

## Part-5: Development of industrial scoping contracts to operations (DISCO) for REMARIS Island

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### Abstract

The business development of industrial scoping contracts to operations (DISCO) is structured for REMARIS Island [6] operations. Firstly, the Advanced Work Packaging (AWP) methods are deployed, which is an effective, cost saving and a new strategy for project delivery that aims maximum productivity in oil and gas sector. AWP involves the planning and execution of activities from concept through commissioning and turnover into optimal work packages aligned across project phases and stakeholders. Secondly, the Capital Management System (CMS) is also adopted, the framework for managing and controlling activities and decisions related capital projects. The CMS covers the entire project development process from business planning, through project definition and execution to operations.

**Keywords:** DISCO; REMARIS; AWP; CMS

## 1. Introduction

### 1.1. Project Definitions

- Advanced Work Packaging (AWP): Advanced Work Packaging (AWP) is a recognized industry best practice for the effective planning and execution of capital projects. When applied across the lifecycle of a project the benefits of AWP are substantial. AWP involves the planning and execution of activities from Concept through Commissioning and Turnover into optimal work packages aligned across project phases and stakeholders.
- Design Basis Scoping Paper (DBSP): A document prepared by the IPT during the FEL 2 DBSP phase of the CMS (led by FPD) that details the complete scope of a given capital project in order to economically achieve the stated business objective(s) in an anticipated operating environment.

The FEL 2 DBSP Deliverables are as follows:

- Business Objective(s)
- Analysis and overview of the proposed location for the facility and any temporary construction facilities
- Interface with existing facilities
- Basis of Design
- Capital Management System (CMS): The CMS is the framework for managing and controlling activities and decisions related to Capital Projects. The CMS covers the entire project development process from business planning, through project definition and execution to operations. The CMS introduces five Capital Management System Efficiency Enablers (CMSEEs), namely:
  - Portfolio Execution Planning (PXP)

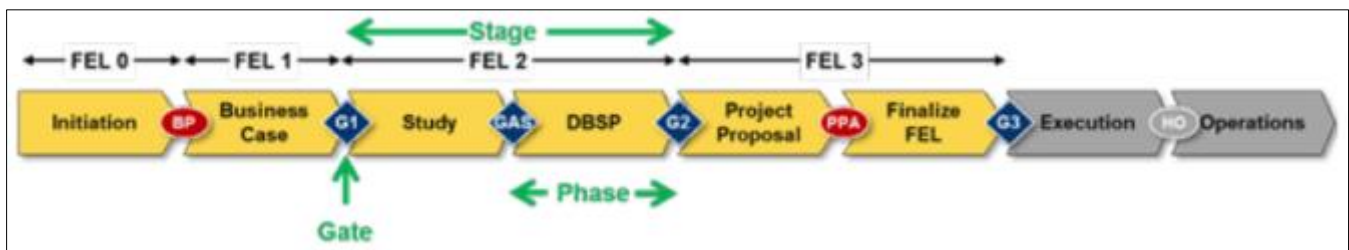
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- Front End Loading (FEL)
- Project Sponsor (PS) and Integrated Project Team (IPT)
- Value Assurance (VA)
- Target Setting (TS)

The CMS deliverables are as follows:

- Project Charter
- Business Case Assessment
- Site Selection Assessment
- Plot Plans
- Land Use Permit (LUP)
- Process Design
- Technology Selection Report
- Utility Power Supply Plan
- Environmental Impact Assessment
- Reliability, Availability and Maintainability (RAM) Study
- Building Risk Assessment (BRA)
- Value Improving Practices (VIPs)

The CMS is governed by a 'stage and gate' governance process.



**Figure 1** State and Gate governance process

- Front End Loading (FEL): A 'Stage and Gate' process to facilitate project planning definition and decision-making that defines:
  - The activities to be performed during each Stage/Phase.
  - The decisions to be made at each Gate.
- Project Sponsor (PS): An Executive or a member of Management, appointed by the proponent organization, who is accountable for meeting project objectives and steering the IPT towards maximizing investment value.
- Integrated Project Team (IPT): A team composed of appointed members from different organizations who work in an integrated manner and have clear roles and accountabilities toward project planning and execution.
- Value Assurance (VA) Process: The VA Process, one of the efficiency enablers of CMS, ensures the project to maintain or improve its overall created value within its defined objectives through all stages of its development. The VA Process is implemented and performed by an independent multidisciplinary team before each Gate and/or Key Decision(s) to examine all aspects of a project from a diverse, holistic and cross discipline perspective to: Identify gaps, risks and opportunities and provide necessary recommendation to the IPT and the Project Sponsor provides an independent assessment of project readiness to support the Decision Maker for the Gate decisions.

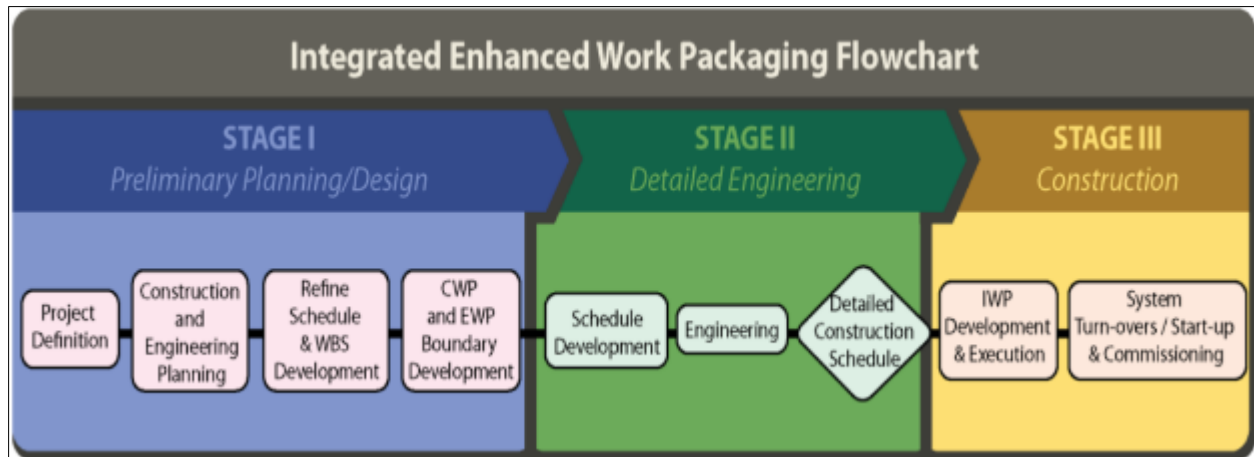
## 2. Research Methodology

### 2.1. Advanced Work Packaging (AWP)

Advanced Work Packaging (AWP) is a back-to-front project planning and execution process with the end in mind for defining, aligning, sequencing, and pacing the execution of EPC packages that allows facilities to be designed and built more predictably.

AWP provides the opportunity to:

- Align, sequence and pace engineering and procurement with construction to improve safety, productivity, schedule, and cost performance on all projects
- Minimize overall EPC duration to allow revenues from the owner's completed facilities to be generated as early as possible
- Achieve the targeted project results more predictability with no surprises
- Have a reduction in field rework and its resulting delays because work in each field installation package is completed "right the first time".
- Lower exposure to construction safety risks because of missing materials and the need to execute field work in multiple passes
- Improve turnover process and reduce turnover timelines
- Improve safety, improve productivity, less rework, significant reduction in RFIs and increased stakeholder alignment.



**Figure 2** Integrated Enhanced Work Packaging Flowchart (IEWP) [8,9]

Properly executed AWP can achieve the following at site:

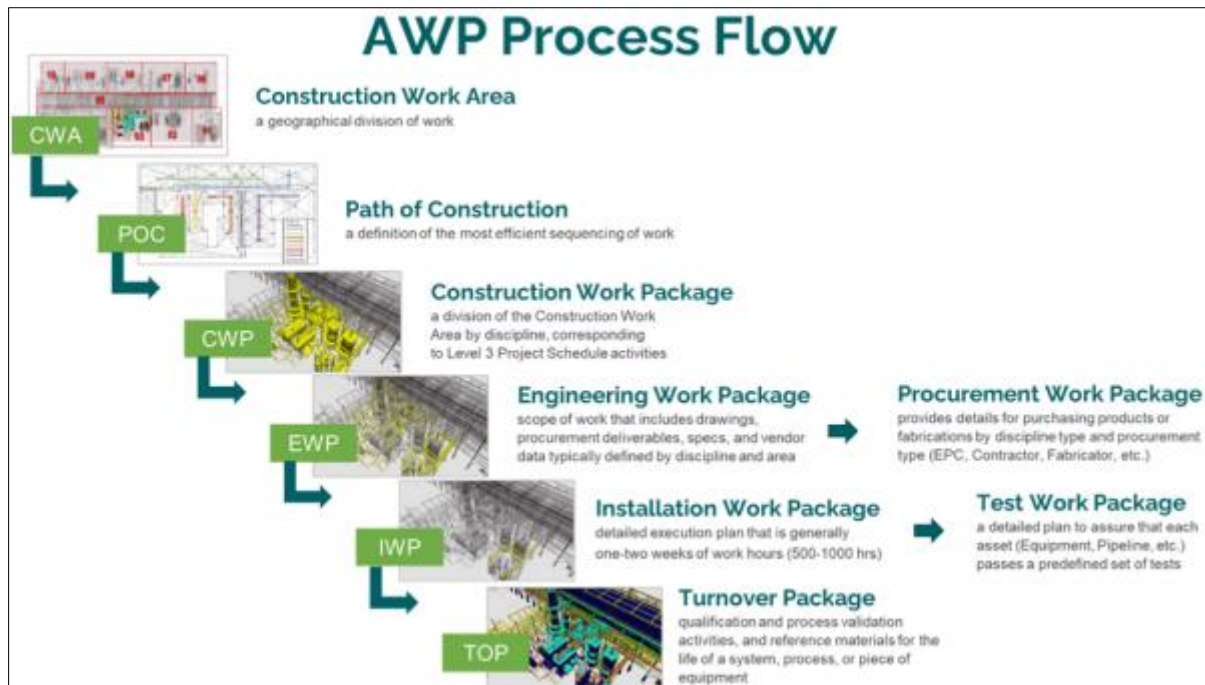
- Reduced punch-list items / quality issues and turnover delays
- Improved visibility/predictability of the schedule (included required-on-site dates)
- Improved material management

AWP methodology encompasses all aspects of the EPC life cycle:

- Construction Work Areas (CWA)
- Engineering Work Packages (EWP)
- Systems Work Packages (SWP)
- Procurement Work Packages (PWP)
- Construction Work Packages (CWP)
- Field Installation Work Packages (FIWP)
- Integrity and Functionality Test Packages (IFTP)

Work is typically defined and logically divided by Construction Work Areas (CWAs) involving multiple disciplines. Then, each Construction Work Package (CWP) focuses on a single discipline. Next, the work is broken into smaller Installation Work Packages (IWPs) that are assigned to work crews led by foremen. IWPs are typically single-discipline and focused on general construction execution, testing, turnover or a variety of other purposes. Engineering Work Packages (EWPs) and Systems Work Packages (SWPs) are also used in AWP.

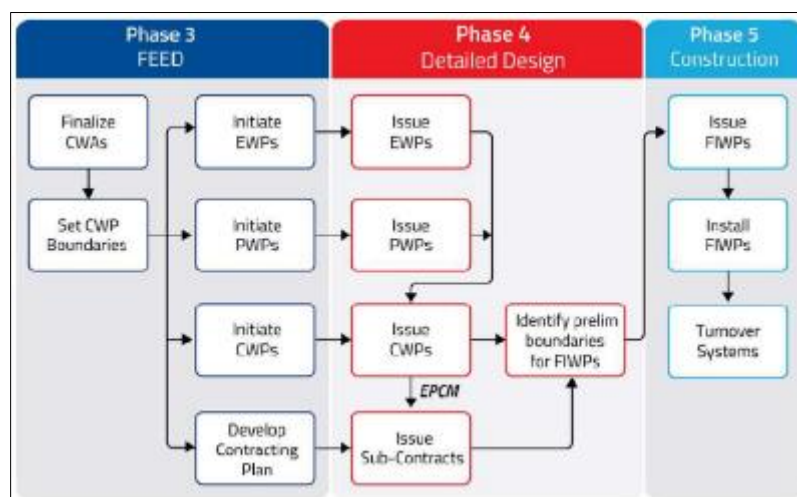
Numerous KPIs are used, including progress curves for packages, productivity at package level, work fronts available, and how long IWPs remain open. Also used are earned value, progress-to-schedule, skyline documents, and tool-time studies. Skyline documents cover how many IWPs are required, how many are produced, and how many are constraint-free, and how many are closed (field work scope physically completed).



**Figure 3** Advanced Work Packaging (AWP) Process Flow [8]

## 2.2. Path of Construction

Alignment is created through interactive planning sessions beginning with development of the Path of Construction. The Path of Construction (PoC) arranges the CWAs and CWPs into a sequence that drives project execution and high-level deliverable planning. The PoC is the basis for the Level III Schedule. Similar to the CWAs and CWPs, the PoC should be established as early as possible.



**Figure 4** Path of Construction (PoC) [10]

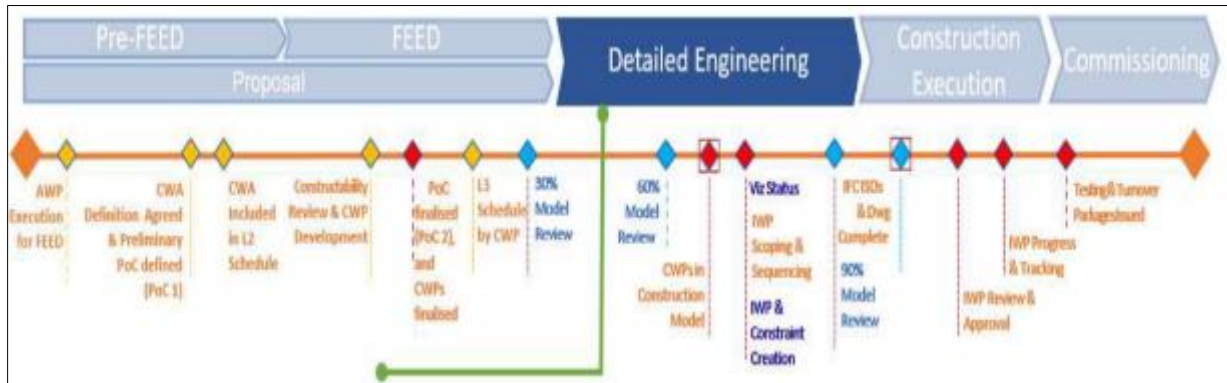
## 2.3. Discipline Involvement

The following activities shall be completed by the associated department.

### Construction

- Early involvement of Construction
- Determine construction work areas utilizing IAPs (Interactive Planning Sessions)
- Establish path of construction based on CWA and CWP construct utilizing IAPs

- Develop construction schedule
- Early start for constructability process and construction safety in design reviews



**Figure 5** Project Life Cycle [8]

### Engineering

- Align and optimize engineering with path of construction
- Engineering sequence based on construction sequence which incorporates operational interfaces and systems handover requirement
- Developing an EWP release plan based on PoC
- Utilize construction input to ensure that engineering supports effective construction execution
- Engineering model needs to have Data/Attributes that support construction planning packaging software

### Project Controls

- Baseline project, schedule, quantities, deliverables, job hours, and scope at EWP,
- PWP, and CWP work breakdown structure
- Early alignment about WBS and naming convention with EWPs/CWPs and commissioning systems
- Early identification of estimate requirements to support EWP development
- Manage the EWP release plan based on PoC
- Support the management of change

### Procurement

- Align and optimize procurement with PoC
- Develop the procurement plan based on PoC
- Identification of Long Lead Materials and Equipment to support Construction Execution
- Identification of data requirements from vendors to support construction
- Develop Material Management System based on AWP

### Contracts

- Contract language clearly defined and enforce AWP/WFP
- Deliverables that support PoC
- Status/progress reporting that is in line with AWP and PoC
- Early identification and early engagement of subcontractors

### Commissioning Operations

- Early involvement of Commissioning & Start Up (C&SU) team
- Systems completion definition to be prepared early
- Develop turnover schedule on an individual system basis
- Optimize turnover schedule on an individual system basis

### 3. Literature Reviews

According to Ali Musarat & Ng Wei Chong et al (2024), *conducted a methodology* for AWP implementation challenges in oil and gas sector in Malaysia. The questionnaire was made from field experts [6,7,14] and structured to begin with enquiries about the respondents personal and company data. The questionnaire consists of (1) Respondent's personal information, (2) awareness about AWP, (3) Impact of AWP on Project Deliverables, and (4) challenges related to AWP. A total of 150 questionnaires were distributed to expert stakeholders as well as academics, to gather a diverse range of perspectives from industry and research stakeholders. Out of the 150 responses received, 62 were returned, yielding a 42% response rate, which is *found adequate for further analysis*.

According to Edward Merrow et al (2017), Independent Project Analysis (IPA), four out of every five oil and gas megaprojects that IPA studies were characterized as failures [10]. A significant amount of project failures continues to occur, especially on larger projects such as megaprojects costing more than US\$ 1 billion, the frequency of project failures is alarming.

Jim Vicknari et al (2024), conducted research on fitness for purpose for AWP, between two similar scope construction projects were performed by the same contractor in the same geographic region. It results in 50% more efficient rate of installation and lower work rate of 6.5%, thus benefiting (a) Improved safety planning and awareness (b) Improved upfront planning (c) Improved overall project predictability (d) Reduced cost and better craft retention [16].

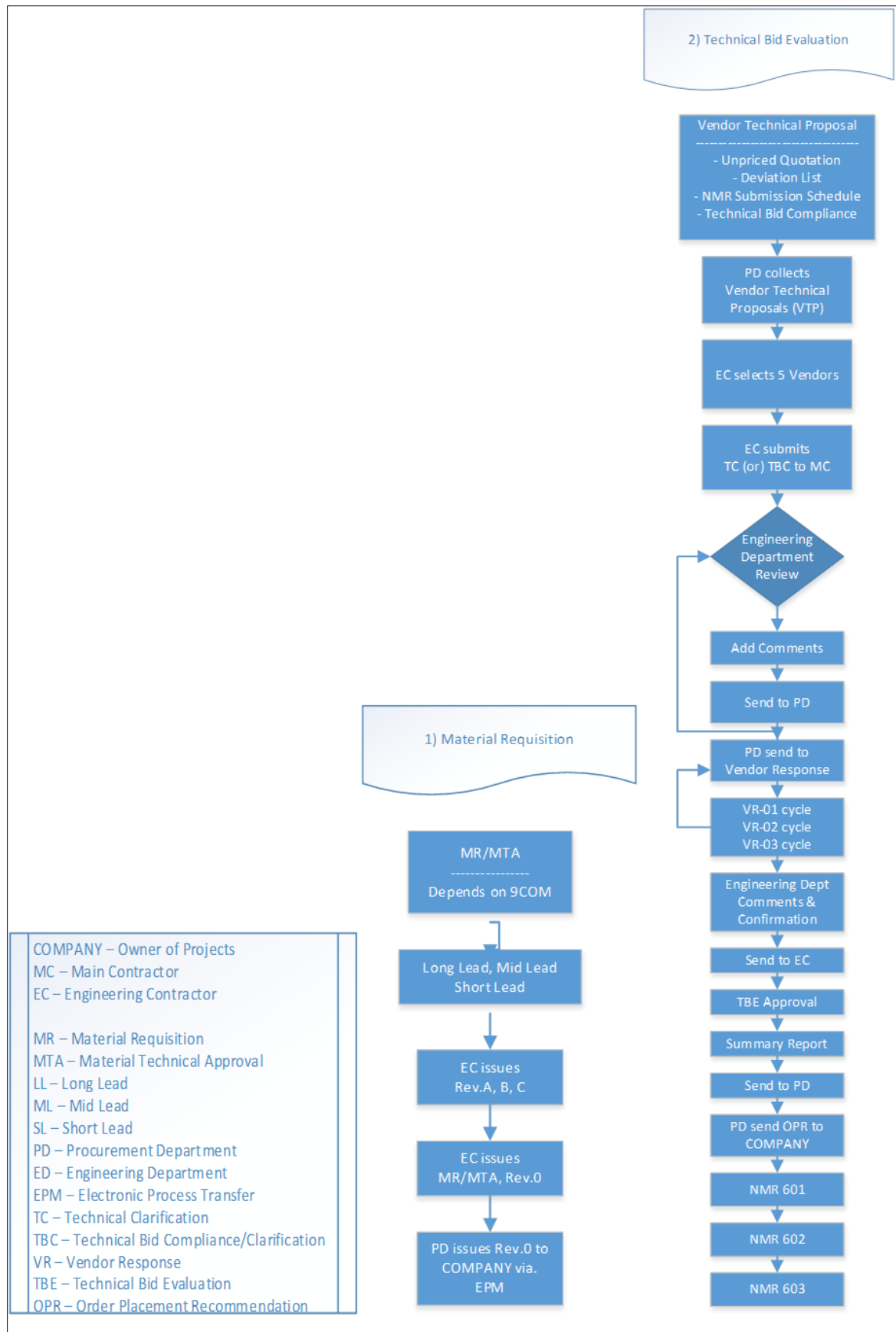
Sara Meeks et al (2011), conducted Case studies and expert interviews simultaneously with the development of the execution model. The model was validated by industry experts who noted its value and provided recommendations for future work [11,13,15]. The research team did not reinvent to project planning "wheel," but provided organization and a solid structure to practices that are benefiting projects in industry today. In general, the case studies and expert interviews excelled in construction planning and IWP development, but had difficulties with front-end involvement of construction and collaboration with engineering. The validation experts agreed that despite some weaknesses within the model, generally due to a lack of details, enhanced work packaging has high potential to add value to projects. The experts highlighted roadblocks for implementation, such as a current lack of buy-in, push-back from engineering, high turnover, and cultural differences, which must be addressed and overcome for work face planning to become a more viable tool for owners and contractors.

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### 4. Engineering Scoping

Engineering scoping is developed with the aim of starting with Vendor material requisitions (MR), Engineering documentation reviews, Drawings revisions and ending with Non material requisitions (NMR). The below flowcharts explain the MR, Technical bid evaluations and NMR's. The flowchart is discerned based on EPC experience for Process Plants & Pipelines.





**Figure 6** Engineering Scoping Evaluation.

## 5. Conclusion

This paper is focused on the implementation of key findings viz. AWP, CMS, CWA etc for Renewable Marine Island (REMARIS) for oil and gas operations. The surveys are conducted through literature reviews, industrial experiences and collaborative practices for the development of industrial scoping contracts to operations (DISCO). A conceptual framework is used between process, people, technology and contractual. Significant research is conducted to contrivance DISCO for REMARIS.

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