# REVIEW OF ISSUES CONTAINED IN THE DJV SUBMISSION ON DIRECTLINK ECONOMICS

**A report to the Australian Energy Regulator**

**21 February 2006**

IES
Intelligent Energy Systems

# Executive Summary

This report presents a review by Intelligent Energy Systems (IES) for the Australian Energy Regulator (AER) on specific aspects of the submission by Directlink Joint Venturers (DJV) in response to the AER draft determination "Directlink Joint Venture Application for Conversion and Revenue Cap".

The specific issues are (1) the value ascribed to unserved energy in the market modelling, (2) the non-inclusion of competition benefits in the market modelling and (3) the recent announcement of new gas-fired generation in New South Wales. These are addressed in turn below.

### Value of Unserved Energy

In relation to the value of unserved energy (USE), this review supports the previous advice by IES of the need to use and give equal weighting to the values of $10,000/MWh and $29,600/MWh in the application of the regulatory test to Directlink.

The key reasons for this are as follows:

- DJV used the 1999 regulatory test for the application for Directlink to be a regulated interconnector.
- The application of the regulatory test is based on credible scenarios with all scenarios being considered on a "non preferred" or equal basis.
- The interpretation of the 1999 regulatory test by the ACCC provides for the use of a value of lost load other than that of the market price cap specified in the NEM Code, if the value is appropriate to the region affected, and has been accurately determined. If not the market price cap should be used for the value of USE.
- DJV did not demonstrate that the value of USE developed by VENCorp for use in the Victorian region is applicable to Directlink. Issues noted include the particular regions and customer classes that would have their load shedding impacted by Directlink, the use of a value of USE based on Victoria alone, and comparative studies that indicate significant differences in the value of USE between regions.
- Having regard to the uncertainty in the value of USE, the regulatory test requires that sensitivities be undertaken that encompass the potential range of value. Previous determinations have also specified that the market price cap should be used as the alternative to an estimate of the value of USE.



### Competition Benefits

In relation to the issue of competition benefits, then review concluded that while it would be expected that the benefits determined by DJV would be lower than had competition benefits been included, without undertaking such modelling, it is not possible to say how much more, if any, the benefits would be. Consequently, it is also not possible to infer whether or not the estimates are conservative.

### Announced Gas Generation in NSW

In regard to the recently announced gas-fired generation in New South Wales, our review finds no reason to conclude that these issues would have a material impact on the results of the market modelling.



# Table of Contents

# 1 Introduction

## 1.1 Background

The Australian Energy Regulator (AER) commissioned Intelligent Energy Systems (IES) to undertake a review of specific aspects of the submission by Directlink Joint Venturers (DJV) to the AER in response to the draft determination "Directlink Joint Venture Application for Conversion and Revenue Cap".

The specific issues relate to the value ascribed to unserved energy in the market scenarios used, the non-inclusion of competition benefits in the market modelling and the recent announcement of new gas-fired generation in New South Wales.

This follows a review undertaken by IES for the AER on the interregional market benefits contained in the application by DJV for Directlink to be converted to a regulated interconnector.

## 1.2 Terms of Reference

The Terms of Reference for this study are listed below.

**Unserved Energy**

The consultant is to review and provide comments on the submissions in relation to the value of unserved energy. To this end the consultant is to:

- consider comments from submissions on the value of unserved energy;
- have regard to the advice provided by Intelligent Energy Systems on the need to give equal weighting to the values of $10 000 per MWh and $29 600 per MWh for the purposes of an estimated value of unserved energy;
- comment and provide reasoning on an appropriate value of unserved energy for application of the regulatory test.

**Competition Benefits and New Generation in New South Wales**

The submission by DJV (number 12) raised the issue of competition benefits not being included in its application and therefore Directlink's market benefit being more likely to be understated. IES was asked to comment on :

- the issue of competition benefits; and
- any potential impact on the Directlink market benefits due to the recent announcement by the New South Wales government in relation to building new gas-fired generators.

## 1.3 Outline of this Report

This report focuses mainly on the issue of the value of unserved energy that should be used in the determination of interregional market benefits in the



regulatory test application by DJV for Directlink to convert to a regulated interconnector. In considering the issues relevant to this question, the report proceeds as follows:

- Chapter 2 considers the issues pertinent to the Directlink application not evident in previous applications of the regulatory test. This chapter also considers the basis of the IES advice to give equal weighting to the two values of unserved energy (USE) used in the market scenarios developed.
- Chapter 3 considers the manner of forecasting USE in modelling studies.
- Given the context presented in Chapter 2, Chapter 4 summarises the issues presented in the submission by DJV to the draft decision.
- Chapter 5 reviews the regulatory test used by DJV and how this was interpreted by the ACCC. This provides the regulatory basis for assumptions used in the test.
- Chapter 6 reviews particular applications and usages of the test. In particular, given the reference to the VENCorp approach in the DJV submission, this chapter presents the rationale for this approach and associated issues.
- Chapter 7 then considers the issues and potential uncertainties in the value of unserved energy proposed for use by DJV, this being the value developed in the 2003 VENCorp study into the VCR (Value of Customer Reliability).
- Having considered the issues relevant to the value of unserved energy, Chapter 8 summarises the issues and concludes.
- Chapter 9 considers the potential impact on benefits of including competition benefits while Chapter 10 considers the issue of potential new generation in NSW.

## 1.4 Terminology

As a number of abbreviations are used in the report, these are listed here for reference:

- Value of Lost Load - VoLL
- Unserved Energy - USE
- Value of Customer Reliability – VCR
- Transenergie US - TEUS
- Directlink Joint Venture - DJV



# 2 Issues Pertinent to the Directlink Application

The issues to be addressed need to be considered within the framework of the regulatory test and the nature of the application. In this regard the Directlink application presents a situation not contemplated in the development of the regulatory test.

In essence, the regulatory test was designed to rank alternative projects on the basis of economic/market modelling, and to select the project that maximises the net market benefits under most but not necessarily all credible market scenarios. The selected project satisfies the test if the net market benefits under most scenarios are positive. The test did not require the assignment of numerical weightings or likelihoods to scenarios.

The IES recommendation that (1) both values of USE used be given equal weighting reflects the "non preferred" basis of scenarios developed in the application of the regulatory test and (2) the use of two values of USE in the scenarios developed was based on the level of uncertainty in the value of USE.

In the case of Directlink, no project satisfied the regulatory test. This was because positive net market benefits were not provided under the majority of the market scenarios considered.

This meant that in the Directlink application, the issue became one of determining an asset value for Directlink. The AER determined that the appropriate economic valuation methodology was that provided by the optimised deprival value (ODC) framework for asset valuation.

Thus the application of the regulatory test to Directlink required not only the ranking of projects under a range of scenarios, but also the development of a fair asset value. This was summarised in the Summary chapter of the draft determination:

> "When the AER applied the regulatory test, however, it found no alternative project satisfied the test. That is, under the regulatory test neither Directlink, nor any other alternative should be constructed.
>
> This outcome presented the AER with a difficult issue for consideration. On the one hand it could be argued that Directlink should be provided with an asset value of zero since its construction could not be justified today. However, on the other hand as Directlink already exists and provides benefits to market participants over and above its operating costs, an asset value that is greater than zero would be appropriate.
>
> To resolve this issue the AER examined an economic valuation (EV) of Directlink under the optimised deprival value (ODV) framework for asset valuation. This framework allows a value to be assigned to Directlink that is consistent with the level of market benefits provided by it."



In the determination of an asset value, the AER selected 6 credible scenarios from the scenarios modelled by TEUS. These were based on historical bidding and a 9% discount rate with variations to the level of load growth and the value ascribed to unserved energy. Scenarios that did not incorporate historical type bidding were not considered appropriate as they did not reflect outcomes that would be expected in the market.

The values ascribed to USE were $10,000/MWh and $29,600/MWh. AER gave the following reason for the selection of the values of USE[1]

> "it is not possible to state whether VENCorp's unserved energy (USE) value of $29 600 per MWh is more or less suitable as a general measure. In the absence of an accurate value for USE, the market value of lost load of $10 000 per MWh should also be used. IES advised the AER that both values need to be considered and given equal weighting."

These 6 scenarios are shown in the table below.

**Credible Scenarios Selected**

| USE Value | Bidding Strategy | Discount Rate | Demand Growth |
|---|---|---|---|
| $10,000 | Historical | 9% | High |
| $29 600 | Historical | 9% | High |
| $10,000 | Historical | 9% | Medium |
| $29 600 | Historical | 9% | Medium |
| $10,000 | Historical | 9% | Low |
| $29 600 | Historical | 9% | Low |

The AER determined that the median value of the 6 scenarios would provide the best measure of central tendency. This required averaging the values of the third and fourth ranked scenarios.

This is expressed in the draft determination as follows[2]:

> "The AER considers that the best balance to determine an EV that is representative of the credible scenarios is to use the measure of central tendency. Given the range of estimates and the skewed distribution, using a mean to determine a single value is not appropriate because the mean is more affected by extreme values and is therefore not a good measure of central tendency. The median is less sensitive to extreme ranges and this makes it a better measure than the mean for skewed distributions.
>
> In determining the median, the ordered middle value is selected when there is an odd number of scenarios. In this case, there is an even number of scenarios. Therefore, the median is determined to be the mean of the two middle values. That is, the mean

[1] Page 129 of the draft determination.
[2] Page 129 to 130 of the draft determination.

> market benefits of scenarios 3 and 4 results in a median EV of $150.55m for Directlink."
>
> "The AER considers that this approach provides an outcome that is consistent with the ODV method outlined in clause 6.2.3(d)(iv)(A) of the code. It provides an economic valuation of Directlink by setting the asset value to be consistent with the level of its economic market benefits."

Thus in the regulatory test application to Directlink, the value of USE was pertinent in two contexts:

- In the ranking of projects and establishment of whether or not the project passed the regulatory test;
- In an asset valuation framework.



# 3 Forecasting Unserved Energy

In relation to the market modelling associated with a regulatory test application, “without project” and “with project” cases are established and modelled, after which the differences between these modelled cases are obtained and costed.

Differences in measured quantities of unserved energy between modelling cases arise as a consequence of:

- The investment rule for the timing of new-entry generation being other than that of maintaining a constant amount of unserved energy in each year for all modelling cases; and
- The lumpy nature of new-entry generation and timing differences in its introduction between modelling cases.

Necessarily the forecast USE reflects any uncertainty in assumptions about the nature and timing of new-entrant generation. Furthermore it is difficult to predict, prior to modelling, whether a high or low value of USE will result in a higher benefit for a particular project.

This is observed in the modelling undertaken by DJV, in which:

- For the medium and low load scenarios, the “with” case had lower levels of unserved energy compared to the “without” case; but
- For the high load scenario, the “without” case had lower levels of unserved energy compared to the “with” case.

In our view it is important that the value(s) of USE be settled prior to modelling before it is evident whether a higher or lower value is beneficial to a particular project.



# 4 DJV Submission – Value of VoLL

Section 11 of DJV's submission to the AER "Submission in Response to the AER's Draft Decision of 8 November 2005" is entitled "Determining a credible estimate of the value of unserved energy". This section contains DJV's response to the decision of the AER to place an equal weighting on the two values of VoLL used in the modelling studies that determined the interregional market value of Directlink. These two values were the market price cap of $10,000/MWh and the estimate used of the Value of Customer Reliability (VCR) of $29,600/MWh.

In relation to the level of VoLL or USE to be used, the argument presented in the submission by DJV was that both the 1999 and 2004 regulatory tests should require the same economic treatment. Quoting from Section 3,

> "These provisions are completely consistent with one another if they are interpreted in the light of sound economics."

Based on this premise, DJV argued that the most appropriate value of unserved energy to use was that provided by the VENCorp study into the Value of Customer Reliability (VCR).

The key points made by DJV in this section are as follows:

- That the market cap price of $10,000/MWh should not be considered for the purpose of the regulatory test. Quoting form Section 11 of DJV's submission:

  > "The Directlink Joint Venturers submit that the NEM wholesale market price cap of $10,000 per MWh does not need to be considered for the purposes of the Regulatory Test because it is in no way an estimate of the value of unserved energy or a value of lost load to customers. The market price cap is set solely to achieve a balance between the need to protect generators and retailers from high spot prices and the need to maintain the market signals necessary to attract reliable supply. Further, there is substantial public domain evidence to suggest that any credible estimate of the value of unserved energy across the NEM is significantly greater than $10,000 per MWh."

- That this is recognised by VENCorp when it determined the value of unserved energy that it now uses for transmission planning. DJV quote from the report by VENCorp "Final report, Value of unserved energy to be used by VENCorp for electricity transmission planning" 23 May 2003 as follows:

  > "As noted in Section 4.1 above, if "reliability increases" are valued at a level below the marginal cost to consumers of unserved energy (the VCR), then the resultant level of supply reliability delivered to consumers will be inefficiently low. In light of this consideration, it is VENCorp's view the value of "reliability increases" must be assessed with reference to the VCR.
  > Any over-riding considerations of competitive neutrality give rise to a further need to ensure that the VCR is consistent with the fundamental driver of



> reliability levels in the wholesale market, which is the Reliability Panel's reliability standard. As noted in Section 4.1 above, the VoLL implied by the Reliability Panel's reliability standard is not less than $26,500 per MWh. This value is consistent with the VCR determined during the recent study commissioned by VENCorp"

- The estimate of $29,600/MWh in the VENCorp study is close to the findings of other Australian studies, and significantly less than studies done overseas.
- Determining a reliable estimate for the value of unserved energy can be difficult due to a number of listed reasons.
- A comparison of the results of the medium load growth scenario / historical bidding modelling results show that increasing the value of VoLL substantially increases the assessed benefits.
- The view being expressed by DJV is implicitly supported by Transgrid and Powerlink who used $29,600 in their March 2004 report of QNI benefits.

IES notes that in determining the level of VoLL, the Reliability panel is required to allow for the standard of reliability (for unserved energy) to be satisfied without the use of NEMMCO's powers of intervention, not create risks which threaten the overall integrity of the market, and take into account any other matters the Panel considers relevant.

In its most recent determination (March 2005)[3], the Reliability Panel concluded that "*at present the current market price cap [$10,000/MWh] appears to be consistent with the delivery of sufficient capacity to meet the reliability standard*". This appears inconsistent with VENCorp's view stated above.

IES notes further however that in the market benefit modelling, the standard of reliability (0.002%) was generally met and therefore it could be argued that a higher value of VoLL would only be required to incentivise the additional generation capacity needed to further reduce the residual energy shortfalls.

IES agrees with DJV that the value of VoLL set by the Reliability Panel is not primarily a value of unserved energy.

[3] Reliability Panel, VoLL and the cumulative price threshold Final Report, NECA, March 2005.



# 5 Interpreting the Regulatory Test Used

VoLL stands for the Value of Lost Load, and theoretically this is how unserved energy should be priced to obtain the economic balance between supply and reliability. VoLL also appears in the Market Rules (or Code as it was previously labelled). However, the use and value ascribed to VoLL in the Market Rules is as a price cap, not as the economic value of unserved energy (consequently terminology such as Market Price Cap would have been more appropriate). As a result, ambiguity or confusion has arisen in precisely what is meant by VoLL in the regulatory test, the economic value of lost load or market price cap.

With this background, there are a number of issues relevant to a consideration of the appropriate value(s) to apply to customer unserved energy in an application of the regulatory test (as a methodology to rank projects). The issues particular to the application by DJV include:

- The regulatory test being used and its specified requirements;
- Previous treatments and decisions in the application of that regulatory test;
- The equivalence of the 1999 and 2004 regulatory tests.

These issues are considered in turn below. The issue associated with the level of confidence in assumptions relating to the value of USE is addressed later in this report.

## 5.1 Regulatory Test Used

In relation to the version of the ACCC Regulatory Test used by DJV in their submission there are two issues. The first issue relates to which test was used and the second issue is whether or not the 1999 and 2004 versions of the regulatory test specify different economic treatments.

The DJV application in April 2004 indicated that the regulatory test being used was that promulgated in December 1999. This was also supported by verbal discussions between the ACCC, DJV and IES. In their November 2005 application, DJV were silent on which test was being used as the basis of the application. The reason for this silence is understood to be that DJV did not consider this an issue, as they argued that the interpretation of both tests should be the same.

It seems to us, that as a matter of principle, an application should be tried under one test. In the case of Directlink, given that the 2004 test emerged part-way through the process, the first step must be to determine which test is being used in a particular application. The issue of differences between the 1999 and 2004 tests is a matter for separate consideration. DJV indicated in the April 2004 application that the 1999 regulatory test was the regulatory test under which the application was to be considered, and following this never gave advice to the



contrary. The wording of their subsequent arguments was also on the basis that the application was being undertaken under the 1999 regulatory test.

Consequently, IES considered that any opinions provided must be within the framework of the 1999 Regulatory Test.

## 5.2 The 1999 Regulatory Test

DJV argued in their response to the draft decision that the interpretation of both the 1999 and 2004 tests should be the same. In particular, that the value of USE in the 1999 regulatory test should correspond to the economic value of load not supplied (and not the market price cap).

After quoting from both the 1999 and 2004 regulatory tests, DJV say in section 3 of their response:

> "These provisions are completely consistent with one another if they are interpreted in the light of sound economics. As outlined in one of our previous submissions, VENCorp has been able, in effect, to reconcile the two when it interpreted the Australian Competition and Consumer Commission's ('**ACCC's**') reference in its 1999 Regulatory Test to 'VoLL' to be a reference to the value of unserved energy to consumers, rather than the wholesale market price cap to avoid encouraging inefficiently low investment. We discuss further the selection of a reasonable value of unserved energy in section 11 of this submission.
>
> In applying either version of the Regulatory Test, the AER has the opportunity to interpret the meaning of particular parts in accordance with sound economic principles to achieve the most accurate and robust answers. Consequently, both versions should bear the same result."

As the issues considered in the regulatory test formulation included competitive neutrality[4] with other investments, there were wider considerations than simply the economics of transmission projects. Consequently, there was no reason why the 1999 and 2004 regulatory tests should specify equivalent treatments.

To consider these issues, the interpretation of the 1999 regulatory test and its effective equivalence to the 2004 regulatory test requires a:

- Review of the 1999 regulatory test, its preamble and the issues that were considered in the development of the 2004 regulatory test;
- Interpretations of the 1999 test by the ACCC and applicants.

The 1999 Regulatory Test says:

> "In determining the *market benefit*, the following information should be considered:
> ……

[4]This issue relates to not favoring one development option over another. The argument is that if the maximum price generation can receive to avoid load not supplied is VoLL as defined in the Code, then this should also apply to transmission.



(b) reasonable forecasts of:

…..

(ii) the value of energy to electricity consumers as reflected in the level of VoLL;"

The preamble to the 1999 test gives guidance to the meaning of VoLL as used in the 1999 Regulatory Test. Here there are two areas where the ACCC discuss VoLL. The first of these is as follows:

"Conversely, faced with the same circumstances, a generator's response will be based on the increased likelihood of high pool (and contract) prices which are capped at the Value of Lost Load (VOLL), which is currently set at $5000/MWh."

The second is:

"Moreover, TransEnergie argued that the reliability benefits of regulated project should be on the same basis as for non-regulated projects (ie on the basis of the then VOLL rather than on a value of avoided capacity)."

This "literal" view of the 1999 regulatory test indicates that the manner the ACCC used VoLL is as the value of VoLL as specified in the Rules (or Code as it was previously called). This presently has VoLL at $10,000/MWh. The key consideration to the ACCC in the wording of the test was the objective of competitive neutrality.

However, it can also be argued that economic considerations and the manner VoLL is used is also not inconsistent with an interpretation that includes VoLL as the economic value of unserved energy. This interpretation was supported by the decision by the ACCC on the application of the regulatory test to Murraylink on 1 October 2003.

## 5.3 Murraylink Decision

This was the most recent application of the 1999 regulatory test, and the one that DJV stated they had used as a basis for the principles that should be used in the Directlink application. In noting the decision by the ACCC on Murraylink, the key issues to the application of the regulatory test were different than those evident in the Directlink application, as the modelling showed that Murraylink would pass the regulatory test regardless of the value ascribed to unserved energy. This meant that the value ascribed to unserved energy did not factor in the decision and that there was no need to undertake any asset valuation subsequently.

The decision by the ACCC made the following points:

- The current wording of the regulatory test does not specify a value of VoLL to be applied for the calculation of the gross market benefits.
- Where an appropriate value of customer reliability has been determined for a region or sub-region, it would be not inconsistent with the regulatory test to be used in the calculation of the estimated benefits to end users from greater reliability.



- In the absence of an accurate value for the value of customer reliability, the VoLL specified in the code should be used.
- It is not inconsistent with a regulatory test assessment for the value of VoLL to be based on the current market price cap and/or a level of VoLL based on an objectively identified measure.
- The applicability of the VCR determined by VENCorp to the assessment of Murraylink economics is questionable - in particular, the validity of using a Victorian wide assessment of VCR to the Riverland region.

These points (excluding the last point above) are evident in the section 4.5.5 of the decision:

> "The Commission is of the view that the current wording of the regulatory test does not specify a value of VoLL to be applied for the calculation of the gross market benefits. The Commission concurs with interested parties that the VoLL specified in the code is a wholesale market price cap and does not necessarily reflect the real or true value of lost load to end user customers, which may vary from customer type and location. Therefore, the Commission is of the view that where an appropriate value of customer reliability has been determined for a region or sub-region, it would be not inconsistent with the regulatory test to be used in the calculation of the estimated benefits to end users from greater reliability. In the absence of an accurate value for the value of customer reliability, the VoLL specified in the code should be used. However, the Commission notes that for the purposes of sensitivity analysis, it is appropriate for different values of VoLL to be tested."

## 5.4 The 2004 Regulatory Test

Nevertheless, the "water was somewhat muddy" in relation to the wording of the 1999 regulatory test and value of unserved energy to be used under the 1999 regulatory test. This was one of the key issues addressed in the development of the 2004 regulatory test.

The preamble to the 2004 regulatory test gives further guidance to the ACCC's view on the issues associated with the 1999 regulatory test and economic value of USE. In particular:

> "The ACCC notes that VoLL is the wholesale price cap. As such it is unlikely to be an appropriate value for making a determination of the true value of lost load to customers."
>
> "The ACCC considers it appropriate to replace VCR with Powerlink's suggested definition of a 'reasonable forecast of the value of electricity to consumers' This expression will now replace the term VoLL which previously appeared in the regulatory test."

This is reflected in the 2004 Regulatory Test which says:



> "In determining the *market benefit*, the analysis may include, but need not be limited to the following benefits:
>
> .....
>
> (c) changes in involuntary load shedding caused through savings in reduction in load lost, using a reasonable forecast of the value of electricity to consumers or deferral of reliability entry plant;"

## 5.5 Conclusions

Thus from the reading of the test, the DJV application and communicated interpretation by the ACCC the following are concluded:

- DJV used the 1999 regulatory test for the application for Directlink to be a regulated interconnector.
- The Commission communicated a wide interpretation of the 1999 regulatory test in relation to the value of VoLL that could be used. This had that where an *appropriate* value of customer reliability has been determined for a region or sub-region, it might be used in the calculation of benefits and that in the absence of an *accurate* value for the value of customer reliability, the VoLL specified in the Code should be used.

  In other words, the 1999 regulatory test can use a value of lost load other than that of the market price cap specified in the NEM Code, if the value is *appropriate* to the region affected, and has been *accurately* determined.
- The 1999 and 2004 regulatory tests do not necessarily specify the same treatment for the value of USE to be used in the development of market benefits.



# 6 Use of the 1999 Regulatory Test

DJV made special mention of the manner VENCorp interpreted the 1999 regulatory test. This was valuing unserved energy at the Value of Customer Reliability determined through a study "Assessment of the Value of Customer Reliability prepared by Charles River Associates December 2002" that considered this for Victorian customers. This has unserved energy valued at $29,600/MWh on a Victorian statewide basis.

Discussions with VENCorp support the interpretation presented in the DJV response to the draft determination. VENCorp indicated that the interpretation adopted in their planning criteria (as detailed in the VENCorp report "Electricity Transmission Network Planning Criteria"July 2003) was not one made in isolation to the ACCC, but one consistent with the interpretation communicated by the ACCC. This was a "wide" interpretation that provided for the economic cost of unserved energy to be used in the determination of market benefits. This interpretation was supported by the ACCC decision in the application of the 1999 regulatory test to Murraylink.

However, both the VENCorp report on planning criteria and the CRA report on VCR indicate that VCR should not be applied without consideration of the project being considered. Particular issues noted related to the type of customers that would be shed and the control that exists to minimize the economic cost of interruptions.

Quoting from VENCorp report on planning criteria:

> "In the transmission investment evaluation decisions, VENCorp applies a VCR of $29,600/MWh statewide. A sector specific VCR may be applied where transmission constraints affect a reasonably clearly distinguishable subset of Victorian load. Table 1 details sector specific values."

The VCR's for the different sectors presented in Table 1 in the VENCorp report are shown below.

| **SECTOR** | **VENCorp Study (2002) VCR($/MWh)** |
|---|---|
| Residential | $11,867 |
| Commercial | $56,625 |
| Agricultural | $54,782 |
| Industrial | $18,531 |
| **VCRState (TOTAL)** | **$29,600** |



The CRA report on VCR within Victoria also makes several points:

> "The results confirm that the current value of VoLL of $10,000/MWh used as the cap in the electricity market price is not reflective of network customer valuations. This is consistent with the determination of the Reliability Panel when it noted the energy market VoLL was targeted at facilitating voluntary balancing of supply and demand on a regional and national level and is best viewed as a price cap rather than an indicator of customer valuations of supply reliability.
>
> In that determination it was also recognised that in the event that customer load shedding is required due to insufficient supply from the energy market, this could be more readily undertaken by selectively choosing which customers are interrupted and by rotating the interruptions across a large customer base and thus minimising the impact on individuals who place a high value on retaining supply. However, this flexibility to manage the impact of shortages is often not available due to network limitations as the effects are more localised and capacity of network assets are the dominant factor as to whether a particular customer is interrupted. It is thus more important that network capacity reflects, to the extent practical, local customer valuations of reliability."

This indicates that due care must be taken in applying a value of unserved energy to specific projects. Specific issues which relate to the localised nature of curtailment are the nature of the transmission project and the controllability of load shedding. These are clearly issues relevant to the type of customers shed and the economic cost.

Within this context, it is noted that the impact on customer load shedding due to the increased level of interconnection due to Directlink is not local in nature and would be potentially spread across NSW, Victoria and SA. In addition, there would be discretion in the makeup of customers shed which would be dictated more by load shedding tables than state averages.

It is noted that in the application of the regulatory test by VENCorp, VENCorp have indicated that they use the statewide average value of $29,600/MWh, and assert that any breakdown into individual classes is not warranted.

Apart from Murraylink, the other application of the regulatory test to an interconnector was that for the Snowy to Victoria Interconnector Upgrade, which was undertaken by NEMMCO. In this study the impact was on Victoria and a statewide estimate of VCR was used to value unserved energy.



# 7 Value of Customer Reliability Used

The previous discussions presented in this paper have concentrated on the regulatory test, its interpretation and its applications by various parties. This has indicated a general acceptance of using VCR in the economic valuation of load not supplied given a reasonable value of that to the affected customers.

The discussion has also indicated that the level of confidence in the accuracy of the estimate of the value of USE is a critical issue in the application of the regulatory test. In particular, if an accurate value of customer reliability has been determined for a region or sub-region it can be used in the calculation of market benefits, but in the absence of such a value for the value of customer reliability, the VoLL specified in the Code should be used. There are a number of issues associated with the development and use of a Value of Customer Reliability. In this regard DJV also make the point that determining a reliable estimate for the value of unserved energy can be difficult.

In relation to the value of VCR determined through the CRA study and applied by DJV, the following issues are noted:

- The basis of the value of VCR determined in the VENCorp study and used by DJV is for the Victorian region;
- The Victorian statewide average VCR is very close to that determined through the previous Monash study, although the values derived for the various sectors were different, particularly that of residential customers.

  The greatest difference was in the residential class of customers where the Monash study had a value of $0.25/kWh and the VENCorp study a value of $3.94/kWh.
- A review of the items included in the unserved energy costs indicate that there may be some wealth transfers contained within the assessment of VCR. However, a more detailed review would be required to ascertain whether or not this is the case.

## 7.1 Key Issues

With respect to the use of the value of lost load based on the CRA study for the State of Victoria the following issues are identified.

- Applicability to region

  The application should demonstrate that the value being used is applicable to the region or regions of concern. This might be achieved as a result of the applicant providing arguments to support the application of the study results to a different region or arranging for the study methodology to be applied to the region of concern i.e undertaking another study specific to the region of interest. To support the applicability of the value established for another



region, the applicant might show that the sectoral weightings (residential, commercial etc) are similar across regions, or if they are not that the impact on the average (weighted according to sectoral weightings) is not material. It would seem more problematic to argue that customer costs or willingness to pay are the same across regions.

- Accuracy of value

  The regulatory test and ruling provide little guidance as to what is a sufficiently accurate value or how one would determine what constitutes an accurate value. In the Murraylink decision the ACCC notes the correspondence between a number used by MTC and the CRA study without taking a view on the accuracy of the number supported by the study. It may not, in fact, be possible to determine an accurate value for customer reliability. It is noted that while the state-wide number produced by the CRA study compared closely with the number produced by the previous Monash study there were significant differences at sector levels.

- Load shedding

  The use of a composite value of customer reliability implies that should energy shortfalls occur, supply interruptions will be shared across customers evenly in accordance with sector weightings. In practice, as far as possible, energy shortfalls are managed in accordance with schedules of load shedding priorities. These schedules might reflect a number of objectives, however to the extent to which economic efficiency is accorded importance, they should serve to direct the shortfall to the sector that places the lowest value on the cost of shortfall. Thus, the particular load shedding procedure practised in the region of interest may be more relevant to determining an appropriate value for VoLL than adjusting a composite number from another region for changes in sectoral weightings (assuming this information is available).

The application by DJV did not address these key issues in any detail. IES provides further commentary on these issues below.

## 7.2 Applicability to Region

In its submission, DJV states that it is

"*of the view that it is appropriate to assume that the value of unserved energy in Victoria is reasonably similar to the value in other Australian regions and that $29,600 is the credible estimate*".

As noted by DJV, Monash University provided a study for both VENCorp in 1997 (Victorian customers) and Transgrid (New South Wales customers) in 1998.

A comparison of the Monash values for the two States is presented below (the values are sourced from Draft Grid Investment Test (New Zealand), Frontier



Economics, June 2004). Difference is calculated by dividing the New South Wales value by the Victorian value.

**Sectorial Differences**

| Sector | Victoria | New South Wales | Difference (%) |
|---|---|---|---|
| Residential | 0.74 | 0.49 | 66% |
| Commercial | 75.96 | 52.37 | 69% |
| Agricultural | 96.20 | 57.59 | 60% |
| Industrial | 11.19 | 20.46 | 183% |
| Total | 28.89 | 20.56 | 71% |

According to the above table, sectoral differences between the two regions range from 60% to 180%.

Not having reviewed these studies, IES is unable to comment on the relative extent to which these differences are attributable to regional customer characteristics on one hand, and variations attributable to the application of the methodology on the other. At the state-wide level both values are in excess of the value of the Market Price Cap ($10,000/MWh) but still differ from one another by 30%.

## 7.3 Accuracy of Values

In its submission, DJV states that VENCorp and many of its stakeholders note that the USE value of $29,600/MWh is supported by an estimate of $28,890/MWh made by Monash University in 1997 (Monash Study).

The state-level comparison referred to suggests good overall agreement between the results of the two studies. However this is not the opinion of the authors of the later study.

The table below is an extract from Table 3 Calculation of sector-level VCRs for Victoria ($/kWh) from the CRA report.

**CRA Report – Sectorial Level VCR's**

| Study | Residential | Commercial | Agricultural | Industrial |
|---|---|---|---|---|
| CRA | $11.88 | $56.67 | $55.49 | $18.54 |
| Monash | $0.74 | $75.96 | $96.19 | $11.19 |
| %difference | 1,505% | -25% | -42% | 66% |

It is evident that notwithstanding the close agreement in state-level values, there are large differences at sectoral level – notably the residential sector in relation to which CRA states that "*No definitive explanation can be given for this difference*".



CRA does however cite the differences in the preparatory actions and costs presented to survey recipients as a possible explanation.

Importantly, according to CRA, "*the fact that the final aggregated State-level values of VCR and VoLL are almost identical therefore is more coincidental than necessarily reinforcing the original VoLL*."

The Monash and CRA studies followed broadly similar methodologies, yet resulted in large differences between values at the sectoral level. In IES' view, unless it can be demonstrated that the CRA study is greatly superior to the Monash study, it is reasonable to suspect that significant variability is attached to the application of the methodology and that it cannot be claimed that the value of customer reliability / lost load has been accurately determined. It appears that CRA may have had concerns as to whether the estimates of residential values in particular in their study were sufficiently robust. CRA proposes that in future an alternative method be used for estimating VCR (a trade-off methodology which attempts to "simulate realistic marketplace choices with a built-in budget constraint"), rather than a direct questioning technique".

## 7.4 Load Shedding

Under the National Electricity Amendment Act 2005, NEMMCO is to develop load shedding procedures for each participating jurisdiction. The procedures must be consistent with load shedding guidelines prepared by the relevant jurisdictional system security coordinator (appointed by the jurisdictional Minister). These guidelines must specify *a list of sensitive loads, and a list of loads or classes of loads (other than sensitive loads) to be shed and restored in that jurisdiction and the order in which those loads are to be shed and restored in the event it is necessary for NEMMCO to do so*.

IES understands that the contents of jurisdictional load shedding guidelines and procedures generally remain confidential to the relevant jurisdictions and NEMMCO. In the case of Tasmania, the Department of Infrastructure, Energy and Resources (DIER) provides a document containing a schedule of load shedding priorities and sets out the guiding principles upon which the schedules are based.

One stated principle is that in a short term event, priority should be given to disconnecting industrial loads in preference to other loads wherever possible. Another is that the exercise of emergency powers as provided for under the jurisdiction's Electricity Supply Act will not necessarily be constrained by the principles and priorities set out in that document. DIER states "*the principle guiding all load shedding is that essential services have the highest priority for electricity supply. The next highest relate to loads where loss of supply causes particular harm or economic loss*".

IES notes that in view of the public expectation that to the greatest extent possible supply shortfalls should be anticipated and managed, indiscriminate load shedding is politically unacceptable. The management of the electricity



shortage consequent on the shutting down of the 1450MW Yallourn power station in January 2000 might be cited as an example of this. Following involuntary load shedding initiated by NEMMCO on 3 February 2000, the Victorian Government issued a direction pursuant to section 47C of the Electricity Act 1993 for all persons to restrict their use of electricity between specified times on working days from 4 February to 10 February 2000. The economic cost ($/MWh) of coping without commercial and domestic air-conditioning and some other conveniences such as elevators on subsequent days would be expected to have been lower than the cost, inconvenience, and public health and safety risk associated with sudden interruption on 3 February.

On the basis that 1) load shedding priorities direct initial interruption to loads where there are no public safety issues and less economic loss and 2) to the extent to which it is believed that supply shortfalls might continue, interruptions will be managed, it might be concluded that in practice, the economic shortfall cost may be less than the average value of customer reliability estimated by the Monash and CRA studies.



# 8 Value of VoLL - Conclusions

The previous sections support the previous advice by IES of the need to use and give equal weighting to the values of $10,000/MWh and $29,600/MWh in the application of the regulatory test to Directlink.

The key issues relevant to this advice are as follows:

- DJV used the 1999 regulatory test for the application for Directlink to be a regulated interconnector.
- The 1999 regulatory test specifies that VoLL should be used for the value of USE.
- The application of the regulatory test is based on credible scenarios with all scenarios being considered on a “non preferred” or equal basis.
- The interpretation of the 1999 regulatory test by the ACCC provides for the use of a value of lost load other than that of the market price cap specified in the NEM Code, if the value is appropriate to the region affected, and has been accurately determined. If not the market price cap should be used for the value of USE.
- The economic value of USE used by DJV was that of the VENCorp study. While ACCC has not provided guidance as to what constitutes a fair and reasonable value of USE to use, there are significant issues relevant to the number used by DJV. These include:
  - No analysis or indication of the regions that would have their load shedding impacted;
  - No analysis or indication of the makeup of customers that would be impacted (noting the manner load shedding would be undertaken);
  - Use of a study that is based on only one of the potential regions where the load shedding would be impacted;
  - Comparative studies that indicate significant differences in the value of USE between regions.
- Having regard to this uncertainty, the regulatory test requires sensitivities be undertaken. This translates into scenarios that encompass the potential range of value.
- Previous determinations have specified that the market price cap should be used as the alternative to an estimate of the value of USE.



# 9 Competition Benefits

In the context of the transmission development, competition benefits are economic benefits that could arise from the impact to generator behaviour brought about by additional transmission. Such benefits arise through a reduction in the number of occasions where generators have incentives to "strategically bid" for the purposes of increasing prices and profitability.

## 9.1 Summary of DJV Submission on the Use of Competition Benefits

DJV raised the issue of competition benefits. In this regard DJV made two points, these being:

- That they did not include competition benefits in the market modelling undertaken, and that as such, the economic assessment is likely to be conservative. Quoting from Section 12 of the DJV submission:

  > "There are a range of benefits that the Directlink Joint Venturers have not included in their assessment of Directlink:
  > • competition benefits; and
  > • other types of technical support;.
  > This confirms that AER may have understated Directlink's [benefits] rather than overstated them, and as such the AER can have a level of comfort that Directlink can achieve its economic value."

- That the 1999 regulatory test does not preclude competition benefits being incorporated into the modelling.

## 9.2 Comments

The first point to make is that the statement by DJV that the 1999 test does not preclude competition benefits is considered correct. The 1999 test says:

> "The forecasts of spot price trends should reflect a range of market outcomes, ranging from short run marginal cost bidding behaviour to simulations that approximate actual market bidding and prices, with power flows to be those most likely to occur under actual systems and market outcomes."

Clearly "simulations that approximate actual market bidding and prices" includes the sorts of behaviour observed, and this includes the influence of transmission and generation on how generators might bid.



The market simulation modelling undertaken by DJV used scenarios that represented historical bidding patterns. Further, these bidding patterns were the same in both the “with project” and without “project cases”. Thus the modelling incorporated the benefits of increased interconnection on dispatch costs etc within this context.

However, the modelling undertaken by DJV did not incorporate the potential change in generator bidding patterns that could arise from the presence of increased interconnection in the “with project” case. The potential change in bidding brought about through increased interconnection results from a reduction the number of occasions where generators have incentives to “strategically bid” for the purposes of increasing prices and profitability. These associated market benefits are referred to as competition benefits. The modelling of competition benefits requires sophisticated modelling that can incorporate the ability for portfolios to undertake profit maximising bidding behaviour. Examples of this are Nash-Cournot and Supply Curve bidding.

As the DJV market simulation modelling did not incorporate competition benefits, it would be expected that the benefits determined by DJV would be lower than had competition benefits been included. IES modelling in this regard has indicated that the level of competition benefits can be quite small depending on the project.

Consequently, without undertaking such modelling it is not possible to say how much more, if any, the benefits determined by DJV could increase. This means that it is not possible to infer whether or not the estimates are conservative.



# 10 Announced New Generation in New South Wales

The ACCC noted that Delta Electricity have recently announced three gas generation projects in NSW.

If these projects were to be assumed in the modelling then the impact would be to reduce the market benefits provided by Directlink. This would be principally due to the delay in capacity deferral in NSW/Victoria/SA that Directlink provides.

However, in relation to this announcement there is no information as to plant type and no firm commitment for these projects to proceed as yet. Consequently, these projects cannot be considered committed from the perspective of the regulatory test and would thus be treated as “generic” new entry generation in the market modelling undertaken.

This means that there would be no impact to the modelling or the results obtained.