

## TECHNICAL MEMO

Date	19 <sup>th</sup> April 2023
To	Carl Charlier Nidhi Pereira
CC	
From	Jarrold McHugh
Subject	Humelink Project – Transmission Line Tower and Conductor Quantities
Job Reference	F2259

## PURPOSE OF TECHNICAL MEMO

**fission** was asked to provide Transgrid with Tower and Conductor advice and information. The purpose of this Technical Memo is to review the rates and quantity data used for the regulatory submission. **fission** was requested to provide Transgrid with project data for the Humelink Project including:

- Transmission Line Steel Tower Weights (t) and price (\$/t) based upon **(a) fission** quantity assessment and **(b)** ECI Stage 1 Tenderer submissions.
- Conductor length (m) quantity quantities based upon **(a) fission** quantity assessment and **(b)** conductor price (\$/km) based on Transgrid early market sounding.

## BACKGROUND

**fission** have been engaged by Transgrid as the Independent Owners Estimator for the Humelink Project during the ECI Process. **fission** is an established ISO 9001:2015/45001:2018/14001:2015 accredited Consulting firm providing expert services across cost estimating, risk management and quantity surveying disciplines. **fission** is presently engaged as Owners Independent Cost Advisor for +\$20B in major infrastructure projects encompassing Power, Rail and Transport Infrastructure. **fission** scope for the Humelink Project encompasses provision of cost, risk and commercial analysis and advice to ensure prudence across cost and commercial matters. **fission** is involved in the ECI process and the assessment of the tender price as an independent estimator.

## TRANSMISSION TOWER STEEL

**fission** assessed the East and West Tower Steel Tonnages using the Aurecon concept design detailed in the **Humelink Concept Design Report reference 507179-160517-REP-ET-003 rev.** **fission** assessed tower weights are noted below:

Description	Tonnes
Towers (East)	
Towers (West)	
<b>TOTAL STEEL</b>	

The Tenderer ECI Stage 1 tower weight quantities are detailed below. The East tower weights are consistent with **fission** quantity assessment. The West tower weights noted below differ to **fission** due to the tower type assessment. The West tower weights noted below differ to the fission assessment. This is due to the Tenderer assessment of alpine vs non-alpine tower design in their tender submission. This assessment is considered more accurate given the data provided.

	Description	Tonnes	Rate	Amount
Towers (East)	Supply of Steel Structure Galvanize -CIF (EAST)			
Towers (East)	Transport of Steel Structure Galvanize - CIF (EAST)		Included in Rate Above	Included in Above
Towers (West)	Supply of Steel Structure Galvanize -CIF (WEST)			
Towers (West)	Unload to Peg (WEST)			
Towers (West)	Transport of Steel Structure Galvanize - CIF (WEST)			
	<b>TOTAL STEEL</b>			

Noting the project delivery model comprises a design and construct scope, the respective Tenderer ECI Stage 1 quantities are considered appropriate, noting the (1) footnote below.

These rates are in line with a contractors tender on a similar size project, with a supply of [REDACTED] and [REDACTED] transport depending on the location.

## CONDUCTOR QUANTITY

The tables below detail the **fission** quantified lengths of conductors and types for the combined East and West Packages.

Total - East + West	Type	Length (km)
Conductor	Orange ACSR/GZ	
Conductor	Orange AACSR/GZ 1120	
Conductor	Olive ACSR/GZ	
OHEW	7/4.25mm SC/AC	
OHEW	19/4.25mm SC/AC	

<sup>1</sup> Quantity based on ECI Stage 1 preferred Tenderer Submission. It is recommended that a 10% contingency be added to accommodate potential tower weight increase for Alpine region towers.

OHEW	Grape ACSR/GZ	
OPGW	OPGW Type A, 96 Core, 115kN as per TLDM	
OPGW	OPGW Type B, 96 Core, 189kN as per TLDM	
OPGW	18mm OPGW Type B 48 Fibre	

**fission** has quantified these lengths based on the Aurecon concept design detailed in the Humelink Concept Design Report reference 507179-160517-REP-ET-003 rev 04. The following technical specifications were provided in the report which **fission** have adopted to calculate the lengths above.

Sl. No.	Material specification	Standards	Remarks
1	<b>Phase conductors</b>		
a)	Non-Alpine & Sub-Alpine regions: <b>Orange</b>	ACSR/GZ to AS3607	=4 conductors/phase x 2 Circuits x 315km x 5%
b)	Low Alpine region: <b>Orange</b>	ACSR/GZ 1120 to AS3607	=4 conductors/phase x 2 Circuits x 45km x 5%
2	<b>OPGW (Earthwire and Comms):</b>		
a)	Non-Alpine & Sub-Alpine regions: 96 Cores, breaking load 115kN, fault capacity 200kA <sup>2</sup>	96 SMF (G.652D), 27SA 184 IEEE 1138-construction of fibres IEC 60793-2-Optic fibre spec IEC 60794-4-10-aerial fibres IEC 61232 (Al clad steel wires)	=1 OPGW per route x 315km x 5%
b)	Low Alpine region: 96 Cores, breaking load 189kN, fault capacity 200kA <sup>2</sup>	96 SMF (G.652D), 27SA 184 IEEE 1138-construction of fibres IEC 60793-2-Optic fibre spec IEC 60794-4-10-aerial fibres IEC 61232 (Al clad steel wires)	=1 OPGW per route x 45km x 5%
3	<b>Earthwire:</b>		
a)	Non-Alpine & Sub-Alpine regions: <b>Lemon</b>	ACSR/GZ to AS3607	=1 Earthwire per route x 315km x 5%
b)	Low Alpine region: <b>19/4.25</b>	SC/GZ to AS1222.1	=1 Earthwire per route x 45km x 5%

**fission** have applied the relevant items above to the specific route length. In addition, **fission** assumed a sagging wastage factor of 5%.

The **fission** quantities were assessed against the ECI Stage 1 Tenderer Price Schedules (East and West), and Conductor quantities there-in, and are consistent.

**fission** has also been asked to verify the industry feedback on pricing proved to the Transgrid project team; specifically, the pricing received from specialist suppliers [Hengtong Group, Prysmian Group, ZTT cable, Midal cable]. The unit prices in the figure below includes the range of pricing the procurement team received from the early market sounding.

Type	Project	Description	Indicative Quantity	UoM	Unit Price Range		Total Forecast Spend		
					Low (\$)	High (\$)	Low (\$)	High (\$)	
CONDUCTOR	HumeLink	ACSR/GZ Orange		Km					
		ACSR/GZ Lemon		Km					
	SUB-TOTAL - HumeLink								
	Hunter Transmission	ACSR/GZ Orange		Km					
		ACSR/GZ Lemon		Km					
		ACSR/GZ Olive		Km					
	SUB-TOTAL - Hunter Transmission								
	VNI-West	ACSR/GZ Orange		Km					
		ACSR/GZ Lemon		Km					
	SUB-TOTAL - VNI-West								
	Network/RP3	ACSR/GZ Mango		Km					
	SUB-TOTAL - Network/RP3								
	<b>ESTIMATED TOTAL FORECAST SPEND (\$m)</b>								
	KerangLink	ACSR/GZ Olive		Km					
		<b>ESTIMATED TOTAL FORECAST SPEND with KerangLink (\$m)</b>							

Type	Project	Description	Indicative Quantity	UoM	Unit Price Range		Total Forecast Spend	
					Low (\$)	High (\$)	Low (\$)	High (\$)
OPGW	HumeLink	Option-1: Type A 48 Core		Km				
	VNI-West	Option-2: 96 Core		Km				
<b>ESTIMATED TOTAL FORECAST SPEND (\$m)</b>								

From the early market sounding data above, which provided a range of prices, the project team have utilised the mid-point rate for their current estimates for procurement of conductors, see table below for overall cost.

Type	Mid-Point Rate per Early Market Sounding	Length per km	Amount
ACSR/GZ Orange			
ACSR/GZ Olive			
OPGW Type A 48 core Option 2: 96 Core			
<b>Total</b>			

**fission** has been involved in a number of power transmission projects, and through these, has access to current transmission line materials pricing data. This information has been used to benchmark the above Transgrid pricing. The rates presented in the Transgrid early market sounding and the use of the mid-point rate are considered reasonable when assessed against the fission benchmark data.

Jarrold McHugh (CPE Eng. RPEQ 24026)



Director – Operations