Integrated Single Electricity Market

(I-SEM)

Directed Contracts Implementation

Decision Paper

SEM-17-081

15th November 2017

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ACRONYMS

BMPCoP: Balancing Market Principles Code of Practice;

CfD: Contract for Difference;

CRM: Capacity Remuneration Mechanism;

DAM: Day Ahead Market;

DCs: Directed Contracts;

FCO: Forward Contract Obligation;

HHI: Herfindahl Hirschman Index;

I-SEM: Integrated Single Electricity Market;

MW: Megawatt;

NDCs: Non-Directed Contracts;

OTC: Over the Counter;

PSO: Public Service Obligation;

RAs: Regulatory Authorities;

RO: Reliability Option;

SEM: Single Electricity Market; and

TWhs: Terawatt hours.

1. INTRODUCTION

1.1 BACKGROUND

1.1.1 On the 4th September 2017, the Single Electricity Market (SEM) Committee published a consultation paper on Directed Contract Implementation (SEM-17-064), the "Consultation Paper".

1.1.2 The Consultation Paper detailed the SEM Committee's intended approach for the implementation of Directed Contracts (DCs) for the first four DC rounds under the revised SEM arrangements arising from Integrated Single Electricity Market (I-SEM) Go-Live, including the methodology that is applied for determining DC prices and volumes that are offered by ESB and the methodology that is used to determine the eligibilities of suppliers to such volumes.

1.1.3 In the Consultation Paper, the SEM Committee invited respondents' feedback on its intended minimal change approach to accommodate the revised SEM arrangements, namely:

- the approach for the implementation of DCs for the first four DC rounds under the revised SEM arrangements;
- the modelling methodology that is to be approved by the SEM Committee for determining DC prices, volumes and eligibility; and
- the future timing of a consultation on changes to the DC process and other considerations outlined in the Forward & Liquidity Decision Paper (SEM-17-015).

1.1.4 Following the closure of the consultation on the 29th September 2017, the SEM Committee received 7 responses to the Consultation Paper from the following organisations:

1) Bord Gais Energy;
2) Energia;
3) ESB;
4) Power NI;
5) PrePayPower;
6) SSE; and
7) Tynagh.

1.1.5 In general, respondents were supportive of a minimal change approach, but expressed divergent views as to the when a future consultation on actions arising from the Forwards & Liquidity Decision Paper (SEM-17-015) should take place. Additionally, respondents requested clarity on the PLEXOS validation that is taking place for I-SEM implementation and some respondents expressed concerns over the accuracy of DC pricing (arising from validation) and its impact on Non Directed Contracts (NDCs) prices.

1.1.6 Respondents also raised potential equity issues regarding the existing DC allocation methodology (e.g. should there be a cap on DCs that can be purchased by Electric Ireland), with another respondent suggesting that non-vertically integrated companies should get a higher allocation of DCs. Additionally, some respondents requested revisions to the Herfindahl Hirschman Index (HHI) used.

1.1.7 The structure of this document, hereafter referred to as the "Decision Paper" is as follows:

- **Section 2:** presents the SEM Committee's decision on the timetable, range and definition of products, the HHI competition threshold and the reference price for the first four DC Rounds under the revised SEM arrangements;
- **Section 3:** presents the SEM Committee's decision on the methodology for the DC volumes prices and eligibility for the first four rounds of DCs under the revised SEM arrangements;
- **Section 4:** presents the SEM Committee's decision on the timing of a future consultation on potential changes to the DC process and other considerations outlined in the Forward & Liquidity Decision Paper; and
- **Section 5:** presents next steps.

2. DC IMPLEMENTATION TIMETABLE, PRODUCTS AND PROCESS FOR REVISED SEM ARRANGEMENTS

2.1 TIMETABLE FOR FIRST FOUR DC ROUNDS

SEM Committee Proposal

2.1.1 In the Consultation Paper, the SEM Committee outlined the proposed processes and timetable for the first four rounds of Directed Contracts under the revised SEM arrangements arising from I-SEM implementation.

2.1.2 The Consultation Paper proposed the continuation of quarterly DC subscription windows for at least the first four rounds of the revised SEM arrangements, with the first round proposed to take place in December 2017.

Respondents' Comments

2.1.3 Two respondents welcomed the timeline for the first four rounds of the DCs under the revised SEM arrangements. One of these respondents emphasised the need to avoid any delay to the first round scheduled for December 2017.

2.1.4 However, one respondent suggested that no DC contracts past the delivery period of Q2 2019 should be offered until a consultation is held on the allocation of DCs. Another respondent noted that the first round was heavily concentrated.

SEM Committee Response

2.1.5 The SEM Committee note that the majority comments on the proposed timetable were generally supportive.

2.1.6 The SEM Committee does not accept that it is practical to have a consultation and decision on the allocation of the DCs in advance of the offering of Q3 2019 DC contracts as suggested by one respondent. Q3 2019 DC products are scheduled to be first offered in the June 2018 DC subscription window, as outlined in Table 1 of the Consultation Paper.

2.1.7 The SEM Committee note that the first round of the DCs contain a greater volume of contracts (100% of Q2-2018 and 50% of Q3 and Q4 2018) which are a result of the proximity of the first DC window, December 2017, relative to the delivery period for the products in question. By the third DC round, the DC products on offer will return to the typical volumes (i.e. approximately 25% for 4 different quarters).

SEM Committee Decision

2.1.8 Having considered respondents' comments, the SEM Committee has decided to proceed with the proposal as outlined in the Consultation Paper.

2.1.9 The first four DC rounds will take place at 3 monthly intervals, as outlined in Table 1 below. The first and second rounds will involve the offering of between 100% and 25% of the volume of the products for certain quarters, while the subsequent rounds will offer 25% of the volume of the products for each quarter. These volumes are subject to the

adjustment for volumes sold in previous rounds as outlined in section 3.2.13 of this Decision Paper.

Table 1: DC Timetable

Activity	Date	Q2-18*	Q3-18	Q4-18	Q1-19	Q2-19	Q3-19	Q4-19
I-SEM DC Round 1	Dec-17	100%	50%	50%	25%			
I-SEM DC Round 2	Mar-18		50%	25%	25%	25%		
I-SEM DC Round 3	Jun-18			25%	25%	25%	25%	
I-SEM DC Round 4	Sep-18				25%	25%	25%	25%
Total offered by DC Round 4		**100%**	**100%**	**100%**	**100%**	**75%**	**50%**	**25%**

*Q2-2018 refers to the period from Go-live of the revised SEM arrangements to the end of June 2018.

2.1.10 Appendix 2 of this Decision Paper contains a detailed timetable with dates for the primary and supplemental windows in each of the four rounds.

2.2 PRODUCTS FOR FIRST FOUR DC ROUNDS

SEM Committee Proposal

2.2.1 In the Consultation Paper (section 2.3), the SEM Committee proposed no change to the range (Baseload, mid merit and peak) or the definition of DC products offered in SEM for the first four rounds of the DCs.

2.2.2 The SEM Committee also noted the impact of the Reliability Option (RO) on a generators ability to hedge prices above the RO strike price and the need to include a cap to payments under the DCs to reflect this other obligation on generators market revenues. ESB has proposed to deal with this by linking a Call Option, which the supplier would be required to sell to ESB, with the 2-way CfD that ESB sells to the supplier.

2.2.3 The SEM Committee proposed that the reference price for the 2-way CfD and the Call Option would be the Day Ahead Market (DAM) price.

Respondents' Comments

2.2.4 Three respondents agreed with the proposal to keep the range and definition of the DCs same as those offered to date. One respondent also agreed to keeping the DC products unchanged in the interest of commencing the first round in December 2017, however the respondent suggested that in the future the DCs should be aligned to the PSO related CfDs and the Non-Directed Contract (NDCs) products (i.e. Baseload and Mid Merit 2). This they suggested would promote forward liquidity. Another respondent made the same point about moving to Baseload and Mid Merit 2 and suggested that this change should be made for the first four DC rounds. They noted that the peak product will be an "*I-SEM special*" and will remove volumes from mid merit.

2.2.5 Regarding the linking of a Call Option to the 2-way CfD in the DCs, one respondent questioned how the value of the Call Option to ESB would be valued and incorporated into the DC pricing formulae. Another respondent suggested that the truncation of the 2-way CfD would be easier to operate than the proposal by ESB. Both of these respondents also raised the possibility that ESB may not have an RO obligation for the stations supporting the DC volumes being offered. In this situation it was argued that ESB would not require a Call Option and could be over-recovering payments from suppliers.

2.2.6 Two respondents agreed with the SEM Committee's proposal to use the DAM price as the reference price for the DCs.

SEM Committee Response

2.2.7 The SEM Committee is of the view that a minimal change approach to the range and definition of the DC products will facilitate the earliest possible date to the first round of the DCs under the revised SEM arrangements.

2.2.8 Changing from the current three DC products to two DC products, one of which would be new to the DCs (mid merit 2), would require an assessment to determine the impact it would have on the mitigation of market power. Additionally, this would require significant alterations to the existing DC models. This assessment and the changes to the DC models could not be carried out within the current timelines for the DCs. Such a proposal can be examined in the future consultation on contracting in the revised SEM arrangements.

2.2.9 The value of the Call Option that is linked to the 2-way CfD will be included in the price of the DC products (see section 3.4 of this Decision Paper for further details). In ESB's reply to responses to SEM-17-065, it has outlined its rationale for using a Call Option linked to the 2-way CfD, instead of creating an embedded cap within the 2-way CfD.

2.2.10 With reference to respondents' comments regarding the possibility that ESB may not have an RO obligation for the stations supporting the DC volumes being offered, the SEM Committee do not expect this to be a material issue but will take action if it transpires that ESB can exert market power in the energy markets by virtue of having a proportion of its capacity not covered by ROs.

2.2.11 The SEM Committee notes the general agreement of respondents on using the DAM price as the DC reference price.

SEM Committee Decision

2.2.12 In light of respondents' comments, and following on from the proposals in the Consultation Paper, the SEM Committee has decided – for the first four rounds of DCs - that:

1) Three DC products will continue to be offered by ESB to suppliers. These are:

   i. **Baseload Product**: For Trading Periods at the Contract Quantity arising in all hours.

ii. **Mid-merit Product**[1]: 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.

iii. **Peak Product**[2]: 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.

2) Given the new capacity market provisions in the revised SEM arrangements (e.g. RO), an additional Call Option requirement is to be added to the DC products which will require the holder of the DC to pay ESB the difference between the reference price and the RO strike price, if this difference is positive, for the DC quantity concerned.

3) The reference price for both the 2-way CfD and the Call Option in the DCs will be the DAM price in the revised SEM arrangements.

2.3 COMPETITION THRESHOLD FOR THE DETERMINATION OF DCS

SEM Committee Proposal

2.3.1 In the Consultation Paper, the SEM Committee proposed keeping the HHI threshold unchanged at 1,150 for the first four rounds of DCs.

Respondents' Comments

2.3.2 One respondent stated that the HHI of 1,150 is too high and that this should be part of the future consultation on contracting. Another respondent stated that the SEM Committee should retain the option to review the HHI threshold.

2.3.3 In contrast, one respondent stated that the proposed HHI threshold was too low and should be increased to 1500 for go-live. Specifically, the respondent stated that the features of the revised SEM arrangements warrant an increase in the HHI, including a number of market power mitigation measures from the RO which creates a price cap of €500/MWh in the energy market; the offer controls of the Balancing Market Principles Code of Practice (BMPCoP) on non-energy actions; and ESB's track record of never exerting market power.

SEM Committee Response

2.3.4 The SEM Committee acknowledge that there are different opinions on what would be the appropriate level for the HHI when setting DC volumes on ESB or any other generator with market power. The purchasers of DCs may have an interest in a greater volume of DCs for hedging purposes and hence seek a lower HHI, while the sellers of DCs may have an interest in lowering the DC volumes to sell greater NDC volumes and seek a higher HHI.

[1] Mid Merit DCs offered for 2007-2008 was defined as 07:30 to 23:00.

[2] Peak DCs offered for 2007-2008 was defined as 16:30 to 20:00.

2.3.5 The SEM Committee has reduced the extent of bid and offer controls to only the complex bid offers in the balancing market, therefore DCs are the key market power mitigation measure on the DAM, apart from the application of REMIT.

2.3.6 With reference to the statement that the HHI should be increased on the basis of ESB's track record of never exerting market power, the SEM Committee is of the view that past behaviour is not a guarantee of future behaviour, and it is the ability and incentive to exercise market power that needs to be mitigated.

SEM Committee Decision

2.3.7 In light of respondents' comments, and following on from the proposals in the Consultation Paper, the SEM Committee has decided that a HHI of 1,150 will be used for the first four rounds of the DCs under the revised SEM arrangements.

3. DC IMPLEMENTATION MODELS

3.1 OVERVIEW

3.1.1 The Consultation Paper, outlined the different models the Regulatory Authorities (RAs) utilise in the determination of DCs and which the SEM Committee propose continuing to use for the revised SEM trading arrangements. The models described in the Consultation Paper included the following:

1. Production Simulation Model (PLEXOS);
2. Market Concentration Model;
3. An Eligibility Model;
4. Econometric Pricing Model; &
5. A PLEXOS interface model.

3.1.2 Responses to the Consultation Paper were mainly focused around the three main DC models (concentration, eligibility and pricing models).

3.2 MARKET CONCENTRATION MODEL

SEM Committee Proposals

3.2.1 In the Consultation Paper, the SEM Committee proposed no change to the operation of the Market Concentration Model for the first four rounds of the DCs.

Respondents' Comments

3.2.2 Two respondents welcomed the proposal that the suite of models utilised in the determination of DCs is not being changed.

3.2.3 Another respondent questioned how the Market Concentration Model worked in practice, as the model has never been published or independently audited or validated. The respondent also requested a more detailed explanation of the model than the one given in the Consultation Paper for improved transparency.

3.2.4 This respondent stated that the current methodology requires ESB to over contract by setting the volumes of DCs in each quarter using the highest monthly volume in that quarter. This means that there is some volume of over contracting in the two other months within a quarter. They suggested a move to monthly DC products.

3.2.5 This respondent believes that the treatment of contracts already sold by ESB, including those sold over the counter (OTC), should be considered in the determination of the HHI in the Market Concentration Model. This they highlight is the premise of the DCs, being considered atomised once allocated to ESB. This respondent believes this would improve the overall functioning of the forwards market, by encouraging trading in advance of the DC windows.

3.2.6 Further to the above, this respondent notes that the current Market Concentration Model methodology, may over or under allocate DCs for a particular product over the different rounds they are offered. This is because the annual volumes determined in each DC round by the Market Concentration Model are multiplied by a set fraction, e.g. ¼ when the product is offered over 4 rounds, instead of taking account of exact volumes sold in the previous round.

3.2.7 This respondent also stated that proposed changes by the SEM Committee to the licence condition of all generators (the introduction of a Forward Contract Obligation (FCO)), as outlined in section 8.9 of Market Power Decision Paper (SEM-16-024), has not taken place in the licence conditions consulted and decided upon by the CRU and the Utility Regulator. This respondent expects that these changes will be implemented before go-live.

3.2.8 Finally, this respondent also requested that the SEM Committee put in place audit and or validation procedures for all the models used to implement DCs for assurance purposes.

SEM Committee Response

3.2.9 The SEM Committee notes that the majority of respondents comments were in favour of the minimal change approach outlined in the Consultation Paper and that only one respondent raised a number of issues with this approach.

3.2.10 The SEM Committee is of the view that the description of the Market Concentration Model given in the Consultation Paper is comprehensive. The SEM Committee is willing to provide further transparency on the Market Concentration Model methodology by publishing a blank version of Market Concentration Model (SEM-17-082) along with this Decision Paper.

3.2.11 In the interest of minimal change, the SEM Committee considers that DCs should remain as quarterly products but that in the future consultation on contracting can consider all the implications of changing DCs to monthly products.

3.2.12 The SEM Committee notes that the DC process, as it currently operates, is wholly determined by the RAs, from the pricing to the determination of volumes and the determination of supplier eligibility. As the RAs have no role in the determination of the price, volume or allocation of ESB's OTC traded contracts or have not endorsed these trades, they cannot currently be considered part of the atomised volumes of forward contracts which mitigate ESB's spot market power.

3.2.13 The SEM Committee acknowledges the point made regarding the over or under allocation of DCs as result of applying a fixed fraction to each round of the DCs regardless of volumes sold in the previous round(s). The SEM Committee will therefore change this part of the Market Concentration Model methodology, such that a fixed fraction will be solely used in the first round that a product is offered and in subsequent rounds up to the penultimate round, previous volumes sold are deducted from the annual total determined by the Market Concentration Model in that round and the balance is then

multiplied by the fixed fraction. In the final round, all the previous volumes sold are deducted from the annual total determined[3].

3.2.14 The Consultation Paper stated that only ESB and NI PPB have a requirement to offer DCs in their licence and that the RAs do not propose to change this before the go-live of the revised SEM arrangements. Following an assessment of the expected ownership concentration over the period covered by the first four rounds, the SEM Committee is satisfied that only ESB will be required to offer DCs. If new data emerges that would change that assessment, the SEM Committee would reconsider the application of DCs, subject to the relevant licence changes.

3.2.15 Regarding the suggestion that the RA's modelling of the DCs should be independently audited and or validated, the RAs will consider including an operational audit of the DC modelling as part of the consultancy support that is used for the annual validation of the PLEXOS SEM model.

SEM Committee Decision

3.2.16 In light of respondents' comments, and following on from the proposals in the Consultation Paper, the SEM Committee has decided to adopt the proposals in the Consultation Paper subject to a change to the accounting of previous DC volumes sold in the previous rounds for the same products, as outlined in 3.2.13.

3.3 ELIGIBILITY MODEL

SEM Committee Proposals

3.3.1 In the Consultation Paper, the SEM Committee proposed no change to the operation of the eligibility model for the first four rounds of the DCs.

Respondents' Comments

3.3.2 One respondent welcomed the minimal change approach to the eligibility model for the revised SEM arrangements.

3.3.3 Another respondent suggested that the current supplier eligibility methodology favours the retail arm of the ESB group who benefit from their large retail market share, which limits access to DC hedges to other suppliers. This respondent also believes that ESB's retail arm are insulated from DC price increases due to being part of the same financial accounts group as the sellers of DCs. They propose changing the methodology by including a cap on the allocation to the incumbent supplier in the market and sharing the remaining volume among the other suppliers in that market.

3.3.4 Another respondent suggested that non-vertically integrated suppliers should have an increased allocation of DCs.

[3] If the volumes in the previous rounds for a particular product add up to more than the annual volume determined by the Market Concentration Model in the last round, then the volumes for that product will be set to zero.

SEM Committee Response

3.3.5 The SEM Committee notes the various views expressed on the proposed methodology for the allocation of DCs among suppliers.

3.3.6 The SEM Committee is of the view that the changes proposed by two respondents would be more appropriately considered in the future consultation on contracting along with other potential changes to the DCs.

SEM Committee Decision

3.3.7 In light of respondents' comments, and in the interests of minimal change and in order to facilitate the earliest possible DC round for revised SEM arrangements, the SEM Committee has decided to proceed with the Consultation Paper proposals for the first four rounds of DCs in the revised SEM arrangements.

3.4 ECONOMETRIC PRICING MODEL

SEM Committee RAs' Proposals

3.4.1 In the Consultation Paper, the SEM Committee outlined the proposed processes for the Econometric Pricing Model to be used for the first four rounds of DCs.

Respondents' Comments

3.4.2 A number of respondents supported the minimal change approach proposed in the Consultation Paper. One of these respondents also noted that the introduction of a premium into the DC price would be contrary to the rationale of mitigation of market power.

3.4.3 One respondent noted that the value of the Call Option which is linked to the 2 way CfD should be incorporated into the pricing of DCs. This respondent also noted that they had difficulty in replicating the DC formulae in recent rounds and that current formulae should be considered for potential review.

3.4.4 Another respondent stated that the forthcoming round of DCs will be forecast without any historical reference data or understanding of participant bidding behaviour to support it. They believe that this has the potential for a substantial financial loss for ESB and there is no mechanism to address this in any future offerings. They also suggest that the RAs may influence the behaviour of market participants through the DCs and distort competition in the market.

3.4.5 This respondent suggested that a forward premium should be added to the DC pricing methodology to reflect actual market prices. They suggested using the average observed premia from the Public Service Obligation (PSO) related CfDs and the OTC traded contracts over the DC prices as a benchmark.

3.4.6 Further this respondent noted that the PLEXOS model that the RAs will be using to forecast prices for the revised SEM arrangements, should include a specific scarcity adder. This should be added to generator unit costs when the system margin tightens.

Baringa's proposal

3.4.7 Baringa Partners LLP are providing the RAs consultancy support to carry out the validation of the RA's PLEXOS model for the revised SEM arrangements covering the period 2018-2019 and also to determine the DC pricing formulae for the first four rounds of the revised SEM arrangements.

3.4.8 As part of their ongoing work on the validation of the PLEXOS SEM model for 2018-19, Baringa have identified certain modelling efficiencies that will allow a revised and improved approach to the regression of DC pricing formulae.

3.4.9 In the current process, a single profile for wind, demand and forced outages is used for each of 53 fuel price sensitivities[4], from which the commodity scalar formulae terms are calculated. A final model run is performed using 10 outage patterns in Monte Carlo mode to set the formulae constant terms.

3.4.10 Baringa have proposed a move to 5 stochastic wind, demand and outage patterns that are used for each of the 53 fuel price scenarios, and that the constant update step be omitted. Baringa believe that moving to a single regression model with stochastic wind, demand and outages improves statistical robustness, and averages out atypical behaviour in base year profiles. See appendix 1 for details on Baringa's note.

SEM Committee Response

3.4.11 The SEM Committee notes the support for minimal change to DC pricing formulae from a number of respondents.

3.4.12 The SEM Committee acknowledge the point that the value of the Call Option should be incorporated into the pricing of the DC products. The SEM Committee has decided to give effect to this by capping the prices modelled in the RAs PLEXOS model for each of the 53 fuel price scenarios at the RO strike price for the period in question. The capping will work by replacing any price outcome above the RO strike price in the model with the RO strike price, and will thus result in a lower DC strike price overall (assuming at least some periods modelled initially exceed the RO strike price).

3.4.13 The SEM Committee does not see any difficulty in replicating the DC pricing formulae, as indicated by one respondent, given that the information required is publicly available.

3.4.14 The RAs have engaged Baringa to carry out the validation of the RAs PLEXOS model for 2018-19 and they will consider all the issues related to the revised SEM arrangement. As part of their work on the validation, Baringa have issued a survey to seek the views of interested parties to the changes brought about to forecasting the revised SEM arrangement. This includes both assumptions on market participant behaviour in the DAM and whether there will be a requirement for a scarcity adder.

[4] The 53 fuel price scenarios are made up of 2 sets (high, medium & low in one set and medium-high, medium, medium-low in the second set for each fuel/emission) of fuel price combinations each using gas, coal and CO2 prices each. Therefore 3^3+3^3 less one common to both sets.

3.4.15 The SEM Committee notes that the most appropriate approach to administratively setting forward prices is to use the best forecast of the spot prices available. This is implemented by the RAs through the use of a validated PLEXOS model and regressing the results of a range of fuel price scenarios. Incorporating an estimate of premia or discounts based on alternative methods of pricing and allocation of forward contracts into the administrative approach is not considered robust or appropriate.

3.4.16 The SEM Committee acknowledges the merits of the proposed changes to the DC regression proposed by Baringa and is satisfied they should be incorporated into the pricing of the first four rounds of the DCs.

SEM Committee Decision

3.4.17 In light of respondents' comments, and following on from the proposals in the Consultation Paper, the SEM Committee has decided to adopt the proposals in the Consultation Paper subject the following changes:

i. The capping of DAM price forecast from PLEXOS at the RO strike price before inputting these values as dependant variable in the DC regression.

ii. Adopting the Baringa proposal to the regression of the DC pricing formulae.

4. FUTURE CONSULTATION ON CONTRACTING

4.1 TIMING FOR THE FUTURE CONTRACTING CONSULTATION

SEM Committee Proposals

4.1.1 The Consultation Paper noted a delay to the consultation on the current allocation process for directed contracts that was proposed in SEM-17-015, which was expected to take place during the summer of 2017. The SEM Committee has decided to adopt a minimal change approach to the DCs in order to meet the Go-Live date of the revised SEM arrangements.

4.1.2 The Consultation Paper stated that potential future changes to the DC process under the revised SEM arrangements will be considered in a further consultation together with other considerations outlined in the Forward & Liquidity Decision Paper (SEM-17-015). The SEM Committee invited respondents to indicate their preferred option, from the list below, as to the timing of this future consultation:

- Option 1: after 3 months of the revised SEM arrangements, Q4 2018.
- Option 2: after 12 months of the revised SEM arrangements, Q3 2019.
- Option 3: after 18 months of the revised SEM arrangements, Q1 2020.

Respondents' Comments

4.1.3 Three respondents favoured Option 1, one respondent favoured Option 2 and three respondents favoured Option 3.

SEM Committee Decision

4.1.4 The SEM Committee has decided that the consultation shall take place between 12 to 18 months after go-live of the revised SEM arrangements. This is to ensure there is enough experience and data of forward trading under the revised SEM arrangements in order to prepare an informed consultation.

5. NEXT STEPS

5.1.1 Following the decision on ESB's Proposed Revisions to Directed Contracts Master Agreement and Subscription Rules, which will be published in parallel with this Decision Paper, the SEM Committee will publish an information paper in advance of each of the four DC rounds, including details of the DC volumes and the DC pricing formulae that will be used during the subscription windows. In addition to this, the RAs will contact eligible suppliers with their DC volumes for the primary window.

APPENDIX 1: BARINGA NOTE

Note on including stochastic inputs in DC pricing methodology

CLIENT: CRU/URegNI
DATE: 15/11/2017

Introduction

The current DC pricing methodology uses a PLEXOS model of SEM and regression analysis to calculate a pricing formula for each contract type and period based on prevailing commodity prices.

In the current process a single profile for wind, demand and forced outages is used for each of 53 fuel price sensitivities, from which the commodity scalar formulae terms are calculated. A final model run is performed using 10 outage patterns in Monte Carlo mode to set the formulae constant terms.

In this note we suggest an alternative process which removes the need for this final constant update step.

Issues with current methodology

The current methodology has two features we believe can be improved:

1. Single demand and wind profile used in all runs
    a. This uses actual data from 2015 to give the half hourly shaping factors
    b. The issue is that 2015 has some features of atypical behaviour (in fact this occurs in all base years), which then get built in to all forward looking projections (i.e. high baseload prices in October using 2015 profiles)
2. Single outage pattern used in 53 fuel price sensitivities, but 10 outage patterns used when setting constant term of formulae
    a. Using a single outage pattern for the 53 fuel price runs is a pragmatic decision to keep run times tractable
    b. Using 10 outage patterns for the final run is an attempt to avoid locking in a single outage pattern for all future projections, and instead projecting prices based on *expected* outages
    c. The issue is that the 10 outage pattern model may be materially different from the single outage pattern model used for the regression analysis, and simply changing the constant term to make the formulae from one model fit the output from another is not statistically robust. It is likely that the differences in SMP between the 10 outage pattern model and 1 outage pattern model are due to more than just the constant (non-fuel) term.

Proposed methodology

Summary:
Baringa are proposing four changes to the current methodology:

1. Use 5 sets of wind and demand profiles (each set of profiles based on a single historic year) for each of the 53 fuel price sensitivities
2. Use 5 stochastic outages for each of the 53 fuel price sensitivities, 1 outage pattern with each of the 5 sets of wind and demand profiles
3. Take the mean SMP output from these stochastic runs
4. Omit the "constant update" model run

Benefits:

- Averages out any atypical features in wind/demand
- Averages out outage patterns in full regression
- Removes the need for the "constant update" step

Downsides:

- Increases run time versus deterministic model (~5x longer)
    - However, due to potential savings outlined in the Information paper[5] (Rounded Relaxation self tune increment increased, hourly granularity) this means that the combination of savings and increases due to stochastics result in similar run time to current validated model
- Reduction of stochastic outages from 10 to 5 increases risk of very extreme outage pattern effecting results
    - See test below – 5 outage patterns give similar results to 10
- To completely eliminate need for the constant update stage we would need to perform full regression analysis each round
        - The regression process has already been streamlined by Baringa, and we would trade 1 regression + 2 constant updates to cover 2 DC rounds for 2 regression updates, a similar amount of effort.

Evidence to support move to proposed methodology

5 versus 10 outage patterns:
We have projected 2018 prices using two models with stochastic outages. One uses 10 outage patterns, one uses 5 outage patterns. The charts below show the average SMP profiles for Winter and Summer respectively. It can be seen that there is very little difference between the two runs.

[5] SEM-17-079 Information paper on PLEXOS Validation and Directed Contracts for I-SEM
https://www.semcommittee.com/publication/baringa-survey-validation-ras-2018-19-sem-plexos-model

Figure 1 Average Winter SMP profile, 10 vs 5 outage patterns

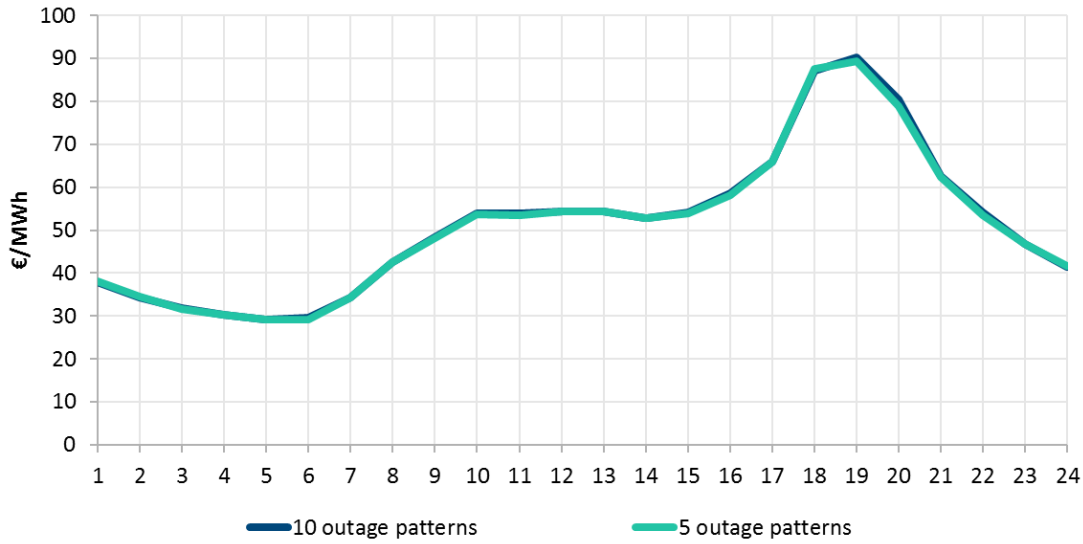
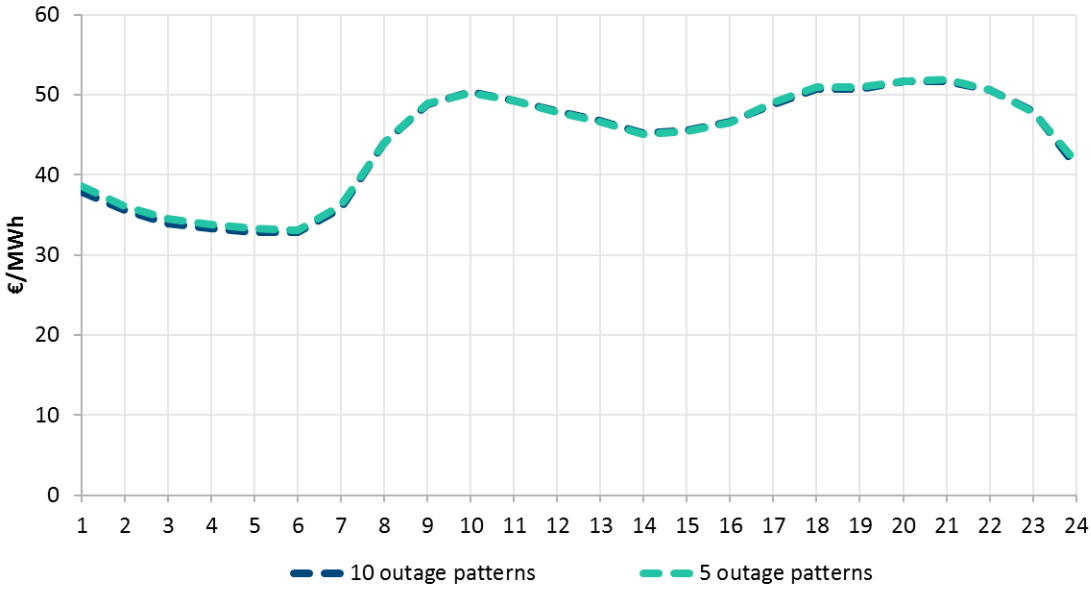


Figure 2 Average Summer SMP profile, 10 vs 5 outage patterns



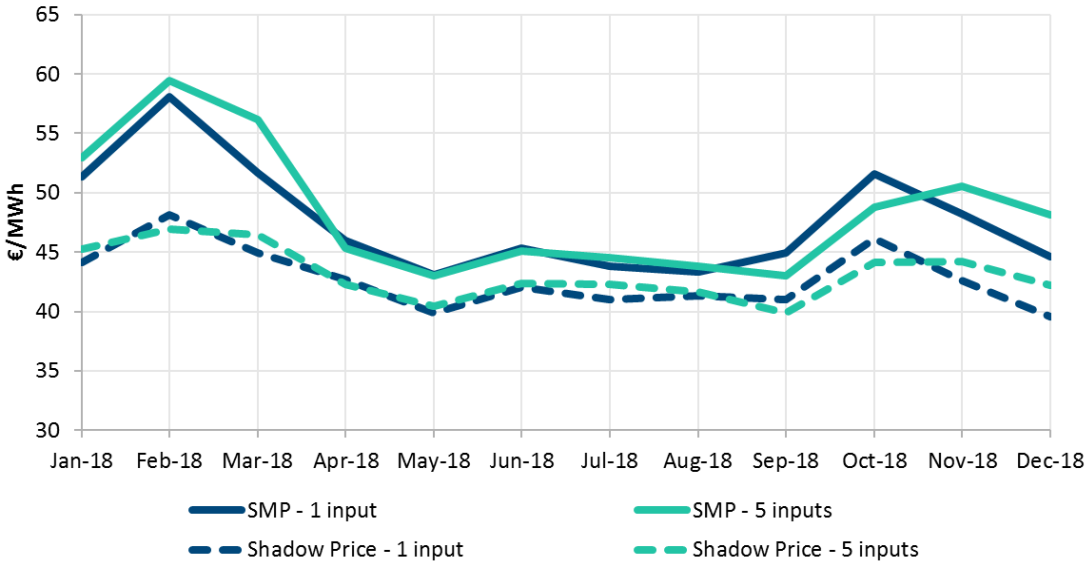
5 vs 1 wind and demand profiles:

We have run the model using 5 sets of stochastic inputs:

- Wind and Demand profiles (from consistent base year, ie wind and demand is correlated)
- Outage patterns

The chart below shows the difference between the monthly average SMP using 1 input (2015 base year) and 5 inputs (2011-2015). It can be seen that some of the atypical monthly peaks in the single 2015 base year are smoothed out when using the 5 inputs. By taking the mean SMP output from 5 sets of wind and demand input data we are projecting the *expected* SMP based on 5 years of recent historic profiles rather than locking in behaviour from a single year.

Figure 3 **Monthly SMP and Shadow price, 1 input vs 5 inputs**



The figures below show the winter and summer price profiles using 1 and 5 input profiles and outage patterns. The 5 profile run is similar to the 1 profile run, the small differences observed are due to taking the average across results from 2011-2015 base years rather than just a single 2015 profile.

Figure 4 **Average Winter SMP profile, different stochastic inputs**

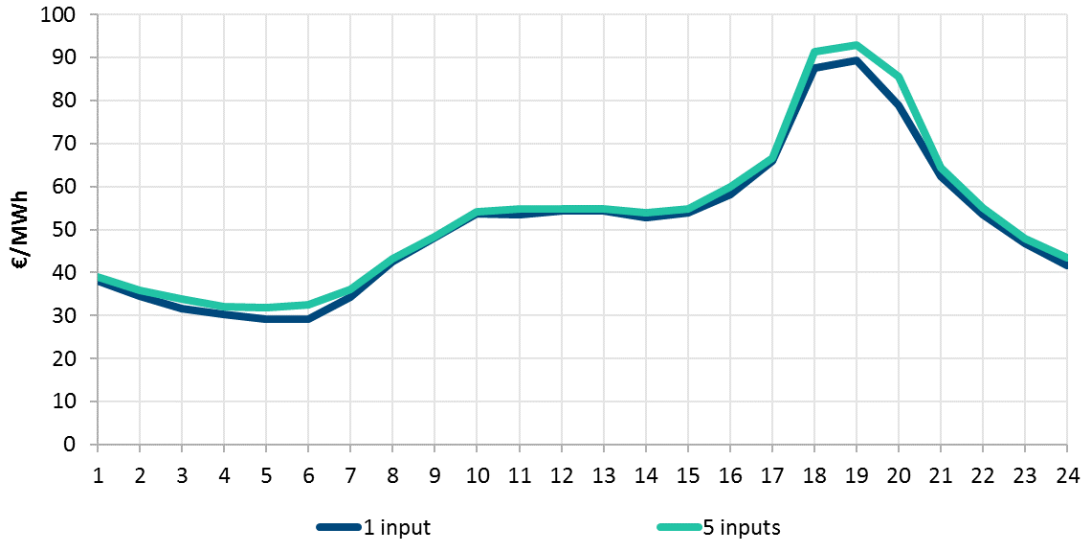
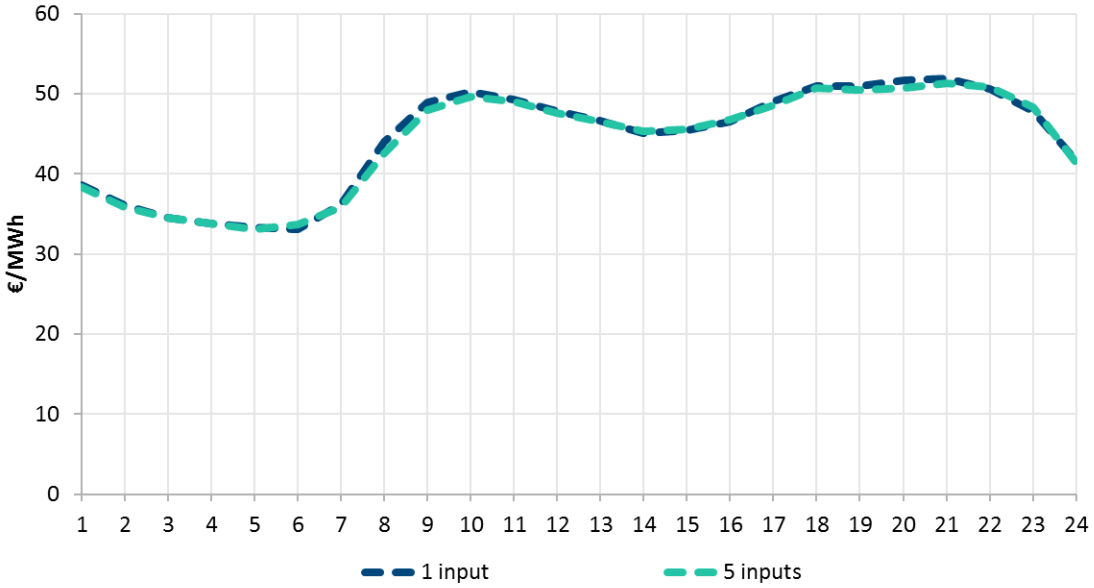


Figure 5 Average Summer SMP profile, different stochastic inputs



Conclusions

Moving to a single regression model with stochastic wind, demand and outages improves statistical robustness, and averages out atypical behaviour in base year profiles.

Our testing has shown that moving from 10 to 5 outage patterns can be done with little impact.

Further, we have shown the “smoothing” benefits of including stochastic wind and demand.

We propose that 5 stochastic wind, demand and outage patterns are used for each of the 53 fuel price scenarios, and the constant update step omitted.

Version History

Version	Date	Description	Prepared by	Approved by
1.0	12th Oct 2017	Final for CRU review	Áine Lane Luke Humphry	Luke Humphry
2.0	18th Oct 2017	Minor updates following CRU comments	Luke Humphry	Luke Humphry

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APPENDIX 2: DETAILED TIMETABLE FOR 1ST FOUR I-SEM DC ROUNDS

Table 2, below, is a detailed timetable of the first four rounds of Directed Contracts for the revised SEM arrangements.

Table 2

Round 1 DC Subscription – December 2017	**Timeline**
RAs publish paper on DC quantities and pricing, and inform suppliers of DC eligibility for Q2 2018* to Q1 2019 product	Mid-December
Primary Subscription Window for Q2 2018* to Q1 2019 product	Tues 12th - Thurs 14th December
Supplemental Subscription Window	Thurs 21st December
Round 2 DC Subscription – March 2018	**Timeline**
RAs publish paper on DC quantities and pricing, and inform suppliers of DC eligibility for Q3 2018 to Q2 2019 product	Mid-March
Primary Subscription Window for Q3 2018 to Q2 2019 product	Tues 20th - Thurs 22nd March
Supplemental Subscription Window	Thurs 29th March
Round 3 DC Subscription – June 2018	**Timeline**
RAs publish paper on DC quantities and pricing, and inform suppliers of DC eligibility for Q4 2018 to Q3 2019 product	Early June
Primary Subscription Window for Q4 2018 to Q3 2019 product	Tues 12th - Thurs 14th June
Supplemental Subscription Window	Thurs 21st June
Round 4 DC Subscription – September 2018	**Timeline**
RAs publish paper on DC quantities and pricing, and inform suppliers of DC eligibility for Q1 2019 to Q4 2019 product	Early September
Primary Subscription Window for Q1 2019 to Q4 2019 product	Tues 11th - Thurs 13th September
Supplemental Subscription Window	Thurs 20th September

*(11pm 22nd May 2018 to the end of June 2018)