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Heavy Oil

Controlled Document

Quest CCS Project

Project Execution Plan

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Summary

Project Execution Plan per PS10 Project Execution Strategy and Planning

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IMPORTANT NOTICE

THE PROJECT PREMISE DOCUMENT (PPD), TOGETHER WITH THE BASIC DESIGN ENGINEERING PACKAGE (BDEP), PROJECT EXECUTION PLAN (PEP), AND THE OPERATIONS READINESS PLAN (ORP), PROVIDES A COMPREHENSIVE AND INTEGRATED SUMMARY OF THE FRONT-END ENGINEERING DESIGN PHASE (DEFINE) STUDY.

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1. INTRODUCTION

1.1. Purpose

The purpose of the Project Execution Plan (PEP) is to communicate those plans, assumptions, and decisions that have been made by the Quest Project Team regarding how the Quest Project will be implemented.

A clear, concise and consistent PEP facilitates decision-making, thereby supporting the project assurance and governance processes. By providing a common basis for project implementation, the PEP also facilitates alignment and integration among project team members. This common basis also enables major changes to the execution plan to be identified and evaluated.

1.2. Scope

The PEP encompasses all phases of project implementation: detailed engineering, procurement, construction, commissioning and startup. In addition, the PEP addresses various activities vital to a project's success, including (but not limited to): HSSE, project drivers, assurance, governance, risk management, project organization, interface management, project controls, quality, contracting, procurement, and information management.

Although the project premises, the project design basis, and the handover plan to Operations are all touched on in the PEP, these topics are properly addressed in the PPD, BDEP, and ORP respectively. The PEP makes reference to these and other project documents, which should be consulted as required to gain a deeper understanding of certain topics, or a broader understanding of the venture as a whole.

2. PROJECT BACKGROUND

2.1. Business Objectives

The Quest CCS Project will reduce GHG emissions from the Scotford Complex. By enhancing the environmental competitiveness of existing Oil Sands facilities, Quest should enable the unlocking of further development opportunities of the resource base.

A full description of the business objectives can be found in the PPD.

2.2. Location of Quest CCS Facilities

The "CO2 Capture" component of the Quest CCS Project will be located within the existing Scotford Upgrader site (both Base Plant and Expansion 1), in Fort Saskatchewan, near Edmonton Alberta. Construction will encompass both greenfield and brownfield elements. The

pipeline will extend to the north of Fort Saskatchewan approximately 84 km, where the CO₂ will be stored underground in a deep geological formation (Basal Cambrian Sands).

2.3. Operator of Quest CCS Facilities

Shell Canada Energy, as operator of the existing Scotford Upgrader facilities (both Base Plant and Expansion 1), will be the operator of the new Quest CCS facilities. The Scotford Upgrader Operations organization will take over operations and maintenance of the capture facilities, pipeline, and wells on behalf of the joint venture owners (Shell, Chevron, and Marathon).

Execution of the Quest CCS Project will be managed by Shell's Projects & Technology organization in Calgary Alberta. The Execution team will lead the project until mechanical completion, when it will be turned over to the Quest CSU team which is part of the Scotford Upgrader Operations organization. The Quest CSU team will lead commissioning and start-up activities with support from P & T including completion of the 3 government of Alberta tests to reach sustainable operations milestone. Quest CSU team will turn over the operating facilities to Scotford Upgrader Operations organization .

3. PREMISES

3.1. Opportunity Statement

The opportunity statement for this venture, from the most recent Opportunity Framing workshop in November 2008:

“To develop a world-scale CCS demonstration for AOSP, Shell, and Alberta, exceeding 1 Mtpa by December 2015.”

3.2. Value Drivers

Quest CCS will not generate revenues other than via Carbon Credits. The project has assumed a price of \$40 per tonne of CO₂ for its economic calculations. However, without considerable funding by federal and provincial governments, the project cannot break even. It is therefore essential for the Quest CCS Project to be developed such that CAPEX, OPEX, and GHG efficiency are optimized, resulting in the greatest possible value for AOSP.

Although cost is the primary driver for this project, quality is also important. If production and availability are not attained as planned, project economics will be significantly impacted.

The following are the project drivers in order of importance:

- Cost – This is the primary project driver, not only because cost is the default driver throughout RDS, but because the Quest facilities will not generate any revenue except via carbon credits.
- Quality – This is the secondary project driver, because part of the government funding is tied to sequestering a specified amount of CO₂ (10.8 Mt) by a specified date (December 2025). If this is not achieved, part of the funding will be pro-rated accordingly.
- Schedule – The strategy for Quest is to achieve sustained operations (S.O.) by December 2015, matching the commitment to government. However, if the execution schedule starts to slip, money will not be spent to maintain this schedule, as government funding is not significantly impacted unless S.O. slips past December 2017. S.O. is deemed to have been achieved when the following three tests have been passed either together or at separate times:
 1. Test A – Capture Unit Capacity – 24 consecutive hours in which Quest capture unit processes a minimum of 2,960 tonnes of CO₂ (1.08 Mtpa over 24 hours) from the HMU facilities.
 2. Test B – Capture Unit Efficiency – 20 consecutive days in which the Quest capture unit processes a minimum of 75% of the total CO₂ produced by the Upgrader base and expansion HMU facilities during those 20 days, while running at an average of at least 50% and a minimum of at least 30% of design rates.
 3. Test C – Integrated Project Reliability – 30 consecutive days in which the Quest project maintains operation whereby the capture, transportation and subsurface facilities operate continuously without shutting down, while running at an average of at least 30% of design rates.

3.3. Key Technical and Execution Boundaries

- The CO₂ Capture facilities involve only the existing Upgrader HMUs (HMU1/2 at Base Plant, and HMU3 at Expansion 1). There is no integration with the Scotford Refinery HMU or with Shell Chemicals.
- There are no provisions for future capacity increases.
- SGSI Amine technology (ADIP-X) will be used to capture CO₂
- CO₂ Compression will only use commercially proven technology
- No impact on base business performance (CO₂ plant modifications must not impact Upgrader availability)

3.4. Project Givens

- Alberta Government funding requires project to be operational by December 2015 (requirement in FPP)
- 1 Mtpa CO₂ reduction by CCS (also required by FPP)
- CCS required to retain ability to grow the Oil Sands business
- Sequestration will be by geological storage

- Voluntary commitment to GHG reduction by AOSP is in public domain as part of leadership in CO2 management
- Regulations are emerging that will soon call for CCS
- MMV is a given – internal and external
- The Quest CCS Project is an AOSP project – 60% Shell, 20% Chevron, 20% Marathon: JV Partners must support the project and sign-off on the FPP
- Any single JV partner has veto power to terminate the project

3.5. Critical Success Measures (after one year of operation)

- No disruption to existing plant
- Achieve Goal Zero (Safety & Environment)
- Secured pore space for life of project
- No loss in well injectivity
- Sustained rate of 3300 tonnes/day
- Minimum impact on environment
- Demonstration of CO2 containment and predictability of its subsurface location: MMV program is working
- No complaints from neighbours
- People coming to visit as a showcase
- Full support from all key stakeholders
- Best achievable combination of CAPEX, OPEX, and GHG efficiency

3.6. Key Opportunity Milestones

- Regulatory Application Submitted: November 2010
- DG3: January 2011
- DG4: November 2011
- Regulatory Approval and FID: March 2012
- Sustained Operations: December 2015

4. DEVELOPMENT CONCEPT & SCOPE

Shell Canada currently operates three Hydrogen Manufacturing Units (HMU1/2 at Base Upgrader and HMU3 at Expansion Upgrader). The production of hydrogen represents a significant source of CO2 generated in the Upgrader, which is released from the reformer furnace stack.

An amine absorption and regeneration system is used to capture and recover 80% of the total CO2 from the three HMU PSA feed gas streams. The absorption process used is the ADIP-X process, which is an accelerated MDEA-based process licensed by Shell Global Solutions International (SGSI). The CO2 Rich Amine streams from each individual HMU is combined in a

common Amine Regeneration section, where the CO₂ is stripped from amine into a greater than 95% CO₂ purity stream.

The recovered CO₂ is compressed in an 8 stage centrifugal Integral Geared (IG) compressor with an electric motor drive. In the first 5 stages, free water is knocked out through compression and cooling. The CO₂ from the 6th stage of compression is routed through a TEG dehydration unit to reduce the water content to less than 4 lb per MMSCF in winter and 6 lb per MMSCF in summer. In the final two stages, the CO₂ stream is compressed to a supercritical fluid state (dense phase) at 14,790 kPag. This dense phase CO₂ is transported by pipeline from the Scotford Upgrader to the injection locations which are located up to 84 kilometres from the Upgrader. There will be between 3 and 8 injector wells drilled to a depth of approximately 2200 m to inject the CO₂ into the Basal Cambrian Sands (BCS) formation.

Further details of the technical scope can be found in the SDP and the BDEP.

5. GOVERNANCE

5.1. Governance Structure

The Quest CCS Project follows the established governance structure for the AOSP JV:

- **Executive Committee (Excom: Budgets > \$15 million)**
- **Operating Committee (Opscom: AFE's and contracts < \$15 million)**

5.2. Financial Authorities

Specific financial authorities will be specified by the Executive Committee for managing EPC contracts for the duration of the project. The Quest CCS Project will be managed based on a no-change policy. However, if a change order became necessary, its monetary value and schedule consequences will require approval by the Project Manager, Vice President – Projects & Technology, and the Executive Vice President – Heavy Oil, depending on their financial authority limits. Financial authority levels for the EPCM contractor for a reimbursable type EPC contract have been defined in the contract.

5.3. Project Development and Implementation Process

As the AOSP JV is operated by Shell, the Shell Opportunity Realization Manual (ORM) is applicable to the Quest CCS project.

As prescribed in the ORM, a Decision Executive (DE) is in place supported by a Decision Review Board (DRB) that takes all key decisions to progress the Quest CCS opportunity.

The composition of the DRB was as follows prior to DG4 is as follows:

Name	Role	DRB Role
John Abbott	EVP Heavy Oil	Decision Executive
Tim Bertels	Unconventional & EOR SIEP	DRB Member
Tyra Henschel	VP Communication SCAN	DRB Member
Robert Patterson	VP Upstream Projects Americas	DRB Member
Carmelina Riccio	H.O. Growth Finance Manager	DRB Member
Peter St.George	GM Scotford Upgrader	DRB Member
Sam Whitney	Mgr Tech Serv, Shell E&P	DRB Member
Bonnie Vogeli	Sr. Counsel Upstream	DRB Member
John Broadhurst	VP Development	DRB Member
Ian Silk	Business Opportunity Manager	

Updated DRB for the end of the Execution Phase is as follows:

Name	Role	DRB Role
Michael Frigge	GM- Upgrader	Decision Executive
Tim Bertels	Unconventional &EOR DIEP	DRB Member
Adrienne Lamb	Communications	DRB Member
Keith Walters	VP Unconventional Projects Americas	DRB Member
Carmelina Riccio	HO Growth Finance Manager	DRB Member
Sam Whitney	Mgr Tech Serv, Shell E&P	DRB Member
Bonnie Vogeli	Sr. Counsel Upstream	DRB Member
Tim Wiwchar	Business Opportunity Manager	

The DE and DRB meet regularly to review and assess the required decisions as identified in the Decision Based Road Map. The Decision Based Road Map is the deal sheet of the Venture team, led by the Business Opportunity Manager (BOM). The Decision Based Road Map is a key document for the venture and can only be updated with approval from the DE/DRB. It describes the key decisions that must be taken to progress this opportunity and its associated risks. The line of sight (LOS) to FID is through the DE (EVP Heavy Oil) and the Quest BOM.

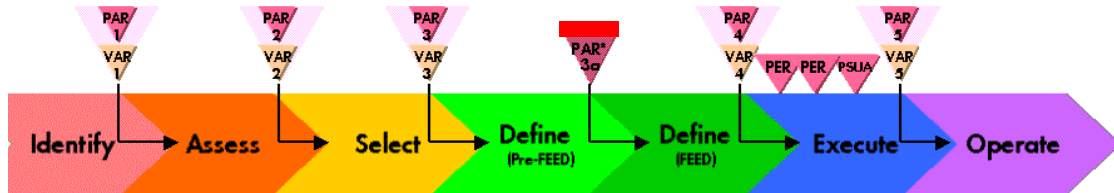
The BOM is supported by his venture team, Heavy Oil Operations, and a project execution and technical team from the Projects and Technology (P&T) division in Shell. The P&T team is led by the Project Manager (Anita Spence).

The Project Manager is responsible for the technical definition and execution of the Quest CCS surface facilities, pipeline and well hook-ups. Subsurface definition is being led by the Storage

Manager. After DG4, the PM’s responsibilities may also include delivery of the injection and monitoring wells.

6. PROJECT ASSURANCE

6.1. ORM Deliverables by Project Phase



Phase Objectives	Business Planning Identify options Economic evaluation SD strategy Opportunity Framing workshop Assurance Reviews	Business Planning Assess & select best options Economic evaluation SD strategy Project Assurance Plan (PAP) ± 30% Estimate Assurance Reviews	Basis for Design Optimum technology Operational requirements Site Selection HSSE assessment Economic Evaluation ± 30% Estimate Assurance Reviews	Process Design Fully defined process scope (PFD's) Economic Evaluation Risk Review HSSE assessment Execution & Ops Planning ± 20% Estimate Assurance Reviews	Basic Engineering Design Complete Project Specification Final Economic Evaluation Integrated EPC & Commissioning schedule Execution & Ops Planning ± 10% Estimate Assurance Reviews	Design Procure Construct Assurance Reviews	Flawless start-up Flawless first cycle of operation Meet business plan PIR
	Phase Deliverables	Schedule Estimate Risk Register Opportunity Framing report Assurance Review Reports	PAP Project Premise Document (PPD 0) Scouting report Project Execution Strategy (PES 0) Operations Implementation Plan (OIP 0) Technical Assurance Plan Risk Register Schedule Estimate Assurance Review Reports	Updated PAP PPD Rev.1 Basis of Design (BOD) PES Rev.1 OIP Rev.1 Technical Assurance Plan Risk Register Schedule Estimate Assurance Review Reports	Updated PAP PPD Rev. 2 Basic Design Package (BDP) Project Execution Plan (PEP) OIP Rev. 2 Risk Register Schedule Estimate Assurance Review Reports	Updated PAP PPD - Final Project Specification (PS) PEP Rev. 1 OIP Rev. 3 Risk Register Schedule Estimate Assurance Review Reports	Updated PAP Safe, environmentally sound, operable facility Assurance Review Reports

6.2. Discipline Controls and Assurance Framework

During the SELECT phase, the Quest CCS Project began applying DCAF to manage quality. This resulted in the development of a project-specific Project Controls and Assurance Plan (PCAP) for the period until DG3. The PCAP was subsequently defined for the DEFINE phase, for the period until DG4. The PCAP lists critical project deliverables, whom is accountable or responsible and identifies those people authorized to sign-off on these deliverables; it should be consulted for details on these topics.

Fluor developed their own quality plans for DEFINE phase deliverables and activities. The project team has checked the contractor’s and Shell’s compliance with the DCAF management system and will participate in the system where and when appropriate. The preparation and alignment of contractor QA plans with the PCAP will be undertaken for EXECUTE phase.

The contractor QA plan will cover technical quality, procurement quality and construction quality. Commissioning and start-up quality will be discussed in the Operations Readiness Plan. Shop inspection and equipment commissioning requirements by both the owner's team and by contractors will be specified in the project QA plan and purchase orders prior to execution of a PO.

6.3. Value Improvement Plan

During the SELECT phase, the project plan for application of VIPs was developed in conjunction with the EPCM contractor. By using multi-discipline teams and external third-party participants, value improvement ideas were identified, developed and implemented; the effect was a >15% reduction in CAPEX prior to completion of the VAR3 estimate.

In addition, the EPCM contractor has an established Value Awareness program to facilitate the ongoing collection of ideas to reduce costs from the integrated team. A Value Awareness committee has been established comprising Shell and EPCM personnel to review and approve ideas as appropriate.

6.4. Top Quartile Project Delivery

Cost is the primary value driver for Quest CCS. Therefore, cost metrics have been selected for benchmarking, and Top Quartile targets have been identified for those metrics. In general, 2nd-4th quintile targets have been selected for schedule. However, there is no target for the overall Execution Schedule, because the lack of overlap between detailed engineering and site construction makes the overall schedule very long compared to most projects. The Project Team belief is that cost excellence will be achieved during construction by having no holds remaining on the Issued For Construction (IFC) drawings, and is therefore not interested in overlapping the engineering and construction schedules. IPA Prospective benchmarking has been carried out prior to VAR4, and the findings will be incorporated in the project.

7. FORMS OF AGREEMENT

7.1. Background

As part of the plan for greenhouse gas management and to reach desired CO₂ reduction targets, the governments of Alberta (GoA) and Canada (GoC) initiated programs to incent early carbon capture and storage projects. The Quest project applied to these programs in a competitive bidding process with the submission of a Full Project Proposal (FPP) in March 2009. After evaluations of the bids submitted and subsequent discussions and negotiations, Quest was notionally awarded funding in both programs, conditional upon having completed and signed funding agreements with federal and provincial governments. The broad terms of the agreements were outlined with the signing of Letters of Intent with the GoA and GoC in

September 2009. Amongst other terms, the funding levels are Cdn\$745 million from the GoA and Cdn\$120 million from the GoC for a total funding level of Cdn\$865 million.

Negotiations on the terms of the agreements have been completed and agreed to by all parties in the government and the AOSP JV. On 24-June-2011, the agreements were signed and announced to the public.

In parallel to the funding agreements, negotiations were conducted and concluded on a related agreement between Quest and the Provincial Government for multi credits applicable to the project. The agreement calls for an additional carbon credit to be awarded to Quest for each tonne of CO₂ captured during the first ten years of the project's operating life, subject to CO₂ market prices. These credits will be usable for meeting greenhouse gas reduction commitments by the AOSP JV partners within the province of Alberta firstly, and any additional amounts are tradeable. The additional credits generated by the design volume of 10.8 million tonnes over ten years represent a significant additional revenue source in achieving the project goal of NPV=0 with a total revenue of 162M CAD at current 15 CAD/tonne credit prices, or 432M CAD at premise 40 CAD/tonne credit prices.

The key terms for each of these agreements are outlined in the following sections.

7.2. GoA Agreement – Key Terms

- (a) Funding amount – Cdn\$745 million
- (b) Administered by the Department of Energy (ADOE)
- (c) Payment of funding is phased as 40% during the post-FID and construction period, 20% upon successful startup and the final 40% over the first 10 years of operating life
- (d) Agreement by Shell to a broad knowledge sharing framework, whereby key CCS knowledge is granted to the government for use in sharing with future CCS developers
- (e) Project startup by end of year 2015 with penalties if late and full repayment of funding if beyond end of year 2017, subject to certain force majeure clauses
- (f) Total government funding is not to exceed 75% of total project costs, including operating costs over the 10 year project operating window
- (g) Money from the operating phase will be withheld if the project is deemed to be profitable. The amount of money withheld will be that amount that brings the project back to a neutral profitability position
- (h) The agreement contains clauses regarding eligible costs and revenue definition, Force Majeure, assignability rights, audit provisions, reporting requirements, etc that protect the interests of all parties.

7.3. GoC Agreement – Key Terms

- (a) Funding amount – Cdn\$120 million
- (b) Administered by Natural Resources Canada (NRCan)
- (c) Payment of funding is immediate upon receipt of information verifying completion of valid work
- (d) Agreement by Shell to a broad knowledge sharing framework, whereby key CCS knowledge is granted to the government for use in sharing with future CCS developers
- (e) Funding to be released after the project has complied with an environmental assessment as per the Canadian Environmental Assessment Act (CEAA)
- (f) Project startup by end of year 2017, otherwise full repayment of funding, subject to force majeure
- (g) Total GoC funding is not to exceed 50% of total project costs
- (h) Money will be returned to the government if the project is deemed to be profitable. The amount of money returned will be that amount that brings the project back to a neutral profitability position
- (i) The agreement contains clauses regarding eligible costs and revenue definition, Force Majeure, assignability rights, audit provisions, reporting requirements, etc that protect the interests of all parties.

7.4. Multiple Credit Agreement – Key Terms

- (a) The agreement allows for the granting of additional credits to Quest under the conditions of the agreement and the amendments to the Specified Gas Emitters Regulation of the Province.
- (b) Additional credits are to be used for compliance purposes by Shell facilities in Alberta.
- (c) The credits expire 3 years after their creation.
- (d) Additional credits not required for compliance are tradeable.
- (e) The maximum amount of additional credits is 10.8 million.
- (f) If the project is in a net positive revenue position, then additional credits in that year will not be granted.
- (g) The quantity of additional credits will be determined by the market price of CO₂. For prices at or under 40 CAD/tonne, one additional credit will be granted per tonne of CO₂ captured and stored. For prices at or over 80 CAD/tonne, no additional credits will be granted. For prices between 40 CAD and 80 CAD, the amount granted will be a linear ratio between one credit at 40 CAD and zero credits at 80 CAD. For clarity, in an example of CO₂ market price of 50 CAD/tonne, the amount granted would be 0.75 credits per tonne of CO₂ captured and stored.

7.5. Agreement Next Steps

Operationalization of the agreements has begun with a program being laid out that clearly specifies the responsibilities and timing of the AOSP obligations. This will ensure timely and effective delivery of all agreement items.

8. FINANCING & INSURANCE

8.1. Financing

The AOSP JV Owners will fund the Quest CCS Project proportionally. Shell Canada's expenditures are currently financed via an intra-Group loan from Shell Finance Switzerland A.G.

The funding agreements require security, which will be provided as a Letter of Credit or as a Guarantee and is still in the process of being negotiated.

8.2. Insurance

A Capital Project Risk & Insurance Strategy has been developed for the Quest CCS Project. It sets out strategies and plans for ensuring that all stakeholders in the Project, including insurers, see their interests addressed in a mutually beneficial way. Topics addressed include, but are not limited to, the following: Role of Risk & Insurance – Modus Operandi, proposed risk management approach, risk allocation principles in contracts (i.e., CARM), insurance clause structure required from contractor to support risk allocation, capital projects risk engineering, marine warranty survey, insurance principles – recommended best practice, proposed insurance procurement strategy, competitive tender exercise, underwriting information, participation of captive companies of the stakeholders, risk retention levels, statutorily and contractually required insurances, insurance in construction phase, early works insurance, general third party liabilities, marine cargo, Construction All Risks (CAR) – Onshore, and claims management.

Prior to FID, an insurance risk review will be performed utilizing results of the independent risk assessment being carried out by DNV. This review will combine the key elements of the Design Phase Risk & Insurance Review (DPRIR) and Underwriting Survey to assist with risk reduction measures and cost effective placement of the insurance policies. The scope of Loss Control Surveys will depend on the requirements of the lead insurer.

During construction, an Owner controlled insurance program placed by Shell will contain the following coverages for the benefit of all Owners, Project Management Consultants and/or Engineering Contractors and/or Construction Contractors and/or Subcontractors:

- First party property damage coverage for the project works can be insured through Construction All Risks (CAR) insurance, including testing, commissioning, and start-up. Existing property is insured under operational insurance policies.

- Coverage for third party liability in the form of a Wrap-Up Liability policy for liability at law to pay any sum as compensation or damages in respect of injury to any person or damage to any property, arising out of, incidental to or in connection with the project.

Also during construction, it is expected that each contractor and subcontractor will carry specified types and amounts of insurance to include Workers' Compensation, Employer's Liability, Commercial General Liability, and Automobile Public Liability, and other insurance that may be required to reflect risk exposures of specific scopes (Professional Indemnity, Aviation Liability, etc).

Post construction, it is anticipated that operational risks will be absorbed into each JV partners' operational insurance programs or, to the extent that is not possible, insured in the commercial market.

8.3. Transition of Responsibilities

In general, P&T finance will maintain the responsibility of Finance functions until Full Capacity Start Up (FCSU) at which time it will move to Scotford Finance. The transition of responsibility will occur throughout the months between Ready for Start Up (RFSU) and FCSU. These activities include Business One monthly reporting, LE updates, government invoicing for funding agreements, and cost allocation to assets. Government invoicing is expected to end once Sustainable Operations is met and Business One reporting continues until one year after RFSU.

9. RISK MANAGEMENT

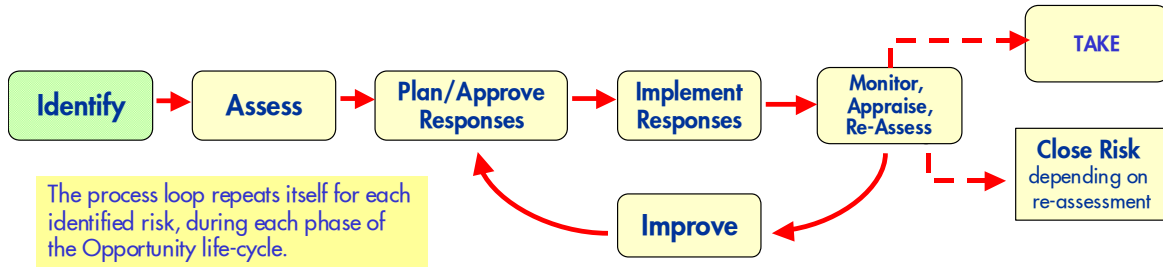
This section provides an overview of Risk Management for Quest CCS.

9.1. Risk Management Process

The goal of Risk Management is to identify and evaluate significant risks to the achievement of project objectives, set boundaries for risk acceptance, and apply fit-for-purpose responses.

Risk Management applies equally to upside risks ("opportunities") and downside risks ("threats") to maximize the likelihood of the project achieving its objectives while maintaining risk exposure at an acceptable level. Therefore, both threats and opportunities are explicitly included in the project Risk Register.

Project risks are being managed using the TECOP (technical, economic, commercial, organizational and political) approach outlined in ORM PS20 Risk Management. Risks are identified, categorized and assessed to identify owners and put mitigation plans in place; this is depicted in the figure below.



The Risk Assessment Matrix for Quest CCS is shown in the figure below:

QUEST - Project Risk Assessment Matrix

Doc # xxx
Jan. 6, 2010

Score	Assessment	CONSEQUENCE					PROBABILITY					
		Cost/Benefit	Schedule to FID	Schedule to Sustain Operations	System Capacity*	HSEI	Reputation	Score Assessment				
								1 VLO	2 LO	3 MED	4 HI	5 VHI
5	VHI	> CONS 50 million	> 8 months	> 8 months	>0.8 min tonnes/year ->0% downtime	Refer to HSEI RAM	International impact	5	10	15	20	25
4	HI	CONS 25-50 million	3-8 m	3-8 m	0.8 to 0.8 min tonnes/year ->0-50% downtime		National impact	4	8	12	16	20
3	MED	CONS 10-25 million	1-3 m	1-3 m	0.8 to 0.4 min tonnes/year ->0 to 50% downtime		Considerable (regional)	3	6	9	12	15
2	LO	CONS 5-10 million	0.5-1 m	0.5-1 m	0.4 to 0.1 min tonnes/year ->0 to 10% downtime		Limited (public concern/local media)	2	4	6	8	10
1	VLO	CONS < 5 million	< 0.5 m	< 0.5 m	<0.1 min tonnes/year ->0-10% downtime		Slight (some public awareness)	1	2	3	4	5

* System Capacity refers to the overall system rate of Capture and Sequestration. It covers the availability, reliability, OSF of the Capture facilities and Pipeline, as well as the Injection rate and pore-space storage capacity.

CRITICAL	Response plans reviewed by the appropriate Project Leads, and the Project Manager, receive final approval from the DE. Proactively manage at highest priority. Requires DE approval to Close.
SEVERE	Response plans should be reviewed by the appropriate Project Lead(s), resourced by the Project Manager (PM). Require PM approval to Close.
MATERIAL	Reviewed and approved by the appropriate Project Lead(s). Material risks require relevant Project Lead(s) approval for closure. Yellow risks should be managed cost effectively and monitored actively.
SMALL	Response plans will be the responsibility of the Risk Owner. Small risks require relevant Project Lead(s) approval for closure. Green risks should be monitored periodically to make sure they do not grow in importance.

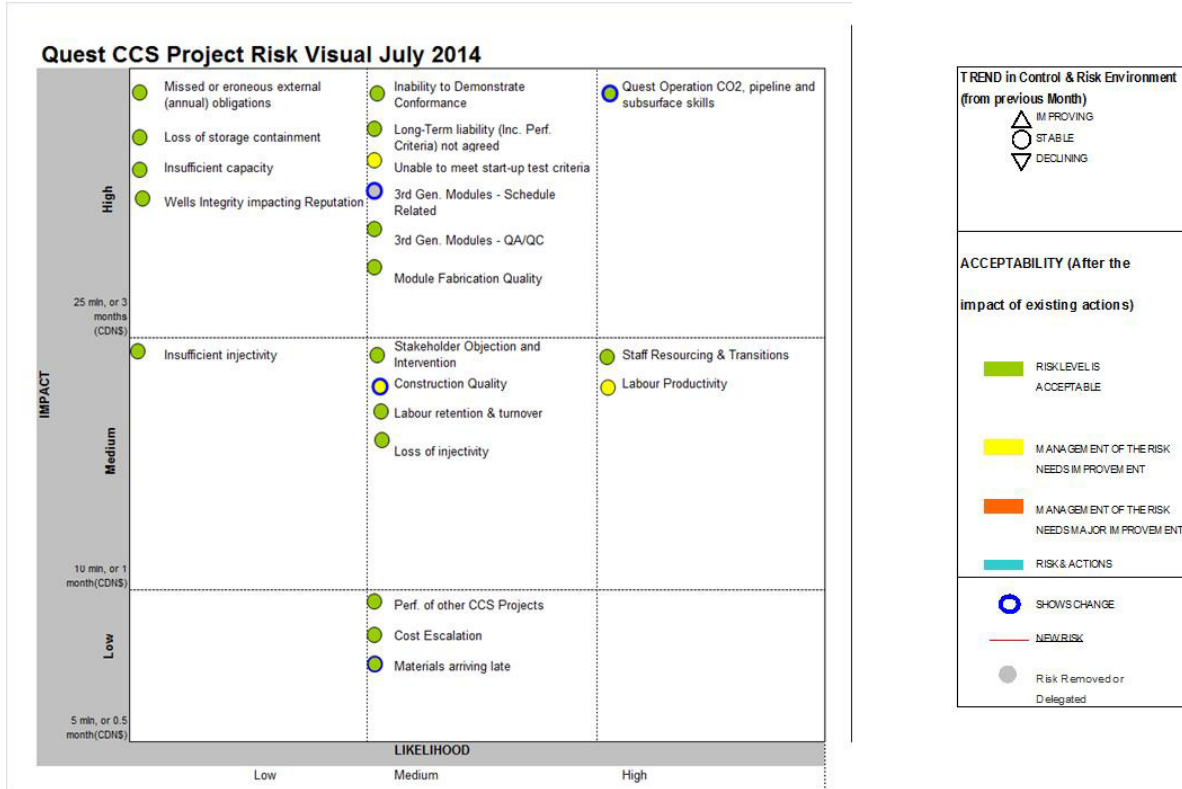
9.2. Risk Management Tools

The following software tools are being used to manage Quest CCS Project risks:

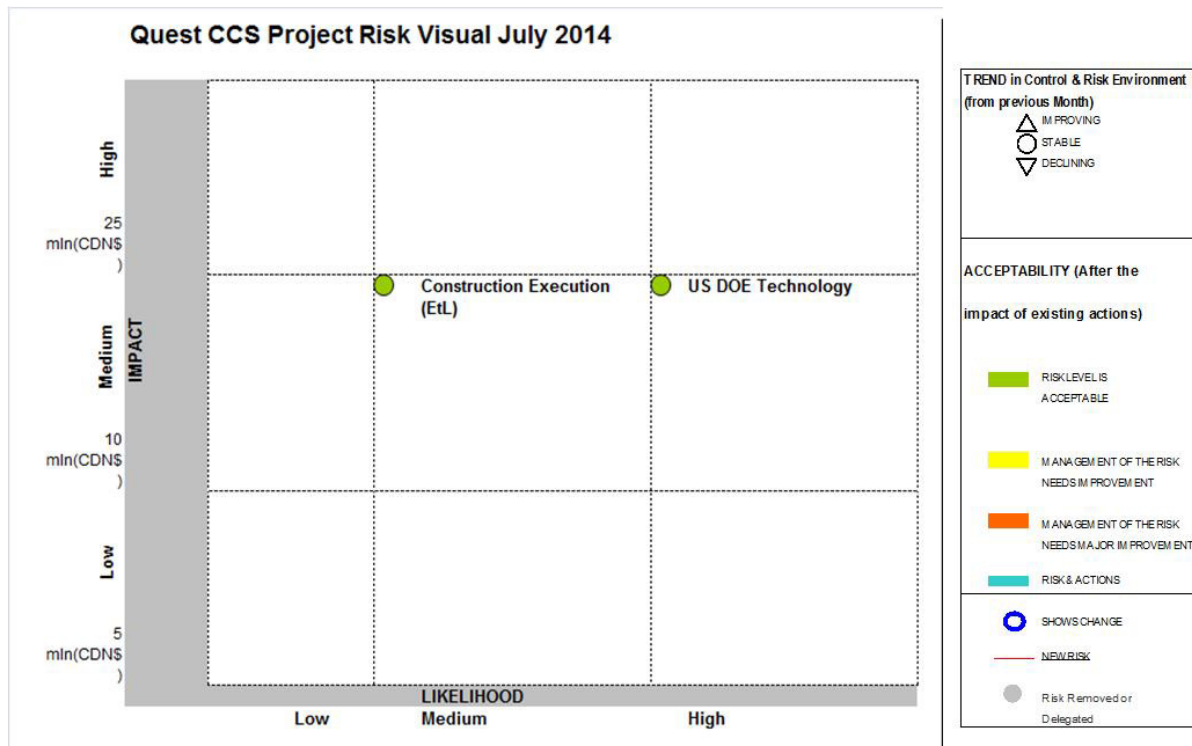
1. EasyRisk v. 3.1: to maintain the Quest CCS Project risk register.
2. Pertmaster v. 8.1: for probabilistic schedule risk analysis.

3. @Risk v. 5.0: for probabilistic cost risk analysis.
4. MS Excel: all probabilistic inputs/outputs and the risk visualisation/plotting tool are kept in MS Excel.

9.3. Key Risks for the Venture



9.4. Key Opportunities for the Venture



10. PERMITS & APPROVALS

This section provides an overview of Quest regulatory approvals. For more detail please consult the Permits and Consents Strategy

10.1. Requirements

The mandate for AOSP is to secure all necessary regulatory approvals for Quest in such a way that:

- All major approvals are in place by FID, anticipated in Q1 2012
- Promotes a thorough and transparent review of the potential environmental impacts of the project, given the public monies invested; and
- Follows the prescribed process, such that it can withstand a legal challenge

Approval must be sought for each of the three major components of the project: Capture, Pipeline, and Storage. Approvals are specified by component below:

Capture

- An amendment to the existing ERCB approval for Scotford
- An amendment to the existing AENV approval for Scotford

Pipeline

- D56 approval for the pipeline
- A Conservation and Reclamation Plan approval from AENV

Storage

- D56 approvals to drill and construct the wells and D51 approvals to inject CO₂ through the wells
- D65 Disposal scheme application, with injection in accordance with D51
- AENV approval

It is recognized that Quest will receive public scrutiny; decisions made by regulators in the process of issuing approvals, or the approvals themselves, will likely be subject to legal challenge from NGOs or local stakeholders. It is also recognized that the public safety aspects of the Storage component will be the subject of the most concern; although the Storage component uses existing technology, it applies this technology in a novel way.

10.2. Strategy

A strategy for securing these approvals has been devised which provides the maximum thoroughness of review without sacrificing efficiency of schedule, or the defensibility of the approvals themselves once they are secured, specifically:

- The application to the ERCB and AENV has been bundled in order to have a concurrent, efficient review of all aspects of the project
- A Quest EA has been prepared to address federal and provincial requirements, Shell's requirements for Integrated Impact Assessment, and Global Environmental Standards
- The Quest CCS Project has planned for a provincial ERCB hearing on all aspects of the project

10.3. Schedule

Planned

November 2010 – Submission of bundled application and EA

Q2/Q3 2011 – Response to Information Requests

Q4 2011 – ERCB Hearing

March 2012 – Regulatory approval received

Actual

March 2012 – ERCB Hearing

August 2012- Regulatory approval received

11. HSSE & SOCIAL PERFORMANCE

11.1. Objectives

The most important objective for the Quest project is Goal Zero. Goal Zero is defined as:

- Zero Lost Time Incidents
- Zero Total Recordable Incidents
- Zero significant environmental incidents

Although the *goal* for total recordable incidents is zero, the target TRCF for Quest will be 2.1. This is a 10% reduction on Expansion 1 results, and keeps Heavy Oil progressing in the right direction. The goal is zero, but a target TRCF of 2.1 is something the project team can manage towards based on recent project performance.

The project will support Goal Zero through the 12 Life Saving Rules and a zero tolerance attitude towards infringements. Specific plans and activities will be implemented through the project HSSE Activity Plan.

The HSSE Plan enables the project manager and venture manager to:

- identify the HSSE requirements for the project
- structure the project plans to successfully implement HSSE requirements during all project phases

In addition, the project leadership team will take responsibility for implementing these objectives and will have Quest specific objectives as part of their Goal Performance Appraisals (GPAs).

One of Shell's key HSSE requirements is to demonstrate that HSSE risks from its operations are As Low As Reasonably Practicable (ALARP). The Hazard and Effects Management Process (HEMP) has been applied throughout the project development. As a result, the project will demonstrate that the process hazards associated with the design have been managed and reduced to a level as low as reasonably practicable (ALARP).

The HSSE Design Case will be the auditable record for HSSE and will be continuously developed throughout the project.

11.2. HSSE Issues Identified in DEFINE Phase

During the DEFINE phase, the following key HSSE issues were identified:

- Dispersion modelling of CO₂ hazards still contains uncertainties, however recent experiments have provided some assurance that current modelling does not underestimate dispersion effects.
- Simultaneous Operations during construction of the Capture component.
- 3rd Generation Modularization will necessitate increased focus on HSSE management at the modular fabrication yards.
- Issues around the Prime Contractor designation of different construction areas at the Scotford site.

The Hazards and Effects register will be used to demonstrate how all key HSSE issues and risks are managed.

11.3. HSSE Plan for the EXECUTE Phase

The control framework, DCAF and PG1 serve as the basis for the project HSSE plan. The plan will be supplemented with group industry guidance and scope specific activities, as agreed to by the HSSE Manager and the Project Manager. This is to ensure that Detailed Engineering design documents are consistent with Shell's requirements and the required reviews have been undertaken on the proposed design. The plan will be reviewed to ensure the selected HSSE activities are consistent with the project scope and the Brownfield nature of the project, and will take consideration of existing Scotford Operations' design safety documents. As part of the plan a project HSSE management system will be developed to describe the systems and process to be followed to execute work safely at the construction site.

The project HSSE Manager will be accountable for the HSSE Activity Plan. Due to some of the uncertainties surrounding the HSSE impacts of CO₂, specialist technical advice will be sought. In addition representatives of the Scotford operating organizations and the main engineering contractor will be requested to participate in key reviews, as defined in the plan.

During DEFINE some construction activities were accelerated to address issues raised during SELECT, e.g. concurrent operations. As the project proceeds into EXECUTE, work will continue to address these issues. A construction HSSE team will be mobilized prior to any field work taking place. This team will consist of dedicated HSSE field staff, including environmental specialists and trainers.

Key HSSE activities for the EXECUTE phase include, but are not limited to:

- Final Design HSE Case & Input to Asset HSE Case
- Security Operating Plan
- Model Reviews (30/60/90%)
- Detailed Bow-Tie Analysis
- Updated QRA
- Final HAZOP
- Final Desktop Safety Reviews
- Final IPF Review
- Final LOPA
- Final SAFOP
- Hazardous Area Classification
- Pre-Startup Safety Reviews (PSSR)
- HFE Implementation Plan
- HEMP for Construction & Commissioning
- Concurrent Operations Plan
- In accordance with AI-PSM, a Statement of Fitness will be developed and maintained for the Quest assets

11.4. Transition of HSSE Responsibilities

As systems are turned over from P&T Construction to Quest Operations team, care, custody and control for the facilities transition to Operations. P&T will maintain the Greenfield designation for the Main Capture plot until systems are officially turned over as per the HSSE in Transition Plan. Post conversion to Brownfield, P&T will remain responsible for the HSE of work and reporting associated with construction related work (ie punch-list completion and demobilization activities). Quest Operations will be responsible for HSE of work and reporting associated with CSU activities. Additionally Quest orientations and training required for the capture site will stop when the Capture plot becomes a Brownfield and at that point only Scotford orientation will be required to complete work at Quest. Pipeline orientation will be handled by the Quest Operations team with the hand over from construction.

11.5. Environmental, Social and Health Profile

This section provides an overview of ESH.

(a) Environmental and Socio-Economic Impact Assessments

The provincial and federal governments each have established Environmental Assessment (EA) Acts and processes; the Canada-Alberta Harmonization describes the provisions to combine the two should an EA be required from both levels of government. The Quest EA has been prepared to meet the requirements of both processes, in addition to Shell's requirements for Integrated Impact Assessment, and Global Environmental Standards.

A Socio-Economic Impact Assessment was carried out in early 2009, and reassessed in 2010 in light of the EA and Regulatory Application activities carried out as part of the revised Regulatory Strategy (see section 10).

(b) Social Performance

The Social Performance Vision for Quest (and for the larger Scotford complex) is:

- To be viewed as having positive impact on the quality of life of the community, and providing significant economic benefit
- To be viewed as operating responsibly and safely
- To be viewed as open, transparent and honest when communicating with neighbours
- To have the support of the community when faced with challenges; and
- To ensure neighbours believe we care about our impact on them

Seven key issues have been identified relating to social performance in the affected communities:

1. Process safety
2. Demonstrating personal safety
3. Demonstration of CO₂ containment
4. Quality of life
5. Health
6. Cumulative effects
7. Maximizing local benefits

Actions related to managing these issues can be found in the Social Performance Plan.

12. PROJECT ORGANIZATION

12.1. Venture and Project Organizations

Management of the Quest CCS Project is the responsibility of Shell Canada Limited-Oil Sands (AOSP) on behalf of the Joint Venture partners.

The Business Opportunity Manager (BOM) has the single point accountability for managing the Quest CCS opportunity from pre-scouting through to completion of DEFINE phase. Thereafter, the BOM remains responsible for managing the opportunity until Handover.

From DG4 onwards, the Projects and Technology (P&T) division is single point responsible for delivering projects on behalf of the business (in this case Heavy Oil). The Quest CCS project will

adhere to the processes and procedures that are applied in P&T for project delivery. P&T in Calgary will staff the Quest CCS Project team to reflect the transfer from the DEFINE phase to the EXECUTE phase in the latter part of 2011.

The Project Manager Quest from the Projects and Technology business group will have single point accountability for managing the Quest CCS Project (including the subsurface component) during EXECUTE, until the project is 'Ready for Start-up' (RFSU) and is handed over to Upgrader Operations.

The Operations organization has staffed up during DEFINE to support the early engineering reviews which are required to realize a 3rd Generation Modularization design.

The current organization for the venture and the projected organization for the project in EXECUTE are presented in the figures below.

Quest Organization in the Define Phase

Last updated 28 July 2011

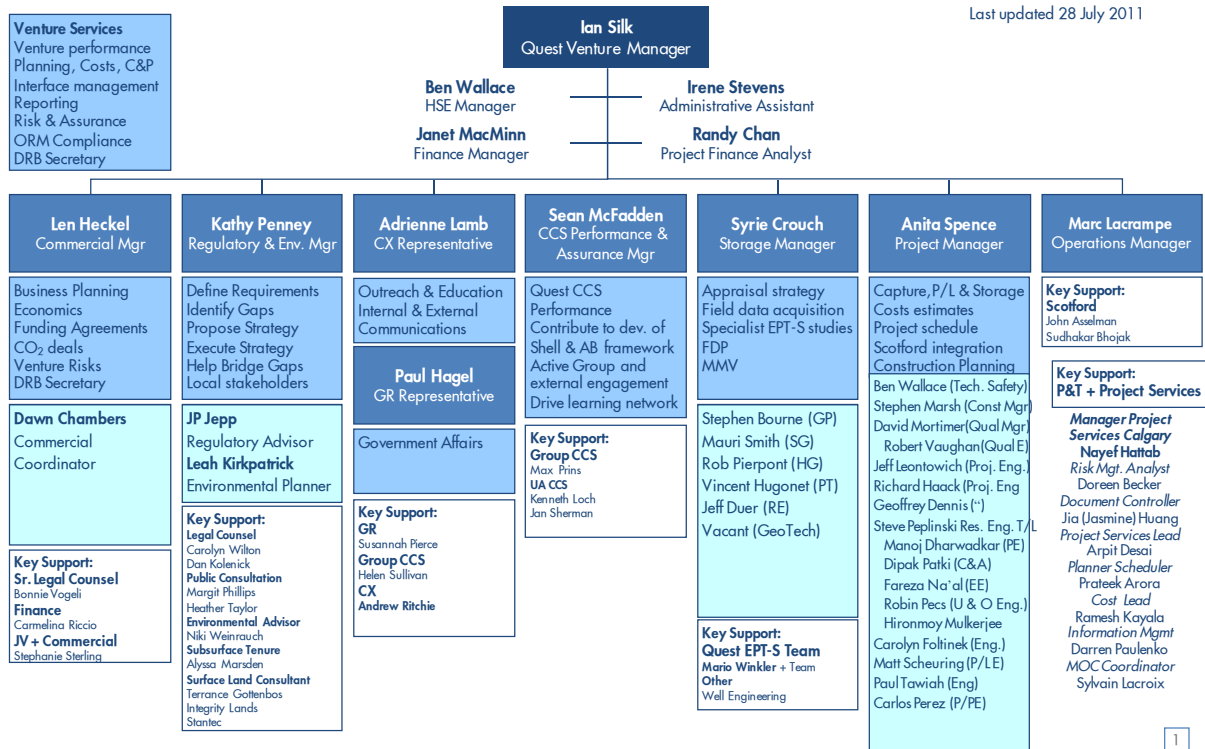


Figure 12-1 Quest Organization in the Define Phase

P&T Upstream Major Projects - Quest Organization
(May 2011)

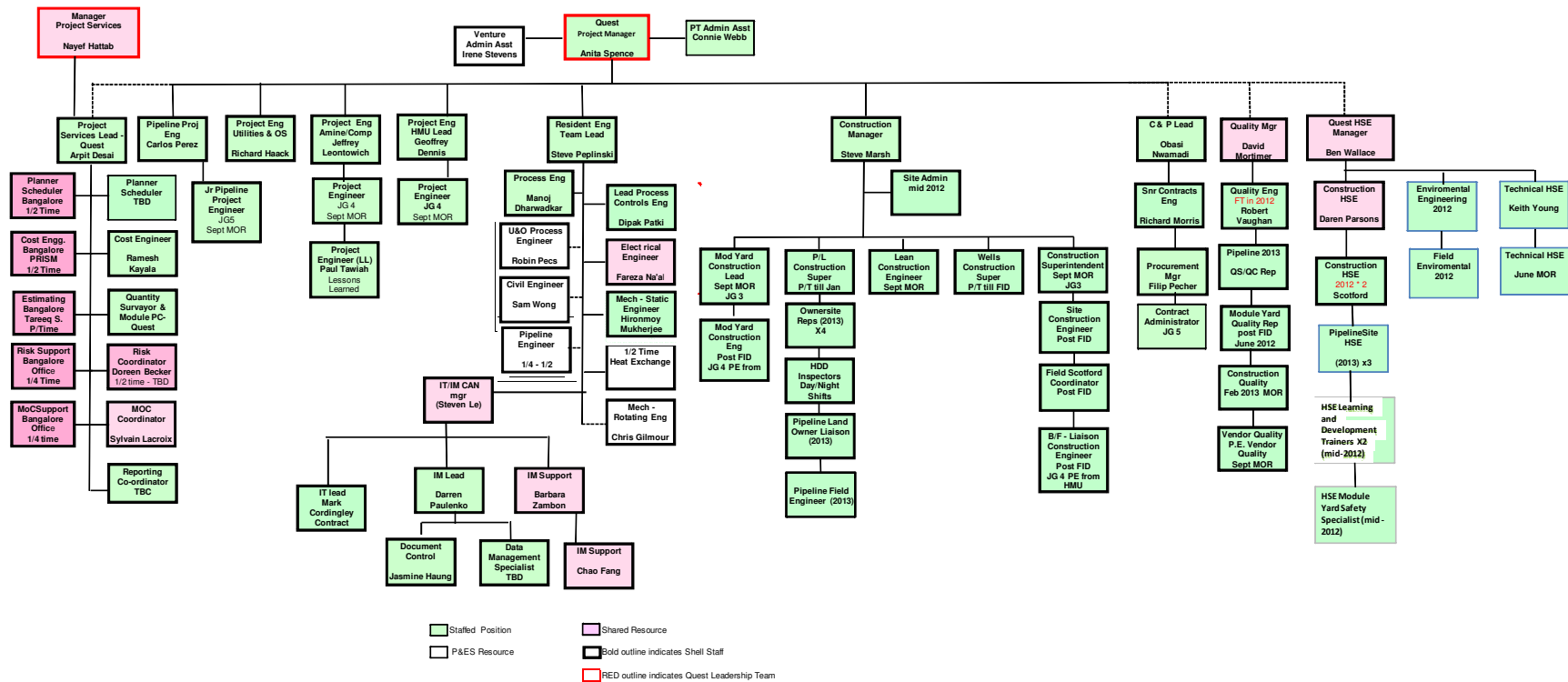


Figure 12-2 Quest (P&T) Organization in the Define Phase

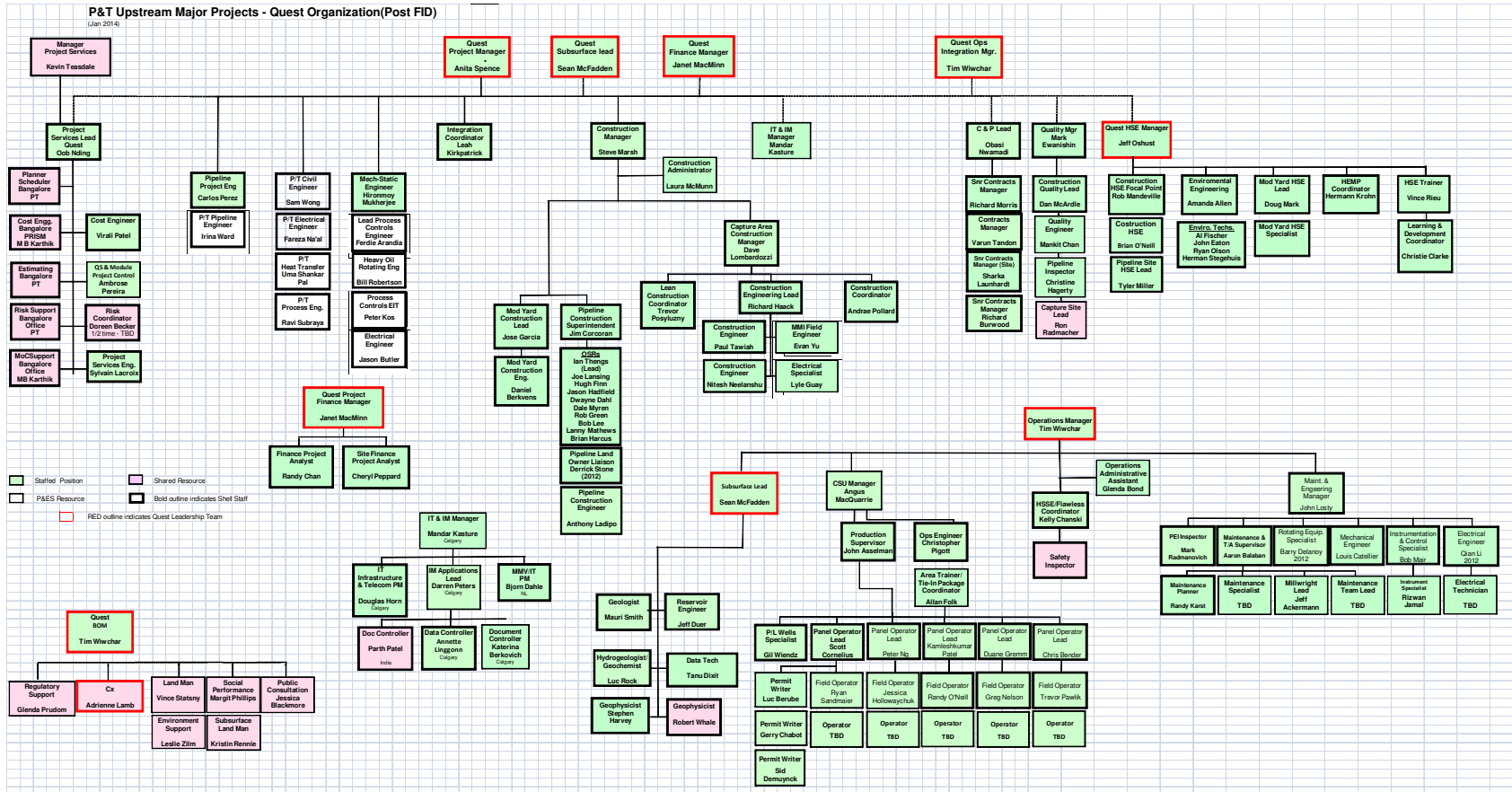


Figure 12-3 Quest Organization in the Execute Phase

A workshop was convened after DG4 but before FID to align around Venture and Project responsibilities during EXECUTE phase.

Shell will be 'Prime Contractor' during the EXECUTE phase for the Quest facilities inside Scotford. Furthermore, the brownfield nature and integration with the Scotford Upgrader whilst in Operation (SIMOPS) has necessitated additional owners' team and Operations resources, as shown in the organization charts above.

In the EXECUTE phase the Quest Project (Projects and Technology) Team maintains accountability for the majority of functions however the CSU and operations team will grow and ramp up preparation for CSU activities and start up. Commissioning and start up activities are within the accountability of the Quest CSU Operations team, which reports to the Scotford Upgrader General Manager within Heavy Oil.

As construction activities wrap up, the need for engineering support decreases, EPCM contracts close, HSSE programs move from P&T centric to Scotford centric, and CSU activities become the focal, the accountability and responsibility for Quest activities shift. The Quest team has drafted a timeline of how work transitions through this time until Sustainable operations and a high- level illustration is given below in Figure 12-4Quest Transition Plan for moving from P&T to Scotford Operations

Key assumptions and definitions to note are the following:

MC= Mechanical Completion

PSUR= Pre Start up Review (a pre-cursor to the formal pre start up audit)

SoF= Statement of Fitness

RFSU= Ready for Start Up

FCSU= Full Capacity Start Up

P2A= Project to Asset

SO= Sustainable Operations. This is achieved when all three Government of Alberta tests are met. (Please see Section 3.2 for a description of the tests)

P&T (via main Capture EPCM) will continue to complete the B and C punch list items post mechanical completion.

A punch list items will be complete prior to mechanical completion.

B punch list items are to be completed prior to start up.

C punch list items are to be completed prior to sustainable operations

D punch list items are to be complete by Shell.

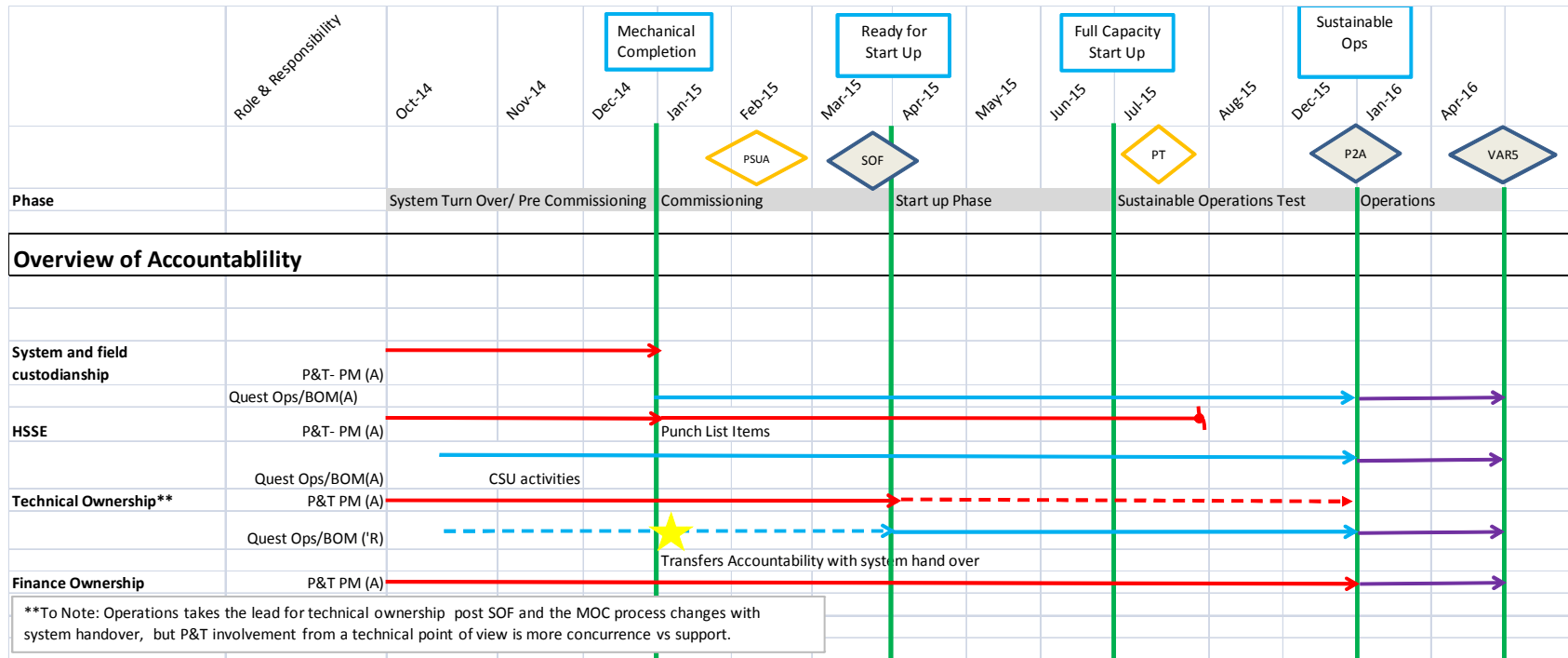


Figure 12-4 Quest Transition Plan for moving from P&T to Scotford Operations

12.2. Market Conditions

Market projections indicate that the Quest CCS Project will be executed in a period of high construction activity in 2013/14. Alberta is likely to experience a tight supply for both skilled trades as well as professional disciplines such as engineers, planners/schedulers, project controls, estimators, SCM, etc. The resources of the owners' team will have to be regularly assessed against the development of the market and the performance of the EPC contractors. A quarterly performance review is built into the Capture-component EPCCM contract, as well as the Pipeline-component EP contract.

12.3. Ethics & Compliance

An Ethics & Compliance Plan has been developed for the project team to ensure that all project activities are conducted in accordance with Shell General Business Principles, the Code of Conduct, and all applicable laws and regulations. A risk assessment has been carried out for members of the project team to identify areas (e.g. Antitrust, Anti-Bribery, Export Controls, Conflict of Interest, etc.) of risk exposure, and a training plan has been initiated for the team to address any gaps. The Ethics & Compliance Plan will be monitored and updated throughout EXECUTE.

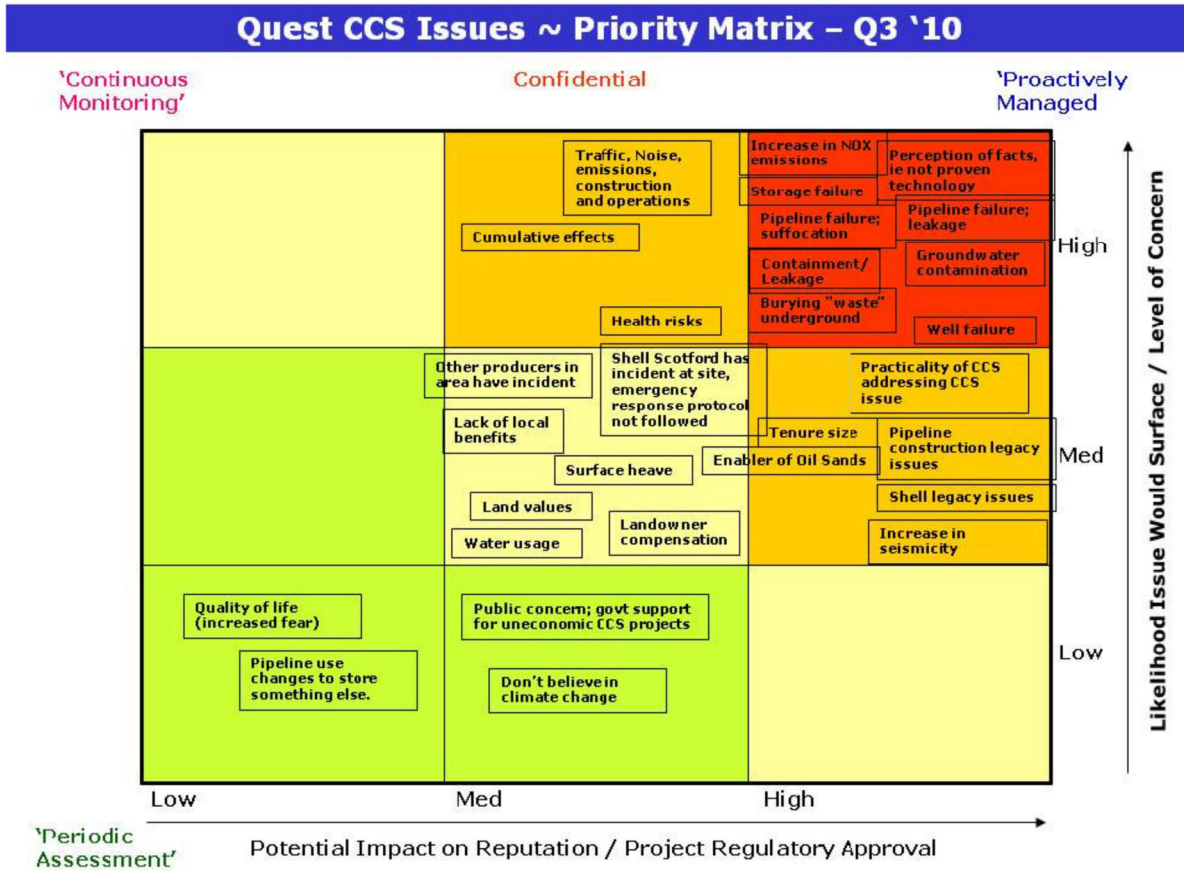
13. STAKEHOLDER ENGAGEMENT

This section gives an overview of Stakeholder Engagement.

Stakeholder engagement is a key component of gaining public acceptance for CCS. Stakeholders' interest in Quest must be recognized, and the ways in which Quest may potentially impact them must be understood. AOSP has developed Consultation Principles which provide the framework for engaging stakeholders:

- **Shared Process** – Design consultation programs with public input
- **Respect** – Respect individual values
- **Timeliness** – Start consultation early
- **Relationships** – Establish and maintain relationships
- **Communication** – Consult with interested parties; gather and listen to feedback to resolve concerns
- **Responsiveness** – Adapt plans based on stakeholder input
- **Accountability** – Trust that representatives of interest groups are accountable to the organizations they represent

Concerns that have been identified by stakeholders are assessed in the Priority Matrix presented below:



13.1. Transition of External Engagement Responsibilities

The BOM maintains the accountability for managing external engagements throughout the EXECUTE phase of the project. Given the unique nature of the project coupled with the government funding, Quest has received a lot of attention in the external environment and thus the time associated with this aspect of the Project is significant. For the Quest project the BOM role is held by the Quest Operations Manager. As the operations based activities increase near MC and after hand over, the external engagement activities will be supported by the Quest Project Manager (P&T).

The Commitment Tracking and Stakeholder Engagement (CTSE) database is used by the Quest HSE team to manage any external commitments made in various settings including the environmental and regulatory documents and subsequent submission. Those related to construction and the development side of the project will be closed off and the database will be handed over to Scotford post Mechanical Completion.

14. INTERFACE MANAGEMENT

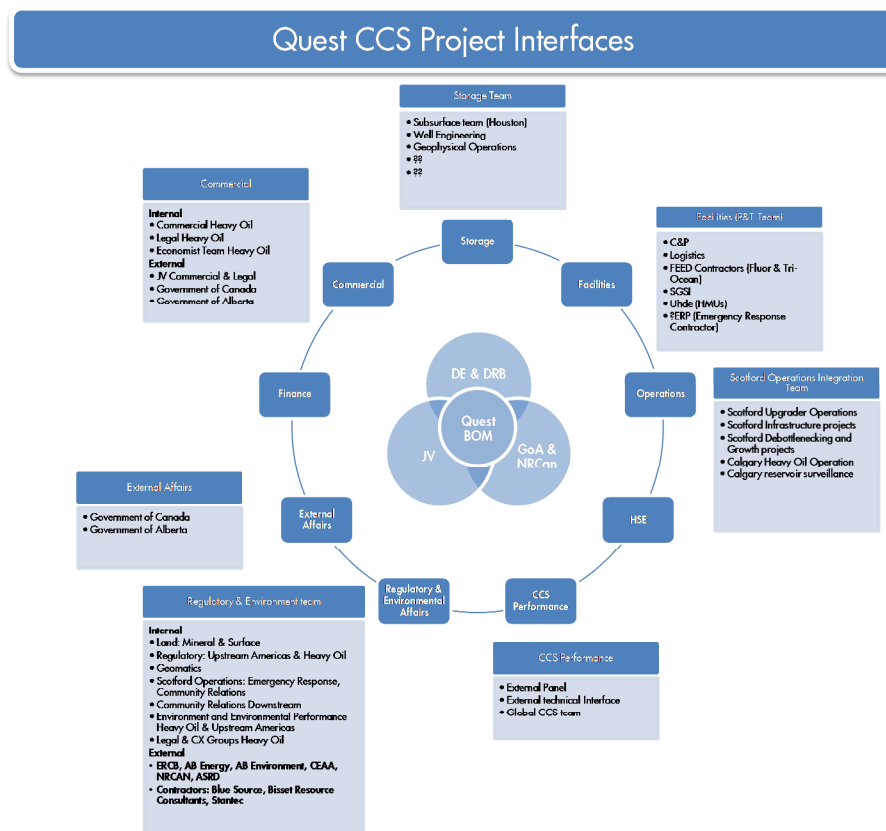
An interface management process has been established that will facilitate the timely identification and resolution of project interfaces. Effective interface management is a key element of sound

project management and is a critical success factor to ensure cost, schedule, safety and quality targets are met. The key aim is to provide a consistent cross-project method by which interfaces can be identified, developed, mutually agreed, managed, tracked, controlled and closed out.

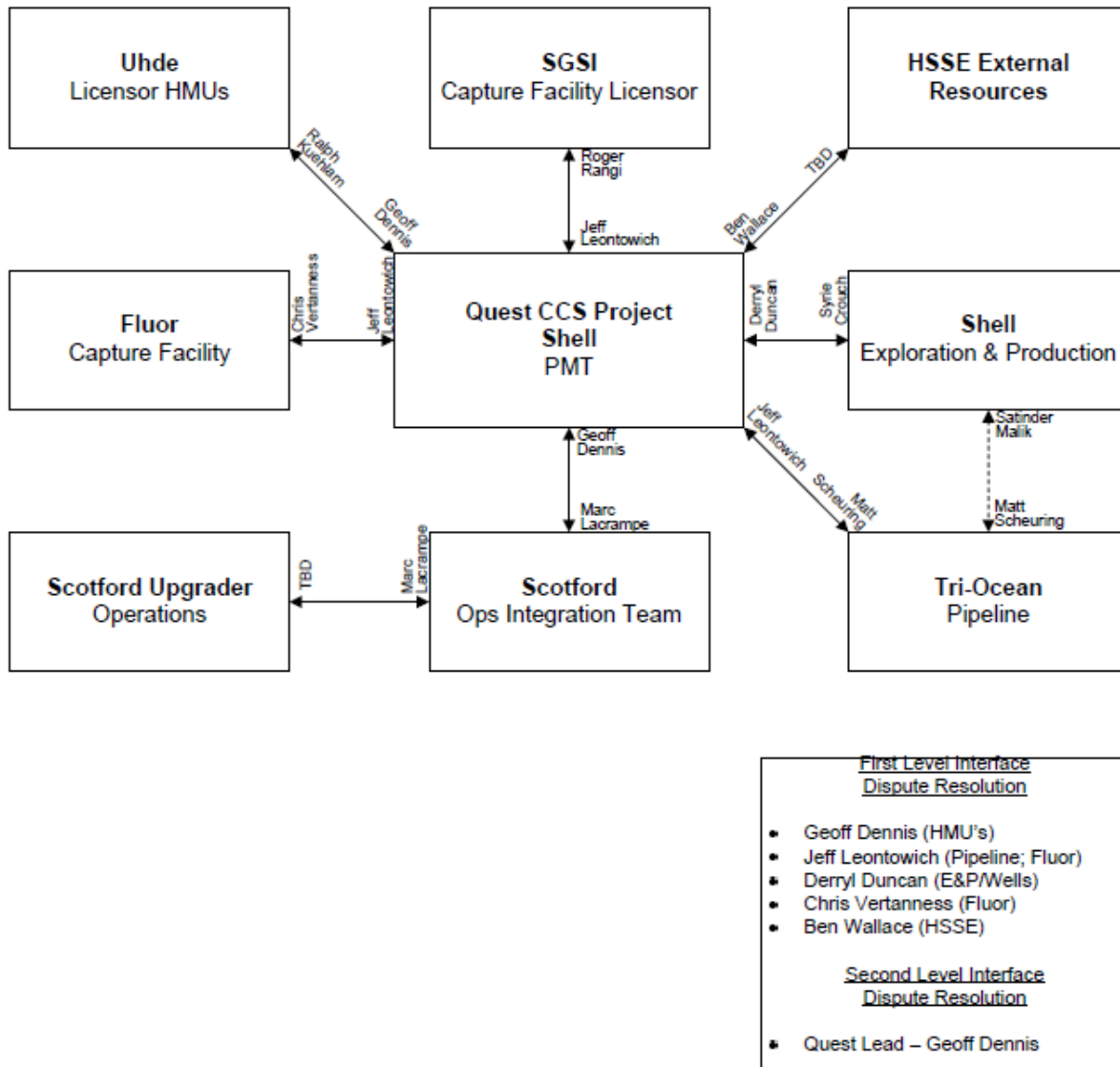
The Interface Management Plan (IMP) provides:

1. A consistent approach for achieving alignment between work areas
2. A process for initiating information requests
3. An auditable trail for interface transfers
4. A process for resolving difficulties or disputes
5. A process for managing changes arising that affect project activities

The Venture and Project Interface Maps and focal points are shown below:



Quest CCS Project Feed Interface Map and Focal Points Roster



The process description of the Interface Management Plan is as follows:

1. Focal point (FP) generates an Interface Data Sheet "IDS" request.
2. IDS request goes to Document Control; Document Controls routes it to FP's and required recipient(s).
3. IDS acquires unique number cover sheet from Document Control.
4. FP's resolve directly and close out.

5. If dispute arrives elevate to interface lead.
6. The IDS revs up under the unique cover.

Monthly updates will be provided to the Shell Interface Lead (report of open and closed issues, past due items, etc.), using the **Project Interface Register** (PIR).

During the Execute phase, the Quest Project Team is fully resourced and the Quest Operations team is increasing its resources. The Quest subsurface team is transitioning into the operations phase with the environmental components of the MMV program transferring to Scotford and some development continuing with SGSI support.

Supporting functions to the Quest Venture are mainly on a part-time basis. The Quest Project team is lead by the Project Manager within Projects and Technology with functional support from Shell Upstream America and Heavy Oil. Although interfaces range physically across the globe, there are six locations within Alberta where work is being completed. Effective team collaboration over this area is required for success.

07-0-AA-5798-0005






In the EXECUTE phase, Quest is using the following main tools for managing interface issues:

1. The Quest Interface Matrix which is reviewed regularly with the key Quest discipline leads and the health of the interfaces are qualitatively assessed. A sample matrix is presented below.

Quest Team (Shell)

	Maintenance & Integrity	CSU	Ops-HSSE/Flawless	Environment Capture/Pipe	HSS	Quality	Project Services	C&P	Finance	Construction- Modyard	Construction- Capture/ISBL	Construction- P/L	Engineering	IT/IM	Subsurface (including MMV)	Regulatory (Quest)	Scotford Env/Regulatory	BOM
Maintenance & Integrity	Black	Green	Yellow	Grey	Grey	Yellow	Green	Yellow	Green	Green	Green	Yellow	Yellow	Grey	Green	Grey	Green	Green
CSU/Ops	Green	Black	Green	Grey	Grey	Yellow	Yellow	Green	Yellow	Green	Green	Green	Green	Green	Green	Grey	Green	Green
Ops-HSSE/Flawless	Green	Green	Black	Green	Green	Yellow	Grey	Green	Green	Green	Green	Green	Grey	Grey	Green	Green	Green	Green
Environment Capture/Pipe	Grey	Green	Green	Black	White	Green	Green	Green	Green	Green	Green	Green	Green	Grey	Grey	Green	Green	Green
HSS	Grey	Green	Green	Green	Black	Green	Green	Green	Green	Green	Green	Green	Green	Grey	Grey	Green	Green	Green
Quality	Green	Yellow	Green	Grey	Green	Black	Green	Green	Grey	Green	Yellow	Green	Green	Green	Grey	Grey	Grey	Grey
Project Services	Yellow	Yellow	Grey	White	Yellow	Grey	Black	Yellow	Green	White	Green	Yellow	White	White	White	Yellow	Yellow	White
C&P	Grey	Green	Green	Grey	Grey	Green	Green	Black	Green	White	Green	Yellow	Grey	Green	Green	Grey	Green	White
Finance	Green	Green	Grey	Green	Green	Grey	Green	Green	Black	Green	Green	Green	Grey	Green	Green	Green	Green	White
Construction- Modyard	Green	Green	Grey	Yellow	Green	Green	Yellow	Green	Grey	Black	Green	Grey	Yellow	Yellow	Grey	Grey	Grey	Grey
Construction- Capture/ISBL	Yellow	Yellow	Yellow	Green	Green	Yellow	Green	Green	Green	White	Black	Green	Yellow	Green	Grey	Grey	Green	White
Construction- P/L	Grey	Grey	Grey	Green	Green	Green	Yellow	Green	Green	White	Green	Black	Yellow	Green	Grey	Green	Grey	White
Technical Authorities (via PE)													Black	White				
IT/IM	Yellow	Green	Green	Grey	Green	Green	Green	Green	Green	White	Yellow	Green	Green	Black	Green	Grey	Grey	White

Subsurface (including MMV)	Working Well	Working Well	Working Well	Working Well	Not Assessed	Not Assessed	Working Well	Working Well	Working Well	Not Applicable	Not Applicable	Working Well	Working Well	Working Well	Major Issue	Working Well	Working Well	Opportunity for Improvement
Regulatory (Quest)																Major Issue		
Scotford Env/Regulatory	Opportunity for Improvement	Opportunity for Improvement	Opportunity for Improvement	Working Well	Opportunity for Improvement	Not Assessed	Not Assessed	Working Well	Working Well		Working Well	Not Applicable	Working Well	Opportunity for Improvement	Working Well	Opportunity for Improvement	Major Issue	
BOM																	Opportunity for Improvement	Major Issue

-  **Not Assessed**
-  **Not Applicable**
-  **Working Well**
-  **Opportunity for Improvement**
-  **Major Issue**

2. Bi Weekly Interface Meetings- at this time, Quest team members report the status of various interface related issues and obtain clarity amongst their colleagues.

15. PROJECT CONTROLS

This section provides an overview of the Project Control Plan (PCP) for the EXECUTE phase. For more detail, please consult the Project Control Plan.

15.1. Objective

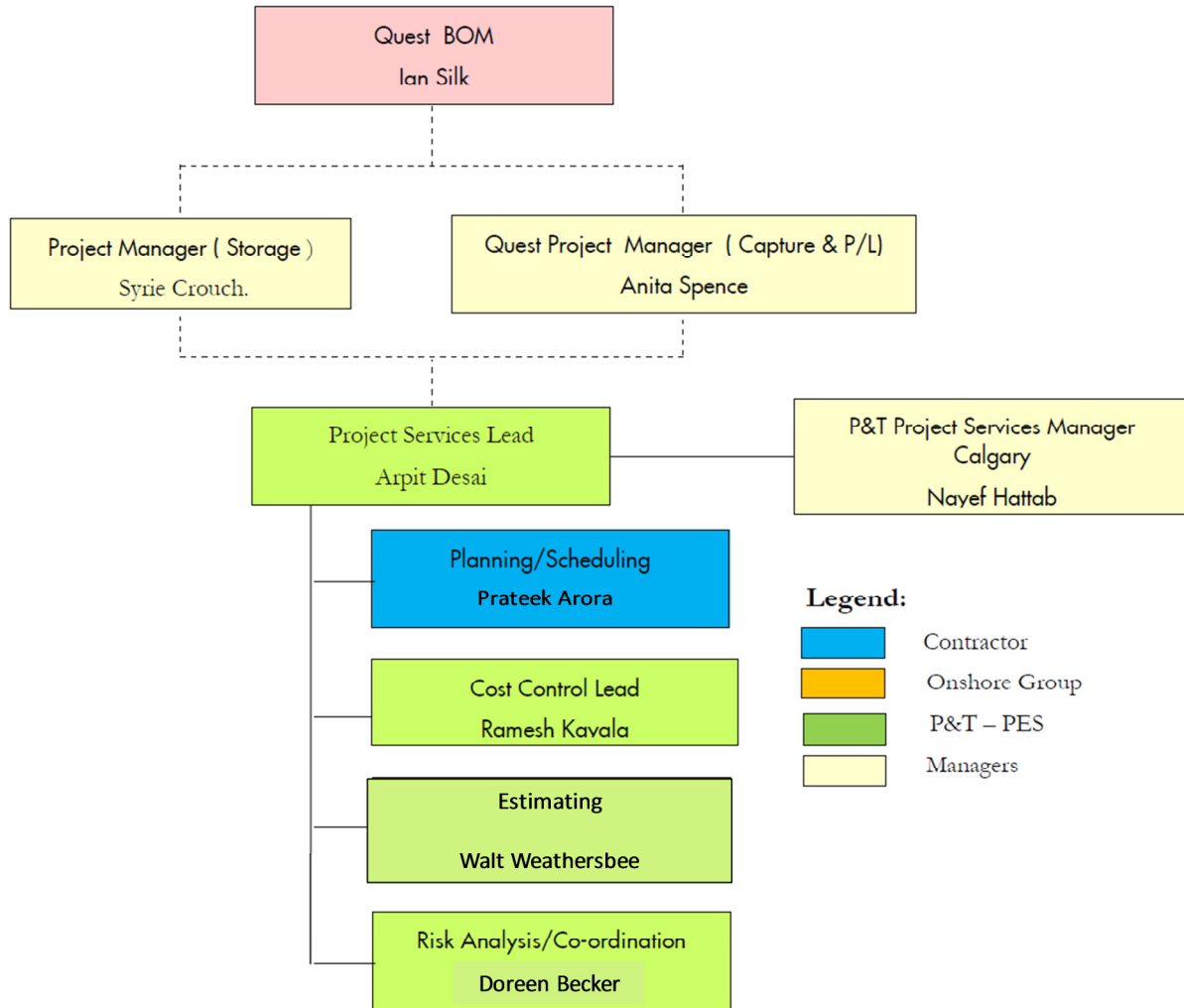
The objective of the Project Control Plan (PCP) for the EXECUTE phase is to provide a specific plan, aligned with Shell's guides and project control procedures (PSM-I-U-001182-FA-0003), that identifies the project controls methods, tools and techniques that will allow identification of potential budget and schedule deviations at an early stage, in a consistent manner, enabling the Project Management Team (PMT) to make decisions that mitigate potential negative cost and schedule impacts.

One Project Controls team will manage project controls for all 11 areas into which the Quest Project has been divided:

- A. Common
- B. HMU
- C. CO2 Capture Facilities (Greenfield)
- D. Utilities
- E. Offsites (Brownfield)
- F. Reservoir
- G. Wells
- H. Logistics
- I. MMV
- J. Pipeline
- K. Wellsite/Hook up

15.2. Project Controls Organization

The Quest Project Controls organization at Define is shown below:



The Quest Project Controls organization at Execute is shown in Figure 12-3 Quest Organization in the Execute Phase.

For details on roles and responsibilities, please consult the Project Controls Plan.

15.3. Cost Control

Cost control during any phase of a project comprises the setting up of the cost procedures and systems and the monitoring and the reporting of the actual project expenditure and commitments against the approved project budget. The early identification and registration of deviations together with the following of trends enables project management to control the project. Cost control for Quest will be accomplished by implementing the processes and tools described in the following sub-sections.

VOWD is a key financial measure of the project costs because it is consolidated and published in the Group financial results, which are subject to external regulation (including Sarbanes Oxley or other new applicable regulations).

VOWD will be calculated, recorded, and reported each month in accordance with the RDS VOWD procedure PSM-I-U-001182-FA-6180-0022.

(d) Commitment Management

Commitment is the value of any contract, purchase order or other agreement between the project and a supplier of goods and/or services, including agreed changes as they are approved and shall be recorded in the transactional currency of the agreement.

Commitments will be authorized, recorded, and reported each month in accordance with the RDS Commitments procedure – PSM-I-U-001182-FA-6180-23

(e) Management of Change (MOC)

Management of Change (MOC) applies to the project's scope, estimated cost, estimated schedule, and production performance. All changes proposals must be identified, recorded, evaluated, approved, and reported.

The intent of managing change during EXECUTE is to:

- Prevent preferential changes that can occur during Detailed Engineering against the backdrop of progressive design development that normally occurs during this project phase;
- Provide for systematic evaluation of potential changes and dissemination of change information to all affected parties;
- Manage staff time in respect of assessing change proposals;
- Identify when a proposed change needs to be formalized in the manner of a Change Proposal;
- Evaluate the impact of proposed change across all disciplines;
- Establish a review process and identifies roles and responsibilities in this process;
- Assure appropriate HSSE review;
- Assure Asset Integrity review; and,
- Facilitate quick and efficient documentation and communication of Change Proposals

(f) Earned Value Management (EVM)

Earned Value Management (EVM) is a project control tool for performance monitoring and analysis. Corrective or recovery actions based on EVM will contribute to project success. The

EVM method will measure project performance and includes Earned Value Analysis (EVA) and Earned Schedule (ES).

The EVA process combines both cost and schedule based on analyzing the variances between actual earned and planned cost of work performed. The ES process is only applicable to schedule and is based on analyzing the variances between the actual time and the planned time taking to reach the earned value.

The results of Earned Value Management support early warning, cost earned, forecast, communication and objective assessment.

(g) Cost and Cash Forecasting

A critical part of the monthly cost control process is the forecasting of the Estimate at Completion (EAC). The EAC is the current estimate, at the reporting period cut-off, of the final cost of the project including the Base Cost Forecast and the P50 Contingency Forecast. The resulting EAC is compared to the project budget to determine if corrective actions and/or supplemental budget funds are required.

Cost and Cash Forecasting will be carried out in accordance with the RDS Cost and Cash Forecasting Procedure – PSM-I-U-001182-FA-6180-0026.

15.4. Integrated Planning and Scheduling

An Integrated Master Schedule (Level 2) and underlying EXECUTE phase schedule (Level 3) have been developed for the Quest project. The schedules have been developed using the Shell approved planning software, Primavera P6. The Detailed Schedule (Level 3) will serve as the control schedule for the EXECUTE phase of the project. Key milestones and interfaces between project sub-components are included. The schedule is logically linked such that the critical path and near-critical activities are visible and understood. Schedule risk analysis has been performed using the Shell approved schedule risk analysis software, Pertmaster, and the resulting schedule contingency has been reflected such that the schedule yields a P50 sustained operation milestone.

The table below illustrates the key milestone dates for the Quest Project:

Quest Project Milestone	Date
SELECT Phase complete	Q4 2010
DEFINE Phase complete	Q3 2011
Regulatory Approval	Q1 2012

FID	Q1 2012
Start-up	Q4 2014
Sustained Operation	Q4 2015

15.5. Cost Estimating

(a) *Type III Budget Authorization Estimate*

At the end of DEFINE, a Type III estimate has been prepared. The Project Control Team has been engaged with the contractors' estimation departments, in defining, guiding, and reviewing the basis of this estimate. The Project Control Team has also participated with the Heavy Oil/P&T Project Control Group in preparing estimates of other costs outside the contractors' scopes, e.g. Owners' costs. The Type III estimate is structured in accordance with the Project WBS, and is described below (and in greater detail in the Project Controls Plan).

The Type III estimate will be used to support the Final Investment Decision (FID). The estimate is a "bottoms-up", material take-off (MTO) based estimate. It is made up of all the MTO quantities available in the design at the time of the estimate deliverable cutoff, and any allowances needed to account for future design growth. Equipment and Bulk material pricing are based on firm quotes for major equipment (65% of material spend), budget quotes (28%), and historical data (7%), which have been escalated to Real Terms (today's value). Labour rates are based on the latest labour agreements. Engineering home office costs are based on the latest contractor information available.

The Type III estimate has been escalated in line with the project schedule and the escalation rates to be applied as per the RDS Project Services guidelines (the Market Guidance Letter).

All estimates have been subjected to a detailed estimate risk analysis. The results of the risk analysis will be used to set the contingencies and determine the range of accuracy for the estimate.

(b) *Type IV Control Estimate*

Looking forward to EXECUTE, the Project Control Team will integrate and prepare a Quest Control estimate during Q2/Q3 – 2013. Fluor and Tri Ocean will prepare the fall out estimate during Q1/Q2 – 2013 when engineering is 95% complete. The Shell Project Control Team will be intimately involved with the contractors' Project Control Teams, in defining and reviewing the estimate basis, and supporting estimate preparation. The Type IV Control Estimate will be the control base for the construction phase of the project.

15.6. Probabilistic Risk Analyses

Formal, quantitative cost and schedule probabilistic risk analyses will be performed prior to FID as well as during EXECUTE, to analyse the variables and uncertainties present in the base cost/schedule. These analyses will assist with the following:

- Forecasting the most likely outcome of project cost/duration by recommending appropriate levels of contingency;
- Identifying the elements of uncertainty that have the greatest impact on overall project cost/schedule; and,
- Quantifying the chance of achieving cost/schedule targets.

These analyses will be carried out by Shell P&T – *not* the core PMT – with significant input from the Quest Project Control Team. The analyses will be carried in accordance with the RDS Cost & Schedule Risk Analysis Procedure – PSM-I-U-00182-FA-6180-0090.

15.7. Project Control Tools

The following tools are used for Project Control functions and reporting:

- Cost Estimating – CapCo\$t an in-house estimating software
- Planning & Scheduling – Primavera P5/P6
- Cost Risk Analysis - @Risk
- Schedule Risk Analysis – Pertmaster Risk Expert 8.1
- Cost Management/Control - PRISM
 - The Shell Canada SAP Blueprint implementation team is developing a PRISM to SAP Blueprint interface so data can flow from the Contractor to PRISM to SAP Blueprint.
- Financial Management - OASYS and JDE (in future, SAP Blueprint will be used)
- Time Writing - SERP

15.8. Transition of Project Controls Responsibilities and Systems

P&T has accountability to deliver the cost and schedule as per the GIP. P&T has the accountability to deliver the name plate capacity including warranty requirements and as such will be involved from a technical perspective until Sustainable Operations is achieved. Technical authorities within the P&T organization have been secured for this time period.

With system handover and MC, the Scotford MOC process will be adopted for technical changes with a requirement for P&T technical authorities as a signatory. In this phase, costs will center around CSU and operations activities and thus responsibility for management will be within those teams. Cost and schedule management of change will continue using the P&T MOC process.

After Mechanical Completion is reached, a large part of P&T Project Control activities will involve completing the Project Close out Report and compiling benchmarking data.

16. QUALITY MANAGEMENT

16.1. Quality Overview

The Quest quality strategy is to implement three key quality programs:

1. Discipline Control and Assurance Framework (DCAF),
2. Technical Integrity Verification (TIV), and
3. Flawless Project Delivery (FPD)

The quality efforts will be implemented by a Quality Focal Point who will coordinate quality efforts project-wide.

Most of the Quality procedures and systems extend throughout the complete cycle of Project Realization, including design, engineering, procurement, fabrication, construction, testing, start-up and commissioning.

The Quality Management System also contains processes that are not a part of the main three systems. These are: Equipment Criticality Assessments, input to Contract language regarding quality requirements (i.e. Inspection and Test Plans, ITPs), and Reviews and Audits of the Quality Management System. Descriptions of all quality areas are provided below.

16.2. Discipline Control and Assurance Framework

The Discipline Controls and Assurance Framework (DCAF) sets the corporate standard for Quality Control (QC) and Quality Assurance (QA) of discipline deliverables and events. As a part of DCAF, a Project Controls and Assurance Plan (PCAP) was developed and used for SELECT phase; another PCAP was then developed and used for DEFINE phase. The PCAP for EXECUTE phase has also been drafted and has been used to form the structure of the EXECUTE phase workplan with the Capture EPCM Contractor. The DCAF incorporates the Technical Authorities from both P&T and UA.

The PCAP includes the list of Global Controls (standard throughout Shell) and the list of Project Specific Controls/Events. The Project Quality Focal Point is responsible for auditing and facilitating the DCAF process for Quest.

16.3. Flawless Project Delivery

Flawless Project Delivery will be implemented on Quest in a fit-for-purpose manner and will include mitigation of Flaws and development of assurance plans for selected Q-areas. A Flawless Project Delivery Implementation Plan has been developed in DEFINE and will be updated in EXECUTE. The FPD implementation effort consists of the following actions:

- Learnings (Flaws) applicable to Quest have been extracted from the FLAWS database, PWRs, and Lessons Learned database.
- Applicable learnings have been assigned to appropriate project team members for mitigation. A Flaws mitigation focal point has been assigned and is responsible for tracking close out of all items.
- Q-areas have been assigned a Q Focal Point to lead the efforts and ensure implementation.
- Q Focal Points will review FPD checklists for their Q-area to assure coverage of all aspects of their responsibility. Applicable items shall be included in equipment/system Inspection & Test Plans.
- The Q Focal Points will establish KPIs for the selected Q-areas.

16.4. Technical Integrity Verification

Technical Integrity Verification has been implemented for Safety Critical Elements which have been identified through Bow-Tie workshops. Technical Integrity Verification consists of the following actions:

- Development of Performance Standards (PSs) and quality management of activities and deliverables that are critical for verification that the performance standards have been met.
- An audit and review schedule of the Performance Standards, with follow up action to verify audit closure.

16.5. Quality Procedures supporting Phases of Project Realization and Execution

Equipment Criticality Assessment: The Project Team shall establish the criticality of systems or items of equipment in the engineering phase (Define and Execute) in order to ascertain the extent and level of involvement in design reviews, maintenance program requirements, and the extent of quality surveillance to be undertaken during the manufacture and testing of equipment. The equipment criticality assessment drives mitigating actions within the Inspection & Testing Plan (ITP) and Contract Terms and Conditions to lower quality risks identified during the assessment. The Project Team will assign a criticality rating to each system or item in accordance with the Equipment Criticality Assessment Procedure.

16.6. Construction and Installation Quality

The Quality language in the Invitation To Tender (ITT) will be refined by Quality in conjunction with each discipline lead. Project Team shall monitor the construction and installation activities in a planned and methodical manner to assure that the construction work meets the requirements of the Contract, design and specifications. The Contractors shall perform the work in accordance with approved procedures, work instructions, method statements and Inspection and Test Plans (ITP) and with suitably qualified and experienced personnel. The extent of monitoring by the Project Team is dependent upon the technical criticality of the work, and shall be indicated in the Inspection & Test Plans.

Regarding the wells, suppliers will be selected that are on the Shell Approved Vendors List and have previously supplied wells tubular to Shell specifications. Single source suppliers will be worked through Shell Canada SCM.

16.7. Reviews and Audits

- The Project Quality Focal Point with the help of the PMT will develop a program of reviews and audits necessary to provide quality assurance throughout design, procurement, fabrication, integration, installation and commissioning/startup. Audit Plans for the EXECUTE phase have been prepared.
- The program of reviews and audits are included in the Project Quality Plan (PQP). The PQP outlines the roles and responsibilities for execution of assurance. The Lead Discipline Engineers are responsible that proper design control is used in the production of project deliverables. Documentation and Data will be prepared and managed as per Shells Project Information Handover Guide 07-0-JA-6180-000. Documentation Requirements and as per agreed project Job Bulletins signed by Shell. Design control will be facilitated by using Fluor Discipline Activity Plans which specify the appropriate procedures, work instructions, and requirements for checking, review, and approval.
- Design reviews will be performed at appropriate stages in the design. All design review comments will be resolved prior to final approval. The PQP specifies what reviews are needed during EXECUTE phase.
- The following areas will be audited by the Quality team:
 - DCAF setup and compliance,
 - Technical Integrity Performance Standards and Verification of Assurance Activities, and Flawless Project Delivery Key Performance Indicators.
 - Contractor discipline audits (in the case of Fluor, this applies to both Calgary and New Delhi). EXECUTE audit plans can be found in the Fluor and Tri-Ocean PEPs respectively.
- Wells will adhere to Shell mandated GWDP (Global Well Delivery Process)

16.8. Transition of Quality Responsibilities

As systems are turned over from P&T Construction to Operations CSU team, quality records will be handed over. As such, the Quality Management Program as a whole will be complete at Mechanical Completion (MC). The main outstanding activities will be the completion of the TIV report. The P&T quality team will maintain responsibility for this document until MC at which time they will take on a supporting function with the Quest Operations team completing the report prior to RFSU. The Flawless program will continue throughout the CSU phase and Quest Operations HSSE will retain responsibility for this program with less support needed from the P&T quality team.

17. TECHNOLOGY

The major systems of each capture concept analyzed in the Assess phase were probed for components requiring technology maturation. The results are documented in the Quest Technology Selection Report – Capture (Document Number 07-0-PX-0580-0001). ADIP-X is the selected CO₂ removal process.

TEG and a solid bed desiccant mol sieve were considered to remove water to prevent hydrate and corrosion issues. Mol sieve is attractive for very low water specifications. However, for the Quest Project the water specification is at the normal TEG dehydration range, so TEG Capital Cost and Operating Cost are lower than for mol sieve. Thus, TEG is selected as the CO₂ dehydration process.

The compressor selected has been reviewed by the TA1 Rotating Discipline Lead. The Dakota Gasification project currently operates three MAN Turbo 8-stage integrally geared centrifugal compressors; model RG80-8, in CO₂ compression service. Other than the fact that they have air-cooled intercoolers whereas the current QUEST design basis is water-cooled intercoolers, those compressors are very similar in size and performance parameters to the compressor required for the Quest project, hence the technology is sufficiently mature for Quest.

During the novelty workshop sessions initially conducted in September 2010, and updated in May 2011, the project team and external participants were consulted to document any novel aspects of the project scope including Capture Pipeline & Subsurface scope. No R&D or technology development releases are required for the capture, pipeline, or wells scopes of the Quest CCS project.

18. ENGINEERING

18.1. Engineering Execution and Deliverables

The following entities / contractors are currently involved in the venture:

- Capture Facilities Process Licensor - Shell Global Solutions
- Capture Facilities – Fluor Canada Ltd.
- Pipeline and Wellsite Facilities – Tri-Ocean
- Preparation of HMU PDP - Uhde
- Wells – Shell Exploration and Production
- Operations – Scotford Ops Integration Team
- PSA vendors (Air Products for HMU 1&2, UOP for HMU 3 PSA unit modifications)

The Capture EXECUTE phase engineering will be completed by Fluor based out of their Calgary office with significant support from their New Delhi office. Tri-Ocean will complete the detailed design work for the pipeline and well surface facilities from their Calgary Alberta office.

The focus of EXECUTE phase engineering is the realization of the 3rd Generation Modularization strategy, completion of engineering deliverables for major construction contracts (pipeline and module construction), completion of HSE-in-design deliverables, and handover of key documents to Operations to facilitate start-up and safe initial operation. This work will culminate with the issuance of Issued For Construction deliverables in construction work packages.

To accomplish the EXECUTE scope of work, Fluor will utilize the following strategies and resources:

- An Engineering strategy for straight through engineering with work completed sequentially and building on foundations of reviewed information will be used. This approach reduces recycle and is consistent with project objectives of cost efficiency. Process engineering will finalize P&IDs by resolving action items from PHAIII. Mechanical, electrical and instrumentation disciplines will prepare key procurement packages early in EXECUTE to support acquisition of selected vendor data required for layout.
- The “3rd Generation ModularizationSM” design approach has matured significantly in DEFINE with buy-in from Operations, and peer reviews completed to validate the approach and layouts developed in FEED phase. The modularization guideline and all specifications were updated in FEED phase and establish the foundation for EXECUTE phase design. During Detailed Engineering the focus on maintaining shippable module weights and centers of gravity, and complying with HFE requirements as vendor data continues to be received will be a significant effort.
- EXECUTE phase deliverables are drafted in the PCAP. This has been included in the EXECUTE Phase Work Authorization with Fluor and appropriate supporting documents have been listed in the Fluor Scope of Services portion of the work authorization (for example detailed calculations, RFQ packages, module drawings etc.).

The Pipeline EXECUTE phase engineering will be completed by Tri Ocean, directed by a dedicated Shell Quest Pipeline Project Engineer. Given that the pipeline is not in the critical path of the overall schedule, the execution plan for the detailed engineering for the pipeline is to complete all engineering activities and have all drawings issued for construction before construction activities begin. A detailed survey of the right of way will be performed in Q4-2011 and detailed drawings will only be produced in April-2012 to minimize pre-FID expenditure. Detailed design of the crossing of the North Saskatchewan River (NSR) by Horizontal

Directional Drilling (HDD) was performed during DEFINE to better understand the risks involved.

Subsurface engineering will continue to be supported from within the Shell E&P organization. The challenge for subsurface will be to incorporate all well delivery objectives in a commercial injector design; a standardized well design will be used for all injectors. Two injectors will be drilled in 2012 after which a decision will be made if any further wells are required; this may enable the pipeline to be shortened prior to submitting the final order for pipeline material.

Commissioning and start up will be supported via a combination of support from within the CSU team, Scotford upgrader technical support and the P & T technical team. P&T has the accountability to deliver the name plate capacity including warranty requirements and as such will be involved from a technical perspective until Sustainable Operations is achieved. Technical authorities within the P&T organization have been secured for this time period.

With system handover and MC, the Scotford MOC process will be adopted for technical changes with a requirement for P&T technical authorities as a signatory. In this phase, costs will center around CSU and operations activities and thus responsibility for management will be within those teams.

18.2. Design Class considerations

A design class (also referred to as Class of Facilities) session was held with Fluor and the project leadership at the commencement of the SELECT phase. To help the project achieve its overall goal of being NPV neutral, the Capture unit will be designed with no provisions for expandability, no ability to exceed nameplate capacity and limited provisions for online maintenance (Design Class 1). The high level decisions were reviewed and confirmed by the project DRB. More detailed class of facilities were performed by engineering discipline and included Shell, Fluor and Operations to drive the high-level design classes to the discipline engineer level by giving guidance on project specification, design options etc.

During DEFINE, a peer review confirmed general adherence to the selected Design Class by the Quest project team.

18.3. Modularization Considerations

3rd Generation Modularization is to be implemented on this project. In order to support this modularization strategy, almost all equipment will be supplied to the module yard shop versus traditionally at site in order to set these into the modules. The compressor package, large horsepower pumps, and vessels that are required to be dressed, will be shipped directly to site.

The plant is designed with a maximum module size of 24'x24'x120'. These are to be assembled in the Alberta area and transported by road to the Scotford site via the Alberta Heavy Haul corridor.

3rd Generation Modular execution is a modular design and construction execution method which is different than the traditional truckable modular construction execution methods which have limitations to the amount of components that can be installed onto the modules. The modules are transported and interconnected into a complete processing facility at a remote location including all mechanical, piping, electrical and control system equipment. The use of specialized design practices and installation details are required to produce this type of design.

This 3rd Generation execution approach provides the following advantages over traditional Oil Sands modular approaches:

- maximum shift of labour hours from the immediate work area off-site to fabrication shop resulting in
 - a reduction of site congestion
 - allowing activities to occur in parallel that otherwise would not
 - ease pressure on site staffing
 - a reduction of overall construction labour cost due to differential in rates between field and fabrication shop.
- reduced quantities of concrete, pipe and cabling resulting in overall reduced cost and schedule
- relocating underground process drainage piping to aboveground shop installation
- reduced construction schedule resulting in a reduced total cost for the project
- minimization of safety risks associated with elevated work and a reduction in scaffolding duration and costs
- maximize shop work to reduce weather impacts on productivity
- improvement in quality of workmanship due to more controlled production environment.

The 3rd Generation Modular ExecutionSM Design Guide (Fluor document # A6GT-200-1065) was issued in SELECT and was customized to Quest requirements during DEFINE. Modularization will also be employed at the wellsite facilities and pipeline linebreak stations largely through the use of skid mounted piping & instrument enclosures.

Where possible, equipment is standardized with existing Scotford equipment. For Quest this is relevant to electrical switchgear, instrumentation, pumps and (possibly) air coolers.

18.4. Plant Availability and Reliability Considerations

Shell Global Solutions has performed an update to the SELECT phase reliability study for the CO₂ capture, compression, and storage facility for the Quest CCS Project. The study was used to determine the availability of the facility, identify key equipment that contributes to the downtime of the system, then use sensitivity analysis to quantify the impact of alternative design configurations. Reliability data was taken from previous studies performed for Shell Canada and other refineries.

For the Base Case, the average Quest production efficiency was predicted to be 97.6%. When the availability of the Scotford Baseplant and Expansion Upgraders were considered this resulted in an overall CO₂ injection availability of 90%, meeting the premises set out in the GOA funding requirements.

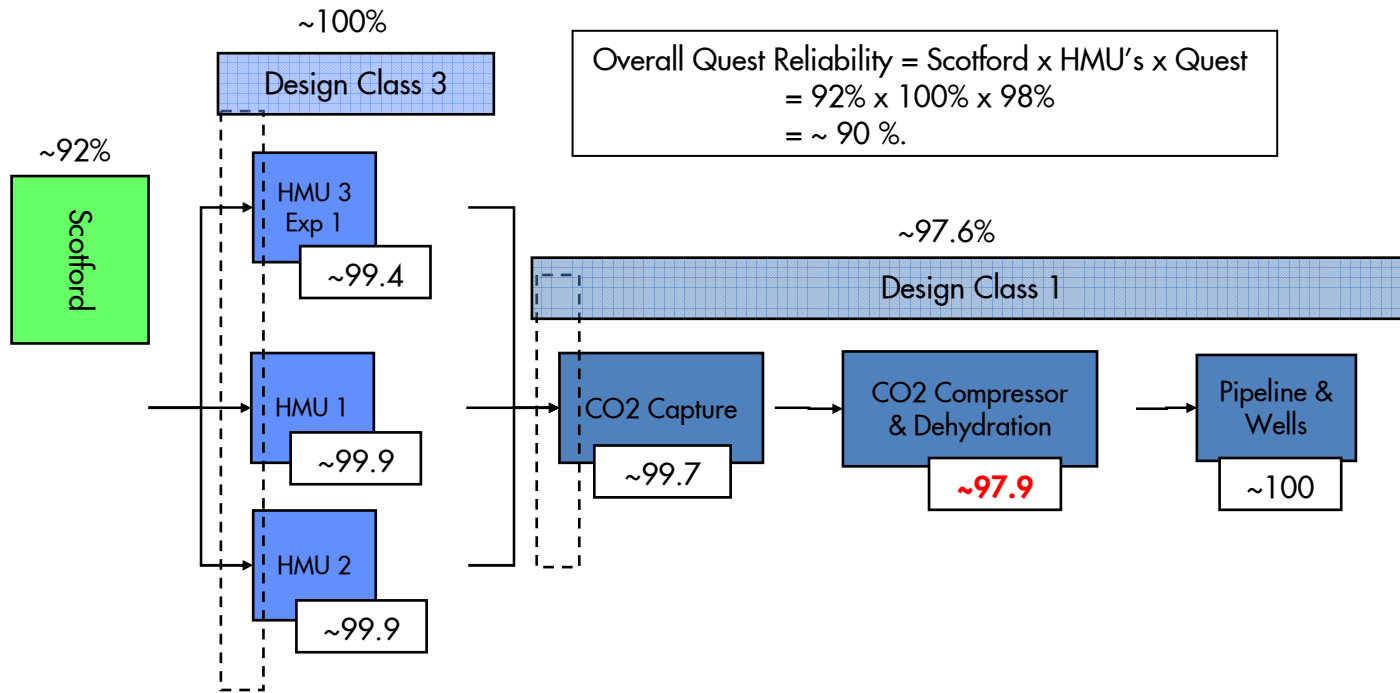


Figure 18.4 – Overall Quest RAM Block Model

The compression section contributed the majority of the losses. Several other scenarios were simulated to include the impact of the pipeline and well injection facilities, and to investigate the sparing of pumps and compressors. A full report of RAM work undertaken in DEFINE is contained in the RAM Study, which was updated for EXECUTE phase.

18.5. Codes and Standards

The order of precedence for Codes and Standards applicable to the Quest CCS Project will be:

- Canadian Federal, Provincial and municipal laws and regulatory requirements
- Existing site approvals. These documents refer to a variety of standards and guidelines. Reference to voluntary documents in the site approvals gives them force of law.
- Shell Canada Energy Minimum Health, Safety, Environment and Sustainable Development Expectations
- Shell HSSE Control Framework Standards and Guideline Manuals
- Shell ESTG (Engineering Standards Technical Guidelines) and DEP (Design & Engineering Practices)
- International Codes and Standards (e.g. ISO, ASME, API)

A Quest Specific list of specifications has been set as the basis of DEFINE and EXECUTE phases for the Capture facilities. The list is based on AOSP - OSG Master List of Project Technical Standards Rev 3, Apr 2009 provided as part of the BDP. This issue was based on SCAN's standards update February 2009 and DEP version 28, February 2009. The list provided in the BDP has been updated to:

- Identify mandatory specification requirements of DEM1 Rev 6, 2010.
- Identify which specifications are not applicable to Shell Quest Scope and remove them from the project list.
- Include updated specifications issued in February 2011 required for Enterprise Framework Agreements (primarily instrumentation and rotating equipment disciplines).

During DEFINE the specifications have been reviewed in detail to:

- Generate project specific deviations to align project specifications with the Quest Design Class Report requirements.
- Generate project specific deviations to align project specifications with specifications included in Enterprise Framework Agreements used on the project.
- Generate DEM1 derogations where required to address specific needs of the Quest project.

Wells will adhere to the GWDP (Global Well Delivery Process).

19. CONTRACTING & PROCUREMENT

19.1. Process and Principles

(a) *Procedures, Manual of Authority & Governance Model*

The Quest CCS Project will ensure strict adherence and compliance to the Shell Contracting and Procurement Procedure Manual (CPPM) and Category Management and Contracting Process (CMCP) for any sourcing activities. Authorizations will be obtained in accordance with Shell Manual of Authorities (MOA) and in compliance with Shell Contracts Board and Joint Venture requirements with Chevron and Marathon.

(b) *Tendering & Market Approach Principles*

The tendering process will be in compliance with Shell C&P requirements. Typical sourcing options will be based on either:

- Competitive tender where several contractors with similar capabilities compete against each other on pricing and project execution, or
- Sole sourcing whenever there is a monopoly situation (i.e. specific expertise) or HSSE concerns or schedule constraint precludes any bidding process.

(c) *Project Contractor & Vendor List Development Plan*

The list of bidders/vendors has been developed and it is currently under review with the Category Management Team in Calgary. The list is confidential and for sensitivity reasons will be shared on a need-to-know basis.

(d) *Global Category Management (GCM) Leverage Opportunities*

New EFAs continue to be executed and the Quest Project has established a working relationship with the Category Management Team in Calgary to be aligned with all new developments in GCM and Outline Agreements (OA).

Below is a List of Global Sourcing and OAs as of August 1, 2011 that will be utilized on the Quest Project:

Mechanical Equipment	CO2 Compressor (EFA) Vertical Line Pumps (EFA) Centrifugal Pumps (EFA)
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Piping Bulks/Specialities	CS Pipe & Fittings (OA) Gate, Globe & Check Valves (OA)
Electrical Equipment	34.5 kV Switchgear (OA) Power Transformers (EFA) LV and MV Switchgear (OA) LV and MV MCCs (OA) Neutral Grounding Resistors (OA) Power and Control Cables Electrical Bulks Cable Trays Heat Tracing Materials
Control Systems & Instrumentation	Control Valves, On/Off Valves (EFA) DCS and SIS Components (EFA) DCS (EFA) Relief Valves-PSV (OA)
Pipeline	Linepipe (EFA) Pipeline Coating (OA)

(e) *Market Intelligence*

Investment in utilities and oil sands projects quickly regains previous peak levels of activity. Employment is projected to remain near record levels until 2015 when a second wave of capital, sustaining capital and maintenance projects drives employment to new peak levels. By 2017, employment on oil sands projects is estimated to be 25 percent higher than the 2007 peak levels of activity.

Rising labour requirements for new construction across the scenario from 2011 to 2019 increases the labour force by 30,000 workers. Expected exits from the labour force due to retirements and mortality total 35,000 workers. Half of the total requirements will be met with 26,000 new entrants, leaving a net in-mobility requirement of almost 30,000 workers that industry will need to bring in from outside Alberta's construction market.

These will impacts modular yards, suppliers and on-site labour for the Project. A heated market situation leading to above average escalation may create higher prices and competition for shop space.

(f) Business Principles

All sourcing/contract awards will be undertaken in full compliance with Shell Group Business principles.

19.2. Contracting Strategy

The project CP and Category strategy was endorsed by the Contracts Board in Q4 2010, with its implementation started afterwards. It was articulated around the project drivers, identifies sourcing risk and opportunities, leveraging on the global enterprise categories and maximizing local content. The key to the strategy is the use of an EPCCM contractor to execute the works for the capture facilities. Further to this, detailed procurement, construction and pipeline execution strategies have also been developed and approved.

Shell awarded an Engineering, Procurement, Construction and Construction Management contract to Fluor Canada in March 2010. Within this agreement, Fluor is responsible for project management, quality assurance and control plans, engineering, procurement, contracting, project controls, construction, construction management services and information management services, as applicable, to its scope of EPCCM Services, and is required to achieve, within budget, safely, efficiently and timely, Mechanical Completion of the Project in accordance with the Contract Documents and readiness of the Project for Commissioning, Flawless Start-Up and Performance Tests and Turnover to Operations.

The EPCCM contract is based on the outcome of EPCM negotiations with Fluor for the Expansion 2/3 Project that was deferred. The liability and risk profile of Fluor is generally consistent with that of similar EPCM contractors for the Expansion 1 Project. The EPCCM contract for Fluor applies to the SELECT, DEFINE, and EXECUTE phases of the Quest Project. No obligations arise unless and until Work Authorizations are issued (see MCB90019).

- 19.2.a.3. The project plans to award the construction services to Fluor Direct Force Labour to perform the on-site construction work including Module installation, structural steel, piping & mechanical equipment installation and electrical and instrumentation. The EPCCM contract that was awarded to Fluor in March 2010 provides the framework to perform construction services. Terms and Conditions related to Construction services have already been negotiated. Using this agreement allows for better rate certainty and competitiveness for the following reasons:
- 19.2.a.4. EPCCM contract negotiated with Fluor in 2009 well into recession which locks in terms for overhead fees and profit on the construction component.
- 19.2.a.5. Current market guidance shows an increase in pricing over the next five year period and current labour requirements show steady increase in labour requirements to a peak equivalent to the 2008 peak.

The Heavy Oil Contracts Board approved on February 24th 2011 to award Scotford on-site construction services (Module Installation, Structural Steel, Piping & Mechanical and Electrical and Instrumentation) to Fluor Canada Ltd, the contracting party in the EPCCM agreement and consent to the subcontracting of the Construction scope to Fluor’s affiliate Fluor Constructors through a specific work authorization release after FID (2012).

(b) Contract Quilt - Pipeline

	Oct09- May10	Jun10- Mar12	Apr12-Sep13	Oct13-Sep14			Oct14	
	SELECT	DEFINE	ENGINEERING & PROCUREMENT	CONSTRUCTION			COMMISSIONING & STARTUP	
Cost Estimate \$ Million	\$0.25	\$1	\$2	\$25 (Material)	\$36 (Labour)			In house
	Sole Source (Tri Ocean)		GFA/BID		Pipeline	LBV sites	Wellsites	Shell
				Mechanical / Civil	Bid (onshore contractors and others)- Unit rate and cost reimbursable (above \$20M)			
				Electrical / Instrumentation	X	Bid (onshore contractors and others)- cost reimbursable		
				SCADA / DCS	Use Call off agreement (cost reimbursable)			
				HDD	Bid/ Unit rate and Cost reimbursable (\$1M)	X		

The following details the supporting elements for the pipeline contracting strategy:

Define phase, Detailed Engineering and Procurement:

Single source to Tri Ocean Engineering Limited for the following supporting reasons;

- Ensure continuity with Tri Ocean and build on relationships already established with other CCS projects
- Enhance bridging work from Select phase to Define and Execution
- Experience with Shell designing pre-fabricated and assembled skids
- Leverage Shell's experience with pipeline design and construction

Construction:

- Mechanical/Civil and E&I: The recommended strategy is to bid the work between onshore gas mechanical contractors and invite additional contractors that have specific expertise and experience for large size pipeline projects. The rationale is to obtain the most cost effective alternative option. In addition the Project will conduct a labour market assessment review in 2012 to review the market conditions and identify whether this scope of work might attract labour attention. Our current strategy is to go "open shop" however the result of the labour posture assessment will influence the choice of potentially using a unionized workforce.
- SCADA: The project recommends calling off Shell existing agreement to ensure compliance with existing standards.
- HDD: Bid this scope to maximize cost savings opportunities.

The project team will conduct a landscaping exercise late 2012 to review potential contractors having both the capacity and the expertise to undertake the construction of the CO₂ pipeline. Project team will seek Heavy Oil Contracts Board support for strategy prior to engaging with any Shell North America onshore gas contractor or tendering construction work.

Construction Management & Project Management:

To be done in-house (Shell). In order to drive accountability and to streamline decision making Shell is better served retaining control of the key managing functions, such as Project Management and Construction Management.

(c) Stakeholder Analysis

The interests of different stakeholders have been considered to arrive at a contracting strategy with the widest possible support. The stakeholders include Shell and its various functions, the ASOP Venture, Canadian Government, Alberta Government, NGOs, local, regional & international contractors as well as the local communities.

As part of direct involvement, the EPCCM and EPC contractors will have direct impact with the work and the labour market while impacting the local communities and business via various means through procurement and services provision.

The high level key stake holder expectations are:

- Top-class safety and transparent environmental performance
- Optimum use of Alberta and Canadian industry capabilities, supply chain and employment
- An equitable risk profile for contractors that will allow them to obtain support from their shareholders, funding and maintain a healthy cash flow
- Good relationships with local communities

Continuous engagement with stakeholders will be a key element of successfully managing the project as it progresses through the EXECUTE phase.

(d) Key Risks/Opportunities

Key risks related to C&P are:

1. With the local market heating up and the major players jostling for resources, lack of capacity and skilled labour in Alberta to meet the rising demand would make it difficult to competitively source fabrication and procurement expertise. This could impinge on the cost and schedule of the project.
2. Aligning strategic agreements (e.g. EFA, LCCS) specifications and terms with the requirements of the project, local regulations and funding agreement could prove to be a challenge.
3. Landscaping of potential contractors later in 2012 (post FID) for various works could result in identification of “available” against “preferred” vendors and contractors and ability to book slots.

Key opportunities related to C&P are:

1. Maximize the use and leveraging of Shell strategic supply agreements and supplier relationships.
2. Maximising low cost country sourcing (sustainable sourcing)
3. Support the engineering team to ensure effectiveness and productivity during implementation by effectively monitoring and managing contractual issues proactively
4. Price certainty for a cost-driven project: Lock in existing negotiated rates in the EPCCM contract for Direct Field Labour performed by Fluor
5. Leverage Shell existing and past project experience while seeking resources for key positions
6. Maximise on Fluor’s motivation to perform very well on the project for future work with Shell, while ensure contractor’s commitment to negotiate competitive deals on behalf of Shell where applicable.

Mitigation strategies and actions for all of the above are detailed in the project risk register.

(e) Contracting Plan

The Quest project contracting plan is to leverage the Shell Global Enterprise Categories to maximize the outcome of the sourcing process, which will be beneficial in terms of volume discount and meeting Shell approved safety and quality standards.

The Quest Project has worked closely with the Local Category Manager team (Canada) to coordinate work with Global Categories and ensure that other sourcing alternatives are available in the event that local sourcing is required or that no services can be provided through the Global Enterprise Categories.

Key stakeholders from the local Category Management team will be included in the individual Contracting Strategy Workshop to help coordinating the sourcing schedule.

Available expertise of the EPCCM contractor will also be harnessed in the implementation of agreed strategies to ensure complete integration of the technical requirements hence avoiding negative impact on quality, cost and schedule.

19.3. Procurement

The Quest Project includes three (3) main components: the Capture Facility, the Pipeline and the Subsurface activity. Quest Project Procurement manages the procurement activities for the Capture Facility and the Pipeline with two (2) EPC Houses being awarded the procurement scope of work. Fluor will procure for the Capture Facility and Tri Ocean will procure for the Pipeline. The UA Wells CP team manages the Subsurface CP activity.

(a) Critical Scope

In order to meet the 3rd Generation module schedule, critical early vendor engineering data and critical long lead materials will be required necessitating the award of some Purchase Order pre-FID. Some equipment is required to be purchased pre-FID to meet the Scotford 2013 shut-down schedule. With an FID target date in Q2 2012 and the attendant gestation period for these equipments a justification will be raised to the Shell CB and JV partners for pre-FID investment.

These pre-FID POs will release engineering data and materials (equipment) only and these items will be priced for invoicing purposes. Post FID, the strategy is to award all the remaining POs as soon as possible.

(b) Transactional Procurement for the initial project phase

See the Quest CCS project schedule to view key procurement milestones for the Capture component going forward.

(c) Long Lead Items Procurement

Various long lead items have been identified from the early engineering. To meet the schedule to install the underground facilities and piping at the Upgrader in August 2012, a small portion of line pipe material is needed to be ordered pre-FID. The rest of the line pipe material will be ordered post-FID.

(d) Standardisation and Variety Control

As part of the standardisation programme, the engineering team is liaising to the existing Scotford plant team to ensure equipment procured is aligned for maintainability and uniformity. The use of Global EFAs where applicable for the purchase of equipment is mandatory and has helped in the standardization programme.

(e) Site Services

The Procurement for the Capture Facility will be managed by Fluor with the following areas of responsibilities:

- a) Storage inventory and preservation activities
- b) Field procurement
- c) Backcharges as required
- d) Co-ordinate field Supplier representatives as required
- e) Minimize and dispose of surplus material
- f) On-site warehousing

There will be no Marshalling Yards. Scope related to the Pipeline will be managed by Tri Ocean and Flint Energy Services Ltd. (Flint) with the areas of responsibilities similar to the above items listed.

(f) Procurement Plan

Detailed Procurement plans for the EPC Houses were prepared by Fluor (for Capture and Tri Ocean (for Pipeline).

CP activities have commenced in FEED and will continue until approximately August 2012. Reference is made to the Quest CCS project schedule for details.

(g) *Early Supplier Involvement Philosophy*

Further to Section 19.3.1, early Supplier involvement is a critical step in ensuring early vendor engineering data and materials and equipment requirements for the Project. It also played a major part in ascertaining budget information for the 2012 FID submission with an intention to secure fixed pricing.

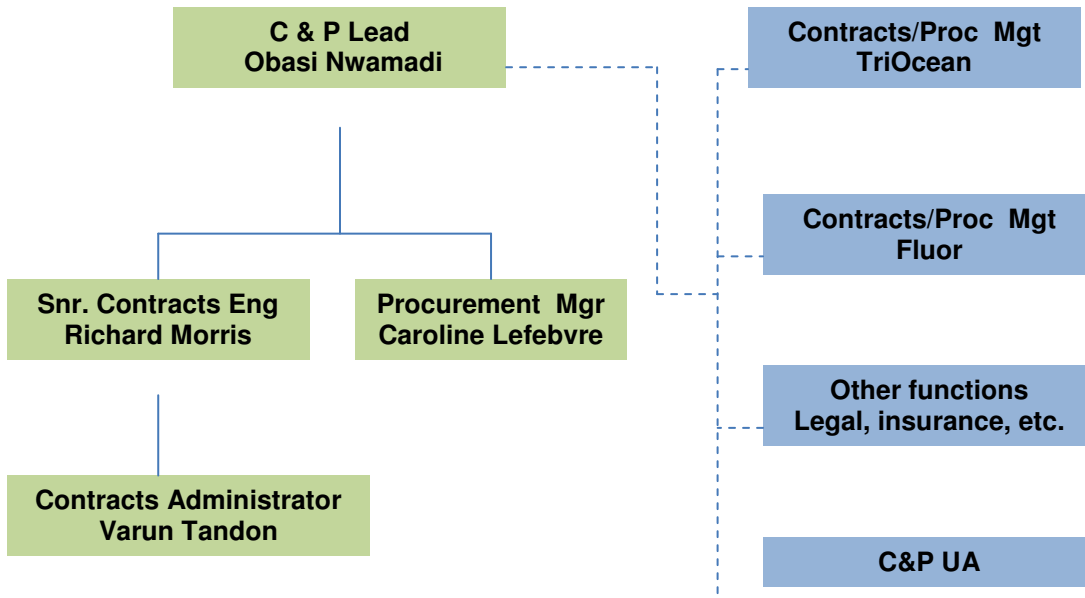
19.4. Administration

Contracting and Procurement activities for the project will be administered by a dedicated Project C&P team headed by a C&P Lead. He will be part of the project leadership team and will manage and administer the project portfolio of contracts and procurement. The team will structure and manage contracts and agreements in a proactive manner with the objective of minimising claims and disputes. The team will also advise and support the Project Management Team on the fundamental principles, processes and procedures to be adopted in developing and implementing contracting strategies and contract management.

The team will utilize and co-ordinate resources and input from other support functions e.g. legal, risk and insurance, finance and global category managers to ensure value for money and compliance with best contracting and procurement practices.

The C&P team will also be responsible for developing contracting strategies and tactics for application in differing contracting markets. Particularly those with severe constraints on availability, capability and competitiveness of engineering contractors and construction subcontractors, while maintaining a close working relationship with other functions central, regional and local to achieve the mandated project objectives.

The C&P team will leverage on the C&P resources of the EPCCM and EPC contractors for the execution of most C&P activities with the exception of EFA call-off orders which will be raised and administered by the Shell C&P team.

(a) *Organisation*

Contract Manager – Richard Morris

- Overall focal point for the entire project
- Accountable for the delivery of Quest Capture, Pipeline and Venture CP activities including gate deliverables
- Strategy and tactics development
- Contract Board/JV approvals
- Governance compliance
- Contract Management of Fluor EPPCM contract

Contract Administrator – Varun Tandon

- Under direction from the CP lead, responsible for Venture contract development and execution
- Contract Management of Venture contracts
- Develop Engineering and Procurement contract with Tri-Ocean with support from CP Lead
- Responsible for Livelink CP folder administration and compliance with Shell archiving rules

Procurement Manager – Caroline Lefebvre

- Equipment and Materials support
- Strategy and tactics development
- Contract Board/JV approvals
- Governance compliance

As the project progresses into the execution stage, there might be a need to place off-site personnel to oversee the administration of various contracts; should this be required, these positions when identified will be resourced accordingly.

(b) Contract Models and Conditions of Purchase

The project has made an effort to bring all the contract and procurement models and templates in compliance with the group standard. With the help and support of the Legal and UA Contracting team, all models used for Quest as of April 1st 2011 are in compliance with the RDS Model Contracts library. Contracts which have been placed prior to this date are being proactively monitored and managed to ensure minimal exposure to the business on areas where they are lacking. In all cases Group Standards will be applied with deviations being signed off via appropriate authority.

(c) Legal/Regulatory requirements, Tax/Customs, Materials Traceability

Aside from the Shell Group legal requirements which need to be met, the project needs to also focus on and be in compliance with the following:

- (a) Statutory requirements of the Government of Canada, the most notable which affects Contracting and Procurement activities being compliance with the National Blanket Orders (NBO) as issued by the Government from time to time, as well as the various environmental laws. Also legislations under the Province of Alberta as they affect the project on various issues.
- (b) The governance and procedural requirements of the Joint Venture agreement between Shell, Chevron and Marathon.
- (c) The requirement of the Funding Agreement between the JV and the various Canadian governments.

The requirements have to be incorporated in advance into the various contracts and procurement orders to be issued by the project.

(d) Local Supplier Development in Contracts

A Project Quest Local Content Policy Statement has been drafted in accordance with Shell Business Principle 6 (good neighbour policy).

The statement has been approved by the Project Manager (Anita Spence) and is awaiting endorsement by the Quest Venture Manager (Ian Silk). Once approved, it will form the basis of a Local Content Development Plan, and will be incorporated into the Scotford Social Performance Plan.

19.5. Project Insurances

Purchase Orders and Contract Insurances will be CARM compliant. Should the project choose to call out equipment RFP's issued prior to April 2011 by Fluor to obtain fixed pricing for the Type 3 Cost Estimate for major equipment, the terms will be reviewed before final order.

19.6. Transition of Contracting and Procurement Responsibilities

As the project approached Mechanical Completion, purchase orders called off of the P&T contracts, will be closed. It is expected that those managed by Fluor (on behalf of Shell) will be closed a month or two after capture mechanical completion, those managed by Toyo (formerly Tri Ocean) will be closed a month or two after the pipeline is mechanically complete and those managed by Shell directly will be either closed or transferred to the Scotford C&P team at MC. The contract with Fluor is expected to be closed approximately two months after capture mechanical complete (with the final submission of as – built). The contract with Toyo is expected to close approximately 2 months after the completion of pipeline construction (with the final submission of as-built). All remaining contracts will be closed as required or transferred to Scotford (this includes the contracts required for the MMV program).

19.7. CSU Contracting and Procurement Plan

The QUEST CSU team will be using existing Scotford contracts for service and materials required for this part of the project. For example, Edmonton Exchangers, one of the main service companies used by the Upgrader, has been selected to complete the CSU activities.

20. CONSTRUCTION

This section provides an overview of the Quest Construction scope and activities.

20.1. Objectives

Presented below, in order of priority, are the construction objectives for the project:

- Achieve “Goal Zero” with respect to all HSSE aspects of the construction activities.
- To ensure the constructed facilities are built at or below the construction budget.
- To ensure that quality of construction facilitates a Flawless Startup and a reliable operating plant.
- To ensure the constructed facilities are built within the schedule parameters.

20.2. Scope and Construction Management

The major scopes of work to be managed and delivered by the Construction Management Team(s) are as follows:

- Offsite module fabrication
- Onsite construction of the Capture facility at Scotford
- Field construction of the Pipeline and Wellsites
- Development of temporary infrastructure required to support onsite construction
- Transportation of materials, equipment, modules and resources to the Scotford site and to the field construction locations

Overall responsibility for Construction Management resides with the Shell Quest Construction Manager, who will have a team of Shell Construction direct reports (as shown in the organizational chart in Section 12), spanning all components of the project: Capture (module fabrication yard), Capture (Scotford site), Pipeline, and Wells.

Shell has employed Fluor to provide EPCCM services for the Capture component of the project. Fluor has the capability to manage this scope, with direction from Shell to ensure compliance to corporate and project processes, standards, and procedures as required. Construction management for the Pipeline and Wellsites will be carried out directly by Shell construction resources.

20.3. Work Optimization and Productivity

(a) *Minimize Onsite Construction Work*

Quest CCS is seeking to maximize the level of modularization at the Capture facility, thereby moving construction labour hours from onsite to offsite. By working in a more controlled environment, safety and quality are improved, and cost and schedule are more predictable. During DEFINE, the module configuration envelopes table was completed, and the critical modules identified; this enabled the team to determine the optimal path of construction and Received At Site (RAS) dates. The modularization plan will be refined in EXECUTE to provide the best combination of ALARP HSSE risks, capital costs and lowered execution risks.

To achieve minimum onsite construction for the Capture component of the project, a “3rd Generation” modularization strategy has been selected (see section 18 for a description of a 3rd Generation module and how it differs from a typical Alberta module). The key benefit of 3rd Generation modularization for construction is that the increased level of shop work dramatically reduces back-end (onsite) completion scope and complexity.

Wellsite facilities, pigging facilities, pipeline line break stations, and monitoring and control stations will be fabricated as completed skids and then shipped to their respective locations.

(b) *Integrated Turnaround Schedule*

The Scotford Upgrader Complex recently undertook a fundamental revision of its T/A strategy. Instead of large, plant-wide shutdowns every 4-5 years, the intent is to have smaller, unit-level

shutdowns at a nominal 18 month frequency. Smaller T/As would be less onerous to manage and execute. An added benefit of having smaller T/As is that the schedule is more flexible. Flexibility enables this optimized T/A strategy to be extended to incorporate the needs of Oil Sands Growth Projects (like Quest CCS).

The new T/A schedule has now been finalized and incorporated in the Quest Level 1 schedule. T/As will take place in 2013 (HMU2), 2014 (HMU3), and 2015 (HMU1). Many tie-ins (especially utilities) will be executed by the Scotford Projects Group on Quest's behalf outside of these T/A windows. For details please consult the Tie-In List and Schedule.

(c) *Manage Construction Interfaces*

Quest CCS incorporates a significant amount of brownfield work in the existing Upgraders, Base Plant and Expansion 1. Managing this interface to ensure safe and efficient execution of tie-ins and interconnects is a key project driver. Operations input has been, and will continue to be, solicited and incorporated in construction activities during EXECUTE, in order to establish the optimal construction execution sequence and timing. Several personnel are dedicated to managing this interface, including one Shell P&T project engineer, one Fluor project engineer, one Scotford Projects Group project engineer, and the Operations Readiness and Assurance team. See also section 14 for details on the Interface Management Plan.

Regarding the interface of the Capture facility and the Pipeline, it has been agreed that Fluor will hire a construction contractor and manage the construction of the pipeline ISBL Scotford Upgrader together with the rest of the undergrounds required for the Capture Facility. The interface point between Fluor and Shell construction management for the pipeline is the bored crossing of the power lines east of the southeast trailer park, where the pipeline contractor will take over the crossing and installation of the rest of the pipeline.

(d) *Manage Indirects*

This is a major focus area for both the Shell P&T organization and for the Shell Heavy Oil business. 3rd party organizations such as the Construction Owners Association of Alberta (COAA) and Independent Project Analysis (IPA) have identified that many recent projects in Alberta have experienced high indirect costs. The most important factor in managing indirects is comprehensive planning during the Engineering and Procurement phases, i.e. *before* mobilizing construction resources in the field. The baseline schedule and budget must clearly and comprehensively specify all elements classified as indirects, and these elements must be carefully monitored. Change of any kind in the field will inevitably cause indirect costs to increase.

By moving a significant amount of construction labour hours offsite, Quest's aggressive 3rd Generation modularization strategy should reduce indirect costs, as compared with the same project executed with a typical modularization strategy.

For the Capture component, Fluor has carried out detailed estimates for Indirect Field Costs (IFC), which will be further refined in EXECUTE, and closely monitored once construction actually begins. To this end, the Fluor construction team will be supported by a dedicated Indirect Cost Specialist.

For the Pipeline and Wellsites components, IFC estimates are currently being established. A detailed control plan for Pipeline/Wellsite indirects will be developed by Shell Construction Management in conjunction with Shell Projects Controls during EXECUTE.

(e) Business Improvement Initiatives

Both Fluor and Shell will have dedicated resources to drive Continuous Improvement Activities (LEAN Construction) throughout EXECUTE. Shell LEAN training is planned for these dedicated resources.

One initiative that has already been adopted by Quest CCS for the Capture component is Workface Planning, which is:

- A process for organizing and delivering all necessary elements (e.g. drawings materials, tools, equipment, checklists, etc) *before* the work is started, to enable craft persons to perform quality work in a safe and efficient manner, and to maximize tool time.
- A process where Construction Work Packages (CWPs) are broken down into smaller, more manageable elements called Field Installation Work Packages (FIWPs). This is done by *dedicated planners*, not by field supervision.
- Considered a Best Practice by COAA.

Regarding the Pipeline and Wellsites components, improvement initiatives (with respect to LEAN construction, Workface Planning, Rework, etc.) will be further defined during EXECUTE.

(f) Maximize Constructability

Constructability has been a key focus of the project team since SELECT, and will continue to be so during EXECUTE. During DEFINE many ideas were identified and evaluated in an attempt to improve the constructability – and thereby the HSSE risk exposure and the overall project cost – of Quest facilities.

(g) Construction Readiness Reviews

A major focus area during EXECUTE will be to develop a Construction Readiness Review process for all construction areas. The intent is to clearly establish the criteria that must be satisfied in order for construction mobilization to occur. The Shell Quest Construction Manager

will be accountable to ensure that construction mobilization does not occur unless construction readiness has been absolutely assured.

20.4. Industrial Relations and Labour Management

The labour posture for the Capture Facility is to utilize unionized Alberta Building Trades (ABT) affiliates. The strategy for the Module Fabrication is to utilize either unionized ABT or Christian Labour Association of Canada (CLAC) employers in the Edmonton region, along the High Load Corridor, and to ensure both are included in the invitation to tender. A meeting was held with the President of the ABT and the UA Local 488 Business Manager. An agreement was reached to waive any conditions in the Collective Agreements, with regards to installing modules that may be fabricated by non-union or alternative union employers. For more information related to Industrial Relations and Labour Management for the Capture Facility, please see section 9 in the Fluor Construction Execution Plan. Fluor plans on having a dedicated Labour Relations Representative assigned to project and located at site.

The intent for the Pipeline and Wellsites is to execute via open-shop contracts. However, CLAC and Alberta Building Trade affiliated employers will be given an opportunity to bid the pipeline scope if they are deemed capable and pre-qualified.

The demand for construction craft labour is predicted to be very high during the Quest CCS Project construction schedule. Attraction and retention plans, incentives, LOA, and recognition awards are currently being evaluated for the Capture Facility. However, in consultation with Fluor and labour leaders from the ABT and UA Local 488, it is believed that the workforce numbers required to construct the Capture Facility and module fabrication are not onerous, hence, the supply of craft workers in the Edmonton region, looking for a local project (versus camp work) is very favourable. Also, the work week hours of 4 ten hour days and 1 eight day is also very attractive to local workers searching for a work life balance.

An Attraction & Retention allowance has been included in the Type III estimate. However, if worker supply does run short in Edmonton, Alberta, or Canada, Temporary Foreign Workers (TFW) will be required. Shell is a member of the Construction Industry Stakeholder's Association of Alberta (CISAA). The Shell Quest Project Manager is on the board of directors of this new association. CISAA was developed to streamline the acquisition of TFW and to allow transferring TFW between owner member organizations.

20.5. Logistics & Infrastructure

This section summarizes the project requirements for logistics and infrastructure, and the plans developed to satisfy these requirements.

(a) *Movement of Personnel*

The construction workforce at Scotford is projected to number approximately 400 at peak, working four 10-hour days and one 8-hour day weekly. The workforce is expected to be primarily local hire. The efficiency of bussing craft to the site for a project of this size is currently being evaluated. If bussing is ultimately determined to be inefficient for a project of this size, there should be adequate parking space to accommodate craft in the main craft parking lot east of the Scotford Administration Building.

Only a small number of people are expected to require air transportation from Calgary to the site, and this on an *ad hoc* basis. Air transport will be supplied by the corporate fleet (SAI), which serves the Josephsberg airport near Scotford from which shuttle service will be provided to the site.

For the Pipeline, the construction workforce will peak at about 200 people, working a 6/1 schedule. Those who travel to/from the worksite will do so by their own means, though the project may encourage the construction contractor to use crew vans and crew cabs to minimize traffic.

(b) *Movement of Equipment and Material*

The strategy for the Capture component scope of the project is to maximize the amount of modularization. These modules will be built in the Edmonton area such that they are transportable by truck and within provincial regulations regarding width, size and weight via the Alberta High Load Corridor (HLC). The shipping envelope for the HLC is defined as 24'x24'x120' and a weight of 156 tonnes.

Besides modules there are also a number of large equipments that will require transportation, particularly: two Amine Absorber Vessels, one Large Amine Absorber Vessel, and one Amine Stripper Vessel. It is expected that the two smaller Absorber Vessels will be sourced from overseas, and that they will arrive in Canada at the port of Vancouver BC, and shipped from there to Scotford by rail. The Large Absorber and the Amine Stripper will be sourced from the Edmonton area and shipped to the site by truck.

For the Pipeline/Wellsites, material will be transported by truck from Edmonton to the workface as it is required. All Pipeline/Wellsite loads fall within road shipping envelopes, and the proposed pipeline route is fully accessible by road.

(c) *Infrastructure*

The Capture component of the project has the largest warehouse/laydown requirements. The plan is to have adequate warehouse/laydown area facilities within the Scotford Complex. A new warehouse facility will be located at the Capture construction site. Infrastructure within the

Capture site will consist of warehouse space, administrative facilities, and a level compacted and drained open area for material and equipment laydown, and parking. The project has requested and been granted land at the site that will fulfill the requirements for space, so there is no need for any additional land (e.g. in Edmonton). The project has yet to define preservation requirements in detail; this will be carried out early in EXECUTE.

The layout of the Capture infrastructure facilities has been developed to minimize travel time to and from the work locations. By locating the new warehouse within the main Capture area, access to material will be facilitated. Tool cribs, lunch cars, and wash cars will all be strategically placed to maximize accessibility by craft.

Regarding the pipeline and wellsites, they are located in a predominantly agricultural area approximately 60 kilometers northeast of Edmonton AB. As such, local access is good, with a network of primary highways, and high grade secondary access roads along range and township lines. It is expected that Shell's construction team would be based in temporary facilities provided by the General Works Contractor. For the purpose of any large meetings it is the intention to make use of local community center facilities as a way of increasing local expenditure.

20.6. Transition of Construction Responsibilities

Unlike many of the other categories, the majority of construction activities end at final completion notification and do not transfer to another organization. Those activities that extend will be managed by the project management team include, technical support to CSU and operations and completing the Project Close Out Report and lessons learned.

21. INFORMATION MANAGEMENT & TECHNOLOGY

21.1. Information Management

This section provides an overview of Information Management for the Quest project.

The objective of the Information Management Plan (documents, data, and knowledge) is to enable effective information distribution to all project & facility stakeholders in a timely manner. This plan addresses deploying IM Global Standards and ensuring that project information requirements are accurately handled through the life of the project.

Below is a summary of the areas the IM Plan addresses:

- Align Information Management activities to project and business processes by:
 - Regular scheduled meetings with all stakeholders to ensure expectations are met
 - Approving IM activities with project team leads
 - Clarify all strategies and plans with team leads

- Maintain IM risks in project Easy Risk
- Maintain a IM organization to assist the project needs, IM Lead and a Doc Control Office to handle all project document and data requirements for the life of the project.
- Support the flow of information throughout the project phases by
 - Gather key stakeholders flow of information to better assist in Information Delivery
 - Assist in the review process for DCAF/PCAP deliverables
 - Assist in the Regulatory hearings
 - Assist in the knowledge sharing commitments as agreed with government
- Manage all deliverable documents for the project including Shell and external contractors by:
 - Use of the Quest Document Numbering Procedure
 - Use of the Quest Information Handover Guide
 - Define Handover plans for project documentation from Project phases
 - Critical documents
 - Non Critical Documents
 - Knowledge Sharing Documents
- Manage the control of data created during the project by:
 - Data loading the Asset Hierarchy in the data warehouse from contractors in timed intervals that meet the project needs
 - Communicating Shell standards to ensure the quality and consistency of this information
- Manage the handover of information to Operations that will address the information created by operations for the following:
 - Physical Plant
 - Information – documents, data and drawings
 - Critical documents gathered from operations
 - Non Critical documents
 - Information in database format
 - SAP, SPI, etc. that will populate operation applications (i.e., Systems and Products (SAP), Operational Integrity Assurance (OIA), Reliability Centred Maintenance (RCM), etc.)

21.2. Information Technology

In order to achieve Top Quartile performance, Information Technology (IT) has been involved since the early stages of project planning to ensure technology is designed to comply with Shell standards and policies for reliability, accessibility, and security.

IT provides both applications and infrastructure to support business processes, as well as effectively integrate systems and enable communication to ensure “Business at the Centre” is realized. Early interaction with the Operations team and the execution contractors will result in architecture that holistically plans for Field Communications, Office Domain and the Process Control Domain.

The co-ordination of IM working with IT ensures supporting infrastructure is addressed for effective information and data management.

21.3. Transition of IT and IM Responsibilities

P&T will maintain responsibility for the IT infrastructure including radios and office trailer equipment until post RFSU at which time the need for the infrastructure is eliminated and/or the Quest Operations team via the Scotford IT team will provide resources. The networks required for MMV data collection, Sample Manager, WRFM and ArcGIS will all be transferred to Quest Operations team via the Scotford IT (asset) team at RFSU.

As the project reaches mechanical completion documentation and information is handed over to the Quest Operations team via the Scotford IM team. Design systems such as SP3D, SPPID and SPI and databases such as Go Completions, SAP and EPSIR will be handed over at Mechanical Completion. “As built” documents, tags, vendor documents, MRBs, IOMs will all transfer over to the operations team with a lag time of approximately 2-3 months post mechanical completion.

Information Handover guide specifies all the specification of data and documents that are to be delivered to asset. IM deliverables (technical and non-technical documents from controlled collections) will be handed over directly from the Project IM to Asset IM team. There will be no intermediate handover to Quest Operations although technically Quest operation will own them post Mechanical Completions the documents will still remain in the project controlled collections until they are physically handed over to Scotford IM.

22. SUBSURFACE

The details of the subsurface program and associated MMV plan are outlined in the Storage Development Plan and the latest Monitoring Measurement and Verification Plan as submitted to AER in February of 2014, MMV Plan.

The activities for the subsurface team throughout the EXECUTE and CSU phase can be summarized in several categories including:

1. MMV Plan Baseline Monitoring activities
2. Subsurface and MMV Plan Implementation
3. MMV Technology Development
4. Surveillance activities and Operations

The MMV plan is summarized in the figure below:

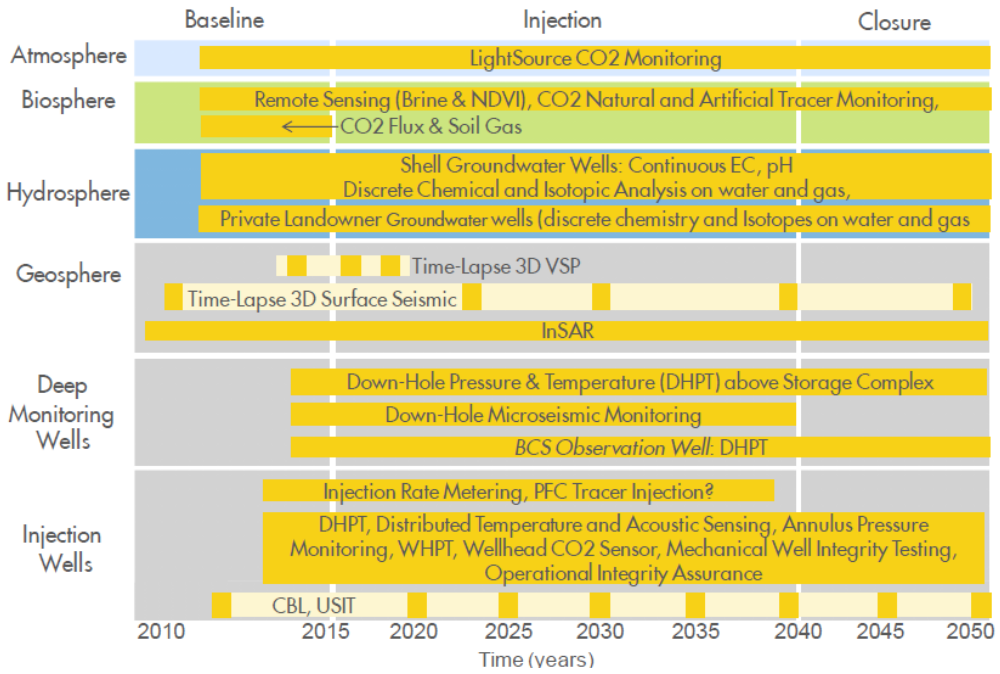


Figure 22-1 Outline of Quest's diversified monitoring program

The types of activities completed for each area has been summarized below:

22.1. MMV Baseline Monitoring Activities

Atmosphere

1. LightSource installation at 8-19 well pad to determine thresholds for CO₂ emission detection.
2. Eddy Covariance (EC) monitoring at well site 8-19

Biosphere

1. HBMP soil and vegetation monitoring activities wrap up end of 2014. Final Baseline report expected in Q1/2015.
2. Surface CO₂ Flux and Soil gas studies
3. Remote sensing data satellite acquisition ongoing over SLA – RadarSat2 (Radar Image analysis), Rapideye (Multispectral Image analysis).
4. Remote sensing for brine detection report due in end of 2014, evaluating the utility of remote sensing technology for detecting brine leakages from the BCS reservoir.

Hydrosphere

1. HBMP groundwater sampling activities to end 2014. Final Baseline report expected in Q1/2015.
2. Quest project groundwater wells continuous monitoring and data collection ongoing.

Geosphere

1. Time-lapse VSP. Baseline survey to occur in January 2015 at all three wellsites.
2. InSAR Baseline Monitoring: final InSAR baseline report complete

Deep Monitoring Wells (DMW)

1. Microseismic installation is planned for DMW8-19 in Q1/2015, in conjunction with the completion of the well with downhole pressure and temperature gauges targeting the Cooking Lake interval.

22.2. Subsurface and MMV Plan Implementation

Atmosphere

1. LightSource cabling infrastructure for power and data at all 3 well sites will be complete by end of 2014 . LightSource hardware will be installed at the 5-35 and 7-11 wellsites in Q1 2015.

Biosphere

1. Plan for monitoring program during injection phase is expected in Q1 2015.

Hydrosphere

1. Quest project groundwater wells. Final testing of data infrastructure expected Q4/2014 with integration into Shell systems.
2. Use of artificial tracers pending a decision from AER. Shell technical recommendation is to use natural tracers. Geosphere

3. InSAR monitoring and RadarSAT2 data collection will continue with an evaluation of the utility of the technology occurring post-injection

Deep Monitoring wells

Microseismic installation is planned for Deep monitoring well DMW8-19 in Q1/2015.

Injection Wells (IW)

1. WRFM and surveillance systems and software are being tested, finalized and connected to Shell data and power systems in Q4/2014.
2. Final connection of down-hole gauges to data and power installations to occur in Q4/2014.
3. Front-end evaluation of DTS hardware ongoing in Q4/2014. Expecting evaluation, purchase and testing of Light boxes for continuous monitoring purposes in Q4/2015.

22.3. MMV Technology Development

1. LightSource technology is under development with Shell P&T and Boreal (hardware vendor), although current deployment meets the project CO2 detection thresholds. Next generation hardware and software are in development.
2. DAS/DTS fiber optic systems. Evaluation of hardware and methods for continuous down-hole monitoring are ongoing throughout 2014-15
3. AITF Groundwater Study finishes end of 2014.
4. Remote Sensing. Evaluation of remote sensing techniques for CO2 and Brine detection are expected end of 2014. Results are not expected to be conclusive, and further studies may be required in 2015 and beyond. Does not currently reflect satellite data collection schedules.
5. Baseline InSAR report has demonstrated ground movement thresholds for detection. Final evaluation (Q3/2014) is waiting Gen-5 dynamic modeling and geomechanical modelling results (Q4/2014) for predictions to compare against injection period InSAR processing results.

22.4. Operations and Surveillance

1. WRFM plan exists and will be updated with the results of the Gen-5 dynamic reservoir modelling. Communication of updates and procedures for start-up and commissioning with operations team is ongoing throughout 2014-15.
2. WRFM toolkit for Quest expected finalized in Q4/2014. SCADA and PI systems will be tested after data and power infrastructure is completed in Q4/2014, and the instrumentation is transmitting baseline data.
3. Sample Manager database for HBMP baseline and monitoring data. Testing software and ongoing loading of baseline data into database throughout 2014-5.
1. Basal Cambrian Sandstone (BCS) Modeling. Gen-5 dynamic modelling is ongoing, results expected in Q4/2015.
2. Cooking Lake (CKLK) Modelling. Static and dynamic modelling updates to occur throughout 2014-15, Seismic interpretation update. New seismic data processing results are being evaluated in advance of the acquisition of the baseline VSP and microseismic, ongoing throughout 2015. Results are to be integrated into updates of the regional leak

path static model and CKLK static model, and to aid in the evaluation of the VSP, time-lapse and microseismic surveillance results post-injection.

3. Significant knowledge sharing is ongoing through the project, via internal and external conferences, scientific data publications and regulatory and governmental submissions. (e.g. Q4/2014 GHGT-12 conference, submission of publications to peer-reviewed journal, monthly meetings with P&T CO2 Storage Team).

23. OPERATIONS READINESS

23.1. Commissioning & Start-Up

The purpose of commissioning is to prepare the plant for operation. The purpose of performance testing is to prove that the plant meets the guaranteed performance values by the various licensors and to demonstrate completion for the agreements now signed with the provincial and federal governments. The Operations Readiness Plan (ORP) addresses the same subjects, but in more detail.

(a) *Commissioning and Start-Up Philosophy*

The philosophy of dividing commissioning into system blocks will be applied to the Quest project. The unit blocks will contain operational systems and may be separated by battery limit valves and spades.

The commissioning and handover of the different system blocks (offsites, utilities, compressor and the amine system) will be phased, which will be dictated by the overall product-in-tank dates and the respective durations of the start-up of individual system blocks.

In addition to the unit blocks, a number of large operational systems will be common to more than one of the system blocks, such as cooling water and fuel gas. A systems completion approach for the large operational systems will be used for the commissioning and start-up activities. The commissioning and start-up team has identified the extent of these systems. Preliminary system definition and system block priority is completed. Further “priority by system” will be assigned after development of P&I diagrams.

The EPCM contractor will be responsible for the mechanical completion activities, with assistance from the Shell project team and the commissioning and start-up team. The commissioning coordinator, who will be part of the commissioning and start-up team, will lead the coarse cleaning activities that are required before mechanical completion. Further cleaning including chemical cleaning will be carried out by the Operations team led by the CSU manager after system handover.

Following handover, the Shell commissioning and start-up team will be responsible for commissioning the new facilities (starting with a nitrogen purge) with the EPCM contractor providing maintenance assistance.

The philosophy is based on:

- the Quest facilities, which will be too large for a single handover
- construction activities, which will be dominantly geographically organized

- hand-over of the Quest facilities, which will be varied between geographical and operational systems
- a degree of flexibility, which will be enabled by the geographical block approach in that completion of blocks will be largely independent
- Operation Readiness team will also define system priority for handover to minimize start up time

(b) *Vendor and Specialist Assistance*

The EPCM contractor will organize vendor and specialist assistance during construction and before mechanical completion. The Shell commissioning and start-up team will organize vendor and specialist assistance during commissioning, start-up and performance testing where required. A detailed list of support and training is available at section 3.7 in the ORP.

(c) *Schedule Philosophy*

The CSU team has established the start-up sequence as a schedule input. Individual engineering, procurement and construction (EPC), and commissioning and start-up schedules have been integrated into an overall master schedule. The start up schedule also includes the Pipeline and Wellsites. The overall master schedule includes all essential elements, both at Scotford, the CO2 pipeline and the wells. Please refer section 4.7 in ORP for more information.

The Shell project teams, along with the commissioning and start-up team, will define the target completion dates for utilities and process facilities, which will support a logical start-up sequence and will result in a phased handover. The owner teams will work with the EPCM contractor to develop schedule milestones to monitor construction work progress for the agreed-on target completion dates.

(d) *Phases*

Phases of the commissioning and start-up activities for which the division of work scope responsibilities and work procedures between the Shell project teams, the EPCM and EP contractors and the operating departments are:

- mechanical completion
- commissioning
- start-up
- performance testing
- sustained operations

23.1.d.1. Mechanical Completion

For mechanical completion, a clean, tight, operable, safe and complete system will be delivered. It will include flushing, system testing, equipment run-ins and pre-punching, and will conclude with handover of the systems, with appropriate documentation, to the commissioning and start-up team.

Regarding the pipeline specifically, it is imperative to remove any solid or small particles from the construction activities that could lead to plugging of the formation. Therefore as part of the dewatering of the pipeline after hydrotest, the pipeline will be swept with specific pigs to clean small particles left in the pipeline. The following split of responsibilities has been agreed for the pipeline:

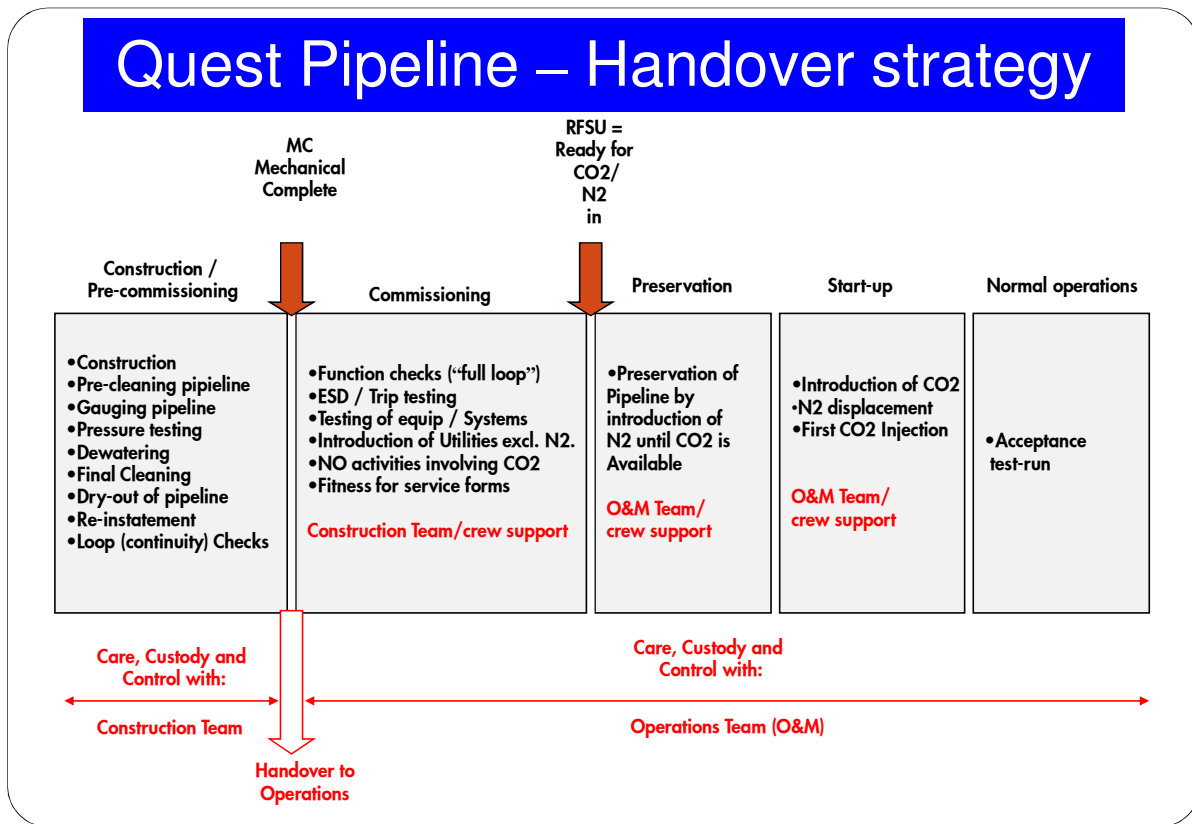


Figure 23-1 Pipeline Handover Strategy in DEFINE phase.

This figure was updated in the EXECUTE and reflected in the figure below.

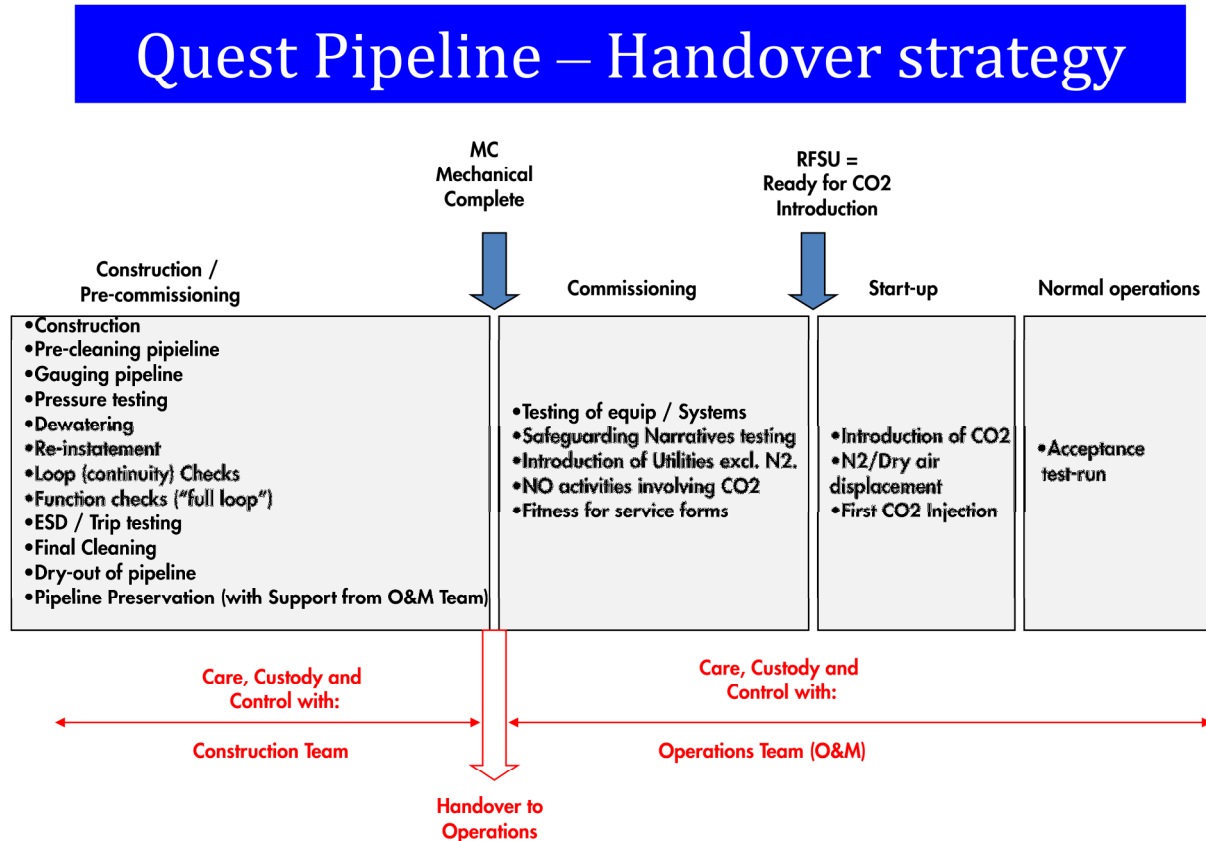


Figure 23-2 Pipeline Handover Strategy in EXECUTE phase

23.1.d.2. Pre-Commissioning & Commissioning

For commissioning, individual systems will be oxygen freed with nitrogen. Utility systems will be put into service. Commissioning will include final punching by the Shell project and operations teams, and will conclude with ready-for-start-up for the specific block.

Considering the highly corrosive nature of CO₂ when mixed with free water, it is required to dry out the pipeline up to a specification of -45 degC. It is planned to engage a specialized contractor to perform the dry out with dry air. Once the pipeline is dried out, the pipeline will be filled up with nitrogen to preserve it until CO₂ is available from the Capture facility. It is expected that this preservation period will last for at least 2 months.

23.1.d.3. Start-Up

For start-up, systems will be filled with nitrogen. The units will be brought on-line and will start to produce CO₂ products. During start-up, systems will be O₂ freed and charged with process fluids.

23.1.d.4. Performance Testing

After a successful start-up, a performance test-run will be conducted to confirm performance, both for warranty purposes for the various process units, and also to satisfy proof-of-performance criteria as specified in the Government Agreements. Please refer to section 4.7 in the ORP for more information about tests.

23.1.d.5. Documentation at Handover

The project Information Handover Guide (iHOG) outlines required documentation at the handover of systems. These documents are considered vital for safe and successful commissioning and start-up, and will be handed over by the contractor with each unit block or operational system.

23.1.d.6. Documentation at Successful Test Run

Where applicable, the following documentation will be available following the performance test run:

- Certificate of Acceptance, issued by Shell to the contractors
- Certificate of Completion of Work, issued by the contractors to Shell
- Documentation to demonstrate that “Sustained Operations”, as defined in the Government Agreements, has been achieved

On completion of the performance test, licensors and/or contractors will be informed in writing if there are warranty issues that necessitate subsequent actions.

23.1.d.7. Post-Implementation Review

A Post-Implementation Review (PIR) compares the actual implementation and performance of the project against the plan, according to Shell Canada Capital Budget Proposal 502F.

Accountability for ensuring that the PIR is conducted in a timely and appropriate fashion lies with the Oil Sands General Manager of mining and upgrading development.

23.2. Operations Readiness Plan

As part of the ORM deliverables, an Operations Readiness Plan (ORP) has been developed. The ORP:

- Defines an operations philosophy that provides a basis from which, together with other input, the operation and management of the facility can be developed or updated
- Defines a vision about the technical and organizational implementation of the project into the operational organization.

- Specifies operational objectives, documentation/data requirements, training, operational risks and key success areas
- Identifies key performance areas (tightness, cleanliness etc)
- Defines critical project success objectives and performance targets for the selected key performance areas
- Defines an organizational structure that supports commissioning & start up requirements with respects to the key performance areas and the objectives set.

Details can be found in the ORP.

23.3. Transition of CSU and ORA responsibilities

With system hand over occurring before and at mechanical completion, Quest moves from construction-centric to CSU-centric. The responsibilities of the Quest CSU and Operations team increase, as is expected. The purpose of this section is to outline where these teams maintain support from the P&T organization until Sustainable Operations. Narrative testing will commence just prior to MC and finish prior to RFSU. CSU will lead this activity with support from P&T construction and PM. The Scotford operations team will become more involved as commissioning activities proceed with them being responsible for balancing utilities and avoiding production upsets.

The P&T construction team will be finishing punch-list items while the CSU team starts their work including the D punch-list items, as such, activities will need to be prioritized. This will be lead by the CSU and Operations team. When technical questions and potentially changes are needed, the Scotford MOC process will be used. Quest CSU and Operations team will lead this process and P&T Construction and Technical Authorities will be involved in the assessment and acceptance of the final solution. See Section 15.8

Final handover to Scotford Operations from the Quest CSU team will occur at sustainable operations once the three government tests are completed and with the final sign off of the Project to Asset handover from the CSU team to Scotford Operations.

24. ACRONYMS

AENV – Alberta Environment
AFE – Authorization for Final Expenditure
AI-PSM – Asset Integrity, Process Safety Management
ALARP – As Low As Reasonably Practicable
AOSP – Athabasca Oil Sands Project
AVL – Approved Vendor List
BCS – Basal Cambrian Sands
BDP – Basic Design Package
BOM – Business Opportunity Manager
CAPEX – Capital Expenditure
CAR – Construction All Risks
CARM – Contractual Allocation of Risk Manual
CCS – Carbon Capture and Storage
CEAA – Canadian Environmental Assessment Act
CII – Construction Industry Institute
CMCP – Category Management and Contracting Process
COAA – Construction Owners Association of Alberta
CP *or* C&P – Contracting & Procurement
CPPM – Contracting & Procurement Procedure Manual
CSU – Commissioning & Start Up
CTR – Cost, Time, Resources
CWP – Construction Work Package
DCAF – Discipline Control & Assurance Framework
DE – Decision Executive
DEP – Design & Engineering Practice
DG – Decision Gate
DPRIR – Design Phase Risk & Insurance Review
DRB – Decision Review Board
EA – Environmental Assessment
EAC – Estimate At Completion
ECS – Enterprise Categories & Suppliers
EFA – Enterprise Frame Agreement
EIA – Environmental Impact Assessment
EOR – Enhanced Oil Recovery
E&P – Exploration & Production
EPC – Engineering, Procurement, Construction

EPCM – Engineering, Procurement, Construction Management
EPCCM – Engineering, Procurement, Construction, Construction Management
ERCB – Energy Resources Conservation Board
ERP – Emergency Response Plan
ES – Earned Schedule
ESAR – Estimate & Schedule Assurance Review
ESH – Environmental, Social, Health
ESTG – Engineering Standard & Technical Guideline
EVA – Earned Value Analysis
EVM – Earned Value Management
EVP – Executive Vice President
FCSU-Full Capacity Start Up FDP – Field Development Plan
FEED – Front End Engineering Design
FID – Final Investment Decision
FIWP – Field Installation Work Package
FP – Focal Point
FPD – Flawless Project Delivery
FPP – Full Project Proposal
FTE – Full Time Equivalent
GHG – Green House Gas
GM – General Manager
GoA – Government of Alberta
GoC – Government of Canada
GPA – Goals & Performance Appraisal
GWDP – Global Well Delivery Process
HAZOP – Hazards & Operability
HLC – Heavy Load Corridor
HMU – Hydrogen Manufacturing Unit
HO – Heavy Oil
HSSE – Health, Safety, Security, Environment
IDS – Interface Data Sheet
IFC – Indirect Field Costs
IG – Integral Geared
iHOG – Information Hand Over Guide
IM – Information Management
IMP – Interface Management Plan
IPA – Independent Project Analysis

IT – Information Technology
ITP – Inspection & Test Plan
JV – Joint Venture
KPI – Key Performance Indicator
LCCS – Low Cost Country Source
LES – Logistics Execution Strategy
LIRA – Logistics & Infrastructure Resource Assessment
LOS – Line of Sight
MDEA – Methyl Diethanolamine
MMSCF – Million Standard Cubic Feet
MMV – Measuring, Monitoring, Verification
MOA – Manual of Authorities
MOC – Management of Change
MTO – Material Take Off
NGO – Non-Governmental Organization
NPV – Net Present Value
NRCan – Natural Resources Canada
OA – Outline Agreement
OPEX – Operating Expenditure
ORM – Opportunity Realization Manual
ORP – Operations Readiness Plan
PCAP – Project Control & Assurance Plan
PCP – Project Controls Plan
PEP – Project Execution Plan
PER – Project Execution Review
PG – Project Guide
PHA – Process Hazards Analysis
P&ID – Piping & Instrumentation Diagram
PIR – Post Implementation Review *or* Project Interface Register
PM – Project Manager
PMT – Project Management Team
PO – Purchase Order
PPD – Project Premise Document
PQP – Project Quality Plan
PS – Project Standard
PSA – Pressure Swing Adsorber
P&T – Projects & Technology

QA – Quality Assurance
QC – Quality Control
QRA – Quantitative Risk Assessment
RAM – Risk Assessment Matrix *or* Reliability & Availability Model
RAS – Required At Site
RCM – Reliability Centred Maintenance
RDS – Royal Dutch Shell
RFQ – Request for Quotation
RFSU – Ready For Start Up
SAI – Shell Aircraft International
SCAN – Shell Canada
SCM – Supply Chain Management
SDP – Storage Development Plan
SEIA – Socio-Economic Impact Assessment
SGSI – Shell Global Solutions International
SIMOP – Simultaneous Operation
SO – Sustained Operations
T/A – Turn Around
TCO – Total Cost of Ownership
TECOP – Technical, Economic, Commercial, Organizational, Political
TEG – Triethylene Glycol
TIV – Technical Integrity Verification
TQ – Top Quartile
TRCF – Total Recordable Case Frequency
VAR – Value Assurance Review
VIP – Value Improvement Process
VOWD – Value of Work Done
VP – Vice President
WBS – Work Breakdown Structure