IRR Calculation Sheets

Region: **Oceania**

Assumptions

1	NH3 Production per Year	1,000,000	t-NH3/y	
2	NH3 Production per Day	3,000	t-NH3/d	
3	Operating Days per Year	333	d/y	
4	Facility Utilization Rate	100	%	8,000 Hours
5	Production Process	Second Generation ~ O2-ATR Method		
6	Feedstock and Energy	Natural gas (NG)		
7	Heat and Natural Gas Required per ton of NH3	9.0	Gcal /t-NH3	HHV
		0.697	t-NG /t-NH3	HHV
8	Natural Gas Input per Day	2,090	t-NG/d	
9	Price of feedstock and Fuel	4.0	$/MMBTU	HHV
		205	$/NG-t	
10	CO2 Capture			
	CO2 Emission per Ton of NH3	1.9	t-CO2/t-NH3	Raw Fuel Input
	Captured Amount	3,975	t-CO2/d	Only SynGas
		1,324,947	t-CO2/y	
	Capture Rate	70%	Ratio of Captured Amount to Total Emission	
11	Investment		1,000US$	
	CAPEX			
	ISBL	700,000		
	OSBL*	350,000		*ISBLx50%
	Additional Cost: 1) CO2 P/L	20,000		a
	Additional Cost: 2) NH3 Loading	120,000		b
	OSBL Subtotal	490,000		*+a+b
	ISBL+OSBL	1,190,000		c
	Contingency allowance	178,500	% of c	15%
	Total	1,368,500		d
	Cost reduction	-136,850	% of d	10%
	Total	1,231,650		
	(After LF Adjustment)	1,231,650	L/F (Using the U.S. as a reference)=	1.00
	Owner's Cost	61,583	After LF Adjustment x	5%
	Recalculated Total	1,293,233		
	Years of Depreciation	15	Straight-line Depreciation	

Composition, Heating Value, and CO2 Emission of Natural Gas being used as Material and Fuel

Composition (mol%)	CH_4:93.9%,C_2H_6:4.2%		
Higher Heating Value (HHV)	MJ/kg	54.1	Ratio of LHV to HHV
Lower Heating Value (LHV)	MJ/kg	48.8	90%
Average Molecular Weight (MW)	kg/kmol	16.8	
CO2 Emission	kg-CO2/NG-kg	2.72	

Assumptions

12	Utility & Others						
1)	Electric Power (Purchase)	17.0	MW/h				1
	Electric Power per Ton of NH3	136	kWh/t-NH3				
2)	Industrial Water (Purchase)	32.2	1,000WT-t/d				
	Industrial Water per Ton of NH3	10.7	WT-t/t-NH3				
3)	Catalyst and Chemicals per Ton of NH3	6.1	U$/t-NH3				2
4)	Personnel						
	Field Manager 1)	2	persons =	2	persons/shift x	1 shift/day	
	Shift Leader(MG)2)	4	persons =	1	persons/shift x	4 shift/day	
	Field Operator3)	28	persons =	6	persons/shift x	4 shift/day	3
	Panel Operator4)	16	persons =	4	persons/shift x	4 shift/day	
	Labo Technician5)	6	persons =	6	persons/shift x	1 shift/day	
	Total	56	persons				4

Cost Calculation (First Year)

EIRR = 9.0%

1. Fixed Cost

1	Labor Cost (Operators)	persons	1,000$/person			7
	Managers 1)+2)	6	150			8
	Panel Operators 4)+5)	22	100			
	Field Operators 3)	28	100			
	Subtotal	5.9	US$/T-NH3			
2	Maintenance Cost ②	18.5	US$/T-NH3	CAPEX x	1.5%	
3	General & Administrative Expenses (Plant)	8.4	US$/T-NH3	①x80%+②x20%		
4	Utility cost	3.5	US$/T-NH3	OSBL* x	1.0%	
5	Insurance and Indirect Tax	6.2	US$/T-NH3	CAPEX x	0.5%	
	Total	42.4	US$/T-NH3			

2. Variable Cost

1	Natural gas (NG)	142.9	US$/T-NH3		
2	Electric Power (Purchase)	9.5	US$/T-NH3	0.07	US$/kWh
3	Industrial Water (Purchase)	6.4	US$/T-NH3	0.60	US$/WT-t
4	Catalyst and Chemicals	6.1	US$/T-NH3		
5	CO2 Transfer	53.0	US$/T-NH3	40.0	US$/t-CO2
	Total	217.9	US$/T-NH3		
	Cash Cost (1+2)	260.4	US$/T-NH3		

Export Price (FOB)	397.5	US$/T-NH3	
Freight	31.0	US$/T-NH3	FOB, Fuel Tanker
CIF Price in Japan	428.5	US$/T-NH3	

Calculation Sheet(Oceania)_ENG.xlsx

Cost Breakdown (by Accounting Item: PL)

					EIRR=	9.0%
Construction and Commissioning: 4 years	1st Year	8th Year	13th Year	18th Year	20th Year	Average of 20 Years
The duration of the project is assumed to be 20 years.	2026	2033	2038	2043	2045	
Fixed Cost (US$/t-NH3)	42.4	42.4	42.4	42.4	42.4	42.8
Labor Cost	5.9	5.9	5.9	5.9	5.9	6.0
Maintenance Cost	18.5	18.5	18.5	18.5	18.5	18.5
General Management Cost, Insurance, Tax, and Rent	18.1	18.1	18.1	18.1	18.1	18.3
Variable cost (US$/t-NH3)	217.9	217.9	217.9	217.9	217.9	217.9
Cost of Natural Gas	142.9	142.9	142.9	142.9	142.9	142.9
Cost of CO2 Sequestration	53.0	53.0	53.0	53.0	53.0	53.0
Others	22.1	22.1	22.1	22.1	22.1	22.1
Depreciation & Interest (US$/t-NH3)	113.5	100.8	91.7	0.0	0.0	75.6
Depreciation Expenses	86.2	86.2	86.2	0.0	0.0	64.7
Interest	27.3	14.6	5.5	0.0	0.0	10.9
Corporate Tax (US$/t-NH3) *	7.1	10.9	13.6	41.1	41.1	18.5
Profit (after Tax)	16.5	25.4	31.8	96.0	96.0	42.7
(Equity share of depreciation added)	42.4	51.3	57.7	96.0	96.0	62.1
Export Price (FOB) (US$/t-NH3)	397.5	397.5	397.5	397.5	397.5	397.5
Transportation (Freight)	31.0	31.0	31.0	31.0	31.0	31.0
CIF Price in Japan (US$/t-NH3)	428.5	428.5	428.5	428.5	428.5	428.5

Note *: Corporate tax is estimated based on the profit on accounting basis, not on net cash flow basis.

(Financial Condition)

Interest Rate	3.0%	-				
Annual Rate of Price Increase (NH3)	0.0%	-				
Annual Rate of Price Increase (NG)	0.0%	-				
Annual Rate of Price Increase (Others)	0.0%	-				
D/E (Equity%)	30%	-				
Corporate Tax	30%	-				

Cost Breakdown by Segment (First Year)

	US$/T-NH3
Purchase of Natural Gas	142.9
NH3 Production , CO2 Capture, etc.	201.6
CO2 Sequestration	53.0
Export Price (FOB)	397.5
Transportation from Country of Production to Japan	31.0
CIF Price in Japan	428.5
	Yen/T-NH3
Unloading and Delivery	0.0
In-tank Price (User's Price)	45,850

= Default Input (Recommended V

= Input for Sensitivity Analysis

= Input for IRR sheet

Exchange Rate

107 Yen/US$

Calculation Sheet(Oceania)_ENG.xlsx