DIRECTLINK JOINT VENTURE

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14 January 2005

Mr Sebastian Roberts
General Manager, Regulatory Affairs – Electricity
Australian Competition and Consumer Commission
470 Northbourne Avenue
CANBERRA ACT 2600

Attention: Mr Sabesh Shivasabesan, Director - Electricity, Regulatory Affairs Division

Dear Mr Roberts

Re: Application for Conversion to a Prescribed Service and a Maximum Allowable Revenue to June 2015

Thank you for providing the Directlink Joint Venturers with the opportunity to comment on the PB Associates report *Review of Directlink Conversion Application – Final Report* that the Commission published on its website on 26 November 2004.

Enclosed is our submission, to which is attached a letter from Burns and Roe Worley.

We would be happy to clarify or discuss any of the matters raised in our submission with Commission staff and their consultants.

Yours sincerely

Dennis Stanley
Directlink Joint Venture Manager

Encl.

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SUBMISSION IN RESPONSE TO PB ASSOCIATES REPORT OF 26 NOVEMBER 2004

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EXECUTIVE SUMMARY

PB Associates has reviewed for the Commission the Directlink Joint Venturers' *Application for Conversion to a Prescribed Service and a Maximum Allowable Revenue to 30 June 2015* of 22 September 2004 ('**Conversion Application**') and the Burns and Roe Worley ('**BRW**') report *Directlink, Selection and Assessment of Alternative Projects to Support Conversion Application to ACCC* ('**BRW Report**').

The Directlink Joint Venturers have examined the PB Associates subsequent report *Review of Directlink Conversion application, Final Report* of 26 November 2004 ('**PB Associates Report'**) and found that it contains a number of substantial shortcomings with regard to its findings and conclusions. This submission highlights the nature of these shortcomings and corrects many of them.

Generally these shortcomings arise from inadequate technical analysis, inaccurate costings and contraventions of the principles of the Regulatory Test. In particular, PB Associates has conducted no power system modelling. Consequently, it has not been able to understand and take into account all the power flow and voltage complexities of the transmission network in northern NSW and Gold Coast areas. PB Associates has also not been able to appreciate the extent to which each potential upgrade and augmentation can alleviate all or only some of the current and emerging network constraints.

On the other hand, in preparing its report, BRW conducted extensive modelling and analysis in close cooperation with the relevant network service providers and NEMMCO. It has gained a detailed understanding of the network conditions in northern NSW and the Gold Coast that exist now and will emerge over the next 15 years, and BRW's understanding is at least as thorough as any that exists in the National Electricity Market ('NEM'), if not more so. BRW used this modelling to select and assess Directlink's alternative projects against explicit selection and performance criteria. BRW also prepared very detailed all-inclusive costings for each alternative. BRW's modelling has clearly confirmed that Directlink's non-firm capacity is already being relied upon to support the northern NSW network for contingency conditions arising from the loss of the 330 kV Armidale to Lismore line during peak load.

When BRW selected Directlink's alternative projects, it considered the Broadwater cogeneration plant and concluded that the plant was technically incapable of providing network support sufficient to meet TransGrid and Country Energy's reliability obligations. BRW consulted TransGrid & Country Energy on this matter during the course of BRW's investigation and all parties agreed with this view. Consequently, in absence of Directlink (or Alternatives 0/1/2), the only reasonable solution to the network constraints that will emerge in 2007 is the construction of the new 330 kV Lismore to Dumaresq line. Directlink can defer that line for a period of 10 years from 2007 in the case of expected load growth.

PB Associates' approach has led it to make a number of incorrect claims or implications about Directlink and the scope and costing of its alternative projects. These incorrect claims or implications include that:

- Directlink's characteristics, size and location are not consistent with optimal longer term network planning requirements for the transmission system;

- the NSW transmission system is not dependent on the capacity offered by Directlink for network support;
- the network control ancillary service contract between NEMMCO and Directlink Joint Venturers will remain in place after Directlink's conversion;
- TransGrid recommended the use of 2% of capital cost as an accurate estimate of the O&M costs of Directlink alternative projects;
- TransGrid do not anticipate requiring Directlink to provide network support for at least 5 years;
- in the case where Directlink provides network support pre-contingently, Directlink would have to be pre-contingently dispatched for extended periods;
- BRW has not considered that additional capacitors can alleviate network constraints;
- cogeneration projects can provide reliable network support and will defer the need for the new 330 kV Lismore – Dumaresq line for a number of years;
- the Electricity Supply Industry Planning Council 2004 Annual Planning Report somehow casts doubt upon Murraylink's and Directlink's network deferral benefits;
- BRW used low load growth forecasts to enhance the deferral benefits of Directlink's alternative projects;
- uncertainty about the construction of an additional third 110 kV transmission line into Terranora substation casts doubt upon Directlink's ability to provide network support into northern NSW;
- the inclusion of interest during construction in the capital cost estimates of the alternative projects is unnecessary and would result in double counting;
- contingency allowances in the capital costs estimates of the alternative projects reflect a measure of inefficiency and are not required;
- Alternative 5 is not an alternative project to Directlink;
- the network support agreement between the Directlink Joint Venturers and Powerlink may remain outside the regulated revenues defined by the Commission;
- Alternative 5 should include the new 330 kV Lismore to Dumaresq line being commissioned in 2011, exclude the Queensland reliability augmentations and include additional works such as the Broadwater cogenerator and the upgrade of Line 966 (even though PB Associates did not do the latter);
- the costs of the Queensland reliability augmentation should exclude easement costs;
- Directlink's alternative projects' network deferral benefits beyond 2014-15 should be estimated to be zero;

- voltage collapse at Koolkhan is due to constraints in the Queensland network;
- estimating the operating and maintenance costs of projects as 2% of their capital costs is more appropriate than estimating their costs with regard for each project's technology and locations;
- as the 330 kV Lismore to Dumaresq line will replace an existing 132 kV line for 66% of its length, only the corresponding incremental operating and maintenance cost should be allowed for;
- details of the protection and control schemes that would be required for Directlink (and Alternatives 0/1/2) to provide pre-contingent support to Code standards are not available;
- if Directlink (or Alternatives 0/1/2) is committed to provide pre-contingent support to the Gold Coast in 2005-06, it is not available for southwards transfer;
- Directlink's actual cost is invalid for the purposes of the Regulatory Test as PB Associates claims it is inflated (by an unspecified amount) due to 'critical delays';
- a more appropriate cost of Directlink itself (Alternative 0) can be obtained by using the average of two roughly calculated costs from two presentation papers describing vaguely similar projects;
- PB Associates' own estimates of the O&M costs for Alternatives 0/1/2 sum to $1.56M;
- HVDC Light A with 'two-level converter' technology should be considered to be the current technology for the purposes of estimating the cost of Alternative 1 because 'three level converter' technology is more expensive;
- BRW scoped and costed Murraylink Alternative 2 as a HVDC Light installation;
- ABB sell, install and support HVDC Light facilities with overhead cable;
- there would be no legal directive for Alternatives 1, 2 or 3 to include a level of undergrounding;
- the cost of HVDC Light must be less than the cost of convention HVDC;
- Directlink does not provide direct interconnection at the transmission level; and
- transfer limits quoted by BRW and PB Associates are the maximum transfer capabilities for each year of the deferral period of the NSW and Queensland augmentations;

On the basis of these shortcomings, PB Associates has incorrectly estimated Directlink's alternative project's costs and network deferral benefits. The Directlink Joint Venturers are in the process of recalculating Alternatives 0/1/2's network deferral benefits to reflect the matters raised in this submission—in particular, the planned upgrade Line 966—and will advise the Commission of the result within a week.

While PB Associates has generally endorsed Directlink Joint Venturers' currently proposed performance incentive scheme and targets, there are a number of PB Associates' related statements with which the Directlink Joint Venturers do not agree:

- the performance incentive penalty should not be capped at 1%;
- the definition of Peak Period should only exclude NSW (not Queensland) public holidays;
- changes should be made to the definition of Excluded Event and Force Majeure Event;
- the maximum reward target for planned outages target should be lower than 100%; and
- a collar should be established around Directlink's performance target levels.

The Directlink Joint Venturers believe that the PB Associates Report contains little new information that changes the principal positions put forward in the Conversion Application in a substantial way.

Attached to this submission is a letter to the Directlink Joint Venturers from BRW, which contains supporting technical advice.

GENERAL COMMENTS

1. Inadequate technical analysis and incorrect conclusions

Issue:

We understand that PB Associates has not conducted any of its own modelling or specified clearly the network performance criteria that it has applied to form its statements and conclusions.

Response:

As a result, many of PB Associate's statements and conclusions are incomplete, and certainly far less accurate than those prepared by Burns and Roe Worley ('**BRW**') for the Directlink Joint Venturers. For example, PB Associates has considered the potential overload of the Koolkhan to Lismore 132 kV line (Line 967) or the current voltage constraints in the Port Macquarie area.

In contrast, BRW has undertaken detailed and extensive modelling. It has specified its network performance criteria[1] and applied it consistently across the whole network. Subsequently, BRW understands all the power flow and voltage complexities throughout the network and the extent to which each potential upgrade and augmentation can alleviate all or only some of the current and emerging network constraints.

2. Inaccurate costing methodologies and estimates

Issue:

We understand that PB Associates has also not conducted any of its own detailed costings for Directlink's alternative projects. Notwithstanding this, PB Associates has sought to replace BRW's detailed costings with its own.

Examples of the shortcomings of the PB Associates Report in this regard include:

- no consideration of BRW's sound and detailed costing methodology, the rationale behind it, and its potential to provide very reliable, accurate and all-inclusive estimates—including a misunderstanding of the purpose of the contingency and interest during construction allowances;

- no apparent consultation with equipment suppliers to gain current quotations or advice on current technology developments given that such information cannot be expected to reside in the public domain;

- unnecessary reliance instead on a range of weak secondary and tertiary sources for capital costs without any consideration for the inaccuracies and major shortcomings of

[1] BRW Report, p. 41.

these sources. In the case of Alternative 0, PB Associates compounded this problem by taking the average of the costs derived from two inconsistent and inappropriate sources;

- unnecessary reliance on an unsubstantiated and inaccurate flat percentage of capital costs to determine the annual operating and maintenance ('**O&M**') costs of Alternatives 3 and 5; and

- no consideration of environmental issues associated with the construction of Directlink's alternative projects and the substantial potential for a quantity of undergrounding to be legally required.

Response:

PB Associates' alternative project costings are not determined with the same level of fine detail and substantiation as BRW's, and are clearly less accurate and less reliable.

3. Contravention of the principles of the Regulatory Test

Issue:

In its report, PB Associates raises a number of matters associated with the scope of the alternative projects and the valuation of network deferral benefits in a manner that we believe contravenes several of the principles set down in the Commission's Regulatory Test.

Examples include:

- insufficient consideration of the Line 966 upgrade and Broadwater cogeneration projects as to whether they satisfy the criteria for committed, anticipated or modelled projects;

- insufficient consideration of the timing and cost of the Line 966 upgrade project in the presence of Directlink or its alternative projects;

- inconsistent and unclear explanation of the scope of Alternative 5 and whether it should be an alternative project;

- the valuation of Alternative 0/1/2's Queensland network deferral benefits as the amount from Powerlink pays to the Directlink Joint Venturers under their network support agreement;

- exclusion of allowances for interest during construction ('**IDC**') and contingency from the total costs of the alternative projects even though they are real cost components; and

- exclusion of the easement costs from the total cost of the Queensland network reliability project.

Response:

PB Associates has ignored the Regulatory Test context in which the costs and benefits of Directlink's alternative projects must be estimated. As a result, PB Associate's findings in

relation to the costs and benefits are incorrect. If accepted without proper scrutiny and adjustment, these findings will distort the outcomes of the Regulatory Test.

The Directlink Joint Venturers explain the points listed above in more detail in later sections of this submission.

PB ASSOCIATE'S EXECUTIVE SUMMARY

There are several matters raised by PB Associates in its executive summary that are not mentioned in the body of the report.

4. Directlink consistent with optimal longer term network planning requirements

Issue:

PB Associates states that its key findings and observations include that Directlink's characteristics, size and location are not consistent with optimal longer term network planning requirements for the transmission system.[2]

Response:

PB Associates do not mention this point again, or substantiate it, in the body of their report.

In fact, Directlink's characteristics, size and location are very well matched to the capacity of the surrounding network. As clearly demonstrated by BRW's modelling and analysis, Directlink has the capability to meet the immediate and longer term reliability requirements in the Gold Coast and northern NSW and to provide substantial inter-regional transfer power flows and reactive voltage support.

5. Current dependence on the capacity of Directlink

Issue:

PB Associates states that the NSW transmission system is not dependent on the capacity offered by Directlink for network support at the present time in meeting its requisite reliability levels.

Response:

This statement is untrue.

BRW's studies show that under even 2003-04 peak load conditions, Line 966 would become overloaded beyond its sustained emergency rating following an outage of the Armidale to Lismore 330 kV line in the absence of Directlink. As Directlink is in place, after such a contingency, NEMMCO could direct Directlink to flow south and alleviate the overload on Line 966. Consequently, for the northern NSW system to be considered as operating in an N-1 condition, the NSW transmission system must be considered dependent on the capacity

[2] PB Associates Report, p. 1.

(albeit non-firm capacity) offered by Directlink for network support at the present time. For this reason, Directlink is already deferring network augmentation projects and BRW's calculation of its deferral benefits is conservative.

6. Network control ancillary service contract with NEMMCO

Issue:

PB Associates states that first among its key findings and observations of its review is[3]:

> NEMMCO has an agreement with Directlink for the supply of reactive power. This is a commercial arrangement which NEMMCO is expected to be maintained [*sic*]. This contract between NEMMCO and DJV, which is formulated based on Directlink operating as a competitive service provider, could be assumed to remain outside of the regulated revenues of the business following conversion.

Response:

This statement is untrue.

In its revised (and original) Conversion Application, the Directlink Joint Venturers indicated that they envisage that Directlink's NCAS service would become part of its prescribed service when Directlink becomes regulated.[4] Further, in its response on stakeholder issues earlier this year, the Directlink Joint Venturers informed the Commission that they are working with NEMMCO in relation to the termination of their network control ancillary service contract.[5]

7. Consultation with key stakeholders

Issue:

PB Associates claims to have undertaken consultation with key stakeholders including the Tweed Council, State and Federal Government departments, transmission authorities, cable manufacturers, construction companies experienced in cable laying and high voltage overhead lines (particularly in the north coast of NSW) and other parties who have expressed an interest in this review.

Some selective details of PB Associates' consultation with Tweed Council, TransGrid and Delta Electricity are provided in the body of the report. However, details of the responses of Tweed Council, TransGrid and Delta in relation to other relevant matters, and all details of the responses of State and Federal Government departments, other transmission

[3] PB Associates Report, p. 1.
[4] Directlink Joint Venturers, *Application for Conversion to a Prescribed Service and a Maximum Allowable Revenue to 30 June 2015*, 22 September 2004 ('**Directlink conversion application**'), p. 23.
[5] Letter from Mr Dennis Stanley of the Directlink Joint Venturers to Mr Sebastian Roberts of the Commission dated 24 August 2004, p. 6, available at <http://www.accc.gov.au/content/index.phtml/itemId/504163/fromItemId/267918>.

authorities, cable manufacturers, construction companies and other parties, have been excluded from the report.

In the body of the report, PB Associates suggests that a proportion of the information provided to it by 'generation proponents' was confidential and could not be included in to its report.[6] However, the DJV's investigation has shown this not to be the case.

Response:

To the extent that PB Associates has relied upon undisclosed outcomes of consultation with stakeholders, the Directlink Joint Venturers are unable to provide an appropriate response and doubt must be cast on the robustness of PB Associates' findings.

An example in the body of the report illustrates this. PB Associates state[7]:

> Moreover, in discussions with TransGrid (and others), it has become apparent to PB Associates that at least two of the options outlined above will be proceeding ahead of construction of the Dumaresq to Lismore 330 kV line regardless of Directlink.

The Directlink Joint Venturers cannot respond to any information provided by 'others' unless the 'others' and the nature of their information is provided.

Further, Delta Electricity has indicated to the Directlink Joint Venturers that none of the information it provided to the Commission or PB Associates was of a confidential nature. Delta Electricity also stated that the information it provided to PB Associates does not extend beyond that set out in the PB Associates Report despite PB Associates' inference that it does.

Upon the Directlink Joint Venturers consulting with Powerlink and TransGrid on the PB Associates Report, both organisations have indicated that they do not support PB Associates findings to the extent implied. Particular examples are set down in several sections below. These examples cast doubt upon PB Associates ability to accurately reflect the views of major stakeholders and draw reliable conclusions from them.

8. Commercial negotiations with TransGrid

Issue:

PB Associates have made a number of unsubstantiated presumptions in relation to the extent to which TransGrid is currently relying upon Directlink's network support being available. They state:

> To the knowledge of PB Associates, DJV has not entered into commercial negotiations with TransGrid for the provision of network support services through Directlink at this time. Given that TransGrid has indicated that network augmentations are required from 2007 to maintain supply, in the absence of other initiatives, and that the timeframe for major upgrades (including the proposed 330 kV line from Lismore to Dumaresq) would require up to 5 years

[6] PB Associates Report, p. 16.
[7] PB Associates Report, p. 24.

> for approvals, environmental assessments and construction, it is apparent that TransGrid do not anticipate requiring Directlink within that timeframe.

Response:

PB Associate's claim is incorrect.

TransGrid has confirmed with the Directlink Joint Venturers that, the absence of commercial negotiations for the formal provision by Directlink of network support services cannot be construed to mean that it does not anticipate requiring Directlink's service for at least another 5 years.

On the contrary, TransGrid is already relying upon Directlink. TransGrid will conclude its process for commercially procuring network support services over the next year. As an existing asset, it is expected that Directlink is highly likely to be the most efficient provider of network support services. That is, Directlink has the capability to provide network support service that can alleviate a range of constraints throughout the northern NSW network at a small economic cost to the NEM.

NEED FOR JUSTIFICATION FOR THE INVESTMENT

9. Nature of pre-contingent flows

Issue:

PB Associates has incorrectly indicated the extent to which Directlink would need to provide pre-contingent flows:

> Pre-contingent flows are defined in Section 2.2 of the BRW report) and refer to flows that are available for extended periods of time to ensure that network elements are not over-loaded and supply is maintained for critical contingency events on a sustained basis. [emphasis added]

Response:

Directlink has the capability to provide network support pre-contingently and post-contingently.

In the case where Directlink provides network support pre-contingently, when the northern NSW load reaches a certain level, Directlink would be pre-contingently dispatched to flow south in anticipation of a contingency. BRW has advised the Directlink Joint Venturers of the load levels that would trigger the need for pre-contingent dispatch based on their detailed modelling. The Directlink Joint Venturers estimate that, typically, about 1-2% of the hours in the year would lead to pre-contingent flows that are counter-price, i.e. southward flows when the Queensland regional price is higher than the NSW price. This is a very small percentage of the time, not an extended period as PB Associates suggests.

In the case where Directlink provides network support post-contingently, Directlink would be dispatched to flow south to alleviate network constraints in northern NSW after a

contingency has actually occurred. Post-contingent dispatch would occur for a negligible percentage of the time.

The Directlink Joint Venturers are committed to working with TransGrid to design and implement post-contingent dispatch.

10. Upgrade of Line 966 and additional capacitors

Issue:

PB Associates claims that TransGrid has advised it that TransGrid will upgrade Line 966 to achieve a sustained emergency rating of approximately 120 MVA in 2006-07, and this will defer the need for the Lismore – Dumaresq line. [8]

PB Associates also implies that BRW has not considered that additional capacitors can alleviate network constraints.

Response:

As mentioned in section 5 of this submission, BRW's studies show that under 2003-04 peak load conditions, the Armidale to Koolkhan 132 kV line (Line 966) would become overloaded beyond its sustained emergency rating following an outage of the Armidale to Coffs Harbour 330 kV line in the absence of Directlink. As Directlink is in place, after such a contingency, NEMMCO could direct Directlink to flow south and alleviate the overload on Line 966. Consequently, for the northern NSW system to be considered as operating in an N-1 condition, the NSW transmission system must be considered dependent on the non-firm capacity offered by Directlink for network support at the present time.

However, another network constraint will appear in 2007 and this network constraint will only allow an upgrade of Line 966 to defer the 330 kV Lismore to Dumaresq line in the absence of network support from Directlink until that time. The post-contingent loading on the Koolkhan to Lismore 132 kV line (Line 967) after the loss of the Coffs Harbour to Lismore 330 kV line will exceed its sustained emergency rating of 136 MVA in 2007-08.

Consequently, an upgrade of Line 966 in 2006-07, as currently planned by TransGrid, will not alleviate its current post-contingent overloading and it will not alleviate the post-contingent loading on Line 967 in 2007-08. Directlink or the proposed 330 kV Lismore to Dumaresq line can alleviate both constraints.

Contrary to PB Associates' implication, BRW's modelling did include new capacitor banks at Koolkhan and Nambucca in service from 2005, consistent with TransGrid's 2004 annual planning report and confirmed in direct discussions between BRW and TransGrid. BRW has not modelled any additional capacitor banks at Lismore and it considers that the statement in the PB Associates Report that the Lismore capacitors will be installed—which was attributed to TransGrid—is incorrect. A requirement for additional capacitor banks at Lismore has not been identified in TransGrid's 2004 annual planning report nor has it been identified in discussions with TransGrid to confirm BRW's modelling assumptions.

[8] PB Associates Report, pp. 13, 16, 25, 27-9.

11. Cogeneration and wind-farm projects

Issue:

PB Associates claims that cogeneration projects and wind farm projects have the potential to provide network support and will defer the need for the Lismore – Dumaresq line.[9]

In relation to the Broadwater cogeneration plant, PB Associates' claims are based on its view that:

> The generator will operate at base-load with an estimated annual availability of 95%. As an embedded generator the unit will be incentivised to operate at times of peak transmission system demand – by virtue of its ability to earn the commercial benefits associated with a reduction in Country Energy's liability for transmission use of system charges (TUoS).

Further, PB Associates claims that its conclusions are supported by statements made in the Powerlink Final Report[10].

Response:

PB Associates claims are based on little of their own technical or commercial analysis. While PB Associates clarifies later that wind farm projects are unsuitable to provide network support[11], it fails to consider some fundamental issues associated with the provision of network support by the Broadwater cogeneration project. These issues include:

- the extent to which the Broadwater cogenerator can resolve all or only some of the network constraints that will exist in 2007;
- the substantial uncertainty that is still associated with the project;
- the extent to which sufficient reliance can be placed on the cogeneration technology being employed at Broadwater to defer the need for the Lismore to Dumaresq line;
- the need for TransGrid or Country Energy to enter into a contractually-binding network support agreement (such as that between the Directlink Joint Venturers and Powerlink) with the Broadwater generator and the willingness of the owners of Broadwater to enter into such an agreement; and
- whether Powerlink intended that comments in its Final Report should be construed as being in support of PB Associates' findings.

The Broadwater and Condong cogeneration plants are not committed projects and, for this reason alone, cannot be relied upon to provide critical network support.

If it proceeds, the new Broadwater plant would be a single generation unit. The Directlink Joint Venturers and BRW are not aware of any other instance in the NEM where a single biomass generation unit has been accepted as a provider of network support services.

[9] PB Associates Report, pp. 13, 18, 26, 27-9.
[10] Powerlink Queensland, *Final Report, Proposed New Large Network Asset – Gold Coast and Tweed Areas*, 6 July 2004.
[11] PB Associates Report, p. 18.

Further, as outlined in the BRW letter attached to this submission, the nature of the Broadwater plant would also be a factor in assessing its ability to perform such a role. Fuel supply and handling is a major constraint upon availability in the operation of biomass generation plants, particularly where there are variable forms of biomass involved. It is understood that the Broadwater plants will rely on other as yet unsecured biomass fuel sources beyond the sugar milling season, i.e. for around half the year. By contrast, elsewhere in the NEM, where multiple gas turbines provide network support, there are many instances in which these are fired using liquid fuels when gas is not available. Gas and liquid fuels are readily handled and stored and do not pose the same risks to reliability and availability. PB Associates has not made any adequate assessment of these issues.

PB Associates considers a non-firm estimate of Broadwater availability of 95% adequate for the provision of reliable network support to defer the Lismore to Dumaresq line. However, PB Associates claims that Directlink must have an availability level of at least 99% to provide the same service[12]. This indicates a level of inconsistency in the PB Associates Report.

As the Directlink Joint Venturers' experience with Powerlink demonstrates, network service providers cannot and will not rely solely on market incentives to ensure that network support services are available at critical times. They will require the providers of network support to enter into contractually-binding arrangements that contain substantial penalties for non-performance. PB Associates has not made an adequate assessment of the willingness of the Broadwater cogenerator to enter into such an arrangement. Delta Electricity did not respond to either Powerlink or TransGrid's recent requests for information in relation to the alleviation of emerging network constraints[13]. These circumstances indicate that it is unlikely that the Broadwater cogenerator owner anticipates entering into such a network support arrangement and this is another reason why the plant could not be relied upon to support the northern NSW network at critical times.

The Directlink Joint Venturers understand that Powerlink has undertaken no detailed modelling or investigation that can confirm that the Broadwater plant is technically capable or commercially willing to commit to provide sufficient network support to the northern NSW network to defer the new 330 kV Lismore-Dumaresq line. Further, Powerlink has clarified with the Directlink Joint Venturers that Powerlink does not consider that any statements in its Final Report for the Gold Coast/Tweed area support any conclusion regarding deferral periods or costs associated with possible network support to the far north coast of New South Wales.

In summary, for the reasons mentioned above, PB Associates' conclusion that cogeneration projects will provide network support and will defer the need for the Lismore to Dumaresq line are incorrect.

[12] PB Associates Report, p. 77.
[13] Powerlink Queensland, *Emerging Transmission Network Limitations – Electricity Transfer to the Gold Coast and Tweed Area*, August 2003 and TransGrid, *Emerging Transmission Network Limitations on the New South Wales Far North Coast*, August 2003.

12. Riverland deferrals

Issue:

PB Associates suggests that the Electricity Supply Industry Planning Council ('**ESIPC**') *2004 Annual Planning Report* somehow casts doubt upon Murraylink's network deferral benefits in the Riverland.[14]

> In the case of the Murraylink application, the application refers to transmission deferrals in the Riverland area in South Australia, deferring the need for voltage support until 2007- 08 and for thermal upgrades until 2012/13. The latest ESIPC annual planning report (dated June 2004) does not indicate that any voltage related augmentations are planned in the Riverland region prior to 2007-08 or that any thermal related augmentations are planned prior to 2012/13. Murraylink has, however, only been regulated for just over twelve months, so PB Associates considers that it is too early to be definitive as to whether the deferrals identified in the Murraylink application are reasonable in retrospect. It is important in developing regulation for Directlink and other potential regulated network assets that the revenues are linked to the services delivered over time. A critical lesson from the Murraylink review is that where deferral or other benefits are attributed to the asset that these deferrals are actually achieved.

Response:

The ESIPC 2004 Annual Planning Report actually confirms Murraylink's ability to defer network augmentation in the Riverland, particularly when it says[15]:

> Contingency studies had shown that by the summer of 2003/04 the existing ElectraNet SA transmission system would no longer have sufficient capacity to supply the loads in the region under a single 132 kV line contingency event. However, Murraylink's regulated status now addresses these limitations and it will continue to do so in the medium term until Murraylink's ability to import power from Victoria is critically constrained by Victorian transmission capacity at times of peak load.

The lesson from the Murraylink case is that Murraylink does defer major network reliability augmentation and creates valuable market benefits accordingly. The ESIPC confirms this and there is no reason for PB Associates to suggest that estimates of the deferral periods made by the Murraylink Transmission Company will be proven to be anything other than correct.

BRW's estimates of the extent to which Directlink can defer network reliability augmentations are based on the best information currently available and account has been taken on the low, medium and high load growth cases. This provides the soundest basis for the Directlink Joint Venturers' Conversion Application and Directlink asset valuation.

13. Load growth forecasts

Issue:

PB Associates initially confirms that the load growth forecasts that BRW has used are comparable with the TransGrid and Powerlink Annual Planning Reviews[16]:

[14] PB Associates Report, pp. 13-4.
[15] ESIPC, *2004 Annual Planning Report*, p. 148.

> BRW has indicated that they have used the TNSP (TransGrid and Powerlink) 2003 Annual Planning statements as the basis for their load growth projections up until 2012/13. Annual load growth projections of 25 MW per annum for the Gold Coast Tweed area and 15 MW per annum for the Far North Coast of NSW area have then been applied.
>
> PB Associates has made a comparison with the information in the 2004 Annual Planning Reports and BRW's projections and the load forecasts are comparable.

However, PB Associates go on to cast doubt upon the load growth forecasts used by BRW:

> Powerlink's 2004 Annual Planning Statement has suggested that the anticipated average increase in South East Qld demand of approximately 170MW (5%) p.a. over the next five years. These growth rates are slightly higher for the medium and low growth scenarios and slightly lower for the high growth scenario compared to the Powerlink 2003 Annual Planning Report. In addition the revised energy growth rates in QLD in the 2004 Annual Planning Report are slightly higher over the long term than in the previous forecast. However, peak demand forecast growth rates have increased significantly – especially those for the next three years.
>
> As a result of this assessment PB Associates believes that the BRW high growth scenario may be more applicable for consideration of the first tranche of deferrals identified for QLD in the BRW report.
>
> TransGrid has indicated that growth in the Far North Coast area has averaged slightly less than 4% over recent years. Country Energy is predicting load growth of just over 3% in the far North Coast region in the short term which is slightly higher than that incorporated in the BRW report (which is based around 2.5% load growth). The use of a lower growth rate tends to enhance the longevity of deferral benefits of a particular project.
>
> Load growth projections by all parties (BRW, TransGrid and Country Energy) do not factor in the potential for significant new local generation facilities, which could significantly impact the timing of the 330 kV asset requirement (refer comments in section 2.9).

Response:

As indicated in the BRW letter attached to this submission, BRW used the load forecasts provided in the Powerlink and TransGrid 2004 annual planning reports and not the 2003 annual reports as stated by PB Associates. BRW also incorporated clarifications or later information provided by Country Energy and Powerlink in respect of the Gold Coast, Tweed and North East NSW substation loading forecasts. The final forecasts used in the modelling, including the methodology for projections beyond the Powerlink, TransGrid and Country Energy 10-year planning horizons, were submitted to and confirmed with Powerlink, TransGrid and Country Energy. The potential impact of any potential embedded generation is taken into account by these planning authorities in their assessment and determination of system load forecasts.

PB Associates comments specifically on the high average growth rates of approximately 5% anticipated by Powerlink's 2004 Annual Planning statement for South East Queensland. BRW has used individual substation projections provided by Powerlink for the Gold Coast and by Country Energy for Terranora as the basis for its modelling. Significantly, the Terranora forecasts indicate growth rates of 4% to 8.6% over this period whereas the Gold

[16] PB Associates Report, p. 14.

Coast growth rates are 4% or below. The growth rates at Terranora are significant in terms of the timing of augmentations and they impact directly on the Directlink transfer limits. Given this situation and the use of the load growth projections from Country Energy, the relevant planning authority, BRW rejects that the PB assertion that the 'use of a lower growth rate tends to enhance the longevity of deferral benefits of a particular project'.

It should also be noted that PB Associates states that "the BRW high growth scenario may be more applicable for consideration of the first tranche of deferrals identified for QLD in the BRW report." BRW's report of 22 September 2004 contained in the Directlink Conversion Application does not seek to defer tranches of Queensland augmentations beyond 2005-06, which has already been accepted and implemented by Powerlink.

14. Third 110 kV transmission line from Mudgeeraba to Terranora/Bungalora

Issue:

PB Associates has concerns that Powerlink may not be able to construct the additional third 110 kV transmission line into Terranora substation within its stated timetables, or even at all, due to the need to obtain planning and environmental approvals for that section of the route within NSW, and this casts doubt upon Directlink's ability to provide network support into northern NSW.[17]

Response:

The Directlink Joint Venturers understand that Powerlink, Country Energy and Energex are undertaking joint planning with in accordance with their National Electricity Code obligations, and the outcomes of this joint planning will determine the next steps in relation to maintaining reliable supply to both Energex and Country Energy demands. In time, demands in the Tweed area will exceed the N-1 capacity of the existing 110 kV lines and a range of capacity augmentations will be considered to increase Powerlink's capacity to supply the area. This can, in turn, alleviate capacity constraints to north of Directlink and allow it to provide increased southward flows.

BRW has made a reasoned prediction of the likely outcome of the current joint planning process. While the joint planning process may in the end choose a different augmentation and timing to that BRW has predicted, the augmentation chosen will still increase Powerlink's capacity to supply the Tweed area and alleviate capacity constraints to north of Directlink in response to the actual rate of load growth in the area.

[17] PB Associates Report, pp. 16, 17, 28-9.

SELECTION OF MOST EFFICIENT INVESTMENT

15. Interest during construction allowance

Issue:

PB Associates has failed to understand BRW's costing methodology and the need for the inclusion of interest during construction in the costs of the alternative projects. It states[18]:

> For the alternatives which are being assumed as proxies for the Directlink assets, the construction and commissioning dates are assumed to be the same, ie 1 July 2005. In this instance, since there is no delay between conversion date (becoming a regulated asset) and revenue derivation, there is no requirement in our view to include IDC's. To include IDC's for estimating the present value of investments for proposed alternatives to Directlink would, in our view result in double counting, as the cost of capital is implicit in the discount rate.

Response:

The reason PB Associates has given for not including IDC is not valid. An IDC allowance has nothing to do with any difference between the date of conversion and the date of revenue determination. And BRW's cost methodology contains no double counting.

BRW's costing methodology is designed to determine as accurately as reasonably possible the costs to a network service provider of procuring a project under a competitively-priced all inclusive engineering, procurement and construction ('**EPC**') contract. This methodology follows the same process that would be used by an EPC contractor to develop the contract price and it involves:

- summating the estimated costs of all the obvious development, approvals, easements and site acquisition, project management and equipment as if they were purchased in July 2005, and expressed in real July 2005 dollars; and

- adding an appropriate contingency allowance to account for uncertainties such as—but not limited to—those associated with the definition of the engineering scope at the time of estimating, allowance for risks associated with unidentified obstacles, environmental industrial delays, and exchange rates.

IDC is an additional cost component borne by the network service provider or the EPC contractor, depending on the terms of payment in the EPC contract. IDC recognises that development, approvals, easements and site acquisition, project management and equipment are not all purchased at the end of the contract, but over a 4-5 year period leading up to the end of the contract. BRW correctly calculated the IDC for each alternative project by considering the cash-flow schedule in each case and applying a commercial interest rate that reflects the real cost of capital to the purchaser.

PB Associates recognises this principle when it suggests that 'the timing of the augmentations by TransGrid will materially alter the present value costs of expenditures relating to Alternative 5'[19].

[18] PB Associates Report, p. 19.
[19] PB Associates Report, p. 60.

The Commission concurred with the inclusion of IDC with consideration for the appropriate cash-flow schedule in the costing of Murraylink's alternative projects.[20]

16. Contingency allowance

Issue:

PB Associates has not understood BRW's costing methodology and the need for the inclusion of an allowance for contingencies in the costs of the alternative projects. It states[21]:

> In the case of contingencies, these are costs in addition to those estimated based on individual components and therefore reflect a measure of inefficiency which is not consistent with the requirements of the National Electricity Code. The costs assumed by PB Associates in the evaluation of alternatives, and also assumed by BRW in its analysis for the DJV, include estimated actual costs and therefore do not require an additional contingency allowance.

Response:

The reason PB Associates has given for not including a contingency allowance is not valid. A contingency allowance has nothing to do with inefficiency.

As mentioned in section 15 of this submission, BRW's costing methodology includes an appropriate contingency allowance to account for uncertainties such as—but not limited to—those associated with the definition of the engineering scope at the time of estimating, allowance for risks associated with unidentified obstacles, environmental industrial delays, and exchange rates.

BRW, an EPC contractor itself, has advised the Directlink Joint Venturers that no EPC contractor would price an EPC contract without including an appropriate level of contingency because an EPC contractor would have a real expectation that additional costs would be incurred beyond those for which costs can be reasonably estimated.

The Commission concurred with the inclusion of a contingency allowance in the costing of Murraylink's alternative projects.[22]

17. Alternative 5 is a comparable alternative

Issue:

PB Associates states that Alternative 5 is not strictly as an alternative[23]:

[20] Letter from Mr Sebastian Roberts of the Commission to Mr Stephane Mailhot of Murraylink Transmission Company, dated 7 April 2004.
[21] PB Associates Report, p. 20.
[22] Letter from Mr Sebastian Roberts of the Commission to Mr Stephane Mailhot of Murraylink Transmission Company, dated 7 April 2004.
[23] PB Associates Report, p. 20.

> … since it provides considerably greater capacity than that offered by Directlink…

Response:

This is not a sound reason to exclude Alternative 5 as one of Directlink's alternative projects.

BRW and PB Associates have clearly established that a need exists for network augmentations in New South Wales and Queensland to enable TransGrid and Powerlink to satisfy their network reliability obligations. Alternative 5 represents a set of network augmentations that would need to be in place in the absence of Directlink's other alternative projects (including Alternative 0, Directlink itself) to satisfy network reliability standards in Queensland and NSW. That is, Alternative 5 is clearly an alternative project from which TNSPs may choose to satisfy the reliability needs in Queensland and New South Wales in the same way that they may choose from Directlink's other alternative projects.

PB Associates presents Alternative 3 as an alternative project even though it provides substantially less capacity and less market benefits than Directlink.

In keeping with the Regulatory Test and the Commission's previous statements, BRW has not limited its selection of Directlink's alternative projects to only those projects that provide an equivalent level of service. Otherwise, it would have only selected and assessed Alternatives 0/1/2.

The Commission's previous statements come from the Murraylink decision[24], in which the Commission indicated that it:

> …does not believe that alternative projects are required to deliver the exact same level of service as the proposed project.

And further:

> The Commission considers that an alternative project could be considered a reasonable alternative if it delivers substantial gross market benefits to all regions and or nodes.

The criteria that BRW has applied to its selection of Directlink's alternative projects[25] is completely consistent with the Commission's view.

BRW's Alternative 5 certainly provides substantial gross market benefits to the same regions and nodes as Directlink, arguably much more than Alternative 3, which PB Associates agrees is an alternative project to Directlink.

The Directlink Joint Venturers agree with the Commission that[26]:

> … the need for an augmentation is driven by either code or jurisdictional obligations or, in the case of a market driven augmentation, come from the size of the market benefits available.

[24] Australian Competition and Consumer Commission, *Decision: Murraylink Transmission Company Application for Conversion and Maximum Allowable Revenue* ('**Murraylink decision**'), 1 October 2003, p. 52.
[25] BRW Report, pp. 16-7.
[26] Murraylink decision, p. 53.

This is why the Directlink Joint Venturers have developed a means by which the relative market benefits of Directlink's alternative projects, including Alternative 5, can be compared properly. In terms of network deferral benefits, each of Directlink's alternative projects creates the starting point for ongoing network reliability investment. The difference between the investment cash-flows represents their relative network deferral benefits.

18. Network services agreement with Powerlink

Issue:

PB Associates is mistaken in its assertion that the network support agreement between the Directlink Joint Venturers and Powerlink 'may remain outside the regulated revenues defined by the Commission'.[27]

Response:

This statement is untrue.

Upon conversion, Directlink's network support into Queensland for the summer of 2005-06 will be provided as part of Directlink's prescribed service and, upon conversion, the Directlink Joint Venturers' only compensation for providing network support to Queensland will be through its regulated revenue.

19. Scope and timing of Alternative 5

Issue:

PB Associates is of the view that the definition of Alternative 5 should be amended by changing the timing of the new Dumaresq to Lismore 330 kV line.[28]

PB Associates also suggests that the Queensland reliability augmentation not be included in Alternative 5 and additional works set out in section 3.2.4.2 of its report are incorporated into Alternative 5.[29]

Response:

As discussed in section 17 of this submission, Alternative 5 represents a set of network augmentations that would need to be in place from 2005-06 in the absence of Directlink's other alternative projects (including Alternative 0, Directlink itself) to satisfy network reliability standards in Queensland and NSW.

Alternative 5 was originally developed by BRW in close consultation with both TransGrid and Powerlink.

[27] PB Associates Report, p. 20.
[28] PB Associates Report, p. 24.
[29] PB Associates Report, p. 60.

Clearly, by definition, Alternative 5 must still include the Greenbank 275 kV augmentation in Queensland, which would have been commissioned in 2005 had Directlink not been in place.

Given BRW has now been able to confirm that the network constraints on Line 966 would have existed by 2003-04 in the absence of Directlink, Alternative 5 should include the upgrade of Line 966 with commissioning in 2003.

As mentioned in section 10, the post-contingent loading on the Koolkhan to Lismore 132 kV line (Line 967) after the loss of the Coffs Harbour to Lismore 330 kV line would exceed its sustained emergency rating of 136 MVA in 2007-08. Without Directlink, the new Lismore to Dumaresq line would be required to resolve this constraint.

In summary, Alternative 5 should now include:

- the Greenbank 275 kV augmentation in Queensland, commissioned in 2005;
- the upgrade of Line 966, commissioned in 2003;
- the Lismore to Dumaresq 330 kV line, commissioned in 2007.

20. Capital cost of Alternative 5

Issue:

PB Associates have accepted BRW's costings of the NSW and Queensland reliability augmentations for Alternative 5 except that PB Associates have removed IDC and contingency and excluded easements from the Queensland component. However, PB Associates suggests that the Queensland reliability augmentation not be included in Alternative 5.

PB has also suggests that the additional works set out in section 3.2.4.2 of its report be incorporated into Alternative 5, but did not include their cost of these works in the cost of Alternative 5[30]

Response:

PB Associates' costing of Alternative 5 is incorrect.

As outlined in sections 15 and 16 of this submission, PB Associates should have included IDC and contingency in its costings of all projects, including Alternative 5.

To avoid distorting the outcomes of the Regulatory Test, PB Associates should also include the easement costs of the Queensland reliability augmentations even though the easements have already been purchased. To exclude the cost of substantial cost items such as easements could create perverse incentives for project proponents conducting the test for this type of project:

[30] PB Associates Report, p. 30.

- Project proponents could make their project more attractive in the light of the Regulatory Test by pre-purchasing major cost items; and

- Alternatives 0, 1, 2 and 3 contain cost components that have already been procured such as substation sites, cable and converters. In fact, all the cost items for Alternative 0 have been procured and PB Associates' logic prevails, it would have a capital cost of zero.

For the Regulatory Test to provide equitable consideration of all the alternative projects, all project specific costs should be included whether sunk or otherwise. This is especially the case where the Regulatory Test is being used to value an existing asset.

As mentioned in section 19 of this submission, Alternative 5 should now include:

- the Greenbank 275 kV augmentation in Queensland, commissioned in 2005;

- the upgrade of Line 966, commissioned in 2003; and

- the Lismore to Dumaresq 330 kV line, commissioned in 2007.

Therefore, all project specific costs should be included in Alternative 5 for each component.

21. Deferral benefits after 2014-15

Issue:

Given that detailed planning has only been undertaken by TransGrid for ten years and that many uncertainties exist regarding other possible scenarios beyond this period, including the challenges of gaining approval to build the third line into Terranora, PB Associates recommends that the deferral benefits only be considered up until 2014-15.[31]

Response:

While the level of the long-term benefits is uncertain, they are highly likely to fall within a range defined by the low, medium and high growth cases, and they will certainly not be zero.

The Commission can be assured that BRW has estimated the long-term deferral benefits of Directlink's alternative projects on the basis of the best currently available information and by taking into consideration likely network development and load growth scenarios. To achieve this, BRW has consulted extensively with Powerlink, TransGrid and Country Energy on all its inputs and assumptions and on its methodology.

There is no sound reason for ACCC to determine that the long-term deferral benefits of Directlink's alternative projects are zero, especially given the significant financial impact such an arbitrary view could impose upon the Directlink Joint Venturers.

Based on a reasonable extrapolation of the best currently available information, Alternatives 0/1/2 can be expected to defer the need for the 330 kV Lismore to Dumaresq line from 2007

[31] PB Associates Report, pp. 29 & 61.

for 10 years in the expected load growth case. If the deferral period was reduced from 10 to 7 years, it would reduce the network deferral benefits of Alternative 0/1/2 by $18.5M.

22. Voltage collapse at Koolkhan

Issue:

PB believes that BRW's report indicates that voltage collapse at Koolkhan will occur after 2016-17 irrespective of any network support provided by Alternative 0/1/2 and that this collapse is due to constraints in the Queensland Powerlink network and the Condong cogenerator, may alleviate this constraint for a further year. [32]

Response:

BRW has advised the Directlink Joint Venturers that constraints in the Queensland network are not responsible for the north east NSW voltage collapse and, as for the Broadwater plant (refer to section 11 of this submission), it is highly unlikely that the potential single Condong 30 MW cogenerator would be relied upon to provide this network support.

Further, the Directlink Joint Venturers understand that Powerlink has undertaken no modelling or investigation that can confirm that the Condong plant is technically capable or commercially willing to commit to provide sufficient network support to the Powerlink network in the short or long term.

23. Estimate annual O&M costs at 2% of capital cost for Alternatives 5 and 3

Issue:

PB Associates has estimated the annual operating and maintenance ('**O&M**') costs of Alternatives 3 and 5 as 2% of their capital costs on the basis of verbal advice from TransGrid.[33]

Response:

TransGrid has advised the Directlink Joint Venturers that it did not advise PB Associates that it would be more accurate to estimate of the annual operating costs of Alternatives 3 and 5 as 2% of their capital costs (excluding contingency and IDC) than the method BRW used.

However, it is not a better estimate than that determined by examining the specific locational and technical characteristics of each alternative project as BRW has done.

[32] PB Associates Report, pp. 29-30.
[33] PB Associates Report, pp. 30 & 58.

24. Decommissioning an existing 132 kV line

Issue:

In its deliberations on O&M costs for the Lismore to Dumaresq 330 kV line PB Associates has assumed that the 330 kV line would replace an existing 132 kV line for 66% of its length and, on this basis, only a corresponding incremental O&M cost has been allowed.

Response:

PB Associates do not allow for the fact that replacement of this section of 132 kV line would require either a second 132 kV line to Tenterfield or a 330/132 kV substation at Tenterfield to maintain the N-1 supply. The difference between the O&M costs of 66% of the existing 132 kV line and the O&M costs of a second line to Tenterfield or a 330/132 kV substation at Tenterfield is likely to be insignificant.

Therefore, PB Associates' finding in this regard is in error.

25. Details of protection and control scheme upgrade

Issue:

PB Associates states that the DJV Conversion Application and the BRW Report do not provide details of the protection and control schemes required for Directlink (and Alternative 0/1/2) to provide pre-contingent support to Code standards, and therefore, implies that this information is not available to the Commission.[34]

Response:

This information has been made available to the Commission. The Directlink Joint Venturers have provided to the Commission a copy of its network support agreement ('**NSA**') with Powerlink, on a confidential basis, that sets out the 'Net Dependable Capacity' that Directlink is contracted to provide. And the Directlink Joint Venturers also provided to the Commission a description of the emergency tripping scheme that they are currently implementing to achieve their contractual obligations under the NSA.

26. Availability of Alternatives 0/1/2 for southwards transfer in 2005-06

Issue:

PB Associates implies that, if Directlink (or Alternatives 0/1/2) is committed to provide pre-contingent support to the Gold Coast in 2005-06, it is not available for southwards transfer at all.[35]

[34] PB Associates Report, pp. 30 & 46.
[35] PB Associates Report, pp. 32, 39, & 47-8.

Response:

This statement is untrue.

During the life of the NSA with Powerlink when Directlink is committed to provide network support to Queensland pre-contingently, it is only when the Gold Coast load reaches a certain level or there has been a contingency in the Gold Coast that Directlink will be pre-contingently dispatched to flow north in anticipation of a contingency. At all other times Directlink is available for southwards transfer.

27. Reliability of Alternative 0 (Directlink) and its impact upon the benefits

Issue:

PB Associates has assumed an availability of at least 99% for 120 MW and is concerned that many of the benefits associated with Alternative 0, including its deferral benefits, would be reduced if Alternative 0's availability fell below that level.[36]

Response:

Flows across Directlink are greatly influenced by wider network constraints at peak load—as described in the BRW Report—even during periods of regional price difference. At peak load, Directlink is typically constrained to around 120 MW. BRW and TEUS have taken this into account when estimating network deferral and inter-regional benefits of Alternative 0. They have, in fact, assumed that peak load transfer limits apply continually and this indicates that BRW and TEUS's estimates incorporate a significant level of conservatism.

Having said this, the Directlink Joint Venture is mindful of its Code obligations upon conversion to maximise Directlink's availability and is committed to implementing a number of equipment upgrades to ensure that Directlink's availability for 180 MW is around 99%.

28. Capital cost of Alternative 0

Issue:

To determine a more appropriate cost of Directlink itself (Alternative 0), PB Associates gleaned high-level project cost information for vaguely similar projects from two 2000 papers: one published by Jeannie Wetherill for the UK Offshore Wind Energy Network[37] and one published by Rudervall et al for the World Bank[38].

PB Associates roughly calculated two capital costs for Directlink (excluding contingency and IDC) and took the average between the two. PB Associates justified this by claiming that the

[36] PB Associates Report, p. 32.
[37] Wetherill, J., 2000, *Review of First International Workshop on Feasibility of HVDC Transmission Networks for Offshore Wind Farms Stockholm March 2000*, available at www.owen.eru.rl.ac.uk/documents/stockholm_hvdc_summary.pdf.
[38] Rudervall, R., Charpentier, J.P. & Sharma, R. 2000, *High Voltage Direct Current (HVDC) Transmission Systems Technology Review Paper*, available at www.worldbank.org/html/fpd/em/transmission/technology_abb.pdf.

Directlink's actual cost is invalid for the purposes of the Regulatory Test as PB Associates claims it is inflated by an unspecified amount due to 'critical delays'—even though Directlink's actual cost falls within the range set by the two papers and any additional costs might have been immaterial or well justified.

Response:

PB Associates approach is highly inaccurate and does not provide a sound alternative to the actual capital cost for Directlink that was provided by the Directlink Joint Venturers.

There are many reasons why PB Associates' approach is inappropriate:

- the scope of the costs provided in the two 2000 papers is highly uncertain and not readily comparable to one another, or to Alternative 0;

- the Wetherill paper is a tertiary source that reports on a presentation by Jen Hobohm and Thomas Ackerman, whose credentials have not been verified;

- contrary to PB Associates' statement that it used a price example 'table' in the Rudervall paper to obtain a price for a 50 MW, 60 km HVDC installation, PB Associates actually scaled the price from a very imprecise graph, which is provided for guidance only.

- in any case, the scope of the 50 MW, 60 km HVDC installation for which the graph indicates a price is not described in any way. For example, there is no indication whether installation is excluded as it was in the Wetherill paper's cost. The Rudervall paper also does not indicate whether its cost guide relates to two or three-level technology—a factor that PB Associates has considered very important for the costing Alternative 1.

- the Rudervall paper actually cautions readers to take its cost information 'in the proper perspective' given that, among other things, 'market conditions at the time of the project is [*sic*] a critical factor'. Further, the Rudervall paper states:

  > It is strongly recommended to take contact with a manufacturer in order to get a first idea of costs and alternatives. The manufacturers should be able to give a budgetary price based on few data, as rated power, transmission distance, type of transmission, voltage level in the AC networks where the converters are going to be connected.

- as PB Associates points out, firm costing data for new HVDC Light technology is not freely available in the public domain. This information is only available from ABB itself upon request. BRW requested and received such information for its costing of Alternative 1.

- a reasonable review of the actual capital cost for Directlink would have demonstrated that it is a reasonable and efficient cost for the following reasons:

  - the Directlink Joint Venturers have a strong commercial interest in minimising the cost of Directlink.

  - Directlink was procured and constructed under a competitively-priced all-inclusive EPC contract.

- while Directlink's construction time was longer than originally anticipated, delays were caused by factors that could not have been foreseen or avoided by the EPC contractor or the Directlink Joint Venturers. The delays were not caused by any type of inefficiency. These delays are the types of unforeseen circumstances for which EPC contractors include a contingency allowance in the EPC contract price.

- the additional cost to the Directlink Joint Venturers as a result of project delays was around $1M, a very small proportion of the overall contract.

The actual capital costs of Directlink is the appropriate costing for Alternative 0 and PB Associates' estimate is far less accurate, and, therefore, inappropriate.

29. Operating and maintenance costs of Alternatives 0/1/2

Issue:

PB Associates has significantly underestimated the efficient costs of operating and maintaining a HVDC installation and, in any case, incorrectly added together its own estimates.[39]

Response:

In the light of comments made by PB Associates in its report, the Directlink Joint Venturers have benchmarked their costs of general management, operations, commercial/regulatory and financial management with the costs incurred by Murraylink Transmission Company ('**MTC**'), which shares resources with TransÉnergie Australia. Under its regulatory cap, MTC has a substantial incentive to incur efficient O&M costs, which will be reflected in MTC's forthcoming regulatory accounts.

This benchmarking exercise has confirmed the reasonable of estimates of the O&M costs for Alternative 0/1/2 present the BRW Report.

In its report, PB Associates has summed its own estimates of the O&M costs for Alternatives 0/1/2 to $1.56M. PB Associates' estimates actually sum to $1.921M.

30. Technology for Alternative 1

Issue:

PB Associates contends that[40]:

- HVDC Light A, using 'two-level converter' technology should be considered to be the current technology for the purposes of estimating the cost of Alternative 1—PB

[39] PB Associates Report, p. 37.
[40] PB Associates Report, pp. 39-40, 43.

Associates refers to an April 2003 ABB marketing brochure[41] as conclusive evidence of this.

- higher voltage three-level converter technology would be more expensive due to the higher rated IGBTs, high voltage equipment being required, and greater phase/ground and phase/phase clearances being required.

Further PB Associates claims that it is unlikely that a HVDC Light A facility would fit on the existing Directlink footprint at Bungalora and Mullumbimby 'where level land is at a premium'.

Response:

Given the highly dynamic nature of the development of HVDC Light, when seeking cost estimates from ABB for Alternative 1, BRW did not specify any particular IGBT technology.

BRW sought costs on the basis of a single 180 MW unit rather than three 60 MW units as in the existing installation. BRW was aware that 60 MW was the largest converter station size available at the time of the original Directlink development and that since that time larger systems had been developed (e.g. Murraylink was a single 220 MW installation). Given that from an engineering perspective a single system should provide economies over multiple systems to achieve the same output. BRW does not agree that one ±150 kV converter station would have a larger footprint and would cost more than three ±80 kV converter stations.

ABB quoted on the basis of the technology being offered for new projects at the time of the preparation of BRW's request for a quotation and this was reconfirmed by ABB Sweden by e-mail on 16 December 2004:

> ABB confirms that the cost estimate provided in December 2003 was based on the three-level technology, at that time being our standard technology, quoted for all new systems.

It would have been inappropriate for BRW to either dictate the technology or request a quotation based on a technology that was not commercially available.

BRW has provided a legitimate cost estimate based upon a reliable manufacturer's quotation. In contrast, it appears that PB Associates did not seek or receive advice on this matter from ABB, the company that develops, sells and installs HVDC Light technology.

31. Use of overhead line for Alternative 1

Issue:

PB Associates questions the validity of BRW's statement that overhead line cannot be used with HVDC Light technology because of the susceptibility of the high voltage equipment at the converter stations to lightning. PB Associates' reasons include that:

[41] ABB 2003, Troll A Precompression project Kollnes -Troll A, Norway, available at http://library.abb.com/GLOBAL/SCOT/SCOT289.nsf/VerityDisplay/C1256CC400312FCFC1256D1F00320130/$File/Troll%20A%20Precomression%20Project.pdf.

- PB Associates could find no public statement by ABB supporting BRW's statement and found references to the 3 MW 10 kV experimental Hellsjon project in Sweden for which a 10 km length of overhead line has been used;

- PB Associates believed that BRW has previously estimated the cost of a HVDC Light facility with overhead line for the Murraylink conversion application; and

- PB Associates claimed that it should be possible for surge protection equipment to prevent over-voltages caused by lightening strikes on an overhead line from entering the converter valves.

PB Associates understands that 'other (non technical) issues exist with regards to the use of DC overhead transmission lines'. However, PB Associates does not indicate what these issues are or whether they are in any way relevant to Directlink's alternative projects.

Response:

It appears that PB Associates did not seek or receive advice on this matter from ABB.

In contrast, BRW has again obtained advice from ABB in Sweden that ABB will not sell or support a HVDC Light facility using overhead cable.

While PB Associates provides a series of theoretical reasons as to why HVDC Light should be suited to applications with overhead line interconnections, it has cited only one example of an overhead line application, that of the Hellsjon project in Sweden. As advised to PB Associates previously, this was a 3 MW, 10 kV pilot project developed to prove the converter technology and it used an existing overhead line with special switching devices to protect the converters. The small scale pilot installation was customised to suit existing infrastructure and cannot be extrapolated to large scale commercial applications, particularly when the technology developer and provider (ABB) explicitly states that the systems are designed for use with cables and that they are not suited to overhead lines.

32. Capital cost of Alternative 1

Issue:

PB Associates contend that HVDC Light A, using 'two-level converter' technology should be considered to be the current technology for the purposes of estimating the cost of Alternative 1. It believes that the only publicly available costing data for 'two-level converter' HVDC Light is BRW's costing of Murraylink's Alternative 2. PB Associates concluded that it would be prudent for it to use BRW's costing of Murraylink's Alternative 2 as the basis of its costing of Directlink's Alternative 1 because[42]:

- PB Associates believed that BRW had scoped and costed Murraylink's Alternative 2 as a HVDC Light facility; and

- PB Associates believes that BRW advised it that BRW had used the cost of Murraylink 'to compare the cost of this alternative'.

[42] PB Associates Report, p. 43.

Response:

BRW's costing of Directlink's Alternative 1 was based upon recent costing information from ABB on HVDC Light technology with recognition for the capacity, length and location of the project. For this reason alone, it is inappropriate for PB Associates to base its costing of Directlink's Alternative 1 upon two year old second-hand information on Murraylink's Alternative 2, which has very material differences, not the least of which is the nature of its HVDC technology.

PB Associates is mistaken that BRW scoped and costed Murraylink's Alternative 2 using HVDC Light technology. It was specified and costed using conventional HVDC technology.[43] While HVDC Light and convention HVDC can provide a similar network service, they have different cost structures.

BRW corrected PB Associates' error in this matter before the PB Associates published its report. Consequently, the Directlink Joint Venturer's cannot understand why PB Associates Report continues to contain this incorrect assertion and, therefore, a highly inaccurate costing for Directlink's Alternative 1.

33. Inclusion of undergrounding

Issue:

PB Associates has provided the costs of fully overhead line construction for Alternatives 1, 2 and 3 due to the fact that, in the absence of legal directives for undergrounding it is appropriate to assume least cost alternatives which in this case represent the overhead construction type.[44]

Response:

PB Associates makes no assessment of any of the environmental issues associated with the alternative projects or related projects and has not demonstrated that no legal directive for undergrounding would exist.

While PB Associates asserts that specific environmental issues associated with credible alternatives—which might lead to a legal requirement for undergrounding to be included—are discussed in Section 3 of its Report[45], this is in fact not the case.

PB Associates also asserted that it has identified environmental issues that 'may delay or potentially preclude altogether the installation of the third 110 kV line being constructed into Terranora substation from Mudgeeraba' and that this 'may impact on the longer term capability of Directlink to provide network support to the NSW system'.[46] PB Associates provides no detail of the relevant environmental issues, the options for environmental impact

[43] BRW, *TransÉnergie – Murraylink, Selection and assessment of alternatives*, 16 October 2002, pp. 15-6.
[44] PB Associates Report, pp. 43 & 50.
[45] PB Associates Report, p. 17.
[46] PB Associates Report, p. 17.

mitigation, the process for environmental assessment and approval, and why the project would be delayed or precluded.

Therefore, any statement that PB Associates makes as to the existence or otherwise of a legal requirement for undergrounding to be included in Directlink's alternative projects, or as to the environmental issues associated with related projects, cannot to be relied upon.

In contrast, the Directlink Joint Venturers have include in their Conversion Application a detailed assessment by URS of the extent to which environmental mitigation measures (route selection and undergrounding) would be necessary for Directlink's alternative projects to achieve environmental approval. In its letter to the Commission of 7 December 2004, the NSW Department of Infrastructure Planning and Natural Resources ('**DIPNR**') indicated the route selection and undergrounding that it considers would be the minimum to achieve environmental approval and that this route and undergrounding is not materially different to that suggested by URS. Specifically, DIPNR states:

> The Department has subsequently undertaken a comprehensive and independent review that identifies an environmentally acceptable route as an alternative to Directlink. The Report, which is attached, concludes that, whilst the Department's preferred option would be for a fully underground route, it accepts that it is possible that it could recommend approval for an alternative which includes a combination of overhead and undergrounding. However, given the particular sensitivities of the study area, and the strengthening community attitudes opposing above ground lines, the extent of undergrounding identified in the Report [which is not materially different to that recommended by URS] would be insisted as an absolute minimum requirement. Following further, more detailed assessment as part of the post approval activities, it is likely that additional mitigation measures, including additional undergrounding, could be required.

This is the standard of advice upon which the Commission can appropriately determine the Directlink matter.

34. Cost comparison between HVDC Light and HVDC Conventional

Issue:

PB Associates is concerned that as ABB have developed and marketed the HVDC Light on the basis that it allows HVDC to be economic at lower active power transfer levels and shorter distances, it is not clear why BRW's cost estimates for Alternative 2 is lower than Alternative 1. PB Associates use this idea to justify its reduced capital cost estimates for Alternatives 0 and 1.

Response:

BRW has previously advised the Commission and PB Associates that its costings of Alternatives 1 and 2 are based on actual manufacturers' quotations. It appears that while ABB, the manufacturer and provider of HVDC Light, was initially very commercially aggressive, the HVDC market has changed in recent times and HVDC Light is no longer less expensive.

35. Directlink is a transmission asset

Issue:

PB Associates has not adequately considered the definition of transmission assets under the Code before stating that Directlink does not provide direct interconnection at the transmission level[47]:

> Directlink provides a degree of connectivity between between [*sic*] Powerlink's transmission network in Queensland and TransGrid's transmission network in NSW. Although it should be noted that Directlink does not provide direct interconnection at the transmission level as a result of it being connected to Country Energy's 110kV distribution network at both ends.

Response:

The National Electricity Code defines a transmission network to be:

> A network within any participating jurisdiction operating at nominal voltages of 220 kV and above plus:
>
> (a) any part of a network operating at nominal voltages between 66 kV and 220 kV that operates in parallel to and provides support to the higher voltage transmission network;
>
> (b) any part of a network operating at nominal voltages between 66 kV and 220 kV that does not operate in parallel to and provide support to the higher voltage transmission network but is deemed by the Regulator to be part of the transmission network.

Directlink operates at 80 kV DC—which is between 66 kV and 220 kV.[48]

The circuit path created by the 132 kV circuits between Mullumbimby and Lismore, Directlink, and the 110 kV circuits between Terranora and Mudgeeraba operates in parallel with QNI and can provide support to the transmission network.

When Directlink is flowing north, it supports voltage in the Gold Coast and alleviates load on the 275 kV Swanbank to Mudgeeraba lines. When Directlink is flowing south, it supports voltage in the far north coast area of New South Wales and alleviates load on the 330 kV Armidale to Lismore line and the 132 kV system. Flows across Directlink can influence spot prices in the Queensland and New South Wales market.

For these reasons, Directlink is a transmission network.

36. Shortcomings of Alternative 3

Issue:

PB Associates have identified a range of shortcomings for Alternative 3, in particular:

> Whilst an AC connection may contribute to overall system inertial response, with the prospect of an increase in transient stability limits, the network benefits of this are likely to be

[47] PB Associates Report, p. 51, footnote 71.
[48] The Code makes no distinction between DC and AC voltages.

> significantly outweighed by the reduced level of power control, the interdependence on the operation of QNI and the associated thermal constraints.

And further:

> In general PB Associates are comfortable with the general conclusions reached by BRW – that Alternative 3, whilst technical feasible, would present some operational difficulties in practice. The duty placed on the PST through the requirement to constantly monitor a number of critical network conditions and continually vary the operation of the PST accordingly, makes this alternative operationally challenging.
>
> Whilst PB Associates would not advocate a PST based solution requiring greater phase angles, we recommend that Alternative 3, as described, does represent a technically possible alternative to Directlink and should therefore be included as an alternative in the markets benefits test. It is recognised, however, that in using Alternative 3 to defer the construction of the 330kV Lismore Dumaresq line, the capacity flowing over QNI would be reduced by any transfer over the alternatives on a 1:1 basis.

Response:

The DJV agrees with PB Associates that Alternative 3 has a number of substantial technical shortcomings and thus its net market benefits could be overstated.

37. Alternative 4 not a reasonable alternative

Issue:

PB Associates agrees with [BRW] that Alternative 4 offers no significant benefits and is, therefore, not a credible alternative to Directlink.

Response:

The Directlink Joint Venturers and BRW agree with PB Associates that Alternative 4 is not a reasonable alternative to Directlink because Alternative 4 is not technically feasible.

As stated in the Directlink Conversion Application[49], given its dependence upon the level and direction of flow across QNI, Alternative 4 is unable to satisfy network performance standards in the Gold Coast and northern New South Wales areas for some period of time. For this reason, BRW has concluded that Alternative 4 is not a reasonable substitute for Directlink for the purposes of the Regulatory Test.

38. Calculation of network deferral benefits of Alternatives 0/1/2

Issue:

PB Associates has incorrectly calculated the network deferral benefits of Alternatives 0/1/2 because it has:

[49] Directlink conversion application, p. 40.

- used incorrect capital and O&M cost estimates for the Lismore to Dumaresq line and the Greenbank augmentation;

- not taken account that, in the absence of Alternatives 0/1/2, the Lismore to Dumaresq line would be required in 2007;

- not taken account that, with Alternatives 0/1/2 in place, the Lismore to Dumaresq line would not be required until 2017 in the expected load growth case; and

- not taken account of the extent to which Alternatives 0/1/2 would already be deferring reliability augmentations such as the upgrade of Line 966.

Further, PB Associates suggests that Alternative 0/1/2's Queensland network deferral benefits can be valued as the amount Powerlink pays to the Directlink Joint Venturers under their network support agreement.

Response:

PB Associates calculation of the network deferral benefits of Alternatives 0/1/2 is incorrect.

As described in sections 15, 16, 20, 23 and 24 of this submission, PB Associates has incorrectly estimated the costs of the Lismore to Dumaresq line and the Greenbank augmentation because it has incorrectly:

- excluded IDC and contingency from its capital costings;

- excluded the easement costs of the Queensland reliability augmentation (the Greenbank augmentation);

- not taken account that a section of 132 kV line—decommissioned after the construction of the Lismore to Dumaresq line—would needed to be replaced with either a second 132 kV line to Tenterfield or a 330/132 kV substation at Tenterfield to maintain the N-1 supply.

- estimated the annual operating costs as 2% of the capital costs (excluding contingency and IDC) rather than examining the specific locational and technical characteristics of each alternative project as BRW has done.

As described in sections 19 and 21 of this submission, based on a reasonable extrapolation of the best currently available information, Alternatives 0/1/2 can be expected to defer the need for the 330 kV Lismore to Dumaresq line from 2007 for 10 years in the expected load growth case. Their network deferral benefits should reflect this.

Directlink is already deferring reliability augmentations such as the upgrade of Line 966. It could defer the upgrade of Line 966 indefinitely. Again, Alternatives 0/1/2's network deferral benefits should reflect this.

The amount Powerlink pays the Directlink Joint Venturers under their network support agreement is a wealth transfer rather than an economic benefit to all those who produce, consume and transport electricity as a whole. The economic benefit is the avoided cost of capital due to the deferment of the Queensland reliability augmentation by 1 year, as BRW

as calculated and as PB Associates has suggested as an alternative. This is an inaccurate application of the Regulatory Test principles.

The Directlink Joint Venturers are in the process of recalculating Alternatives 0/1/2's network deferral benefits to reflect the matters described above and will advise the Commission of their result within a week.

39. Transfer limits

Issue:

PB Associates have replicated in its report, and thereby implicitly endorsed, the peak load transfer limits calculated by BRW.[50]

Further, PB Associates stated that these transfer limits are the maximum transfer capabilities for each year of the deferral period of the NSW and Queensland augmentations.

Response:

PB Associates should have acknowledged that the transfer limits it published in Tables 1-1, 3-18, 3-19 and 3-20 of its report were those calculated by BRW.

And the transfer limits in those tables are not the maximum transfer capabilities for each year of the deferral period. There are only the transfer limits that apply during peak summer load conditions in each year, a very small proportion of the whole year.

SERVICE STANDARDS

40. Directlink should be rewarded on the basis of the reliable capacity available for deferment

Issue:

PB Associates is of the view that since much of the value of the Directlink asset as a regulated asset revolves around the deferral of the 330 kV Dumaresq to Lismore line then the deferral benefit component should be rewarded on the basis of the reliable capacity available for deferment.[51]

Further, PB Associates believes that the Commission should consider penalty provisions that are not capped at 1% given the history of technical issues and high unavailability of the Directlink asset operating as a market network service provider in the NEM.[52]

Response:

[50] PB Associates Report, pp. 2 & 62-4.
[51] PB Associates Report, p. 67.
[52] PB Associates Report, p. 75.

Since Directlink came into commercial operation, it has provided a market network service. During this time, the Directlink Joint Venturers have had no implicit or explicit external obligation to maximise the availability of Directlink. Directlink's availability has been managed to provide the Directlink Joint Venturers with an opportunity to earn market network service revenue as and when these opportunities have arisen. Since January 2003, Directlink's availability with regard to scheduled and forced outages has been 99.6% and 80.9%, respectively. The Directlink Joint Venture studied Directlink's performance in detail and is initiating a range of equipment upgrades to significantly improve its availability.

For the purposes of the performance incentive scheme in their Conversion Application, the Directlink Joint Venturers have proposed to place 1% of their regulated revenue at risk, which is consistent with the levels of revenue at risk that the Commission has determined recently for other TNSPs[53] and consistent with the Commission's Service Standard Guidelines[54]. Directlink Joint Venturers have proposed a scheme that provides them with an incentive to meet an availability target in the order of 99% in terms of forced availability in peak and off-peak periods and scheduled availability.

The Directlink Joint Venturers note that the Commission is currently at an early stage of its work to develop the principles that it will apply to the reporting of performance and the establishment of performance incentives for TNSPs. This work is challenging given the current NEM market design and the role and regulation of TNSPs in the market. Most importantly, when considering whether a higher level of TNSP revenue should be placed at risk in relation to performance or whether a TNSP should be subjected to competitive disciplines, the ACCC must have regard to the material adjustment that would have to be made to the TNSP's WACC.

At this stage, while the Commission continues to determine regulatory WACCs in the manner it does—assuming a low variance in cash flows that permits a higher level of debt financing than for unregulated activities—the Directlink Joint Venturers believe that the Commission could only justify placing small amounts of TNSP revenue at risk.

The Directlink Joint Venturers also continue to propose that, when making its determination of their Conversion Application, the Commission decides to review their performance incentive scheme 5 years after the Commission's determination takes effect.

41. Nature of Directlink's proposed performance incentive scheme

Issue:

PB Associates extensively analyses the performance incentive scheme submitted in the Directlink Joint Venturers' original Conversion Application only to conclude that the scheme should be that proposed in the revised Conversion Application.[55]

[53] Examples include the Commission's recent transmission revenue cap decisions for Transend (2003), Murraylink Transmission Company (2003), SPI PowerNet (2002) and ElectraNet SA (2002).
[54] ACCC, Decision: Statement of Principles for the Regulation of Transmission Revenues: Service Standard Guidelines ('**Service Standard Guidelines**'), 12 November 2003.
[55] PB Associates Report, pp. 67-72.

Response:

The Directlink Joint Venturers are satisfied that PB Associates has generally endorsed their currently proposed performance incentive scheme and targets as set out in their letter to the Commission of 17 November 2004.

42. Excluding Queensland public holidays from the Peak Period

Issue:

PB Associates believes that that the definition of Peak Period in Directlink's performance incentive scheme should only exclude NSW (not Queensland) public holidays and should explicitly be referenced to Eastern Standard Time as it is consistent with Market conventions.[56]

Response:

There is only one day in the year when a public holiday is held in Queensland and not in NSW, and this is on the first Monday of May. PB Associates has not made a clear case as to why this public holiday should be included in the Peak Period given that it is highly unlikely peak load would occur on this day in either southern Queensland or northern New South Wales. As it is highly unlikely peak load would occur during the May Queensland public holiday, it should be excluded from the Peak Period.

The Directlink Joint Venturers has assumed that its Peak and Off Peak Periods would be set according to Eastern Standard Time as is the case for the whole National Electricity Market.

43. Excluded events and force majeure

Issue:

PB Associates believes that[57]:

- a direction by a relevant authority or damage to cables or other equipment by a third party should not be classed as an Excluded Event unless the Directlink Joint Venturers can justify the exclusion;

- specifically identified set of events should not be included in the definition of force majeure because the Commission did not allow such events in the Murraylink case; and

- where the Directlink Joint Venturers want a particular event excluded due to force majeure, they would need to satisfy the Commission that they had complied with any requirements of the [National Electricity] Code not covered in the Service Standards Guidelines.

[56] PB Associates Report, p. 71.
[57] PB Associates Report, p. 74.

Response:

The Excluded Events and Force Majeure Event provisions that Directlink Joint Venturers have proposed as part of their performance incentive scheme are both reasonable and consistent with the Commission's Service Standard Guidelines and its previous decisions.

Excluded events are currently defined as[58]:

> An **Excluded Event** is any event that causes the Circuit to be not Available and that is shown to be the result of:
>
> (a) a fault, other event or capacity constraint on a Third Party System (e.g. inter-trip signal, generator outage, reaching a thermal power flow or voltage limit, failure of SCADA or other communications system);
>
> (b) an instruction or direction from an Authority;
>
> (c) Disconnection, Interruption or Works by Country Energy, TransGrid or Powerlink Queensland;
>
> (d) damage to the Circuit's cable or equipment that results from action by a third party that, in the opinion of the Commission, the Directlink Joint Venturers' best endeavours were unable to prevent; or
>
> (e) Force Majeure Events.

And force majeure events are defined as[59]:

> **Force Majeure Event** includes any event, act or circumstance or combination of events, acts and circumstances which (despite the observance of good electricity industry practice) is beyond the reasonable control of the Directlink Joint Venturers and that results in the Circuit being not Available, which event, act or circumstance may include, without limitation, the following:
>
> (a) fire, lightning, explosion, flood, earthquake, storm, cyclone, action of the elements, riots, civil commotion, malicious damage, natural disaster, sabotage, act of a public enemy, act of God, war (declared or undeclared), blockage, revolution, radioactive contamination, toxic or dangerous chemical contamination or force of nature;
>
> (b) action or inaction by a court, government agency (including denial, refusal or failure to grant any authorisation, despite timely best endeavour to obtain same);
>
> (c) strikes, lockouts, industrial and/or labour disputes and/or difficulties, work bans, blockades or picketing; or
>
> (d) acts or omissions (other than a failure to pay money) of a party other than the Directlink Joint Venturers which party either is connected to or uses the high voltage grid, or is directly connected to or uses a system for the supply of electricity which in turn is connected to the high voltage grid, where those acts or omissions affect the

[58] Letter from Dennis Stanley of the Directlink Joint Venturers to Sebastian Roberts of the Commission, dated 17 November 2004, Attachment 1, p. 3.
[59] Letter from Dennis Stanley of the Directlink Joint Venturers to Sebastian Roberts of the Commission, dated 17 November 2004, Attachment 1, pp. 3-4.

ability of the Directlink Joint Venturers to perform its obligations under the service standard by virtue of that direct or indirect connection to or use of the high voltage grid.

To avoid doubt, a Force Majeure Event specifically includes an event when the outcome is:

(e) The loss of or damage to 11 or more control or secondary cables;

(f) The loss or damage to two or more transformers and capacitor banks, either single or three phase, connected to a bus; or

(g) The loss or damage to a transformer, capacitor bank, or reactor, which loss or damage is not repairable on site according to normal practices.

This is not intended to limit the definition of force majeure rather to provide guidance in its application.

Even if an event that is the result of a direction by a relevant authority is not explicitly an Excluded Event, it could be Force Majeure Event under part (b) of the Force Majeure Event definition. To put this beyond doubt, part (b) of the definition could be augmented to bring it into line with that for SPI PowerNet[60]:

(b) action or inaction by a court, NEMMCO, government agency (including denial, refusal or failure to grant any authorisation, despite timely best endeavour to obtain same);

As the Murraylink Transmission Company proposed the same wording for Excluded Event as the Directlink Joint Venturers, and the Commission did not seek to vary it, the Directlink Joint Venturers believe the wording is very reasonable as its stands.

However, the Directlink Joint Venturers would be comfortable that an event that is the result of a direction by a relevant authority could become a Force Majeure Event by amending the definition of Force Majeure Event to make it consistent with that for SPI PowerNet. The Commission would then have the comfort that Force Majeure Events must be 'beyond the reasonable control of the Directlink Joint Venturers'.

The current wording of the definition of Excluded Event should already satisfy PB Associates' concern given that an event that results from damage to Directlink's cable or equipment that results from action by a third party can only be an Excluded Events if, in the opinion of the Commission, the Directlink Joint Ventures' best endeavours were unable to prevent it.

The events that are specified in parts (e)-(g) of the Force Majeure Event definition are a subset of those that the Commission decided were appropriate for SPI PowerNet, and, therefore, parts (e)-(g)should be acceptable to the Commission for Directlink.

Whether the Directlink Joint Venturers are alleged to have breached the National Electricity Code [Rules], or any other law, is not a matter for their performance incentive scheme.

[60] Australian Competition and Consumer Commission, *Decision: Victorian Transmission Network Revenue Cap 2003-2008*, 11 December 2002, p. 133.

44. Lower maximum reward target for planned outages

Issue:

PB Associates recommends a maximum reward target for planned outages target lower 100% to make sure there are incentives for at least a prudent minimal amount of maintenance to be carried out.[61]

Response:

The Directlink Joint Venturers' forced outage targets and the long term welfare of the asset will be ample incentive for them to ensure that at least a prudent minimal amount of maintenance is carried out.

45. PB Associates needs more information on minimum maintenance

Issue:

PB Associates believes that a collar should be established around Directlink's performance target levels. However, it claims that it does not have sufficient information to justify recommending specific floor and cap levels for all of the circuit availability metrics proposed. Specifically PB Associates says that it would require details of the minimum maintenance that is tolerable for the Directlink units to establish a performance level in order to achieve a 1% reward incentive.[62]

Response:

The Directlink Joint Venturers believe that further development and restructuring of their performance incentive scheme in the manner suggested by PB Associates is an unnecessary level of complexity.

[61] PB Associates Report, p. 76.
[62] PB Associates Report, p. 76.

ATTACHMENT 1

Letter from Rod Touzel of BRW to Dennis Stanley of the Directlink Joint Venturers of 14 January 2005.

Burns and Roe Worley

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14 January 2005

Directlink Joint Venture Manager
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Attention: Dennis Stanley

RE: Directlink: BRW Comments on PB Associates Report of 26 November 2004

Dear Dennis

BRW has been asked to comment on PB Associates report "Review of Directlink Conversion Application Final Report" of 26 November 2004. In summary, it is pertinent to comment that the report is considered to contain significant errors and shortcomings with the major issues being addressed in the sections below.

Generally specific power system issues that have arisen from BRW's detailed analysis and modelling[1] have been considered by PB Associates in isolation failing to recognise broader system implications. No system modelling or rigorous analysis has been carried out by PB Associates to assess the impact of its various recommendations and, as a consequence, the impact of a particular recommendation on other issues often has not been appreciated[2]. The treatment of costs is also considered flawed with simplified and inappropriate rules of thumb being used to derive O&M costs, incorrect or outdated bases being used for capital costs and legitimate allowances for IDC and contingency being excluded as "inefficiencies". It is disappointing to see that factual errors made by and pointed out to PB Associates during its review process have not been corrected and that technical support, opinion and cost information provided from the Directlink technology developer and supplier (ABB) has been rejected.

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[1] *Directlink Selection and Assessment of Alternative Projects to Support Conversion Application to ACCC.* Burns and Roe Worley, 22 September 2004.

[2] Whilst the primary reason for use of Directlink might be to relieve a particular constraint, the injection of active or reactive power into the network to relieve this may also provide support to relieve other emerging constraints. As an example, injecting power to relieve an overloaded condition on a particular line may also reduce loadings on other critical lines and in some instances provide significant voltage support. Whilst upgrading of the line might address the specific line issue, no relief is provided to the other emerging constraints.

1 Upgrading of Line 966 and Capacitor Banks (Section 3.2.4.3)

Issue

PB Associates states that TransGrid has advised that it will be upgrading the Armidale - Koolkhan 132 kV line and also installing additional capacitors at its Koolkhan, Lismore and Nambucca substations.

Capacitor Banks

BRW's modelling has included new capacitor banks at Koolkhan and Nambucca as being in service from 2005 consistent with the requirements and timing referred to in Section 6.3.4 of TransGrid's *New South Wales Annual Planning Report 2004* (APR) and confirmed in direct discussions with TransGrid in relation to BRW's modelling assumptions. BRW has not modelled any additional capacitor banks at Lismore and it considers that the statement by PB Associates and attributed to TransGrid is likely to be incorrect. A requirement for additional capacitor banks at Lismore has not been identified in the APR nor has it been identified in discussions with TransGrid to confirm BRW's modelling assumptions.

Line 966

BRW understands that TransGrid will be progressively upgrading line 966 as part of a refurbishment program with a target for completion by 2006/07. Whilst the anticipated sustained emergency rating of 120 MW would clearly relieve any potential overloading of that line under contingency conditions following completion of the upgrade, the line would be subject to loading above its current sustained emergency rating prior to that time.

As indicated in Table 4.3.1(a) of BRW's report of 22 September 2004, for medium load growth and without support from Directlink, the loading of Line 966 would rise to 109 MVA in 2005/06 and 110 MVA in 2006/07 following an outage of the Armidale to Coffs Harbour 330 kV line. BRW's analysis has indicated that Line 966 would already be overloaded to beyond its sustained emergency rating up under current peak load post-contingent conditions. This analysis has been confirmed by an assessment of the NEMMCO snapshot files for the 2003/04 summer peak conditions and copies of this analysis have been provided to TransGrid.

2 The Prospect of a third overhead circuit into Terranora substation (Section 3.2.4.3)

Issue

BRW has assumed in its modelling that a third 110kv line would be required to the Tweed region by 2006/07. PB Associates has questioned the timing of the third line and the viability of constructing this into the Terranora substation.

Timing

The timing and need for an augmentation to the existing supply to the Tweed region is driven by load growth and not Directlink requirements. Detailed load growth forecasts provided by Country Energy confirm that the projected Terranora load growth is very high ranging from 4% to 8.6% per annum (medium growth) through the period 2005/06 to 2009/10 and this higher than average growth could mean that the loading on the existing two Mudgeeraba – Terranora 110 kV circuits will reach the continuous rating of one line (the N-1 criterion) earlier than anticipated in previous studies. Discussions with Country Energy and Powerlink in the process of confirming the modelling assumptions have indicated that these ratings are strictly adhered to for planning purposes and that short-term load shedding ratings are not applied.

PB Associates has also expressed concern about possible delays in the building of any additional line and the impact that this could have on the ability to provide network support to the northern NSW. BRW's studies indicated that the peak requirement in the period 2005/06 to 2009/10 was in

the year 2007/08 to relieve the post-contingent loading on Line 966 following loss of the Armidale – Coffs Harbour 330 kV line. Subsequent advice from TransGrid is that the refurbishment of Line 966 should be completed by 2006/07 and, with the line's anticipated increased capacity, support from Directlink should not be required. Should the increased capacity in the supply to the Tweed region not be available for the year 2007/08, Directlink could still provide the level of injection required but at reduced operating safety margins[3].

Viability

Consistent with the response given by Powerlink on 16 December 2004, the timing and evaluation of solutions to the reliability of the supply to Terranora will be evaluated through joint planning and Powerlink, Energex and Country Energy are in the early stages of this process[4]. In the modelling assumptions confirmed with Powerlink, Country Energy and TransGrid, BRW has assumed that this issue would be addressed by a third line into the **Tweed** region, most likely into Bungalora rather than Terranora. This is one of a number of options to be evaluated through the joint planning along with other options such as retrofitting of high temperature conductors to provide higher capacities for the existing two circuits.

BRW recognises the access and environmental issues associated with transmission or sub transmission circuits into Terranora and in any new line developments. The Terranora issues have been discussed specifically in Section 6.7 of BRW's report. As the need and timing for the augmentation to reinforce the supply to the Tweed region are independent of the Directlink requirements, the nature of the augmentation will not impact on the deferment benefits assuming that the required capacity can be achieved.

3 Proposed Local Generation (Section 3.2.4.3)

Issue

Delta Electricity in conjunction with the NSW Sugar Milling Cooperative is seeking to develop cogeneration plants in the Broadwater and Condong sugar mills. Under the proposed development, each of the new cogeneration plants would be based on a bagasse-fired boiler providing steam to a 30 MW steam turbine generator. The boilers would be capable of firing other forms of biomass as supplementary fuel. PB Associates has proposed that the Broadwater generator would be able to provide network support, in particular to maintain acceptable voltage conditions at Koolkhan from 2009/10 until around 2011/12.

BRW has modelled the Broadwater generator and its relatively weak 66 kV connection to the Lismore substation. When operating, the net injection to the Lismore bus would be approximately 25 MW and the results confirm that this development potentially could defer the voltage collapse at Koolkhan by two years.

Whilst the injection could provide some improvement to system conditions in the Lismore and Clarence areas during periods of generator operation, it is not able to provide any significant support to areas beyond this region. Current 132 kV voltage levels in the Port Macquarie area are at the lower end of acceptable levels even under normal operation. Directlink has the capacity to provide a significant level of support to the voltage at Port Macquarie, particularly in the period up until the establishment of the Coffs Harbour 330/132 kV transformation before the winter of 2006 and following that in the event of a loss of the Armidale – Coff's Harbour 330 kV line up until the completion of the anticipated Armidale – Port Macquarie 330 kV line in 2008/09. A 30 MW generator at Broadwater, when operating, cannot provide any significant voltage support to the Port Macquarie area.

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[3] A 10% operating safety margin is applied in the NEMMCO dispatch equations for Directlink.

Irrespective of the level of support that could be provided when a Broadwater generator is in service, the key issue is as to whether or not this could be relied upon for network support. The new Condong and Broadwater plants are to be based on single generators and BRW is not aware of any other instance in the NEM where a single machine has been accepted in this role. The nature of the plant would also be a factor in assessing its ability to perform such a role. Fuel supply and handling are usually major causes of loss of availability in the operation of biomass generation plants, particularly where there are variable forms of biomass involved. It is understood that the Broadwater and Condong plants will rely on other as yet unsecured biomass fuel sources beyond the sugar milling season, i.e. for around half the year. By contrast, multiple gas turbines are typically used in network support role and in many instances these are fired from liquid fuels as gas is not available. Gas and liquid fuels are readily handled and stored and do not pose the same risks to reliability and availability.

BRW was aware of the proposed Condong and Broadwater developments at the time of its Directlink modelling work and report preparation. The proposed developments were discussed in a joint meeting with TransGrid and Country Energy on 27 August 2004 to review BRW's modelling assumptions and it was agreed at those discussions that no allowance should be made in the modelling for the possible developments, this consideration was primarily based on a lack of confidence in relying on a "single shaft" installation for the provision of network support. It is also understood that the developers have not sought to negotiate a network support agreement for either of the developments and that the financial closure anticipated in the PB Associates report to occur in early December 2004 has not yet been achieved with this latest delay casting possible doubt on the future of the project.

4 Post Contingent Overloading of Line 967 (Section 3.2.4.3)

Issue

The PB Associates report does not address the issue of post-contingent overloading of Line 967 from 2007/08 and the need for Directlink support..

The only consideration given by PB Associates to the post-contingent overloading of Koolkhan – Lismore 132 kV line (Line 967) is in relation to comments on the voltage collapse at Koolkhan. PB Associates states that the voltage collapse at Koolkhan from 2009/10 becomes the limiting factor rather than the thermal rating of Line 966 or 967. Table 4.3.1(b) of BRW's report indicates that the post-contingent loading on the (Line 967) for a loss of the Coffs Harbour – Lismore 330 kV line is a constraint prior to the onset of the voltage collapse. BRW's modelling has shown that this constraint becomes binding initially in 2007/08 when the post-contingent loading on Line 967 of 141 MVA would exceed the sustained emergency rating of 136 MVA. The use of Directlink indicated in Table 4.3.1(a) to relieve the potential post-contingent overloading of Line 966 would also relieve the loading on Line 967.

The anticipated commissioning of the Armidale – Port Macquarie 330 kV line in 2008/09 would provide some short-term support to relieve the post-contingent loading on Line 967 under the conditions described, however, the modelling has identified a need for support from Directlink from 2009/10 to prevent post-contingent overloading of the line. It is this condition that determines the level of support required in the initial years (until 2012/13) rather than the maintenance of the voltage at Koolkhan stated by PB Associates. Whilst upgrading of Line 966 is planned to be carried out by 2006/07, no plans have been identified in discussions with TransGrid for the

[4] *RESPONSE TO: PB Associates Report Directlink Conversion Application.* Powerlink submission to ACCC, 16 December 2004.

upgrading of Line 967. Support from Directlink would be required from 2007/08 to relieve the post-contingent loading in Line 967.

Whilst the proposed Broadwater generator would have the capacity to provide the level of injection required initially in 2007/08, it is not considered that it could be relied upon to provide this service. Similarly, it would have the capacity to provide support to relieve the post-contingent loading on Line 967 for two years from 2009/10. Again for the reasons discussed in Section 3 it is considered that this could not be relied upon.

5 COSTING

5.1 Interest during construction (IDC's) and contingencies (Section 3.1.1)

Issue

PB Associates has reviewed the inclusion of IDC and contingency allowances in BRW's capital cost estimates and has rejected the inclusion of these cost components in its subsequent derivation of "efficient" costs for each of the alternative projects.

IDC

PB Associates states that "the construction and commissioning dates are assumed to be the same, i.e. 1 July 2005. In this instance, since there is no delay between conversion date (becoming a regulated asset) and revenue derivation, there is no requirement in our view to include IDC's." It is suggested that the inclusion of IDC in the estimate of present values would result in double counting as the cost of capital is implicit in the discount rate.

The conclusion drawn by PB Associates is wrong. BRW's report (Section 7.1) clearly indicates a project development and construction program ranging from four to five years with a fall of capital expenditure for each alternative project. This is used to determine a present value capital cost of each alternative project at a common base date of 1 July 2005. The timing and quantum of the cash flows during the development and construction program prior to that base date will determine interest costs that have to borne directly by the developer or the EPC contractor depending on the scope and payment terms of the EPC contract. Differing expenditure profiles will have an impact on IDC, e.g. protracted approvals with an overhead line. This is not double counting and not implicit in the discount rate. Any delay in regulatory conversion is also considered to be irrelevant to this argument. If there is a delay in the conversion date, it is understood that there would be an appropriate adjustment to the capital cost to reflect basic cost escalation between the two dates – the development and construction schedule and interest costs relative to a completion base date would not change.

Contingency

PB Associates has stated:

> "In the case of contingencies, these are costs in addition to those estimated on individual components and therefore reflect a measure of inefficiency which is not consistent with the requirements of the National Electricity Code".

This "inefficiency" argument has been used as the basis of deleting the contingency allowance from BRW's cost estimates for each alternative.

Contingency amounts in project cost estimates reflect an allowance for items such as the uncertainties in the level of definition of the engineering scope at the time of estimating, allowance for risks associated with unidentified obstacles, environmental industrial delays, exchange rate uncertainties, etc. These are costs that can be anticipated beyond the costs estimated based on the individual components but they cannot be directly quantified at the estimate or tendering stage. Contingency allowances are a legitimate component of capital cost estimates and their magnitude

will vary with the nature of the project. They should not be viewed as reflecting a measure of inefficiency.

ACCC Position on IDC and Contingency Allowances

The issue of the inclusion of IDC and contingency allowances was also the subject of consideration by the ACCC and submissions from other parties in the Murraylink conversion case. The ACCC determined that the inclusion of such allowances was appropriate and this was explicitly stated in the Murraylink decision.

"The Commission also believes that an allowance for profit and overhead, interest during construction and contingency is appropriate."[5]

5.2 O&M Costs

Issue

PB Associates has assessed "efficient" annual O&M costs for the alternative projects on the basis of 2% of construction contract costs – it is stated that the 2% basis was indicated by TransGrid during discussions, Section 3.2.4.5. BRW has assessed the O&M costs of each alternative by building up an estimate based on the technical characteristics of alternative.

"Rules of thumb" of the type indicated are often used as a simple broad brush measure to provide initial cost estimates for projects and, whilst they serve this purpose, they have significant deficiencies due to wide variations in cost that will result from the nature of assets involved including their technical complexity, operational duty, environmental factors, location, etc.

PB Associates approach to assessment of O&M costs is considered to lack rigor particularly when the nature of the projects is taken into account, i.e. the application of high level HVDC technologies in Alternatives 1 and 2, development in areas of significant environmental sensitivity, etc. The weakness of this is also highlighted by the issues associated with the costing of the HVDC Light® equipment. PB Associates has highlighted the wide range of capital costs for a number of HVDC Light® projects from various sources and the low cost of the existing Directlink installation compared to cost estimates for contemporary equivalents widens this range even further. Such capital costs can be influenced heavily by market forces and constructability issues (obstacles, environmental mitigation issues, etc). The price paid is unlikely to have any significant impact on the fundamental O&M requirements. The application of a simple linear 2% rule is totally inadequate under such circumstances and unnecessary when the parameters of the project are known.

In respect of the NSW augmentations, PB Associates notes in Section 3.2.4.5 that the new Dumaresq – Lismore 330 kV line would replace an existing 132 kV line for approximately 66% of its length and on this basis an incremental O&M cost should be used. The $0.548M p.a. appears to be the cost for around one third of the line on a 2% basis and, whilst the incremental cost argument has validity, the O&M costs for a 330 kV line would be significantly higher (even by the 2% rule!). The PB Associates costing also does not allow for the fact that replacement of this section of 132 kV line would require either a second 132 kV line to Tenterfield or a 330/132 kV substation at Tenterfield to maintain an N-1 supply. In discussions with TransGrid, it has been indicated that it would be reasonable to assume the 330/132 kV substation option with a capital cost of around $10 M. The O&M costs for this substation would also have to be included.

[5] *Decision Murraylink Transmission Company Application for Conversion and Maximum Allowable Revenue.* ACCC, 1 October 2004, Executive Summary, p xvii.

5.3 Alternative 1 Basis of Capital Costs

Two-level versus three-level technology

Issue

PB Associates has criticised the costing of Alternative 1 on the basis of increased costs for three-level versus two-level technology. Concern is expressed about higher costs for the three-level IGBT's (Section 3.4.2.5) and an increased footprint for the converter stations.

BRW has not sought to differentiate between technologies. In seeking cost estimates from ABB for the alternative projects, BRW sought costs on the basis of a single 180 MV system rather than three 60 MW systems as in the existing installation. BRW was aware that 60 MW was largest converter station size available at the time of the original Directlink development and that since that time larger systems had been developed (e.g. Murraylink was a single 220 MW installation). Given that from an engineering perspective a single system should provide economies over multiple systems[6] to achieve the same output, BRW sought a quotation based on this configuration rather than specifying the IGBT technology.

ABB quoted on the basis of the technology being provided for new projects at the time of the preparation of BRW's request for a quotation and this was reconfirmed by ABB Sweden by e-mail on 16 December 2004:

> "ABB confirms that the cost estimate provided in December 2003 was based on the three-level technology, at that time being our standard technology, quoted for all new systems."

It would have been inappropriate for BRW to either dictate the technology or request a quotation based on a technology that was not commercially available.

Use of Overhead Line for HVDC Light® Applications (Section 3.4.2.7)

Issue

PB Associates has rejected the costing of Alternative 1 based on underground cabling and claimed that there was not sufficient evidence to support the basis used by BRW that, on advice from the technology supplier ABB, overhead line could not be used with HVDC Light® applications.

Given PB Associates' direct challenge to ABB's advice, BRW has obtained the following further confirmation of this requirement from ABB Sweden by e-mail on 16 December 2004:

> "ABB confirms that the standard implementation of HVDC Light technology is based on the use of cable interconnection. HVDC Light shall be considered as one product, and that product includes cables between the converter stations, for two reasons. First, cables are environmentally attractive, and usually facilitates the permitting process for the customer. Secondly, the use of cables exclude a fault case that is disastrous to a Light converter. A pole-to-pole short circuit would produce fault currents that the equipment is not capable of handling, and protective means are yet to be invented. A pole-to-pole short circuit is a rather likely event if an overhead line is used between the stations.
>
> ABB confirms that the cost estimate provided in December 2003 was based on the standard concept using cables between the converter stations."

Although PB Associates provides a series of theoretical reasons as to why HVDC Light® **should** be suited to applications with overhead line interconnections, only one example of an overhead

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[6] Single systems generally have economies of scale and there can be considerable savings in costs associated with high technology protection and controls where the costs do not vary significantly with rating. Installation costs and costs associated with switchgear, cabling, etc would be lower. A single system would require less space resulting in savings in buildings and civil works.

line application has been cited, that of the Hellsjon project in Sweden. As advised to PB Associates previously, this was a 3 MW, 10 kV pilot project developed to prove the converter technology and it used an existing overhead line with special switching devices to protect the converters. The experience of the small scale pilot installation customised to suit existing infrastructure cannot be extrapolated to large scale commercial applications, particularly when the technology developer and provider explicitly states that the systems are designed for use with cables and that they are not suited to overhead lines.

Converter Station Costs (Section 3.4.3.1)

Issue

PB Associates states that it cannot use the costs it determined for Alternative 0 as a basis for the costs of Alternative 1 on the basis that Alternative 0 was based on the original two-level rather than the new three-level technology. PB Associates has based its Alternative 1 costs on BRW's alternative project report for the Murraylink application[7] claiming that this is a ±150kV three-level HVDC Light® facility and that it is the only publicly available information identified by PB Associates.

This is an error and misuse of information by PB Associates. BRW's HVDC alternative project for the Murraylink application was not based on HVDC Light® and, unlike the Directlink application, BRW was not given access to any cost information relating to the Murraylink project. This was a significant issue for BRW in the Murraylink work and difficulty was experienced in obtaining firm costs for HVDC equipment. Reference to the Risk Model (Section 4, Appendix 5 of BRW's Murraylink report) indicates a -20% to +40% variability on the converter station estimates compared to -10% to +15% on the other equipment estimates reflecting this uncertainty.

At the time BRW became aware that PB Associates was using the Murraylink costing for these purposes, BRW contacted PB Associates to clarify this matter. It is disappointing that such an erroneous, misleading and significant error has been allowed in the published report.

6 General Errors

6.1 Technical Services (S2.3, p12)

Issue

PB Associates states that the DJV has not assigned any specific value to Directlink's reactive power capability. PB Associates also states that it "considers that the Directlink asset only really offers controllable interregional flow capabilities and that claimed benefits of reactive capabilities are simply a restatement of these capabilities."

This statement is incorrect as a review of BRW's modelling results in Tables 4.3.1(a) and 4.3.1(b) shows that Directlink's reactive capability has been used to achieve the post-contingent loading and voltage conditions required in northern NSW with up to 50 MVAR reactive injection.

6.2 Load Growth Assumptions (S2.5, p 14)

Issue

PB Associates has questioned a number of aspects of the load growth assumptions used by BRW.

The projections used by BRW have been based on forecasts provided from the Powerlink and TransGrid 2004 annual planning reports (Section 4.1.1 of BRW report) and not the 2003 annual

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[7] *TransÉnergieAustralia – Murraylink Selection and Assessment of Alternatives.* Burns and Roe Worley, 16 October 2002.

reports as stated by PB Associates. BRW also incorporated clarifications or later information provided by Country Energy and Powerlink in respect of the Gold Coast, Tweed and North East NSW substation loading forecasts. The final forecasts used in the modelling, including the methodology for projections beyond the Powerlink, TransGrid and Country Energy 10-year planning horizons, were submitted to and confirmed with Powerlink, TransGrid and Country Energy. The potential impact of any potential embedded generation is taken into account by these planning authorities in their assessment and determination of system load forecasts.

PB Associates comments specifically on the high average growth rates of approximately 5%anticipated by Powerlink's 2004 Annual Planning statement for South East Queensland. BRW has used individual substation projections provided by Powerlink for the Gold Coast and by Country Energy for Terranora as the basis for its modelling. Significantly, the Terranora forecasts indicate growth rates of 4% to 8.6% over this period whereas the Gold Coast growth rates are 4% or below. The growth rates at Terranora are significant in terms of the timing of augmentations and they impact directly on the Directlink transfer limits. Given this situation and the use of the load growth projections from Country Energy, the relevant planning authority, BRW rejects that the PB assertion that the "use of a lower growth rate tends to enhance the longevity of deferral benefits of a particular project."

It should also be noted that PB Associates states that "the BRW high growth scenario may be more applicable for consideration of the first tranche of deferrals identified for QLD in the BRW report." BRW's report of 22 September 2004 does not seek to defer tranches of Queensland augmentations.

6.3 PB Associates findings on the NSW augmentation element of Alternative 5 (S3.2.4.4)

Issue

In commenting on the voltage collapse in North East NSW indicated in BRW's report Tables 4.3.1(a) and 4.3.1(b), PB Associates states that it assumes "this voltage collapse is due to constraints in the Queensland Powerlink network … and that the Condong sugar mill 30MW, which is connected to the 66 kV feeder from Terranora to Murwillumbah, may alleviate this constraint for a further year allowing Directlink to defer the need to construct the 330 kV Dumaresq to Lismore line until 2017/18.

The voltage collapse in North East NSW is due to the characteristics of the local NSW 132 kV network, load growth and the need for increased injection into the network to maintain voltage levels under these high load conditions in the event of a failure of the 330 kV transmission to Coffs Harbour or Lismore. Table 4.3.1(b) in BRW's report indicates that under medium load growth the injection required from Directlink to prevent the collapse up until 2016/17 is 80 MW + 50 MVAR. This level of injection is well within the transfer limit of 126 MW for Directlink in 2016/17 indicated in Table 5.6(a) of BRW's report and which allow for any constraints in the Queensland system.

Table 4.3.1(a) in BRW's report indicates that the injection required from Directlink reaches 125 MW + 50 MVAR in 2016/17 for the case of limiting the loading on Line 966 to its current sustained emergency rating of 88 MVA. This would be the limit of support from Directlink under peak load conditions due to transfer limits - the constraint being due to the capacity of the 110 kV supply to the Terranora/Tweed region. As discussed in relation to the earlier comments on the rating of Line 966, it is understood from discussions with TransGrid that the sustained emergency rating of this line will be increased to 120 MW following its refurbishment. As a consequence of the latter, this level of injection will not be required and the constraint due to the 110 kV supply to the Terranora/Tweed region would not apply.

Irrespective of the fact that constraints in the Queensland network are not responsible for the North East NSW voltage collapse, it is highly unlikely that the potential single Condong 30 MW

generator would be relied upon to provide this network support –refer to discussion in respect of Section 3.

6.4 Provision of Pre-Contingent Support to Gold Coast in 2005/06 (S3.3.2.4, 3.4.2.4, 3.5.2.4)

Issue

PB Associates states that if Directlink "is committed to provide pre-contingent support to the Gold Coast in 2005/06 it is not available for southwards transfer during that year."

This statement is incorrect. The Network Support Agreement (NSA) between Powerlink and the DJV defines the conditions under which Directlink must provide services to Powerlink to support the Gold Coast. These conditions do not prevent the provision of support to NSW at other times. In the event of prescribed contingencies in the northern NSW system, an emergency tripping system will trip Directlink to minimise the risk of overloading in the system. Following such a contingency event, Directlink could be despatched under NEMMCO control to support the NSW system or the Gold Coast as appropriate to the system conditions at the time. The provisions of the NSA allow for NEMMCO to direct the control of Directlink at any time. The potential conversion of Directlink to a Prescribed Service would not change the technical or operational requirements under the NSA.

The DJV is actively developing a project to design and implement an automated post-contingent support within the northern NSW system. Under such an arrangement, Directlink would be controlled to automatically respond to prescribed network contingency conditions rather than being pre-contingently dispatched to maintain system conditions within rating limits in the post-contingent period. This will not impact on the NSA provisions as it is anticipated that the automated system could not be commissioned until 2007.

Yours sincerely
Burns and Roe Worley

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