

LIWA專案簡介

中鼎工程公司

王奉鈺



Agenda

- Safety Moment
- 專案簡介
- JV專案團隊
- Multi-Execution Centers的運作
- Liwa 專案執行挑戰的實例分享
- 大型國際EPC專案的展望

Safety moment

DID YOU KNOW

The best way in is not always the best way out.

- ◆ Sometimes safety is about quickly getting away from an unsafe situation. That's why it pays to know your exits.
- ◆ Chances are you're aware of the exits near your place.
- ◆ If you know exactly where to go, you'll get there a lot quicker.
- ◆ Be aware of the exits from your home or your workplace and always keep them clear.
- ◆ Get in the habit of always locating the emergency exit wherever you are.



CTCI CSR Moment

Liwa專案的合作夥伴CB&I

- CB&I的 general practice 是5個人的集會，分享Safety的報導、經驗、見聞，形式不拘。作為開會或簡報前的暖場和顯示對工安的重視。

Liwa HSE Manager 的分享

- 工安不是利用規定和罰責來驅動，獎勵勝過處罰。
- 工安是一種習慣和態度，這也是CB&I公司要求作Safety Moment的原因。

中鼎目前的應用

- 中鼎在開會前分享CSR Moment，來推廣企業永續責任的理念。



永續補給站
2020/12/01



2020集團「全員CSR微電影展」作品集
2020/05/21



「全員CSR Moment」提案競賽
2020/05/11



「2020 小小永續工程師暑期營隊」
2020/05/11



CSR Moment，開跑了！
2019/10/07



集團全員CSR永續必修課程開跑(續)
2019/06/10



集團全員CSR永續必修課程開跑
2019/05/23



全員CSR宣導說明會
2019/05/23

專案簡介

Liwa Complex 簡介

1. Steam Cracker (Unit 10)

- SCU plant within Sohar Industrial Port incl. supporting units (Utilities & Offsites)
- All Sohar based installation with tie ins to existing Orpic refinery and new Polymers(unit 20)

2. Polymers (unit 20)

- PE/PP plant within geographical boundaries Polymer area
- Wiring to CCR / Substations outside Polymers area
- Dedicated Hardware and Software at Control room / substation
- Dedicated connections in existing areas

3. NGL plant (unit 30)

- Tie ins at Fahud Compressor Station
- Interconnection piping FCS - NGL E
- NGL E Plant
- 132 kV Connection
- Excluding scraper/receiver stations

4. Pipeline (unit 40)

- NGL pipeline Fahud to Sohar
- Scraper sender/receiver station



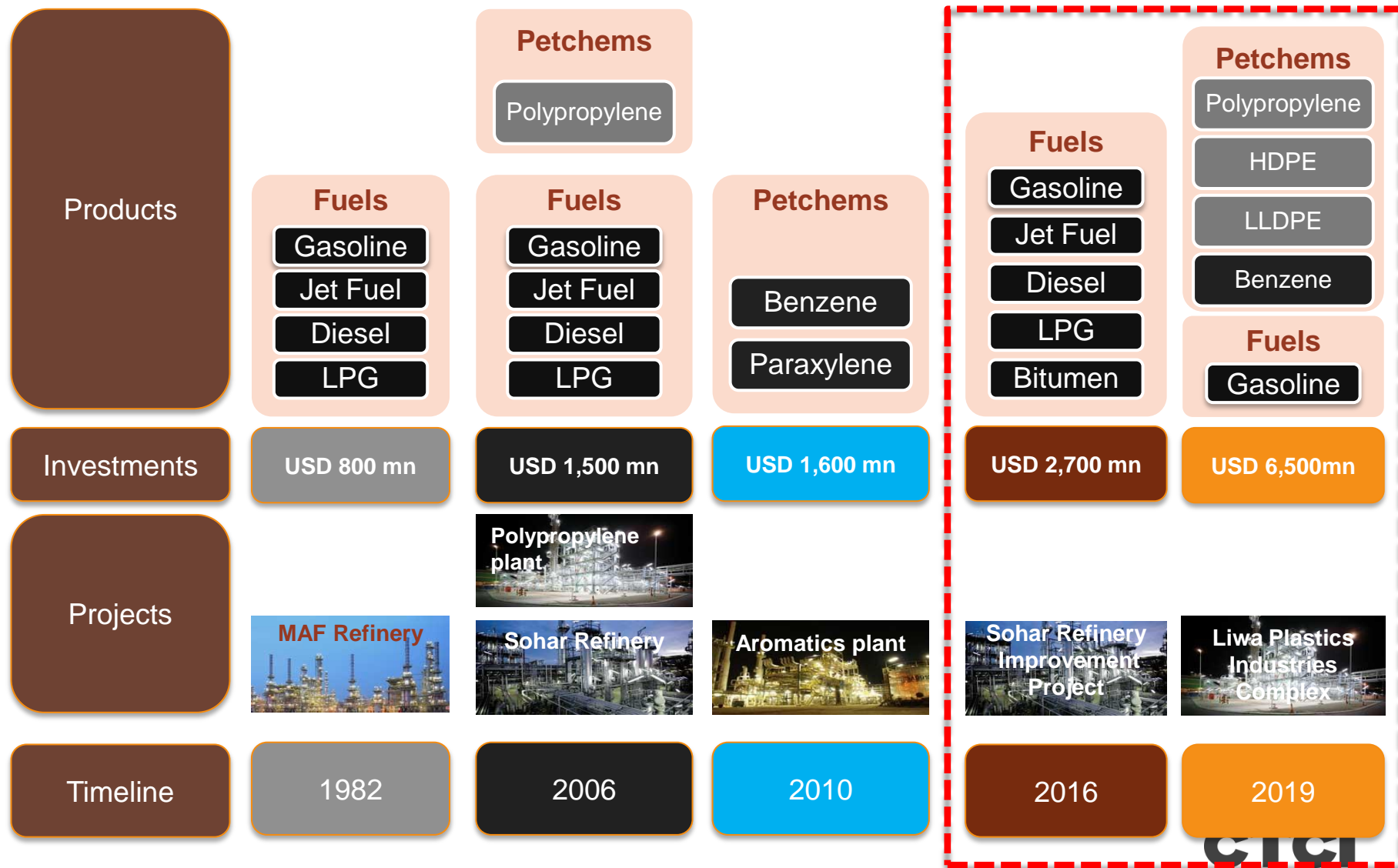
Selected Bidders:

- | | |
|-------|--------------------|
| EPC-1 | CB&I/CTCI |
| EPC-2 | Tecnimont |
| EPC-3 | GS&Mitsui |
| EPC-4 | Punj Lloyd Limited |

Liwa PKG 1 Project Background

Project:	Liwa Plastics Industries Complex (Package 1: Steam Cracker with Offsite works & Utilities)
Project name:	LPIC EPC1 SCU
Location:	Sohar, Oman
Purpose	870 kTA ethylene production steam cracker plant (乙烯, with main feedstock of NGLs (C2+) from Fahud (300 km south))
Client/ Owner:	ORPIC (100% Owned by Government of Sultanate of Oman)
Contract	Lump Sum Turn Key EPC in JV with CTCL(=CCJV)
FEED	CB&I (Completed April 2015)
Technology	Ethylene, MTBE/Butene-1: CB&I Pygas: Axens
PMC	Bechtel
Schedule	NTP 4 Feb. 2016 MC 4 Sep. 2019 – RFSU 4 Nov. 2019 – IA 4 Feb. 2020(against LD's)

Orpic's Expanding Product Mix



Site Map

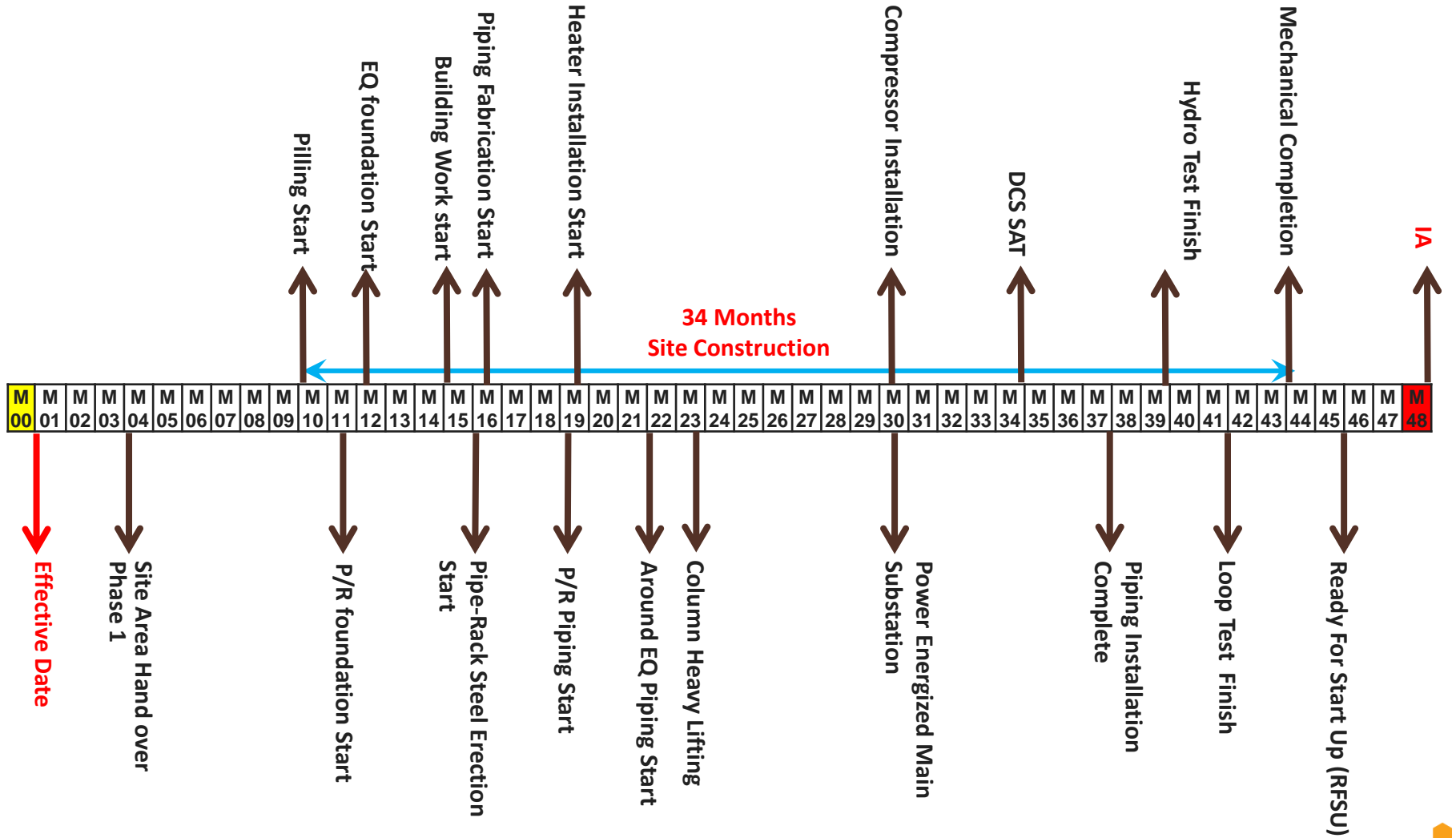
 Jetty Topside Scope



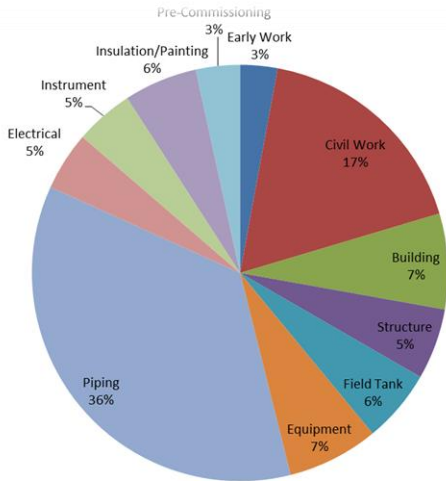
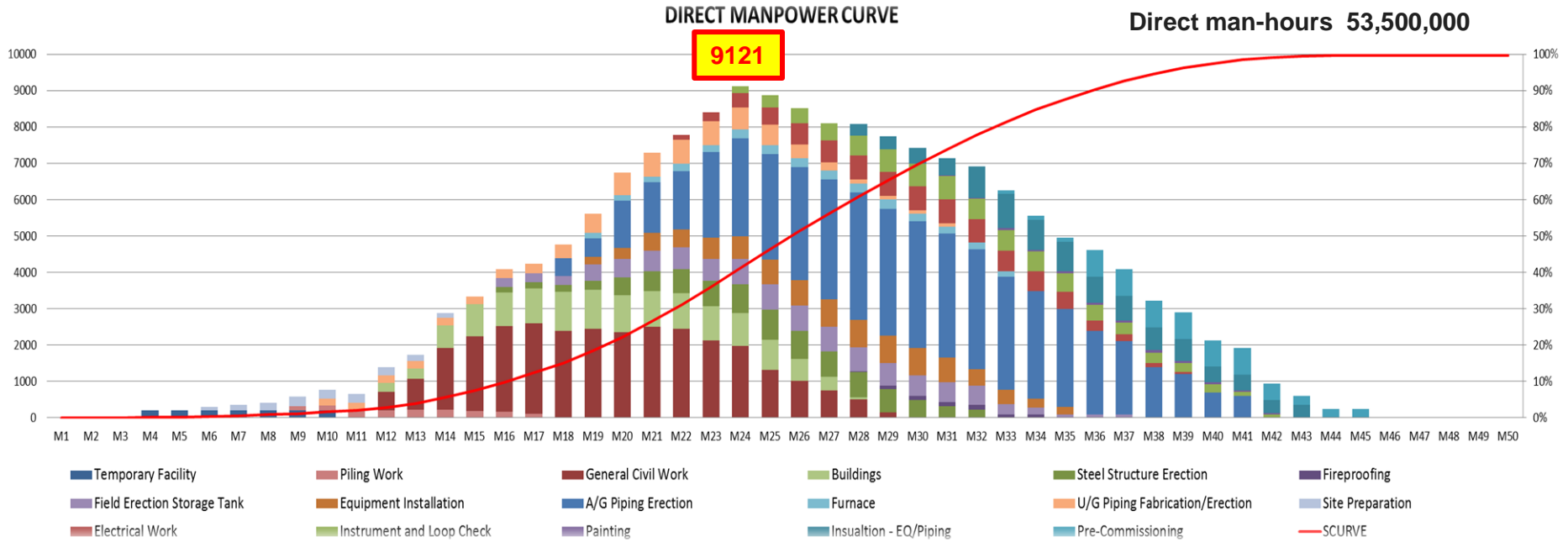
-  Sea Water Intake
-  SCU (40%)
-  Storage U&O (50%)
-  PE
-  PP
-  Control Building LIWA
-  Existing Refinery
-  Polymer Complex (ITB Package #2)
-  Cracker Complex (ITB Package #1)

Construction Execution Plan – Schedule

■ Finish Milestone



Construction Execution Plan – Direct Manpower Histogram

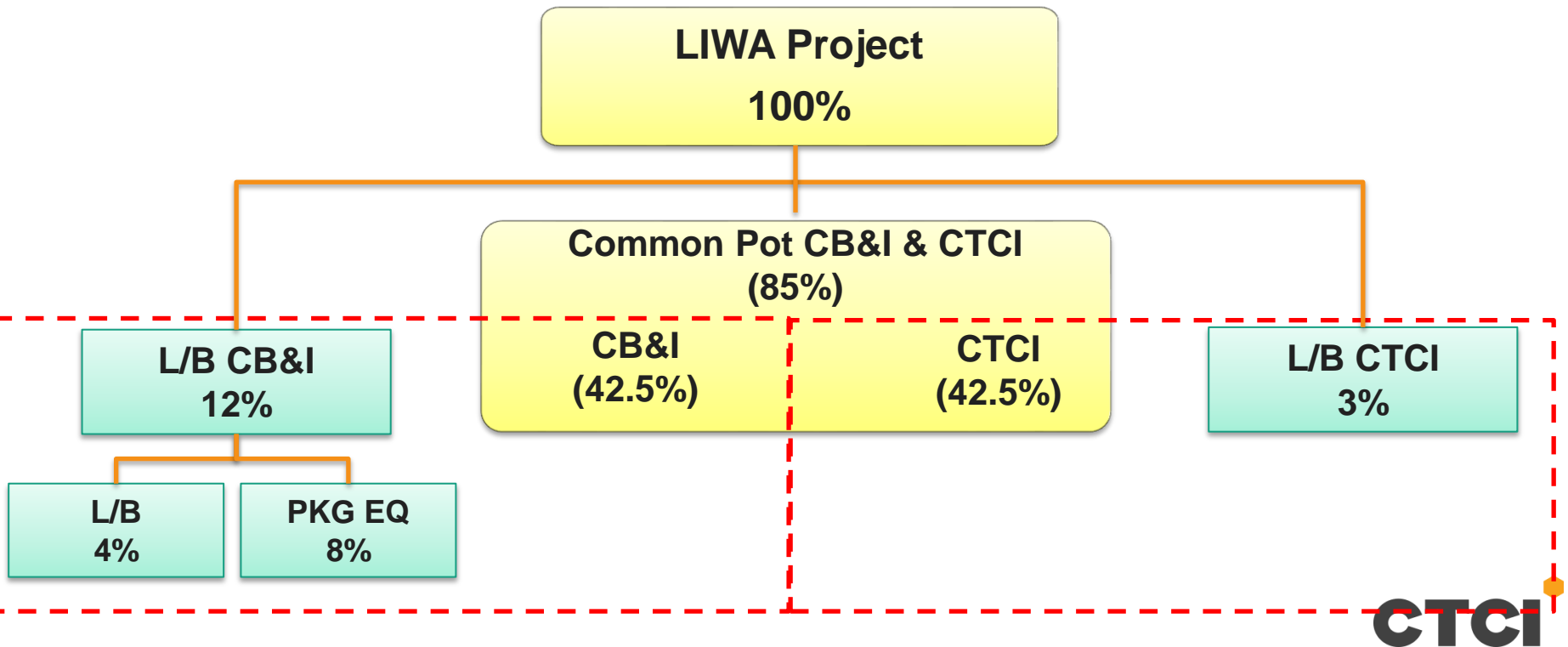


JV專案團隊

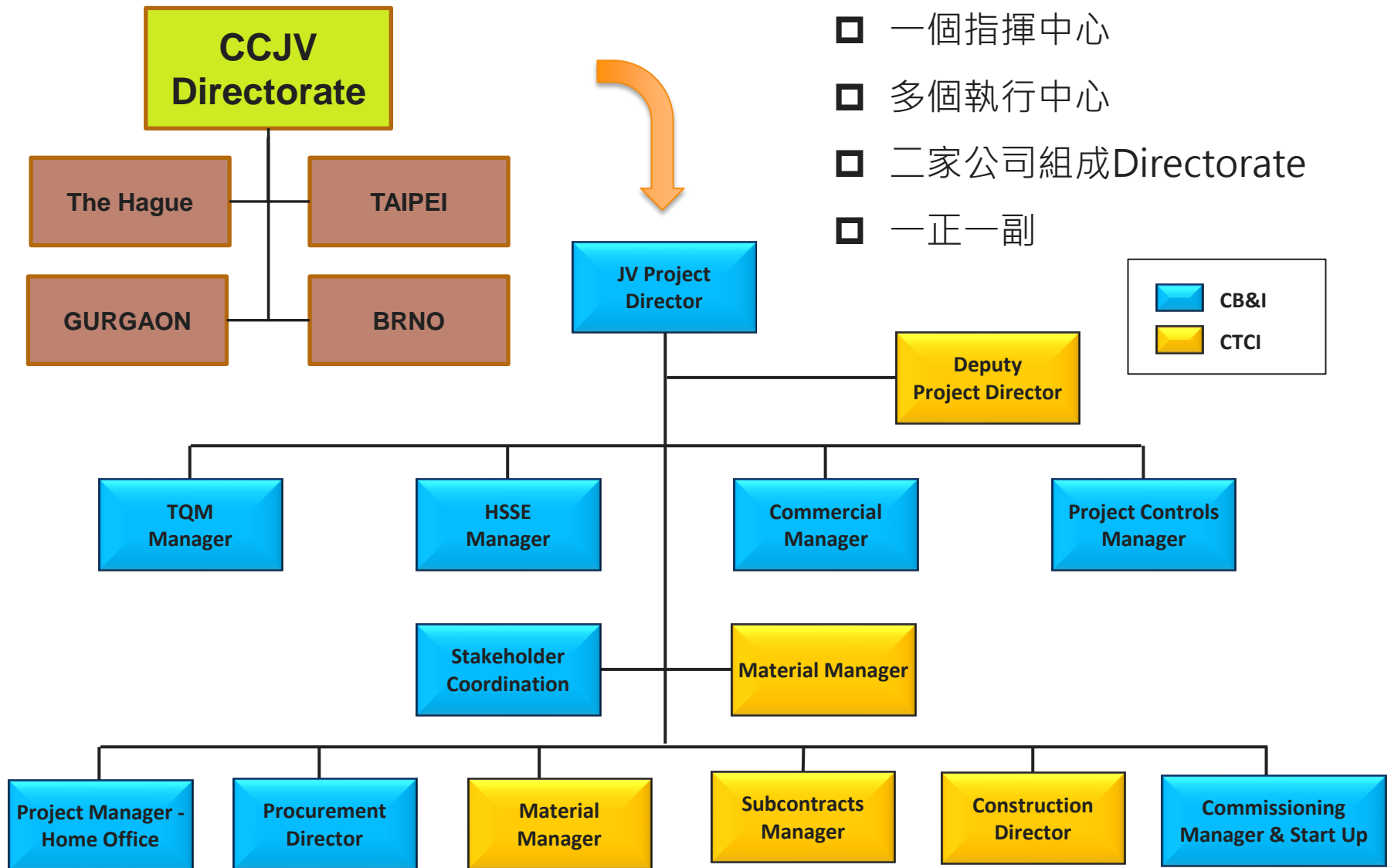
- 從二個公司到一個專案

Contract Scheme 合約架構

- ◆ CB&I as JV Leader
- ◆ CB&I & CTCI 50% via 50% of Common Part
- ◆ Engineering as individual Lump sum
- ◆ Licensor Propriety Equipment as CB&I Lump sum
- ◆ 專案管理/採購/建造/試車-Common Part ; 共組專案團隊執行



JV Directorate & Multi-Execution Centers



JV專案管理團隊的形成

◆ JV Operation Agreement

- ✓ 公司層級、合約面的規範

◆ 專案授權準則

- ✓ 專案文件簽署權限

◆ 建立專案作業規則和程序

- ✓ 文件作業流程

◆ 專案任務分工討論

- ✓ 如何優化專案的任務分工

◆ 組織JV專案團隊

- ✓ 人員來源、分配與適任？

◆ 專案執行

- ✓ 如何融合團隊- Communication, Workshop

JV專案管理團隊的形成

- ◆ 管理制度的不同
- ◆ 文化差異
- ◆ 表達能力
- ◆ 實例分享
 - ✓ 專案層級的授權比公司高階管理人簽核金額還高？
 - ✓ 不能加班Hague團隊 vs 7-11的台灣團隊
 - ✓ 出差規定大不同 - 飛機艙等、住宿Hotel

Multi-Execution Centers的運作

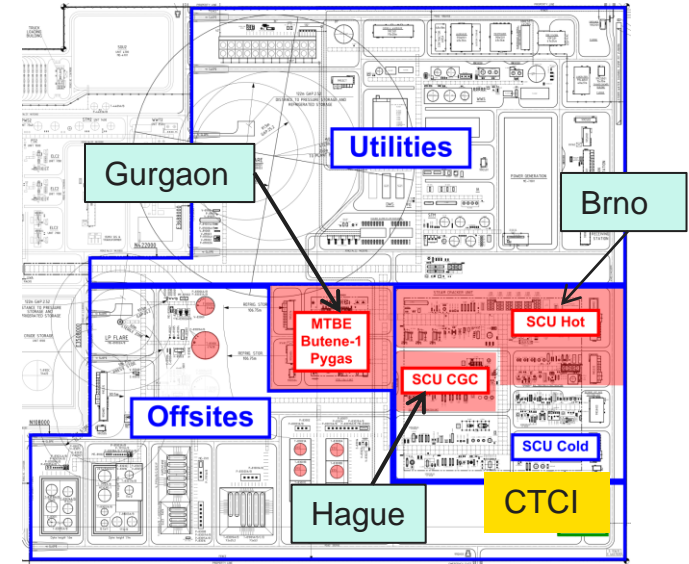
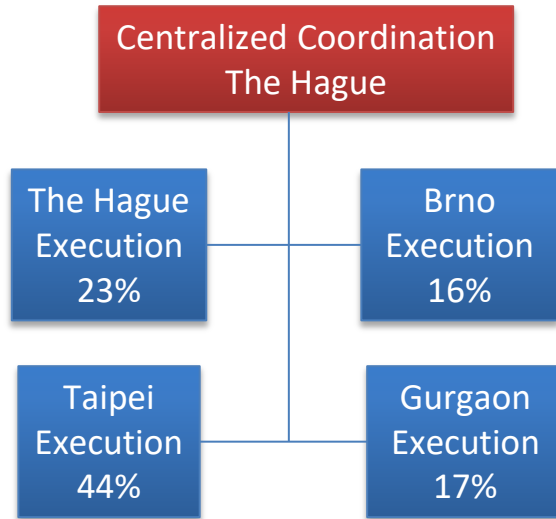
Directorate via Operation Centers

- 從報價 (理想世界) 到成案 (現實生活)
 - ✓ 報價團隊與執行團隊成員的改變
 - ✓ Directorate 與 HEC (Hague Execution Center) 的分工矛盾
 - ✓ Directorate組織規模 – 整合 or 主導？
 - ✓ 業主的需求與期待 - 單一窗口且熟悉細節？
 - ✓ Directorate與 Operation Centers 的KPI 不一致
 - ✓ Common Pot 與 Lump Sum Scope 的矛盾 (公司利益)

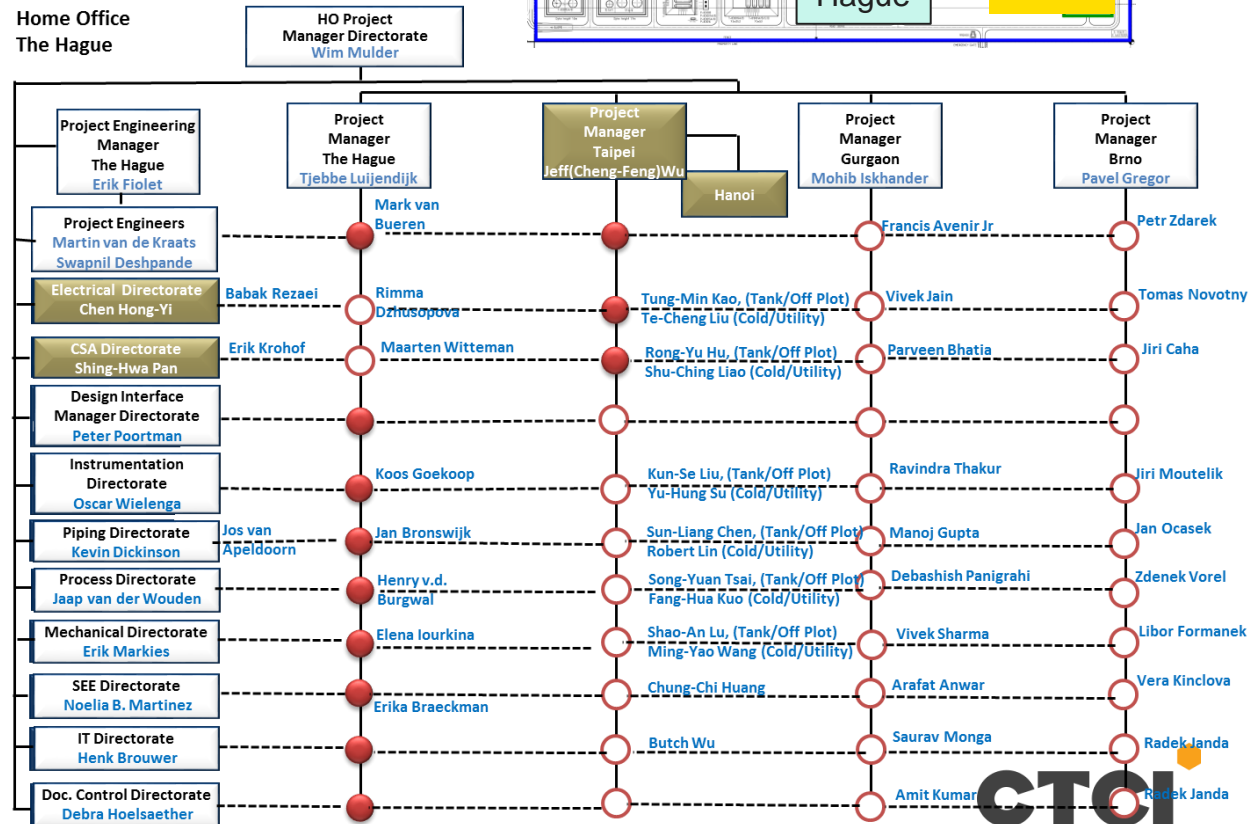
- 處置方案
 - ✓ 重新定義專案團隊的R&R
 - ✓ 調整人員編制、預算
 - ✓ 向專案成員溝通說明
 - ✓ 建立工作實例

Multi-ECs Engineering

Execution Centers (Engineering & Procurement)

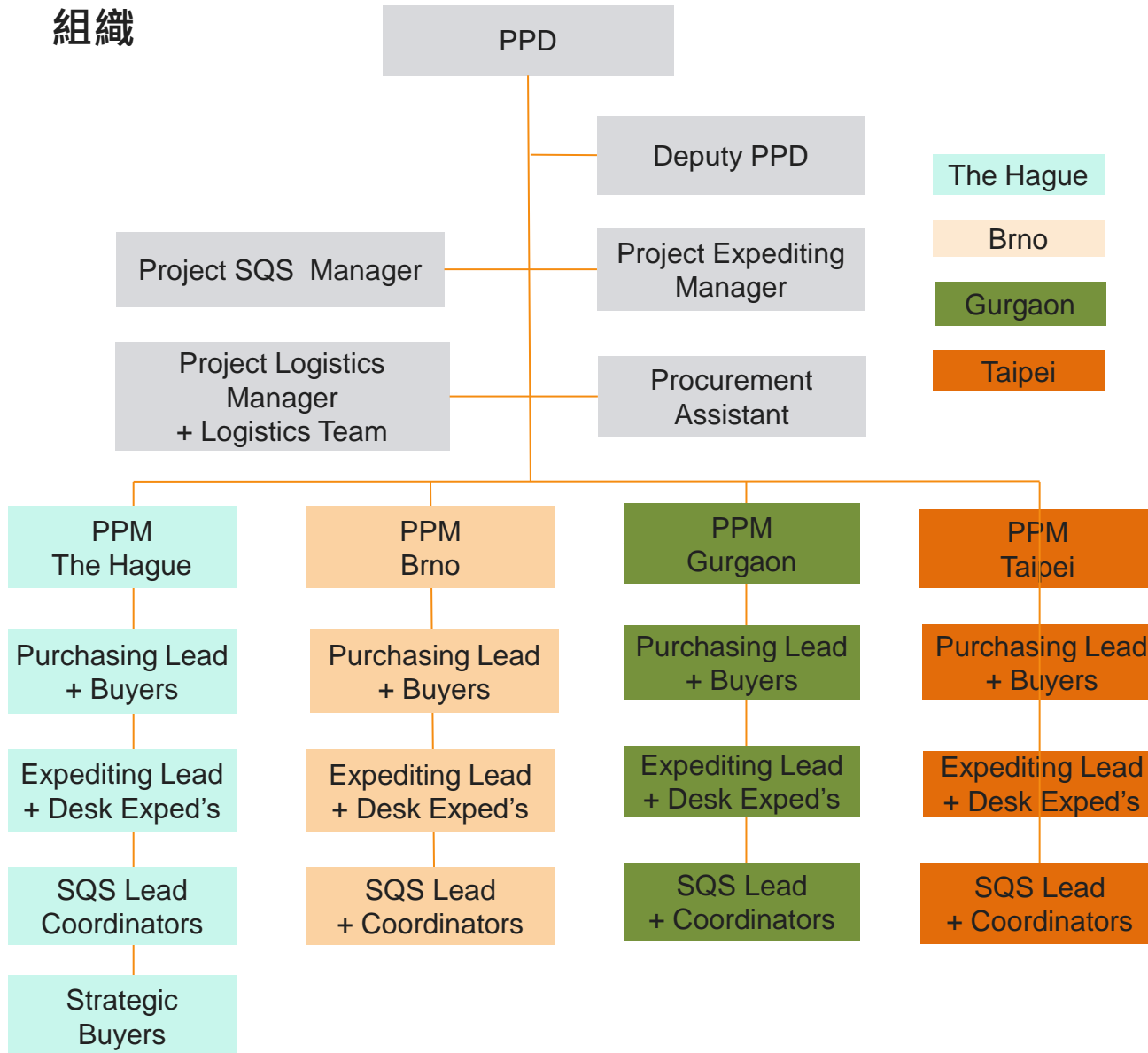


- ◆ 獨立的執行中心，依WBS分區負責進行工程設計、工程採購
- ◆ 工程設計如右圖的分工，是矩陣式的安排，Directorate的Engineer LE會作規範制定與業主的溝通窗口



Multi-ECs Procurement

組織



採購類別

Strategy

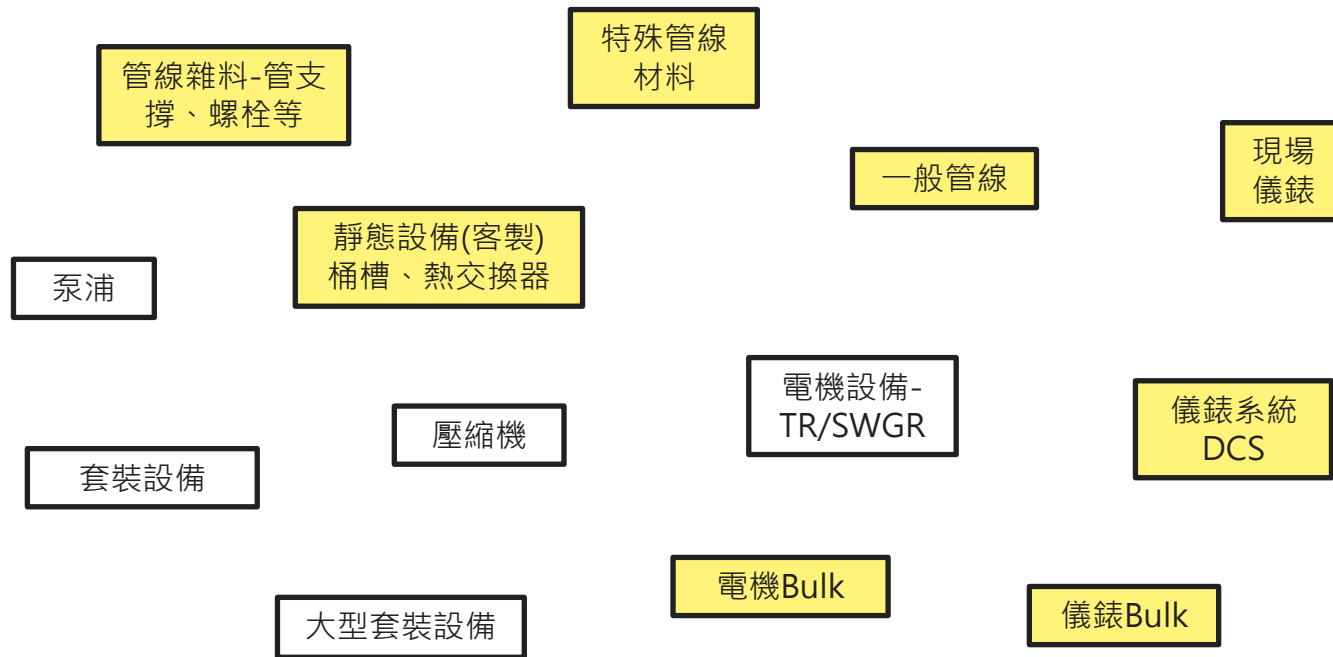
- Central Purchase
- Local Purchase
- Frame of Agreement

Special Requirement

- ECA (Export Credit Agency)

Multi-ECs的採購執行

- ◆ Central Purchase – 由Project Directorate採購，進行詢、比、議價
- ◆ Local Purchase – 由各執行中心進行採購行，進行詢、比、議價
- ◆ 請購單(規格)開立與技術審標都需依賴各EC的工程師、各EC都有Qualified的採購人員；那大家腦力激盪一下，什麼是Central？什麼是Local？



Strategy

Equipment (examples)

LOCAL

- Packaged Units
- Dosing Units
- Chemicals and catalyst
- Coalescers
- Cold Boxes
- Compressors (excl CG and R)
- Deaerators
- Desuperheaters
- Elevators
- Filters
- Flame arrestors
- Flares
- Furnace
- Heat Exchangers - Double Pipe, Air Cooled, Armstrong, Plate & Frame, electrical, spent caustic
- Incinerators
- Loading arms
- Overhead Cranes
- Pumps – diaphragm, reciprocating, rotary, self priming screw, submerged
- Quench fittings
- Reactors
- Sample stations
- Silencers
- Spers
- Static Mixers
- Storage Tanks
- UOP tubes

Strategy	Equipment (examples)
CENTRAL	<p>Frame Agreements:</p> <ul style="list-style-type: none">• Centrifugal Pumps (OH2,VS1,VS4,VS6,BB1,BB2,BB3,BB5)• Columns and internals• Vessels• S&T Heat Exchangers• Major Columns• Charge Gas and Refrigerant Compressors

Multi-ECs的採購執行

PRE-AWARD ACTIVITIES	(1) Data sheet	(2) Inquiry Req'n	(3) Inquiry	(4) Shortlist	(5A) Tech Bid Evaluation & Clarification	(5B) Commercial Bid Evaluation	(6) Clarification & Negotiation	(7) Approval (int. & ext.)	(8) Call Off Agreement
Local	Local	Local	Local	Local	Local	Local	Local	Central	N/A
Central	Central	Central	Central	Central	Central	Central	Central	Central	Central

POST-AWARD ACTIVITIES	(9) Purchase Req'n	(110) Purchase / Call off Order	(11A) Seller Doc Review	(11B) Expediting	(11C) Inspection	(12) Logistics
Local	Local	Local	Local	Desk : Local Shop : Central	Desk : Local Shop : Central	Central
Central	Local	Local	Local	Desk : Local Shop : Central	Desk : Local Shop : Central	Central

Local :

- CTCI Taipei Cold Section & Utilities
- CB&I Hague Steam Cracker
- CB&I Brno Hot Section
- CB&I Gurgaon Pygas & MTBE

Central:

JV Directorate in Hague

Purpose of Centralization

Central coordination and control to

- Ensure fulfillment of ECA requirements
- Consider standardization of instruments and electrical materials/equipment
- Facilitate material control for piping, electrical and instrument bulks

Liwa專案執行挑戰的實例分享

- Interface Management
- Schedule Delay Mitigation

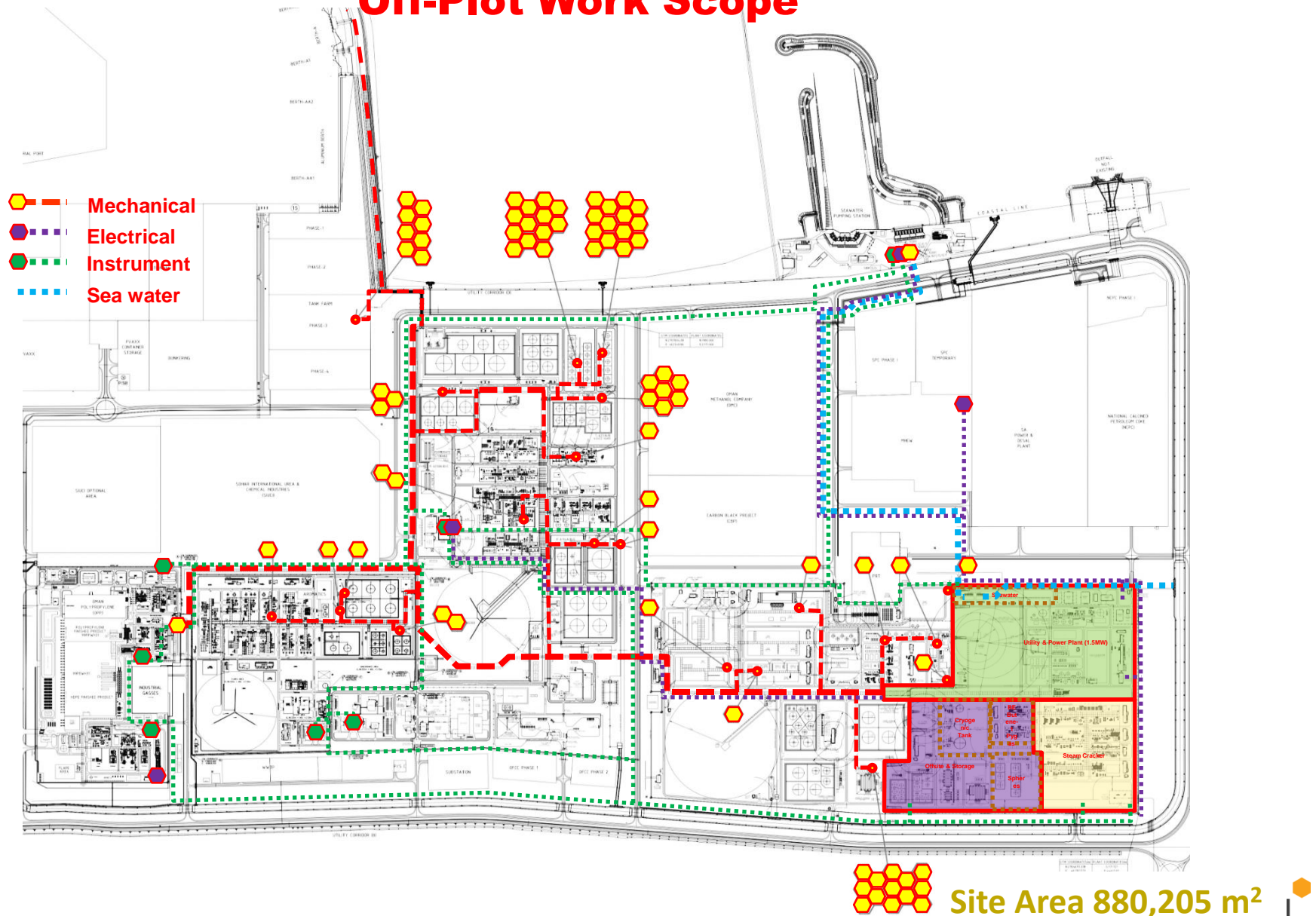
Interface & Stakeholders Management

Why are we interested in 3rd party Stakeholders?

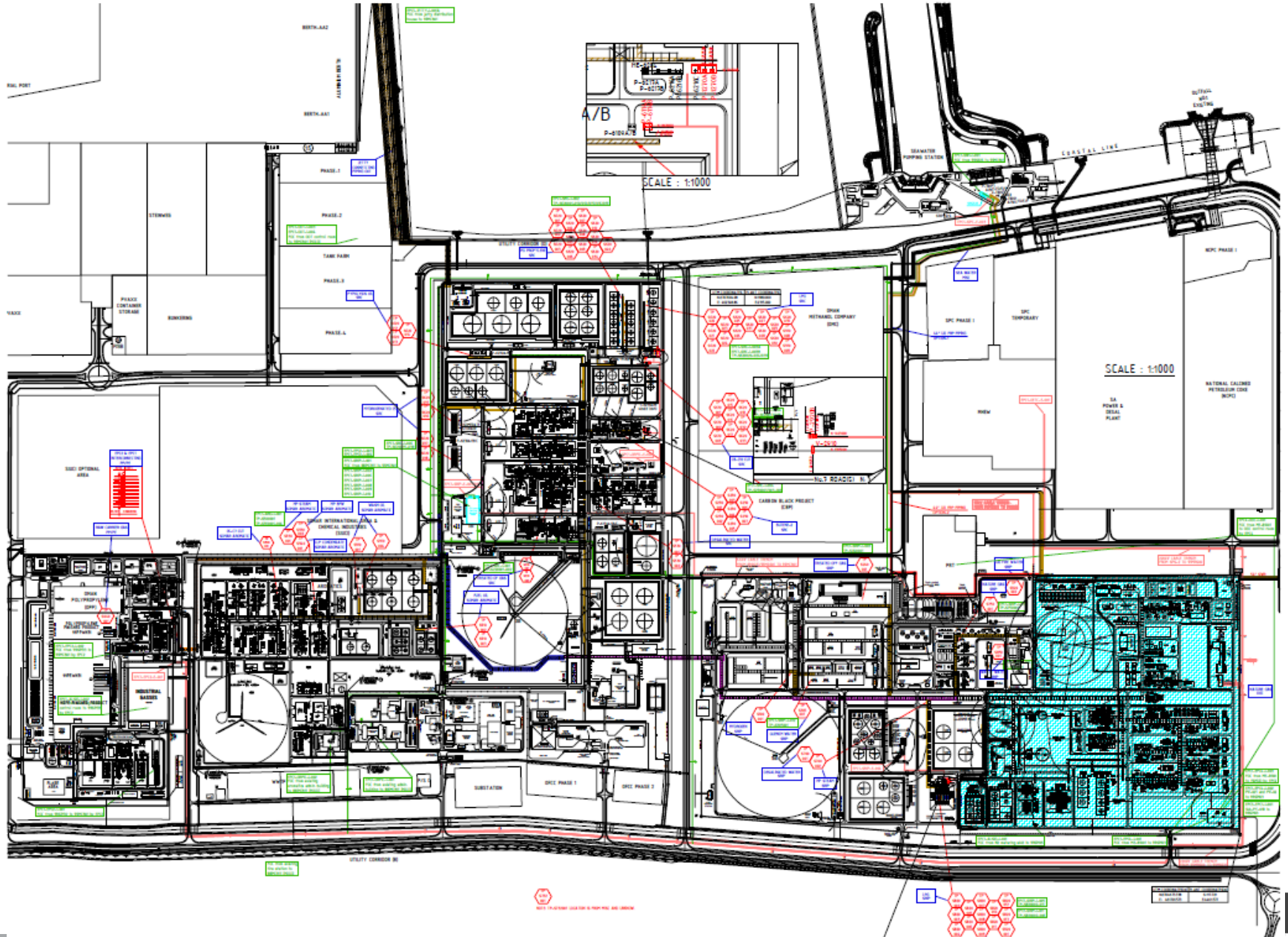
- Review and clarify scope
- Understand the similarities and differences among the 3rd parties
 - as well as the influence they have on CCJV and the EPC1 Project
- **Clarify roles and responsibilities within CCJV**
- Confirm who our counterparts are within the 3rd parties
- Discuss the nature of our interface with each 3rd party
 - What we need / want and what they need / want
- **Align on the tools and tactics we will use to manage these interfaces**
- **Brainstorm opportunities for better performance**
 - ...and risks to be mitigated
- Summarize actions

Tie-Ins – An Early View (Tender Period)

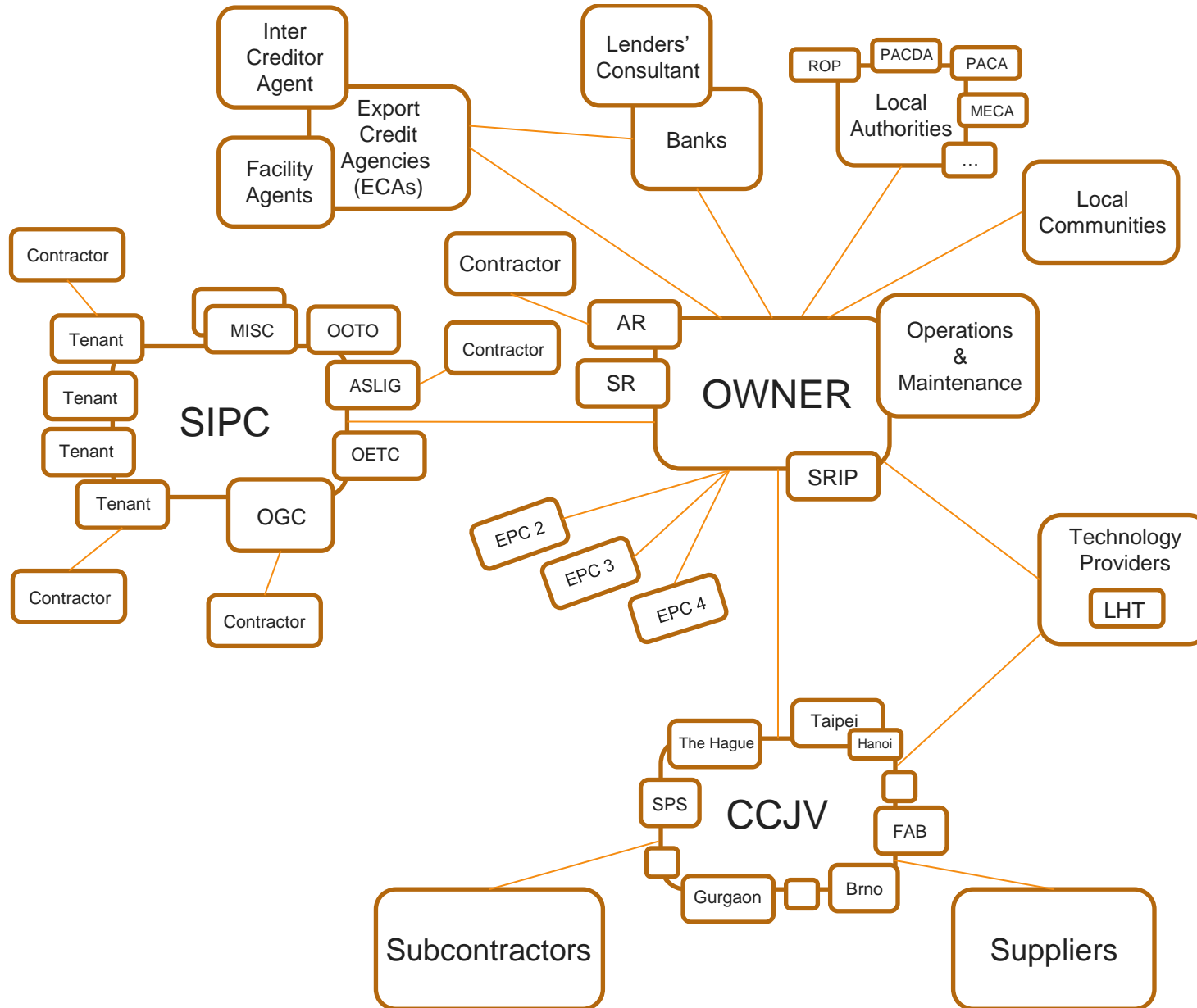
Off-Plot Work Scope



192937-0000-IM-DWG-50001 (iDocs 14.3.2.5)



Project Stakeholders



Case Study 時程延遲的處置

前言：

- ◆ 煉油石化EPC專案中的管線工作是最大量耗費人力的，所以大型專案的管線工作，管段Spool常會採境外預製，利用自動焊接機器作成可運輸的管段，運輸到工地作連結。

情境：

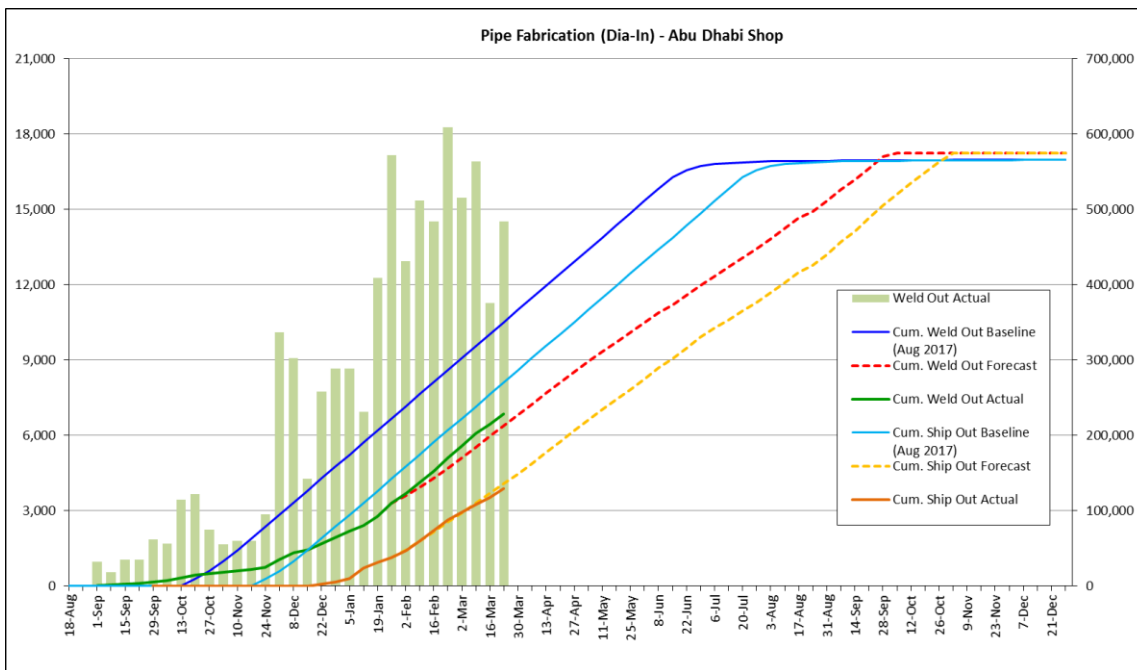
- ◆ 2016年原始計畫因設計、採購延遲，所以管段預製亦較晚開始，加上現場進度建造落後，所以於2017年底重新擬定Forecast，作為的新的Baseline。進行到2018年6月，預製廠的出貨又開始落後Forecast。如下頁(二個圖表)

處置方法：

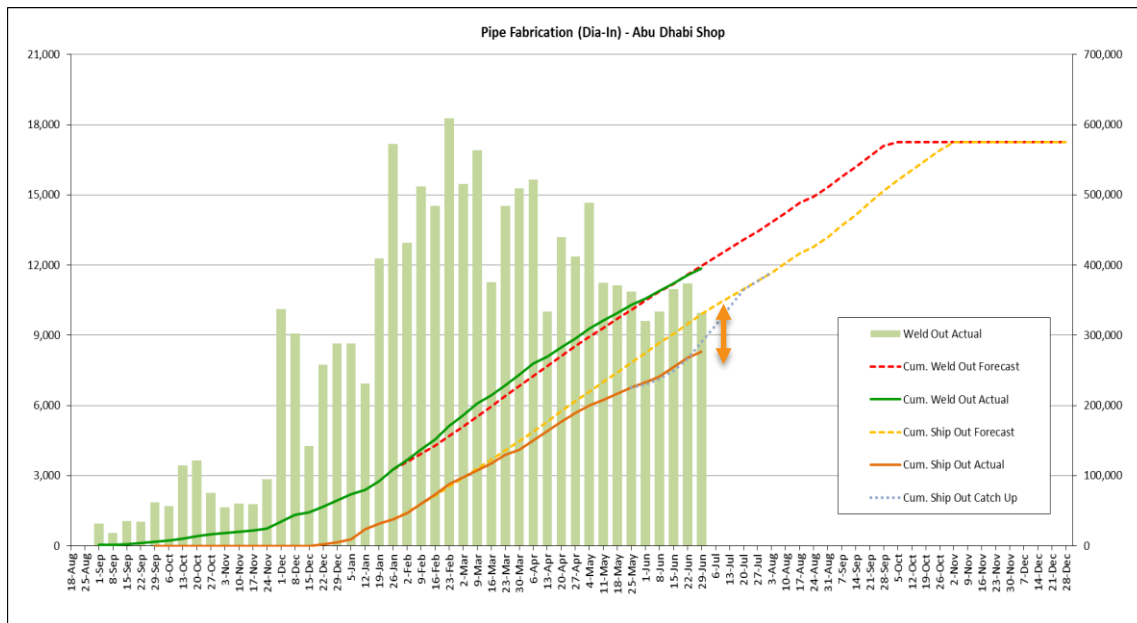
A、催預製廠趕工，評估可能的延遲，未來現場趕工。

B、鋸箭法 - 以2018年10月為限，之後的材料打包到工地去施作。

採用A或B...？



2018年1月



2018年6月

鋸箭法的好處？

- 現成的效果，建造進度可以立刻提昇
- 在工地趕工，可以更單一管理，有效的趕工
- 管理階層會見到立即的成效

CB&I 堅決反對鋸箭法，中鼎同時在馬來西亞類似的專案，是使用鋸箭法，最後證明是一場災難。

鋸箭法的壞處？

- 原本的施工計畫並不支援，管段的運送、儲存場地、追加的現場工作數量和人力
- 複雜的商業結算問題

國際EPC專案的展望

國際大型專案的學習

- 專案管理流程的延續性
 - 2015年報價、2016年2月執行到2021年RFSU
 - CB&I由McDermott合併，McDermott經歷財務危機
 - 公司具有良好的作業準則和流程
- 合作的業主與專案團隊
 - ORPIC雖為國營單位，但與EPC廠商有同舟共濟的精神
 - CCJV的Lead CBI荷蘭分公司，尊重文化差異，凝聚共識。
- 如何強化工程知識技術、經驗與產業供應鏈
 - 國際化的EPC工程人員參與
 - 相關的實務經驗 ECA (Export Credit Agency), ICV (In Country Value)
 - 製作類設備、機械加工業、泵浦與施工廠商

THANK YOU