



Issued for Information	02	16.04.2026	KaB	TN	KjB
Issued for Information	01	18.02.2026	KaB	BK	KjB
<b>RELEASE PURPOSE</b>	<b>REVISION</b>	<b>REV.DATE</b>	<b>PREP. BY</b>	<b>CHECKED</b>	<b>APPROVED</b>

				<b>PAGES</b> 33	<b>ENCLOSURE</b> -
<b>PROJECT</b> Company: Hafslund Celsio AS Client Ref.: - Project: Oslo CCS Project No.: HI2305		<b>DOCUMENT TITLE:</b>  Lessons Learned Report 2025			
<b>COMPANY/SUPPLIER LOGO:</b>  		<b>COMPANY DOCUMENT ID:</b> HI2305-CEL-Z-RA-0016			02
		<b>SUPPLIER DOCUMENT ID:</b> N/A			N/A
		<b>Project number</b>	<b>Vendor code</b>	<b>Discipline &amp; Doc. Type</b>	<b>Sequence number</b>

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 2 of 33

---

### REVISION HISTORY

<b>RELEASE PURPOSE</b>	<b>REV.:</b>	<b>DESCRIPTION OF CHANGES:</b>
Issued for Information	01	Issued for Information
Issued for Information	02	More details from FEED added, including an overview of implemented risk reducing measures.

## TABLE OF CONTENTS

1	Executive management summary .....	5
1.1	Key Achievements .....	6
1.2	Top 10 Lessons Learned .....	6
2	Introduction .....	7
2.1	Purpose and Context of the Experience Report .....	7
2.2	Strategic Context .....	7
2.3	Knowledge Sharing and Sector Impact .....	7
2.4	Structure of the Report .....	8
3	Key Lessons learned from early phases .....	8
3.1	Summarized lessons learned from FEED .....	9
4	Lessons Learned from first year of execution .....	10
4.1	Brief overview of the project's purpose and status at year-end .....	10
4.2	Project Organization and Governance .....	11
4.3	Planning and summary of key milestones achieved in 2025 .....	11
4.3.1	Lessons learned .....	12
4.4	Contract strategy .....	12
4.4.1	Groundworks Contract (Civil 1) .....	13
4.4.2	Civil 2 Contract .....	13
4.4.3	Main EPCIC Contract – Target Price Model .....	13
4.4.4	Standardization and cost cutting initiatives .....	13
4.4.5	Cost Management and Procurement .....	14
4.4.6	Collaboration and Role Clarity .....	14
4.4.7	Lessons learned .....	14
4.5	Risk follow-up .....	15
4.6	Technical Solutions .....	16
4.6.1	Pressure Conditions and Flue Gas System .....	17
4.6.2	CO2 Measurement Equipment .....	17
4.6.3	Noise level .....	18
4.6.4	Interface Management and existing Infrastructure .....	18
4.6.5	Lessons learned .....	19
4.7	Regulatory Challenges and Permitting Experience .....	20
4.7.1	Building Permit .....	20
4.7.2	Power Supply Concession .....	20
4.7.3	Development Agreement for Pedestrian and Bicycle Path .....	20
4.7.4	DSB Consent Application .....	21

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 4 of 33

---

4.7.5 Lessons Learned .....	22
4.8 Ethical and Environmental Considerations .....	22
4.9 Health, Safety and Environment (HSE) .....	22
4.10 Quality management .....	23
4.10.1 Lessons learned .....	24
4.11 Financial reporting and follow-up .....	24
4.11.1 Lessons learned .....	24
4.12 User Involvement .....	25
4.12.1 Lessons Learned .....	25
5 Acronyms .....	27
6 Attachments .....	28

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 5 of 33

---

## 1 EXECUTIVE MANAGEMENT SUMMARY

The Oslo CCS project is a cornerstone of Norway's Longship initiative and represents the world's first full-scale carbon capture facility at a waste-to-energy plant. The project aims to capture approximately 350,000 tonnes of CO<sub>2</sub> annually from the Klemetsrud facility, corresponding to around 90% of total emissions, thereby significantly reducing the climate footprint of Oslo's district heating system.

This report summarizes key lessons learned from the first year of project execution (February–December 2025), following Final Investment Decision (FID) in January 2025. The experience confirms that the selected CCS concept is technically feasible, and that large, complex CCS projects in urban environments can be executed successfully. At the same time, the first year of execution highlights that project complexity lies less in the core technology itself and more in integration, governance, permitting, and risk management.

A main insight from the first year of execution is that opportunities for cost reduction are limited once the project enters the execution phase. Key cost drivers are largely defined during FEED and early procurement, and late optimization initiatives have limited effect. This underlines the importance of robust FEED quality, early standardization, and clear contract strategies before contract award and construction start.

Our experience so far is that the EPCIC contract with the Joint Venture between Aker Solutions AS and SLB Capturi Norway AS, based on a target price model with pain/gain mechanisms, has worked well and supported transparent collaboration and cost awareness. We acknowledge that future stages of the project may provide new insights and experiences. However, differences in systems, work processes, and culture across organizations required additional effort to align expectations and establish common governance, planning, and reporting routines.

Regulatory processes have proven to be a major schedule risk driver. Permitting activities are highly interdependent, resource-demanding, and subject to long lead times and limited authority capacity. The experience underlines that permitting must be treated as a core project discipline, supported by dedicated competence in technical safety, risk analysis (QRA), and authority for interface management. Early engagement, continuous follow-up, and clear mapping of regulatory dependencies are critical to avoid impacts on the project's critical path.

Risk management has been embedded in the project since day one and has proven essential. Systematic risk identification, frequent workshops, clear ownership, and continuous follow-up have enabled proactive handling of both technical and organizational risks. The integration of qualitative risk registers with cost and schedule analyses has strengthened decision-making and provided management with improved insight into overall project uncertainty.

Based on the first year of execution, the key recommendations for future CCS projects are to invest early in FEED quality and owner competence, initiate permitting and power supply processes before FID, simplify technical standards where feasible, establish strong interface and risk governance from the outset, and ensure early and structured involvement of operations and maintenance resources. The lessons learned from Oslo CCS are directly transferable to future CCS projects in Norway and internationally, particularly for large-scale facilities integrated into existing industrial or urban environments.

## 1.1 Key Achievements

- Preparatory work at Klemetsrud completed on schedule
- EPCIC with Aker Solutions/SLB Capturi Norway JV and Civil 2 contract with AF Gruppen at Klemetsrud awarded.
- Civil works initiated; governance and planning systems established.
- Risk management embedded from day one with >150 risks tracked.
- Regulatory permits are largely secured despite complexity.
- Strong collaboration with contractors and authorities.

## 1.2 Top 10 Lessons Learned

Topic	Lessons learned	Recommendation
<b>1) Engagement with Authorities</b>	Regulatory processes are complex and interdependent	Start dialogue early and maintain pressure. Map permit interdependencies to avoid critical path delays. Begin permitting and power supply processes before FID and prepare contingency plans for regulatory delays. Develop a regulatory dependency matrix and contingency plans for inter-agency conflicts.
<b>2) FEED Phase Quality</b>	Robust FEED is essential; gaps lead to costly redesigns.	Allocate sufficient time and resources. Strengthen FEED reviews and include operational input early to avoid late changes.
<b>3) Contract Strategy</b>	Incentive-based models (target price with pain/gain) have worked well.	Define scope and risk allocation early. Maintain transparent cost structures and consider incentive mechanisms for alignment.
<b>4) Design Optimization</b>	Oil & gas standards can cause over-specification.	Address cost and standardization early; Standardize technical solutions where possible to reduce cost and complexity.
<b>5) Risk Management</b>	Continuous workshops and monitoring keep risk profiles under control.	Use visual dashboards for risk tracking and ensure risk ownership is clear across teams.
<b>6) Interface Management</b>	Structured interface systems and dedicated roles are critical for interface handling.	Expand dashboard use for interface tracking and enforce escalation protocols.
<b>7) User Involvement</b>	Maintain downward communication; embedded coordinator role for alignment with operations.	Integrate operational resources into the project team from day one.
<b>8) Maintenance Input</b>	Engage maintenance early to avoid late operational adjustments.	Formalize maintenance reviews during FEED and detailed design phases.
<b>9) Binding agreements</b>	Securing binding agreements for project sites and temporary work areas is essential to ensure smooth construction and execution	Establish and formalize these agreements at an early stage to avoid delays and conflicts
<b>10) Stakeholder Collaboration</b>	Clear roles, structured communication, and escalation channels are vital.	Continue structured collaboration models and strengthen joint risk reviews with contractors.

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 7 of 33

---

## 2 INTRODUCTION

### 2.1 Purpose and Context of the Experience Report

As required under the State Support Agreement, Celsio shall prepare an annual experience report during the Establishment Period. The purpose of this report is to document and communicate contractual learning areas related to technical solutions, project execution, regulatory processes, HSE, interfaces, and business models, in accordance with the terms set out in the project documentation.

This report presents key lessons learned during the period from February to December 2025, following the Final Investment Decision (FID) in January 2025. Lessons learned prior to February 2025 are summarised separately in Chapter 3. Together, these chapters provide a consolidated overview of experiences from early planning through execution, ensuring continuity and traceability of project learning.

The report highlights insights across technical solutions, project execution, environmental and regulatory processes, health and safety, and business models, reflecting the contractual learning areas defined in the State Support Agreement. The intention is to capture both successes and challenges encountered during the establishment phase, with a focus on actionable learning.

### 2.2 Strategic Context

Celsio's ambition is to become Norway's leading circular energy company. As one of the first full scale CCS projects at a waste-to-energy plant, Celsio is targeting the capture of up to 90 percent of CO<sub>2</sub> emissions, corresponding to approximately 350,000 tonnes of CO<sub>2</sub> annually from the Klemetsrud facility in Oslo.

This pioneering role positions Celsio at the forefront of emerging CCS and CCUS markets, offering significant strategic opportunities. At the same time, the project entails considerable risk due to its first-of-a-kind nature, complex interfaces, and evolving regulatory and commercial frameworks. Capturing and systematically documenting experience during this phase is therefore critical—both for project success and for informing future CCS deployments.

### 2.3 Knowledge Sharing and Sector Impact

The Oslo CCS project has placed strong emphasis on systematic experience transfer from multiple CCS projects, covering a broad range of technical, organisational, and execution-related experience. While learnings have been drawn from several relevant CCS initiatives, the project has had its closest and most continuous interaction with the Brevik CCS and Northern Lights Øygarden projects.

Experience transfer has been achieved through multiple physical site visits and structured meetings with the project organisations in Brevik and Øygarden, providing first-hand insight into technical solutions, execution strategies, and challenges encountered during engineering and implementation.

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 8 of 33

---

Furthermore, experience transfer has been reinforced by engaging many of the same key project resources, both within the owner's organisation and at the main contractor, who have previously worked on the Brevik and Øygarden projects. This continuity has enabled direct application of practical lessons learned and reduced the risk of repeating known challenges. Key learning points from these projects have been actively followed up during engineering, including through weekly engineering follow-up meetings, ensuring that known issues related to design maturity, interfaces, constructability, and execution are systematically addressed.

## 2.4 Structure of the Report

This annual experience report consolidates learnings from the early planning phase through execution, with the aim of fostering continuous improvement both within Celsio and across the broader CCS community. It also provides a foundation for identifying improvement opportunities and ensuring alignment with best practices and regulatory expectations. Chapter 4 presents detailed insights within each contractual learning area, including:

- Technical solutions
- Project execution and interfaces
- Regulatory and environmental processes
- Health, safety, and working environment (HSE)
- Business models and commercial structures

## 3 KEY LESSONS LEARNED FROM EARLY PHASES

This chapter summarizes the main lessons from concept development, FEED, permitting, technology selection, and stakeholder engagement, up to the start of execution. The purpose is to help future CCS projects avoid pitfalls and replicate successful strategies.

The Oslo CCS project showed that evaluating capture technologies requires focus on energy demand, solvent degradation, CAPEX and OPEX. Emissions of entrained solvent are critical for health assessments, and pilot testing was essential for validating technology. Safety is a priority, and retrofitting waste-to-energy plants proved feasible and safe for personnel and nearby communities.

CO<sub>2</sub> transport by truck to the Port of Oslo was selected after pipeline transport was assessed and rejected during the concept phase. Pipeline development would likely have required rezoning, introducing significant schedule risk due to lengthy regulatory processes and expected local opposition along densely populated routes. Truck transport offered lower CAPEX, reduced HSE risk, greater flexibility, and enabled smaller emitters to connect to the value chain.

Early securing of power supply was critical, as grid upgrades may take longer than capture plant construction. Access to land also proved challenging, underscoring the need to secure contractual land rights early. Early involvement of plant operators strengthened ownership and eased integration, while permitting and EU funding processes required dedicated resources and specialized expertise to ensure progress and compliance.

Key cost drivers that led to the project being put on hold included inflation, high power prices, adverse market and currency conditions, changes to the final location at the Port of Oslo, increased area and infrastructure requirements, and growing organizational needs. The FEED phase proved critical for execution, cost escalations identified after FEED resulted in a pause in 2023 and a subsequent cost-reduction phase, highlighting the importance of strong planning and continuous cost control. A competitive FEED process also led to a change in CCS technology provider.

Prior to execution, strategic measures were implemented to reduce investment costs, establish partnerships with Aker Solutions and SLB Capturi, and transition to a commercial model supported by long-term offtake agreements (e.g. Microsoft and Frontier). Integration into Norway's Longship value chain and alignment with Northern Lights for CO<sub>2</sub> storage were essential to project viability.

Finally, the project demonstrated the challenge of balancing limited pre-investment funding with the need for adequate staffing. Lack of experienced project resources at the start of execution in 2022 highlighted the importance of establishing a sufficiently strong and experienced project organization already in the early phases to ensure decision quality and execution readiness.

### 3.1 Summarized lessons learned from FEED

CCS specific lessons learned:	
Topic	Lessons learned
<b>EU Funding Application Process</b>	Applying for EU Innovation Fund support requires specialized expertise and significant resources.
	Lessons from the first application cycle improved the second round significantly, highlighting the value of feedback and external consultancy support.
	Documentation must be tailored to EU requirements and not assumed to be reusable from national processes.
<b>Technology Qualification and Pilot Testing</b>	Pilot testing over a minimum of 6 months provided critical data on emissions, process stability, and solvent degradation, especially under varying flue gas conditions.
	<a href="#">The pilot results from Oslo CCS</a> are particularly relevant for other WtE plants and can reduce the need for extensive testing in similar contexts.
<b>Safety and Retrofit Feasibility</b>	Detailed analyses and pilot testing confirmed that retrofitting a WtE plant with CCS is safe for both personnel and nearby residents.
	The findings are applicable to both retrofit and new-build CCS installations.
<b>CO<sub>2</sub> Transport Strategy</b>	Truck-based transport from Klemetsrud to the Port of Oslo was validated as a flexible and scalable solution.
	Emission-free heavy-duty trucks are feasible and relevant for distributed capture sources not located near ports.
<b>Power Supply Planning</b>	Securing grid access and power supply can take longer than plant construction and must be initiated early.
	A formal concession from NVE should be obtained before FID to avoid delays.

General lessons learned:	
<b>Stakeholder and Workforce Engagement</b>	Early involvement of plant operators fosters ownership and reduces internal resistance.
	Dedicated resources from the operating organization should be integrated into the project team from the start.
<b>Authority Processes and Permitting</b>	Permit acquisition is complex and time-consuming; early planning and dedicated oversight are essential.
	Assigning a single responsible person to manage all authority interactions proved effective.
<b>FEED Phase Quality and Robustness</b>	Several conceptual changes in post-FEED revealed gaps in initial planning, including site layout and equipment sizing.
<b>Project Control and Baseline Updates</b>	Comprehensive baseline updates of cost and schedule are critical information for decision-making.
	The decision to pause and revise the project was based on such updates and enabled a more viable and cost-effective solution.

## 4 LESSONS LEARNED FROM FIRST YEAR OF EXECUTION

This chapter highlights the main lessons learned after the first year of project execution.

### 4.1 Brief overview of the project’s purpose and status at year-end

Hafslund Celsio AS is constructing a carbon capture facility designed to capture approximately 350,000 tonnes of CO<sub>2</sub> annually from the flue gas emitted by the waste-to-energy plant at Klemetsrud. This represents full-scale purification of all flue gas from the existing incineration facility.

An alliance (Joint Venture – JV) between Aker Solutions (AKSO) and SLB Capturi (SLBC) has been contracted as the EPCIC contractor for both the process plant at Klemetsrud and the CO<sub>2</sub> terminal at the Port of Oslo. SLBC will deploy its proprietary amine-based CO<sub>2</sub> capture technology.

The captured CO<sub>2</sub> will be cooled and compressed into a stable liquid form, then transported by zero-emission tank trucks to the Port of Oslo for temporary storage. From there, the CO<sub>2</sub> will be transferred to ships owned by Northern Lights, which will transport it to their intermediate storage facility at the Naturgassparken in Øygarden. In Phase 1, the CO<sub>2</sub> will be pumped through a subsea pipeline to a well at the Aurora field, where it will be permanently stored in geological formations beneath the seabed.

The Oslo CCS project is part of Langskip, the Norwegian Government’s initiative for full-scale carbon capture and permanent storage of CO<sub>2</sub>. The project execution started in the beginning of 2025 and is planned to be finalized in 2029. As of year-end 2025, the main contracts have been awarded, and approximately 70% of the procurement packages have been formally allocated. The project is currently 16,2% complete.

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 11 of 33

---

In September, AF Gruppen was awarded the Civil 2 contract and initiated preparatory construction activities in November 2025. Prior to this, Anlegg Øst completed the Civil 1 scope, which included essential groundwork and enabling works, allowing AF Gruppen to commence execution under the Civil 2 contract.

Until November 25, Anlegg Øst served as the principal contractor for civil works at the site. Going forward, AF Gruppen will assume the role of principal contractor until the Joint Venture (JV) takes over site responsibility in the autumn of 2026.

## 4.2 Project Organization and Governance

The Oslo CCS project is organized with a clear governance structure anchored in Hafslund Celsio's corporate framework and the state support agreement. A dedicated Project Director leads the execution phase, supported by specialized managers for Engineering, Civil, Planning, Quality and risk, HSE, Contracts, and procurement. Decision-making follows a defined stage-gate model (TG0–TG4), with the Steering Committee acting as a strategic advisory body and ensuring alignment with corporate and governmental requirements. Roles and responsibilities are documented, including authority matrix and reporting lines.

The organizational setup was not fully defined at the start, requiring staffing adjustments during execution. The project underestimated the need for new governance systems and had to integrate personnel from diverse organizations and backgrounds while developing processes on the fly. An early Gassnova audit in 2023 provided a valuable roadmap and checklist for establishing a robust governance framework, later confirmed through an internal Hafslund audit conducted in June and July.

Early user involvement is essential and could have been stronger at the start. Challenges included unclear responsibilities within the owner's organization and limited ownership from end-users. Alignment between project deliverables and operational needs improved compared to previous phases but remains a key learning point.

### Collaboration Between Stakeholders:

The project relies on close collaboration between the client, contractors, and authorities. Regular interface meetings and structured communication plans ensure alignment with Oslo Port Authority, Elvia, Northern Lights, and regulatory bodies such as PBE and DSB. A dedicated user group integrates operational experience from the Klemetsrud plant into design and execution, securing maintainability and safety.

## 4.3 Planning and summary of key milestones achieved in 2025

Planning is managed through a unified Safran-based schedule, integrating contractor and owner activities under a common coding structure. Progress is tracked and reported monthly to all stakeholders. Change management follows formal procedures, with all variations logged in Interaxo and evaluated for cost and schedule impact before approval.

The project implements several digital platforms to ensure transparency and efficiency:

- **Safran** for integrated planning and progress control
- **Interaxo** for document management, interface registers, and change logs

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 12 of 33

- **TIMS and PIMS** for technical interface management with JV

The current approach works well and supports the open book philosophy. Close collaboration with JV planners ensures efficient communication and alignment. The contract text is considered adequate, although compliance with certain requirements varies.

#### 4.3.1 Lessons learned

Topic	Lessons learned
<b>Regulatory processes</b>	Early planning of input to regulatory processes was underestimated before JV joined as a contracting partner.
<b>Contract</b>	Appendix C to the JV contract, included dedicated milestones for required input to regulatory processes.
<b>Applications</b>	Regulatory activities are also scheduled in Safran as part of owner activities, which has proven valuable for maintaining control and reminders.
	Adequate buffers were included to manage unforeseen challenges in application processes.
<b>Planning tool</b>	We have positive experience using Safran, especially as an integrated planning tool with JV contractor.
<b>Start up audit</b>	Perform a structured, independent project audit early in the pre-execution or initial execution phase. The audit should review and validate roles and responsibilities, organizational structure, governing documents, work processes, routines, and project management tools.

#### 4.4 Contract strategy

The contract strategy for the Oslo CCS project was designed to ensure efficient execution, cost control, and compliance with public procurement regulations. The main scope was awarded as a turnkey EPCIC contract to a Joint Venture (JV) between Aker Solutions and SLB Capturi, covering both the carbon capture plant (CCP) at Klemetsrud and the CO<sub>2</sub> terminal at the Port of Oslo.

##### Objectives of the Strategy

- Minimize the number of contractors managed directly by Celsio.
- Clarify responsibilities and reduce interface risks.
- Ensure flexibility and scalability.
- Embed environmental and sustainability requirements in all procurements.

##### Approach

To reduce complexity and interface risks, civil engineering and coordination responsibilities were included in the EPCIC scope. Civil construction contracts were procured separately in line with public procurement rules, allowing Celsio to maintain direct control over regulated contracts while strengthening the owner's organization with support from the Hafslund Group and framework partners.

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 13 of 33

---

The project was divided into five sub-areas: CCP, CO<sub>2</sub> terminal, area changes and preparatory works, power supply, and transport. Each area applied tailored contract forms and procurement processes, aligned with investment decision gates.

### **Owner's Perspective**

A key insight is that achieving cost reductions in an ongoing project is highly challenging, as opportunities to influence costs often come too late in the process. The project is staffed with a few experienced personnel from the owner's team, and additional needs are continuously evaluated. Initial challenges included setting up collaboration tools (e.g., Interaxo).

### **Joint Venture Dynamics**

The EPCIC contract provides strong technical competence through the JV (Joint Venture), but differences in systems, work processes, and corporate culture required extra coordination. Common procedures, shared planning environments, and harmonized reporting routines were established to mitigate these challenges.

#### **4.4.1 Groundworks Contract (Civil 1)**

For the groundworks, a quantity-based payment model was selected. The contract, executed by Anlegg Øst is completed on schedule. During 2025, minor scope changes were strategically added to Civil 1, thereby reducing the scope of the Civil 2 contract. This reduced the risk of delays later in the project and ensured that critical groundwork was carried out during favourable seasonal conditions.

#### **4.4.2 Civil 2 Contract.**

For the Civil 2 works, a quantity-based payment model was chosen. AF Gruppen Norge started on-site mobilization activities on Monday, November 3, 2025.

The contract is on track with start-up activities such as establishing the project room in Interaxo, approval of start-up documentation, registration of main and subcontractors in HMSREG, planning for compliance with main contractor responsibilities and supervisory duties, environmental follow-up, and organization of meeting activities.

#### **4.4.3 Main EPCIC Contract – Target Price Model**

The EPCIC contract uses a target price model with a pain/gain incentive mechanism. This hybrid between reimbursable and fixed-price contracts has proven effective in motivating cost control and given the Parties a joint incentive to achieve cost reduction.

#### **4.4.4 Standardization and cost cutting initiatives**

The project has implemented a broad range of cost-cutting initiatives across both the Terminal and Klemetsrud sites, focusing on standardization, design optimization, and construction efficiency. For the heat pump package, early engagement with the supplier allowed the project to replace customized technical solutions with a standard product using conventional refrigerants, resulting in substantial savings compared to the main contractor's initial proposal.

At the Terminal, several design simplifications and optimizations contributed to reduced costs:

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 14 of 33

- Optimized the storage tank capacity to three large tanks in line with zoning requirements.
- Challenged legacy design requirements, including replacing the external stair tower with an integrated stair design.
- Reduced the number of lightning arresters on the CO<sub>2</sub> tanks at both Klemetsrud and the Terminal, based on evidence from previous CCS projects showing significant over-dimensioning.
- Reduced lighting specifications on the large CO<sub>2</sub> tanks based on evidence from previous CCS projects showing significant over-dimensioning.
- Adopted a new transport and up-ending method that minimizes scaffolding needs compared to Brevik and Norther Lights 1.

Further efficiencies across both sites include:

- Use of containerized E&I solutions instead of a traditional substation.
- Simplification of the pipe rack design.
- At Klemetsrud, a more compact layout that eliminated the need to acquire additional land and reduced cable and pipe lengths.
- A compact technical building design combined with JC400 modules.
- Use of industry-standard insulation solutions.
- Simpler flanges for low-pressure utility systems.
- Increased use of cold-bent piping.
- Standard supplier products wherever functional requirements are allowed.
- Construction methodologies that maximize off-site fabrication for both Klemetsrud and Oslo Havn.
- Applying cold bending of pipes within the Aker Solutions scope wherever feasible to reduce installation time and cost.

#### 4.4.5 Cost Management and Procurement

JV appears to operate with a strong focus on procurement, while the culture for cost optimization could be further developed. Decisions are based on highly detailed input, and the Project Execution Model (PEM) applied by the contractor may limit flexibility in identifying and implementing more cost-effective solutions.

#### 4.4.6 Collaboration and Role Clarity

There has been a strong and constructive collaboration between the procurement teams of the main contractor and the client. Both parties have demonstrated a good understanding of each other's needs and responsibilities. Clear role definitions on both sides of the contract have contributed to efficient and solution-oriented cooperation.

#### 4.4.7 Lessons learned

CCS Specific Lessons learned	
Topic	Lessons learned
FEED Timing	Allocate adequate time for FEED and contract clarifications; fast-track approaches have consequences.

<b>Supplier Engagement</b>	Early engagement with key suppliers enables simpler technical solutions and prevents contractors from steering design toward tailored, high-cost systems.
<b>Standardization</b>	Early focus on standardization and use of supplier standard products significantly reduces both engineering hours and cost.
<b>Design Optimization</b>	Challenge legacy design requirements early (e.g., stair towers, lighting, lightning protection) to avoid over-engineered and unnecessary solutions.
<b>Over-engineering</b>	Review previous project design practices critically—areas such as lightning protection, lighting specifications, and insulation are often over-dimensioned.
<b>Simplified Specifications</b>	For utility systems and tank systems, simplified specifications (e.g., flanges, insulation, lighting) can be applied without compromising functionality or safety.
<b>General lessons learned</b>	
<b>Contract Strategy</b>	Define contract strategy early in FEED to clarify scope, interfaces, and risk allocation before execution.
<b>Incentives</b>	Use incentive-based models (e.g., target price with pain/gain) to drive cost discipline and collaboration.
<b>Owner Resources</b>	Ensure sufficient owner resources during FEED, as critical decisions are made at this stage.
<b>Core Competency</b>	Suppliers perform best within their core competencies; plan for extra management follow up of subjects outside EPCI contractor core competence.
<b>Roles and responsibilities</b>	Establish clear roles and responsibilities for efficient decision-making.
<b>Flexibility</b>	Maintain flexibility in contract execution to adapt to seasonal conditions and mitigate schedule risks.
<b>Site Layout</b>	Compact site layouts reduce footprint, cabling, piping and eliminate land-acquisition needs; this should be a structured design driver from FEED.
<b>Off-site Fabrication</b>	Maximize off-site fabrication and cold-bent piping to reduce on-site labor, improve predictability, and lower installation cost.
<b>Constructability</b>	Evaluate constructability during early design; simplified lifting/transport methods and reduced scaffolding have major cost and schedule benefits.
<b>Collaboration</b>	Include clear collaboration requirements in tender documents and manage expectations, especially regarding 3D models, where offshore and onshore practices differ.

#### 4.5 Risk follow-up

The project has maintained a strong focus on risk management from day one. Risks have been systematically identified through quarterly workshops and monitored via monthly and biweekly one-on-one meetings with risk owners and mitigation owners. A Top 10 risk register has been presented and discussed in every weekly management meeting, with particular attention to week-to-week changes and emerging trends. That includes the project “Risk pressure”, expressed through the economic expected value of all identified active risks. The trend curve enables the project to assess whether the cumulative known risk remains within the allocated contingency margins at any given time.

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 16 of 33

---

By late 2025, the project's risk profile reflected a broad range of identified risk elements, with particular emphasis on technical, organizational, and interface-related challenges. Approximately 150 risks have been assessed and actively managed, of which 70 remain open. Critical issues persist in areas such as technical maturity, interface clarification, regulatory approvals, staffing, and supplier management. Mitigation measures have been defined for all identified risks, with close monitoring of those ranked as most critical.

Highest ranked risks in 2025 have been related to:

- Timely approval of the DSB consent application to secure project schedule.
- Operational challenges observed at Brevik—pose a risk of recurrence at Oslo CCS due to similar technical solutions and partly suppliers.
- Timely delivery of the JC400 Module
- Risk of flue gas pressure impact on the incineration plant from the capture facility.
- Possible delays due to late delivery of input to the civil contractor and the complex coordination required between the JV, Multiconsult, the civil contractor, and the Company.
- Market situation during a period marked by geopolitical uncertainty.

During the first year of execution, the project has primarily focused on mobilization, transition from development, and risk reduction ahead of full-scale construction. While physical construction activities have only just started, several mitigation measures implemented during this period have already proven effective in reducing execution risk. The measures below represent those assessed to have had the greatest impact during the first year.

- Tight management of key interfaces and the critical path during mobilization and early execution, particularly between the JV, civil contractors and the client, reduced the risk of early schedule slippage before main construction activities commenced.
- Systematic use of risk workshops, design and maturity reviews (including third-party verification) was effective in reducing uncertainty and maturing technical solutions ahead of irreversible decisions.
- Early and continuous dialogue with authorities (DSB, PBE, Port of Oslo and others) improved regulatory predictability and reduced the risk of redesign, permitting delays or work stoppages prior to full construction.
- Early strengthening of the project organization and clarification of roles and responsibilities increased decision-making capacity and improved coordination during the transition from development into execution.
- Structured experience transfer from reference projects, particularly Brevik, integrated into design, procurement and control plans, reduced exposure to known technical and operational risks at an early stage.

## 4.6 Technical Solutions

Throughout the year, the project has deliberately focused on identifying and, where feasible, reducing the use of cost-driving offshore standards in favour of more fit-for-purpose solutions for a land-based CCS facility. At the same time, we acknowledge that there is still a way to go,

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 17 of 33

---

as already noted elsewhere in this report. Internal discussions have explored whether the project could have achieved greater cost efficiencies by adopting simpler technical standards instead of the traditional, highly robust Oil and Gas specifications. While these standards are proven and reliable, and provide assurance of robust design quality, they were developed for demanding offshore environments and may have resulted in over-specification and unnecessary cost in certain areas.

We have encountered a strong Oil and Gas culture both within authorities and across the contractor chain, often reflected in partly exaggerated specifications and requirements. A particularly challenging legacy is the overextended documentation practices from the oil and gas era, which led to the production of thousands of pages of reports and certificates, beyond what is necessary for a land-based CCS facility. This added significant administrative overhead and cost without delivering proportional value. Addressing such practices and tailoring requirements to actual needs is therefore critical during the FEED phase, before contract award and project execution. The following sections outline key technical insights and lessons learned from the project to date.

#### **4.6.1 Pressure Conditions and Flue Gas System**

A key technical risk throughout 2025 has been the potential impact of the CO<sub>2</sub> capture plant on pressure conditions in the incineration units at Klemetsrud. In April 2025, the contractor commissioned a CFD analysis, from May to September, including considerations of the use of multiple fans.

In November, the JV presented documentation confirming that the incineration plant would not be negatively affected by the capture facility. Three different alternatives had been assessed (one, two, or three flue gas fans), and it was confirmed that all options would work. Advantages and disadvantages of each alternative were outlined, and JV recommended a single common fan. Subsequently, there was an internal discussion within Celsio on whether the project preferred multiple fans. By late December, the project concluded that it would not instruct the JV to change its approach and will proceed with their recommended solution of one fan.

#### **4.6.2 CO<sub>2</sub> Measurement Equipment**

Several risk factors have been identified related to CO<sub>2</sub> measurement equipment for quality and quantity of CO<sub>2</sub> and other relevant emissions in the carbon capture plant and the CO<sub>2</sub>-terminal. To avoid this, a clear measurement philosophy and agreed solution for measurement should be made earlier in the project, preferably before signing the EPCIC contract. This philosophy should include requirements from all stakeholders such as Northern Lights, buyers of BECCS (Bioenergy with Carbon Capture and Storage), Truck transport company, relevant

authorities and possibly other internal needs that Celsio could have measurement. Late implementation of additional equipment may have negative impact for the project.

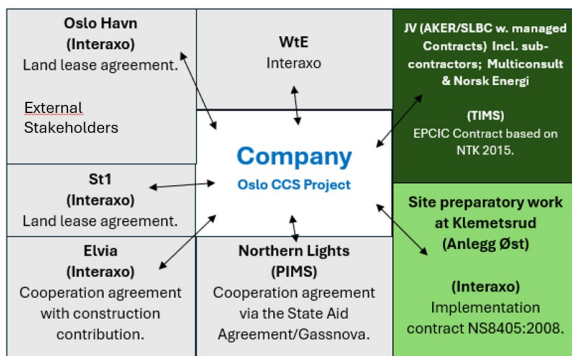
### 4.6.3 Noise level

The project has potential concerns related to noise emissions towards neighbours from equipment, drawing on operational experience from similar facilities. These concerns remain a risk that actual noise levels may exceed specified values. This is an area that, in our view, requires continued attention going forward on Klemetsrud and Oslo Harbour.

### 4.6.4 Interface Management and existing Infrastructure

The project has significant interfaces with existing facilities, requiring extensive coordination and follow-up from the owner. Critical interfaces include flue gas systems, district heating integration, steam supply and condensate return, firewater and city water, high-voltage connections, and other existing infrastructure. Contractors tend to perform best within their own defined scope and boundaries, which reinforces the need for strong interface management processes and plans.

The below figure shows Company’s formal dependencies to contractors, external parties and stakeholders.



**Figure 1 – Shows the dependencies between Company, Contractors, external parties and stakeholders.**

The interface work in the Oslo CCS project is organized through a structured system with clear roles, processes, and digital tools. Celsio has a dedicated Interface Manager who acts as the Single Point of Contact (SPOC) for all interfaces with contractors and external parties.

This role, in collaboration with the JV, coordinates meetings, establishes and maintains Interface registers, and ensures that all clarifications are made in accordance with the contract and project schedule.

The process is based on the principle that each party is responsible for defining its own interfaces, information needs, and deadlines, as well as documenting clarifications in the project's systems. Established IT interface tools are used for the handling.

All formal interface clarifications are registered in these systems, and status is monitored through regular meetings and monthly reports. This ensures traceability, predictability, and early handling of potential conflicts or delays. The project also involves numerous interfaces with third parties (such as integration at Oslo Port) that are not governed by contractual agreements. This has posed a significant risk, which has been mitigated through robust systems and routines for clarifications and stakeholder management—so far with positive results.

#### 4.6.5 Lessons learned

Topic	Lessons learned
<b>Risk Management</b>	Systematic risk management from day one, supported by regular workshops and ongoing monitoring, is essential to keep the project's risk profile under control. Continuously calculating the project's risk pressure, expressed through the economic expected value of all active risks, provides a real-time view of the total inherent uncertainty.
<b>Design optimization and cost awareness</b>	Address design optimization early since flexibility is significantly reduced after contract award.
	Align contractor and client early to ensure shared understanding of concepts, priorities, and optimization opportunities.
	Balance procurement-driven execution with engineering input to maintain cost awareness and technical integrity.
	Prioritize standardization where it is feasible to reduce complexity and cost.
<b>Interfaces</b>	CO <sub>2</sub> carriers have strict requirements for safety and mooring. The project achieved significant progress on clarifications before the investment decision, which helped avoid cost increases related to potential changes.
	Plan for technical interfaces and contingencies (e.g., pressure conditions between capture plant and incineration units).
	As interfaces are to be resolved across disciplines for both the contractor and the client, it is important to clarify new IRs as quickly as possible internally, both in terms of solution and deadlines, and to ensure that they are quickly communicated internally for clarification.
	Ensure close communication with contractor when need dates for interface information cannot be reached.
<b>Stakeholder management</b>	It has proven useful to have weekly follow-up meetings internally to follow up on delayed IRs and to raise the status weekly to management.
	Ensure robust systems and routines for clarifications and stakeholder management with interfaces not governed by contractual agreements.

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 20 of 33

<b>Noise</b>	Experience from similar facilities indicates a need for increased noise protection. Noise has proven to be an emerging challenge.
--------------	---

## 4.7 Regulatory Challenges and Permitting Experience

Regulatory processes have been critical to maintaining the project schedule and securing key milestones. Several permits and agreements were interdependent, creating a complex web of requirements that demanded proactive management and stakeholder engagement. However, limited availability of case officers at regulatory bodies, particularly the Norwegian Directorate for Civil Protection (DSB), has posed challenges and reinforced the need for early engagement.

Authorities have shown limited understanding of the impact of delayed decisions, compounded by long decision-making chains, lack of decision leadership, and insufficient awareness of sequencing requirements.

The handling of sequencing requirements has also been problematic. In some cases, projects with substantial budgets have been subjected to additional conditions that, while formally relevant, go beyond the original scope. Challenging these practices with authorities has proven difficult. An overview of the Norwegian authority applications is included in the report attachment.

### 4.7.1 Building Permit

At the time of the investment decision, the project did not have a general building permit (Rammesøknad) from the Oslo Port Authority, creating significant risk and uncertainty during the early execution phase. The permit for the CO<sub>2</sub> terminal was submitted to the Agency for Planning and Building Services (PBE) in May 2025 and approved in July.

Over the summer, the project encountered a regulatory challenge when the CO<sub>2</sub> storage tanks at Klemetsrud were found to exceed the zoning plan's maximum height allowance by several meters. This required an exemption application, which was approved in September, allowing the project to proceed as planned.

### 4.7.2 Power Supply Concession

A well-substantiated concession application to the Norwegian Water Resources and Energy Directorate (NVE) for a new switching station and transformers at Klemetsrud was submitted in June and approved in October. There was some uncertainty surrounding the application, as the standard processing time was stated to be 6 to 12 months unless the "fast-track" option was accepted. However, good dialogue with NVE led to expedited processing, as the project itself prepared the necessary documentation required for a swift review.

### 4.7.3 Development Agreement for Pedestrian and Bicycle Path

A critical regulatory issue was the requirement to establish a pedestrian and bicycle path as a condition set by PBE. This was linked to both the issuance of the construction permit (IG for the technical building) and the operating permit for the CCS facility. The development agreement had to be signed before IG submission; failure to resolve this would have halted AF Gruppen's construction activities.

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 21 of 33

---

The challenge arose because the Urban Environment Agency (BYM) refused to assume ownership of the path after construction, creating a deadlock with the Property and Urban Renewal Agency (EBY). The project considered applying for an exemption, but PBE confirmed that this was not possible under §19.2 of the planning regulations. In November 2025, the project applied to PBE for a permanent exemption from the requirement to establish a pedestrian and bicycle path, after securing full support from both BYM and EBY. PBE granted the exemption in December 2025.

#### 4.7.4 DSB Consent Application

The first application for consent from the Norwegian Directorate for Civil Protection (DSB) in April was rejected because the Quantitative Risk Assessment (QRA) showed risk contours extending beyond property boundaries. Specifically, the innermost contour (1E-05) exceeded acceptance criteria. These contours were based on potential CO<sub>2</sub> dispersion in the event of a major leak and the associated risk of asphyxiation within the hazard zone. This highlighted the strict regulatory thresholds for CO<sub>2</sub> dispersion risk in public areas.

A revised QRA, based on a more relevant frequency model was developed in a Joint Venture Project (with DSB participation), and submitted in September. This successfully addressed the initial concerns by ensuring all risk contours remained within project boundaries. However, as of mid-December, the application was still pending due to DSB's workload and their need to professionally assess whether the new frequency model could be used.

DSB consent was a prerequisite for submitting the building permit application to PBE, creating a direct link between regulatory approval and construction progress. This outcome underscores the importance of early and precise alignment between risk modelling and regulatory expectations, as well as the need for close collaboration between technical experts and authorities during the preparation phase.

One key lesson learned is the importance of involving the right expertise in technical safety and Quantitative Risk Assessment (QRA), as well as understanding how these processes need to be aligned with DSB requirements. This aspect was underestimated during the initial phase of the project.

#### Comment to coming DSB guidance update

The DSB consent process consists of two stages: Step I before construction, and Step II before start-up. Previously, some documentation could be submitted in Step II because detailed engineering is not normally complete at Step I. The updated guidance (September 2025) removes this flexibility, and DSB case officers now follow the guidance strictly.

This means detailed engineering must be largely completed before construction. For example, all P&IDs must be finalized at Step I and cannot be changed before Step II. This is not aligned with normal project execution.

Oslo CCS is not affected, as it has already been agreed that some documentation may be delivered after Step I. However, the new practice will have major consequences for future projects. Projects typically mature during detailed engineering, and technical adjustments after Step I are common, provided they do not negatively affect the QRA risk contours.

The updated guidance no longer allows such changes if they affect the risk profile, representing a significant shift in practice.

#### 4.7.5 Lessons Learned

Topic	Lessons learned
<b>Regulatory bodies</b>	Start Early: Initiate dialogue with regulatory bodies before submission deadlines.
	Maintain Pressure: Regular follow-ups and status checks are essential.
	Plan for Contingencies: Develop fallback options for critical path items.
	Escalate When Needed: Establish escalation channels to resolve inter-agency conflicts quickly.
	Ensure that framework permits are in place well before the investment decision in future projects.
	Be aware of the new DSB requirement for full confirmation at Stage 1.
<b>Acceptance criteria</b>	The acceptance criteria for increased risk due to CO <sub>2</sub> dispersion are extremely strict and very challenging to meet in areas accessible to the public.
<b>QRA</b>	Ensure QRA Alignment: Engage risk analysts early to meet acceptance criteria.
	Align QRA risk modeling with regulatory expectations early in the process.
	The design of the components that have the greatest impact on the risk contours must be assessed against DSB acceptance criteria at the earliest possible stage
<b>Application Dependencies</b>	Application Dependencies: Map all permit interdependencies to manage critical paths.
<b>Competence</b>	Ensure availability of proper Technical Safety competency in the project to follow up applications toward DSB.
<b>Stakeholders</b>	Engage Stakeholders: Secure written commitments from third parties (e.g., Oslo Port Authority) and clarify responsibilities for public infrastructure.

#### 4.8 Ethical and Environmental Considerations

The Company Code of Conduct (Hafslund Ethical guidelines) outlined in Appendix D is included in all contracts. That includes the requirements of the Oslo Agreement (Oslomodellen). These measures ensure that all suppliers and contractors operate under a clear framework of integrity and sustainability.

A significant focus has been placed on minimizing noise pollution in the surrounding areas, particularly concerning the equestrian center located adjacent to the Klemetsrud site. The center expressed strong concerns about potential noise disturbances from construction activities. While current assessments indicate that the project has not breached, nor is expected to breach, established noise limits, proactive steps were taken to maintain a positive relationship with the local community. As part of these efforts, the project decided to construct a dedicated noise barrier near the equestrian center. This decision reflects a commitment to stakeholder engagement and demonstrates the project's willingness to go beyond regulatory compliance to address community concerns.

#### 4.9 Health, Safety and Environment (HSE)

By year-end, the project has logged 30,000 work-hours with four recordable injuries, none serious or resulting in lost time, though one required medical treatment.

Oslo CCS project applies a clear HSE principle: each party manages the risks they introduce. Design and procurement processes integrate SHA/HSE early, supported by systematic risk reviews (HAZID, HAZOP) and close collaboration across disciplines. The project retains internal coordinators for design and execution phases and ensures strong on-site presence,

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 23 of 33

---

including a full-time KU. Emergency preparedness is aligned with Celsio's response plans and contractor routines.

Key success factors include early HSE integration, strong contractual partnerships, and active follow-up on site. The main contractor brings a mature HSE culture from oil and gas but required adaptation to land-based construction practices. Joint efforts have strengthened competence and collaboration.

Implementing HMSREG has been critical for managing SHA, complying with the Oslo Model, and reducing risks of labor crime and social dumping. The contractor has fully embraced this approach. HMSREG is a digital system used to register personnel and contractors to manage HSE reporting, access control, compliance and orderly pay and working conditions.

Incidents with potential damage identified to date in the project include one blasting-related incident and three incidents during excavation activities involving electrical cables. All incidents have been investigated, and the resulting recommendations are being followed up through the company's incident and continuous improvement management system.

In addition, several unwanted situations have been registered involving third-party personnel unintentionally entering the construction site instead of using designated external walkways. As corrective measures, improvements have been implemented to construction fencing, access control, and gate security.

The project remains in an early phase with significant work ahead. We will continue to capture lessons learned and adjust as activity and workforce increase.

#### **4.10 Quality management**

During the first year of the Oslo CCS project, the team faced the challenge of establishing a robust quality and risk management framework with limited support from the base organization. Consequently, most routines and tools were developed internally. This autonomy allowed for tailored solutions but required significant effort to ensure compliance with international standards and project-specific requirements.

The project introduced a common control plan covering audits, design reviews, risk analyses, and inspection and test plans. This approach helped clarify responsibilities, improve coordination, and align quality assurance activities across disciplines.

The project implemented a process-based management system, structured into core and support processes, as outlined in the Quality Plan. This system facilitated clear ownership and accountability, enabling efficient governance and streamlined workflows.

Risk management is an important focus area. The project uses a simple spreadsheet-based risk register, which provides flexibility and ease of use. Early in the project, the expected value of identified risks was calculated and tracked as a trend in leadership meetings. This approach gives insight into overall risk exposure and its development over time. So far, the cumulative expected risk value remains below the project's uncertainty margin. Furthermore, the risk register served as an input for cost and schedule risk analyses conducted prior to establishing Baseline 1 in October. This integration strengthened the link between qualitative risk assessments and quantitative project controls.

The project established a process flow for handling technical clarifications and deviation requests. These processes support timely resolution of issues and help maintain compliance with contractual and regulatory requirements.

The project maintains a structured collaboration with the main contractor's Quality representative through regular meetings focused on planning and executing control activities. These meetings ensure systematic follow-up of findings and timely implementation of corrective actions, supporting transparency and accountability across the project.

In summary, the first year shows that internally developed routines, combined with structured control plans, risk monitoring, and collaboration with contractors, have provided a workable foundation. These approaches offer useful lessons for future CCS projects.

#### 4.10.1 Lessons learned

Topic	Lessons learned
<b>Control plan</b>	A common control plan for audits, design reviews, risk analyses, and inspection/test plans ensure clarity and effective coordination across disciplines.
<b>Governance system</b>	Process-based project management system with clear ownership of core and support processes improved accountability and streamlined workflow
<b>Risk register</b>	Simple and flexible risk register enables easy understanding and integration with cost and schedule risk analyses.
	Early tracking of expected risk value gave management a clear view of risk trends and supported proactive decision-making.
<b>Technical clarifications and non-conformities</b>	Structured process for technical clarifications and deviation requests ensured timely resolution and compliance.
<b>Collaboration</b>	Close collaboration with the main contractor, through regular meetings, strengthened planning and execution of control activities, and ensured systematic follow-up of findings and actions.

#### 4.11 Financial reporting and follow-up

The Oslo CCS project is significant in size and has a timeline of four years. The project further has a contract structure with shared incentive model with main contractors (Aker Solutions and SLB Capturi), a financing structure with financial support from the State, the City of Oslo and the Hafslund Celsio owners, and buyers of BECCS certificates. These stakeholders are all dependent upon timely delivery of the CCS project, and hence all require continuous timely project and cost reporting.

A key objective since the re-start of the project early 2025 has been to establish efficient reporting, including cash management, which provides good project control and fulfil the reporting requirements of the various stakeholders as far as possible without duplicating reporting.

##### 4.11.1 Lessons learned

Topic	Lessons learned
<b>Contract insight</b>	Ensure a good operational and commercial understanding of all key contracts, both w.r.t. construction and financing, to be able to follow commercial contractual aspects, establish appropriate reporting structure and to deliver contractual reporting requirements.

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 25 of 33

<b>IT systems</b>	Pre-project start, evaluate and decide upon which IT systems to be used for project control and reporting, including IT systems and structure for document control throughout the life cycle of the project.
<b>Reporting structure</b>	Establish a standardized project reporting structure, including Baseline updates, with focus on key project activities and risks, clear responsibilities and a lean reporting process. The project reporting structure should be aligned with the reporting structure of suppliers to ensure that the suppliers and project owner have a mutual understanding of project progress, schedule, cost and risk. Terminology should be standardized across all stakeholders.
<b>Annual contractual indexation</b>	Ensure all contracts, including contract for State support, have annual indexation at the same date to ensure comparability between cost/Baseline cost revisions and indexation of State support / total capex budget.
<b>Physical cost breakdown structure</b>	Include in the project preparation and supplier contracts the need for reporting according to a project physical cost breakdown structure.
<b>Templates for reporting format, policies, routines, etc.</b>	The availability of templates for project reporting, including templates on policies, routines, etc., which meet the requirement of good project management and the requirements of State support, would be useful as a basis for efficient establishment of a project reporting framework.

## 4.12 User Involvement

The user group was established during the FEED phase and has continued with weekly coordination meetings throughout the project execution. The group consists of personnel from the operations organization, the Chief Safety Delegate, and union representatives. The project also participates in the Working Environment Committee (AMU) and provides regular status updates. The dialogue is good, and the unions are positive toward the project.

The operations organization is small and manageable, but the project spends more time on upward communication than downward. The project sees a need to strengthen communication downward in the organization going forward, including through planned weekly intranet updates.

The project has a main user group and extended groups for each discipline (process, district heating, electrical, etc.). Some members participate in 3D reviews, but it is challenging to secure sufficient time from user representatives. Structure is maintained through detailed meeting logs and by having the CCS Coordinator embedded in the project as a link between the project and operations/maintenance.

### 4.12.1 Lessons Learned

Topic	Lessons learned
<b>Available resources</b>	Engage users early to secure timely input.
	Allocate sufficient time and resources for user participation. It is recommended that participants from operations in the project is 100% dedicated to the project and released from his/hers regular job.
<b>Communication</b>	Communicate broadly—strengthen downward communication in the organization.
<b>Follow-up log</b>	Use structured tools such as meeting logs for follow-up.
<b>Maintenance</b>	Involve maintenance early to address operational needs.

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 26 of 33

---

<b>Coordinator</b>	A dedicated coordinator role significantly improves alignment and readiness.
--------------------	--

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 27 of 33

---

## 5 ACRONYMS

CC	Carbon Capture
CCS	Carbon Capture and Storage
Celsio	Hafslund Oslo Celsio AS
CFD	Computational Fluid Dynamics
DG	Decision Gate
DSB	Directorate for Civil Protection
EIA	Environmental Impact Assessment
EPC	Engineering Procurement and Construction
ETS	Emission Trading System
EU IF	European Union Innovation Fund
FEED	Front End Engineering Design
FID	Final Investment Decision
HAZID	Hazard Identification Analysis
HAZOP	Hazard and Operational Analysis
HMSREG	Digital system used to register personnel and contractors to manage HSE reporting, access control, compliance and orderly pay and working conditions.
JV	Joint Venture between Aker Solutions AS and SLB Capturi Norway AS
MW	Mega Watt
NEA	Norwegian Environmental Agency
NVE	Norwegian Water Resources and Energy Directorate
OPEX	Operational Expenditure
PBE	Plan and Building Authorities
QRA	Quantitative Risk Assessment
WtE	Waste to Energy

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 28 of 33

## 6 ATTACHMENTS

### Authority applications and processes Oslo CCS projects (Norwegian)

Type søknad	Søknaden gjelder / Forutsetninger
<b>PBE : Oppføring av karbonfangstanlegg CCP og teknisk bygg</b>	
Rammesøknad	Nytt karbonfangstanlegg, reguleringsplanen felt 1 og 3. Oppføring av karbonfangstanlegg og mellomlagringsanlegg for CO2 ved Klemetsrud gjenvinningsanlegg. Karbonfangstanlegget plasseres ved dagens kolle i bestemmelsesområde 2, innenfor felt 1. Mellomlagringsanlegget plasseres på felt 3, sørvest for karbonfangstanlegget.
IG 1	Grunnarbeider (sprenging og terrengendringer) innenfor felt 1
Endringssøknad, E01	Midlertidig dispensasjon for krav til IG. Disp: S-5078: Midlertidig dispensasjon fra § 14 (Krav til IG: sikret opparbeidelse av sykkelanlegg og fortau mellom avkjørsel til felt 1 og Ljabruveien)
Endringssøknad, E02	Bergskjæring utenfor regulert byggegrense, Bergskjæring trekkes 50 cm mot karbonfangstanlegget, fjerning av en mindre kolle mellom Klemetsrudveien og forbrenningsanlegget/nytt fangstanlegg, og oppføring av vegrekkverk og gjerde mot regulert kjøreveg. Dispensasjoner: S-5078: § 2.1.1 Byggegrense (Bergskjæring langs tiltaket krysser regulert byggegrense i felt 1)
Endringssøknad, E03 + IG2	Endring av tiltak/utvidelse av tiltaksområdet, felt 10-13. Ytterligere kjøreveier og terrengendring i sør, en midlertidig anleggsvei, og etablering av støttemur. Sprengningsarbeider og støttemurer for vegarealer internt på området, vist som nummer 10, 11, 12 og 13. Fjerning av prosessanlegg med biogass i felt 10. Dispensasjoner: S-5078 Formålsgrænse/byggegrens, Formål o_ friområde og krav til opparbeidelse, jf. §15 andre ledd, Rekkefølgekrav §14 andre ledd Saksnummer 79/83 med tilknytning til PlanID S-2539: Formål friområde (parkbelte) KPA: Formål friområde
Endringssøknad, E04	Etablering av mur og gjerde, Endret skjæring, Etablering av autovern, Terrengarbeider inkl. etablering av tett grøft mellom vei og mur, Dispensasjon fra regulert byggegrense, jf. reguleringsplanen pkt. 2.1.1, Midlertidig dispensasjon fra reguleringsplanens pkt. 14 annet ledd
IG3	Igangsettingstillatelse for tiltakene omfattet av E04
Endringssøknad, E05	Endringssøknad nytt prosjekt / Dokumenter, uttalelse fra VAV&BYM, rettigheter til grunn/avtaler
IG4 - KIG1A	Utvendig VA og Grunnsikring
Endringssøknad, E06 - KRA2	Endringssøknad grunnet justert prosjekt (teknisk bygg: flate, fasader, kjeller), gjerde, antall tanker, plasseringer mv. Dispensasjon grunnet høyde tanker (35 m)
IG5 - KIG1B	Fundamenter DEL 1
IG6 - KIG1B	Peler under teknisk bygg / Dokumenter / Samtykke VAV, godkjent tiltaksplan forurenset grunn, illustrasjon grensen for DSB samtykke
IG7 - KIG1B	Fundamenter under teknisk bygg, unntatt CO2 kompressorum / Dokumenter, illustrasjon grensen for DSB samtykke
Endringssøknad, E07	Tank på teknisk bygg
IG8 - KIG2	Fundamenter under CO2-kompressorum og råbygg teknisk bygg inkl. kompressorum.
IG9 - KIG2	Øvrige fundamenter
IG10 - KIG3	Tett bygg inkl. tekniske fag (fasader, brannalarmanlegg, ventilasjon, innvendige arbeider osv.) inkl. installering av resterende deler av fangstanlegg (må defineres)
IG11 - KIG4	Resterende arbeider
Endringssøknad E08 + IG12	Endringssøknad, "Fremtidens Klemetsrud"
MB	Midlertidig brukstillatelse / Dokumenter, Utslippstillatelse, DSB samtykke del II

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 29 of 33

Type søknad	Søknaden gjelder / Forutsetninger
FA	Søknad om ferdigattest / Bekreftelse VAV
<b>Oslo havn, Etablering av terminal og mellomlager for CO2 på Oslo havn</b>	
Rammesøknad	Rammesøknad / uttalelse fra VAV&BYM, rettigheter til grunn/avtaler
IG - TIG1/2	Igangsetningsstillatelse - Hele tiltaket / Samtykke VAV, DSB samtykke del I, godkjent tiltaksplan forurenset grunn
MB	Midlertidig brukstillatelse / Utslippstillatelse, DSB samtykke del II
FA	Ferdigattest / Bekreftelse VAV
Rammesøknad	Rammesøknad for etablering av ny avkjørsel, midlertidig anleggsvei mv. / uttalelse fra VAV&BYM, uttalelse SVV, rettigheter til grunn/avtaler
IG1	Alt unntatt rundkjøringsarm og bygninger / Samtykke VAV, godkjent tiltaksplan forurenset grunn, utbyggingsavtale
IG2	Rundkjøringsarm / godkjent byggeplan SVV
IG3	Resten av tiltaket & Samtykke AT
MB	Midlertidig brukstillatelse
FA	Ferdigattest / Bekreftelse VAV
<b>Forberedende arbeider</b>	
Rammesøknad	Etablering av midlertidig administrasjonsbygg på to etasjer, og etablering av midlertidig kantine på en etasje
Endringssøknad	Endret plassering
IG	Tiltak omfattet av rammesøknad med senere endring
Midlertidig brukstillatelse	Midlertidig brukstillatelse
Endringssøknad	Endret utforming, endring branntekniske forutsetninger
Endringssøknad	Tillatelse til forlenget plassering / samtykke VAV og AT
Ferdigattest	Ferdigattest / Bekreftelse VAV
<b>Riving av Rødrakkene, telt og eksisterende portvakt</b>	
Søknad i ett trinn	Riving av rødrakkene og telt / Godkjent tiltaksplan forurenset grunn, Samtykke fra VAV
Ferdigattest	Ferdigattest / Bekreftelse VAV
Frittstående dispensasjon uten byggetiltak	Dispensasjon for omlegging av GS-veg, plassering av K2 mv.
Søknad i ett-trinn	Omlegging og legging av ny, privat vannledning som tilknyttes kommunal kum. Graving på eiendom 178/183 og 177/1 og boring under kommunal vei. Plugging av eksisterende vannledning.

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 30 of 33

Type søknad	Søknaden gjelder / Forutsetninger
MB	Søknad om midlertidig brukstillatelse / bekreftelse VAV
FA	Søknad om ferdigattest / bekreftelse VAV
Søknad i ett-trinn	Riving av administrasjonsbygg / bekreftelse VAV, godkjent tiltaksplan forenset grunn
FA	Ferdigattest / bekreftelse VAV
Rammesøknad	Nytt administrasjonsbygning, ny vaskehall, nytt industrivern og bruksendring til garderobe og trimrom
Endringsøknad	Ekstra etasje på administrasjonsbygget
IG1	Grunnarbeider der vaskehall og industrivern er planlagt – begrenset til planering til kote + 140.
IG2	Igangsetting resten av tiltaket
MB	Midlertidig brukstillatelse
FA	Ferdigattest
Søknad i ett-trinn	Terrengendring i nord, for lagring og parkering / bekreftelse VAV
FA	Ferdigattest / bekreftelse VAV
Tillatelse til forensende virksomhet	Tillatelse til karbonfangst og mellomlagring av CO2
Oppdatert informasjon	Avklart med MDir at vi sender inn oppdatert informasjon grunnet endret anlegg
Revidert søknad	Tillatelse til brenning/utslipp av degradert amin
Samtykke riving	Sletting av tilflutsrom
Samtykke del I	Samtykke til bygging av anlegg for fangst- og mellomlagring av CO2, Klemetsrudanlegget og Sydhavna
Revidert samtykke del 1	Samtykke til bygging av anlegg for fangst- og mellomlagring av CO2, Klemetsrudanlegget og Sydhavna. Revisjon grunnet endring tanker Sydhavna
Samtykke del I	CCP
Samtykke del II	CCP / samtykke del I
Revidert samtykke del I	Havn
Samtykke del II	Havn / samtykke del I
Konsesjon	Konsesjon høyspent - anlegg fra KL2 til teknisk bygg samt høyspentanlegg i teknisk bygg
Konsesjon	Konsesjon varmepumpe
Konsesjon	Konsesjon varmepumpe
Samtykke aml. § 18-9	Oppføring av administrasjonsbygg og tilbygg til vaskehall/industrivern garasje

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 31 of 33

Type søknad	Søknaden gjelder / Forutsetninger
Samtykke aml. § 18-9	Etablering av midlertidige bygninger
Samtykke aml. § 18-9	Etablering av karbonfangstanlegg
Samtykke aml. § 18-9	Ny plassering midlertidige resepsjon og vektbu
Samtykke aml. § 18-9	Forlenget plassering kantine/adminbygg og resepsjon
<b>Søknader VAV</b>	
Samordnet forhåndsuttalelse til rammetillatelse	CCP: Plassering ift. kommunale ledninger og overvannshåndtering, bygging innenfor hensynssone H190(sikringssone)
Samordnet forhåndsuttalelse til IG	CCP: Plassering ift. kommunale ledninger, tilknytning til kommuns hovedledninger, sikring mot forurensning, overvannshåndtering, håndtering av anleggsvann , bygging innenfor hensynssone H190 (sikringssone)
Tillatelse til tilknytning	Midlertidige bygg: Tillatelse til midlertidig tilknytning i inntil 2 år
Tillatelse til tilknytning	Midlertidige bygg: Tillatelse til midlertidig tilknytning i inntil 2 år
Forhåndsuttalelse til rammesøknad	Riving av adm.bygg: Midlertidig plugging
Forhåndsuttalelse til IG	Riving av adm.bygg: Midlertidig plugging
Forhåndsuttalelse til IG	Omlegging av eksisterende vannledning i nord: Plassering ift. kommunens hovedledning, tilknytning til kommunens hovedledninger, sikring mot forurensning, overvannshåndtering, håndtering av anleggsvann
Bekreftelse på mottatt sluttdokumentasjon	Omlegging av eksisterende vannledning i nord:bekreftelse på mottatt sluttdokumentasjon
Samordnet forhåndsuttalelse til rammetillatelse	Oppføring av adm.bygg og vaskehall: Plassering ift. kommunens hovedledning, overvannshåndtering
Samordnet forhåndsuttalelse til IG	Oppføring av adm.bygg og vaskehall: Plassering ift. kommunens hovedledning, tilknytning til kommunens hovedledninger, overvannshåndtering
Revidert samtykke til rammetillatelse	CCP: Plassering ift. kommunale ledninger, tilknytning til kommuns hovedledninger, sikring mot forurensning, overvannshåndtering, håndtering av anleggsvann , bygging innenfor hensynssone H190 (sikringssone)
Revidert samtykke til IG	CCP: Plassering ift. kommunale ledninger, tilknytning til kommuns hovedledninger, sikring mot forurensning, overvannshåndtering, håndtering av anleggsvann , bygging innenfor hensynssone H190 (sikringssone)
Revidert samtykke til IG	CCP: Uttalelse knyttet til endringssøknad "Fremtidens Klemetsrud"
Bekreftelse på mottatt sluttdokumentasjon	CCP: Bekreftelse på mottatt sluttdokumentasjon
Samordnet forhåndsuttalelse til IG	Oppføring av tiltak Oslo havn: Plassering ift. kommunale ledninger, tilknytning til kommuns hovedledninger, sikring mot forurensning, overvannshåndtering, håndtering av anleggsvann
Bekreftelse på mottatt sluttdokumentasjon	Oppføring av tiltak Oslo havn
Samordnet forhåndsuttalelse til rammetillatelse	Forberedende arbeider (FA): Plassering ift. kommunale ledninger, tilknytning til kommuns hovedledninger, sikring mot forurensning, overvannshåndtering, håndtering av anleggsvann , bygging innenfor hensynssone H190 (sikringssone)

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
 Supplier Doc.ID.: N/A  
 Title: Lessons Learned Report 2025

Date: 16.04.2026  
 Company Rev.: 02  
 Supplier Rev.: N/A  
 Page: 32 of 33

Type søknad	Søknaden gjelder / Forutsetninger
Samordnet forhåndsuttalelse til IG	Forberedelse arbeider (FA): Plassering ift. kommunale ledninger, tilknytning til kommuns hovedledninger, sikring mot forurensning, overvannshåndtering, håndtering av anleggsvann , bygging innenfor hensynssone H190 (sikringsone)
Bekreftelse på mottatt sluttokumentasjon	Forberedende arbeider (FA)
Samordnet forhåndsuttalelse til rammetillatelse	KL2: Tiltakets plassering ift. kommunens hovedledninger, overvann, bygging innenfor hensynsone H190(sikringsone)
Samordnet forhåndsuttalelse til IG	Midlertidig kantine/adminbygg og resepsjon - forlenget tilkobling
Bekreftelse på mottatt sluttokumentasjon	Midlertidig kantine/adminbygg og resepsjon - forlenget plassering
Samordnet forhåndsuttalelse til IG	Riving av Rødrakkene og telt, Plugging
Bekreftelse på mottatt sluttokumentasjon	Riving av Rødrakkene og telt, plugging
Samordnet forhåndsuttalelse til igangsettingstillatelse	Oppføring av karbonfangstanlegg
Tillatelse til påslipp	Oppføring av karbonfangstanlegg
Forhåndsuttalelse til rammesøknad	Midlertidig betongplate
Godkjenning av tiltaksplan forurenset grunn	Riving av adminbygg: Godkjenning av tiltaksplan forurenset grunn
Godkjenning av tiltaksplan for forurenset grunn	Nytt administrasjonsbygg: Godkjenning av tiltaksplan forurenset grunn
Godkjenning av tiltaksplan forurenset grunn	CCP: Godkjenning av tiltaksplan forurenset grunn
Revidert tiltaksplan	CCP: Revidert tiltaksplan
Revidert tiltaksplan	CCP: Revidert tiltaksplan
Revisjon tiltaksplan forurenset grunn CCP	CCP: Revidert tiltaksplan grunnet endringssøknad E06
Godkjenning av tiltaksplan forurenset grunn	CCP: Revidert tiltaksplan grunnet endringssøknad "Fremtidens Klemetsrud" E07?
Godkjenning av tiltaksplan forurenset grunn	Felt 14: Innlemming av areal i tiltaksplan for CCP, godkjenning av tiltaksplan forurenset grunn
Godkjenning av tiltaksplan forurenset grunn	Forberedende arbeider: Godkjenning av tiltaksplan forurenset grunn
Godkjenning av tiltaksplan forurenset grunn	Oslo havn: Godkjenning av tiltaksplan for forurenset grunn

---

Company Doc.ID.: HI2305-CEL-Z-RA-0016  
Supplier Doc.ID.: N/A  
Title: Lessons Learned Report 2025

Date: 16.04.2026  
Company Rev.: 02  
Supplier Rev.: N/A  
Page: 33 of 33

---

Type søknad	Søknaden gjelder / Forutsetninger
Godkjenning av tiltaksplan forurenset grunn	Riving av rødbrakkene: Godkjent tiltaksplan for forurenset grunn