Single Electricity Market Committee

Directed Contracts – 2011/2012 Quantification and Pricing

Decision Paper

17 June 2011

SEM-11-045

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1. INTRODUCTION

Background

Since 1st November 2007 the Northern Ireland Authority for Utility Regulation (Utility Regulator) and the Commission for Energy Regulation (CER), together referred to as the Regulatory Authorities or RAs, have jointly regulated the all-Island wholesale electricity market known as the Single Electricity Market (SEM) covering both Northern Ireland and the Republic of Ireland. Further details on the project can be found on the AIP website at www.allislandproject.org.

The SEM includes a centralised gross pool (or spot) market which, given its mandatory nature for generators (above 10 MW) and suppliers, is fully liquid. In this pool electricity is bought and sold through a market clearing mechanism, whereby generators bid in their Short Run Marginal Cost (SRMC) and receive the System Marginal Price (SMP) for each trading period for their scheduled market quantities, as well as other revenue streams. Suppliers purchasing energy from the pool pay the SMP for each trading period along with other costs.

Risk Management is an integral element of the efficient and effective operation of the SEM. To date there have been offerings of 2-way Contracts for Differences (CfDs) which have enabled generators and suppliers to manage and hedge the wholesale price - i.e. SMP - risk inherent in the SEM. CfDs assist both wholesale and retail competition to the ultimate benefit of final customers. This is because the ability of generators and suppliers to enter into and access contracts enhances the financial certainty, flexibility and innovation of participants in both the wholesale and retail markets.

Directed Contracts (DCs) are CfDs which are imposed by the RAs on the incumbent generators - ESB PG and NIE Energy PPB - if they have a certain level of market power in the SEM. This is part of the RAs' Market Power Mitigation Strategy. As they are "directed", it is the RAs who decide on the methodology, pricing and quantity of these DCs. The intent of DCs is effectively to reduce the amount of generation that those incumbents who are subject to DCs will be receiving spot-based prices from through the SEM. This means they have a reduced incentive to submit commercial bids into the SEM above competitive levels, or otherwise withhold capacity, in order to influence spot prices or future contract price, hence mitigating their market power.

Further details on RAs' Market Power Mitigation Strategy and on DCs, including methodologies (which were consulted and decided on in previous years) for the determination of DC quantities, prices and eligibilities, are available at SEM-10-057 at the following link:

http://www.allislandproject.org/GetAttachment.aspx?id=e83a335f-8366-416c-a6fe-96a0d54b1721

Directed Contracts for Next Tariff Year

Details on the implementation of DC process for the forthcoming tariff year, October 2011 to end September 2012, were published by the RAs on 13th April in SEM-11-017 (following earlier consultation). This also included information on the DC modelling and methodology.

This was followed up with further detail on the DC timelines in an RA paper published on 1st June in SEM-11-027, linked below.

http://www.allislandproject.org/en/market_decision_documents.aspx?article=151a9561-cef9-47f2-9f48-21f6c62cef34

SEM-11-027 included a timeline around the DC process, with one of the key milestones being that, in the week starting 13th June, the RAs would publish a paper on the DC quantities and prices, and inform relevant suppliers of DC eligibilities. Accordingly, this decision paper from the SEM Committee[1] reports on the results of the RAs' work on the quantities and prices of the DCs, with a term from 1st October 2011 to 30th September 2012.

As detailed in SEM-11-027, the DC Primary Subscription Window is from Monday 27th June to Monday 11th July inclusive (i.e. 11 working days). The DC Supplemental Subscription Window is from Monday 18th to Friday 22nd July inclusive (i.e. 5 working days).

[1] The SEM Committee is established in Ireland and Northern Ireland by virtue of section 8A of the Electricity Regulation Act 1999 as inserted by section 4 of the Electricity Regulation (Amendment) Act 2007, and Article 6 (1) of the Electricity (Single Wholesale Market) (Northern Ireland) Order 2007 respectively. The SEM Committee is a Committee of both CER and NIAUR (together the Regulatory Authorities) that, on behalf of the Regulatory Authorities, takes any decision as to the exercise of a relevant function of CER or NIAUR in relation to a SEM matter.

2. SUMMARY OF DC IMPLEMENTATION RESULTS

There are three elements to the RAs' work on the implementation of DCs. These are the quantification of the DCs required to mitigate market power in the SEM, the pricing of DCs, and the eligibility of suppliers in the SEM to subscribe to DCs. The relevant results are summarised below followed by some more detail in the following section.

- **Quantity of DCs**

For the purpose of determining DC quantities, a HHI (Herfindahl-Hirschman Index) level of 1,150 was considered appropriate for the first year of the SEM and this continues to be applied by the RAs for the next tariff year. At this HHI level only ESB Power Generation (ESB PG) will be required to sell DCs. As with the current tariff year, NIE Energy PPB is not required to offer DCs at this HHI level for the 2011/2012 contracting year. The quantities of DCs which ESB PG will be required to make available to eligible suppliers during the subscription windows are shown below.

	ESB PG		
	Directed Contract Quantities		
Quarter	**Baseload Quantity (MW)**	**Mid-Merit Quantity (MW)**	**Peak Quantity (MW)**
Q4 2011	209	104	36
Q1 2012	154	73	0
Q2 2012	119	99	n/a
Q3 2012	0	154	n/a

- **Pricing of DCs**

The prices of DCs will be determined each day during the DC subscription period using the regression formulae as determined by the RAs through econometric analysis. The constants and coefficients of the pricing formulae are presented in the table below.

The regression formulae for the calculation of the DC strike prices take the following form:

$$DCStrike_{q,p} = \alpha_{q,p} + \beta_{q,p} * NG_q + \delta_{q,p} * CL_q + \varepsilon_{q,p} * C_q$$

The regression constants and coefficients are shown in the table below.

			Coefficients		
			Multiply Gas coefficient by euro/therm Gas price and all other coefficients by euro/tonne fuel or euro/tonne C02 price.		
Contract (p)	**Quarter (q)**	**Constant ($\alpha_{p,q}$)**	**Gas ($\beta_{p,q}$)**	**Coal ($\delta_{p,q}$)**	**CO2 ($\varepsilon_{p,q}$)**
Baseload	Q4 '11	10.58	63.88	0.0815	0.4331
Mid-Merit	Q4 '11	10.85	70.8	0.1042	0.4791
Peak	Q4 '11	42.37	56.98	0.1846	0.4745
Baseload	Q1 '12	6.56	59.84	0.1187	0.5020
Mid-Merit	Q1 '12	7.63	65.37	0.1319	0.5263
Peak	Q1 '12	23.80	54.88	0.2648	0.5325
Baseload	Q2 '12	9.83	52.61	0.1190	0.6379
Mid-Merit	Q2 '12	11.56	54.81	0.1368	0.7180
Baseload	Q3 '12	10.29	53.93	0.1027	0.6229
Mid-Merit	Q3 '12	10.82	55.9	0.1359	0.7410

- **Supplier Eligibility**

Using supplier Maximum Import Capacity (MIC) data and historical energy and load shape for each customer type, the RAs have calculated the MW eligibility for each type of DC for each supplier for each of the DCs being offered by ESB PG, given that particular supplier's MVA of MIC for each customer class. Suppliers' MICs may be monitored by the RAs to ensure that suppliers are not opportunistically putting load back onto the incumbent suppliers, NIE Energy and ESB Electric Ireland, on a seasonal basis to profit from DCs.

Supplier eligibility for DCs will be communicated from the RAs to each relevant supplier and to the seller (ESB PG) separately.

3. DIRECTED CONTRACT QUANTITIES

DCs will be offered in quarterly segments for the period 1st October 2011 to 30th September 2012. There are three DC products in the market: Baseload, Mid-Merit and Peak. Suppliers can elect to subscribe for any given product in any particular quarter from ESB PG. The definitions of the products are set out in the Master Agreement. These are as follows:

- Baseload Product: For Trading Periods at the Contract Quantity arising in all hours.
- Mid-merit Product: For Trading Periods at the Contract Quantity during the hours beginning at 07:00 and ending at 23:00 on Business Days and for Trading Periods on days that are not Business Days at 80% of the Contract Quantity.
- Peak: For Trading Periods arising during the hours beginning at 17:00 and ending at 21:00 on all days during, October, November, December, January, February and March at the Contract Quantity.

As previously, the RAs used the Herfindahl Hirschman Index (HHI) to set DC quantities and have continued to use a target HHI level of 1,150 for the 2011/2012 contract year.

This HHI level is an input into the Concentration Model which is used by the RAs to determine the DC allocations to ESB PG and NIE Energy PPB for each product, by reducing monthly HHI levels to the target of 1,150. The Concentration Model used by the RAs calculates the quantity of DCs that ESB PG and NIE Energy PPB will be required to make available to eligible supplier to reach the 1,150 threshold.

A validated PLEXOS model was required before the Concentration Model could be used. DC quantities were determined, using the HHI threshold for 3 different generation market segments of baseload, mid-merit and peaking, with each examined by quarter in the tariff year. The process worked as follows:

- The RAs input fuel data into a validated PLEXOS model to give a forecast of half-hourly SMPs and Wind/Hydro Generation. For each half hour the “Market Concentration” is calculated. Only potentially competitive capacity is counted, defined as capacity with cost less than or equal to 1.05*SMP - essentially each generator’s market share is based on the generator’s running which in turn is based on whether it is within the 1.05*SMP threshold.

- Based on this the HHI is determined for the market to determine its concentration, divided into baseload, mid-merit and peaking by quarter.

- If the HHI exceeds the HHI threshold level of 1,150 for these segments, the incumbent with the largest baseload market share in that month (ESB PG or NIE Energy PPB) is allocated 1% of said share as a DC quantity. This is repeated, with allocated DC quantities not contributing to the HHI, until the monthly baseload HHI is below the 1,150 threshold level.

Resulting from this process, the DC quantities for ESB PG for the next contract year are set out below. As with last year, NIE Energy PPB’s market share does not warrant the offering of DCs.

	ESB PG		
	Directed Contract Quantities		
Quarter	**Baseload Quantity (MW)**	**Mid-Merit Quantity (MW)**	**Peak Quantity (MW)**
Q4 2011	209	104	36
Q1 2012	154	73	0
Q2 2012	119	99	n/a
Q3 2012	0	154	n/a

4. DIRECTED CONTRACT PRICING

The prices of DCs are determined by regression formulae that express the DC strike price in a given quarter and for a given product (Baseload, Mid-Merit or Peak) as a function of forward fuel and carbon prices. The dependent variable in the regression formulae is the DC strike price; the independent variables are forward fuel and carbon prices.

Base prices of DCs were derived from the validated market simulation model, PLEXOS, by taking the average of 50 PLEXOS runs, each based on different forced outage schedules. Forward or future fuel and carbon prices on 6 June 2011 were used. PLEXOS was then run over 145 times using an historically realistic range of fuel and carbon price combinations to derive a range of prices for the three products (Baseload, Mid-Merit and Peak). These SMPs were then regressed on the range of input fuel and carbon prices to derive a regression equation for each product and each quarter using an econometric pricing model, which measures the effects of changes in fuel prices on SMP. The pricing formulae will consequently estimate the relationship between fuel and carbon prices on the one hand and electricity prices in the SEM on the other and essentially provides a derived estimate of the SMPs PLEXOS would produce if run each day throughout the subscription window.

The DC seller, ESB PG, will apply the approved published fuel and carbon indices to the regression formulae each day throughout the subscription window and notify suppliers who have elected to subscribe for DC products on that day of the calculated strike price. ESB PG contracts will be priced in euro.

It should be noted that if, between the publication date of the pricing formulae and a time at which it is applied during the subscription period, forward fuel or carbon markets move to a point outside the range of values for which there is sufficient confidence in the pricing formulae, the Regulatory Authorities reserve the right to suspend subscription and rerun the econometric pricing model or otherwise to amend the determination of the DC strike prices to correct any mispricing. The rerun would be done using the prevailing forward fuel and carbon prices as inputs. In this case, the resulting formulae would replace the original formulae and would be used to establish DC strike prices thereafter. The formulae may also be rerun if there is significant change to plant availability. The subscription window would reopen once the formulae have been revised.

The Directed Contract regression formulae take the following form:

$$DCStrike_{q,p} = \alpha_{q,p} + \beta_{q,p} * NG_q + \delta_{q,p} * CL_q + \varepsilon_{q,p} * C_q$$

where:

$DCStrike_{q,p}$ = Directed Contract Strike Price (in €/MWh) for the relevant quarter (q) and product (p), i.e., baseload, mid-merit and peak.

$\alpha_{q,p}$ = formula constant, which may vary by quarter (q) and product (p).

$\beta_{q,p}$, $\delta_{q,p}$, and $\varepsilon_{q,p}$ = formula coefficients, which may vary by quarter (q) and product (p).

NG_q = the price (in pence sterling per therm) for quarterly Intercontinental Exchange Natural Gas Futures for the relevant quarter, as published on www.theice.com as the "Daily Volumes for ICE UK Natural Gas Futures (Quarters)" ÷ (GBP/EURO Exchange Rate) / 100.

CL_q = the price (in US dollars per metric tonne) for quarterly Forward Coal API2 swap transactions, as reported by Argus Coal Daily International ÷ USD/EURO Exchange Rate.

C_q = the settle price (in Euro per tonne of Carbon Dioxide) for the December month Intercontinental Exchange ECX EUA Carbon futures as reported on www.theice.com as "ICE ECX EUA Futures (monthly)" for the given calendar year. This data is available under the report section of this website once the following options are selected – Category "End of Day Report"; Market – "ICE Futures Europe"; Report – "ICE Futures Europe". The December price for a given year will apply to all quarters falling within that year.

The values of the constants and the independent variable coefficients are set out in the table below.

			Coefficients		
			Multiply Gas coefficient by euro/therm Gas price and all other coefficients by euro/tonne fuel or euro/tonne C02 price.		
Contract (p)	**Quarter (q)**	**Constant ($\alpha_{p,q}$)**	**Gas ($\beta_{p,q}$)**	**Coal ($\delta_{p,q}$)**	**CO2 ($\varepsilon_{p,q}$)**
Baseload	Q4 '11	10.58	63.88	0.0815	0.4331
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Worked Example of Price for Q1 2012:

The following example uses hypothetical fuel and carbon prices to illustrate the calculation of DC strike prices given the relevant regression formulae.

Given the following spot exchange rates and Q1 2012 fuel and carbon prices:

Fuel and Carbon Prices		
Gas	75	GBP pence /therm
Coal	130.00	USD per tonne
CO_2	17.00	Euro/tonne
Exchange Rates		
USD/EURO	1.4292	
GBP/EURO	0.8797	

And converting the fuel to Euro using spot exchange rates (e.g. Gas: 75/100 ÷ 0.8797) results in the following Euro prices:

Conversion of Fuel Prices to Euro		
Gas	0.8526	Euro/therm
Coal	90.96	Euro per tonne
CO_2	17.00	Euro/tonne

The contract strike prices for the Baseload, Mid-merit and Peak products in Quarter 1 2012 are calculated as follows:

- Baseload Q1 ’12 Strike Price = €76.91
- Mid-Merit Q1 ’12 Strike Price = €84.31
- Peak Q1 ’12 Strike Price = €103.73

The following tables show DC prices using actual fuel, carbon and exchange rate inputs as reported for 15 June 2011 in euro.

Sample ESB PG Directed Contract Prices			
Quarter	Baseload Price (€/MWh)	Mid-Merit Price (€/MWh)	Peak Price (€/MWh)
Q4 2011	76.15	84.76	112.34
Q1 2012	77.04	84.46	103.88
Q2 2012	71.91	78.32	
Q3 2012	71.48	78.56	

Please note that in reality, the DC seller, ESB PG, will apply the approved published fuel and carbon indices to the regression formulae each day throughout the subscription window.