



**Review of the Market Concentration Model
for Determining Directed Contracts
Volumes**

SEM-26-26

Consultation Paper

23rd June 2026

EXECUTIVE SUMMARY

The Regulatory Authorities (RAs, i.e., UR and CRU) implement a range of measures to limit the potential for the exercise of market power within the SEM. Directed Contracts (DCs) are part of the RAs market power mitigation strategy to ensure that the benefits associated with the SEM are not undermined by the abuse of market power. This Consultation Paper explains in non-technical terms how the RAs determine the volumes of DCs and it outlines several proposed updates to the model that determines DC volumes.

The SEM Committee (SEMC) is consulting on the proposed amendments to the Market Concentration Model. The Market Concentration Model is used by the RAs to determine the volumes of DCs that are required to be offered during each quarterly DC round. The DC quantities are currently calculated such that market concentration in the SEM (as calculated by the model) is below a certain Herfindahl–Hirschman Index (HHI) threshold. The review ensures that the way in which DC volumes are calculated is efficient, robust and reflective of the changing market environment.

The SEMC notes that a trend of zero DC volumes output from the Market Concentration Model has persisted in recent DC rounds. This follows a decreasing trend in DC volumes to be offered in recent years. Increased interconnection, renewable capacity and the transition of ESB'S Moneypoint Units in the year 2025 are contributory factors to the reduction in output volumes observed.

In 2024, the SEM Committee published an Information Note to notify market participants of their intention to commence a review of the Market Concentration Model ('the Model') ([SEM-24-038](#)). NERA was appointed to carry out the review in collaboration with the RAs. NERA has provided the RAs with a report detailing the findings of their assessment and recommendations of the proposed Model updates. The report is published on the SEMC website alongside this Consultation Paper.

The purpose of this Consultation Paper is to summarise the findings of NERA's recommendations and to seek stakeholder's feedback of the proposed updates to the Model. **Stakeholders should consider the details of this paper, in conjunction with the full NERA report accompanying this publication, to ensure a comprehensive understanding of the analysis undertaken and its conclusions.**

The objective of this consultation is to seek stakeholders' view on the following:

1. To ascertain the value of potentially changing the methodology of the Market Concentration Model;
2. Transition from the existing Herfindahl-Hirschman Index (HHI) approach to the Residual Supplier Index (RSI) approach as the key measure of market concentration. The HHI indicator is a common tool used by economists to measure market concentration and is equal to the sum of the squares of the market shares of firms in the industry. The market share calculations that underlie the HHI analysis in the Concentration Model are based on potentially competitive capacity. Since 2007, the HHI threshold in terms of calculating DCs has been set at 1150. If the forecast market HHI of the Model is;
 - <= 1,500; the market is considered competitive;
 - between 1,500 to 2,500; the market is considered moderately concentrated; and
 - >= 2,500; the market is considered highly concentrated.

The RSI approach directly assesses supply relative to demand whereas the existing HHI approach measures concentration solely focusing on supply without regard to demand;

3. The impact of the proposal to transition to an RSI approach is dependent on the choice of specific values that are set for four key parameters used within the calculation methodology. Decisions of the different parameters to use will result in different volumes of DCs output from the Model. The four parameters are outlined as follows;
 - i. **X-RSI:** where X is the number of companies excluded (i.e., 1, 2, or 3 RSI) from the RSI calculation, e.g., 1-RSI removes the company with the largest share of cost competitive capacity in each hour from the total available supply;
 - ii. **RSI Threshold:** The model calculates the percentage of hours in which RSI falls below the selected threshold. The Model allocates DCs to generation companies until the percentage of hours below the RSI threshold is below a limit (ref. iv. below). An RSI threshold of 1.0 and/or lower identifies hours in which the largest supplier is pivotal. Higher thresholds (e.g., 1.1) could identify conditions in which there are tight system conditions which could be conducive to market power potential;
 - iii. **Cost-competitive capacity threshold (CCCT):** This is applied to determine what supply resources are relevant for the RSI calculation. A decision of whether to

count all available capacity as supply in the RSI calculation or apply a CCCT is required;

- iv. **% limit on hours that can be below the RSI threshold:** this is defined as a percentage of all hours in a segment¹, i.e., determine the share of hours per segment (e.g., 5%, 10%, 15%) that should be allowed to fall below the RSI threshold.
4. Improvements to the treatment of renewable generation capacity within the model in order to better reflect DAM conditions and to account for different financial support schemes.
 5. Allowing DCs to be allocated to more than one company, where appropriate.
 6. Consideration of future modelling priorities and ensuring that the model remains robust and as reflective of the current market as possible.

The SEM Committee seeks stakeholders' views on these key considerations. A consultation response template, which outlines the key questions is appended to this document. Respondents are requested to use the template and provide concise feedback, supported by evidence and examples, where appropriate. Please ensure any responses containing commercially sensitive information are clearly marked as confidential.

The SEM Committee reiterates that stakeholders should consider the details of this paper, and the NERA report accompanying this publication, to ensure a comprehensive understanding of the analysis undertaken and its conclusions. The RAs request comments by close of business on Friday 21 August 2026.

¹ A "segment" means the set hours over which market concentration is calculated (i.e. peak hours, mid-merit hours and off-peak hours).

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1. Introduction

1.1 Background

The SEM relies on a number of measures to mitigate the scope for the exercise of market power. The key market power mitigation mechanisms currently in place are as follows:

- Bidding Code of Practice (BCoP): All generators are required to bid in line with a defined set of rules. These rules have been designed to prevent market abuse in situations where market power could be present.
- Market Monitoring Unit (MMU): Located within the Regulatory Authorities, the MMU carries out ex-post monitoring of the SEM to ensure that generators' bids comply with the BCoP. It also investigates the exercise of market power, including potential breaches of bidding principles and other market rules.
- Vertical ring-fencing: This consists of strict licensing arrangements for ESB and Viridian. These arrangements are intended to prevent anti-competitive behaviour, cross-subsidies, and the sale or purchase of contracts between generation and supply businesses other than on an arm's length basis and on normal commercial terms. In practice, this means, for example, that ESB Generation must offer forward financial contracts to all suppliers on the same basis and cannot provide preferential terms to its own supply business.
- Directed Contracts (DCs): These are forward financial Contracts for Differences (CfDs) directed by the Regulatory Authorities. They are part of the RAs' market power mitigation strategy to ensure that the benefits associated with the SEM are not undermined by the abuse of market power. DCs mitigate market power by reducing the incentive for incumbent generator(s) who are subject to DC contracts to submit commercial bids into the SEM above competitive levels, or otherwise withhold capacity, in order to influence spot prices or future contract prices. DC subscription windows are typically held every quarter, with DCs allocated on a rolling basis up to five quarters ahead.

DC prices are based upon a forecast of DAM prices. Prices are forecast by RAs using an econometric pricing model that creates the DC Pricing Formulae that specify the strike prices for DC transactions, as a function of forward fuel and carbon prices. The DC Pricing Formulae are designed to determine for each quarter a unique price for baseload

transactions, mid-merit transactions and peak transactions. The Econometric Pricing Model uses the recently validated SEM PLEXOS model outputs that are based on various fuel price scenarios ([SEM-25-010](#)).

The Market Concentration Model (the Model) is used by RAs to calculate the quantity of DCs required to be offered to eligible suppliers in each DC round. The Model was described in detail within the Directed Contracts Implementation Consultation Paper ([SEM-17-064](#)) and is published ([SEM-17-082](#)) alongside the Directed Contracts Implementation Decision Paper ([SEM-17-081](#)). An operational review of the model was undertaken in 2019 and an Information note detailing the key changes that were made to the model was published ([SEM-19-030a](#)), in addition to an updated version of the model ([SEM-19-030b](#)).

The existing Model calculates DC quantities (MW) using a HHI² approach. Since 2007, the HHI threshold in terms of calculating DCs is 1150. The 1150 threshold level was chosen as a result of several factors including *“the low elasticity of spot electric markets, the disproportionate contribution of a single player to the HHI, computational assumptions and limitations on the ability to develop perfect data, the ringfencing decision and the fact that the SEM was a new and untested market at the time”* (AIP/SEM/208/06³). In economic terms, the HHI equals to the sum of the squares of the market shares of firms in the industry. If the forecast market HHI of the Model is;

$\leq 1,500$; the market is considered competitive;

between 1,500 to 2,500; the market is considered moderately concentrated.

$\geq 2,500$; the market is considered highly concentrated.

Within the model DCs continue to be allocated until the HHI reduces to a level just below 1150 target.

The RAs note a recent trend of zero volumes across all modelled quarters that were output from the DC Market Concentration Model. DC volumes have been following a downward trend in recent DC rounds due to the impact of increased interconnection and the increase in renewable capacity that is forecast within the SEM PLEXOS Model. Other factors contributing to the reduction in volumes include the transition of ESB’s Moneypoint Units in the year 2025. The RAs previously notified market participants of their intention to commence a review of the Market Concentration Model in 2024 ([SEM-24-038](#)). This

² Herfindahl Hirschman Index; HHI is a tool used by economists to measure market concentration.

³ Directed Contract Quantification Methodology Decision Paper

review follows the RAs completion of a back cast and validation of the SEM PLEXOS Model ([SEM-25-010](#)) and reflects the RAs' commitment to ensure that the way in which DC volumes are calculated is efficient, robust and reflective of the changing market environment. Independent external consultants, NERA, were appointed by the RAs to carry out the review.

The objective of this consultation paper is to inform stakeholders of the key findings arising from the external review and to seek stakeholders feedback of the review and of the proposed updates to be implemented to the Model.

1.1.2 Structure of Paper

The remainder of this document is structured as follows:

- **Section 2:** Outlines the key findings arising from the external review and the proposed updates to be implemented to the Model;
- **Section 3:** Outlines the output DC volumes resulting from various scenarios tests that were conducted based on the updated RSI Model approach;
- **Section 4:** Summarises the proposed updates to be implemented to the Model in tabular format;
- **Section 5:** Lists the consultation questions that the SEM Committee seeks stakeholders' views on;
- **Section 6:** Outlines the next steps and includes information of the duration of the consultation phase and the requested format for responses.

2. Outcome of the Review and Proposed Updates to be Implemented to the Model

2.1 Replacing the existing HHI approach with the Residual Supplier Index (RSI) as the Measure of Market Concentration

HHI is a common tool used by economists to measure market concentration. The HHI indicator is equal to the sum of the squares of the market shares of firms in the industry. The market share calculations that underlie the HHI analysis in the Concentration Model are based on potentially competitive capacity. DCs are allocated until the HHI is reduced below the current target HHI level of 1,150. The existing Model format that calculates DC

quantities (MW) using the HHI approach has resulted in zero volumes in numerous recent DC rounds. This model outcome⁴ potentially indicates one of the following;

- a. that the market has become sufficiently competitive across the four modelled quarters;
or
- b. that the metric is not reflective of dynamic market conditions, e.g., in a situation of high demand and limited available capacity (supply).

Merits of the HHI approach include its relatively straightforward calculation with one key parameter (the HHI threshold) and, similar to the RSI approach, it considers the relative market size of all market participants beyond the largest suppliers. Further there are various precedents of its use in the electricity sector in SEM and other jurisdictions.

A key difference between RSI and HHI is that RSI measures the concentration of a market with consideration to the demand in such market, whereas HHI does not consider demand in a market. As a result, HHI can understate market power risk during tight periods, whereas RSI considers how tight a market is and therefore has the ability to ascertain the risk of abuse of market power in a wide variety of supply and demand situations. Tight periods are intervals when system demand is high relative to available generation capacity, leaving little spare (or residual) capacity on the system. This can occur for a number of reasons including during peak demand hours, cold spells, periods of low renewables, generator outages, or reduced plant availability. All things being equal, lower levels of installed capacity relative to demand increases the potential for tight periods.

Even in a market with relatively diversified ownership, a large generator may still have significant influence when demand is high, and the system is operating close to its capacity limits. RSI addresses this limitation by directly linking supply concentration to demand conditions. This is carried out by determining if the largest supplier(s) were unavailable, whether the remaining generators would be sufficient to meet demand. By comparing the remaining available generation to expected demand, RSI provides a clearer picture of how dependent the system is on large suppliers at critical times. Therefore, it could be argued

⁴ Should not be considered an accurate predictor/reflection of true market concentration in the SEM. The market share calculations that underlie the HHI analysis in the Model are based on the potentially competitive capacity modelled in the context of the Day Ahead Market only. The "market" in the model is defined as the total amount of capacity that is relevant to competition in any given hour. "*Potentially competitive capacity*" is calculated hourly for the various generation owners in the Model, based on the cost of each generation owner's units. In a given hour, a unit's capacity is considered potentially competitive so long as its cost is less than or equal to the DAM Price * (1.05).

that RSI is better suited to identifying market power risk in hours when the system is tight, as it directly reflects the extent to which demand relies on a small number of large generators to be met.

Company c 's RSI in hour h is calculated as follows (as shown in the formula, DC Volumes reduce a company's supply for the purposes of the RSI calculation in the Model):

$$RSI_{h,c} = \frac{\text{Total Cost Competitive Supply}_h - \text{Max}(0, \text{Cost Competitive Supply}_{h,c} - \text{DC Volume}_c)}{\text{Load}_h}$$

RSI compares demand with the amount of generation available once the largest supplier or suppliers are removed, giving a clearer picture of dependence on large generators during tight periods. An RSI value near to or below 1.0 in an hour suggests company c 's capacity is required to serve load and it is near to or at pivotality, i.e., there is greater potential for market abuse within this hour. If company c were obliged to offer DCs, it will increase its RSI value. RSI compares demand with the amount of generation available once the largest supplier or suppliers are removed, giving a clearer picture of dependence on large generators during tight periods.

There is precedent for the use of RSI approaches in other markets. For example, a full-year formal threshold test was conducted in Germany, which uses $1 - RSI < 1.0$, and a limit of 5 per cent of hours to determine if a supplier has a dominant market position. EU guidance from 2007 also suggests the use of a full-year RSI test, where the test is $1 - RSI < 1.1$ and a limit of 5 per cent of hours. The Pennsylvania-New Jersey-Maryland Interconnector (PJM, a regional grid in the eastern US) and the California Independent System Operator (CAISO, the regional grid in California) uses ex ante mitigation, based on RSI calculated for individual hours rather than across the full year. The Southwest Power Pool (SPP) has also used pivotal supplier analysis as a tool in evaluating market power.

The SEM Committee's minded to position is to replace the existing HHI approach with the Residual Supplier Index (RSI) as the key measure of market concentration within the DC Market Concentration Model.

2.2 Four Key Parameters used in the RSI Calculation Approach

To use the RSI approach as a measure of market concentration, SEMC needs to decide upon four key parameters. Together, these define how cautious the model is during

periods of high demand relative to supply (more cautious indicating harder to satisfy the RSI threshold). Consequently, the impact on output DC volumes is dependent on the choice of specific values that are set for four key parameters used within the RSI calculation.

The four parameters are outlined as follows;

- i. **X-RSI:** where X is the number of companies excluded (i.e., 1, 2, or 3 RSI) from the RSI calculation, e.g., 1-RSI focuses on the largest supplier and removes the company with the largest share of cost competitive capacity in each hour. 2-RSI or 3-RSI subtracts the total cost-competitive capacity of the top two or three largest suppliers respectively. NERA found a 3-RSI approach is likely to be overly stringent for the SEM as within their test models a high limit on hours was required in order to reach a 3-RSI model solution with DC volumes less than c. 1.25 GW, even when applying no cost-competitive capacity threshold.

- ii. **RSI Threshold:** The model calculates the percentage of hours in which RSI falls below the selected threshold. The Model allocates DCs to generation companies until the percentage of hours below the RSI threshold is below a limit (ref. iv. below). An RSI threshold of 1.0 identifies hours in which the largest supplier(s) are pivotal. Pivotality refers to a supplier that has a sufficient share of capacity such that they have the ability to withhold its capacity and the remaining generation would not be sufficient enough to meet total demand. NERA notes that there is precedent that a threshold of 1.1 indicates that a market is close to pivotality. A threshold of 1.1 may identify conditions in which there is potential for market power without any entity being pivotal, e.g., tight system conditions or a risk of plant outages;

- iii. **Cost-competitive capacity threshold (CCCT):** This is applied to determine what supply resources are relevant for the RSI calculation. A decision on whether to count all available capacity as supply in the RSI calculation or apply a CCCT is required. There is precedent from other jurisdictions for either using all capacity or setting a CCCT of 50 per cent, i.e., allowing all capacity that is priced below the market clearing price plus 50 per cent of the clearing price to be considered cost-competitive. Since the CCCT is set as a percentage of the market clearing price, if the market clearing price is very low the allowance for cost-competitive capacity

could be very limited. To counteract this, a floor could be applied to the value of the CCCT”.

- iv. **% limit on hours that can be below the RSI threshold:** this is defined as a percentage of all hours in a segment, i.e., to determine the share of hours per segment (e.g., 5%, 10%, 15%) that should be allowed to fall below the RSI threshold.

The above parameters do not operate in isolation, rather, they interact simultaneously to determine the overall level of market power mitigation delivered by the RSI model. A more conservative setting in one parameter can be offset by a less restrictive setting in another, allowing calibration of the model to reflect the overall tolerance for risk. Table 1 below outlines the output DC volumes from the RSI Model under seven different parameter scenarios⁵. The DC quantities shown reflect the sum of baseload, mid-merit, and peak DCs, by quarter and across companies. Table 1 shows that the updated Model allocates between **0MW and 895MW** of DCs (on average for the year) for the different combinations of the parameters chosen. By way of comparison, under the existing HHI approach, the model output zero volumes across all modelled quarters in DC Round 31. Refer to page 46 of NERA’s report where further information of their analysis is detailed.

⁵ Utilises DC Round 31 inputs and outputs as the base model ([SEM-25-020](#))

Input: Parameter Settings				Output: Allocated DCs (MW)				
X-RSI	RSI threshold	Cost-competitive capacity threshold (CCCT)	Limit on hours	Q4 2025	Q1 2026	Q2 2026	Q3 2026	Average
2-RSI	1.0	No CCCT	5%	750	1350	990	490	895
2-RSI	1.0	100%	15%	540	700	770	320	583
2-RSI	1.0	No CCCT	15%	360	610	570	90	408
1-RSI	1.1	50%	5%	90	540	540	0	293
1-RSI	1.1	50%	10%	0	150	310	0	115
1-RSI	1.1	100%	5%	40	360	110	0	128
1-RSI	1.0	50%	5%	0	0	0	0	0

Table 1: The Volume of DCs Output from the RSI Model Depends on the Settings Chosen for Four Parameters (*Illustrative Example of Seven Parameter Settings*) Source: NERA

Due to the complex and substantive nature of the four parameters, the SEM Committee have not formed a minded-to position of the four parameters at this stage and is seeking stakeholder input to support its considerations.

2.3 Improvements to the Treatment of Renewable Generation Capacity

Part of NERA’s assignment included reviewing the treatment of wind and solar in the model, accounting for different ownership structures of renewable resources and considering whether a renewable unit is part of a renewable energy support scheme (e.g., RESS). SEMC proposes, based on NERA’s recommendations, a number of key updates to the treatment of wind and solar units in the Concentration Model. The proposal includes the following;

- i. **Adding solar capacity to the Model:** Solar is currently not reflected in the model. Given its increasing prominence in the SEM, SEMC proposes to include solar capacity and treating such units the same as wind capacity.
- ii. **Updating ownership shares for wind and solar units:** The existing model only specifies the ownership of ESB’s wind units and assumes ESB owns 12% of all wind capacity. The remaining 88% of wind capacity is split equally amongst five wind owners and are treated as separate entities. SEMC proposes to include the

wind ownership shares for all named companies in the Model that own at least one dispatchable resource within the SEM PLEXOS Model. Table 2 below reflects the proposed updated wind and solar ownership shares by company.

NERA calculated the wind and solar ownership percentages using data provided by the RAs (data retrieved from market participants via data requests), the TSOs, and publicly available data. Pending approval, the RAs intend to update the wind and solar ownership data within the model on a regular basis. The RAs note that all participants, per their licence conditions, are expected to respond to data requests in an accurate, timely and comprehensive manner. Where participants do not supply the necessary information, the RAs will proceed using their own derived estimates.

Name	Wind % Ownership	Solar % Ownership
ESB	11.5%	9.6%
Bord na Móna	4.5%	0%
SSE	18.3%	1.2%
Energia	11.5%	0.7%
Bord Gáis Energy	3.9%	8.8%
Other Owners ⁶	50.2%	79.6%

Table 2: Estimated Wind and Solar Ownership Shares by Company

iii. **Atomisation of wind and solar units that are subject to certain renewable support schemes**

Specific wind and solar units that are part of certain renewable support schemes have no incentive to exercise market power. For example, participants of the Renewable Electricity Support Scheme (RESS) in Ireland are subject to a two-way Contract for Difference (CfD) and thus are not exposed to market spot prices, which limits (or eliminates) the incentive to exercise market power. NERA have treated units in receipt of such financial support by “atomising” them. Atomisation of capacity means that the Model counts it in the *overall* market’s supply but does not count it in any individual owner’s supply. In the existing HHI-based model, atomisation reduces the HHI and has a larger impact if the atomised

⁶ “Other Owners” denote owners without dispatchable generation in the SEM and distributed wind and solar resources which are not registered in the SEM. Any party that owns dispatchable generation in the SEM and does not appear in the table does not own any wind or solar per the methodology set out below. Source: NERA analysis of wind and solar registration data from MMG and public data sources.

capacity belongs to the largest owner. In the RSI model, atomisation increases the RSI if the largest owner's (or owners', for 2- or 3-RSI) capacity is atomised. Atomisation of wind and solar supported by the RESS scheme would be a change versus the existing Model, which does not atomise any wind capacity.

By contrast, Ireland's Renewable Energy Feed-in Tariff (REFIT) scheme is a one-way CfD. Under a one-way CfD, the wind or solar unit can benefit from increased prices if prices are above the contract reference price and therefore may have an incentive to raise prices. NERA does not recommend atomising such capacity, as current SEM prices are not substantially below the REFIT reference price, therefore this capacity may benefit from higher market prices. Northern Ireland's Renewables Obligation (NIRO) scheme provides a supplementary source of revenue for renewables in addition to the market price. Renewables participating in such scheme may receive the benefit of higher SEM prices and therefore have an incentive to exercise market power. NERA also does not recommend atomising renewables under the NIRO scheme. Not atomising wind and solar supported by the REFIT or NIRO schemes aligns with the approach in the existing Model.

iv. Treatment of curtailed wind and solar

PLEXOS has the ability to curtail wind or solar in cases where there is insufficient load to absorb all output or when it is economically efficient within an unconstrained model to curtail⁷. The existing Market Concentration Model does not consider curtailed volumes of wind and solar as part of supply for the purposes of measuring market concentration. The SEM PLEXOS model rarely curtails wind and therefore the decision to curtail wind and solar is not material. However, as total renewables on the system increases, the occurrence of curtailment may increase. NERA recommends that the Model includes curtailed wind and solar as part of the supply as such curtailed volumes may help prevent market power abuse as they are part of the wider supply of capacity.

The SEM Committee's minded to position with regard to improving the representation of renewable generation in the model is as follows:

- Include solar capacity in the Model and treating such units the same as wind capacity;

⁷ The RAs stress that the curtailments discussed herein are curtailments that occur in the unconstrained SEM PLEXOS Model, where the SEM PLEXOS Model also does not have a System Non-Synchronous Penetration limit. Wind and solar generation curtailed during actual SEM operations due to transmission constraints or non-synchronous limits are already counted in the SEM PLEXOS Model and hence in the Concentration Model.

- Updating the ownership shares of wind and solar units for all named companies in the Model that own at least one dispatchable resource in the SEM PLEXOS Model, as outlined in Table 2;
- Atomise units that participate in RESS, do not atomise units that participate in REFIT and the NIRO scheme; and
- Include curtailed wind and solar as part of the supply mix for the purpose of measuring market concentration.

2.4 Treatment of Batteries

Batteries are currently not included in the Model. NERA recommends including batteries in the Model. Pumped storage and batteries function similarly in the PLEXOS model; both store energy over time and incur efficiency losses that result in lower discharge relative to charging. Their treatment in the model should therefore be consistent. NERA recommends treating batteries as cost-competitive capacity in the model, similar to hydro and pumped storage units.

Conceptually, including a unit's full *potential* capacity in every period would cause the Model to understate market concentration, because it would overstate the capacity that is actually available across all periods. Using scheduled generation instead may slightly overstate concentration, since it does not fully capture the additional cost-competitive capacity that hydro and pumped storage units could provide in a given period. Using actual generation is a highly simplified way of reflecting the energy limited nature of the units.

The SEM Committee's minded to position with regard to batteries is to include them in the Model, using actual generation output from the PLEXOS Model.

2.5 Treatment of Demand Side Units (DSUs)

The existing model currently does not include DSUs and NERA has recommended maintaining this approach. Conceptually, DSUs may help mitigate market power by providing extra supply during tight conditions and they could be factored into market concentration measures. However, NERA note in practice DSUs may be of limited impact on market power because they may only respond at high prices, particularly over shorter periods, as many DSUs submit offers that include high shutdown costs. The SEM PLEXOS model outputs ~19 MW of DSU supply, reflecting the low DSU levels seen in practice. NERA notes that if the RAs maintain the principle of alignment between the Concentration Model and the SEM PLEXOS Model, the limited DSU volume represented

in PLEXOS implies that their inclusion or exclusion would have no material impact on the Concentration Model outcomes.

The SEM Committee's minded to position with regard to DSUs is to maintain the existing format whereby DSUs are not included in the Model.

2.6 Allocating DCs to More than One Company

The existing Model restricts the number of companies that are eligible to be obliged to offer DCs to two and there is a requirement for the user to pre-select the companies that are eligible to be obliged to offer DCs. Historically, ESB is the only entity that has been allocated DCs⁸. As part of the RSI-based model, NERA have developed a proposed approach that assigns DCs to the largest companies, based on an algorithm where all companies are treated equally based on their average RSI levels, with no restriction on the number of companies eligible to be mandated to offer DCs. Whether DCs in practice are allocated to companies beside ESB depends on the state of the supply and demand mix, market concentration, and the RSI parameters set within the Model. NERA recommends allowing the Model to treat all companies equally in terms of potential to be obliged to offer DCs.

The existing HHI-based Model assigns the next incremental MW of DCs to the company whose net competitive supply is largest (i.e. competitive supply after removing any DCs already allocated). The proposed RSI model takes a similar approach and assigns the next increment of DCs to the company with the *lowest average RSI* for the relevant quarter and type of hour (baseload, mid-merit, or peak), after consideration of DCs already allocated. NERA devised this proposal due to the simplicity, explainability, and intuitiveness of that approach. Under current conditions and for the foreseeable future, NERA's scenario analysis suggests that it is unlikely that a company besides ESB may be obliged to offer material quantities of DCs.

The proposed Model currently only assigns DCs to companies other the ESB when a high total volume of DCs are required to meet the RSI threshold, as set by certain relatively

⁸ With the exception of an occurrence in 2008/9 whereby NIE PPB were obliged to offer DCs, ref. SEM-08-051.

“strict” RSI parameters⁹. Other factors that may influence if DCs are allocated to more than one company include supply and demand conditions and the relative size of ESB versus other entities. NERA recommends that if the Model were to assign material volumes of DCs to multiple companies and the RAs should more carefully consider the relative merits of different approaches to determining which company receives the next incremental MW of DCs.

The SEM Committee’s minded to position with regard to allocating DCs to More than company is as follows:

- Assigns DCs to the largest companies where all companies are treated equally, with no restriction on the number of companies eligible to be allocated DCs.

3. Sensitivity Testing: Estimated DCs from the updated RSI Model Under Different Scenarios

NERA note that an RSI model will not necessarily output more DC volumes by comparison to the existing HHI model. The volume of DCs allocated by an RSI model is sensitive to the selection of values for the four key parameters used to calibrate the model. In a similar way, the volume of DCs allocated by a HHI model is sensitive to the selection of the HHI threshold that is the key parameter of the model. A further difference between the RSI and HHI models is that the RSI model may produce more variable DCs from quarter to quarter as the approach focuses on market concentration in the most concerning hours. NERA ran sensitivity tests to examine how the volume of DCs produced by the RSI model would change across three scenarios. The results of each scenario are outlined below;

- **Scenario 1 - High Gas and CO2 Price:** this scenario produced lower DC volumes for those parametrisations with a CCCT (50% or 100%). The higher prices increased the SEM clearing price, causing more gasoil peakers to count as cost-competitive capacity (therefore increasing the RSI and reducing DCs).
- **Scenario 2 - Low gas and CO2 Price:** this scenario produced higher DC volumes for parametrisations with a CCCT (50% or 100%). With the opposite of the effect of Scenario 1, as lower prices decreased SEM clearing prices causing fewer gasoil

⁹ The choice of 1-RSI or 2-RSI does not affect whether companies other than ESB might receive DCs. The Model can allocate DCs to one or two companies under a 1-RSI approach and under a 2-RSI approach.

peakers to count as cost-competitive capacity. There was minimal change for parametrisations with no limit to CCCT.

- Scenario 3 - Expected conditions in 2029:** this scenario produced zero DC volumes across all RSI parametrisations considered. The impact of the increased supply outside the control of ESB and other large owners (i.e., the Celtic interconnector and additional renewables and non-renewables not owned by the largest companies) on RSI exceeded the impact of increased demand from data centres. NERA note this result suggests that in the future as the SEM becomes more interconnected and has more capacity from more suppliers, the Model may consistently produce zero DCs, but NERA note that this is not guaranteed and ultimately depends on how supply and demand conditions actually evolve. Output DC volumes between the scenarios are dependent on the choice of RSI parameter input into the model, as outlined in Table 3 below.

<u>Parameter Settings</u>				<u>Average DC Volumes per Quarter by Scenario (MW)</u>			
X-RSI	RSI threshold	Cost-competitive capacity threshold (CCCT)	Limit on hours	Base Case	Scenario 1: High Price	Scenario 2: Low Price	Scenario 3: Future Year (2029)
2-RSI	1	No CCCT	5%	895	868	883	0
2-RSI	1	100%	15%	583	415	723	0
2-RSI	1	No CCCT	15%	408	383	395	0
1-RSI	1.1	50%	5%	293	65	510	0
1-RSI	1.1	50%	10%	115	0	275	0
1-RSI	1.1	100%	5%	128	25	238	0
1-RSI	1	50%	5%	0	0	0	0

Table 3: The Volume of DCs Various Across Modelling Scenarios as well as Parameter Settings

Further information and details of the analysis NERA conducted can be found in the NERA report accompanying this publication.

4. Proposed Updates to be Implemented to the Model

<u>Topic</u>	<u>Proposal(s)</u>	<u>Rationale</u>
Measure of Market Concentration	Replace the existing HHI approach with the RSI as the key measure of market concentration within the Model.	<ul style="list-style-type: none"> • RSI measures the concentration of a market with consideration to the demand in such market, whereas HHI does not focus on the variability of demand. • RSI considers how tight a market is and therefore has the ability to ascertain the risk of abuse of market power in a wide variety of supply and demand situations. • The impact of using the RSI as a key measure of market concentration is dependent on the choice of specific values that are set for the four key parameters used within the RSI calculation.
Four key parameters used within the RSI calculation	Set the specific value for each parameter; 1. X-RSI; 2. RSI Threshold; 3. Cost-competitive capacity threshold (CCCT); 4. % limit on hours that can be below the RSI threshold.	<ul style="list-style-type: none"> • The parameters do not operate in isolation, rather, they interact simultaneously to determine the overall level of market power mitigation to be delivered by the RSI model. • A more conservative setting in one parameter can be offset by a less restrictive setting in another, allowing calibration of the model to reflect the overall tolerance for risk. • The parameters chosen will define how cautious the model is during periods of high demand and have a material impact on output DC volumes.
Treatment of Renewables	<ul style="list-style-type: none"> i. Add solar capacity to the Model. ii. Update ownership shares for wind and solar units. iii. Atomisation of wind and solar units that are subject to certain renewable support schemes (e.g., REFIT and NIRO only) 	<ul style="list-style-type: none"> • Solar is not reflected in the existing model. Given its increasing prominence in the SEM, propose to include solar capacity and treating such units the same as wind capacity. • The existing model specifies the ownership of ESB's wind units only and assumes ESB owns 12% of all wind capacity. The remaining 88% of wind capacity is split equally amongst five wind owners and are treated as separate entities. Proposed update is to include the wind ownership shares for all named companies in the Model that own at least one dispatchable resource within the SEM PLEXOS Model. • RESS participants are subject to a two-way CfD, suggesting limited to no incentive to exercise market power. Proposed update is to atomise such units. REFIT and NIRO participants may have an incentive to raise prices – proposal is to continue not to atomise such units.

	iv. Include curtailed wind and solar as part of the supply.	<ul style="list-style-type: none"> As total renewables on the system increases, the occurrence of curtailment may increase even in the unconstrained SEM PLEXOS Model. Proposed update is to include curtailed wind and solar as part of the supply as the curtailed volumes may help prevent market power abuse as they are part of the wider supply of capacity.
Treatment of Batteries	Include batteries in the Model, using actual generation output from the PLEXOS Model.	<ul style="list-style-type: none"> Pumped storage and batteries function similarly in the PLEXOS model; both store energy over time and incur efficiency losses that result in lower discharge relative to charging. Their treatment in the model should therefore be consistent. Proposal to treat batteries as cost-competitive capacity in the model, using actual generation output from PLEXOS.
Treatment of DSUs	Maintain the existing approach whereby DSUs are not included in the model.	<ul style="list-style-type: none"> In practice DSUs may be of limited impact on market power because they may only respond at high prices, particularly over shorter periods, as many DSUs submit offers that include high shutdown costs. SEM PLEXOS model outputs ~19 MW of DSU supply, reflecting the low DSU levels seen in practice. The limited DSU volume represented implies that their inclusion or exclusion would have no material impact on the Model outcomes.
Allocation of DCs to More than One Company	Assigns DCs to the largest companies where all companies are treated equally, with no restriction on the number of companies eligible to be obliged to offer DCs.	<ul style="list-style-type: none"> The existing Model restricts the number of companies that are eligible to be allocated DCs to two and there is a requirement for the user to pre-select the companies that are eligible to be allocated DCs. Greater flexibility in allocation may improve competitive outcomes and reduce concentration concerns. Whether DCs in practice are allocated to companies besides ESB depends on the state of the supply and demand mix, market concentration, and the RSI parameters set within the Model.

5. Consultation Questions

The SEM Committee reiterates that this consultation paper summarises the findings of the NERA report and should be considered alongside the full report accompanying this publication to ensure that stakeholders have a comprehensive understanding of the analysis undertaken and its conclusions.

The SEM Committee requests that all stakeholders incorporate their responses in to the 'Response Template' document accompanying this publication. Responses should be clearly marked as confidential, where required.

6. Next Steps

Responses to this paper should be input into the '*Response Template*' document accompanying this publication and forwarded to the Market Modelling Group (mmg@cru.ie) by close of business on 21st August 2026. Following the review of stakeholders' feedback and consideration of all responses received, the SEM Committee will publish its next steps in the process and potentially, will publish the envisaged timeline to implement any changes to the Market Concentration Model on an enduring basis.