



Commission for Energy Regulation

An Coimisiún um Rialáil Fuinnimh

## **Best New Entrant Price 2007**

**A Decision and Response Paper  
By  
The Commission for Energy Regulation**

**CER/06/148  
1<sup>st</sup> August 2006**

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## **1. INTRODUCTION**

On 23<sup>rd</sup> June 2006, the Commission published its consultation paper, entitled “Best New Entrant Price 2007” (reference: CER/06/116).

This set out the Commission’s proposals with respect to the cost of a best new entrant (BNE) generator in the Irish market, as well as the methodology for calculating those costs and arriving at the BNE price to apply for 2007, i.e. the price at which a BNE would be expected to produce electricity.

In its consultation paper, the Commission invited comment on all aspects of the model for calculating the BNE price. The methodology for calculating the fuel cost of the BNE was identified as being a key issue and specific comment was invited on this.

The consultation closed on 11<sup>th</sup> July 2006. The Commission received a substantial response on this matter and thanks all respondents for their submissions.

The Commission has considered all of the responses received and has made appropriate changes to the BNE model. This paper sets out the Commission’s final decision on the BNE for 2007, describes the revised model for the BNE and sets the price for 2007. The paper concludes with a summary of the comments received and also details the Commission’s response to those comments (see Section 9).

## **2. BACKGROUND**

The then Minister for Public Enterprise issued a Policy Direction to the Commission on 27<sup>th</sup> July 1999. This Direction set out the principles for the electricity trading system to be put in place for the transitional period leading to full market opening in February 2005.

Statutory Instrument No. 49 of 2000<sup>1</sup> governs the operation of this market. This transitional regime will continue until the establishment of the Single Electricity Market (“SEM”).

A regime for the provision of ‘top-up’ and ‘spill’ was to be put in place allowing the independent sector to purchase power shortfalls from and sell power surpluses to ESB Power Generation when the independent sector’s production did not exactly match the aggregate demand of the customers of the independent sector.

The trading arrangements put in place in February 2000 allow the independent energy sector to purchase “top-up” from ESB Power Generation in sufficient quantity to provide adequate back-up supplies to the independent sector at prices that average out over the year to the estimated full cost of a best new entrant.

The Commission has defined a Best New Entrant power plant (“BNE”) in terms of plant type, output, investment and operating costs. These parameters are used to quantify monies to be paid by independent operators to ESB for the provision of ‘top-up’ electricity.

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<sup>1</sup> Electricity Regulation Act 1999 (Trading Arrangements in Electricity) Regulations, 2000

It is the opinion of the Commission that an annual review of the BNE price is appropriate to account for current and expected economic conditions. However, in exceptional circumstances, such as arise when fuel prices change significantly, the Commission may undertake intermediate reviews where it deems it appropriate.

For each year that the present transitional market arrangements are in place, the Commission presents its proposed model of the BNE which derives the price to be applied from January of the subsequent year. The BNE price must be determined by 1<sup>st</sup> August 2006 for the purposes of the Public Service Obligation Levy Decision for 2007.

### **3. DECISION ON BNE PRICE 2007**

The configuration and size of the BNE is assumed to be a gas fired CCGT employing a single shaft, “1+1” configuration with an output of 401 MW<sup>2</sup>. Investment and operating costs have been estimated for a BNE of this configuration.

Overall, the methodology for the derivation of the 2006 BNE price has been employed for the calculation of the BNE price for 2007 with the exception of gas costs, where no hedging has been assumed for the 2007 model, and instead a forward price used.

As referred to in the Commission’s consultation paper, the Commission’s decision on the BNE price for 2007 is influenced by the scheduled introduction of the Single Electricity Market (SEM) in 2007. The BNE mechanism, as set out under the Ministerial Policy Direction, will apply only for the period that the current electricity market arrangements operate in 2007 (i.e. the period up to the introduction of the SEM). The SEM had been scheduled for introduction from 1<sup>st</sup> July 2007. However, it was announced on 29<sup>th</sup> July 2006 that consideration was being given to a delay of up to nine months in the implementation of SEM.

The timing of the introduction of the SEM would have implications for the calculation of the BNE as, should the BNE operate on a half year basis (as opposed to a full year basis), it may be considered appropriate that the gas price for the BNE (and hence, the gas cost) would be treated differently than if the BNE were to apply for the full year 2007. In light of the consideration of a delay of up to nine months in the introduction of the SEM, and given that a decision on BNE is required on 1<sup>st</sup> August, the Commission has determined the gas price and gas cost inputs for the 2007 BNE model on the basis of a full year.

Gas and carbon prices are key inputs into the BNE model, accounting for just over 80% of the final BNE price calculation. On 19<sup>th</sup> July 2006, the decision on those components of the BNE model was announced on [www.cer.ie](http://www.cer.ie). It was stated that the average forward prices for each would be used, as quoted over the period 19<sup>th</sup> to 31<sup>st</sup> July 2006.

The Commission has also revised other inputs for the BNE model 2007 further to the consideration of comments from respondents to the consultation and more up-to-date information being available concerning certain elements of the model.

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<sup>2</sup> The Commission is aware that other options in terms of the model to use for a BNE plant are available. This matter is addressed in Section 6.2.

In summary, the combined changes contribute to a BNE price for 2007 of €86.40/MWh, compared to a BNE price for 2006 of €66.10/MWh and the Commission's consultation on the BNE price for 2007 of €85.75/MWh. This is an increase of 30.7% on the 2006 BNE price. This increase on the 2006 BNE price is driven primarily by an increase in forward gas prices.

This paper now sets out the Commission's decision on the BNE model for 2007, specifically:

1. Key economic and financial parameters (price base, cost of capital);
2. Investment cost estimate (site procurement and up-front investment costs);
3. Non-fuel operation costs (operation, maintenance, Use of System costs, etc.);
4. Operational Performance parameters (efficiency, outage rates, fuel price, carbon price, etc.);

The paper concludes by presenting the overall model for the 2007 BNE and the price to apply for 2007.

## **4. ECONOMIC AND FINANCIAL PARAMETERS**

### **4.1. PRICE BASE**

Current price (nominal price) is a term used to define costs and benefits and includes the effect of general price inflation. Constant Price (real price) refers to a value from which the overall effect of general price inflation has been removed. Using constant prices ensures that the future costs and benefits are estimated in the same units as the cost and benefits measured at the time the decisions to invest in the project are made. The BNE price is calculated using constant price.

### **4.2. COST OF CAPITAL**

The rate of return earned by a new entrant must be sufficient to cover the risk of entering the Irish generation market. The Commission has decided to continue using the weighted average cost of capital (WACC) formula as the basis for calculating this rate of return and considers that the WACC figure of 7.83% is appropriate for the 2007 BNE Price.

This rate is higher than the 7.38% used in the consultation paper, mainly because of the Commission revising the debt risk premium from 1.5% to 2% to reflect an increase over the past year in the debt premium on investment grade corporate debt (see Table 1). Furthermore, the Commission has revised the nominal risk free rate from 5.43% to 5.53% to reflect the most recent data on 10 year benchmark Euro area government bonds.

**Table 1: Weighted Average Cost of Capital**

	<i>Description</i>	<i>Value</i>	<i>Calculation</i>
		%	
	<b>Cost of Debt</b>		
A	Nominal risk free rate	5.53	
B	Debt risk premium	2.0	
C	Inflation	2.6	
D	Real cost of debt ( $r_d$ )	4.86	$B + ((1+A)/(1+C) - 1)$
	<b>Cost of Equity</b>		
E	Nominal risk free rate	5.53	
F	Inflation	2.6	
G	Real risk free rate	2.86	$(1+A)/(1+C) - 1$
H	Equity risk premium	5.5	
I	Expected market rate of return	8.36	$G + H$
J	Equity beta	1.83	
K	Post-tax cost of equity	12.92	$G+H \times J$
L	Tax rate	12.50	
M	Pre-tax cost of equity ( $r_c$ )	14.77	$K/ (1-L)$
	<b>WACC</b>		
N	Gearing (g)	70	
			<i>For methodology, see 2002 BNE Decision paper, section 2.2.1</i>
O	$WACC = g \times r_d + (1 - g) \times r_c$	7.83	$N \times D + (1-N) \times M$

#### 4.3. PLANT LIFE

The 2006 BNE price was based on a plant life of 15 years. The Commission has not changed its view on the lifetime of a plant from an investor's perspective.

#### 4.4. TREATMENT OF PRICE, CURRENCY , INFLATION AND OTHER INPUTS

With respect to inputs to the BNE model which fluctuate on an on-going basis (such as the gas price, exchange rate and the price of carbon), the Commission announced on [www.cer.ie](http://www.cer.ie) on 19<sup>th</sup> July 2006 that, for its decision on the BNE price, it would use the following:

- The Heren index forward market gas price for 2007 (full year) as the basis for determining the gas price input in the BNE model. The average of that forward gas price as calculated from the market prices over the period 19<sup>th</sup> July 2006 to 31<sup>st</sup> July 2006 inclusive would be the input for the BNE price 2007;
- The same basis as above to be applied for the determination of the carbon price (the basis of which will be the forward carbon price for 2007 (source: Bloomberg).

The Commission stated that should there be any anomalous or extenuating circumstances which affect the above prices, resulting in significant fluctuations in the prices over the period for the price calculation (within +/- 15% of the prices as quoted on 18<sup>th</sup> July 2006), it may consider an alternative calculation methodology for the gas and carbon inputs. Given that the prices have remained relatively stable and within the tolerance range set by the Commission, the gas and carbon prices have been inputted to the BNE model in accordance with the methodology as set out above.

With respect to the inclusion of a forward currency rate, the Commission stated that it would use the average over the period 19<sup>th</sup> July to 31<sup>st</sup> July 2006 (inclusive) of the daily average of the 5 month and year-end 2007 forward sterling/euro rates as quoted on Bloomberg. This has been determined as being 1.4443 (Sterling-Euro).

The Commission has used the connection and network Use of System charges for electricity) as they apply at the present time (i.e. the 2006 charges). For gas network Use of System charges, the Commission has revised its model to reflect the changes in the Commission's proposed decision on the relevant charges for 2007, as announced by the Commission on 21<sup>st</sup> July 2006 (reference: CER/06/130 and CER/06/128).

The Commission has used a figure of 2.6% for the forecast increase in the Consumer Price Index ("CPI") in 2007, as reported in the ESRI Spring 2006 Quarterly Report. While the Commission is aware that the ESRI has recently published its Summer 2006 Quarterly forecasts, the Commission has decided to use the forecast figure of 2.6% from the ESRI's Spring 2006 forecasts to maintain consistency with the forecast inflation rate being used elsewhere, e.g., for the purposes of setting network tariffs for 2007.

## **5. INVESTMENT COST ESTIMATE**

### **5.1. INTRODUCTION**

In the 2006 BNE calculations, the Commission reviewed different plant configurations and decided that a configuration based on a single shaft CCGT was the appropriate BNE as it appeared to represent the most efficient plant option. The Commission has decided that this plant should continue to be adopted in the calculation of the 2007 BNE on the basis that the gas CCGT plant remains the most appropriate plant for the BNE model, given that it has high availability, a low construction time and cost, low emissions and overall low operating costs<sup>3</sup>.

Furthermore, the fact that the proposed large new entrants into the Irish thermal generation market in the immediate to medium term are understood to be gas CCGT plants, the Commission is of the opinion that the use of a gas CCGT plant for the BNE model continues to be appropriate, rather than coal<sup>4</sup>.

Based on an assessment of plant of this type available in the market, the Commission has decided that the net power output (new) should be increased from 395MW as used in BNE 2006 to 401MW.

The estimate of investment costs for this 401MW (net power output new) single shaft 1 + 1 CCGT plant<sup>5</sup>, built in Ireland, is €273.471 million (compared to the BNE 2006 figure of €260.850 million and the consultation paper figure of €269.989). The make-up of this investment cost estimate is set out in Table 2 and described below. The Commission considers this price reasonable in light of plant prices internationally in recent years.

### **5.2. BREAKDOWN IN INVESTMENT COSTS**

Investment costs can be subdivided between:

- site procurement costs;
- pre-financial close costs;
- post-financial close costs (including the cost of interconnection, Engineering, Procurement and Construction (EPC) costs); and,
- other costs.

The estimated cost of each of these is discussed below. Investment costs are based on the cost of a plant located in the south-west region (see next section).

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<sup>3</sup> The Commission invited specific comment on the choice of plant for the BNE model in its consultation on the 2006 BNE and set out its decision and response to comments in its decision paper (see CER/05/088 and CER/05/110).

<sup>4</sup> See Commission's Direction on Gate 2 Connection Offers published 16<sup>th</sup> June 2006 (CER/06/112)

<sup>5</sup> See Section 6 which details the Output and Performance of the proposed BNE plant

### **5.3. SITE PROCUREMENT**

For the 2006 BNE model, the Commission decided that the most appropriate location for a best new entrant plant is the south-west of Ireland, which was in accordance with the Transmission System Operator's Forecast Statement 2004-2010<sup>6</sup> (which indicates that the best opportunity for the connection of new generation exists in the south-west).

As the Transmission System Operator's Forecast Statement 2005-2011 presents a similar view, the Commission remains of this view that the BNE plant should be located in the south-west.

The estimate of the cost of purchasing a suitable site has been increased in line with inflation to €7.182 million.

### **5.4. PRE-FINANCIAL CLOSE COSTS**

The estimate for pre-financial close costs amounts to a total of €10.951 million, derived by applying an inflationary increase of 2.6% to the 2006 figure of €10.672 million.

### **5.5. EPC CONTRACT PRICE**

The estimated cost of the EPC contract is based on the plant configuration discussed previously and budget quotations from EPC contractors with knowledge of both these machines and construction in Ireland.

The estimated cost of the EPC contract price, including contingency, for a combined cycle plant with this configuration is €202.135 million, which represents an increase on the 2006 figure (which was €196.953 million).

This price includes:

- gas turbine, steam turbine and electrical generator on common shaft;
- heat recovery steam generator;
- air-cooling system;
- mechanical auxiliary equipment including dual fuel capability;
- electrical auxiliary and control equipment (including generator step-up transformer and HV line terminal equipment);
- ancillary facilities (office, stores, etc);
- civil works.

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<sup>6</sup> Transmission System Operator's "Forecast Statement 2005-2011" (published on [www.eirgrid.com](http://www.eirgrid.com)) presents a study into the optimal location for new plant on the transmission network.

## **5.6. CONNECTION TO ELECTRICAL TRANSMISSION SYSTEM**

The Commission has not changed its assumption that the BNE would be connected to an existing ESB 220 kV substation.

The assumptions made with respect to the costs associated with the electrical connection are:

- The capital cost of a shallow connection between the plant and the grid;
- Two sets of switchgear and a 2 km single circuit will connect the power station to the grid;
- BNE would pay 'Use of System' ("UoS") charges for the use of the grid;
- the step-up generator transformer is included in the EPC contract as part of the BNE plant.

The capital cost estimate for the grid connection, based on a 220 kV single circuit line, 2 km in length, as discussed above is €2.338 million.

## **5.7. GAS CONNECTION**

It is assumed that the BNE plant would be located reasonably close to the gas transmission system. An allowance of €4.893 million is included to cover the cost of connecting to the system. The proposed 2007 gas transmission UoS charges are included in the gas price.

## **5.8. OTHER COSTS**

There is a range of miscellaneous costs that would be incurred which have been included under this heading. Estimates calculated as percentages of the value of the EPC contract have been used, based on historical data and experience.

The methodology for calculating the level of "other costs" is the same as that adopted in the calculation of the 2006 BNE and the consultation paper (i.e. cost as a percentage of the total EPC figure).

Further to comments received during the consultation, the Commission has decided to include an additional cost item to the BNE Model 2007. The Commission has estimated a cost of €3m in the capital expenditure of the BNE relating to trading losses during construction. The Commission calculated this by considering the reduced efficiency of a plant during commissioning and the average of the differential between the day ahead gas cost and the out-turn spill price over the period January 2005 to May 2006.

## **5.9. OWNER'S ENGINEERING COSTS**

An allowance is made for project management, engineering and insurance from financial closure to commissioning of the plant. A value of 3% of the EPC contract price is used, equivalent to €6.064 million.

**5.10. SPARE PARTS**

In addition to the above base price, allowance has been made for a reasonable amount of spares, which would be expected to be kept on site to ensure the efficient operation of the station within a competitive market environment. These have been valued at 2.5% of the EPC contract price, amounting to €5.053 million.

**5.11. PRE-OPERATION O&M COSTS**

The up-front cost of O&M mobilisation is estimated to be in the region of 2% of the EPC contract price, €4.043 million.

**5.12. CONTINGENCY**

Contingency of 5% of the EPC contract price has been included, amounting to €10.107 million.

**5.13. INTEREST DURING CONSTRUCTION**

Interest during construction has been calculated based on a 2.5-year construction period and a Weighted Average Cost of Capital of 7.83%. This amounts to €24.936 million. It is assumed that a disbursement schedule of 30%, 30%, 30% and 10% in the years  $Y_{C-3}$ ,  $Y_{C-2}$ ,  $Y_{C-1}$  and  $Y_C$  will apply (where  $Y_C$  is the year of commissioning).

**5.14. TOTAL INVESTMENT COST**

Based on the above, and as shown in Table 2, the investment cost estimate for the BNE generating plant is €273.471 million, compared to a figure of €260.850 million for 2006 and €268.989 in the consultation paper.

**TABLE 2      INVESTMENT COST ESTIMATE FOR 'BEST NEW ENTRANT'  
SINGLE SHAFT CCGT 401 MW POWER STATION  
(€ '000s)**

<b><u>Site procurement</u></b>	<b>7,182</b>
<b><u>Pre financial close costs</u></b>	
Project developer's cost	6,641
EIA	349
Engineering	629
Financial and legal costs	3,332
<b>Total</b>	<b>10,951</b>
<b><u>Post financial close costs</u></b>	
<b><u>E.P.C. Contract</u></b>	
Plant	159,060
Civil Works	15,429
Engineering	11,134
Contingency	9,281
<b><u>Interconnections</u></b>	
Electrical interconnection	2,338
Gas interconnection	4,893
<b>Total</b>	<b>202,135</b>
<b><u>Other costs</u></b>	
Owner engineering, project management	6,064
O&M mobilization	4,043
Contingencies	10,107
Spares	5,053
Cost of IDC	24,936
<b>Total</b>	<b>50,203</b>
Trading Losses during Construction	3,000
<b><u>TOTAL INVESTMENT COST</u></b>	<b>273,471</b>
<b><u>Exported MW</u></b>	<b>389</b>
Total investment cost per MW exported	703

## **6. NON-FUEL OPERATION COSTS**

### **6.1. OPERATION AND MAINTENANCE**

The cost basis for operation and maintenance expenditure remain unchanged. The costs for a CCGT plant typically include the following expenditure:

- salaries and owner's maintenance costs;
- insurance;
- rates;
- owner's general and administration costs;
- use of system charges;
- servicing agreement costs for major items of the plant.

### **6.2. SALARIES AND OWNER'S MAINTENANCE COSTS**

Salaries and owner's maintenance cost includes the following items: staff wages and social costs; and other fixed cost comprising: minor service contracts for balance of plant items; routine maintenance; and plant tools & equipment. The total annual cost is estimated to be €4.725m p.a. (estimated- Salaries of €3.15 million and other costs of €1.575 million).

### **6.3. INSURANCE**

Insurance costs are estimated to be €3.125 million (which is consistent with the 2006 BNE model and the consultation paper) and reflects the stabilisation in the risk profile of power plants as observed by global insurance markets and insurance costs prevailing for similar power plants.

### **6.4. RATES**

The estimate for Rates has been increased in line with inflation to €3.163 million per year.

### **6.5. OWNER'S GENERAL AND ADMINISTRATION COSTS**

Owner's general and administration costs have been increased in line with inflation and are estimated to be €0.858 million per year.

### **6.6. TRANSMISSION CHARGES**

ESB National Grid (ESBNG), the business unit within ESB responsible for the Transmission System Operator function, provides access to the transmission system. ESBNG levies two distinct charges, the Transmission System Maintenance Charge and the Use of System charge.

**6.7. TRANSMISSION SYSTEM MAINTENANCE CHARGE**

The maintenance charge is based on the principle that individual users connecting to the transmission system should pay for maintenance of the shallow connection assets.

The annual maintenance charge is estimated to be approximately €47,000 (2% of connection assets).

**6.8. TRANSMISSION USE OF SYSTEM CHARGE**

Under Section 35 of the Electricity Regulation Act, 1999, the Commission is required to approve the ESB statements of charges for use of the transmission and distribution systems.

Generation users should pay locational Use of System charges depending on the relative costs imposed on the system.

For a BNE plant that is located in the south-west and connected to the transmission system at 220kV, an indicative annual TUoS charge is approximately €1,968 million.

**6.9. SERVICE AGREEMENTS**

It would be normal for the BNE owner to enter into a long-term service agreement to cover the Gas Turbine. The cost of such an agreement is estimated to be €5.643 million per annum.

## **7. OPERATIONAL PERFORMANCE**

### **7.1. OUTPUT AND EFFICIENCY**

'As new' output and efficiency is the starting point: they will be based on specified ambient conditions and clean heat transfer surfaces. In practice, the long-term expectation of both output and efficiency will be lower.

### **7.2. OUTPUT**

Based on what is currently available in the market, the calculated 'as-new' net power output of this type of unit ranges between 389MW and 402MW, depending on the choice of manufacturer. For the purposes of BNE 2007, the net power output value has been raised from 395MW to 401MW, which is consistent with products offered in the market.

For a given turbine inlet temperature, the output of gas turbine plant is known to be degraded with age, owing to the formation of deposits on compressor and turbine blades, blade wear, and general leakage. Some of the performance can be recovered by measures such as blade cleaning, but there tends to be a progressive deterioration. Degradation also occurs in boiler and steam turbine plant so that the combined cycle as a whole suffers a long-term fall off in performance.

The rate of deterioration depends on many variables but ambient conditions and the type of fuel are major factors. Natural gas is recognised as being a clean fuel and has the least detrimental effect.

It is not realistic to suppose that the rate of deterioration can be predicted accurately.

A major overhaul aims to return the GT to an 'as-new' condition but in practice, this is generally not the case due to cylinder distortion, increased leakage paths, increased surface roughness to cylinder, disc and blade surfaces caused by changes in flow path resulting from erosion or rust deposits. Typically, for industrial GTs, a recovery of about 99% of the 'as-new' condition is more likely.

For a CCGT, we assume an output degradation factor of approximately 0.97. Accordingly, we take the long-term net output of the BNE plant to be  $(0.97 \times 401) = 388.97\text{MW}$ .

### **7.3. EFFICIENCY**

Account has to be taken of the fact that, once in operation, a unit will not always run at full load nor will conditions always be test conditions, nor will heat exchanger surfaces stay perfectly clean. Accordingly, long-term average efficiency values are lower than the test values, owing to the 'operations factor'. The value to be assumed for the operations factor is a matter of judgement, backed up perhaps by statistical evidence.

The Commission has determined that this year the 'as-new' net efficiency shall be 55.9% which is considered to be consistent with the present-day performance of an F-technology CCGT using an air-cooled condenser. This is higher than the assumed value for BNE 2006 which was 55.2%.

For a CCGT plant, we believe a reasonable plant efficiency degradation factor to be 0.98. Thus, we employ a 'lifetime' mean operational efficiency of  $(0.98 \times 55.9\%) = 54.7\%$  net. This reflects efficiency rates being currently quoted by leading manufacturers.

**7.4. PLANNED OUTAGE RATE**

As is consistent with previous years, we estimate annual planned outages for maintenance for this type of technology and configuration and for base load operation at 16 days. The Commission believes that this reflects current practice adopted by generators operating in a competitive market environment.

**7.5. FORCED OUTAGE RATE**

As in the 2006 BNE calculation, we expect a combined cycle plant of the technology and configuration adopted to have a mature forced outage rate ("FOR") of approximately 4% per annum.

**7.6. CAPACITY FACTOR**

As in the 2006 BNE calculation, we have assumed 99% as a reasonable utilisation factor.

As mentioned above, we estimate an average annual maintenance duration of 16 days and a long-term FOR of 4 %. Hence, we calculate the plant availability factor to be 91.79%.

**7.7. FUEL PRICE**

The Commission continues to take the view that the most realistic way to source a gas supply of the large magnitude required by a BNE plant is via the UK market.

A reasonable indicator of UK gas prices for 2007 is the forward market.

As stated in Section 4.4, the Commission has decided to use the Heren index forward market gas price for 2007 (full year) as the basis for determining the gas price input in the BNE model. The Commission decided that the average of that forward gas price as calculated from the market prices over the period 19<sup>th</sup> July 2006 to 31<sup>st</sup> July 2006 inclusive would be the input for the BNE price 2007.

Below is the Commission's derivation of the gas price on the basis set out above:

	19/07	20/07	21/07	24/07	25/07	26/07	27/07	28/07	31/07	AVE
Gas p/therm	61.65	61.875	61.35	61.05	60.925	60.90	61.20	61.225	60.475	<b>61.18</b>

The Commission has also revised the model to include a notional 1.5% premium on the gas price to account for both shrinkage and the transaction costs of gas purchasing.

On that basis, the total delivered cost of gas used for the calculation of the 2007 BNE price, including transportation charges, using this methodology is €c97.77/therm.

## **7.8. CO<sub>2</sub> EMISSIONS**

Following the introduction of the Carbon Trading arrangements from January 2005, and as was the case for the 2005 and 2006 models, the Commission has included the cost of procurement of Carbon Credits in the 2007 BNE price calculation.

Generators have been allocated free approximately 73.7% of their requirements in the draft Irish National Allocation Plan (NAP), on an annual basis.

As stated in Section 4.4, the Commission has decided to use the forward market carbon price for 2007 (full year) as the basis for determining the carbon price input in the BNE model. The Commission stated that the average of that forward price as calculated from the market prices (quoted on Bloomberg) over the period 19<sup>th</sup> July 2006 to 31<sup>st</sup> July 2006 inclusive would be the input for the BNE price 2007;

Below is the Commission's derivation of the carbon price on the basis set out above:

	<b>19/07</b>	<b>20/07</b>	<b>21/07</b>	<b>24/07</b>	<b>25/07</b>	<b>26/07</b>	<b>27/07</b>	<b>28/07</b>	<b>31/07</b>	<b>AVE</b>
<b>Carbon €/tonne CO<sub>2</sub></b>	17.1	17.4	17.2	17.2	16.8	16.9	17.2	16.7	16.65	<b>17.02</b>

The generation cost of carbon, being that amount of carbon which needs to be purchased, is €c0.17/kWh.

## 8. 2007 BEST NEW ENTRANT PRICE

The Commission has decided that, based on an analysis of the latest data, the BNE price for 2007 is € 0.0864/kWh or €86.40/MWh. The costs are summarised in Table 3 below.

The following are the key points in relation to the calculation of the BNE for 2007:

- Based on the Generation Adequacy Report 2006-2012 and the Forecast Statement 2006-2012, as published by the Transmission System Operator, the Commission believes that the BNE should be located in the south-west of Ireland. This is consistent with the previous year's methodology and impacts on the Use of System charges for the BNE model.
- The Commission maintained investment costs to reflect the present and anticipated market situation with respect to gas turbine plant and Irish construction costs.
- The Commission is aware that, given the prevailing fuel price in the market, the choice of a gas CCGT plant for BNE may not, at this time, be the most economic model for a new plant and that a coal plant might be the most economic model to use. As stated previously, given the uncertainty of this trend in gas prices over the lifetime of a BNE plant investment and the fact that the proposed new entrants into the Irish thermal generation market in the immediate to medium term will be gas CCGT, the Commission is of the opinion that the use of a gas CCGT plant for the BNE model continues to be appropriate.
- In its consultation, the Commission had proposed a figure of €85.75/MWh based on the full gas year methodology (Methodology B as presented in the consultation paper).

The Commission revised its model in light of the comments received. The majority of the costs remained unchanged..

**Table 3: BNE Component Summary**

<u>Costs</u>		<u>BNE 2007</u>
<u>Annualised capital cost</u>		
Capex	€ '000	273,471
Plant life	years	15
WACC	% p.a.	7.83%
<b>Annualised cost</b>	<b>€ '000</b>	<b>31,619</b>
<u>Fixed costs</u>		
LTSA	€ '000	5,643
Salaries and owner's maintenance costs	€ '000	4,725
Transmission charges		
Annual use-of-system charge	€ '000	1,968

Maintenance charge	€ '000	47
Owner's general and admin costs	€ '000	858
Insurance cost	€ '000	3,125
Rates cost	€ '000	<u>3,163</u>
<b>Total</b>		<b>19,529</b>
<u>Capital plus fixed costs</u>	€ '000	51,147
Generation output	GWh	3,096
Unit cost of generation	c/kWh	1.65
<u>Variable costs</u>		
Variable O&M cost	c/kWh	0.05
Fuel cost	c/kWh	6.76
Carbon dioxide cost	c/kWh	<u>0.17</u>
		6.98
BNE price	c/kWh	8.64
<b>BNE price</b>	<b>€/MWh</b>	<b>86.40</b>

As can be seen from Table 3 above, the BNE price for 2007 (at the gate or exported) is **€86.40/MWh**.

## 9. SUMMARY OF COMMENTS RECEIVED AND COMMISSION'S RESPONSE

The Commission received seven responses to its consultation on the BNE 2007. Comments were received from a variety of parties including industry participants, consumers/consumer representative bodies and other interested parties.

Below, the relevant comments from respondents have been summarised and the Commission's response provided (the Commission's response appears in italics).

### **Gas and Carbon Price Inputs**

1. Several respondents commented that the methodology for determining the gas and carbon price inputs into the BNE model. These are summarised below:
  - The BNE should use the gas price as determined by calculating the average value of forward prices over a quoted range of dates in the future. Otherwise, a volatility premium should be applied. These methodologies were suggested in order to facilitate hedging on a quoted spot forward price (as seen in the options market);
  - It was suggested that the Commission should ensure adequate prior warning is given to market participants to allow them to hedge gas, whilst still allowing the tariffs to be set on a specific BNE price;
  - The gas price should be consulted on further when it is clear what new timetable for BNE and the SEM is;
  - One respondent requested that the Commission should consider alternatives to calculating gas costs in 2007, balancing the futures price against that of the likely outturn price and based on the likely stabilisation of oil prices;
  - The gas price calculation describes a the methodology for gas price used as being a market opportunity price for a BNE rather than a true cost of gas that would be achievable for a BNE;
  - Comments on the determination on the carbon price suggested it should be calculated on the same basis as that suggested for the gas price determination (the average value of forward prices over a quoted range of dates in the future);
  - One respondent suggested that the same methodology as last year be employed (historic forward hedging prices).

*The Commission considered the above comments and agreed that it would be appropriate to modify the methodology for determination of the gas price and carbon price inputs into the BNE model for 2007. The Commission announced on 19<sup>th</sup> July that it would take the average of the daily quoted prices for the forward market (2007) for gas and carbon over the period 19<sup>th</sup> July to 31<sup>st</sup> July 2007.*

*The Commission considered the above to be an appropriate change such that it could facilitate market participants with respect to their hedging of gas for 2007. The Commission is of the view that the stated methodology is the best estimate of the gas costs achievable by a BNE for 2007 at the point at which the BNE decision has to be taken (i.e. five months ahead of January 2007).*

*This methodology used in the decision was considered more appropriate than the alternative methodologies suggested (addition of a volatility premium to the market price or repeating last year's methodology based on historic forward prices).*

2. The following comments were received on other issues relating to the calculation of the gas cost in BNE:
  - Shrinkage should be included in fuel cost, as delivered gas price in RoI also includes shrinkage costs imposed by BGE;
  - Every therm traded across the NBP in RoI incurs a handling fee charged by traders in UK and this should be accounted for in the price.

*The Commission has revised the model to include a notional 1.5% premium on NBP gas price to account for both shrinkage and transaction costs of gas purchase.*

### **Treatment of Carbon**

3. Several respondents commented on the treatment of carbon in the BNE model. These are summarised below:
  - The full cost of carbon should be passed through. In a fully competitive market the full costs of CO<sub>2</sub> emissions are passed through. In determining a partial pass through of CO<sub>2</sub> emissions for the BNE the CER are implicitly distorting the market;
  - While there is a New Entrant Set-Aside for those installations that are due to commence operation before 31st December 2007, there is no guarantee that a new entrant will receive 73.7% of their requirements for free;
  - It is also important to align with other markets prior to the implementation on SEM to ensure efficient use of interconnection and also prevent distortion of the market. Failure to align with international markets would potentially give arbitrage opportunities to export electricity from Ireland and threaten security of supply;

*The Commission is of the view that the BNE price is a calculation of the costs facing a best new entrant plant. It therefore considers only the cost of carbon in the operation of a best new entrant plant and does not consider the "economic opportunity cost" of free carbon credits in its calculations. The 73.7% figure for the allocation of carbon is considered reasonable and is consistent with previous years.*

4. One respondent requested details of calculation for conversion of CO<sub>2</sub> price per tonne to price per MWh as used in the BNE Model.

*The following is the calculation contained in the BNE 2007:*

- *The cost of carbon (€/tonne) is converted to a carbon cost of generation (€/MWh) assuming the carbon (C) content of natural gas is 1501 grams per therm, equivalent to 0.0055 tonnes of CO<sub>2</sub> per therm;*
- *The lifetime net plant heat rate is 7299 kJ per kWh (HHV) which yields a specific CO<sub>2</sub> production of 0.38 tonnes per MWh generated;*

- *The cost of carbon credits is assumed to be €17.02 per tonne but the BNE receives 73.7% free allocation of credits meaning that it is only charged the shortfall of 26.3%. The overall carbon cost of generation is therefore €1.7/MWh.*

## **Connection and Use of System Charges**

5. A number of responses commented on the gas use of system charges.

*The BNE Price has been calculated on the basis of the tariff charges outlined in document CER/06/130*

6. The Gas Connection costs (Section 4.7 of the paper) of €4.893m are low. Following the recent change in BGE connection charging policy, all future power generators will be required to pay the shallow costs for their AGI / pipeline connections (as opposed to the past system under which these costs were recovered under the STA). As a result, the BNE should now include an amount of €6 - 7m at least to cover this, even for locations very close the gas transmission network.

*The BNE Price has always included 100% of the above ground installation costs of a new gas pipeline connection. In this regard, the BNE Price is not affected by BGE's change in connection policy. The Commission believes that the estimate used in its model, as presented in this paper, is appropriate for setting BNE Price 2007.*

7. Based on 2006 TUoS charges for a Generator in the South West, should be substantially higher. What is the basis for the €1,968,000 quoted in the paper? It is suggested that the average of the Aghada and Tarbert TUoS charges uplifted by CPI should be used – this would represent a more realistic value.

*Zonal transmission charges prevail in Ireland at the present time. In an extract from the TSO Forecast Statement 2005-2011 (page 64), it is noted that "...the Incremental Transfer Capabilities (ITC) for Clashavoon, Cullenagh and Knockraha indicate that between 250 MW and 400 MW of generation can be accommodated at these stations without the need for additional reinforcements to the grid." In this regard, the BNE Price has adopted the simple arithmetic average of the indicative tariffs for Clashavoon, Cullenagh and Knockraha (EUR4.9112/kW p.a.) which is equivalent to €409/MW per month or €1.968 million per year.*

8. The shallow connection cost for connection of €2,338,000 to the 220kv system is unrealistically low. The shallow electrical connection costs for a BNE plant seem to presume that the BNE plant in question is built on an existing site (and therefore has access to cheap and ready connections) which is not realistic. This figure needs revising by an order of magnitude of at least three times the figure quoted in the paper.

*The Commission set a precedent in the BNE Price 2000 by assuming the plant was located reasonably close to an existing 220kV transmission line. In this, the eighth and final revision, the Commission believes its original assumption is valid and should be used for setting the BNE Price 2007.*

*The Commission believes that the current estimate of €2.338 million for transmission plant and equipment (2km of single circuit OHL and two sets of switchgear) is appropriate for setting the BNE Price 2007.*

### **Financial and Operational Aspects of BNE**

9. The BNE consultation paper used the CPI from the ESRI Quarter 1 2006 Report. It was commented that the CPI from the ESRI Quarter 2 2006 Report should be used (published 25<sup>th</sup> July 2006).

*The Commission has used the ESRI Quarter 1 2006 Report as presented in its consultation paper. The Commission has utilised this figure as it is consistent with the 2007 inflation rate which has been used in the Commission's revenue review exercises, which are currently underway.*

10. The Risk Free rate has increased from 4.6% to 5.4% while the debt risk premium has remained at 1.5% resulting in an increase in the real cost of debt from 3.88% to 4.26% year on year. The debt risk premium should be higher due to the uncertainty a sponsor would see in the market as the perceived risks associated with recovering the costs of a CCGT have increased.

*The Commission accepts this point. There is evidence that the debt risk premium on investment grade corporate debt has risen, by about 50 basis points, over the past year. The Commission has therefore decided to increase the debt risk premium in the calculation of the WACC to 2 percentage points. The Commission has also revised the nominal risk free rate (from 5.43% to 5.53%) to reflect current market rates. These changes increase the WACC from 7.38% in the Consultation paper to 7.83%.*

11. After project initiation in the first year of construction the largest payments are in year 2 (Y c-2) when the lion's share of the main plant arrives on site and has to be paid for. Interest payments are therefore highest in the second year of construction and consequently less in the two years preceding commissioning. Thus the disbursement schedule should be 30%, 50%, 15% and 5% in the years Y c-3, Y c-2, Y c-1 and Y c (where Y c is the year of commissioning).

*Payment terms form part of the contract negotiations between a developer and EPC contractor - the disbursement schedule will vary from plant to plant. The Commission set a precedent [30%, 30%, 30% and 10% in the years Y c-3, Y c-2, Y c-1 and Y c] in its approach to calculating BNE Price 2001. In this, the eighth and final revision, the Commission believes the existing estimate of disbursements is still appropriate for the purposes of calculating the BNE Price.*

12. 15 year return period is too short. It does not reflect the operational capacity of the plant

*The Commission believes a 15 year payback period is appropriate. While the plant may last longer than that from an operational point of view, debt and equity investors will want to ensure that they recover the costs of their*

*investment over a shorter period. Fifteen years is considered to be a reasonable length of time.*

13. In today's business climate, industry is continually seeking to reduce business costs in order to remain competitive'. Why is this not the case for power plants

*The Commission believes that the power generation equipment market in Europe is a competitive one and that the prices being used here to determine a Best New Entrant cost reflect those competitively determined prices.*

14. A CCGT must sell to a supply company. The cost of secondary top-up means the optimal position is to have peak load that matches peak output capacity of the plant. Even if the BNE plant's customers were in the larger I&C category; customer load factors would only reach 80%. At market gas prices it is generally not worthwhile spilling. The volume of primary top up is restricted so that it essentially covers forced and scheduled outages only. It is proposed that the utilisation factor is adjusted to 80%.

*The Commission set a precedent in calculating the BNE Price 2003 by introducing a capacity factor assumption, i.e. "...as the minimum grid load demand, particularly in summer, can drop below 2,500 MW, it is possible that output from large-scale units will be restricted because of grid stability considerations. We have therefore assumed 99% as a reasonable utilisation factor." In essence, this acknowledged that there maybe limited periods of time when the output from a baseload CCGT plant would be constrained by system operational issues. The suggested value of 80% is driven by commercial issues that are not congruent to the rationale of the BNE price calculation.*

15. Recent rises in Copper and Iron prices have resulted in an increase in generator and transformer costs. There should be a resultant uplift in the EPC price to reflect the underlying increase in materials costs. The equipment market has hardened since last year. This could have an impact of up to 5% on EPC costs.

*The Commission's technical advisor has reviewed prevailing prices for CCGT plant and has taken account of recent market trends.*

16. What is the basis for an annual planned outage of 16 days as quoted in the consultation paper? An annual planned outage of 18 days better reflects the full planned maintenance outage program for a CCGT in order to include the "balance of plant" items.

*The Commission set a precedent in calculating the BNE Price 2000 by assuming 16 days per year for planned maintenance. The actual number of outage days per year required for routine maintenance on a CCGT unit will vary depending on its relative position in the maintenance cycle. The minimum amount of time required will average about 16 days per year when it is expressed as an annual average calculated over the six-year maintenance cycle period. Although some project developers and lenders would insist on a more conservative planned outages value, it is the Commission's view that the current assumption for BNE 2007 need not be revised.*

17. No provision is allowed for the trading losses that occur during the commissioning of the plant. During that time the plant is normally operated in a sub optimal condition (part load, non-normal plant configuration) for a considerable period of time. It is normal and prudent not to sell electricity on a commercial basis due to the potential for penal top up charges. It has been a feature of the Irish market for commissioning generators that the payments from spill do not cover the costs of gas commodity and fixed transportation costs. These costs could be in €5-10m over the commissioning period.

*The Commission has considered the above point and has included an additional cost of €3m in the capital expenditure of the BNE. The Commission calculated this by considering the reduced efficiency of a plant during commissioning and the average of the differential between the day ahead gas cost and the out-turn spill price over the period January 2005 to May 2006. On this basis, a figure of €3m was considered appropriate.*

18. The Commission should produce the profile of the BNE price (Top-up) at the same time as the BNE. This allows the price to reflect the underlying gas price, resulting in a BNE profiled price which reflects the gas prices in each month. Top-up prices should reflect seasonal variation in gas prices to align the two alternatives into one.

*The BNE price is used in a number of ways, one of which is to set the ex ante time-weighted top-up price. A decision on how to profile that ex ante price will be taken at a later date, when the profile of the price at which ESB PG sells to ESB PES is decided.*

19. The Commission should endeavour to reduce the proposed increase in BNE.

*It is the Commission's objective to set a BNE price that represents the least cost addition to generating capacity in current circumstances. To achieve that objective, it uses the best available estimates of the various elements that combine to make up the levelised cost of a best new entrant.*