economic assessment.

EC.14085 GAWLER EAST CONNECTION POINT

- SAPN has reviewed and confirmed the current demand forecast (May 2017)
- The preliminary RIT-D analysis concluded that the preferred option (new 132/11kV Connection Point Zone Substation) provides the highest net market benefit under all scenarios considered
- As part of the formal RIT-D process, SAPN will consider non-network options that may address the network constraint by formally seeking submissions from non-network providers on potential credible options
- However, current information indicates that for:
 - Generation Support - at least a [REDACTED] would be required to delay network augmentation by 12 months. The indicative cost of a typical [REDACTED] [REDACTED]. This option appears unlikely to offer an economical means of deferring the network augmentation.
 - Demand Side Management - at least a [REDACTED] would be required to delay network augmentation by 12 months. [REDACTED]

EC.14105 BRINKWORTH-WATERLOO BEARER REPLACEMENT

- There are key drivers which increase reactive replacement costs including:
 - **Lack of spares** - hardware and technology near end of life and is no longer manufactured
 - **Assets carry multiple services** - impacts are significant with multiple workarounds required to maintain services during replacement
 - **Labour costs** - significantly more labour input is required for a reactive replacement when compared to a planned replacement including site investigation, temporary protection setting changes etc.
- Estimate of additional costs to reactively repair radio faults
 - **Radio fault**, multiple services affected with emergency cranes and rigging required – 100%
- As this project focuses on radio, reactive cost loading of 100% has been applied
- Additional call out and emergency response costs are included in the reactive replacement uplift, so this additional input has been removed
- Adjustments made do not impact on the outcomes of the assessment
- A conservative approach has been taken in regards to the benefits of installing OPGW
- A number of additional benefits have not been quantified:
 - **Resilience of the Mid-North network** is improved by replacing high risk structures
 - **Reliability of this transmission line** is improved by full earthwire coverage to protect from lightning strikes
 - **Market benefits** due to increased line availability reducing constraints on the operation of windfarms (runback requirements) at Wattle Point and in the Mid North region



EC.14049 LEIGH CREEK SOUTH TRANSFORMER REPLACEMENT

- The transformers are currently 61 years old and nearing the end of their technical lives
- Both transformers have oil leaks (after numerous repairs) and neither transformer has a bund to contain the oil should a breach of the tank occur
- 132 kV resin bonded paper bushings are still in service and are showing significant deterioration and present a safety risk
- Furan analysis has predicted end of life of the transformers as 2015 (TF2) and 2018 (TF1) respectively
- The project scope involves replacing two 10 MVA transformers with a single 5 MVA transformer.
- An option considering delaying the replacement 5 years until 2024-2028 period was considered, but is not preferred on an economic basis when compared to ongoing risk and maintenance costs

EC.14077 MANNUM TRANSFORMER 1 AND 2 REPLACEMENT

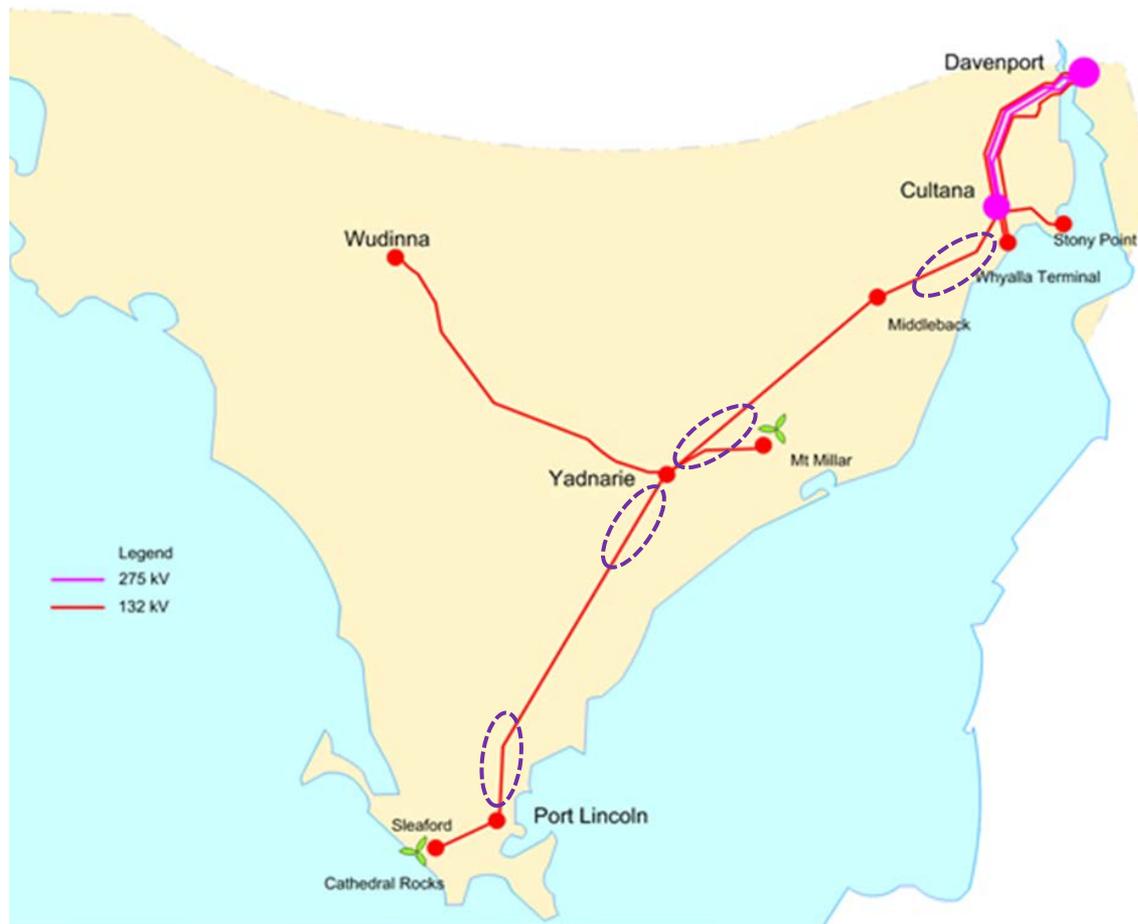
- ElectraNet has selected its standard transformer sizes to enable efficiencies in procurement, spares, ability to be re-deployed, engineering design etc. ElectraNet's standard 132/33kV transformer size that can accommodate a forecast peak load of 14.8 MVA is 25 MVA.
- ElectraNet is required to maintain N-1 transformer capability at the Mannum connection point
- A smaller transformer size (e.g. 20MVA) would offer minimal capital cost savings (estimated at ~4%) which would be expected to be eroded by the other issues inherent in a non-standard size.
- As such ElectraNet does not consider that a smaller size (2 X 20 MVA) is a prudent or efficient investment solution

EC.14056 TEMPLERS WEST, EC.14215 PARA AND EC.14216 BLYTH WEST REACTORS

- ElectraNet is preparing to conduct a RIT-T on main grid voltage levels, recognising that the underlying requirements for the Templers West, Blyth West and Para reactors are interrelated
- Efficiencies gained by conducting three similar projects have already been taken into account by means of reduced design costs in the latter two projects
- The Templers West reactor project (EC.14056) is still proposed for a delivery date in late 2018

EC.14145 AND EC.14137 LINE REFURBISHMENT - CONTEXT

- The projects are required to replace the sections of line conductors and earth wire in poor condition between Cultana and Yadnarie and Yadnarie and Pt Lincoln



EC.14145 AND EC.14137 LINE REFURBISHMENT

- A [REDACTED] was assumed in the USE calculation for the economic assessments during the start-up period of the network support arrangement, while the IRT assessments assumed a [REDACTED]
- ElectraNet's internal analysis suggests that historically where there is a loss of supply, the start-up period is around [REDACTED]
- We agree that where forced rectification works occur and the line remains in service there is no loss of supply
- We have updated the IRT and economic assessments to reflect this
- VCR has also been updated

EC.14145 AND EC.14137 LINE REFURBISHMENT – UPDATED NPV ANALYSIS

- In summary, revised assumptions in the economic assessment are:
 - Reduction in GT starting reliability from [REDACTED] (in line with the ETC reliability standard)
 - Revised average load estimates based on more accurate data
 - New VCR numbers applied (described earlier)
 - Adjustment of GT start-up time from [REDACTED] (for line drop) and to [REDACTED] (for forced corrective outage)
- The analysis conservatively assumes the entire load of the Eyre Peninsula can be supplied as an island under line outage conditions – in the event this is not technically and economically possible under all scenarios, unserved energy estimates increase accordingly

RISK ASSESSMENT INCLUDING EC.14145 LINE REFURBISHMENT WORKED EXAMPLE

- Asset Risk Cost Modelling Guideline
- Eyre Peninsula Line Conductor and Earth Wire Refurbishment – walk through of updated IRT Model Explanation Note
- Review illustrated calculation of conductor drop risk cost evaluation



QUESTIONS AND ANSWERS