Single Electricity Market Committee

Directed Contracts – Q4 2012 to Q3 2013 Quantification and Pricing for Initial "Front Loaded" Auction

Decision Paper

25th June 2012

SEM-12-048

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1. INTRODUCTION

1.1. 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 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.

1.2 Initial "Front Loaded" DC Auction

This paper provides information related to the quantity and pricing of DCs for the period Q4 2012 to Q3 2013, for the initial "front loaded" DC auction. This follows the publication on 19th April of a SEM Committee[1] decision paper (SEM-12-026) committing to a new rolling quarterly approach to the offering of DCs, which applies from this October.

[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 RAs) that, on behalf of the RAs, takes any decision as to the exercise of a relevant function of CER or NIAUR in relation to an SEM matter.

Under this new system, which was broadly favoured by respondents to the consultation, the DC subscription windows will be held every quarter, with DCs being allocated on a rolling basis up to 5 quarters ahead and pricing and supplier eligibilities also updated quarterly. Please see SEM-12-026 for further information, at the following link:

http://www.allislandproject.org/GetAttachment.aspx?id=2a24bf50-64b5-469c-81b1-841701b63bfc

In line with the new approach to DCs, this paper provides information related to the quantity and pricing of DCs for the period Q4 2012 to Q3 2013, for the initial "front loaded" DC auction, following recent modelling by the RAs using PLEXOS software.

The initial dates front loaded" DC Primary Subscription Window, as detailed in SEM-12-026, have been re-scheduled slightly as per the RAs information note[2] on 21st June. The primary DC subscription window was scheduled to run from Monday 25th June to Friday 6th July. This will now take place a few days later, over the period Thursday 28th June to Wednesday 11th July inclusive (i.e. 10 working days). The supplemental subscription window will then be held from Tuesday 17th to Thursday 19th July inclusive (i.e. 3 working days).

Information on subsequent DC auction quantities and prices will be published by the RAs in line with the timelines provided in SEM-12-026.

1.3 Future Review of IC Flows

For the determination of the DC volumes, the EWIC, like the Moyle interconnector, is assumed to be importing, i.e. is assumed to be 100% "competitive capacity". This is in line with the approved methodology always used in previous years for DCs. Modelling indicates that with EWIC and Moyle there is a predicted import over 70% of the time during 2012/13, though of course the out-turn depends on GB fuel prices and participant behaviour.

However, it would be timely to investigate reviewing the "100% competitive capacity assumption" for IC flows and DC volumes and the appropriate flexibility of ICs assumed in Plexos for the purpose of determining DC prices. Hence the RAs plan to publish a consultation paper this Summer on how interconnectors should be treated in future modelling for the purpose of DCs. Any resulting change would not apply retrospectively to DCs.

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[2] http://www.allislandproject.org/en/market_decision_documents.aspx?article=0180d6b1-6ee3-4f8f-9a9b-57e66968be07

2. SUMMARY OF DC RESULTS FOR INITIAL AUCTION

There are three elements to the RAs' work on the implementation of DCs. These are the quantification and pricing of the DCs required to mitigate market power in the SEM, and the eligibility of suppliers in the SEM to subscribe to DCs.

The relevant results for the initial "front-loaded" DC auction are summarised below, following recent modelling by the RAs using PLEXOS software. More detail on the quantities and pricing is provided in the following sections of this paper.

Information on subsequent DC auction quantities and prices will be published by the RAs in line with the timelines provided in SEM-12-026.

2.1 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 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 period to Q3 2013.

Please note that in calculating the HHI, unlike in previous years, the horizontal integration of ESB's PG and other ESB generation businesses from this October was assumed by the RAs, as this was allowed by the SEM Committee in its SEM-12-002[3] decision paper.

The DC quantities from ESB for the Q4 2012 to Q3 2013 period are as below, for the forthcoming initial "front loaded" DC auction only. This is because, as referred to in section 1.2, a new rolling quarterly approach is being adopted to DCs, and so only a portion of DCs for the entire Q4 '12 to Q3 '13 period are being allocated in the forthcoming auction (the remaining portions will be re-estimated and allocated in subsequent auctions).

DCs from ESB in Initial Front Loaded Auction

QUARTER	BASELOAD	MIDMERIT	PEAK
Q4 2012	247	0	165
Q1 2013	172	0	0
Q2 2013	160	0	N/A
Q3 2013	100	39	N/A

[3] Please see the following link: http://www.allislandproject.org/GetAttachment.aspx?id=fd2b05ff-b0ee-443d-87db-01b1ac4fe27a

2.2 Pricing of DCs

The price of DCs for Q4 2012 to Q3 2013 in the initial "front loaded" DC auction will be determined each day during the subscription windows from 28th June to 19th July, using the regression formulae determined by the RAs through econometric analysis and PLEXOS. 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:

$$DCStrike_{q,p} = \alpha_{q,p} + \beta_{q,p} * Gas_q + \delta_{q,p} * Coal_q + \varepsilon_{q,p} * CO2_q + \eta_{q,p} * Gas_q^2$$

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

Coefficients Multiply Gas coefficient by euro/therm Gas price and Gas^2 coefficient by the square of the euro/therm Gas price and all other coefficients by euro/tonne fuel or euro/tonne C02 price.						
Contract (p)	**Quarter (q)**	**Constant ($\alpha_{q,p}$)**	**Gas ($\beta_{q,p}$)**	**Coal ($\delta_{q,p}$)**	**CO2 ($\varepsilon_{q,p}$)**	**Gas^2 ($\eta_{q,p}$)**
Baseload	Q4 '12	10.19	61.598	0.0427	0.3791	0.000
Mid-Merit	Q4 '12	13.81	61.999	0.0526	0.3982	0.000
Peak	Q4 '12	117.29	-105.283	0.1121	0.3699	79.771
Baseload	Q1 '13	10.96	62.039	0.0416	0.3810	0.000
Mid-Merit	Q1 '13	15.56	60.947	0.0572	0.4014	0.000
Peak	Q1 '13	116.33	-86.284	0.1182	0.3661	66.254
Baseload	Q2 '13	9.66	62.209	0.0239	0.4143	0.000
Mid-Merit	Q2 '13	12.97	60.974	0.0311	0.4250	0.000
Baseload	Q3 '13	10.63	61.135	0.0389	0.4350	0.000
Mid-Merit	Q3 '13	13.77	60.988	0.0485	0.4609	0.000
Baseload	Q4 '13	10.03	59.858	0.0513	0.3634	0.000
Mid-Merit	Q4 '13	11.89	62.199	0.0601	0.3819	0.000
Peak	Q4 '13	120.38	-122.212	0.1331	0.3175	90.410

The pricing will be updated every quarter in line with the new rolling approach to DCs as per SEM-12-026. Every 2nd quarter new pricing formulae will be derived taking account of new market data such as generator data and demand assumptions.

2.3 Supplier Eligibility

Using supplier Maximum Import Capacity (MIC) data and historical energy and load shape for customer type, the RAs have calculated the MW eligibility for each type of DC for each supplier. This is done for each of the DCs being offered by ESB, given

that particular supplier's MVA of MIC for each customer class.

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

Supplier eligibility for DCs will be updated every quarter in line with the new rolling approach to DCs as per SEM-12-026.

3. DIRECTED CONTRACT QUANTITIES

In line with the new approach the DC subscription windows will be held every quarter, with DCs being allocated on a rolling basis up to 5 quarters ahead. The initial "front loaded" DC Primary Subscription Window will be held from Thursday 28th June to Wednesday 11th July inclusive, with the associated DC Supplemental Subscription Window from Tuesday 17th to Thursday 19th July 2012 inclusive. DCs will be offered in quarterly segments for the period Q4 2012 to Q3 2013.

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. 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 period Q4 2012 to Q3 2013. This HHI level is an input into the Concentration Model which is used by the RAs to determine the DC allocations to ESB 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 and NIE Energy PPB will be required to make available to eligible supplier to reach the 1,150 threshold.

Please note that in calculating the HHI, unlike in previous years, the horizontal integration of ESB's PG and other ESB generation businesses from this October was assumed by the RAs, as this was allowed by the SEM Committee in its SEM-12-002[4] decision paper.

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.

[4] Please see the following link: http://www.allislandproject.org/GetAttachment.aspx?id=fd2b05ff-b0ee-443d-87db-01b1ac4fe27a

- 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 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.

As with last year, NIE Energy PPB's market share does not warrant the offering of DCs. Resulting from this process, the DC quantities for ESB for the entire period Q4 2012 to Q3 2013 are set out below. Please note that as only a portion of DCs for the Q4'12 to Q3 '13 period will actually be allocated in the forthcoming "front loaded" auction (the remaining portions will be allocated, after being re-estimated, in subsequent auctions).

Total Estimated ESB DCs for 2012/13, MW

QUARTER	BASELOAD	MIDMERIT	PEAK
Q4 2012	247	0	165
Q1 2013	230	0	0
Q2 2013	319	0	N/A
Q3 2013	400	155	N/A

Percentage of (above) DCs being offered in Forthcoming Front Loaded Auction

QUARTER	BASELOAD	MIDMERIT	PEAK
Q4 2012	100%	100%	100%
Q1 2013	75%	75%	75%
Q2 2013	50%	50%	N/A
Q3 2013	25%	25%	N/A

Actual ESB DCs for 2012/13 in Forthcoming Front Loaded Auction, MW

QUARTER	BASELOAD	MIDMERIT	PEAK
Q4 2012	247	0	165
Q1 2013	172	0	0
Q2 2013	160	0	N/A
Q3 2013	100	39	N/A

The Concentration Model and the process set out above will be conducted by the RAs on a quarterly basis in line with the new rolling approach to DCs as per SEM-12-026.

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.

The pricing formulae will be updated every quarter in line with the new rolling approach to DCs as per SEM-12-026. Every 2nd quarter new pricing formulae will be derived taking account of new market data such as generator data and demand assumptions.

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 8th June 2012 were used. PLEXOS was then run 85 times using a 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, 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 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:

$$DCStrike_{q,p} = \alpha_{q,p} + \beta_{q,p} * Gas_q + \delta_{q,p} * Coal_q + \varepsilon_{q,p} * CO2_q + \eta_{q,p} * Gas_q^2$$

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).

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

Gas_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.

$Coal_q$ = 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.

$CO2_q$ = 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 Gas^2 coefficient by the square of the euro/therm Gas price and all other coefficients by euro/tonne fuel or euro/tonne C02 price.						
Contract (p)	**Quarter (q)**	**Constant ($\alpha_{q,p}$)**	**Gas ($\beta_{q,p}$)**	**Coal ($\delta_{q,p}$)**	**CO2 ($\varepsilon_{q,p}$)**	**Gas^2 ($\eta_{q,p}$)**
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Worked Example of Price for Q1 2013:

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 2013 fuel and carbon prices:

Fuel and Carbon Prices		
Gas	70	GBP pence /therm
Coal	100.00	USD/tonne
CO_2	7.00	Euro/tonne
Exchange Rates		
USD/EURO	1.25	
GBP/EURO	0.80	

And converting the fuel to Euro using spot exchange rates (e.g. Gas: 70/100 ÷ 0.80) results in the following Euro prices:

Conversion of Fuel Prices to Euro		
Gas	0.875	Euro/therm
Coal	80.00	Euro/ tonne
CO_2	7.00	Euro/tonne

The contract strike prices for the Baseload, Mid-merit and Peak products in Quarter 1 2013 are calculated as follows:

- Baseload Q1 ’13 Strike Price = €71.24/MWh
- Mid-Merit Q1 ’13 Strike Price = €76.27/MWh
- Peak Q1 ’13 Strike Price = €103.58/MWh

The following table shows DC prices for the products being offered in the coming auction using actual fuel, carbon and exchange rate inputs as reported for 8th June 2012 in euro.

Sample ESB Directed Contract Prices			
Quarter	Baseload Price (€/MWh)	Mid-Merit Price (€/MWh)	Peak Price (€/MWh)
Q4 2012	63.95	N/A	94.39
Q1 2013	68.70	N/A	N/A
Q2 2013	59.04	N/A	
Q3 2013	60.38	64.35	

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