EUROPEAN SPALLATION SOURCE

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Configuration Management Plan

	Name	Affiliation	Signatures
Author	Romuald Duperrier Systems Engineering Manager	ESS AB	
Reviewer	Johan Lehander Chairman of the CCB of the programme	ESS AB	
Approver	James Yeck ESS CEO	ESS AB	

Distribution: All programme participants.

European Spallation Source ESS AB
Visiting address: ESS, Tunavägen 24
P.O. Box 176
SE-221 00 Lund
SWEDEN

www.esss.se

TABLE OF CONTENT

1. INTRODUCTION

1.1 Purpose

The purpose of this Configuration Management Plan – CMP - is to identify the organization providing the configuration control, defines what a configuration-controlled item is, describes or refers to the change control process, and identifies the plan for configuration status accounting and audit. In this respect, the CMP conforms to the ESS configuration management policy [CMPolicy].
This CMP is designed to ensure that:

1. Configuration identification and versions are defined and documented,
2. Which part of the configuration is the current baseline,
3. Documentation is identified, released and controlled,
4. The Change Control Board (CCB) function is established,
5. Changes to the current baseline are evaluated and controlled,
6. Approved baseline changes are implemented and tracked,
7. Configuration status accounting is accomplished.
8. Principles for a configuration audit are established.

1.2 Scope

The CMP is applicable to all work performed as part of the ESS construction programme, which includes all activities from requirement engineering to validation of the facility as defined in the ESS Systems Engineering policy [SEP]. It provides guidance for all personnel on configuration management – CM - activities in support of the ESS programme, including all subsystem teams and subcontractors. CM is applied to items selected as a specific subset of the work products, which constitute the configuration. Once approved, the items under configuration control establish the baseline. In this respect, the baseline is a subset of the configuration.

This CMP is published and maintained as a separate document and is the responsibility of the Systems Engineering Manager. The chairman of the CCB of the programme approves the CMP. Changes to the ESS System Baselines are managed and controlled in accordance with the procedures defined in this document, and are evaluated for risk in accordance with the procedures defined in the Risk Management Process [RMP].

1.3 Definitions, acronyms and abbreviations

Abbreviation/Name	Explanation of abbreviation
Annex to the ESS statutes.	Set of the stakeholder's requirements that defines the ESS scientific, and technical scope, and the performance and design goals of the ESS facility.
Baseline	Defined set of work products that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be a technical, cost, or schedule baseline. It can be changed only through formal change control procedures.
CEO	Chief Executive Office
Change Control	Process for assessing, accepting and implementing change to

	the baseline and establish a new baseline.
Change Control Board (CCB)	Group of persons with responsibility and authority to make decisions on the baseline.
CHESS	Collaboration Home at ESS. Name of the platform supporting Product Life Cycle Management at ESS. It is a collection of interrelated tools that support creation and maintenance of work products.
Configuration	Set of interrelated characteristics of a system defined in product configuration information.
Configuration Management	Process for establishing and maintaining consistent records of the parameters of the facility, its systems, subsystems and parts. It gives traceability and ability to retrieve the configuration baseline for any given point in time. Configuration management is applied throughout the entire lifecycle of the facility.
CMP	Configuration Management Plan
EPG	ESS Programme Group
Interface	A common physical or functional boundary between systems. Flows of e.g. data, energy or matter may be exchanged through the interface between the systems.
Item	A single article, entity or unit.
PM	Project Manager
SEMP	Systems Engineering Management Plan.
SEO	Systems Engineering Office.
System Owner	Person who has the responsibility to deliver the system of interest as defined by the system documentation.

1.4 References

[CMPolicy] ESS Configuration Management Policy, ESS-0001880.

[SEP] ESS Systems Engineering Policy, ESS-0000967.

[SEMP] Systems Engineering Management Plan, ESS-0002908.

[WBS] ESS Work Breakdown Structure, http://primavera.esss.lu.se:8203/p6/action/login?sessionExpired=true

[PP] Programme Plan, ESS-0001122.

[RMP] ESS Risk Management Process, ESS-0000263.

[IMP] Interface Management Plan, ESS-0002917.

[CCP] Change Control Process, ESS-0001879.

[BIM] BIM guidelines for Conventional Facilities, ESS-0000340.

[MDP] Mechanical Design Process, ESS-0002411.

2. OVERVIEW

CM is the process through which the ESS programme documents the functional and physical characteristics of the facility, controls changes to those characteristics, and provides information on the state of change action. The key elements of CM, as shown in Figure 1, are Configuration Identification, Configuration Change Control, Configuration Status Accounting, and Configuration Audits.

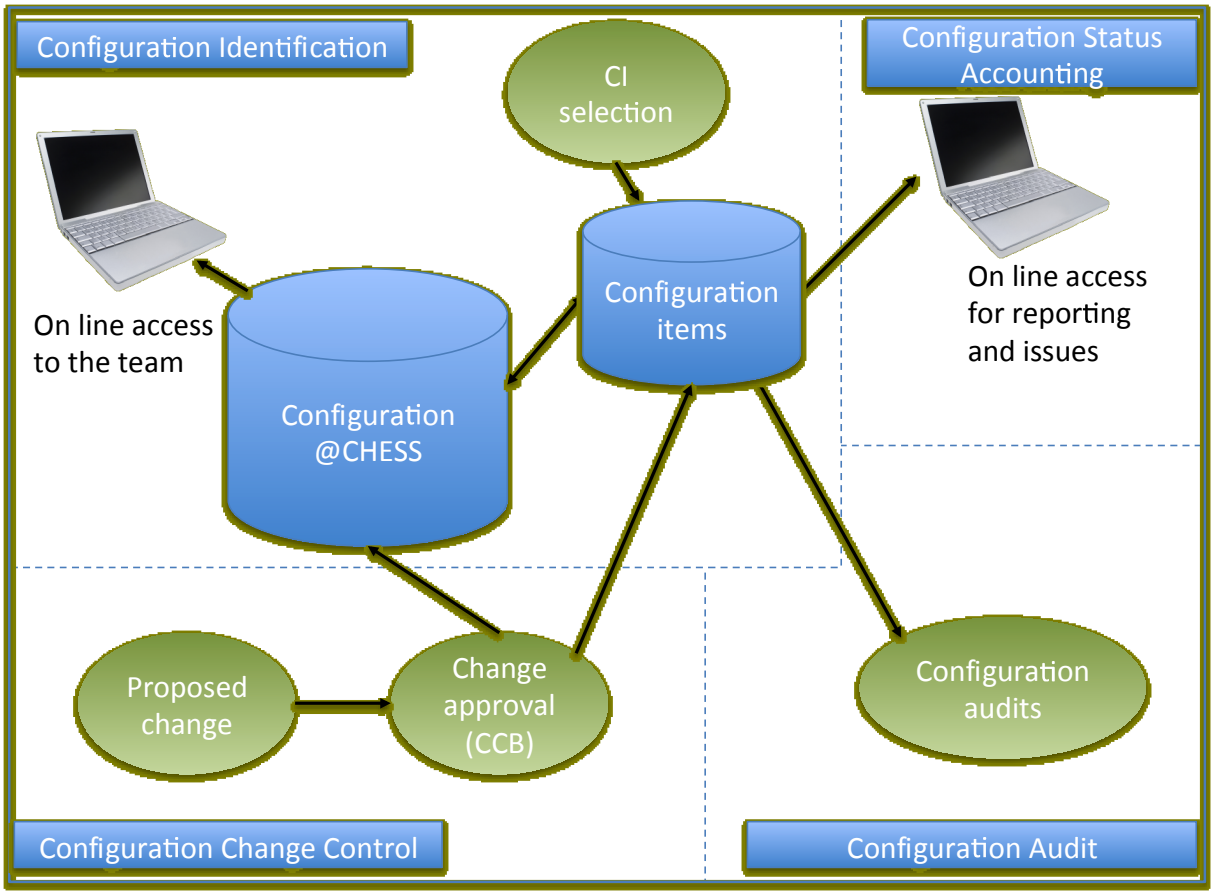

Figure 1: ESS programme Configuration Management model.

Configuration Identification defines the ESS system through a set of products information. For convenience[1], the ESS configuration is broken down into objects and those, which have been approved, establish the baseline. The baseline is split into the three primary elements:

1. *Technical baseline* - It describes the performance capabilities the programme must provide. Reflecting the status of requirements, design data and data for operation.
2. *Cost baseline* - It describes the detailed product and activities cost.
3. *Schedule baseline* - It defines the tasks and their dependencies constituting the Work Breakdown Structure which the ESS programme is to provide the required capabilities.

[1] The set of CIs aims at selecting relevant items for the control of the configuration while conciliating the ability of the ESS team to perform this control.

Configuration Items –CIs- are specific elements of the configuration. The CIs are formally listed in the section 5 of this document. This list references CIs and its defining documentation stored in CHESS.

The *Change Control process* is the vehicle by which proposed changes are reviewed and approved. It ensures that the technical, cost and schedule impacts of each major change are considered before approval is granted.

Status Accounting is means to track configuration information and relay it to key personnel in order to support decision-making and ensure that all work is performed according to the current configuration of the facility architecture descriptions.

The Configuration Audit process ensures that the current configuration match the intended design by verifying e.g. the implementation of each approved change through periodic or on-demand configuration audits.

CM process definition is the responsibility of the SEO and must be supported by all ESS programme team members. Figure 2 shows the organization breakdown structure of the ESS programme regarding the configuration management. The board has the overall responsibility for CM of the stakeholder's requirements, the annex to the ESS statutes. The ESS programme group (EPG) has the responsibility for CM of the ESS facility requirements. The CEO of the programme has the responsibility for CM within the scope of the programme. The CEO is responsible for ensuring that all construction programme CIs are identified and controlled. This responsibility is delegated to Project Managers when needed. The Project Manager –PM- is responsible for implementing approved changes to the baseline.

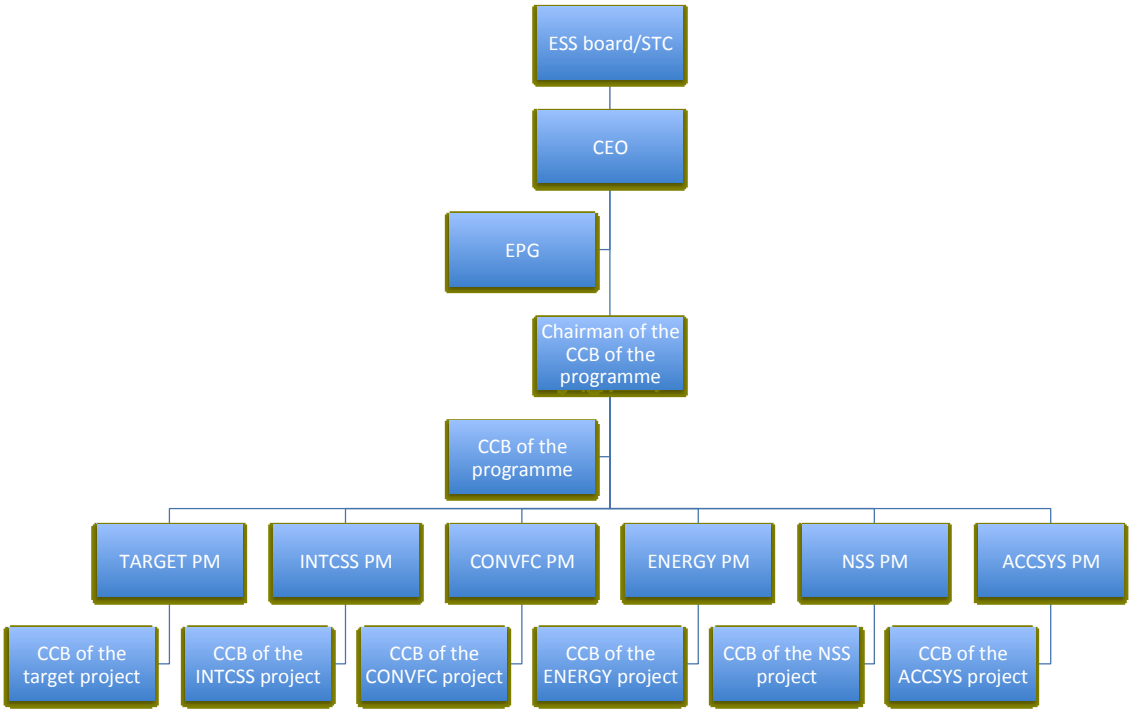

Figure 2: ESS programme organisation.

3. RESOURCES

3.1 Human resources

The roles needed to perform CM as defined in the section 4 are:

- Configuration controllers provided by the programme,
- Configuration controllers provided by the projects,
- Change Control Board members at the programme level,
- Change Control Board members at the project level,
- ESS Board and Steering Committee members,
- ESS Programme Group members,
- Change Leaders,
- Configuration Item authors,
- Configuration Item reviewers, and
- CCB secretaries.

3.2 Tools

The current tools for data accommodation, storage, and management that constitutes the CHESS platform are:

- Enovia/Library Central for documentation management,
- Enovia/Library Central for Location Breakdown Structure items,
- Enovia for CAD vaulting,
- Enovia/Library Central for component standardization,
- CATIA V6 for collaborative mechanical design,
- Primavera for the WBS e.g cost and effort information,
- Magic Draw for edition of the ESS meta-model part containing requirements, PBS, concepts of operations (use cases), and verification plans (test cases).
- Team Work server for the versioning of this part of the ESS meta-model.

Training in the use of selected CM tools and their application to this programme's environment is provided to all affected members of the project organization.

3.3 Sources of Funding

The sources of funding needed to perform this process are:

- The people for all activities will be funded by the programme and projects,
- The tools for all activities will be funded by the ESS AB administration directorate,
- The training of the ESS team members for using the tools will be funded by the ESS projects.

The effort, cost and duration of the Configuration Management tasks are captured and maintained in the programme WBS [WBS].

4. ASSIGNMENT OF RESPONSIBILITIES AND AUTHORITIES

Assignment of responsibilities for individual tasks is captured and maintained in the Programme schedule [WBS].

4.1 ESS CEO

The ESS Chief Executive Officer chairs the EPG meetings. He decides on changes related to this CCB.

4.2 Chairman of the CCB of the programme

The deputy of the Machine Director chairs the CCB of the programme and decides on changes related to this CCB.

4.3 Project Manager

The Project Manager chairs the CCB of the project and decides on changes related to this CCB.

4.4 Programme Configuration controllers

The Configuration controllers of the programme are the programme office manager and the systems engineering manager. They have the responsibility for the management and performance of the Configuration Management Process in the programme and support the Change Leader for a change related to the CCB of the programme.

The configuration controllers of the programme are responsible for monitoring the status of change requests before and after review by the CCB of the programme; are responsible for bringing change request progress or status issues to the attention of the chairman of the CCB of the programme; are responsible for the conduct of periodic configuration audits.

4.5 Project Configuration controllers

The Configuration controllers of a project are the project controller and the systems engineer of the project. They have the responsibility for the management and performance of the Configuration Management Process in the project and support the Change Leader for a change related to the CCB of the project.

The Configuration controllers of a project are responsible for monitoring the status of change requests before and after review by the CCB of the project; are responsible for bringing change request progress or status issues to the attention of the Project Manager; are responsible for the conduct of periodic configuration audits.

4.6 ESS Board and Steering Committee

The ESS board and Steering Committee members represent the 17 Countries which jointly own the ESS facility. The ESS board decides on change of Level 1 (see 6).

4.7 ESS Programme Group

The ESS Programme Group members are the project managers, the machine director, the science director, the infrastructure director, the programme director, the chairman of the CCB of the programme, the ESS operation manager, the Quality manager and the ESS CEO. The required attendees at any specific EPG meeting may be adjusted according to programme circumstances at the EPG chairman's discretion.

The CEO chairs EPG.

4.8 Change Control Board of the programme

The CCB of the programme members are the deputy of the Machine Director, the project managers, and the programme configuration controllers and the Head of Safety, Health and Environment division.

The required attendees at any specific Change Control Board meeting may be adjusted according to Programme circumstances at the CCB chairman's discretion.

4.9 Change Control Board of a project

The CCB of the project members are the project manager, responsible officers for functions related to safety and engineering in the project, the work package managers and the project configuration controllers.

The required attendees at any specific Change Control Board meeting may be adjusted according to Project circumstances at the Project Manager's discretion.

4.10 Change Leader (see 6)

A change leader once assigned is responsible for formally support the change control process as defined in the reference [CCP].

4.11 Configuration Item authors

Configuration Item Authors are those who are generating configuration items, and may come from any team in the programme. Configuration Item Authors are responsible for generating the contents, and storage of Configuration Items in accordance with ESS policies, processes and procedures. Configuration Item authors may be called in any CCB as needed.

4.12 Configuration Item reviewers

Configuration Item Reviewers are those who review one or more configuration items, and may come from any team in the programme or an external institute or company. Reviewing of Configuration Items is a responsibility that is only held temporarily until the review of the Configuration Item is completed.

4.13 Secretary of the CCB of the programme

The Secretary of the CCB of the programme is a member of the CCB and exercises control of the CCB documentation. He/She is responsible for assuring the completeness of the CCB record and their communication to the stakeholders.

4.14 Secretary of the CCB of the project

The Secretary of the CCB of the project is a member of the CCB and exercises control of the CCB documentation. He/She is responsible for assuring the completeness of the CCB record and their communication to the stakeholders.

4.15 Secretary of the ESS Board and Steering Committee

The Secretary of the ESS board and Steering Committee is a member of the ESS board and Steering Committee and exercises control of the ESS Board and Steering Committee documentation related to the configuration management process. He/She is responsible for assuring the completeness of the ESS board record and their communication to the stakeholders when relevant to the configuration management process.

4.16 Secretary of the EPG

The Secretary of the EPG is a member of the EPG and exercises control of the EPG documentation related to the configuration management process. He/She is responsible for assuring the completeness of the EPG record and their communication to the stakeholders when relevant to the configuration management process.

5. CONFIGURATION IDENTIFICATION

The configuration identification process uniquely identifies the elements within the ESS baseline. This unique identification promotes the ability to create and maintain master inventory lists of baselines. As part of the Systems Engineering effort [SEMP], the ESS facility is being split into several technical baselines that are composed of configuration items and serve as the critical elements subjected to rigorous formal control. From these technical characteristics, project data are elaborated and enrich the configuration. Configuration identification provides unique identity to the ESS system components as well as their documentation. The items may be deliverable items under the construction or enabling products used to produce the deliverable items (test equipment, tooling).

5.1.1 Configuration Definition and Promotion

Configuration items are placed under configuration control upon their initial release i.e. once approved. Prior to initial release, the originator or configuration item author submits the item to a milestone review as introduced in the section 5.1.5 and defined in the SEMP. Peer or expert reviewers might contribute to the review at the discretion of the system owner. The review shall encompass all life cycle aspects e.g. maintenance and disposal and safety. Once the system owner approved, the new items are uploaded or promoted into CHESS by the configuration controllers. System owner and/or configuration controllers may delegate their responsibility.

5.1.2 Scope of the Configuration Items

In order to facilitate CM, the ESS system will be broken down into manageable units. Among the ESS configuration elements, CIs are selected through a top-down system approach considering the following criteria:

- Regulatory requirements e.g. environment and local regulation,
- Criticality in terms of risks, safety,
- New or modified technology,
- Critical interfaces,
- Procurement conditions (In-Kind or vendors).

Selected technical configuration items are of the following types:

- Stakeholder and system requirements,
- Architectural design results i.e. PBS nodes with interface specification (ICDs),
- Results of the implementation activities i.e. design specifications: it encompasses the System Design Description documents and related documents for systems identified in the PBS, and stored in Enovia/Library Central.
- Verification information (plans and reports) for systems identified in the PBS,
- Operation and support documents (maintenance manuals, concepts of operation).

Schedule and costs data related to technical configuration items identified above are also placed in configuration control.

Specific project management documents that govern the "How do we work?" are also placed in configuration control:

- The Programme Plan [PP],
- The Risk Management Process [RMP],
- The Systems Engineering Management Plan [SEMP],
- This Configuration Management Plan.

Where the ESS design incorporates commercial off-the-shelf (COTS) hardware or software, the vendor part number will be used in ESS design specifications, but only as a complement to ESS part numbers. The design data and documentation owned by the vendor is not subject to ESS CM.

5.1.3 Identification and versioning

Id for each element of the configuration is generated in accordance with the CHESS Reference Designation Convention as defined after. Each CI will have a dedicated specific attribute for keeping track of the status:

- In Work,
- In review,
- Approved,
- In revision,
- Released,
- Obsolete.

Change of status is defined by a workflow execution and supported by CHESS.

For any status, the item might have various versions. Change of status is always performed with a change of the version number.

The status "Approved" might be complemented by the mention:

- "As Designed", or
- "As Built", or
- "As Verified", or
- "As Validated",

in accordance to the passed review. This additional attribute informs about the belonging of the item to a specific baseline as described in section 5.1.5. Items are identified in accordance with their context. Their reference designation is a concatenation of part of their own attributes, own referencing element, and context configuration items referencing elements. Referencing element of an item is either:

- An item name, or
- An item number (may be sequential or random but is unique in the context), or
- An item letter code (reduced form of the name).

Example: "Target Station" is an item name, while its letter code could be "TSt".

5.1.4 Formal Reference Convention of Configuration Items

5.1.4.1 Requirement items

The reference convention for the stakeholder's requirements of the ESS is presented in Table 1. The version number of each requirement is incremented by Magic Draw for each authorized change. All requirements are contained in the ESS meta-model which has its own version number generated by the TeamWork server tool.

Table 1: Stakeholder's requirement naming convention.

ESS stakeholder's requirements unique identifier	
StR-	n
Prefix for stakeholder's requirements	Incremental integer number
Example: StR-123	

The naming convention for requirements of the ESS systems is presented in Table 2.

Table 2: System's requirement naming convention.

Requirements for ESS systems unique identifier		
aaaa	.SyR-	n
PBS letter code	Prefix for system's requirements	Incremental integer number
Example: ESS.SyR-134		

5.1.4.2 System item or Product Breakdown Structure Node

The reference convention for PBS elements of the ESS system is presented in Table 3. This convention applies for software and hardware items. The version number of each PBS node is incremented by Magic Draw for each authorized change. The PBS elements are contained in the ESS meta-model part edited with Magic Draw. This part of the model has its own version number generated by the TeamWork server tool.

Table 3: PBS element naming convention.

Logical Breakdown unique identifier	
Logical::	name1::name2
Prefix	*Parent item name***::***item name.* Here, "name2" is the short name for the item of interest name but the unique identifier of the item is the full length name Logical::name1::name2. It is as long as needed.
Example: Logical::ESS::Accelerator::RF Systems	

Each item short name could be replaced for convenience by its letter code or a number. The correspondence between the name, letter code and number for systems is defined in the ESS Naming Convention reference tables [ESS-0000757]. These reference tables are also under configuration control.

5.1.4.3 Formal File Documents issued by ESS AB and an IKC

The naming convention for formal file documents issued by ESS AB or an In Kind Contributors is presented in Table 4. The long name is a concatenation of the Id (name generated by CHESS) and several attributes of the document. See section 10 for the different types of documents and their letter code.

Table 4: Reference convention for naming file documents issued by the programme.

File unique identifier for document issued by the ESS programme		Additional information							
ESS-	NNNNNNN	-	DT	-	ISS	-	vN	-	name1::name2
prefix	Random number assigned by CHESS (7 digits)		Document type (letter code)		Issuer entity		Version number		PBS name or letter code (2 levels)

Example: ESS-0001234-SRD-IPNO-v1-SCL::High Beta Cryomodule.docx

5.1.4.4 Formal File Documents issued by a supplier

The reference convention for formal file documents issued by suppliers is presented in Table 5. List of issuer entities is specified in the section 9.

Table 5: Reference convention for file documents issued by suppliers.

Unique identifier for document issued by supplier		Additional information									
ESS-	NNNNNNN	-	ISS	-	MMMMM	-	vN	-	name1::name2	-	Description (optional)
Prefix	Random number assigned by CHESS (7 digits)		Issuer entity		Issuer unique reference		Version number		PBS name (2 levels)		Textual description
Example: ESS-0000123-TLS-ABCDEF-v1-SCL::High Beta Cryomodule-Minutes of 20130101 meeting.pdf											

5.1.4.5 Design items

Drawings

The reference convention for formal drawings is presented in Table 6. List of issuer entities is specified in the section 9.

Table 6: Reference convention for Drawings naming.

Unique identifier for drawings issued by CHESS		Additional information					
ESS-	NNNNNNN	-DWG-	ISS	-	vN	-	name1::name2
prefix	Random # assigned by CHESS (7	Document type (letter code) always DWG	Issuer entity		Version number		PBS name or letter code (2 levels)

Unique identifier for drawings issued by CHESS		Additional information					
	digits)						
Example: ESS-0001234-DWG-IPNO-v1-SCL::High Beta Cryomodule.pdf							

CAD models files and Parts

The reference convention for formal CAD files (single part or assembly of parts) or part naming is presented in Table 5. List of issuer entities is specified in the section 9.

Table 7: Reference convention for CAD file and Part naming.

Unique identifier for CAD files and Part issued by CHESS		Additional information									
ESS-	NNNNNNN	-	DT	-	ISS	-	vN	-	name1::name2	-	n
prefix	Random number assigned by CHESS (7 digits)		Document type (letter code) always SP or AP		Issuer entity		Version number		PBS name or letter code (2 levels)		Site number 0 for Lund and 1 for Copenhagen
Example: ESS-0001235-SP-IPNO-v1-SCL::High Beta Cryomodule-0.CATPart											

For integrating Part numbers issued by a supplier, the preceding name will be completed by the field '-XXXXXXX' where XXXXXXX is the supplier part number. For built instances of a part, the name is defined by a concatenation of the part name and the chain '-XXXXX' where the additional part is the serial number issued by the supplier.

Piping and Instrumentation Diagrams

The reference convention for formal P&ID specifications is presented in Table 5. List of issuer entities is specified in the section 9.

Table 8: Reference convention for P&ID specification naming.

File unique identifier for P&ID issued by CHESS		Additional information							
ESS-	NNNNNNN	-	PID	-	ISS	-	vN	-	name1::name2
prefix	Random number by CHESS (7 digits)		Document type (letter code) always PID		Issuer entity		Version number		PBS name or letter code (2 levels)
Example: ESS-0001234-PID-IPNO-v1-SCL::High Beta Cryomodule.pdf									

5.1.4.6 Location Breakdown Structure items

The reference convention for Location Breakdown Structure items is presented in reference [BIM].

5.1.4.7 Work items

The reference convention for Work Breakdown Structure items are presented in Table 9

Table 9: Reference convention for WBS items (task).

Unique identifier for WBS items						
Project	.	N1.N2.N3	.	Annnnnn	.	vNN
Project letter code		Task container level		Task reference		Version number
Example: ACCSYS.1.4.2.A219030.v01						

Each WBS as a whole as a version number with the following convention:

Unique identifier for Schedule Baseline							
B	NNN	DD	nn		xxx		20NN

Baseline prefix	Baseline number with 3 integers	Data Date prefix	day		month		year
Example: B001 DD 1 Feb 2013							

The Data Date – DD - is the date the baseline was progressed to.

5.1.5 Formal baseline identification

Configuration identification includes establishing and maintaining baselines that define the system or subsystem configuration items at any point in time. Based on the ESS programme life cycle phases, which relies on an incremental development and delivery scheme, different technical baselines, are progressively established and populated by configuration items [SEMP]. Configuration Identification uses configuration baselines as an integral configuration management concept. A technical baseline is defined as means to reveal the products maturity between two product development phases; it therefore serves as both the completion stage of one product phase and the initiation point of the following phase. Each baseline is initiated from the top i.e. the facility level and gradually enriched by the lower levels as their development maturity progresses.

The controlled technical baselines include:

- Functional Baseline,
- Allocated Baseline,
- Design Baseline,
- Product Baseline,
- Performance Baseline,
- Operational Baseline.

While most of the ESS systems will be waterfall elaborated but their development maturity will not be synchronized, several baselines will coexist at several points in time. At the closure of the construction programme, only the Operational Baseline will remain. Inherited from the incremental development and delivery nature of the ESS construction, several ORR will be held for authorizing operation of the facility with its new increments [SEMP].

Formal baselines are initiated at programme milestones, the most notable of which are the Formal Reviews that are the point for beginning a new phase of development activity. The configuration baselines are established and maintained in a series of approved configuration reviews [SEMP].

Formal baselines include a specific set of documents described hereafter and their related items as soon as they can be individually identified (e.g. a requirement item). Change requests are also identify as a CI.

Project data are developed and updated in parallel from the WBS released in October 2012 [REF is missing]. These updates will constitute the changes to the cost and schedule baselines.

5.1.5.1 Functional Baseline

The Functional Baseline is the initially approved documentation describing the ESS system's top-level functional characteristics, its concepts of operations and the verification methods required to demonstrate the achievement of those characteristics. The ESS functional baseline is initiated by the Facility Requirement Document and the Facility Concepts of Operations document and after the Facility Functional Review.

The Functional Baseline applies to all software and hardware items where required

functional, constraint requirements are specified in a descriptive manner qualified by performance requirements. In this respect, the functional baseline initiated after the Facility Functional Review is enriched gradually by the requirements engineering activities at lower levels (use cases, functional decomposition).

When authenticated and placed under configuration control, the following information items establish the CI of the Functional Baselines:

- ESS validation strategy and plan document,
- Concept of Operations documents (use cases and associated models e.g. activities or operator/system interaction specifications), and
- System Requirement Documents.

Once the Functional Baseline is initially established at the Facility Functional Review (FFR), it is subsequently updated by functional reviews at lower levels and decisions made by the relevant CCBs.

5.1.5.2 Allocated Baseline

The Allocated Baseline for the ESS System applies to all software and hardware items where requirements from the Functional Baseline are broken down and allocated to elements of the system architecture, and the system design is provided in a descriptive manner. When authenticated and placed under configuration control, the following information items establish the ESS Allocated Baseline:

- System Architecture Specification documents,
- Interface Control Documents, and
- System Verification Plans.

The ESS Allocated Baseline is initially established upon completion of the first Preliminary Design Review (PDR). It is subsequently updated by PDR at lower levels and decisions made by the relevant CCBs.

5.1.5.3 Design Baseline

The Design Baseline for the ESS System applies to all software and hardware items where the Functional Baseline and the Allocated Baseline guide the implementation of the system. The Design Baseline is the formal design specification of the ESS system. This configuration baseline contains the manufacturing drawings, models, procedures, and specifications that will be used to build the system. When authenticated and placed under configuration control, the following information items establish the ESS Design Baseline:

- “As Designed” Database design description i.e. the System Design Description documents and related documents (drawings, CAD, mechanical, electrical and instrumentation designs),
- “As Designed” Source code,
- “As Designed” System Verification plans,
- “As Designed” Manufacturing Process specification if applicable,
- “As Designed” Manufacturing Verification Activities specification,
- “As Designed” System Operation and Maintenance manuals at the component level,
- “As Designed” System Requirement Documents,
- “As Designed” System Concepts of Operation Documents,
- “As Designed” System Architecture Specification documents,

- "As Designed" Interface Control Documents,
- "As Designed" System Analysis Reports if applicable,
- "As Designed" Application Programming Interfaces specifications (software ICD),
- "As Designed" System Integration Plans.

The Design Baseline is established upon completion of a pre-production audit of the design documentation in conjunction with the Critical Design Review (CDR) for any system prior to manufacturing or procurement [MDP]. It is subsequently updated by decisions made by the relevant CCBs.

5.1.5.4 Product Baseline

The Product Baseline for the ESS System applies to all software and hardware items where the Design Baseline has been evolved to reflect the "as built" products and provided in a descriptive manner. When authenticated and placed under configuration control, the following CI establish the ESS Product Baseline:

- "As Built" Database design description i.e. the System Design Description documents and related documents (drawings, CAD, mechanical, electrical and instrumentation designs),
- "As Built" System Verification plans,
- "As Built" Manufacturing Process specification if applicable,
- "As Built" Manufacturing Verification Activities specification,
- Manufacturing Verification Reports,
- "As Built" System Operation and Maintenance manuals,
- "As Built" System Requirement Documents,
- "As Built" System Concepts of Operation Documents,
- "As Built" System Architecture Specification documents,
- "As Built" Interface Control Documents,
- "As Built" System Analysis Reports if applicable,
- "As Built" Application Programming Interfaces specifications (software ICD),
- "As Built" System Integration Plans.
- Hardware product item as a PBS instance,
- Software product item as a PBS instance.

The Product Baseline is established upon completion of the first system manufacturing verification activity in conjunction with the Test Readiness Review (TRR). It is subsequently updated by other system manufacturing verification activity results (bottom-up).

5.1.5.5 Performance Baseline

The Performance Baseline for the ESS System applies to all software and hardware items where the Product Baseline has been evolved to reflect the "as verified" products. When authenticated and placed under configuration control, the following CI establish the ESS Performance Baseline:

- "As Verified" Database design description i.e. the System Design Description documents and related documents (drawings, CAD, mechanical, electrical and instrumentation designs),
- "As Verified" System Verification plans,
- "As Verified" Manufacturing Process specification if applicable,
- "As Verified" Manufacturing Verification Activities specification,

- "As Verified" Manufacturing Verification Reports,
- "As Verified" System Operation and Maintenance manuals,
- "As Verified" System Requirement Documents,
- "As Verified" System Concepts of Operation Documents,
- "As Verified" System Architecture Specification documents,
- "As Verified" Interface Control Documents,
- "As Verified" System Analysis Reports if applicable,
- "As Verified" Application Programming Interfaces specifications,
- "As Verified" System Integration Plans.
- System Verification Reports.
- "As Verified" Hardware product item as a PBS instance,
- "As Verified" Software product item as a PBS instance.

The Performance Baseline is established upon completion of the first System Acceptance Review. It is subsequently updated by completion of other system verification activities in conjunction their SAR. The System Acceptance Review –SAR- verifies the completeness of the specific end products in relation to their expected maturity level and assesses compliance to requirements (ESS verification). The SAR examines the system, its end products and documentation, and test data and analyses that support verification.

5.1.5.6 Operational Baseline

The Operational Baseline for the ESS System applies to all software and hardware items where the Performance Baseline has been evolved to reflect the "as validated" products issued after their commissioning. When authenticated and placed under configuration control, the following CI establish the ESS Operational Baseline:

- "As Validated" Database design description i.e. the System Design Description documents and related documents (drawings, CAD, mechanical, electrical and instrumentation designs),
- "As Validated" System Verification plans,
- "As Validated" Manufacturing Process specification if applicable,
- "As Validated" Manufacturing Verification Activities specification,
- "As Validated" System Operation and Maintenance manuals,
- "As Validated" System Requirement Documents,
- "As Validated" System Concepts of Operation Documents,
- "As Validated" System Architecture Specification documents,
- "As Validated" Interface Control Documents,
- "As Validated" System Analysis Reports if applicable,
- "As Validated" Application Programming Interfaces specifications,
- "As Validated" System Integration Plans.
- "As Validated" System Verification Reports,
- Results of the personnel training programme,
- Inspection results (spare provision, results of procedure audits),
- "As Validated" Hardware product item as a PBS instance,
- "As Validated" Software product item as a PBS instance.

The Operational Baseline is established upon completion of the validation activity i.e. commissioning in conjunction with the Operation Readiness Review (ORR). The ORR examines the actual facility characteristics and ensures that the ESS AB personnel and procedures have reached the required maturity.

5.1.6 On-Line Documentation

All technical configuration documentation will be available to all ESS programme team members through read-only on-line access via the CHESS platform. This will enable all team members to obtain and verify the latest approved version of controlled items:

- Access to CHESS: https://etapps1.esss.lu.se/enovia/common/emxNavigator.jsp

5.1.7 Development environment

At any point of time, the ESS construction occurs in a specific development environment provided by ESS AB and partners laboratories. While all support tools, associated manuals and documentation, operating environments, and supporting software are not under CM control, changes in the development environment e.g. new software versions are a concern for the ESS programme. In this respect, the impact of changes of a proposed new development environment must be assessed and communicated to the ESS programme.

5.1.8 Printing policy

Printed copies of documents under CM or any other support of communication of any CI like data in an Excel sheet shall be considered for reference only. It is the responsibility of users to ensure that they are handling the correct version of the data by checking its reference held on by CHESS.

6. CHANGE CONTROL

The establishment of a Change Control process ensures traceability of all changes, identification of the changes and management decisions, ensures appropriate information is available throughout the life of the project and that changes are properly assessed and managed.

The change control process is defined in the reference [CCP].

The change control process may be accelerated, if required, to accommodate urgent change requests. In urgent situations, an emergency CCB meeting is convened, consisting of the CCB chairperson and his designated participants. A change request is presented and evaluated. Action items may be identified and verbal approval granted contingent on the action items.

The risk configuration (risk register, associated actions and reports) is a sub-set of the configuration but its elements are not to be configuration item as they change through the development by nature. However, the elements of this sub-set of the configuration must be trace linked to the technical, cost and schedule configurations items to support the impact assessment of a change on these previous elements. Indeed, the work products related to risk management in the configuration are set up by the stakeholders regarding a specific configuration in time. In this respect, the owner of a risk related to a configuration item shall be involved in the impact assessment of a change.

The process for controlling the change is supported by CHESS/Enovia. It includes the following features:

- A description of and justification for the change;
- An evaluation of the consequences of the change (risk, technical, cost and schedule);
- Description of how the change should be implemented and verified.

Deviation and waiver requests are processed, categorized, approved and tracked in the same manner as other change requests.

A deviation is a programme approval to deviate from the approved design and occurs before the unit is built. The deviation differs from the normal change request in that it applies only for a limited quantity or limited time period.

A waiver is programme approval to waive a specific requirement because of a nonconformance that violates an approved requirement. Waivers are generated to built hardware, and are accompanied by a discrepancy report(s) referred in the System Status Report of the system of interest. Waivers are for a limited quantity or limited time period.

7. CONFIGURATION STATUS ACCOUNTING

7.1.1 Configuration Tracking

The CHESS platform provides the ability to track all changes to CIs. CHESS will contain information providing traceability and status of all change requests. On demand, reports on the change history of all CIs are generated so that the evolution of the system will be documented. Traceability reports might be generated either with CHESS/Magic Draw or CHESS/Enovia.

7.1.2 Configuration Status Reporting

7.1.2.1 System Status Reports

System Reports provides the main tool for the Engineering function to document and assess the status of the development of the systems. In this respect, it is an essential tool for the configuration management activities. The starting point for System Status Reports is the first version of the technical configuration of ESS. The System Status Reports then constitutes a summary of critical information relating to the configuration, changes and risks. System Status Reports shall cover the entire ESS system of systems and shall be available for all systems or groups of systems.

Basic requirements for the layout and content of a System Status Report are outline and defined in a document template available in CHESS/Library Central when such document is created.

The System Status Report with a Statement of Approval briefly summarizes the status of the system and provides a statement on the achieved results for the system, any restrictions, and a recommendation for the interpretation of the report for further decision making in the development, construction or commissioning processes.

7.1.2.2 Project Reports

On a monthly basis, Project Reports are issued by the project managers and will report the status of the risk, cost and schedule data. The Project Report addresses achievements for the past months and focus on expected achievements during the next three months at the date the report is issued. The Project Report details Performance Metrics of the project based on an earned value approach.

8. CONFIGURATION AUDIT

The Configuration Management activities are subject to Quality Audits. These may be performed at any time upon request from any process owner or someone responsible for part of a configuration management process. The purpose is to assess the application of the configuration management process and to ensure that corrective action, when necessary, is conducted through the configuration control process.

Each Project is responsible for ensuring the quality of the configuration management process at contributors and suppliers by means of e.g quality audits.

Each Configuration Audit will focus on a configuration item or set of configuration items.

9. ANNEX 1: ISSUER ENTITIES

Criteria for assigning the 3-4 letter code:

1. If entity already has a letter code, use it.
2. If no code exists, select 3 or 4 letters from name that do not conflict with existing codes and submit a request to your configuration managers for an update of the issuer entity list.

Issuer letter code	Issuer Entity	Country code
CEA	Commissariat à l'Energie Atomique et aux Energies Alternatives	FR
CNRS	Centre National de la Recherche Scientifique	FR
ESS	ESS AB	SW
KIT	Karlsruhe Institute of Technology	DE
TLS	Thales	FR

10. ANNEX 2: DOCUMENT TYPES

Criteria for assigning the 2-3 letter code:

1. If entity already has a letter code, use it.
2. If no code exists, select 2 or 3 letters from name that do not conflict with existing codes and submit a request to your configuration managers for an update of the issuer entity list.

Letter code	Description
AP	Assembly/CATproduct
BoM	Build of Material
CN	Change Notice
CO	Change Order
CR	Change Request
DWG	Drawing
ICD	Interface Control Document
MIN	Minutes
MP	Management Plan
PID	Piping and Instrumentation Diagram
SAR	System Analysis Report
SAS	System Architecture Specification
SCO	System Concepts of Operation
SDD	System Design Description
SIP	System Integration Plan
SOM	System Operation and Maintenance Manual

SP	Single Part/CATPart
SRD	System Requirement Document
SSR	System Status Report
STOS	System Trade Off Study
SVP	System Verification Plan
SVR	System Verification Report
SVS	System Verification Strategy and Plan

11. ANNEX 3: WBS ELEMENTS

Letter code	Description
ACCSYS	Accelerator project
CONVFC	Conventional Facilities project
ENERGY	Energy project
NSSPRJ	Neutron Science Systems project
INTCSS	Integrated Control System project
PROADM	Programme support
TARGET	Target project