Business Case

Service Provider:	APA Group	**Date:**	December 2019
Asset:	Directlink		
Project:	**Replacement/Refurbishment**		
Project Type:	*Capex/Opex :*	Capex *$1.0m*	
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PURPOSE

To present a project recommendation and expenditure forecast for inclusion in the Directlink Regulatory Proposal for the years 2020 to 2025.

BACKGROUND

Directlink converter stations comprise multiple motors and cooling fans in order to maintain operation of the system.

This equipment deteriorates as it ages and through usage. Directlink has a program of refurbishment of these assets. The program reflects original equipment manufacturer recommendations on equipment life and maintenance. Original equipment manufacturers make recommendations, assuming correct ongoing maintenance, for the life of equipment.

The cost of refurbishment and replacement of significant assets can be similar so they can be considered competing options at the time.

Refurbishment (overhauling) the equipment involves an extensive amount of work.

The equipment is removed from its operating location. It is then completely dismantled at the 3rd party workshop. All working parts are tested for

performance and all parts are assessed for condition. Those parts that fail the test are replaced. The equipment is reassembled and returned to site. The equipment at this point is "renewed" for another 10 years in operation.

In contrast servicing equipment involves testing in place for overall equipment performance. Ie weight balance on fans and assessing for balanced current. There is minimal, in any, internal investigation of the equipment.

Servicing the equipment does not result in an extension to the operating life of the equipment like refurbishing it does. The cost of servicing is treated as operating expenditure and is included in base year operating expenditure.

IDENTIFICATION OF NEED

In the current and next transmission determination periods the following equipment reach the end of their recommended operation life:

The phase reactors on the older convertors are air cooled. There are two cooling fans per phase reactor. One is in active and the other is in standby. The cooling fans pressurise the area around the reactor to create an even airflow over the reactor winding core. Conducting maintenance on the motors is difficult due to their elevated position in the HV area.

Valve Cooling System Pumps

The cooling system is designed to dissipate the power losses generated in the IGBT valves. There is one cooling system for each convertor. There are two redundant main flow pumps in the cooling liquid circuit. One of the main flow pumps is always in operation and it remains in operation as long as one of the redundant cooling control systems is active. Any loss of flow results in a system trip.

Valve Cooling System Electric Motors

The valve cooling motors drive the valve cooling pumps. The motors are a 2 speed design. When the system is not transferring power the motor is in low speed. When the system is transferring power the motor is in high speed. A failure of a motor results in the loss of the redundant pump.

Cooling Tower Electric Motors

The cooling tower motors are smaller 2.3 kW motors directly coupled to cooling fans that are used to cool the water in the cooling tower. A failure of the motor will result in an incremental decrease in cooling capability.

Motor Control Centre Motor Start Contactors

The contactors are used to turn on/off control all the electric motors and motorised valves in the cooling system. A failure of the contractors will result is a failure of the necessary motor to start when required with flow on impact on the reliability of Directlink.

Motor Control Centre Control Relays

These are relays used within the Motor Control Centre for control, protection and monitoring. A failure of the relay will result in the relevant equipment not operating as required.

Motor Control Centre Switches

There are a number of switches in the motor control system for isolating equipment. Many of the switches operate Circuit Breakers. Both the switch and circuit breaker will be replaced. A failure of the switches results in equipment not operating.

Dehumidifiers

These are used in the valve rooms to lower the humidity below 40 %. Lower humidity reduces the chance of arcing or flash over. High humidity can also lead to higher failure rates of fibre and IGBTs.

Some equipment reaches its refurbishment/replacement life in the current period but by necessity of resource constraints and the "bring forward" of the replacement of fibre optics has been delayed to the next period.

EVALUATION OF ALTERNATIVES

Do nothing

This increases the risk of sudden failure of the equipment. Further it does not provide an extension to the expected operational life of the equipment.

Replace the equipment with new equipment

This option would result in an equipment with a longer expected life than the refurbished equipment but comes at a higher cost. An early estimate of the cost is $2 m

Refurbish all the equipment.

This option would result a higher cost. An early estimate of the cost is $1.5 m. That is some equipment where it is less expensive to replace than refurbish would be refurbished.

RECOMMENDATION

A program of refurbishment or replacement on a case by case basis of the following assets

- Reactor Cooling Fan Electric Motors
- Valve Cooling System Pumps
- Valve Cooling System Electric Motors
- Cooling Tower Electric Motors
- Motor Control Centre Motor Start Contactors
- Motor Control Centre Control Relays
- Motor Control Centre Switches
- Dehumidifiers

ESTIMATE OF COST

The total estimate for the *refurbishment project* is $1,000,000. The cost estimate is based on a competitive tender for refurbishment work.

This project is forecast to be executed in FY21-FY24.

The estimated costs for the recommendation detailed have been included in the capital expenditure forecasts for the Directlink Regulatory submissions.

PLAN FOR EFFECTIVE EXECUTION

The requirement for AER acceptance of capital and operating expenditure specified in 6A.6.7(c) and 6A.6.6(c) of the National Electricity Rules is that the expenditure must be such as would be incurred by a prudent service provider acting efficiently, and represent a realistic expectation of the costs to achieve the requirement.

The delivery of the project has been scheduled as detailed in the Estimate of cost section above, occuring in FY21-F24.

JUSTIFICATION

The Refurbishment Project for "Directlink" is required to meet the following capital and operating expenditure objectives set out in clause 6A.6.7(a) and 6A.6.6(a) of the National Electricity Rules (the Rules):

(1) meet the expected demand for prescribed transmission services over that period;

(2) comply with all applicable regulatory obligations or requirements associated with the provision of prescribed transmission services;

(3) maintain the quality, reliability and security of supply of prescribed transmission services; and

(4) maintain the reliability, safety and security of the transmission system through the supply of prescribed transmission services.

The project is justified under sub rule (3) on the basis that the refurbishment project will assist to maintain the quality, reliability and security of supply of prescribed transmission service