Recommended Values for SEM Credit Cover Parameters - 2022

Report to the Regulatory Authorities

Version 2.0 18/08/2021

EIRGRID semo Single Electricity Market Operator SONI

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1. SEMC Policy and Trading & Settlement Code Obligations

1.1 Overview of SEM

I-SEM Go-Live on the 30th September 2018 has provided Participants the opportunity to trade in multiple timeframes. Participants have the option to buy and sell energy in the day-ahead market and the intraday markets, with generators having bids or offers accepted in the balancing market based on commercial offers for deviations from their physical notifications as provided to the System Operators (SOs). Settlement for trading energy outlined within Part B of the Trading & Settlement Code covers both balancing actions taken by the SOs and an imbalance settlement requirement which intends to true up Participants' aggregate market positions based on activity in the day-ahead, intraday and balancing markets against their actual (or deemed, in the case of Assetless Units and DSUs) metered positions. In addition to these markets for trading energy, SEM includes a Capacity Market (CM) based on Reliability Options.

SEM allows the TSOs to take actions for non-energy reasons (such as system requirements like voltage support, reserve provision etc.), and to take actions for energy reasons (i.e. maintaining the balancing between demand and supply), using the commercial data submitted for the balancing market. These actions and any differences between traded positions and metered output or consumption are settled through the imbalance settlement processes.

Capacity payments are made to Participants who have succeeded in a capacity auction, recovered through capacity charges on suppliers. As part of the capacity mechanism, those units who are being paid a capacity payment are also exposed to difference charges if the relevant market reference price exceeds a strike price, with Supplier Units being eligible for difference payments in these scenarios.

In the ex-ante markets, the NEMO is responsible for the financial management of the cross border exchanges that result from these trades as well as all local trades. As such, credit arrangements relating to the settlement components in these marketplaces are not considered in scope for this document.

The credit arrangements relating to the settlement components in terms of balancing market, imbalances, and capacity market settlement are considered in scope for the credit arrangements within in this document. The balancing market, imbalance and capacity settlement arrangements will be based on trust arrangements similar to those that were in place in Legacy SEM and detailed within Part A of the Trading and Settlement Code.

Timeframes for imbalance settlement are longer than the ex-ante markets, i.e. weekly rather than daily, these are the same timelines as within the SEM for trading payments and charges. Settlement amounts may generally be smaller than the

Legacy SEM amounts compared to SEM accounts, since not all energy trades are settled through this market but rather just those related to balancing actions and imbalances. However, the imbalance settlement calculations are more complicated, with the need to consider meter data, dispatch instructions, bid-offer acceptances, uninstructed imbalances, testing charges, contracted volumes from the ex-ante markets, etc. Also, as the SEM design separates the responsibility for spot market trading from balancing market actions, this has the effect of splitting cash flows that were aggregated in Legacy SEM.[1] This may have an increasing effect of collateral requirements for generators who are frequently constrained down from their spot market positions. Credit management for the imbalance settlement could be higher risk in SEM compared to Legacy SEM, where a Participant not trading in the ex-ante markets may result in all volumes falling into the imbalance market, and no ability to exclude suppliers from purchasing from this timeframe quickly because of the need to reassign their end use customers:

- If a Participant gets into financial difficulties they will very quickly be stopped from trading in the ex-ante markets when they reach their credit limits. As a result, the risk of payment shortfalls due to a default in the ex-ante markets is minimised by the NEMO;
- The same cannot be done in the balancing market where purchases driven by end customer consumption cannot be stopped immediately, due to the time lag in moving customers to a new supplier or Supplier of Last Resort (SOLR). This means where a supplier is in financial difficulties they will continue to purchase from the balancing market until their customers can be transferred to the SOLR. During this same period all of their purchases of power will likely occur in the balancing market since if they are in genuine financial difficulties it is likely they would have also defaulted and been locked out of ex-ante market trading;
- Hence, in SEM, their entire debt will likely fall into the balancing market when they are in financial difficulties;
- It is on this basis that Supplier Unit undefined exposure is based on forecast Metered Quantities and Imbalance Settlement Prices, rather than based on analysis of historic imbalance settlement.

Settlement of capacity market amounts which are related to energy market activity, i.e. the settlement of Difference Charges and Difference Payments which are based on prices and quantities in the day-ahead, intraday and balancing markets, will be settled to the same timeframes as energy amounts and will be considered trading charges or payments, i.e. weekly. Capacity market amounts related to capacity payments and charges will be settled monthly.

In SEM, a single Settlement Document is issued to a Participant covering all payments and charges in respect of their Generator Units and Supplier Units for imbalance settlement and capacity market settlement. It is intended that this will also

[1] In SEM, the NEMO will settle the spot market amounts while constraint actions (which would appear as non-energy SO balancing actions) are settled by SEMO.

cover initial settlement and any settlement re-runs that are due for billing on the same day. Each payment or charge will be summed to a single line item. The Settlement Document will be the document against which payments must be made by Participants and the Market Operator (MO). This means that the amount issued for settlement will include automatic netting where a Participant has both supplier and Generator Units registered. Based on all of this, a single collateral solution has been implemented for the settlement of Trading Payments and Charges, and Capacity Payments and Charges.

1.2 Credit Cover Requirements in SEM

Credit Cover Obligations refer to the obligations on Participants in respect to collateral that they are required to post. In SEM there are a number of separate market timeframes that require credit management functions as a result there are multiple Credit reports that are published by the MO for Market Participants on a daily basis (Three Credit reports on all week days with the exception of Mondays or days immediately after a bank holiday when only one Credit report is issued).

In the ex-ante markets (the day-ahead and intraday), Participants are using centralised platforms for submitting their commercial offer data to the Nominated Electricity Market Operator (NEMO). In the balancing market, Participants offer balancing energy to the SOs who is responsible for maintaining system balance at all times.

The intent of the SEM design is that all exposures should be covered by collaterals and this has been implemented in Part B of Trading and Settlement Code, calculating exposures relating to the following:

- Fixed Credit Requirement;
- Amounts billed not paid;
- Amounts settled not billed;
- Amounts traded but not delivered; and
- Amounts relating to undefined exposure.

Forecasting is required to determine the undefined exposure elements in the Trading and Settlement Code. It is for use in this forecasting process that a number of the parameters determined through these methodologies are required.

A forecast price is required for calculation of exposures in the Undefined Exposure Period. This is known as the Credit Assessment Price (PCA_g) for the Undefined Exposure Period, g, which is calculated, based on a historical analysis of average past Imbalance Settlement Prices. This price is required for the calculation of exposures relating to Trading Charges for Supplier Units, exposures relating to Trading Charges for New Participants for Generator Units, Supplier Units or Assetless Units, exposures relating to Trading Charges for Adjusted Participants for Supplier Units, and exposures relating to volumes traded not yet delivered for Generator Units, Supplier Units and Assetless Units.

A forecast of a Supplier Unit's Metered Quantity is required to determine their exposure in the Undefined Exposure Period. This is known as the Billing Period Undefined Potential Exposure Quantity ($QUPEB_{pg}$) for a Participant, p, for an Undefined Exposure Period, g, which is calculated based on a historical analysis of average past Metered Quantities for that Participant. This quantity is required for the calculation of exposures relating to Trading Charges and Capacity Charges for a Participant, Adjusted Participant or New Participant for Supplier Units.

A forecast of a Generator Unit's balancing market settlement amounts is required to determine their exposure in the Undefined Exposure Period, in particular for the calculation of Billing Period Undefined Potential Exposure ($EUPEG_{pg}$) for a Participant, p, in relation to its Generator Units and Assetless Units for Undefined Exposure Period, g. This is calculated based on a historical analysis of past Billing Period Cash Flows (CUB_{pg}), relating to average past Total Daily Amounts.

Since these forecasts are based on statistical analysis of historic Sample Undefined Exposure Periods, parameters required as input into this process include the number of days in the Historical Assessment Period (DINHAP), the Analysis Percentile Parameter (AnPP), and the number of days in the Undefined Exposure Period ($UEPBD_g$).

1.3 Parameters for Credit Cover Calculations

Under section G.10 of Part B Of the Trading and Settlement Code, the MO is required to report to the Regulatory Authorities proposing parameters to be used in the calculations of Required Credit Cover at least four months before the start of the Trading Year. This document provides the MO's recommendations, and the rationale used in determining the MO's recommendations, for the following parameters considered under section G.10 are as follows:

- Fixed Credit Requirement;
- Historical Assessment Period;
- Analysis Percentile Parameter;
- Credit Cover Adjustment Trigger;
- Level of the Warning Limit; and
- Level of the Breach Limit.

Under paragraph G.9.1.12 of Part B of the Code, the MO shall determine the Undefined Exposure Period in respect of Billing Period payments and charges from time to time. This document provides the MO's determinations for the Undefined Exposure Period.

Where no change to current SEM values are suggested through the analysis and consideration of a parameter, it has been recommended in this report that the current value used in SEM should be maintained until such a time as any further analysis or considerations of new context indicate otherwise. This was the case with the Fixed Credit Requirement parameter. Where analysis and considerations may identify a potential need to change values from those currently used within SEM, the rationale for these recommendations has been outlined.

The following roles and entities are relevant in the operation of credit cover considered in scope of this document:

- Market Operator – the MO are responsible for the calculation of required credit cover for Participants within SEM balancing market, imbalance and capacity market settlement arrangements. In relation to the SEM Balancing and Capacity Market settlement arrangements, the MO will issue reports to Participants on their level of posted credit cover, their level of required credit cover, whether Participants are in breach of any warning or trading limits, credit cover increase notices as required and will manage posted credit cover with the SEM bank;
- Participant – Participants are required to post credit cover as per the calculations carried out by the MO;
- Credit Cover Provider – Credit Cover Providers are approved banks that can provide an irrevocable Letter of Credit that can be drawn down according to the timings required by the market rules;
- SEM Bank – Participants can lodge cash collaterals in a Collateral Reserve Account with the SEM Bank to cover their credit cover obligations.

1.4 Overview of Data for Analysis

The daily settlement amounts, average Imbalance Settlement Price, and Metered Demand for a “steady supplier” unit from October 2018 through to June 2021 were used for the analysis of the number of days in the Historical Assessment Period, the Analysis Percentile Parameter, the Credit Cover Adjustment Trigger, the level of the Warning Limit, and the level of the Breach Limit.

Actual values have been adjusted slightly by random multipliers in order to create anonymity, while maintaining the general trends.

Brief analysis of the data available has been carried out to determine whether there were any patterns in the data that may affect the results depending on the methodology used. The normalised amount of the daily settlement for the full data period was calculated by using the absolute value divided by the average of the entire data set.

There is an overall increase in settlement amounts since October 2018. This can be seen in Figure 1.

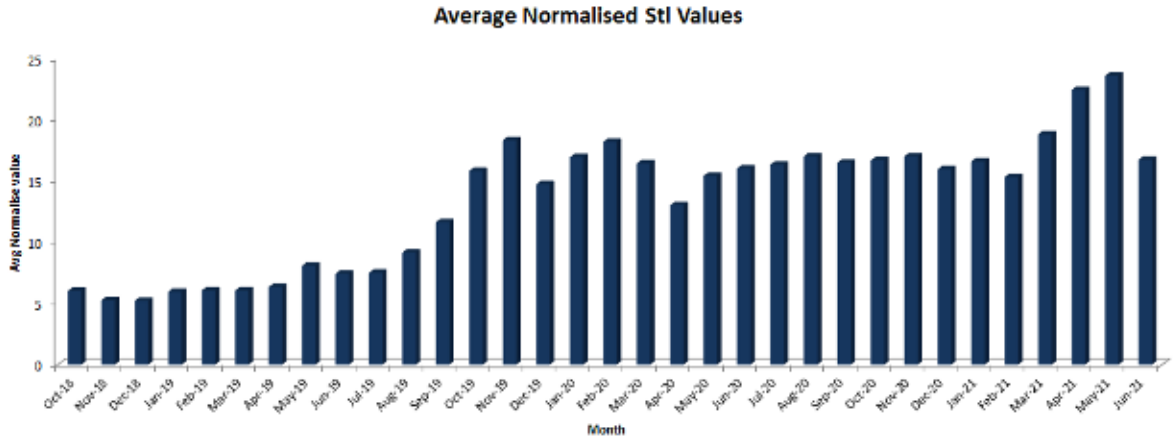

Figure 1: Average Daily Normalised Settlement Amounts by Month

It is intended that the Credit Cover parameters will be reviewed on an annual basis based on the data from the previous year. For the analysis undertaken as part of this report, a data set was selected from 01/10/2018 to 20/06/2021. This is the most recent data within SEM supplied for which the necessary forward looking calculations of realised exposure can be calculated.

Figure 2 shows the metered demand and associated settlement amounts over the data period used in determination of the credit cover parameters. The metered demand is fairly constant showing a weekly cycle as expected from the steady state supplier data. The dip over the Christmas and New Year period is also clearly shown to be related to volume and not price. There is also a clear reduction in metered demand from March 2020 due to COVID-19. The settlement amounts on the other hand show more variation due to the effect of both price and volume. While there is a drop over the Christmas period it is not as marked. The large jump in metering from March 2021 is caused by one supply unit going for zero meter values to over 6k MWh per day. The MDP has confirmed these values are correct as a new supplier was added under the participant.

The large spike displayed on 11/02/2020 in Figure 2 and Figure 3 occurred due to trading. The participant in question did not trade supplier unit volumes in the day ahead and intraday markets and therefore was settled in the balancing market which caused this large spike in supplier settlement.

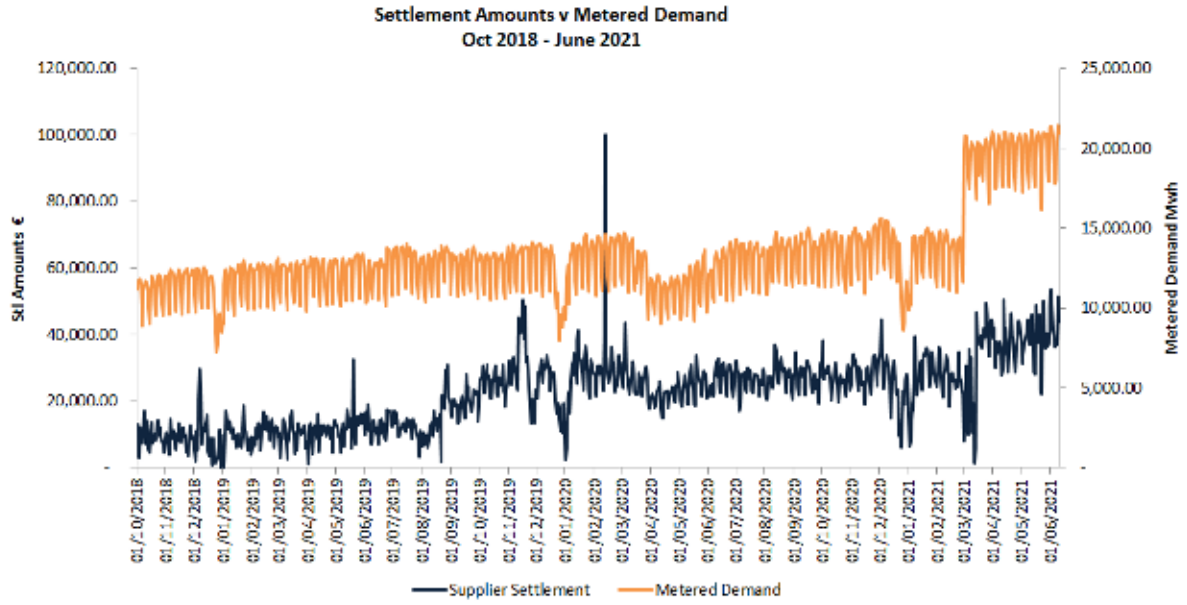

Figure 2: Metered Demand vs Settlement Amounts

Figure 3 shows the steady undefined exposure amounts though higher levels of exposure can be seen where the Imbalance prices increase, resulting in higher supplier settlement values within the sample periods of the Historical Assessment period.

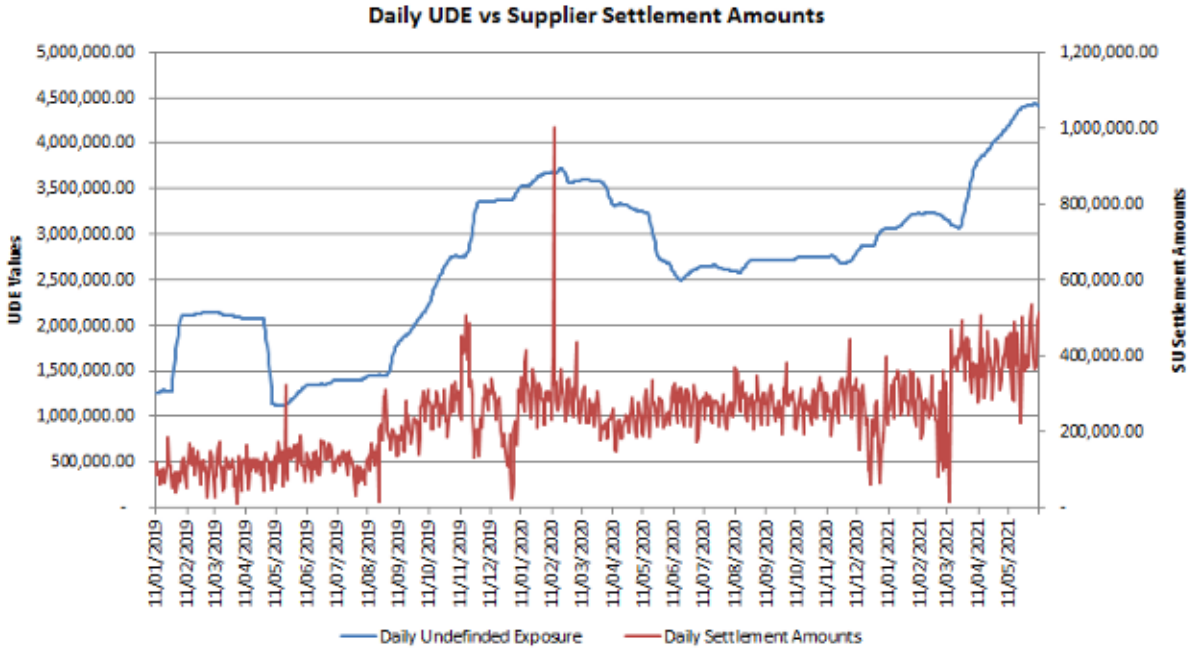

Figure 3: Daily Undefined Exposure vs Supplier Settlement Amounts

The key observation is that settlement amounts, and therefore Undefined Exposure are dependent on both volume and price variation. Importantly, the sample data has episodes of each with volume reductions driving the end of year dip in settlement

amounts, and price increases driving the end of sample increase in settlement amounts. The increase near the end of the sample in Daily Undefined Exposure corresponds with the increased meter values received from MDP.

The methodology for analysing many of the parameters in this report rely on comparisons between the realised Undefined Exposure (calculated retrospectively once actual settlement amounts are available) with the estimated Undefined Exposure calculated using the different options for the parameter in question. This difference is known as the Undefined Exposure Variance. This is not a Code term, but can be a comparison between the estimated Undefined Exposure and realised Undefined Exposure in a period, and can be calculated as the percentage difference between the estimated Undefined Exposure (as defined in the credit cover calculations) and the realised Undefined Exposure.

The important aspects of the Undefined Exposure Variance comparison value are:

- Where the Undefined Exposure Variance percentage is > 0%, or the estimated Undefined Exposure is greater than the realised Undefined Exposure, it is an indication that the calculation of Credit Cover for the Participant would have been over estimated;
- Where the Undefined Exposure Variance percentage < 0%, or the estimated Undefined Exposure is less than the realised Undefined Exposure, it is an indication that the calculation of Credit Cover for the Participant would have been under estimated.

Figure 4 shows the Undefined Exposure Variance for the “steady supplier” whose data was used for this analysis over a sample period from June 2020 to June 2021 with the recommended values for the Credit Cover Parameters. This shows the maximum credit cover shortfalls of approximately 20%, and maximum credit cover surplus of up to 120%. Would have occurred in the sample year using the SEM analysis percentile of 95% (one tail). The shortfall was primarily driven by a period of higher Imbalance prices and the sample periods beginning to utilise realised settlement amounts with in the Historical Assessment period. The maximum surpluses have been primarily driven by a decrease in demand for the supplier and lower Imbalance prices.

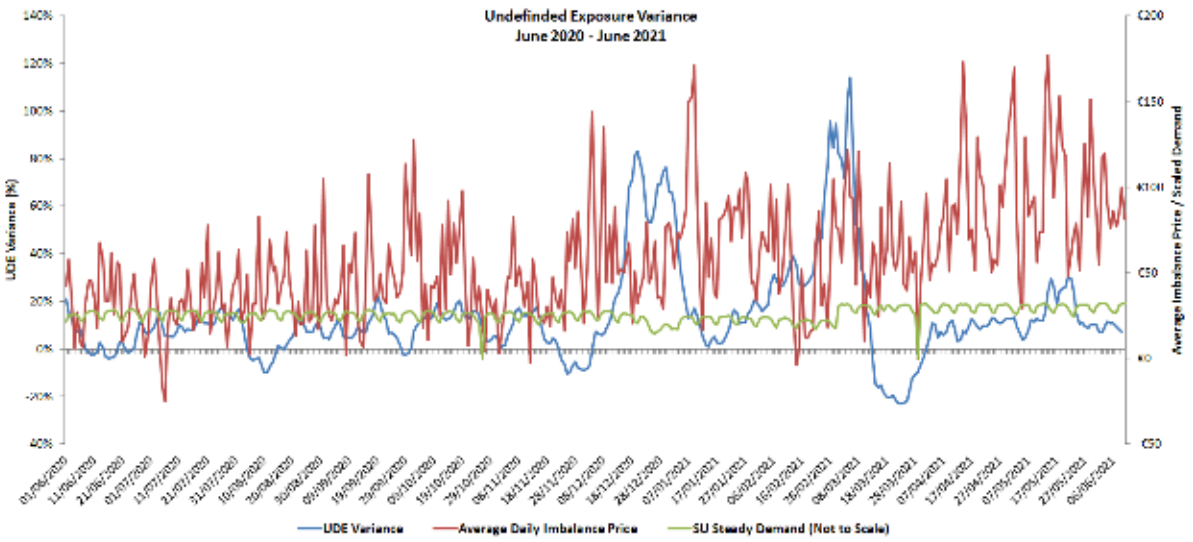

Figure 4: Undefined Exposure Variance for "Steady Supplier" using Recommended Parameter Values

The Trading and Settlement Code equation for the calculation of forecast amounts has two components, the "Point Estimate Component" and the "Deviation Component", as highlighted below taking the equation Part B of the Trading and Settlement Code for the Billing Period Undefined Exposure Quantity calculation for Supplier Units (section: G.14.7.6

> G.14.7.6 The Billing Period Undefined Potential Exposure Quantity ($QUPEB_{pg}$) to be applied for Participant p in respect of its Supplier Units for the Undefined Exposure Period g shall be calculated as follows:

$$QUPEB_{pg} = QMBM_{pg} + AnPP(QMBSD_{pg})$$

where:

(a) $QMBM_{pg}$ is the mean of the Billing Period Metered Demand for Participant p in respect of its Supplier Units to be applied for the Undefined Exposure Period g for all Undefined Exposure Periods in the Historical Assessment Period as calculated in accordance with paragraph G.14.7.4;

(b) AnPP is the Analysis Percentile Parameter applicable for Undefined Exposure Period g; and

(c) $QMBSD_{pg}$ is the standard deviation of the Billing Period Metered Demand for Participant p in respect of its Supplier Units for all Sample Undefined Exposure Periods ω in the Historical Assessment Period to be applied for Undefined Exposure Period g as calculated in accordance with paragraph G.14.7.5."

In this example, $QMBM_{pg}$, is an estimate of a single value of the quantity based on the average over a number of previous samples. The "Deviation Component" in the example is $AnPP(QMBSD_{pg})$, and it is an addition to ensure the estimate covers

statistically likely values (through the standard deviation calculation) to a certain confidence level (through the Analysis Percentile Parameter). The values of each of these two components for different options for the parameter in question can be used in comparisons to determine the most appropriate value for the parameter.

2. Fixed Credit Requirement Parameter

2.1 Background

The Fixed Credit Requirement for a Participant in a Year (known as FCR_{py} in Part B of the Trading and Settlement Code) is part of the current SEM design and is considered the minimum credit cover requirement for any Participant. While the other components of the credit cover calculation relate to recent short-term activity, and the undefined exposure is a statistical estimate of future risk, changes relating to month+4 and month+13 Settlement Reruns (for periods for which resettlement has not yet happened) are not captured in this approach. Also, the statistical approach only provides an estimate of possible exposure and can be susceptible to significant swings in demand or price which make its results inaccurate, as does the transition between different seasons (where the summer load is used in the estimate of exposure into the autumn period). These inaccuracies were taken into account in the development of the Fixed Credit Requirement within the SEM design. This is a value which is calculated for each Generator Unit and Supplier Unit separately. A value is required for all trading unit types, including Assetless Units and Trading Units.

2.2 Considerations

The Fixed Credit Requirement is based on the total resettlement amounts in M+4 and M+13 timeframes, as the FCR is intended to cover the potential amounts arising in resettlement. In SEM, the potential amounts arising from resettlement are assessed based on past total resettlement amounts in those timeframes to ensure that the amount of this credit cover present is sufficient to cover the resettlement amount in the majority of cases. This is because the aspects which drive resettlements in the SEM are largely the same as Legacy SEM, though due to a number of settlement defects, re-settlement at month+4 and month+13 may see higher values of re-settlement pass through the system and result in higher or lower credit cover requirements required for re-settlement.

There has been operational experience to date of these values being sufficient to cover typical payments arising from Settlement Reruns without being overly burdensome, and as many of the drivers for these payments remain the same as Legacy SEM the current values may be sufficient to maintain the incentives in the SEM.

Generator Units would have potential data changes in items such as metered quantity and dispatch instructions which would not be experienced by Assetless Units and Trading Units. However all of these units share a source for potential changes between settlement runs in ex-ante market trade data. This means that Trading Units and Assetless Units are seen as largely the same, when considering their potential for payments due to Settlement Reruns. The payment amounts which could potentially arise from Settlement Reruns would also be of a similar magnitude to that of Generator Units due to similar sources of data. Ex-ante market trade data changes would likely be large volume differences, given the potential reasons for the values of the contracted quantities used to calculate it being incorrect, including

missing files, incorrect application of contract rejection functionality, etc. Therefore as per the first two years of operation all Generator Units, including Assetless Units and Trading Units, could be considered as the same in terms of the value of Fixed Credit Requirement.

In future years, we may refine the values required for specific types of units.

At present Fixed Credit Requirement is not necessary for Capacity Market Units. In all situations since the market went live, a Capacity Market Unit and a Generator Unit would be the same physical entity. Therefore it has been sufficient to consider the requirement under the Generator Unit amounts.

2.3 Recommendation

The following reflects the recommendations of values for the Fixed Credit Requirement of different Participant types for year 2022 of SEM:

- For Supplier Units the Fixed Credit Requirement should be calculated by using a rate of €8.77/MWh multiplied by the average daily demand of each unit subject to a minimum value of €1,000 and a maximum of €15,000;
- For Generator Units the Fixed Credit Requirement value of €5,000 should be maintained. This includes all units considered as Generator Units in the draft Trading and Settlement Code, including Assetless Units and Trading Units.

Analysis and operational experience in the SEM shall provide a balance between maintaining a low level of risk of bad debt while not over burdening Participants with credit cover requirements which could be seen as a barrier to entry or a barrier to continuation of trade.

It is proposed that a value of zero is used for Fixed Credit Requirement for Capacity Market Units, and this may be further considered in the future.

3. Number of Days in the Undefined Exposure Period

3.1 Background

The number of days in the Undefined Exposure Period, g (known as the parameter $UEPBD_g$ in the Trading and Settlement Code) is the period for which settlement amounts are not known, but where Participants are, or have the ability of, incurring further liability until they are removed from the market. It is used to determine the unknown element of a Participant's liability for the calculation of their Required Credit Cover.

3.2 Considerations

This parameter therefore needs to take into account all times where the liability of a Participant is not known at the time of carrying out a credit assessment, which can be summarised into the following periods:

- The days in the future after the unit has been suspended from the market (which could arise following a credit assessment which indicates that the Participant's posted credit cover is insufficient to cover their Required Credit Cover, and the Participant fails to rectify this following issuance of a Credit Cover Increase Notice) where the unit could be still trading in the market until they have been removed from the market. The length of this period of time is considered in the Supplier Suspension Delay Period (SSDP) and Generator Suspension Delay Period (GSDP) parameters. The SEM decision on these parameters is that the SSDP shall be 14 days in the Republic of Ireland, and the GSDP shall be 7 days (*SEM-17-034*) this is set to 7 days in SEM as dual suspension delays are not functionally possible at this time. SSDP shall be 7 days in Northern Ireland.

- The days in the past for which Settlement Statements are not available at the time of carrying out the credit assessment. Initial settlement for a settlement day is carried out the following day (D+1) when metering data becomes available. When carrying out the credit assessment for any given Trading Day, a settlement statement is not available for that day or the previous day, as the latest day for which meter data is available is two days previous, therefore the Undefined Exposure Period must consider those days so that their exposure is included in the estimate.
- Energy Traded Not Delivered. This is where a unit has traded in the ex-ante markets and are expected to deliver these volumes within the balancing market.

These are accounted for in undefined exposures and is calculated within each credit assessment.

A change in the timing of any of these components may drive a consideration for whether the Undefined Exposure Period needs to change.

Since a single value for all Participants is currently applied, in order to ensure the market is as close to full collateralisation as possible it needs to consider the maximum of the lengths of time it takes to remove a Participant from the market. This will ensure that collateral requirements for those Participants will not be intentionally underestimated, but may result in overcollateralization of Participants who can be removed from the market quicker than the maximum amount of time required.

3.3 Recommendation

The number of days in the Undefined Exposure Period for the coming year, 2022 of SEM is determined to be 9 days, maintaining the value from the first year of SEM.

4. Number of Days in the Historical Assessment Period

4.1 Background

The number of days in the Historical Assessment Period (known as the parameter DINHAP in Part B of the Trading and Settlement Code) is the number of days prior to the day of the issue of the latest relevant Settlement Document over which a statistical analysis of a Participant's incurred liabilities shall be undertaken in order to support the forecasting of undefined liabilities for that Participant. This will be the number of historical days over which the analysis of quantities, prices, or settlement values will be carried out for the purposes of forecasting values for the calculation of exposure over the Undefined Exposure Period, eventually used to determine the level of Required Credit Cover for each Participant.

As the credit cover arrangements for trading amounts and capacity amounts are now aligned within SEM, a single Historical Assessment Period is used for both.

4.2 Considerations

The Analysis Percentile Parameter and DINHAP settings work together to provide an estimate of the Undefined Exposure, and by extension the Undefined Exposure Variance. The value for the number of days in the Historical Assessment Period is a driver of the Undefined Exposure Variance, as it determines the number of samples used for the forecast of liabilities and the number of samples used influences the accuracy of how the estimated Undefined Exposure mirrors the realised Undefined Exposure. Therefore the Undefined Exposure Variance will be used to assess the value to be proposed for the number of days in the Historical Assessment Period. To eliminate the effects of variations in demand, the analysis of this metric is carried out for a "steady supplier". This is a typical Supplier in SEM with steady demand (i.e. demand which on average may not have fluctuated over the course of the study period being considered).

The accuracy of the estimated Undefined Exposure calculated (i.e. the closer to zero the variance is), and cases where it results in a negative variance (i.e. difference between the two which is such that the Undefined Potential Exposure is less than the actual Undefined Exposure, indicating that there was insufficient credit to cover the actual liability), can be compared between the different options to determine which is the most appropriate.

There may be trade-offs to consider – in ensuring the estimated Undefined Exposure is most accurate most of the time, this may result in more instances where the Undefined Potential Exposure is less than the actual Undefined Exposure which results in higher risk. If the instances where the estimated Undefined Exposure is less than the realised Undefined Exposure are minimised, this may result in other instances where the estimated Undefined Exposure does not accurately reflect the

realised Undefined Exposure, resulting in Participants having to post more credit cover than they could otherwise have been required.

In SEM, the intention is to capture all potential future settlement amounts in the Undefined Exposure Period which would arise if a Supplier Unit was settled entirely in the imbalance arrangements.

However since in reality some of the unit's settlement could be through the ex-ante markets, an assessment of past settlement amounts would not indicate all potential future settlement amounts which would arise if the unit was settled entirely through Imbalance.

4.3 Results and Analysis

Of the two components the deviation component is by far the smaller, as shown in Figure 5 and Figure 6. The standard deviation on which this is based is defined as the standard deviation of all Sample Undefined Exposure Periods within the Historical Assessment Period. As explained earlier, for small DINHAP values this results in poor (and generally low) estimates of the standard deviation. Larger DINHAP results in more samples and in more consistent (and generally larger) estimates of the standard deviation. As shown in Figure 7 the increase of DINHAP from 20 days to 100 days results in significantly greater deviation components in the estimated Undefined Exposure.

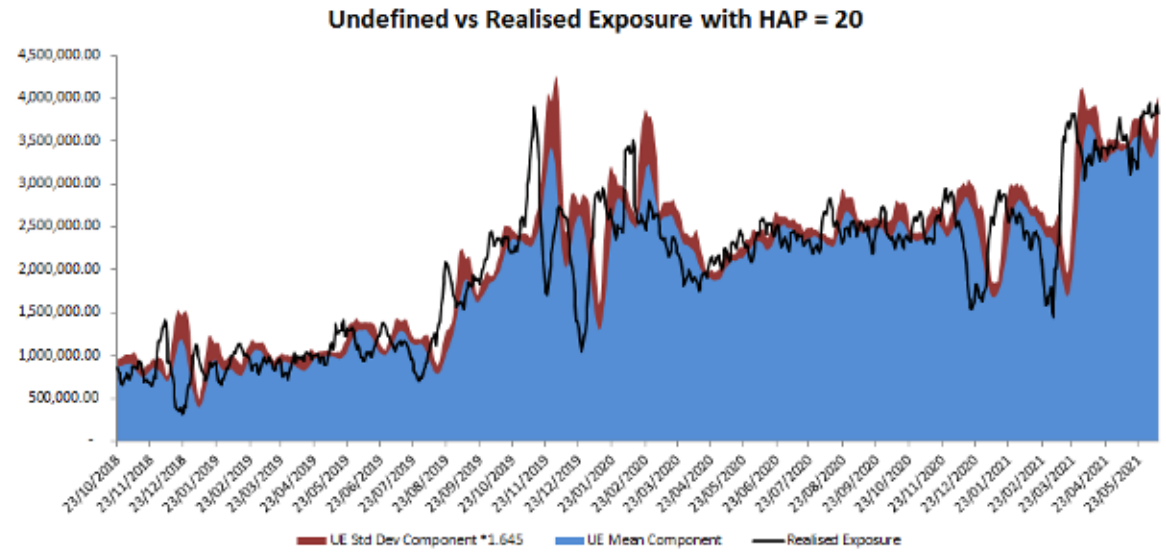

Figure 5: Estimated Undefined Exposure vs Realised Undefined Exposure with DINHAP = 20

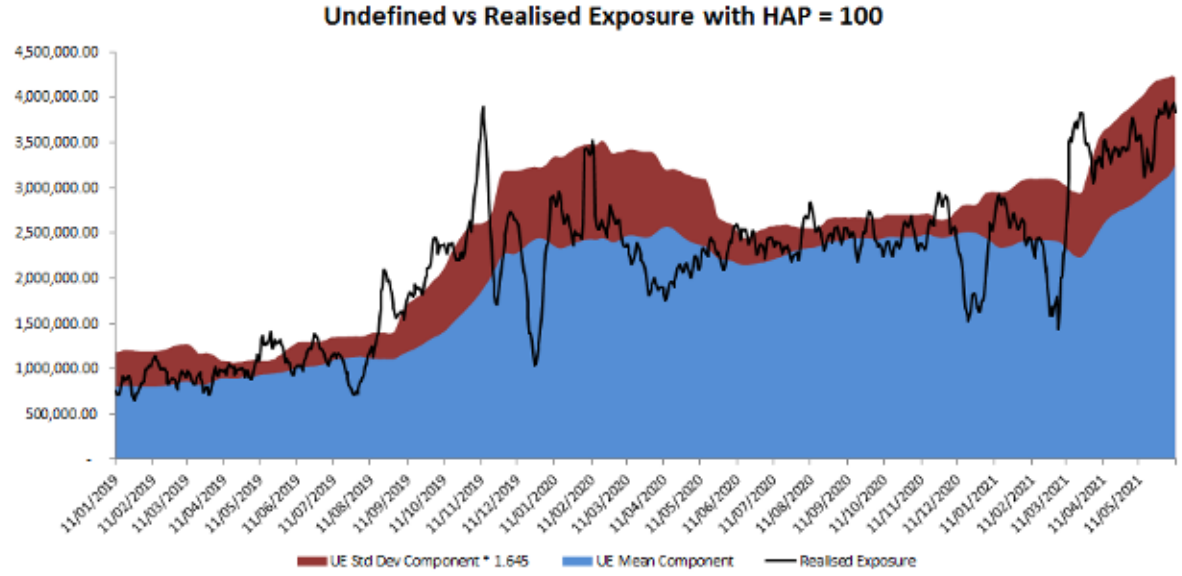

Figure 6: Estimated Undefined Exposure vs Realised Undefined Exposure with DINHAP = 100

DINHAP reflects the number of periods for which the sample undefined exposure and its standard deviation are calculated. As DINHAP is increased the estimate of the standard deviation of undefined exposure improves, and generally grows larger, as correlation over small samples is more influential in reducing the estimate of the standard deviation. Conversely, the longer DINHAP is, the slower the system reacts to changes in the market.

From the perspective of credit cover, a faster adjustment speed to changing market realities will reduce under collateralisation when settlement amounts increase quickly.

There are limitations to this approach as the longer the DINHAP the more each measure becomes data dependent. In this case, longer DINHAP stretching back through the year incorporate other high price periods which improve the estimated Undefined Exposure when prices rise towards the end of the sample. However, in cases where prior prices were lower, these measures would accentuate the effect. Accordingly, this approach for determining DINHAP is best employed for DINHAP in which there is stability prior to the particular event or market shock that drives assessment of parameter performance.

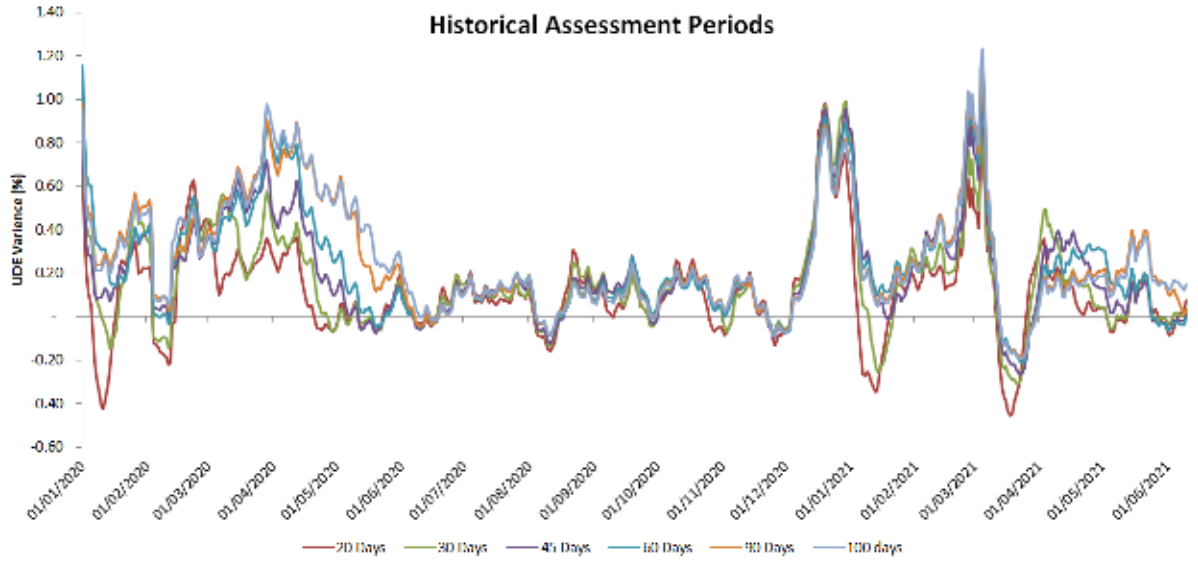

Figure 7: Effect of Different HAPB on UDE Variance for Supplier with Steady Demand

Figure 7 illustrates how the UDE Variance changes with different HAPB values. Each of the profiles is for the same Participant (Supplier – steady demand) over the same period with different HAPB being the only variable.

Figure 7 also details that small differences arise when changing the HAPB value. It confirms, as per analysis carried out in previous years within Legacy SEM and continued on to SEM, that the smaller the HAPB the higher the number of events and the magnitude of under-estimation (i.e. graph lines dropping below 0%). A small HAPB makes the UDE variations more exposed to SMP variations. A larger HAPB would react more slowly to sudden changes in SMP reducing the effects on the under-estimation but increasing periods of over-estimations.

Although differences appear to be small, we see no reason to change the HAPB at the current level of 100 days, which appears to continue to provide the best compromise solution between reducing instances of under-estimation and avoiding excessive over-estimation. This HAPB has fewer days where credit cover is under-estimated (as opposed to HAPB of 60 and 90 days which have a higher proportion of days under-estimated) while avoiding excessive over-estimation.

As shown in previous years' reports a variable demand only tends to accentuate the peaks and troughs of the UDE Variance without changing the observation made on the different values of HAPB.

4.4 Recommendation

The recommendation for number of days in the Historical Assessment Period for SEM year 2022 is 100 days.

5. Analysis Percentile Parameter

5.1 Background

The Analysis Percentile Parameter (known as the AnPP in the Trading and Settlement Code) sets the percentile confidence value in the statistical analysis for determining the Undefined Exposure of a Participant. The Analysis Percentile Parameter is the z score taken from the standard normal distribution that corresponds to the Analysis Percentile, representing the number of standard deviations from the mean taken in the statistical analysis. Up to and including 2020/2021 the AnPP was based on a two tail z score which is two sides of the statistic (i.e. a value of 1.96 is equivalent to 95% confidence). For this year's analysis we also reviewed a one tail z score which is one side of the statistic (i.e. a value of 1.645 is equivalent to 95% confidence).

5.2 Considerations

The value for the Analysis Percentile Parameter is a driver of the Undefined Exposure Variance, as it determines the degree of statistical confidence that the forecast values used to calculate the forecast liabilities (or the estimated Undefined Exposure) will cover the actual liabilities (or the realised Undefined Exposure). The value chosen for the Analysis Percentile Parameter therefore must consider a trade-off between the level of risk being taken in ensuring that credit cover is always sufficient to match potential liabilities, and the accuracy of how the estimated Undefined Exposure mirrors the realised Undefined Exposure. Therefore the Undefined Exposure Variance will be used to assess the value to be proposed for the number of days in the Historical Assessment Period.

5.3 Results and Analysis

The statistical calculation of UDE for Standard Participants is based on the choice of a percentile value. As part of this calculation the standard deviation of the samples is multiplied by the Analysis Percentile Parameter and then added to the mean UDE in order to arrive at the UDE Credit Cover Requirement. Depending on the Analysis Percentile used, the resulting value can be said to be approximately the 90^{th} (One tail) 95^{th} (One and two tail) or 99^{th} percentile (One tail).

The modelling was performed on the typical steady demand profiles described previously in Section 3. Taking the UDE Energy variance an example, Figure 8 below illustrates two key points.

- As the Analysis Percentile Parameter increases, the UDE Variance tends to shift upward just slightly and Participants Credit Cover becomes only marginally less frequently under-estimated.
- With a HAPB held constant at 100 days, as used in Figure 8, the Analysis Percentile Parameter has really little impact on the UDE Variance overall

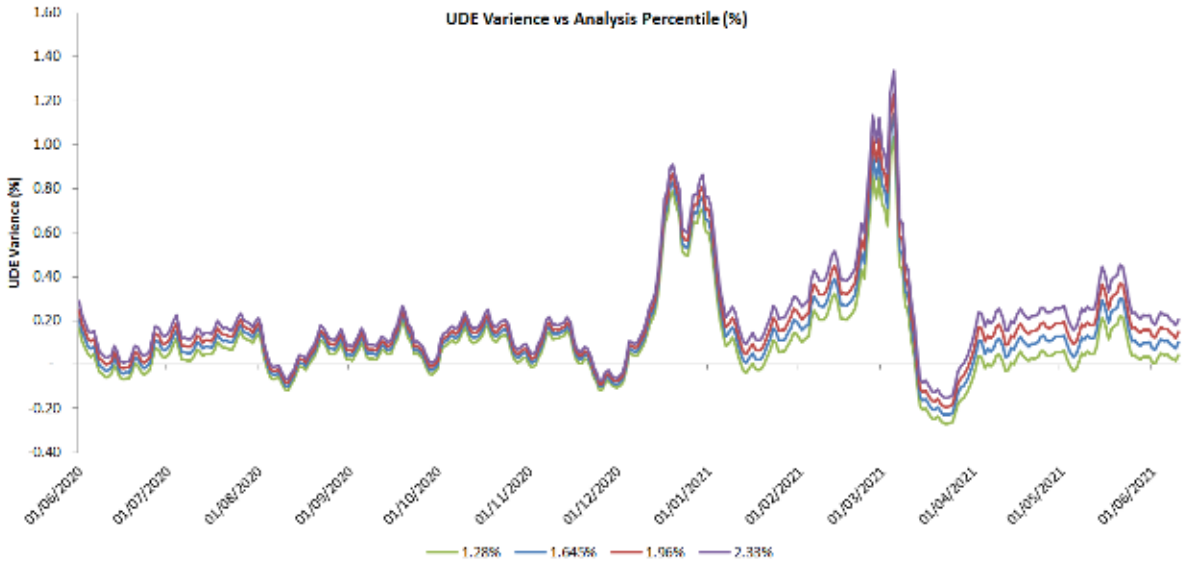

Figure 8: Different Analysis Percentiles Effect on UDE Variance with HAPB of 100 days

As can be seen from Figure 8, the influence of the AnPP setting does not have a large impact on the UDE variance. At the end of the sample there are slightly larger fluctuations but this is still within 0.3% of UDE variance between the 90th Percentile and the 99th Percentile. We believe a one tailed z score is a more accurate reflection on credit calculations as this focuses on one side of the statistic where credit cover could be called upon.

5.4 Recommendation

A value of 1.645% is recommended for the Analysis Percentile Parameter for the SEM year 2022.

6. Credit Cover Adjustment Trigger

6.1 Background

The Credit Cover Adjustment Trigger is the expected percentage change (increase or decrease) in future generation or demand above which a Participant is required to report to SEMO that it should become an Adjusted Participant, rather than a Standard Participant and have its Credit Cover requirements calculated on the basis of its forecasts of future demand or generation. While in SEM it is expected that more volumes will be traded in the ex-ante markets, it is still feasible that a Participant can deliberately leave a portion of its trading to the imbalance arrangements. Use of the Credit Cover Adjustment Trigger will reduce the need for sudden Credit Cover Increase Notices when a Participant's level of exposure rises unexpectedly.

The statistical calculations for Standard Participants as set out in the Part B of the Trading and Settlement Code where normal distribution and, as such, work to a reasonable effectiveness when Participant volumes of trade are not subject to major fluctuations. However, this assumption is not maintained under certain market conditions. The statistical calculations are intended to accommodate small changes in Participants demand/generation profiles, and therefore where a step change in the demand/generation profile occurs, the statistical basis will not be effective. A step change in the demand/generation profile of a Participant may be caused by a number of events including but not limited to:

- acquisition of new assets;
- winning significant new customers in the retail market; or
- Significant generator planned outage.

6.2 Considerations

This parameter is required as an indication of what is the acceptable level of inaccuracy in the estimated Undefined Exposure to try and match the realised Undefined Exposure. Like with other parameters, the assessment of this parameter is subject to comparison of trade-offs. The lower the value of this parameter, the more accurate the estimated Undefined Exposure will be in matching the realised Undefined Exposure, dependent on how accurate the Participant's forecast of the change in their generation/demand profile is. However it would result in greater instances of deviating from the standard credit cover approach, increasing the workload for Participants in having to regularly submit forecasts of demand/generation profiles for what may be a small benefit. This could have a disproportionate impact on smaller Participants, for whom a percentage change in their profile could result from a relatively small increase or decrease in the number of their retail customers.

The higher the value for this trigger, the more the standard process for determining credit cover will be used and therefore the burden of requiring submission of forecast

changes is reduced. However it would result in more time, and for larger amounts, where there are differences between the estimated Undefined Exposure and the realised Undefined Exposure. This could result in a Participant being over-collateralised in cases where their change was for a reduction in their settlement amounts (resulting from a reduction in their demand or generation), and being under-collateralised (and therefore resulting in increased market risk) in cases where their changes was for an increase in their settlement amounts (resulting from an increase in their demand or generation).

As this methodology is based on methodologies previously used for the determination of these parameters, the below future considerations may be taken into account for potential changes to the methodology to accurately incorporate new context:

Changes in settlement amounts for Generator Units can result from a broader base of reasons than changes in metered quantities, including:

- Changes in metered quantities (due to the reasons such as prolonged outages and changes in assets);
- Changes in traded quantities (and therefore level of potential imbalance when considered against changes in metered quantities);
- Changes in Imbalance Settlement Prices;
- Change in quantities and prices associated with Bid Offer Acceptances in the balancing market.
- Ex-ante volumes for Generators and Suppliers

The previous market approach analysed changes in settlement amounts as a proxy for changes in metered quantities. The basis of credit cover is the same for suppliers in SEM and the future, therefore this approach is applicable for the calculation of values in settlement amounts as a proxy for changes in metered quantities. For future considerations and any change to the Credit Cover Adjustment Trigger the approach shall adjust (as it needs to also for the number of days in the Historical Assessment Period, and the Analysis Percentile Parameter) to instead analyse changes in what the settlement amounts would have been had all settlement been through the imbalance arrangements.

6.3 Results and Analysis

The underlying basis of the credit cover parameter is to develop an estimated Undefined Exposure based on statistical analysis and then deal by exception with discrete changes in the market, such as those that may result from takeovers, new entrants, or long term generator outages, for example. It is recognised that these events should not be covered by the standard parameters. With that in mind, the Credit Cover Adjustment Trigger (CCAT) is defined as a percentage change threshold, so that Participants anticipating a change beyond the CCAT must notify the market to become an adjusted Participant. The setting of the parameter is achieved by considering a time period with minimal seasonality and examining the implications of such a change. The criteria for setting the parameter are the maximum under collateralisation and the time taken to achieve cover after such an adjustment.

To date the Market Operator has not been informed of any supplier that has submitted updated metered quantities to detail & analyse the effects on it undefined exposure and overall credit requirements within SEM.

6.4 Recommendation

A value of 30% is recommended for the Credit Cover Adjustment Trigger for the year 2022 of SEM.

Analysis indicates that this value is sufficient to reduce any potential impacts of shortfalls between estimated and realised Undefined Exposure created by discrete increases in the variables driving the calculation of estimated Undefined Exposure, while not being so low that it would disruptively increase of frequency in the use of alternative credit cover calculations.

7. Level of the Warning Limit

7.1 Background

The Warning Limit has been introduced as a new parameter within SEM. While Legacy SEM contained a Warning Limit, set to a limit of 80% within the Code itself with individual Participants permitted to set this at different levels as they see fit, to allow Participants set an "early warning" level on their Posted Credit Cover which will allow them take mitigation actions earlier in the event that they are approaching; however, it is a non-binding value and does not require any specific action.

7.2 Considerations

To take account of changes to the Credit Cover policies for Part B of the Trading and Settlement Code, particularly with respect to the interaction between different sub-markets, the Warning Limit was moved into the parameter space. While its application in the calculations is the same as per the SEM, it is considered that by parameterising this value, this allows additional meaning to be applied to this value.

Process change only – Participants cannot request alternative values and only one value can be entered into the credit calculation at this stage.

7.3 Results and Analysis

Both the Warning and Breach Limits are designed to respectively provide notice to Participants that they are within a range of limits, or very close to limits and might breach their posted credit cover within each of the daily Credit Assessments.

These limits apply to the ratio of the Required Credit Cover (taking into account all exposures) and the Posted Credit Cover for a Participant.

The warning level implicitly defines the speed at which a Participant approaches their Maximum Posted Credit Cover, so that whenever that threshold is crossed the Participant may take action or make adjustments to ensure that the level of Required Credit Cover does not exceed Posted Credit Cover. That speed limit is effectively set by using a single sample, that being the approach to the maximum exposure in the sample period.

Ideally the limits are helpful to market participants without being onerous, resulting in warning notices being issued with high frequency so that Participants ignore them.

From 31/05/2020 to 20/06/2021 there has been 655 credit reports produced for approximately 192 market participants, this equates to approx. 125,760 individual credit reports published by the market operator. There has been 7,844 warning limits issued which represents 6.2% of the credit reports published during this period.

7.4 Recommendations

A maintained value of 80% is recommended for the level of the Warning Limit for the year 2022 for SEM. This is currently providing a sufficient level of comfort without being onerous on market participants.

8. Level of the Breach Limit

8.1 Background

The Breach Limit has been introduced as a new parameter within SEM. It is the value used in the monitoring of credit cover, where the ratio of a Participant's Required Credit Cover to their Posted Credit Cover is checked against this value. If the ratio is greater than the value of this parameter, then the unit is deemed to be in breach of its credit cover requirements, and a Credit Cover Increase Notice will be issued by the Market Operator to the Participant.

8.2 Considerations

SEM daily credit reports provide for a Credit Cover Increase Notice to be issued where a Participant's Required Credit Cover exceeds its Posted Credit Cover. At this point, a Participant is obliged to put in place additional collateral within two working days.

It may be considered in the future with impacts on non-acceptance quantities that further analysis is to be provided to lower this limit to avoid non-delivery of ex-ante trades and avoid bad debt scenarios.

8.3 Results and Analysis

Both the Warning and Breach Limits are designed to respectively provide notice to Participants that they are within a range of limits, or very close to limits and might breach their posted credit cover.

From 31/05/2020 to 20/06/2021 there has been 655 credit reports produced for approximately 192 market participants, this equates to approx. 125,760 individual credit reports published by the market operator. There has been 1,610 Breaches issued which represents 1.3% of the credit reports published. As of June 2021 posted credit cover of participants was approx. €187million which included Letters of Credit and Cash Collateral accounts.

8.4 Recommendation

A maintained value of 100% is recommended for the level of the Breach Limit for the year 2022 for SEM.

9. Conclusions

The recommended values for the SEM year are proposed within the below table.

Parameter	2021 SEM current values	2022 SEM Proposed Values
Fixed Credit Requirement (FCR_{py}) for Suppliers	Based on rate of 8.77€/MWh of average daily demand subject to a minimum value of €1,000 and a maximum of €15,000	Based on rate of 8.77€/MWh of average daily demand subject to a minimum value of €1,000 and a maximum of €15,000
Fixed Credit Requirement for Generator Units	€5,000	€5,000
Fixed Credit Requirement (FCR_{py}) for Capacity Market Units	€0	€0
Number of days in the Undefined Exposure Period for each Undefined Exposure Period, g, $UEPBD_g$	9	9
Number of days in the Historical Assessment Period, DINHAP	100 Days for Trading and Capacity	100 Days for Trading and Capacity
Analysis Percentile Parameter, AnPP	1.96	1.645
Credit Cover Adjustment Trigger	30%	30%
Level of the Warning Limit	80%	80%
Level of the Breach Limit	100%	100%