
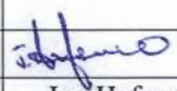
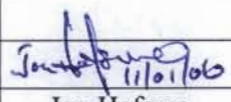




## RAJASTHAN NORTHERN AREA DEVELOPMENT PROJECT

### HSE MANAGEMENT PLAN

**DECO-RX-R-PEP-0062**

					
B1	02-01-06	Issued for Implementation	Jitendra Kumar	Jon Hafsmo	Jon Hafsmo
Rev	Date	Purpose of Issue	Prepared By	Checked By	Approved By

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# **1 PURPOSE**

The purpose of this document is to describe HSE, Corporate Social Responsibility and Security Management (hereafter referred to as HSE) strategy which, when implemented, will provide the Head of Development Project with the assurance that, on completion of the Rajasthan Development Project execution, he and his team have fulfilled the objectives of the Group HSE policies and Cairn Energy India Pty. Limited (CEIL) Health, Safety and Environmental Management System (HSE-MS) with regards to the execution of the Project work scope. The steps required to achieve this goal for each phase of the project are described in this document.

## **1.1 PROJECT HSE VISION**

The Project Management Team endorses CEIL QHSE vision;

- A healthy, safe and secure working environment
- No accidents, no injuries and no harm to people
- Environmental impacts minimized
- A positive contribution to local communities

Shared by all of us

A personal value

**‘Everyone in CEIL is responsible for HSE’**

## **1.2 DEVELOPEMNT KEY PERFORMANCE INDICATORS**

The HSE objectives and targets for the Development Project shall be disseminated through plans and be discussed in HSE meetings.

The HSE Key Performance Indicators (KPI's) have been selected for monitoring this Project are listed here under.'

<b>Negative Indicators</b>	<b>Positive Indicators</b>
Fatality - None	Managers Tours Programme – 100 %
Lost Time Injury Rate – <1 per million hour	HSE induction for all field personnel – 100%
Total Record able Injury Rate – <3.2	Drills and Exercises Programme – 100% (per month)
Environmental Incident Frequency Rate – <0.5	HSE Worksite Inspection programme completed at each location – 100% (per month)
	All Incidents reported and investigated
	HSE Audit and corrective actions closed out – No critical recommendation > 1 month (reviewed monthly).
	HSE meetings schedule at each location – weekly
	Safety Observation Programme for the duration of the Development Project
	Weekly Analysis of Unsafe Conditions
	Stakeholders Communications Plan Implemented
	Achieve ISO 14001 certification 3 months post 1 <sup>st</sup> Oil

### **1.3 PROJECT HSE PLAN SCOPE**

The RJ-ON-90/1 Project is unique in terms of the wide geographical spread of the block. The current area of the block is around 6620 km<sup>2</sup> covering Barmer and Jalore districts. The plan covers the design, construction, commissioning and start-up of the Mangala and Northern Fields in Rajasthan.

HSE Plan scope includes only upstream activities up to crude oil delivery point (with mid stream & downstream interfaces), for the Northern Field Development Project. This plan also includes references to providing HSE, CSR and Security inputs as necessary to the mid-stream and down-stream projects

Development Project environmental regulatory approvals and clearances and implementation of the CSR strategy are managed separately under the stewardship of the DGM Environment and CSR in conjunction with Director, Stakeholder Relation Chennai. While these are currently separate activities, the outcomes that impact the project need to be captured and addressed during the project execution phase.

Interrelated Development Project activities such as drilling & completions, Seismic Operations, Water Resource Project and Early Well Testing Operations are managed separately under their respective HSE plan and procedures. Refer Figure 1 - Illustrates the interrelated projects and operations activities that may potentially occur concurrently during RJ-ON-90/1 Development Project.

### **1.4 DESCRIPTION OF MANGALA AND NORTHERN FIELDS FACILITIES**

It is proposed that the Northern Area Oil Fields are developed in the following sequence, Mangala and Aishwariya.

Proposed Facilities include the following:-

- Well pads
- Oil Processing area
- Water processing area
- Tank farm area
- Captive Power Plant (CPP)
- In field interconnecting pipelines
- Above ground Power transmission network
- Interconnecting Roads with corridors for pipelines, electrical and communications cable systems.
- Crude Export (Road / Train)
- Permanent Accommodation Camp
- Warehouse

### **1.5 PROJECT HSE PLAN OBJECTIVES**

- Conducting safe operations in the field during the period of construction and simultaneous activities.
- Apply Group HSE, Security & CSR Guiding Principles in the Development Project tendering process, to define environmental and social behaviors expected of contractors and suppliers.
- Integrate HSE, CSR and Security aspects throughout the Development Project life cycle.
- Ensures HSE, CSR and Security inputs are provided to the deliverables at the agreed milestones under the Rajasthan Project 'Gated process'
- Defines HSE accountabilities and responsibilities for the Development Project team, and implement a HSE Training Programme to deliver outstanding HSE awareness and performance for this Project
- Incorporate measures for prevention and mitigation of pollution and safety in the design through concurrent risk engineering, and minimizing failure, accident and pollution incidents through adoption of best available technology and deliver 'Fit for Purpose' COMAH (Control of Major Accident Hazard) study.

- Defines the project HSE assurance process that which ensures that Cairn HSE, Security and CSR policies/ standards /procedures are being implemented throughout Development Project life cycle.
- Ensures compliance with all applicable Indian Statutory and Regulatory, Code of Practice and Standards (MoEF, OISD, RSPCB, CCOE, Electrical Inspectorate, Director General Mines Safety, Petroleum Rules, Manufacture, Storage and Import of Hazardous Chemicals Rules).
- Development Project related field activities (construction, pre-commissioning / commissioning) are in accordance with international industry codes of practices (OGP) and standards throughout the Development Project life cycle.

## **1.6 PROJECT HSE MILESTONES**

- UK COMAH Safety (Integrated HSE) Report verified by independent third party as 'Fit for Purpose' prior to commencement of pre-commissioning activities.
- HSE Systems and procedures issued to Rev 1 by Pre-commissioning (Rev 0 available for training)
- Operations training program completed prior to Pre-commissioning
- Operations & HSE systems in place and fully functioning, with trained and competent personnel by start of pre-commissioning for Start Up
- All regulatory approvals / consents in place prior to commencement of First Oil.

## **1.7 INTERNAL STAKEHOLDERS**

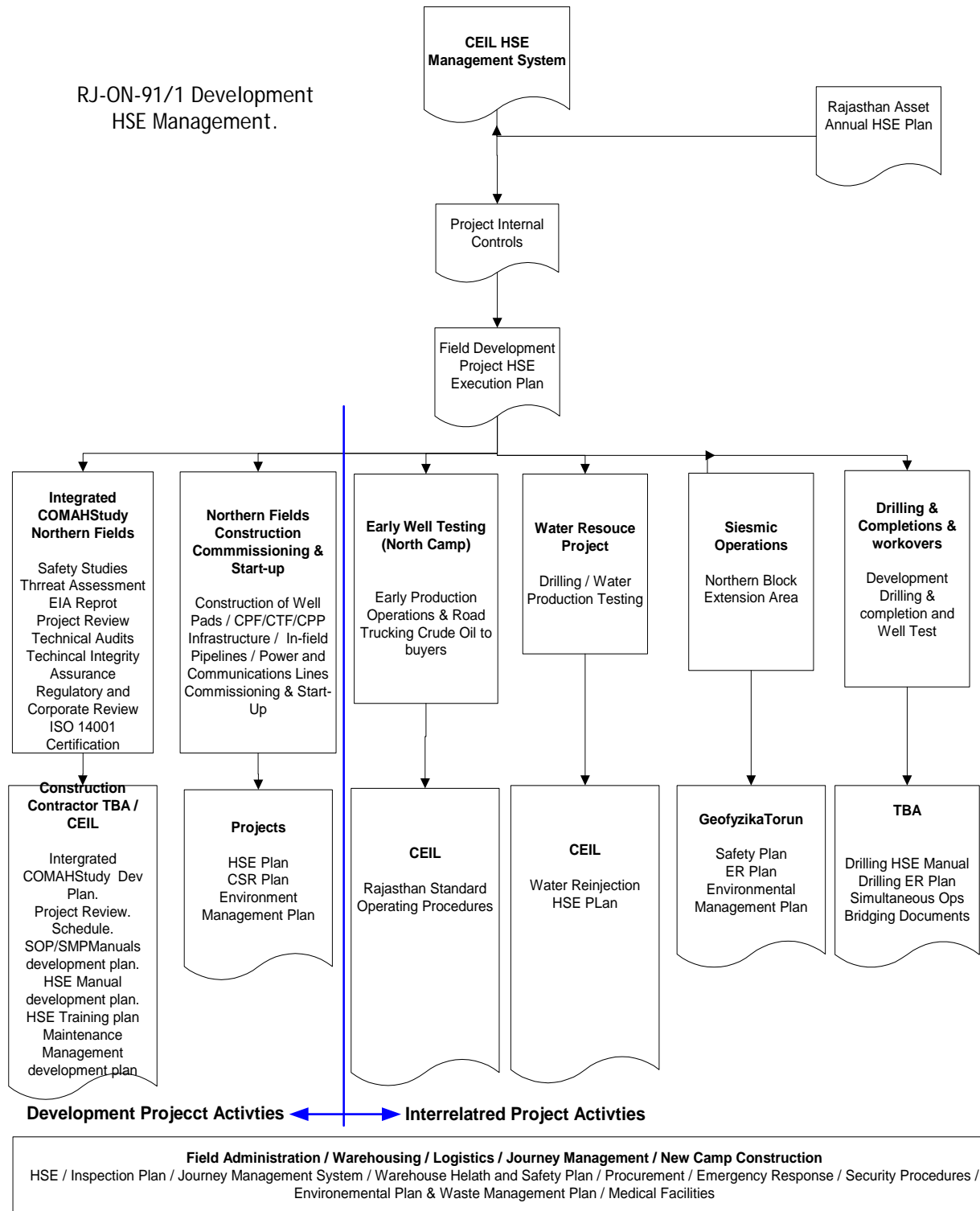
- Laurie Smyth – Managing Director CEIL
- Phil Tracy – Project Director Rajasthan
- Rolf Stork – Chief Operating Officer India North
- Jon Hafsmo – Head of Development Project Rajasthan is accountable for delivery of facilities safe for operation.
- Bill Pearce – Service Project Manager Rajasthan
- Jagdeep Chhaya – DGM Operations Rajasthan
- H.P Bhalla - Director Stakeholder Relations CEIL
- Steve Welton –acting as Project Gate Keeper, as well as functional head of the Group Head HSE, Risk and Assurance function. The role of Project Gatekeeper is to provide independent assurance to the Rajasthan Project Management Board and PLC Board that these deliverables are in place thereby allowing the project to pass through each gate ( Refer to HSE and Operations Assurance Section)
- Umakanthan RR – Head HSS CEIL, responsible for providing Health, Safety and Security guidance and support to the Rajasthan Asset team, and for monitoring Development Project HSE Assurance process.
- Jaishankar Krishnan – DGM Environment, CSR, Media and Land CEIL, is responsible for managing environmental regulatory approvals, clearances and consents, and providing guidance, and managing Asset CSR related matters.
- Jitendra Kumar - Project HSE Manager is responsible in monitoring, providing support and guidance in the implementation of various HSE requirements in the project.
- Mr. R.K. Jain, Rajasthan Asset HSE Manager in consultation with Project HSE Manager, is responsible for advising and assisting the asset management in fulfilling various HSE requirements in the asset and in the field and carryout monitoring and provides feedback on HSE performance.

## **1.8 PROJECT HSE ASSUMPTIONS**

- The FEED HSE Assurance process will address concerns regarding changing scope of Development Project, for example the differences with the original Environmental Social Impact Assessment, and Environmental Clearance applications and meeting local regulatory requirements.

- HSE Plan scope includes all upstream activities up to a delivery point (with downstream interfaces), for the Northern Field Development Project.
- Development Project of Operations Safety (HSE) requires all levels of work force (along with the Project HSE Manager and Asset HSE Manager) participation, inputs and consultation in all stages.
- Carbon Sequestration emissions cap / capture and re-injection one of the key feature / opportunity of the Development Project. An assessment of the potential benefits of applying Clean Development Mechanism to the Development Project will considered on a Business Case basis.
- Water Resource Strategy and Community Development Project Implementation plan in place.
- Northern Field - a separate Environmental Clearance and HSE Execution Plan will be developed for both Mid Stream crude export and storage facilities and Down Stream storage and marine facilities as projects definition matures.
- Project HSE Manager is aware of the associated activities in the Southern Area Development and coordinates between the two area developments for consistency of approach.
- The monitoring and reporting Health, Safety, Environment, Security and CSR performance data in accordance with CEIL and Group reporting requirement covering the project activities will be recorded on the Promasys software / database.
- The Rajasthan Asset have standardized (Field) HSE and Security procedures and controls to support all Project and related (concurrent) activities (Figure 1 - Illustrates the interrelated projects and operations activities that may potentially occur concurrently during
- RJ-ON-90/1 Development Project, and broadly identifies the prevailing HSE documentation.
  - Emergency Response
  - Medical Facilities
  - Journey Management
  - Aviation Strategy
  - Safety orientation and strategy
  - Permit to work procedures
  - Incentive Plan
  - Contractor Management
  - Security
  - Procurement
  - Environmental
  - Waste Management
  - Logistics and Warehousing (material movements)
  - Incident Reporting
  - Safe Work Procedures

## RJ-ON-90/1 Development Project HSE Management Plan



**Figure 1 - Illustrates the interrelated projects and operations activities that may potentially occur concurrently during RJ-ON-90/1 Development Project, and broadly identifies the prevailing HSE documentation.**

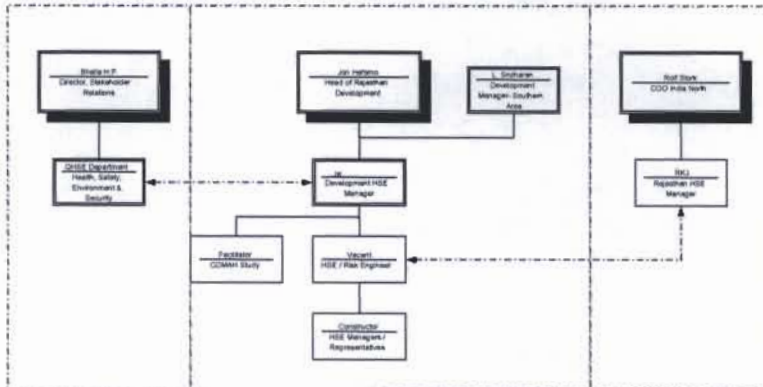


## 1.9 PROJECT HSE RESOURCES / ORAGANISATION

The Project requires dedicated HSE support personnel, accountable to the Head of Development Project, and be an integral part of the Project Team. It is suggested a Development Project of this magnitude; the following Project HSE organization and functional relationship should be established and resourced.

The following Figure illustrates the structure for the Project HSE function, with line and functional relationship depicted in solid and dotted line respectively.

**Figure 2 – Proposed Development Project HSE Organisation**



Project HSE Manager will regularly interact and consult with Head H,S&S on various Health, Safety and Security aspects of the project and will have functional reporting line with Head- H,S&S. The Project HSE Manager will also consult the DGM, Environment and CSR on various Environmental, CSR and related matters

*Project HSE Manager and Rajasthan Asset HSE Manager - to work closely on interrelated Rajasthan activities and issues including. regulatory approvals, HSE training, safety inspections and supervision etc with inputs from Head HS& S.*

## 1.10 INTERRELATED DEVELOPMENT PROJECT ACTIVITIES

- RJ-ON-90/1 Development Project Drilling Program
- RJ-ON-90/1 Seismic Program – Northern Extension
- Logistical and Warehousing
- Barmer Field Administration Office
- Barmer Accommodation Camp (in construction currently) Administration
- Water Resource Project (drilling and testing)
- Mid Stream crude oil export (whether Pipeline or Rail Carriage option) and Storage outside crude oil delivery point.
- Development Project of adequate medical/ health facilities / resources in the Barmer Area
- Downstream export or Refinery / Marine SBM facilities
- Community project work
- Asset security management and establishment

## 1.11 CHANGE MANAGEMENT

Changes to this plan prior to FEED document approval will be treated as design and planning inputs.

Changes in this plan post FEED deliverables and approval requiring a written request and processed for approval as per project internal change control procedures.

## 2 CEIL HSES & CSR GUIDANCE

Group HSE, Security and CSR Guiding Principles describes Cairn's fundamental values and approach to HSE, Security and CSR management and set out appropriate internal codes, standards or conventions to which the Company aspires. The Development Project team will promote these values throughout our activities influencing our business partners, regulators, employees, suppliers and contractors to subscribe to the same policies, or adopt or apply essentially similar policies.

The Rajasthan Development Project will be supported by the policies and objectives laid down in the CEIL HSE Management System, and CEIL Environmental Management System. The objective of the CEIL HSE MS & CEIL EMS documentation is to provide uniform direction to the Development Project in the management of Health, Safety, Environmental, Security and Corporate Social Responsibility issues.

The Development Project will ensure that the requirements of CEIL HSES & CSR are adhered to, in addition to the applicable national regulatory and legislative requirements while also meeting the requirements of the ISO 14001 standard.

The Group HSE Management System hierarchy as shown in (Figure 3 - CEIL HSE Management System Hierarchy) highlighting the relationship between Group and the CEIL HSE Management Systems (HSE) and CEIL Environmental Management System (EMS).

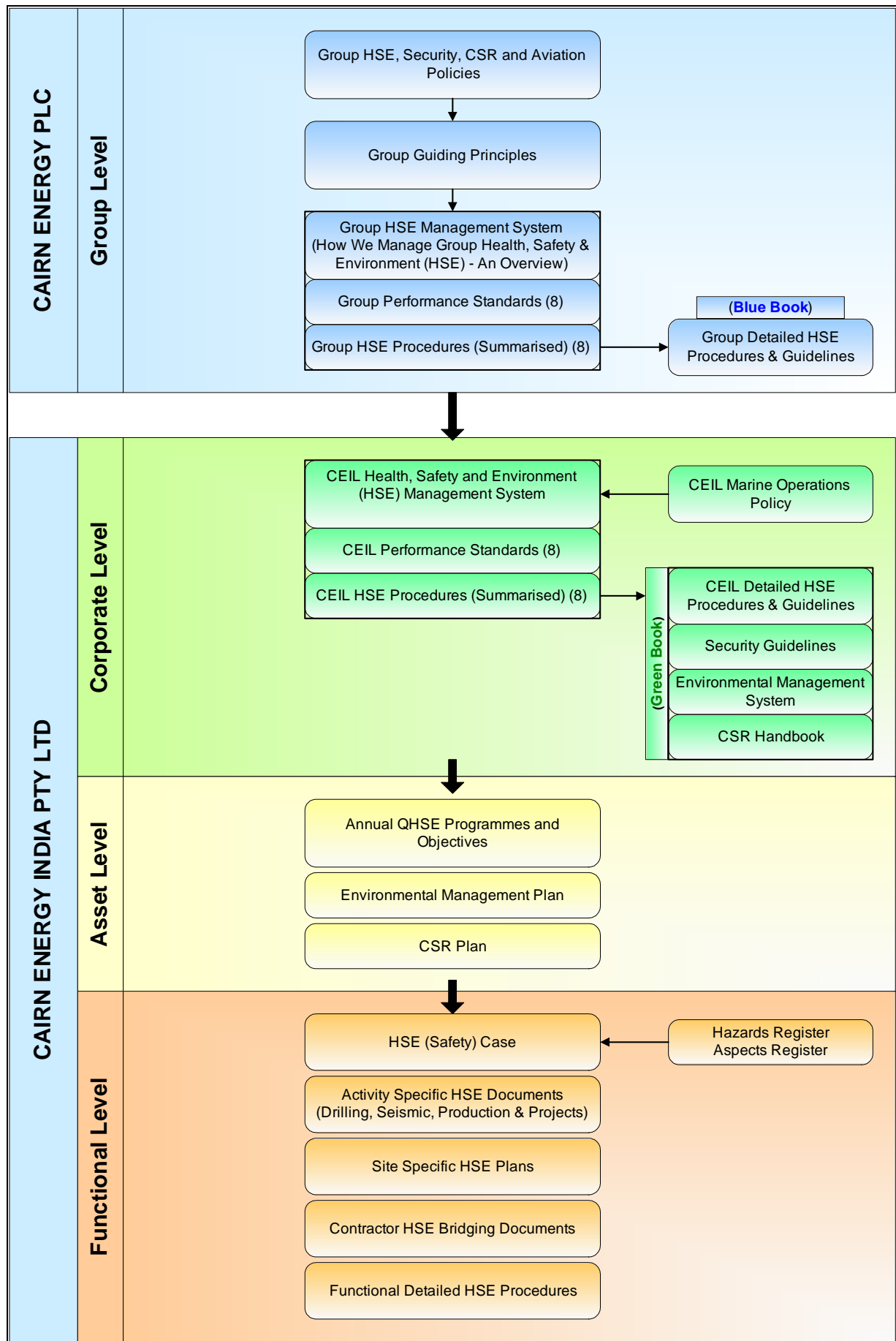
CEIL Reference Documents

- CEIL HSE Management System (HSE&S)- CEI/QHSE/MAN/016
- CEIL Environmental Management System (EMS) – CEI/HSE/MAN/009

The Group HSE standards and procedures will be applied as a minimum. Where CEIL standards and procedures have been developed corresponding with the relevant Group HSE Procedures then these shall prevail.

The intent within the design phase of the Development Project facilities is to develop an integrated approach to the assessment of major hazards and environmental aspects. Application of Group standards will ensure adequacy in facilities design, and continued use to manage the safety of the working practices and environmental aspects throughout operations lifecycle.

Figure 3 - CEIL HSE Management System Hierarchy



### 3 PROJECT HSE, CSR AND SECURITY ORGANISATION & RESPONSIBILITIES

The responsibility for implementation of all health and safety objectives lie with the Head of Development Project, the person assigned or directed to manage the execution of the Project. The Head of Development Project is responsible for ensuring that safety is given an importance equal to that of cost, time, and quality in the management of the project. None of these business objectives can be met at the expense of others.

Accordingly, a successful Project is one which meets its safety objectives as well as those of time, cost and quality. The Head of Development Project is accountable for this success and, equally, for any failure.

It is the Head of Development Project's responsibility to ensure that sufficient time and resources are provided to complete essential safety studies.

It is the Development Project HSE Manager responsibility to advise on HSE policy, objectives and HSE plan, project risk management process, and monitoring implementation of Project HSE Assurance system, a competent Project HSE/Risk Engineer to be included in the Project team as to support the Project HSE function.

All members of the Project team have a responsibility for the successful completion of the Project and it is important that their role is clearly defined and is fully understood. To ensure a clear understanding at all levels the Head of Development Project (aided by the Development Project HSE Manager) shall develop activity specific HSE Plan(s) from which individual objectives, tasks and targets are developed.

#### 3.1 RESPONSIBILITIES OF HSE TEAM

The main responsibilities of the Project HSE Team are to:

- Develop project specific HSE Management Plans for the Northern Fields development projects
- Assist Engineering, Construction and Commissioning functions in establishing specific HSE requirements for the project
- Support the provision of HSE training programs for project team and contractors involved in the project
- Provide coaching to project team on conducting effective HSE meetings
- Provide Safety Risk Assessment procedure
- Provide functional support through programs, systems and HSE resources to DD&E, Construction and Commissioning functions
- Establish an HSE audit plan to provide assurance that Regulatory, Corporate and JV HSE requirements and policies are being followed
- Support Construction Manager in preparation of Emergency Response Plans for field construction operations
- Advise project team on incident reporting and participate in investigation of incidents as and when appropriate

Figure 7 lists out the activities that are required for the project. It also includes activities for monitoring, audit and review, of this Project HSE Plan.

#### 3.2 SECURITY

This category would cover the requirements for security in the field and associated infrastructure. It is recommended that a strong security presence is required in the

### **1.12 SAFETY (HSE) ACTION MONITORING SYSTEM**

The purpose of this system is to monitor throughout the phases of the project (i.e. feasibility studies, conceptual design, drilling, detail design, fabrication, commissioning, hook-up and operation. ) the methods of raising, recording and reviewing Safety Actions, and the implementation of the resulting actions. A procedure for the management of Safety Actions will form part of the Project Management System. The Project HSE Manager is responsible for maintaining Safety Action Database.

The project will utilize Cairn Energy Plc standard application 'PAWS' to formally record and track responses on Issues / Actions / Recommendations / NCR's / from studies, audits and reviews, relating to the Technical; Safety; Environmental; CSR, Quality and Security aspects raised during the life of the project.

Rajasthan field in order to manage the security concerns of the facility and infrastructure. Each of the well pads and main facilities will have security guards, supervisors, patrol crew for 24-hours per day, 365 days per year.

It is envisaged that all the security personnel will be working in 2 shifts. The number in each shift envisaged for various facilities is given below:

- |                    |              |
|--------------------|--------------|
| - Well pad         | 2 personnel  |
| - Plant Facilities | 25 personnel |
| - Power Plant      | 10 personnel |
| - Camp             | 30 personnel |

In addition there will be security personnel for Patrolling and working as supervisors / area in-charge.



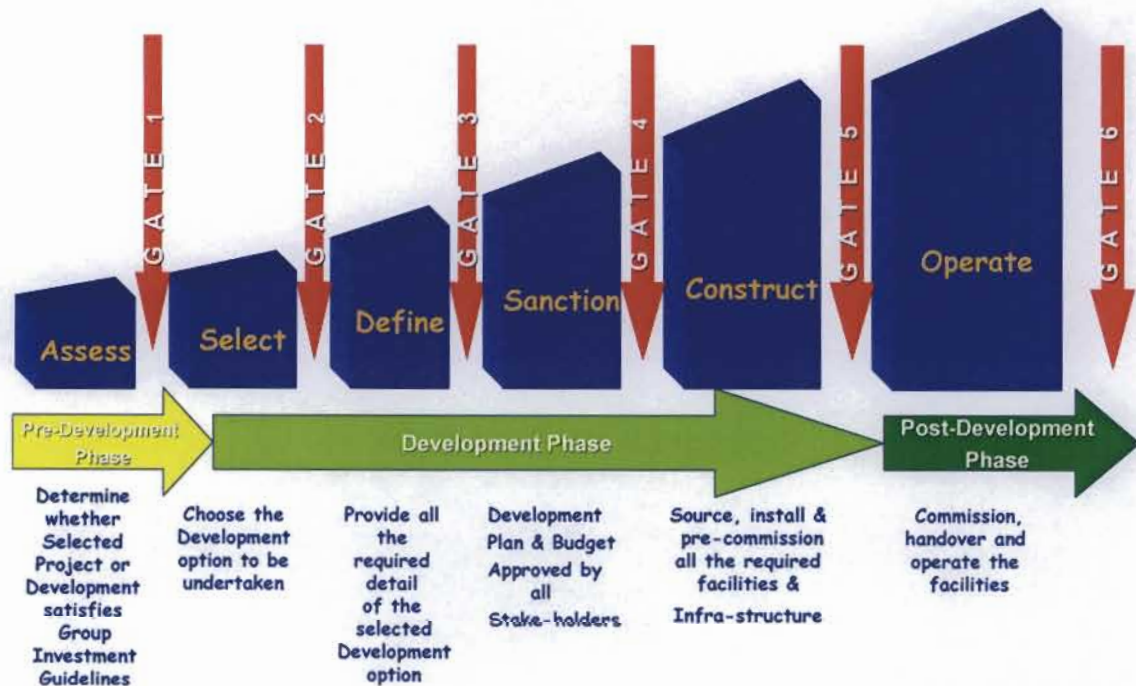
## 4 HSE & OPERATIONS ASSURANCE

### 4.1 THE CAIRN GATED PROCESS

The Cairn Gated Process (CGP) provides an overall framework for project management which allows systematic appraisal and decision-making with respect to the readiness of the project to proceed from one project phase into the next phase. The CGP is a key part of Cairn's business investment process providing a structured and integrated approach to analysis of investment options, project selection, capital efficiency, value optimization and asset monetisation.

The CGP has defined Decision Gates (DG) at the end of each project phase. At these gates the Gatekeeper, in conjunction with the Project Board, shall assure that the defined deliverables have been produced and thereby ready to move into the next stage. The purpose of the Decision Gates is to provide a clear framework and timelines for Management interventions, support to effective early decision making and better capital planning.

The CGP is a six stage process as illustrated by the figure below.



Specific deliverables have been developed for each stage for the Mangala & Aishwariya Development Project and target gate passage dates established. Following is a listing of deliverables per stage as amended by the Project Board on 1st June 2005.

### 4.2 PROJECT HSE REVIEWS (PHSER)

The Project HSE Reviews are a requirement of Cairn Energy PLC Procedure H1 HSE, Security & CSR Audits and reviews Doc. EDHSEPRO02 1247.

Development Project Manager is required to verify the HSE performance of their project through its life cycle of: design, construction, pre-start up, commissioning and operation. This will be achieved (primarily) through the implementation of an integrated approach of Project HSE Review (PHSER).

Head QHSE –CEIL is responsible monitoring the HSE & operations Assurance process implementation of PHSER

PHSER will be conducted at the following stages in the project life cycles:

- PHSER II – Post FEED document delivery (Concept Selection)
- PHSER III- Conducted in the final stage of Detailed Engineering and Design
- PHSER IV – Conducted in stages during the Construction phase
- PHSER V – Pre-Commissioning / Commissioning conducted at the end of construction phase
- PHSER VI – Conducted early in the Commissioning Phase

Refer to Figure 6 - HSE & Operations Assurance Overlay – Mangala Development Project

#### **4.2.1 PHSER II – DEVELOPMENT PROJECT DEFINITION PHASE**

The Stage II PHSER will be carried out, depending on the project timing towards the completion of the FEED Stages.

This review will be carried out when it is considered that adequate definition has been reached in the definition phase determined by the Project Manager in consultation with the Head Health, Safety and Security. PHSER II is considered a deliverable for the Project Gate 4 Sanction approval process.

The PHSER will be completed expeditiously to avoid delaying the project and incurring modifications during construction, which may well have already commenced.

Objectives:

- To confirm that Cairn HSE, CSR and Security aspects have been incorporated into the project.
- To confirm all applicable internal and regulatory requirements are imbedded throughout the lifecycle of the project
- To confirm the environmental mitigation and monitoring measures outlined in the project EIA are considered throughout the project design, implementation and operation in order to avoid or control adverse environmental impacts.
- To confirm that the outcomes and recommendations of the RISC Project Peer Review have been incorporated into the project as appropriate.
- To follow-up WPM HAZOP study findings/ recommendations to ensure these are being addressed by the Project and where necessary included FEED.

#### **4.2.2 PHSER III - DETAILED ENGINEERING & DESIGN PHASE**

The PHSER III will be carried out towards the end of the detailed design stage when engineering and equipment specifications are substantially firm but not yet frozen and satisfactory HAZOP/ Risk Studies, where appropriate, have been completed. The PHSER will be completed expeditiously to avoid delaying the project and incurring modifications during construction, which may well have already commenced.

Objectives:

- To confirm that the design requirements specified at the Stage II PHSER have been implemented correctly.
- To follow-up risk studies (Reviews /HAZID/HAZOP/Consequence Modeling) findings/ recommendations to ensure these are being addressed by the Project and where necessary included in the detailed design drawings (P&ID's).
- To confirm that fabrication, construction, pre-commissioning, commissioning, normal and emergency operation have been fully considered in the detailed design.

#### **4.2.3 PHSER IV - CONSTRUCTION**

The PHSER IV will commence as soon as Stage III is complete and meet periodically covering the construction period until the facility / well is ready for commissioning. The PHSER is aimed at providing assurance that adequate procedures exist for the inspection, testing and pre-commissioning check.

Therefore this has to be borne in mind in the timing.

Objectives



- To confirm that safe working practices and the HSE, Security, CSR Policies and procedures and 'controls' are being implemented during the construction phase.
- To confirm that no dilution of the design intent introducing additional hazards has occurred during fabrication and construction.
- To review the procedures for site change control and materials handling and to check that overall systems for inspection, testing and documental control are in place and being implemented.

#### **4.2.4 PHSER V - PRE-COMMISSIONING / COMMISSIONING**

The pre-commissioning Stage V PHSER will be carried out during the final stages of construction immediately prior to the commissioning phase. The Stage V PHSER will most probably overlap with the Stage IV PHSER and close liaison between the respective teams is essential. The PHSER should be completed and a report issued prior to commissioning.

Objective

- To confirm that the facility may be commissioned and operated safely and that the operating unit is ready to be commissioned and put in operation.

#### **4.2.5 PHSER VI – START UP & OPERATION**

This should be carried out during the early stages in the commissioning allowing time to complete any outstanding critical operational HSE aspects identified or reported.

Objectives

- To confirm that the operability aspects of the facility / wells and its safety and environmental performance are acceptable and consistent with the performance targets defined in the Safety (HSE) Case. To identify and report any possible improvements that may be considered.

### **4.3 HSE PERFORMANCE MONITORING**

Development Project HSE performance will be monitored through regular reporting from site. Inspections, internal/external audits, manager's safety tour will be conducted to upgrade the systems for higher performance levels required.

Environmental monitoring will include compliance monitoring of effluents and emissions in the site facilities and also of the ambient environment around the sites. Conditions stipulated by the regulatory agencies will be adhered to and status of compliance shall be reported as per required schedules. The Development Project HSE team will oversee the monitoring and compliance requirements pertaining to all HSE matters.

The Development Project HSE Manager is responsible to establish the Internal and External HSE reporting requirements for the project.

### **4.4 ANNUAL HSE ASSURANCE LETTER**

The Head of Development Project is responsible to submit an annual feedback from key Line Managers on the status and progress made on HSE, Security and CSR within the Project over the previous calendar year and submitted in the form of an Annual HSE Assurance Letter(s), which are compiled and submitted to the Cairn Energy PLC Board.

The aim is to get a "snapshot-in-time" perception of HSE performance from key Line Managers. These responses will be consolidated to identify both those areas where progress has been made and those areas of weaknesses that still need to be addressed. The findings will then be included in the following years HSE work plans and programmes.

The objective of the HSE Assurance Letters is to provide assurance to the Cairn Energy PLC Board that Project Management are making progress with the implementation of the Group and CEIL HSE Management Systems within their particular area of activity.

## **5 DEVELOPMENT PROJECT OF SAFE FACILITIES**

Rajasthan Development Project is managed through a series of project life cycles or phases i.e. Definition (FEED), Detailed Engineering and Design, Construction, Pre-commissioning / Commissioning and Start Up. All hazards are identified and safe guards employed to address them.

### **5.1 DEFINITION PHASE**

All non-technical issues are identified, economics and technical feasibility are studied, and various alternatives considered covering both new Development Projects and major modifications. The 'front-end engineering and design (FEED), requirements are finalized, the final alternatives selected and the hardware specified and costed for incorporation into the Development Project plan execution. It advances to a final planning stage "the project specification" where everything has been defined in sufficient detail to enable detailed design work and actual procurement to commence.

### **5.2 DETAILED ENGINEERING AND DESIGN PHASE**

FEED requirements are translated in detailed engineering for prevention and mitigation of pollution, and safety in the design will be incorporated through concurrent risk engineering, and to minimize potential of failure, accident and pollution incidents through adoption of best available technology, and through the adoption of international and industry recognised standards.

### **5.3 CONSTRUCTION PHASE**

Apart from safeguards required to ensure Health & Safety on site, and to the surrounding local communities during the construction phase, this period is also critical to ensure the operational safety of the facilities. For the facilities to operate safely, it is essential that it is constructed in accordance with the design intent, and to the appropriate level of quality.

Incorrect fabrication or installation of equipment or use of inappropriate materials may only manifest in the future in the operating life of the facilities until wear and tear, corrosion, or deterioration have had their effect, or when the component is stressed beyond its operating condition or has to operate in an emergency. To ensure against this, safety critical procedures and controls have been built into the scope of the project i.e. Project Quality Plan and Change Management Procedures.

### **5.4 PRE-COMMISSIONING / COMMISSIONING PHASE**

To review the procedures for site change control and materials handling and to check that overall systems for inspection, testing and documental control are in place and being implemented.

### **5.5 START-UP**

Verifies that all operational preparedness matters are closed out, construction and commissioning, safety and project quality assurance measures (final check on the appropriateness of design and specifications) and ensure they have been complied with.

## 6 DEFINITION PHASE - HSE INPUT FOR WPM FEED DELIVERABLES

All non-technical issues are identified, economics and technical feasibility are studied, and various alternatives considered covering both new Development Projects and major modifications. The 'front-end engineering and design (FEED)', requirements are finalized, the final alternatives selected and the hardware specified and costed for incorporation into the Development Project Design. It advances to a final planning stage "the project specification" where everything has been defined in sufficient detail to enable detailed design work and actual procurement to commence.

The following list of documents are essential inputs to the FEED study that ensures all HSE, CSR and Security aspects pertaining the Project are accounted for in the FEED Deliverables from WPM by mid July, 2005.

- RJ-ON-90/1 Environmental Impact Assessment for Hydrocarbon Development Project
- RJ-ON-90/1 Risk Assessment for Hydrocarbon Development Project
- RJ-ON-90/1 Land Use Study Pattern - plus satellite imagery (ensuring facilities are not sited within areas of natural / social or environmental importance, and designated protected areas)
- RJ-ON-90/1 Social Base Line Study
- RJ-ON-90/1 Project Inputs:-
  - Regulatory / Standards requirements register<sup>1</sup>
  - Field Development Project HAZID Recommendations<sup>2</sup>
  - Ground Water Exploitation Strategy<sup>3</sup>
- Security Strategy<sup>4</sup>
- Carbon Sequestration emissions cap / capture and re-injection requirements<sup>5</sup>
- Rajasthan Community Development Project Implementation Plan<sup>6</sup>
- Quality Plan<sup>7</sup>
- Operations Philosophy<sup>8</sup> Based upon CEIL Operations and Technical Integrity Management System (OPTIMS) CEI/QHSE/POL005
- Fire Fighting Philosophy<sup>9</sup>
- Contracting Strategy<sup>10</sup>

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<sup>1</sup> Project HSE Engineer with assistance from Project Coordinator QA/QC

<sup>2</sup> Conducted by WPM / Cairn - recommendations out for project comment

<sup>3</sup> Head Water Resource Project with some monitoring input from EIA

<sup>4</sup> Group Security Advisor / Head QHSE

<sup>5</sup> Deputy GM Environment and CSR to develop base case for consideration

<sup>6</sup> Head Group HSE, Risk and Assurance

<sup>7</sup> Manager Business Risk and Quality with assistance from Project Coordinator QA/AC

<sup>8</sup> Rajasthan Asset Manager

<sup>9</sup> Project HSE Engineer with assistance from HSE Manager

<sup>10</sup> Head of Development Project

## **7 DETAIL ENGINEERING & DESIGN PHASE**

### **7.1 HSE INPUTS DETAILED DESIGN ENGINEERING**

As part of the scope of work of the Detailed Engineering and Design, the successful contractors shall be responsible to engage a reputable safety / risk company (acceptable to Development Project Management) to prepare and deliver a 'Fit for Purpose' Operations COMAH study in accordance with UK HSE Hazardous Assessment Guidelines.

The basis for adopting COMAH Assessment principles for this project is outline in the Figure 8 - Development Project HSE Case - Use of COMAH Regulations.

The Hazard and Operability (HAZOP) and risk assessment will be an integrated approach of Safety, Health, Environment, Security, and Social Responsibility and undertaken concurrent with detailed engineering and design work thereby Safety (HSE) is continually addressed through all stages of the design and detail engineering in order to engineer out risk and reduce risk to ALARP. Safety Integrity Level (SIL) Classification shall be carried out for trips and alarm systems in the project.

The design and operations of the Safety (HSE) Case facility shall be in accordance with the quality assurance requirements of ISO 9001: 2000 and environment management principles of ISO 14001.

Refer to

### **7.2 SAFETY (HSE) COMAH STUDY DEVELOPMENT PROJECT OBJECTIVES**

The COMAH study will demonstrate that:

- a 'Fit for Purpose' integrated approach to managing important Health, Safety, Environment, Security and Social / Community issues;
- all potential major hazards and environmental aspects associated with the Development Project, and the risks to individuals and society, have been identified, understood and assessed; and that the significant impact are managed to ALARP;
- operations including transportation (land and air), drilling (SIMOPS), well services and seismic are carried out safely;
- adequacy of design for the complete Development Project facilities throughout the operation life cycles;
- an effective operational HSE MS is developed that continually identifies, assesses, eliminates and/or minimizes hazards/ impacts / threats / vulnerabilities thereby managing risk during operations to ALARP;
- facilities are being operated within their design limits by detailing permitted operating parameter;
- provisions for escape, temporary refuge, protection, evacuation and rescue are adequate during any incident;
- all emergency systems required for the protection of personnel, the environment, and local community will perform their function adequately in any accident;

The Hazard / Aspect Register seeks to demonstrate that each hazard or potentially hazardous event has been identified and analyzed and that there are effective measures in place to ensure control and mitigate potential impacts to the environment.

### **7.3 COMAH STUDY FACILITATOR- SCOPE OF WORK**

Within the Terms and Conditions of the Detailed Engineering and Design contract CEIL shall nominate an independent COMAH study Facilitator, with requisite risk / COMAH experience, to oversee and coordinate the Development Project of the Operations COMAH study on behalf of CEIL.

The role of the Facilitator is to facilitate the safety / risk company (sub contracted to Detailed Engineering and Design contractor) to compile COMAH Report, and review studies at key milestones that will ensure

- that the deliverables of the COMAH study meet Project HSE objectives.

- that the COMAH study is 'Fit for Purpose' reflecting onshore operations, and
- advising the Development Project team of threats which may impact on the COMAH study delivery schedule.

On appointment, the Facilitator will have a direct reporting function to the Development Project HSE Manager.

Refer to Figure 4 - COMAH Study Development Project Organisation with Discipline and Functional Lines of Reporting.

The majority of the facilitators time will be based in the Detailed Engineering and Design Contractors premises with requirements to attend Project and HSE Meetings in Chennai / Delhi, liaising directly with safety / Risk Company. There will be a requirement for travel to Chennai /Delhi and Onshore site, with ongoing work relating to ALARP workshops, facilitating operations participation and ownership, along with technical discussions with the Development Project Team and with Detailed Engineering and Design Contractor.

#### **7.4 COMAH STUDY GOALS**

The Project Safety COMAH study goals are fundamental to the study and managing risk to personnel. The focus of the safety goals is to design and operate inherently safe facilities so that risk to personnel the environment and local community is reduced to As Low As Reasonably Practicable (ALARP).

The Safety (HSE) Goals are as follows:-

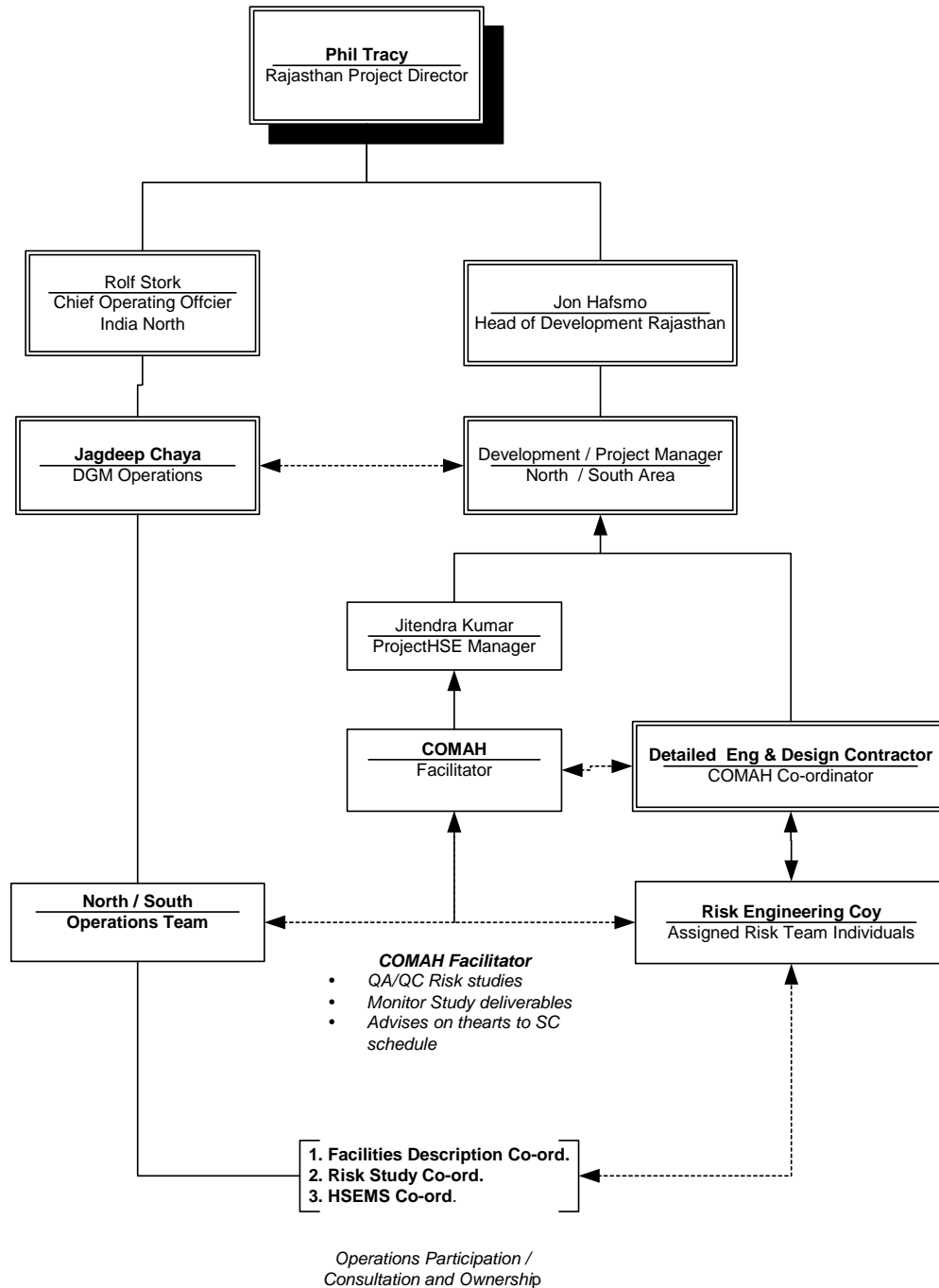
- |         |  |
|---------|--|
| Goal 1: | Eliminate or Minimise the HSE Hazards and Effects                                      |
| Goal 2: | Prevent Realisation of the HSE Hazard and Effects                                      |
| Goal 3: | Prevent Escalation of an Accident Event and Effects                                    |
| Goal 4: | Minimise Exposure of Personnel to Hazards and Effects                                  |
| Goal 5: | Ensure Personnel Can Reach A Place Of Safety In Any Credible Accident Event.           |
| Goal 6: | Reduce Resource Consumption and Minimise Energy Conversation and Environmental Loading |
| Goal 7: | Create a positive contribution to Local Communities                                    |

#### **7.5 COMAH STUDY SCOPE**

The Operation COMAH Study will be prepared cover the operation of following facilities and associated support activities:-

- Well pads
- Oil Processing area
- Water processing area
- Tank farm area
- Captive Power Plant (CPP)
- Below ground interconnecting pipelines
- Above ground Power transmission network
- Crude Export (road / train) from delivery point this option to be finalized.
- Air Strip / Helipad
- Logistics (Road / Air)
- Ware-houses.

# Rajasthan Project Development COMAH Study



\_\_\_\_\_ Formal Project (COMAH) Lines of Responsibility and Reporting  
 - - - - - COMAH development interface(s) between CEIL and Risk Engineering Coy.

**Figure 4 - COMAH Study Development Project Organisation with Discipline and Functional Lines of Reporting**

## **8 CONSTRUCTION PHASE**

### **8.1 CONTRACTOR MANAGEMENT**

This section describes the HSE policies and procedures for the systematic management approach to health and safety as it relates to the Rajasthan Development Project construction activities. The purpose is to establish a standard approach for contractor health and safety that will assist in identification of hazardous situations and ensure procedures of safe working methods that reduce or eliminate exposure to unwanted injury or events.

An important HSE & S aspect at this phase is the Contracting Strategy adopted e.g. If Project chooses go to EPIC contract, HSE Management will be the responsibility of the Contractor and therefore contractor management process requires ensuring that the Contractors HSE responsibilities and CEIL HSE & S expectation are clearly laid out at within the bidding stage.

The CEIL Contracts and Procurement Manual CEI/HSE/PRO/006 (along with Contract and Procurement HSE requirements document which is under finalization) and provides guidance to Contracts Manager who could use this as a basis for contract document preparation and to define the contractor's HSE requirements. The above Manual provides guidance on the different steps to follow in order to achieve a good level of contractor HSE performance, namely:

- Risk Assessment to identify Contractor HSE Risk
- Assignment of Contractor Management Responsibilities
- Pre-Qualification of Contractors
- Selection of Contractors on HSE ability
- Agreement of HSE Plan with Contractors
- Assurance of Contractor Competency
- Agreement of Communications and Reporting Requirements
- Monitoring HSE Performance
- Audit
- Purchasing

### **8.2 HSE REQUIREMENTS IN CONSTRUCTION PHASE**

The Contractors (and subcontractors) Safety Management Plan will be developed for each Project as per requirements under CEIL HSE Management System, whereby detailed Contractor HSE requirements are defined during the tendering and contract issuing phase. Contractor HSE acceptance will be given equal status to technical capability, quality and cost.

A key HSE deliverable from the successful contractor(s) will be the delivery of a Construction Safety Study (Safety Case) and Project HSE & S Management Plan which identifies all hazards, controls / mitigation measures relevant to the contractors' activities including but not limited to mobilization / demobilisation, construction, pre-commissioning and commissioning of the Development Project Facilities.

Following the list outlines the applicable Cairn Energy India rules that will ensure an excellent level of health and safety performance throughout the project.

Refer to Rajasthan Project regulatory compliance register document listing applicable regulations

### **8.3 MONITORING AND COMPLIANCE**

Following the list outlines the applicable Indian regulations that will apply throughout the Development Project.

#### **Environment**

- The Water (Prevention & Control of Pollution) Act 1974

- The Water (Prevention & Control of Pollution) Cess Act, 1977
- The Air (Prevention & Control of Pollution) Cess Act, 1977
- The Air (Prevention & Control of Pollution) Act, 1981
- Environment (Protection) Act, 1986.
- Environment (Protection) Rules, 1986.

#### **Safety**

- The Hazardous Wastes(Mgt. & Handling) Rules, 1989
- Manufacture, Storage & Import of Hazardous Chemicals Rules, 1989
- The Mines Act, 1952
- The Mines Rules, 1955
- The Oil Mines Regulations, 1984
- The Petroleum Act 1934
- The Petroleum Rules 1976
- Gas Cylinders Rules, 1981
- Static & Mobile Pressure Vessels (Unfired) Rules, 1981
- Motor Vehicles Act 1988
- Indian Electricity Act, 1956
- Explosives Acts and Rules

#### **Labour**

- The Contract Labour (Regulation and Abolition) Act, 1970
- The Contract Labour (Regulation and Abolition) Rules, 1971
- Workmen's Compensation Act, 1923
- Child Labour (Prohibition and Regulation) Act, 1986.
- Personal Injuries(Compensation Insurance) Act, 1963
- Payment of Bonus Act, 1965
- Employees' State Insurance Act, 1948
- Employees' Provident Funds and [Miscellaneous Provisions] Act, 1952
- The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979

#### **General**

- The Public Liability Insurance Act, 1991
- The Public Liability Insurance Rules, 1991



## **9 PRE-COMMISSIONING & COMMISSIONING PHASE**

### **9.1 HSE OBJECTIVES**

Systems and procedures are established, incorporating regulatory requirements, industry standards and good oilfield practice to ensure that risks and hazards are eliminated or reduced to as low as reasonably practicable during the commissioning and start up of the facilities.

### **9.2 HSE BRIDGING DOCUMENT**

The purpose of this Health, Safety, Environment and Security Management bridging document is to provide a specific framework for managing the risks and achieving the project HSES objectives during the Commissioning and Start Up activities.

HSE& S bridging document will apply to:

- the completion of construction, pre-commissioning and commissioning of the facilities and acceptance by the Development Project Team of those facilities from Contractor, the introduction of 1<sup>st</sup> Oil into the pipeline from satellite well pads, and 1st Oil into the Central Processing Plant , and
- the production ramp up to steady state production conditions, and handover of the facilities by the Development Project team to the Field production team, and the,
- interrelated Development Project activities such as drilling, seismic, production operations etc.

All project and operational personnel engaged in Commissioning and Start Up activities shall adhere to the requirements of the plan.

Site control and prevailing Influence should include the duly notified OMR requirements of Mines Manager and Installation Manager's duties and the HSE documents of which will prevail during the commissioning and start-up phase of Project.

Any deviation from the plan must be with prior approval of the Operations Field Manger, in consultant with the Project Manager and Contractor Project Manager and DGM Production Operations

### **9.3 DEVELOPMENT HSE CLOSE OUT REPORT**

A single report will be issued at the pre-commissioning and commissioning phase. This report collates into a single document the recommendations from HSE studies and PHSER reviews relating to Project i.e. HAZOP, HAZID, ALARP etc.

The demonstration a technical integrity In addition, the report shall review all unresolved outstanding construction / engineering issues including Non Conformance Register's, Technical Query Registers, Inspection Test Records, Certification, and Regulatory Approval, and Punch list items dealt with by Project Management.

### **9.4 START UP DOCUMENTATION REQUIREMENTS**

- HSE Plan descriptions (Commissioning to Operations)
- DGH / CO Explosives / Military Regulatory Consents
- Project HSE Close-Out Report
- Pre Start-Up Audit
- Verification of Mechanical completion
- Handover Procedure
- Commissioning Plan
- Commissioning Work packs
- Commissioning Procedures
- Inspection and test records (ITR)

- Inspection and test procedures
- Pipeline Emergency Procedures
- Contingency Plans / Fire Plans / Pipeline Emergency Procedures
- QA/QC Records
- Verify as-built documentation
- As-built drawings and specifications
- As-built HAZOP's
- SIL Classification
- COMAH Report

### **9.5 REGULATORY CONSENTS AND APPROVALS**

The regulatory requirements document “Regulatory Requirements Register” lists out the Consents and Approvals including MoEF, OISD, RSPCB, CCOE, Electrical Inspectorate, Director of Explosives, and Director - General Mines Safety. The responsibility to ensure timely consents and approvals throughout the Development Project phases will rest with Head-HSS.

## **10 START-UP PHASE**

### **10.1 COMAH REPORT CONCLUSION AND STATEMENT OF FITNESS**

Prior to the introduction of hydrocarbons into pipelines and facilities i.e. 'First Oil', the Operations COMAH Report Owner and his Management Team and independent 3<sup>rd</sup> party shall sign off the Report attesting that it adequately demonstrates that risk to personnel and nearby residents have been identified and are reduced to a level that is as low as reasonably practicable for the environment in which they are required to operate and live. In addition, it describes the H, S&E Management System, which demonstrates how the Health and Safety Policy is implemented.

### **10.2 PROJECT HSE REVIEW CLOSE OUT**

A requirement of the Terms of Reference of PHSER VI will requires that any actions arising from the previous PHSER's have been closed-out. In particular, it assures Development Project Management Team that all safety systems are in place before start-up can commence.

This series of reviews and audits will continue into the operating phase when the operations of facilities will be subject to regular technical safety audits. Amongst other aspects, these audits will confirm whether the operation is being conducted within the design intent, as defined in the COMAH Report.

### **10.3 PRODUCTION TEAM PREPAREDNESS**

Upon introduction of hydrocarbons into the facilities, the COMAH Report shall apply as the prevailing instrument of management control for safe operations for start up of production. Formal handover of the facilities by the Development Project Team to the Production Team will occur whereupon the Asset Manager becomes responsible for safe operation of Productions Facilities.

The Development Project Team shall develop and maintain an effective participation and consultative mechanisms and processes with the Asset and Production Teams during the life cycle of the Project. This is to promote active communication and involvement of all personnel in the management of safety, control of worksite hazards and awareness of the COMAH Report.

"Consultation and Participation" process by the Production Team includes but not limited to the following activities:

- Operations Philosophy for the Development Project
- Input to all Design Reviews to include HAZOP / Safety Studies and COMAH study Development
- Logistics Study /Analysis
- Pre Commissioning and Commissioning phase ( including an active role in M/C system breakdown leading to System/Sub System breakdowns and commissioning schedule )
- Joint Commissioning Team Development Project
- Witnessing and input into FAT and SAT Testing and system commissioning.
- Operations testing of all safety systems before Pre oil introduction.
- Quality assurance of Vendor Operations & Maintenance documentation during drafting and acceptance
- Occupational Health Risk Assessment.
- Development Project of 'SIMOPS' guide lines for the well pads.
- Assist close out of design and commissioning safety action items
- Participate in "ALARP" workshops.

Production Team Key Deliverable Prior to Start Up includes but not limited to the following:

- Preparation of operations HSES Plan.
- Establish Operational Readiness Plan including

- Recruitment of Production Team
- Emergency Preparedness Plan and appropriate training to be in place. e.g. Emergency Response Teams, Incident Control Centre, Sick Bay with Medivac procedures in place.
- Development of plans for Control of Incidents and Major Accident Hazards. Action Plan to include facility, pipeline, well pads and flow lines.
- Development of Operating Procedures and Instructions. (RSOPs')
- Development of Training Manuals
- Development of Safety Manuals ( PTW/Risk Management/PPE/ Control of Hazardous Chemical etc)
- Development of Security Manual and Procedures.
- Training of Operations personnel by Vendors and Suppliers.
- Training of Operating Personnel in Joint Commissioning Teams.
- Development and Implementation of Safety Critical and Skill based Competency Based Training Modules.
- Development and implementation of procedures leading to achievement of certification in ISO14001 soon after steady state production is established.

#### **10.4 DEVELOPMENT PROJECT CARRY OVER ACTIVITIES**

Scope of carry over work in the project which remains to be completed after start up (by the Contractor), but not essential for start up will be under the responsibility of the duly notified DGMS positions of Mines Manager and Field / Installation Manager, and the COMAH Report becomes the prevailing instrument of control throughout the commissioning and start-up phase of the Project.

#### **10.5 OPERATIONS REFERENCE DOCUMENTS**

- Contractors HSE Plan
- Project HSE Management Plan
- Rajasthan Annual QHSE Plan
- Facilities Operating Manual– Installation Start Up and Shut Down
- Commissioning & Start Up Procedure
- Operations Safety (HSE) Case COMAH study Documentation
- Operations O&M Documentation
- Oil Sales Contract
- Crude Export Operations Manual
- Oil Mines Regulations and Rajasthan Pollution Control Board requirements.
- MOEF Environmental Clearance Conditions

Refer to Figure 5 - COMAH Documentation Hierarchy Used to Demonstrate Start Up Readiness in Asset as an example.

#### **10.6 DEFINITIONS**

Facilities - Commissioning and start up phase is deemed to commence from time that the pipeline nitrogen pack is introduced into the facility.

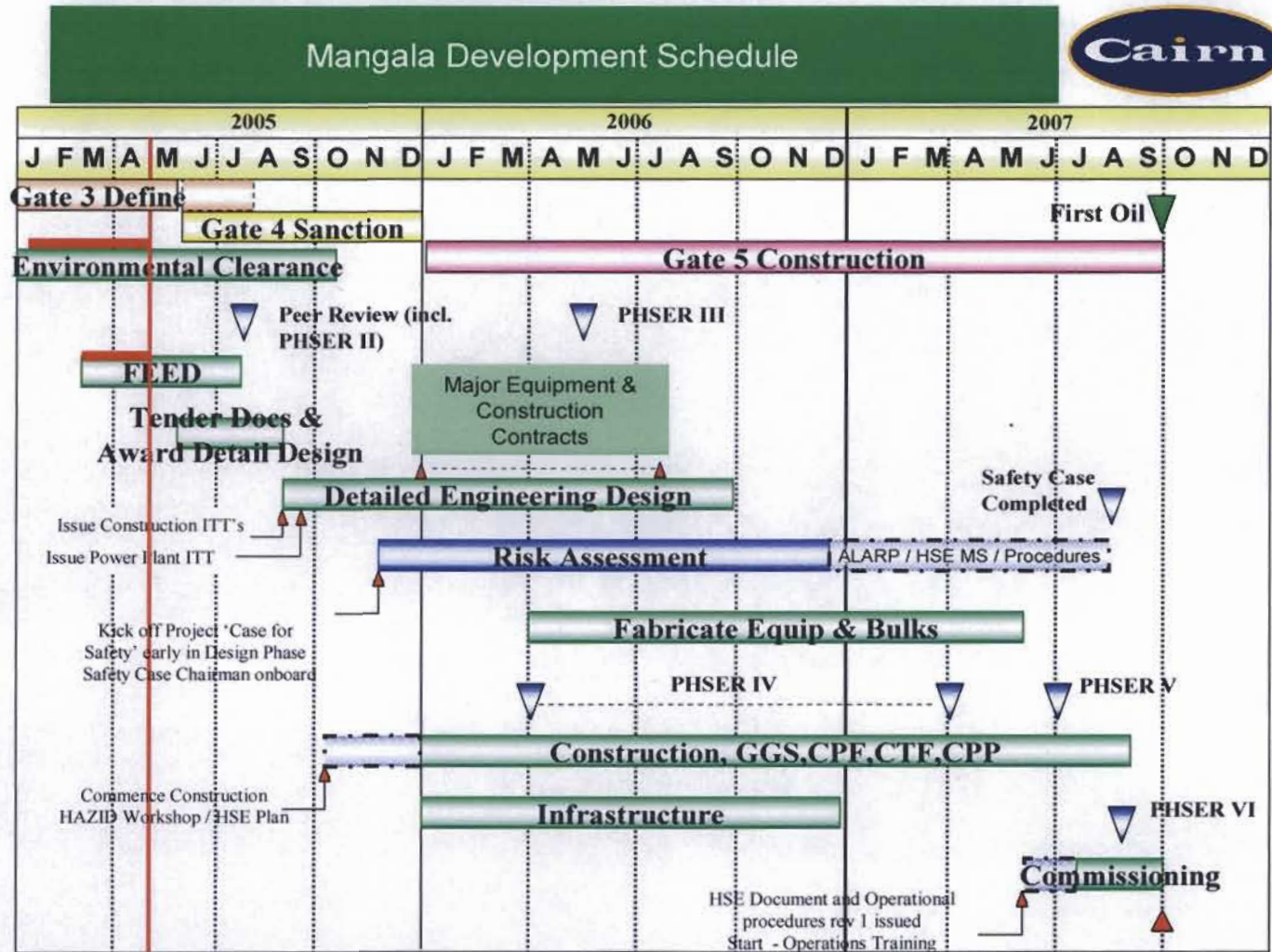
Commissioning will commence at each system completion and handover from the construction group (construction completion). This will be a phased activity leading up to eventual start up which will be determined by many factors and not simply the nitrogen pack.

Well Pads - Commissioning and start up phase is deemed to commence from the time the 1st tubing plug is pulled creating communication between the wellhead and the reservoir. Commissioning will be

essentially complete prior to pulling the tubing plug. Start up will commence after the plug is pulled. Normal production operations safe work practices and controls apply from time plugs are pulled..



Figure 6 - HSE & Operations Assurance Overlay – Mangala Development Project



## RJ-ON-90/1 Development Project HSE Management Plan

Figure 7 - Development Project Safety (HSE) Case COMAH Study Specification (scope outline guide only)

ITEM	STUDY	SCOPE	INPUTS	DELIVERABLES	EST. Time
<b>1. Major Hazards Assessment</b>					
	Field HAZID	Conduct a series of HAZID workshops involving members of the Rajasthan Operations team, members of the project design team, HSE personnel and management as appropriate.  Primary input into FEED & primary risk mitigation and actions requiring capture.	Field Development Project Plan, FEED HAZOP report, Layout drawings and operations, project and HSE personnel for workshop attendance.	HAZID Workshop Report	2 weeks June 1 <sup>st</sup>
	Safety Related Goals				
	Non- Flammable Hazards Analysis	Transport Risk Personnel / Crude /helicopters	HAZID report	NFHA Report	4 weeks
	Fire and Explosion Analysis	Flare radiation study / impact of lower stack heights		FER report	4 weeks
	Escape and Evacuation Analysis		HAZID, NFHA report, FEA report	EEA report	6 weeks
	Temporary Refuge Impairment Analysis	CCR blast and gas and smoke dispersion modeling, as applicable under. (Bomb Shelter)	HAZID report, FEA report, NFHA report, EEA report.	TRIA report	4 weeks
	Emergency Systems Survivability Analysis		HAZID report, FEA report, NFHA report, EEA report.	ESSA report	4 weeks
	Fire Protection Review				
	Safety Integrity Level (SIL) classification	Trips and alarm systems in the project design.	HAZOP, P&IDs, Design basis, Control Philosophy.	SIL classification report	4 weeks
	QRA (Risk Contour Mapping)	Carry out a QRA of the Major Accident events using risk contours. Risk contours are a graphical representation of the risks present on the plant (and actual risk to personnel). QRA shall document all the assumptions made within it and to reflect the	HAZID report, FEA report, NFHA report, EEA report, Industry databases for leak frequency and event likelihood, local weather	QRA report	12 weeks



### RJ-ON-90/1 Development Project HSE Management Plan

ITEM	STUDY	SCOPE	INPUTS	DELIVERABLES	EST. Time
		results of various consequence analyses. All calculations are to be annexed such that they may be traced through the document without reference to other documents.	data (wind directions) risk modeling tools		
	ALARP Studies	Carry out series of ALARP workshops involving the operations, HSE and management personnel. The workshops shall introduce all personnel to the results of the risk assessment and the QRA performed for the field facilities and shall allow personnel to propose risk reduction options. These options shall be reviewed for their applicability and suitability for implementation in light of the cost benefit analysis and those suitable shall be recommended.	Results from QRA report, and other consequence studies carried out, Cairn Energy risk acceptance criteria, and Cairn Energy ICAF acceptability criteria for CBA calculations	ALARP report.	6 weeks
	FSA Summary Report	Prepare a FSA Summary report for inclusion in the COMAH study. The Chapter on Potential for Major Accident is to provide the reader with sufficient information to be able to understand the risk assessment process and its basic results as also how this applies to the information contained within the Facility description and the HSE Management System description.	HAZID report, FEA report, NFHA report, EEA report, QRA report and ALARP report.	FSA Summary rev A for comment, Finalized FSA summary document incorporating consolidated comments	10 weeks
	Compile Northern Field COMAH study	Compile the COMAH study and submit for review and consolidate the comments for incorporation.	FFSA Summary Report, Facility Description, and HSE Management Description.	Completed Safety (HSE) Case COMAH study for the Field.	10 weeks
	Pipeline Risk Assessment	Carry out risk assessment of the Field interconnect pipeline routes upstream the delivery point, the assessment to look at the location specific threats at each location and the various threat barriers required to combat this. AS2885 standard.	Pipeline(s) route alignment drawings & Layout of local areas.	Pipeline Risk Assessment	4-8 weeks

**RJ-ON-90/1 Development Project HSE Management Plan**

ITEM	STUDY	SCOPE	INPUTS	DELIVERABLES	EST. Time
	Health Risk Assessment	Carry out HRA emphasis on all health aspects, which may impact on the health of employees, dependents and the local communities in relation to the project.	Material Safety Data Sheets, Material Handling Study, Task Analysis, Environmental data, operating philosophy, personnel exposure data. Plant and Control Room Layouts	Health Risk Report & Health Risk Register	4-8 weeks
	Security Risk Assessment	Identify physical security threat to asset and operations personnel.	FEED, layout drawings, Field Drawings, local Social –political environment, criminal history. Terrorist target	Security Risk Assessment Report, Some aspects interfaced or documented in COMAH study	4 weeks
	Environmental Aspect Register	Identify all environmental aspects and their associated impacts to the environment associated with new facilities operation. The process will be carried out through the whole life cycle, starting from acquisition and finishing with abandonment / disposal, as relevant.	RJ-ON-91/1 Development Project EIA, Environmental data, operating philosophy.	Aspect Register	6 weeks
	Hazard Register	Develop the hazard register for the field operation. The hazard register shall take the results of the HAZID workshop and demonstrate how all of the hazards identified are controlled adequately and, for the Major Accidents (multiple fatality) shall demonstrate where these are addressed and dealt within the COMAH study.	HAZID Report, results from FSA Studies, Facility description and HSE Management System Description	Hazard Register	2 weeks
	Support Operations Risk Assessment	Air / Land transportation Study Well Servicing Guidelines Well pad SIMOPS / Permitted Ops Matrices		Risk Register Guidelines & procedures	

**RJ-ON-90/1 Development Project HSE Management Plan**

ITEM	STUDY	SCOPE	INPUTS	DELIVERABLES	EST. Time
<b>2. Facilities Description (FD) - Construction Phase</b>					
	Facilities Description	Develop a FD for the Field facilities, to provide reader with sufficient knowledge of the facility to be able to understand the subsequent safety management systems and formal safety assessment.	Design drawings, Layouts, P&ID's, PFD's & Cause and Effects, and Operating Philosophies and Manuals	Facility Description Rev A, and finalized FD incorporating agreed and consolidated comments	4 weeks
<b>3. HSE Management System Description - Construction Phase</b>					
	HSE Management System Description	Rajasthan HSE MS	Formal Safety Assessment, CEIL HSE Management System, EMS, CSR Strategy, Security Strategy	HSE Management Systems Description	6 weeks

## RJ-ON-90/1 Development Project HSE Management Plan

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**Figure 8 - Development Project HSE Case - Use of CMAH Regulations.**

To: Paul Mayland, Mike Watts  
Cc: Malcolm Thoms, Phil Tracy, Hugh White, John McNeill, Jon Hafsmo, HP Bhalla, Rolf Stork, Umakanthan  
From: Steve Welton  
Date: 3rd August 2005  
Subject: Rajasthan Project Safety Case – Use of UK COMAH Regulations

In order to meet the commitments in the Group HSE Policy, the Group HSE Management System (HSEMS) requires that all new 'Major Hazard Facilities' produce a Safety Case which demonstrates that the HSE risks have been reduced to "As Low as Reasonably Practical" (ALARP) levels, i.e. the level at which further risk reduction would be physically impractical or involve costs which are disproportionate to the benefit gained. Further the HSEMS requires that this Safety Case should follow the intent of the UK Safety Case Regulations outside the UK. A Safety Case approach has been applied in CEIL on the Lakshmi/Gauri development.

While a Safety Case approach is appropriate for an offshore development where extra precautions are necessary due to the close proximity of people to hazardous equipment/fluids and the difficulty of escape, this is not the case for onshore fields. Hence we were already looking to clarify the appropriate Safety Case approach to the Rajasthan development. This was also picked up by the RISC Peer Review Team and one of their recommendations is that we should adopt the UK 'Control of Major Accidents Hazards' (COMAH) regulations for safety reporting on the Rajasthan development.

On further evaluation of COMAH, I concur with this recommendation and the purpose of this memorandum is to request your approval for the adoption of the UK COMAH regulations for the development of the Rajasthan Safety Report. The attached briefing note provides further explanation for this recommendation.

Please confirm your approval for this recommendation by counter signing this memorandum below.

.....  
Steve Welton  
Head of HSE,

.....  
Paul Mayland

.....  
Mike Watts

## ADOPTION OF UK COMAH REGULATIONS FOR RAJASTHAN DEVELOPMENT

### 1. Introduction

This briefing paper has been prepared in response to the recommendation in the Rajasthan Development Peer Group Review to adopt the 'Control of Major Accident Hazards' (COMAH) regulations. The specific recommendation was as follows:

“Consider using COMAH (Control of Major Accidents Hazards) principles for the basis of safety reporting rather than the intent of the Offshore Safety Case Regulations as identified both in Corporate Policy and the developing HSE Execution Plan”.

COMAH allows for a two tier reporting system where the requirements are dictated on the basis of threshold values of inventories of dangerous substances. Additionally:

- COMAH meets the requirements both of UK and Indian safety legislation;
- COMAH does not specify “Performance Standards” and is more specific to human risks;
- COMAH allows optimisation of QRA (Quantitative Risk Assessment);
- COMAH recognises applicable onshore codes and standards;
- COMAH still follows ALARP principles but recognises the geographical differences of onshore and offshore operations.

### 2. Cairn Group HSE Policy Requirements

It is a Cairn Group requirement that all new 'Major Hazard Facilities' produce a Safety Case compliant with local regulations and the intent of UK regulations to demonstrate that the required levels of HSE performance have been achieved.

The Safety Case should be a clear and concise document, providing a level of detail commensurate with the complexity and hazards of the operation being considered. It should contain sufficient information to make the necessary demonstrations of arrangements in place (and any plans for improvement) to a third party but need not give all the details of every procedure. The required contents should provide documentary evidence to demonstrate that:

The arrangements within the HSE Management System are adequate to ensure that the Group HSE Policy and statutory requirements will be complied with;

- All HSE hazards which could give rise to a major incident or the need for evacuation, escape or rescue have been systematically identified and their risks to persons (workforce and/or members of the public) and the environment evaluated;
- Measures have been or will be taken to prevent the hazards occurring or to reduce the risks to persons and the environment to as low as reasonably practicable (ALARP) levels;
- Appropriate performance standards have been established for the critical measures required to manage major hazards and associated risks and appropriate schemes are in place for verification of these;
- Adequate arrangements for the audit of the arrangements within the HSE Management System have been established.

The development of the Safety Case is not a one-off exercise, rather it should remain as a living document following the life cycle of the operation. The Safety Case should be reviewed periodically (typically annually) and whenever significant changes are proposed to an operation. These may be changes to the plant, process, organisational structure or management systems. The impact of these changes on the Safety Case should be assessed to identify whether the arrangements remain adequate.

For Asset Management it should provide a systematic framework for formal reviews of the safety management of the operation. For site managers and supervisors it provides them with a reference to check that the proper procedures and other safeguards are implemented and provide the basis for conducting audits, inspections etc. For new staff at all levels it enables a rapid familiarisation of the facilities and operation together with the associated hazards and arrangements for controlling them.

### **3. India Regulatory Requirements**

The legislative requirements covering the safety measures to be in place for the Rajasthan operations are prescribed in “The Manufacture, Storage and Import of Hazardous Chemicals 1989” and under the “Oil Mines Regulations” of 1984. Both these documents refer to “amounts and types of hazardous substances”.

### **4. Rajasthan Project Requirements**

In order to meet Cairn Group requirements for a Safety Case that is also compliant with UK legislation, two instruments exist:

- COMAH (Control of Major Accident Hazards) Regulations
- SI 1992/2885 Safety Case Regulations.

To date the assets within CEIL’s business have been of an offshore nature and CEIL have followed the “intent” of the UK Safety Case for Offshore Operations.

#### **4.1. COMAH vs. Safety Case**

COMAH or Seveso II as it is known in other parts of Europe is in layman’s terms the onshore equivalent to a UK Offshore Safety Case. In the UK onshore oil and gas facilities such as gathering terminals are subject to the COMAH regulations.

A COMAH safety report follows a two tier principal, based on the inventory of hazardous substances, as follows:

- Typically if the inventory was a dangerous substance as Natural Gas then if the inventory were above 50 tonnes but below 200 tonnes then a lower tier report would be generated.
- Should the inventory be above 200 tonnes then a higher tier report would be generated. Similarly other hazardous materials would be considered against the thresholds for the specific materials.

This application is mirrored but using different inventory levels in both of the Indian statutes earlier mentioned. When determining the thresholds for reporting using COMAH the more stringent of the UK and Indian thresholds should be adopted.

Key comparisons between the two regulations are given below.

- Prevent and mitigate the effects of major accident hazards. Major accident hazards are defined in the Offshore Safety Case regulations such as helicopter collision, structural damage, diving incidents. In COMAH the emphasis is in Major Accident Hazards involving dangerous substances but not excluding other hazards due to operations rather than involving hazardous substances.
- COMAH treats risks to the environment as seriously as those to people. The Offshore Safety Case regulations emphasise safety to people risks.
- COMAH requires assessment and mitigation of the impact to surrounding populations and coordination of emergency plans with surrounding populations.
- Both COMAH and Offshore Safety Case summarise all of the work carried out to demonstrate risks are ALARP.
- Both COMAH and Offshore Safety Case require the demonstration of effective HSE management systems.
- Quantified Risk Assessment (QRA) is not required by either COMAH or Offshore Safety Case but is common practice in both types of submissions in the UK .

- The Offshore Safety Case regulations provide for ‘performance standards’ relevant to the offshore environment e.g. safe havens.

In summary, the COMAH framework appears well suited to providing Safety Case reporting requirements for the Rajasthan project installations in line with the Group HSE Management System expectations.

#### **4.2. What is required in a COMAH Safety Report and how would CEIL produce one.**

COMAH is applied at two thresholds determined by the quantity of dangerous substances involved. These are the 'Lower Tier' and the 'Top Tier'.

Operators of sites equal to or above the higher thresholds ('Top Tier' sites) will be subject to stricter reporting requirements than those equal to or above the lower thresholds ('Lower Tier' sites). The thresholds vary depending on the substance involved. Regulating requirements will need to be checked to establish which category any facility belongs to.

Operators of all COMAH sites, including both 'Top' and 'Lower Tier' sites, are required to:

##### **1. Notification**

Take measures to prevent major accidents by undertaking a risk analysis to understand and predict:

- the circumstances that might lead to a major accident; and
- the potential consequences of such an accident.

##### **2. Define and implement all necessary measures to prevent major accidents.**

##### **3. Prepare a Major Accident Prevention Policy (MAPP) document that shows the adequacy of the safety management system. The MAPP should include details of the aims and principles used to control major accident hazards. The safety management system should include the organizational structure, responsibilities, practices, procedures, processes and resources for determining and implementing the MAPP.**

##### **4. Collect documented evidence that have been taken and appropriate precautions, including plans, systems and procedures, implemented.**

##### **5. Should a major accident occur, take all necessary steps to minimize its effects on people and the environment.**

In addition to the above, 'Top Tier' sites would:

##### **6. Document a Safety Report (the details needed in this report is given in both the Indian regulatory requirements referred to in section 3.)**

##### **7. Review it whenever there is a need to as a result of new facts or to take into account new technical knowledge; or whenever change is made to the safety management system.**

##### **8. Prepare an On-site Emergency Plan before the establishment starts to operate. The plan must cover the actions needed in the event of an accident. This should include arrangements to warn people on- and off-site and the emergency services, and details of how staff will be trained in their emergency duties.**

##### **9. Test, review and where necessary revise the On-site Emergency Plan at least every three years.**

#### **4.3. The Sections of a Safety Report following the intent of COMAH**

A COMAH Safety Report is split into 4 segments covering the following topics:-

- Information relating to Hazardous Substances - The Inventory
- Information Relating to The Installation – The Design and Location
- Information Relating to the Management System – Staffing/competency and other requirements

- Information Relating to the Potential of a Major accident – Source/ Consequence/ Exposure

Typically a COMAH Safety Report would be a compilation exercise of documentation that would be produced in our normal course of development and operation of a new facility. It will contain various details on the intent and assurance and demonstrate in each of the 4 sections, how safety is built into the facility and staff.

Some aspects of the security risk assessments may also interface with, and be documented in, the Safety Case.

Attachment 1 Typical Table of Contents for the 4 sections of a COMAH Safety Report for a Rajasthan Project Facility



ATTACHMENT 1

**COMAH Safety Report for Rajasthan North Facilities**  
**Part A Information Relating to Hazardous Substances**

**TABLE OF CONTENT**

1. Name of Hazardous Substance
  - a. Substance present on site
  - b. Hazardous Substance With Inventory exceeding the Threshold Quantity
  - c. Physical and Chemical Properties of Hazardous Substance
    - i. Methane
    - ii. Carbon Dioxide
    - iii. Ethane
    - iv. PPD
    - v. Demulsifier
    - vi. Flammable Oil
2. Analytical Method
  - a. Physical Detection
  - b. Gas Detection
  - c. Flame Detection
3. Hazards Posed by Hazardous Substance
  - a. Methane
    - i. Fire and Explosion Hazards
    - ii. Health Hazard
  - b. Carbon Dioxide
    - i. Fire and Explosion Hazards
    - ii. Health Hazards
  - c. Ethane
    - i. Fire and Explosion Hazards
    - ii. Heath Hazards
4. Purity of Hazardous Substance

**COMAH Safety Report for Rajasthan North Facilities**

**Part B Information Relating to the Installation**

**TABLE OF CONTENT**

1. Introduction
2. Description of Process Facilities
  - a. GGS
  - b. CPF
  - c. CTF
  - d. Well Pad
  - e. Pipelines
3. Description of Utilities
  - a. Power Generation Systems
  - b. Fuel Gas System
  - c. Sewage Treatment
  - d. Raw Water
  - e. Water Treatment
  - f. Instrument Air
  - g. Nitrogen
4. Description of Support Facilities
  - a. Accommodation
  - b. Control Building
  - c. Workshop
  - d. Medical Building
  - e. Security Building
5. Protection and Safety System
  - a. Fire and Gas Detection
  - b. ESD Systems
  - c. Fixed Fire Fighting Systems
  - d. Portable Fire Fighting Systems
  - e. Hazardous Area Classification
  - f. Fire Truck

**COMAH Safety Report for Rajasthan North Facilities  
Part C Information Relating to the Management System.**

**TABLE OF CONTENT**

1. Staffing Arrangement
  - a. Operating Philosophy
  - b. CEIL Management
  - c. Rajasthan Facilities Operation
  - d. Working Hours
  - e. Personnel Distribution
  - f. Security Arrangements
2. Roles and Responsibilities
  - a. HSE Committees
  - b. Emergency Contact List
  - c. Relief Assignment
  - d. Personnel Assignment
3. Arrangement for Safe Design, Installation and Operation
  - a. HSE Policy
  - b. HSE Management System
  - c. Design Specification and Standards
  - d. Risk Evaluation
  - e. Management of Change
  - f. Operating Practises
  - g. Operations Manuals and Procedures
  - h. MSDS
  - i. Permit To Work
  - j. General Safety
  - k. Contractor Safety
  - l. Maintenance and Inspection
4. HSE Communication
  - a. HSE Performance
  - b. HSE Implementation/Execution Plans
  - c. HSE Meetings
  - d. HSE Pamphlets and Awards
  - e. Internal Communication
  - f. External Communication

- 5. Personnel Protective Equipment
- 6. Emergency Response Management
  - a. Emergency Response Plan
  - b. Emergency Response Management
  - c. Medical Evacuation and Reception Procedures
- 7. Training and Competency
  - a. Induction Training
  - b. Training Need Analysis
  - c. Safety Critical Competency Based Training
  - d. Skill Competency Based Training.

**COMAH Safety Report for Rajasthan North Facilities**  
**Part D Information Relating to the Potential of Major Accident**

**TABLE OF CONTENTS**

1. Potential Sources of Major Accidents
  - a. Hazard Identification
  - b. External Events
  - c. Internal Events
  - d. Types of Major Accident
  - e. Hazardous Events
2. Arrangements for Safe Operation and Control Measures
3. Meteorological Conditions
  - a. Climate
  - b. Temperature
  - c. Relative Humidity
  - d. Rainfall
4. Consequence Modelling
  - a. Scenarios
  - b. Thermal Radiation
  - c. Vapour Cloud Explosion
  - d. BLEVE
  - e. Pool Fire
  - f. Jet Fire
  - g. Over Pressure
5. Number of People Exposed