

part of eex group



Stress Testing Framework

1.1

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1. Introduction

1.1 Purpose

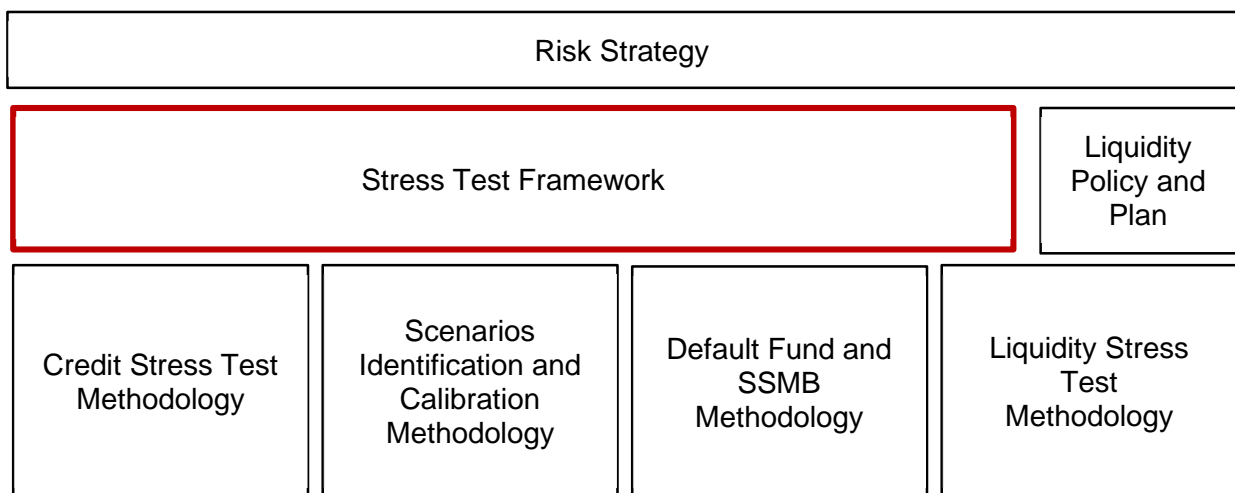
This document describes the methodological framework for stress testing ECC’s exposures from covered activities according to Article 29 and 32 of RTS 153/2013. It is used to determine the minimum size of the default fund and the amount of other financial resources necessary to satisfy the requirements of Articles 42 and 43 of Regulation (EU) No 648/2012 (EMIR) and to assess potential liquidity needs according to Article 44 of Regulation (EU) No 648/2012 (EMIR).

Exposures from covered activities in the meaning of this framework include positions and payments that directly result from clearing and settlement of positions on ECC’s derivatives markets or from spot market transactions.

1.2 Documentation structure

The methodological details of ECC stress testing are documented as follows:

- The Stress Test Framework contains the guiding principles and cornerstones. It includes a statement describing how the CCP defines extreme but plausible market conditions.
- The Credit Stress Test Methodology describes the calculation of the credit stress exposures and the aggregation rules.
- The Liquidity Stress Test Methodology describes the calculation of the liquidity stress exposures and the aggregation rules.
- The scenario identification and calibration, both for historical and hypothetical scenarios, are described in the Scenario Identification and Calibration Methodology
- The calculation of the default fund and the supplementary margin requirements is given in the Default Fund and SSMB Methodology



The stress test framework is documented and retained in accordance with RTS 153/2013 Article 12.

1.3 Requirements under supervisory legislation

The supervisory requirements, in particular regulation (EU) No 648/2012 (European Market Infrastructure Regulation – EMIR) and delegated technical regulations (RTS), establish the minimum scope of stress tests to be considered for central counterparties (CCP) in the European Union. EMIR and the RTS follows the existing “Principles for Financial Market Infrastructures published by the Committee on Payment and Settlement Systems and the Board of the International Organization of Securities Commissions” (PFMIs).

The key requirements are as follows:

- According to EMIR Article 42, a CCP shall maintain a pre-funded default fund to cover losses that exceed the losses, under extreme but plausible market conditions, to be covered by margin requirements laid down in Article 41, arising from the default of at least the largest or of the second and third largest clearing member, if the sum of their exposures is larger. A minimum size of contributions to the default fund shall be established.
- According to EMIR Article 43, a CCP shall maintain sufficient pre-funded available financial resources to cover potential losses that exceed the losses to be covered by margin requirements laid down in Article 41 and the default fund as referred to in Article 42, arising from the default of at least the two clearing members to which it has the largest exposures under extreme but plausible market conditions
- According to EMIR Article 44 in connection with RTS 153/2013, a CCP shall at all times have access to adequate liquidity to perform its services and activities. It shall take into account the liquidity risk under a wide range of potential stress scenarios, a.o. generated by the default of at least the two clearing members to which it has the largest exposures in extreme but plausible market conditions.
- According to RTS 153/2013 Article 29, a CCP shall implement a framework for defining the types of extreme but plausible market conditions that could expose it to greatest risk and for describing how the CCP defines extreme but plausible market conditions.
- According to RTS 153/2013 Article 57, a CCP shall conduct reverse stress tests which are designed to identify under which market conditions the combination of its margin, default fund and other financial resources may provide insufficient coverage of credit exposures and for which its liquid financial resources may be insufficient

This stress testing framework and the subordinated documents describe how ECC complies with all applicable regulatory requirements listed above.

2. Basic Definitions

2.1 Types of stress testing

2.1.1 Credit risk stress testing

Credit risk defines the risk that a counterpart fails to meet its contractual obligations towards ECC and that the credit exposures, under extreme but plausible conditions, exceed the margin requirements according to EMIR Art. 41 (“stress loss over initial margin” (SLOIM)).

According to EMIR Article 42 the credit risk stress test shall consider the default of the clearing member to which it has the largest exposures or of the second and third largest clearing members to determine the size of the default fund.

According to EMIR Article 43 the credit stress test shall consider the default of at least the two clearing members under extreme but plausible market conditions to which it has the largest exposures to assess the total pre-funded financial resources (initial margin, default fund, skin in the game).

For both articles the definition of largest clearing members is based on the individual stress loss over initial margin.

If several counterparties belong to the same group, the default scenario assumes the default of the whole group. The simultaneous default of two groups always assumes the same market conditions (same stress scenario).

2.1.2 Liquidity risk stress testing

Liquidity risk defines the risk that ECC’s contractual payment obligations exceed, under extreme but plausible conditions, the available liquid financial resources.

According to EMIR Article 44 in connection with ECC’s liquidity policy and plan, the liquidity risk stress test shall at least consider the liquid financial resources required to withstand under extreme but plausible market conditions the default of the two counterparties (i.e. clearing members or settlement / payment banks etc.) that cause the highest combined liquidity requirement. The exposures to identify the largest counterparties are based on the stressed profit and loss (i.e., the potential variation margin).

Specific liquidity stress scenarios are applied to consider the actual availability of liquid financial resources within the stress period of risk¹ (e.g., pledged vs. title transfer securities collateral, swap of cash vs. securities collaterals, or investments of member cash deposits) or liquidity needs arising due to timing differences of cash in- and outflows from covered activities.

If several counterparties belong to the same group, the default scenario assumes the default of the whole group. The simultaneous default of two groups always assumes the same market conditions (same stress scenario).

¹ See 2.4

2.1.3 Reverse stress testing

According to EMIR RTS 153 / 2013 Article 57 the reverse stress test identifies under which market conditions the combination of margin, default fund and other financial resources may provide insufficient coverage of credit exposures and for which its liquid financial resources may be insufficient. When conducting such tests, a CCP shall model extreme market conditions that go beyond what is considered plausible market conditions, in order to help determine the limits of its models, its liquidity risk management framework, its financial resources and its liquid financial resources.

ECC has defined specific scenarios that are calculated on a daily basis to assess the market conditions that would lead to a depletion of its financial resources. This covers additional scenarios that are not used to size the default fund but for the monthly assessment to determine if the extreme but plausible scenarios are adequate (as stipulated in EMIR RTS 153/2013 Article 57 (3)).

ECC has applied the following reverse stress test evaluations:

- a) Increased magnitude of stress losses:
 - The applied stress shifts of the existing extreme but plausible scenario set are increased by a number of multipliers to determine how much worse a given scenario can become before ECC's financial resources are exhausted.
 - Additional payment related reverse stress scenarios shall cover cases like no exchange of payments between ECC and the defaulting member due at the start of the business assuming no intraday margin calls have taken place, or members that build up intraday exposures in extreme amounts.
 - Additional reverse stress scenarios (beyond scenarios applied in (1)) for analysis purposes shall cover market conditions which go beyond what are considered plausible.
- b) Increased number of defaulting clearing members:
 - The number of members that default in the leading stress scenario are increased and the impact on ECC's lines of defense are analyzed.

2.2 Default Fund

According to ECC's risk strategy, ECC's default fund according to EMIR Article 42 is sized to cover the losses of the default of the two largest clearing members under extreme but plausible market conditions. This requirement is also called "cover-2" requirement. The total default fund shall be allocated to ECC's clearing members proportional to their risk contribution as defined in "Default Fund and SSMB Methodology".

2.3 Extreme but plausible market conditions

The stress test framework shall identify unfavorable movements in the market prices of cleared instruments, reduced market liquidity for these instruments, and declines in the liquidation value of collateral². The scenarios shall include the most volatile periods that have been experienced by the markets for which the CCP provides its services and a range of potential future scenarios. In this

² See chapter 2.6

context the wording “extreme but plausible” is used frequently in the rules and regulations but is not defined precisely. ECC uses the following general guidelines to determine extreme but plausible:

- Largest historical market movements of relevant benchmarks over the longest period for which reliable data is available are considered extreme. Largest refers to both increases or decreases and can therefore be either positive or negative returns.
- If a quantitative approach is used to calibrate the extremeness of a scenario stress shift, a confidence level of at least 99.9% is considered.³
- Scenarios are considered plausible if the conditions for such scenarios to materialize are consistent from a macro-economic perspective, including but not limited to current regulatory (e.g., market design for ETS) and economic (e.g., energy mix and main import regions) environment.^{4 5}

2.4 Stress Period of Risk

The Stress Period of Risk (SPOR) shall consider the margin period of risk according to article 53(5) RTS 153/2013.⁶ For the products ECC clears, Article 26 RTS 153/2013 requires a margin period of risk (MPOR) of at least 2 business days, which is consistent with ECC’s Default Management Procedure. Hence, the actual applied MPOR is used as stress period of risk following industry best practices.⁷

2.5 Stress Exposure Calculation

Stress exposure according to EMIR Article 42 is defined as losses that exceed the losses to be covered by margin requirements laid down in EMIR Article 41, arising from the default, including the opening of an insolvency procedure, of one or more clearing members (Stress Loss over Initial Margin – SLOIM). This requires consistency between the assumptions used to calculate initial margin and stress test exposures. Therefore, the stress exposure calculation used for sizing the Default Fund is based on the following assumptions:

- The data used for initial margin and for stress test shall consider the end of day derivative positions of the previous ECC business day (18:00 on any T2 business day). If a default of the clearing member is declared over night or if the payments in the settlement run before start of the following ECC business day are not successful, the clearing member and all its clients are suspended from trading before start of the exchange trading window. Any further built-up of intraday positions is hence not possible.⁸
- For derivative positions the stress exposure is calculated based on the difference between the latest settlement price and the simulated close-out price for these positions in the respective product currency within the stress period of risk in extreme but plausible market conditions. Options are

³ See also EACH „Best practices for CCPs stress tests“ 2015: Best practice 3

⁴ Resilience of central counterparties (CCPs): Further guidance on the PFMI (July 2017): “Establishing the plausibility of a scenario often involves subjective judgment by the CCP”, p. 16

⁵ See also EACH „Best practices for CCPs stress tests“ 2015: Best practice 3

⁶ Also in line with „Resilience of central counterparties (CCPs): Further guidance on the PFMI“ (July 2017).

⁷ EACH “Best practices for CCPs stress tests“, 2015: Best practice 4 „The stress period of risk should be aligned with the MPOR“.

⁸ EACH „Best practices for CCPs stress tests“, 2015: Best practice 5

CCP12 „CCP12 PRIMER ON CREDIT STRESS TESTING“, 2020: 4.1 GUIDING PRINCIPLES FOR STRESS TESTING

revalued using the simulated close-out price of the underlying and stressed implied volatility assumptions.

- The spot exposure has two elements:
 - o First element is the exposure from all spot transactions which are traded but not settled until the end of the previous ECC business day (18:00 on any T2 business day). Their exposure is the nominal amount in the respective product currency as significant intraday exposures would be covered by intraday margin calls.
 - o Second element are transactions after end of the previous ECC business day until the start of the next ECC business day. Since trading on spot market is 24/7 there is a risk that transactions over night are concluded at extreme but plausible market conditions and the exposure is not reduced by intraday margin calls. Stress exposure is the product of the volume of those transactions at a stressed transaction price.

The stress calculation takes place at around 10:00 on each ECC business day. At this time the payments due at the start of the business day (e.g., variation margin payments and spot market settlements) are known. Outstanding payment amounts are considered in the calculation of the stress exposure. A reverse stress test scenario covers failure of all outstanding payments.

Potential open payment amounts from covered transactions to counterparties that are not clearing members (e.g., VAT payments) are considered in liquidity stress testing.

2.6 Collateral

Collaterals are valued based on conservative assumptions. According to EMIR RTS 153/2013 Article 41 the haircuts on collaterals shall be set considering that collateral may have to be liquidated in stressed market conditions. ECC uses a confidence level of 99.9% to set the haircuts on securities collateral.⁹ ECC also considers concentration in collateral as set out in EMIR RTS 153/2013 Article 42. ECC's collateral also fulfils the requirements of being highly liquid according to Annex I of EMIR RTS 153/2013.

2.6.1 Credit stress testing

All calculations are based on the start of day margin requirement by margin account¹⁰ and not on the actual collateral in the collateral pools, i.e., any overcollateralization is not considered. This is a conservative assumption. ECC performs near to real time intraday risk monitoring and can perform intraday margin calls, which ensures with a high degree of certainty that posted collateral is higher than the margin requirement. Any amounts below the current margin requirement cannot be withdrawn. Potential declines in the liquidation value of collateral are considered via prudent collateral haircuts.

2.6.2 Liquidity stress testing

The liquidity risk generated by the default of a counterparty considers all available liquid financial resources from the covered business. This mainly includes available, unpledged cash collaterals which are pre-funded and provided by ECC's clearing members to fulfill margin and default fund requirements.

⁹ See also ECC's applied „Haircut Framework“

¹⁰ Note: Failure of margin payments are considered in ECC's reverse stress test.

Additional liquidity resources to cover specific liquidity risks not caused by the default of a counterparty but due to timing differences of payment flows are considered in line with the liquidity plan.

2.7 Segregation and Portability

ECC offers individual and omnibus segregation models according to EMIR Article 39.¹¹ The credit stress testing framework considers the segregation models by not allowing initial margin recorded in one segregated pool covering losses of another segregated pool. Initial margin of the house pool however can be used to cover losses in any other pool.

For liquidity stress testing all liquid financial resources are considered independent from the segregation model as according to ECC's clearing conditions 3.4.6.1 (4) cash collateral becomes part of the assets of ECC and ECC is entitled to use cash initial margins and default fund contributions at its own discretion in order to safeguard its own working order as a clearing house.

2.8 Risk Factors

According to RTS 153/2013 Article 52 1(d) the risk factors shall consider the different categories and sub-categories of commodity contracts and related derivatives cleared by ECC. For the purposes of conducting stress tests as well as defining and applying stress scenarios, the risk factors shall consider the underlying (asset class and market area), the load profile (base, peak) and the settlement period of the contract. The stress scenarios are defined on risk factor curves defined on an adequate granularity. Stress scenarios for an actual contract are deviated from the respective risk factor curve subject to the contract's settlement period to ensure consistency and no-arbitrage conditions. Additional risk factors to stress option implied volatilities, exchange rates and interest rates are applied. Details are given in "Scenarios Identification and Calibration Documentation".

2.9 Concentration Risk

According to article 42 (3) of EMIR and article 53 (3) in ESMA RTS 153/2013 a CCP shall evaluate the risk of rapid reductions in market liquidity and that liquidating clearing member positions could have an impact on the market and the CCP's level of margin coverage. In context of the stress testing framework concentration risk materialize, when positions are large relative to market capacity and their liquidation in a short time frame (such as in the context of ECC's default management process) causes market prices to move further in an adverse direction than would have been observed otherwise. The impact of this component depends on the size of the position in relation to average daily market turnover and is calculated on clearing member pool level.

¹¹ For details see the current version of the ECC Clearing Conditions on ECC's website: <https://www.ecc.de/en/about-ecc/rules>

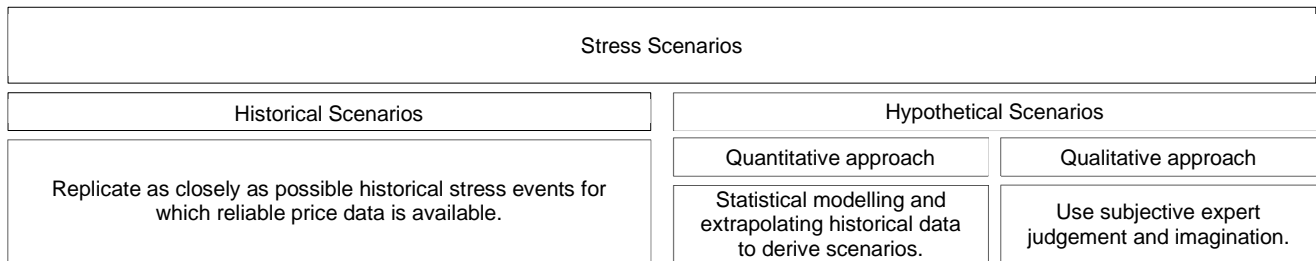
3. Extreme but plausible scenarios

Extreme but plausible scenarios are designed and applied to a set of risk factors that consider the specific characteristics of the commodity markets ECC clears.

In general, a stress shift is defined as a relative shock to the current risk factor curve. To cover cases of low or negative price levels absolute shifts or floors can be used.

Two different types of scenarios to simulate extreme but plausible market conditions are considered¹²:

- a) Historical scenarios replicate as closely as possible historical stress events observed in the past 30 years, or as long as reliable data is available, that would have exposed the CCP to greatest financial risk.^{13 14}
- b) Hypothetical scenarios founded on consistent assumptions regarding market volatility drawing on both quantitative and qualitative assessments of potential market conditions¹⁵. Hypothetical scenarios are based on quantitative or qualitative approaches. The hypothetical scenarios amend the historical scenarios by covering market conditions not yet observed.



3.1 Identification and calibration

3.1.1 Historical scenarios

Historical scenarios replay historical observed stress events. The unfiltered, historic risk factor movements shall be taken into account with their full relative magnitudes over the respective stress period of risk for all asset classes. To ensure scenario shifts for new risk factors or risk factors with short history, ECC uses proxies from similar asset classes.¹⁶

The selection of historical scenarios is based on a two-step approach: First potential dates for a historical scenario are selected by analyzing the changes in market conditions. Market conditions are represented by adequate benchmark contracts. Second a qualitative assessment with respect to the comparability of the economical, physical & environmental, or geopolitical & social environment at the identified historical date with today’s market conditions is performed to prove validity of the scenario and to derive plausible and consistent scenarios.¹⁷

¹² EMIR RTS 153 / 2013 Art. 30 and “Resilience of central counterparties (CCPs): Further guidance on the PFMI“ (CPMI)”, 3.1.2

¹³ Resilience of central counterparties (CCPs): Further guidance on the PFMI”, 3.2.34

¹⁴ “EMIR RTS 153 / 2013”, Art. 30 (2a)

¹⁵ “EMIR RTS 153 / 2013”, Art. 30 (2b)

¹⁶ In line with PFMI „Resilience of central counterparties (CCPs): Further guidance on the PFMI“, 3.2.35

¹⁷ If one global stress event results in more than one date with extreme price movements, all dates will be considered as different historical sub-scenarios.

Details are given in “Scenarios Identification and Calibration Methodology”.

3.1.2 Hypothetical scenarios

Hypothetical scenarios complement the historical stress scenarios and aim to capture stress events that are plausible but have not been observed in the historic data (e.g., due the changes in the relevant price determinants) or where historical observations are not considered extreme under current conditions or where the available prices history is not long enough / not reliable to determine stress scenarios.

The development of hypothetical scenarios is based on the underlying price determinants for ECC’s main asset classes. By considering a wide range of possible economical, physical & environmental¹⁸ or geopolitical & social events or past events that have occurred in different but related assets the impact on the price determinants (e.g., supply, demand or other commodity prices) is assessed and multiple scenarios are constructed. This risk identification process is based on historical experience (quantitative approach) as well as out-of-the-box scenarios (qualitative approach) based on judgment of market experts (e.g., internal business experts, risk committee members).¹⁹

The result of the scenario identification process leads to a set of hypothetical scenarios amending the (observed) historical scenarios to ensure a complete inventory of stress events covering extreme, but plausible scenarios.

Details are given in “Scenarios Identification and Calibration Methodology”.

¹⁸ Including climate risk

¹⁹ This approach is in line with 3.2.27 “Final report-Resilience of central counterparties (CCPs): Further guidance on the PFMI”, CPMI IOSCO.

4. Monitoring, reporting and mitigation

4.1 Monitoring

On a daily basis ECC calculates

- the utilization of the default fund, i.e., the ratio of default fund and stress test result,
- the liquidity ratio and
- the results of reverse stress testing.

ECC reviews at least on a monthly basis the reverse stress tests and the inventory of stress test scenarios and their calibration to ensure they remain relevant under current conditions. In case of changes of an existing scenario or the introduction of a new stress scenario, the unit “Stresstesting & Risk Analytics”, after consultation with the risk committee, will request the management board for an update of the scenario inventory. Until approval, the updated or new scenarios will be run for analysis purposes and not be used for sizing the default fund.

If according to Article 30 (2) RTS 153/2013 ECC “decides that recurrence of a historical instance of large price movements is not plausible”, ECC analyzes if either the historic data can no longer assumed to reliably reflect price dynamics of today’s products or the re-occurrence of such an event is highly unlikely due to e.g.:

- Changes in the underlying product properties (e.g., a split or merger of underlying delivery areas of spot products that serve as underlying for a future or changes in the market design which changes the pricing process)
- Delisting of products
- Changes in the price determinants or catalysts (e.g., regulatory and economic environment like changes in law, product innovation or macro-economic dependencies) regarding the relevant products which make it implausible that historic events will occur in the same magnitude

In such cases the historical scenario will either be:

- Converted into a hypothetical scenario considering the new market structure and conditions. The conversion is subject to the consultation of the risk committee and management board approval.
- Omitted from the inventory of stress scenarios. In such case the omission is subject to the consultation of the risk committee and management board approval and also requires approval by ECCs competent authority.

4.2 Reporting

ECC reports to various internal and external recipients.

- Daily risk report to the Management Board
- At least monthly reporting to ECC’s management board as part of the Monthly Risk Report
- Quarterly reporting to the Supervisory Board as part of the Risk Report
- Quarterly reporting of stress testing results to the EMIR Risk Committee as part of the risk report. Additional at least annual presentation regarding the review of the stress testing framework according to RTS 153/2013.

- At least monthly clearing member reports.

In case of external recipients, the reported results are in a form that does not breach confidentiality (i.e., aggregated or anonymized).

4.3 Mitigation

Depending on the results of the monitoring process mitigation and escalation actions are initiated. Proposed mitigating actions are based on detailed root cause analysis. Any potential mitigation actions require approval of / by the responsible managers in line with to the model change policy.

Possible mitigating actions include but are not limited to:

- **Supplementary Margin:** In case the credit stress test result exceeds ECC's total default fund, Supplementary Margin is called from clearing members according to their contribution to the credit stress test result. The supplementary margin reduces the SLOIM of the clearing member and hence the stress test result. Risk mitigation via Supplementary Margins is a standard process defined in the "Default Fund and SSMB Methodology" document. In case the stress test result exceeds ECC's total default fund amount and the first skin in the game, supplementary margin is called intraday immediately after the daily run of the stress test calculation²⁰ to comply with EMIR article 43. To cover potential exposures between the initiation and the completion of intraday supplementary margin calls other financial resources and the second skin in the game are not considered when calculating the amount of intraday supplementary margin requirements.
- **Default fund size and contribution:** In case the stress test result according to EMIR Article 43 exceeds ECC's total default fund, ECC reserves the right to adjust the size of the default fund and default fund contributions ad hoc. Furthermore, the parameters to size the default fund can be reviewed and updated as part of a regular or ad-hoc default fund calibration.
- **Minimum Cash Quota:** In case of low liquidity ratios, a minimum proportion of the margin to be provided in cash collateral can be determined by ECC. Further specific mitigating actions in the context of liquidity risk management are outlined in the liquidity plan.

²⁰ The daily stress test calculation will be finished before 10:00.

5. Glossary

Abbreviation	Meaning
CRO	Chief Risk Officer
Director CCP RiMa & RiCo	Director CCP Risk Management & Risk Controlling
RTS	Regulatory Technical Standards
EMIR	European Market Infrastructure Regulation
ETS	EU Emissions Trading System
EUA	European Union Allowances
MPOR	Margin Period of Risk
SPOR	Stressed Period of Risk
CCP	Central Counterparty
DVP	Delivery versus payment
SLOIM	Stress loss over initial margin
DCP	Direct Clearing Participant