Directlink
Joint Venture

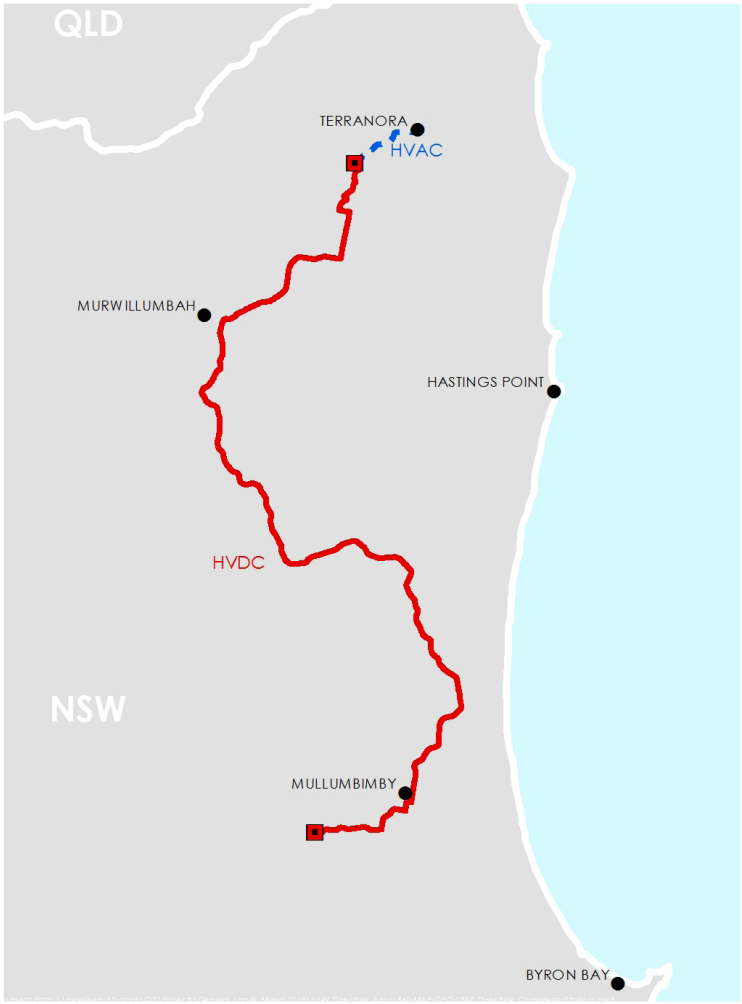
Revenue Proposal
July 2020 to June 2025

Directlink is a 180 megawatt connection between the NSW and Queensland wholesale electricity markets.

In 2017 it carried 308 gigawatt hours of electricity. All this electricity resulted in price reductions paid to customers for their wholesale electricity. In 2018 Directlink saved customers 100s of millions of dollars.

Directlink is submitting its revenue proposal for the 2020 to 2025 period.

Directlink will be seeking stakeholder feedback on this proposal as part of the regulatory determination process. To facilitate this we will be hosting a workshop with stakeholders in March.



Directlink provides significant market benefits in excess of its cost. From 2016 to 2018 Directlink provided wholesale market savings of $1.2 billion. As such, benefit to customers outweighed the cost of Directlink by $1.16 billion.

Also, at times, it was presence of Directlink that was the difference between customers in Northern NSW being supplied with electricity or blackouts.

Energy Infrastructure Investments

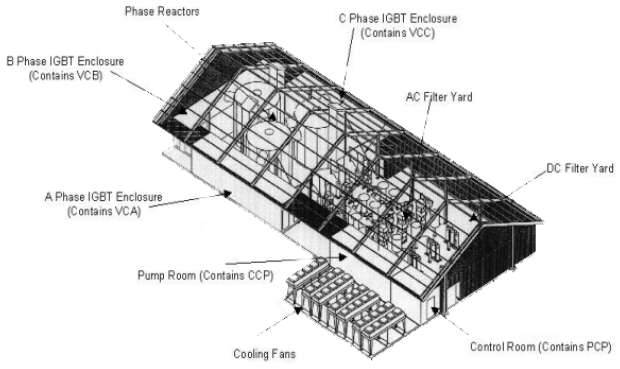
What is Directlink?

Directlink is a 180 megawatt direct current connection between the NSW and Queensland wholesale electricity markets. The Directlink interconnector is a 59 km, 180 MW High Voltage Direct Current (HVDC) interconnect running between Mullumbimby and Bungalora in NSW.

Unique Features

Directlink has a number of unique features that distinguishes it from the more conventional static transmission assets operated by other Transmission Network Service Providers (TNSPs).

- It is a point to point transmission line, not a network with multiple connections or direct connected customers.
- The cables are exposed to direct voltages, which imposes different stresses and potential insulation breakdown mechanisms, than alternating voltage cables.
- The cables have unusual installation approaches - Directlink cables are laid primarily underground, and partly in above-ground galvanised steel tray (GST).
- Directlink has a finite technical life, to reflect this the entire asset will be fully depreciated in 2041.
- Directlink was initially valued for regulatory purposes on the benefit it provided to the market rather than cost.



maintaining the reliability of critical infrastructure.

Overview

Directlink is focused on delivering for its customers. To do this requires maintaining the reliability and availability of the interconnector to maximise the benefit to retail customers from lower wholesale market prices in Queensland and New South Wales. Directlink's expenditure program is about delivering this in an efficient and safe manner.

Key Projects

The biggest project is the replacement of obsolete Isolated Gate Bi-Polar Transistors ($17m). Directlink have done a lot of analysis that demonstrates that currently the best long term option is to sign a long term asset replacement contract with ABB (the manufacturer) rather than pay for replacing the equipment directly. The contract means for an annual fee ABB will be responsible for all future asset replacements for Isolated Gate Bi-Polar Transistors and the Control and protection system (which we are currently replacing). This means if an asset covered by the contract fails or becomes obsolete then ABB will have to replace it for no additional cost to Directlink.

Because of the cost the replacement of the Isolated Gate Bi-Polar Transistors will be subject to public consultation under the Regulatory Investment Test – Transmission. So people will get their chance to recommend different options or provide feedback on the existing options and we will consider all feedback before a final decision on the best option is made.

The next largest project is making the above ground sections of the high voltage cable safe. Directlink cables run next to an abandoned rail line. The Tweed Shire Council is proposing to convert the rail line to a recreational trail. There are concerns that when there is heavy equipment operating close to the cable there is real risk of death should the workers accidentally make contact with the cable.

The other unusual project from a regulatory perspective is putting aside an amount of money each year to pay for rectification and restoration costs for Directlink when it ceases operation in late 2041. This means the money can earn interest thus reducing the overall cost that will be paid by customers in the long run.

Revenue

Revenue that cover different categories of expenditure:
- Return
- Operating Expenditure
- Depreciation (determined by past and future capital expenditure and asset lives)
- Tax

The return is set by the regulator and tax is determined by a formula in the AER's model. So the proposal focuses on what Directlink can influence, operating expenditure and future capital expenditure.

Replacing Equipment

The other significant areas of expenditure relate to the replacement of equipment:

- Replacing equipment that if it fails could affect reliability of Directlink ($4.4m)
- Replacing failing fibre optic cables (3.8m)
- Replacing corroded equipment ($2.9m)
- Cable modification researching and fixing cable areas with high failure rates ($2.1)
- Spare Cables, capacitors and transistors ($1.9m)
- Other ($2.4m).

Operating Environment.

Natural Environment

The natural environment that Directlink operates in is challenging. The area has high rainfall. Mullumbimby averages over 1800mm a year. This compares to just over 1200mm in Sydney and 1000mm in Brisbane . In some locations Directlink's easement is surrounded by dense vegetation which leads to issues of access to the easement and the above ground sections of the cable. Directlink runs from just North West of Byron Bay, to just south-east of Murwillumbah to just north-west of Kingscliff. In addition there are 124 water crossings and 17 tunnels in the 59kms. All of these crossings required engineering solutions to cross, each of which represents a point of reliability weakness for the transmission lines. In addition due to the nature of the rainfall in the area, the water levels in the creeks are highly variable resulting in threats of flooding again a risk to the reliable operation of the network if the flooding occurs in areas where the cable is above ground.

Technological Environment

Directlink is HVDC light technology. The convertor stations and the HVDC cables are designed to operate as a single system. Much (but not all) of the equipment, and the software which controls its operation, is proprietary technology; it is the intellectual property of ABB. This interconnected nature mean that any individual piece of this equipment must be capable of operating flawlessly with the other equipment.

Maturing Asset Base

Directlink is middle aged. It was commissioned in 2000 and the converter stations are expected to continue to operate until 2041/42. However, the converter stations are made up of a range of equipment that have different life expectancies.

Impacts of Regional Development

Directlink has an obligation to maintain standards of public safety. There is increasing public use of sites near Directlink. This encroachment of public activity next to or in the vicinity of the asset access is expected to increase materially in the next transmission determination period.

The Mullumbimby area, due to the appeal of its location and natural attributes, is undergoing substantial ongoing development. The estimated population of the Mullumbimby area has increased by 10% since 2012. Inevitability as population density increases what was previously acceptable practices and operations for industrial operations become no longer acceptable. Directlink is experiencing an increased number of noise complaints in relation to the operation of the converter stations.

Parts of the path of the Directlink transmission cables are along the easement for the former railway line corridor.The Tweed Shire Council is undertaking the Northern Rivers Rail Trail along this rail corridor. The Rail Trail will provide access to pedestrians and cyclists to the existing rail corridor.

The construction will impose a significant construction program adjacent to the above ground cable section in particular and following construction, will increase public access well beyond what was anticipated at the time of construction. This is particularly problematic in that 14 kms of the Directlink cables are above ground.

Capital Expenditure Program.

Obsolete Insulator Bi-Polar Transistors.

There are several thousand IGBTs in service at any one time at Directlink. IGBTs switch power from AC/DC to DC.Directlink utilises ABB's Generation One IGBTs on 5 systems (Mullumbimby System 1 was reconstructed using Generation three IGBTs following the fire). ABB have announced they can no longer provide more generation 1 IGBTs. As IGBTs need to be replaced periodically eventually Directlink will run out and stop working. Directlink is proposing to resolve this by signing a long term asset replacement contract with ABB where they take responsibility for upgrading the IGBTs and ensuring there are enough to keep Directlink operating. The public will be invited to comment on this as part of a Regulatory Investment Test - Transmission. (17M)

Cable Protection

There is increasing development of the hinterland area where Directlink is located. However, there is one development in particular that is likely to result in capital expenditure being necessary to accommodate appropriate shared use of the corridor, being the Northern Rivers Rail Trail. This cable protection is primarily aimed at ensuring the safety of the public and workers on the rail trail. (5M)

Reliability

Reliability maintenance projects seek to maintain Directlink's availability by ensuring key components and equipment that contribute to reliability are in optimum working order and utilising advanced technologies and products available to high-voltage direct current assets. EII has identified a number of projects that have an affect on Directlink's reliability performance. Cyber Security, Power Supply and Variable Speed Drive (VSD) for Phase Reactor and Cooling Pumps. (4M)

Optic Fibres

The optic fibre cables used for communication inside the working parts of the convertor station are failing. Given the precision of the operation of the equipment, in particular the IGBTs to within microseconds, failure of the optic fibres results in failures of other more significant equipment or catastrophic failures of multiple pieces of equipment. Directlink is replacing them to stop that from happening. (4M)

Corrosion and Deterioration

The assets of Directlink are exposed to weather and have problems with corrosion and deterioration. This program is designed to efficiently replace those assets before they fail resulting in problems for the interconnector.(3M)

Cable Modification

Directlink seeks to invest in regular analysis of cable fault data, to assist with any improvement strategies that could be implemented to maintain reliability. Cable faults cause downtime to the network and are a disruption to productivity in the business. Fault repairs can be a strain on resources and our normal operations. We are undertaking a work program to accurately identify where those faults may occur and preventing them. Stoping deterioration in availability and leading to a more reliable Directlink. (2M)

Capital Expenditure

Program Continued.

Stay in Business

Stay in Business (SIB) projects are generally ad-hoc and discrete packages of work, with a low to medium cost associated as opposed to major projects. Essentially SIB is a group of projects that may be unrelated but have been identified as beneficial to business operation. (0.8M)

Essential Spares

Due to the failure rates associated with IGBTs and capacitors a stock of these items is held in storage so to be available when either of these items fails it does not result in significant outages for any of the systems that make up Directlink. (0.8M)

Testing Equipment

Testing Equipment projects seek to ensure systems and equipment are in a condition capable of meeting operational requirements. This program has identified three specific projects to replace equipment that has reached the end of its life or new purchase equipment to increase our testing capabilities. (0.8M)

Noise Monitoring Equipment

There have been multiple complaints about noise levels at the Bungalora and Mullumbimby Convertor stations, with a notable recent increase at Mullumbimby. Directlink is undertaking work to identify what the level of noise coming from its converter stations may be and if necessary identifying its cause so it can rectify it. (0.5M)

Regulatory

Directlink is incurring additional costs as it develops better means to communicate with its stakeholders. These projects are focused on ensuring a better level of consultation going forward. (0.3M)

Financial Tables.

Opening Regulatory Asset Value

	FY16	FY17	FY18	FY19	FY20
Opening RAB	129.4	130.8	130.9	138.2	144.2
Capital expenditure	4.0	3.4	10.2	8.3	7.7
Depreciation	- 4.9	- 5.3	- 5.4	- 5.6	- 5.8
Indexation	2.2	1.9	2.5	3.3	3.5
Adjustment	-	-	-	-	- 1.1
Closing RAB	130.8	130.9	138.2	144.2	148.4

Capital Expenditure

	FY 21	FY 22	FY 23	FY 24	FY 25	Total
Forecast Capital Expenditure	129.4	130.8	130.9	138.2	144.2	673.4

Forecast Regulatory Asset Value

	FY 21	FY 22	FY 23	FY 24	FY 25
Opening regulatory asset base	148.4	156.9	161.6	164.9	169.3
plus indexation	3.6	3.8	3.9	4.0	4.1
plus forecast capital expenditure	12.1	8.8	7.8	9.5	5.6
less forecast depreciation	- 7.1	- 7.9	- 8.5	- 9.1	- 9.7
less forecast disposals	-	-	-	-	-
less forecast redundant assets	-	-	-	-	-
Closing regulatory asset base	156.9	161.6	164.9	169.3	169.2

Building Block Revenue

	FY 21	FY 22	FY 23	FY 24	FY 25	Total
Return on capital	7.7	8.1	8.4	8.5	8.8	41.4
Return of capital	3.5	4.1	4.6	5.1	5.7	22.9
plus operating expenditure	5.0	5.1	5.3	5.5	5.6	26.5
plus Revenue adjustment	- 1.0	- 1.1	- 0.5	- 0.2	0.1	- 2.8
plus net tax allowance	0.3	0.3	0.3	0.4	0.4	1.7
Unsmoothed revenue requirement	15.5	16.5	18.0	19.2	20.5	89.8

Smoothed Revenue and X Factors

	FY 21	FY 22	FY 23	FY 24	FY 25	Total
Unsmoothed Revenue	15.5	16.5	18.0	19.2	20.5	89.8
Smoothed Revenue	15.5	16.6	17.9	19.2	20.6	89.8
Xfactors		-4.93%	-4.93%	-4.93%	-4.93%	

Glossary of Terms.

• AER Model – Australian Energy Regulator's Microsoft excel spreadsheet used to calculate the post-tax revenue for the transmission business.

• Asset Value – The value decided by the regulator for the buildings and equipment of the interconnector.

• Building Block Revenue – an annual amount of revenue for each of the five years based on the annual costs of the business plus a return calculated by the Australian Energy Regulator.

• Depreciation – an amount included in the building block revenue to recover the cost of buildings and equipment previously constructed Expenditure – costs incurred by Directlink to construct, maintain and operate the interconnector.

• Return – the amount approved by the Australian Energy Regulator for the purpose of Directlink financing interconnector expenditure.

For more information, please contact
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