# Heywood Interconnector Upgrade

## Response to AER Information Request

24 January 2014

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# Tables

The following information is provided in response to the information request from the AER on the Heywood Interconnector Upgrade submitted to ElectraNet via email on 21 January 2014.

# 1. Question 2 – Risk Analysis

**AER Request**

*The AER is interested in understanding the basis of the estimates used in the risk analysis that forms part of the project costing. Please provide:*

*a) a detailed description of each of the risks modelled in the risk analysis*

*b) details of all input figures used in the risk analysis including the source of the figures, description of how the input figures were derived, copies of any estimates used to derive the input figures, and what risk the input figures relate to*

*c) a description of the basis of any range or distribution estimates used in the modelling*

*d) a fully copy of any model used to calculate the total risk estimate*

*e) details of the modelling used to determine the total risk estimate including all supporting documentation*

*Please ensure that your response includes details that fully characterise the 'other risks' category noted on page 13 of the 'Heywood Interconnector Contingent Project Application, AER Briefing' (dated 4 December 2013), particularly in relation to points a, b and c above.*

**ElectraNet Response**

The following response provides the further information requested on the estimates used in the risk analysis undertaken for the Heywood Interconnector Upgrade project, addressing the points listed above.

The risk allowance is reflective of the relatively early stage of the project at this point, and complexity of the works involved.

a) A detailed description of each of the risks incorporated in the Heywood Interconnector Upgrade project risk analysis is set out in the project risk register which is included in Attachment A with this response.

b) Details of the input figures, sources and cost assumptions used in the risk analysis are provided in Attachment A.

c) The basis of preparation for the range and distribution of estimates used in the project risk modelling is consistent with ElectraNet's project risk assessment methodology. A summary of the process undertaken is as follows:

- Project risks were identified during project risk workshops held with the relevant subject matter experts;
- Based on professional engineering assessment, minimum, mean and maximum cost impacts were estimated for all project risks, together with a likelihood of occurrence based on available information. Where required, supplier estimates were also obtained; and

- Potential cost outcomes and likelihood of occurrence for each risk identified were further quantified by the relevant disciplines based on the area of activity or expertise in understanding the risk required.

d) ElectraNet's project cost estimating engine 'Success Estimator' (a widely-used proprietary software package produced by US Cost) was used to run a Monte Carlo simulation of potential project risk outcomes, based on the likelihood of occurrence and range of potential cost impacts across each of the identified risks. The outcomes of this analysis were used to establish the risk allowance component of the capital cost estimate.

Attachment B to this response provides the outputs from the risk analysis prepared for the Heywood Interconnector Upgrade project. These results should be readily replicable using the same inputs and assumptions using similar risk analysis software tools (such as @Risk).

e) A Monte Carlo simulation modelling methodology was used to derive a probabilistic distribution for project risk. Key assumptions are identified below:

- Outcomes were based on 5,000 model iterations;
- For each risk input a normal distribution was assumed; and
- The 50th percentile outcome (i.e. P50) was used to determine the project risk allowance.

## 2. Question 3 – Proposed Commissioning Date

**AER Request**

*The AER notes that the proposed commissioning date for the increased transfer capacity as stated in section 2.4 (page 9) of the 'Contingent Project Application' (dated December 2013) is July 2016. However, section 3.3 (page 12) states that the increased transfer capacity is due to be commissioned by 30 June 2018. Please clarify the date by which the increased transfer capacity is due to be commissioned. Include an explanation for the discrepancy in the dates addressing factors outside ElectraNet's control, the timing of works on the Victorian side of the border and the coordination of interconnector outages.*

**ElectraNet Response**

Page 9 of the Contingent Project Application confirms that the proposed commissioning date for the increased transfer capacity is July 2016, consistent with the optimal timing identified through the RIT-T process. This corresponds with the completion of the installation and commissioning of the series capacitors, at which point the increased transfer capacity will become available.

ElectraNet understands that AEMO is proceeding to undertake the required works in the Victorian network in accordance with this timeframe. Network outages associated with the interconnector will be coordinated in accordance with the standard operational protocols, in consultation with AEMO.

The project completion date of 30 June 2018 referred to on page 12 of the application refers to the anticipated completion date for the overall project, including completion of the required line demolition works and all remaining project close out activities.

# 3. Question 4 – South East Control Scheme

**AER Request**

*The extract of the 'Heywood Interconnector RIT-T PACR' (PACR) provided with the contingent project application includes on page 23 a discussion on the inclusion of the south east control scheme but minus the 3rd Heywood transformer. Would ElectraNet please provide documentation (incl. a business case if available) explaining why the south east control scheme is now included within the scope of the Heywood Interconnector contingent project?*

**ElectraNet Response**

The inclusion of the South East control scheme in the scope of the Heywood Interconnector Upgrade was addressed in the joint response submitted by ElectraNet and AEMO to the AER on 21 June 2013 in response to stakeholder comments raised in the course of the 5.16.6 Determination process.1

As explained in that response, the South East transformer control scheme was not assessed as economic at the time that the PACR was published. ElectraNet and AEMO concluded that this scheme can be assessed separately, without altering the conclusions of the preferred option or biasing any decisions on the additional control scheme that may be made at a later date.

Subsequently, the connection of new embedded generation by Kimberly-Clark Australia in the South East of South Australia has led to lower forecast demand levels in that region of the network, and is expected to increase the cost of constraints.

Review of the analysis into the South East transformer control scheme based on these revised loading levels indicates that there are sufficient benefits created by the South East control scheme for it to be included in the scope of the preferred option. ElectraNet has therefore included the South East control scheme in the scope of the Heywood Interconnector Upgrade project.

# 4. Question 5 – Project Timeline

**AER Request**

*Please provide a project timeline clearly indicating at least the commencement, commissioning and completion dates for the:*

*a) series compensation capability*

*b) 132 kV network reconfiguration*

*c) south east control scheme*

*d) south east asset rating upgrades*

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1 ElectraNet and AEMO, Heywood Interconnector Upgrade – AER Information request, 21 June 2013, Attachment A, page 16. Available at http://www.aer.gov.au/node/19916

*e) decommissioning of the 132 kV lines*

*f) the overall project*

**ElectraNet Response**

Table 4-1 provides a summary of the commencement, commissioning and completion dates for each major component of the Heywood Interconnector Upgrade project.

**Table 4-1: Key Timelines for the Heywood Interconnector Upgrade Project**

| Project Component | Commencement Date | Commissioning Date | Completion Date |
|---|---|---|---|
| Series Compensation | August 2013 | July 2016 | July 2016 |
| South East Control Scheme | August 2013 | December 2014 | December 2014 |
| South East Asset Rating Upgrades | August 2013 | April 2016 | April 2016 |
| 132kV Network Reconfiguration | May 2015 | N/A | March 2018 |
| **Overall Project** | **July 2013** | **As above** | **June 2018** |

The commencement date represents the scheduled starting date for detailed scoping and approvals activity for each component. The commissioning date represents the date when the asset has been placed into service, while the completion date represents the conclusion of this portion of the project.

Decommissioning of the 132kV lines is included in the 132kV network reconfiguration works.

Note that the project remains at a relatively early phase at this point, with current activities focusing on detailed the scoping of the subsequent phases of delivery planning, tendering, detailed design, construction, commissioning and project finalisation.

# 5. Question 6 – Project Capital Cost Model

**AER Request**

*ElectraNet's submission included extracts of the 'Heywood Interconnector Upgrade Contingent Project Capital Cost Model' in PDF format. Please provide the original cost model.*

**ElectraNet Response**

The Heywood Interconnector Upgrade Project Capital Cost Model is included with this response as Attachment C.

# 6. Question 7 – Forecast Operating Expenditure

## AER Request

*Section 5.1 (page 15) of the 'Contingent Project Application' (dated December 2013) notes that the operating expenditure was determined using a combination of zero based (or bottom up) estimates and an asset growth factor approach. Please provide the zero based (or bottom up) estimating model for the operating expenditure estimate.*

## ElectraNet Response

As noted in the application, incremental operating expenditure for the Heywood Interconnector Upgrade project was determined using the opex forecasting methodology and models accepted by the AER in its Revenue Determination for ElectraNet for the current regulatory control period.

A zero based (or bottom up) approach was used to determine the net impact of the project on routine maintenance requirements. Based on the new infrastructure to be installed, the range, frequency and cost of the additional routine maintenance tasks was determined. This increase in maintenance requirements was offset by the impact of the discontinued routine tasks associated with the assets to be removed from service. From this the net incremental impact in maintenance costs was determined. A copy of the zero based incremental operating expenditure forecast model is included in Attachment D.

An asset growth factor approach was used to forecast indirect operating expenditure items such as maintenance support, network operations and asset manager and corporate support. The asset growth factors in the AER's operating expenditure model used for ElectraNet's 2013-18 Revenue Determination were adjusted to reflect the additional augmentation capital expenditure associated with the Heywood Interconnector Upgrade project, consistent with the methodology approved by the AER.

The impact of the Heywood Interconnector Upgrade project on ElectraNet's asset growth factors and forecast operating expenditure is presented in Tables 6-1 and 6-2 below. A copy of the Revenue Determination operating expenditure model adjusted for the inclusion of the Heywood Interconnector Upgrade project is included as Attachment E with this response.

**Table 6-1: Forecast Total Asset Growth Factors**

| Total Asset Growth Factors (%pa cumulative growth) | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 |
|---|---|---|---|---|---|
| AER 2013-18 Revenue Determination | 102.3 | 108.8 | 109.3 | 110.6 | 112.0 |
| AER Determination + Heywood Interconnector Upgrade | 102.3 | 108.8 | 109.3 | 112.2 | 113.6 |

**Table 6-2: Controllable Operating Expenditure Forecast**

| Forecast Opex ($m2012-13) | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | Total |
|---|---|---|---|---|---|---|
| AER 2013-18 Revenue Determination | 69.60 | 72.45 | 73.85 | 76.95 | 77.50 | **370.36** |
| AER Determination + Heywood Asset Growth | 69.60 | 72.45 | 73.85 | 77.64 | 78.19 | **371.74** |
| AER Determination + Heywood Asset Growth + Net Maintenance Impact | 69.60 | 72.45 | 73.85 | 77.70 | 78.23 | **371.84** |
| **TOTAL Heywood Opex (ex. Debt Raising Costs)** | **0.00** | **0.00** | **0.00** | **0.75** | **0.73** | **1.49** |

# 7. Question 9 – Review of Project Design

## AER Request

*Where available, please provide copies of any independent reviews of the project design.*

## ElectraNet Response

At this point, independent reviews of the project design have not been undertaken as the project has not yet progressed to the detailed design stage. However, external design review will occur at the relevant phase of the project.

Given the unique nature of the series compensation component of the project, particularly the high level of complexity, the limited roll out of the technology within Australia and the potential for this infrastructure to significantly affect network operation, it has been recognised that expert technical assistance will be required both for network studies and for the detailed scoping of these works.

ElectraNet has identified and engaged suitably qualified external network planners that will assist with the highly specialised network studies required, and is in the process of identifying suitable technical consultants with the required expertise for the detailed scoping of this component of the project and technical evaluation of supplier offers.

AEMO will be involved in these network studies in its dual roles as Victorian planner and market operator. As market operator, AEMO will perform due-diligence assessments of the network studies results. These studies will assist in optimising the proposed series compensation, following which more detailed scoping will occur.

During the detailed design and construction stage, as components of the works are of a specialised nature (e.g. series capacitors) the associated design and construction works will be approached as turn-key project solutions. This approach ensures full independent assessment of the detailed design requirements.

# 8. Question 10 – Review of Capital and Operating Costs

**AER Request**

*Please also provide copies of any independent reviews of the project capital and/or operating cost estimate (where available)? We understand from the PACR that an independent cost review was undertaken.*

**ElectraNet Response**

An independent cost estimate was obtained from SKM for the purposes of the RIT-T assessment in order to provide an independent benchmark against which to assess initial costings and options.

Following the RIT-T process, the scope and costing of the preferred solution has been further refined on the basis of market pricing and available benchmarks. The capital expenditure forecast compares favourably with the RIT-T estimate, with a total cost variance of less than 1%.

# 9. Question 11 – Black Range Site Design

**AER Request**

*The AER is interested in understanding the nature of the proposed design of the Black Range series capacitor station. For the Black Range site, would ElectraNet please provide the following information:*

*a) a single line diagram*

*b) a geographic diagram showing the proposed rearrangement of the existing 275 kV transmission and the proposed site arrangement.*

*c) a site layout diagram indicating the extent of the site (i.e. lot boundaries), location of all proposed primary plant, buildings, access roads, fencing and landscaping. Please ensure that the scale is indicated on the drawing.*

*d) architectural drawings (or similar) of the proposed buildings. Where architectural drawings (or similar) are not yet available please provide a description of the proposed buildings including key dimensions and a description of the construction noting the primary materials involved.*

**ElectraNet Response**

A number of Attachments have been included with this response to address the AER's queries regarding the proposed design of the Black Range series capacitor station. This includes the following:

a) A single line diagram for the Black Range site is at Attachment F.

b) A detailed survey drawing of the Black Range site geography is at Attachment G.

c) The proposed preliminary layout for the Black Range site is at Attachment H.

d) Architectural drawings for standard substation control building layouts are included in Attachments I to L. These drawings are indicative of the type of control building expected to be built on the Black Range site. The final design of the control building will be determined as part of the detailed scoping and design phase.

## 10. List of Attachments

To follow is a list of file attachments included with this response. Given the commercially sensitive nature of the detailed costings and other project information contained in these files, these are supplied on a confidential basis to the AER:

| | |
|---|---|
| **Attachment A** | Copy of the Heywood Interconnector Upgrade project risk register |
| **Attachment B** | Output sheet from the Heywood interconnector Upgrade project risk analysis |
| **Attachment C** | Heywood Interconnector Upgrade Project Capital Cost Model |
| **Attachment D** | Copy of the zero base routine maintenance opex forecast model |
| **Attachment E** | Copy of the AER's ElectraNet Revenue Determination 2013-18 opex model with adjusted asset growth factors to reflect the impact of the Heywood Interconnector Upgrade project |
| **Attachment F** | Single line diagram drawing of the Black Range substation |
| **Attachment G** | Detailed geographical survey of the Black Range substation site and surrounding area |
| **Attachment H** | Preliminary layout of the Black Range Substation |
| **Attachment I** | Architectural drawing of an example control building layout |
| **Attachment J** | Architectural drawing of an example control building layout |
| **Attachment K** | Architectural drawing of an example control building layout |
| **Attachment L** | Architectural drawing of an example control building layout |