



# ASAE 3402

## **Assurance Report on Controls at a Service Organisation relating to the Clearing House Electronic Subregister System (CHES)**

1 JULY 2019 – 30 JUNE 2020



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## 01 / Assertion by Management

The information provided by ASX management in this report has been prepared for facility users who have used CHES (Facility Users) and their auditors who have a sufficient understanding to consider the description, along with other information (including information about controls operated by Facility Users themselves), when assessing the risks of material misstatement of Facility User's financial reports / statements. ASX confirms:

- (a) The accompanying description in Sections 5, 6 and 8 fairly presents CHES for processing Facility User's transactions throughout the period 1 July 2019 to 30 June 2020.

The criteria used in making this statement were that the accompanying description:

- (i) presents how the system was designed and implemented, including:
- the types of services provided including, as appropriate, classes of transactions processed
  - the procedures, within both information technology and manual systems, by which those transactions were initiated, recorded, processed, corrected as necessary, and transferred to the reports prepared for Facility Users
  - the related accounting records, supporting information and specific accounts that were used to initiate, record, process and report transactions; this includes the correction of incorrect information and how information was transferred to the reports prepared for Facility Users
  - how the system dealt with significant events and conditions, other than transactions
  - the process used to prepare reports for Facility Users
  - relevant control objectives and controls designed to achieve those objectives
  - controls that ASX assumed, in the design of the system, would be implemented by Facility Users, and which, if necessary to achieve control objectives stated in the accompanying description, are identified in the description along with the specific control objectives that cannot be achieved by ASX alone, and
  - other aspects of the ASX control environment, risk assessment process, information system (including the related business processes) and communication, control activities and monitoring controls that were relevant to processing and reporting Facility User's transactions.
- (ii) includes relevant details of changes to CHES during the period 1 July 2019 to 30 June 2020, and
- (iii) does not omit or distort information relevant to the scope of the system being described, while acknowledging that the description is prepared to meet the common needs of a broad range of Facility Users and their auditors and may not, therefore, include every aspect of the system that each individual Facility User may consider important in its own particular environment.

- (b) The controls related to the control objectives stated in the accompanying description were suitably designed and operated effectively throughout the period 1 July 2019 to 30 June 2020. The criteria used in making this statement were that:

- (i) the risks that threatened achievement of the control objectives stated in the description were identified
- (ii) the identified controls would, if operated as described, provide reasonable assurance that those risks did not prevent the stated control objectives from being achieved, and



- (iii) the controls were consistently applied as designed, including that manual controls were applied by individuals who have the appropriate competence and authority, throughout the period 1 July 2019 to 30 June 2020. In response to the COVID-19 pandemic and in accordance with Government and other expert advice, in March 2020 ASX transitioned to a remote working operating model for the majority of personnel, including some responsible for transaction processing and operational support of the CHES system. There has been no material change to the control environment, including the design and operating effectiveness of the controls listed in section 8 of this report, as a result of this change.

Signed on behalf of management

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Tim Hogben

Chief Operating Officer

28 July 2020



## 02 / Independent Service Auditor's assurance report on the description of controls, their design and operating effectiveness

To: Directors of ASX Limited (ASX)

### Scope

In accordance with the terms of the engagement letter dated 16 April 2020, we were engaged to report on the ASX Limited's description in Section 5 and 6 at pages 10-14 of its CHES System for processing Facility User's transactions throughout the period 1 July 2019 to 30 June 2020 (the description), and on the design and operation of controls related to the control objectives stated in Section 8 at pages 17-42 of this report.

The description indicates that certain control objectives specified in the description can be achieved only if complementary Facility User controls contemplated in the design of ASX's controls are suitably designed and operating effectively, along with related controls at the service organisation. We have not evaluated the suitability of the design or operating effectiveness of such complementary Facility User controls.

### ASX's Responsibilities

ASX is responsible for preparing the description and accompanying statement in Section 1 at pages 3-4, including the completeness, accuracy and method of presentation of the description and statement; providing the services covered by the description; stating the control objectives; and designing, implementing and effectively operating controls to achieve the stated control objectives.

### Our Independence and Quality Control

We have complied with relevant ethical requirements related to assurance engagements, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour.

The firm applies Auditing Standard ASQC 1 *Quality Control for Firms that Perform Audits and Reviews of Financial Reports and Other Financial Information, Other Assurance Engagements and Related Services Engagements* and accordingly maintains a comprehensive system of quality control including documented policies and procedures regarding compliance with ethical requirements, professional standards and applicable legal and regulatory requirements.

### Service Auditor's Responsibilities

Our responsibility is to express an opinion on ASX's description and on the design and operation of controls related to the control objectives stated in that description, based on our procedures. We conducted our

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engagement in accordance with Standard on Assurance Engagements ASAE 3402 *Assurance Reports on Controls at a Service Organisation (ASAE 3402)*, issued by the Auditing and Assurance Standards Board. That standard requires that we plan and perform our procedures to obtain reasonable assurance about whether, in all material respects, the description is fairly presented and the controls are suitably designed and operating effectively.

An assurance engagement to report on the description, design and operating effectiveness of controls at a service organisation involves performing procedures to obtain evidence about the disclosures in the service organisation's description of its System, and the design and operating effectiveness of controls. The procedures selected depend on our judgement, including the assessment of the risks that the description is not fairly presented, and that controls are not suitably designed or operating effectively. Our procedures included testing the operating effectiveness of those controls that we consider necessary to provide reasonable assurance that the control objectives stated in the description were achieved. An assurance engagement of this type also includes evaluating the overall presentation of the description, the suitability of the objectives stated therein, and the suitability of the criteria specified by the service organisation and described in Section 1 at pages 3-4.

We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

## **Limitations of Controls at a Service Organisation**

ASX's description is prepared to meet the common needs of a broad range of Facility Users and their auditors and may not, therefore, include every aspect of the System that each individual Facility User may consider important in its own particular environment. In addition to this, because of their nature, controls at a service organisation may not prevent or detect all errors or omissions in processing or reporting transactions. Further, the projection of any evaluation of effectiveness to future periods is subject to the risk that controls at a service organisation may become inadequate or fail.

## **Opinion**

Our opinion has been formed on the basis of the matters outlined in this report. The criteria we used in forming our opinion are those described in ASX's statement in Section 1. In our opinion, provided Facility Users have applied the complementary Facility User controls contemplated in the design of ASX's System and those controls were operating effectively, in all material respects:

- (a) The description fairly presents the System as designed and implemented throughout the period from 1 July 2019 to 30 June 2020.
- (b) The controls related to the control objectives stated in the description were suitably designed throughout the period from 1 July 2019 to 30 June 2020.
- (c) The controls tested, which were those necessary to provide reasonable assurance that the control objectives stated in the description were achieved, operated effectively throughout the period from 1 July 2019 to 30 June 2020.



## Description of Tests of Controls

The specific controls tested and the nature, timing and results of those tests are listed in Section 8 at pages 17-42.

## Intended Users and Purpose of the report

This report and the description of tests of controls in Section 5, 6 and 8 are intended only for Facility Users who have used ASX's System and their auditors, who have sufficient understanding to consider it, along with other information including information about controls operated by Facility Users themselves, when assessing the risks of material misstatements of Facility User's financial reports / statements.

This report is prepared only for the purpose set out above and we disclaim any liability in relation to our report or any assumption of responsibility for any reliance on our report to any person other than ASX, Facility Users and their auditors who have used ASX's System or for any purpose other than that for which it was prepared.

PricewaterhouseCoopers

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*Corinne Best*  
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Partner

Sydney  
28 July 2020

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## 03 / Introduction

ASX management is responsible for the design, implementation and maintenance of the internal control procedures and for the declarations and assertions in this report. In carrying out this responsibility, management has regard to the interests of Facility Users, the general effectiveness of the operation of CHES and the overall stability of the Australian financial system.

This report has been prepared to provide:

- an overview of the ASX Group
- an overview of CHES and its role in the clearing and settlement process
- a summary of ASX's corporate governance arrangements relating to the CHES operating environment
- the control objectives and control procedures that underpin the CHES control environment, and
- the independent auditor's report on the control objectives and procedures.

The report has been prepared in compliance with *ASAE 3402 Assurance Reports on Controls at a Service Organisation*.





## 04/ Overview of the ASX Group

ASX is an integrated exchange offering listings, trading, clearing, settlement, technical and information services, and other post-trade services. It operates markets for a wide range of asset classes including equities, fixed income, commodities and energy and is a top 10 global securities exchange by value and the largest interest rate derivatives market in Asia.

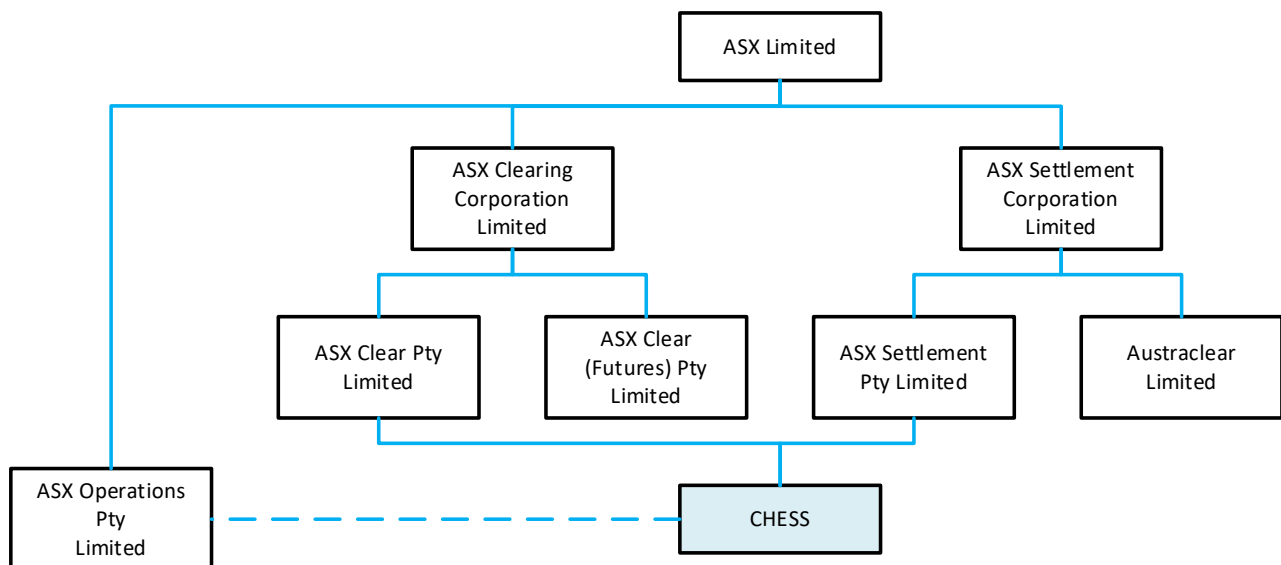
Companies, corporates and issuers of capital from Australia and around the world engage with ASX to manage risk and to raise capital to grow. ASX operates liquid, transparent and reliable markets of integrity. The certainty of its clearing and settlement activities underpins the systemic stability of the Australian economy.

ASX also provides data and technology services to intermediaries, banks, information vendors and software developers to help them make informed decisions, offer services to their clients and connect with one another.

More information about ASX can be found at: [www.asx.com.au](http://www.asx.com.au).

### Structure

Relevant parts of the ASX Group structure, including the responsibility for the CHES system, are depicted below:





## 05 / Overall Control Environment

### Corporate Governance

The control environment within which ASX operates CHES is not restricted to the control objectives and procedures outlined in this report.

The ASX Group maintains a high standard of corporate governance and has implemented governance arrangements which are consistent with the ASX Corporate Governance Council's Corporate Governance Principles and Recommendations (4th Edition). An overview of those components of ASX's corporate governance framework which are relevant to the operation of CHES is set out below. More information on ASX's corporate governance framework is available on ASX's website and in its Annual Report.

CHES is operated by ASX Operations Pty Limited, a wholly-owned ASX Group subsidiary, to fulfil the clearing and settlement functions of ASX Clear Pty Limited and ASX Settlement Pty Limited respectively. ASX Clear and ASX Settlement are clearing and settlement facility licensees and are wholly-owned subsidiaries of ASX. They are two of four clearing and settlement facility licensees in the ASX Group.

The ASX Board relies on the Clearing and Settlement Boards to provide oversight of the clearing and settlement operations of the clearing and settlement subsidiaries including, the management of clearing and settlement risk, and compliance with the Financial Stability Standards determined by the Reserve Bank of Australia (RBA). The Clearing and Settlement Boards' Charter sets out further details regarding their functions and governance.

ASX Limited has established an Audit and Risk Committee (ARC) (comprising independent, non-executive directors of ASX Limited). The ARC also serves as the audit and risk committee of ASX's Clearing and Settlement Boards (including ASX Clear and ASX Settlement).

The following Committees (comprised of Senior Management) also form an integral part of the overall control environment in which CHES operates:

- Risk Committee
- Regulatory Committee, and
- Technology, Operations and Security Committee.

The system of internal control and risk management is reviewed by Internal Audit. The General Manager Internal Audit reports to the ARC, the Managing Director and Chief Executive Officer for functional audit purposes, and the Chief Risk Officer for administrative purposes. The General Manager Internal Audit presents an Internal Audit Plan and quarterly audit findings to the ARC and Clearing and Settlement Boards.

In addition, ASX's Enterprise Compliance function conducts oversight of the ASX Group by mapping the compliance framework for key obligations (including clearing and settlement facility obligations), undertaking compliance reviews, and reporting to regulators. This function is headed by a General Manager who has a direct reporting line to the ARC and Clearing and Settlement Boards for key licence obligations, and reports to the Chief Risk Officer for other purposes.

Charters of the ASX Board, Clearing and Settlement Boards, ARC and Internal Audit are available on ASX's website: [www.asx.com.au](http://www.asx.com.au).

### Regulatory Governance

Licensed entities in the ASX Group are subject to review by ASIC and the RBA.



## Operational Governance

The primary divisions that have direct control over the operational governance of CHES are Operations and Technology.

Operations is responsible for the day to day processing of trading, clearing and settlement transactions. The CHES operational environment includes processes and controls in the following areas:

- transaction processing
- error resolution and escalation, and
- security and operational resilience.

Technology is responsible for the IT support and development of CHES. The control environment in operation within Technology includes the following processes and controls areas:

- system operations
- change management
- security, and
- system resilience.

Both Operations and Technology are headed by the Chief Operating Officer of ASX.

## Operational Resilience

ASX Group operates using a dual site model for all key functions, with one operational site outside of the CBD. In addition, a disaster recovery site is maintained for its technology systems, and disaster recovery plans are tested periodically in accordance with a centrally-managed testing schedule.

During the financial year ASX relocated its secondary data centre to a purpose-built, third-party facility approximately 30 km from the CBD (hereafter, the previous secondary data centre is referred to as the “ASX-managed secondary data centre” and the new secondary data centre is referred to as the “vendor-managed secondary data centre”). ASX controls access to the ASX-secured area and monitors the completion of maintenance activities for environmental controls. The CHES back up instance was moved to the new disaster recovery site on 15 February 2020 with no interruptions to services or significant changes to operational processes and controls.

## Control Objectives and Control Procedures

Set out in the report are the control objectives implemented over the CHES system by ASX. The specific controls listed in Section 8 of the report have been designed to achieve each of the control objectives.



## 06 / Overview of CHES

The clearing and settlement of equities is a critical component of the operation of Australia's financial markets. ASX Clear Pty Limited (ASX Clear) and ASX Settlement Pty Limited (ASX Settlement) are licenced clearing and settlement (CS) facilities under the Corporations Act. ASX Clear and ASX Settlement (the CS facilities) are currently the sole providers of clearing and settlement services for Australia's equity markets for cash market products traded on the ASX market, cash equities traded on the NSX and SSX markets, ASX-listed cash equities quoted and traded on the Chi-X market, and warrants, ETFs and TraCRs quoted on Chi-X.

### Regulation

ASX Clear and ASX Settlement as licensed CS facilities under the Corporations Act must comply with the Financial Stability Standards (FSS) published by the RBA. In addition, they must:

- to the extent that it is reasonably practicable to do so, do all other things necessary to reduce systemic risk
- to the extent that it is reasonably practicable to do so, do all things necessary to ensure that the facility's services are provided in a fair and effective way, and
- have an adequate arrangement for supervising the facility.

### CHES

The CS facilities are licensed to operate the cash equities clearing and settlement facility and currently, they do this using the CHES system.

Settlement conducted through CHES, operates a Model 3 Delivery versus Payment (DvP) multilateral net batch settlement mechanism, exchanging cash for securities irrevocably. Cash payments are made across the RBA RITS infrastructure while securities title is transferred in CHES. This is performed via batch processing each morning (known as the 'CHES Batch') and is usually complete by 12.30pm.

The CHES settlement facility provides ASX approved CHES participants with the ability to meet settlement obligations, register and transfer holdings of securities via electronic CHES messaging. In May 2014 the facility was expanded to facilitate the buying (applying for), selling (redeeming) and registration of units in unlisted managed funds (mFund).

CHES was developed internally by ASX and has been operating since 1994. It is fully supported by a dedicated ASX technology team who performs all development requirements.

Transactions typically performed in CHES include:

- client administration and maintenance
- security and holding administration and maintenance
- clearing and settlement processing (including daily batch)
- transfers between subregisters, and
- corporate actions.

ASX Settlement authorises Facility Users such as brokers, custodians, third party clearing participants, settlement agents and others to access CHES, and settle trades made by themselves or on behalf of their clients. In addition, Facility Users use CHES for the purposes of receiving clearing services from ASX Clear Pty Limited.



In administering the CHES Subregister, the CS facilities provide additional services to issuers, participants and holders of securities, including transfers and conversions, monthly statements, corporate action processing, takeover acceptances, primary and secondary market capital raising, depositary receipts in foreign securities, and reporting services.

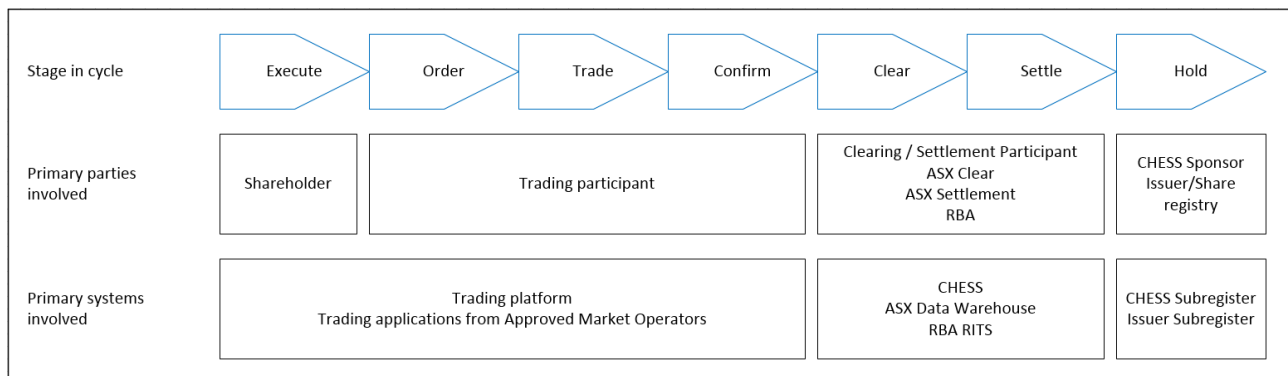
## Holding Securities in CHES

The CS facilities establish and administer a subregister of securities within CHES, known as the “CHES Subregister”. CHES registers the title (ownership) of shares on its subregister and maintains a legal record of the balances of holdings in CHES for securities holders. The Principal Register for any particular company is made up of the combined holdings registered on both the CHES Subregister and the Issuer Sponsored Subregister (maintained by the issuer’s share registry). Holdings on CHES are recorded on Holder Identification Number’s (HINs) and holdings on the Issuer Sponsored Subregister are held on a Security holder Reference Number (SRN). An SRN must be issued for each holding in a security but a HIN may hold multiple securities on the one identification number.

A security holder can only record their holding in the CHES Subregister through an approved ASX Settlement Participant and accordingly is required to enter into a “Sponsorship Agreement” with that ASX Settlement Participant (referred to as a “CHES Sponsor”). The Sponsorship Agreement sets out the terms and conditions under which the CHES Sponsor maintains a client’s holdings and HIN.

The process of ordering, trading, clearing and settlement is a fully automated process. CHES interacts with a number of ASX internal systems (such as the trading, risk management and data warehouse systems) as well as the systems and interfaces of Approved Market Operators, Facility Users and regulators.

An overview of the primary parties and systems involved in the trading cycle is depicted below.



## CHES Transaction Processing

Information between Facility Users and the clearing and settlement facility is communicated via a range of messages specified via a prescribed protocol. Each type of message allows for a business function to be performed. Within a functional area, there may be one or more sets of messages forming a sequence for that function. Information on CHES messages can be found in the CHES External Interface Specification manual.

## ASX Settlement Services

### Trade Acceptance Service (TAS)

A trade execution venue for ASX and non-ASX-quoted securities can use ASX’s Trade Acceptance Service (TAS) to put in place the clearing and settlement arrangements it needs to obtain an Australian market licence. ASIC is responsible for the granting of Australian market licences.



The TAS provides non-discriminatory access to clearing and settlement arrangements for other market operators which trade ASX and non-ASX-quoted securities.

The TAS enables trades in CHESS-eligible securities executed on any Australian licensed trading platform to be cleared and settled by the CS facilities in an identical fashion to trades executed on ASX's own cash equity market.

### **Settlement Facilitation Service (SFS)**

ASX Settlement provides settlement arrangements for approved listing venues (Approved Market Operators or AMOs) in respect of CHESS-eligible financial products listed on the markets of those AMOs.

There are two options for the settlement arrangements:

- a Transfer Facilitation Service where CHESS-eligible AMO-listed financial products can be transferred in real-time by ASX Settlement participants through CHESS. Payment is handled bilaterally by participants outside of CHESS, or
- a DvP Facilitation Service where CHESS-eligible AMO-listed financial products can be settled on a delivery versus payment (DvP) basis by ASX Settlement participants through the CHESS settlement batch.

ASX Settlement has also put in place arrangements for AMO-listed issuers to access the following services:

- ASX Primary Market Facility, which enables them to use DvP settlement for certain capital raisings, and
- a Corporate Actions Service where ASX Settlement may process a corporate action, through the settlement facility for CHESS-eligible AMO listed financial products.

### **CHESS Processing Times**

The CHESS system is available for Registry processing from 5.10am and Facility Users processing from 6:00 am and closes at 7:00pm so that end of day processing can commence. The key components of end of day processing are CHESS reporting, corporate action processing and netting. Netting occurs on settlement date minus one (S-1), whereby the trades reported via ASX Trade or the TAS are netted together at participant, security and settlement account level. Facility Users are advised via CHESS messaging of the outcome of netting.

Processing errors are either flagged by the CHESS system or identified by ASX via operational monitoring of the system and transaction reports. Once identified, errors follow a defined escalation path.

### **System Change**

During the period, there were changes made to the CHESS environment as part of usual management and support.



## 07 / Use and Scope of the Report

### Requirement for the Report

The requirement for and scope of the independent audit is mandated in the ASX Settlement Operating Rules. The following table provides the requirements under section 12.3 of the ASX Settlement Operating Rules.

Rule Ref	Title	Content
12.3.1	ASX Settlement to conduct annual review	ASX Settlement must require an independent auditor to conduct an annual review of CHES and that review must comprise the matters specified in the Procedures (refer below).
12.3.2	Copy of audit certificate to be provided to Facility User	<p>If a Facility User requests that ASX Settlement provides a copy of any audit certificate arising from an annual review under Rule 12.3.1, ASX Settlement must, without charge, provide a copy of the audit certificate to that Facility User within 1 calendar month of:</p> <ul style="list-style-type: none"> <li>(a) ASX Settlement receiving the audit certificate; or</li> <li>(b) the request</li> </ul> <p>whichever is the later.</p>
12.3.3	Facility User may request other review of CHES	<p>If a Facility User gives notice to ASX Settlement requesting an audit certificate in relation to any review of CHES other than an annual review under Rule 12.3.1:</p> <ul style="list-style-type: none"> <li>(i) the Facility User must in the Notice undertake to pay the fee for that service set out in the Fees and Charges Schedule; and</li> <li>(ii) ASX Settlement must request an independent auditor to conduct the requested review and supply an audit certificate in relation to the review to that Facility User as soon as reasonably practicable.</li> </ul>
12.3.4	No other right to inspect ASX Settlement records	Except as expressly provided in these Rules, no Facility User has any right of access to, or right to inspect, ASX Settlement records.
12.3.5	Facility User to accept review by auditor	Each Facility User must accept and treat a review conducted by ASX Settlement's auditor under this Section as if that review were conducted by that Facility User's own auditor.

Note: The ASX Settlement Operating Rules define a facility user (under section 2.13) as a participant; an issuer of approved financial products; or a market licensee which is provided with a transfer service under Rule 4.1A.



The following provides the requirements under section 12.3.1 of the ASX Settlement Operating Rules – Procedures:

The review of CHES is to comprise:

- (a) reviewing ASX Settlement’s information processing facilities and the integrity of CHES including:
  - (i) maintenance of security and confidentiality over the data of Facility Users;
  - (ii) security over the physical operation of CHES;
  - (iii) CHES backup and disaster recovery procedures; and
  - (iv) CHES access controls.
- (b) assessing the integrity and accuracy of information generated by CHES including:
  - (i) internal controls over data input by ASX Settlement; and
  - (ii) processing and reporting of transaction data.

## Use of the Report

The report has been prepared for ASX Settlement to comply with the ASX Settlement Operating Rules. While ASX understands Facility Users may provide the report to external parties (e.g. their own auditors), ASX has no knowledge or understanding of the individual circumstances of any Facility User.

## Facility User Controls

Achievement of each of the control objectives set out in Section 8 is also dependent on Facility Users maintaining an effective control environment and implementing controls such as:

- documented policies and procedures (including transaction processing procedures, risk management policies such as conditions and restrictions for system use, good password practices and virus protection)
- restricted access to operating systems, applications, databases and underlying records (including role based security mechanisms)
- user administration management
- a documented security strategy that includes appropriate tools and techniques to prevent, detect, respond to and recover from security incidents
- transaction processing, monitoring and reporting mechanisms
- segregation of duties in transaction processing
- reconciliation of transactions and holdings with the Principle Register and follow up of any variances
- physical security of system infrastructure
- provision of data backup and restoration and other computer operations, and
- business continuity and disaster recovery planning.





## 08 / Control Objectives and Related Control Procedures

The scope in relation to this control report has been defined in the control objectives and associated control procedures for CHESS that have been included below. Any references made to the network, application, operating system and database are specific to CHESS.

### Logical Access

**Control Objective 1:** *Controls provide reasonable assurance logical access is restricted to prevent inappropriate or unauthorised access to the network, application software, operating systems and underlying data.*

Description of controls	Test performed by PwC	Results
1.1 The ASX Identity and Access Management Policy (the Policy) outlines the principles for restricting access to the network, application software, operating systems and underlying data. The Policy is available to all staff.	<b>Inspection</b> Verified through inspection that the ASX Identity and Access Management Policy outlines the principles for restricting access to the network, application software, operating systems and underlying data and is available to all staff.	No exception noted.
1.2 Processes are in place for administering access to the network, application software, operating systems and the underlying data. This includes approval of access granted and the timely termination of accounts no longer required.	<b>Inspection</b> For a sample of new users, verified through inspection that access to the network, application, operating system and database was approved prior to access being granted.  <b>Inspection</b> For a sample of user revocations, verified through inspection that access to the network, application, operating system and database was revoked in a timely manner.	No exception noted.



Description of controls	Test performed by PwC	Results
	<p><b>Observation</b></p> <p>Verified through onscreen observation that an automated deactivation process is in place to disable terminated staff network access on the last day of service.</p>	
<p>1.3 Access to the application is authenticated and restricted through the use of password controls at the application and network layer. Per the Policy, controls include:</p> <ul style="list-style-type: none"> <li>- authentication by a unique user ID and password</li> <li>- system enforced a minimum password length</li> <li>- the requirement to change passwords at predefined intervals, and</li> <li>- the lockout of user accounts after a pre-defined number of invalid sign-in attempts.</li> </ul>	<p><b>Observation</b></p> <p>Verified through onscreen observation that access to the application, operating system and database required the use of a user ID and password.</p> <p><b>Inspection</b></p> <p>Verified through inspection that password parameters at the application, operating system and database layer are in line with the ASX Identity and Access Management Policy requirements which include:</p> <ul style="list-style-type: none"> <li>- system enforced a minimum password length</li> <li>- users changing passwords at pre-defined intervals, and</li> <li>- lockout of user accounts after a pre-defined number of invalid sign-in attempts.</li> </ul>	<p>No exception noted.</p>



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>Where the password parameters are not in compliance with the ASX Identity and Access Management Policy requirements, validate through inspection that a current exemption for the deviation exists.</p>	
<p>1.4 Regular user access reviews are performed to confirm currency and appropriateness of access.</p>	<p><b>Inspection</b></p> <p>For a sample of application, operating system and database user access reviews, verified through inspection that the reviews were performed to confirm currency and appropriateness of access.</p>	<p>No exception noted.</p>
<p>1.5 Documented procedures are in place outlining the principles for safeguarding against the threat of malicious attack.</p>	<p><b>Inspection</b></p> <p>Verified through inspection of the Security Patching Policy, Malicious Code Management Standard and Cyber Security Escalation Procedure that principles for safeguarding against the threat of malicious attack are outlined.</p>	<p>No exception noted.</p>
<p>1.6 Network security measures including firewalls, intrusion detection software, anti-virus software and incident response processes are in place.</p>	<p><b>Inspection and Observation</b></p> <p>Verified through inspection of network documentation and onscreen observation that a number of measures including firewalls, intrusion detection software and anti-virus software are in place.</p>	<p>No exception noted.</p>



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>Verified through inspection of the Cyber Security Escalation Procedure and playbooks document that incident response processes are in place.</p>	
<p>1.7 Remote access to the network, application software, operating system and underlying data is restricted and includes security measures such as digital certificates and/or RSA tokens.</p>	<p><b>Observation</b></p> <p>Verified through onscreen observation that User IDs and passwords, as well as digital certificates or RSA tokens, are required to access the ASX network remotely.</p> <p><b>Inspection</b></p> <p>Verified through inspection of the ASX Mobility and Remote Access Standard that remote access using RSA token is required to be authorised.</p> <p><b>Inspection</b></p> <p>For a sample of new remote access using RSA tokens, verified through inspection that remote access to the ASX network, application software, operating system and database was authorised in accordance with the standard.</p> <p><b>Inspection</b></p> <p>For a sample of user departures with remote access accounts, verified through inspection that remote access was removed in a timely manner.</p>	<p>No exception noted.</p>



## Change Management

**Control Objective 2:** Controls provide reasonable assurance all changes relating to the application software, operating system software and underlying data within the CHES production environment are authorised and tested in accordance with the ASX change management policy.

Description of controls	Test performed by PwC	Results
2.1 Documented change management procedures are in place. All changes and upgrades follow the procedures.	<b>Inspection</b> Verified through inspection that documented change management procedures are in place covering the change lifecycle.	No exception noted.
2.2 All changes are logged and monitored throughout the life cycle of the change.	<b>Inspection</b> For a sample of changes, verified through inspection that changes were logged and monitored throughout the life cycle of the change.	No exception noted.
2.3 Testing results are recorded, tracked and signed off.	<b>Inspection</b> For a sample of changes, verified through inspection that testing results were recorded and signed off.	No exception noted.
2.4 Test documentation exists, including test plans / strategies, test cases / criteria, test logs and issue reporting.	<b>Inspection</b> For a sample of changes, verified through inspection that test documentation existed, including test plans / strategies, test cases / criteria, test logs and issue reporting.	No exception noted.



Description of controls	Test performed by PwC	Results
2.5 Changes are subject to levels of system (i.e. developer) and user testing prior to implementation.	<p><b>Inspection</b></p> <p>For a sample of changes, verified through inspection of relevant documentation that each change was subject to levels of system and user testing prior to implementation.</p>	No exception noted.
2.6 Changes are subject to authorisation by Technology and/or the Business prior to implementation.	<p><b>Inspection</b></p> <p>For a sample of changes, verified through inspection that each change was subject to authorisation by Technology and/or the Business prior to implementation.</p>	No exception noted.
2.7 There is segregation of the development, test and production environments.	<p><b>Observation</b></p> <p>Verified through onscreen observation that segregated development, test and production environments exist.</p>	No exception noted.
2.8 Documented procedures for emergency changes are in place. Emergency changes are subject to formal authorisation prior to or as soon as practical after implementation. Emergency changes are documented and tested as soon as practical upon implementation.	<p><b>Inspection</b></p> <p>Verified through inspection that documented procedures for emergency changes are in place.</p> <p><b>Inspection</b></p> <p>For a sample of emergency changes, verified through inspection that each change was formally authorised, tested and documented according to emergency procedures.</p>	No exception noted.



Description of controls	Test performed by PwC	Results
2.9 All system and user documentation is updated accordingly.	<b>Inspection</b> For a sample of changes, verified through inspection that release notes were published and user documentation was updated.	No exception noted.



## Physical Security

**Control Objective 3:** *Controls provide reasonable assurance physical security is restricted to prevent unauthorised access to ASX Data Centres (including the primary and secondary data centres).*

Description of controls	Test performed by PwC	Results
3.1 Documented physical security policies and procedures are in place. This includes site visitation procedures for each category of access.	<p><b>Inspection</b></p> <p>Verified through inspection that the documented physical security policies and procedures are in place.</p>	No exception noted.
3.2 Access to the ASX Data Centres is restricted and monitored through the use of electronic security devices and other arrangements.	<p><b>Observation</b></p> <p>Verified through observation of the primary and secondary data centre, using live feed streaming under our direction, that access to the ASX data centres is restricted and monitored through the use of electronic security devices and other arrangements, including:</p> <ul style="list-style-type: none"> <li>- exterior doors were locked</li> <li>- electronic access cards were required to enter the data centre, and</li> <li>- the data centres were monitored by CCTV.</li> </ul>	No exception noted.
3.3 Access requests to the ASX Data Centres are approved prior to access being granted.	<p><b>a. Primary data centre</b></p> <p><b>Inspection</b></p> <p>For a sample of access requests to the primary data centre, verified through inspection that access to the ASX data centres was approved prior to access being granted.</p>	No exception noted.





Description of controls	Test performed by PwC	Results
	<b>b. Secondary data centres</b>	
	<b>Inspection</b>	No exception noted.
	For a sample of access requests to the ASX-managed secondary data centre, verified through inspection that access to the ASX data centres was approved prior to access being granted.	
	<b>Inspection</b>	No exception noted.
	For a sample of access requests to the vendor-managed secondary data centre, verified through inspection that access to the ASX data centres was approved prior to access being granted.	



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>Verified through inspection that all temporary access passes managed by the vendor were used only by approved personnel.</p>	<p>Exception noted.</p> <p>Our review of the user access controls in the vendor-managed secondary data centre noted that there were active temporary passes to the ASX secure area managed by both the ASX project team and the vendor. For the period between 1 February 2020 and 1 June 2020, ASX controls did not include the recording of who used the access pass on each occasion.</p> <p>We noted that for this period, there were instances where temporary passes were used without being recorded in the manual sign in sheet managed by the vendor. Further investigation by management noted that in all such instances, access was used by appropriate personnel (either by an active ASX employee or an approved contractor).</p> <p><b>Management Response</b></p> <p>ASX management has put in place additional controls from 1 June 2020. This includes the implementation of dual-factor authentication for access to the ASX secure area and the deactivation of all temporary passes for this data centre. These passes are only reactivated when required for an approved period of time by ASX Security.</p>



Description of controls	Test performed by PwC	Results
<p>3.4 Staff, visitors, contractors and customers are required to wear identification badges / tags.</p>	<p><b>Observation</b></p> <p>Verified through observation using live feed streaming under our direction, that staff, visitors, contractors and customers were required to wear identification badges / tags.</p>	<p>No exception noted.</p>
<p>3.5 Access is removed in a timely manner for employees who no longer require access to the ASX Data Centres.</p>	<p><b>a. Primary data centre</b></p> <p><b>Inspection</b></p> <p>For a sample of terminated employees, verified through inspection that access to the primary data centre was removed in a timely manner.</p> <p><b>a. Secondary data centres</b></p> <p><b>Inspection</b></p> <p>For a sample of terminated employees to the ASX-managed secondary data centre, verified through inspection that access to the ASX data centres was removed in a timely manner.</p> <p><b>Inspection</b></p> <p>For a sample of terminated employees to the vendor-managed secondary data centre, verified through inspection that access to the ASX data centres was removed in a timely manner.</p>	<p>No exception noted.</p>



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>For the vendor-managed data centre, for the period between 1 February 2020 to 1 June 2020, verified through inspection of the sign in sheet that all visitors to the data centre had signed out and contractor passes were returned before leaving the data centre</p>	
<p>3.6 Regular access reviews are performed to confirm currency and appropriateness of access to the ASX Data Centres.</p>	<p><b>Inspection</b></p> <p>For a sample of data centre user access reviews, verified through inspection that regular access reviews were performed to confirm currency and appropriateness of access to the ASX Data Centres.</p>	<p>No exception noted.</p>



## Disaster Recovery Procedures

**Control Objective 4:** *Controls provide reasonable assurance in the event of a disaster, measures are in place to enable CHES to resume effective operations within agreed timeframes.*

Description of controls	Test performed by PwC	Results
4.1 A Documented Disaster Recovery Plan for the System is in place.	<b>Inspection</b> Verified through inspection that the Disaster Recovery Plan exists.	No exception noted.
4.2 The Disaster Recovery Plan for the System is tested on a regular basis.	<b>Inspection</b> Verified through inspection that the Disaster Recovery Plan was tested on a regular basis.	No exception noted.



## IT Processing

**Control Objective 5:** *Controls provide reasonable assurance the CHES system is backed up, and system processing and performance is monitored.*

Description of controls	Test performed by PwC	Results
5.1 Documented backup policies and procedures are in place.	<p><b>Inspection</b></p> <p>Verified through inspection that backup policies and procedures have been documented.</p>	No exception noted.
5.2 Application data is backed up on a regular basis.	<p><b>Observation</b></p> <p>Verified through onscreen observation that the backup schedule for application data was setup in line with policy requirements.</p> <p><b>Observation and Inspection</b></p> <p>Verified through onscreen observation and inspection that an automated notification is generated upon failure of a backup job.</p> <p><b>Inspection</b></p> <p>For a sample of days, verified through inspection that backups were completed successfully.</p> <p><b>Inspection</b></p> <p>For a sample of incident tickets raised due to backup failures, verified through inspection that they were resolved in a timely manner.</p>	No exception noted.



Description of controls	Test performed by PwC	Results
<p>5.3 Backed up data is stored in an offsite secure location and restricted to authorised personnel.</p>	<p><b>Inspection</b></p> <p>Verified through inspection of a copy of the agreement with the third-party service provider that backed up data is taken and stored in an offsite secure location.</p> <p><b>Inspection</b></p> <p>For a sample of days, verified through inspection that sign-off was obtained by an authorised representative indicating that backup tapes had been taken off-site for storage.</p> <p><b>Inquiry and Inspection</b></p> <p>Verified through inquiry with management and inspection of the listing of individuals with access to ASX data stored at offsite locations that they were authorised personnel.</p>	<p>No exception noted.</p>
<p>5.4 Network capacity, performance incidents, operational incidents and system availability is monitored and reported.</p>	<p><b>Inspection</b></p> <p>Verified through inspection of a sample of management status reports that network capacity, performance incidents, operational incidents and system availability are monitored and reported.</p>	<p>No exception noted.</p>
<p>5.5 Automated system monitoring tools are used to monitor operational integrity. Exception reporting is used to alert staff of operational failures.</p>	<p><b>Observation</b></p> <p>Verified through onscreen observation that system monitoring tools are utilised to monitor the operational integrity of the System.</p>	<p>No exception noted.</p>



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>Verified through inspection that exception reporting functionality alerted staff of operational failures.</p>	
<p>5.6 Job schedules are in place for batch processing. Each time a job schedule is run the results are documented and reviewed.</p>	<p><b>Inspection</b></p> <p>Verified through inspection that job schedules are in place for batch processing.</p> <p><b>Inspection</b></p> <p>For a sample of days, verified through inspection that the job schedules results were documented and reviewed.</p>	<p>No exception noted.</p>
<p>5.7 Changes to job schedules are approved.</p>	<p><b>Inspection</b></p> <p>For a sample of changes to job schedules, verified through inspection that they were approved.</p>	<p>No exception noted.</p>





## Environmental Controls

**Control Objective 6:** *Controls provide reasonable assurance environmentally controlled data centres exist to facilitate continuity of data processing operations.*

Description of controls	Test performed by PwC	Results
<p>6.1 The data centres contain the following environmental mechanisms</p> <ul style="list-style-type: none"> <li>- fire detection and suppression systems</li> <li>- air conditioning systems</li> <li>- uninterruptible power supplies, and</li> <li>- water detection systems.</li> </ul>	<p><b>Observation</b></p> <p>Verified through observation of the primary and secondary data centres, using live feed streaming under our direction, that they contain the following environmental mechanisms:</p> <ul style="list-style-type: none"> <li>- fire detection and suppression systems</li> <li>- air conditioning systems</li> <li>- uninterruptible power supplies, and</li> <li>- water detection systems.</li> </ul> <p><b>Inspection</b></p> <p>For the vendor-managed secondary data centre, for a sample of months, verified through inspection that management receives and reviews a report which includes information on these relevant environmental mechanisms.</p>	No exception noted.
<p>6.2 A schedule of maintenance is performed on a regular basis to assist in preventing operational failure of the above environmental mechanisms.</p>	<p><b>Inspection</b></p> <p>Verified through inspection of the primary and secondary data centres maintenance schedule that maintenance of the above environmental mechanisms is performed on a regular basis.</p>	No exception noted.



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>For primary and ASX-managed secondary data centre, verified through inspection of a sample of maintenance reports that the preventative maintenance occurred in accordance with the schedule.</p> <p><b>Inspection</b></p> <p>For the vendor-managed secondary data centre, verified through inspection that management has performed a monitoring check to ensure maintenance for environmental mechanisms relevant to ASX have been completed in accordance with the pre-defined schedule.</p>	



## CHES

**Control Objective 7:** *Controls provide reasonable assurance the process of daily settlement is complete and accurate.*

Description of controls	Test performed by PwC	Results
7.1 Job schedules are in place for daily batch settlement processing. Each time the job schedule is run results are documented and reviewed.	<p><b>Inspection</b></p> <p>Verified through inspection that job schedules are in place for batch settlement processing.</p> <p><b>Inspection</b></p> <p>For a sample of days, verified through inspection that the job schedule results were documented and reviewed.</p>	No exception noted.
7.2 Documented CHES payment failure policies and procedures are in place.	<p><b>Inspection</b></p> <p>Verified through inspection that documented CHES payment failure policies and procedures are in place.</p> <p><b>Inspection</b></p> <p>For a sample of CHES payment failures, verified through inspection that they were investigated and resolved by management.</p>	No exception noted for the documented policy.
7.3 Documented CHES securities failure policies and procedures are in place.	<p><b>Inspection</b></p> <p>Verified through inspection that documented CHES securities failure policies and procedures are in place.</p>	There were no CHES payment failures in the period between 1 July 2019 to 30 June 2020.



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>For a sample of days, verified through inspection that securities failures were monitored and were followed up with the participants where required.</p> <p><b>Inspection</b></p> <p>For a sample of securities that did not settle within the required timeframe, verified through inspection that these failures were escalated to ASX Compliance in a timely manner.</p>	
7.4 Extensions to the daily batch settlement process are recorded and actioned.	<p><b>Inspection</b></p> <p>For a sample of extensions to the daily batch settlement process, verified through inspection that each extension was recorded and actioned.</p>	No exception noted.
7.5 Deviations from scheduled settlement instructions (cancellations and re-schedules) are recorded and actioned.	<p><b>Inspection</b></p> <p>For a sample of days where scheduled settlement instructions were cancelled or rescheduled, verified through inspection that the required procedures were recorded and actioned.</p>	No exception noted.
7.6 Authorisation from the payment provider is required prior to ASXS performing assisted transactions.	<p><b>Inspection</b></p> <p>For a sample of quarters, verified through inspection that signatory listings of payment providers were confirmed.</p>	No exception noted.



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>For a sample of ASXS assisted transactions, verified through inspection of relevant documentation that authorisation had been received from the payment provider prior to the transactions being performed.</p>	



**Control Objective 8:** *Controls provide reasonable assurance the securities holdings recorded and maintained by CHESS, are complete and accurate.*

Description of controls	Test performed by PwC	Results
8.1 Documented procedures are in place for the processing and approval of new participants.	<b>Inspection</b> Verified through inspection that documented procedures for the processing and approval of new settlement participants are in place.	No exception noted.
8.2 Documented procedures are in place for the processing and approval of new issuers.	<b>Inspection</b> Verified through inspection that documented procedures for the processing and approval of new issuers are in place.	No exception noted.
8.3 Documented procedures are in place for the removal of participants.	<b>Inspection</b> Verified through inspection that documented procedures for the removal participants are in place.	No exception noted.
8.4 Documented procedures are in place for the removal of issuers.	<b>Inspection</b> Verified through inspection that documented procedures for the removal of issuers are in place.	No exception noted.
8.5 Documented procedures are in place for additions or modifications to the security holdings data.	<b>Inspection</b> Verified through inspection that documented procedures for additions and modifications to the security holdings data are in place.	No exception noted.



Description of controls	Test performed by PwC	Results
	<p><b>Inspection</b></p> <p>For a sample of changes to securities holdings data, verified through inspection that documentation of the change existed and the change was processed by a team member of the Post Trade Operations team.</p> <p><b>Inspection</b></p> <p>For a sample of :</p> <ul style="list-style-type: none"> <li>- set up of payment facilities,</li> <li>- modification of payment facilities and</li> <li>- cancellation of payment facilities.</li> </ul> <p>verified through inspection that approval has been received from the participant.</p> <p><b>Inspection</b></p> <p>For a sample of transfers of holdings from Issuer Sponsored Subregister to CHESs Sponsored Subregister, verified through inspection that the transfers were processed completely and accurately.</p>	
<p>8.6 A reconciliation between CHESs and the Principal Register is performed on a daily basis by the issuer's share registry. In the event of discrepancies, ASX Operations or</p>	<p><b>Inspection</b></p> <p>Verified through inspection that documented policy is in place for operational incident management.</p>	<p>No exception noted.</p>



Description of controls	Test performed by PwC	Results
Technology Team are notified, an incident is raised and tracked to resolution.	<b>Inspection</b> For a sample of incidents relating to discrepancies between security holdings in CHESS and the Principal Register, verified through inspection that the incident was raised and tracked to resolution by the ASX Operations or Technology Team.	There was no instance during the period between 1 July 2019 to 30 June 2020 where ASX was notified of discrepancies between CHESS and the Principal Registers.





**Control Objective 9:** Controls provide reasonable assurance the processing of transactions initiated by the ASXS, participants or registries is complete and accurate.

Description of controls	Test performed by PwC	Results
9.1 CHES messages follow predefined CHES parameters to prevent inappropriate message structure.	<p><b>Inquiry</b></p> <p>Verified through inquiry with management that there is a predefined message format required for CHES messages and that there had not been changes to the method of validating CHES messages during the review period.</p> <p><b>Inspection</b></p> <p>For a sample of CHES messages, verified through inspection that the messages were validated against the predefined parameters before being accepted.</p>	No exception noted.
9.2 CHES messages received and sent are logged. Exception reports are produced and any unprocessed CHES messages are actioned.	<p><b>Inspection</b></p> <p>Verified through inspection of CHES message logs that CHES messages received and sent were logged.</p> <p><b>Inspection</b></p> <p>Verified through inspection that the following exception reports are produced and procedures are in place for the review and actioning of any unprocessed CHES messages:</p> <ul style="list-style-type: none"> <li>- Admin General Error Report</li> <li>- Corporate Actions Error Report</li> </ul>	No exception noted.



Description of controls	Test performed by PwC	Results
9.3 Dual authorisation is required for the set up and cancellation of payment facilities.	<b>Observation</b> Confirmed through onscreen observation that dual authorisation is required for the set up and cancellation of payment facilities.	No exception noted.
9.4 In the event of operational issues resulted by the incomplete or inaccurate processing of transactions in CHES, an incident is logged and tracked to resolution by ASX Operations or Technology team.	<b>Inspection</b> Verified through inspection that documented policy is in place for operational incident management.  <b>Inspection</b> For a sample of operational issues resulted by the incomplete or inaccurate processing of transactions in CHES, verified through inspection that the incident was raised and tracked to resolution by ASX Operations or Technology Team.	No exception noted.