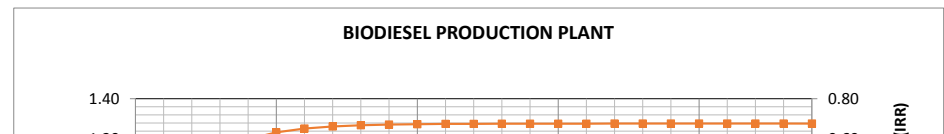
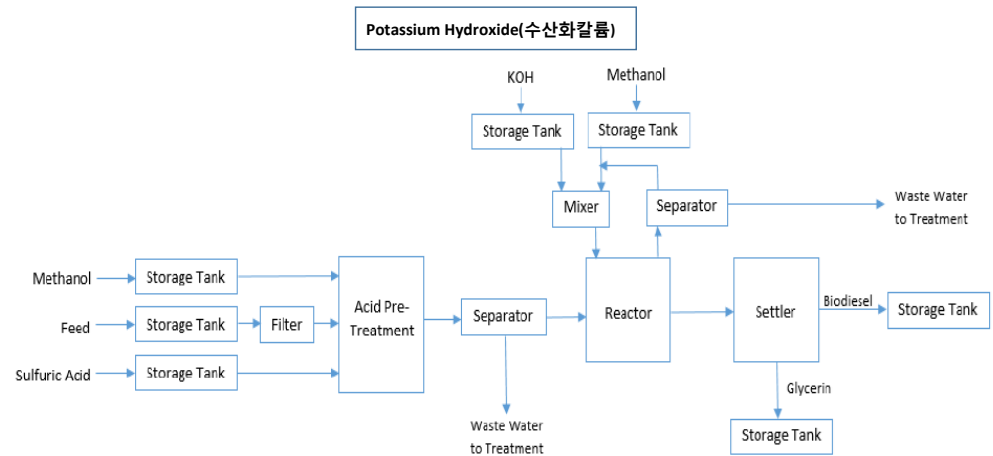


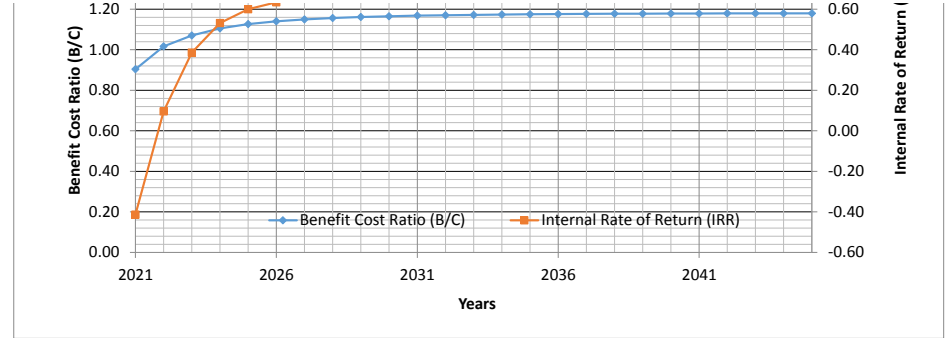
**Malaysia Bio-Diesel Production Plant 200KTA**

Description	Values	Unit
Work Start Year	2018	Years
Operating Year	2021	Years
Location of Bio-Diesel Plant	Green Field	<-Green Field, Brown Field
Site and Contry for Project	Malaysia	
Sensitivity of Golobal Financial Crisis	0	Years- Active Crisis Year, Otherwise = 0
Assumed Bio-Diesel Product Capacity	200.00	KTA(KilloTon/Ann.)
Input of Vegetable Oil	Palm	200.00 KTA(KilloTon/Ann.)
Input of	Methanol	22.00 KTA(KilloTon/Ann.)
Input of	Sulfuric acid(H <sub>2</sub> SO <sub>4</sub> )	0.88 KTA(KilloTon/Ann.)
Input of Catalyst	Sodium Methoxide(NaOCH <sub>3</sub> )	5.50 KTA(KilloTon/Ann.)
Input of	Water	258.00 KTA(KilloTon/Ann.)
Transportation Speed	60.00	km/hr
One Trailler Quantities	38.00	m <sup>3</sup>
Distance from site to Plant	50.00	km
Raw Material Transportation Cost	4,012,292.24	USD/Year
Product of	Pharmaceutical glycerine	18 KTA
Product of	Crude Glycerine 90	1 KTA
Product of	Potarsium chloride	2 KTA
Product of	Biodiesel	199 KTA
Product of	Waste water	400 KTA
Initial Inflation of Raw Material Price	0	%
Cost for Raw Material of	Palm	158,600,000.00 USD/Annual 793USD/ton
Cost for Raw Material of	Methanol	10,538,520.37 USD/Annual 479.02365USD/ton
Cost for Raw Material of	Sulfuric acid(H <sub>2</sub> SO <sub>4</sub> )	330,808.01 USD/Annual 375.9182USD/ton
Cost for Raw Material of	Sodium Methoxide(NaOCH <sub>3</sub> )	4,087,619.16 USD/Annual 743.20348USD/ton
Cost for Raw Material of	Water	584,893.78 USD/Annual 2.2670302USD/ton
<b>Total Purchase Cost for Raw material</b>	<b>174,141,841.33</b>	<b>USD/Annual</b>
Initial Inflation of Product Material Price	0	%
Sail Cost for Product of	Pharmaceutical glycerine	8,071,967.33 USD/Annual 453.79898USD/ton
Sail Cost for Product of	Crude Glycerine 90	108,251.70 USD/Annual 114.41335USD/ton
Sail Cost for Product of	Potarsium chloride	384,331.20 USD/Annual 251USD/ton
Sail Cost for Product of	Biodiesel	198,690,600.00 USD/Annual 1000USD/ton
Sail Cost for Product of	Waste water	0.00 USD/Annual 2.2670302USD/ton
<b>Total Salse Cost for Product</b>	<b>207,255,150.23</b>	<b>USD/Annual</b>
Unit CAPEX of Caustic Soda Production Plant	149,109.80	USD/1KTA
Total CAPEX of Caustic Soda Production Plant	29,821,959	USD - 이천구백팔십이만일천구백오십
Required Electric Power(Diesel fired generator)	0.23	MW
Power Supply System	0	0 for Power Outer Supply, 1 for Site Gen.
Power Supply Unit Price	0.11	USD/kwh for Power Outer Supply only
Fixed and Various OPEX	5,423,093	USD/Year(With Transportation)
Storage Area	19243.08	m <sup>2</sup> for stock days = 21days
Unit Caustic Soda Plant Land Size per 1KTA	387	m <sup>2</sup> /KTA
Total Land Size	96,555	m <sup>2</sup> - 23.86Acre
Unit Space Acquisition Cost	16	USD/m <sup>2</sup> in Malaysia
CAPEX of Area Acquisition Cost	1,543,922	USD
CAPEX for Break Water Length is	0	USD 100,000USD/m
CAPEX for Berthing Dolphine	36k DWT x 1 set	6,352,941 6 176,471k DWT
CAPEX for Trestle and Piers	x 0m	0 USD 12,905USD/m
CAPEX for Unloading ARM	36k DWT x 1 set	360,000 USD 100,000k DWT
CAPEX for Conveyer System	x 0m	0 USD 1,000USD/m

STORAGE TANK							
Materials	Density(ton/m <sup>3</sup> )	Storage	Nos of Tank	Diameters	Center Gap	Edge gap	Required Space
Palm	867	13,263m <sup>3</sup>	1	30.8m	0.5D	0.5D	3,794.6m <sup>2</sup>
Methanol	792	1,597m <sup>3</sup>	1	15.4m	0.5D	0.5D	948.6m <sup>2</sup>
Sulfuric Acid	1840	27m <sup>3</sup>	1	4.3m	0.5D	0.5D	74.0m <sup>2</sup>
Sodium Methoxide(N	947	334m <sup>3</sup>	1	9.3m	0.5D	0.5D	346.0m <sup>2</sup>
Water	1000	14,834m <sup>3</sup>	1	32.0m	0.5D	0.5D	4,096.0m <sup>2</sup>
Pharmaceutical glyce	1260	812m <sup>3</sup>	1	12.4m	0.5D	0.5D	615.0m <sup>2</sup>
Crude Glycerine 90	1238.95	44m <sup>3</sup>	1	4.9m	0.5D	0.5D	96.0m <sup>2</sup>
Potarsium chloride	2660	33m <sup>3</sup>	1	4.5m	0.5D	0.5D	81.0m <sup>2</sup>
Biodiesel	880	12,981m <sup>3</sup>	1	30.6m	0.5D	0.5D	3,745.4m <sup>2</sup>
Waste water	1000	22,998m <sup>3</sup>	1	36.9m	0.5D	0.5D	5,446.4m <sup>2</sup>
							19,243.1m <sup>2</sup>



CAPEX for onshore	Pipe x 12.00inch	x 0m	0	USD	123USD/m
CAPEX for Transmission Line Length is		5km	509,985	USD -6Kv --Single Circ	1 - Circuit
Total CAPEX for Construction and Fabrication			38,588,806	USD	- 삼전팔백오십팔만팔천팔백육십
Construction and Fabrication Period			3	Years	
Interest FEE during Construction and Fabrication			3,912,941	USD	
<b>TOTAL CAPEX AND INTREST FEE DURING CONSTRUCTION</b>			<b>42,501,747</b>	USD	- 사천이백오십만일천칠백사십칠
Fund Intrest			6.5	%	
Return rate on investment of Net Profit, r			1	%	
Operating Periods			25	Years	
Project Design Life			50	Years	
Benefit Cost Ratio (B/C)			1.18		≥ 1.1 GOOD For 25Years Operating
IRR(Internal Rate of Return)			67.72%		> 0 GOOD For 25Years Operating
NPV(Net Present Value)			821,230,126	USD with Asset value of Project for 25Year	
Inflation of Raw material Purchased Price			0	%	%, If Inflation = 0, the Raw/Product Unit price shall be quoted Forecast Price, otherwise consider inflation based on 2021Years Purchase/Sale Cost, if no consider Inflation, the value=10E-11
Inflation of Sale Product Price			0	%	
Income tax rate for government			18	%	
Inflation of Space Acquisition			1	%	
First Project residual value			19,548,892	USD	after 10 Years
Second Project residual value			9,178,761	USD	after 30 Years
Final residual value on Design Life			5,366,987	USD	after 50 Years
<b>Net Payback Turn Over Periods</b>			<b>1.231</b>	Years	



Actual Payback turn Over Years	2Years	2Years	해 찾기
Initial Value(min 0%, max 50%)	49.156%	49.156%	1,579,444 Good
Limit of Initial Value	≤ 50%	≤ 50%	

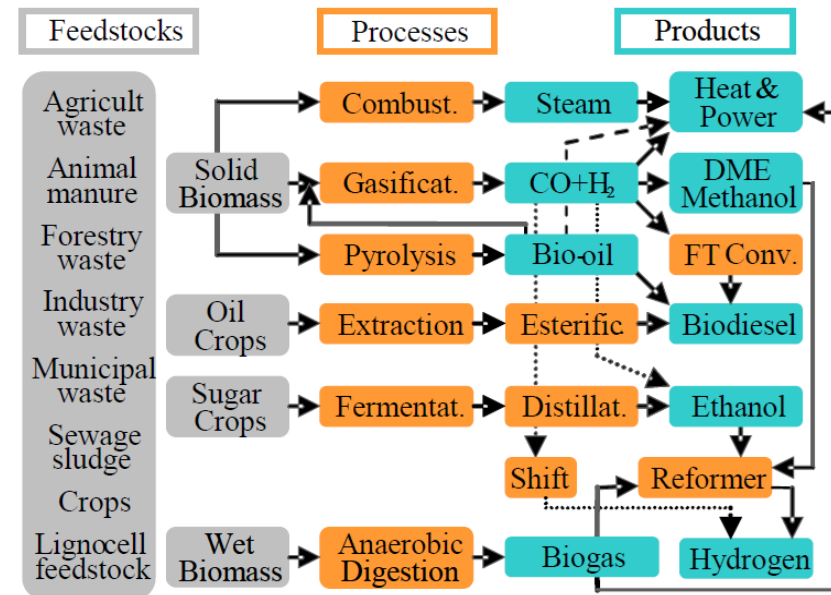
End of Year	%	Return of Equity (USD)	Return of FUND(USD)	Remain Cost(USD)	Fund Interest 6.5%(USD)	OPEX(USD)	Yearly Revenue(USD)	Yearly Purchased Price(USD) of LNG W/ Inflation	Net Profit(USD)	(현재자산가치)Asset value=Residual Value(USD)	(순현재가치)Net Present Value	Benefit Cost Ratio (B/C)	(내부수익률)Internal Rate of Return (IRR)		
														% of Return of Equity	% of Return of FUND
2021	1	49.16%	49.16%	4,178,435	16,713,742	42,501,747	2,762,614	5,423,093	207,255,150	174,141,841	3,309,048	28,569,728	-17,644,508	0.90	-0.41
2022	2	50.84%	50.84%	4,321,914	17,287,656	21,609,570	1,404,622	5,423,093	207,494,002	176,947,443	1,729,604	27,364,525	5,376,767	1.02	0.10
2023	3	0.00%	0.00%	0	0	0	0	5,423,093	216,673,931	178,905,275	26,523,362	26,220,875	36,460,218	1.07	0.39
2024	4	0.00%	0.00%	0	0	0	0	5,423,093	225,853,860	181,177,783	32,187,446	25,133,938	73,808,085	1.11	0.53
2025	5	0.00%	0.00%	0	0	0	0	5,423,093	228,646,089	183,820,000	32,310,457	24,103,717	110,927,489	1.13	0.60
2026	6	0.00%	0.00%	0	0	0	0	5,423,093	231,525,688	186,503,272	32,471,445	23,101,934	147,862,493	1.14	0.63
2027	7	0.00%	0.00%	0	0	0	0	5,423,093	234,405,288	189,187,616	32,631,555	22,156,870	184,612,119	1.15	0.65
2028	8	0.00%	0.00%	0	0	0	0	5,423,093	237,284,888	192,049,046	32,646,453	21,240,248	221,014,500	1.16	0.66
2029	9	0.00%	0.00%	0	0	0	0	5,423,093	240,164,487	194,911,580	32,660,447	20,380,347	257,071,911	1.16	0.67
2030	10	0.00%	0.00%	0	0	0	0	5,423,093	243,044,087	197,775,232	32,673,524	19,548,892	292,786,611	1.17	0.67
2031	11	0.00%	0.00%	0	0	0	0	5,423,093	245,474,528	200,000,020	32,842,160	18,774,161	328,330,208	1.17	0.67
2032	12	0.00%	0.00%	0	0	0	0	5,423,093	247,929,273	202,243,959	33,015,020	18,027,879	363,707,115	1.17	0.68
2033	13	0.00%	0.00%	0	0	0	0	5,423,093	250,408,566	204,507,247	33,192,144	17,310,047	398,921,671	1.17	0.68
2034	14	0.00%	0.00%	0	0	0	0	5,423,093	252,912,651	206,790,083	33,373,570	16,620,668	433,978,143	1.17	0.68
2035	15	0.00%	0.00%	0	0	0	0	5,423,093	255,441,778	209,092,666	33,559,335	15,959,742	468,880,721	1.17	0.68
2036	16	0.00%	0.00%	0	0	0	0	5,423,093	257,996,196	211,415,201	33,749,479	15,355,550	503,633,527	1.18	0.68
2037	17	0.00%	0.00%	0	0	0	0	5,423,093	260,576,158	213,757,892	33,944,041	14,779,814	538,240,607	1.18	0.68
2038	18	0.00%	0.00%	0	0	0	0	5,423,093	263,181,919	216,120,947	34,143,061	14,204,260	572,705,942	1.18	0.68
2039	19	0.00%	0.00%	0	0	0	0	5,423,093	265,813,738	218,504,574	34,346,578	13,657,167	607,033,440	1.18	0.68
2040	20	0.00%	0.00%	0	0	0	0	5,423,093	268,471,876	220,908,986	34,554,633	13,138,537	641,226,942	1.18	0.68
2041	21	0.00%	0.00%	0	0	0	0	5,423,093	271,156,594	223,334,396	34,767,266	12,648,371	675,290,222	1.18	0.68
2042	22	0.00%	0.00%	0	0	0	0	5,423,093	273,868,160	225,781,021	34,984,518	12,186,671	709,226,987	1.18	0.68
2043	23	0.00%	0.00%	0	0	0	0	5,423,093	276,606,842	228,249,078	35,206,430	11,753,440	743,040,879	1.18	0.68
2044	24	0.00%	0.00%	0	0	0	0	5,423,093	279,372,910	230,738,788	35,433,044	11,320,401	776,735,477	1.18	0.68

2045	25	0.00%	0.00%	0	0	0	0	5,423,093	282,166,640	233,250,373	35,664,402	10,915,834	810,314,292	1.18	0.68
2046	26	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2047	27	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2048	28	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2049	29	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2050	30	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2051	31	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2052	32	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2053	33	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2054	34	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2055	35	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2056	36	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2057	37	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2058	38	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2059	39	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2060	40	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2061	41	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2062	42	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2063	43	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2064	44	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2065	45	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2066	46	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2067	47	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2068	48	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2069	49	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2070	50	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	Summation	100%	100%	8,500,349	34,001,398	64,111,318	4,167,236	135,577,334	6,223,725,299	5,100,114,320	771,919,022	10,915,834	821,230,126	1.18	0.68

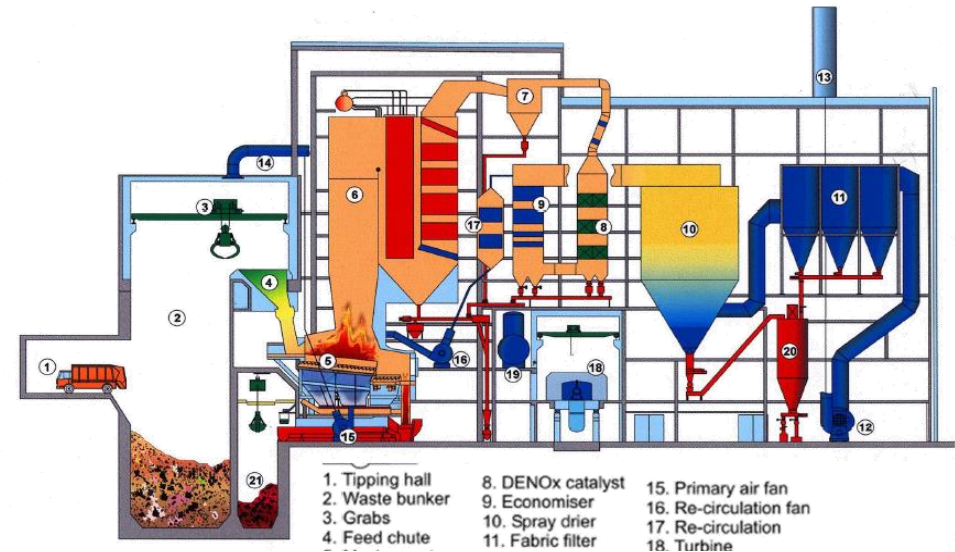
1. Mauza Johron, Kala Amb, Tehsil Nahan, Pre-feasibility study Report for Himalaya Alkalies & Chemicals Ltd.
2. OXYCHEM, 2013, CAUSTIC SODA HANDBOOK, Occidental Chemical Corporation
3. National Parks of Lake Superior Foundation, 2010, Sodium Hydroxide (NaOH) Practicality Study
4. Alexander Simon, Takahiro Fujjoka, 2014, Sodium hydroxide production from sodium carbonate and bicarbonate solutions using membrane electrolysis: a feasibility study

### Malaysia Bio-Mass Power Plant 40MW

Input parameters		
Work Start Year	2018	Years
Site and Contry for Project	Malaysia	
Location of Bio-Mass Plant	Green Field	<--Green Field, Brown Field
Operation Years	2021	Years
Sensitivity of Golobal Financial Crisis	0	Years- Active Crisis Year, Otherwise = 0
Data centre requires:	40,000	kW electricity
Demand profile:	constant	
Tier 1 availability	99.671%	
<b>Assumptions</b>		
Efficiency of electricity conversion	36%	Bio-mass power plant(25%-36%)
Fuel Moisture Content(%)	60%	(0% to 80% for 5% multiple)
Average calorific value of fuel:	12.21	MI/kg
Average bulk volume of wood:	5.42	m <sup>3</sup> /te
Boiler type	expensive (3)	rugged (4)
Typical maintenance interval, weeks	13	4
Typical maintenance period, days	1	1.5
<b>Calculations</b>		
<b>Energy</b>		
Combustion power incl waste heat= requirement/efficiency	111,111	kW
Number of seconds in one day = 24x60x60	86,400	seconds
Energy input to combustion per day = combustion x sec/day	9,600,000,000	kJ/ day
Amount of biofuel required per day= Energy / av calorific val	786,192	kg/ day
<b>Availability</b>		
Availability = 1 - (maintenance period)/(maintenance interval)		
	Availability	Days backup power required
For expensive boiler	98.901%	4.0 days
For rugged boiler	94.643%	19.6 days
<b>Conclusion</b>		
Biomass furnace capcity	111,111	kW
Biomass could power the data centre but would require woodchip:	786	te/day
	4,259	m <sup>3</sup> /day
But even the best boiler does not have the required availability		
Backup power always required	4-20	days per year
<b>Energy yield calculations</b>		
<b>Assumptions:</b>		
Softwood is slower growing so assume half the yield poplar or willow in terms of yield per hectare per year		
Dry matter energy yield	26.21	MI/kg
Energy yield of seasonal wood	12.21	MI/kg
Crop yield	57,165	te dry matter / ha/ yr
Proportion of finished Fuels	50%	Used Fuel Propotion
<b>Calculation:</b>		
Factor for dry/seasonal weight:	0.466	te dry matter per te delivered chips
Annual mass of Fuel:	259,443	te seasonal Fuel
Annual dry mass in those chips:	120,866	te dry matter (= mass x factor)
No of hectares = te dry matter /(proportion chips x yield per ha)	4	ha required

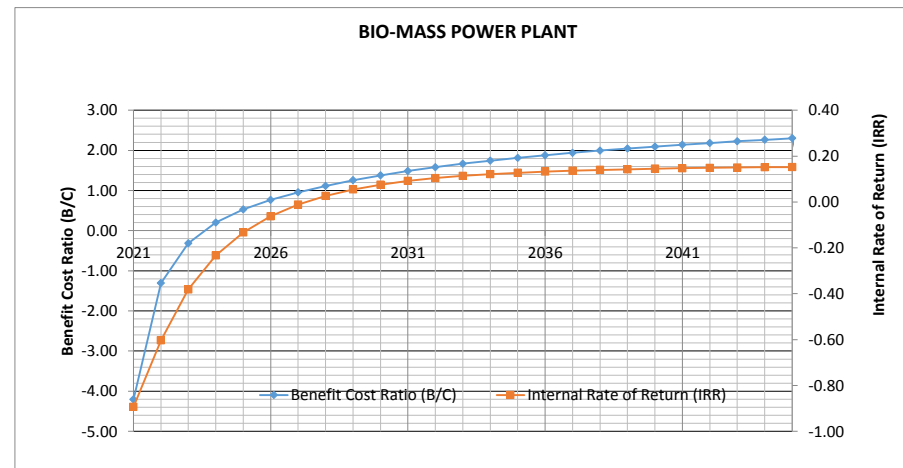


Biomass Conversion Paths



About 4.2 ha of managed conifer forest required to fuel this plant, BUT 50% of the output is high-value finished Fuels		
<b>Waste Heat Calculation</b>		
If electrical conversion efficiency is only 20%, waste heat will be available at high temp (50-60 deg)		
Assume unrecoverable losses incl heat for drying woodchip etc	5%	
Max Waste heat recovered = 1-losses - electricity prdn	59%	
Power Supplier for days of Avaible in year	330	days per year
Total energy available per year = data centre power x plant availability/electr efficiency x 330 x 24	870,329,670	kWh
Total for waste heat available per year = Energy x recovery efficiency	513,494,505	kWh
Power Sales Cost	0.11	USD/kw
Total Power Sales Cost per year	56,484,396	USD - 오천육백사십팔만사천삼백구십육달러
Space heating energy required per person (8)	24.6	kWh/person/day
Factor for for Northerly climate	1	
Assumed no of people per household	3	
Heating & hot water required for house per yeas	24,354	kWh per year
No of households to be supplied	21,085	houses
CAPEX of Equipment	Fixed bed gasifier GT ▼	130,000,000 USD
CAPEX of Civil Work		3,200,000 USD
CAPEX of Dust Extraction System		11,200,000 USD
CAPEX of Storage		3,520,000 USD
CAPEX of Flue Gas Treatment		16,800,000 USD
CAPEX of Installation		13,680,000 USD
CAPEX of Engineering		3,200,000 USD
TOTAL CAPEX of Plant	181,600,000	USD - 일억팔천일백육십만달러
Transportation Speed	60.00	km/hr
One Trailer Quantities	38.00	m <sup>3</sup> /Trailer
Distance from site to Plant	50.00	km
Raw Material Transportation Cost	10,235,065	USD/Year
Annual OPEX of Equipment	11,804,260	USD - 일천일백팔십만사천이백육십달러
Aquisition Unit LAND Area	4.75	m <sup>2</sup> /kw
Aquisition Total LAND Area	190,000	m <sup>2</sup>
Unit Space Acquisition Cost	15.99	USD/m <sup>2</sup> in Malaysia
CAPEX of Area Acquisition Cost	3,038,100	USD
Initial Inflation of Raw Material Price	0	%
Annual Cost of Fuels	Food and organic waste ▼	-404,048 USD
Construction and Fabrication Period	3	Years
Interest FEE during Construction and Fabrication	18,298,430	USD
TOTAL CAPEX AND INTREST FEE DURING CONSTRUCTION	202,936,530	USD - 이억이백구십삼만육천오백삼십달러
Fund Intrest	6.5	%
Return rate on investment of Net Profit, r	1	%
Operating Periods	25	Years
Project Design Life	50	Years
Benefit Cost Ratio (B/C)	2.30	≥ 1.1 GOOD For 25Years Operating
IRR(Internal Rate of Return)	15.24%	> 0 GOOD For 25Years Operating
NPV(Net Present Value)	717,322,063	USD with Asset value of Project for 25Years

- 5. Moving grate
- 6. Boiler
- 7. Electrostatic precipitator
- 12. Fan
- 13. Stack
- 14. Bunker air extraction
- 18. Air blower
- 19. Residue silo
- 20. Bottom ash bunker



Inflation of Raw material Purchased Price	0	% , if inflation = 0, the Raw/Product Unit price shall be quoted Forecast Price, otherwise consider inflation based on Years Purchase/Sale Cost, if no consider Inflation, the value=10E-11
Inflation of Sale Power Price	0	
Income tax rate for government	18	%
Inflation of Space Acquisition	1	%
First Project residual value	116,028,511	USD after 10 Years
Second Project residual value	48,913,937	USD after 30 Years
Final residual value on Design Life	22,852,746	USD after 50 Years
<b>Net Payback Turn Over Periods</b>	<b>7.009</b>	<b>Years</b>

Years

Actual Payback turn Over Years	8Years	8Years	해 찾기
Initial Value(min 0%, max 12.5%)	8.767%	8.767%	0 Good
Limit of Initial Value	≤ 12.5%	≤ 12.5%	

End of Year	% of Return of Equity	% of Return of FUND	Return of Equity (USD)	Return of FUND(USD)	Remain Cost(USD)	Fund Interest 6.5%(USD)	OPEX(USD)	Yearly Revenue(USD)	Yearly Purchased Price(USD) of LNG W/ Inflation	Net Profit(USD)	(현재자산가치)Asset value-Residual Value(USD)	(순현재가치)Net Present Value	Benefit Cost Ratio (B/C)	(내부수익률)Internal Rate of Return (IRR)
			20% of Equity	80% of FUND										
2021	1	8.77%	3,558,093	14,232,371	202,936,530	13,190,874	22,039,325	56,484,396	-404,048	3,171,580	194,005,708	-179,695,766	-4.21	-0.89
2022	2	9.83%	3,991,042	15,964,166	185,146,065	12,034,494	22,039,325	57,049,240	-408,089	2,811,207	185,406,534	-156,999,962	-1.31	-0.60
2023	3	10.90%	4,423,990	17,695,961	165,190,858	10,737,406	22,039,325	57,619,732	-412,169	2,570,880	177,241,690	-132,730,240	-0.32	-0.38
2024	4	11.97%	4,856,939	19,427,756	143,070,907	9,299,609	22,039,325	58,195,929	-416,291	2,450,645	169,476,952	-106,780,643	0.20	-0.23
2025	5	13.03%	5,289,888	21,159,550	118,786,212	7,721,104	22,039,325	58,777,889	-420,454	2,450,550	162,112,325	-79,048,797	0.53	-0.13
2026	6	14.10%	5,722,836	22,891,345	92,336,774	6,001,890	22,039,325	59,365,667	-424,659	2,570,642	154,947,912	-49,435,828	0.77	-0.06
2027	7	15.17%	6,155,785	24,623,140	63,722,593	4,141,969	22,039,325	59,959,324	-428,905	2,810,969	148,183,616	-17,846,297	0.95	-0.01
2028	8	16.23%	6,588,734	26,354,935	32,943,668	2,141,338	22,039,325	60,558,917	-433,194	3,171,580	141,619,540	15,811,877	1.11	0.03
2029	9	0.00%	0	0	0	0	22,039,325	61,164,507	-437,526	32,441,420	135,455,587	51,627,480	1.26	0.05
2030	10	0.00%	0	0	0	0	22,039,325	61,776,152	-441,901	32,946,557	129,491,861	87,640,627	1.38	0.08
2031	11	0.00%	0	0	0	0	22,039,325	62,393,913	-446,320	33,456,745	123,928,265	123,849,361	1.49	0.09
2032	12	0.00%	0	0	0	0	22,039,325	63,017,852	-450,784	33,972,035	118,564,903	160,251,748	1.58	0.10
2033	13	0.00%	0	0	0	0	22,039,325	63,648,031	-455,291	34,492,478	113,401,777	196,845,868	1.67	0.11
2034	14	0.00%	0	0	0	0	22,039,325	64,284,511	-459,844	35,018,125	108,438,893	233,629,823	1.74	0.12
2035	15	0.00%	0	0	0	0	22,039,325	64,927,356	-464,443	35,549,029	103,676,253	270,601,735	1.81	0.13
2036	16	0.00%	0	0	0	0	22,039,325	65,576,630	-469,087	36,085,242	99,313,759	307,759,742	1.88	0.13
2037	17	0.00%	0	0	0	0	22,039,325	66,232,396	-473,778	36,626,816	95,151,516	345,102,001	1.94	0.14
2038	18	0.00%	0	0	0	0	22,039,325	66,894,720	-478,516	37,173,807	90,989,629	382,626,689	1.99	0.14
2039	19	0.00%	0	0	0	0	22,039,325	67,563,667	-483,301	37,726,268	87,028,001	420,331,998	2.04	0.14
2040	20	0.00%	0	0	0	0	22,039,325	68,239,304	-488,134	38,284,253	83,266,634	458,216,142	2.09	0.15
2041	21	0.00%	0	0	0	0	22,039,325	68,921,697	-493,015	38,847,818	79,705,533	496,277,348	2.14	0.15
2042	22	0.00%	0	0	0	0	22,039,325	69,610,914	-497,946	39,417,018	76,344,701	534,513,865	2.18	0.15
2043	23	0.00%	0	0	0	0	22,039,325	70,307,023	-502,925	39,991,911	73,184,142	572,923,956	2.22	0.15
2044	24	0.00%	0	0	0	0	22,039,325	71,010,093	-507,954	40,572,553	70,023,961	611,505,902	2.26	0.15
2045	25	0.00%	0	0	0	0	22,039,325	71,720,194	-513,034	41,159,001	67,064,060	650,258,003	2.30	0.15
2046	26	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2047	27	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2048	28	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2049	29	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2050	30	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2051	31	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2052	32	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2053	33	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2054	34	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2055	35	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2056	36	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00

2057	37	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2058	38	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2059	39	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2060	40	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2061	41	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2062	42	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2063	43	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2064	44	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2065	45	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2066	46	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2067	47	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2068	48	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2069	49	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
2070	50	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
	Summation	100%	100%	40,587,306	162,349,224	1,004,133,606	65,268,684	550,983,123	1,595,300,054	-11,411,610	645,769,128	67,064,060	717,322,063	2.30	0.15

ENVIRONMENTAL EMISSIONS

TYPE OF TURBINE =

11

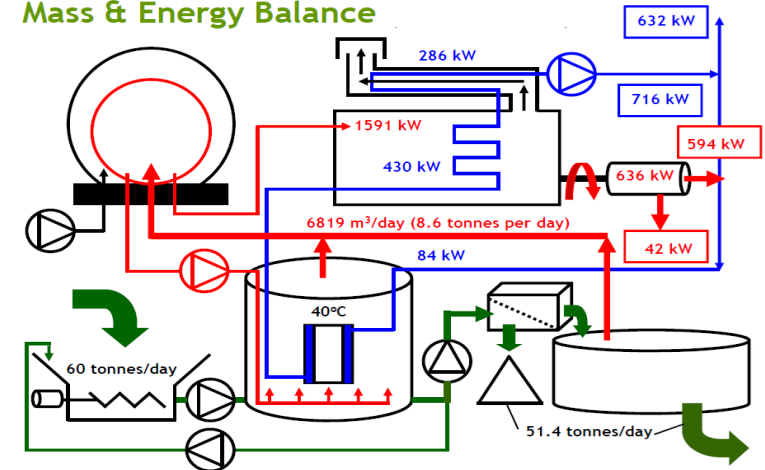
Fixed bed gasifier GT

SO2 (kg/kWh)	Nox (kg/kWh)	CO2 (kg/kWh)	SO2 (kg/day)	Nox (kg/day)	CO2 (kg/day)	SO2 (tonne/year)	Nox (tonne/year)	CO2 (tonne/year)
0.00E+00	4.20E-05	1.09E+00	0.00E+00	6.54E+01	1.70E+06	0	24	620,414

**PROCESS CALCULATIONS  
BIO-GAS PLANT**

FEEDSTOCK PARAMETERS	Type of FEEDSTOCK	Cattle Slurry	Food Waste	Pigs manure	Feedstock Total	Notes
Work Start Year	Years				2018	Years
Site and Contry for Project	Country				Malaysia	
Location of Bio-Mass Plant	Field				Green Field	←-Green Field, Brown Field
Operation Years	Years				2021	Years
DM(Dry Matter)=(Dry W/Wet W) *100	%	10%	28%	19%	19%	
ODM(Organic Dry Matter)=(Dry W-Dry Ash W)/Dry W(g)*100	%	80%	92%	83%	87%	
Inert	%	20%	8%	17%	13%	
CH <sub>4</sub>	%	55%	56%	68%	61%	
Density of CH <sub>4</sub> for 1 kmol of a perfect gas 22.4m <sup>3</sup>	kg/m <sup>3</sup>	0.71	0.71	0.71		
Density of biogas	kg/m <sup>3</sup>	1.27	1.26	1.12		CO <sub>2</sub> has a density of 1.96kg/m <sup>3</sup>
BMP(Bio-Methane Potential)	m <sup>3</sup> CH <sub>4</sub> /tonneODM	250	178	445	278	
Specific Gravity of CH <sub>4</sub>	-	1.06	1.05	0.93	1.01	
Feedstock Unit Weight	kg/m <sup>3</sup>	942	840	888	890	
Supply of Feedstock Volume per day	m <sup>3</sup> /day	500	500	500	1,500	
Mass	tonne/day	471.2	420.0	444.1	1335.3	
Volume	m <sup>3</sup> /day	444.4	400.0	477.5	1321.8	= mass / SG.
Mass	tonne/yr	171,988	153,300	162,107	487,395	
Dry matter	tonne/day	47.1	117.6	86.2	250.9	= mass x %DM
Organic Dry Matter	tonne/day	37.7	108.2	71.4	217.3	= DM x %ODM
Methane Production	m <sup>3</sup> /day	9,424	19,258	31,777	60,460	= ODM x BMP
Biogas Production	m <sup>3</sup> /day	17,135	34,383	47,078	98,595	= CH <sub>4</sub> / %CH <sub>4</sub>
<b>DIGESTER CAPACITY CALCULATION</b>						
	Unit					
Mass of Feedstock	tonne/day	471.2	420.0	444.1	1,335.3	
Volume of Feedstock	m <sup>3</sup> /day	444.4	400.0	477.5	1,321.8	
Organic Dry Matter	tonne/day	37.7	108.2	71.4	217.3	
Digester Capacity	m <sup>3</sup>	430	85	85	600	
Hydraulic Retention Time	day	0.9	0.2	0.2	0.4	= Digester Capacity / Feedstock Volume
ORL(Organic Loading Rate)	kg/m <sup>3</sup> day	87.7	1272.8	840.1	362.2	= Organic Dry Matter * 1000/ Digester Capacity
<b>ENERGY BALANCE</b>						
Methane Production	m <sup>3</sup> /day	9,424	19,258	31,777	60,460	
Energy Value of Biogas	MJ/day	336,437	687,517	1,134,457	2,158,410	= CH <sub>4</sub> * 35.7
Energy Value of Biogas	kWh/day	93,455	190,977	315,127	599,558	= MJ / 3600
Energy Value of Biogas	kW	3,894	7,957	13,130	24,982	= kWh / 24
Biogas for Boiler	%	5%	5%	5%	5%	
Biogas for CHP	%	90%	90%	90%	90%	
Biogas Flared	%	5%	5%	5%	5%	
Heat Efficiency of Boiler	%	85%	85%	85%	85%	
Electrical Efficiency of CHP	%	30%	30%	30%	30%	

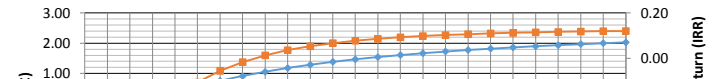
**Mass & Energy Balance**





Heat Efficiency of CHP	%	55%	55%	55%	55%	= 85% - Electrical Efficiency
<b>Energy Production</b>						
Heat Production from Boiler	kW	165	338	558	1,062	= Energy Value * Boiler% * Boiler Efficiency
Heat Production from CHP	kW	1,928	3,939	6,499	12,366	= Energy Value * CHP% * CHP Heat Efficiency
Total Heat Production	kW	2,093	4,277	7,058	13,428	
Total Heat Production	kWh/day	50,232	102,650	169,381	322,263	= kW * 24
Electricity Production	kW	1,051	2,148	3,545	6,745	= Energy Value * CHP% * CHP Electrical Efficiency
Electricity Production	kWh/day	25,233	51,564	85,084	161,881	
<b>Digester Heat Input</b>						
Temperature of Feedstock	°C	10	25	15	16	
Temperature of Digester	°C	40	40	40	40	
Heat Input to Feedstock	MJ/day	59,230	26,397	46,522	132,149	= Mass * Delta T * 4.19
Heat Input to Feedstock	kW	686	306	538	1,530	= MJ * 1000 / 3600 / 24
Digester Surface Area	m <sup>2</sup>	315	107	107	394	Assumes Height = Diameter
Thermal Conductivity	W/m <sup>2</sup> °C	0.35	0.35	0.35	0.35	Assumes 100mm of Mineral Wool
Outside Air Temperature	°C	5	5	5	5	
Digester Heat Loss	kW	4	1	1	5	= Tank Area x Delta T x Conductivity / 1000
Digester Heat Loss	MJ/day	334	113	113	417	= MJ * 1000 / 3600 / 24
Total Digester Heat Input	MJ/day	59,564	26,510	46,636	132,566	= Heat to Feedstock + Heat Loss
Total Digester Heat Input	kW	689	307	540	1,534	= MJ * 1000 / 3600 / 24
Digester Heat : Available Heat	%	32.9%	7.2%	7.6%	11.4%	
<b>Energy Balance</b>						
Electricity Production	kW	1,051	2,148	3,545	6,745	
Digester Electricity Consumption	kWh/day	1,009	2,063	3,403	6,475	
Digester Electricity Consumption	kW	42.1	85.9	141.8	269.8	= kWh / 24
Reduced Digester Electricity Output Ratio	%	4.00%	4.00%	4.00%	4.00%	
Total Digester Electricity Output for Sale	kW	1,009.3	2,062.6	3,403.4	6,475.2	
Heat Production	kW	2,093	4,277	7,058	13,428	
Total Digester Heat Input	MJ/day	59,564	26,510	46,636	132,566	
Total Digester Heat Input	kW	689	307	540	1,534	= MJ * 1000 / 3600 / 24
Digester Heat : Available Heat	%	32.94%	7.17%	7.65%	11.43%	
<b>MASS BALANCE</b>						
Mass of Feedstock	tonne/yr	171,988	153,300	162,107	487,395	
Volume of CH <sub>4</sub>	m <sup>3</sup> /yr	3,439,760	7,029,234	11,598,785	22,067,779	
	mmNcfd	0.332805419	0.680096067	1.122211589	2.135113075	
	mmscfd	0.351758125	0.718826388	1.186119641	2.256704154	
Volume of CO <sub>2</sub>	m <sup>3</sup> /yr	2,814,349	5,520,452	5,584,600	13,919,401	= Biogas - Methane
Mass of CH <sub>4</sub>	tonne/yr	2,442	4,991	8,235	15,668	= CH <sub>4</sub> * 0.71 / 1000
	MTPA	0.00244223	0.004990756	0.008235137	0.015668123	
Mass of CO <sub>2</sub>	tonne/yr	5,516	10,820	10,946	27,282	= CO <sub>2</sub> * 1.96 / 1000
Mass of Biogas	tonne/yr	7,958	15,811	19,181	42,950	
Mass of Digestate	tonne/yr	164,030	137,489	142,926	444,445	= Feedstock Mass - Biogas Mass

BIO-GAS POWER PLANT



Mass Reduction	tonne/yr	7,958	15,811	19,181	42,950	
% Mass Reduction	%	4.6%	10.3%	11.8%	8.8%	
<b>CAPEX and OPEX</b>						
Unit CAPEX of Biogas Construction	USD/MW	8,701,145	8,701,145	8,701,145	8,701,145	
Total CAPEX of Biogas Construction	USD	9,148,079	18,694,325	30,847,096	58,689,501	
Total OPEX of Biogas Construction	USD/yr	690,173	1,410,386	2,327,247	4,427,806	
Unit Acquisition LAND Area	m <sup>2</sup> /MW	2,200	2,200	2,200	2,200	
Total Acquisition LAND Area	m <sup>2</sup>	2,313	4,727	7,799	14,839	
Unit Space Acquisition Cost	USD/m <sup>2</sup>	16	16	16	16	in Malaysia
Total Acquisition LAND Cost	USD	36,985	75,580	124,712	237,277	
Construction and Fabrication Period					<b>3</b>	Years
Interest FEE during Construction and Fabrication					<b>5,768,495</b>	USD
<b>TOTAL CAPEX AND INTREST FEE DURING CONSTRUCTION</b>						
					<b>64,695,273</b>	USD - 육천사백육십구만오천이백칠십삼
Purchase Cost of Feedstock material	USD/year	25,798	22,995	24,316	73,109	
Transportation Speed	km/kr	60	60	60		
Distance from Plant to One Trallier Quantities	km	20	30	10		
Transportation Cost	USD/year	358,554	479,391	168,977	1,006,921	
Costs Waste Disposal	USD/year	-266,874	-545,364	-899,893	-1,712,130	
Cost Unit Electricity	USD/kwh	0.2	0.2	0.2	0.2	
Total Sales of Electricity	USD/yr	2,976,130	4,151,158	6,908,371	14,032,749	
<b>FS Information and Results</b>						
Fund Intrest	%				6.5%	
Return rate on investment of Net Profit, r	%				1.0%	
Operating Periods	Years				25	Years
Project Design Life	Years				50	Years
Benefit Cost Ratio (B/C)	-				2.03	≥ 1.1 GOOD For 25Years Operating
IRR(Internal Rate of Return)	%				12.06%	> 0 GOOD For 25Years Operating
NPV(Net Present Value)	USD				156,142,371	USD with Asset value of Project for 25Years
Inflation of Raw material Purchased Price	%				0.0%	
Inflation of Sale Power Price	%				0.0%	
Income tax rate for government	%				18.0%	
Inflation of Space Acquisition	%				1.0%	
First Project residual value	USD				95,264	USD after 10 Years
Second Project residual value	USD				51,802	USD after 30 Years
Final residual value on Design Life	USD				34,560	USD after 50 Years
<b>Net Payback Turn Over Periods</b>	<b>Years</b>				<b>8.012</b>	<b>YEARS</b>



End of Year	% of Return of Equity	% of Return of FUND	Actual Payback turn Over Years		Return of Equity (USD)	Return of FUND(USD)	Remain Cost(USD)	Fund Interest %(USD)	OPEX(USD)	Yearly Revenue(USD)	Yearly Purchased Price(USD) of LNG W/ Inflation	Net Profit(USD)	[현재 자산가치] Asset value-Residual Value(USD)	[순현재가치] Net Present Value	Benefit Cost Ratio (B/C)	[내부수익률] Internal Rate of Return (IRR)
			9Years	8.313%												
1	8.31%	8.31%	9Years	8.313%	1,075,644	4,302,575	64,695,273	4,205,193	4,427,806	15,744,879	1,080,030	652,454	56,069,183	-58,141,727	-4.99	-0.91
2	9.01%	9.01%	8.313%	8.313%	1,166,151	4,664,604	59,317,054	3,855,609	4,427,806	15,744,879	1,080,030	549,688	53,545,753	-51,947,971	-1.72	-0.64
3	9.71%	9.71%	≤ 11.111%	8.313%	1,256,658	5,026,633	53,486,299	3,476,609	4,427,806	15,744,879	1,080,030	476,283	51,149,235	-45,451,327	-0.62	-0.42
4	10.41%	10.41%	≤ 11.111%	8.313%	1,347,165	5,388,662	47,203,008	3,068,196	4,427,806	15,744,879	1,080,030	432,240	48,869,622	-38,630,416	-0.05	-0.28
5	11.11%	11.11%	≤ 11.111%	8.313%	1,437,673	5,750,691	40,467,180	2,630,367	4,427,806	15,744,879	1,080,030	417,559	46,706,914	-31,464,583	0.31	-0.18
6	11.81%	11.81%	≤ 11.111%	8.313%	1,528,180	6,112,720	33,278,817	2,163,123	4,427,806	15,744,879	1,080,030	432,240	44,602,657	-23,933,893	0.56	-0.11

7	12.51%	12.51%	1,618,687	6,474,749	25,637,917	1,666,465	4,427,806	15,744,879	1,080,030	476,283	42,615,305	-16,019,108	0.76	-0.06
8	13.21%	13.21%	1,709,194	6,836,778	17,544,481	1,140,391	4,427,806	15,744,879	1,080,030	549,688	40,686,406	-7,701,678	0.92	-0.02
9	13.91%	13.91%	1,799,702	7,198,807	8,998,508	584,903	4,427,806	15,744,879	1,080,030	652,454	38,874,411	1,036,278	1.05	0.01
10	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	37,120,868	10,211,982	1.18	0.04
11	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	35,484,229	19,296,837	1.29	0.05
12	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	33,906,043	28,291,743	1.38	0.07
13	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	32,386,309	37,197,591	1.47	0.08
14	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	30,925,027	46,015,262	1.54	0.09
15	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	29,522,197	54,745,629	1.61	0.09
16	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	28,236,272	63,389,557	1.67	0.10
17	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	27,008,799	71,947,902	1.73	0.10
18	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	25,781,326	80,421,510	1.78	0.11
19	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	24,612,305	88,811,222	1.82	0.11
20	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	23,501,737	97,117,867	1.86	0.11
21	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	22,449,621	105,342,268	1.90	0.11
22	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	21,455,957	113,485,239	1.94	0.12
23	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	20,520,745	121,547,587	1.97	0.12
24	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	19,585,533	129,530,109	2.00	0.12
25	0.00%	0.00%	0	0	0	0	4,427,806	15,744,879	1,080,030	10,218,616	18,708,773	137,433,597	2.03	0.12
26	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
27	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
28	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
29	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
30	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
31	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
32	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
33	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
34	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
35	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
36	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
37	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
38	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
39	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
40	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
41	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
42	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
43	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
44	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
45	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
46	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
47	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
48	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
49	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
50	0.00%	0.00%	0	0	0	0	0	0	0	0	0	0	0.00	0.00
Summatio	100.00%	100.00%	12,939,055	51,756,218	350,628,537	22,790,855	110,695,160	393,621,978	27,000,760	168,136,738	18,708,773	156,142,371	2.029263815	0.120644117