



ASX CHESS

Public Roadmap Update Report of ASX
Clear Pty Limited and ASX Settlement Pty
Limited

July 2024

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1. Executive Summary

This CHES Roadmap Report outlines the updates to the CHES Roadmap since it was published in April 2023. As at May 2024, following the completion of the annual review process for updating the CHES Roadmap, ASX confirms that:

- CHES remains adequately supported from a financial, technological, and human capital perspective based on current projections of future growth.
- Services provided by CHES continue to operate within key performance indicators, meeting or exceeding all service level objectives.
- The current CHES program of work has completed 18 of the 27 initiatives in the April 2023 CHES Roadmap (including all planned FY23 initiatives).
- The CHES Roadmap has been updated to track and monitor seven new initiatives.
- ASX will continue to undertake independent audit and assurance activities over the progress and completion of Roadmap initiatives.
- ASX will continue to provide appropriate transparency to regulators and market stakeholders through standard communication channels.

As a result of reviewing and updating the CHES Roadmap, ASX confirms that:

ASX considers that its existing governance, investment, and management arrangements for CHES are commensurate with its role in providing critical financial market infrastructure.

ASX has and will continue to invest in and enhance CHES to support the long-term interests of Australia's financial markets and meet applicable regulatory requirements, including the FSS. ASX has a program of work to enhance CHES to ensure it remains operationally reliable until a new solution is implemented.

2. Overview

2.1. Background & Objective

ASX Clear Pty Limited (ASX Clear) and ASX Settlement Pty Limited (ASX Settlement) are licensed clearing and settlement (CS) facility operators under Part 7.3 of the Corporations Act 2001 (Cth) (Corporations Act) and are wholly owned subsidiaries of ASX Limited (ASX). Under the Corporations Act, ASX Clear and ASX Settlement are required (to the extent that it is reasonably practicable to do so) to comply with the Reserve Bank of Australia's (RBA) Financial Stability Standards (FSS), do all other things necessary to reduce systemic risk and ensure that the CS facility's services are provided in a fair and effective way. They are also required to have adequate arrangements for supervising the CS facility.

CHESS is the system used by ASX Clear and ASX Settlement to facilitate clearing, settlement and other post-trade services for the Australian cash equities market. It is a critical piece of national financial market infrastructure, enabling the management of clearing and settlement risks across the cash equities market. Accordingly, ASX, its customers, and regulatory agencies need confidence in the continued performance, resilience, and supportability of the CHESS system, including its ability to meet and comply with the FSS.

While ASX continues to engage and work with the industry on the successful replacement of CHESS, important work continues to ensure the ongoing support and maintenance of the existing requirements of CHESS. The objective of this program of work is to identify and implement various initiatives to ensure the safe and reliable operations of the CHESS system until it is safely replaced. Importantly, this work enables ASX to inform and provide timely updates to regulatory bodies on the status of CHESS, including ASX's management of risks associated with the supportability of the system. This report provides a summary of this work as at May 2024.

2.2. Roadmap Scope

The CHESS Roadmap continues to evolve as ASX identifies and addresses the risks associated with maintaining the operational reliability of CHESS. This report summarises CHESS Roadmap initiatives that have been completed in the year since the Special Report, and outlines the revised CHESS Roadmap as at May 2024 following the completion of the annual process of updating the CHESS Roadmap. The initiatives in the updated CHESS Roadmap are categorised under three themes (Continuity, Security, Operations) and include new initiatives that have been identified as a result of the annual process. While the planning horizon for the CHESS Roadmap extends to 2032, the initiatives detailed in this report are defined across FY24-26 in line with the annual process for updating the CHESS Roadmap. ASX's ongoing assessment of existing and any new risks associated with the continued supportability of CHESS will continue to inform decisions regarding new initiatives as required over time.

3. CHESS Update

3.1. Current Performance of CHESS

ASX recognises the importance of maintaining market confidence in the continued performance, resilience, security and supportability of CHESS-including its ability to continue to meet the RBA's FSS requirements. Over the last 10 years, CHESS has exceeded its target availability of 99.8%. CHESS continues to operate within key performance indicators and achieved or exceeded all service level objectives YTD FY 2024:

- 100% availability for CHESS¹
- No major CHESS incidents²
- No changes resulting in a CHESS incident
- Successful annual CHESS disaster recovery test.

ASX management continues to monitor key performance indicators to assess the need to improve the operational capacity of CHESS until it is safely replaced.

3.2. Stress Testing including Market Management in the event of extreme Trading Volumes

In FY24, ASX designed and executed stress testing of the current CHESS service to evaluate the system's performance under extreme market trade volumes.³ The objective of the stress testing was to identify capacity measures that may result in a technical break point or the service failing to meet its availability target. CHESS has previously been successfully tested to a capacity of 10M trades per day over a period of five days. Noting the current CY24 peak daily trade volume of 2.69M, the stress testing resulted in the following key findings:

- CHESS successfully processed a peak of 12.5M trades per day with no technical break, but minor delays to the service levels
- In stress testing up to a peak of 15M, CHESS experienced a technical break which was remediated during the course of the test, and significant delays to the service levels
- Options were identified for performance and capacity improvements of CHESS.

Importantly, Release 1 of CHESS replacement is expected to deliver improved scalable performance and capacity of at least double projected stressed volumes.⁴ ASX continues to monitor our key performance indicators against lead times to improve capacity and performance of CHESS to ensure we maintain the operational capacity and performance of CHESS until it is safely replaced.

In the event of extreme trading volumes, a set of Market Management Guiding Principles has been designed to formalise the existing tools and approaches to provide the ASX with a paradigm for decision making that is clear to Participants, Regulators and AMOs in the event of an exceptionally high-volume trading day. The six principles have been provided to CHESS users through the ASX Business Committee and to the regulators.

¹ Availability is a metric defined as a percentage of accessibility of a business service to its users within agreed time windows. For the purposes of regulatory reporting, any unavailability is when the business service is unable to be used or accessed by users. For CHESS the time window is 6.00am to 7.00pm Monday to Friday.

² No Severity 1 or Severity 2 incidents.

³ The full technical Stress Test Report was provided to the RBA on 25 January 2024.

⁴ FSS requirement 14million (double ASX's historical peak of 7M trades on March 13, 2020).

4. CHES Roadmap

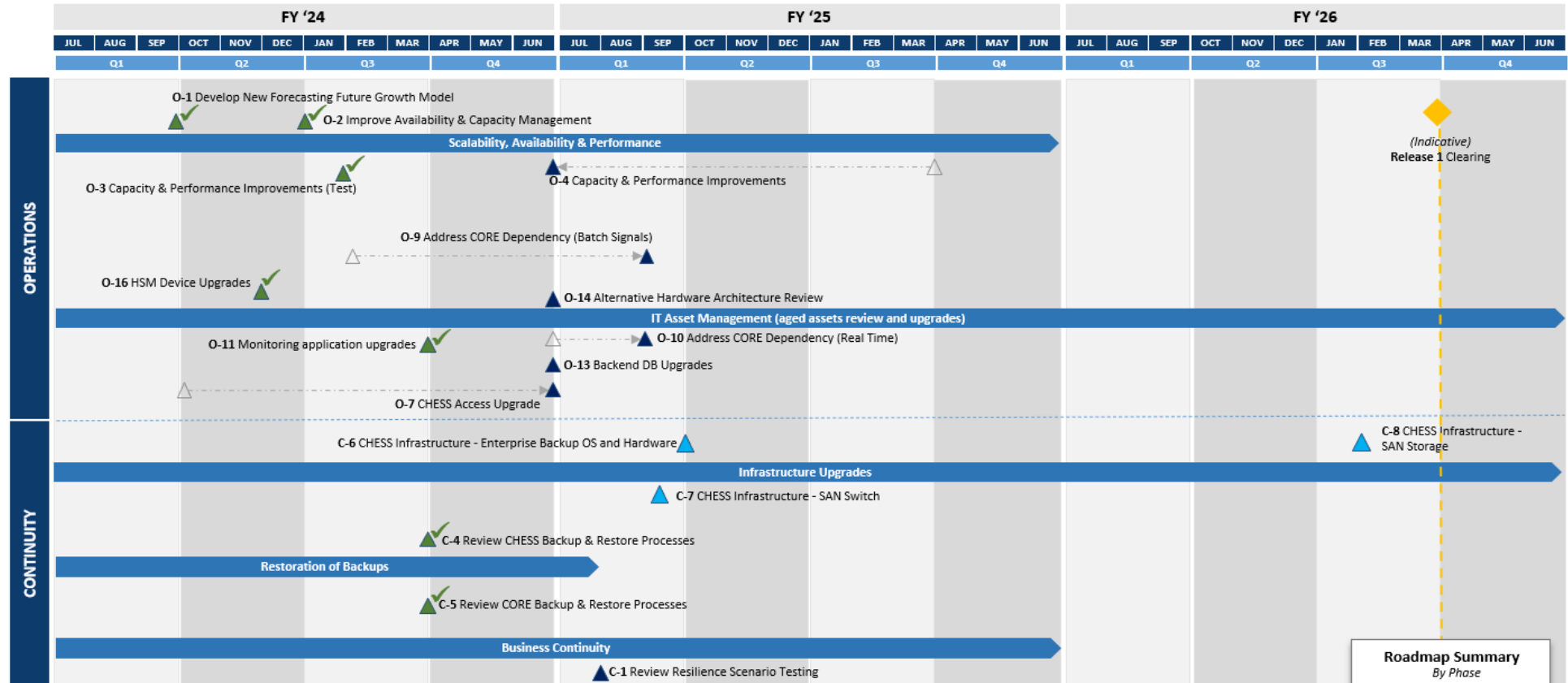
The CHES Roadmap defines the key initiatives to maintain and upgrade CHES as necessary until it has been replaced. Initiatives are identified and monitored across three themes: Operation, Security, Continuity. Governance based initiatives are delivered through BAU activities and have not been depicted in the CHES Roadmap. In April 2023, ASX published the first iteration of the CHES Roadmap which contained 27 initial initiatives linked to specific CHES risks including Reliability, Availability, Resourcing, IT Asset, Compliance, Performance, Capacity and Security. Since this time, ASX has continued to undertake important work to manage risks and ensure CHES remains operationally reliable until the new clearing and settlement system is implemented. At a high level, this work includes the completion of 18 of the 27 initiatives in the April 2023 CHES Roadmap.

Following the evaluation of current CHES risks and the completion of existing business planning processes, ASX has updated the CHES Roadmap to include seven new initiatives scheduled for delivery across FY24 to FY26. The ongoing assessment of existing CHES risks, and any new CHES risks, will continue to inform decisions regarding new initiatives as required over time. Accordingly, the CHES Roadmap will continue to evolve beyond FY26 and will be updated annually to provide visibility over any required support and maintenance activities until 2032, or such time as the CHES system is replaced.

CHES Roadmap (as at May 2024)	Initial (FY23)	Completed	New	FY24 Total
<i>Operations</i>	16	(8)	-	8
<i>Security</i>	4	(4)	3	3
<i>Continuity</i>	7	(6)	4	5
	27	(18)	7	16

To note, all Security initiatives, and certain Operational and Continuity initiatives, have not been depicted in the Roadmap due to commercial sensitivity.

Current CHES Roadmap FY24 – 26



NOTE: The dates presented in this Roadmap are indicative only.
 Risks & Governance based initiatives have not been depicted in the above roadmap as they are considered ongoing and business as usual in nature.
 All Security initiatives (and certain Operational and Continuity initiatives) have not been depicted in the above roadmap due to commercial sensitivity.
 8x Special Report items have been completed in FY23 and do not fall inside the roadmap calendar range.
 C-9 CHES Frontend & Backend Hardware is currently being monitored and its delivery is dependent on the outcome of O-14.

Figure 1: CY24-26 CHES Roadmap

4.1. Completed Initiatives

ASX completed all planned FY23/24 initiatives. This included 18 of the initial 27 initiatives from the April 2023 CHES Roadmap. The remaining April 2023 CHES Roadmap initiatives are either in flight or scheduled for delivery across FY24-26. Notably, ASX has decided to include additional testing activities for initiatives O-9 and O-10 to ensure completeness. Additional time has been allocated to O-7 as delivery is dependent on industry readiness. Where practical, ASX will bring initiative delivery dates forward to provide enhancements earlier, as evidenced with O-4. A summary of the work completed as at May 2024 is provided below. To note, all Security and certain Operational and Continuity initiatives have not been detailed due to commercial sensitivity.

4.1.1 Operation

ASX has implemented eight operational initiatives for CHES. These initiatives focused on managing risks associated with IT asset management, capacity, availability, and performance of CHES. Key initiatives included the development and implementation of an improved trade predictability forecasting model and conducting a trade stress test for a daily trade volume, identifying breakpoints and enabling planning for future capacity and performance improvements if necessary. Additionally, ASX conducted software and infrastructure upgrades to address obsolescence and maintain supportability. This included enhancing key assets and services to ensure the ongoing compliance with CHES operational requirements and service levels. ASX also established an enterprise Availability and Capacity Management Framework in accordance with ISACA's COBIT standards. This framework has enhanced ASX's ability to:

- Ensure services meet business requirements.
- Plan system requirements effectively.
- Support proactive planning for system scalability.

Lastly, the replacement of third-party Virtual Private Network (VPN) software resulted in the enhanced stability and supportability of customer connectivity to ASX-Net.

4.1.2 Continuity

ASX has completed four CHES continuity enhancement initiatives aimed at bolstering CHES and its underlying systems against various disruption scenarios. The completed initiatives aimed to improve the reliability of CHES by addressing technology operational risks including the failure to meet business and regulatory requirements due to non-malicious external factors such as outages, reduced performance, processing failures, data corruption or leakage, and non-compliance with obligations. Work completed included refining backup and restoration processes, identifying opportunities for transitioning to more robust services, and improving security of backup data. ASX aligned these processes with the current RITS Members Business Continuity and Security Standards.

Refer to Appendix A *Detailed CHES Roadmap* for further information on the completed initiatives.

4.2. New and Existing Initiatives

As at May 2024, the CHES Roadmap details 16 initiatives to maintain and upgrade CHES. These initiatives are comprised of seven new initiatives and nine initiatives from the previous iteration of the CHES Roadmap which remain either in flight or scheduled for delivery. The new initiatives are a result of an assessment of the current CHES risks and existing business processes and are planned for delivery through to the end FY 2026.

The sub-sections below summarise the new and existing initiatives identified across the applicable themes:

4.2.1 Operation

ASX has eight in flight or scheduled CHES operational enhancement initiatives. These initiatives aim to manage technology operational risks including the potential impacts to the reliability of CHES and/or associated systems and maintaining their ability to meet business and regulatory requirements. At a high level, these initiatives include:

- Middleware upgrades
- Programming language upgrades to improve operating system compatibility

- Migration of security and trade feeds from the current CORE platform to deliver enhanced capacity and performance.

Additionally, work is scheduled to review the current hardware architecture to enable future upgrades.

4.2.2 Continuity

The CHES Roadmap has five continuity enhancement initiatives designed to support the reliability of CHES by managing risks associated with an outage or unavailability due to a software or hardware defect. Arising from the yearly review of aged assets, the new initiatives include an end-to-end operating environment review and upgrades to the existing CHES infrastructure and hardware.

Refer to Appendix A *Detailed CHES Roadmap* for further information on the new and inflight initiatives.

4.3. Continued investment in CHES

The CHES Roadmap will continue to be updated to define key CHES initiatives in line with the annual process. ASX will closely track the progress of these initiatives as per the existing ASX Delivery and Project Governance processes and frameworks set out in section 5.

4.3.1 CHES Replacement

To continue to operate successful market infrastructure for the Australian economy, ASX has continued to evolve its vision to the future design of the clearing and settlement system that is; open and accessible to the market, data led, scalable and flexible, resilient and secure, interoperable and able to support evolving industry needs. ASX understands that this will be achieved by taking manageable steps with the industry to deliver a solution that enhances core market capabilities, strengthens the stability of Australia's financial markets and continues to support compliance with ASX's licence obligations and regulatory expectations.

On 20 November 2023, ASX entered into an agreement with Tata Consultancy Services (TCS) for the delivery of its TCS BaNCS for Market Infrastructure product which offers a modular technology platform for CS services. ASX believes that the replacement system will enable ASX to continue to provide a reliable, supportable, and scalable platform that meets the licence obligations of ASX Clear and ASX Settlement and the needs of the Australian market now and into the future.

5. CHES Governance and Assurance

5.1. CHES Governance

The CHES Governance Statement provides a guide to the governance framework that applies to CHES. It is intended to help stakeholders understand the roles and responsibilities of the different ASX governance forums relevant to CHES, including the CHES Roadmap and the delivery of the CHES replacement project.

The CHES Governance Statement can be found [here](#).

5.2. CHES Roadmap Assurance

ASX will continue to undertake assurance activities over the CHES Roadmap via ASX internal audit and/or independent external audits. There is an ongoing assurance program regarding the completion (or non-completion) of each of the identified initiatives to ensure the initiatives are meeting their risk objectives. Additionally, each assurance cycle includes a deep dive topic. The next deep dives are on market-management and cyber security, followed by third party management and business continuity and resilience. The assurance cycles are six months in duration and designed to provide ASX assurance that the initiatives are delivering the desired scope and benefits stated in each work item.

APPENDICES

Appendix A – Detailed CHES Roadmap Initiatives

Table Appendix A.A.1 – Completed Roadmap Initiatives

Pillar	ID	Status	Completion Date	Initiative Name	Description
Operations	O-1	Completed	Sep 23	Develop a new model for forecasting future trading growth	Initiative to develop a new model to forecast future trade growth that would consider underlying drivers of volume increase based on historical experience of events such as market structure changes, major corporate action events, and unplanned/outlier events such as the COVID-19 pandemic.
Operations	O-2	Completed	Dec 23	Improve maturity level of the Availability and Capacity Management Framework and processes based on COBIT	Establish an enterprise 'Availability and Capacity Management Framework' to align with COBIT. Includes Availability Management, Business Capacity Management, Service Capacity Management and Component Capacity Management across Critical services that S&P will then imbed for CHES.
Operations	O-3	Completed	Jan 24	Stress test CHES to determine further points of failure	Perform CHES stress test to determine further points of failure.
Operations	O-5	Completed	Jun 23	Establish a Managed Service Contract agreement with current operating system vendor	Convert the current vendor agreement (Break-fix) to a Managed Service Agreement Contract agreement for CHES and CORE covering the operating system and database.
Operations	O-6	Complete	Jun 23	Front-end – OS and Hardware upgrade	Upgrade of the CHES front-end hardware and operating system to the latest version. The initiative will ensure continued vendor support key to the operational resiliency of future CHES operations.

Operations	O-11	Completed	Mar 24	Monitoring application upgrades	Upgrade CHES and CORE monitoring application to be on the latest hardware and latest version.
Operations	O-15	Completed	Jun 23 (Phase 1)	Customer VPN Access	Customer Site VPN software is required to be upgraded to maintain ongoing support arrangements by the customer.
Operations	O-16	Completed	Nov 23	HSM Device upgrades	Upgrade the CHES hardware security modules, critical to the secure operation of CHES, to the latest hardware.
Continuity	C-4	Completed	Mar 24	CHES - Review backup and restore processes	Review CHES backup and restore processes as these pertain to the Business Continuity and Security Standards for RITS Members - December 2022.
Continuity	C-5	Completed	Mar 24	CORE - Review the backup and restore processes	Review the CHES Signal Feeds (presently delivered by CORE) backup and restore processes as these pertain to the Business Continuity and Security Standards for RITS Members - December 2022.

Table Appendix A.A.2 – Inflight Roadmap Initiatives

Pillar	ID	Status	Indicative Date	Initiative Name	Description
Operations	O-4	Planned	Jun 24 (Phase 1)	Capacity & Performance Improvements	Remediate short-term points of failure and assess options for further performance improvements to address the outcomes of the CHESStress test and develop a plan for remediation.
Operations	O-7	In Progress	Jun 24	CHESStress Access upgrade	Upgrade of CHESStress Access programming language and underlying middleware.
Operations	O-9 & O-10	In progress	Jun 24 (Phase 1 O-9) Jul 24 (Phase 2 O-10)	Address CORE dependencies: Reference Data (Batch) & Trade Data (Real time)	Migration of security and trade feeds from the current CORE platform to deliver enhanced capacity and performance.
Operations	O-13	In progress	Jul 24	Backend upgrades – database upgrade to the latest version	Upgrade the CHESStress database to the latest version. This is to ensure continued support and resilient operation of CHESStress.
Operations	O-14	In progress	Jun 24	Assess alternative hardware architecture for backend servers to support CHESStress	Assess alternative hardware architecture to support CHESStress. The initiative will be a driver for the future CHESStress server hardware upgrades.
Continuity	C-1	In progress	Jul 24	Review CHESStress resilience scenario testing	Further analysis will be performed to support an end-to-end view of the CHESStress operating environment. This will support completion of a stocktake of current resilience testing activities against plausible disruptions scenarios. Any identified gaps will be risk assessed and an appropriate approach formed to enable testing of scenarios. A test program will be created that details the outcomes of the stocktake, plausible scenarios, detailed approach to ongoing testing and reporting requirements.

Table Appendix A.A.3 – New Roadmap Initiatives

Pillar	ID	Status	Indicative Date	Initiative Name	Description
Continuity	C-6	New	Sep 24	CHESS Infrastructure - Enterprise Backup OS and Hardware	The work on this initiative is to upgrade hardware to ensure continued support post July 2024 and align the CHESS backup solution design to enterprise standards
Continuity	C-7	New	Aug 24	CHESS Infrastructure - SAN Switch	The work on this initiative is to upgrade an aged asset to ensure continued supportability post June 2026.
Continuity	C-8	New	Jan 26	CHESS Infrastructure - SAN Storage	The work on this initiative is to upgrade an aged asset to ensure continued supportability post August 2026 and remediate security concerns relating to the encryption of data.
Continuity	C-9	New	TBC	CHESS Frontend & Backend Hardware	This initiative is currently being monitored and its delivery is dependent on the outcome of O-14.