

# Independent Expert Report

Independent assessment of ASX's Assurance Program for its Implementation of the CHES Replacement Program

Six Monthly Progress Report

31 December 2022

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# 1. Executive Summary

## Introduction

ASX Operations Pty Ltd (“ASX”) is undertaking a project to replace its Clearing House Electronic Subregister System (CHES) with a new implemented system based on distributed ledger technology (CHES Replacement Program).

ASX has developed an Assurance Program in connection with the CHES Replacement Program, with the purpose of providing confidence to internal and external stakeholders and assisting in ensuring that the project meets its objectives. The Assurance Program is part of the critical path of the project and includes a number of reviews focused on important project milestones and key risk areas.

In November 2021 ASIC imposed certain Licence Conditions on ASX Clear and ASX Settlement which included the appointment of an independent expert.

## Scope

In accordance with the relevant Licence Conditions, ASX, with ASIC’s and the RBA’s consent, engaged EY to assess ASX’s Assurance Program for its implementation of the CHES Replacement Program and oversee the implementation of any remedial actions from the trade outage independent expert review recommendations which are relevant to the CHES Replacement Program.

On 28 February 2022, we issued our first report on the design assessment of the Assurance Program to determine whether it was fit for purpose, identifying any topics that required further independent assessment and any remedial actions. Subsequently, we issued our second independent expert report on 29 June 2022, providing an update of the design assessment and outlining the findings and recommendations resulting from our assessment of remedial actions from completed assurance reviews and the trade outage recommendations.

This is our third independent expert report under the Licence Conditions.

The objective of this report is to provide an update on the status of the remedial actions from the 30 June 2022 Report and the progress of completed assurance activities in the period. This report also includes an update on the trade outage independent expert review recommendations relevant to the CHES Replacement Program. Refer to section 2.2 for scope details.

## Key events in the period

- **CHES Replacement Project Delay and Program Replan.** On 11 May 2022, ASX announced that there had been delays to the expected delivery schedule and the April 2023 go-live date was no longer viable and that a new go-live date would be determined after further planning.
- **Commission of independent review of new CHES application.** On 3 August 2022, ASX announced that they have identified more development was required than previously anticipated and a third-party had been engaged to provide an independent review of the new CHES application and assess a number of functional components as well as project delivery.

That review has provided 45 recommendations for ASX to address as part of its replanning exercise.

- **CHES Replacement Project paused to reassess the solution design.** On 17 November 2022, ASX announced that current activities on the project have been paused due to significant challenges with the solution design and its ability to meet ASX’s requirements identified by the independent review commissioned on the new CHES application. The public announcement outlined that ASX will reassess all aspects of the CHES replacement project following completion of the independent review and its own internal assessment.

Considering the extensive project replanning activities happening in the period and the subsequent independent review of the new CHES application leading to the reassessment of the solution design, a number of assurance reviews within the Assurance Program have been put on hold.

Therefore, a limited number of assurance reviews have been completed since our last six-monthly report and planning of upcoming reviews was limited to the assessment of the Program Replan review and the review of CHES program testing capabilities, which at the date of this report have both been paused.

Once the conclusions of the independent assessment of the new CHES application have been evaluated and the activities associated with the reassessment of the solution design following the public announcement are completed, ASX is expected to update the Assurance Program accordingly in consideration of new defined project milestones and timelines. This will include the assurance work to be completed over the solution design activities.

### Summary findings and recommendations

Based on our findings below, our assessment found that the Assurance Program continued to be fit for purpose in the period under review, subject to ASX addressing our recommendations.

- ▶ **30 June Assessment Update** - Four management actions were created by ASX to address the two recommendations raised from our 30 June Report, we found that three of the four management actions had been fully addressed one whilst the remaining recommendation was partially remediated.

We found that ASX improved the closure process and documentation for closed findings, the consistency of applying risk ratings from the assurance reviews and the precision of Go/No go criteria definition and reporting.

The tracking of remedial actions managed by other teams and other projects could be further enhanced in relation to expected timelines

for closure as due dates for defects remediation have not been established. The defects are instead aligned to program increment (PI) planning milestones which currently do not have definitive timelines, as this was awaiting completion of independent review of the new CHES application and the replan.

- ▶ **Assessment of the scope of the independent review of the new CHES application** - ASX has engaged an independent reviewer to assess the current issues with the CHES Replacement application delivery. The review includes the assessment of product and technical requirements of the overall defined solution in relation to scalability, resiliency and supportability, the supporting architecture, design, current implementation, and a high-level sample code review to examine practices and levels of technical debt post-deployment.

We have assessed the Statement of Work (SOW) for this independent review to determine whether the proposed scope and approach was fit for purpose. Our assessment found that the independent reviewer approach as set out in its SOW was fit for purpose, based on the objective of the review. In addition, we provided six (6) recommendations and two (2) clarification points for ASX to consider as part of its replan activities.

We have assessed ASX's management response to these recommendations and clarification points and we are satisfied that if executed they will address the recommendations and points raised.

We will review the final deliverables produced by the independent reviewer, management's responses and subsequent closure of findings which are expected to be tracked within the Assurance Program, as appropriate.

- ▶ **Assessment of the scope of the Program Replan review** - Prior to the public announcement to pause the Project on 17 November 2022, ASX was in the process of re-planning its CHES Replacement Program.

A review of the CHES System Replacement Program Replan was included in the Assurance Program whereby our assessment of the associated Statement of Work (SOW) for this independent review was found to be fit for purpose based on the objective of the review. This review has now been discontinued while the program re-assesses the solution design.

We will re-evaluate the changes to the Assurance Program and related assurance activities once ASX completes its reassessment of the solution design.

- ▶ **Assessment of completed and inflight assurance reviews** - ASX has received 4 reports since 30 June 2022, relating to the assurance reviews completed for Identity and Access Management, Security Design, Security Assurance and our independent assessment of the Assurance Program first six-monthly report.

We found that for the 7 findings that have been closed since our 30 June report, the artefacts captured to demonstrate the closure of the remedial actions were sufficient to satisfy the Assurance Program's closure requirements. The process around closure of findings has been improved following the recommendation from our 30 June Report whereby a guidance outlining quality expectations for the development of action plans to address findings has been established and it highlights any approvals required and outlines that appropriate due dates need to be assigned in line with target milestones. Additionally, an approach for involving assurance providers in the closure process has been developed and approved by the Program Assurance Governance Forum.

ASX has one planned assurance review to assess the Chess Replacement Program's internal test practices and capabilities against a relevant industry standard to measure maturity of its practices and to identify any further opportunities for improvement. Once ASX's management has analysed the outcome of the independent review of the new CHES application and has completed the reassessment of the solution design, the timing and detailed scope of this assurance review will be reassessed by the Assurance Program.

We have assessed the proposed SOW for this review. Our assessment found that the independent reviewer scope and approach as set out in its proposed SOW with ASX for the review of the CHES program testing capabilities is fit for purpose, based on the purpose of the review.

- ▶ **Assessment of the remedial actions from the trade outage Independent Expert review recommendations** - Our assessment found that, out of the 7 findings that have been closed since our 30 June report, 2 of them are related to the trade outage Independent Expert review recommendations. Similarly, the artefacts captured to demonstrate the closure of the remedial actions were sufficient to satisfy the Assurance Program's closure requirements.

11 recommendations were considered by ASX management as not requiring further management actions at the time of report finalisation in November 2021 as these were either completed or would be superseded by ongoing or future activities. We reviewed the relevant artefacts and found that 4 recommendations were adequately closed whilst the remaining 7 will require further analysis as the corresponding actions relates to the in-flight activities including the completion of the CHES program's testing capabilities review, which will be conducted by an independent third-party. We will review the final deliverables to assess closure of actions, when appropriate. In addition, 10 management actions are still open and will be reviewed in our future six-monthly reports, when considered closed by ASX.

### Next steps

Our next report under the Licence Condition is due on 30 June 2023.

The scope of that report will cover how ASX has addressed the recommendations in this 31 December 2022 progress report, and any update on the implementation of any remedial actions from the completed assurance activities.

We will also assess the impact on the Assurance Program of the outcome of the independent review of the new CHES application and the

reassessment of the solution design, as appropriate. Should the reassessment inform any fundamental changes to the Replacement Program and the Assurance Program, we will re-apply the EY Cube methodology to assess that the Assurance Program design is fit for purpose for the updated Replacement Program.

We acknowledge and thank ASX for its cooperation in undertaking our independent assessment activities to date.

## 2. Introduction

### 2.1 Background

#### CHES Replacement Program

ASX commenced a process of evaluating replacement options for its Clearing House Electronic Subregister System (CHES) in 2015. CHES is used by ASX as a core system to perform clearing, settlement and other post-trade services for the Australian equity market.

In December 2017, ASX announced the decision to replace CHES implementing a new system based on Digital Asset's (DA) distributed ledger technology (DLT), project known as the 'CHES Replacement Program'. There are four key objectives/goals for overall CHES Replacement project plans to achieve:

- ▶ To replace the CHES system which is based on ageing technology
- ▶ To adopt international messaging standards (ISO20022) and enable the retirement of proprietary CHES messaging
- ▶ To comply with regulatory expectations to be capable of implementing settlement services that are multi-CCP compatible
- ▶ To develop and enable new business services in relation to clearing and settlement made possible by a flexible and secure system design using contemporary technology providing DLT optionality

#### CHES Replacement Program Replan Activities

On 11 May 2022, ASX announced that the April 2023 go-live date was no longer viable due to delays to the expected delivery schedule of the CHES application software and that a new go-live date would be determined after the completion of Program Replan activities.

On 3 August 2022, ASX announced that it was engaging an independent third-party to provide an independent review of the new CHES application and assess a number of functional components as well as assess project delivery. ASX and the application software provider had identified that more development than previously anticipated was required to meet ASX's scalability and resilience requirements for the application, which was contributing to delays in the delivery schedule.

On 17 November 2022, ASX announced that current activities on the project have been paused due to significant challenges with the solution design and its ability to meet ASX's requirements. The announcement outlined that ASX will reassess all aspects of the CHES replacement project following completion of independent review of the new CHES application and its own internal assessment.

#### CHES Replacement Program Assurance Program

The Assurance Program is continuously adapting to the changes in the Project whereby planned reviews have been paused to align with the revised timing of the Project milestones, redesign, and replanning activities.

Specific reviews planned for this period, such as the Project Health Check, have been paused as its proposed scope was going to be impacted by the project replan and a Program Replan review was introduced to provide assurance over those replanning activities.

Considering the outcome of the independent review of the new CHES application, re-assessment of solution design, and the replanning activities, ASX will refresh the Assurance Program with updated timelines and areas of focus.

## ASX Clear and ASX Settlement Licence conditions

As a related matter, in November 2020 an outage occurred following a major upgrade to ASX's equity trading platform (ASX Trade), called the ASX Trade Refresh project. Consequently, the Australian Securities and Investments Commission (ASIC) and the Reserve Bank of Australia (RBA) required an independent expert review of the ASX Trade Refresh project to be completed. The independent expert made recommendations in seven key categories from this review: risk, governance, delivery, requirements, vendor management, testing and incident management (trade outage independent expert review recommendations).

The combination of the trade outage and the criticality of the CHES Replacement program has led ASIC (as delegate for the Minister) to impose certain Licence Conditions on ASX Clear and ASX Settlement. Australian CS Facility Licence (ASX Clear Pty Limited) Additional Conditions Notice 2021 (No.1) dated 24 November 2021 and Australian CS Facility Licence (ASX Settlement Pty Limited) Additional Conditions Notice 2021 (No.1) dated 24 November 2021, condition 2 on Schedule 1 "Appointment of an independent expert" required ASX to engage an independent third party (independent expert) to conduct an assessment of its existing Assurance Program on its CHES Replacement Program prior to Go-Live and oversee the implementation of any remedial actions from the trade outage independent expert review recommendations which are relevant to the CHES Replacement Program.

## 2.2 Scope

EY has been engaged to deliver the following scope of work:

1. In accordance with the relevant Licence Conditions, EY will assess ASX's Assurance Program for its implementation of the CHES Replacement Program and oversee the implementation of any remedial actions from the trade outage independent expert review recommendations which are relevant to the CHES Replacement Program.

2. In addition to the Licence Conditions, ASIC has required a Pre Go-Live Confirmation from EY as to our opinion with respect to:
  - a. The Assurance Program meeting its objectives of:
    - i. The successful replacement of CHES with a system that meets ASX's functional and non-functional requirements, and
    - ii. Promoting confidence to internal and external stakeholders
  - b. The adequacy of ASX's governance framework for testing, and
  - c. The design adequacy of the CHES Replacement Program's 'Go-Live' decision framework (which incorporates both the business decision to implement the new system and implementation activity decision check-points over the cut-over weekend) and whether the decision framework has been followed.

Our engagement will deliver the following reports as required by the Licence Conditions and the Pre Go-Live Confirmation:

- ▶ Design Report that was published on 28 February 2022 included an assessment whether the existing Assurance Program is fit for purpose, identifying any topics that required further independent assessment and any remedial actions.
- ▶ Six Monthly Progress Reports, providing a status update of existing remedial actions and identifying any further remedial actions, and updating on implementation of any remedial actions from the trade outage independent expert review.
- ▶ Pre Go-Live report, which will set out the status of any remedial actions and whether they are necessary to be undertaken prior to Go-Live and an update on findings of the totality of the Assurance Program reviews indicating whether the remedial actions from the



Design Report and Six Monthly Progress Reports and the relevant trade outage independent expert review recommendations have been appropriately implemented by ASX.

- ▶ Pre Go-Live Confirmation requested by ASIC in addition to the Licence Condition
- ▶ Two Post-Implementation Reviews (PIR)

This document refers to the second Six Monthly Progress Report per the agreed scope of work.

The objective of this Six Monthly Progress Report is to assess whether the CHES Replacement Program continues to be fit for purpose giving due consideration to the following aspects of the Assurance Program:

- ▶ **30 June Assessment Update.** Evaluate the status of the remediation actions associated with the findings raised in the first six monthly Progress Report and the effectiveness of the change management and governance process of the Assurance Program.
- ▶ **Assessment of the scope of the independent review of the new CHES application.** Evaluate the SoW relating to the independent review of the new CHES application to assess whether it was fit for purpose and identify potential gaps. This specific review of the SoW was conducted per the request from the regulators (ASIC and RBA).
- ▶ **Assessment of the scope of the Program Replan review.** We have assessed the Statement of Work (SOW) for this independent review however, this will need to be re-evaluated once ASX completes its review of the solution design, the subsequent assurance over the redesign and the updates to the Assurance Program.
- ▶ **Assessment of the findings from the completed and inflight assurance reviews.** Evaluate the SoW relating to the CHES program internal testing capabilities, the status on the implementation of remedial actions arising from completed reviews

and assess the adequacy of the validation process undertaken over the closure of those actions.

- ▶ **Assessment of the remedial actions from the trade outage Independent Expert review recommendations.** Evaluate the status on the implementation of any remedial actions from the trade outage Independent Expert review recommendations which are relevant to the CHES Replacement Program.

## 2.3 Approach

In undertaking our assessment for the delivery of this report, the following activities were performed:

1. *Documentation review:* A detailed review and analysis of ASX's Assurance Program and related relevant artefacts including those associated to the CHES Replacement Program. All documentation was provided to EY by ASX based on a documentation request. A list of documentation reviewed can be found in Appendix E.
2. *Assurance Program Governance meetings:* Meetings were held to understand the status and process of closure of the findings from the completed assurance activities including on-going governance and change management activities in relation to the Assurance Program.
3. *Interviews with key stakeholders:* The review also involved stakeholder interviews to capture additional input to complement the analysis of the documentation provided and inform our understanding. Key business stakeholders were asked about their role with respect to the project and the Assurance Program including the coverage of key project risks. Interviews with assurance providers were held to discuss the scope, approach, and outcome of the assurance reviews conducted. A list of interviews conducted with key stakeholders can be found in Appendix D.
4. *Attendance to observe ESG and Assurance Program Governance meetings -* EY have joined a sample of Executive Steering Group

(ESG) and Assurance Program Governance meetings as observer to assess how key risks and progress of the Project were communicated and addressed.

5. *Assurance Program progress assessment:* Our evaluation of the progress of the Assurance Program included an assessment of the amendments to the areas in scope for review to determine the alignment with any changes coming from the CHES Replacement Project timelines and new key risks identified in the project RAID.

## 2.4 Limitations

We draw your attention to the limitations inherent in this report:

- ▶ Our work was not performed in accordance with generally accepted auditing, review, or other assurance standards in Australia and accordingly does not express any form of assurance. This report does not constitute legal opinion or advice. We have not conducted a review to detect fraud or illegal acts.
- ▶ Our work does not assume any responsibility for any third-party products, programs or services, their performance or compliance with your specifications or otherwise.
- ▶ Our work did not intend to identify, address, or correct any errors or defects in your computer systems, other devices, or components thereof ("Systems"), whether or not due to imprecise or ambiguous entry, storage, interpretation, or processing or reporting of data. We are not responsible for any defect or problem arising out of or related to data processing in any Systems in relation to the CHES Replacement Program and its Assurance Program.
- ▶ Our review of the closure of the remedial actions associated with the completed assurance reviews was limited to assess the due diligence of the process undertaken through the review of the documentation provided by ASX as documented evidence to support the closure. Professional scepticism required that our review of

issue closure was based on the artefacts that supported the closure at the time, rather than present day interviews with those involved in historic closures. We did not evaluate the operational implementation and adequacy of the remedial actions.

- ▶ Our review was limited to documents requested by EY and provided by ASX as deemed relevant in line with the agreed scope and EY requests, with the expectation that ASX had those artefacts documented to satisfy its own governance arrangements and executive accountability needs.
- ▶ Our scope under the licence conditions requires us to oversee the implementation of any remedial actions from the trade outage Independent Expert review recommendations which are relevant to the CHES Replacement Program. For the purpose of our engagement, we define oversee as to observe, inspect and test that ASX has implemented the remedial actions. ASX are accountable and responsible for the implementation activities and EY will not act as management or direct the implementation.

## 2.5 Use and disclosure of our reports

We are providing specific advice only for this engagement and for no other purpose and we disclaim any responsibility for the use of our advice for a different purpose or in a different context. If you plan to use this advice on another transaction or in another context, please let us know and provide us with all material information so that we can provide advice tailored to the appropriate circumstances.

Our Reports (including the EY Summary Reports) may be relied upon by ASX and ASX's regulators ASIC and the RBA for the purpose outlined in this SOW only. We understand that ASIC and the RBA, and ASX may issue a media release and/or a public report referring to or publishing the content of our Reports, and may make or issue our Reports or a summary of the content of our Reports. We will prepare a summary of our Reports (EY Summary Reports). We consent to ASIC and the RBA,

and ASX publishing our Reports, EY Summary Reports and/or summaries of our Reports.

For the avoidance of doubt, no other party other than ASX, ASIC and the RBA may rely on the Reports. We disclaim all responsibility to any such other party for any loss or liability that the other party may suffer or incur arising from or relating to or in any way connected with the contents of our Reports, the provision of our Reports to the other party or the reliance upon our report by the other party.

### 3. Findings and Recommendations

Detailed below are the findings and recommendations from our 31 December 2022 Progress Report which includes our review and update on the 30 June Report and status update of existing remedial actions from the completed Assurance Reviews, and the assessment of remedial actions from the trade outage Independent Expert review recommendations.

We also assessed the amendments made to the Assurance Program in response to changes to the project timelines, approach, and milestones.

#### 3.1 30 June Assessment Update

The objective of this area is to evaluate the status of the remediation actions associated with the findings raised in the 30 June Report and the continued effectiveness of the change management and governance process of the Assurance Program.

##### Context

ASX has developed an Assurance Program to assist with ensuring the project meets its objective of the successful replacement of CHES with a system based on DLT that meets ASX's functional & non-functional requirements and to provide confidence to internal and external stakeholders, supporting decision-making for key project milestones including go-live readiness.

Our 30 June Report published on 29 June 2022 included two (2) recommendations associated to four (4) findings associated with the process around closure of findings, the consistency of Risk Ratings on reviews, the management and oversight of remedial actions owned by other teams and projects as well as the go / no go criteria definition and reporting process. Those findings with the corresponding update at the date of this report is included in the following table:

Finding Title	Remediation Status
Closure process and documentation for closed findings	<p><b>Closed</b></p> <p>We have observed that ASX has developed detailed guidance outlining quality expectations for the development of action plans to address findings, which includes expectations for:</p> <ul style="list-style-type: none"> <li>i) any approvals required for a finding to be fully closed;</li> <li>ii) completeness of actions to address all aspects of a recommendation and</li> <li>iii) assigning appropriate due dates in line with target milestones.</li> </ul> <p>This guidance also includes an approach for involving assurance providers in the closure process as appropriate depending on the nature and complexity of the action. The detailed guidance has been approved by the CRO.</p>
Consistency of risk ratings from reviews	<p><b>Closed</b></p> <p>We have observed that ASX has developed an approach to apply an appropriate Risk Rating to the findings applicable to the CHES Assurance Program. The risk assessment process has been improved, involving key stakeholders as appropriate (e.g. assurance provider, accountable management/action owners, Senior Manager Program Assurance). The project Risk Rating matrix has been consistently applied in the reports reviewed within this period.</p>

Finding Title	Remediation Status
Remedial actions managed by other teams and other projects	<p><b>Partially Closed</b></p> <p><b>Risk Rating: Medium (Impact: Major; Likelihood: Possible)*</b></p> <p>We found that ASX has significantly improved the visibility and tracking of remedial actions managed by other teams and other projects with impact on the CHES Replacement Program. Defects have been included in the Assurance Program Tracker and the resolution as well as the quality of artefacts produced are reviewed by the Senior Program Manager of the Assurance Program, who maintains periodic interactions with the teams responsible for the remediation of defects to monitor status and planning information of work ahead.</p> <p>Further room for improvement exists in relation to provide clarity from a CHES Assurance Program perspective over expected timelines for closure, as due dates for defects have not been established. The defects are instead aligned to program increment (PI) planning which currently do not have definitive timelines as this was awaiting completion of independent review of the new CHES application and the replan.</p> <p>We acknowledge that due to extensive replanning and redesigning activities that are underway including reprioritisation of activities and the dependencies with project milestones, establishing accurate due dates for closure is challenging. We also understand that the closure of defects is dependent on the engagement of the third-party involved with the review and that the next program</p>

Finding Title	Remediation Status
	<p>increment (PI7) has been deferred due to replanning activities.</p> <p>However, we recommend that the periodic reporting of defects should provide clarity over expected timelines for closure supported by agreed due dates, in connection with their potential impact to CHES Program milestones and any roadblocks, allowing full visibility over the ongoing activities which will feed into the governance forums and will facilitate greater transparency in the assessment of acceptance criteria. In the case where a defect has been de-prioritised due to resourcing constraints or risk assessed as low, this should be clearly articulated in the Assurance program tracker and reported to the relevant forums.</p>
Go/No go criteria definition and reporting	<p><b>Closed</b></p> <p>We found that ASX improved the Go / No Go criteria definition and reporting process. Our assessment of the evidence supporting the July 2022 go/no go decision for ITE1 Release 1.3, found that there was sufficient information and challenge to support the decision. The precision of the criteria has been enhanced and there was a clear view of outcomes and accountability for the evaluation of each of the criteria.</p>

\*The risk rating applied is based on ASX's Project Risk Rating Scalar. Refer to Appendix F.

### 3.2 Assessment of the scope of the independent review of the new CHES application

The objective of this area is to evaluate the SoW relating to the independent review of the new CHES application to assess whether it was fit for purpose and identify potential gaps.

## Context

On 03 August 2022, ASX announced that they have identified more development was required than previously anticipated to meet ASX's scalability and resilience requirements for the application. Hence, ASX announced it was engaging an independent third-party to provide an independent review of the new CHES application and assess a number of functional components as well as assess project delivery.

The proposed scope includes the review of the product and technical requirements of the overall defined solution, the supporting architecture, design, current implementation, and a high-level sample code review to examine practices and levels of technical debt post-deployment. This review also includes an assessment of the solution in relation to scalability, resiliency and supportability.

Given the importance of the ASX Replan activities and EY's role in overall program assurance, ASX and relevant regulators (including ASIC) have requested EY to assess the third-party's Statement of Work (SOW) to assess whether the approach was fit for purpose and identify any potential gaps or issues between the proposed approach and the purpose of the review.

## Findings

Our review found that the third-party's proposed approach as set out in its SOW was fit for purpose, based on the purpose of the review.

Our review of the SOW provided the following six recommendations for ASX to consider as part of its replan activities.

1. ASX should consider a review of historical foundational architectural decisions (relating to technology architecture) to

assess any potential impact on the success of the CHES replacement program

2. ASX should consider expanding the scope of the review to confirm and validate operational controls built into the CHES application
3. [REDACTED]
4. ASX should consider expanding the scope of the review to include a more detailed review of the post go-live operating model
5. ASX should validate the sufficiency of the current security reviews undertaken and/or planned to be undertaken in the future
6. ASX should consider expanding the scope of the review to include considerations for the ability to either engage alternative solutions and how much of the current delivery could be reused.

We raised two items for clarification of SOW scope elements:

1. A review of code is within scope of the expert's review. ASX should confirm that the expert will select a material amount of code randomly or ensure that code they do select was produced by all non-ASX developers to best ensure ongoing supportability of the code base
2. A review of contingency is within scope of the expert's review. ASX should confirm that reporting of contingency approach captures all forms of contingency.

For the avoidance of doubt, these recommendations and clarifications did not qualify the conclusion around the SOW being fit for purpose.

ASX accepted these recommendations and clarifications, and provided us with a management response. We assessed the ASX proposed actions, accountable executives, and due dates. We challenged ASX on some of their responses and ASX confirmed amended actions that we are satisfied, if executed as proposed, would address the EY recommendations.

These recommendations will be assessed for closure and reported in our next six-monthly reports, according to the resolution date.

As next step looking forward, EY will review the final deliverables produced by the third-party to evaluate the impact on the CHES Replacement Assurance Program and assess the closure of findings as appropriate.

### **3.3 Assessment of the scope of the Program Replan review**

The objective of this area is to provide an update in relation to the Program Replan review and outline any observations encountered during the review of the associated Statements of Work (SOW).

#### **Context**

Prior to the public announcement to pause the Project on 17 November 2022, ASX was in the process of re-planning its CHES Replacement Program. A review of the CHES System Replacement Program Replan was included in the Assurance Program.

This independent review of the Replan activities would evaluate whether relevant information has been considered as input to the Replan, it has appropriately considered program contingency, has engaged relevant internal and external stakeholders in the process and has factored their input into the Replan.

#### **Findings**

We reviewed the Statement of Work (SOW) for this review and found that it was fit for purpose, based on the objective of the review. Considering the announcement to pause the CHES Replacement Program activities as ASX re-assess the solution design, the Replan review will no longer occur.

The impact on the Assurance Program will need to be reassessed once ASX completes its review of the solution design.

### **3.4 Assessment of completed and inflight assurance reviews**

The objective of this area is to evaluate the status of the implementation of remedial actions and assess the adequacy of the validation process undertaken over the closure of the remedial actions arising from completed reviews.

In addition, this area also evaluated the proposed upcoming assurance reviews within the Assurance Program and outline any observations encountered during the review of the related Statements of Work (SOW).

#### **Context - Status and closure of remedial actions**

As a result of the independent review on the new CHES application and the ongoing replanning activities, the planned reviews in the Assurance Program have been paused or rescheduled to align with the revised timing of the Project milestones coming out of the replanning activities.

Multiple reviews are conducted within the Assurance Program and the assurance providers produce a final report which outlines the findings and recommendations for each reviewed domain. The project team evaluates the suggested recommendations, and a management response is produced, outlining the management actions that will be implemented as remediation. The current process defines the Senior Program Manager as the responsible for the overall monitoring of the status of the

remediation actions coming from assurance reviews conducted within the Assurance Program. Defects, bugs, and best practice recommendations identified through technical reviews (security and identity access management) are monitored by specific teams that have the technical expertise to assess the closure of defects, although they are now also tracked centrally within the Assurance Program.

To monitor the status of remediation activities, the Senior Program Manager engages with the different teams and issue owners to assess the closure of findings raised as part of different reviews conducted by the assurance providers. The relevant artefacts are attached to internal tracking tools within JIRA/ Confluence and the findings are closed as appropriate.

The table below represents the status of existing remedial actions from the completed Assurance Reviews tracked by the Senior Program Manager as of 28th October 2022. Refer to Appendix B for the detailed table outlining the status per assurance review.

Reviews completed as of 28 October 2022	17/44
Findings closed to date	127
Findings open	22
Total findings to date <sup>1</sup>	149
Findings subject to technical assurer closure validation <sup>2</sup>	1
Findings due to be closed this month	1
Findings due to be closed between 1 and 3 months	10
Findings due to be closed between 3 and 6 months	4
Findings due to be closed in > 6 months	6
<b>Total open findings</b>	<b>22</b>

<sup>1</sup> The total number of findings to date does not include the ones raised as defects. The defects are tracked separately by the Senior Program Manager as the closure process involve specific teams who have the necessary technical expertise. The summary of defects raised in relation to Security and Identity Access Management (IDAM) is included below.

<sup>2</sup> Closure to be validated by the technical assurance provider for technical review.

Summary of defects for Security and IDAM Reviews as of 28 October 2022	
Penetration testing defects closed	█
Penetration testing defects open	█
Penetration testing defects raised	█
IDAM Best practise recommendations closed	█
IDAM Best practise recommendations open	█
IDAM best practise recommendations raised	█

We have independently assessed the process for the closure of management actions linked to the completed assurance activities through the review of relevant artefacts provided by ASX and workshops conducted with the assurance providers and the project team.

The project team closed 7 findings since our 30 June Report:

- 2 findings from the Trade Outage Review Recommendations.
- 2 findings related to the Data Migration Review, and
- 3 findings related to the Assurance Program Design Update review.

The project team closed █ security defects related to Penetration testing and █ defects related to IDAM. We assessed the relevant artefacts and held meetings with the respective assurance providers to clarify any queries to complete our assessment of the closure process.

### Findings - Status and closure of remedial actions

We assessed the relevant artefacts and found that the maturity of the closure process for findings related to the Assurance Program has improved following our recommendation from the 30 June Report. No significant findings have been identified on the closure of remediation activities in the period.

In relation to defects managed by other projects, we found that the artefacts captured to demonstrate the closure of the defects were sufficient to satisfy the Assurance Program's closure requirements.



## Context - CHES Internal Testing SOW

ASX has completed in this period the planning for a review of the CHES program's testing capabilities, which will be conducted by an independent third-party to assess ASX's test practices and capabilities against a relevant industry standard to measure maturity of its practices and to identify any further opportunities for improvement.

## Findings - CHES Internal Testing SOW

We reviewed the Statement of Work (SOW) for this review and found that it was fit for purpose, based on the objective of the review.

Due to ongoing replanning activities, the timing for this review has not been confirmed yet by ASX. In addition, the outcome of the independent review of the new CHES application might inform scope changes in the proposed SOW for this review.

EY will review the final agreed scope (if any changes) and the deliverables produced by the independent party and will assess the closure of findings as appropriate on our next six-monthly progress reports if the review has been completed within the next period.

## 3.5 Assessment of the remedial actions from the trade outage Independent Expert review recommendations

The objective of this area is to evaluate the status on the implementation of any remedial actions from the trade outage Independent Expert review recommendations which are relevant to the CHES Replacement Program.

### Context

In November 2020, ASX implemented a major upgrade to the Trade platform through the ASX Trade Refresh Project which resulted to a market outage.

As a result, an Independent Expert was commissioned by ASX to conduct a review of the ASX Trade Refresh Project. The Independent Expert report released in June 2021 provided 59 specific recommendations for improvement.

### Findings

As part of the reviews included in the Assurance Program, ASX then engaged a third-party assurance provider to assess how well the CHES program had implemented each of the 59 recommendations. The following were outlined in the November, 2021 Independent Expert report in relation to these 59 recommendations:

- ▶ 7 recommendations were tagged as out of scope as these were either enterprise-wide recommendations or not relevant to CHES replacement program.
- ▶ 14 recommendations were considered to have been fully addressed by the CHES program and hence no further action required.
- ▶ 11 recommendations were considered by ASX management as not requiring further management actions (as at November 2021) as these were either completed or would be superseded by ongoing or future activities. Considering the assessment by management, the closure of these items were not tracked by PMO or the Assurance Program.

For these 11 recommendations, we reviewed the relevant artefacts provided by ASX and found that 4 recommendations were adequately closed whilst the remaining 7 recommendations will require future evaluation as the corresponding actions relates to the completion of in-flight activities including independent expert reviews to address the recommendations. Refer to Appendix C for the details of our assessment.

- ▶ 3 recommendations were tagged as 'not ready' at the time the issuance of the November 2021 report due to the progress of the project.
- ▶ 24 recommendations were found to require management attention whereby ASX defined 17 associated actions to remediate these items which were being tracked by the Assurance Program.

Considering the inclusion of the 3 'not ready' recommendations for tracking purposes, the total number of findings related to this particular review increased from 17 to 20. Currently, 10 actions have been closed and another 10 are due to be implemented over the following months.

Out of the 10 closed actions, 8 were evaluated during the 30 June progress report whilst 2 were assessed during this period as described in section 3.4.

We will assess the status and closure of the 10 open actions in our future six-monthly progress reports. Refer to Appendix C for the status of these 20 items.

## Appendix A ASX Assurance Program summary

Review*	Project Accountable Party*	Indicative Scope & Timetable*	Assurance Provider*	Status / Progress Update*
<b>Project Governance</b>				
Project Health Check		Roles and responsibilities, reporting framework, RAID management, cost management, stakeholder engagement, schedule management [Nov 2019]	3rd-party A	Complete
Project Replan		Process Review, Assumption Review, Challenge Process, Contingency Planning [Sept 2020]	3rd-party A	Complete
Project Health Check		Roles and responsibilities, reporting framework, RAID management, cost management, stakeholder engagement, schedule management [May 2021]	3rd-party A	Complete
Trade outage independent expert review Recommendations Self Assessment		Assess the program against the 59 recommendations from the trade outage independent expert Review [Oct 2021]	Project Team	Complete
Trade outage independent expert Review Recommendations		Assess the program against the 59 recommendations from the trade outage independent expert Review [Dec 2021]	3rd-party A	Complete
Project Health Check		Scope limited to the following program domains: Program Governance, Planning Management, Scope Management (including Change Control), Risks, Assumptions, Issues and Dependencies (RAID) Management, Supplier Management and Quality Management [Date TBC]	3rd-party A	Review Paused for Replan Review
Post Implementation Review		The PIR provides an opportunity for those involved in the project to reflect upon it from start to finish. This is done in order to determine what went well, what could have been improved and what actions they would recommend for future [Date TBC]	Project Delivery	Not Started

Review*	Project Accountable Party*	Indicative Scope & Timetable*	Assurance Provider*	Status / Progress Update*
[NEW] Project Replan 2022 Review		Independent review of the Replan activities, so that ASX can evaluate whether relevant information has been considered as input to the Replan, it has appropriately considered program contingency, has engaged relevant internal and external stakeholders in the process and has factored their input into the Replan.	3rd-party A	Review Paused
<b>Assurance Program Design / New Licence Conditions</b>				
Assurance Program Design		Report on the design of the Assurance Program [Feb 2022]	3rd-party A	Complete
Assurance Program Design Update		Update on design of Assurance Program; remedial action update (including trade outage independent expert review recommendation actions) [Jun 2022]	3rd-party A	Complete
Assurance Program Design Update		Review of Accenture SOW for Application Delivery Review, Status of remedial actions from June 2022 review, assurance activities and action closure in 6 month period, scope of assurance activities over the replan and implications of the replan for the Assurance Program. [Dec 2022]	3rd-party A	In Progress
Go Live Governance Readiness		Assess that the Assurance Program has met its objectives; adequacy of Testing Framework; adequacy of Go Live Decision Framework [Date TBC]	3rd-party A	Not Started
Post Implementation Review Report		Assess that the Assurance Program has met its objectives; adequacy of testing framework; adequacy of Go Live Decision Framework [6 + 12 months post go live]	3rd-party A	Not Started
<b>Technical Solution and Design</b>				
Testing Approach Review		Adequacy of test approach [Apr 2021]	3rd-party B (embedded)	Complete
Performance Review		Review of (a) the ASX performance design and testing strategy, (b) scalability design and testing strategy and (c) the performance / scalability test results achieved from the production release candidate solution to key ASX requirements [Date TBC]	3rd-party B (embedded)	Not Started

Review*	Project Accountable Party*	Indicative Scope & Timetable*	Assurance Provider*	Status / Progress Update*
Scalability Review		Review of (a) the ASX performance design and testing strategy, (b) scalability design and testing strategy and (c) the performance / scalability test results achieved from the production release candidate solution to key ASX requirements [Date TBC]	3rd-party B (embedded)	Not Started
Test Approach / Strategy Review		Review of the ASX test strategy and the ASX industry test strategy for the project, contrasting against the leading test practice for a technology change project for an enterprise-scale / national infrastructure [Date TBC]	3rd-party B	Deferred
<b>Technical Solution and Design – Security Design</b>				
Security Design Review		Security review of the DLT platform and CHES+ application covering security design and threat risk assessment, ongoing component testing as security functionality is delivered, environment reviews pre go live for ITE and Prod environments and penetration testing pre go live (and potentially at ITE).  Pre ITE1 - Interim Report - Findings from a design review (gaps). Security design and architecture, security NFR testing [May 2021]	3rd-party C (embedded)	Complete
Security Test (Pre-ITE1)		Ongoing component testing as security functionality is delivered, environment reviews pre go live for ITE1 and penetration testing pre go live for ITE1 Pre ITE1 Security NFR testing [Oct 2021]	3rd-party C (embedded)	Complete
Security Assurance Review (ITE2)		Component coverage - all channels + infrastructure + CSAM/CIAM (CHES+ exposed functionality only) [Date TBC]	3rd-party C (embedded)	Complete

Review*	Project Accountable Party*	Indicative Scope & Timetable*	Assurance Provider*	Status / Progress Update*
Security Assurance Review (Prod - White box)		Testing scope will be defined by the security requirements as captured in ASX NFRs, Vendor NFRs, Claims and ASVS. Assessment will be conducted on relevant components of the go-live versions of platform, CHES+ application, channels and infrastructure [Date TBC]	3rd-party C (embedded)	Not Started
Security Assurance Review (Prod - Black box)		Testing scope will be CHES Replacement Solution and the operating environment as exposed to anticipated threat actors such as cyber adversary on the internet, malicious insider, etc. [Date TBC]	3rd-party C	Not Started
Security Design & Architecture Review		The CHES+ solution is defined by the security requirements, any component within the CHES+ solution that is touched by these requirements become in scope for this assessment [Oct 2022]	3rd-party C (embedded)	Complete
Security assurance review (ITE-M)		Predominantly 'grey box' penetration testing on security controls associated with ITE-M go live [Date TBC]	3rd-party C (embedded)	Not Started
[NEW] Security Assurance Review (MDRO)		Combination of 'white box' penetration testing on security controls associated with Prod target state security controls (as per "Security Assurance Review (Prod- White Box) and 'grey box' penetration testing of security controls in the environment (similar to ITE2 security assurance review) [Date TBC]	3rd-party C (embedded)	Not Started
<b>Operational Process and Control Design and Implementation</b>				
Identity and Access Management (Best Practice Review)		Identity and Access Management system (3rd-party D) configuration and setup health check [Sep 2021]	3rd-party D (embedded)	Complete
Identity and Access Management (ITE2)		Penetration Test, Application Hardening Assessment, Web Application Assessment	3rd-party B	Complete

Review*	Project Accountable Party*	Indicative Scope & Timetable*	Assurance Provider*	Status / Progress Update*
Technology Controls Review	[Redacted]	Review of the design of supporting processes for ITE1 including: <ul style="list-style-type: none"> <li>▶ software vendor on-boarding process</li> <li>▶ identity access management (IAM) process for internal and external users</li> <li>▶ defect management process, and</li> <li>▶ monitoring of system performance and stability including any related vendor requirements.</li> </ul> [Nov 2021]	Internal Audit	Complete
Technology Controls Review	[Redacted]	Op. Readiness - Assess the adequacy of the design and use of key process and controls in ITE2, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Technology Controls Review	[Redacted]	Pre GO-LIVE - Assess the adequacy of the design and operational effectiveness of key process and controls, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Technology Controls Review	[Redacted]	Post GO-LIVE - assess the production operational effectiveness of key process and controls, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Operational Controls Review	[Redacted]	Review of the design of supporting processes for ITE1 including: <ul style="list-style-type: none"> <li>▶ software vendor on-boarding process</li> <li>▶ identity access management (IAM) process for internal and external users</li> <li>▶ defect management process, and</li> <li>▶ monitoring of system performance and stability including any related vendor requirements.</li> </ul> [Nov 2021]	Internal Audit	Complete
Operational Controls Review	[Redacted]	Op. Readiness - Assess the adequacy of the design and use of key process and controls in ITE2, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Operational Controls Review	[Redacted]	Pre GO-LIVE - Assess the adequacy of the design and operational effectiveness of key process and controls, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started

Review*	Project Accountable Party*	Indicative Scope & Timetable*	Assurance Provider*	Status / Progress Update*
Operational Controls Review	[Redacted]	Post GO-LIVE - assess the production operational effectiveness of key process and controls, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Operational Controls Review - Clearing Risk / Billing / Participant Compliance	[Redacted]	Op. Readiness - Assess the adequacy of the design and use of key process and controls in ITE2, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Operational Controls Review - Clearing Risk / Billing / Participant Compliance	[Redacted]	Pre GO-LIVE - Assess the adequacy of the design and operational effectiveness of key process and controls, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Operational Controls Review - Clearing Risk / Billing / Participant Compliance	[Redacted]	Post GO-LIVE - assess the production operational effectiveness of key process and controls, supporting both operational and technology areas [Date TBC]	Internal Audit	Not Started
Technology and Operation Controls Review - 3rd-party E	[Redacted]	Technology and Operation Controls Review [Date TBC]	Internal Audit/3rd-party E	Not Started
Post Go Live ASAE 3402 Controls Reports	[Redacted]	The processes below are covered by the current ASAE 3402 reports: Operations: Daily settlement, Securities holdings, ASXS initiated transactions Technology: Logical Access, Change Management, Physical security, Disaster recovery, IT operations and Environmental controls [Date TBC]	Internal Audit/3rd-party E	Not Started



Review*	Project Accountable Party*	Indicative Scope & Timetable*	Assurance Provider*	Status / Progress Update*
[NEW] Playbook Review	[REDACTED]	TBC	3rd-party F/3rd-party G	Planning Paused waiting for Replan
<b>Industry Readiness and Implementation</b>				
Data Migration Review	[REDACTED]	Independent assessment of the accuracy and completeness of the data migration from old to new CHES. Assessment of outcomes of various dress rehearsals ahead of go-live and migrated data post go live. Review Strategy [Dec 2021]	3rd-party A	Complete
Data Migration Review	[REDACTED]	Market Dress Rehearsal Readiness Assessment [Date TBC]	3rd-party A	Not Started
Customer Readiness Review	[REDACTED]	Assurance that * ASX is ready for the cutover * Customers and vendors are ready for the cutover - setup, accreditation and attestation [Date TBC]	TBC	Not Started



## Appendix C Trade outage independent expert review recommendations

- Table 1.1 below outline the assessment results on the closure of the 11 recommendations from the November 2021 CHES Replacement Trade Outage Recommendations Report which were considered by ASX as closed at the time the report was finalised.

Table 1.1

Trade Outage Independent Expert Recommendation	Management Action (November, 2021 CHES Replacement Project)	EY Assessment Results
1.2.3 Enhance the control framework to ensure that there are suitable controls, alternative and independent viewpoints during the Project Risk Assessment (PRA) template completion exercise and/or after the template completion by the project teams. This will add alternative diverse viewpoints and also is a means to the challenge the team's rationale. Consider the use of the Delphi technique to independently complete the form, and use the average output or use the range, to reduce risk of groupthink. This is also relevant to the Process Risk Assessment exercise.	PRA's commenced on a 6 monthly basis from July 2021. PRA outcomes are reported to ESG. PRA findings are logged into the RAID register, allocated to an appropriate project team member and tracked to closure. Overdue closure of risks are subject to stream and management reviews. (Management consider this action closed)	Fully Addressed. Inspected the latest PRA completed and found that results were reported to ESG and logged within the RAID register.
1.3.7 Update the implementation readiness templates and supporting guidance, such that the risks in the implementation readiness document clearly highlights whether they are inherent or residual in nature. The likelihood and impact assessment should be noted, to produce the risk rating. Controls/treatments should be tagged clearly as whether having been performed (preventative) or actions to take should an event occur (detective / corrective). In addition, the listed risks should have lineage to the project risk register.	The Implementation Readiness Documentation has been completed for ITE1 and is planned for future implementations. This includes the addition of residual risk ratings. (Management consider this action closed)	Fully Addressed. Implementation readiness were found to be documented and reported to ESG including assessment of project risks.
2.1.2 Evaluate the need to update the necessary policies to require an independent viewpoint, that the delivery team and its reporting line cannot exceed a given percentage of the total governance function membership.	The Terms of Reference (TOR) for the ESG have been updated to include a "CEO private session" where the Project Sponsor and Project Owner leave the meeting. The project considers that this update alongside the recently completed assessment of independence of ESG members appropriately covers this action. (Management considers this action closed)	Fully Addressed. Observed that CEO private session was held during ESG meetings.
3.2.2 Investigate and determine the benefits of formalising upon quality management framework (e.g. ISO 9001 or similar), for embedding into project process and policies.	SOW's for independent review of the projects test approach incorporates validation of alignment of relevant industry standards. (Management consider this action closed)	Partially Addressed. The related SoW scope includes reviewing whether the test approach aligns with the relevant industry standards.  Review of final deliverables will be performed to assess closure of the recommendation.
6.1.2 Establish an independent testing quality assurance service for internal projects.	A testing maturity assessment is included in the scope of the third-party test strategy review. (Management consider this action closed)	Partially Addressed. The related SOW includes

Trade Outage Independent Expert Recommendation	Management Action (November, 2021 CHES Replacement Project)	EY Assessment Results
		<p>testing maturity assessment.</p> <p>Review of final deliverables will be performed to assess closure of the recommendation.</p>
<p>6.1.3 Design, document and implement a Continuous Test Process Improvement process.</p>	<p>All PIR's / Retro's will capture outcomes from testing. Improvement recommendations for testing-related items will be incorporated into broader program improvements for future implementations and will be tracked in the Strategic Quality Forum (SQF). (Management consider this action closed)</p>	<p>Fully Addressed. The Retro document inspected includes the outcomes and were reported at the CHES Replacement Project Working Group (PWG) deep dive Sessions.</p>
<p>6.3.3 Adopt an overarching and detailed ASX Test Methodology which includes templates, methods and processes, job role and guidelines to ensure any compliance to ISO29119 guidelines.</p>	<p>A testing maturity assessment applying third-party's proprietary quality assurance method, test methodology and associated test practices to contrast against the ASX strategy documentation is included in the scope of the third-party's test strategy review. (Management consider this action closed)</p>	<p>Partially Addressed. The related SoW scope includes reviewing whether test approach aligns with the relevant industry standards.</p> <p>Review of final deliverables will be performed to assess closure of the recommendation.</p>
<p>6.4.1 As part of the Design Authority checklist, include a solution maturity assessment that covers the market and technology maturity dimensions.</p>	<p>A number of parallel activities are being undertaken to ensure that the ledger meets functional and non-functional requirements, including proof of traceability, tracking of test scripting and execution progress, and measurement/reporting of quality metrics. (Management consider this action closed)</p>	<p>Partially addressed. For the in-flight test activities, it was observed that test plan and test reports captures functional and non-functional requirement, progress of testing, and defects identified.</p> <p>An independent review to assess Chess Replacement Program's internal test practices and capabilities against a relevant industry standard is being planned which will help to determine the maturity of those testing activities.</p>

Trade Outage Independent Expert Recommendation	Management Action (November, 2021 CHES Replacement Project)	EY Assessment Results
		Review of final deliverables will be performed to assess the closure of the recommendation.
6.4.5 Create a detailed interface and integration log, and for high importance interfaces ensure that end-to-end test coverage is completed. Where interfaces are not tested, then a clear rationale should be identified, the risk should be logged in the risk register and added to the implementation readiness document. Require that all high-risk feeds and interfaces, internal and external must be included in integration and end-to end tests using test or live feeds rather than a virtualised or simulated stub.	Per 6.3.2, the risk-based testing approach for CHES Replacement will include an evaluation of risk for each integration point. (Management consider this action closed)	Partially Addressed. The closure of this item is also dependent on recommendation 6.3.2 which is currently open as per table 1.2 below.
6.4.7 Document a test planning guide that prompts delivery teams to consider a wider coverage of the requirements due to inherent risks and complexities involved. For example, consider dynamic functional scenarios e.g. at start of day, in a slow market, in a very fast market, with many cancels, in a top of book scenario, in a nontop of book scenarios, across partition.	While test coverage will be a component of the findings that the independent assessment produces, specific guidelines for improving coverage will be a part of the enterprise-wide Quality Engineering (QE) capability. Input from independent assessment findings will be taken into the broader QE capability. (Management consider this action closed)	Partially Addressed. ASX's Quality Engineering & Testing team is currently defining the enterprise wide guidelines for test planning and test coverage. The CHES program team will review and adopt the guidelines once these are made available.  Refer to 6.4.1 for the testing capabilities review.
6.4.8 For complex high-risk projects, consider using an independent specialist party for an independent review of the plan and provide for a wider set of test capabilities in addition to internal testing. For example, for the test strategy and planning, to extend the depth and breadth of risk identification, greater test plan execution coverage.	A testing maturity assessment is included in the scope of the third-party's test strategy review. (Management consider this action closed)	Partially Addressed. Testing maturity assessment is in-scope as defined in the relevant SoW.  Review of final deliverables will be performed to assess closure of the recommendation.

- ▶ Table 1.2 below outline the status of the 20 management actions associated with the findings described in the November 2021 CHES Replacement Trade Outage Recommendations Report.

Table 1.2

Independent Expert Recommendation Reference	Status for CHESS (as at 28 <sup>th</sup> October 2022)	EY Assessment Result
1.1.1	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report.
1.3.4	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report.
1.3.6	Closed	Fully Addressed. The PRA illustrates that Delphi Technique has been implemented with a score evaluated for each risk. Outcome of the PRA was reported to ESG.
1.4.1	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report.
3.1.1	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report.
3.1.2	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report.
3.2.1	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report.
3.2.7	Closed	Fully Addressed. Go/no go meeting minutes were documented.
4.1.1	Open	N/A. To be reviewed in future progress reports.
5.1.1	Open	N/A. To be reviewed in future progress reports
5.1.2	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report
6.2.1	Open	N/A. To be reviewed in future progress reports.
6.3.2	Open	N/A. To be reviewed in future progress reports.
6.4.3	Open	N/A. To be reviewed in future progress reports.
6.4.4	Open	N/A. To be reviewed in future progress reports.
6.4.6	Open	N/A. To be reviewed in future progress reports.
6.5.1	Closed	Fully Addressed. Evaluated as part of the 30 June 2022 Progress Report.
6.5.3	Open	N/A. To be reviewed in future progress reports.
6.5.4	Open	N/A. To be reviewed in future progress reports.
7.1.1	Open	N/A. To be reviewed in future progress reports.

## Appendix D Interview list

The below table outline the interviews conducted with ASX stakeholders:

Interview list	
Role	Date of interview
Chief Risk Officer	Weekly meeting
Chief Information Security Officer	12 October 2022
Senior Program Manager	Weekly meeting; Interviews on specific topics conducted on 2 September 2022; 5 October 2022; 25 October 2022
Delivery Manager Implementation Readiness	5 October 2022
Delivery Manager Technology	5 October 2022
Interview with 3 <sup>rd</sup> -party B to discuss completed reviews	5 October 2022
Interview with 3 <sup>rd</sup> -party C to discuss completed reviews	21 October 2022
Senior Manager, Securities and Payments	5 October 2022

## Appendix E Documents reviewed











# Appendix F ASX Project Risk Rating Scalar

Project Risk Rating Scalar		Impact				
		Assessment of all risks that may have a broader Enterprise / Organisation wide impact (e.g. regulatory, customer, licence, brand and reputaion) should revert to the 5x5 Likelihood and Impact Scalar prescribed within the Enterprise Risk Management Framework. These risks should also be captured in ERICA as appropriate. Any risks that remain open at the end of the project will be transferred to appropriate Business Unit and will follow standard ERM Framework as per current process.				
		1 - Insignificant	2 - Minor	3 - Moderate	4 - Major	5 - Severe
Likelihood	<b>5. Almost Certain (80%-100% probability):</b> There is a very high probability of the risk to occur. The risk is expected to occur	Low	Medium	High	High	High
	<b>4. Likely (50%-80% probability):</b> There is a high-medium possibility of the risk to occur. The risk will occur in most circumstances.	Low	Medium	Medium	High	High
	<b>3. Possible (20%-50% probability):</b> There is medium to low probability of the risk to occur. The risk might occur in some circumstances	Low	Low	Medium	Medium	High
	<b>2. Unlikely (5% - 20% probability):</b> There is a low probability of the risk to occur. The risk could occur in some circumstances.	Low	Low	Low	Medium	High
	<b>1. Rare (0%-5% probability):</b> There is a limited probability of the risk to occur, however it may occur but only in exceptional circumstances	Low	Low	Low	Low	Medium

## Appendix G Release Notice

Ernst & Young ("EY") was engaged on the instructions of ASX Operations Pty Ltd ("ASX", "Client" or "you") to conduct an Independent Assessment of the CHES Replacement Assurance Program ("Project"), in accordance with the engagement agreement dated 21 December 2021 including the General Terms and Conditions ("the **Engagement Agreement**").

The results of EY's work, including the assumptions and qualifications made in preparing the report, are set out in EY's report dated 28 February 2022 ("**Report**"). ASX and ASX's regulators ASIC and the RBA, should read the Report in its entirety including any disclaimers and attachments. A reference to the Report includes any part of the Report. No further work has been undertaken by EY since the date of the Report to update it.

Unless otherwise agreed in writing with EY, access to the Report is made only on the following basis and in either accessing the Report or obtaining a copy of the Report the recipient agrees to the following terms.

1. Subject to the provisions of this notice, the Report has been prepared for ASX and ASX's regulators ASIC and the RBA, and may not be disclosed to any other party or used by any other party or relied upon by any other party without the prior written consent of EY.
2. EY disclaims all liability in relation to any other party who seeks to rely upon the Report or any of its contents.
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