

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision		01
	Process owner	Director AURORA	Page: 1 van 14		
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	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 2 van 14		
Controlled copy available on SharePoint					

Contents

1	Introduction/ Background	3
2	Objective and scope of this document	3
3	Project Overview	3
4	Project Objectives	4
5	General process description	4
6	Overall Project Scope	5
6.1	Project scope development	5
6.2	User Requirement Specification	6
6.3	FEL 2 (Basis of Design)	6
6.4	FEL 3 (FEED + Project Proposal)	6
6.5	Construction	6
6.6	Ramp up and Production	6
7	FEL3 Scope	6
8	FEL3 Organisational outlook	7
9	Objectives for PMC	7
10	Tasks and Deliverables	8
10.1	General	8
10.2	Project Governance requirements	8
10.3	Project Execution Planning	8
10.4	Due diligence	8
10.5	Vendor/ Contractor selection	8
10.6	Interface management	9
10.6.1	Main contractor	9
10.6.2	Client team	9
10.7	Design Integrity	9
10.8	Quality Assurance and Control	9
10.9	Studies and workshops	10
10.10	Documentation management	10
10.11	Commissioning & Start-up preparation	10
10.12	Readiness assurance	10
10.13	Progress management & Reporting	10
10.13.1	Resource plan	11
10.13.2	Schedule	11
10.13.3	Earned Value Management	11
10.13.4	Cost control	11
10.13.5	Change management	11
10.13.6	Reporting	12
10.13.7	Meetings	12
10.14	Risk management	12
10.15	Estimating preparation, budgeting and reviews	12
10.16	Procurement management	13
10.17	Contracting approach and Contract preparation	13
10.18	Stakeholder management	13
10.19	HSE	13
10.20	Regulatory requirements	13
11	Abbreviations	14
12	References	14

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 3 van 14		
<i>Controlled copy available on SharePoint</i>					

1 Introduction/ Background

AEB is planning to develop a Post Combustion Carbon Capture plant. The intent is to capture 480.000 ton CO₂ annually from its flue gases. The captured CO₂ shall be transported, injected and stored in a depleted gas field in the North Sea. For AEB this project is important as the capture and storage of CO₂ guarantees continuity for its operations. Without this project, the increasing cost for CO₂ emission will jeopardize AEB's profitability.

2 Objective and scope of this document

This document describes the scope of work for the PMC and their associated roles and responsibilities. It covers the period in which the project commences from Stage Gate 2 and typically award of this contract, up to closure for Stage Gate 3, which means the fully delivered FEL3 scope as per the scope described in this document. This documents also describes the relationship between the three parties (Main Contractor, PMC and Client team), and serves as the Terms of Reference for Client and PMC.

3 Project Overview

AEB is exploring opportunities to lower its CO₂ emissions and contribute to circularity. AEB has applied for a SDE++ subsidy which was granted in 2022. The subsidy covers the capture and storage of a total of 7.200.000 ton CO₂ in 15 years, starting in 2028. To meet the aforementioned capture and storage requirements, AEB is developing a Post Combustion Capture plant (PCC) with a capacity of approximately 480.000 ton CO₂/year.

Figure-1 shows the proposed location of the PCC (red marked). Flue gas will be derived from both the AEC and HRC flue gas stack.



Figure - 1 Location CO₂ capture plant

For transport and storage, AEB aims to enter into contracts with a chain of potential partners.

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 4 van 14		
Controlled copy available on SharePoint					

4 Project Objectives

The main objective of the project is to ensure continuity of AEB;

- By realizing CO₂ capture and storage within a predetermined time/money/quality/safety
- With CO₂ reduction, we help our customers to become greener and contribute to circularity.

The objective is to deliver the facility to Operations beginning 2028 (after commissioning), with respect to the schedules of the transport and storage parties. As a direct consequence of this target, construction (and Detail Design) will have to start in the third quarter of 2025. This requires FEL3 to finish in Q1 2025, allowing enough time for approvals and FID. The plan is to commence with FEL3 in Q2 2024.

The technology shall at least be at readiness level 8, considering the technology (amine scrubbing) at TRL9, but the application and size of the plant are relatively new (flue gases), which reduces the technical readiness level slightly.

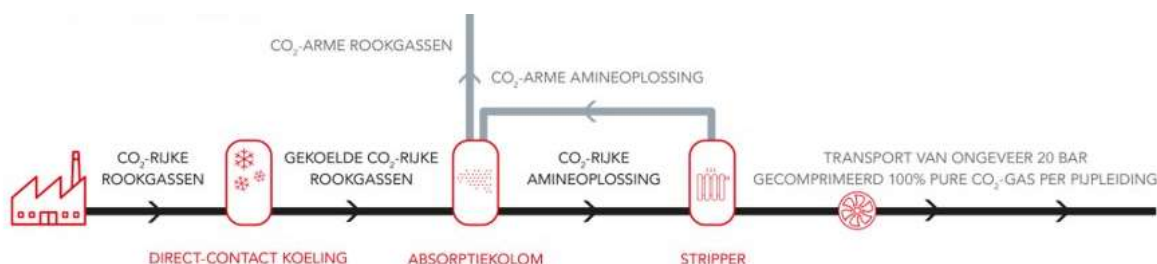
The plant shall be designed in such a way that construction on site is limited to the shortest possible period. This could be achieved by modularized designs, prefabrication, skids etcetera. Tie ins shall be planned as efficiently as possible, which means these designs shall be ready for implementation during planned maintenance shutdowns.

The plant design shall be fit for purpose and use, and although this is simply applying logic, no gold plating is allowed.

5 General process description

Flue gases from the six waste incinerator lines will be collected from six tie-in points to a trunk line and routed to the PCC plant. The PCC plant consists of several subunits, such as Pre-Treatment, CO₂ Absorption, Regeneration, Raw CO₂ Purification and Raw CO₂ Compression and Drying. The gaseous CO₂ Product will be sent to the downstream pipeline up to the injection point (pipeline is out of scope).

A simple Block Flow Diagram of the PCC plant is shown in the figure below.



The amine-based post-combustion CO₂ capture process consists of the following process steps:

Flue Gas Extraction: Flue gases are generated from the incineration of waste materials in a waste-to-energy (WtE) facility. The WtE facility consists of six separate waste incineration lines. All flue gases pass state-of-art flue gas cleaning systems and meet the flue gas emission limit values in the environmental permit of AEB Amsterdam. Six tie-ins with open-close valves enable the extraction of flue gasses from the various incineration lines and are transported by means of a common truckline towards the PCC plant.

Flue Gas Pre-Treatment: Before entering the carbon capture system, the flue gases may undergo pre-treatment to remove particulate matter, sulfur compounds, and other impurities. This helps to protect the equipment and enhance the efficiency of the carbon capture process.

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 5 van 14		
<i>Controlled copy available on SharePoint</i>					

Flue Gas Cooling: The pre-treated flue gases are cooled to a temperature suitable for the subsequent absorption process. Cooling may also help to condense water vapor present in the flue gases.

CO2 absorption: The cooled flue gases are introduced into an absorption column or tower, where they come into contact with a liquid amine solution. The amine solution selectively captures CO2 from the flue gases, forming a loaded or rich amine solution.

CO2 regeneration: The rich amine solution is heated to release the captured CO2 through a process called stripping. The regenerated or lean amine solution is then cooled for reuse in the absorption unit.

CO2 conditioning: The concentrated gaseous CO2 stream, separated during the regeneration process, is now available for further handling. This stream must be compressed and impurities must be removed to meet the specs of the offtaker of the gaseous CO2.

Byproduct Handling: Depending on the specific amine used, there may be some byproducts or impurities in the process. These need to be managed appropriately, and treatment steps may be included in the overall process design.

Continuous Operation: The entire process operates continuously to capture CO2 emissions from the waste incineration flue gases while maintaining the efficiency of the amine solution through regeneration, recirculation and reclaiming.

6 Overall Project Scope

A high-level project scope description is provided below. It covers PCC and its implementation in an existing WtE facility, procurement, supply chain and project management items.

The project is considered a brown field project. Although most works are centralized on an existing empty plot, there are a considerable number of interfaces with the existing plant. This requires the design team to emphasize the importance of safety in design and execution.

6.1 Project scope development

The project utilizes the Front-End Loading (FEL) methodology:



Figure 1 Front End Loading

FEL 1 has been closed. During this phase the business case has been developed and scope determined for FEL 2. At the start of FEL 2 a URS was developed and agreed upon. Subsequently the URS served as the BoD which has also been formally signed and will now serve for the FEED during FEL 3. For more details see the paragraphs below.

All project deliverables, technical documentation and business case validation has led to a full suite of documents to be presented at stage gate 2. Stage gate 2 is planned for Q1 2024.

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 6 van 14		
Controlled copy available on SharePoint					

6.2 User Requirement Specification

The basis for the scope is stated in the User Requirement Specification (URS). It was developed based on the pre-FEED study and thereafter further developed by AEB SME's and the Aurora project team. It serves as the basis for the Basis of Design (BoD).

6.3 FEL 2 (Basis of Design)

The development of the BoD was done by an external engineering contractor in close collaboration with the Aurora project team. After development of the BoD a review was conducted by AEB's subject matter experts finalizing the BoD. The BoD is a conceptual design and serves as the basis for the FEED.

6.4 FEL 3 (FEED + Project Proposal)

FEL 3 comprises of two main deliverables, the FEED and a Project Proposal. The FEED is a further development of the BoD, with the objective to decide on key elements, such as materials selection, sizes, equipment and layout. Subsequently the FEED package gives directions to the Detail Design. The FEED package serves as input for estimating, scheduling and the other items that are part of the Project Proposal. The FEED covers more than half of the projects' schedule for FEL 3.

During the remainder of this schedule, the Project Proposal shall be developed. The project proposal comprises of the Execution plan, Risk management, Schedule development, Estimating, contract preparation and all other deliverables that support the main objective of this phase, being a well-informed FID.

6.5 Construction

After development of the FEED and after FID, the Main Contractor is awarded the contract for the construction. This phase consists of the detailed design, construction, start-up and handover of the PCC. The exact scope for this phase is developed during FEL3.

6.6 Ramp up and Production

After Detail Design, Commissioning and Handover, the plant shall go into operations. This phase starts with the ramp up and ends at a stable operating plant. The requirements for this phase shall be further developed during FEL 3.

7 FEL3 Scope

FEL 3 comprises of two main deliverables, the FEED and a Project Proposal. The FEED is a further development of the BoD, with the objective of deciding on key elements, such as materials selection, sizes, equipment and layout. Subsequently the FEED package gives directions to the Detail Design. The FEED package serves as input for estimating, scheduling and the other items that are part of the Project Proposal. The FEED covers more than half of the projects' schedule for FEL 3.

During the remainder of this schedule, the Project Proposal shall be developed. The project proposal comprises of the Execution plan, Risk management, Schedule development, Estimating, contract preparation and all other deliverables that support the main objective of this phase; a well-informed FID.

The main deliverables and their objectives for this phase are the following:

1. FEED: Develop the design up to a level where all design parameters are clear, with the objective to have a clearly defined basic design that serves as the starting point for detail design.
2. Project proposal: Prepare a Project Proposal, based on the FEED, with the objective to have a clear understanding of Capex / Opex as input for the Business Case and also for awarding a contract for the construction phase.
3. Supply chain contracts: Close supply chain contracts so costs/ requirements are clear as they are input for the business case.
4. Business Case: Update the business case, and all underlaying information, up to a level where a well-informed FID can be taken.

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 7 van 14		
<i>Controlled copy available on SharePoint</i>					

Refer to the FEL 3 scope of work for more details (ref. 1: AUR_PMO_SOW_001).
The FEL 3 Scope of work describes all work and associated deliverables for FEL3. It covers the FEED and the Project Proposal, including procurement/ contracting, supply chain and project management items.
FEL3 ends with stage gate 3.

8 FEL3 Organisational outlook

The full project scope of the project will be executed by an Integrated Project Team (IPT, 'Bouwteam'). The IPT comprises of three main parties, Client team, Main contractor and the PMC. Herewith the overall roles of the three parties:

- Client team: The client teams' main role is to ensure the scopes are executed in compliance with contractual agreements between parties.
- Main contractor: The Main contractor is responsible for executing the actual projects' scope as per their Scope of work.
- PMC: Responsible for the adherence to the Scope of work by the main contractor and overseeing and managing the total FEL3 projects' scope from a technical and managerial perspective, including all interfaces.

The client team consists of two (2) groups; The core team and the wider AEB team members.

The core team composition:

- Project manager
- Project Engineering manager
- Technologist/ SME ISBL
- Technologist/ SME OSBL
- Contract Manager
- Permitting SME
- Finance representative
- Operations liaison/ C&SU manager
- Market SME
- Admin support
- Project Director

AEB has several departments in a functional organisation setting that occasionally the IPT will have to liaise with:

- Risk & Performance
- Maintenance
- Operations
- Safety, Health, Environmental and Quality
- Legal
- Finance
- Project board
- Advisory board

From a project governance perspective, a project board and an Advisory board have been established.

9 Objectives for PMC

During this phase of the project (FEL3) the Main contractor shall deliver the following main artefacts:

- FEED (Front End Engineering Design) and all its associated documentation
- Requisitions main equipment (10pcs)
- Project Execution Plan (overall project)
- Schedules
- Proposal

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 8 van 14		
Controlled copy available on SharePoint					

The objective of the PMC is to ensure the aforementioned suite of artefacts are consistent, complete and in line with contractual agreements between client and the Main contractor. The PMC shall also ensure that the documents are fit for purpose. The role of the PMC is to manage the contract and the scope of the Main contractor. The PMC reports to the client on forecast, adherence, technical completeness, decision making and design integrity.

It is assumed that the following roles/ functions shall be added to the PMC-team:

- Project/ interface manager
- Contracts specialist
- Engineering manager
- Scheduler
- Cost controller
- Document controller
- Engineering capacity (advice/reviews)

10 Tasks and Deliverables

10.1 General

The following chapters highlight the requirements, Tasks and deliverables.

10.2 Project Governance requirements

The scope shall be executed according FEL-methodology. Project management methodology/ by industry most accepted (best) practices shall be implemented (based on PMI/IPMA or equivalent). The PMC is tasked with delivering guidance to the rest of the IPT, with full team alignment as a result.

10.3 Project Execution Planning

In close coordination with Client and Main contractor, PMC will prepare a project execution plan, including a level 4 schedule, based on a document control list and Work breakdown structure. The FEED portion and the overall scope delivered by the Main contractor will be planned by the Main contractor and embedded in an overall schedule. PMC is responsible for completeness, consistency and the right level of detail enabling full control of the schedule, forecasting and reporting progress.

The following deliverables shall be prepared by PMC:

- Project Execution Plan FEL3 (within 4 weeks after award)
- Work Breakdown Structure FEL3 (within 4 weeks after award)
- Level 4 schedule FEL3 (within 4 weeks after award)
- Level 3 schedule Construction Phase
- Project Execution plan Construction Phase (serves as reference)
- Scope of Work Construction Phase

10.4 Due diligence

PMC will ensure that the Main contractors' works are adding value to the project. The technical solution, provided by the Main contractor, shall meet the requirements as per the BoD. Therefore, the PMC shall support the Main contractors' BoD validation. The Main contractor can potentially identify items that are subject to change. PMC will manage these items and ensure the Main contractor eventually takes ownership of the BoD as presented with the by client agreed changes.

10.5 Vendor/ Contractor selection

Several (sub-) contracts will be entered. For these contracts, Scopes of work will have to be produced by the main contractor and/or client*. PMC will review these contracts on completeness and correctness. The following contracts are expected to be developed (not limited to):

- Laser scanning
- Underground radar mapping
- Geotechnical reports
- Soil reports

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 9 van 14		
<i>Controlled copy available on SharePoint</i>					

*PMC could be requested to deliver the SoW for any of the (sub-) contractors if required.

10.6 Interface management

Initially, three parties are identified; Main contractor, PMC and client team. The following specific interfaces require coordination or attention (specific roles and responsibilities per interface are states ad required):

10.6.1 Main contractor

The Main contractor will potentially have some subcontracts for their part of the scope - apart from the contractor for the civil part of the work. The most likely subcontract will be the FEED contractor. There will be potential Main contractors that have their own engineering capabilities. In case of a main contractor that subcontracts the FEED, the interfaces between main contractor and this FEED subcontractor are full responsibility of the Main contractor. All other Main contractors' subcontracts are at the sole responsibility of the Main contractor.

RFI/Queries from these subcontractors are therefore full responsibility of the Main contractor, although practically the engineers will most likely communicate with the PMC directly, as these would be part of the IPT. The PMC shall manage the communication between the Main contractor and the client team.

10.6.2 Client team

The PMC shall communicate with the client team daily (see organisational outlook). Whenever required, PMC will have to organize communication with and information from/to departments within the wider AEB.

From a project governance perspective, a project board (PB) and an Advisory board (AB) have been established. Communication with PB is full and sole responsibility of the client team. For the AB the PMC might be requested to support and/or attend the monthly session.

Other interfaces are:

- Omgevingsdienst (OD – permits): Communication would normally be through the client team, but on occasion the PMC could be requested to attend meetings or support for the environmental permit(s) and later for the construction permit.
- Municipality of Amsterdam: Regular meetings and issuance of documentation are managed by the client team. The PMC could be requested to support preparation and/or attending meetings.
- Other external parties are considered to be managed by the client team.
- Project board
- Advisory board

10.7 Design Integrity

Although *design integrity* is the sole responsibility of the design contractor for the FEED (potentially subcontracted by Main contractor), eventually the full IPT carries the responsibility for the design, hence this is a combined effort by all parties involved. Specific responsibilities are listed below:

- Main contractor/ FEED: End responsible and accountable for the design and its integrity.
- PMC: Responsible for following safety in design principles and assuring all have been applied as per best industry practices.
- Client: Assuring all required data has been made available and the right authorities have been consulted within AEB and beyond, if required.

10.8 Quality Assurance and Control

The main contractor will ideally utilize their own QA/QC systems, which includes their own procedures, tools and systems. Where and when required, and in case the main contractor is unable to provide the aforementioned, the PMC shall provide their systems, tools and procedures to ensure the project is executed in a robust and smooth manner.

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 10 van 14		
Controlled copy available on SharePoint					

It is assumed that the FEED shall progress in three (3) review cycles, 30, 60 and 90%. Although the Main contractor is responsible for correct implementation of comments, responses to clarifications and design errors, the PMC is responsible for the process and management of these comments via comments reconciliation and management practices.

The main contractor is and stays responsible for the design, the PMC is responsible for assuring the technical completeness of the design and the associated scope(s).

Once the FEED and the associated scopes are developed, the PMC shall conduct a PDRI-review (or equivalent). The score depends on the system used, but should indicate that the package is complete, fit for use and purpose, and at the right level of detail to develop a Class 1 or 2 estimate (AACE).

10.9 Studies and workshops

During FEL3 several studies will have to be conducted. If not part of the FEED, the PMC shall coordinate and document these.

10.10 Documentation management

The PMC is responsible for document management. This entails coordinating, storing, filing and distribution of all project and technical documentation for the full project. It is assumed that document distribution of information between Main contractor and client are also managed through this same route.

The PMC shall use their own tools, systems and procedures to manage and facilitate this process. All contributors shall gain access to this system.

Configuration management is the responsibility of the main contractor, but the PMC shall ensure that all changes are implemented on all documents if and when required. The PMC shall maintain a list of changes with the objective to track these changes and proof of correct implementation.

The PMC shall extract (or develop) a Document Control List (DCL) from its system. This DCL shall contain all forecasted deliverables and serve as the basis of document distribution and progress reporting.

10.11 Commissioning & Start-up preparation

Start-up preparation entails the initial start-up planning, with respect to the overall project plan, and whatever is required for a smooth start up.

The Main contractor is responsible for the development of the commissioning plans, handbook and (turn over-) systems. The PMC will support this development but is mainly tasked with the reviews. During FEL3 this only entails the preparation of the documents and systems. Details will follow during Detail Design.

10.12 Readiness assurance

The PMC shall collaboratively work with the IPT to develop a readiness assurance plan. The PMC takes ownership and responsibility of the readiness assurance plan, which will consist of the following items:

- Overall Readiness assurance plan system
- Checklists for RFSU (Readiness For Start Up)
- Operations training plan
- Define Operational systems and requirements
- Hold & Witness points
- Maintaining the Review Action Database

10.13 Progress management & Reporting

The PMC is responsible for the overall coordination, progress and reporting. Reporting covers the full IPT, which includes the main contractor, subcontracts, services and the PMC. All related artefacts shall be updated on a regular basis, whereas this frequency is determined by the need and logic. AEB prefers to use the PMC's systems, tools and procedures, as these are well known to the PMC's team. Below are the minimal requirements and their frequency of updating/ publishing.

	AUR_CON_SOW_001 – PMC					
	Document owner	PMO – AURORA		Revision		01
	Process owner	Director AURORA		Page: 11 van 14		
<i>Controlled copy available on SharePoint</i>						

10.13.1 Resource plan

A resource plan shall be developed and maintained throughout FEL3. The resource plan shall cover the full FEL 3 phase and contain at least the following items:

- All IPT resources
- Manhours per resource
- (Sub-) contracts
- Services
- Actuals (hours)
- Estimate to complete plotted over time

The resource plan shall be updated at least bi-weekly, and published on a monthly basis as part of the month report, and published for use after agreement with the client within the mobilisation period.

10.13.2 Schedule

A schedule shall be developed and maintained throughout FEL3. The schedule shall cover all activities and deliverables for the full project, which includes the activities of the main contractor, PMC and client. The schedule will be at a level 3 or 4 (depending on definition). The schedule shall be developed in Primavera, and published for use after agreement with the client within the mobilisation period.

The schedule shall be updated at least bi-weekly, and published on a monthly basis as part of the month report.

10.13.3 Earned Value Management

The DCL and the schedule serve as the basis for Earned Value Management. How this is exactly implemented shall be discussed during mobilisation. Actual manhours are to be derived from weekly approved timesheets. The PMC shall propose their approach, which shall at least contain the following metrics:

- Cost performance indicators
- Schedule performance indicators
- Engineering efficiency
- Team performance
- Budgeted manhours
- Estimated To Complete (Manhours)
- Estimate At Completion (Manhours)
- Approved changes

The proposed EVM methodology shall be part of the proposal package (tender), but to be agreed within 4 weeks after award. The DCL shall be published for use after agreement with the client within the mobilisation period.

10.13.4 Cost control

Both the Main contractor and the PMC will, as part of the tender, submit a proposal, which shall serve as the control budget. This control budget, schedule, resource plan and progress measurement shall be the basis for cost reporting. The PMC is responsible for development of an s-curve and the analyses of actuals versus Planned, forecasted hours versus planned etc. Although the PMC is not responsible for overruns by the Main contractor, the PMC is responsible for reporting, analyses, claims resolution and coordinating the development of recovery plans. Obviously the PMC is responsible for all the aforementioned related to the PMC's contract.

10.13.5 Change management

Any changes to the scope documents (overall FEL3 scope, scope main contractor and this document) are subject to change management. In addition, changes to the approved and agreed schedule and the DCL shall be discussed and agreed prior to commencing the associated works. Only approved changes shall be added to the project artefacts. Overruns that cannot be explained shall also be captured as changes.

	AUR_CON_SOW_001 – PMC					
	Document owner	PMO – AURORA		Revision		01
	Process owner	Director AURORA		Page: 12 van 14		
Controlled copy available on SharePoint						

10.13.6 Reporting

The PMC shall propose a reporting procedure within 4 weeks after award. The proposal shall consist of a procedure and associated templates. The reports cover the full IPT. The PMC shall at least develop and publish the following:

1. Weekly highlight report (published every Tuesday before COB):
 - a. Achieved last week
 - b. Actuals (hours)
 - c. Planned coming week
 - d. Main concerns and risk
2. Monthly report (within 5 working days in the consecutive month):
 - a. Achieved last Period
 - b. Actuals (hours)
 - c. Planned coming Period
 - d. Main concerns and risk
 - e. Schedule analyses (incl. CPM/CPA) and recovery
 - f. Man hour histograms and s-curve
 - g. EVM report
 - h. Cost analyses and recovery
 - i. Changes
 - j. Risks & concerns
 - k. Presentation that captures the above (shall be used for all meetings in the subject period)

Both reports shall be issued for approval to the client team - project manager. The approval or rejection shall follow within 48 hours.

10.13.7 Meetings

The following meetings are minimal required:

1. Weekly progress meetings: attendance by all that are working on activities within the discussed period. This is a short meeting (maximal 1 hour) to share any issues that may arise and impacting safety, progress, cost or quality. In this meeting an action and decision register shall be updated and maintained by the PMC.
2. Monthly progress meetings: Full team attendance. The PMC presents the presentation that was issued with the monthly report.
3. Financial meeting: Project management of all parties to attend, and present their status and forecast.
4. Technical meetings: Weekly, but only if required.

The PMC shall draft Terms of References (ToR) for all meetings listed. These ToR shall be concise, clear and fit for purpose. These are simple documents that trigger preparation and clearly set the requirements for the meetings. The PMC shall manage, coordinate and minute these meetings.

10.14 Risk management

The PMC shall coordinate and facilitate risk management for the full project. A risk management plan shall be developed with associated templates. The PMC shall propose a procedure within 4 weeks after award. The proposal shall consist of a procedure and associated templates. A risk register shall be maintained throughout the project. Mitigation plans shall be initiated and implemented. PMC is responsible for the coordination of these.

10.15 Estimating preparation, budgeting and reviews

The PMC shall coordinate the development of the management cost estimate. This cost estimate serves as a counter estimate and preparation for FID. This estimate consists of the full capex estimate from FID until full acceptance by AEB-operations, and the opex costs including identified potential future reinvestments. This estimate shall be based on an accepted FEED. It is expected that for the main equipment requisitions will be produced by the main contractor (10pcs). The FEED and these requisitions will have to be reviewed on completeness, quality and fit for use.

	AUR_CON_SOW_001 – PMC				
	Document owner	PMO – AURORA	Revision	01	
	Process owner	Director AURORA	Page: 13 van 14		
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10.16 Procurement management

Procurement is not part of the scope for PMC, although there might be some services where the PMC will be requested to support development of scopes and/or negotiations.

10.17 Contracting approach and Contract preparation

The client team and PMC will have early conversations about the most suitable contracting approach for the construction phase. Once agreed, the contract documents will be developed. The PMC shall prepare the contract document, Terms and Conditions and all other required documents for the 2nd phase after FEL3, being the details design, procurement and construction.

10.18 Stakeholder management

The PMC shall support and facilitate stakeholder management, but client team is responsible for implementation and execution.

10.19 HSE

The PMC shall develop all required mandatory HSE plans and coordinate all HSE tasks. This includes specific requirements as per Dutch legislation (i.e. art. 2.30 Arbeidsomstandighedenbesluit). The plans shall be reviewed by AEB's SHEQ representative and the client team.

10.20 Regulatory requirements

The project is subject to WABO legislation. The environmental permit applications have been submitted, pending publishing and approval. It is likely that during the FEL3 phase of the project additional requests are made or requirements might change. These will not be part of the scope, but AEB might request some support in this regard.

A construction permit will have to be obtained as part of WABO. The PMC shall prepare this permit application in close coordination with the Main contractor (sizes, weights, plotplan, schedule etc) and the client team. The PMC is responsible for timely application and completeness of the package.

	AUR_CON_SOW_001 – PMC				 	
	Document owner	PMO – AURORA		Revision		01
	Process owner	Director AURORA		Page: 14 van 14		
<i>Controlled copy available on SharePoint</i>						

11 Abbreviations

- To be updated

AACE	Association fir the Advancement of Cost Engineering
AEB	Company
AEC	Afval Energie Centrale
BoD	Basis of Design
Capex	Capital Expenditure
CE	Cost Estimate
CO2	Carbon dioxide
COB	Close of Business
CPA	Critical Path Analyses
CPM	Critical Path Method
DCL	Document Control List
EVM	Earned Value Management
FEED	Front End Engineering Development
FEL	Front End Loading
FID	Final Investment Decision
HRC	Hoog Rendement Centrale
HSE	Health, Safety and Environment
IFC	Issued for Comments
IFR	Issued for Review
IFA	Issued for Approval
IFU	Issued for Use
IFI	Issued for Information
IPT	Integrated Project Team
ISBL	Inside Battery Limits
OD	Omgevingsdiesnt
Opex	Operational Expenditure
OSBL	Outside Battery Limits
PCC	Post Combustion Capture
PMC	Project Management Consultant
Q	Quarter
RFI	Request For Information
RFSU	Ready For Start Up
SME	Subject Matter Expert
SOW	Scope of Work
ToR	Terms of Reference
URS	User Requirements Specification
VOWD	Value of Work Done
WABO	Wet Algemene Bepaling Omgevingsrecht
WtE	Waste to Energy

12 References

ref. 1: AUR_PMO_SOW_001