



# **Annual energy cost review**

FINAL REPORT

PREPARED FOR THE INDEPENDENT PRICING AND REGULATORY  
TRIBUNAL

March 2008



# Annual energy cost review

<b>1</b>	<b>Introduction .....</b>	<b>3</b>
1.1	Background.....	3
1.2	IPART'S determination .....	3
1.3	Frontier Economics' previous recommendations to IPART.....	4
1.4	Changes since Frontier's May 2007 report.....	5
1.5	This report .....	6
<b>2</b>	<b>Requirements of the annual review.....</b>	<b>7</b>
<b>3</b>	<b>Modelling .....</b>	<b>9</b>
3.1	Modelling approach.....	9
3.2	Modelling results .....	11
<b>4</b>	<b>Summary and conclusions .....</b>	<b>21</b>

## Annual energy cost review

Figure 1: Three staged electricity modelling process .....	10
Figure 2: Average forward prices for baseload swaps (including contract premiums).....	13
Figure 3: Base swap price changes.....	14
Figure 4: Peak swap price changes.....	15
Figure 5: Implied off-peak swap price changes .....	15
Figure 6: Peak cap price changes .....	16
Figure 7: Country Energy efficient frontiers.....	17
Figure 8: EnergyAustralia efficient frontiers.....	18
Figure 9: Integral Energy efficient frontiers.....	18
Figure 10: Summary of impact compared to IPART's Final Determination.....	19
Table 1: Comparison of energy projections from 2006 SOO and 2007 SOO (medium, GWh) .....	11

# 1 Introduction

## 1.1 BACKGROUND

Frontier Economics has been retained by the Independent Pricing and Regulatory Tribunal (IPART) to advise on the market-based electricity purchase cost allowance for standard retailers in NSW. This advice is provided as part of IPART's annual review mechanism for the market-based electricity purchase cost allowance. This note sets out the results of Frontier Economics' conclusions on the market-based electricity purchase cost allowance for standard retailers in NSW for 2008/09 and 2009/10.

## 1.2 IPART'S DETERMINATION

IPART's Final Determination on regulated electricity tariffs for small customers, released in June 2007, recognised that the roll-off of the Electricity Tariff Equalisation Fund (ETEF) imposes additional risks to standard retailers supplying regulated customers.<sup>1</sup> Standard retailers will have to increasingly rely on purchasing electricity at volatile, unregulated prices while being required to sell an unknown quantity of electricity to regulated customers at fixed regulated prices. In this environment, IPART is required to estimate the likely electricity purchase costs ahead of when the retailers have to buy this power and, on the basis of this cost estimate, determine a retail price. This retail price will remain fixed for at least the following year.<sup>2</sup> The risk to retailers is that their actual electricity purchase costs may exceed the level at which they are obliged to sell this same electricity to regulated customers.

In recognition of this changed environment, IPART has developed a series of related measures to manage the additional risks to which retailers are exposed. These measures include:

- allowing for a higher retail margin to compensate the standard retailers for the additional risks they face as the ETEF rolls off;
- basing the energy cost allowance for each retailer on the most conservative point on the efficient frontier (which reflects the high level of hedging that a risk averse retailer would prefer);
- making an allowance for the cost to retailers of holding sufficient working capital to withstand cash flow variations;

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<sup>1</sup> IPART, *Promoting retail competition and investment in the NSW electricity industry, Regulated electricity retail tariffs and charges for small customers 2007 to 2010, Electricity - Final Report and Final Determination*, June 2007.

<http://www.ipart.nsw.gov.au/files/Electricity%20Retail%20Review%20-%20Final%20report%20and%20determination%20-%20Web%20version%20-%20June%202007.PDF>

<sup>2</sup> Unless a standard retailer applies to re-open the determination because of exceptional circumstances.

- providing for a review of the market-based electricity purchase cost allowance to be conducted annually during the determination period. The annual review only considers the movement of energy costs based on the load data provided by the standard retailers for the purposes of developing the Determination. No other cost movements – for example, green costs or compensation for volatility – are considered in this annual review; and
- providing a cost pass-through mechanism, which allows retailers to pass through to customers material increases or decreases in costs associated with regulatory or taxation change events that could not be anticipated at the time of the determination.

This first annual review of wholesale electricity prices is undertaken in the context of the long-term drought that has gripped Australia for a number of years. Until the Queensland Government decided to restrict the water available for electricity generation to its generators in the South-East of Queensland (Tarong and Swanbank) the drought had not materially affected energy purchase costs for retailers. However, following the imposition of the Queensland Government's generation restrictions in March 2007 the forward prices of electricity hedging contracts jumped sharply across the NEM. These price changes occurred rapidly and almost immediately after the release of IPART's Draft Determination, but prior to IPART's Final Determination.

### 1.3 FRONTIER ECONOMICS' PREVIOUS RECOMMENDATIONS TO IPART

Prior to the release of its Final Determination, IPART requested Frontier Economics to examine the reasons for the change in forward prices that occurred after the release of the Draft Determination, and to advise on whether, in light of these movements, IPART ought to consider revising their initial view of the energy cost allowance as set out in the Draft Determination.

In a publicly released report of May 2007, Frontier Economics recommended that IPART should not, at that stage, amend its position as set out in the Draft Determination.<sup>3</sup> This recommendation recognised that IPART's Draft Determination (and, ultimately, IPART's Final Determination) set out tariffs that would transition to full cost-reflectivity by 2009/10. Frontier Economics considered that there was a very high likelihood that contract prices would return to normal by 2009/10, so that adjustment to the energy cost allowance included in the Draft Determination was not necessary. Frontier Economics formed the view that prices would return to normal by 2009/10 for two key reasons:

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<sup>3</sup> Frontier Economics, *Analysis of recent changes in NEM wholesale electricity prices, effect on energy cost allowance*, May 2007.

<http://www.ipart.nsw.gov.au/files/Supplementary%20Energy%20Costs%20advice%20from%20fronter%20economics%20-%20Final%20Final%20Version%20-%20STC%20-%20webdoc.PDF>

- there was strong evidence emerging at the time that rainfall patterns would return to normal over the following 12 months, which would assist in replenishing the storages of hydro generators;
- Frontier Economics' modelling showed that if the delivery of recycled water to the Tarong power station were to occur as planned, and Kogan Creek were to be commissioned on time, this would relieve the shortage of capacity and raise competitive pressures for generators across the NEM.

Frontier Economics was of the view that given most retailers would be substantially hedged (and may have even been overhedged) for the 2007/08 year, and standard retailers were shielded from any cost increases in the 2007/08 year due to ETEF, the retailers would not be significantly exposed to increased forward prices over 2007/08.

Frontier Economics recognised that there was a chance that rainfall would not have returned to normal levels by the time of this first annual review and, even if rainfall did return to normal levels, there was a change that market prices would not return to the forecast levels set out in the Draft Determination in the time a prudent retailer would need to commence arranging hedging cover for this period. For that reason, Frontier Economics recommended that IPART should review its Final Determination prior to the first stage of the roll-off of ETEF, at which point standard retailers will be more exposed to the prevailing market prices.

#### 1.4 CHANGES SINCE FRONTIER'S MAY 2007 REPORT

Since Frontier Economics indicated in May 2007 that there was strong evidence to suggest that rainfall would be above average across South-East Australia, this has indeed occurred. This rainfall led the Minister for Energy in Queensland to announce on 13 February 2008 that restrictions on the use of water by Tarong North and Swanbank power stations would be eased.<sup>4</sup> This easing of water use restrictions will place downward pressure on prices going into the remainder of 2008. If rainfall returns to normal levels over the next 12 to 18 months this will further increase the chances of achieving the 2009/10 energy purchase costs estimated in IPART's Final Determination.

Having said this, the major hydro systems in Tasmania, the Victorian Alps and Snowy are still suffering the effects of water reserves substantially below their long-term averages. It is important to note that in the analysis of the effect on drought on prices set out in the May 2007 Report, Frontier Economics assumed that these hydro facilities would continue to suffer low water reserves over the Determination period, which still seems likely to be the case. These drought-affected water levels have already been accommodated in Frontier Economics'

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<sup>4</sup> Queensland Department of Mines and Energy (2008), Media Release, "Water restrictions eased for power stations", 12 February.

[http://www.dme.qld.gov.au/media\\_centre.cfm?item=438.0](http://www.dme.qld.gov.au/media_centre.cfm?item=438.0)

energy cost estimates, as set out in Frontier Economics' March 2007 Final Report<sup>5</sup> and incorporated in IPART's Final Determination.

## 1.5 THIS REPORT

The aim of this report is to describe the modelling and analysis undertaken to assess whether or not trigger of a 10 per cent difference in the energy cost allowance is met.

This paper is structured as follows:

- Section 2 sets out the basis of the annual energy cost allowance from IPART's Final Determination;
- Section 3 presents and briefly discusses the results of the updated energy cost modelling undertaken for the purposes of this first annual review of the energy cost allowance; and
- Section 4 presents the conclusions of the annual energy cost allowance review.

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<sup>5</sup> Frontier Economics, *Energy Costs*, March 2007.

<http://www.ipart.nsw.gov.au/files/Frontier%20Economics%20-%20Final%20report%20energy%20costs%20-%20electricity%20retail%20review%20-%20April%202007.PDF>



## 2 Requirements of the annual review

As indicated above IPART determined that it was appropriate to conduct an annual review of the energy cost allowance (although not the greenhouse and renewable energy cost allowance). IPART's Final Determination set out the following decision rule:

“If the results of a review of the market-based electricity purchase cost allowance for a future year in the determination period show a change (positive or negative) of 10 per cent or more compared to the Tribunal's most recent allowance amount for the market-based electricity purchase cost, then the Tribunal will notify the Standard Retailers and publish the new electricity purchase cost allowance amount.”<sup>6</sup>

While accommodating the uncertainties of the market through an annual review, IPART has limited the scope of the review in the following way:

“In undertaking the reviews, the Tribunal will adopt the same approach it used in making the 2007 Determination. That is, the Tribunal will:

- adopt a conservative approach to estimating the market-based electricity purchase cost, and focus on changes to the spot and contract prices for electricity
- use the same the load profiles as it used in the 2007 Determination – it will not update the load profiles.

The reviews will not reconsider the long-run marginal cost of electricity generation, the volatility allowance, green energy costs, NEM fees, energy losses, retail operating costs, customer acquisition costs or the retail margin.”<sup>7</sup>

In its March 2007 Final Report, Frontier Economics considered a range of sources of price data to come to a view about the likely prudent energy purchasing costs of the standard retailers. IPART ultimately accepted Frontier Economics' view about future electricity prices, as their expert adviser for the review. In respect of the annual review, IPART committed to also relying on expert advice:

“The Tribunal concluded that, for the purpose of setting the market-based electricity purchase cost allowance, the use of expert advice is superior to relying on the publicly available information. Therefore, for each annual review of this allowance, the Tribunal will engage an expert to advise it on the appropriate future market based electricity purchase cost allowance”<sup>8</sup>

Consistent with these requirements, Frontier Economics has modelled the market-based energy cost for 2008/09 and 2009/10. To test the reasonableness of Frontier Economics' 2008/09 and 2009/10 price estimates, they will be

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<sup>6</sup> IPART, *Promoting retail competition and investment in the NSW electricity industry, Regulated electricity retail tariffs and charges for small customers 2007 to 2010, Electricity - Final Report and Final Determination*, June 2007, p87.

<sup>7</sup> *ibid*, p87.

<sup>8</sup> *ibid*, p86.

compared against d-cypha's latest (3 March 2008) forward prices. We will use the same load profiles used for the purposes of Frontier Economics' March 2007 Final Report.

## 3 Modelling

This section briefly recaps the modelling approach Frontier Economics applied to estimate the energy cost allowance set out in Frontier Economics' March 2007 Final Report, and sets out the results of this same modelling process as undertaken for this first annual review.

### 3.1 MODELLING APPROACH

Estimating the market based energy cost involves using Frontier Economics' three-staged modelling approach:

- Stage 1 – The first stage involves modelling the future characteristics of the NEM power system over the Determination period, focusing on the requirement for new generation capacity by location to meet the NEM reliability criteria and accounting for possible changes in the NEM rules, such as the possible treatments of the Snowy region. This stage involves the use of Frontier's long-term NEM investment model, *WHIRLYGIG*. The structure and operation of *WHIRLYGIG* is summarized in Frontier Economics' Draft Methodology Paper, released in October 2006.<sup>9</sup>
- Stage 2 – Involves modelling the price outcomes in the NEM based on the market structure derived in the Stage 1 modelling using Frontier's market model, *SPARK*. This stage focuses on identifying optimal (i.e. mutually profit maximizing) generator bidding patterns and using these to determine future prices. This analysis is used to understand the effects on the market price from the roll-off of ETEF, together with the tightening of the balance of supply and demand over the Determination period. The modelling also incorporates the effects of changes to the NEM such as the abolition of the Snowy region by 1 July 2008, which Frontier Economics has reported on in detail.<sup>10</sup> The results of this modelling are a set of half hourly spot price forecasts for the Determination period. Contract prices can be derived from these spot forecasts. As noted in Frontier Economics' March 2007 Final Report an issue is the contract premium to be added to the spot price. We have adopted the same approach as used in the modelling undertaken for the March 2007 Final Report and included a 5 per cent contract premium on the spot prices. The structure and operation of *SPARK* is summarized in Frontier Economics' Draft Methodology Paper.
- Stage 3 – This stage involves drawing together the spot and contract price data derived from Stage 2, together with each standard retailer's regulated load, into Frontier's portfolio optimisation model, *STRIKE*. *STRIKE*

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<sup>9</sup> Frontier Economics, *Draft methodology for energy costs consultancy and retail costs/margin consultancy*, October 2006.

<http://www.ipart.nsw.gov.au/files/Frontier%20Economics%20-%20Draft%20methodology%20paper%20-%20FINAL%20-%202007%20October%202006.PDF>

<sup>10</sup> AEMC (2007), Abolition of the Snowy Region, <http://www.aemc.gov.au/electricity.php?r=20051214.200700>

determines the efficient mix of energy purchasing instruments (i.e. spot and contracts of various kinds) for each level of risk. The structure and operation of *STRIKE* is summarized in Frontier Economics' Draft Methodology Paper.

The *STRIKE* analysis requires a correlated time-series of load and price data as an input. It is important that the data capture the likely correlation of load and spot price, as this relationship will ultimately impact on the efficient energy purchase costs. For example, a given load shape with a relatively high correlation to spot prices will have a higher efficient purchase cost than the same load shape with a lower correlation to spot prices.

As indicated in Section 2, the annual review is to be conducted using fresh price estimates supplied by Frontier Economics, updated to reflect any material changes to the NEM (not already taken into account in the modelling) since the modelling was concluded for the energy cost allowance incorporated in IPART's Final Determination. However, as required, the load data used is the same used in the estimation of the energy cost allowance incorporated in IPART's Final Determination. The analysis is forward looking and not an ex-post review of the retailers' actual energy costs.

This 3-staged modelling process and the relationship between each model is summarised in Figure 1.

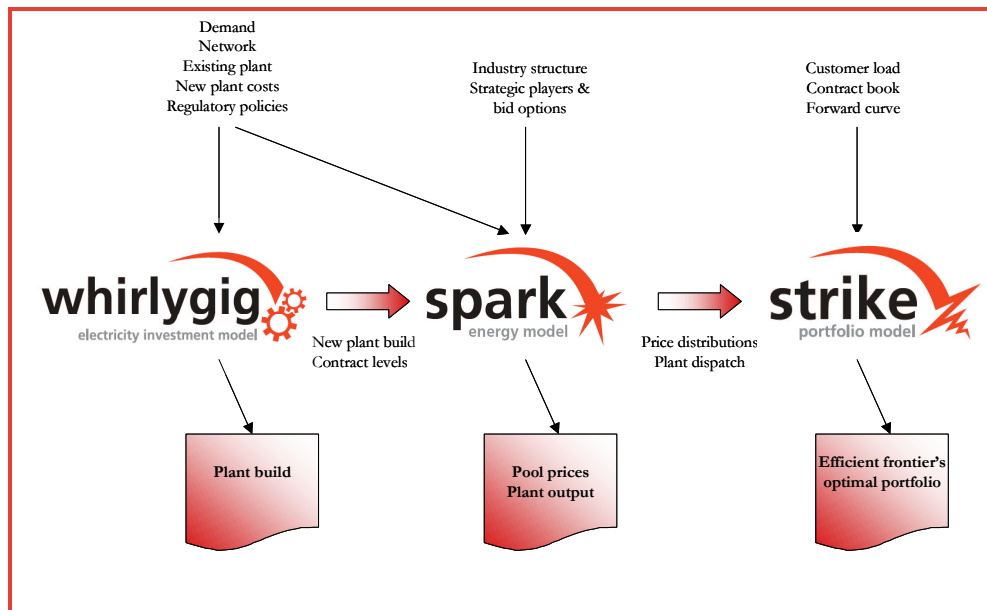


Figure 1: Three staged electricity modelling process

## 3.2 MODELLING RESULTS

This section discusses some key changes to input assumptions that have been made for the purposes of modelling for this first annual review, and present the results of Frontier Economics' estimates of market based energy costs.

### 3.2.1 Spot prices

#### *Key data changes*

For this first annual review, Frontier Economics has forecast spot prices using the same data sources as used for Frontier Economics' March 2007 Final Report and May 2007 Report, with two exceptions.

First, demand and supply forecasts have been updated from the latest information in NEMMCO's 2007 Statement of Opportunities. The differences in NSW energy demand are shown in Table 1. In respect of 2008/09, modelling for the purposes of Frontier Economics' March 2007 Final Report assumed annual demand of 76,840 GWh. NEMMCO's 2007 SOO forecasts demand to be 76,900 GWh, which is, for all intents and purposes, the same. There is also very slight difference in the demand forecast for 2009/10.

Year	2006 SOO	2007 SOO
<b>FY ending 2007</b>	74,240	74,090
<b>FY ending 2008</b>	75,600	75,710
<b>FY ending 2009</b>	76,840	76,900
<b>FY ending 2010</b>	78,160	78,000

Table 1: Comparison of energy projections from 2006 SOO and 2007 SOO (medium, GWh)

Source: NEMMCO

Second, there is some changes to plant assumptions, The key change is that modelling for the purposes of Frontier Economics' March 2007 Final Report did not include Delta's Colongra 660MW gas turbine, to be commissioned before the 2009/10 summer. The modelling for the purposes of Frontier Economics' March 2007 Final Report did assume that a new gas turbine was to built at Munmorah, but this was only assumed to be a 125 MW gas turbine, to be commissioned in 2008/09. The effect of this larger plant is more or less balanced out by the fact that it enters the system a year later than originally assumed.

There are reasons to expect that these data changes will not have a material impact on spot price forecasts and, as discussed below, the results support this expectation.

### *Estimated prices*

Frontier Economics has modelled spot prices to reflect the changes in market data since May 2007 and applied the same ‘drought’ modelling scenario used for the purposes of Frontier Economics May 2007 Report. That is, it is assumed that:

- Snowy produces at 80 per cent of long-term average and there is significantly more pumping in off-peak times;
- Dartmouth and Eildon power stations do not run at all.

In the modelling for the purposes of Frontier Economics’ May 2007 Report, Frontier Economics did not have Tarong fully available until mid 2008. For this first annual review, Tarong is assumed to be fully available, reflecting the Queensland Government announcement that water use restrictions on the power station have been lifted. This, of course, adds more capacity to the system and will tend to somewhat suppress prices.

In the event, Frontier Economics’ forecasts of market prices for 2008/09 and 2009/10, even after accounting for lingering drought impacts in the southern States, are not materially different from those incorporated in IPART’s Final Determination.

Figure 2 sets out a series of forward prices for baseload swap contracts based on Frontier Economics’ modelling, which are compared to forward prices from an independent source (d-cypha). The red lines represent Frontier Economics’ estimates of contract prices from the March 2007 Final Report, the May 2007 Report and this first annual review. The blue lines represent d-cypha forward prices considered for the purposes of the March 2007 Final Report and the May 2007 Report. The green line represents d-cypha forward prices from early March 2008.

As seen in Figure 2, following the Queensland Government’s surprise announcement in March 2007 that the output of two major base load power stations in the high load South-East Queensland region would be severely curtailed, forward electricity prices jumped sharply. Following this announcement, there were increases in both the d-cypha forward prices and Frontier Economics’ price estimate (with Frontier Economics price estimate reflecting the shortage of Queensland capacity and a reasonable representation of the drought conditions that were to prevail over the period to 2009/10, and accounting for projects that were underway to add new capacity to the system, including the development of a pipeline to deliver recycled water to Tarong and Swanbank). The d-cypha price at that time was on the outer edge of the distribution of Frontier Economics’ price forecasts (including a contract premium).

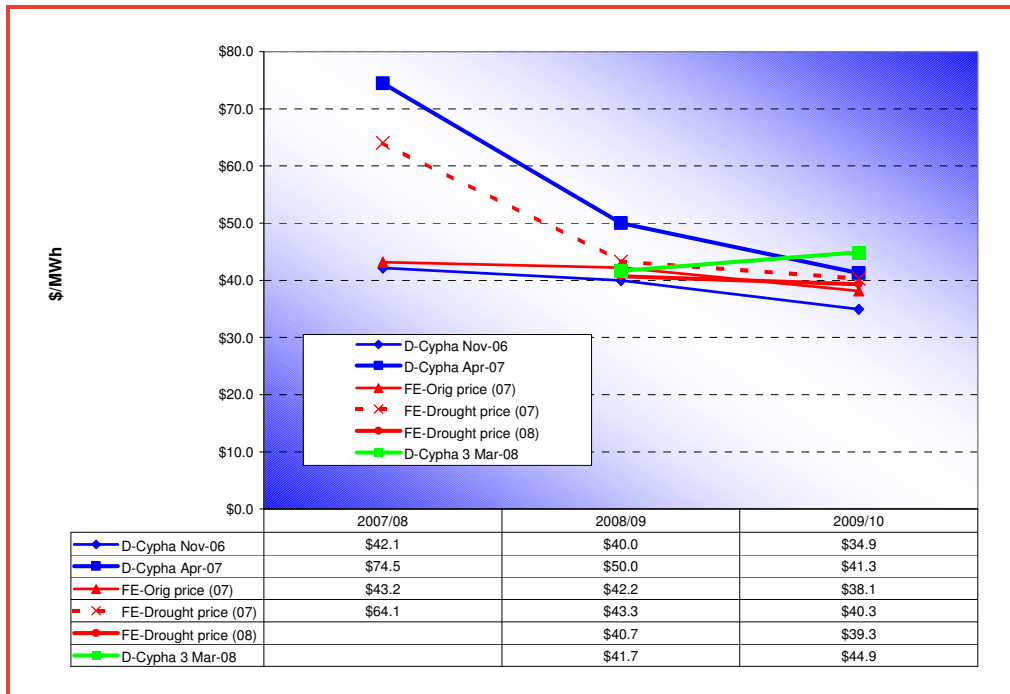


Figure 2: Average forward prices for baseload swaps (including contract premiums)

As seen in Figure 2, in March 2007 Frontier Economics forecast that the average baseload contract price for 2008/09 would be \$42.20/MWh (including contract premiums). The latest d-cypha prices indicate an average purchase cost of \$41.70/MWh for 2008/09, which is a difference of only around 1 per cent.

### 3.2.2 Contract prices

As indicated above, the energy cost allowance in IPART's Draft Determination was based on modelling conducted in November 2006. As noted in Frontier Economics' May 2007 Report, the Queensland Water Commission (QWC) placed material restrictions on the use of water by power stations in the production of electricity. This occurred at the same time that Snowy Hydro had been issuing public warnings in its monthly water situation reports that its water levels were low and declining<sup>11</sup> and on 29 March 2007 said that its water inflows were the lowest over the 105 years that records had been kept.<sup>12</sup> Other major hydro systems, such as the Southern Hydro facility in Victoria and Hydro Tasmania were (and continue to be) similarly affected by drought.

Forward wholesale electricity prices jumped soon after the announcement of the restrictions on the use of water by South-East Queensland generators, at approximately the same time that IPART published its Draft Determination.

<sup>11</sup> Snowy Hydro, Media Releases  
<http://www.snowyhydro.com.au/media.asp?pageID=53&parentID=3>

<sup>12</sup> Snowy Hydro (2007), *Snowy provides water security through worst drought*, 29 March,  
[http://www.snowyhydro.com.au/sysfiles/media//SnowyHydro\\_MR\\_136.pdf](http://www.snowyhydro.com.au/sysfiles/media//SnowyHydro_MR_136.pdf)

The change in forward prices, from November 2006 (when the modelling for Frontier Economics' March 2007 Final Report was undertaken) to those observed in April 2007 (when the modelling for Frontier Economics' May 2007 Report was undertaken), are presented in Figure 3 to Figure 6 for, respectively, base load swap, peak swaps, (implied) off-peak swaps and \$300 cap contracts. In all cases the forward prices increased by a substantial amount over the period from November 2006 to April 2007 and, in some cases, more than doubled. The size of those increases and speed with which they occurred were unprecedented in the NEM. Since April 2007 prices have fallen substantially. The most recent (3 March 2008) d-cypha prices for base load swap, peak swaps, (implied) off-peak swaps and \$300 cap contracts are also shown in these figures. These recent d-cypha prices are becoming more reflective of those posted in November 2006, particularly for 2008/09.

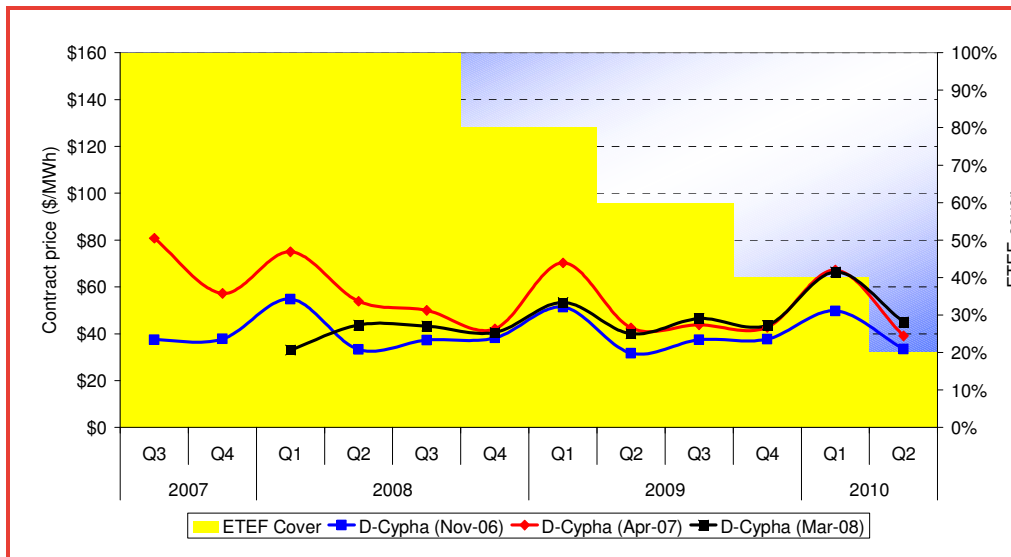


Figure 3: Base swap price changes

Source: d-cypha



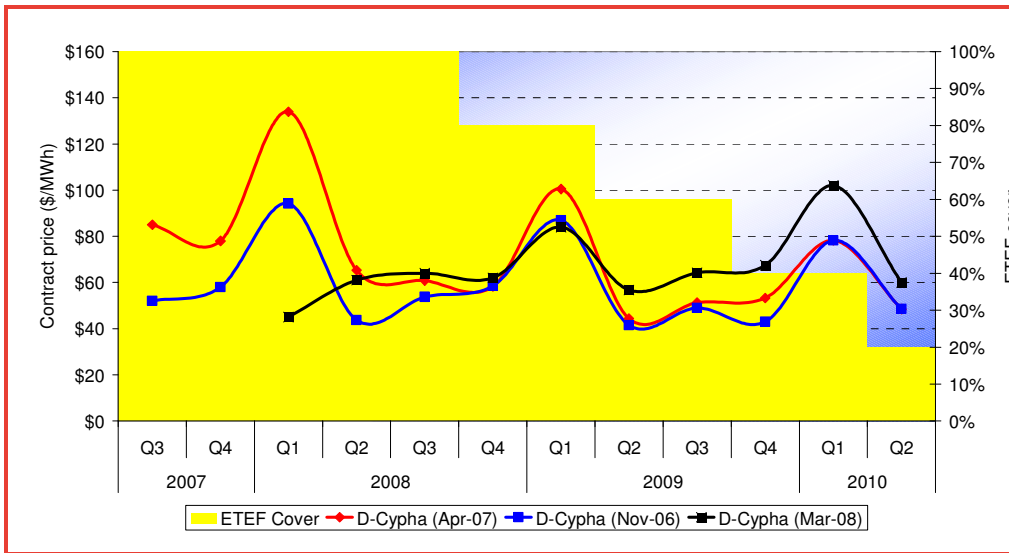


Figure 4: Peak swap price changes

Source: d-cypha

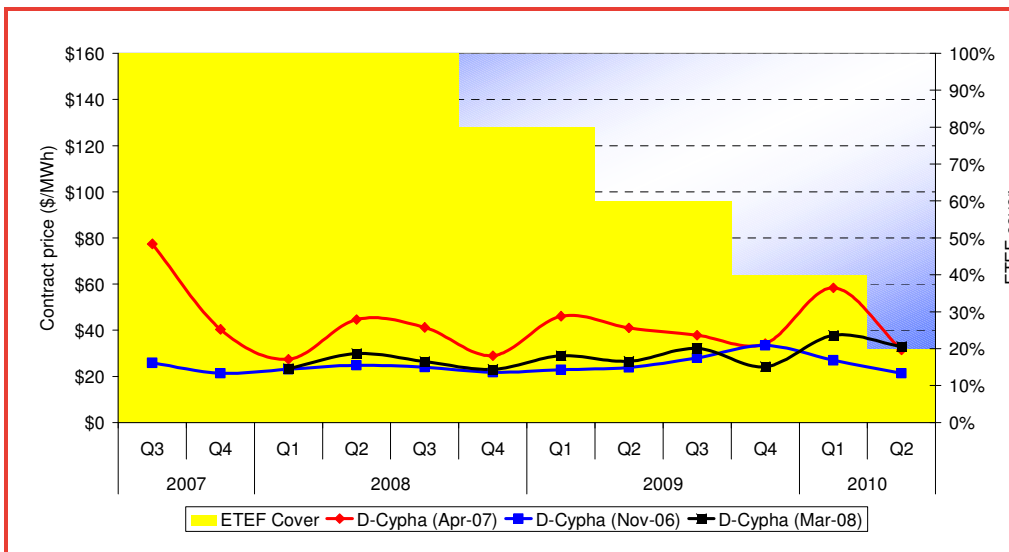


Figure 5: Implied off-peak swap price changes

Source: Frontier Economics estimate

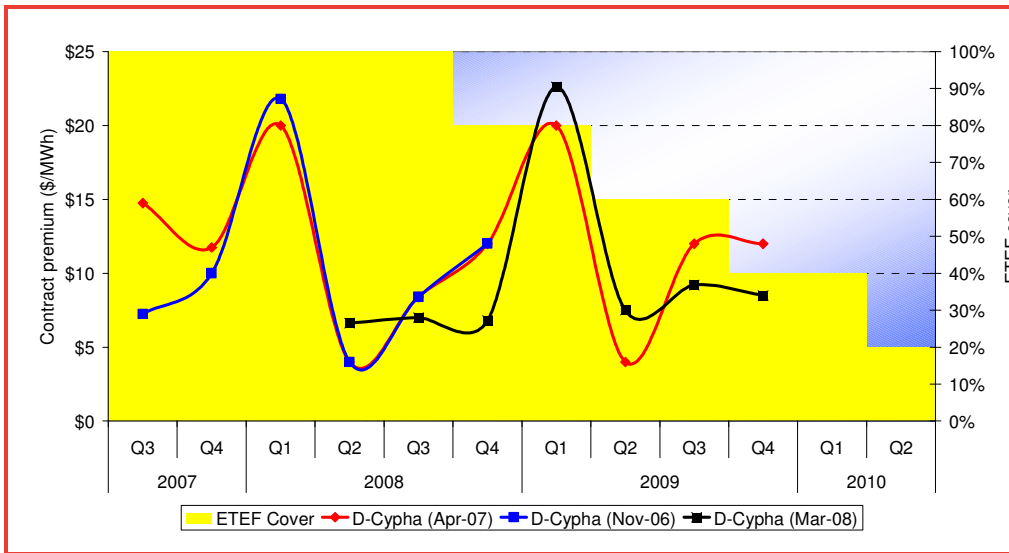


Figure 6: Peak cap price changes

Source: d-cypha

### 3.2.3 Efficient purchase costs

In this section, the efficient frontiers are presented for each of 2008/09 and 2009/10 for each standard retailer. Four efficient frontiers are calculated. The two blue lines reflect the estimated energy cost in 2008/09, with the thicker line representing the original estimate from Frontier Economics' March 2007 Final Report and the thinner line representing the current estimate of energy costs using updated NEM data as described above. The two red lines reflect the estimated energy cost in 2009/10, with the thicker red line representing the original estimate from Frontier Economics' March 2007 Final Report and the thinner red line representing the current estimate of energy costs using updated NEM data.

Each frontier has been truncated at the point where the standard deviation exceeds \$10/MWh to permit a closer view of the detail around the area of interest.

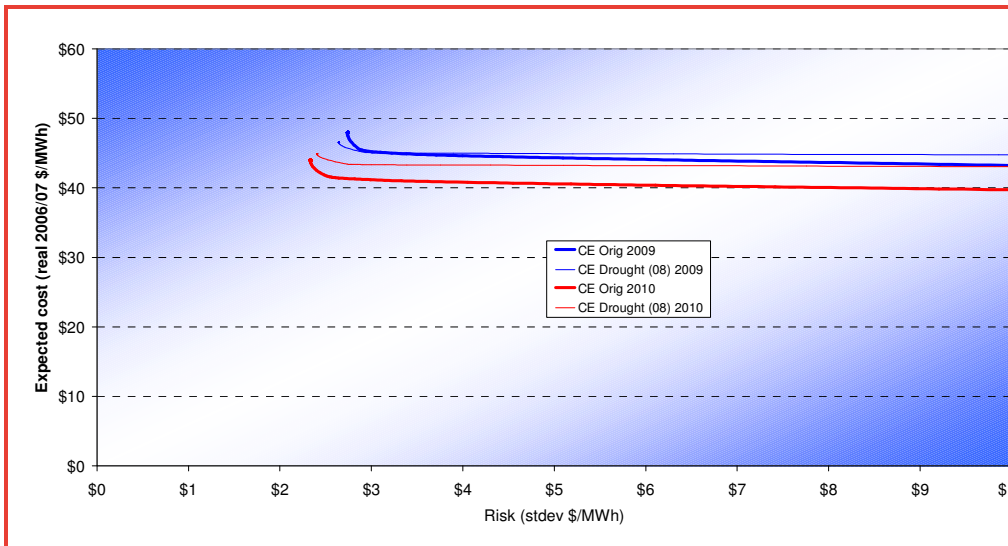


Figure 7: Country Energy efficient frontiers

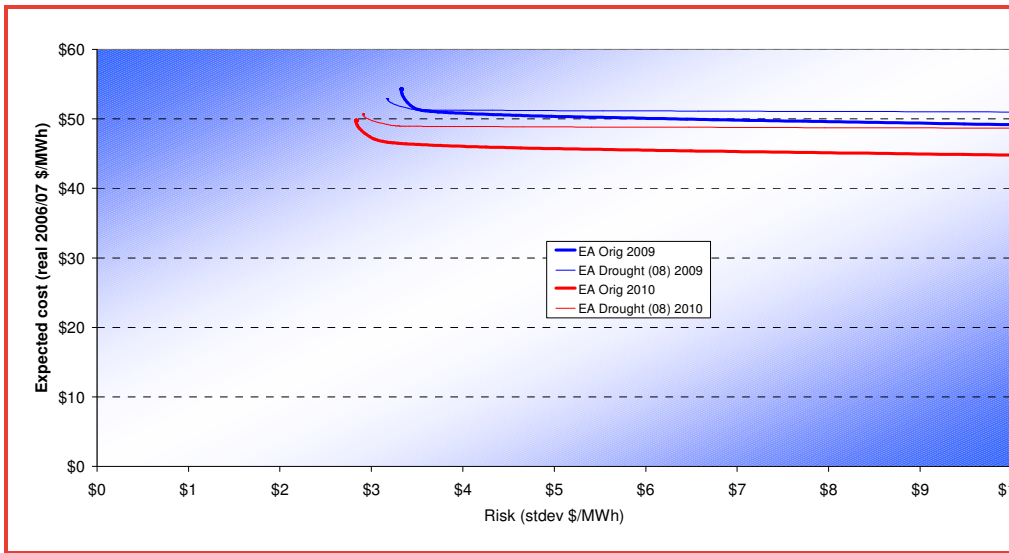


Figure 8: EnergyAustralia efficient frontiers

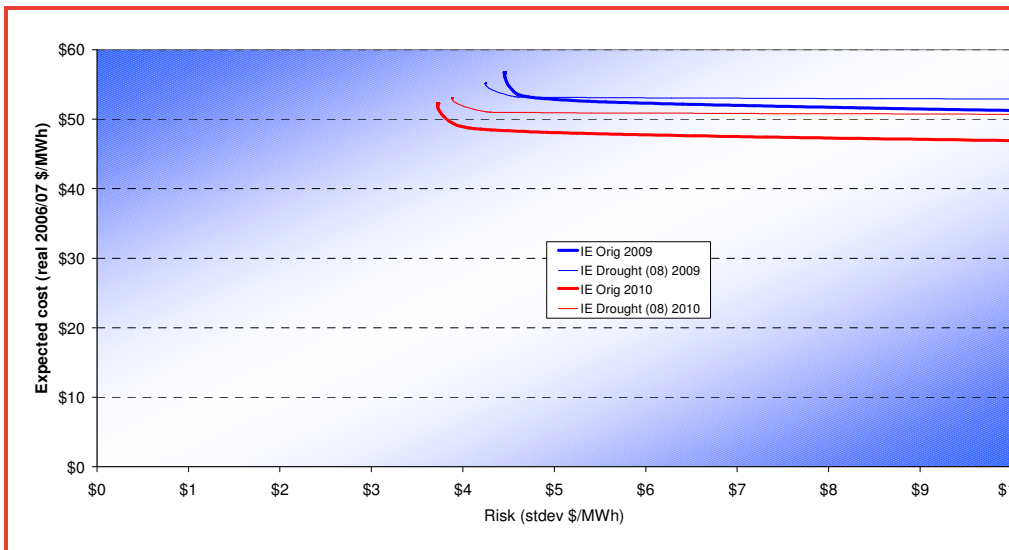


Figure 9: Integral Energy efficient frontiers

Taking the most conservative points on these efficient frontiers, as used in IPART's Final Determination, the estimated energy costs for 2008/09 and 2009/10 for each business are summarised in Figure 10. The blue bar in Figure 10 indicates the estimated annual energy cost allowance incorporated in IPART's Final Determination. The error bar at the top of the blue bar indicates the limits of the 10 per cent threshold for each business for each year. The yellow bar presents the revised energy cost allowances for each business for each year.

As can be seen in Figure 10, the yellow bar does not, at this stage, exceed the 10 per cent error bar in any year for any business. Indeed, the updated estimates show a slightly lower price for each business in 2008/09. This reflects the early return of Tarong to the system and a slightly lower peak demand compared to the original November 2006 estimate.

However, Frontier Economics currently expects a somewhat higher price in 2009/10 for all standard retailers, but not high enough to exceed the 10 per cent threshold.

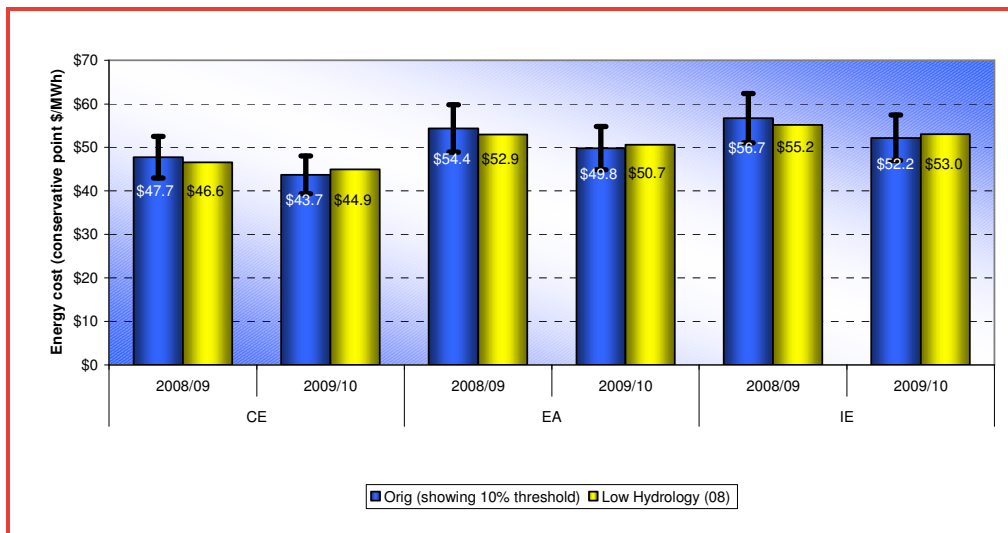


Figure 10: Summary of impact compared to IPART's Final Determination (\$2006/07)

It is worth commenting on Frontier Economics' estimated prices for 2009/10 compared to the d-cypha price for the same period, as summarised in Figure 2 and broken down in Figure 3 to Figure 6. Comparing the averages of the Frontier Economics' estimated prices and d-cypha presented in Figure 2 shows the d-cypha prices at a premium to Frontier Economics current market estimates. The premium of d-cypha prices over Frontier Economics' price estimates in 2009/10 is about 14 per cent.

Frontier Economics considers that there are good reasons, at this stage, to discount this value. First, this d-cypha price represents an open interest of just a

few hundred MW of trade<sup>13</sup> and therefore is unlikely to be representative of the underlying value of power in 2009/10. Second, the current price is likely to over-represent recent past prices, volatility and uncertainty, and deepening industry concerns about the nature of policies that influence power prices across the NEM. It is likely that if climate conditions become more stable and return to more normal (or even wetter conditions), the trend towards prices that reflect more normal levels of capacity scarcity will continue.

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<sup>13</sup> d-cypha <http://www.d-cyphatrade.com.au/>

## 4 Summary and conclusions

Based on Frontier Economics' modelling work, and the recent drop in d-cypha prices to levels seen prior to the introduction of water restrictions to Tarong North and Swanbank, Frontier Economics considers that the market-based electricity purchase cost allowance for 2008/09 should not differ by 10 per cent or more from the allowance incorporated in IPART's Final Determination.

Frontier Economics considers that, on balance, the original electricity purchase cost estimates are just as likely now as they were at the time they were prepared in November 2006. In any case, Frontier Economics notes that IPART will again look at these factors in early 2009 to assess whether conditions have changed sufficiently to alter IPART's view on energy purchase costs set out in the Final Determination. For these reasons, Frontier Economics would recommend that IPART not change the energy cost purchase allowance from that set out in the Final Determination.

THE FRONTIER ECONOMICS NETWORK

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