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**2NLDR3**

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**Paper**

**DCT & WPDES Project Execution Plan**

Project Execution Plan for DEMO Design Work Package (WPDES).

<i>IDM Review &amp; Approval Process</i>		
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*Change Log*

**DCT & WPDES Project Execution Plan (2NLDR3)**

<i>Version</i>	<i>Latest Status</i>	<i>Issue Date</i>	<i>Description of Change</i>
v0.0	In Work	28 May 2020	
v1.0	Approved	06 Aug 2020	
v2.0	Approved	05 Jul 2021	Updated WBS and budget table following GA approval of the budget in April. Grant milestones and deliverables reflect the CWP.



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**DEMO Central Team (DCT) and Work Package  
DEMO Design (WPDES)  
Project Execution Plan (PEP)**

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Prepared by	A Beaumont
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## DOCUMENT APPROVAL RECORD

Name	Role	Signature
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## CHANGE LOG

Reason for and (short) description of changes(s)	Version	Date
First Issue	V1.0	06/08/2020
Updated WBS and budget table	V2.0	01/07/2021

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## ACRONYMS AND ABBREVIATIONS

Abbreviations used in the DCT and WPDES PEP.

Acronym	Definition
BB	Breeding Blanket
BoP	Balance of Plant
CAD	Computer Aided Design
CD	Conceptual Design
DC	Diagnostics and Control
DCT	DEMO Central Team
DDA	DEMO Design Authority
DEMO	Demonstration Fusion Power Plant
DIV	Divertor
HCD	Heating and Current Drive
MAG	Magnets
MAT	Materials
OGS	Other goods and services
PES	Plant Electrical Systems
SAE	Safety and Environment
SE	Systems Engineering
WBS	Work Breakdown Structure
WP	Work Programme / Work Package
WPBB	Work Package Breeding Blanket
WPDES	DEMO Design Work Package

**Table 0.1 – Acronyms and Abbreviations**

## 1 INTRODUCTION

### 1.1 Document Description

This document provides an overview of the objectives and the corresponding scope of work to be performed by the DEMO Central Team (DCT) and the Work Package DEMO Design (WPDES).

### 1.2 Intended Use of this Document

This document has been written to outline the activities that will be carried out by DCT and WPDES in the Conceptual Design (CD) phase. It is foreseen that this document will be reviewed and updated yearly throughout the duration of the CD phase.

## 2 WP DESCRIPTION

### 2.1 WP Objectives

- To assist the DEMO Project.

### 2.2 WP Description

The WPDES will support the DCT to advance the technical basis of DEMO in order to arrive to an integrated concept design so that detailed assessments of technical feasibility, reliability, safety, maintainability and costs can be progressively undertaken. WPDES consists of a set of activities, directed by the DCT, to be executed in the appropriate EUROfusion research units, universities and industry, the latter primarily through a dedicated Framework Services Contract<sup>1</sup>. The DCT will work in close collaboration with all WPs and organise frequent technical coordination meetings to discuss the evolution of the baseline design configuration, to resolve technical issues and coordinate the interfaces, to rapidly converge to a plant layout, including the architecture of the critical systems.

At least until the completion of the concept selection phase, the DCT will centralise the effort to define the architecture of systems that are critical for the definition of the overall plant and have a strong impact on its performance. These include Plasma, Containment Structures, Breeding Blanket, Divertor, Heating and Current Drive Systems and Magnets Systems. This architecting work will be managed using an agile methodology. The technology R&D will remain in the Work Packages (WPs). For a number of systems, with limited impact on the overall DEMO plant architecture, or where the system design competence is primarily in the Beneficiaries, such as Tritium Fuelling and Vacuum Systems, Balance of Plant, Plant Electrical System and Diagnostics and Control Systems, the responsibility for the design will remain with the respective WPs. Nevertheless, for these systems, technical input and coordination from the DCT is foreseen.

A proposal for the management of the activities is described in the DEMO Project Charter (1).

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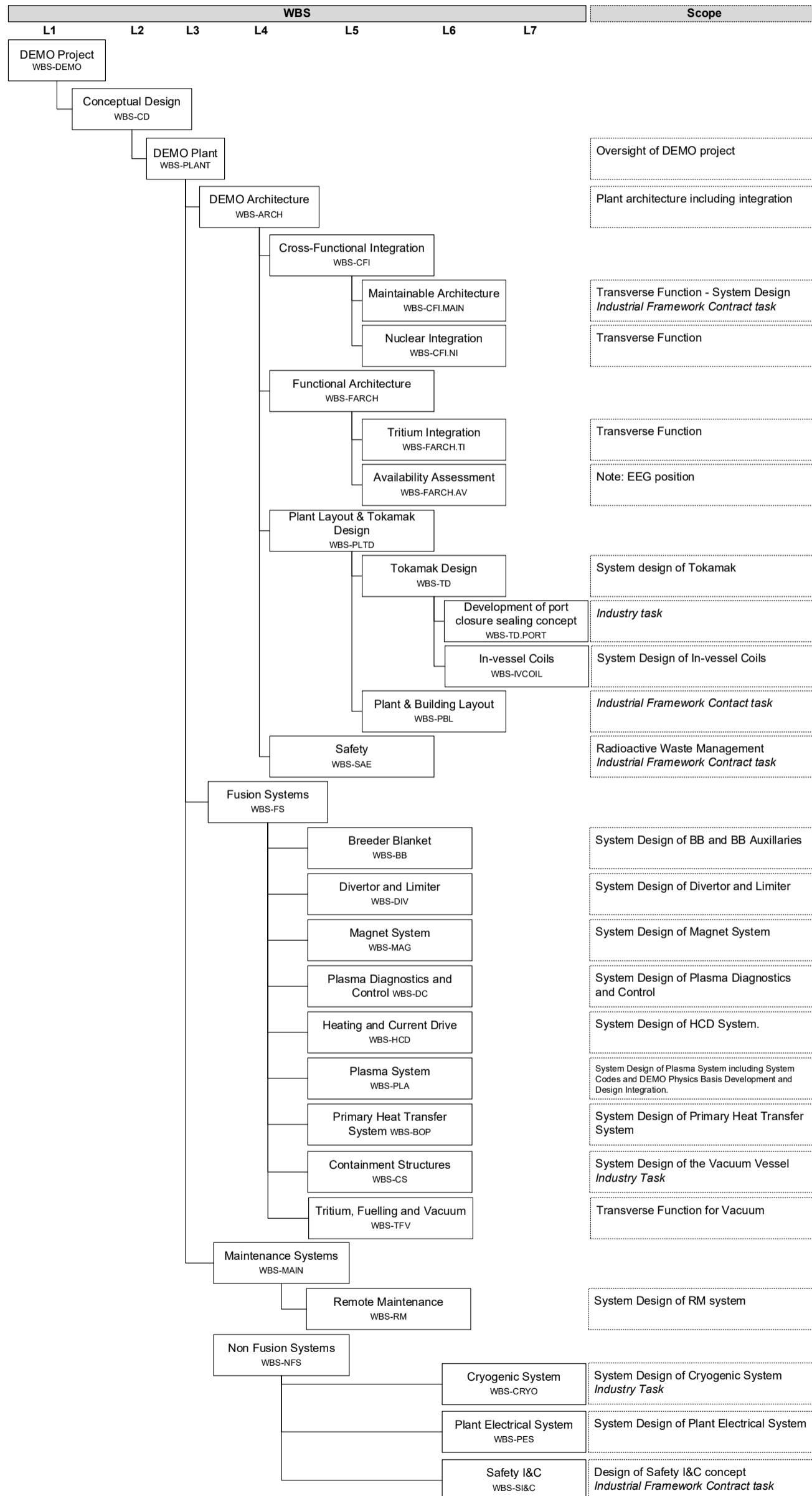
<sup>1</sup> The services of this Framework Contract will be provided in the form of individual work requests, based on technical specifications that will be the basis of individual task orders.



### 3 WORK BREAKDOWN STRUCTURE

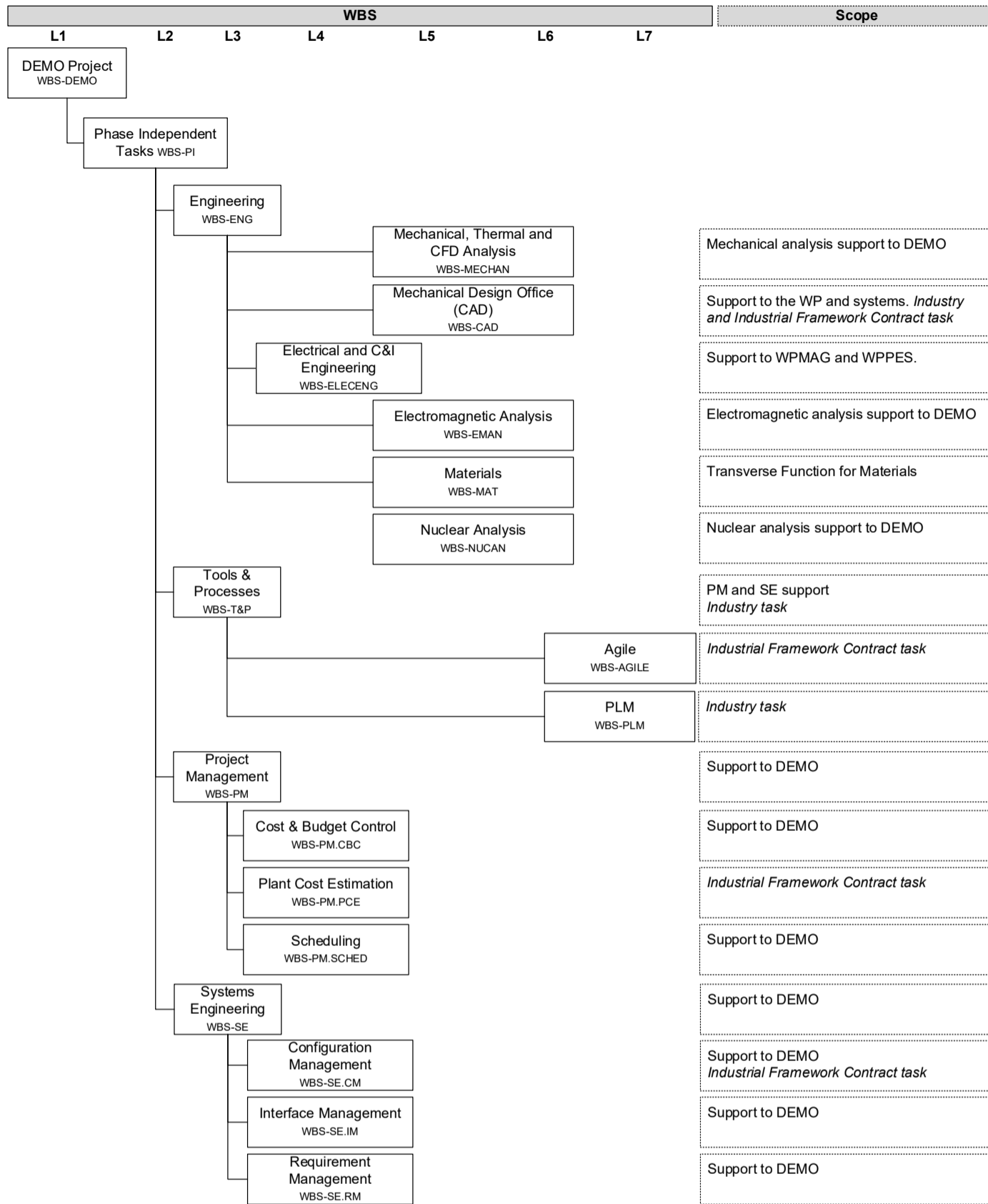
The Work Breakdown Structure (WBS) for DCT and WPDES is presented in Figure 3-1.<sup>2</sup> However, it should be noted that the activities of the WPDES should retain sufficient flexibility and be revised periodically to match the needs arising from the DEMO design evolution, as the CD progresses.

Figure 3-1 – WBS of DCT/WPDES activities



<sup>2</sup> Refer to DEMO WBS for the DCT and WPDES resourced WBS.

Figure 3-1 – WBS of DCT/WPDES activities (cont.)



## 4 SCHEDULE

### 4.1 Agile Methodology

Work shall be organised in an agile way to ensure efficient design iterations. It is foreseen to use in the feasibility phase (a) “sprints” and (b) internal reviews, supported by the DEMO Design Authority<sup>3</sup> to ensure rapid and impartial assessments.

### 4.2 List of Milestones and Deliverables

**Table 4.1 – DCT and WPDES Milestones**

Milestone ID	Title	Grant Milestone	Date
G2	DEMO Gate G2 review meeting completed	DES.M01	2024 <sup>4</sup>
G3	Gate G3	Yes	2027

**Table 4.2 – DCT and WPDES Deliverables**

Deliverable ID	Title	WBS ID	Grant Deliverable	Date
PM-D01	DEMO PEP	WBS-PM		2021
PM-D02	WPDES PEP <sup>5</sup>	WBS-PM	DES.D01	2021
SE.CM-D01	Project Change Dossier <sup>6</sup> - 2021 record	WBS-SE.CM		2021
SE.CM-D02	Project Change Dossier - 2022 record	WBS-SE.CM		2022
SE.CM-D03	Project Change Dossier - 2023 record	WBS-SE.CM		2023
SE.CM-D04	Project Change Dossier - 2024 record	WBS-SE.CM		2024
DEMO-D01	Technical Baseline 2024 <sup>7</sup>	WBS-DEMO		2024
DEMO-D02	Summary report on Technical Baseline 2024	WBS-DEMO	DES.D02	2024
PM-D03	Project Performance Baseline 2024 <sup>8</sup>	WBS-PM WBS-PM.PCE WBS-PM.SCHED		2024
PM-D04	Summary report on Project Performance	WBS-PM	DES.D03	2024

<sup>3</sup> Refer to DEMO Project Charter (1)

<sup>4</sup> G2 is allocated in a timeframe between H2 2024 to H1 2025, which cannot be fixed at the time of document production.

<sup>5</sup> This document will be subject to periodic revisions. This deliverable refers to the PEP approved in 2021.

<sup>6</sup> Every decision of the DEMO Design Authority that requires a modification of the baseline (e.g. down-selection of a variant, selection of an architecture) will be recorded in the Project Change Dossier.

<sup>7</sup> The technical baseline (T) gives the technical definition of the project and contains engineering documentation: requirements, drawings, schematics, bill of materials, data-sheets, etc.

<sup>8</sup> The project performance baseline (PP) defines the “project management” part of the project, incl. PEP, ERICA register and additional documents like schedule and cost estimate, etc.

	Baseline 2024	WBS-PM.PCE WBS-PM.SCHED		
T&P-D01	Management Baseline 2024 <sup>9</sup>	WBS-T&P WBS-PM WBS-SE		2024
T&P-D02	Summary report on Management Baseline 2024	WBS-T&P WBS-PM WBS-SE	DES.D04	2024
DEMO-D03	Knowledge Management Dossier	WBS-DEMO	DES.D05	2024
DEMO-D04	DEMO G2 Document Map report <sup>10</sup>	WBS-DEMO	DES.D06	2024
SE.CM-D05	Project Change Dossier - 2025 record	WBS-SE.CM		2025
SE.CM-D06	Project Change Dossier - 2026 record	WBS-SE.CM		2026
SE.CM-D07	Project Change Dossier - 2027 record	WBS-SE.CM		2027
DEMO-D05	Technical Baseline 2027	WBS-DEMO		2027
DEMO-D06	Summary report on Technical Baseline 2027	WBS-DEMO	Yes	2027
PM-D05	Project Performance Baseline 2027	WBS-PM WBS-PM.PCE WBS-PM.SCHED		2027
PM-D06	Summary Report on Project Performance Baseline 2027	WBS-PM WBS-PM.PCE WBS-PM.SCHED	Yes	2027
T&P-D02	Management Baseline 2027	WBS-T&P WBS-PM WBS-SE		2027
T&P-D03	Summary report on Management Baseline 2027	WBS-T&P WBS-PM WBS-SE	Yes	2027
PLM-D01	Product Life Cycle Management (PLM) Platform	WBS-PLM	Yes	2027

<sup>9</sup> The management baseline (P) defines “how” things are organized and must be done in the project. At a high level, it defines the governance of the project, at a lower level, it contains in general procedures to follow by all actors of the projects.

<sup>10</sup> This deliverable maps out the complete baseline reporting submitted at Gate G2.

## 5 FACILITIES, INDUSTRY AND INTERNATIONAL COLLABORATION

### 5.1 Facilities

**Table 5.1 – Facilities used to carry out DCT & WPDES activities**

Facility Name/ Location	R&D Activities	Planned period(s) of use	Deliverable(s)
n/a	n/a	n/a	n/a

### 5.2 Industrial Involvement

Industrial partners shall participate in project activities as indicated in Table 5.2 and Table 5.3.

**Table 5.2 – Work Package activities foreseen to be part of the Industrial Framework Contract**

WP Activities	Planned period(s) of engagement	WBS ID
DEMO Complex Building Design	2021 - 2024	WBS-PBL
Safety Analysis	2021 - 2024	WBS-SAE.S
Tools for agile design methodologies	2021 - 2024	WBS-AGILE
Tokamak Building Design Pressure Choice	2021-2024	WBS-PBL
Plant systems & geometrical integration services	2022 - 2024	WBS-PBL
Design office services to support the central team	2021 - 2024	WBS-CAD
Cost estimation services	2021 - 2024	WBS-PM.PCE
Configuration management services	2022 - 2024	WBS-SE.CM
Safety & licensing support	2022 - 2024	WBS-SAE.S
System design (cooling water, safety & convent. systems)	2022 - 2024	WBS-BOP.S
Preliminary Design of Safety Mitigation System	2022 - 2024	WBS-SI&C
Maintenance strategy concept inside bioshield	2022 - 2024	WBS-CFI.MAIN

**Table 5.3 – Work Package Industrial Activities outside of the Framework Contract**

WP Activities	Planned period(s) of engagement	WBS ID
Development of port closure plate sealing concept	2021 - 2025	WBS-TD.PORT Note: Subcontracting
Conceptual design of the Vacuum	2022 - 2025	WBS-VV.S



Vessel		Note: Subcontracting
Cryogenic Plant and Cryo-distribution Systems	2021 - 2025	WBS-CRYO Note: Subcontracting
Execution of key project management and system engineering activities	2021 - 2025	WBS-T&P Note: Subcontracting
Set-up and configure a PLM system	2022 - 2025	WBS-PLM Note: Subcontracting
DEMO design activities with CAD in support to DCT	2022 - 2025	WBS-CAD Note: Other Goods and Services (OGS)
Dedicated R&D on fabrication techniques fabrication methods - manufacturing trials	2024 - 2025	Note: OGS
Stiction / bonding tests to validate (PoP) in-vessel component interfaces	2022	Note: OGS

Commented [BA1]: Is this correct or will it be LTP?

### 5.3 International Collaboration

Table 5.4 – Work Package International Collaboration

Country	Description of Collaboration
n/a	n/a

## 6 BUDGET

Table 6.1 and **Error! Reference source not found.** summarises the planned budget of WPDES and DCT. The values shown here were agreed by the General Assembly on 6<sup>th</sup>/7<sup>th</sup> April 2021. It is important to note the following:

- i. The table includes the employment and secondment costs of the members of the DCT to Garching;
- ii. The EC Industry Framework budget (worth 10.5M€) will be deducted, because the EC decided to fund these activities outside the Eurofusion Grant Agreement.

**Table 6.1 – DCT and WPDES Project Budget**

Year	PPY @ 70%	PPY @ 100%	Total PPY cost [k€]	Total Eq./OGS @ Cost [k€]	Total Missions Cost [k€]	Indirect Costs (k€)	Unit Costs [k€]	Subcontracting 100% (k€)	Total Resources (k€)
2021	38.3	17.4	4,253	350	23	1157	720	480	6,983
2022	46.1	28.8	5,570	650	47	1,566	900	480	9,213
2023	50.3	30.9	6,093	500	52	1,661	1,080	480	9,866
2024	55.1	30.9	6,476	575	57	1,777	1,200	480	10,565
2025	56.2	31	6,606	575	62	1,811	1,200	480	10,734
<b>TOTAL</b>	<b>245.9</b>	<b>139</b>	<b>28,998</b>	<b>2,650</b>	<b>241</b>	<b>7,972</b>	<b>5,100</b>	<b>2,400</b>	<b>47,361</b>

## 7 REFERENCES

1. DEMO Project Charter Proposal, EFDA\_D\_2P3ZEP.
2. DEMO Project Execution Plan, EFDA\_D\_2NV475.