

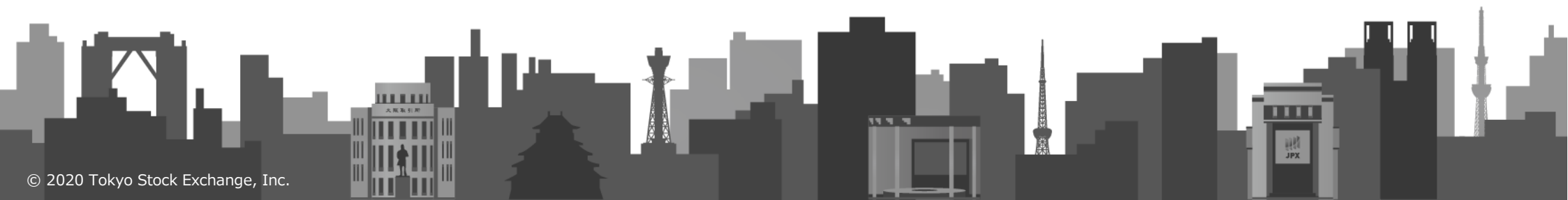


Council for Recurrence Prevention Measures (2nd meeting - Interim Summary)

Total smart exchange

Tokyo Stock Exchange, Inc.

December 21, 2020



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- On October 1, 2020, a system failure within arrowhead meant that TSE was unable to provide opportunities for trading for the entire day. In response to this incident, with the aim of developing rules for order handling at the time of a system failure and improving the clarity and transparency of criteria and procedures for recovery, the Specialist Working Group (WG) is considering how rules on and responses to system failures should look from the viewpoint of investors. The WG has identified the below points as the base for all system failure responses, and has discussed specific procedures and rules, etc. based on these. This document provides an interim summary of these discussions.
- **TSE action to prevent recurrence**
 - The Exchange will expand measures and improve functions to ensure that it can fully implement a trading suspension in the case of a system failure that requires one, so that it does not cause inconsistency between the rules and the system like that which occurred on October 1.
 - In addition, TSE will develop frameworks to prevent trading suspensions wherever possible by limiting the range of impact of system failures, through the development of procedures for forced hardware switchovers and the implementation of tests, etc. relating to the switchover. It will also implement various measures to make sure that the Exchange carries out data preservation, etc. to ensure a smooth trading resumption in the event such a failure does happen.
- **Basic approach on recovery**
 - Even in the cases above, or if inconsistency occurs due to a system failure, TSE's main priority will be to preserve orders as much as possible and work towards a trading resumption.
 - The WG will discuss, from both rules and system perspectives and considering the impact on trading participants and investors, responses and steps toward recovery in cases where the Exchange cannot be expected to resolve inconsistency on its own.

(1) Clarification of Standards, etc. for Trading Resumption under Contingency Plan



1-1. Clarification of Standards for Trading Resumption under Contingency Plan

- The current contingency plan states that TSE will "comprehensively take into account" various factors such as the types of investors and number of securities companies that are unable to participate in trading, in addition to their overall share of trading value.
- For trading resumptions, exchanges need to ensure fair price formation and liquidity based on a certain level of investor diversity and trading volume in the same way as the standards for trading suspensions. Although fair price formation in trading after resumption is ensured through the rules on special quotes and sequential trade quotes, it will have to be sufficiently considered when putting a resumption into practice.
- With this in mind, within the trading suspension/resumption standards, TSE will establish a numerical standard not only for the share of trading value but also for the rate of possible retail participation, which needs particular consideration.

Standards for Trading Suspensions/Resumptions

- Trading will be resumed when the following standards (1) and (2) are met.
 - (1) The share of trading value of trading participants who are able to participate in trading is **approx. more than 50%**.
 - This standard will be established to ensure liquidity in the entire market.
 - (2) The sum of retail orders brokered by trading participants who are able to participate in trading is **approx. more than 30% of trading value by retail investors.**
 - This standard will be established to ensure a certain level of investor diversity and fair price formation.
 - The scope of trading participants engaged in brokering retail orders and the share of trading value by retail investors will be determined/calculated based on the surveys on investment trends by investor category.

1-2. Clarification of Order Acceptance Time and Trading Hours after Recovery

- As this failure prevented TSE from providing trading opportunities for the whole day, we could not provide the price discovery service that is expected of us as a market operator, and this was a big problem. As such, we need to focus on being able to provide trading opportunities on the same day wherever possible, even if trading conditions are abnormal.
- At the same time, to resume trading, a certain amount of order acceptance time and trading hours need to be secured, so we will enhance transparency and foreseeability of responses by setting standards for these in advance with reference to similar rules from overseas, etc.

Standards for Order Acceptance Time and Trading Hours that Have to be Secured after Recovery

- Order acceptance time: Secure approx. 15 min. for resending orders, correcting orders, etc. after recovery.
- Trading hours: Resume trading for even a short period of time to provide trading opportunities on the day as far as possible.

➤ Resume trading if order acceptance can be resumed by around 14:30 JST.

(Example: Order acceptance starts at 14:30 JST and trading resumes at 14:45 JST.)

Notes: 1) The above proposed standard is based on a current rule specifying a 15 min. trading suspension to disseminate material facts, and rules in other countries for order acceptance periods (15-20 min.) for trading resumptions.

2) At least 15 min. is expected to be secured for reconnecting systems (including receiving multicast routing maintenance messages and reconnecting virtual servers) before starting order acceptance. After the decision to restart trading, some time will be needed for system recovery and responses to customers, etc., before the start of order acceptance, but as this will vary depending on the status of the failure, etc., we do not plan to specify a standard for how long this should take.

Topic for Future Discussion: Extension of Trading Hours

- If it is impossible to resume trading during normal trading hours, we could consider pushing back the market closing time to provide trading opportunities on the day as far as possible. In this case, as well as system and operational procedure-related issues, we expect the following points to be important and we invite comments on these.

(1) Would it be appropriate to conduct an extension of trading hours temporarily in the event of a system failure, etc., or considering that our trading hours are already shorter than those of overseas exchanges, would it be more appropriate to take actions such as extending them permanently or reviewing trading sessions as a whole?

(2) If we were to extend trading hours, how far would it be possible to do this? We see the following as possible standards:

- ✓ around 15:30 JST, the closing time of other exchanges in Japan
- ✓ around 17:30 JST, based on trading hours of the ToSTNeT Market, etc.
- ✓ the latest possible time that would allow investment trusts to calculate base prices and securities companies to carry out post-closing processes, etc.

Main Comments from the 3rd and 4th WG Meetings

- The closing time should not be too late because we calculate base prices for investment trusts after the market closes.
- Changing the market close to a much later time deserves careful consideration because it will significantly affect subsequent processes. If the extension is more than 30 minutes, operating processes will need to be substantially revised.
- Since systems currently operate on the assumption that the market closes at 15:00 JST, we have to consider the impact to these.
- One hour will be the longest we can push back the closing time.
- It would be difficult to extend trading hours just once in the event of a system failure.
- We also need to consider the cut-off time for loan applications to Japan Securities Finance Co., Ltd.
- The extension of trading hours needs to be discussed separately from the WG.
- TSE needs to also consider how trust banks and fund distributors should be dealt with.

2. Trading Suspension/Resumption in a Natural Disaster, etc.

- In the event of a natural disaster, etc. (a powerful typhoon, the Tokyo Inland Earthquake, etc.), TSE's current rules state that it will "comprehensively consider" various factors including the share of trading value of trading participants that are unable to participate in trading. Unlike a system failure related to exchange markets, we also have to take into account the safety of human lives and the function of the financial market as a whole.
- In order to respond to societal demand for trading and understand the actual situation with regards to damage, information needs to be shared with the relevant authority and related organizations (such as Japan Securities Dealers Association, the Investment Trusts Association, Japan, Japan Investment Advisers Association, Japan Securities Depository Center, Inc., and the Bank of Japan). As such, in the event of a natural disaster, etc., we will determine trading suspensions/resumptions based on discussions with these parties.
- In cases such as when a trading suspension is determined before damage is incurred, or a trading resumption is decided when the recovery timeline is still uncertain (cases such as the below), existing frameworks may not be applicable. For this reason, we suggest that standard responses, etc. to these cases should be discussed and clarified industry-wide.

Possible example cases for trading suspensions/resumptions in the event of a natural disaster, etc.

- When, for example, a powerful typhoon is expected to cause significant damage due to overflowing rivers, etc., and we have to determine whether a trading suspension is appropriate before it arrives, this will not be possible based on the numerical standard of the share of trading value. We would need to consider other factors such as expected damage and the overall operation of the financial market.
- When determining trading resumption in the aftermath of a large earthquake, we expect that to avoid investors being unable to sell their shares for a long period of time, the decision will have to be made based on not only the numerical standard of the share of trading value but also discussions with related parties.

3. Development of Procedure for Gathering Opinions

- In the event of a system failure, we need to quickly assess whether the trading resumption standards have been met in an effective and highly transparent manner. Thus, TSE will create a framework which specifies in advance the contact persons of each trading participant and receives their reply about the possibility of their participation after trading resumption based on a notice sent by the Exchange with necessary information.

Procedure for Gathering Opinions on Trading Resumptions

(1) Contact persons for opinion gathering

- TSE will gather opinions from **all trading participants** through **persons responsible for securities trading**.

- * The rules will be amended to specify a procedure for gathering opinions through the persons responsible for securities trading.
- * To secure a contact when said persons cannot be reached, we will ask for information on multiple contact persons.
- * In addition, we will check the situations at system vendors and information vendors.

(2) Details on the method for opinion gathering

- After determining when recovery operations can be completed, the Exchange will promptly notify trading participant representatives and persons responsible for securities trading through Target.
- Said notice will describe recovery procedures (necessity of resending orders, connection procedure, etc.), a tentative schedule (time for starting reconnection, etc.), and a response deadline (e.g., respond within 30 min. ahead of a final decision on resumption).

- **Responses are assumed to be registered via Target** as a general rule.

- * If Target is unavailable, we will separately check with persons responsible for securities trading of the top 30 trading participants by share of trading value.
- Trading participants can expect to choose from four responses: (1) Probably can participate within the day, (2) Probably can participate only in wholesale operations within the day, (3) Probably can participate only in retail operations within the day, and (4) No immediate prospects on participation/Unknown.
 - * The above procedure for gathering opinions may not be conducted if trading can be resumed in the event of a system failure by having trading participants reconnect according to the connection procedures as per normal.
 - * This procedure is also expected to be used to allow trading participants to report whether they can participate in the event of a natural disaster, etc.

(2) Development of Rules and Procedures, etc. for Handling of Orders and Resuming Trading in the Event of a System Failure



1. Development of necessary rules for handling already-placed orders to enable same-day trading resumption

Issue: Policies for implementing trading suspensions, etc. in line with the situation when a failure occurs and how trading participants should handle orders entrusted by customers in the case of order cancellation by the Exchange need to be organized and clarified in the rules.



1-1. Cases which require implementation of non-acceptance of orders/trading suspension, etc.

- In order to enable smooth preparation for a trading resumption, policies for trading suspensions, etc. have been determined as follows, to be implemented in line with the situation:
 - (1) If the operational impact of the system failure cannot be foreseen, in order to avoid any subsequent impact, a trading suspension with orders not accepted will be implemented.
 - (2) Measures used for not accepting orders will be carried out in an order of priority specified in advance based on the impact on trading participants.
- Policies and operational procedures will be specified in the connection specifications, etc. later.

1-2. Handling, etc. of orders entrusted by customers in the case of order cancellation by the Exchange

- Handling of orders entrusted by customers which the Exchange has been forced to cancel, due to a "reboot and reset", for example, will be clarified in the rules.
- In practice, trading participants should in principle resend customer orders even when orders are cancelled by the Exchange since the agreement between the customer and the securities company continues, but since there are some types of orders and situations where alternative approaches are necessary, the Brokerage Agreement Standards and other rules will be amended to clarify that these are allowed.
- As well as amending rules, TSE will present and disseminate examples of and notes on types of orders for which resending could be considered unpreferable.

2. Development of procedures for resuming trading in the case of an irregular trading suspension

Issue: In order to prepare for cases requiring a reboot of the Exchange's trading system like the failure in October, system responses and operational procedures for a trading resumption, including for time efficiency, need to be established.

2-1. Handling of orders affected by invalidation of already accepted orders by the Exchange

- Depending on the failure situation, in cases where clearing the order book would contribute to a smooth trading resumption, TSE considers manual invalidation of already accepted orders by the Exchange as a possible measure, and this will become TSE policy in these cases.
- Policies and operational procedures will be specified in the connection specifications, etc. later.

2-2. Failure response through a system reboot

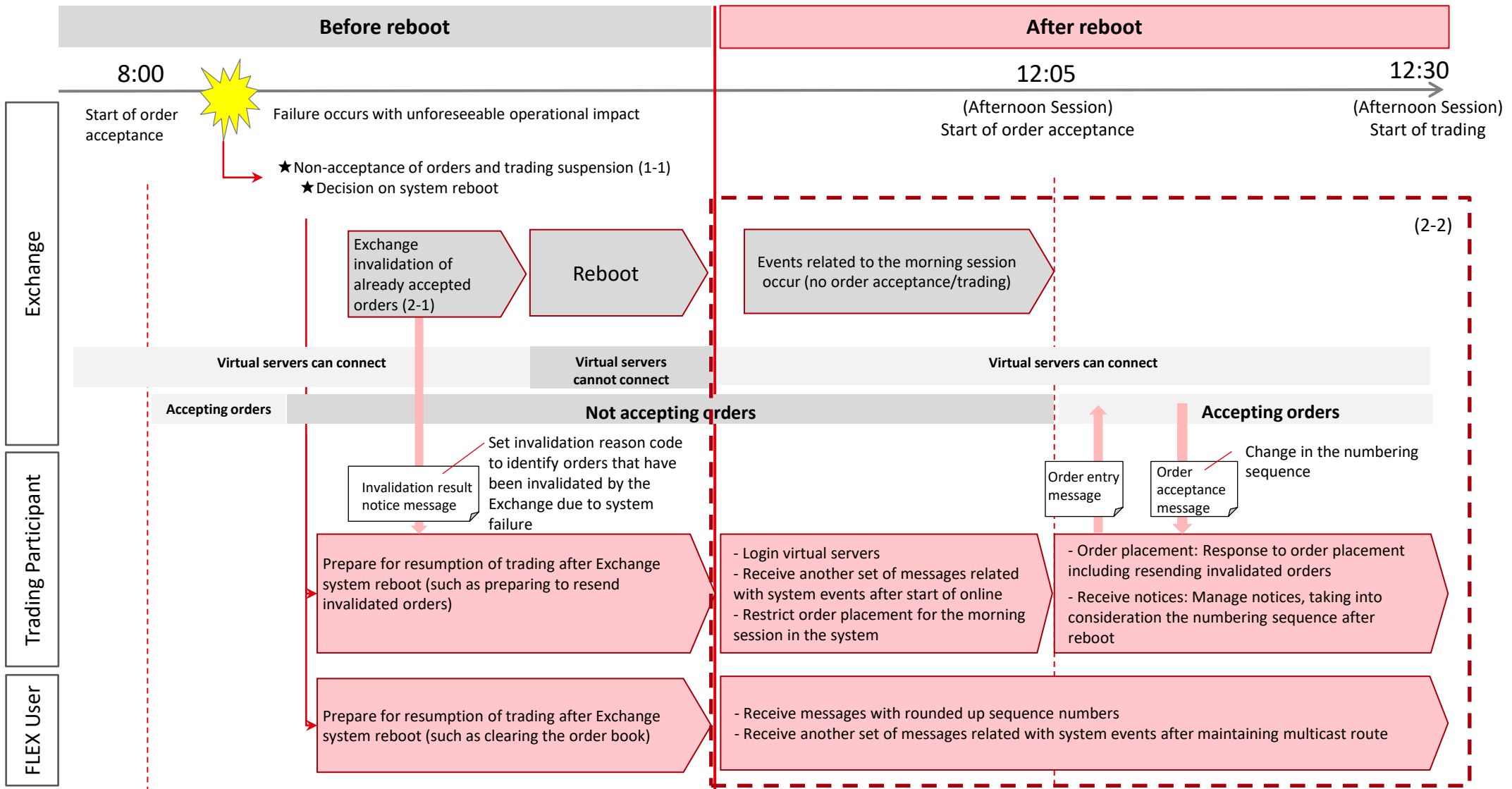
- In the case that a system reboot is necessary to resolve inconsistency, TSE considers it as a possible measure in aiming for a trading resumption, and policies for order suspension, order invalidation, procedures for connection or recovery of market information after the reboot, etc. will be clarified. Specific procedures required will be discussed based on the following points:

- (1) Approach in cases where the Exchange cannot return order invalidation result notices
 - (2) Specific system operations under the post-reboot revised schedule
 - (3) Handling, etc. of order sequence numbers after reboot
 - (4) Rounding up of message sequence numbers in the Market Information System (FLEX), etc.
- We will later discuss specific procedures for how execution data can be relayed between the Exchange and trading participants if a system failure occurs during a trading session.

Note: As derivatives are different from equities in terms of product features, investor base, IT systems and other things, although we will take into account the equity market discussions, we may carry out different responses in some cases, including reviewing contingency plans.

Recovery in the Event of a System Failure

The following illustrates the case where trading is resumed from the afternoon session through a reboot in the event of a system failure that occurs between the start of order acceptance and the start of trading.



[Notes]

- The above illustration focuses on system-related responses. Information on the failure and recovery operations will be disclosed appropriately.
- The timings of the various decisions and system reboot are provisional.

Response Measures for Non-acceptance of Orders, Trading Suspension, etc.

If the Exchange cannot foresee the impact of the system failure and determines that trading of all issues may be affected, TSE's basic policy will be not to accept orders for all issues. (Non-acceptance will be carried out through the following measures where possible and in order of priority):

Priority	Before Starting Order Acceptance	After Starting Order Acceptance (including during trading hours)
1	<p>Change the start time of order acceptance and do not send the market administration message (Order Status: Accepting Orders) at the normal time.</p> <p>*Orders placed in this situation are returned as errors (Outside Order Acceptance Hours).</p> <p>*A market administration message (Order Status: Accepting Orders) is sent out at the altered start time of order acceptance.</p>	<p>Send the market administration message (Order Status: Outside Order Acceptance Hours)</p> <p>*Orders placed in this situation are returned as errors (Outside Order Acceptance Hours).</p> <p>*A market administration message (Order Status: Accepting Orders) is sent out when resuming order acceptance.</p> <p>*The number of market administration messages per day would be different from a normal trading day (more due to suspension/resumption)</p>
2	<p>Disconnect virtual servers before the start of order acceptance.</p> <p>*A market administration message (Order Status: Accepting Orders) is sent after connections are recovered.</p>	<p>The following two measures will be carried out in sequence:</p> <ul style="list-style-type: none"> - Do not send the market administration message (Order Status: Outside Order Acceptance Hours) and do not accept orders (1) *Orders placed in this situation are returned as errors (During Temporary Trading Halt). *Warning Information Message (Warning Information Type: Trading Halt (Not Accepting Orders)) is sent. In addition, in FLEX, an ST tag (Not Accepting Orders) is disseminated. *Warning Information Messages are sent to notify of resumption of order acceptance and trading. - Disconnect virtual servers *A market administration message (Order Status: Accepting Orders) is sent after connections are recovered.

If the failure situation means neither of the above measures can be taken, TSE may stop orders being sent on a trading participant or virtual server basis, to avoid orders being accepted and invalid order executions being generated as a consequence.

[Action required by Trading Participants]

- When the Exchange conducts the above measures, trading participants will be expected to immediately restrict order placement in order to finalize which orders will need order placement when order acceptance is resumed, but only after checking for information such as a market administration message, a warning information message, the reason for orders returned as errors, FLEX information, and system failure notices provided by the Exchange. Also, trading participants will need to clarify in advance how they will handle orders returned as errors up to and when trading resumes.

- The above measures will be taken when the Exchange determines that a failure may affect all issues. However, if the Exchange determines that only some specific issues may be affected (in cases such as a failure in a part of trading servers), since trading may be suspended (orders not accepted) in those specific issues (the market administration message will not be sent with any placed orders returned as errors), in this case trading participants will need to take the same actions.

Draft Rule Outline for Handling of Orders Entrusted by Customers, etc.

- Handling of entrusted orders needs to be clarified in advance as there are likely to be cases where the Exchange has no choice but to cancel already accepted orders from transaction participants due to the impact of a system failure, etc.
- For handling of orders entrusted by customers in the case of order cancellation by the Exchange, default rules will be established. At the same time, necessary revisions will be made to clarify that a separate arrangement can be made when necessary based on the nature of the entrusted orders or operational needs, as below.

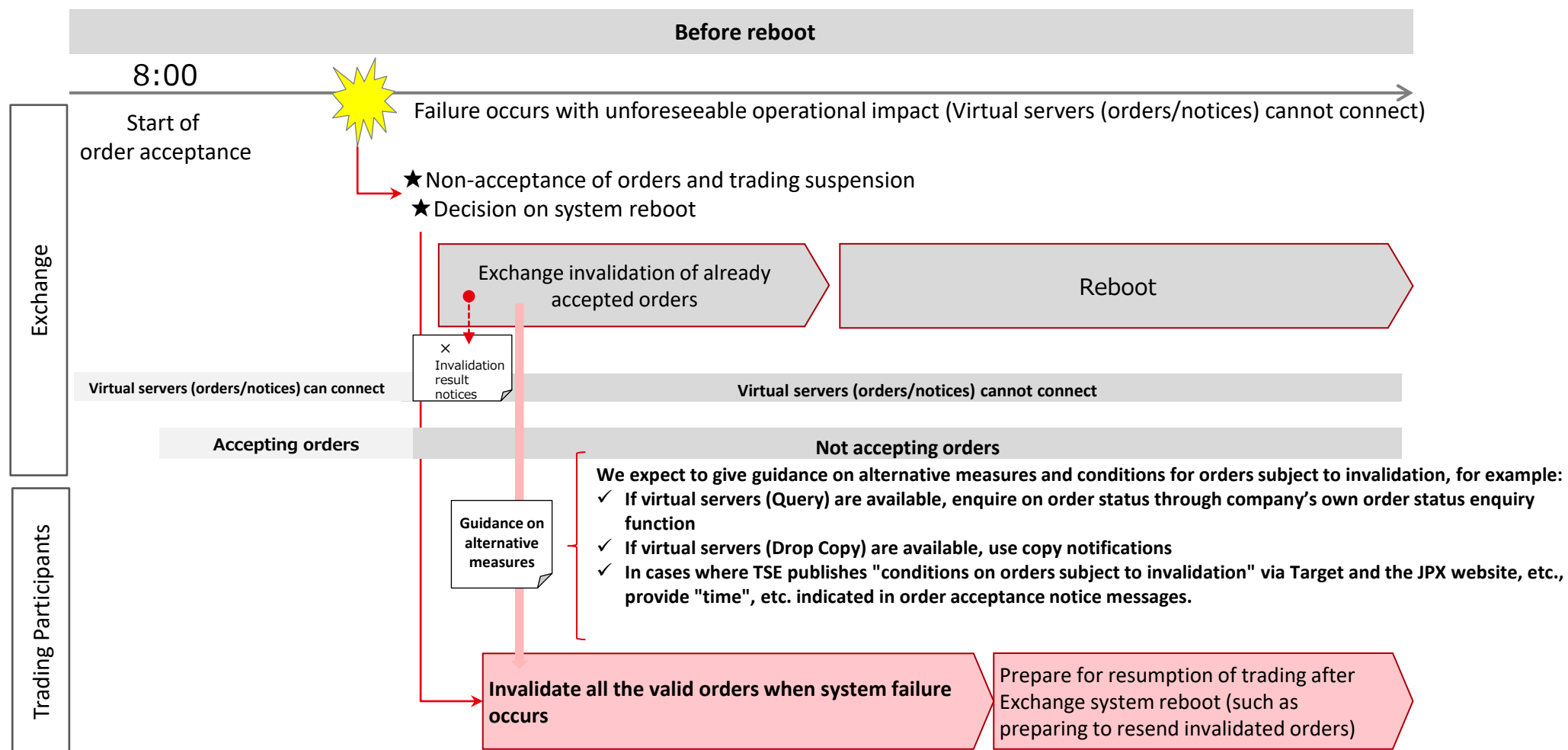
Item	Description	Additional Comments
1. Cancellation of Bids/Offers	<ul style="list-style-type: none"> Clarification that the Exchange may cancel bids/offers from trading participants in the case of not only a trading suspension but also a system failure, etc. 	<ul style="list-style-type: none"> The current rules provide that the validity of bids/offers in the case of trading suspension will be "specified on a case-by-case basis".
2. Validity of Entrusted Orders	<ul style="list-style-type: none"> Clarification that, as a general rule, orders entrusted by customers with trading participants will remain valid, even after bids/offers from trading participants are cancelled by the Exchange. 	<ul style="list-style-type: none"> The current rules provide that entrusted orders will remain valid even after trading suspensions.
3. Necessity of Resending Entrusted Orders	<ul style="list-style-type: none"> Clarification that, as a general rule, trading participants need to resend orders entrusted by customers, even after bids/offers are cancelled by the Exchange. However, it will also be clarified that if an arrangement has been made in advance between the trading participant and its customer or there is an instruction by the customer, the necessity for trading participants to resend entrusted orders will follow that arrangement or instruction. 	<ul style="list-style-type: none"> If provisions on whether to resend orders, etc. are included in the general conditions of the contract between the trading participant and the customer, this will apply if an arrangement has been made in advance.
4. Implementation Date	<ul style="list-style-type: none"> Gathering of public comments in January 2021 and implementation of rules around April 2021. 	

Inconsistency resolution by system reboot

- The following illustrates the response required by trading participants (or FLEX users) in cases where trading is resumed through a reboot in the event of a system failure that occurs before the start of trading.

(1) In a case where the Exchange cannot return order invalidation result notices.

In the event of a system failure, etc. involving an inability to connect with virtual servers (orders/notices), if order invalidation result messages cannot be returned from the Exchange, trading participants will need to invalidate orders using alternative measures, which is illustrated as follows.



(2) Schedule changes

- System events which had occurred after systems came online will occur again after the reboot (with changes such as shortening of the event duration if the event's initially scheduled time is past).

Example: In the case of a resumption from the afternoon session, information on the status of the morning session will be disseminated and a shortened trading period will be provided, but orders will not be accepted.

- Trading participants will need to operate their systems under the revised schedule after receiving a new set of messages related to system events which occur after systems come online.

(3) Handling of sequence numbers after reboot

- In case of a reboot following the current system specifications, various types of sequence numbers will be reset. Since duplication of notice sequence orders is considered one of the main issues that make it difficult for trading participants to respond, the Exchange is considering the following two proposals and will decide taking into consideration the impact on trading participants.
 1. Assigning a flag, etc. to ESP login response messages which makes it possible to distinguish those after the reboot (probably using a Reserved column)
 2. Assigning post-reboot notice sequence numbers rounded up to a higher point (such as restarting with 10000001)
- For columns used in messages to the Exchange (order entry sequence number and field for internal processing), values used before the reboot may be used after the reboot (optional). However, for duplication checks, etc. conducted on order acceptance numbers in trading participant systems, please note that order acceptance numbers will be "virtual server number + order entry sequence number".

(4) Flex information

- Flex users will need to clear any received quote information in preparation for the reboot. In addition, since message sequence numbers will be rolled forward after the reboot and a new set of messages related to system events which occur after the multicast route is maintained will be transmitted, FLEX users will need to recreate order books on receiving said messages (see the next page for details).

- When the system failure happened on October 1, the problem was the inability to disseminate not the quote information itself, but the basic information that is disseminated beforehand. For this reason, we will clarify alternative measures and recovery plans for cases where this basic information cannot be disseminated. The connection specifications will be revised to reflect this, in addition to system behavior when trading resumes through a system reboot and responses to the occurrence of a failure.
- Based on the above, necessary modifications will also be made to the Market Information System (MAINS).

Response Policy Based on Discussions in this WG Meeting

- Matters to be specified in the connection specifications
 - ✓ Expected recovery plan for cases where FLEX message dissemination will be on an irregular schedule
 - ✓ Specification of data format for providing issue information, base price information, and multicast group number information by file
 - ✓ In the case where quote clear information cannot be disseminated from TSE, users may actively clear the data.
 - ✓ For trading resumption, the recovery of quote information necessary for recreating the order book will take priority, and any corrections to other information (expected to be information such as OHLC prices, trading volume, trading value, VWAP, and index values disseminated by TSE) will be published after the day's market close. The data format for publishing said information will also be specified.
- Actions required for responses to MAINS (appropriate modifications will be made to the connection specifications)
 - ✓ When trading resumes through a system reboot, message sequence numbers will be rolled forward as before.
 - ✓ The day's issue information, base price information, and multicast group number information will be able to be obtained via TCP retransmission even if multicast transmission is not possible.

- In the event any inconsistency occurs due to a system failure after start of trading, said inconsistency needs to be resolved in order to maintain market order and ensure the security of trading and settlement as well as investor protection.
- For this purpose, (1) executed trades need to be finalized by both the Exchange and trading participants, and (2) for inside the Exchange system, the approach to price continuity and how the rules should be applied need to be considered.

1. Actions between the Exchange and trading participants

- For the purpose of finalizing executed trades and resolving inconsistency, the following main actions should be conducted based on data in the Exchange system.

(1) In principle, trades for which execution notices have been returned to the trading participants shall be considered executed trades.

(2) In the event of inconsistency in the sending status of the execution notices for a transaction, the inconsistency should be resolved by having the Exchange convey the execution data to the trading participants in some way.

*Further discussion is necessary for handling of partially executed orders as well as handling of cases where the execution notice message has been delayed only for one party, etc. (To be discussed in the WG together with other discussion topics.)

*Depending on the type of failure, there could be cases where the execution data in the Exchange system is lost. Only in such situations will executed trades be subject to cancellation. (The current rules do not clarify this and will be revised accordingly.)

2. Approach to price continuity and application of the rules

- In the case of a reboot, since the order book mid price and the application of the rules will be reset to as they were in the morning, the following main points need to be considered.

(1) Order book mid price: Adjust to the most recent execution price or flexibly renew quotations for the purpose of controlling the impact at an early stage.

(2) Application of the rules:

Issues subject to a trading halt before the system failure due to certain corporate information will continue to be halted after the resumption of trading.

Issues subject to short selling price restrictions will require some response after the trading resumption based on the purpose of the restrictions.

(3) Plan for Upcoming System Failure Drills



Plan for Upcoming System Failure Drills (draft)

- To ensure the effectiveness of the policies discussed by this Working Group, we will conduct system failure drills on non-business days: in the first half of FY2021, tests of single functions used for system recovery; and in the second half of FY2021, tests of comprehensive scenarios based around trading resumptions.

	Planned checks (Items to be checked by users)	Possible Scenarios	
		Order Placement	FLEX
1H FY2021 (Apr. 2021- Sep. 2021)	Checks of single functions used for system recovery <ul style="list-style-type: none"> - Comprehensive check of set values such as reason codes already defined in the connection specifications - Checks of operational procedures in the event of a system failure as indicated in the connection specifications after it is updated 	<ul style="list-style-type: none"> - Error returned: During Temporary Trading Halt - Error returned: No Order Allowed - Orders invalidated by TSE - Start of order acceptance is pushed back by not sending market administration messages on time - Orders not accepted by disconnecting virtual servers before the start of order acceptance etc. 	<ul style="list-style-type: none"> - Basic issue information temporarily disseminated - Backup/refresh data sent - Recovery for when FLEX message dissemination does not start on time - Provision of files for basic issue information, etc. when multicast transmission is impossible etc.
2H FY2021 (Oct. 2021- Mar. 2022)	Checks of recovery scenarios <ul style="list-style-type: none"> • Checks of system behavior and operational flow in the event of a system failure before the start of trading using a comprehensive scenario • Checks of functions of TSE systems or user systems that are likely to change 	<ul style="list-style-type: none"> - Orders not accepted by sending market administration messages after order acceptance etc. 	<ul style="list-style-type: none"> - Obtaining basic issue information via TCP when multicast transmission is impossible, etc.
		<ul style="list-style-type: none"> - Resumption of trading through a system reboot - Orders invalidated by TSE (resending invalidated orders later as needed) - Drills of the procedure for gathering opinions 	

* Drills based on the same scenario will be conducted multiple times on different dates.

* Along with the above system failure drills, we will also carry out tests on communication via the website where appropriate (the first drill is scheduled to be conducted in January 2021).

* In addition to non-business day drills, we plan to provide the same test opportunities in a weekday test environment.

* In addition to the above, we will also continue to conduct drills based on scenarios which we have been using until now.

(4) Information Provision Policy in the Event of a System Failure



Draft Information Provision Policy in the Event of a System Failure (1)

- To make sure that investors and other market users can access information on details of the system failure and the situation regarding TSE's responses, etc. quickly and appropriately, we will create a dedicated web page on the JPX website and use it to post this information.
- We will develop rules about the frequency of updates (every 30 minutes as a rule) as well as the information contents, and disseminate information based on these rules.
- Information posted on the JPX website will also be made known to the general public using Twitter, etc.

Item	Description	Notes
1. Location of posted information	<p>(1) JPX website</p> <ul style="list-style-type: none"> - A web page will be launched to enable various stakeholders to access information compiled specific to system failure. It will include information such as whether trading is affected and details of system failure. - If trading is affected as in the case of a trading suspension, an alert for notification will be conspicuously posted on the homepage to bring attention to it. <p>(2) Target</p> <ul style="list-style-type: none"> - If a trading suspension, etc. is needed, notifications will be issued through Target in addition to (1). 	<ul style="list-style-type: none"> - In the event of a failure that does not affect operations, such as when an automatic switchover normally occurs, a notification will not be specially posted on the homepage.
2. Update frequency	<p>(1) JPX website</p> <ul style="list-style-type: none"> - The first notification will be posted immediately after a failure is detected and as soon as possible when the extent of impact, etc. is confirmed. (However, if order acceptance must be suspended immediately, such as in the case of a trading server failure, the first notification will be posted even if confirmation of the failure impact has yet to be fully completed.) - Afterwards, whenever there is new information on the extent of impact or the event summary, etc., the relevant information will be updated. - Even if there is no new information (no developments in the situation), this will be clarified in an update, as a general rule every 30 minutes from the most recent update. <p>(2) Target, email to contact persons in the event of a system failure, Twitter, etc.</p> <ul style="list-style-type: none"> - When the JPX website is updated, notification of an update will also be sent through these tools (push notifications) 	<ul style="list-style-type: none"> - Even if system recovery occurs immediately, a notification will be given that "a system failure occurred but the system is now recovered". - Emails will be sent to the email address of the "contact person(s) in the event of a system failure" registered via arrowface (up to three (3) addresses can be registered.)

Draft Information Provision Policy in the Event of a System Failure (2)

Item	Description	Notes
3. Published contents	<ul style="list-style-type: none"> - The following information will be disclosed on the JPX website: <ul style="list-style-type: none"> ✓ Operational status of arrowhead and ToSTNeT system (whether trading is affected or not) ✓ Details of the system failure such as the affected system(s), the extent of impact, and event summary ✓ Updated information in chronological order, etc. - The above disclosure steps are expected to include the following: <ol style="list-style-type: none"> (1) Event detection (system failure) (2) Operational impact (possible event in the future in addition to an event occurring at that time) (3) Possibility of a trading suspension (4) Trading suspension (5) Expected timing of trade resumption (in the case of a trading suspension) (6) When trade resumption is determined, the resumption procedures and schedule (in the case of a trading suspension) (7) Trading schedule on the next business day, etc. 	<ul style="list-style-type: none"> - Information will be promptly disclosed in English after being disclosed in Japanese. - Every effort will be made to provide details or causes of the failure. However, in cases where these are not identifiable immediately, sending information on systems operations, impact on trading and trading recovery will take priority.
4. Information dissemination	<ol style="list-style-type: none"> 1) Target, email to contact person(s) in the event of a system failure <ul style="list-style-type: none"> - Notification will also be issued via Target and email to contact person(s) in the event of a system failure, as before. (2) Twitter, etc. <ul style="list-style-type: none"> - For system failures that could affect trading, information posted on the JPX website needs to be made known to the general public, so Twitter (official JPX account) and other similar platforms will be used to do this. 	
5. Implementation date	<ul style="list-style-type: none"> - With arrowhead, information provision will begin with a test run together with system testing for users scheduled in Jan. 2021 and live operations from Feb. 2021. - Enhancing information provision to other JPX systems is also under consideration. 	<ul style="list-style-type: none"> - This policy will be improved as required through system failure response drills, etc.

Reference Material



Progress of Recurrence Prevention Measures

#	Recurrence Prevention Measures	Contents	Schedule
1	System responses and comprehensive checks	- Correction of NAS switchover setting	[Completed] Oct. 5, 2020
		- Comprehensive check of NAS settings	[Completed] End of Oct.
		- Development of measures for forced switchover of other hardware	[Completed] End of Nov.
		- Switchover tests and drills	Jan. 23, 2021 (user test) and ongoing
2	Enhancement of procedures for failsafe trading suspensions	- Confirmation of whether there are any past cases of failure to suspend trading	[Completed] End of Oct.
		- Development of a function which suspends trading without using NAS	[Completed] End of Nov.
3	Development of rules for trading suspensions and resumptions	- Development of rules necessary to resume trading on the same day, clarification of standards for trading suspensions/resumptions, discussion on ideal information provision, and so on	Interim report: this document Final report: by around the end of Mar. 2021

Examples of Orders for which Resending Is Inappropriate

- In the survey sheet, etc. comments were received on whether to resend entrusted orders for the following order types.
- We would like to receive comments such as on what order types, including the following, a consensus should be built on between trading participants and investors on what aspects, in terms of operations or systems, would make it difficult or inappropriate to resend orders.

Order Types	Summary of Comments Received	TSE Response (Draft)
Orders from Institutional Investors	<ul style="list-style-type: none"> • Whether to continue executing all orders will be checked as a business practice. • However, predetermined arrangements on handling will be need to be agreed with overseas investors as it is not possible to check with them. 	<ul style="list-style-type: none"> • It is possible to check with customers whether to continue executing their orders. • On the other hand, it is possible to specify rules for resending orders, including with overseas customers.
DSA Orders	<ul style="list-style-type: none"> • It is necessary to check with customers individually whether to execute their orders as per prior instructions at unusual trading hours. (e.g. algorithms that calculate market impact based on a full day of order executions) • We would like to remove the need to check with individual customers whether to resend orders. 	<ul style="list-style-type: none"> • Some consider that it is necessary to check with customers their intentions, while others do not. It seems to be difficult come to a consensus.
DMA Orders	<ul style="list-style-type: none"> • It is necessary for customers to resend orders or prepare alternative measures. 	<ul style="list-style-type: none"> • Does the nature of these orders make it difficult for trading participants to resend such orders?
VWAP Orders	<ul style="list-style-type: none"> • It is necessary to check with customers their intentions. 	<ul style="list-style-type: none"> • It will be possible i) to check with customers individually or ii) to agree on arrangements with customers in advance.
On-open/on-close Orders	<ul style="list-style-type: none"> • It may be necessary to check with customers their intentions based on market conditions. 	<ul style="list-style-type: none"> • It will be possible i) to check with customers individually or ii) to clarify with customers in advance that orders will be executed on open/close after trading resumption.

Cases of System Failures at TSE and Other Exchanges

Exchange	Date	Trading Suspension Period, etc.	Details
Tokyo Stock Exchange	Nov. 1, 2005	9:00 – 13:30	- An error occurred since the program which reads trading participant-related data read different data from that it was supposed to read and the boot process of the trading system was suspended
	Feb. 2, 2012	9:00 – 12:30 (241 issues on TSE & all issues on Sapporo SE)	- Market information on a proportion of listed issues was not disseminated from the stock trading system, due to a failure of switching of servers following a hardware problem
Exchange	Date	Trading Suspension Period, etc.	Details
London Stock Exchange	Feb. 2, 2011	8:03 – 12:15	- Trading was halted at 8:03 after the market open, due to a failure resulting from a problem with market data feeds. (Trading was resumed after all orders were cleared.)
Nasdaq	Aug. 22, 2013	12:14 – 15:25	- Trading was halted due to a SIP failure resulting from transactions that overwhelmed the processing capacity of the SIP, such as an unusually large number of connect and disconnect sequences and a stream of quotes for inaccurate symbols from NYSE Arca.
Singapore Exchange	Dec. 3, 2014	9:00 – 12:30	- Market open was delayed due to errors in end-of-day processing for the previous day on the securities client-accounting system hosted by SGX on behalf of member firms.
New York Stock Exchange	Jul. 8, 2015	11:32 – 15:10	- Trading was suspended due to communication issues between the NYSE trading units ¹ and customer gateways that make up the system, which were made worse when the gateways were updated with a new version of software in an attempt to solve the issue. (Trading was resumed after all orders were cleared.)
London Stock Exchange	Aug. 16, 2019	8:00 – 9:40 (FTSE 100 & 250 issues)	- Trading was suspended on specified stocks when Good-Till-Date (GTD) orders which should have expired remained on the system.
Hong Kong Exchanges and Clearing	Sep. 3, 2019	14:00 – 16:00	- Trading was suspended in the derivatives market due to software issues in the vendor supplied trading system which caused connectivity issues on the Futures Automatic Trading System.
Frankfurt Stock Exchange	Apr. 14, 2020	7:25 – 11:45	- Trading was suspended due to a malfunction in the internal communication of the trading system.
New Zealand Stock Exchange	Aug. 25 – 28, 2020	Aug. 25 – 28	- Trading was halted in order to maintain market integrity, after DDoS attacks impacted the Exchange's ability to publish market announcements to the public.
Euronext	Oct. 19, 2020	10:00 – 12:15	- Trading was halted due to a technical issue affecting a third-party middleware system. After trading restarted, the closing auction could not be carried out properly and the Exchange had to cancel all trades performed after 17:30. (All remaining orders were cleared by the Exchange including orders with validity periods, etc.)
Australia Stock Exchange	Nov. 16, 2020	10:24 – 16:12	- Trading was halted for an entire day when a software issue limited to combination trading ² created inaccurate market data for some sectors (industrials, energy, index, other). That day was the go-live for an update to the ASX Trade system, so it is possible that this was the cause.

¹ The core part of the system that carries out order matching, etc.

² The trading of multiple securities in a single order

Note: Compiled by TSE based on information available on each exchange's website and other sources

Responses at Selected Exchanges¹

	NYSE	LSE	DB	SGX	Euronext	HKEx	TSE
Rules on order cancellation (Whether the exchange can decide to cancel already accepted orders in the case of a system failure, etc.)	Y Rule 17	Y Rule 2104 in Order Book Trading Rules Section	Partial Article 59 (Depending on the type of suspension, all orders may be cancelled.)	Y rule 8.13.5	Partial or N Harmonised Rules 4202/3 ² in Rule Book I	Y Rule 204.(11) Rule 572	Partial Rule 3 ⁴ of Rules Concerning Bids and Offers
Rules on methods of notification concerning order cancellation (How the exchange notifies the trading participant of the cancellation of already accepted orders)	Y Rule 17 - The rules stipulate that the exchange shall provide "notice of the cancellation" when cancelling orders.	Partial 6.9.2; 11.6, etc. in MIT201 (In principle, a corresponding message is sent to the trading participant when an order is cancelled; however, under certain circumstances, the exchange may cancel an order without a corresponding confirmation being sent to a participant.)	Y Article 77(6) - The rules stipulate that "the companies shall electronically be informed".	Y Practice Note 8.13 and 8.15 (The exchange will notify Trading Members of the status of their unmatched orders before the lifting of a market suspension.)	Partial or N Harmonised Rules 4202/3 ² in Rule Book I (Unexecuted orders shall be cancelled, as set forth in one or more Notices. ³)	N	N

¹ Compiled based on information available on each exchange's website and other sources

² The rules stipulate that unexecuted orders shall be cancelled upon the occurrence of certain events that are likely to substantially affect the price of a security. As such, this rule may not have specifically considered system failure.

³ Individual notifications do not seem to have been sent out for order cancellations in relation to the system failure on October 19, 2020.

⁴ A bid/offer shall become invalid at the time of the close of the trading sessions of the day; provided, however, that, where trading is halted pursuant to the provisions of Rule 29 of the Business Regulations, the validity of a bid/offer may be specified on a case-by-case basis.

Responses at Selected Exchanges

	NYSE	LSE	DB	SGX	Euronext	HKEx	TSE
Time period before resumption of trading (Order acceptance time)	-	At least 20 minutes MIT201 11.5	-	At least 15 minutes (Adjust Phase) Practice Note 8.13 and 8.15	-	-	In principle, 30 minutes (Internal manuals)
Requirements, etc. for trading (market) suspension and resumption of trading	<ul style="list-style-type: none"> Although, in principle, exchanges strive to resume trading with as many remaining customer orders as possible, they also foresee situations where there is order cancellation, etc. In cases where there is difficulty in sending cancellation notification messages, some exchanges notify cancellation by other means. Since the criteria to suspend/resume trading (market) are not published, this decision seems to be made based on each exchange's internal criteria.⁵ If certain internal criteria of an exchange are met, the exchange may resume trading even if not all trading participants can respond. 						Comprehensive consideration of the share of trading value (generally above 50%), attributes of trading participants, and other factors

⁵ The criteria are thought to be pre-determined by each exchange and may include not only quantitative criteria, such as share of trading value, but also qualitative criteria, such as attributes of securities companies.

Contingency Plan with Regard to Trading in the TSE Market (excerpt)

Possible Situations	Measures to be taken by TSE	Rationale	Regulatory Basis
I. In the event of a failure in TSE trading systems	<p>1. Matching Systems: - TSE will halt trading of issues for which continued trading is difficult.</p> <p>2. Order Placement Systems: (1) Stocks and the like - <u>TSE will consider whether to halt trading of securities tradable through arrowhead, comprehensively taking into account the past market share based on trading value of trading participants that are unable to participate in trading (generally above 50%) and the state of the system failure (including the number of trading participants, etc. that are unable to participate in trading and their attributes).</u> - If only specific divisions of a trading participant are unable to participate in trading due to a failure in individual TSE systems, the past market share based on trading value of the affected trading participant shall be the total trading share of the participant through the numbers of the inter-system connection virtual servers (hereinafter "virtual server numbers") that are unable to participate in trading only if the trading participant declares such virtual server numbers to TSE in a prescribed form. - Failures involving trading participants that account for market share above a certain level are considered to have a material impact on market liquidity. - However, ToSTNeT trading will continue as long as any trading participant is able to place orders.</p>	<p>- It is impossible, as a matter of fact, to execute trades manually.</p> <p>- Failures involving trading participants that account for market share above a certain level are considered to have a material impact on market liquidity.</p>	<p>- Rule 29, Item 4 of the Business Regulations, etc.</p> <p>- Rule 29, Item 4 of the Business Regulations, etc.</p>
II. In the event of a failure in the TSE Market Information system	<p><u>- If a failure is likely to distort price formation in the market, such as an overall system failure or where normal quote information is not distributed, TSE will halt trading.</u></p> <p>- In the event that appropriate price checks cannot be conducted for the auction trading price due to a failure in the information distribution function, TSE will halt only ToSTNeT trading.</p>	<p>-If investment continues without sufficient dissemination of market information in a situation such as where there is a failure in the arrowhead information distribution function, it is considered that price formation in the market is likely to be distorted.</p>	<p>- Rule 29, Item 3 of the Business Regulations, etc.</p>
V. In the event of a system failure on the side of trading participants	<p>1. Stocks and the like <u>- TSE will consider whether to halt trading of securities tradable through arrowhead, comprehensively taking into account the past market share based on trading value of trading participants that are unable to participate in trading (generally above 50%) and the state of the system failure (including the number of trading participants, etc. that are unable to participate in trading and their attributes).</u> - If only specific divisions at a trading participant are unable to participate in trading due to a failure in the trading participant's internal system, the past market share based on trading value of the affected trading participant shall be the total trading share through the virtual server numbers that are unable to participate in trading only if the trading participant declares such virtual server numbers to TSE in a prescribed form. - However, ToSTNeT trading will continue as long as any trading participant is able to place orders.</p>	<p>- Failures involving trading participants that account for market shares above a certain level are considered to have a material impact on market liquidity.</p>	<p>- Rule 29, Item 3 of the Business Regulations, etc.</p>

Contingency Plan with Regard to Trading in the TSE Market (excerpt)

Possible Situations	Measures to be taken by TSE	Rationale	Regulatory Basis
<p>VI. In the event of an earthquake, wind/flood damage, terrorist act, failure in social infrastructure including power/tele-communications networks, etc.</p>	<p>1. When TSE is unable to monitor trading in securities, etc. - If TSE concludes that it is difficult to continue operations and is unable to monitor trading in securities, etc. sufficiently in the event that employees of TSE are forced to evacuate the building due to disaster, terrorist act, etc., TSE will halt trading in such securities, etc.</p> <p>2. When trading participants are unable to participate in trading in stocks and convertible bonds, etc. (1) Stocks and the like <u>- TSE will consider whether to halt trading of securities tradable through arrowhead, comprehensively taking into account the past market share based on trading value of trading participants that are unable to participate in the market (generally above 50%), the state of the disaster or system failure (the number of trading participants, etc. that are unable to participate in trading and their attributes, the state of the entire financial market, etc.), and its social roles.</u> - If only specified divisions of a trading participant are unable to participate in trading, the past market share based on trading value of the affected trading participant shall be the total trading share of the participant through the virtual server numbers that are unable to participate in trading only if the trading participant declares such virtual server numbers to TSE in a prescribed form. - However, ToSTNeT trading will continue as long as any trading participant is able to place orders.</p> <p>3. When clearing/settlement is impossible at the clearing organization or settlement organization(s) - In the event of a system failure at the clearing organization (JSCC) or the settlement organization(s) (Japan Securities Depository Center, Inc., the Bank of Japan, fund-settlement banks, etc.), the handling of the settlement date, etc. shall be governed by the provisions of JSCC. - If it will take several days for the recovery of the systems at the clearing organization or the settlement organization (s), TSE may temporarily halt trading entirely.</p>	<p>- In order to prevent settlement risk from increasing due to the accumulation of unsettled transactions.</p>	<p>- Rule 29, Item 3 of the Business Regulations, etc.</p> <p>- Rule 4 of the Business Regulations, etc.</p>