PROJECT SYSTEMS COMPLETION, COMMISSIONING AND START UP PRACTICES IN OIL AND GAS INDUSTRY

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KANJIS ENGINEERING SOLUTIONS

Speaker - U Soe Min Than's Profile

- Obtained Diploma in Manufacturing(Automation & Control) from Nanyang Polytechnic, Singapore in 2001.

- Over 25 years experience in Energy Industry especially in the areas of Project Management ~ Engineering, Erection, Integration, Systems Completion & Commissioning ~ Field Servicing ~ Aftermarket ~ Maintenance in Singapore and Southeast Asia Region


NO. (1) STEEL MILL (MYINGYAN)
DANIELI


ConocoPhillips


BW Offshore
BW PIONEER

“Begin with the END in Mind”

- **Systems completion, commissioning, and start-up (CSU)** is the organized process of taking an industrial facility from its construction phase to full, safe, and efficient commercial operation. It ensures all equipment and systems operate together as intended.

1. Mechanical Completion

This is the end of the physical construction phase. It verifies that everything has been built according to engineering designs, drawings, and specifications

Handover: At this stage, the construction contractor hands the facility over to the commissioning team.

2. Pre-Commissioning

Pre-commissioning involves static testing (testing while the equipment is turned off or unpowered) to verify that individual components work properly.

3. Commissioning
During commissioning, systems are dynamically tested (turned on and operated), often using water or air instead of actual process fluids or chemicals.
Key activities: Energizing electrical switchgear, verifying control and safety systems, and tuning automated loops.
Goal: To ensure each system can safely handle operational conditions before moving to live production.

4. Start-Up
Start-up is the actual introduction of the live process materials (e.g., oil, gas, or chemicals) into the plant.
Key activities: Bringing auxiliary subsystems online, carefully introducing raw materials, and steadily ramping up production to reach "nameplate" (full commercial) capacity.
Transition: This phase shifts full control and responsibility from the project and contractor teams to the permanent operations and maintenance staff.

5. Performance Testing

After the plant has been running stably, a "Banker's Test" or performance test is conducted.

Goal: To prove that the fully integrated facility satisfies all contractual requirements, operates safely, and meets production output and efficiency guarantees.

- **System Completion / Mechanical Completion:**
- **Commissioning :**
- **Start Up:**

9 Key Elements of Successful Plant Commissioning

1. Planning
2. Mechanical Completion
3. P&ID Checking
4. Pre-commissioning
5. Commissioning
6. Start Up
7. Initial Operation
8. Performance Testing
9. Post Commissioning

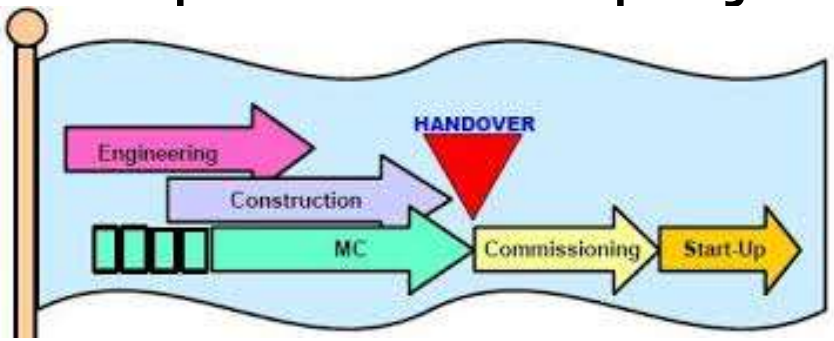
Planning

- Risk Assessment (eg. HAZOP- Hazard & Operability Analysis)
- System Definition (P&ID Master Set, Latest Revision)
- Completion Prioritization (Start-Up Sequence)
- Software (e.g. ICAPS™- Integrated Commissioning & Progress System)
- Documents (Time Schedule, Organizational Chart, Checklists, Operating Manual, Pre-Commissioning Procedures, Commissioning Procedures, Safety Procedures, Quality Control Procedures, Emergency Response Procedures, Status Progress Reporting, Test Records, Punch List Template)
- Manpower (Pre-commissioning, Commissioning, Operation, Maintenance, Contractors, Vendors, etc)
- Material (Blinds, Spool pieces, Hoses, Additional Gaskets, etc)
- Equipment
- Tools

System Completion / Mechanical Completion

Definition

- Checking and testing of equipment and construction to confirm that the installation is in accordance with drawings and specifications and ready for pre-commissioning **OR** commissioning in a safe manner and in compliance with project requirements.

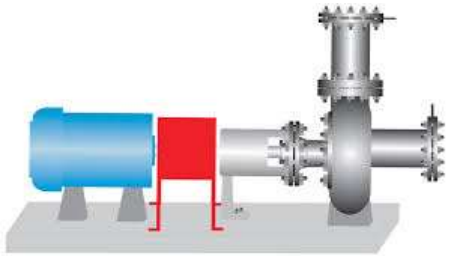


Typical Tasks

1. Mechanical
2. Piping
3. Structural
4. Electrical
5. Instrumentation

Typical Tasks (Mechanical)

- Visual inspection for complete and correct installation
- Verification of name plate details at tanks, vessels , rotating equipment and other machines
- Internal inspection of tanks and vessels
- Hydrostatic test of vessels and tanks
- Vendor representatives for large and/or complicated equipment
- Dimension control
- Bolt tensioning
- Preservation



Typical Tasks (Piping)

- NDT done (nondestructive testing)
- Pipe supports completed
- Removal of all items subject to damage during flushing, cleaning and pressure testing
- Blowing
- Flushing
- Chemical cleaning
- Drying
- Preservation
- Reinstatement
- Bolt tensioning
- (Insulation)
- (Flow coding)

Typical Tasks (Structural)

- Inspection of all supporting structure

Typical Tasks (Electrical)

- Inspection (Cable trays, cable tray supports, cable tray fills, cables, bend radius, Wiring, Termination, Grounding)
- Megger Testing

Typical Tasks (Instrumentation)

- Inspection (Cable trays, cable tray supports, cable tray fills, cables, bend radius, Wiring, Termination, Grounding)
- Validation of instruments
- Validation of valves
- Loop checks
- Flushing of tubing
- Tightness test of tubing

P&ID Checking

- System checks/Plant Inspection/Punching
- Who checks – Commissioning Team
- What to check – Piping, Equipment, Instrumentation, Point of view (Safety, Construction, Operation, Maintenance)
- When to check - After handing over systems from construction to commissioning team
- Which P&ID (Latest Revision, Marked with system boundaries)
- Which Other Documents (Plans,Drawings,Check lists,Specification,Standards,Hook ups,Vendor Documents)
- Punch List

Pre-Commissioning

- The term Pre-Commissioning is used for activities after construction completion, such as cleaning, dry-runs and checks within the systems in order to prepare these items/systems for the next step - commissioning.
- Pre-Commissioning Activities (Examples- Flushing, blowing and drying activities, Chemical cleaning, Final inspection and closing of vessels and tanks, Final reinstatement of systems or sub-systems, Air tightness "Leak" testing of systems, Lubricants application, Vendor and factory acceptance testing, Instrument, electrical and motor loop testing)
- Pre-Commissioning Sequence
- Pre-Commissioning Procedures
- Pre-Commissioning Checklists
- Pre-Commissioning Checklists
- RFC (Ready for Commissioning)

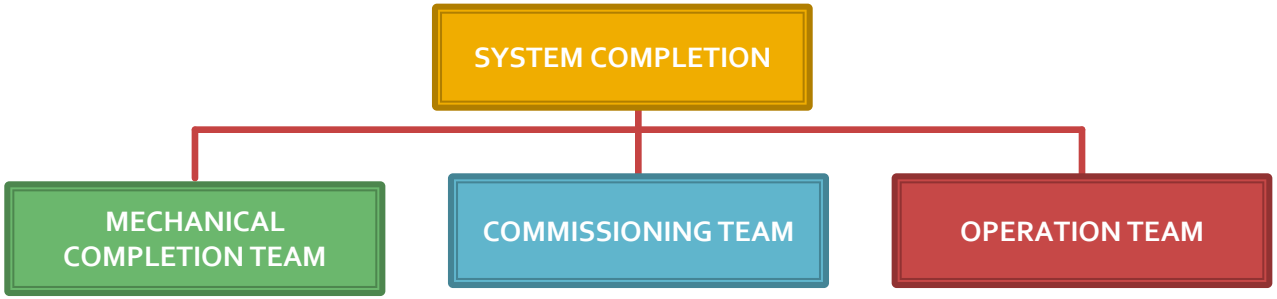
CONTENT

OBJECTIVES AND GOALS

- ✓ To be aware of modern-day practices in Energy Industry
- ✓ Team alignment between all stakeholders.
- ✓ Alignment on Systems Completion planning and execution methodology
- ✓ Focus on execution planning during the engineering and construction phases
- ✓ Understanding of required deliverables from Engineering and Construction to enable MC certificates to be issued.
- ✓ Focus on alignment of Systems Completion Process and Procedures.
- ✓ Acknowledgement of challenges and need for on-going contingency planning.
- ✓ Achieving COMPANY/CLIENT System Completion Requirements

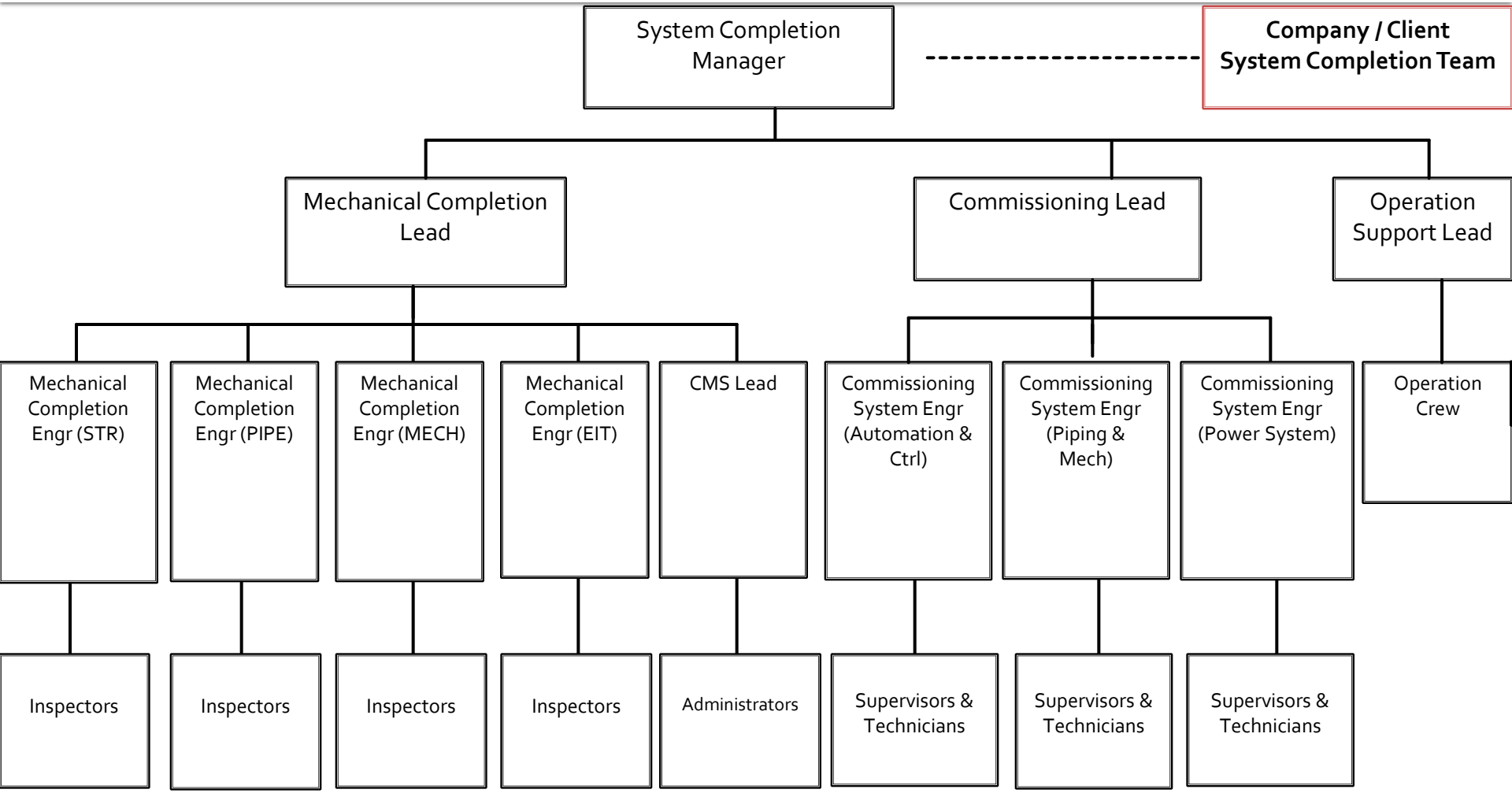
INTRODUCTION

- Integration of Resources from Various group



- Ensuring / Validating Critical System Design
- Form the basis for successful hand over of FSO till Final Acceptance

ORGANIZATION



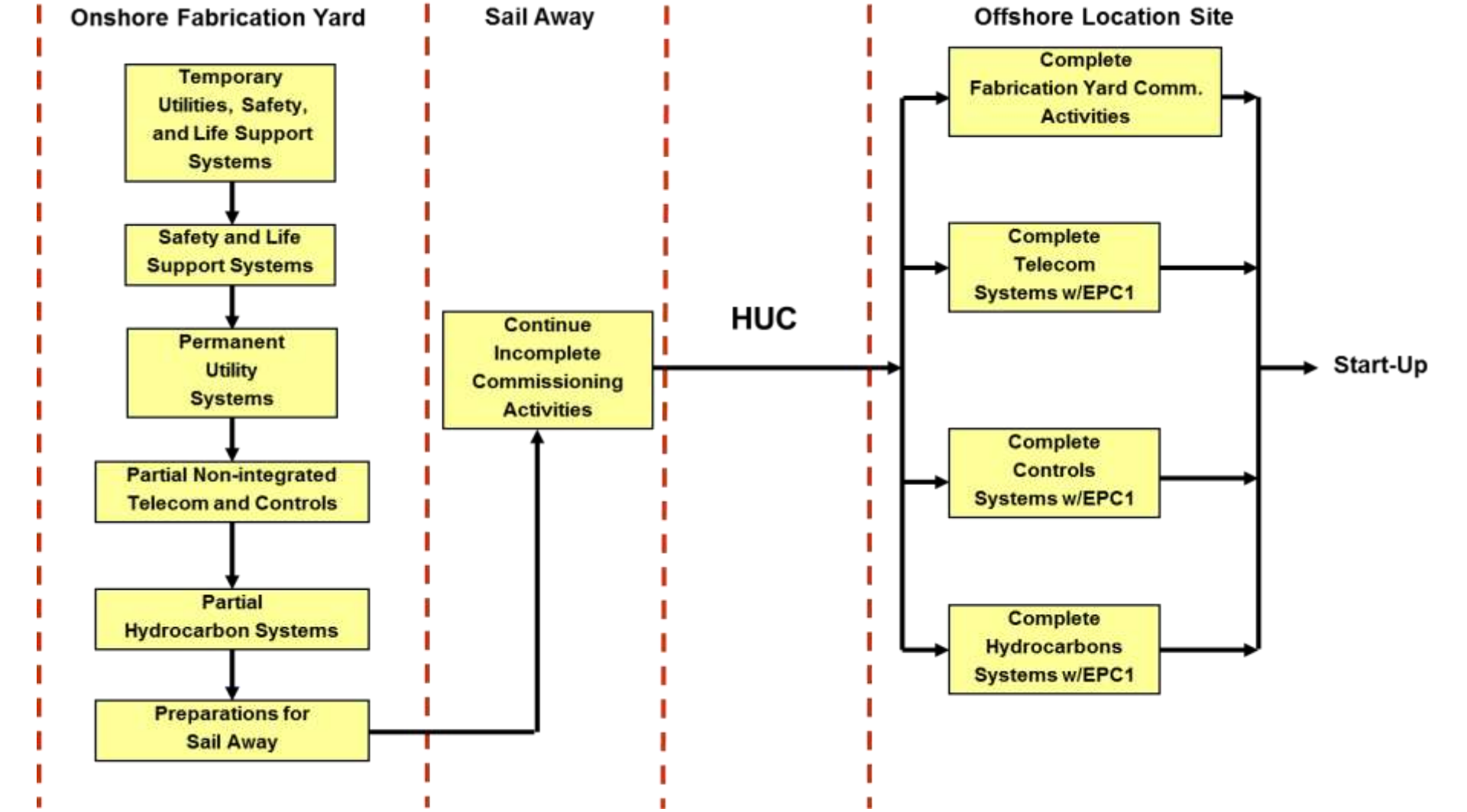
SYSTEM LISTING

LIST OF SYSTEM FOR SYSTEM COMPLETION

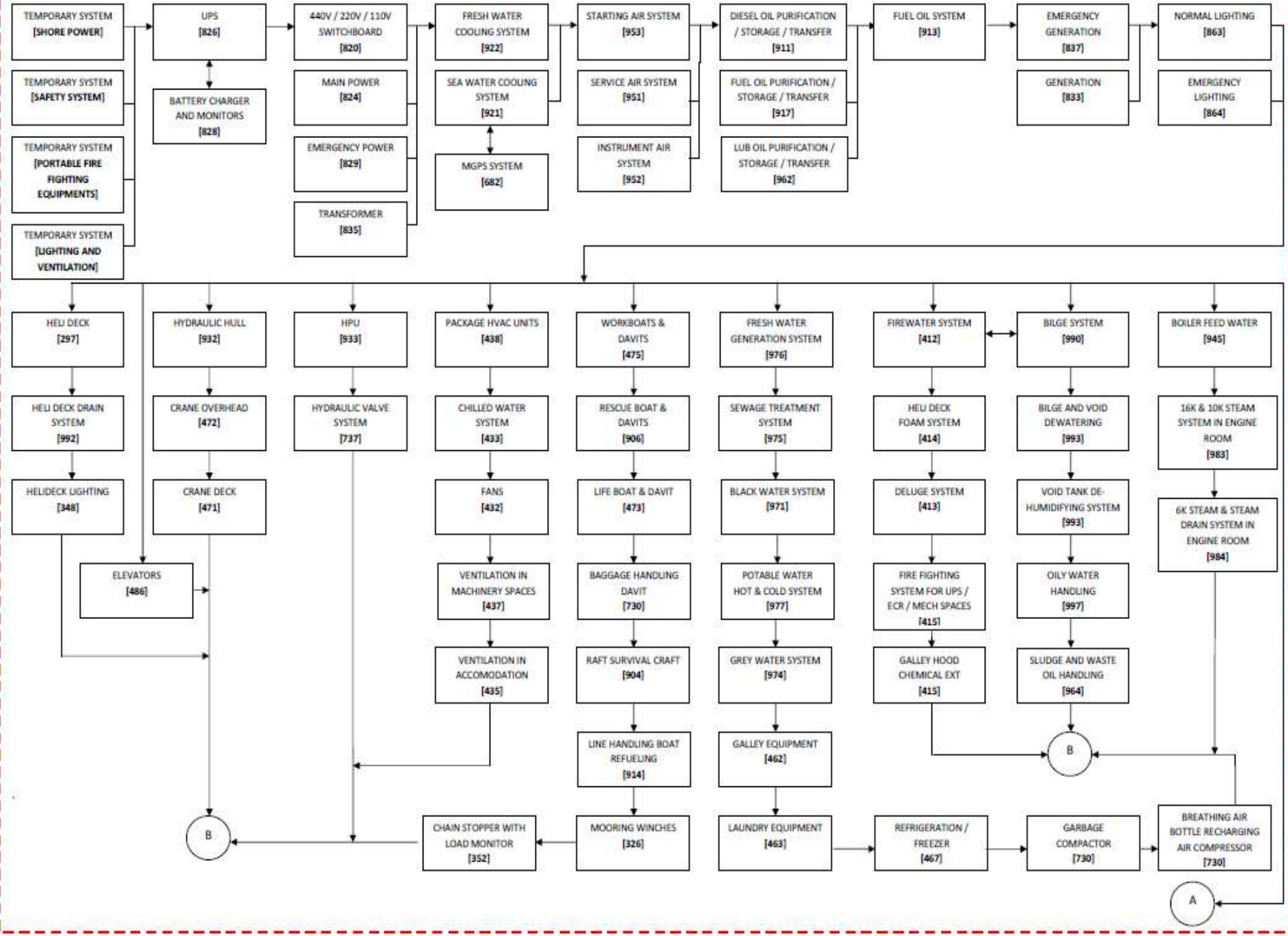
- Total System Based on Preliminary System completion Plan

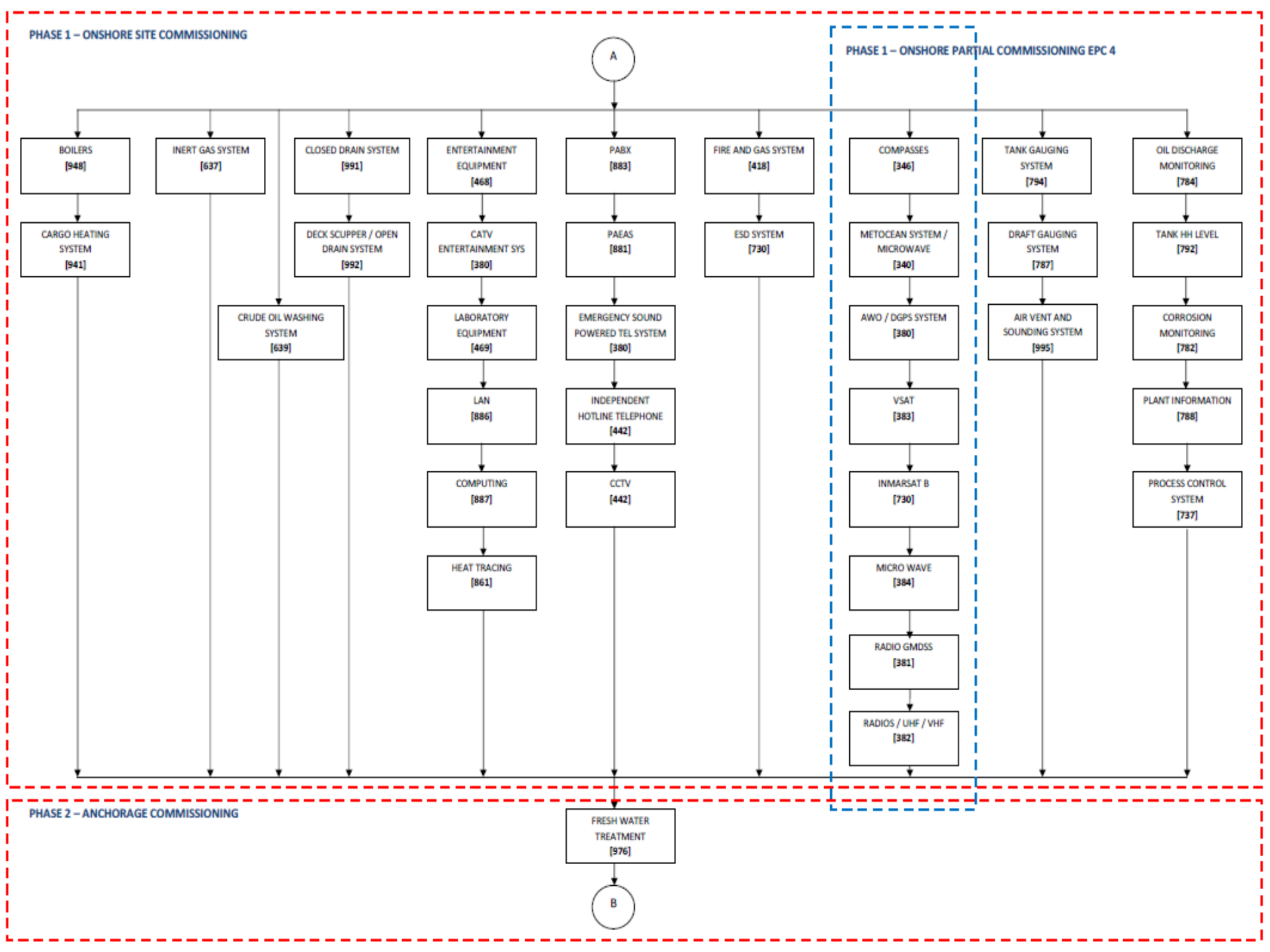
CATEGORY	SYSTEMS INVOLVED	CATEGORY DEFINATION
1	134 SYSTEMS	PLANNED TO BE FULLY COMMISSIONED PRIOR TO INTRODUCTION OF PROCESS FLUID
2	36 SYSTEMS	PLANNED TO BE MECHANICALLY COMPLETED / TESTED AND COMMISSIONED TO THE GREATEST EXTENT POSSIBLE PRIOR INTRODUCTION OF PROCESS FLUID
3	1 SYSTEM	SYSTEM THAT MAIN MAINLY VENDOR PURCHASED EQUIPMENT REQUIRE LITTLE OR NO COMMISSIOINING

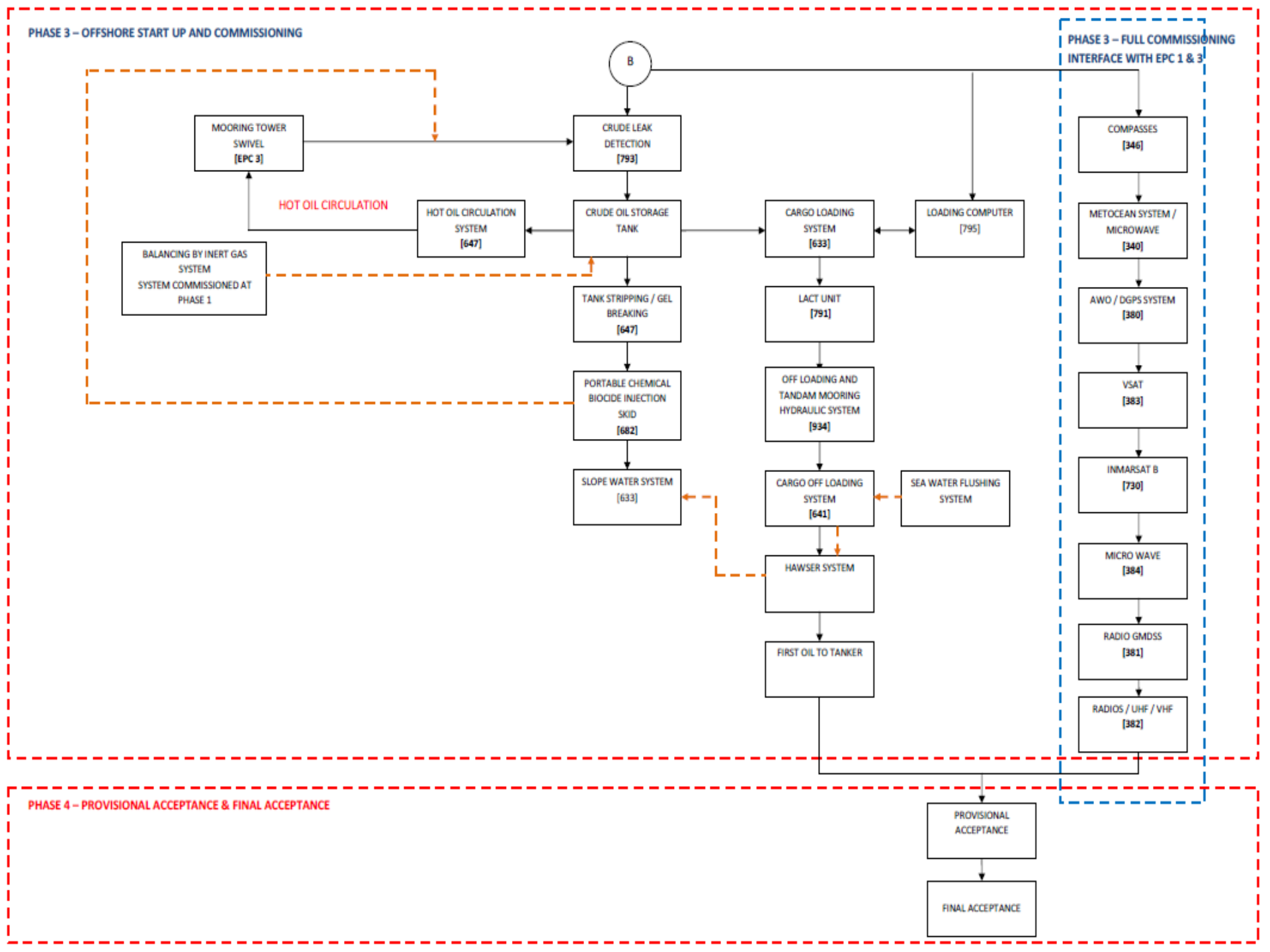
COMMISSIONING AND START UP SEQUENCE [GENERAL OVERVIEW]



PHASE 1 – ONSHORE SITE COMMISSIONING

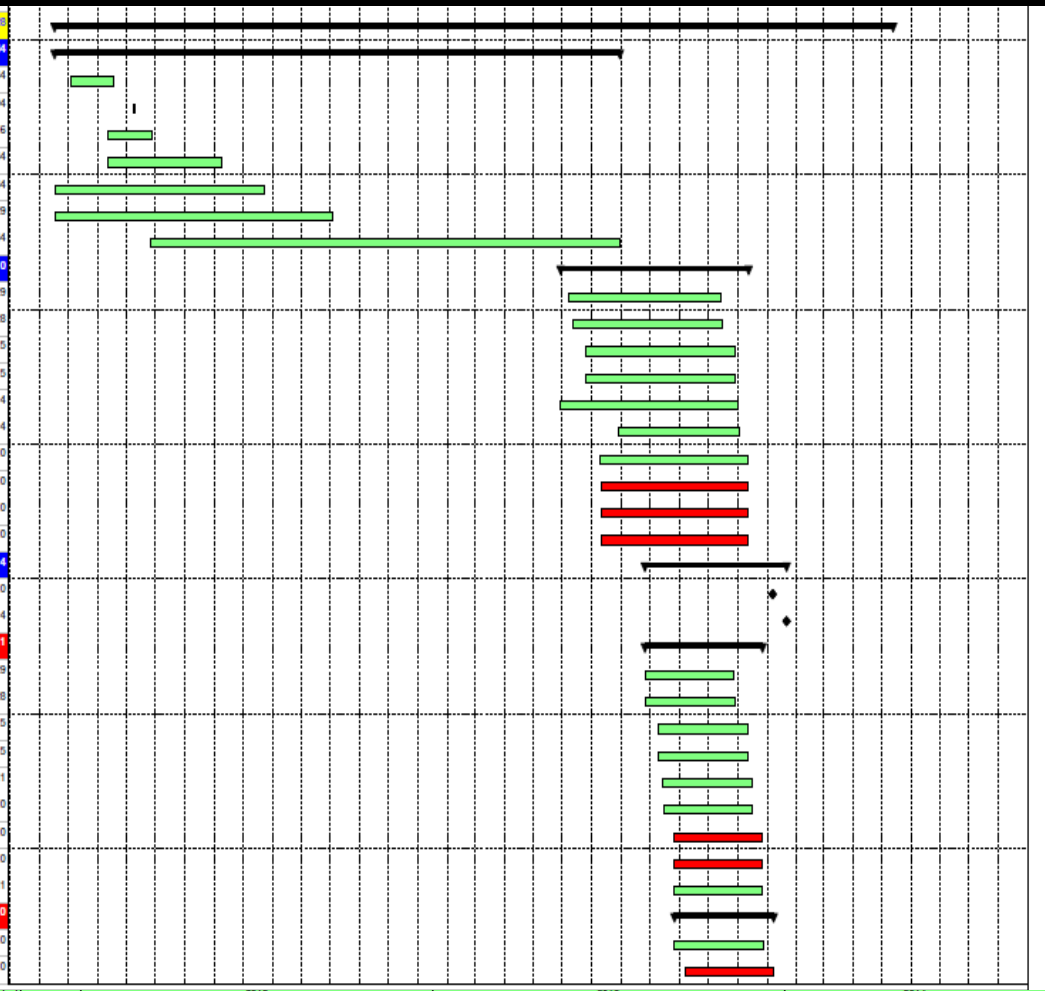



PHASE 1 – ONSHORE SITE COMMISSIONING
PHASE 1 – ONSHORE PARTIAL COMMISSIONING EPC 4
A
BOILERS [948]
CARGO HEATING SYSTEM [941]
INERT GAS SYSTEM [637]
CRUDE OIL WASHING SYSTEM [639]
CLOSED DRAIN SYSTEM [991]
DECK SCUPPER / OPEN DRAIN SYSTEM [992]
ENTERTAINMENT EQUIPMENT [468]
CATV ENTERTAINMENT SYS [380]
LABORATORY EQUIPMENT [469]
LAN [886]
COMPUTING [887]
HEAT TRACING [861]
PABX [883]
PAEAS [881]
EMERGENCY SOUND POWERED TEL SYSTEM [380]
INDEPENDENT HOTLINE TELEPHONE [442]
CCTV [442]
FIRE AND GAS SYSTEM [418]
ESD SYSTEM [730]
COMPASSES [346]
METOCEAN SYSTEM / MICROWAVE [340]
AWO / DGPS SYSTEM [380]
VSAT [383]
INMARSAT B [730]
MICRO WAVE [384]
RADIO GMDSS [381]
RADIOS / UHF / VHF [382]
TANK GAUGING SYSTEM [794]
DRAFT GAUGING SYSTEM [787]
AIR VENT AND SOUNDING SYSTEM [995]
OIL DISCHARGE MONITORING [784]
TANK HH LEVEL [792]
CORROSION MONITORING [782]
PLANT INFORMATION [788]
PROCESS CONTROL SYSTEM [737]
PHASE 2 – ANCHORAGE COMMISSIONING
FRESH WATER TREATMENT [976]
B

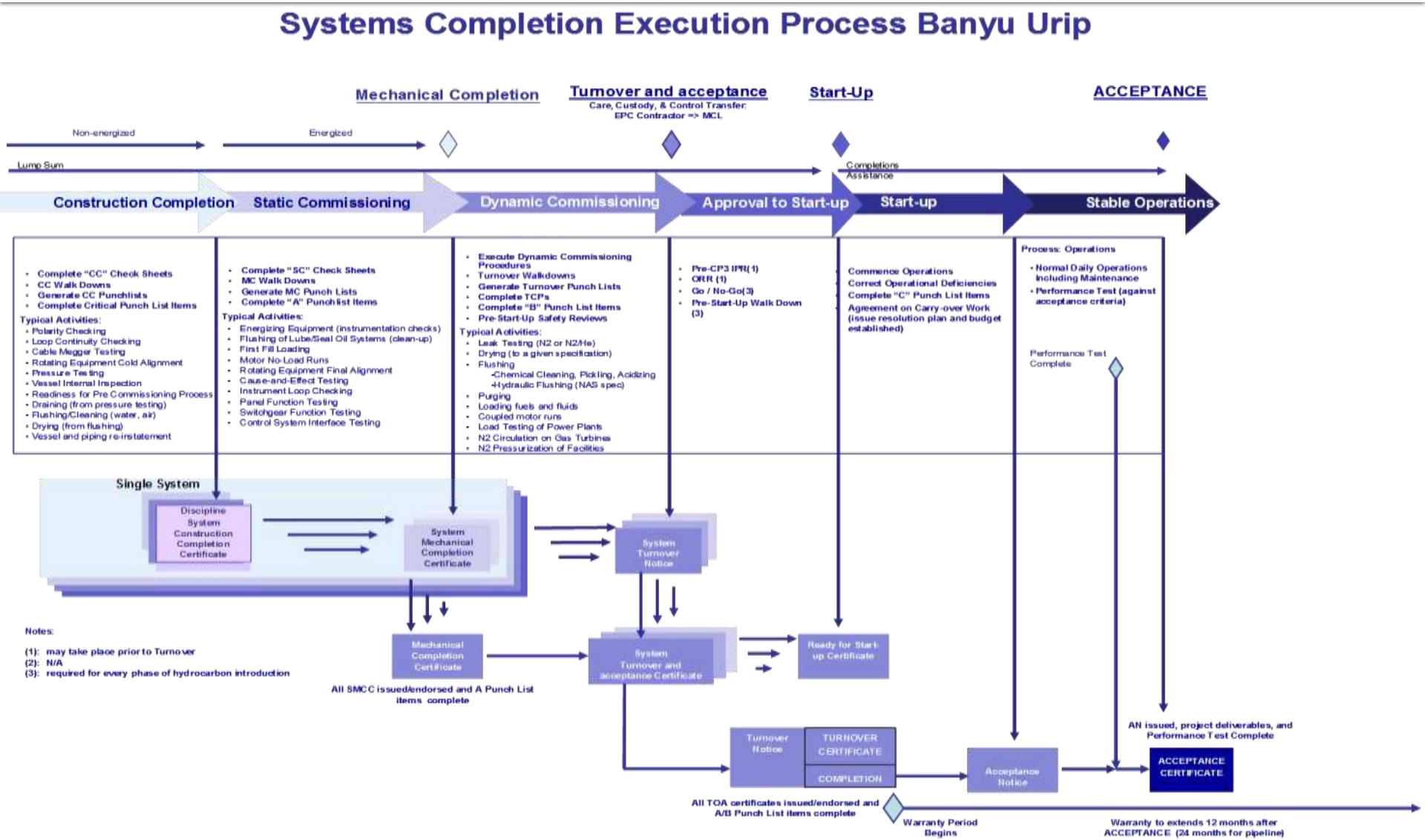

PHASE 3 – OFFSHORE START UP AND COMMISSIONING
PHASE 3 – FULL COMMISSIONING
INTERFACE WITH EPC 1 & 3
B
MOORING TOWER SWIVEL [EPC 3]
CRUDE LEAK DETECTION [793]
COMPASSES [346]
HOT OIL CIRCULATION
HOT OIL CIRCULATION SYSTEM [647]
CRUDE OIL STORAGE TANK
CARGO LOADING SYSTEM [633]
LOADING COMPUTER [795]
METOCEAN SYSTEM / MICROWAVE [340]
BALANCING BY INERT GAS SYSTEM
SYSTEM COMMISSIONED AT PHASE 1
TANK STRIPPING / GEL BREAKING [647]
LACT UNIT [791]
AWO / DGPS SYSTEM [380]
PORTABLE CHEMICAL BIOCIDE INJECTION SKID [682]
OFF LOADING AND TANDAM MOORING HYDRAULIC SYSTEM [934]
VSAT [383]
SLOPE WATER SYSTEM [633]
CARGO OFF LOADING SYSTEM [641]
SEA WATER FLUSHING SYSTEM
INMARSAT B [730]
HAWSER SYSTEM
MICRO WAVE [384]
FIRST OIL TO TANKER
RADIO GMDSS [381]
RADIOS / UHF / VHF [382]
PHASE 4 – PROVISIONAL ACCEPTANCE & FINAL ACCEPTANCE
PROVISIONAL ACCEPTANCE
FINAL ACCEPTANCE

SYSTEM COMPLETION SCHEDULE

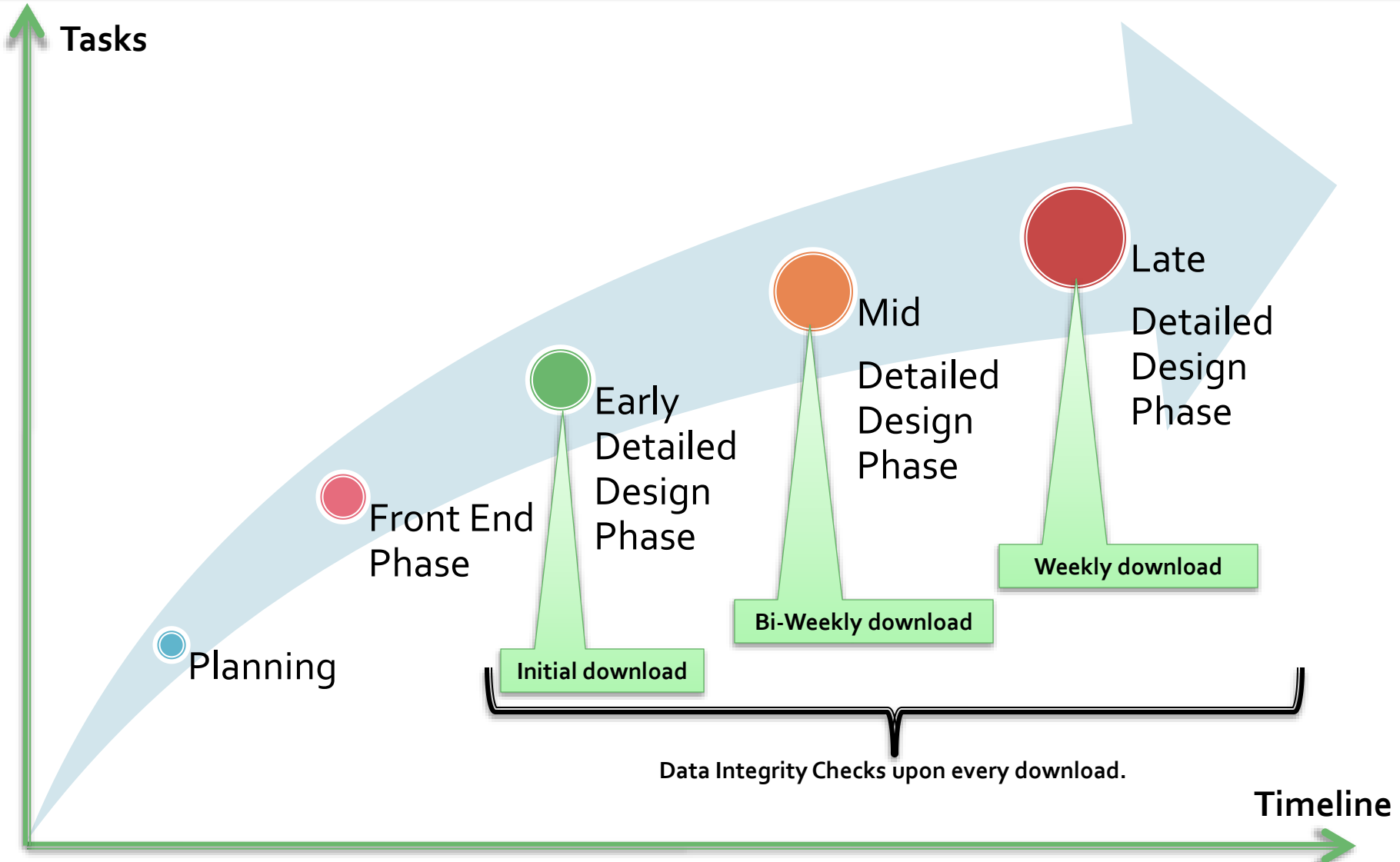
Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
SYSTEM COMPLETION		846	17-Dec-11	13-May-14	20
System Completion Preparation		570	17-Dec-11	31-Jul-13	64
CONV-WS1-SC-0030	Prepare Technical Specification CMS	45	02-Jan-12	17-Feb-12	64
CONV-WS1-SC-0060	System Completion Work Shop	1	08-Mar-12	09-Mar-12	94
CONV-WS1-SC-0050	Review cycle of Technical Specification CMS	45	10-Feb-12	28-Mar-12	76
CONV-WS1-SC-0040	Evaluation and Recommendation CMS System administrator	115	10-Feb-12	08-Jun-12	64
CONV-WS1-SC-0010	Review Check Sheets	210	17-Dec-11	23-Jul-12	64
CONV-WS1-SC-0020	Engineering details input to CMS	280	17-Dec-11	03-Oct-12	129
CONV-WS1-SC-0070	Generation and upload of Check Sheets	475	26-Mar-12	31-Jul-13	64
Mechanical Completion - Construction Check Record 'A'		191	29-May-13	13-Dec-13	0
CONV-WS1-MC-0020	Safety MC	153	07-Jun-13	13-Nov-13	29
CONV-WS1-MC-0090	Mechanical MC	150	12-Jun-13	14-Nov-13	28
CONV-WS1-MC-0100	Architectural MC	150	25-Jun-13	28-Nov-13	15
CONV-WS1-MC-0040	HVAC MC	150	25-Jun-13	28-Nov-13	15
CONV-WS1-MC-0060	Piping MC	180	29-May-13	02-Dec-13	4
CONV-WS1-MC-0030	Structural MC	121	30-Jul-13	03-Dec-13	4
CONV-WS1-MC-0010	Telecommunication MC	150	10-Jul-13	13-Dec-13	0
CONV-WS1-MC-0050	Electrical MC	150	11-Jul-13	13-Dec-13	0
CONV-WS1-MC-0070	Instrumentation MC	150	11-Jul-13	13-Dec-13	0
CONV-WS1-MC-0080	Area Completion MC	150	11-Jul-13	13-Dec-13	0
Pre-Commissioning and Commissioning		142	26-Aug-13	21-Jan-14	4
COM-WS1-0090	Inclination Test	0	07-Jan-14		0
COM-WS1-0110	Anchorage Test	0	21-Jan-14		4
Pre-Commissioning 'B' Inspection Test Plan		119	26-Aug-13	27-Dec-13	11
COM-WS1-0016	Safety System Pre-commissioning	90	26-Aug-13	27-Nov-13	29
COM-WS1-0012	Mechanical System Pre-commissioning	90	27-Aug-13	28-Nov-13	28
COM-WS1-0018	HVAC System Pre-commissioning	90	10-Sep-13	12-Dec-13	15
COM-WS1-0055	Architectural System Pre-commissioning	90	10-Sep-13	12-Dec-13	15
COM-WS1-0010	Piping and Mechanical System Pre-commissioning	90	13-Sep-13	16-Dec-13	11
COM-WS1-0014	Structure Pre-commissioning	90	14-Sep-13	17-Dec-13	10
COM-WS1-0040	Power System Pre-commissioning	90	25-Sep-13	27-Dec-13	0
COM-WS1-0030	Instrumentation and Automation System Pre-commissioning	90	25-Sep-13	27-Dec-13	0
COM-WS1-110	Area Pre-commissioning	90	25-Sep-13	27-Dec-13	11
Commissioning - Test and Commissioning Packages TCP		101	26-Sep-13	08-Jan-14	0
COM-WS1-0020	Piping and Mechanical System Commissioning	90	26-Sep-13	28-Dec-13	10
COM-WS1-0050	Power System Commissioning	90	07-Oct-13	08-Jan-14	0
COM-WS1-0060	Instrumentation and Automation System Commissioning	90	07-Oct-13	08-Jan-14	0
COM-WS1-0080	Dynamic Commissioning	90	07-Oct-13	08-Jan-14	0



CMS REQUIREMENTS

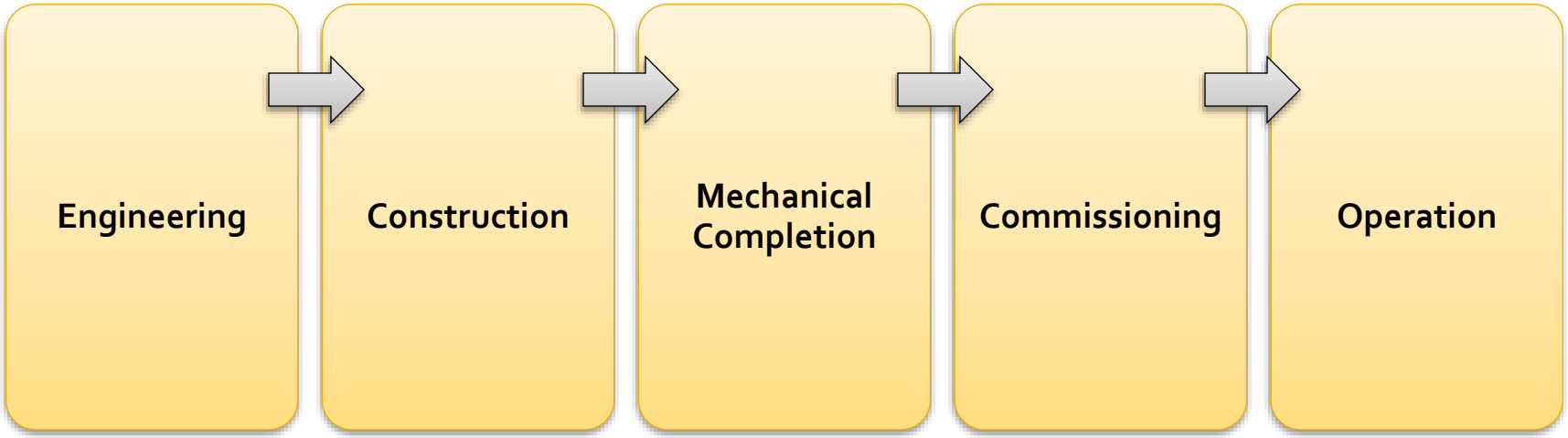


CMS: PLANNING AND SCHEDULING

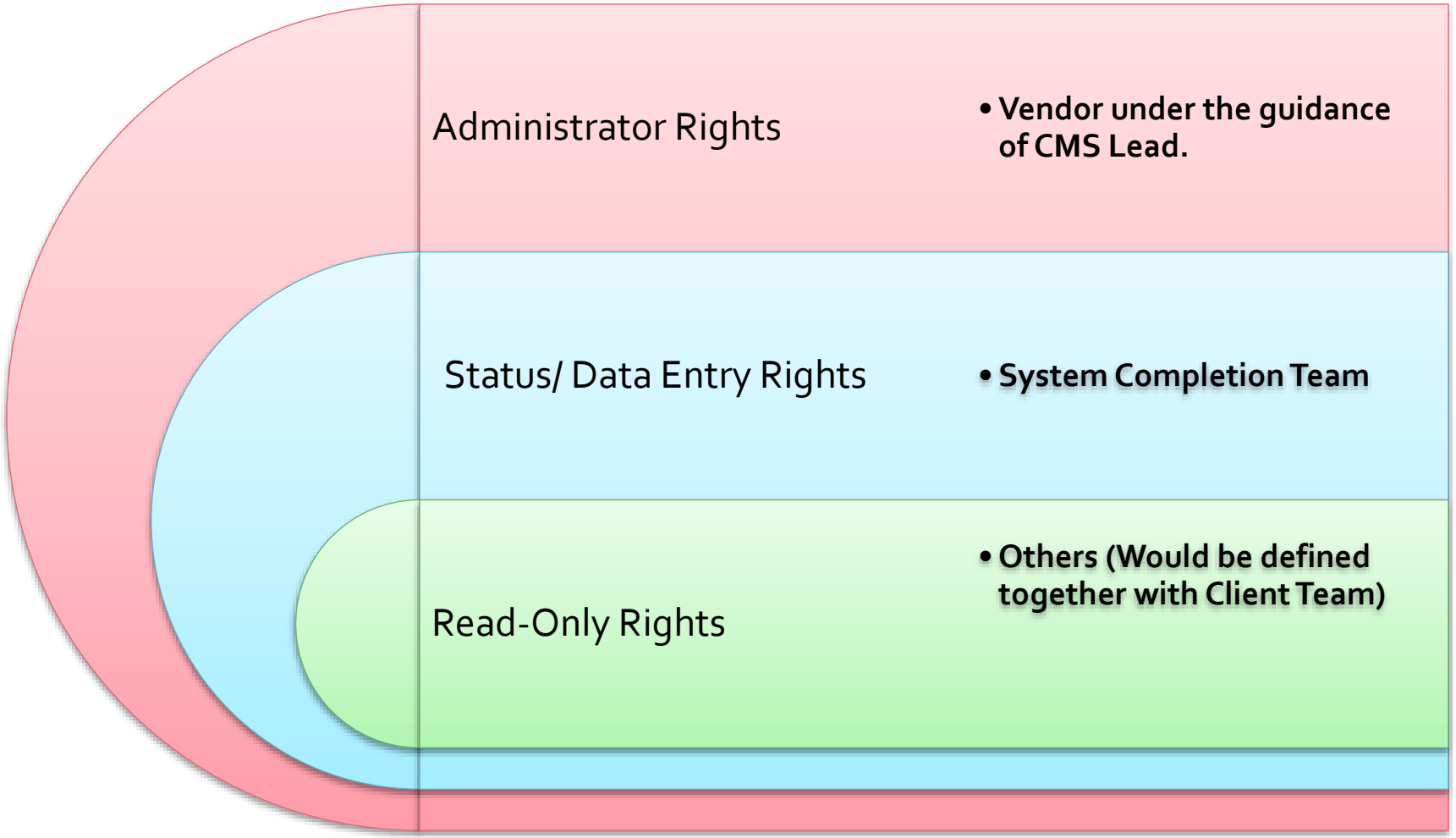


CMS: PROCESS FLOW

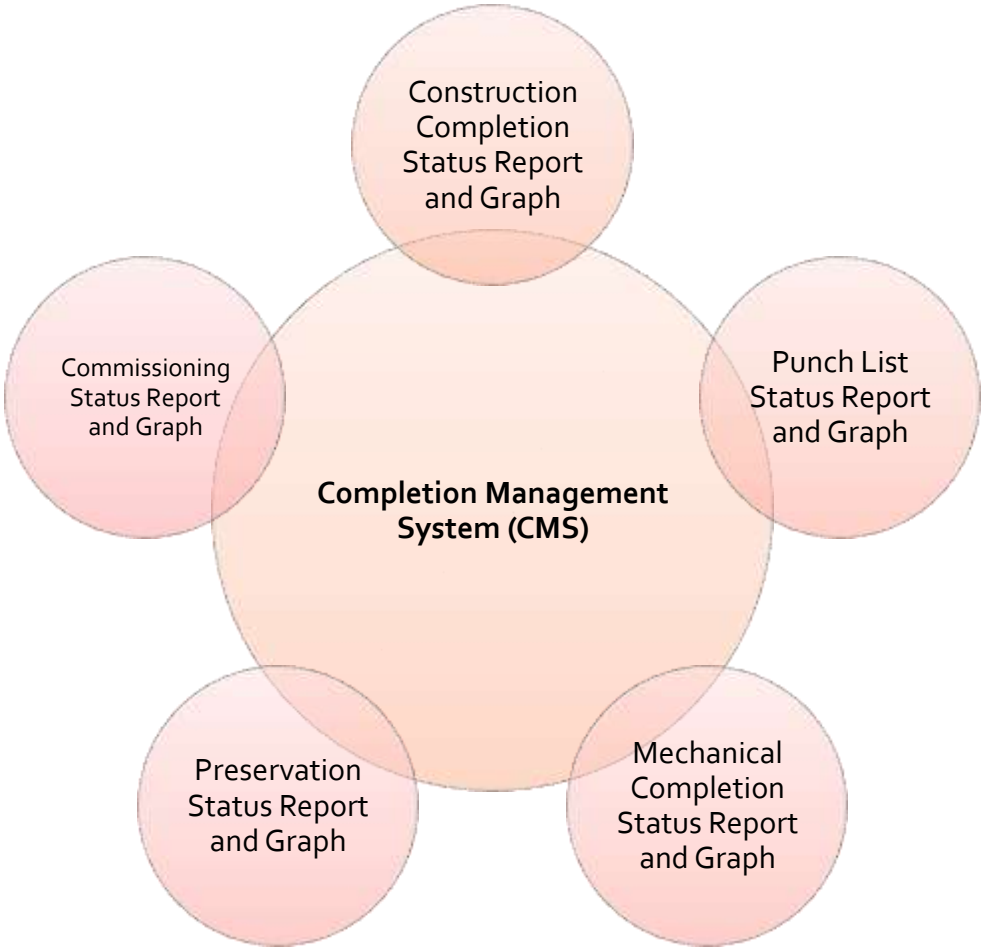
Completion Management System (CMS)



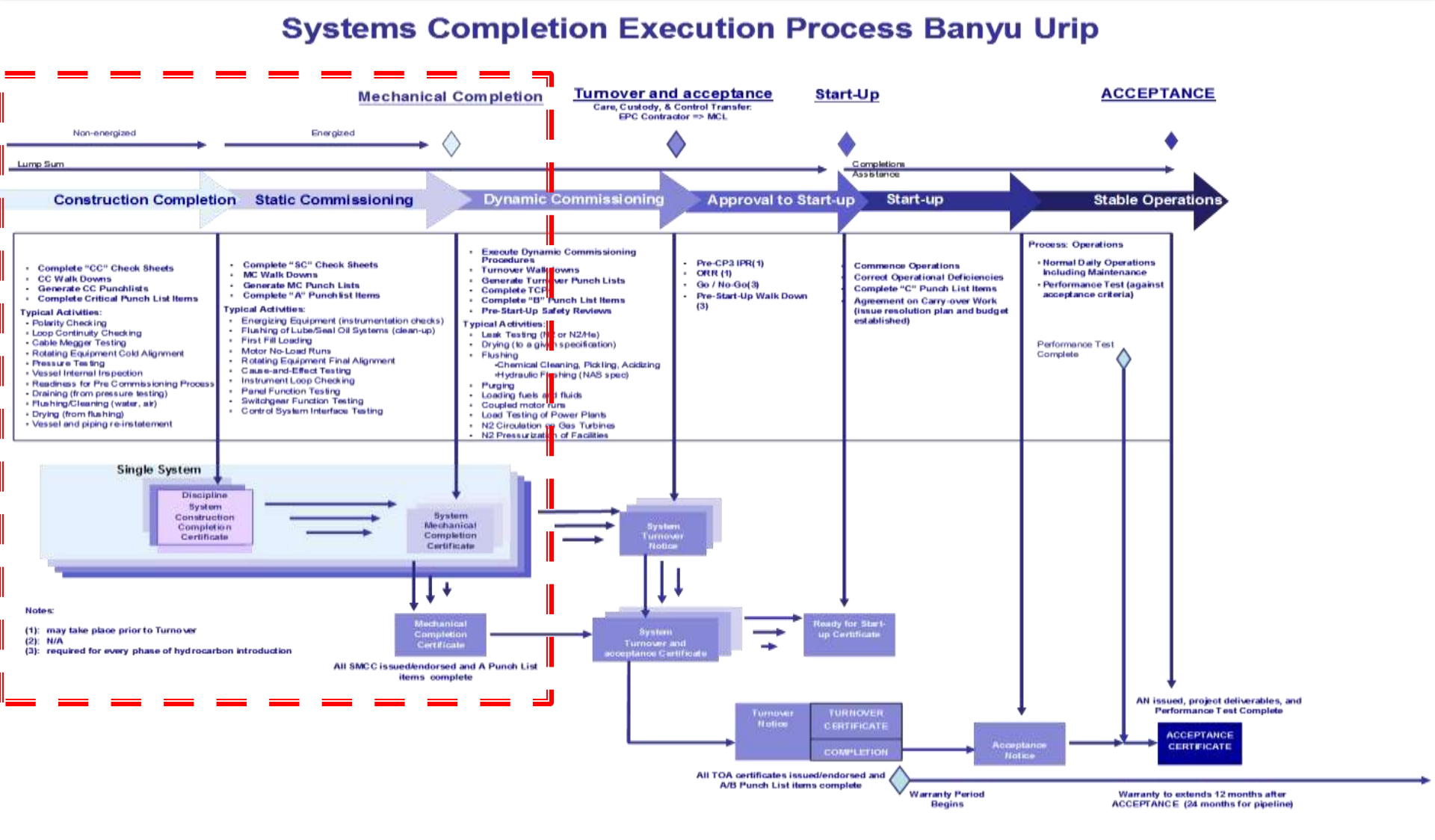
CMS: PROCESS FLOW – LEVEL OF ACCESS



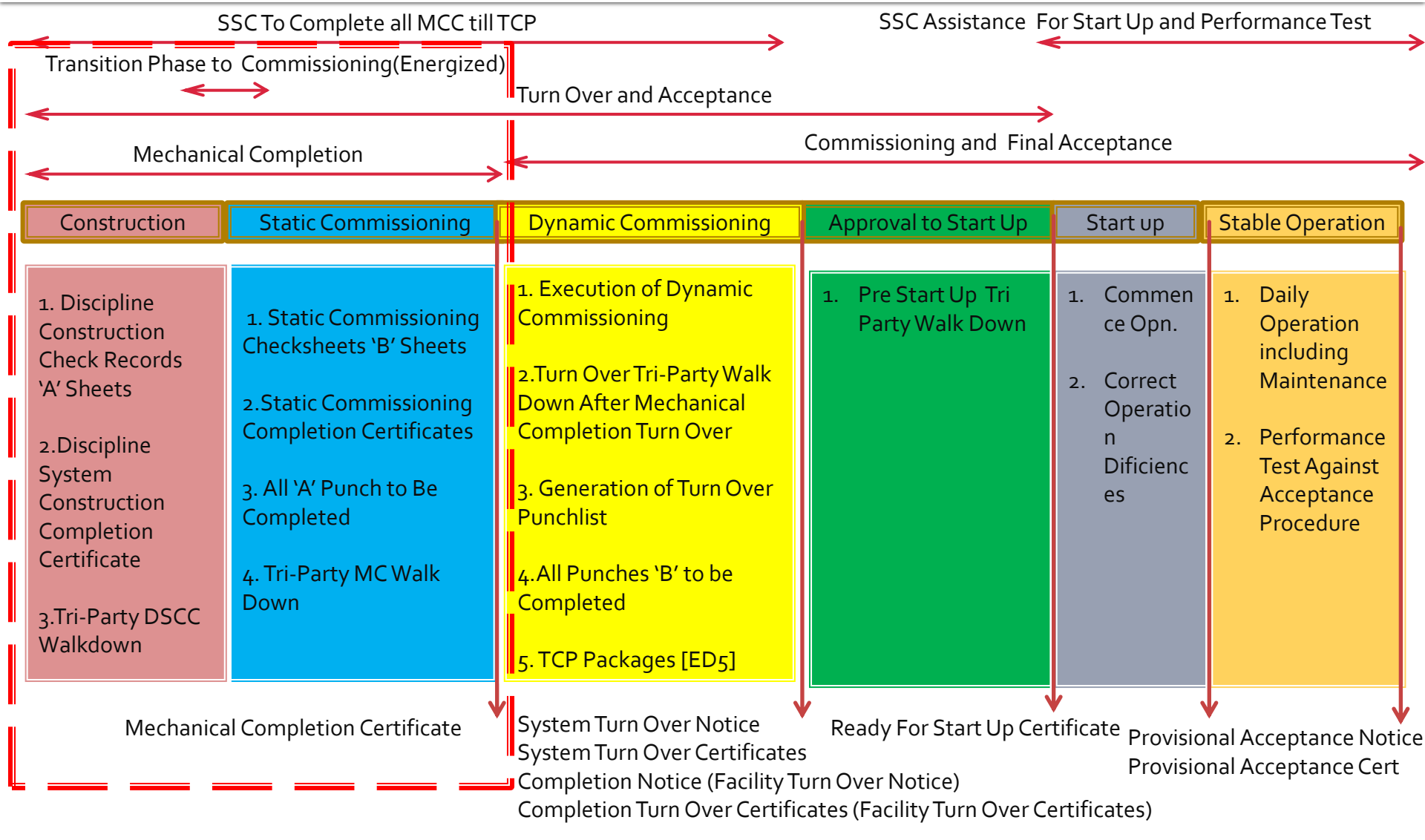
CMS: DELIVERABLES



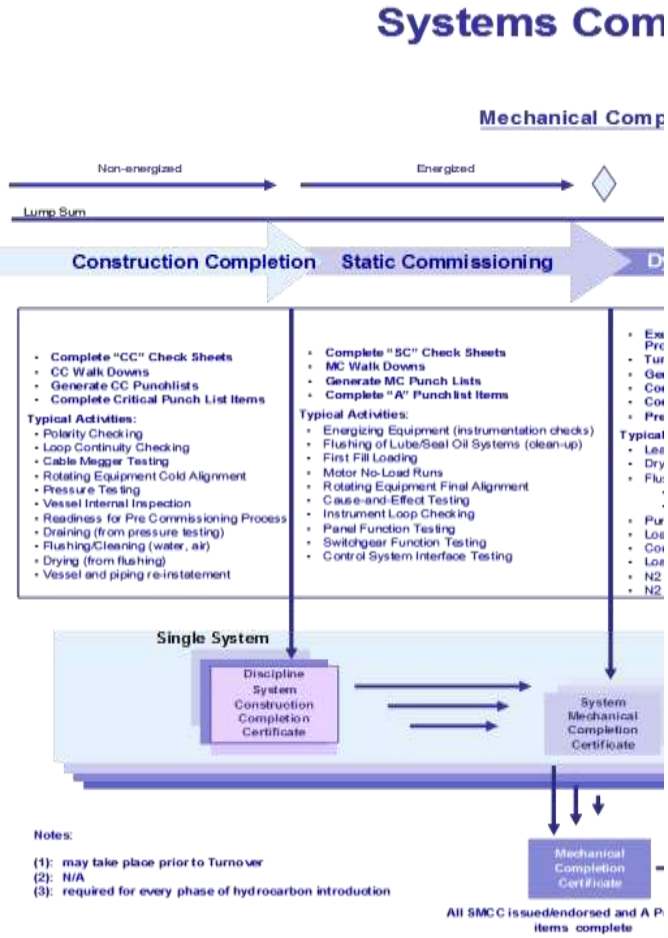
SYSTEM COMPLETION - MC REQUIREMENTS



SYSTEM COMPLETION –MC REQUIREMENTS



MC: PROCESS FLOW



ENGINEERING
MTO (AFC/ IFC)

PROCURMENT

MULTI-DISCIPLINE
FABRICATION

MULTI-DISCIPLINE
QUALITY CHECKS
&
MC CHECKS

'A' CHECK RECORDS &
'B' CHECK SHEETS
(If applicable)

DISCIPLINE
CONSTRUCTION
COMPLETION WALK
DOWN

DISCIPLINE
CONSTRUCTION
COMPLETION
CERTIFICATE. (DCCC)

'B' CHECK SHEETS
(If applicable)

SYSTEM MECHANICAL
COMPLETION
CERTIFICATES (SMCC)
WALK DOWN

SYSTEM MECHANICAL
COMPLETION
CERTIFICATES (SMCC)

MECHANICAL
COMPLETION
CERTIFICATE (MCC)

Clear "A" Punches

HANDOVER TO
COMMISSIONING

'A' CHECK RECORDS

	MCCCR GAGAK RIMANG BANYU URIP PROJECT EPC 4 – FSO				
System No.		Sub System No.		Discipline	MECHANICAL
Tag No.				Print Date	
Equipment Description				Location	
Sub System Description					
Drawing No.				Rev.	01
Check Record No.	M01CR – PRESSURE VESSEL / TANK			Sheet	1 of 1

S/N	Description	Yes	No	Remarks
1	Check internal inspection of equipment are in accordance with the datasheet.			
2	Check name plate are correct in accordance with the datasheet.			
3	Confirm there is adequate access for removal of internals.			
4	Confirm All valves and gauges are accessible.			
5	Confirm equipment installed in accordance with manufacturer's instructions.			
6	Check hold down bolts are torque, if required.			
7	Confirm supports are level and secure with no undue flange distortion.			
8	Confirm sliding feet are free.			
9	Visually inspect equipment for internal/ external damage including paintwork and insulation.			
10	Confirm all vessel trims are installed according to drawing.			
11	Confirm access to equipment is adequate and access ladders platforms correctly installed.			
12	Confirm man way is accessible and lifting arrangement is correct to drawing.			
13	Confirm internals are fitted and secured as per drawing.			
14	Confirm internal coating is visually undamaged.			
15	Confirm tank/vessel closed out for mechanical completion.			
16	Grease all davit bearings on man way covers and verify freedom of movement.			
17	Confirm all vents and drains are installed correctly.			
18	Confirm all nozzles are correctly aligned.			
19	Confirm earth boss are fitted.			
20	Confirm equipment is clear of debris and contaminates.			
21	Check all bolts are torque up correctly and Preservation applied as per specification.			

Remarks:

Outstanding Punch List attached? (Yes / No)

Description	Completed By	Approved By	Accepted By	Witnessed By	Input By
Company / Dept	SSC Construction	SSC Quality	MCL Quality	Third Party / Regulatory	WinPCs
Name					
Signature					
Date					

	MCCCR GAGAK RIMANG BANYU URIP PROJECT EPC 4 – FSO				
System No.		Sub System No.		Discipline	INSTRUMENTATION
Tag No.				Print Date	
Equipment Description				Location	
Sub System Description					
Drawing No.				Rev.	01
Check Record No.	I03CR – CONTROL VALVE			Sheet	1 of 1

S/N	Description	Yes	No	Remarks
1	Check Valve data-plate details against data sheet.			
2	Valve installed correct to Hook-up drawing.			
3	Valve located correct to P&ID or Location drawing.			
4	All Ancillary equipment correctly installed as appropriate.			
5	Check units is accessible for operation and maintenance access.			
6	Check flow direction is marked and correct to the P&ID.			
7	Check unit is clean internal / external and has no visible signs of damage.			
8	Spare entries plugged correct plug for area classification.			
9	Check bug screens are installed.			
10	Confirm E17CR i.e. Detailed 'EX' inspection sheet for Ex rated equipment is completed.			
11	Check earthing and bonding correct as per drawing.			
12	Check preservation installed in accordance with specification.			

Remarks:

Outstanding Punch List attached? (Yes / No)

Description	Completed by	Approved by	Accepted By	Witnessed By	Input By
Company / Dept	SSC Construction	SSC Quality	MCL Quality	Third Party / Regulatory	WinPCS
Name					
Signature					
Date					

'B' CHECK SHEETS

	MCSCCS GAGAK RIMANG BANYU URIP PROJECT EPC 4 – FSO				
System No.		Sub System No.		Discipline	MECHANICAL
Tag No.				Print Date	
Equipment Description				Location	
Sub System Description					
Drawing No.				Rev.	01
Check Record No.	M08B – PUMP (CENTRIFUGAL TYPE)			Sheet	1 of 1

S/N	Description	Yes	No	Remarks
1	Confirm that all associated Sub-System A sheets and Punch Items Category A are signed off prior to starting any work. Confirm that the content of the accepted punch lists will not impede commissioning. Confirm all certifying authority exception items complete or transferred to punch list.			
2	Check that all components are free from damage.			
3	Confirm that all preservation temporary measures have now been removed.			
4	Confirm that all valves are greased and free to operate.			
5	Confirm that all temporary oil filters, screens, and plugs are removed.			
6	Confirm that power is isolated and that all shafts are free to turn by hand.			
7	Confirm transportation crankcase plug has been removed and correct crankcase oiler bottle fitted.			
8	Confirm coupling re-installed if removed for transportation / installation / uncoupled motor run.			
9	Confirm that pump/coupling alignment is acceptable (OR) alignment rechecked and new 'A' sheets raise.			
10	Confirm all guards are fitted and secure.			
11	Confirm correct lubrication has been applied to the bearings, check the lubrication schedule.			
12	Ensure Mechanical Seal piping is complete and correct.			
13	Check Lube oil / Seal oil system for any leaks.			
14	Confirm that equipment suction strainers are installed.			
15	Confirm that the Earth Bonding strap is intact.			
16	Suction Priming System complete and ready for service.			
17	Confirm the FW / SW in the suction line is purged and filled with water up to the impeller to avoid pump damage if the priming system fail.			
18	Carry out Vendor recommended pre-start up checks in accordance with Vendor Start Up and Operating Manual.			
19	Review the manufacturers' recommendation for preparation to start and confirm that no conflicts arise between that document and the commissioning procedure.			
20	Confirm all instruments installed and in operational condition.			
21	Confirm Interlock Logic. (If applicable)			
22	Confirm bypass operation. (If applicable)			
23	Notifications for run mode. Permit in place.			

Remarks:

Outstanding Punch List attached? (Yes / No)

Description	Completed By	Completed By	Witnessed By	Witnessed By	Approved By	Input By
Company / Dept	SSC Commissioning	MCL Commissioning	MCL Operation	Third Party / Regulatory	MCL SC Lead	WinPCS
Name						
Signature						
Date						

	MCSCCS GAGAK RIMANG BANYU URIP PROJECT EPC 4 – FSO				
System No.		Sub System No.		Discipline	MECHANICAL
Tag No.				Print Date	
Equipment Description				Location	
Sub System Description					
Drawing No.				Rev.	01
Check Record No.	M18B – FAN			Sheet	1 of 1

S/N	Description	Yes	No	Remarks
1	Confirm that all associated packs are signed off prior to starting any work. Confirm that the content of the accepted punch lists will not impede commissioning. Confirm all certifying authority exception items complete or transferred to punch list.			
2	Check that all components are free from damage.			
3	Confirm that all recommended procedure, and that all preservation temporary measures have now been removed.			
4	Confirm all sea fastening removed. (Not Applicable for onshore use)			
5	Confirm that all valves are greased and free to operate.			
6	Confirm all guards are fitted and secure.			
7	Confirm unit internals are clean and free of debris.			
8	Confirm maintenance access acceptable.			
9	Confirm flexible connection between duct and unit is tight and secured.			
10	Confirm fan rotates freely without rubbing.			
11	Confirm fan shaft and bearings are undamaged.			
12	Confirm Anti vibration mountings undamaged and adjusted correctly.			
13	Confirm drive belts tension and pulley alignment.			
14	Confirm duct system completed and clean.			
15	Confirm holding down bolts of fan and motor are tight.			
16	Confirm no leakage.			
17	Confirm that the Earth Bonding strap is intact.			
18	Review the manufacturer's recommendation for preparation to start and confirm that no conflicts arise between that document and the commissioning procedure.			
19	Confirm equipment is ready for dynamic commissioning as specified on relevant dynamic commissioning procedure.			
20	Portable vibration and temperature monitor has to be provided to monitor the performance of equipment during First Start-Up.			

Remarks:

Outstanding Punch List attached? (Yes / No)

Description	Completed By	Completed By	Witnessed By	Witnessed by	Approved By	Input By
Company / Dept	SSC Commissioning	MCL Commissioning	MCL Operation	Third Party / Regulatory	MCL SC Lead	WinPCS
Name						
Signature						
Date						

CERTIFICATES

	SYSTEM CONSTRUCTION COMPLETION CERTIFICATE GAGAK RIMANG BANYU URIP PROJECT EPC 4 - FSO	
System Description		
Sub / System Number		Date
Certificate Number		Rev.

Discipline: _____ System _____ Sub-System: _____

This certificate acknowledges that, except as set forth below, all work for this package is constructed and complete as of the above date and the package is ready to begin commissioning activities. Upon acceptance and sign-off of this certificate, this package will be under the supervision of Commissioning group.

No.	Hold Point	Check
1	Confirm / Verify all TQ / SQ, Change orders for this sub system are fully implemented and completed.	
2	All components comprising this discipline, sub system, or system have been erected or assembled in full accordance with design and vendor drawings.	
3	All necessary factory acceptance testing has been completed and documented.	
4	Any applicable Vendor Release Notices for this discipline, sub system, or system have been issued by the CONTRACTOR	
5	This certificate is accompanied by all documentation as agreed upon for this project (including redlines).	
6	All Check Records are complete.	
7	All "A" punch list items are complete.	
8	All remaining punch list items have been categorized and entered into the CMS Database.	
9	All preservation activities as called for in TCP documentation have been completed.	

Summary of remaining items to be completed as follows:

ENDORSED	APPROVED
(Print Name, Date & Sign) CONTRACTOR – Construction / Designee	(Print Name, Date & Sign) COMPANY – Construction Lead/ Designee
(Print Name & Date) CONTRACTOR – Mechanical Completion/ Designee	(Print Name, Date & Sign) COMPANY - Mechanical Completion Lead/ Designee
(Print Name & Date) CONTRACTOR – Commissioning/ Designee	(Print Name & Date) COMPANY – Commissioning Lead/ Designee

Note: Endorsement to be carried out and signed on completion of the tri-party walk down (Within 24 hours).

MECHANICAL COMPLETION DELIEVERABLES

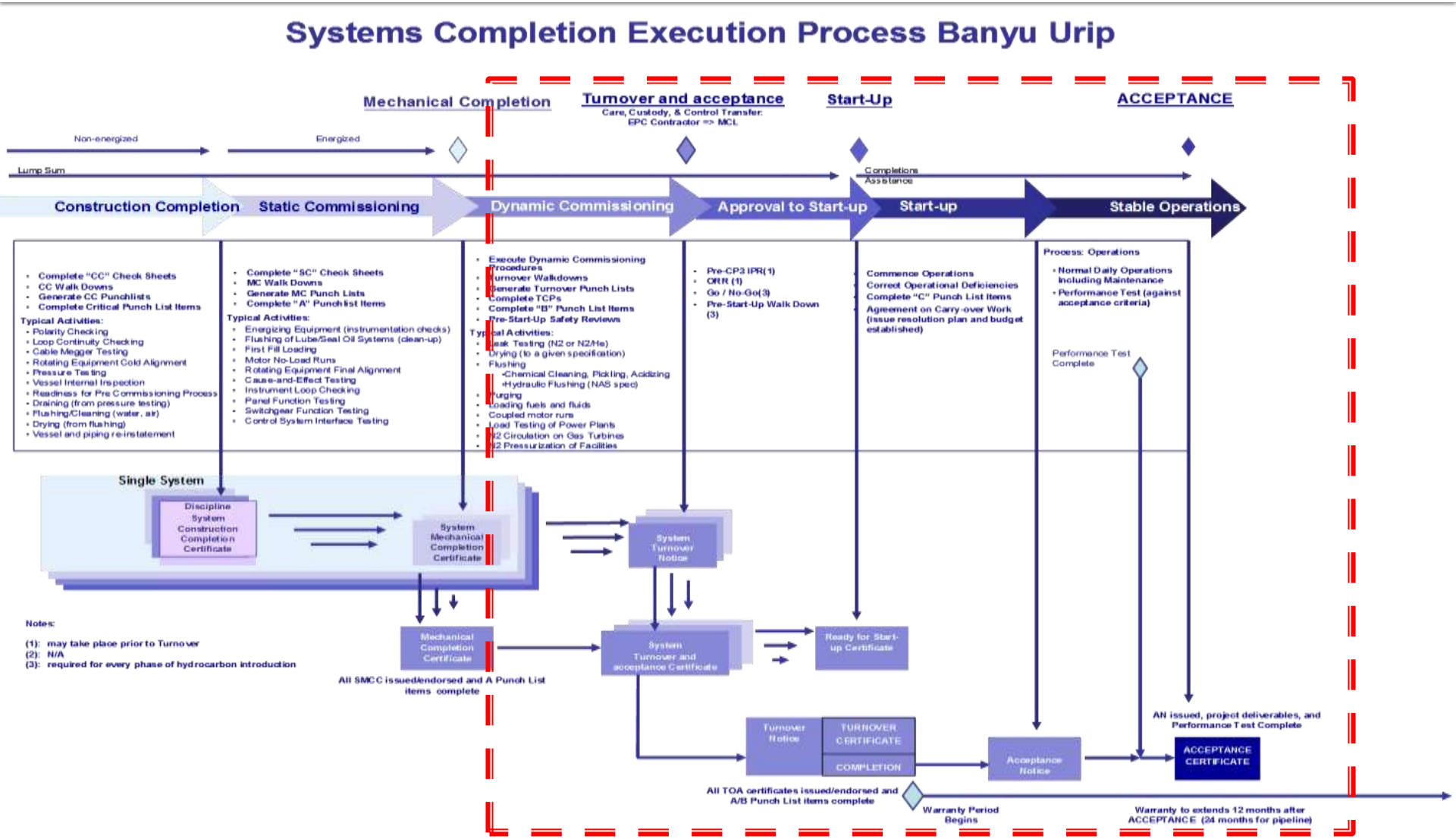
Mechanical Completion Certificate (MCC)

CMS Index of Deliverables

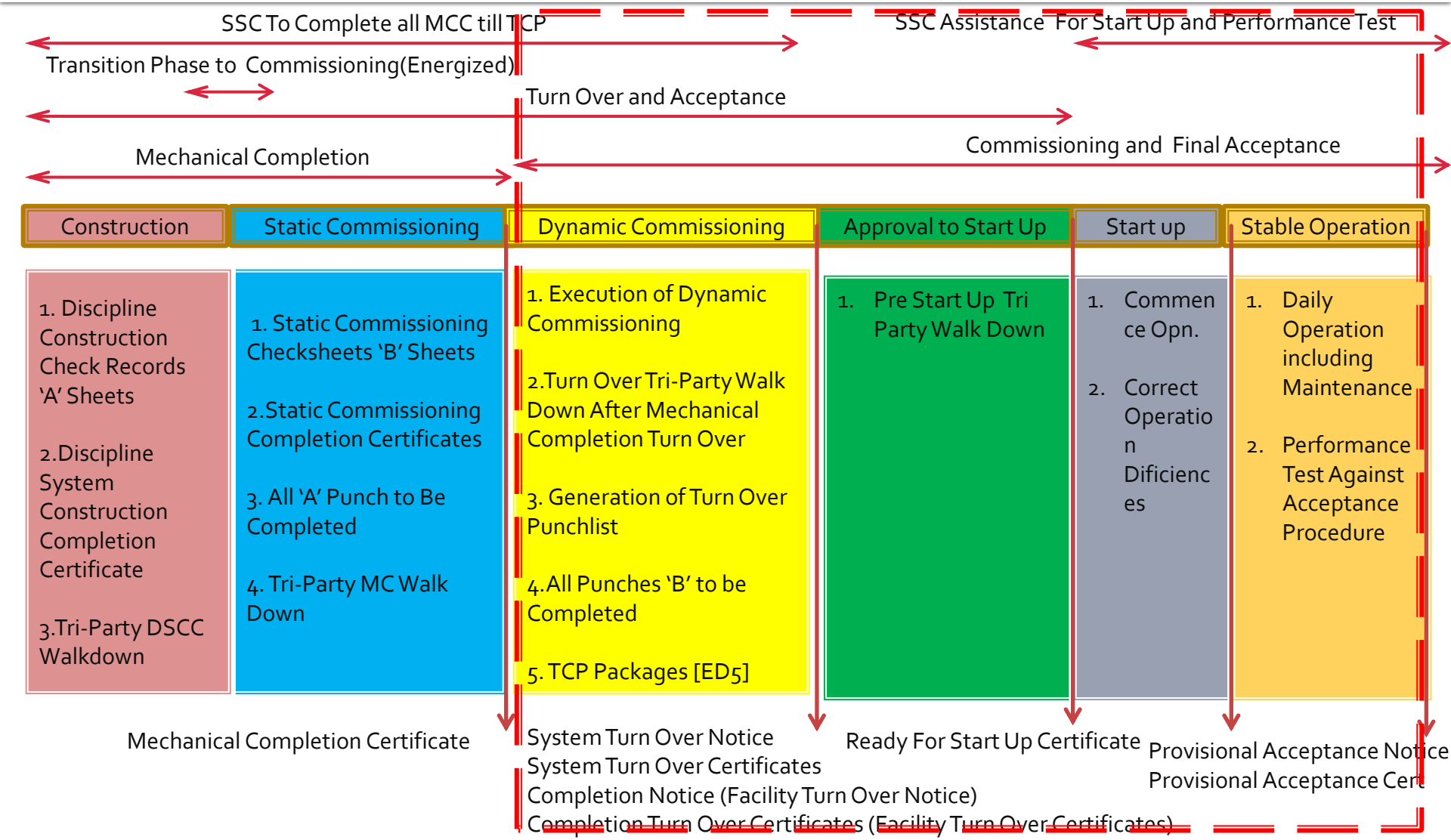
New & Existing Packages

Marked Up DWG, P&ID, SDL, D&ID	Punch List Summary Multi –Discipline	System Mechanical Completion Certificate (SMCC)	Discipline System Construction Completion Certificate (DSCCC)	Preservation Multi –Discipline
		Check Sheets – 'B' Multi –Discipline	Check Records – 'A' Multi –Discipline	Check Records Multi –Discipline

SYSTEM COMPLETION – TURN OVER REQUIREMENTS



SYSTEM COMPLETION – TURNOVER REQUIREMENTS



TURN OVER AND ACCEPTANCE EXECUTION

- System Mechanical Completion Certificates
  Requires:
  - Completion of Discipline System Construction Certificates
  - Static Commissioning Certificates

- Dynamic Commissioning
  - System Commissioning Procedure to be submitted and Reviewed / Approved by Company System Completion Team
  - Ensure All 'CC' and 'SC' Check sheets for the related System to be commissioned has been completed and Signed Off by Authorized Parties.
  - Ensure Availability of Commissioning Spares 30 Days Prior Static Commissioning.
  - All 'A' Punch Closed

- System Turn Over Notice
  - Notice issued by Contractor Upon Completion of System Dynamic Commissioning inclusive of Completion of 'A' and 'B' punchlist
  - Turn Over Completion Packages (TCP) to be prepared and Submitted to Company as a package per system / subsystem

TURN OVER NOTICE AND CERTIFICATES

	FACILITY TURNOVER NOTICE AND CERTIFICATE GAGAK RIMANG BANYU URIP PROJECT EPC 4 - FSO		
Facility Description			
Sub / System Number		Date	
Certificate Number		Rev.	

Full Facility _____ Partial Facility: _____

This Notice is issued to notify that, except as set forth below, the facility described above or parts thereof described above has been fully dynamically commissioned as outlined in the TCPs and is ready to safely commence Start-Up activities. The issuance of this FTN does not constitute FACILITY ACCEPTANCE as defined in the CONTRACT.

FACILITY TURNOVER NOTICE

Hold Point	Check
All system Turnover Certificates for the facility described above or parts thereof have been approved by the COMPANY.	
Summary of remaining items to be completed as follows: _____ _____	
For any remaining items, a plan has been made and approved to complete these items (attach the approved plan).	
Describe any portions of the system that are excluded from this Notice: _____ _____	

System Turnover Notice (STN) Issued and Endorsed by:

_____
(Print Name, Date & Sign)
CONTRACTOR – Commissioning Lead

_____
(Print Name & Date)
CONTRACTOR – Commissioning Lead

_____
(Print Name & Date)
CONTRACTOR – Project Manager

Note:

	SYSTEM TURNOVER CERTIFICATE GAGAK RIMANG BANYU URIP PROJECT EPC 4 - FSO		
System Description			
Sub / System Number		Date	
Certificate Number		Rev.	

Full System _____ Partial System: _____

This Certificate acknowledges that, except as set forth below, the system described above has met all CONTRACT requirements and is ready to safely commence Start-Up activities. Care, Custody, and Control of the system will be transferred to COMPANY on the date specified above for start-up and performance testing activities upon COMPANY's approval below. The issuance of this STC does not constitute FACILITY ACCEPTANCE as defined in the CONTRACT.

This certificate also acknowledges the transfer of Care, Custody, and Control of the systems as described above from COMPANY Project Team to the COMPANY (MCL) Operations Team

ENDORSED BY:	APPROVED BY:
(Print Name, Date & Sign) COMPANY – TOA Coordinator	(Print Name, Date & Sign) COMPANY – Commissioning Manager
(Print Name & Date) COMPANY – Commissioning Lead	(Print Name, Date & Sign) COMPANY – Start Up Manager
(Print Name & Date) COMPANY – Start Up Lead	(Print Name & Date) COMPANY – System Completion Manager
(Print Name & Date) COMPANY – Site Manager	(Print Name & Date) COMPANY – Project Manager
	(Print Name & Date) COMPANY – Operation manager

TURN OVER AND ACCEPTANCE EXECUTION

- Turn Over Completion Packages (Part of ED 5 Submission)
  - Section 1 – Objectives
  - Section 2 – System Description / System Limits / Associated System / Temporary System and Performance Standard
  - Section 3 – Safety Assessment
  - Section 4 – Mechanical Completion and Commissioning
  - Section 5 – Vendor Support
  - Section 6 – Preservation and De-Preservation Records
  - Section 7 – Commissioning Materials / Spares and Test Equipments
  - Section 8 – Commissioning Scope and Procedure
  - Section 9 – Commissioning Test Records and Reports
  - Section 10 – Drawing and Vendor Information
  - Section 11- Turn Over Documentation
  - Section 12 – Notes and Correspondence

TURN OVER AND ACCEPTANCE EXECUTION

APPENDIX L: TCP OUTLINE (TYPICAL)

Section 1. Objective
- 1.1 General Statement
- 1.2 Statement of Intent

Section 2. System Description, System Limits, Associated Systems, Temporary Systems, and Performance Standards
- 2.1 System Description
- 2.2 System Limits
- 2.3 Associated Systems
- 2.4 Temporary Systems
- 2.5 Performance Standards

Section 3. Safety Assessment
- 3.1 General Safety
- 3.2 System Specific Safety
- 3.3 Environmental Considerations

Section 4. Mechanical Completion and Commissioning
- 4.1 Status Index of 'A' Check sheets from Completion Management System
- 4.2 Status Index of 'B' Check sheets form Completion Management System
- 4.3 Status Index reports for outstanding and completed Punch Items (Punch lists).
- 4.4 Certificates, Discipline Mech. Comp. Certificate (DMCC), Systems Mech. Comp. Certificate (SMCC).

Section 5. Vendor Support
- 5.1 Support Requirements
- 5.2 Contingency Requirements
- 5.3 Vendor Spares List

Section 6. Preservation/De-preservation
- 6.1 Preservation Procedures
- 6.2 De-preservation Procedures
- 6.3 Preservation/De-preservation Status Reports

Section 7. Commissioning Materials, Spares, and Test Equipment
- 7.1 Commissioning Materials
- 7.2 Commissioning Spares

- 7.3 Special Tools and Test Equipment

Section 8. Commissioning Scope and Procedure
- 8.1 Commissioning Scope
- 8.2 Commissioning Procedures

Section 9. Commissioning Test Records and Reports
- 9.1 Commissioning Checklist Status
- 9.2 Test Requirements and/or Reports (FATs/SITs)

Section 10. Drawings and Vendor Information
- 10.1 As-Built Drawings
- 10.2 Vendor Drawings
- 10.3 Vendor Data Sheets
- 10.4 FAT Results and/or Records

Section 11. Turnover Documentation
- 11.1 System Acceptante Certificats
- 11.2 Turnover Punch lists
- 11.3 System Turnover Notice

Section 12. Notes and Correspondence
- 12.1 Engineering/Site Queries/Modifications/Non-Conformance
- 12.2 General Information and Notes

Note: Every System will have a Turnover and Completion Package (TCP). Every TCP will have the same content as described above; however, some sections may be "Not Applicable."

TURN OVER AND ACCEPTANCE EXECUTION

- System Turn Over and Acceptance Certificates
  - Company Will review SSC Submission of TCP and ensure Tri-Party Walk Down has Occurred Prior Issuing System Turn Over and Acceptance Certificates
- Completion Notice (Facility Turn Over Notice)
  - Notice will be Generated By SSC to Company that all System Turn Over Notice have been issued and System Turn Over Certificates has been received.
  - All System has been Commissioned and Turnover Completion Packages has been accepted
- Turn Over Certificates (Facility Turn Over Certificate)
  - Company Will review SSC Submission of Completion Notice Ensuring SSC has Completed all the work.

TURN OVER AND ACCEPTANCE EXECUTION

- Ready For Start Up Certificate
  - Prior Start Up offshore interface EPC 3 and EPC 4 Commissioning Tri-Party Walk down will be Completed.
  - A Certificate Issued by Company indicating that hydrocarbons may safely be introduced into the facility upon Commissioning of Offshore System which interface with EPC 3and EPC 4.
- Start Up and Stable Operation
  - SSC will Provide Assistance for Start Up Operation Till Stable Operation
  - Once Operation Is Stable SSC will issue a Provisional Acceptance Notice to Company.
    - All Punchlist to be Completed
    - All DFO Documentation to be Completed.
    - Completion of Performance Test Against Acceptance Procedure

TURN OVER TILL ACCEPTANCE DELIVERABLES

FINAL ACCEPTANCE

PROVISIONAL ACCEPTANCE NOTICE

START UP CERTIFICATE

COMPLETION CERTIFICATE
(FACILITY TURN OVER CERTIFICATE)

COMPLETION NOTICE (FACILITY TURN OVER NOTICE)

SYSTEM TURN OVER NOTICE

SYSTEM TURN OVER CERTIFICATE

DYNAMIC COMMISSIONING

TURN OVER COMPLETION PACKAGE (TCP)

MECHANICAL COMPLETION CERTIFICATE

INTERFACE WITH COMPANY/CLIENT SYSTEM COMPLETION TEAM

INTERFACE COMPLETION TEAM

- Formation of an Identified and nominated Integrated System Completion Team from both SSC and Company to Facilitate effective Execution of Commissioning till effective handover of systems From Projects Team to Company Operation Team.

- Nominated System Managers Will be the Driving Force to Get System Mechanically Completed Till Completion of TCP and Final Acceptance.

EXAMPLE OF SYSTEM CHAMPIONS / SYSTEM MANAGER

Cooling Medium

Sys No	TCP No	System Description	SSC Engineering System Manager	SSC Construction Team System Manager	SSC System Completion System Manager	Company System Manager
921	921	Sea Water Cooling				
922	922	Fresh Water Cooling				
923	923	Cooling Water (Inert Gas)				
924	924	Main/ Auxiliary Circulating Cooling Seawater				
925	925	Sea Water to Inert Gas				

KEY CHALLENGES

- **ZERO** Punch Items for System Completion Activities.
- Prompt Delivery of Engineering Deliverables
- Prompt Execution of Construction Activities Leading to System Completion Activities due to Compressed Commissioning Schedule.
- Undertaking Offshore and Start Up Commissioning of Facilities
- Proper Coordination And Immediate Rectification within Multi Discipline during execution of System Completion/Commissioning.

CASE STUDY

BW CATCHER FPSO

Owner Operation, Commissioning Team, Vendor/Manufacturer and DNV Class Inspector Altogether testing and commissioning the FPSO Turret System Successfully..
Team Work Deliver…

CASE STUDY

No. 1 Myin Gyan Steel Mill Plant

Myanmar Engineers successfully delivered the completion and commissioning of the plant even without the Vendor Support.

Areas to Improve

Safety Permit to Work System, Emergency Response Team Preparation,QAQC, Vendor Support for Advanced Control System Upgrade..etc.

CASE STUDY

PengPat Steel Mill Plant

Myanmar Engineers Successfully deliver the completion and commissioning of the plant together with the Russian Engineers.

Areas to Improve

Safety Permit to work system. Emergency Response Team Preparation.QAQC. Preservation of the plant after commissioning before start up and operation.

QUESTION AND ANSWER