SEM-GB Trading Arrangements

Consultation Paper

SEM-22-005

28 February 2022

1. Introduction

Since the 1 Jan 2021, the SEM has been decoupled from the GB market in the Day-Ahead timeframe and capacity allocation on the SEM-GB interconnectors has taken place exclusively in the Intraday (IDA) timeframe. Implicit allocation in the IDA 1 and 2 markets is the fallback arrangement to which SEM-GB trading has reverted, pending the implementation of the new Day-Ahead trading arrangements between the EU and the UK, as set out in the Trade and Cooperation Agreement (TCA)[1] concluded between the two parties.

The Energy Title of the TCA specifies that:
"*…for capacity allocation and congestion management at the day ahead stage, the Specialised Committee on Energy, as a matter of priority, shall take the necessary steps […] to ensure that transmission system operators develop arrangements setting out technical procedures in accordance with Annex 29*".

Annex 29 of the TCA sets out at a high level, the agreed procedure for the allocation of electricity interconnector capacity at the Day-Ahead timeframe. This high-level procedure is referred to as "Multi-Region Loose Volume Coupling" (MRLVC). This is to involve a form of implicit allocation in the Day-Ahead timeframe using:

- commercial bids and offers for the EU Day-Ahead Market (DAM) from those bidding zones directly interconnected with GB;
- commercial bids and offers for GB DAM;
- network capacity data and system capabilities; and
- forecast commercial flows of interconnectors between those bidding zones directly interconnected with GB and other bidding zones within the EU's Internal Energy Market.

The MRLVC market coupling function is to produce results in advance of the operation of both the EU and the GB DAM, so that those results may be used as inputs to these two separate markets.

Annex 29 also sets out a timeline for implementation, beginning from the entry into force of the TCA as follows:

- within 3 months – Cost Benefit Analysis (CBA) and outline of proposals for technical procedures (1 April 2021)
- within 10 months – proposals for technical procedures (1 Nov 2021)
- within 15 months – entry into operation of technical procedures (1 Apr 2022)

The first milestone in this timeline was reached in April 2021 when the EU and UK TSO's published a CBA[2], including an assessment of two options for implementing MRLVC compared to the fallback arrangements in place on the SEM-GB border, and

[1] The EU-UK Trade and Cooperation Agreement | European Commission (europa.eu)

[2] Cost Benefit Analysis of Multi-Region Loose Volume Coupling (MRLVC) arrangements to apply between the UK and the bidding zones directly connected to the UK - European Network of Transmission System Operators for Electricity - Citizen Space (entsoe.eu)

those in place on the other EU-GB borders i.e. explicit allocation via Physical Transmission Rights (PTRs). One of the two options identified for implementing MRLVC was ruled out by the CBA, while the second was considered a potentially beneficial solution, but noting two major open questions:

1. how accurate a methodology can be developed for forecasting the commercial flows of interconnectors between those bidding zones directly interconnected with GB and other bidding zones within the EU's Internal Energy Market; and
2. what the scope is for implementing the potentially beneficial option in a way that is consistent with the operational constraints of the EU's Single Day-Ahead Coupling (SDAC) process.

Following finalisation of the CBA, the EU TSO's indicated that they would require input from the European Commission (EC) as regards the scope for implementing this second option in a way that is consistent with the SDAC, and thhe EC has been considering this question. The Specialised Committee on Energy (SCE), which is responsible for governance of the Energy Title of the TCA and is composed of representatives of both the EU and the UK, met for the first time in July 2021.

In the interim, the joint UK and EU TSO proposals for the technical procedures have not been developed further since the CBA was completed. It is therefore very likely that MRLVC will not be implemented according to the timeline set out in the TCA.

Given this likely delay in the implementation of the new Day-Ahead trading arrangements, and given also that the implicit Intraday fallback arrangements have now been in operation for more than a full year, the SEM Committee is publishing this Consultation Paper to seek stakeholders' views on:

1. the operation of the SEM since 1 Jan 2021, in terms of the impact (short-, medium-term and enduring) of decoupling of the DAM;
2. whether there is a need for change to the existing fallback arrangements, given the expected delay in implementing MRLVC; and
3. what improvements could be made to the existing arrangements in advance of the implementation of MRLVC, to either persist when MRLVC is implemented, or to fall away.

1.1 Structure of Paper

To inform this consultation process, this paper presents analysis carried out by the SEM RAs of prices and volumes traded in the SEM and GB across the coupled and decoupled markets before and since 1 Jan 2021. This initial assessment of the impacts of the current arrangements for allocation of cross border capacity between the SEM and GB consisted of:

- Analysis of market arrangements and price arbitrage between the SEM and GB across the Day Ahead and Intraday timeframes pre and post 1 Jan 2021.
- Price Modelling Exercise;

This paper also presents an overview of other relevant models for allocation of Interconnection capacity and concludes with a set of consultation questions.

1.2 Responding to this consultation

Responses are invited to the consultation questions set out in Section 5.1 and should be sent, in electronic form, to jeanpierre.miura@uregni.gov.uk and gblack@cru.ie, by 28/03/2022.

2. Market Arrangements and Price Arbitrage between the SEM and GB

2.1 Current Market Arrangements

The SEM ex-ante markets are traded via a number of auctions at the day ahead and intraday stage. These auctions are complemented by continuous intraday trading. For each trading day, there are 4 auctions: Day Ahead (DAM), Intraday 1 (IDA1), Intraday 2 (IDA2) and Intraday 3 (IDA3). The DAM and IDA3 are local auctions in the sense that only orders originated by market participants established in the SEM are matched. The IDA1 and IDA2 are coupled auctions, which means that orders originated in the SEM and GB are matched. As a consequence of the coupling process, the capacity of the SEM interconnectors is allocated in these 2 auctions. Interconnector flows are allocated in the direction of the higher price zone.

The SEM Trading Day starts at 23:00 (GMT) D-1 and ends at 23:00 (GMT) D. The SEM DAM and IDA1 take place in the day ahead of the delivery while the IDA2 and IDA3 take place within the day of the delivery and clear volumes for the remaining hours within the day D. Charts 1 and 2 respectively show the actual volumes traded and the prices for each of these auctions during 2021.

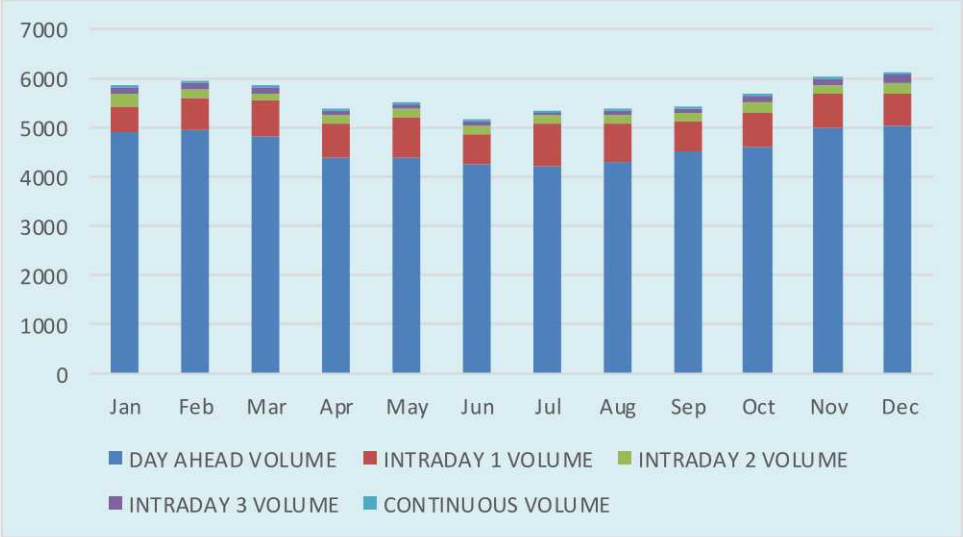

Chart 1: Volumes (MW) traded in the different SEM ex-ante trading timeframes in 2021

Chart 2: Average SEM Prices (€/MWh) across the different SEM ex-ante trading timeframes in 2021

As can be seen in Chart 2, there are price arbitrage opportunities across the different trading timeframes. Chart 3 focuses on the DAM and IDA1 prices as most of the volumes are traded in these timeframes.

Chart 3: SEM DAM vs. IDA1 Average Prices in 2021

From Chart 3 we see that the average SEM DAM (Decoupled) prices have been mostly higher than the IDA1 (Coupled) price. These price differentials between the different trading timeframes create arbitrage opportunities for market participants, particularly for assetless traders. The typical transaction is selling at the DAM and buying at the IDA1 and IDA2. This operation mitigates to some extent the lack of allocation of interconnected capacity between the SEM and GB at the DAM. However as can be observed from Chart 1, the relative volumes traded in the IDA1 are small.

Figure 1 illustrates the timeframe associated with each auction. The colored bars represent the volumes that are traded in each auction (in approximated relative scale as captured from Chart 1).

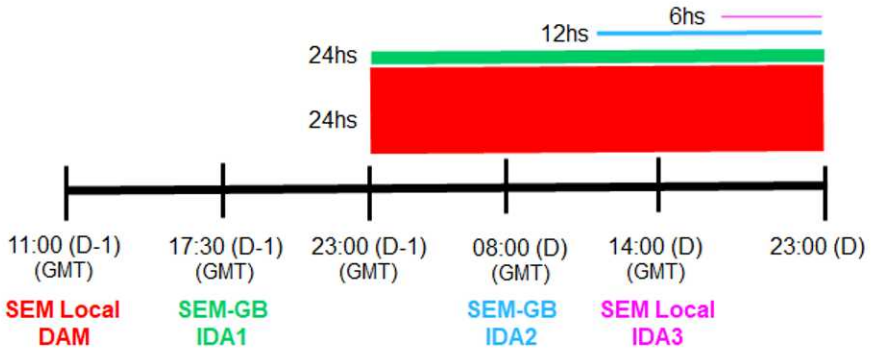

Figure 1: Timeframes and approximate volumes traded in SEM ex-ante markets

The SEM DAM and IDA1 cover the same Trading Day and both take place in the day (D-1) which precedes the delivery day (D).

For the purposes of assessing price arbitrage between the SEM and GB this consultation paper will focus on the decoupled DAM and coupled IDA1 as they concentrate the vast majority of the volumes traded in the SEM Market.

2.2 Price Arbitrage SEM-GB observed since January 2021 (Period Post Brexit)

As a first step, it is useful to create an initial view of the magnitude of the SEM vs. GB markets. Chart 4, compares the metered demand in MW of the two markets. As can be seen, the demand in GB is on average (2021 data) over six times higher than in the SEM. For that reason, GB should be a much stronger driver for price formation when the two markets are coupled.

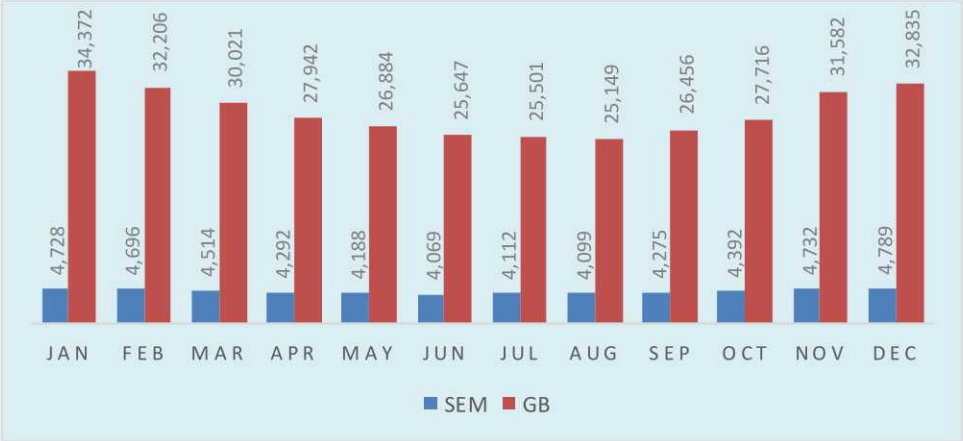

Chart 4: Electricity Average Demand in MW (2021)

Chart 5 shows the volumes cleared in the respective Day Ahead Markets (DAM). GB volumes are obtained by adding up the volumes of both Power Exchanges (EPEX and Nord Pool). It can be seen that the SEM clears substantially more volumes in comparison to the market's demand than GB. The volumes above the demand in the SEM are likely related to units that are subsequently constrained in the balancing market or due to the participation of assetless traders.

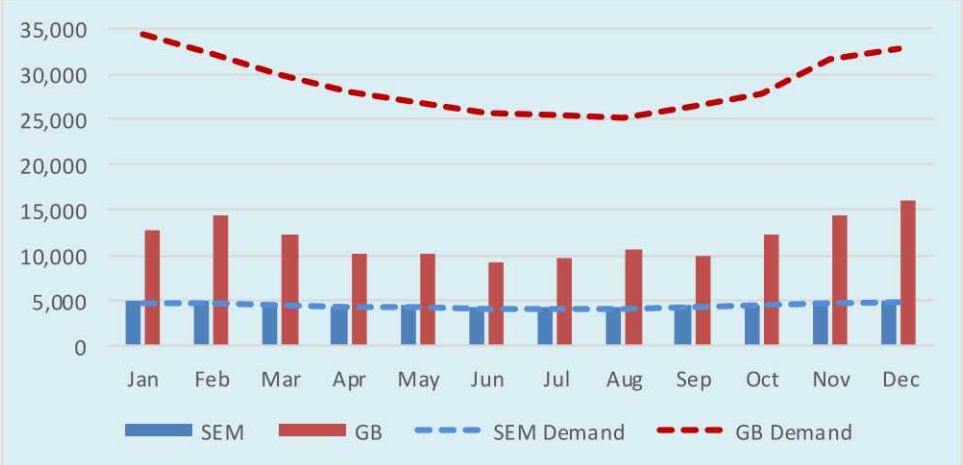

Chart 5: Day Ahead Market Average Volumes SEM vs. GB in MW (2021) against the

There are of course differences in market design which explain why GB clears a smaller proportion of total demand at the DAM, for instance, GB has a physical forward market and operates under a self-dispatch model while in the SEM, the system is operated under a central dispatch model and the spot market (DAM/IDM) is the exclusive route for physical nominations.

Chart 6 shows the average volumes cleared in the coupled SEM and GB IDA1 auction. It can be seen that on average the volumes traded in the SEM DAM are over 6 times higher than in the Intraday (IDA1). This proportion is even lower on the GB side.

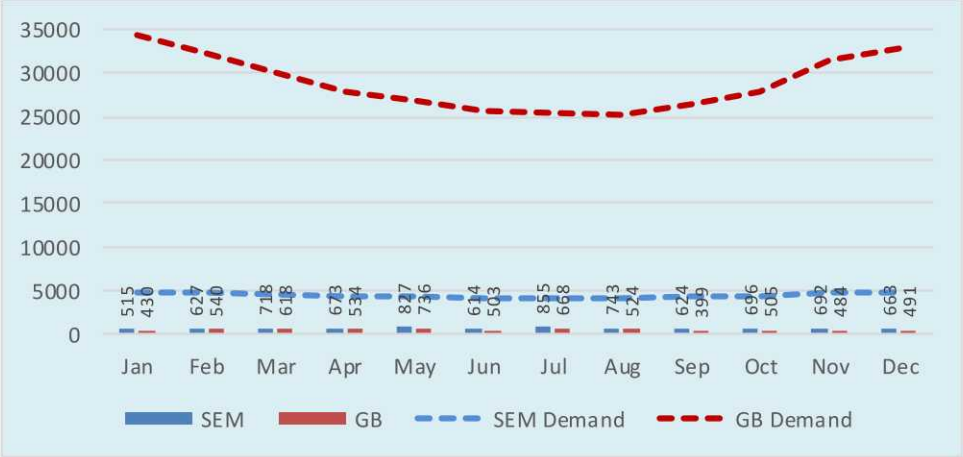

Chart 6: IDA1 Average Volumes in MW SEM vs. GB (2021)

Chart 7 shows the average prices in the DAM across SEM and GB markets. As discussed, these prices are formed in isolation as since January 2021 since there has been no allocation of cross border capacity at the Day Ahead stage. The GB prices were obtained by taking the average of the EPEX and Nord Pool prices.

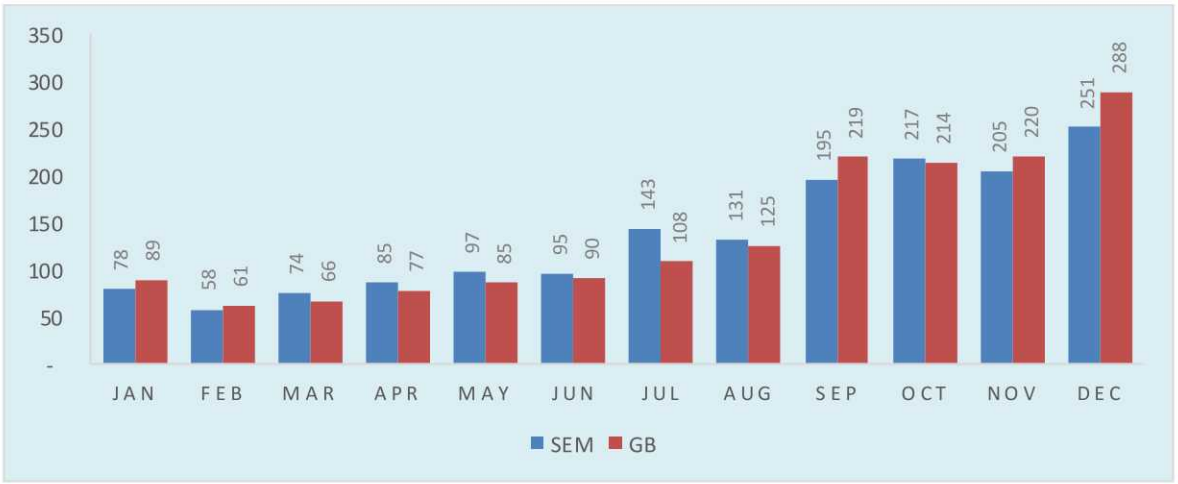

Chart 7: DAM Average Prices (€/MWh) SEM vs. GB (2021)

Chart 8 shows the average prices in the intraday (IDA1) market which is coupled with GB. It can be seen that it follows a similar trend to the day ahead market although with narrower spreads between SEM and GB than are observed in the DAM.

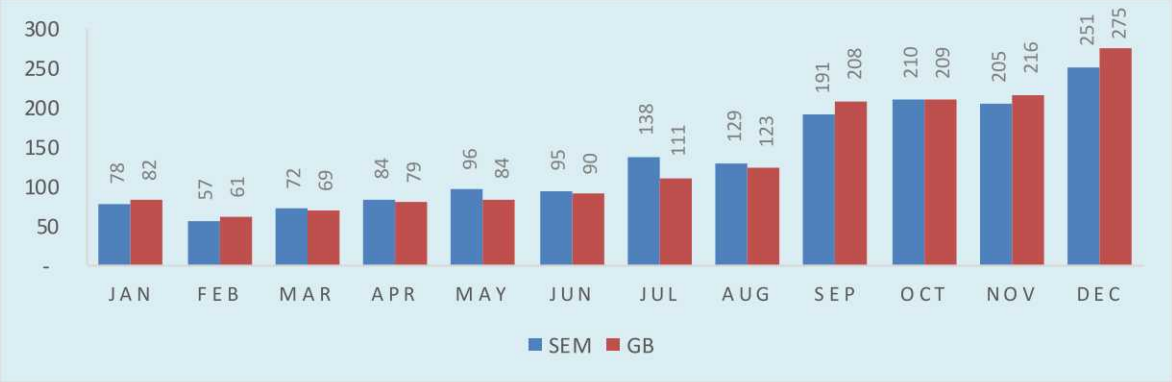

Chart 8: IDA1 Average Prices (€/MWh) SEM vs. GB (2021)

2.3 Price Arbitrage SEM-GB observed since January 2019 (Pre vs. Post Brexit)

Chart 9 shows the observed prices in the SEM and GB Day Ahead Markets over the 2019-2021 period. It can be seen that prices increased noticeably in January 2021, which coincided with the introduction of the new cross border arrangements between the SEM and GB and also between GB and the continent. Prices then dropped in February but have trended upwards since then. From September prices have increased substantially. The substantial increase observed in the second part of the year is largely related to lower levels of wind and a steep increase in fuel prices. However in terms of assessing the benefits of interconnection capacity we need to look into the price differential between the two markets.

Chart 9: DAM Average Prices SEM vs. GB (2019-2021)

Chart 10 shows the magnitude of the average price differentials between the two markets (i.e. absolute values of negative and positive hourly price differentials) over the 2019-2021 period. It can be seen that the price arbitrage between the SEM and GB has increased in the period post Brexit. The decoupling of the Day Ahead market should explain, at least to some extent, the increase in price differentials between the two markets. However, the higher fuel costs observed in 2021 have contributed to

raise power prices in both markets. At higher price levels (and in particular when GB hourly power prices reach levels above the SEM Reliability Option strike price) we observe a higher price differential between the two markets.

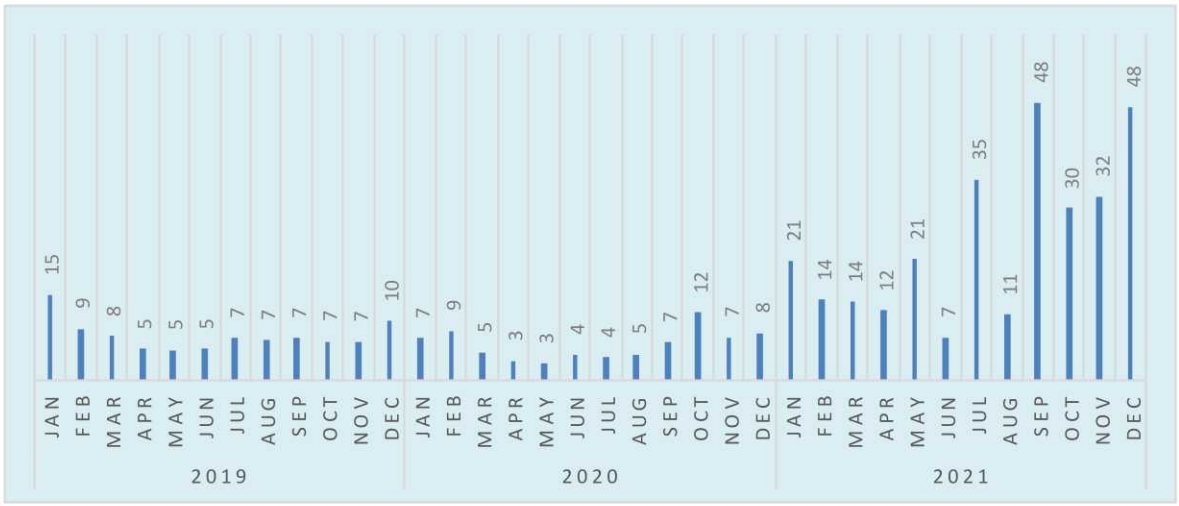

Chart 10: Absolute Price Differentials between SEM and GB's DAM (2019-2020)

Another relevant metric when looking at the price arbitrage between the two markets is the direction of the price differentials. Chart 11 shows that in January 2021 prices in the SEM were substantially lower than in GB. This trend reversed from March to August. In September prices in GB spiked to unprecedented levels.

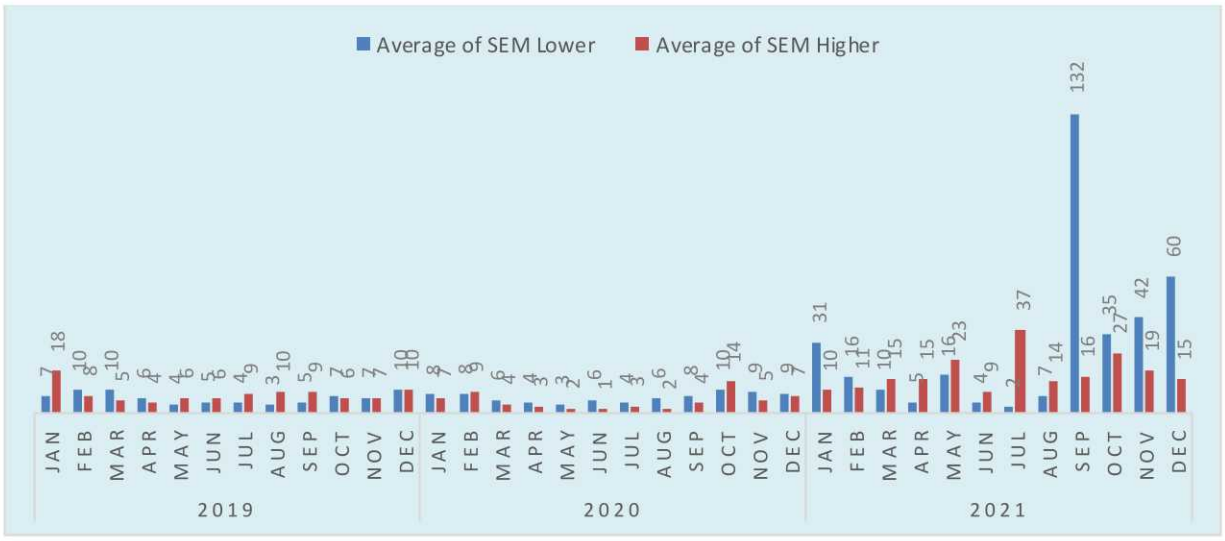

Chart 11: Average of Price Differentials when SEM price is lower and when SEM price is higher EUR/MWh (2019-2020)

The figures in Chart 11 have been calculated according to the following formula:

$$If\ SEMPrice_h < GBPrice_h\ then$$
$$SEMLower_h = GBPrice_h - SEMPrice_h$$
$$Else$$
$$SEMHigher_h = SEMPrice - GBPrice_h$$

Chart 12 shows the average DAM prices within the month of September. It can be seen that while for the majority of the month the SEM and GB prices have been largely correlated, there were specific points in time within the month that GB prices have deviated substantially from the SEM prices.

Chart 12: SEM vs. GB DAM prices - September 2021 in EUR/MWh

It is evident that the GB prices deviate from the SEM prices when they breach the Strike Price of the CRM Reliability Option in the SEM, which was €500 in September 2021.

3. Impacts of Interconnection Capacity on Energy Costs.

As Charts 4 and 5 have shown, the vast majority of the liquidity is concentrated in the SEM and GB Day Ahead markets. The SEM clears, on average, around 4,500 MW in the day ahead market. This equates to 39,420,000 MWh per year. Hence, for each €1 per year that, due to the Interconnection capacity, prices are moved up or down a fluctuation in overall energy costs of circa €39.4 million per year results.

If the same exercise is conducted for the IDA1 timeframe, the fluctuation in energy costs caused by a €1 per year shift in prices would be circa € 5.9 million (The IDA1 clears on average 680 MW, or approximately 5,900,000 MWh per year). This analysis is a very rough estimate and the purpose is to illustrate the fact that the SEM DAM has in 2021 cleared much larger volumes of energy and for that reason fluctuations in the SEM DAM prices produce a much larger impact on the SEM overall energy costs.

Given that the Interconnection capacity between the SEM and GB corresponds to 22% of the SEM average demand, it would be expected that the allocation of Interconnection capacity at the Day Ahead stage would have contributed to narrowing the price differential between the two markets.

The Market Modelling Group (MMG) within the SEM RAs carried out a modeling exercise in the context of setting prices for the purposes of Directed Contracts. Prices

were calculated for the three DC products in the market: Baseload, Mid-Merit and Peak. The MMG team ran two models, one with interconnection capacity switched on and the other with the SEM operating in isolation (Interconnectors off). The Table 2 below provides information on the pricing for the Round 14, covering the period Q3 2021 to Q2 2022 inclusive.

Interconnectors On				Interconnectors Off				delta		
Quarter	Baseload	Mid-merit	Peak	Quarter	Baseload	Mid-merit	Peak	Baseload	Mid-merit	Peak
Q3 2021	€56.92	€62.57		Q3 2021	€61.54	€69.13		8%	10%	
Q4 2021	€67.73	€76.63	€99.87	Q4 2021	€71.64	€84.65	€110.90	6%	10%	11%
Q1 2022	€73.86	€84.24	€109.31	Q1 2022	€76.88	€90.88	€117.04	4%	8%	7%
Q2 2022	€57.85	€63.26		Q2 2022	€63.16	€70.77		9%	12%	

Table 2: Price Modelling results (€/MWh) - Interconnectors on and off

It can be seen from the Table 2 that the projected prices for the SEM are lower when interconnection capacity with GB is switched on. The delta figures show by how much. These results are a good indicator as to how interconnection capacity could influence price formation in the SEM day ahead market. However it is necessary to observe that part of the gains of having the two markets coupled, reflected in the delta, is currently captured in the intraday market.

4. Other relevant cross border trading arrangements

This section outlines the different arrangements for cross border trading which exist on GB's other borders.

4.1 Channel Area Interconnectors

Great Britain's electricity market currently has 5GW of electricity interconnector capacity across the English Channel:

- 3GW to France (IFA and IFA2)
- 1GW to the Netherlands (BritNed)
- 1GW to Belgium (Nemo Link)

Since 1 January 2021 (Post implementation period), the capacity of these interconnectors is no longer allocated by the SDAC arrangements and there are no other mechanisms in place for implicit allocation of capacity in any trading timeframe. Instead the capacity of these interconnectors has been allocated via the applicable fallback arrangements i.e. an explicit mechanism whereby market participants buy Physical Transmission Rights (PTRs) which are subject to the Use it or Lose It (UIOLI) principle.

4.2 North Sea Link

Since 1 October 2021, the North Sea Link (NSL) has been operational. The NSL is a 1400MW, 720 kilometer subsea interconnector linking the electricity systems of GB and Norway.

Norway operates inside the EU Internal Energy Market (IEM) and hence participates in the SDAC. As an EEA country, Norway is not party to the TCA between the EU and UK. Instead, trade with Norway is governed by the UK/Norway: Agreement on Cross-Border Trade in Electricity and Cooperation on Electricity Interconnection [TS No.18/2021] signed in September 2021. Nord Pool has been awarded a contract by National Grid and Statnett to deliver asolution outside of the IEM to provide implicit capacity in its day ahead market for the NSL.

In 2021, Ofgem and NVE-RME approved the Access Rules (ARs) for the NSL. The approved ARs set out the arrangements for implicit day-ahead capacity allocation. NSL went live with a day-ahead implicit auction mechanism, which coupled the Nord Pool day-ahead market of GB and a NO2 bidding zone (separated from NO2 included in the SDAC) in Norway. The implicit auction process is being run using an algorithm (similar to the one used by the SDAC) developed and maintained by Nord Pool, which matches orders between market participants.

The implicit auction that allocates the NSL capacity runs in advance of the SDAC process, and participants from Norway can take part in the SDAC if their orders are not matched in the NSL auction. This arrangement produces two different prices for Norway's NO2 bidding zone (SDAC and NSL prices).

The NSL implicit auction closes at 09:50 GMT. The day-ahead implicit solution produces market coupling results with respect to each hour in the period starting at 23:00 GMT (24:00 CET) on Day D-1 and ending at 22:59 GMT (23:59 CET) on Day D. There are currently no provisions for intraday or forward trading across the NSL.

4.3 Future Celtic Interconnector

The Celtic Interconnector is a planned (due to be completed in 2026) 700 MW subsea link between Ireland and France. Unlike the SEM-GB interconnectors, when operational this interconnector will have its capacity allocated under the EU IEM rules as it will link two member states.

5. Consultation

In light of the uncertainty over the timing of implementation of MRLVC the RAs will consider options feasible as an interim step and are therefore seeking input from stakeholders in this regard via this consultation. The question of how long any interim arrangements would last will ultimately be an important consideration in determining whether and what kind of alternative arrangements might be introduced.

The spectrum of possibilities could include for example:

- No change to current arrangements
- Evaluating options to enhance the current implicit allocation of capacity between the SEM and GB.
- Introduction of Physical Transmission Rights (PTRs) with nomination at the Day Ahead Stage.

Responses are invited to the consultation questions set out in Section 5.1 and should be sent, in electronic form, to jeanpierre.miura@uregni.gov.uk and gblack@cru.ie, by 28/03/2022.

5.1 Consultation questions:

1. What impacts have market participants seen since 1 Jan 2021 of decoupling in the Day-Ahead timeframe? What are the most significant impacts identified, if any?

2. Have market participants changed their trading behaviour as a result of the transition to the fallback arrangements (i.e. implicit coupling in the Intraday timeframe)? If there was to be a substantial delay in the implementation of MRLVC, would this cause market participants to change their trading behaviour (further)?

3. How well are the fallback arrangements (i.e. implicit coupling in the Intraday timeframe) working? Is there a need for change to the existing fallback arrangements? If there was to be a substantial delay in the implementation of MRLVC, would there then be a need for a change to the existing fallback arrangements?

4. What improvements could be made to the fallback arrangements in advance of the implementation of MRLVC? Could these improvements continue to bring benefit once MRLVC is implemented?

5. Would the introduction of PTRs in advance of the implementation of MRLVC be beneficial, and to what extent?