X-XX : Project Name

Present to VACEx/Sub-PIC/PIC | Date: DD MMM YYYY

Presenters:

Project Initiator	:	Name Sur. <XX-XX-XX/XXXX>
Process Engineer	:	Name Sur. <XX-XX-XX/XXXX>
Project Engineer	:	Name Sur. <XX-XX-XX/XXXX>
or Others (pls. specify)	:	Name Sur. <XX-XX-XX/XXXX>

Summary

Project Information	Initiative ID:	xxxx-xxxxxx	MoC No:	x-xx-xxxx/xxx	Project No.:	CP-xxxx-xxxxx	Project Location:	X-XX/X-XX *(such as A-P1)*
	Project Title:	**Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx**						
	Investment Type:	**XXXX** (XXXXXX) *(such as **Sustain Core** (Operational Excellence))*						

Current Status

We are here! (Gate 3)

KOM	Gate 1	Gate 2	Gate 3	Gate 4
Kick-Off	**Phase I**	**Phase II**	**Phase III**	**Phase IV**
	KOM to Gate 1		*Gate 1 to Gate 3*	
KOM: DD MMM YYYY	Plan Gate 1: DD MMM YYYY	Plan Gate 2: DD MMM YYYY	Plan Gate 3: DD MMM YYYY	Plan Gate 4: DD MMM YYYY
	Actual Gate 1: DD MMM YYYY	Actual Gate 2: DD MMM YYYY	Actual Gate 3: DD MMM YYYY	
	Project Budget: XX.XX MTHB	Project Budget: XX.XX MTHB	Project Budget: XX.XX MTHB	
	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	
	Simplified Project: Yes/No?			

KOM to Gate1: < 1.5 Months; 1.5 - 2 Months; > 2 Months

Gate1 to Gate3: < 3 Months; 3 - 4 Months; > 4 Months

- ❑ Received OPEX XX.XX MTHB from Gate X for xxxxx and/or CAPEX XX.XX MTHB from Gate X for xxxxx
  - ✓ Completed xxxxx
  - ✓ Completed xxxxx
  - ✓ Completed xxxxx

Meeting for Current Gate

Passed:
- ✓ Meeting Name: DD MMM YYYY

In-Process/Pending:
- ❑ Cost Est. Review: DD MMM YYYY
- ❑ VACEx: DD MMM YYYY
- ❑ Sub-PIC/PIC: DD MMM YYYY
- ❑ Other *(if any, please specify)*

Today's Objective

Project request **Sub-PIC/PIC** to endorse as following details.

Proposal for:	**Gate X**; Approval to xxxxx *(such as **Gate 3**; Approval to perform Detailed Engineering, Procurement, and Construction)*				
Project Budget:	**XX.XX MTHB** *(OPEX X.XX MTHB + CAPEX X.XX MTHB)* ➢ Request **OPEX XX.XX** MTHB for xxxxx/ Request **CAPEX XX.XX** MTHB for xxxxx				
Budget Source:	xxxxx *(such as OPEX study budget (TP-PP Pool), CAPEX Mid-Year YYYY budget, CAPEX End-Year YYYY, MAX Infinity budget, MTPI budget, PIM pooled budget Year YYYY, CEO Contingency budget, Other (please specify))*				
Project Justification:	Benefit: XX.XX MTHB/Year	IRR: XX.XX %	Payback: X.X Year	RAM Level: XXX	J-Factor: X.XX
Project Schedule:	DD MMM YYYY – DD MMM YYYY				

Summary

Project Information	Initiative ID:	XXXX-XXXXXX	MoC No: x-xx-xxxx/xxx	Project No.:	CP-xxxx-xxxxx	Project Location:	X-XX/X-XX *(such as A-P1)*
	Project Title:	**Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx**					
	Investment Type:	**XXXX** (XXXXXX) *(such as **Sustain Core** (Operational Excellence))*					

Current Status

We are here! (Gate 3)

KOM	Gate 1	Gate 2	Gate 3	Gate 4
Kick-Off	**Phase I**	**Phase II**	**Phase III**	**Phase IV**
	KOM to Gate 1 (green)		*Gate 1 to Gate 3* (green)	
KOM: DD MMM YYYY	Plan Gate 1: DD MMM YYYY	Plan Gate 2: DD MMM YYYY	Plan Gate 3: DD MMM YYYY	Plan Gate 4: DD MMM YYYY
	Actual Gate 1: DD MMM YYYY	Actual Gate 2: DD MMM YYYY	Actual Gate 3: DD MMM YYYY	
	Project Budget: XX.XX MTHB	Project Budget: XX.XX MTHB	Project Budget: XX.XX MTHB	
	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	
	Simplified Project: Yes/No?			

KOM to Gate1: (green) < 1.5 Months (yellow) 1.5 - 2 Months (red) > 2 Months

Gate1 to Gate3: (green) < 3 Months (yellow) 3 - 4 Months (red) > 4 Months

- ❑ Received OPEX XX.XX MTHB from Gate X for xxxxx and/or CAPEX XX.XX MTHB from Gate X for xxxxx
  - ✓ Completed xxxxx
  - ✓ Completed xxxxx
  - ✓ Completed xxxxx

Meeting for Current Gate

Passed:
- ✓ Meeting Name: DD MMM YYYY

In-Process/Pending:
- ❑ Cost Est. Review: DD MMM YYYY
- ❑ VACEx: DD MMM YYYY
- ❑ Sub-PIC/PIC: DD MMM YYYY
- ❑ Other *(if any, please specify)*

Today's Objective

Project request **Sub-PIC/PIC** to endorse as following details.

Proposal for:	**Gate X**; Approval to xxxxx *(such as **Gate 3**; Approval to perform Detailed Engineering, Procurement, and Construction)*				
Project Budget:	**XX.XX MTHB** *(OPEX X.XX MTHB + CAPEX X.XX MTHB)* ➢ Request **OPEX XX.XX** MTHB for xxxxx/ Request **CAPEX XX.XX** MTHB for xxxxx				
Budget Source:	xxxxx *(such as OPEX study budget (TP-PP Pool), CAPEX Mid-Year YYYY budget, CAPEX End-Year YYYY, MAX Infinity budget, MTPI budget, PIM pooled budget Year YYYY, CEO Contingency budget, Other (please specify))*				
Project Justification:	Benefit: XX.XX MTHB/Year	IRR: XX.XX %	Payback: X.X Year	RAM Level: XXX	J-Factor: X.XX
Project Schedule:	DD MMM YYYY – DD MMM YYYY				

Summary

Project Information

Initiative ID: xxxx-xxxxxx	MoC No: x-xx-xxxx/xxx	Project No.: CP-xxxx-xxxxx	Project Location: X-XX/X-XX *(such as A-P1)*
Project Title:	**Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx**		
Investment Type:	**XXXX** (XXXXXX) *(such as **Sustain Core** (Operational Excellence))*		

Integration

Current Status

We are here! (Gate 3)

Kick-Off	Phase I	Phase II	Phase III	Phase IV
KOM	Gate 1	Gate 2	Gate 3	Gate 4
	KOM to Gate 1 ●		*Gate 1 to Gate 3* ●	
KOM: DD MMM YYYY	Plan Gate 1: DD MMM YYYY	Plan Gate 2: DD MMM YYYY	Plan Gate 3: DD MMM YYYY	Plan Gate 4: DD MMM YYYY
	Actual Gate 1: DD MMM YYYY	Actual Gate 2: DD MMM YYYY	Actual Gate 3: DD MMM YYYY	
	Project Budget: XX.XX MTHB	Project Budget: XX.XX MTHB	Project Budget: XX.XX MTHB	
	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	Benefit: XX.XX MTHB/Year IRR: XX.XX % Payback: X.X Year J-Factor: X.XX	
	Simplified Project: Yes/No?			

KOM to Gate1: ● < 1.5 Months ● 1.5 - 2 Months ● > 2 Months

Gate1 to Gate3: ● < 3 Months ● 3 - 4 Months ● > 4 Months

- ❑ Received OPEX XX.XX MTHB from Gate X for xxxxx and/or CAPEX XX.XX MTHB from Gate X for xxxxx
  - ✓ Completed xxxxx
  - ✓ Completed xxxxx
  - ✓ Completed xxxxx

Meeting for Current Gate

Passed:
- ✓ Meeting Name: DD MMM YYYY

In-Process/Pending:
- ❑ Cost Est. Review: DD MMM YYYY
- ❑ VACEx: DD MMM YYYY
- ❑ Sub-PIC/PIC: DD MMM YYYY
- ❑ Other *(if any, please specify)*

Today's Objective

Project request **Sub-PIC/PIC** to endorse as following details.

Proposal for:	**Gate X**; Approval to xxxxx *(such as **Gate 3**; Approval to perform Detailed Engineering, Procurement, and Construction)*				
Project Budget:	**XX.XX MTHB** *(OPEX X.XX MTHB + CAPEX X.XX MTHB)* ➢ Request **OPEX XX.XX** MTHB for xxxxx/ Request **CAPEX XX.XX** MTHB for xxxxx				
Budget Source:	xxxxx *(such as OPEX study budget (TP-PP Pool), CAPEX Mid-Year YYYY budget, CAPEX End-Year YYYY, MAX Infinity budget, MTPI budget, PIM pooled budget Year YYYY, CEO Contingency budget, Other (please specify))*				
Project Justification:	Benefit: XX.XX MTHB/Year	IRR: XX.XX %	Payback: X.X Year	RAM Level: XXX	J-Factor: X.XX
Project Schedule:	DD MMM YYYY – DD MMM YYYY				

Agenda

1. Value Assurance Checks
2. Project Background & Objectives
3. Alternatives
4. Proposal/Project Scope
5. Cost Estimate
6. Benefit and Project Justification
7. Project Schedule
8. Risk Assessment

1. Value Assurance Checks (VAC)

Key Deliverables:

Legend:

***Yes**: Required and completed, **No**: Required but not completed yet, **N/A**: Not applicable for this project*

Phase I Required Deliverables:			YES	NO	N/A	Review/Comment
General Project Deliverables	1)	Confirmed EHIA/EIA Checklist and/or Approved Document				
	2)	Labor's Market Survey/Project Organization/Resources				
	3)	MTOs/BOQs/BOMs*				
	4)	Project Cost Estimate Document as per AACE Class 5 or 4*, Cash Flow Forecast, ROU				
	5)	Project Schedule include Critical Activity				
	6)	Project Justification/Benefit Calculation Sheet				
	7)	Risk Assessment and Mitigation Plan				
	8)	e-MoC Part 2: Technical Review (Identified e-MoC Part 2, Completed Basic Design Review (BDR) & Preliminary SHE Assessment)				
	9)	Stakeholder Engagement Plan Review*				
	10)	Standard VAC Checklist for Gate 1 (If project budget greater than 50M THB)				
Engineering Deliverables	11)	Basic Process Design Document (Including Hydraulic Calculation)/Engineering Package				
	12)	Block Flow Diagram/PFDs				
	13)	P&IDs				
	14)	Heat & Material Balance*				
	15)	Utility Balance/Confirmed UTY Utility Requirement				
	16)	Plant Utility Balance (Plant Air, Instrument Air, Fuel Gas etc.)				
	17)	Equipment List				
	18)	Overall Plot Plan				
	19)	Equipment Layouts*				
	20)	Electrical Single-Line Diagrams				
Project Justification	21)	J-Factor (> 0.2)				
	22)	%IRR Sustain Core/Maintain Reliability (≥ 15%)				
	23)	%IRR Energy Saving (≥ 8.00% : WACC Y2021)				
	24)	Payback period (MAXI only)				

*Note: * Additional requirement for Simplified Project*

1. Value Assurance Checks (VAC)

Key Deliverables:

Legend:

***Yes**: Required and completed, **No**: Required but not completed yet, **N/A**: Not applicable for this project*

Phase II Required Deliverables:			YES	NO	N/A	Review/Comment
General Project Deliverables	1)	Site Conditions and Site Survey				
	2)	Confirmed EHIA/EIA Checklist and/or Approved Document				
	3)	Confirmed Permitting Checklist and Plan (e.g. Construction Permit and BOI)				
	4)	Labor's Market Survey/Project Organization/Resources				
	5)	MTOs/BOQs/BOMs				
	6)	Major/Critical Items Budgetary Quotation				
	7)	Project Cost Estimate Document as per AACE Class 4, Cash Flow Forecast, ROU				
	8)	Project Schedule include Critical Activity				
	9)	Project Justification/Benefit Calculation Sheet				
	10)	Construction Plans (Including Rigging Plan, Constructability Review, Fabrication/Modularization Plan)				
	11)	Risk Assessment and Mitigation Plan				
	12)	e-MoC Part 2: Technical Review (Identified e-MoC Part 2, Completed BDR, Prelim SHE Assessment & DIRR Review)				
	13)	Stakeholder Engagement Plan Review				
	14)	Peer Review/ PDRI (If project budget greater than 300M THB)				
	15)	Standard VAC Checklist for Gate 2 (If project budget greater than 50M THB)				
Engineering Deliverables	16)	Basic Process Design Document (Including Hydraulic Calculation)/Engineering Package				
	17)	Block Flow Diagram/PFDs				
	18)	P&IDs				
	19)	Heat & Material Balance				
	20)	Utility Balance, Confirmed UTY Utility Requirement, Plant Utility Balance (Plant Air, Instrument Air, Fuel Gas etc.)				
	21)	Major Equipment Sizes, Analysis of Existing Equipment				
	22)	Overall Plot Plans, Equipment Layouts				
	23)	Major Foundation/Structure Sketch				
	24)	Electrical Single-Line Diagrams				
	25)	Hazardous Area Classification				
Project Justification	26)	J-Factor (> 0.2)				
	27)	%IRR Sustain Core / Maintain Reliability (≥ 15%)				
	28)	%IRR Energy Saving (≥ 8.00%: WACC Y2021)				
	29)	Payback period (MAXI only)				

1. Value Assurance Checks (VAC)

Key Deliverables:

Legend:

***Yes**: Required and completed, **No**: Required but not completed yet, **N/A**: Not applicable for this project*

Phase III Required Deliverables:			YES	NO	N/A	Review/Comment
General Project Deliverables	1)	Site Conditions and Site Survey				
	2)	Confirmed EHIA/EIA Checklist and/or Approved Document				
	3)	Confirmed Permitting Checklist and Plan (e.g. Construction Permit and BOI)				
	4)	Labor's Market Survey/Project Organization/Resources				
	5)	MTOs/BOQs/BOMs				
	6)	Major/Critical Items Budgetary Quotation				
	7)	Project Cost Estimate Document as per AACE Class 3, Cash Flow Forecast, ROU				
	8)	Project Schedule include Critical Activity				
	9)	Project Justification/Benefit Calculation Sheet				
	10)	Construction Plans (Including Rigging Plan, Constructability Review, Fabrication/Modularization Plan), Tie-in Plans				
	11)	Risk Assessment and Mitigation Plan				
	12)	e-MoC Part 2: Technical Review (Identified e-MoC Part 2, Completed BDR, Prelim SHE Assessment & DIRR Review)				
	13)	Stakeholder Engagement Plan Review				
	14)	Peer Review/ PDRI (If project budget greater than 300M THB)				
	15)	Project Charter				
	16)	Standard VAC Checklist for Gate 3 (If project budget greater than 50M THB)				
Engineering Deliverables	17)	Approved Process Engineering Design Report (Including Hydraulic Calculation)/ Engineering Package				
	18)	Approved P&IDs (Completed Material Selection)				
	19)	PHA i.e., HAZOPs, What-If, Checklist				
	20)	Heat & Material Balance				
	21)	Utility Balance, Confirmed UTY Utility Requirement, Plant Utility Balance (Plant Air, Instrument Air, Fuel Gas etc.)				
	22)	Major Equipment Sizes/Equipment Data Sheet/Specification				
	23)	Major Equipment Sizes, Analysis of Existing Equipment				
	24)	Approved Overall Plot Plans, Approved Equipment Layouts				
	25)	Major Foundation/Structure Sketch				
	26)	Electrical Single-Line Diagrams				
	27)	Approved Hazardous Area Classification				
Project Justification	28)	J-Factor (> 0.2)				
	29)	%IRR Sustain Core / Maintain Reliability (≥ 15%)				
	30)	%IRR Energy Saving (≥ 8.00%: WACC Y2021)				
	31)	Payback period (MAXI only)				

1. Value Assurance Checks (VAC)

MOM of Previous Meeting & Previous Gate (e.g., VAC, Sub-PIC, PIC), Meeting on DD MMM YYYY:

O-P2.3 Install TBC removal unit for C4-C5 Btm BD column recovery to BHU Project request PIC to endorse **Gate 3 (±10%)** Project **budget: 59** MTHB Investment type: **Sustain Core** (Operational Excellence) Benefit: 13.3 MTHB/Year IRR: 22.5 % Payback: 4.4 Year Project Schedule: June 2019– December 2020 ***Passed* VAC Gate-3** and can propose to gate decision committee with comments. **Comments from VAC committees;** 1. Project team to show process conditions in simplified diagram and to use same line color meaning in other slide to easy understanding. 2. Project team to recheck and confirm if TBC removal will gene[illegible]y other negative effect e.g. 3. Project team to confirm that what will happen with BH[illegible] unit cannot function. 4. Project team to recheck and confirm that after TBC [illegible]val, we can send to quench tower as original design or not. 5. Project team to check fire water spraying ra[illegible] installed location to ensure that it is enough. 6. Project team to review flare load to e[illegible]hat it is enough. 7. Project team to recheck if SIL is req[illegible] because it may affect to project cost. 8. Project team to discuss about the confirmed EIA checklist with Q-EH-EV team (K. Bussarin K <Q-EH-EV/1311>) again to ensure that IEE is required or not because it will affect to project schedule. 9. Project team to correct DB in cost estimate table. 10. For benefit and project justification, • Project team to recheck benefit calculation by considering yield of recovered C4 because it is not same as feed LPG. • Project team to revise operating day per year by considering T/A. • Project team to show sensitivity scenario for different C4 recovery rate to support the reason of why 80% is selected. 11. Project team to show two (2) schedule scenario base on following cases. • IEE is not required. • IEE is required. 12. During waiting for checking fouling result in T/A period, Project team can proceed only engineering and tie-in work first. 13. Project team to add IEE issue into risk and mitigation plan table as well. 14. Project team to complete all VAC comments and submit the revise presentation for review again before present PIC.	Project Team	Next PIC meeting

1. Value Assurance Checks (VAC)

Comments Closure of Previous Meeting (e.g., VAC, Sub-PIC, PIC), Meeting on DD MMM YYYY:

Comments from MOM xxxxx Meeting on DD MMM YYYY	Status	Clarifications/Notes

2. Project Background & Objectives

Project Background (History/Situation/Problem/Opportunity):

Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

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Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Project Objectives:

1) xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
2) xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

3. Alternatives

xx

No.	Description	Pros	Cons
1 **Selected**	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
2	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
3	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
4	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	• xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx • xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Project team selects Alternative 1) because xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

4. Proposal/Project Scope

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Demolition:

- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Modification:

- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

New:

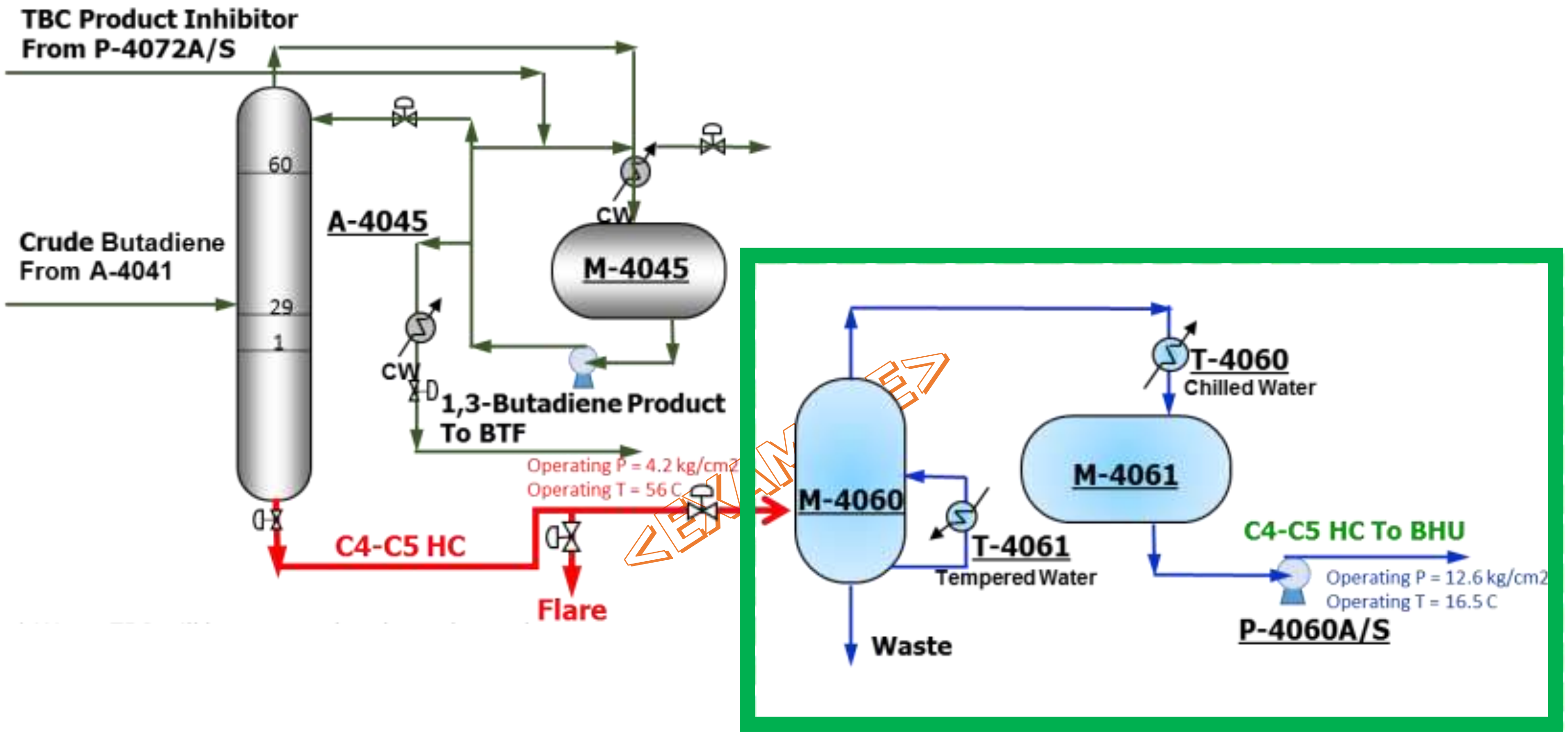
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

Legend:

Line	Meaning
solid black line	: Existing
dashed grey line	: Demolition
solid red line	: Modification (Project Scope)
solid green line	: New (Project Scope)
solid blue line	: xxxx (if any)

Process Description/Block Flow Diagram/Process Flow Diagram/Marked-up P&ID

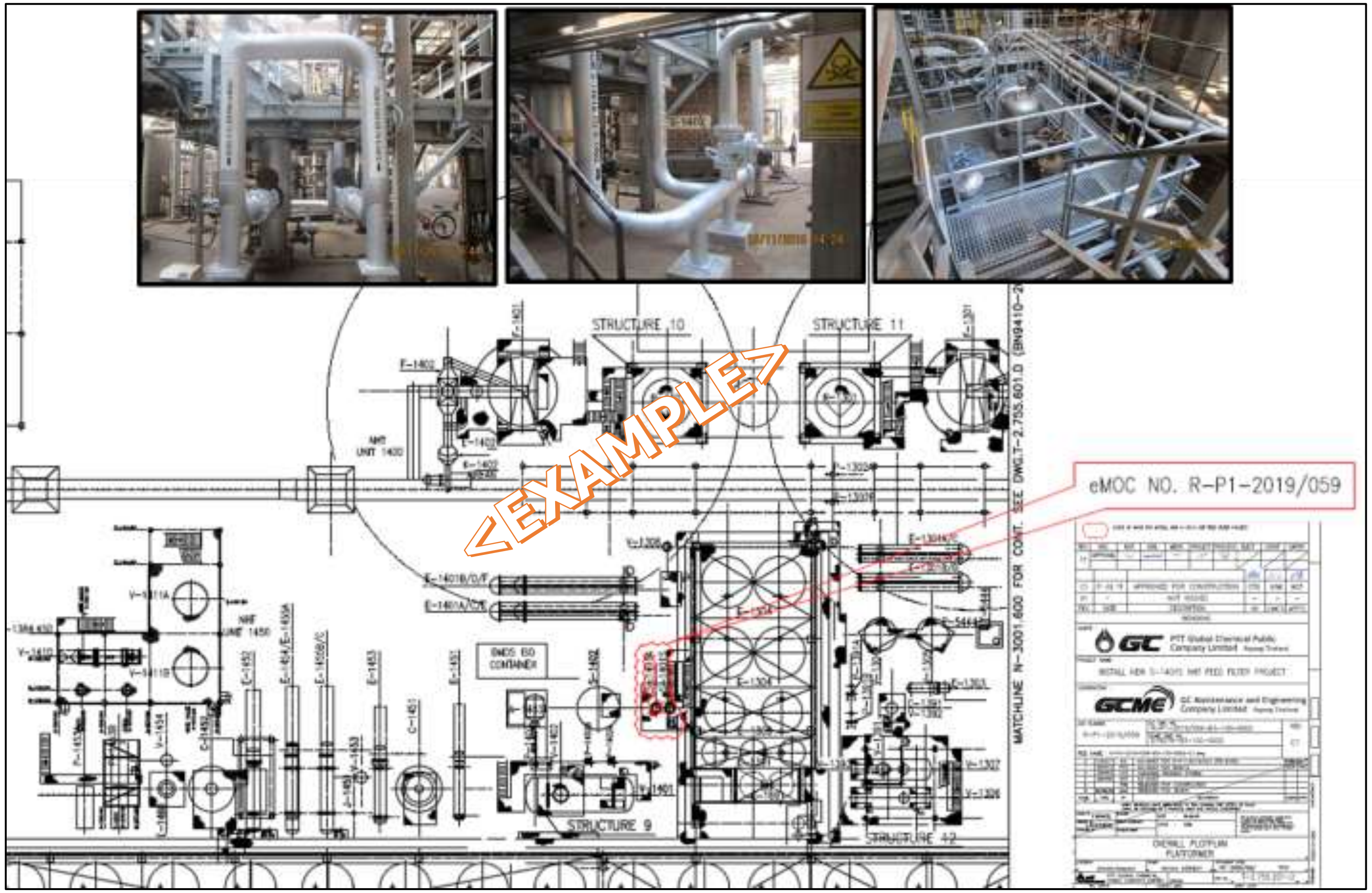
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX



Legend:	
(solid black line)	: Existing
(dashed grey line)	: Demolition
(red line)	: Modification (Project Scope)
(green line)	: New (Project Scope)
(blue line)	: xxxx (if any)

Plot Plan/Site Photos/GA Drawings

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX



Legend:	
▬▬▬ (black solid line)	: Existing
▬ ▬ ▬ (grey dashed line)	: Demolition
▬▬▬ (red line)	: Modification (Project Scope)
▬▬▬ (green line)	: New (Project Scope)
▬▬▬ (blue line)	: xxxx (if any)

Safety/Constructability/Operability/Maintainability Review

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
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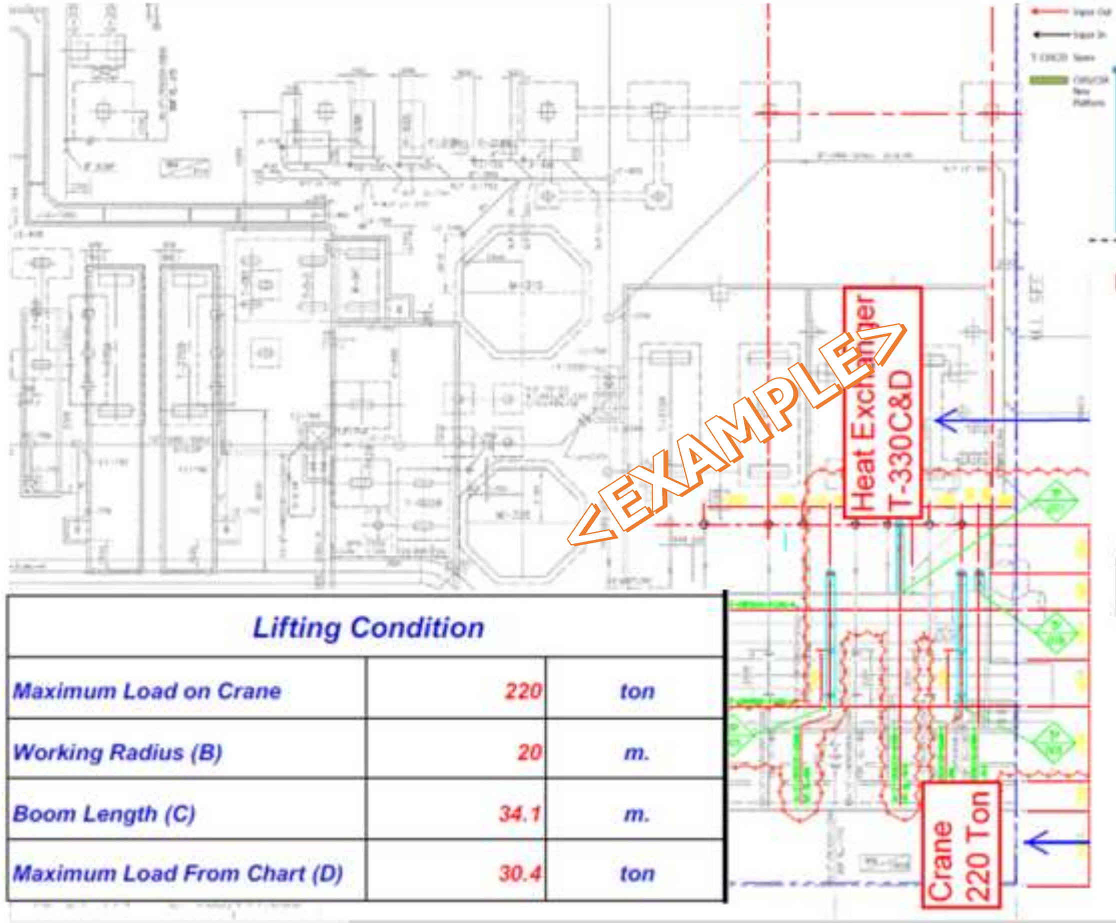
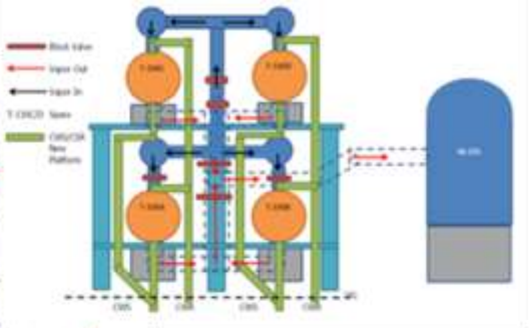
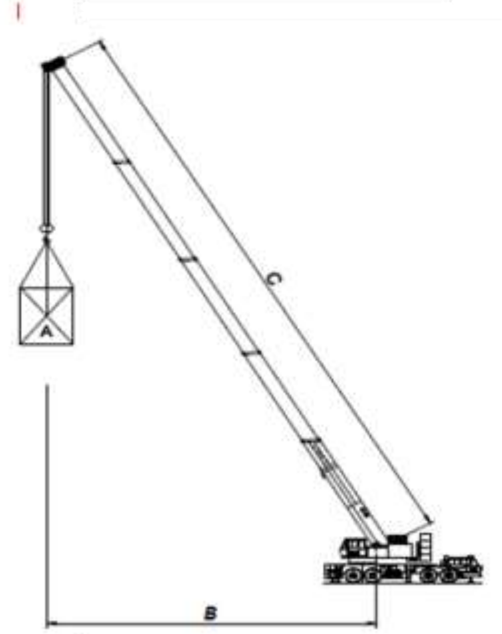


Lifting Condition		
Maximum Load on Crane	220	ton
Working Radius (B)	20	m.
Boom Length (C)	34.1	m.
Maximum Load From Chart (D)	30.4	ton





5. Cost Estimate

Overall Project Cost (OPEX + CAPEX): AACE Class X

Reviewed by Name Sur. <XX-XX-XX/XXXX>

COST ITEM	DESCRIPTION	TOTAL (THB)	REMARKS
1	**PROJECT STUDY OPEX**		
2	**DETAILED ENGINEERING**		
3	**PROCUREMENT**		
3.1	**EQUIPMENT**		
3.1.1	MECHANICAL		
3.1.2	ELECTRICAL		
3.1.3	INSTRUMENT		
3.2	**BULK MATERIALS**		
3.2.1	PIPING		
3.2.2	ELECTRICAL		
3.2.3	INSTRUMENT		
4	**CONSTRUCTION**		
4.1	**CIVIL WORK**		
4.2	**PIPING WORK**		
4.2.1	SHOP WELDING		
4.2.2	FIELD WELDING		
4.2.3	NDE , CLEANING/FLUSHING AND PRESSURE TEST		
4.2.4	INSULATION & PAINTING		
4.2.5	TEMPORARY AND CONSTRUCTION FACILITIES EQUIPMENT AND OTHER		
4.3	**MECHANICAL WORK**		
4.4	**ELECTRICAL WORK**		
4.5	**INSTRUMENT WORK**		
4.6	**PROJECT MANAGEMENT , SUPERVISION AND TAX DUTY**		
5	**OWNER COST**		
6	**CONTINGENCY (10%)**		
	OVERALL PROJECT COST		

Please use this template
"DO NOT MODIFY"

5. Cost Estimate

Details of OPEX Cost Estimate and Deliverables:

Reviewed by Name Sur. <XX-XX-XX/XXXX>

COST ITEM	DESCRIPTION	TOTAL (THB)	DELIVERABLES
1	**ENGINEERING**		
1.1	PROJECT ENGINEER		
1.2	ESTIMATOR ENGINEERING		
1.3	PROCESS ENGINEERING		
1.4	PIPING ENGINEERING		
1.5	CIVIL/STRUCTURAL ENGINEERING		
1.6	MECHANICAL ENGINEERING		
1.7	ELECTRICAL ENGINEERING		
1.8	INSTRUMENT ENGINEERING		
1.9	SAFETY ENGINEERING		
	TOTAL OPEX		

For Request OPEX only

XXX

5. Cost Estimate

Details of CAPEX Cost Estimate for Tie-In work/ Long Lead Items:

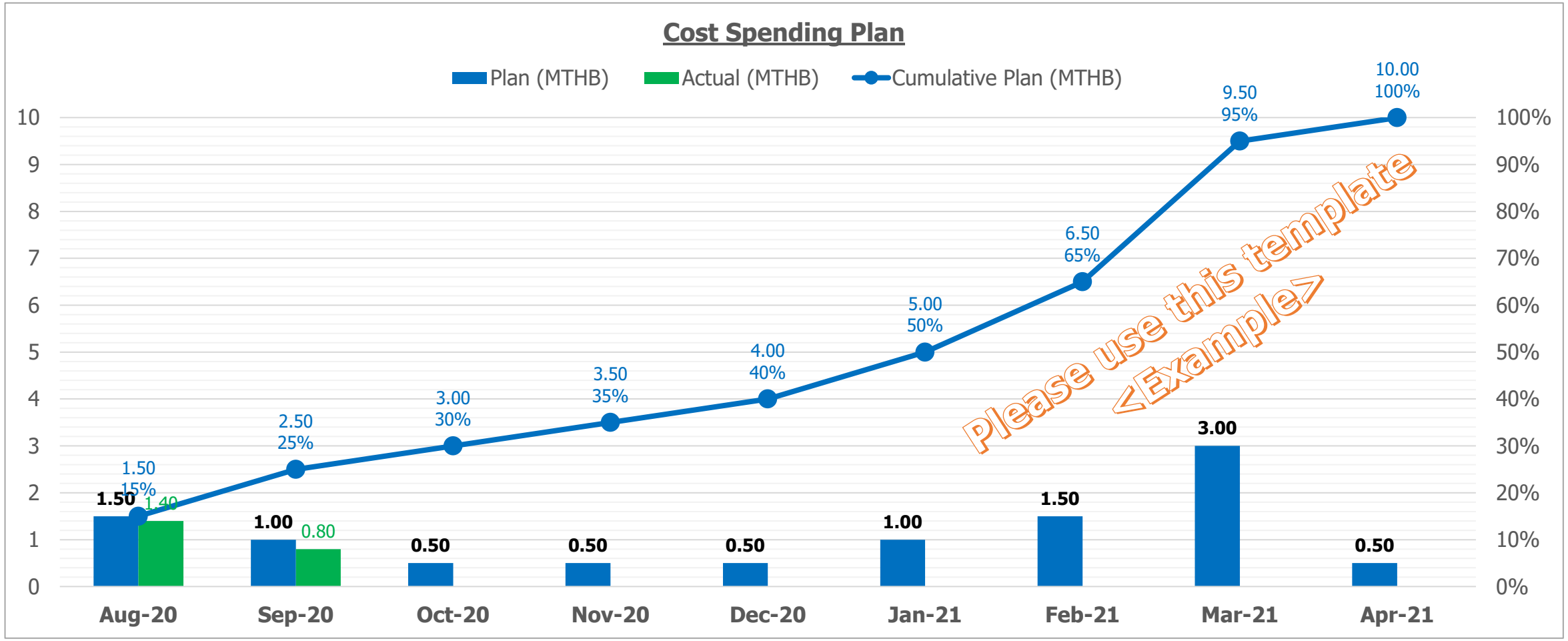
Reviewed by Name Sur. <TP-PM-CC/XXXX>

COST ITEM	DESCRIPTION	TOTAL (THB)	REMARKS
1	**PROJECT STUDY OPEX**		
2	**DETAILED ENGINEERING**		
3	**PROCUREMENT**		
3.1	**EQUIPMENT**		
3.1.1	MECHANICAL		
3.1.2	ELECTRICAL		
3.1.3	INSTRUMENT		
3.2	**BULK MATERIALS**		
3.2.1	PIPING		
3.2.2	ELECTRICAL		
3.2.3	INSTRUMENT		
4	**CONSTRUCTION**		
4.1	**CIVIL WORK**		
4.2	**PIPING WORK**		
4.2.1	SHOP WELDING		
4.2.2	FIELD WELDING		
4.2.3	NDE , CLEANING/FLUSHING AND PRESSURE TEST		
4.2.4	INSULATION & PAINTING		
4.2.5	TEMPORARY AND CONSTRUCTION FACILITIES EQUIPMENT AND OTHER		
4.3	**MECHANICAL WORK**		
4.4	**ELECTRICAL WORK**		
4.5	**INSTRUMENT WORK**		
4.6	**PROJECT MANAGEMENT , SUPERVISION AND TAX DUTY**		
5	**OWNER COST**		
6	**CONTINGENCY (10%)**		
	OVERALL PROJECT COST		

For Request CAPEX for Tie-In work/ Long lead items

5. Cost Estimate

Cost Spending Plan:



6. Benefit and Project Justification

Basic Assumption

Basic Assumptions			Remarks
Price Assumption:			
Feed/Product	xxx	THB/Unit	
Utility	xxx	THB/Unit	
Others (i.e. Land Cost)	xxx	THB/Unit	
Financial:			
Project Life Time/Depreciation	20	Years	
Equity	100	%	
Interest Loan Rate	5.5	%	*Include Interest During Construction / Working Capital Interest /Short term Loan*
WACC (Y2021)	8.00	%	
FX Rate	xx.x	THB/	
Tax	20	%	
CPI	0	%	*Corporate Assumption*
Contingency Cost	xx	%	
Others:			
Operating Days	xxx	Days/Year	
Maintenance	1.5	% of Investment Cost	
Insurance	1	% of Investment Cost	

6. Benefit and Project Justification

Benefit Assumption & IRR Calculation

Reviewed & confirmed that the benefit calculation is correct and not redundant with other projects by:	**Name Sur. <XX-XX-XX/XXXX>**

Benefit gained of this project is from reduction of steam consumption at E-1305

Assumption :
Op. time = 8022 hr/yr
Steam 40 price = 1050 THB/ton

Benefit Calculation :
Steam S40 saving = 1.55 T/hr
= 1.55 x 1050 x 8022
= 13,053,379 THB/yr

(For Sustain Core & Maintain Reliability Project Only)
<EXAMPLE>

2.2) Growth or Sustain Core or BAU (Maintain Reliability) Project Categorization	
Total Investment Cost (฿)	47,500,000
Project Starting Year	2021
Project Completion Year	2022
Residual Value (฿)	
Utilities (฿/year)	
Labour (฿/year)	-
Maintenance (% of total investment cost)	1.5%
Catalyst & Chemicals (฿/year)	-
Benefits (฿/year)	13,053,379
Profit (฿/year)	12,340,879
Simple Payback (Year)	5.67
IRR	18.02%
NPV	46,826,833
WACC (as per latest announced Corporate Assumption)	8.00%

Benefit Calculation		
Investment	47.50	MTHB
Benefit	13.05	MTHB/Year
IRR @ 20 Years	18.02	%
NPV@ WACC 8.00%	46.82	MTHB
Simple Payback	5.67	Years

Because the categorization of this project is Sustain Core (Energy Saving). And IRR is **18.02%** and Simple Payback **5.67** years so this project should consider to invest.

Performance Lookback (Gate 4) will be performed by **Name Sur. <XX-XX-XX/XXXX>**

6. Benefit and Project Justification

Sensitivity Analysis

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Base IRR = xx.x%

Case 1: Price set (± 10%)

Case 2: Volume (± 10%)

Case 3: Cost (± 10%)

Case 4: Delay (± 1 month)

Case 5: Others (Pls specify)

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

6. Benefit and Project Justification

Risk Assessment Matrix (RAM)

Reviewed by Name Sur. <Q-TS-TS/XXXX>

Consequence:
>> Social (Law/Regulation)

Severity Number:
>> (3) Non-compliance with Thai's law and regulation Y2019 about storage location of LPG and containment

Likelihood:
>> Likely (4) Has happened at the location at GC8 as non-compliance with Thai's law since 2019

Criticality:
>> High

Since this project criticality is high, Then J-Factor is calculated for further project justification.

	General Term (No.)	How often?	Criticality of Project Category – SHE & Law & Not in kind Replacement				
Likelihood	Frequent (5)	Has happened more than once per year in the Location	Low	Medium	High	Extreme	Extreme
	Likely (4)	Has happened at the Location or more than once per year in the PTTGC group	Low	Medium	High	High	Extreme
	Possible (3)	Has happened in the PTTGC group or more than once per year in the Industry	Low	Low	Medium	High	High
	Unlikely (2)	Possible to occur in the Industry (or has occurred)	Very Low	Low	Low	Medium	Medium
	Improbable (1)	Unlikely to occur in the Industry (or has not occurred)	Very Low	Very Low	Low	Low	Low
Consequence	Severity Number		(1)	(2)	(3)	(4)	(5)
	People (Safety, Health, Morale)		- No injury or First Aid case - No or very low health effect - No or Minimal impact	- Medical treatment or Lost time to work - Low health effect - Short term impact	- Loss time injury - Medium health effect - Long-term morale impact	- Single fatality or Permanent total disabilities - High health effect - Protesters rally or official complaint	- More than one fatality - High health effect - Employees or Contractors strike
	Environment		Slight Effect	Minor Effect	Moderate Effect	Major Effect	Massive Effect
	Economic (Total Loss)	Upstream Plant (THB)	< 0.3 M	0.3 - < 3 M	3 - < 30 M	30 - < 300 M	≥ 300 M
		Downstream Plant (THB)	< 0.1 M	0.1 - < 1 M	1 - < 10 M	10 - < 100 M	≥ 100 M
		GC-S and small Plant (THB)	< 0.01 M	0.01 - < 0.1 M	0.1 - < 1 M	1 - < 10 M	≥ 10 M
	Social (Community, Reputation, Customer, Law/Regulation)		- No or Slight impact to Community, Reputation and Customer - No fault or insignificant fault of complying with laws	- Minor impact with Short term recovery - Local media - Verbal complaints - Partly comply with laws	- Moderate impact with long term recovery - Regional media - Official letter complaint - Non-compliance with laws	- Major impact with national concern - National media - Customer less purchase - Violate the laws	- Massive impact with international concern - International media - Customer stop purchase - Violate the laws and/or subject to order to dissolve the company

(For Business as Usual and aintain Reliability Project)
<EXAMPLE>

6. Benefit and Project Justification

Reference Case for J-Factor Calculation

Reviewed by Name Sur. <Q-TS-TS/XXXX>

กฎกระทรวง

สถานที่เก็บรักษาก๊าซปิโตรเลียมเหลวประเภทสถานที่ใช้

พ.ศ. ๒๕๖๒

(๓) บริเวณพื้นใต้ถังเก็บและจ่ายก๊าซปิโตรเลียมเหลวต้องไม่ต่ำกว่าระดับพื้นภายนอก และต้องทำให้ลาดต่ำลงไปทางด้านใดด้านหนึ่งตามความเหมาะสม โดยต้องเทคอนกรีตหรือลาดด้วยยางแอสฟัลท์ให้เรียบ ไม่มีร่อง บ่อ หรือที่ต่ำซึ่งจะเป็นที่สะสมก๊าซปิโตรเลียมเหลวได้ ภายในรัศมี ๓.๐๐ เมตร โดยรอบถังเก็บและจ่ายก๊าซปิโตรเลียมเหลว

According to API Standard 2510

5.2 DRAINAGE

5.2.1 The ground under and surrounding a vessel used to store LPG shall be graded to drain any liquid spills to a safe area away from the vessel and piping. The grading shall be at a slope of at least 1%.

5.5.4 The holdup of the diked area shall be at least 25% of the volume of the largest vessel within it. If the material stored in the vessel has a vapor pressure that is less than 100 psia at 100°F, the holdup for the diked area shall be at least 50% of the volume of the largest vessel within it. Larger holdups shall be provided in the diked area at locations where the expected vaporization is less than that indicated by the material's vapor pressure because of climatic conditions or the physical properties of the material.

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

6. Benefit and Project Justification

J-Factor Calculation

Reviewed by Name Sur. <Q-TS-TS/XXXX>

Annual Likelihood:
>> Expected to happen

As the condition of non-compliance has been already occurred and remain.

Exposure Factor:
>> Continuous

This unit is operated continuously, there fore condition of non-compliance is continuous.

Effectiveness of Alternative:
>> 100%

By implementing this project, condition of non-compliance will be 100% eliminated.

J-Factor:
>> 5.88

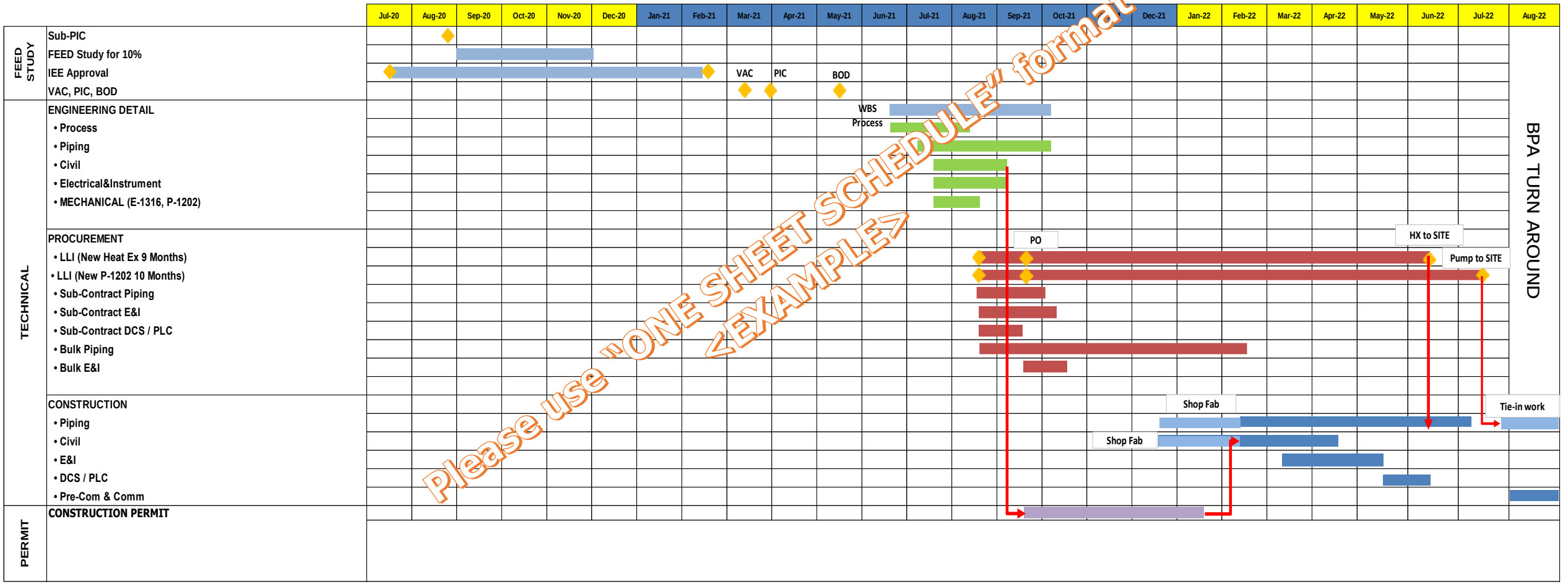
Clearly justifiable

2.1) BAU (Safety, Environment and Law & Regulation) Project Categorization				
RAM Assessment (Criticality)	High	(if RAM assessment result is Very low or Low, No investment)		
Base Risk, the risk without any modifications				
Potential Consequence Cost (Enter RAM Cost from below or enter own calculation as per detail)				30,000,000
RAM translator, enter severity Number from RAM	3	RAM eq Cost	30,000,000 Baht(B)	
Annual Likelihood (Use drop down menu or enter own calculation)			Expected to ha	1
Exposure Factor (Use drop down menu or enter own calculation)			Cont	1
Calculated annual Probability				1
Annualised Base Risk (B/year)				**30,000,000**
Risk of Alternative				
Effectiveness of alternative	Eliminates the Risk 100%		tion in Risk	100%
Annualised Risk of Alternative (B/year)				**0**
Cost of Alternative				
Project Cost of Alternative (B)				5,100,000
Production Loss during Implementation (B)				0
Increase in Operating Costs or other economic pen				0
Decrease in Operating Costs or other econom nefits (B)				0
Project Life Time to convert Opex/Pe to once off Cost(years)				10
Pay Out Time Investment Crite convert benefits into economically justifiable Cost (years)				0
Cost of Risk Reduct				**5,100,000**
Annualised Ba sk (B/year)				**30,000,000**
Annua k of Alternative (B/year)				**0**
C of Risk Reduction (B)				**5,100,000**
Justification Factor				**5.88**

(For Business as Usual and Maintain Reliability Project)
<EXAMPLE>

7. Project Schedule

Plan to Complete: AUG 2022



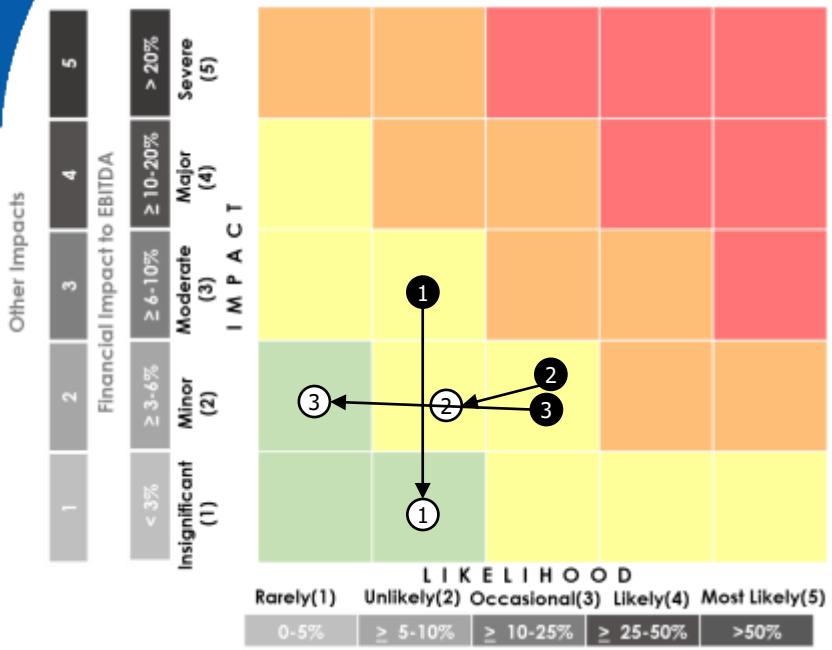
7. Project Schedule

Key Milestones:

xxx

No.	Activity	Target	Remarks
1	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	MMM YYYY	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
2	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	MMM YYYY	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
3	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	MMM YYYY	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
4	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	MMM YYYY	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

8. Risk Assessment



Risk Details Phase : 1

No.	Risk Factors	Description *(Event and Consequences of Uncontained risk or Cause)*	Inherent Risks *(Before Mitigation)*		Mitigation Plan *(Proposed/Existing Key Controls)*	Residual Risks *(After Mitigation)*		Expected Mitigation Completion Date	Risk Owner *(Action By)*	Risk Status
			Impact, Likelihood	Risk Level		Impact, Likelihood	Risk Level			
1	Project Management	Schedule slippage due to **EHIA approval delay** that project completion may not match Olefins I-1 T/A schedule	3, 2		• EHIA is included in EHIA of OIP project and already submitted for approval, Plan to get approval by Feb-22 • Closed following up and quick response as requested (if any)	1, 2		10-Feb-22	Project Team and OIP Project Team	Monitoring
2	Procurement	Schedule slippage due to **Equipment/material delay** that project completion may not match Olefins I-1 T/A schedule	2, 3		• Matching project schedule with Olefins I-1 T/A schedule • Issue plan for Gate 3 presentation to get budget approval on time • Issue PR/PO on time • Closed monitoring on manufacturing and delivery progress	2, 2		T/A 2023	Project Team	Identified
3	Project Management	Project cost overrun due to **project scope change**	2, 3		Ensure and freeze project scope by following action • Scope for EGF modification shall be studied by JZ during FEED • Full Pipe Stress Analysis is required during FEED • HAZOP review • Constructability review	2, 1		10-Dec-21	Project Team	Identified

Risk Level

- Critical
- Significant
- Low
- Very Low

Risk Status	Description
Identified	New item identified and awaiting action.
In-Progress	Item undergoing treatment/mitigation activities.
Closed & Monitor Risk	Treatment/Mitigation activities completed and being monitored
Closed & Risk Eliminated	Fully closed mitigation activities and ensuring risk eliminated
Accepted	Accepting the risk and its impact should it occur
Rejected	Rejection is when the organization decides that continuing to take the risk is untenable so rejects the risk and/or risk invalid

8.1 Lessons Learned from Other Sources

Project team have studied lessons learned of project xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx and applied the following lessons learned for this project.

No.	Topic	Source/ Ref. no.	Lessons Learned Description
1	xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx	xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx	**What happened?:** Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx **Why did it happen?** Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx **Lessons Learned/What to be improved?** Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
2	xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx	xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx	**What happened?:** Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx **Why did it happen?** Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx **Lessons Learned/What to be improved?** Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

8.2 Capture of Current Phase Lessons Learned

This project have lessons learned as below.

No.	**Issues** (What happened?)	**Background** (Why did it happen?)	**Lessons Learned** (Lessons Learned/What to be improved?)
1	xxxxxxxxxx	xxxxxxxxxx	• xxxxxxxxxx • xxxxxxxxxx
2	xxxxxxxxxx	xxxxxxxxxx	• xxxxxxxxxx • xxxxxxxxxx
3	xxxxxxxxxx	xxxxxxxxxx	• xxxxxxxxxx • xxxxxxxxxx
4	xxxxxxxxxx	xxxxxxxxxx	• xxxxxxxxxx • xxxxxxxxxx
5	xxxxxxxxxx	xxxxxxxxxx	• xxxxxxxxxx • xxxxxxxxxx

Thank You

Backup A

Backup A will be sent to
slide reviewers/committee to increase their
understanding about the project content

Backup B

Backup B will **NOT** be sent to slide reviewers/committee. It is supplementary information presenter may need during project presentation.

Appendix

Appendix A:
Cost Estimation Guideline

(Cf. P-(TP-PM-CC)-001: Project Cost Estimate Process)

Appendix A: Cost Estimation

AACEI Estimate Classes

AACE GATES	IDENTIFY	EVALUATE	DEFINE		EXECUTE
Estimate Class	5	4	3	2	1
Estimate Type	Factored or Parametric Models	Factored or Parametric Models	Factored and/or Quantity Based	Quantity Based	Quantity Based
Estimate Category	Concept Screening	Study / Feasibility	Budget Authoriza-tion	Control / Bid Tender	Check Estimate
Level of Project Definition	0% - 2%	1% - 15%	10% - 40%	30% - 70%	50% - 100%
Estimate Accuracy	-50%/+100%	-15% / +50%	-10% / +30%	-5% / +20%	-3 / +15%
Contingency	30% to 50%	20% to 25%	10% to 15%	< 10%	< 5%

- AACE International Recommended Practice No. 18R-97, Estimate Accuracy Definitions (American Association of Cost Engineering)

Appendix A: Cost Estimation

Required Level Of Project Definition

AACEI Class 5 Identify & Assess Phase Order of Magnitude Estimate	• Scenarios developed. • Locations of plant and main processes and facility types specified.
AACEI Class 4 Select Phase Screening Estimate	• Major equipment specifications, flow diagrams, plot plans, location plans available. • Outline Basis of Design, Project Technical Specification and Project Strategy available. • Develop work breakdown structure.
AACEI Class 3 or Class 2 Define & Develop Phase Control Estimate	• Choice of technology made. • BOD produced and finalised • Project locations and environmental conditions studied and surveyed • All Equipment confirmed, capacity ratings finalised • Flow and line diagrams finalised • Quantified material take offs of bulk materials produced • Project schedule prepared • Value improvement practices carried out. • Operations and maintenance needs defined. • Safety reviews completed
AACEI Class 2 or Class 1 Execute Phase Definitive Estimate	• Major equipment ordered. • Design nearing completion. • Final material take offs of bulk materials made. • Major contracts let. • Construction commences.

Appendix B:
Project Justification Guideline

(Cf. P-(TP-PM)-OEMS-001: Plant Investment Management _R1)

Appendix B: Project Justification Guideline

PIM Investment Criteria

Investment Type	Criteria		
Sustain Core, Growth	IRR ≥ 15%		
Energy Saving	IRR ≥ WACC **(8.00%)**		
Maintain Reliability	IRR ≥ 15%	AND	Risk = **High/Extreme** & **J-Factor > 0.2** Risk = **Medium** & **J-Factor > 0.5**
Environment, Safety, Law & Regulation	Risk = Very Low/Low (No investment)		
	Risk = **High/Extreme** & **Factor > 0.2**		
	Risk = **Medium** & **J-Factor > 0.5**		

Appendix B: Project Justification Guideline

Assumption

Basic Assumption

- ✓ Follow the **Project Standard Assumption** (except margin & new product price)

Please contact TP-PM-CO for more details!

Benefit Assumption

- ✓ Based on **first committed values** (e.g., contract, agreement)

- ✓ Then available forecast assumption (**Corporate Assumption**)

Please contact TP-PM-CO for more details!

%Maintenance

- ✓ Refer **actual maintenance cost** per year if known.
- ✓ In case no reference value, **1.5% as Project Standard Assumption** is preliminarily accepted.

Appendix B: Project Justification Guideline

Calculation Method

Calculation Tools

- ✓ Use **Idea MANI System** (For Preliminary/Simple Calculation only) or **ECON Calculation Sheet** of M-SE-SO

Link to Idea MANI System:
https://ideamani.pttgcgroup.com

ECON calculation sheet

Benefit Calculation

Benefit for input in project cash flow to calculate %IRR.

✓ For **normal case**, use the forecast benefit/year

✓ For **recurrence benefit**, use the forecast benefit of each year

✓ For **one time benefit**, to consider NPV for project justification (NPV > 0)

Sensitivity Analysis

- ✓ Perform sensitivity analysis as following **standard sensitivity scenarios**.

- **Case 1: Price set**
(refer to key product/item price which has high risk of price variation)

- **Case 2: Volume**

- **Case 3: Investment cost**
(refer to accuracy of cost estimate for each gate)

- **Case 4: Project Schedule**

- **Case 5: Others (Pls specify)**

Appendix B: Project Justification Guideline

Example of Normal Case (Benefit/Year):

Project: (MAX.17783) O-P1-2017/058 Yellow Oil Removal Unit Project

Benfit of the project:
- Reduce oil & caustic waste 1,781 Ton/year
- Reduce activated carbon waste 2 Ton/year
- Reduce VOCs release to atmosphere 197 ppm
- Gain Yellow oil produce 445 Ton/Year (25% of total waste)

Project scope: To install new Yellow Oil Separator Unit, Transfer pump and product loading pump, piping system, Yellow Oil vessel, Vapor handling system, power supply, system control and truck loading system.

A liquid gravity settling vessel technology is proposed to use for separate the Yellow Oil from Spent Caustic.Project implementation strategy will be EPC lump sum contract with meet standard design, safety, and guarantee performance.

Assumption:
1. Price assumption refer : BP2020 (Version R1.3)
2. Benefit of the project
   - Gain Yellow oil produce 445 Ton/Year and can selling as LCB with FBP > 400 C (ไม่เข้าพิกัดเสียภาษี)
   - Reduce activated carbon waste 2 Ton/year
3. Cost of the project & Investment
   - 3.1 Investment cost: 47.32 MTHB
4. Project timeline : Project start Jan 2020 and completed in Nov 2020
5. Project spending plan : Start Dec 2020

Forecast Benefit/Year

Benefit count since 1 Dec 20 — Finish in 30 Nov 40

	Unit	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
Year no.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Fx	THB/USD	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	30.9	
- Gain benefit from saving waste treatment cost	MUSD/yr	0.02	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	
- Gain benefit from selling as LCB price (5 Baht/kg)	MUSD/yr	0.01	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	
Net benefit to support Yellow Oil Removal Unit Project	**MUSD/yr**	**0.03**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.34**	**0.33**	
Additional operating cost	MUSD/yr	0.00002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	

Total Benefit of the project

	Avg	Unit	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Net benefit to support Yellow Oil Removal Unit Project	0.33	MUSD/yr	0.03	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33

Year		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Gain EBITDA	M$/year	0.03	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33

Assumption

Fx		30.9	THB/USD
Investment	47.32 MTHB	1.53	MUSD
Depreciation		20	years
TAX rate		0.2	
Maintenance cost		0.02	of Investment

		MUSD/year	MTHB/year
Avg EBITDA, M$/yr	(Avg 2021-2040)	0.31	9.6
Avg net profit, M$/yr	(Avg 2021-2040)	0.26	8.1
IRR @	20 years	16.7%	
NPV @	8.53%	1.0	30.2
Simple Payback	years	5.8	

	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Benefit	0.03	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.33
Maintenance cost	0.00	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Earning Before Depre/ Tax	0.03	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Depreciation	0.00	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.06
Earning Before Tax	0.03	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.24
TAX	0.00	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
Earning After Tax	0.03	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27
Breakdown investment	1.00																				
Investment	-1.53																				
Cash Flow (with TAX)	-1.51	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.27
PayBack period	-1.51	-1.24	-0.98	-0.72	-0.45	-0.19	0.07	0.34	0.60	0.86	1.12	1.39	1.65	1.91	2.18	2.44	2.70	2.97	3.23	3.49	3.76

Appendix B: Project Justification Guideline

Example of Recurrence Benefit:

Economic Model

Year					0	0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Operating day					350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Option 2	Feed CR via T-5270			AVG 2023-2042	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043

Project: CR management when T-5292 SD

Project scope:

Assumption:

Price assumption

BP2020 Corporate Price assumption R1.2 (balancing case)

Fx (corporate price) 30.9 THB/USD

D/E = 1:1, with loan interest rate at 4.5% p.a. and repayment period 7 years

Pump cost	Investment	new Pump	new Pump	Modification
	Option 1	2.4	2.4	Feed CR from ARO directly to CRS
	Option 2	72.1	64.1	Feed CR via T-5270
	Option 3	93.1	85.1	Feed CR via T-5212
	Option 4	33.6	25.6	Feed CR via T-5293 with T-1103
	Option 5	52.7	32.4	Feed CR via T-5293 with T-5212

Project assumption

Operating day 350 days

Spending plan

Investment of project @ +/- 50% 100% 72.1 MTHB | Sensitivity 0% | Investment 72.1 MTHB

Spending date start on Jan-20

Project completion (COD) Jan-23

Base case: Store CR from ARO1 and 2 at T5212 (65kT), TK945TK20A/B (2kT), 2945TK51 (2kT) and T1103 (30kT)during T5292 SD. Sell Excess vol.

Project case: Modify facilities to receive CR from ARO1/2 instead of T5292 SD

Forecast Benefit of Each Year

BP2020 compare CRS run rate

ARO1 FFU run			t/h		309	298	290	306	317	274	306	317	290	306	317	258	306	317	290	290	290	290	290	290	290	290	290	290
ARO2 FFU run			t/h		307	327	327	295	327	327	311	327	327	279	327	327	312	327	327	327	327	327	327	327	327	327	327	327
CR production	95%	CR yield	kT/yr	400	399	404	399	390	417	389	400	417	399	379	417	379	400	417	399	399	399	399	399	399	399	399	399	399
CRS run check		Sensitivity	t/d		4436	4494	4438	4328	4633	4326	4446	4633	4438	4210	4633	4214	4447	4633	4438	4438	4438	4438	4438	4438	4438	4438	4438	4438
Project Benefit				**AVG 2023-2042**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**
CRS upgrading margin			$/Ton		124.9	118.9	111.1	104.5	104.2	102.6	102.8	103.4	104.3	104.4	106.4	107.7	109.0	110.0	111.1	111.1	111.1	111.1	111.1	111.1	111.1	111.1	0.0	0.0
T5292 SD period	90	days																										
CRS run	4600	t/d																										
CR production during T5292 SD deduct volume store at T5212			kT/yr		315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315	315
Cleaning cost	-	MTHB	M$/yr		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CR export LPO during T5292 SD			**M$/yr**		**0.0**	**0.0**	**0.0**	**32.9**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**35.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Addition CR Stock for	15	kTon			**0.0**	**0.0**	**1.7**	**0.0**	**0.0**	**1.5**	**0.0**	**0.0**	**1.6**	**0.0**	**0.0**	**1.6**	**0.0**	**0.0**	**1.7**	**0.0**	**0.0**	**1.7**	**0.0**	**0.0**	**1.7**	**0.0**	**0.0**	**0.0**
T5292 SD: SD=1, not SD=0					0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
REF SD/TA					0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1
								1	<-Start month																			
				AVG 2023-2042	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**	**2042**	**2043**
Benefit (CM)		0%	**M$/year**	4.0	**0.0**	**0.0**	**1.7**	**32.9**	**0.0**	**1.5**	**0.0**	**0.0**	**1.6**	**0.0**	**0.0**	**1.6**	**0.0**	**0.0**	**1.7**	**0.0**	**0.0**	**1.7**	**35.0**	**0.0**	**1.7**	**0.0**	**0.0**	**0.0**
			MTHB/year	120	**0**	**0**	**51**	**1018**	**0**	**48**	**0**	**0**	**48**	**0**	**0**	**50**	**0**	**0**	**51**	**0**	**0**	**51**	**1081**	**0**	**51**	**0**	**0**	**0**

Assumption

Fx	30.9	THB/USD	
Investment	2.3	MUSD	72.1 MTHB
Depreciation	20	years	1016
TAX rate	20%	%	
Maintenance cost	2.5%	of ISBL+OSBI	0.06 MUSD
Interest	4.5%	p.a.	

		MUSD/year	MTHB/year
Avg EBITDA, M$/yr	AVG 2023-2042	**3.8**	**118.1**
Avg net profit, M$/yr	AVG 2023-2042	**0.1**	**3.6**
IRR @	**20 years**	**244.8%**	
NPV @	**8.53%**	**28.9**	**892.0**
Payback	**years**	**0.04**	
Exclude construction period 3 years			
Payback		**3.1**	
Include construction period 3 years			
Simple payback (years)		**0.6**	

Benefit				0.00	0.00	1.67	32.93	0.00	1.54	0.00	0.00	1.56	0.00	0.00	1.62	0.00	0.00	1.67	0.00	0.00	1.67	34.98	0.00	1.67	0.00	0.00	0.00
Maintenance cost				0.00	0.000	0.000	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.000
EBITDA				0.00	0.00	1.67	32.87	-0.06	1.48	-0.06	-0.06	1.51	-0.06	-0.06	1.56	-0.06	-0.06	1.61	-0.06	-0.06	1.61	34.93	-0.06	1.61	-0.06	-0.06	0.00
Depreciation				0.00	0.000	0.000	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.117	0.000
EBIT				0.00	0.00	1.67	32.76	-0.18	1.36	-0.18	-0.18	1.39	-0.18	-0.18	1.44	-0.18	-0.18	1.49	-0.18	-0.18	1.49	34.81	-0.18	1.49	-0.18	-0.18	0.00
Interest							0.10	0.08	0.07	0.05	0.04	0.02	0.01															
IC				0.00	0.05	0.10																						
EBT (Earning Before Tax)				0.00	0.00	1.67	32.66	-0.26	1.30	-0.23	-0.21	1.37	-0.18	-0.18	1.44	-0.18	-0.18	1.49	-0.18	-0.18	1.49	34.81	-0.18	1.49	-0.18	-0.18	0.00
TAX				0.00	0.00	0.33	6.53	-0.05	0.26	-0.05	-0.04	0.27	-0.04	-0.04	0.29	-0.04	-0.04	0.30	-0.04	-0.04	0.30	6.96	-0.04	0.30	-0.04	-0.04	0.00
NI (Earing After Tax)				0.00	0.00	1.33	26.34	-0.01	1.22	-0.01	-0.02	1.23	-0.02	-0.02	1.27	-0.02	-0.02	1.31	-0.02	-0.02	1.31	27.96	-0.02	1.31	-0.02	-0.02	0.00
NOPAT = EBIT-TAX				0.00	0.00	1.33	26.22	-0.12	1.10	-0.13	-0.13	1.12	-0.14	-0.14	1.15	-0.14	-0.14	1.19	-0.14	-0.14	1.19	27.85	-0.14	1.19	-0.14	-0.14	0.00
Add back: Depre				0.00	0.00	0.00	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.00
Breakdown Investment				6%	90%	4%																						
Investment				-0.14	-2.10	-0.09																						
Delta Working cap																												
Free Cash Flow				-0.14	-2.10	1.24	26.34	-0.01	1.22	-0.01	-0.02	1.23	-0.02	-0.02	1.27	-0.02	-0.02	1.31	-0.02	-0.02	1.31	27.96	-0.02	1.31	-0.02	-0.02	0.00
Terminal value (5 x EBITDA)																												
Sum Free Cash Flow				**(0.1)**	**(2.1)**	**1.2**	**26.3**	**(0.0)**	**1.2**	**(0.0)**	**(0.0)**	**1.2**	**(0.0)**	**(0.0)**	**1.3**	**(0.0)**	**(0.0)**	**1.3**	**(0.0)**	**(0.0)**	**1.3**	**28.0**	**(0.0)**	**1.3**	**(0.0)**	**(0.0)**	**0.0**
Accumulated Cash flow				**(0.1)**	**(2.2)**	**(1.0)**	**25.3**	**25.3**	**26.6**	**26.5**	**26.5**	**27.8**	**27.7**	**27.7**	**29.0**	**29.0**	**28.9**	**30.2**	**30.2**	**30.2**	**31.5**	**59.5**	**59.4**	**60.8**	**60.7**	**60.7**	**60.7**

Appendix B: Project Justification Guideline

Example of One Time Benefit:

Recovery FRC high mercury at T-1102

Month	Jan-20	Feb-20	Mar-20	Apr-20
Dom Condy, $/ton	546	476	485	486

ปริมาณ FRC Waste ที่มี	700	ton		
ปริมาณ FRC Waste ที่กรองกลับมาใช้ใหม่ได้	490	ton	*% FRC recovery*	*70%*
ปริมาณ FRC Waste ที่ยังคงเหลือและต้องส่งกำจัด	210	ton		
ค่าจ้าง Contractor ในการกรอง FRC Waste	4,843,345	THB		
Exchange rate (TBH/$)	30.9	THB/$	<<=== Max Price Set	
ราคา FRC ($/tons) Apr'20	486	$/ton	<<=== Domestic mktn Thai Gulf	
ค่าบริการบำบัดและกำจัดกากอุตสาหกรรม (THB/ton)	5,500	THB/ton	>> source : tab "Support"	
ค่าบริการขนส่งกากอุตสาหกรรม (THB/trip) (Truck sizing 15 T/trip)	12,000	THB/trip	>> source : tab "Support"	
Truck capcity	15	Ton/trip		

One Time Benefit

	QTY(Ton)	Price/unit (THB/Ton)	Amount (MB)
FRC Feed cost Apr'20	490	15,017.40	7.36
Reduce Treatment cost	490	6,111	2.99
Filter unit cost	-	-	(4.84)
Total Benefit			**5.51**

NPV = Benefit 5,510,000 - Investment Cost 4,843,345 = 666,655 (NPV > 0)

Appendix C:
Risk Assessment Guideline

(Cf. P-(TP-PM-CO)-008 Project Risk Management)

Risk Assessment Criteria

IMPACT

Financial amount

Safety, Health & Environment

Supplier/Customers/ Partners

Law and Regulation

Reputation/Image

Objective/Target Achievement

LIKELIHOOD

Probability of future events

X

Frequency of past events

X

Experience/ Capability to control

Project Risk Assessment Criteria : *Impact*

	Financial	Safety, Health & Environment		Supplier/Customers/ Partners	
	EBITDA (%, Amount)	**People**	**Environmental**	**Supplier**	**Customers**
Severe (5)	• **Project Delay** : X > 20% of project timeframe or > 6 months • **Cost Overrun** : X > 20% of total project cost • **EBITDA** : Having > 20% impact on 1st full-year EBITDA of the project	• บาดเจ็บสาหัส ทุพพลภาพจำนวนมาก หรือเสียชีวิต > 1 คน • ส่งผลกระทบต่อสุขภาพรุนแรง • ชุมชนรอบโรงงานได้รับผลกระทบในการประกอบอาชีพจนต้องอพยพออกจากพื้นที่ เป็นเวลา > 1 ปี • มีพนักงานหรือผู้รับเหมานัดหยุดงานประท้วง,หยุดงาน	• เสียหายเฉียบพลัน รุนแรงเป็นวงกว้าง • ยากต่อการฟื้นฟู หรือใช้เวลาฟื้นฟูมากกว่า 1 ปี	• คู่ค้า : ยกเลิกสัญญาธุรกรรมการขายสินค้าและบริการ ส่งผลกระทบต่อยอดขาย > 50% ของยอดขาย/ปี	• ลูกค้า : ต่อต้าน (Boycott) การซื้อสินค้าและบริการ ส่งผลกระทบต่อยอดขาย > 50% ของยอดขาย/ปี
Major (4)	• **Project Delay** : X ≥ 10% of project timeframe or ≥ 3 months • **Cost Overrun** : X ≥ 10% of total project cost • **EBITDA** : Having X ≥ 10% impact on 1st full-year EBITDA of the project	• บาดเจ็บสาหัส จนถึงขั้นทุพพลภาพหรือเสียชีวิต • ส่งผลกระทบต่อสุขภาพมาก • มีการชุมนุมประท้วงหรือมีการร้องเรียนอย่างเป็นทางการ	• ทำให้สิ่งแวดล้อมเสียหายมาก • ต้องใช้เวลาในการฟื้นฟูมากกว่า 6-12 เดือน	• สูญเสียคู่ค้ารายใหญ่ • ปริมาณการซื้อขายรายผลิตภัณฑ์หลักลดลงมากกว่า 20% • คู่ค้ารายใหญ่ไม่สามารถส่งมอบสินค้าหรือบริการได้	• สูญเสียลูกค้ารายใหญ่ • ปริมาณการซื้อขายรายผลิตภัณฑ์หลักลดลงมากกว่า 20% • ลูกค้ารายใหญ่ไม่สามารถชำระค่าสินค้าได้
Moderate (3)	• **Project Delay** : 6% ≤ X < 10% of project timeframe or < 3 months • **Cost Overrun** : 6% ≤ X < 10% of total project cost • **EBITDA** : Having 6% ≤ X < 10% impact on 1st full-year EBITDA of the project	• บาดเจ็บค่อนข้างมาก ต้องได้รับการรักษาทางการแพทย์ ไม่ถึงขั้นทุพพลภาพ แต่ต้องหยุดงาน • ส่งผลกระทบต่อสุขภาพปานกลางและขวัญกำลังใจระยะยาว	• ทำให้สิ่งแวดล้อมเสียหายปานกลาง • ใช้เวลาในการฟื้นฟู 3-6 เดือน	• คู่ค้ารายใหญ่ ทำหนังสือแสดงความไม่พอใจ (Official Complain) • ปริมาณการซื้อขายรายผลิตภัณฑ์หลักลดลง 10-20% • คู่ค้ารายใหญ่สามารถส่งมอบสินค้าหรือบริการได้บางส่วน	• ลูกค้ารายใหญ่ ทำหนังสือแสดงความไม่พอใจ (Official Complain) • ปริมาณการซื้อขายรายผลิตภัณฑ์หลักลดลง 10-20% • ลูกค้าค้ารายใหญ่สามารถส่งมอบสินค้าหรือบริการได้บางส่วน
Minor (2)	• **Project Delay** : 3% ≤ X < 6% of project timeframe or < 2 months • **Cost Overrun** : 3% ≤ X < 6% of total project cost as BOD approval • **EBITDA** : Having 3% ≤ X < 6% impact on 1st full-year EBITDA of the project	• บาดเจ็บต้องได้รับการรักษาทางการแพทย์ หรือมีคำสั่งให้ปฏิบัติงานหน้าที่อื่น • ส่งผลกระทบต่อสุขภาพน้อยและขวัญกำลังใจระยะสั้นๆ	• ทำให้สิ่งแวดล้อมเสียหายน้อย • ใช้เวลาในการฟื้นฟูน้อยกว่า 3 เดือน	• คู่ค้าแสดงความไม่พอใจ (Verbal complains) • ปริมาณการซื้อขายรายผลิตภัณฑ์หลักลดลง 5-10% • ลูกค้ารายย่อยไม่สามารถชำระค่าสินค้าได้ • คู่ค้ารายย่อยไม่สามารถส่งมอบสินค้าหรือบริการได้	• ลูกค้าแสดงความไม่พอใจ (Verbal complains) • ปริมาณการซื้อขายรายผลิตภัณฑ์หลักลดลง 5-10% • ลูกค้ารายย่อยไม่สามารถชำระค่าสินค้าได้ • คู่ค้ารายย่อยไม่สามารถส่งมอบสินค้าหรือบริการได้
Insignificant (1)	• **Project Delay** : X < 3% of project timeframe or < 1 month • **Cost Overrun** : X < 3% of total project cost • **EBITDA** : Having X < 3% impact on 1st full-year EBITDA of the project	• ไม่มีการบาดเจ็บหรือบาดเจ็บเล็กน้อยในระดับปฐมพยาบาล • ไม่มีผลหรือมีผลกระทบต่อสุขภาพและขวัญกำลังใจน้อยมาก	• ไม่ส่งผลกระทบต่อสิ่งแวดล้อมหรือเสียหายน้อยมาก	• คู่ค้ารายย่อย ไม่พอใจร้องเรียนกลับมา • ปริมาณการซื้อขายรายผลิตภัณฑ์ลดลงต่ำกว่า 5% • คู่ค้ารายย่อยส่งมอบสินค้าหรือบริการได้บางส่วน	• ลูกค้ารายย่อย ไม่พอใจร้องเรียนกลับมา • ปริมาณการซื้อขายรายผลิตภัณฑ์ลดลงต่ำกว่า 5% • ลูกค้ารายย่อยชำระค่าสินค้าได้บางส่วน

Project Risk Assessment Criteria : *Impact*

	Law and Regulation	Reputation/Image		Objective/Target Achievement
		Reputation and Image	Negative News	Deviation
Severe (5)	• [Black Swan] บริษัทถูกถอดถอนออกจากตลาดหลักทรัพย์ • ผิดกฎหมายอาญาหรือกฎหมายแพ่งและมีคำสั่งให้บริษัทหยุดดำเนินธุรกิจ ถูกเพิกถอนใบอนุญาต หรือหยุดดำเนินการชั่วคราว	• [Black Swan] ชื่อเสียงและภาพลักษณ์ของบริษัทฯ เสียหายรุนแรง ส่งผลต่อความเชื่อมั่นอย่างรุนแรง และเป็นประเด็นในระดับประเทศที่กระทรวงหรือหน่วยงานภาครัฐที่เกี่ยวข้องมีการติดตาม ตรวจสอบและร่วมดำเนินการแก้ไข	• ได้รับข้อร้องเรียนเป็นข่าวในด้านลบ มีข่าวออกสื่อต่างประเทศ	• ต่ำกว่าเป้าหมาย >50%
Major (4)	• ผิดกฎหมายอาญาหรือกฎหมายแพ่ง หรือผิดข้อบังคับของบริษัทฯ มีโทษทางอาญา จำคุกและปรับ	• ชื่อเสียงและภาพลักษณ์ของบริษัทฯ เสียหายมากจนส่งผลให้บุคคลหรือองค์กรภายนอกขาดความเชื่อมั่นต่อบริษัทฯ อย่างมาก	• ได้รับข้อร้องเรียนเป็นข่าวในด้านลบ มีข่าวออกสื่อในระดับประเทศ	• ต่ำกว่าเป้าหมาย >30%-50%
Moderate (3)	• อาจทำให้ไม่เป็นไปตามกฎหมาย หรือข้อบังคับของบริษัทฯ (Non-compliance with laws/Articles of association)	• กระทบต่อชื่อเสียงและภาพลักษณ์ของบริษัทฯ ปานกลาง ทำให้เกิดความไม่พอใจจากชุมชนหรือสาธารณะ	• เป็นข่าวในด้านลบ มีข่าวออกสื่อระดับจังหวัดภูมิภาค	• ต่ำกว่าเป้าหมาย >10%-30%
Minor (2)	• อาจทำให้ไม่เป็นไปตามข้อกำหนด หรือมาตรฐานภายในบริษัทฯ (Non-conformance)	• กระทบต่อชื่อเสียงและภาพลักษณ์ของบริษัทฯ เล็กน้อย สามารถแก้ไขได้ในระยะเวลาสั้น	• ได้รับข้อร้องเรียนจากชุมชนผ่านช่องทางบริษัทอย่างไม่เป็นทางการ เป็นข่าวในด้านลบ มีข่าวออกสื่อท้องถิ่น	• ต่ำกว่าเป้าหมาย >5-10%
Insignificant (1)	• บกพร่องในการดำเนินการตามกฎหมายหรือข้อกำหนด แต่อยู่ในวิสัยที่สามารถแก้ไขได้โดยง่าย	• กระทบต่อชื่อเสียงและภาพลักษณ์ของบริษัทฯ น้อยมาก	• ไม่เป็นกระแสในสื่อท้องถิ่น	• ต่ำกว่าเป้าหมาย <5%

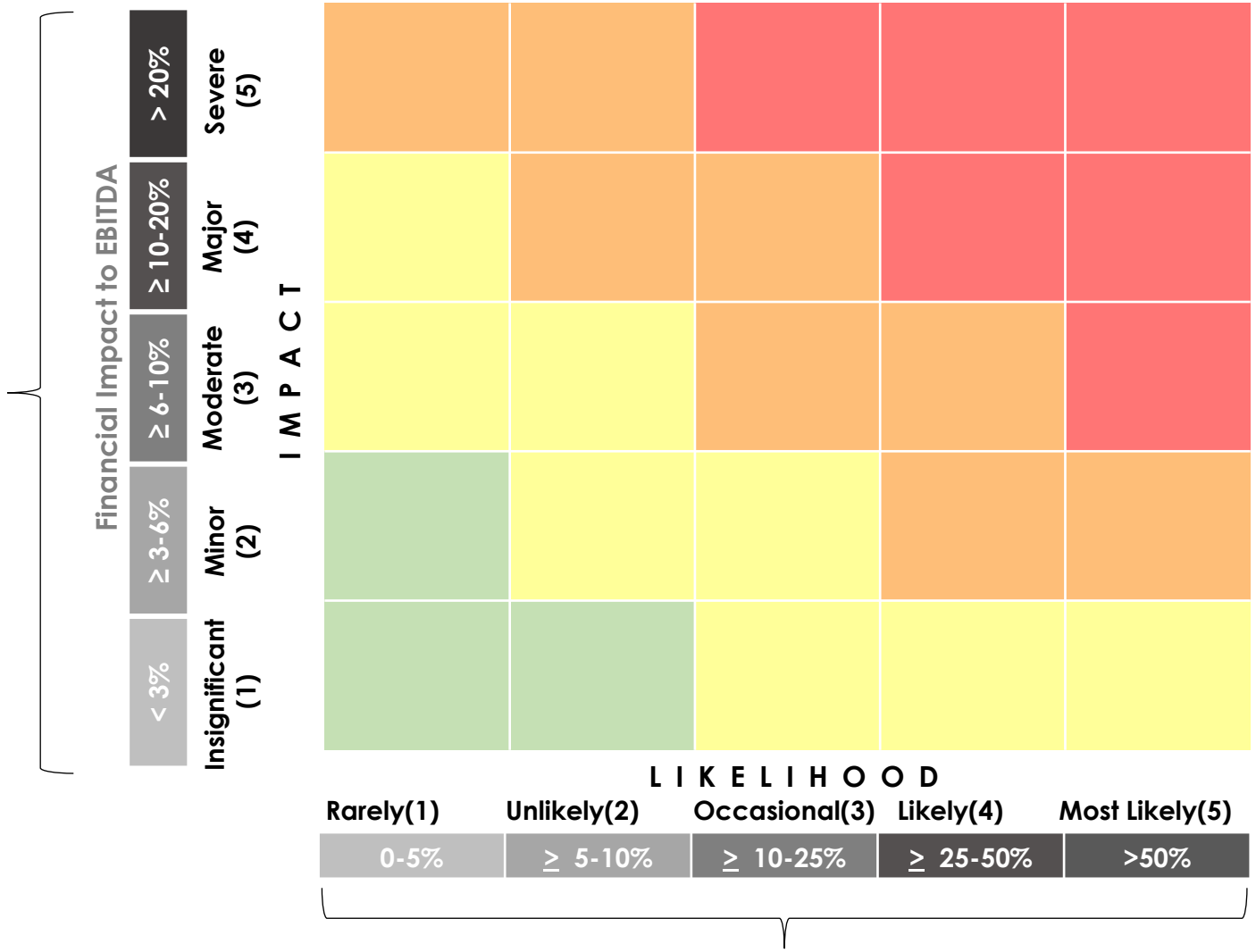
Project Risk Assessment Criteria : *Likelihood*

Likelihood	Probability of future events	Frequency of past events	Experience/ Capability to control	
			กระบวนการทำงาน/ ความสามารถในการควบคุม	ประสบการณ์และความสำเร็จที่ผ่านมา
Most Likely (5)	**>50%**	• เคยเกิดขึ้น มากกว่า 1 ครั้งในพื้นที่ ใน 1 ปีที่ผ่านมา ใน GC Group	• กระบวนการทำงานซับซ้อนมาก และไม่มีการตรวจสอบ หรือยังไม่เคยมีการควบคุม • มีความสามารถในการควบคุมน้อยมากหรือไม่มีเลย	• มีประสบการณ์น้อยมากหรือไม่มีเลย ในธุรกิจหรืองานนั้นๆ
Likely (4)	**>25% - 50%**	• เคยเกิดขึ้น 1 ครั้งในพื้นที่ หรือมากกว่า 1 ครั้ง ใน GC Group ใน 1 ปี ที่ผ่านมา	• กระบวนการทำงานซับซ้อน และมีการตรวจสอบน้อย หรือยังมีการควบคุมน้อย • ความสามารถในการควบคุมน้อย	• มีประสบการณ์น้อย ในธุรกิจหรืองานนั้นๆ
Occasional (3) Updated : MC 1 Nov 2021	**>10% - 25%**	• เคยเกิดขึ้นมากกว่า 1 ครั้งใน 3 ปีที่ผ่านมา ในอุตสาหกรรม หรือธุรกิจหรือระบบ ที่ใกล้เคียงกับของ GC Group	• กระบวนการทำงานซับซ้อน แต่มีการตรวจสอบหรือควบคุมพอสมควร • มีความสามารถในการควบคุมอยู่บ้างหรือระดับปานกลาง	• มีประสบการณ์อยู่บ้างหรือระดับปานกลาง ในธุรกิจหรืองานนั้นๆ
Unlikely (2)	**5% -10%**	• เคยเกิดขึ้น 1 ครั้งใน 3 ปีที่ผ่านมา ในอุตสาหกรรม หรือธุรกิจ หรือระบบ ที่ใกล้เคียงกับของ GC Group	• กระบวนการทำงานซับซ้อนขึ้น แต่ยังมีการตรวจสอบหรือการควบคุมที่ดี • มีความสามารถในการควบคุมที่ดี	• มีประสบการณ์มาก ในธุรกิจหรือลักษณะงานที่ใกล้เคียงกัน
Rarely (1)	**< 5%**	• ไม่เคยเกิดขึ้น หรืออาจเกิดขึ้นได้ในระยะเวลามากกว่า 3 ปี	• กระบวนการทำงานง่าย และโอกาสเกิดข้อผิดพลาดน้อย มีการตรวจสอบหรือการควบคุมที่ดีรัดกุม • มีความสามารถในการควบคุมดีมาก	• มีประสบการณ์โดยตรง ในธุรกิจหรืองานนั้นๆ

Project Risk Map

Impact criteria

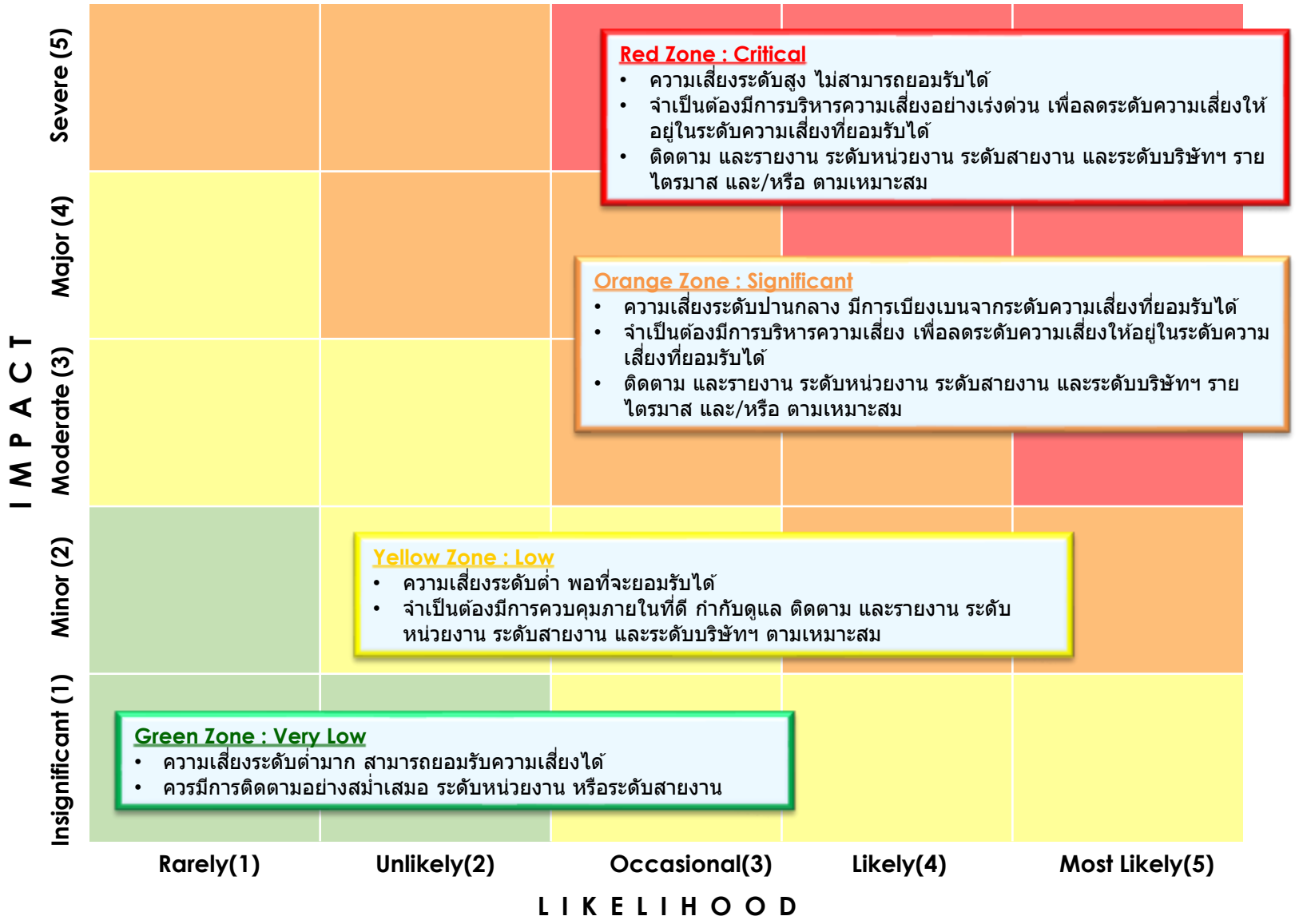
- ✓ Financial (amount)
- ✓ Safety, health and environment
- ✓ Suppliers / Customers / Partners
- ✓ Law and regulation
- ✓ Reputation / Image
- ✓ Objective / Target achievement



Likelihood criteria

- ✓ Probability of events occurring in the future
- ✓ Frequency of past events
- ✓ Experience / Capability to control

Risk level under 5 x 5 matrix



Critical

Significant

Low

Very Low

Project Risk Taxonomy

LV1	Strategic			
LV2	Major Initiative (Project Excecution)			
LV3	**Plaining and Execution**	**Change Management**	**Mesurment and mornitoring**	**Technology Implementation**
LV4	Business Performance	Community and Social	Business Performance	Integration
	Captital Structure	Competitor	Captital Structure	Operations/Commissioning
	Comercial Operation	Governance	Comercial Operation	People & Capability
	Community and Social	Integration	Economic	Procurement/Contract
	Construction	JV/Partner	Environment	Project Management
	Engineering	Legal and Regulatory	Liquidity and credit management	Technology
	Environment	Political	Plant Performance	
	Fraud	Safety & Health	Safety & Health	
	Funding	Technology	Sale and marketing	
	Governance		Tax	
	Integration			
	JV/Partner			
	Legal and Regulatory			
	Liquidity and credit management			
	Operations/Commissioning			
	People & Capability			
	Plant Performance			
	Political			
	Procurement/Contract			
	Project Management			
	Safety & Health			
	Standard			
	Supply Chain			
	Technology			

สำหรับชื่อของความเสี่ยงในระดับ LV3 และ LV4 มีระบุในระบบ Idea MANI

Project Risk Formulation Guide Word

Plaining and Execution

Business Performance
Process
Innovation
Integration synergies

Captital Structure
Cost of capital
Higher equity

Community and Social
Archaeology & Cultural
Heritage
Livelihood
Visual Impacts
Racial/Religious Conflict
Resettlement
Revolution
Civil unrest/Crime/Terrorism/War
Visual Impacts
Relationship
Reputation
Local authority's and communities' requirement

Construction
Site not available
Access of site
Equipment damages
Communication
Utilities
Site conditions
Weather and other natural hazards
Underground obstacles
Construction fabrication shop
Construction laydown areas
Construction change order
Facilities
Conflict
Delays
Emergency/Evacuation
Equipment/Tooling
Ground/Weather Conditions
Inspection/Tests Interfaces
Logistics & Transportation
Medical
Modifications/Authorization
Organization & Control
Relocation
Restrictions
Safety/Security
Working Conditions
labour or subcontracting manpower
Insurance coverage

Engineering
Authorization/Acceptance
Basis of Design/Design Change
Communication/Interfaces
Complexity
Contractors
Control
Cost Estimates
Document/Data Management
TechnologiesEmerging Technology
Experiences
Information
Innovation
Materials
Packages/3rd Party subcontractors
Responsibilities
Reviews
Scope/Specification

Environment
Impact of neibouring emissions
Air Quality
Emission/Discharges
Land Contamination
Land Use
Liquid Wastes/Solid Waste
Preservation
Surface/Ground Water

Fraud
Transparency

Funding
Financial readiness
Parent quarantee
Time delay
Exchange rate

Governance
Governance implementation

Integration
Team readiness

JV/Partner
Management conflict of interest
Objective misaligned on the JV
Strategic importance of JV partner
Uncleared issues during JV formulation

Legal and Regulatory
Expropriation of project assets
Privatisation
Risk of customer's site rules and regulations
Licenses
Labor & Human Rights
Commercial obligation
Specific regulatory standards
Permitting (EIA, EHIA, BOI, etc.)
Environmental
Labor & Human Rights
Legislation
Licenses
Insurance
Intellectual Property Rights Management
Interaction (other contracts)
Permitting (EIA, EHIA, BOI, etc.)
Radiological
Payment Currency/Terms
Scope & Completion requirement
Termination
Variations/Claims
Change in rules and regulations
Policies (Changes)
Sanctions
Design Standards
Litigation
Inability to export profits/loans/dividends
Import restrictions
Contract enforceability
Country laws
State owned/home organization
Dispute resolution
Liability for environmental conditions
Intergroup asset transfer
Compliance audits
Maintenance standards

Liquidity and credit management
Unbudgeted liability
Insurance coverage

Operations/Commissioning
Commissioning/Decommissioning
Major equipment vendors
Acceptance/Operation/Testing
Authorizations
Availability/Reliability
Costs
Start-up
Training
Feed/Utilities/chemical readiness
Commissioning readiness
Permit readiness
Operator/operation support team readiness
Contract/custody/logistics/packaging readiness
Customer credit evaluation readiness
Inventory build-up and product ready
Metering and billing readiness

People & Capability
Culture/Attitude
Demobilization/Skill silo
Language
Office space/Expansion
Ownership
Overheads
Performance/Inefficiency
Rework
Repatriation
Capability
Knowledge
Interpersonnal skill
Staff assignment/recruitment
Unqualified
Recruit/retain
Keep the project team
Qualification and skill
Manning reduction

Plant Performance
Inexperience with operation of the plant
Unable to operate at assume capacity
Unable to proved purity levels required
Unable to match demand pattern
Poor plant reliablity
Spares not available
Unreliability of supply/utilites
Performance Acceptant
Plant performance (guarantees)
Standard and specification
Performance below contractual guarantee

Political
Government Policy

Procurement/Contract
Fast Track
Suppliers delivery at targets and cost
Critical suppliers
Equipment or materials delay
Capital spares purchasing
Process
Third parties qualification
Confidentiality
Delays
Evaluation
Export Restrictions
Inspection
Insurance
Logistics
Quality Control
Vendor/Supplier
Contractors
Force Majeure
Liquidity Liabilities
Penalties
Contract

Project Management
Quality of project definition
Changes in design
Change management process
Scope of work
Plant site data
Refurbishment scope and cost
Adequacy/Suitability
Availability
Baseline
Contingency
Contractors
Commitment
Culture
Leadership
Retention
Satisfaction
Stability/Continuity
Training
Qualified resources
Communication and interfacing
HAZOP
Project schedule and cost
Quality of data and document

Project Management
JV team alignment and cooperation
Late delivery of design
Exposure to pricing
Insurance coverage

Safety & Health
Health Impacts
HSE Management Systems
Natural hazards
Fire and explosion
Emergency response
communication system
Safety training
Additional time and expense on HAZOP
Noise pollution
Asbestos usage
Reclamation/Remediation
Occupational Health & Safety and welfare
Large equipment transportation to the site
Security
SHE staff's capability
Permits/regulations
Changes to environmental registration
Compliance

Standard
Customer standards
Specification and standard
Assessment (Audit & Review)
Certification
Compliance
Competency (Qualification/training)
Process Control Corrective
Customer Feedback/complaints
Document
Inspection/Testing
Preventive Action (Risk)
System compliance (ISO)
Tolerance/Calibration
Verification

Supply Chain
Infrastructure
logistics availability

Technology
Economies of Scale/Uncompetitive
Information
Technologies Evaluation
Scale or size limitation
Improper technology

Project Risk Formulation Guide Word

Change management

Community and Social
Protests/interruptions

Competitor
Competitor retaliation
Lack of knowledge
Market information and intelligence
Unqualified market consultant
Product and market positioning

Governance
Corporate Governance implementation

Integration
Effective integration

JV/Partner
JV cashtraps

Legal and Regulatory
Cancellation

Political
Government (Changes)
Change of political regime

Safety & Health
Crisis & Emergency Management

Technology
Global trend
Change in technology

Mesurment and mornitoring

Business Performance
Higher unit costs, low rate of production
Business model and Business process
Foreign Exchange (Forex)
Revenue/Profits

Captital Structure
Leverage

Comercial Operation
Customer's project delay

Economic
Economic Stability
Economic growth slowdown
Appreciation/depreciation of currency
Interest rate high
Excess Inflation

Environment
Sudden environmental impairment
Gradual environmental impairment

Liquidity and credit management
Customer defaulty
Customer cashflow
Customer credit
Quality of customer assets
Cashflow
Cost Management
Invoicing
Liquidity
Non-billable

Plant Performance
Assets/Equipment
Business Continuity Planning

Safety & Health
Safety Target
Natural Disasters

Sale and marketing
Market Gap/Emerging Market
Marketing and sales team
Demand lowers than forecast
Customer's plant shut down
Sale Volume
Sustain growth in particular market

Tax
BOI Promotional Privileges
Taxation (Income Tax rate)

Technology Implementation

Integration
Ineffective systems integration

Operations/Commissioning
Business process/IT system readiness

People & Capability
Knowledge Management
Training/competency
Insufficient manpower availability

Procurement/Contract
Third party's Application knowledge

Project Management
Project team's knowledge
Manhour overruns
Unable to provide realiable design data

Technology
Integrated
Failure/Lack of Information Security
Work practices
Complexity/difficulty/reliability
IP infringement